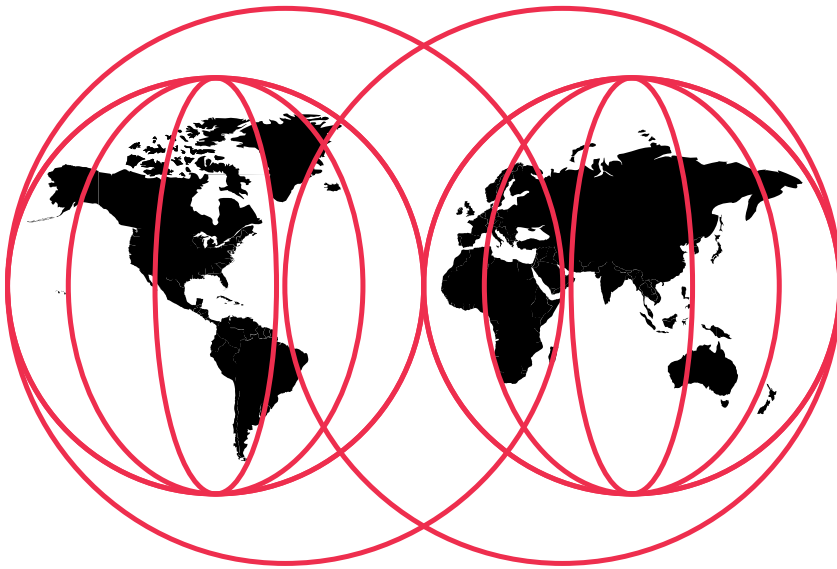


A Roadmap for Deploying Domino in the Organization

Marion Hawker, Doug Browning, Heather Gillbanks, Sue Nunn, Jan Seuri, Leon Sienkiewicz



International Technical Support Organization

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International Technical Support Organization

A Roadmap for Deploying Domino in the Organization

October 1999

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First Edition (October 1999)

This edition applies to Lotus Domino Release 4.x and Release 5.x.

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Contents

Preface	xv	Document Management	13
The Team That Wrote This Redbook	xvi	Conferencing and Real-Time Collaboration	13
Comments Welcome	xviii	User Considerations	14
Part One. Business Evaluation and Decision	1	Requirements for Mobile Users	14
1 What the Organization Wants and Needs	3	Roaming Desktop	14
Terminology	4	Training	14
General Business Considerations	4	Internet and Intranet	15
Return on Investment (ROI)	5	Access to the Internet	15
Leveraging Current Investment	6	Creating an Internet site or an Intranet	15
Corporate Culture	6	Security Requirements	16
Time Scales	7	How Sensitive Is the Data?	16
Service Level Agreements	7	Passwords	16
Requirements for Conducting Electronic Business (e-business)	8	Access from Outside	16
Centralized or Distributed	8	Laptop Security	17
Legal Constraints	9	Summary	17
Language Support	9	2 What Domino Is and What It Is Not	19
Mail	9	Executive Overview	19
Choice of a Robust and Feature-Rich Product	9	Who Uses Domino?	20
Migration from Other Mail Systems	10	What Domino Is	21
Coexistence with Other Mail Systems or Gateways	10	High Return on Investment (ROI)	21
Applications and Collaboration	11	Strong Enterprise Messaging	22
Quick Wins	11	Reliable	24
Knowledge Management	12	Scalable	24
Workflow	13	Manageable	25
		Application Development	26

Collaboration and Knowledge Management	26
Conferencing and Real-Time Collaboration	29
Workflow	29
Document Management	30
Mobility	30
Internet and Intranet Integration	31
Integration with Back-End Data	34
Secure	35
Well Supported	35
Multi-Language	35
What Domino Is Not	36
Just an E-mail Package	36
Transaction Processing/ Record Locking	36
Relational Database Management System (RDBMS) or Real-Time	36
A Heavy Reporting Tool	36
For Heavy Number Crunching	36
A Full-Featured Word Processor	37
Summary	37

Part Two. Technical Evaluation and Decision 39

3 Evaluating Your Current Environment 41

Computer Hardware and Software	41
The Physical Server Machines	42
The Physical Workstation Machines	42
The Physical Network Backbone	43
Software Considerations	44
Business Organization	46
Summary	47

4 Choosing a Domino Server Platform 49

What Are My Platform Choices?	49
Existing Infrastructure	50
Current Investment	50
Skills	50
Performance and Scalability	51
Bigger Is Better?	51
Few versus Many	51
Number of Domino Servers	52
Scalability	52
Other	54
Domino R5 Performance Aspects	54
Sources of Information	54
Reliability and Availability	55
Distributed versus Centralized	56
Network Bandwidth Considerations	56
Considering Your Business Model	56
Planning for the Future	56
Combining Platforms	57
Cost	57
Large Platform versus Small Platform	57
Total Cost of Ownership Reports	57
Industry Presence	58
Add-on Tool Support	58
Tying it All Together	59
Summary	61
5 Choosing a Client 63	
One Desktop Client	64
Making Data Available to Outside Organizations	64
Do You Already Have Browsers Installed?	65

User Training	65	Policies and Procedures	83
Platform Support	66	Production versus Experimentation	83
Cost Considerations	66	Evaluating the Results	84
Replication	67	Summary	85
Standard Browsers	67	Part Three. Notes/Domino	
Performance Considerations	68	Design and Deployment	87
Supported Features	68	7 Designing a Hardware	
Security Considerations	69	Infrastructure	89
How Do I Decide?	70	Determining What You Need	90
Summary	71	Elements of the Drawing	90
6 Setting up a		An Example	91
Notes/Domino Pilot	73	Knowing the Domino	
Why Should I Set up a Pilot?	73	Infrastructure Elements	92
A Chance to Learn	73	Consulting an Expert	93
Getting Feedback	75	Sizing the Hardware	93
Proof of Concept	75	Sources of Information for	
Gathering Information for the		All Platforms	94
Rollout Plan	75	Sources of Information for NT	95
Building a Pilot Deployment Team	76	Sources of Information for AS/400	95
Why You Need a Pilot Team	76	Sources of Information for S/390	96
Who Should Be on the Pilot Team	76	Sources of information for RS/6000	96
Developing a Pilot Deployment Plan		Sources of Information for OS/2	96
and Strategy	77	Sources of Information for Solaris	97
Defining the Objectives	78	Sources of Information for HP-UX	97
Involve Departments with an Interest	78	Making the Purchasing Decision	97
Limit the Size of the Pilot	79	The First Step	97
Make the Pilot a Realistic Experience	79	The Second Step	98
Rolling out the Servers and Clients	80	The Third Step	99
Number of Servers	80	Planning for Growth	101
Number of Users per Server	81	Increasing the Complexity	102
Procuring Hardware	81	Hardware Planning for	
Security	82	Large Deployments	102
Support	82	Clustering and	
Backup	82	Partitioning Considerations	103

Presenting the	
Hardware Recommendation	104
Making Adjustments	106
Summary	107
8 Defining Standards	109
Are Standards So Important?	110
What to Consider	110
Hardware and Software	111
Hardware	111
Software	112
Domino Directory Structures	113
Notes/Data Directory	113
ID Files	114
Mail Servers	114
Notes Application Servers	115
Web Application Servers	116
Naming Conventions	117
Domains	118
Certifiers	118
Servers	120
Network and Port Names	121
User Names	122
Group Names	122
Cluster names	123
Default Access Control Lists (ACLs)	124
Default	124
Reader	124
Editor	125
Designer	125
Manager	125
Maximum Internet Name and Password	126
Mail File Sizes	126
Summary	127

9 Designing a Messaging Infrastructure	129
Overview of the Domino R5	
Messaging Architecture	129
Mail Clients	130
Domino Server	133
Directory Services of Domino	136
Domain Name Service	137
Implementing Mail Routing	138
Server Topologies	138
Mail Routing Documents in the Domino Directory	139
Notes Routing and Required Documents	144
SMTP Routing Scenarios	146
Four Types of Mail Routing	151
Customizing and Enhancements	152
Multiple Mail Boxes	152
Shared Mail	153
Mail Filtering Options	154
Anti-Spam Controls	156
Restricting Who Can Use Your System to Relay Internet Mail	157
Mail Monitoring	157
Controlling Message Transfer	157
Summary	158
10 Designing a Calendaring Infrastructure	159
Introduction	160
Planning Considerations	160
A New Look-and-Feel of the Calendar View	161
Owner Actions and Participant Actions Buttons	162
Calendar Preferences	162
Calendar Printing	163

Group Calendar	164	What Are Your Objectives?	178
Holiday Definitions	165	Managing Domino Databases Using an Application Registry	179
Improved Invitation Management	166	Why Use a Domino Application Registry	179
Users Who Are Part of the Same Domino Mail Server and Domain	166	What Is an Application Registry	180
Users Located in Different Domino Domains	166	Implementing a Successful Replication Strategy	183
Users with Different Scheduling Applications	167	Defining Roles and Responsibilities	185
Free Time Search in Clustered Mail Servers	167	Application Owner	185
Creating a Meeting Invitation	168	Application Developer	187
Resource Management	168	Domino Database Administrator	187
Enhanced Alarm Support	169	Application Reviewer	189
Integrated Task Management	169	Pilot Users	189
Improved Performance	169	The Importance of Test and Development Domains	190
Synchronizing with Personal Information Managers (PIM)	169	Standards for Test or Development Domains	190
Summary	170	Some Final Words of Advice	191
11 Designing an Application Infrastructure	171	Summary	192
The Life Cycle of a Domino Database	172	12 Designing a Client Infrastructure	193
Starting with an Idea	172	Installing the Notes Client	193
Documenting the Requirements	172	Hardware and Protocol Requirements	193
Obtaining Approval to Proceed	173	Software Requirements	194
Designing the Application	174	Additional Requirements for Mobile Users	194
Developing the Application	174	Installation	195
Reviewing the Application Design	175	Configuring the Notes Client	199
Piloting the Application	175	The Workstation Setup	199
Moving the Application into Production	176	Additional Considerations for Mobile Users	205
Making Modifications to the Application	176	Maintaining the Notes Desktop	206
Sunsetting the Application	177	Domino User Setup Profiles	206
Thinking About Database Development Standards	177	A Corporate Home Page	206

Configuring and Maintaining Browsers	207	Security in Information Technology	224
Using a Jump Page	207	Protection	224
Other Tools for Configuring and Managing Browsers	208	Integrity	225
Summary	209	The Domino Security Model	225
13 The Internet	211	Physical Security	225
Why Should I Use Internet Standards?	211	Secure Room	225
Easy to Connect to Other Companies	211	Hardware Locks and Passwords	226
Ease of Integration Between Products	212	Operating System Level	226
Choices	213	Lotus Domino Level	226
Expanded Reach: e-Business	213	Network Security	226
Intranets	213	Firewalls in General	226
The Internet Side of the		Packet Filtering	227
Domino Server	214	Services and Default Ports	227
The HTTP Server Task	214	Application Proxy	227
SMTP Mail Routing	215	Domino Passthru NRPC Proxy	228
LDAP	216	Circuit-Level Proxy (Socks Server)	230
The DIIOP Server Task	216	The Demilitarized Zone (DMZ)	231
The NNTP Server Task	216	Directory Links	232
The POP3 Server Task	217	Remote Control	232
Secure Sockets Layer (SSL)	217	Virus Protection	232
The Internet Cluster Manager	218	Internet Security	233
Domino for IIS	218	Name and Password Authentication	233
Domino Certificate Authority	219	X.509 Certificate	235
The IMAP Server Task	219	Certificate Authority (CA)	235
The Internet Side of the Notes Client	220	Secure Socket Layer (SSL)	235
Mail	220	Secure E-mail Messaging with S/MIME	236
Web Pages	221	Telnet	236
Directories	221	FTP	237
Newsgroups	221	ID File Security	237
Summary	222	User ID, Server ID, Certifier ID	237
14 Security	223	Certificates	238
Introduction	223	Validation and Authentication	238
Choosing a Security Policy	224	Password Protection	239

User ID and Password Recovery	240	15 Training	261
Assigning Multiple Passwords to Server and Certifier IDs	240	Understanding the Need to Train	262
Cross-Certification	241	Benefits of Training	262
Encryption and Electronic Signatures	241	Danger of Not Training	262
Server Security	244	Devising a Training Plan	263
Only Allow Server Access to Users Listed in this Directory	245	Analyzing the Training Needs	263
Access Server Field	245	Deciding When to Train	263
Not Access Server Field	245	Describing the Training Goals	265
Deny Notes User Access to all Servers in a Domain	245	Basic Users	266
Anonymous Server Access	246	Power Users	266
Allow Anonymous Notes Connections Field	246	Mobile and Remote Users	267
Access to a Specific Network Port	246	Executives	267
Creation of Databases and Replicas	247	Administrators	268
Database Monitoring	247	Application Developers	268
Passthru	247	Help Desk Personnel	269
Server Agents	248	Training Team	269
Browsers that Use Java and JavaScript	249	Acceptable Use Policies	270
Browser Access to Server Files	249	Choosing a Training Method	271
Application Security	250	Types of Training	271
Access Control List (ACL)	250	Deciding Who Will Provide the Training	272
Application Design Element Security	255	In-House Training	272
Form Access Control	255	Other Options	272
Document Access Control	256	Developing a Training Model	273
Field Access Control	257	Developing the Courseware	273
Workstation Security: Execution Control List (ECL)	257	Implementing the Courseware	274
Creating a Workstation ECL	258	Evaluating the Training	274
Opening the Workstation ECL	259	Sample Training Plan	275
Summary	260	Summary	275
		16 Preparing for the Rollout	277
		Assembling the Rollout Team	277
		Criteria for Team Members	277
		Roles to Include	278
		Sizing the Team	279

Creating a Rollout Plan	280	The Importance of Change Control	307
Must-Do Items	280	Adopting a Change Control Process	308
Potential Pitfalls	281	Integrating Domino into a Support Infrastructure	309
Reviewing Your Design Document	281	Looking at the Help Desk	309
Reviewing Success Criteria	281	Ensure Early Involvement	310
Developing a Rollout Plan	282	Putting Staff in Place	310
Other Issues to Consider	286	Education and Training	310
Summary	288	Tools and Resources	311
17 Producing Documentation	289	Contacting the Help Desk	311
Formalizing the Deployment Plan	290	Hours of Operation	313
Creating Policies and Procedures	292	On-Call and After-Hours Support	313
Policies	292	Level of Access	313
Work Instructions	293	Use of “Champions/Power Users” as First-Line Support	313
Procedures	293	Communicating Your Problem Resolution Process to All Users	314
Sample Procedure Outline	294	Points of Escalation	314
Help Desk Handbook	295	What If You Cannot Fix the Problem?	314
Sample Help Desk Handbook Table of Contents	296	Building Your Support Teams	315
Electronic Documentation	296	Roles and Responsibilities	315
Ongoing Documentation Needs	298	Developing a Communication Strategy	319
Documenting Special Cases	299	Communicating within the Organization	319
Summary	300	Communications between Support Teams	322
Part Four. Systems Management	301	Summary	323
18 Support and Communications	303	19 Administering Your Domino Environment	325
Setting up Service Level Agreements (SLAs)	304	Managing Your Notes User Community	326
What Does It All Mean?	304	Setting Up New Users	326
What Should an SLA Include?	305	Managing User IDs	330
Assessing the Impact of a Problem	305	User Name Changes and Recertifications	331
Defining Target Resolution Times and Severity Levels	306		
Negotiating Maintenance Windows	306		

The Termination Process	332	Tools for Monitoring Domino	352
Contractor IDs	332	What Domino Can Do	352
Managing Your Domino Server		Third-Party Products	358
Infrastructure	333	Virus Checking	361
Routine Maintenance Procedures	333	Reporting	362
Operations Checklists	334	Why You Should Prepare Reports	362
Tools to Make Your Life Easier	336	What You Should Report On	363
R5 Administration Client	337	Some Guidelines	363
Web Administrator	338	How to Store and Access the Information	364
Server Configuration Document	339	Summary	365
Program Documents	339	21 Performance	367
Server Tasks	340	General Performance Considerations	367
Domino System Databases	340	Basics of Performance	368
Documentation	341	Domino Server Performance	369
Resources and References	342	Domino Tools for Server Performance Planning and Measuring	369
Summary	342	CPU Considerations	371
20 Monitoring and Reporting	343	Memory Considerations	371
Why Monitoring Is Important	343	Disk Input/Output (I/O) Considerations	372
Determining the Requirements	344	Network Considerations	372
Existing Infrastructure	344	Don't Run Things You Don't Need	373
Number of Domino Servers	344	Don't Use Excessive Logging	375
Service Level Agreement Commitments	345	Mail Performance	375
Organizational Structure	345	Domino Directory	378
Centralized or Distributed Management	345	Transaction Logging	379
Going Global	346	Agents	379
Network Capacity	346	HTTP Performance	380
Support Structure	346	Load Balancing	381
Reporting Requirements	347	Semaphores	381
What to Monitor?	347	Client Mix	383
Monitoring Tasks Outside of Domino	347		
Monitoring Domino	348		

Notes Client Performance	383	Neutralizing Viruses	407
Workstation Specification	383	Choosing Anti-Virus Software	408
Workstation Configuration	384	Data Decay	409
Database Subscriptions	384	Recovery	410
Database Performance	385	Hard Disk Recovery	411
Heavily-Used Databases	385	Restoring Domino	412
Database Design	386	Retrieval of ID Files	413
Make Use of the New R5		Summary	414
ODS Features	388	23 Troubleshooting	415
Six Top Performance Tips	390	Steps to Troubleshooting	
Summary	390	a Problem	415
22 Contingency Planning	391	Defining the Problem	415
Recovery Planning	391	Determining the Cause	417
Issues to Consider	392	Finding Possible Solutions	419
What Can Really Go Wrong?	393	Implementing the Best Solution	420
Documenting a Recovery Plan	393	How to Prepare for	
Preventing Disaster	395	Potential Problems	421
Is Recovery Planning Worth It?	396	Tools and Utilities	422
Backups	397	Domino Databases	422
What to Back Up	397	Domino Utilities	423
Who Should Perform Backups?	398	Operating System Logs	424
Archiving	399	Operating System Utilities	424
Replication	399	Third-Party Tools	424
Types of Backup Systems	399	Sources of Information	425
Using Backup Methods		Internal Databases and Reports	425
with Domino	401	Online Help	425
Tivoli Data Protection for		Books	426
Lotus Domino	402	Magazines	426
Power Protection	403	Web Sites	426
The Problems with Power	403	Support Providers	429
Calculating UPS Size	404	Summary	429
Protecting against Viruses	405		
What Is a Virus?	406		
Identifying Virus Threats	406		

Part Five. Growing and Changing	431
24 Upgrading and Consolidating	433
Upgrading or Consolidating	
Server Hardware	433
Performance	433
Growth and Expansion	434
Consolidating Your Server Infrastructure	434
A Change in Policy	436
Upgrading Operating System Software	436
Upgrading Domino	436
Minor Releases (QMRs and QMUs)	436
Planning a Major Release Upgrade	437
Implementing a Major Release Upgrade	443
Regression	455
Summary	457
25 Expanding the Reach of Domino	459
Extranets: Communicating with Other Companies	460
What Is an Extranet?	460
How Does an Extranet Work?	462
Benefits of Extranets	463
What to Watch Out For	463
Summary	463
Fax for Domino	464
Benefits of a Fax Server	464
Notes/Domino Integration	465
Advanced Features	465
How It Works	466
Fax for Domino System Requirements	467
Sizing a Fax Server	468
Further Information	469
Summary	469
Sametime	470
Using Sametime	470
Why Consider Using Sametime	471
Summary	471
Domino.Doc	472
What Is Domino.Doc?	472
Domino.Doc Features	473
Architecture	474
Planning for Domino.Doc	475
Installing Domino.Doc	477
Benefits of Domino.Doc	478
Summary	478
QuickPlace	478
Workflow	479
Building a Workflow	480
Summary	480
Integrating with Back-End Data	481
Why Integrate Back-End Data?	481
Ways to Integrate Back-End Data	482
Summary	484
Summary	484
26 The Changing Enterprise	485
Company Mergers: Basic Considerations	485
What You Need to Know about IT Mergers	485
Planning during a Merger	486
Merging Domino Infrastructures	487
Merger Strategies	488
Tips and Tricks of Implementation	492
Summary	493

Special Notices 495

Related Publications 499

International Technical Support
 Organization Publications 499

Redbooks on CD-ROMs 501

Other Publications 502

How to Get ITSO Redbooks 503

IBM Intranet for Employees 503

IBM Redbook Fax Order Form 505

Index 507

ITSO Redbook Evaluation 511

Preface

This redbook is a guide for decision makers and technical people who need a thorough understanding of all aspects relating to a Lotus Domino R5 deployment in the organization. Most of the information covered in this book also applies to previous releases of Lotus Domino.

Part One introduces the issues that are important when evaluating and implementing a messaging and groupware product such as Lotus Domino. This includes defining what your organization wants and needs, and how Domino can help you accomplish your objectives.

Part Two looks at the technical evaluations and decisions you will need to make before deploying Domino in the organization. The chapters in Part Two discuss the importance of evaluating your current environment, and describe the key factors to consider when choosing a server and a client platform. Part Two finishes by presenting the stages involved in setting up a Notes/Domino pilot.

Part Three assumes that the decision has been taken to deploy Lotus Domino. This part takes you through the process of rolling out Domino in the organization. It shows you how to design hardware, messaging, calendaring, application, and client infrastructures and also provides details on the important topic of defining standards.

The following chapters in Part Three deal with the Internet side of Domino as well as with security concerns. In addition, an insight into training issues is given. Finally, Chapter 16 ties all of the preceding chapters together by discussing the creation of a rollout plan. Part Three ends by emphasizing the need for producing documentation throughout the deployment process.

Part Four explores the different aspects of managing your Notes/Domino environment once it has been established. This includes topics such as support and communications, Domino administration, monitoring and reporting, performance, contingency planning, and troubleshooting.

Part Five describes how to handle growth and change in the organization. It documents aspects relating to a hardware and software upgrade, before pointing to additional software packages that can help expand the reach of Domino. The last chapter explains what to watch out for when acquisitions or other circumstances require the merging of Domino infrastructures.

This redbook mentions a number of third-party products. By including the tools in this document, IBM/Lotus do not solely endorse the use of these products. Other products may be available that perform similar or equivalent functions.

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the IBM/Lotus Integration Center in Westlake, Texas, on behalf of the International Technical Support Organization at Lotus Development in Cambridge, Massachusetts, USA.

Doug Browning is a consultant with Norstan Consulting, a Lotus Premium Business Partner with headquarters in Charlotte, USA. He provides consulting services in Notes/Domino administration, deployment, and application development for a variety of clients. He has been working with Notes/Domino for about four years. Doug is a Certified Lotus Professional in Domino Systems Administration and Application Development as well as a Microsoft Certified Professional for Windows 95.

Heather Gillbanks is a Lotus Domino architect and application developer and an Associate at Maverick Technology Partners, LLC, in Dallas, USA. She has experience internationally and in the United States designing, planning, implementing and extending Notes/Domino networks. Prior to working with Lotus Notes, Heather specialized in Novell and Microsoft network architecture and support. Heather has also managed several large-scale Notes training projects, from curriculum development through delivery.

Sue Nunn is a Lotus Domino architect for IBM Global Services in Sydney, Australia. She has over four years of experience with Lotus Notes and Domino and has been working for IBM for the last two and a half years. Sue supports the IBM account deploying Domino to over 25000 users in 14 countries across Asia Pacific. Before joining IBM, she worked for a large insurance company specializing in Notes. Her areas of expertise include systems management and Domino infrastructure design and deployment. Sue is a Certified Lotus Professional in System Administration.

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- Rufus Woody III, IBM/Lotus Integration Center, Dallas/USA (special thanks to Rufus!)

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Part One. Business Evaluation and Decision

Chapter 1

What the Organization Wants and Needs

Since you are reading a book about Domino deployment, your company is probably already interested in deploying a solution for messaging which will also offer, either now or at a later stage, the advanced collaborative features of a groupware product. You may also be considering upgrading from an existing mail system, one which you have outgrown or which has a limited future in your organization.

However, before we discuss Domino itself, it is probably a good idea to consider what your organization wants, what it needs, and what its constraints are.

Even if you feel you have already performed this step in your organization, we recommend that you read this chapter — it covers the issues that experience has shown to be important when evaluating and implementing a messaging and groupware product.

This chapter is also intended to be product independent, and is aimed at anyone who is involved in considering a messaging/groupware implementation — be they a manager or a “techie.”

We will cover the following topics:

- Terminology
- General business considerations
- Mail
- Applications and collaboration
- User considerations
- Internet and intranet
- Security

Then in the next chapter we will explore what Domino is and what it is not, and hopefully this will help you to decide whether or not Domino is the product your organization needs.

Terminology

The term “groupware” will be used quite a lot in this chapter and the next.

Groupware is sometimes described as “e-mail with bells on” but it is much more than that. Groupware is software that enables groups of people to collaborate, even when they are geographically dispersed or are disconnected from the corporate network.

A more complete definition of groupware is “computer-based systems that support groups of people engaged in a common task or goal and that provide an interface to a shared environment.”

(Ellis, C., Gibbs, S. and Rein, G.: 1991, Groupware - Some Issues and Experiences, Communications of the ACM 34).

General Business Considerations

Why do organizations implement groupware?

“What is every major institution in the world focusing on? Re-engineering. Getting competitive. Reducing time and cost. Flattening organisations. Increasing customer responsiveness. All of these require a collaboration with the customers, with suppliers and with vendors. All the efforts, in short, depend on networking.”

(Louis V. Gerstner, IBM Chief Executive Officer: Business Week, 30 October, 1995).

As well as describing the importance of networking, this is also a good summary of the reasons why groupware has become so popular and so successful.

Most organizations are under pressure to do more with less, and are seeking a competitive edge by being faster to respond:

- In dealing with customers and suppliers
- To changes in the market
- To what their competitors are doing
- To new opportunities
- In deploying systems to achieve all of the above.

Many companies also want to leverage their internal knowledge and their investments in legacy systems, and they want the tools to then enable them to gather, access, organize, distribute, and collaborate using this information.

They often have teams which spring up quickly to collaborate on projects of short duration, and which may be geographically dispersed. They want solutions which will support this fluid way of working, and which can be put in place quickly and easily.

Many organizations are using groupware products to achieve these goals.

Return on Investment (ROI)

Many organizations have found that an investment in groupware pays for itself quickly (more details in Chapter 2) due to benefits such as:

- More accurate and timely information.
- Time and effort saved, for instance due to a reduction in the number of meetings that need to be held.
- Reduced response times to customers.
- Applications which can be developed and deployed faster.
- Reduced administrative effort at an individual level, for instance, with better messaging and calendar management tools and products such as electronic fax direct to and from the desktop.
- Reduced administrative effort across the organization. For example systems which allow employees to schedule their own meetings, book their own training, or check in their own visitors, can reduce the number of administrative staff the company requires.

When calculating Return on Investment (ROI), in addition to looking at the initial cost, you will need to calculate the Total Cost of Ownership (TCO). The TCO is what the system will actually cost to run as well as to implement. You should consider:

- Future growth implications — how much it will cost to grow and to change, and to keep the technology aligned to the business needs, how adaptable and scalable will the system be
- System management costs
- Whether you will reuse any existing assets
- License costs
- Software and hardware maintenance
- Support costs
- Training costs
- Impact on users when the system is down (low availability costs)

It is worth looking for a solution which can reduce the number of different products that are needed, both on the user's desktop, and to support and manage the infrastructure. If a common interface can be used to provide many or all of the functional requirements, this will reduce software, training and support costs.

Leveraging Current Investment

You probably have significant investment in back-end enterprise data and legacy systems, and also in the sheer knowledge that exists in your people and your business processes. You will, of course, want to leverage this.

For instance you may have requirements to connect to:

- Relational databases such as DB2 or Access
- Transaction systems such as CICS
- Enterprise Resource Planning (ERP) systems such as SAP, PeopleSoft or JD Edwards OneWorld

You may have considerable investment in hardware and software platforms and we will cover these issues in more depth later in the book. Not all organizations are homogenous in the hardware and software platforms they use to support their business. Your organization may already have invested in a variety of platforms, or if you have focused on a single platform then you will probably have a significant investment in the skills of the people who support it. So an important consideration here is the choice in platform support that a product can offer.

Corporate Culture

The existing corporate culture, and its readiness to embrace groupware is one of the key factors for a successful implementation. Cultural change, and some incentives to make that change, may be required.

Groupware is all about sharing information and collaborating. Knowledge can be a company's biggest asset. If the tendency in your organization is to hoard information rather than share it you should plan how to address this to get the most out of a groupware implementation (and also the most out of your people and your informational assets). Sometimes the reward systems in an organization can be over-biased towards individual rather than group achievement.

Important Executive level sponsorship is vital. If there is no buy-in from the top there is less chance of a successful implementation. Some organizations roll out from the top downwards, so that as each tier in the organization is included, they find that their managers are already using the technology and are expecting them to do likewise.

Another cultural factor to consider concerns the level of control over users. For example, while many organizations will impose size limits on mail data, some do resist such measures, as they have a cultural bias toward a free and easy, unrestricted environment. Also it is often the more senior managers in an organization who tend to have the most mail data, and this can sometimes inhibit IT departments from implementing proper controls.

However, most systems are easier to manage and to predict if there are some controls in place, and if these are not considered upfront they can be harder to implement later. There is also a significant cost factor in trying to cater to uncontrolled growth.

Time Scales

Your time scales may be tight but they should allow for proper planning. This may seem a little obvious, but many organizations set out with the intention of creating a controlled and limited-scope pilot project and then find themselves attempting to roll out their initial pilot to a much larger community without having designed the wider global environment. In trying to do this they frequently find that without a planned and architected infrastructure, the extended solution lacks scalability, and therefore fails to address user expectations.

Service Level Agreements

You may have to conform to Service Level Agreements (SLAs). In order to avoid jeopardizing these you should consider how robust the solution will be, and ask questions such as:

- Can this product be run 24x7?
- How can I measure performance?
- Will it be vulnerable to a single “point of failure” such as a server going down?
- What level of service does the organization need, as opposed to what would be nice?

If asked, most managers would like a 24x7 system that never goes down, but when presented with all the options and the costs, they may realize that they only actually need the full 24x7 service for certain key systems, or that they really only need to guarantee the system during office hours.

Requirements for Conducting Electronic Business (e-business)

Many companies are now seeking solutions to enable them to do e-business on either a business-to-business extranet basis, or business-to-consumer over the Internet. Key factors to consider when selecting a product will be the ability to provide:

- Security
- Scalability
- Reliability
- Throughput strengths
- Links to back-end data
- Web capabilities
- Rapid development

Centralized or Distributed

Questions to consider in the arena of centralized versus distributed systems are:

- Is the organization centrally controlled or is it decentralized and autonomous?
- Will this be reflected in who will manage what parts of the infrastructure?
- Will there be common standards?
- Where should the hardware be located?
- Where should support staff be located?
- Who will determine the overall policy?
- What are the plans for the future — for example, will more branches be opening, or will consolidation be likely?

This may be an opportunity to revisit your strategy on this. For instance, although you may now have a decentralized policy, could this be the time to invest in network bandwidth, and bring control and administration to a central point, and reduce the costs of ownership?

Conversely you may have to go for a decentralized approach because of factors such as time zone or language differences, which would increase costs if supported centrally.

In a very large or dispersed organization there may already be some pockets that have implemented, or are piloting, a new messaging or groupware system, and you will need to take those into account.

Legal Constraints

The analysis of the organization's need should include any legal requirements that exist, such as retention of data, archiving or auditing. For example, many financial institutions are legally obliged to retain information for many years, or to be able to provide audit trails if certain events arise.

Language Support

If the company is multinational you will need to consider what the requirements will be for multi-language support and different character sets, and what level of support a product offers in this area.

Mail

Initially many companies start by implementing a mail solution which can later be expanded to incorporate the advanced collaborative features of a groupware product.

The major considerations when looking at mail requirements are described in the following sections.

Choice of a Robust and Feature-Rich Product

You should consider the following:

- You will require a strong messaging backbone which is scalable and reliable.
- Calendaring and scheduling and task management features — will these be integrated, or will they require a separate product?
- Support for addressing external users (colleagues, customers or suppliers) in third-party Web-based directories like Four11 and Bigfoot. These directories, also known as White Pages, are run by independent organizations and are often populated by processes which scan for addresses on the Internet (for example in USENET news postings). They are widely used as they contain many millions of Internet mail addresses. For more information see www.four11.com or www.bigfoot.com
- Off-line mail and addressing — the ability for mobile users to work with their mail and be able to select names from the corporate mail directory while they are disconnected from the network

- What should your policy be for retaining mail data — will you require archiving facilities for old mail?
- Internet mail. There will almost certainly be a requirement to send and receive Internet mail — what support will you require for the different Internet mail standards and protocols?
- Access to mail from a browser, or over the Internet.
- User-defined rules for message routing control. For example, the ability to route all messages from a certain sender or messages which contain a certain subject header, to a particular person when you are out of the office (preferably without having to leave your PC on while you're out!).
- Options on types of mail clients, such as IMAP or POP3.

Migration from Other Mail Systems

You might be migrating from another mail system because you:

- Need to move from a non-Year 2000(Y2K) compliant mail system.
- Have outgrown your existing mail system.
- You want more from a mail system — such as integrated calendaring and scheduling or better support for your mobile workers.

You should also consider the following:

- The speed at which this migration would be feasible.
- What tools are available to migrate users and data from different messaging systems.

Coexistence with Other Mail Systems or Gateways

Factors to consider are as follow:

- Directory synchronization with other mail systems
- Message conversion
- Links to external gateways such as fax and pagers

More Information

There is more information on mail migration and coexistence with other systems in the following Domino redbooks, which can be found at www.lotus.com/redbooks or www.redbooks.ibm.com

- *Eight Steps to a Successful Messaging Migration: A Planning Guide for Migrating to Lotus Notes and Domino*, IBM form number SG24-5335, Lotus part number CT6HINA
- *The Next Generation in Messaging: Moving from Microsoft Mail to Lotus Notes and Domino*, IBM form number SG24-5152, Lotus part number CT7SBNA
- *The Three Steps to Super.Human.Software: Compare, Coexist, Migrate. From Microsoft Exchange to Lotus Domino. Part Two: Coexistence and Migration*, IBM form number SG24-5615, Lotus part number CT7QWNA
- *The Next Generation in Messaging: Moving from Novell GroupWise to Lotus Notes and Domino*, IBM form number SG24-5321, Lotus part number CT7NNNA
- *The Next Step in Messaging: Upgrade Case Studies for Lotus cc:Mail to Lotus Domino and Lotus Notes*, IBM form number SG24-5100, Lotus part number 12992

Applications and Collaboration

The following sections discuss aspects relating to applications and collaboration which you may want to consider when deciding on a groupware product.

Quick Wins

Implementing a number of smaller applications which are easy to deploy can often give greater benefit in a fraction of the time (and with less risk). To gain the greatest advantage to the business with the least effort it can be appropriate to first pick the easy-to-reach “low hanging fruit.” Once there are a number of successful showcase applications in place, the business can attempt the larger-scale projects with greater confidence and experience.

Just putting the internal telephone directory online and making it available as part of the rollout can be a quick win. Implementing a mail-to-fax gateway can be a fairly simple exercise, particularly for outgoing faxes, which pays immediate dividends as users realize how much time it saves them from standing at the fax machine retrying a busy number (and their managers quickly realize the ROI).

The ability to develop solutions quickly and deploy them easily, to stay responsive to business changes, is very important.

Knowledge Management

Many believe that the next evolutionary step in groupware is that of Knowledge Management (KM). KM has been described as “the systematic leveraging of information and expertise.”

KM is about taking the knowledge that exists not just in computer systems but also in the intellectual assets of an organization, its business activities and what is inside its employees’ heads, and applying it to directly generate positive business results.

The major themes in KM are:

- Reuse
- Respond
- Learn
- Innovate

Knowledge management is a way of taking groupware further to leverage even more from your assets. For example, when someone new joins the company, the faster that person becomes fully productive the more the company saves.

The new employee will want to know:

- “Where is the information vital to my job?”
- “Who are the people on my project and what is their expertise?”
- “How can I contribute?”

While the organization should be asking “how can we reduce the socialization time for new, eager employees?”

More Information on KM

For more details on Knowledge Management, refer to the following sources of information:

- Ernst and Young Web site www.ey.com/knowledge/
- Davenport, Thomas H. PhD. Some Principles of Knowledge Management, located on www.itmweb.com/essay538.htm#KM, Expensive Subheading.
- Davenport, Thomas H. and Prusak, Laurence. “Working Knowledge: How Organizations Manage what they Know.” Harvard Business School Press. Excerpted as: “Know What You Know,” located on www.brint.com/km/davenport/cio/know.htm

- Malhotra, Yogesh; Abdullah Al-shehri and Jeff J. Jones. National Information Infrastructure: Myths, Metaphors and Realities, located on www.brint.com/papers/nii
- Free-Press. www.free-press.com/journals/knowledge/issue1/articles8.htm
- You can also find articles, white papers and links on KM on the Lotus Web site at www.lotus.com

Workflow

You should consider the enormous benefits that workflow applications can bring. These are applications which map to real business processes and transform them by enabling them to be performed electronically, and therefore much faster and more easily, and with built-in status tracking. A simple example is an application to request and authorize travel or leave. A more advanced workflow application might be one which handles the entire purchase requisitioning and procurement processes in an organization.

Document Management

While document management is a big subject in its own right, and an in-depth discussion of it is beyond the scope of this redbook, it is an important consideration when looking at groupware solutions. Requirements you may consider are:

- Versioning
- Imaging
- Document locking
- Security
- Search capabilities

Conferencing and Real-Time Collaboration

Many companies are seeking solutions which offer features such as:

- Real-time collaboration, for example, online collaboration on documents
- Online conferencing or chat
- Distance learning

User Considerations

The following sections look at different requirements your users may have.

Requirements for Mobile Users

How much of your workforce is mobile? It is widely predicted that the percentage of workers who are mobile will grow rapidly in the next few years. For more information on this see www.software.ibm.com/ebusiness/mobile.html

Questions you should consider regarding mobile users are:

- Will they need a product that allows them to work with mail off-line, and synchronize mail and other information in the background while they continue to work?
- Will they need to use applications remotely as well as mail?
- Will they need to schedule meetings while disconnected, or “on the road?”
- What are their mail addressing needs? Do they need to store the organization’s directory locally, and how big will this be?
- Will they require support after hours?
- Do they require support for Personal Digital Assistants (PDAs)?

Roaming Desktop

Some organizations require a “roaming” desktop. This is where the user can log on to any computer in any office and expect to find their own personal desktop and mailbox. In other organizations this is not an issue as they will always use the same workstation.

Training

Consider these questions:

- What will your organizations’ training needs be?
- What level of computer competency exists in the organization?
- Will everyone need formalized, class-based training or would other types of training such as Computer Based Training (CBT) suffice for some?

- Are there local experts or “power users” in the key departments that will be able to assist their colleagues?
- What products are the users familiar with now? Do they use a Web browser, or products such as Microsoft Outlook?

For more information on training see Chapter 15.

Internet and Intranet

The impact of the Internet and its associated Web technology cannot be overstated, and any solution you choose will surely need to take account of it. Specific issues to consider are discussed in the following sections.

Access to the Internet

Consider the following:

- Do you require connection to the Internet for e-mail, Web browsing, or USENET newsgroups?
- If so, how will you manage it?
- What will be the Acceptable Use policy?
- Will you want to Web-enable applications?

Creating an Internet site or an Intranet

Consider this:

- If an Internet site, will it be hosted externally?
- How will content be authored and maintained?
 - Will there be many content writers?
 - Will they want to learn Web publishing?
 - Is the content likely to be updated often?
 - Would there be a need for automated publishing from applications?
 - Do you need a good level of control over who can publish, and with audit trails?
 - Would you require real-time publishing with validation of the content published?
- Do you want workflow features to manage approval of content before publishing?

Security Requirements

We will cover security in more depth later in the book, but here are some general considerations.

How Sensitive Is the Data?

Things to consider include:

- The importance of access control, and at what levels this can be applied and fine-tuned (from the server level down to individual fields)
- Encryption of data on disk or of network traffic
- Access to internal company data by contract staff
- Logging accesses to data (audit trails)

Most systems, including the enterprise-level mainframe-based systems, have system managers or administrators who need access to all data in order to perform their job (for example, to change the access to an application, or to restore data for a user). This is a trusted position, and with proper controls and disciplines (which may include the signing of non-disclosure agreements) it is usually not an issue. However, if you have highly sensitive data you will need to be sure you choose a solution that can protect it, even at this level.

Passwords

You should consider your requirements for a system that:

- Stores passwords securely
- Forces users to change passwords regularly
- Checks the quality of passwords used
- Has features to prevent people who have left the organization from gaining access

Access from Outside

You may want to consider the need for a system that can force all connections from outside (such as mobile users and connections from other organizations) to go through a single point of entry. This can be a dedicated and restricted gateway to the rest of the organization's systems, which will be easier to monitor than if there are many points of entry to your systems. Or you may want a solution that can be opened to the outside, but in a secure way, to do e-business for instance.

Laptop Security

If you have mobile users you will need a product that offers total security for the data on their laptops.

Summary

In this chapter we have covered a wide range of factors to consider with respect to your organization's requirements when considering a messaging and groupware deployment.

The areas covered were

- Terminology
- General business considerations
- Mail
- Applications and collaboration
- User considerations
- Internet and intranet
- Security

At this stage you probably have a list of all the features that you require from a groupware product, and the relative importance of each one to your organization. You may find this useful to refer back to when reading the subsequent chapters.

Chapter 2

What Domino Is and What It Is Not

In the last chapter we discussed the factors to assess when you are considering a messaging and groupware deployment. If you now have a list all the features that you require from a groupware product, and the relative importance of each one to your organization, you may find that list useful to refer back to when reading this and subsequent chapters.

In this chapter we will look at what Domino is and what it is not. The following topics will be covered:

- Executive overview
- Who uses Domino?
- What Domino is
- What Domino is not

Executive Overview

Domino™ is the server component of the product, and Lotus Notes™ is the client component, the software on the user's desktop. Originally the product was just known as Lotus Notes.

The Notes/Domino product is widely acknowledged as the market-leading client server e-mail and groupware product, with a world-wide user base of over 29 million at the end of 1998. That user base is constantly growing.

Notes/Domino has been available since 1989, and is now at major release level 5. As a result it is a stable and mature product with a solid back-end architecture, and with many add-ons, and tools to allow the integration needed to protect an organization's investment in legacy systems. There are over 18,000 Lotus Business Partners world-wide to provide a range of services.

Notes/Domino has been a Year 2000 (Y2K) compliant product from the start, and many customers have used it to replace other messaging systems. There are migration tools available for cc:Mail, Microsoft Exchange, Microsoft Mail and others.

The Domino server family is an integrated messaging and rapid groupware application-development platform. It is Web-enabled and can serve both Notes clients and browser clients.

The Domino server runs on a wide range of platforms and it is scalable to grow with your requirements — from a small 10-user pilot to thousands of users on a single server.

The Notes client offers comprehensive e-mail with integrated calendaring and scheduling, and support for Internet mail standards and protocols.

Notes/Domino is well known for its extensive support for mobile users, allowing them to collaborate even when disconnected from the network.

Organizations that have deployed Notes/Domino have typically seen high return on investment (ROI). A study by IDC showed an average ROI of 186%, with an average payback period of 2.5 years.

In 1998 the InfoWorld Test Center analysts voted Lotus' Domino server and Notes client, Release 4.6, as their workgroup and end-user software Product of the Year.

Who Uses Domino?

Domino is used by many of the world's leading companies to deliver secure communication, collaboration and business applications.

Domino has been deployed for messaging and groupware in 42 of the Fortune 50 companies, and 78 of the Fortune 100.

Some of the organizations using Domino include:

<i>Organization</i>	<i>Approximate number of Notes Users</i>
IBM	260,000
GM	100,000
Asea Brown Boveri	85,000
Coopers & Lybrand	60,000
Prudential	65,000
Computer Sciences Corporation	54,000
Ernst & Young	54,000
Victorian Government	30,000
3M	30,000
Nationwide Insurance	17,500

Continued

<i>Organization</i>	<i>Approximate number of Notes Users</i>
US Naval System Supply Command	15,000
US West	15,000
Royal Mail	13,000
Smith Kline Beecham - R&D	10,000

(Information as of 12/17/97)

For more information on Lotus-based industry solutions, see
www.lotus.com/solutions

What Domino Is

The following sections give you an overview of what Domino is.

High Return on Investment (ROI)

A study by International Data Corporation showed that companies that implemented Notes/Domino had an average ROI of 186%, with an average payback period of 2.5 years. The table below shows the breakdown of the data, based on year 3 ROI.

<i>Return on Investment</i>	<i>% of Companies</i>
300% or more	26%
200 - 299%	7%
100 - 199%	18%
40% to 99%	38%
up to 39%	11%

(McReady, Scott C., & Palermo, Ann M.: Lotus Notes: Agent of Change; The Financial Impact of Lotus Notes on Business, International Data Corp., 1994. Available at www.lotus.com/products/notes.nsf/return+on+investment)

A study by the Business Research Group (BRG) determined “it takes less time and money to develop, deploy and maintain intranet applications with Notes than with other intranet products.”

(Joyce Becknell, senior analyst, BRG in Notes Intranets: Cost of Ownership Study)

Strong Enterprise Messaging

In the messaging arena, let's first look at the Domino server, and then the Notes client, to see the features Domino provides.

Domino Server

These are the major messaging features as they relate to the Domino server:

- A strong client/server messaging backbone which is scalable and reliable.
- Support for the different Internet mail standards and protocols such as IMAP, POP3 and SMTP.
- Lightweight Directory Access Protocol (LDAP) support for addressing external users in third-party Web-based directories like Four11 and Bigfoot. Also the Domino directory can be queried by other LDAP clients.
- Access to mail from a browser, or over the Internet.
- Features for migrating easily from other mail systems such as cc:Mail, Microsoft Exchange, and Microsoft Mail, to name just a few.
- Coexistence with other mail systems.
 - Directory synchronization with other mail systems
 - Message Transfer Agents (MTAs) to provide message conversion and routing between different mail systems
 - Links via external gateways such as fax and pagers
- Ability to mail-enable applications developed in Domino.

Notes Mail Client

These are the major messaging features as they relate to the Notes mail client:

- An intuitive three-pane user interface based on the award-winning cc:Mail interface.
- Built-in calendaring, scheduling, and Personal Information Management (PIM) features for managing time and appointments. There are features for scheduling meetings and checking the availability of both the invitees and other resources such as meeting rooms. And when you need to take your calendar with you, Notes R5 gives you multiple print formats to choose from.

- You can automatically add tasks to your calendar, create alarms for tasks, and specify if incomplete tasks should follow you from day-to-day. Also, with R5 there is full workflow capability for tasks. For example, task owners can reschedule or cancel tasks, and task assignees can either accept, delegate, or request modifications to the task.
- You can delegate mail and calendar management to others.
- You can preset preferences for every e-mail you send, such as automatic spell check or sending all mail high priority with a return receipt requested.
- Notes R5 mail supports signature files, giving you a simple way to further identify yourself and add pertinent information to every e-mail you send.
- User-defined rules for filtering new messages as they arrive. You can specify that Notes watch for messages from a certain sender (such as your boss), or messages that contain a certain subject, and then select what to do when those messages arrive (copy or move them to a folder, delete them, or change the importance of the message). All of the message checking occurs on the server, so it's fast and does not affect the performance of the client, and you don't need to leave your PC on when you are away as with some products.
- An easy to use out-of-office agent to let senders of mail know that you are away, and when you will be able to respond to their message.
- Archiving facilities, to allow the transfer of older information out of mail (or other databases) into an archive database. This can be a manual process or automated.
- The Notes Minder utility displays an icon in the Windows 95/98/NT system tray to notify you of new mail, calendar reminders, and new headlines. It notifies you without the need to have the Notes client running.

More Information

There is more information on mail migration and coexistence with other systems in the following Domino redbooks, which can be found at www.lotus.com/redbooks or at www.redbooks.ibm.com

- *Eight Steps to a Successful Messaging Migration: A Planning Guide for Migrating to Lotus Notes and Domino*, IBM form number SG24-5335, Lotus part number CT6HINA
- *The Next Generation in Messaging: Moving from Microsoft Mail to Lotus Notes and Domino*, IBM form number SG24-5152, Lotus part number CT7SBNA

- *The Three Steps to Super.Human.Software: Compare, Coexist, Migrate. From Microsoft Exchange to Lotus Domino. Part One: Comparison*, IBM form number SG24-5614, Lotus part number CT7QTNA
- *The Three Steps to Super.Human.Software: Compare, Coexist, Migrate. From Microsoft Exchange to Lotus Domino. Part Two: Coexistence and Migration*, IBM form number SG24-5615, Lotus part number CT7QWNA
- *The Next Generation in Messaging: Moving from Novell Groupwise to Lotus Notes and Domino*, IBM form number SG24-5321, Lotus part number CT7NNNA.
- *The Next Step in Messaging: Upgrade Case Studies for Lotus cc:Mail to Lotus Domino and Lotus Notes*, IBM form number SG24-5100, Lotus part number 12992

Reliable

While the Domino server itself is highly reliable, even further resilience can be gained by the use of Domino clustering. This allows up to six servers to be linked together in a cluster, to provide fail-over protection to Notes clients in the event that any server goes down. Real-time replication keeps the data on all servers synchronized. The Internet Cluster Manager (ICM) provides similar protection to browser clients using Domino's HTTP Web server.

Scalable

Each major release of Domino has seen improvements in the extent to which Domino can scale.

Servers

Many thousands of users per server is now possible on high-end platforms such as S/390, UNIX platforms running AIX, Solaris or HP-UX, and AS/400. Except for the S/390, the limitations now tend to be the server hardware and operating system software rather than internal Domino constraints.

Here are some real-life examples taken from "Scalability Demystified" which can be found at www.lotus.com/products/perform.nsf/club

- Bankinter: More than 55,000 POP3 mail users assigned to a single Domino server. "Electronic access to banking services is a key part of our strategy to make Bankinter the most prominent bank in Spain. Domino allows us to provide the kind of Internet-based customer service that makes it all possible." — Jose Luis Estrada, Distributed Information Systems Manager

- Countrywide: 99 Gigabyte mail-message storage capacity on a single server. “We compared Lotus Notes against other products, and we continue to review alternatives, but nothing matches the benefits we get from Notes.” — Phil Usher, Senior Vice President, Messaging
- Lante Corporation: 10,000 mail users registered on single server. “The scalability of Notes made it much easier to put all 10,000 mailboxes on one machine and allow fewer servers to support an increasing number of connections.” — Mark Tebbe, President
- Lotus (Virtual Lotusphere): 800,000-1,200,000 hits per day, peaks as high as 360 hits per second. “We had to be up and running only 2 weeks after FCS (First Customer Shipment) of the Domino server [January ‘97] — so even we were a little nervous. But the performance and up-time provided by combining Domino with the IBM SP2 server worked like a charm!” — Matthew Malloy, Manager of Internet Technologies.

The Domino Directory

In R5 the Domino directory (formerly know as the Public Address Book) can scale to one million users.

Databases

There is no theoretical size limit to databases in R5 (the maximum tested database size so far is 64GB).

Manageable

Each major release of Domino has brought vast improvements in system management features. Now with R5 there exists a comprehensive dedicated Domino Administration client which enables all management tasks to be performed easily from a central location using a single Explorer-style interface.

Alternatively there is an extensive administration tool for use from a browser client, and when NT version 5 ships it will be possible to administer Domino from the Microsoft Management Console (MMC.).

Domino R5 provides centralized client management, for example the ability to push out changes to proxy server settings, bookmarks and preferences.

With the new transactional logging feature, Domino R5 now allows for 24x7 online, incremental backups (that is, only backing up data that has changed since the last backup) so you no longer need to shut down Domino servers in order to maintain them. You can use a variety of backup utilities from IBM and third party vendors. For more information on this see Chapter 22 in this book.

Application Development

Domino is an advanced application development platform with the following features:

- A powerful development product, the Domino Designer, enables sophisticated Domino applications to be developed, either from scratch, or using the supplied templates, for prototyping and very rapid visual application development.
- Applications can be developed for use by both Notes clients and browser clients. In conjunction with the HTTP serving capability provided by the Domino server this makes it an ideal tool for developing Web applications for use on intranets or public Web sites.
- Applications can also be deployed easily and quickly. For instance, by simply sending an e-mail to a group of Notes client users with a button in it, the application can be installed with a single click. Alternatively the application can be pushed to the user's desktop by an administrator. There is no additional client software to install, no DLLs or INI files to distribute, and no network drives to map.
- As well as the versatile and extensive LotusScript language, there is also support for Java, Javascript, C++ and CORBA.

More information on application development can be found in the redbook *Lotus Domino Release 5.0: A Developer's Handbook*, IBM form number SG24-5331, Lotus part number CT6HPIE.

Collaboration and Knowledge Management

The Notes/Domino environment provides many features to enable collaboration and Knowledge Management (KM). Because the technology is built on a Domino groupware "sharing" platform, the context is richer and the leverage is greater than is typically possible with "sending" tools like e-mail.

Domino also makes it possible to support teams whose members are geographically distributed, and who are sometimes unable to be connected to their computer network. As well as the rich application development features described earlier, there are built-in template applications and add-on features as described in the following.

Discussion Databases

A discussion database can be used by a workgroup to share their thoughts and ideas, and can be created easily and quickly from a standard template, a factor which can be vital to a dynamic organization, where teams often spring up quickly.

For example, an engineering group can discuss the products they are designing, or an advertising agency can discuss the ad campaigns they are developing. To get started, a user can simply browse through discussion topics and responses that others have contributed. This is particularly useful for new workgroup members who need access to existing knowledge to quickly come up to speed on important issues that the group is working on.

The history of discussion about these issues is preserved in the group's discussion database. And unlike a physical meeting, the participants do not have to be in the same room at the same time to share information. People can participate when it is convenient for them to do so, and because it is easy for them to share information, they will do so.

Teamrooms

More advanced than a discussion database, TeamRoom is a template application designed to support processes that help people work together using many of the basic practices of "good teaming." Examples of work made easier and more efficient by TeamRoom include:

- Raising and discussing issues and concerns.
- Brainstorming (which hopefully leads to resolution and action).
- Preparing for meetings: Information can be presented and shared in the TeamRoom before the meeting, so that meeting time can be focused on decision making.
- Tracking meeting agendas and resulting action items.

Shared context is at the heart of team learning and effective performance. Team members focus on their individual work within the context of the team work, and focus on team work within the context of the team's results.

Teams are more likely to do their best when they are committed to a common purpose, with clear, specific goals, and have a well-articulated idea of how they will work — as individuals and as a team — to achieve those goals. These commonly-held goals and descriptions of work are set down by the team in the TeamRoom's Mission Page. In other words "Why are we here, and what do we intend to accomplish?"

Headlines

The Notes R5 customizable Headlines page lets you select the information that you want to see first. You'll be alerted to important e-mail messages, tasks, or meetings for the day. You can even receive updates from intranet applications and view Web content dynamically.

Each item on the Headlines page is a point of entry, so if you've received an urgent e-mail message, the full document is just a mouse click away. In addition, IT departments can customize Headlines to feed corporate information right onto the user's desktop.

Search

The new domain search capability in R5 is a key element in the Lotus knowledge management strategy. It allows you to search every server in your domain for any information located in virtually any document (subject to Domino security settings of course), whether it is in a Domino database or a public file system.

You can search the information using a Web browser or the Notes client. Domain search combines the ease of searching on the Web with the power and security of Notes.

Lotus Instant!TEAMROOM

Lotus Instant!TEAMROOM(ITR) is a rentable Web application that allows anyone with a browser and an Internet connection to establish a private workspace for managing projects or for initiatives with teams of colleagues, partners, and even customers.

Users can share files and information, capture discussions, create and store related documents, and track team progress from start to finish. ITR is based on world-leading Lotus Domino Web server technology and is provided through major service providers world-wide.

LearningSpace

LearningSpace™ helps organizations transfer company knowledge and expertise to employees, no matter where they are, through Web-based distributed training and education courses.

LearningSpace contains one central management tool and five specialized interactive course database modules that allow users to:

- Engage in problem-solving activities, debates, discussions and learning exercises that result in the creation of knowledge
- Manage and leverage knowledge that is key to an organization's success
- Access and use stored information
- Receive personalized feedback from instructors

Conferencing and Real-Time Collaboration

Technologies such as chat, conferencing, shared whiteboards and shared applications are adding a new, rich dimension to business collaboration.

Lotus Sametime™ is a new family of products that deliver the benefits of network-based, real-time communication and collaboration. Features include awareness of online users, conversation with others, and document or application sharing. In addition, Sametime provides a platform that allows developers to incorporate real-time elements into their Notes/Domino applications.

Workflow

We described the importance of workflow in Chapter 1. As well as offering the ability to develop your own customized workflow applications, Domino R5 provides many database templates such as the Approval Cycle Template. This template contains some excellent workflow features that are very easy to incorporate into an application and make it possible to have a complex workflow application working in a very short period of time.

At the time of writing Lotus has just announced Domino Workflow 2.0. By significantly extending the native workflow capabilities of Lotus Domino, Domino Workflow 2.0 provides companies with a powerful workflow management system to rapidly develop a wide variety of Domino-based workflow applications. This includes:

- **Domino Workflow Architect** — This provides the intuitive, graphical “drag-n-drop” interface that enables system designers to quickly design and manage workflow processes by specifying workflow process logic, process participants and the rules governing participation, without the need for programming. By representing the entire workflow process in one window, developers can adjust or change all aspects of the workflow process easily. The Architect then automatically activates process definitions for the Domino Workflow Engine, and offers a process debugging feature to assure that process logic is complete and error free prior to activation.
- **Domino Workflow Engine** — The Domino Workflow system includes five Domino databases that implement and store the process logic, organization information, process-related information objects, workflow instances, audit trails and archives. It allows developers to save and reuse process logic and components and uses the Notes and Domino object services and design tools, including Domino Designer. No training is required since the engine uses familiar Notes and Domino administration and management services.

Document Management

Available as a standard template, document libraries give Notes users the ability to seamlessly create and save documents using Lotus SmartSuite™ or Microsoft Office™ applications without leaving Notes.

In addition, the library serves as an electronic filing cabinet for these documents, making it easy for all members of a workgroup to locate, update, and print desired documents. The database might contain anything from environmental impact statements for a group of engineers using Word, to financial statements for a group of loan officers using Lotus 1-2-3.

Besides being a repository and point of interaction for documents created with application software, the document library includes other important document management features. These features include archiving and review cycle capabilities.

For more advanced document management the Lotus Domino.Doc™ product provides a distributed framework for capturing, storing, retrieving, securing, and distributing documents in the Web age. Domino.Doc accommodates a broad range of content and allows that content to be created with a user's choice of editors.

Once created, the content can be viewed by a wide variety of clients. Collaborative authoring and review is possible in a Domino.Doc implementation, with user interfaces changing as appropriate per defined roles.

Mobility

Notes/Domino allows mobile and remote users to fully participate in the business process, whether or not they are connected to the network. The Notes client can be used as a standalone when disconnected from the network, to read and prepare mail, to schedule meetings (you can store other users' free time details locally) and to use Domino applications.

Then, when communication is required, the mobile user can very easily connect using either their companies' preferred dial-up software, or using Notes. With a simple-to-use Replicator page they can synchronize mail and other information, in the background, while they continue to work.

With R5, the needs of mobile users to be able to look up addresses on the corporate Domino directory are catered for with the new directory catalog. This allows mobile users to store their entire company directory in a compressed format locally on their laptops. Even a directory with 350,000 names will only take up around 50MB on their hard disk.

A feature called passthru allows mobile users to use one phone connection to the passthru server to access one or more destination servers on the same network. Using a passthru server this way means there need only be one point of entry to your network, and also saves the costs of supporting modem connections to all servers.

The strong security features of Domino are available to use on the laptops of your mobile users. All their locally stored Domino databases can be secured and encrypted as desired to prevent the data getting into the wrong hands.

R5 now includes native support for Personal Digital Assistants (PDAs), removing the need to download additional drivers.

Internet and Intranet Integration

Since Release 4.5, the Domino server has been Web-enabled, allowing Notes databases to be viewed and updated via browsers. Domino has an integrated HTTP server, which allows the creation and management of intranet and public Web site applications with all the advantages of Domino's rapid application development and easy deployment features. Domino databases are converted to HTML and served to browser clients "on the fly," while simultaneously being served to Notes clients.

The Notes client can also be used as a feature-rich Web authoring system that can produce professional looking Web sites, and is an excellent tool for content authoring, especially in situations where there are many authors to a site.

Authors can focus their time on updating the site using the same Notes client that they are already familiar with for mail and applications — these people do not always have a great deal of time to be educated in Web techniques. They simply create it in Notes and it's also available on the Web or the intranet.

Advantages of Using the Notes Client for Intranet and Web Authoring

Here is a list of advantages for using the Notes client for intranet and Web authoring:

- Good for a large group of content writers who don't want to learn Web publishing or be Webmasters.
- Good when the site content is updated often.
- Gives a high level of control using Domino's renowned security features to control access and restrict parts of site as required, as well as offering a full audit trail.
- Leverages Domino security.
- Provides field-level validation.

- The Notes client provides functions that are still missing from many Web-based solutions, such as full richtext support, spell checking, and embedded objects.
- Domino workflow techniques can be used for the approval cycle of the content.
- Authors can work even while disconnected from the network, with updates later being replicated to the site.
- Notes may already be deployed throughout the organization. The users only need one environment to work in which means savings in education, deployment, maintenance and backup. Also they are publishing the information to your Notes users as well as to the Web or the intranet.
- Gives the ability to preview the finished article in a Web browser.

IBM Global Services and Lotus Professional Services, the services organizations in IBM and Lotus respectively, have successfully implemented many sites for customers that use the Notes client for authoring and produce a graphically rich Web output that has none of the usual visual Domino trademarks, such as views and twisties.

Advantages of Using the Domino Server as an Intranet or Web Server

Here is a list of advantages of using the Domino server as an intranet or Web server:

- Agents in Domino databases can deliver scheduled updates to the site, for instance, press releases which are often created in advance but embargoed until the scheduled release date and time.
- Domino server replication can push changes easily to other servers, internally or through a firewall to the Web.
- Document hot links are automatically removed if the document is deleted from the database.
- It can offer a real-time authoring environment — publishing can be, (but doesn't have to be) immediate.
- Granular publishing — the ability to publish changes to the site at document level.

Hybrid Solutions — Architecture for the Future?

If performance becomes an issue and site hits are far greater than the number of changes that are taking place on the site, Domino may not be the tool to actually serve the main Web site.

In these situations Domino has, however, been successfully deployed in what is known as a “push” implementation. This results in the Web pages sitting on a file system being served via many alternate HTML servers (such as Lotus Go Webserver) with the Domino Server still being used for the things it is best at. These include the generation of the pages and the required links, on the fly, triggered by approved content changes that are controlled in Domino applications, rather than simply occurring on demand.

With complementary technologies (for example, HTML, Java, Javascript and CORBA) that are common between Domino and other Web tools, the opportunity to deploy solutions harnessing the advantages of both technologies may be an architecture for the future. The powerful, secure messaging and the workflow that Domino provides can be combined with the speed and transactional capability that other Web serving products like IBM’s WebSphere have to offer.

IBM WebSphere is a general purpose Java application server and enterprise scale transaction server that can be used to build a wide array of e-business applications. For example, online shopping applications have been created with the Web site documents and messaging being handled by Domino, and the shopping cart and pricing aspects being dealt with by WebSphere. For more information on this subject see the article “Building E-Business Solutions with Lotus Domino and IBM WebSphere” on www.lotus.com

In R5, Domino now allows the use of Microsoft Internet Information Server (IIS) to handle HTTP requests, using Domino to serve dynamic and secure Web pages, and still use all of the Domino application services (like replication, security, indexing, and messaging). When you configure Domino to use IIS as its HTTP stack, IIS handles all URL requests, calling Domino to process URL requests that are for Domino pages (indicated by URLs that include the extension “.nsf”).

Support for Internet Standards

In addition to its support for Web site creation, there is native support for Internet standards in Domino R5. This means you can view Internet mail messages, Web pages, and newsgroups with full fidelity (because of MIME and HTML support) and security (using SSL, S/MIME, and X.509 certificates) in the Notes client. Native support means that Notes displays information in its original format, without any conversions.

It is also possible to read and send messages from Internet mail servers (using POP3 or IMAP) and read and post articles directly to any Internet newsgroup discussion (using NNTP).

Domino R5 supports the Lightweight Directory Access Protocol (LDAP). This is the Internet standard protocol for accessing directory services over TCP/IP, allowing Notes mail users to address external users — colleagues, customers or suppliers — in LDAP-compliant public directories on the Internet, such as Four11 and Bigfoot.

Also, native LDAP support enables users of POP3, IMAP or other Internet mail clients which support LDAP to perform name lookups into the Domino server directory when addressing e-mails. Additionally, Domino server administrators can set up their Domino servers to perform LDAP lookups into the LDAP-compliant public directories.

Integration with Back-End Data

Domino has very strong support for linking with corporate, back-end, and legacy data.

Domino Enterprise Connectivity Services (DECS) gives you an easy-to-use forms-based interface that lets you integrate connectivity with external data, for example, relational databases such as DB2, Sybase, or Oracle, from Domino applications. With DECS, you can work with a non-programmatic template application to make external source data an integrated part of any Domino application.

It is also possible to link with transaction systems, for example, CICS and Enterprise Resource Planning (ERP) systems such as SAP, PeopleSoft, or JD Edwards OneWorld.

For more information see the following IBM redbooks:

- *Lotus Solutions for the Enterprise, Volume 3. Using the IBM CICS Gateway for Lotus Notes*, IBM part number SG24-4512
- *Lotus Solutions for the Enterprise, Volume 4. Lotus Notes and the MQSeries Enterprise Integrator*, IBM part number SG24-2217, Lotus part number 12992
- *Lotus Solutions for the Enterprise, Volume 5. NotesPump, the Enterprise Data Mover*, IBM part number SG24-5255, Lotus part number CT69DNA

Secure

The Domino security model provides user authentication, digital signatures, flexible access control (from the server level down to individual fields in documents), and encryption.

Domino security enables you to extend your intranet applications to customers and business partners. Notes makes use of a number of cryptographic techniques, such as public key and symmetric key encryption, digital signatures, and public key certificates.

Remote and external users can be forced to dial in through a single Passthru server, before accessing other servers on the network.

On a Notes client workstation Execution Control Lists (ECLs) control exactly what can be run. For example, it is possible to set the ECL to prevent an application (or a mail message) which is not electronically signed by a user in your organization, or one that you trust, from having any access whatsoever to the file system on a workstation.

For more information on Domino security see Chapter 14, or refer to the Domino redbook *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, IBM form number SG24-5341, Lotus part number CT6TPNA.

Well Supported

There are over 18,000 Lotus Business Partners who can provide off-the shelf solutions, custom application development, consulting, support and other services.

Also, as Domino is a mature product, there are now many add-ons to enhance it. Some of these have already been mentioned, and some will be covered in more detail in Chapter 25 later in this book.

Multi-Language

If your company is multinational you will need to consider what the requirements will be for multi-language support. Domino is designed to be used internationally, so it has the capability of supporting many languages. In general Domino will support any language that is supported by the underlying operating system that the Notes client is running on.

The Domino Designer client includes Domino Global WorkBench, a set of software tools that help you manage the localization (translation) of the design elements in Domino databases, especially Web site databases. It also includes synchronization features that help you manage the content of localized databases across languages.

What Domino Is Not

Now that we have looked at everything Domino can provide, the following sections give an overview of the things that Domino would not be suitable for.

Just an E-mail Package

Domino includes mail, but as you have read earlier in this chapter it is much more than just e-mail. Domino applications are implicitly mail-enabled; calendar and scheduling, task management is built-in and there is extended mobile support.

Transaction Processing/Record Locking

Although R5 now includes transactional logging with commit and rollback features, these are intended for performance and recovery purposes. Domino is not a transaction-processing product. There is no record locking and you wouldn't use it to develop an airline reservation system, for example.

Relational Database Management System (RDBMS) or Real-Time

Domino databases are not relational, and are not real-time. However they can serve as a good front end to relational and other types of back-end data. For example Domino Enterprise Connectivity Services (DECS) is a Domino server task that does allow Domino databases to be linked to relational databases, allowing access to them in real time.

For more information on this see the redbook titled *Lotus Domino Release 5.0: A Developer's Handbook*, IBM form number SG24-5331, Lotus part number CT6HPIE.

A Heavy Reporting Tool

Domino itself is not designed for producing detailed printed reports of the type associated with batch systems or other products. Data is usually presented logically in the form of views, which can be sorted "on the fly" by the user. However, you can find information about the reporting and analysis tool Notes Reporter™ on www.lotus.com/products

For Heavy Number Crunching

Domino applications do support mathematical calculations, but it is not the tool for real number-crunching applications which require a high degree of mathematical computation.

A Full-Featured Word Processor

The text editing features of the Notes client do not have all the features you would find in a dedicated word processor such as Lotus Word Pro or Microsoft Word. However, each new release of Notes has seen additions to the text-processing capabilities, and these are often sufficient for everyday use. In R5 new features include text flow around graphics, paragraph-like alignment and a text highlighter.

Summary

This chapter began with an executive overview of Domino and Notes, and information on some of the major companies who use it.

Next we explored in more depth what Domino provides in terms of :

- ROI
- Enterprise messaging
- Reliability
- Scalability
- Manageability
- Application development
- Collaboration and Knowledge Management
- Conferencing and real-time collaboration
- Workflow
- Document management
- Mobility
- Internet and intranet integration
- Integration with back-end data
- Security
- The fact Domino is well supported in the industry
- Multi-language support

And also what Domino is not suitable for in terms of:

- It is not just an e-mail package
- It is not a transaction processing product
- It is not RDBMS or real-time
- It is not a heavy-duty reporting tool
- It is not suited to heavy-number crunching
- It is not a full-featured word processor

Part Two. Technical Evaluation and Decision

Chapter 3

Evaluating Your Current Environment

The first step in any major undertaking is to gather the facts. You need to know where you are starting from in order to determine what you will need to do to reach your end goals.

All of the information gathered in this chapter is not specific to Domino, but general information about your organization. Some of these topics were also discussed in Chapter 1 from a business perspective, while the objective of this chapter is more to research these topics from a technical perspective. You can use the information gathered to make an informed technical decision throughout the remaining chapters of this book.

The information to be collected is broken down into the following three parts:

- Computer hardware and software
- People
- Business organization

Computer Hardware and Software

Your information gathering will cover every area of your company's computer infrastructure including the following:

- The physical server machines
- The physical workstation machines
- The physical network backbone
- The software

The Physical Server Machines

Hopefully your company already has a detailed list of all the hardware that is used across the organization. If not, you will need to make one of your own, possibly using automated techniques to accomplish this.

Your company probably has several Information Systems/Information Technology (IS/IT) departments, each in charge of their own equipment. You should contact each of these groups to find out what they have now and what they plan to purchase in the immediate future. If you are with a smaller organization you may need to do the inventory yourself.

At this point, you will not necessarily need to know the exact speed of the processors, the amount of RAM installed, or the hard drive space available, since you may not be installing anything directly on these machines. What you are looking for here is an idea of what your company is running and why.

If your IS/IT strategy is not centrally controlled, you may find that certain departments are Dell fans, while others are in favor of IBM SP nodes. Or maybe all of the departments have been standardizing on AS/400, and that is the decided direction for the future. You may also find machines that are underutilized or groups that are trying to get enough support to buy a new S/390.

You should document not only the types of the machines, but where they are located. This will start to give you a picture of the overall layout of the infrastructure and what its possibilities for the future are. Things like whether your company uses server farms and data centers or smaller distributed servers, will play a major role in your platform decision later.

The Physical Workstation Machines

Again, hopefully this list already exists, but if it does not, you will have to make it now. If your IS/IT department has the budget for it, there are external services available which will come into your organization and draw up network plans, including a complete hardware inventory for you. This can be a tremendous time saver, and can serve as a useful baseline down the road. In some cases, having professionals do the inventory could end up being cheaper than the per-hour rate you would pay an internal person.

For the workstations, you do want to know the exact physical specifications of the machines, because you will be installing software on them during the rollout (either the Notes client or Web browser).

Some of the items you should document include the following:

- Processor speeds and types
- The amount of RAM installed

- The type of video cards
- The amount of hard drive space available
- The monitor sizes
- The multimedia hardware available

You will also want to determine what the upgrade possibilities are for each machine. This is especially true of older machines that often have the processor soldered to the motherboard or can only hold eight one-megabyte SIMMs (Single In-line Memory Module) and therefore, cannot be upgraded.

Also check with the workstation managers to see what the plans for the future are, any problems they have had, and any other special issues you should be aware of.

All of the above information will be used to help you choose which client to use (Web browser or Notes client) and what upgrades you will need to perform to run the chosen client. For more details on choosing a client see Chapter 5, “Choosing a Client,” and Chapter 12, “Designing a Client Infrastructure.”

The Physical Network Backbone

One of the most overlooked areas of an infrastructure is the network backbone. This fact could make this the hardest area to explore. The importance of your network must not be underestimated, because if the network is down, everything is down (you might as well lose power) and if the network is slow, everything is slow.

Some of the information you will need includes the following:

- The media type (Ethernet or Token Ring)
- The rated speed in Kbps (kilobits per second)
- Upgrade plans
- Protocols used (TCP/IP, IPX/SPX)
- Connections to remote offices
- Connections to the Internet
- Routers and hubs
- Capacity
- A current network diagram (topology)
- Health of the network (reliability and stability)

While gathering the above data, keep in mind that many companies have a different infrastructure for the servers than for the clients (high-speed ATM for the servers and 10 Base-T to the workstations, for example), so make sure you check out both individually. Also, consider the additional strain a Domino infrastructure could put on the current backbone.

You will use this information later to construct Domino server infrastructure diagrams.

Software Considerations

Next, consider the software that is currently running on all of the machines in your organization. In addition to operating systems and their respective release levels, you need to consider applications and their release levels, especially on client machines, as well as system/network management tools and their release levels, especially on server machines.

Clients

In an organization with a fresh client desktop rollout it is possible that a “standard” client configuration exists and that there is some sort of client management software to maintain it. It could also be that your Domino rollout is going to be a piece of a new desktop rollout (part of a company-wide move to PC based clients, for example). Get in contact with the head of the client team for details on what you will have available to you when installing client software on the workstations.

You may also have a wide array of software running on your client machines that was installed by a variety of people. If this is the case, it is probably a good idea to take a look now at moving to a more standard configuration. In some cases, this might also mean to upgrade some of your current hardware.

Servers

Servers are often specialized in what they do and therefore, often do not have a standard set of software running on them. The main thing you want to find out here are the details of the different operating systems that exist in your company. Are you an NT shop, an AIX shop, or a mixture?

Make sure to be specific about documenting the versions of the operating systems as you go, the schedule for any upgrades, and who maintains what. The goal is to get a feel for what your company is using now, and where your company is going in the future. You may find that the CIO has decided against NT, for example, which will definitely affect your platform decisions later on.

Other

The other important software considerations to investigate, especially in a highly decentralized environment, are which mail systems, calendaring and scheduling packages, backup software, monitoring software, and data store systems are currently in use.

Make sure to include the version numbers of the software and find out who is in charge of maintaining them. This information will help in migration planning and database integration planning during the roll-out. For more information on mail migration see Chapter 9, “Designing a Messaging Infrastructure,” as well as the Web site www.lotus.com/migration, and for more information on connecting to back-end data stores see Chapter 25, “Expanding the Reach of Domino,” as well as the Web site www.edge.lotus.com

People

After you find out what hardware and software you have in your organization, you need to find out who, if anyone, is supporting that hardware and software and what their skill levels are.

If a person or department is already stretched to the limit on time or does not have the level of skills you will need, they may not be able to support your servers, and you will need to plan accordingly. This information will play a major role in the decision of which platform your organization will run Domino on.

Since it can be difficult to get skilled people, you may want to choose a platform for which you already have in-house skills. Get a good list of all your organization’s talent, including their skill level, and the company’s future plans in the area of human resources.

You will also want to get an idea of your user community’s computer comfort level and software experience. This will help in your training decisions and planning, decisions on which client to choose, help desk preparation, and rollout strategy.

One common example in today’s organizations is the decision to use the browser as the end-user interface. Many users have been using the browser for a while now and already feel comfortable with it. The Notes client versus browser issue will be explored further in Chapter 5.

Business Organization

Finally, let's look at the business side of your organization.

You need to gather as much information as possible about the day-to-day activities and structure of your company. This information is critical in making sure that your Notes/Domino deployment meshes well with your organization. If a piece of software makes the user's job easier and more efficient, they will use it. If it does not, they won't. Your goal is, of course, to make sure Domino/Notes fits well, and for your users to use it.

The items below should be fully explored from a technical perspective:

- The geographic layout of the organization (distributed or centralized workforce). For example, will you need to support users in just one location or in multiple locations?
- Multinational or local. Will you need to worry about language barriers and time zone differences?
- Mobile or static user community. Will you need to support laptop configurations and dial-in lines? Can you use a service provider instead to provide a secure interface from dial-in clients to your LAN-based/WAN-based network? Do users transfer between locations often?
- The total number of users and where they are located. How many users will your servers need to support in each location?
- The business model. Is most communication and interaction taking place inside departments, between departments, or external to the company (as in a sales organization)? Are branches autonomous units or tightly integrated?
- The work environment. Will there be open access to information or will security be tight?
- The organization's future plans such as growth or down-sizing. Will your servers need to support rapid growth?
- Possible branch reorganization. Will you be able to consolidate your distributed servers? Is there a major upcoming reorganization which would prevent you from building a permanent structure for your installation now?
- The training infrastructure currently in place. Who handles the training on the other products in your organization?
- The main communication channels used. What do your users use to communicate most often? Voice mail, fax, e-mail, paper?

- The support infrastructure. How is support handled in your organization?
- Who the decision makers are. Who will you need to sell on using Domino?
- Determine key departmental issues. Is the IT department likely to be outsourced soon? Is the Accounting department going to be spun off as its own business unit? Does the sales team have a multibillion dollar project on the go which cannot be held back?

Summary

In this chapter, we covered aspects relating to the evaluation of your current environment.

First, we touched upon the three major areas you need to analyze: Hardware and software, people, and the business organization. The key areas to remember in gathering hardware information are your current server structure, LAN infrastructure, and what, if any, desktop standardization you have.

The software considerations are mostly centered around the type of LAN you run, as well as the operating system(s) already supported in your organization.

The people aspect will be important for training, support, and implementation, while the business organization evaluation is important for making sure that your Notes/Domino deployment meshes well with your organization.

Chapter 4

Choosing a Domino Server Platform

In Chapter 3 we covered the information you should gather before any decisions are made. This was done early to ensure unbiased information. We can now put this unbiased information to work.

Once you have decided that Lotus Domino is the tool for you, one of your next major decisions will be: What platform should we run it on?

There is a wide choice in server platforms for Domino. Our goal with this chapter is not to tell you which platform is the best, but rather what your choices are, and the factors you should consider when making the decision.

Some of these factors will be unique to your organization, but a majority of them are being discussed at organizations all over the world.

This chapter covers the following topics:

- What are my platform choices?
- Existing infrastructure
- Performance and scalability
- Reliability and availability
- Distributed versus centralized
- Cost
- Add-on tool support
- Tying it all together

What Are My Platform Choices?

The currently-supported platforms for Domino R5 are:

- Windows NT 4.0/Intel
- Windows NT 4.0/Alpha
- AIX 4.3
- HP-UX 11.0

- Solaris/SPARC 2.6
- Solaris/Intel 2.6
- OS/2 Warp Server 4
- OS/400 V4R2
- OS/390 V2R6

At the time of writing this redbook, beta code for a Linux version of Domino was being made available.

In most cases, operating systems at releases later than those specified above will be supported, but have not yet been certified.

The currently-supported protocols are:

- TCP/IP on all platforms
- X.PC supported on all platforms, except for IBM OS/400 and IBM OS/390
- SPX, SPXII, NetBIOS/NetBEUI, VINES, X.25, SNA, and ISDN supported on selected platforms

For the most current information on the supported platforms for Domino visit the Lotus Web site www.lotus.com

Existing Infrastructure

A large part of your platform decision will depend on your existing infrastructure.

Current Investment

If your organization has a large investment in a particular platform it could be beneficial to use that platform for Domino. As an example, if you have spare capacity on a S/390 system, there could be strong advantages in choosing S/390, as well as integrating Domino data into your current S/390 backup infrastructure.

Skills

Possibly the single biggest factor in the platform decision will be the current skills you have in your organization. The stability of an environment is greatly determined by the skill level of the people supporting it. All of the Domino platforms are high-quality, stable options when administered correctly. But if any of them are not properly administered they are likely to

fail. So if you do have existing in-house skills for a particular platform that is a strong reason for choosing that platform for Domino.

If your choice in platform means that you will be considering recruiting new skills, take into consideration the current situation in your local job market. Some skills may be harder to acquire and retain.

Performance and Scalability

Traditionally the number one comparison made between different platforms has been performance. Competition among vendors can make it difficult to find objective comparisons. Manufacturers like to show the results of tests that make them look the best, but their data may not be relevant to the way you plan to use the platform.

Bigger Is Better?

One of the biggest problems seen with choosing a platform is the bigger-is-better attitude. People so often get caught up in getting the biggest, fastest box, that they lose sight of what they need. If your organization will only consist of 100 mail users, and is unlikely to grow significantly, you probably do not need one of the large platforms. Yes, it will support growth for a long time, but the startup costs would be greater.

However, maybe you have a large, powerful server which is under-utilized and you also have lots of in-house expertise in that server platform. You may wish to add the Domino server to that machine rather than buying a new server and training your staff in a new operating system. In this case, your 100 mail users may not take much of that particular server's resources.

Few versus Many

If you choose a smaller platform you will need to maintain many smaller machines. This is not necessarily a bad thing but it can mean more effort is required to maintain control and consistency across a group of many machines.

However, another factor to consider is that with a larger number of smaller servers the overall impact is reduced if any one server goes down. With the larger platforms more attention needs to be paid to planning with regards to the impact of a server being down.

Number of Domino Servers

The other major consideration when talking about performance and scalability is the number of actual Domino servers. One of the main advantages of using the larger platforms is that it reduces the number of physical machines to manage.

However you should bear in mind that this does not necessarily reduce the number of logical Domino servers. On the smaller platforms such as NT you would typically have one logical Domino server per physical machine.

On the large platforms such as RS/6000, AS/400, and S/390 you would typically run one physical machine with several logical Domino servers on that machine, using Domino partitioning.

So in the end, you may have the same number of logical Domino servers.

Sources of information covering why and when to run multiple Domino servers on a single machine for each of the platforms will be given in Chapter 7, "Designing a Hardware Infrastructure."

Scalability

Characteristics of a highly scalable system include, for example:

- Ability to support the processing of large applications.
- Ability to manage the resource requirements of multiple applications, that is, mixed workloads.
- Large file systems support.
- Ability to accommodate from one user to thousands of simultaneous users.
- Hardware scalability, that is, from a single CPU to SMP configurations with up to 64 processors.
- Large I/O subsystems that can support a lot of controllers and large volumes of data and files. Supporting higher numbers of controllers means you can distribute your I/O more efficiently. Storage capacity and bandwidth can be further extended with high-speed RAID boxes.

With Domino R5, changes have been made to improve the way Domino scales to take advantage of the larger platform architecture. The following table shows examples of platform scalability features, and how Domino exploits those features:

<i>Platform Scalability Feature/Metric</i>	<i>How Domino Exploits the Scalability Metric</i>
Ability of platform to support large I/O subsystems (large number of controllers and volumes of data/files). Means that I/O can be distributed more efficiently.	<ol style="list-style-type: none"> 1. Optimization of the database format (the on-disk structure or ODS) to minimize I/O contention. Writes to disk are fewer and more efficient. 2. Transaction logging: Database operations are recorded sequentially, which reduces I/O activity while increasing data integrity and significantly improving server restart time.
CPU scalability: Scaling application performance across multiple processors, using single version of the operating system.	Thread pool model: Results in less memory and CPU utilization.
Support for large memory configurations.	<p>More efficient memory utilization through:</p> <ul style="list-style-type: none"> – Improved memory management via Unified Buffer Manager – Better use of RAM for internal caches and buffers, which boosts performance – The ability to use higher than 500MB means faster throughput.
<p>Inherent scalability features of, for example, UNIX operating systems means:</p> <ul style="list-style-type: none"> – Journaled file system for faster recovery following server crash – Support for very large memory configurations to process large applications – Large file system support provides more scalability – Application resource management, meaning the ability to support mixed workloads 	<p>Cumulative effect of R5 performance/scalability enhancements with underlying platform scalability features means:</p> <ul style="list-style-type: none"> – Lower memory and CPU utilization – Faster response times – More efficient use of I/O – Lower network traffic

Other

Other factors to consider in terms of scalability include the following:

- Mass storage options

Large-scale platforms have many more options available for handling large amounts of disk space. If you are going to need very large amounts of data on a single server, you may need to consider the mass storage farm solutions available with the larger platforms.

- Physical space

If you have limited floor space in your organization you need to consider the physical room the server or servers will take up.

Domino R5 Performance Aspects

At the time of writing this book Domino R5 performance numbers on the different platforms were not available. There have been big advances in the code for R5, and all the early indications are that R5 provides significant performance improvements over Release 4.x.

The general procedure to apply at this stage would be to use Domino Release 4.x numbers and any gains received from using R5 will be an additional bonus.

Sources of Information

Here is a list of the most common places to check for information on performance and scalability metrics:

- Notesbench - www.notesbench.org
- Redbooks for each platform -
www.redbooks.ibm.com/solutions/sk2t8039.html
and www.lotus.com/redbooks
- Sizing worksheets from IBM
For the AS/400 platform, check at
www.as400.ibm.com/lotus_notes/domsz2.htm
- Experienced consultants
- IBM representatives
- Lotus representatives
- Other companies that have done major deployments

- Your local Notes User Group
- White Paper “Domino Performance and Scalability: A Guide to Capacity Planning” on www.lotus.com/performance

The above sources should be used for computing general numbers for each of the platforms. A list of exact hardware sizing sources by platform will be covered in Chapter 7.

Be careful when consulting some of the above sources for performance numbers. The numbers given are often based on simulations and do not necessarily reflect real-life situations. Thus, always make sure you know how the numbers you are looking at have been derived.

In the end you should use the numbers given only for making relative comparisons between the platforms, and then, when it is time to build an actual machine, use the information in Chapter 7.

Our advice here would be to let the primary considerations, such as the existing infrastructure and in-house skills, narrow your choices down first, and then evaluate the remaining options.

Reliability and Availability

We all would like our servers up 24 hours a day, 7 days a week, 365 days a year. How vital this is can vary from organization to organization. The specific reliability issues covered here are the ones that vary for each of the different platforms.

One of the major differences between hardware platforms can be the average server uptime. In evaluating platforms for reliability you need to consider what features are available to reduce downtime, such as built-in hardware redundancy features like hot swappable disks which can be removed and replaced without the need to shut down the server.

The average downtime of the various operating systems is a topic of some debate. Reports on NT, for example, seem to indicate an average down time of about 30 minutes a month versus a down time of just a few seconds per month on the larger platforms, such as AS/400, RS/6000, and S/390.

As an example, using the combination of Domino clustering and HACMP on a set of RS/6000s, it is not uncommon to exceed 99.9% availability to your Notes clients. Using HACMP with the AIX features of remote system management, Web-based system manager, work load manager, and dynamic kernel features, will provide additional levels of non-stop availability and support needed where there are high-availability requirements.

Note HACMP has been rated the number one high-availability software package by D.H. Brown in its September, 1998 report.

Different methods that can help you keep Domino available 24x7 will be covered in Chapter 7, “Designing a Hardware Infrastructure.”

Distributed versus Centralized

One of the biggest decisions you will have to make during your Domino deployment is the choice between central or distributed servers.

Network Bandwidth Considerations

If your organization exists entirely in one building with one server room the choice is probably easy. If your organization contains either a central office and branches, or a conglomeration of small offices, you will have to decide whether to put all of your servers in one location and purchase enough network bandwidth for the remote offices to connect to the central office, or to put servers in each location.

Adequate network bandwidth to remote offices might already be in place or be planned for other reasons, which you will know from your information gathering. It might also be the case that there are no funds to purchase high bandwidth connections to the remote offices.

Considering Your Business Model

The platform you choose should fit your network and business model.

If you have many small offices with only low-speed connections between them you would probably want to put servers at each location to guarantee high availability and excellent performance, which would mean that one of the large platforms is probably not normally a good choice. It would be very costly to purchase an AS/400 or an S/390 for each of a dozen small branches.

Conversely, if your company is based in one or two large buildings and already uses a predominately central infrastructure, a single, larger machine would probably be a good choice.

Planning for the Future

The platform you choose should be able to handle not only your current needs but your needs for the future. If your company will soon be down-sizing, consolidating branches, acquiring other companies, or aggressively expanding, make sure your platform can adapt well to the changes.

Combining Platforms

It is very possible that your company has both large offices and small branches. If this is true you might want to consider using a combination of different platforms. An example would be using a large server like an RS/6000 or an AS/400 for your central office of 6,000+ users and a number of smaller NT servers for each of your 100 - 500 user branch offices.

If you do go with multiple platforms, be very careful not to let the number of platforms get out of hand. The most you will probably want to use is two platforms: One large and one small.

Another dual platform situation that is becoming more and more common is having a number of distributed small servers and then one large server that acts as a mail and replication hub. This is especially useful for companies with corporate data centers that have large-platform talent on hand and also have local small platform administrators out at the remote offices.

Cost

The two main elements of cost are the initial investment and the long-term cost of ownership, including service and support costs.

Large Platform versus Small Platform

The major attraction of the large platforms is the lower total cost of ownership (TCO), which is usually attributed to reduced support costs and increased uptime. The attraction of the smaller platforms can be their lower initial cost.

The budget required to invest in a large platform might be too high for smaller organizations, but to those supporting only a few thousand users, it could be a wise investment, particularly if the opportunity exists to make use of existing hardware.

Total Cost of Ownership Reports

The two numbers you will see most often in TCO reports is total cost of ownership and cost per user. Total cost of ownership refers to the total cost associated with a platform including acquisition cost (hardware, software), system administration and management cost (administration, help desk, tech support), training (administrator training, tech support training), and indirect costs such as downtime loss. Total cost per user is determined by dividing the total cost of ownership by the total number of users.

Here are a few places to look for TCO reports:

- www.gartner.com
- www.idc.com
- www.interpose.com
- www.pc.ibm.com/us/solutions/tco/
- Redbooks for each platform -
www.redbooks.ibm.com/solutions/sk2t8039.html
and www.lotus.com/redbooks
- IBM Web site - www.ibm.com
- Lotus Web site - www.lotus.com

Industry Presence

In the world of computers today we all realize that nothing lasts forever. Change is guaranteed. To minimize the negative impact of change on your business you want to pick a platform that has a strong presence in the industry and is likely to have a strong future.

NT is currently in the spotlight and will no doubt be a force in the industry for some time to come. The IBM operating system versions are starting to gain popularity and will be the leader for large installations. IBM has a strong, stable history with its support for platforms like the RS/6000, AS/400, and S/390. Solaris and HP-UX also have a long history of support. OS/2 is still supported as a server platform for Domino and this may be a good choice for organizations who have a current investment in that platform. Novell Netware is no longer supported on Domino R5.

Add-on Tool Support

If there are add-on products that you know you would like to implement in the future, you should investigate what platforms they are supported on. These could include Lotus products such as Sametime, Domino.Doc and QuickPlace, or third-party monitoring tools and products. Add-on products are discussed in more detail in Chapter 25, "Expanding the Reach of Domino."

Tying it All Together

Before making a final decision you should consider drawing up a design document for each of the platforms you are considering. This will give you a good idea of how the infrastructure might look for each of the platforms and help you spot any inherent problems with a particular platform.

Your design should include the following things:

- Physical placement of servers
- The platform on each of the machines
- Number of Domino servers running on each machine
- Size of the network connections between the servers
- Approximate number of users per server
- General idea of how mail and replication will flow, and how future changes would be handled.

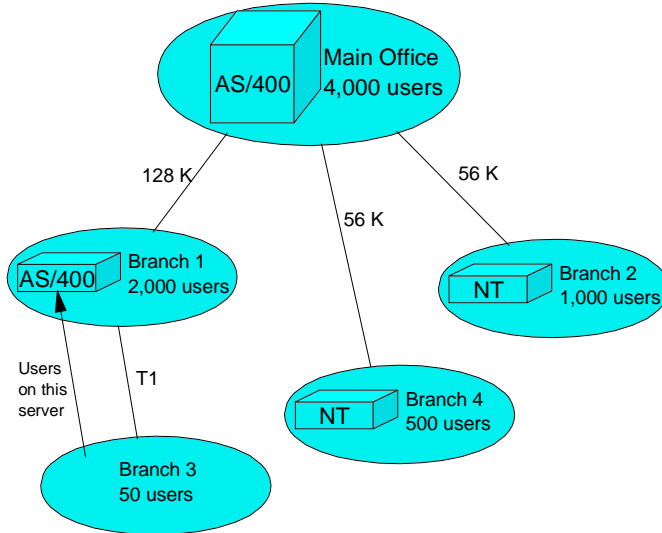
If you do not have a high level of Domino experience you may find making infrastructure drawings a little much at this point. The key is not to worry about the details but to just get a general idea. You can use your knowledge of other platforms to help guide you. For example, you would never try to have your remote clients access files on a Novell server over a modem line or buy a quad-processor machine with three gigabytes of RAM to serve files for a 5-user office, so why would you for Domino?

This may be a good time to engage the services of Lotus Professional Services, IBM Global Services, or a Lotus Business Partner. They will be able to give you real-life examples of how the different platforms have been utilized, point out some things you might not have considered, and help you get up-to-speed on Domino.

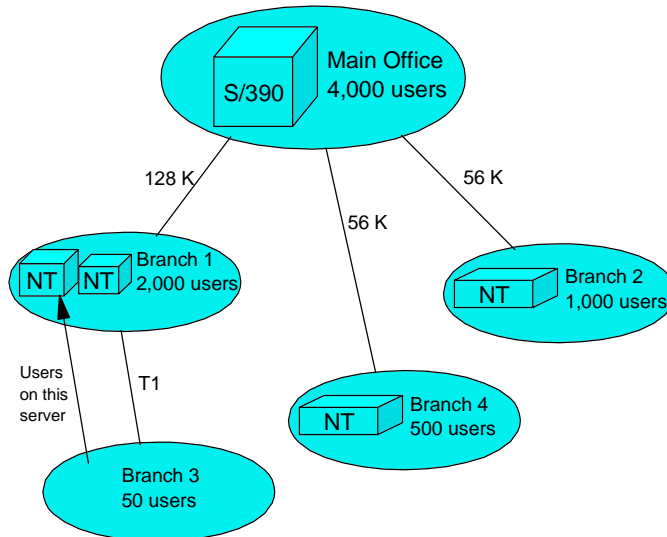
Make sure to keep very involved in all decisions and understand the reasons behind all the platform considerations discussed. It is easy to step to the side and let a more experienced person take the lead, but this may cause problems later on in the deployment. Ask questions, point out concerns, and test the arguments.

Below are two sample server infrastructure drawings to give you an idea of the level of detail you should include at this point. Both drawings are possible infrastructures for the same company.

Here is the first drawing, which uses a combination of AS/400 servers and NT servers:



The second drawing uses one S/390 server for the main office and NT servers for all of the branch offices:



Notice the rough numbers and lack of detail about the servers. We used different size boxes to designate larger machines but did not list specifics such as model numbers, amount of RAM, or number of processors.

We also did not cover the details of what the Domino server infrastructure would look like in each case. You would look at issues like the number of mail and application servers, mail and replication topologies, and number of Domino domains, later in the deployment.

You might also want to add cost predictions for each of the servers in your drawing, especially if there are existing servers that will be reused for Domino.

A more detailed explanation of hardware sizing, infrastructure design, and setup details is covered in part three. You will start installing and configuring machines when setting up the Domino pilot in Chapter 6.

Summary

In this chapter we discussed the different issues involved when choosing a server platform for Domino.

The deciding factors we looked at included your current infrastructure, the existing skills you have in-house, the performance, scalability, and reliability of the platforms, the ease of administration of the platforms, the cost factors involved, the industry presence of the platform, and the add-on tool options to consider.

We also looked at how you would tie all the information together and begin to plan out your infrastructure.

While considering all these factors bear in mind that the best choice will vary for each organization — each organization is unique.

Chapter 5

Choosing a Client

The first major step in designing a client infrastructure is choosing the client that your organization will use. The three choices available for Domino R5 are the Notes client, a Web browser, or both.

The “best” choice is, of course, different for each organization. Our purpose here is to give an overview of the differences between the two clients and discuss some of the issues to consider when choosing a client.

This chapter covers the following topics:

- One desktop client
- Making data available to outside organizations
- Do you already have browsers installed?
- User training
- Platform support
- Cost considerations
- Replication
- Standard browsers
- Performance considerations
- Supported features
- Security considerations
- How do I decide?
- Summary

One Desktop Client

One of the goals of a lot of organizations has been to have one desktop client that can access all of their different data sources. The Web browser seems to be becoming that client. Many software vendors are working on a way to make their data available to a Web browser. Some are building direct interfaces while others are developing ways for the data to connect to the back-end.

The other thing to consider is the amount of tools being developed and attention currently being given to the Web browser. This will give you many different options and possibilities for the future.

Making Data Available to Outside Organizations

If all of your data can be viewed through a Web browser it will be easy to make it available to users and organizations external to your company. Since most companies have Web browsers available already all you would have to do is send them a URL.

Be aware that if your browser-based applications require a relatively new Web browser, a plug-in, or special configuration, this could prevent you from sharing applications with outside companies.

If your applications and infrastructure only support Notes clients, you would need to supply Notes clients to anyone that you wanted to share your applications with. Some organizations may not want to install software simply to communicate with an outside company.

On the other hand, if your Notes infrastructure supports Web browsers you would also be able to open up your Notes applications to customers over the Internet. Home customers could use a standard Web browser to access information such as order status, Frequently Asked Questions (FAQs), and data sheets.

Do You Already Have Browsers Installed?

If you already have Web browsers installed on all of the machines in your organization there are advantages to choosing a browser. The main advantage would be that you may not have to install anything on the client workstations.

However, in reality, even when using a browser you will still almost always need to install something on the client machines. Maybe the browsers you have on your workstations are an older version. For a modern-day intranet you will want to be using at least a version 4 browser. Version 4 browsers are not installed as a default on most machines purchased. The second most common case is that you will want to install some type of plug-in for your intranet.

In other words: If you do need to install anything extra to make the browser work then this may no longer be a real advantage as compared to installing a Notes client.

User Training

Many organizations have been using Web browsers for a while and their users have become familiar with them. Also, a lot of people are now connected to the Internet at home and are becoming rather proficient, and feel comfortable with, a Web browser.

This does not mean that no user training is required for the browser, however. Because of the open nature of the Web browser, every site on the Internet has designed its own user interface. Some sites use a graphical toolbar and place it in a frame on the left, right, top, or bottom of the screen. Others use text-based links or some new tool that no one has ever seen before.

Because there is no standard UI for the Web browser, your intranet site or application will have its own unique look and feel. You will be able to have a consistent look and feel for the site as a whole, but that look will still be something the user has never seen before. Thus, you will still need to train the users if you choose to implement a Web browser. However, overall, there is probably less training required for using a Web browser than there is for using the Notes client.

Platform Support

The Notes R5 client is supported on the 32-bit version of Windows (95, 98, and NT) as well as the MacOS, while there are Web browsers available for just about every client platform on the market. If you are using a client platform other than Windows 32 or Macintosh in your organization, and you have no plans currently to implement one of those two platforms, the browser may be your only choice.

Cost Considerations

A number of companies look to using a Web browser because they believe it will be cheaper to implement. This might be true in some cases, but not necessarily in all, and will depend on your organization.

For example, if you already have a Web browser on your workstations that will not need to be customized you could save in installation costs. But, as mentioned in the section “User Training,” if you need to update or customize the installed browser the potential cost savings may very well be minimal.

The other possible cost savings with a browser come from reduced training requirements for the users. If your users are already familiar with a browser you will not have to provide training for them on the browser. Again, as mentioned before, however, you will usually still need training on any customizations you may have performed. Your amount of training, and therefore cost, might therefore not be that much lower than the cost associated with training the users on a Notes client.

One of the more popular cost arguments for a Web browser is that the browser software is free. On the other hand, consider that when you purchase Notes/Domino, you will still need to purchase a Client Access License (CAL) when using a Web browser for accessing the Domino server.

The other potential cost savings companies look to achieve by using a browser is associated with not having to upgrade their client machines. Some companies may plan on using their 386 or 486 processor machines as so-called “thin-clients.” The way they look at it is that these machines would be “thin” because they would only need to run a Web browser.

However, in any Web-based infrastructure today you will most likely want to use a version 4 or higher browser. They usually require a fair amount of RAM, processor speed, and hard disk space, so using your old machines will probably not be a valid option.

Tip For recommended client requirements, see Chapter 12.

Many organizations believe that it will be cheaper to develop applications for the Web than for the Notes client. This depends on what you are trying to accomplish. In fact, the Web browser requires the developer to construct all of the user interface for the application, while the Notes client has much of the user interface already constructed. This reduces development time and therefore cost.

Also, when developing for the Web browser you have to make sure your site works with a variety of browser versions and types (Internet Explorer, Netscape, etc.). This can increase development time and therefore cost.

Replication

One of the major features of Notes/Domino is replication. Replication allows users to work off-line by copying data down to local hard drives. It provides tools for synchronizing the data when needed.

Replication is not available when using a Web browser for the client. If replication is a key requirement for your organization then you will need to deploy the Notes client rather than the browser.

For more information on replication see the Administration manuals provided with Domino.

Standard Browsers

Web developers have been struggling with the inconsistencies between different browsers for years. Each company has their own way of implementing the different features and each offer their own add-on tools.

Developing for the multiple versions of browsers can also be a problem. The fact that there is no standard browser interface adds to development time. If your developers need to make sure their code works with Netscape 3 and 4, Internet Explorer 3, 4, and 5, Opera, and other browsers, it will take them more time. It will also take longer to test the applications.

On the Notes client side, there may also be a need for you to make sure that your application works with different Notes client releases, however, this is generally less of an issue.

Performance Considerations

The Web browser relies on the server to do most of the processing for it and only needs to be able to display a text document. The Notes client is designed to do a lot of processing for itself. This means that a Domino server needs to do more work to communicate with a Web browser than with a Notes client.

On the other hand, a computer running a Notes client will need to do more work than a computer running a Web browser.

All in all, be aware that with the growing size of Web browsers the difference between the processor power needed to run the Notes client versus a Web browser is likely to become smaller in the future.

It is of course possible to build an infrastructure that will support both browser clients and Notes clients. In all likelihood, you will require more servers to support browser clients than you will need to support the same number of Notes clients.

For example, you can do mail with Notes clients, or you could use a combination of POP3, IMAP, and/or HTTP-based mail with a Web browser. If you wish to minimize the load on your server in order to maximize the number of mail clients you can support, using the Notes client is the best option. Using POP3 is next best; using IMAP is next best; and using HTTP, while sometimes appropriate, will allow you to support the fewest number of mail users of any of these four options.

Tip See www.lotus.com/performance for more information.

Supported Features

Domino R5 has come a long way in making applications work and look the same in the Web browser and the Notes client. Still, there are a number of things a browser cannot do.

One major example is drag and drop. When using mail in a Notes client a user can drag and drop e-mail messages between folders. In a Web browser this feature is not supported. The user needs to first click on a Move to Folder button and then click on the folder they want to move the message to. This is not necessarily a problem for the browser user, though, since users familiar with the Web will be used to such things.

For a list of programming features that do not work on the Web see the Lotus yellow books *Application Development with Domino Designer* and the *Domino Designer Programming Guide*.

Security Considerations

One of the core aspects of Notes is the built-in security which satisfies the most stringent security requirements a company may have.

Domino uses ID files to identify users and to control access to servers. An ID file is a file with the extension .id. The ID file sits on the client workstation and is protected by a password.

Web browsers do not use ID files. They are proprietary to Notes, which requires the ID files to be on the client workstation. If Domino required browser users to have an ID file on their local machine it would impact the advantages of using a browser. These include such things as being able to use any browser from any machine, or allowing users outside the organization to browse pages without any special software, to name just a few.

Instead of ID files, browsers typically use user names and passwords for security. Most sites on the Internet pass user names and passwords between the client and server in clear-text format. This means that anyone can intercept the message and easily read the user name and password. This is not as big of an issue in a closed, private network, but may be an issue when opening up Domino to outside users.

To enhance security on the Web, Domino also allows the use of SSL (Secure Sockets Layer) and X.509 certificates for Web browser authentication.

The main point here is that authentication and other aspects of security are different in a Web browser and a Notes client. You should look carefully at the differences between the two when making a client decision, especially if security is a top concern in your organization.

For details on Web browser security see the Lotus Administrator yellow books, the IBM redbook *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, IBM form number SG24-5341, Lotus part number CT6TPNA, as well as Chapter 14, "Security," in this book.

How Do I Decide?

The “best” client choice will differ for each organization. Use the information you gathered in Chapter 3 and the points described in the previous sections to help you decide which client will work best in your organization.

First, check to see if your desktops are ready to use the Notes client. If you are not running Windows 32 or MacOS on your desktops, the Notes client is not an option for Notes R5. If some of your clients can run Notes while others cannot, decide if you will allow a combination of clients. You may want to run some Notes Release 4.6.x clients against a Domino R5 server, but there are certain features and functions of both Domino R5 and Notes R5 that will not be available to these clients. In general, it is best to plan to move all your clients to Notes R5 as soon as possible.

Second, determine if the browser will be used for other things. If the Web browser is going to be on the desktop anyway, it might be more practical to use the browser than to run the browser on some desktops and the Notes client on others. Also, if you already have Web developers in-house, they might feel more comfortable developing for the browser.

Third, try both of them out. Set up both a Web browser and a Notes client and test their functionality. Maybe the client offers some functionality you really like, or maybe the browser suits you more.

Fourth, determine if there is any feature of the two clients that you must have. If you must have replication, or your databases must be Web-capable, the decision is in favor of the Notes client.

Fifth, make a pros and cons list for the Notes client as well as the Web browser and compare the lists. The client that turns out having the most pros and least cons could be the winner.

Many companies have decided to use a combination of the two clients. A common setup is to use the Notes client inside the building and the Web browser outside the building. Outside the building could be either another company, or an employee working from home. You are then using the advantages of both clients where appropriate. Domino is unique in that it can gracefully handle this dual client setup.

There might be some initial development overhead to make your Notes applications work in both clients, but it is usually a good investment. It will give you a lot of flexibility for the future, and it takes less time in the end to make your applications dual-client capable at the start than to go back and change them later.

If the majority of your users will be using the Notes client, consider building applications that have full functionality in the Notes client, where they are used most often, and more limited functionality in the browser, where they are used less frequently. For example, you could enable users to just read, but not edit, when using a browser.

Summary

In this chapter we looked at the different factors to consider when choosing a client for accessing the Domino server.

We first looked at some of the possible benefits of using a browser. This included being able to have one desktop client for multiple applications, easily making data available outside the company, reducing software distribution costs, lowering the amount of user training, and broader platform support.

We then looked at the possible drawbacks to using a browser. These included loss of replication capability, reduced server capacity, reduced feature set, and fewer security features.

In the end we found that the choice will depend on your current infrastructure and your organization's wants and needs.

Chapter 6

Setting up a Notes/Domino Pilot

After deciding on the platform you will use for your Domino infrastructure it is time to start testing and learning. The pilot is the final test before full Lotus Notes buy-in by your organization. The pilot will give you a good idea of the problems you will have to face during the final rollout and the benefits you will see when Notes becomes a part of your business.

The main topics covered in this chapter include:

- Why should I set up a pilot?
- Building a pilot deployment team
- Developing a pilot deployment plan and strategy
- Rolling out the servers and clients
- Evaluating the results
- Summary

You will find it useful to read through Part Three in this book on deploying Domino while setting up the pilot, since it covers more of the technical details and other information you will need. The specific chapters to reference will be pointed out where they apply.

Why Should I Set up a Pilot?

The following sections discuss why it is important for you to set up a pilot before fully deploying Domino/Notes.

A Chance to Learn

Nothing beats experience. If you do not have any Domino experience at this point, it is a good idea to make a trial run.

Or, maybe you have Domino experience with some platforms but not the one you will be using in the pilot.

The other possibility is that you are an expert on Domino and the platform you are using, but you are still not very familiar with all the aspects relating to the organization in which you will be deploying Domino. Each organization is

unique in what it is, how it runs, and what it needs. The pilot will help you spot many of the issues you will face during the full deployment.

Learn About Domino

If the first case is true and you do not have much experience with Domino, then the main thing you will gain from a pilot is Domino knowledge.

You will want to take this opportunity to learn as much as you can about the technical side of Domino. Practice installing and configuring new servers several times until you feel comfortable with the processes. If you are going to use clustering, try setting up two servers in a cluster and then test it. If you are going to be running multiple partition servers, try setting up some partition servers and take the time to make sure you understand how they work.

You should also try setting up the client you will be using (Notes or browser) and connecting it to the servers. Also, register a number of users, delete a number of users, move users between mail servers, and try anything else you think might come up in your organization. Keep a list of things you think will be important later and the places where you found useful information.

Learn About the Platform

If the second case is true and you have experience with Domino but not with the platform you will be using, take some time to learn the platform. Practice things like configuring multiple IP addresses, installing multiple NICs, and binding different IP addresses to the different cards.

Try installing partition servers if you are going to use them and understand what is happening. Read up on general platform administration or work with the IT professional that will be responsible for keeping the operating system side of the machine up, if there is one, so that you can solve minor problems by yourself in an emergency. Again, the main goal is simply to learn as much as you can.

Learn About the Organization

If the last case is true and you are already an expert in both Domino and the platform that will be used, then spend your time learning things particular to the organization. Things like the network infrastructure, the client workstation setup, and the support personnel are all unique to every organization.

Getting Feedback

A pilot will give you the opportunity to get some direct feedback from your end users. You will get an early idea of the amount of training that is going to be required, performance problems with workstations, common problems users are having, configuration options that should be changed, ideas for future applications, and what they generally think about Notes. By addressing any issues, such as client performance, early in the process, you prevent them from turning into show stoppers later when it comes to general deployment. Keep in constant contact with your pilot users and address their concerns.

Proof of Concept

Just about every project in today's world goes through a process called proof of concept. This is typically a slimmed-down version of the full deliverable to allow people to see an actual example of what, to this point, has only been expressed in words.

The Notes pilot will give you, your end users, and most importantly the decision makers, a chance to see Notes in action. A pilot is usually the last step before complete Notes buy-in from your organization. Therefore, you want to create excitement about the product and get commitments to see the deployment through.

A pilot also allows you to try out and "prove" your platform decision. You may find that the performance is not what you expected, the installation and configuration is too difficult, or the stability is not acceptable. This is your chance to find out before you invest large sums of money in hardware or personnel.

Also, once the concept is "proven", or even if it is disproven and corrected, you, and the rest of your organization, will have a higher degree of confidence when the full deployment begins.

Gathering Information for the Rollout Plan

A pilot allows you to do a mini, non-critical, rollout. The closer to the real deployment you make the pilot, the more you will learn about possible problem areas that could arise in the full deployment. This information can be very valuable.

You want your production deployment to be as smooth for the end users as possible. If users have to jump through too many hoops and waste a lot of time and energy when they first use Notes, they will not use it with confidence, or possibly not use it at all, in the future.

Take user concerns and problems to heart and make sure they are addressed in the final rollout.

Building a Pilot Deployment Team

You will build a deployment team for your pilot that will be a subset of the full deployment team. The size and scope of the pilot team will depend on the size and scope of the pilot.

Why You Need a Pilot Team

The main purpose of gathering the pilot team is really not to do the installation and configuration work itself, but to start pulling the team together for the final rollout.

You should have a good idea of who is in charge of the different IS/IT areas in your company from your initial information gathering phase discussed in Chapter 3. You will now need to ask each of these managers for resources and appoint persons from their department. These points of contact will be able to give you a better idea of what exactly needs to be done to accomplish the rollout tasks, and will allow you to give the contact people a heads up about what needs to be accomplished. This will give the departments a chance to prepare for the full deployment. This might include installing products that will help make the rollout easier and making sure resources are available.

Forming a pilot deployment team will also give team members a chance to get up to speed on the technical aspects of Domino/Notes. They will then be able to make better time and resource estimates for the full deployment, and help ensure the rollout goes as smoothly as possible.

The other benefit of getting an early team together is being able to meet and become comfortable with each other. The team will need to work well together to ensure a smooth deployment. Good communication is essential to a successful deployment.

Who Should Be on the Pilot Team

As mentioned above, the pilot team will most likely be a subset of the full deployment team and will vary in size depending on the size and scope of the pilot. For the most part, the Domino team will be responsible for the rollout activities in the pilot, with the points of contact from each department supplying only technical guidance and access to servers and workstations. You should, however, try to get the team members involved as much as possible in the pilot so that they are better prepared for the full deployment.

The team members should include people from the following departments:

- Network operations
- The help desk

- In-house or external training group
- Workstation support team
- Team members using specific software that is migrated
- Operating system support team for the particular Domino platform chosen
- Security team
- Notes application development team (if any application development activity has already been started or is planned)
- All Domino administrators
- Executive sponsor
- Overall Domino project manager
- Representative end users

It is of course possible that several of the above contacts turn out to be the same person (especially in smaller companies). Chapter 16 will cover the full rollout team, as well as other issues to consider in team selection, in more detail.

Developing a Pilot Deployment Plan and Strategy

The next phase in deploying a Domino pilot is to create a detailed deployment plan and strategy outline. Depending on the scale of your pilot this may seem like a trivial task. The thing to keep in mind is that the main purpose of the pilot is to learn. A pilot deployment plan will be good practice for writing the full deployment plan. It will also help the pilot go as smoothly as possible, ensuring that the pilot users have a good test experience.

Even though the pilot plan is a training exercise, you will want to make it as “real life” as possible. This means covering such things as documentation, roles and responsibilities, and time lines.

For a full list of items that should be included in the rollout plan see Chapter 16.

In addition to the items covered for a full deployment plan, there are a number of issues that make a pilot plan unique. These topics are covered in the following sections.

Defining the Objectives

Be very specific about the completion criteria and success criteria as they apply to the pilot. You need to be very clear on what everyone is expecting from the pilot. There will almost always be one group of users that will be expecting a production-level environment and will be dissatisfied when the pilot does not deliver.

Be clear about the levels of functionality, the levels of support, the levels of training, the levels of stability, the future support of data (will pilot data be migrated or discarded), and other issues. The point here is to make sure none of the users become disillusioned with using Notes.

You will also want to define clear milestones that mark the phases and the end of the pilot. Be careful about using absolute dates for milestones. It is good to have definite dates, but often one problem can force all of the future dates to be pushed back, causing the project to be continuously late.

A better approach might be to commit to relative dates based on certain events. For example a goal of 30 users rolled out within 30 days of receiving a server machine. A time table with absolute dates should be based on these relative numbers and adjusted when necessary.

The only drawback to this approach is that it often becomes too easy for dates to be relaxed. What helps is that everyone is aware of the order in which the steps need to occur and that it will be obvious to the entire group, and management, if someone does not meet their goals. This will put the offending group in the spotlight with no one to blame, and will hopefully encourage them to meet their goals on time.

Submit the list of milestones to management and other interested parties to help facilitate success and a fair evaluation at the end of the pilot. Also consider having regular, periodic reviews of the pilot, during the pilot itself. This way, problems can be resolved during the pilot, helping to ensure its success.

Involve Departments with an Interest

Involve any departments that have been considering Domino or pushing for Domino.

Involving departments that have an interest in Notes/Domino will ensure that your test users are motivated about the project. Also, they will be able to test some of the ideas or applications they had in mind, ensuring their success for the full deployment. Having successful applications early will get Domino off to a good start.

Limit the Size of the Pilot

Do not let the pilot grow too large. You should make a specific list of pilot users and stick to it. When users see other people enjoying Notes benefits such as including attachments in e-mail, integrated calendaring, and replication, they will want it too. Some of these users you may want to get involved in the pilot, especially executives, to ensure support during the full deployment, but you need to be very careful not to overrun your pilot infrastructure.

If you design a pilot infrastructure with 20 or 30 users in mind and let it explode to 90 or 100, the performance and stability of the pilot infrastructure will surely suffer. Once the quality of service for the pilot users degrades, their positive opinions of Notes may begin to change.

Also, the more users are added to the pilot, the harder it will be to move to the production environment. Users will want to keep their mail and calendar entries and departments will want to save their applications. This can slow down the full deployment and wreak havoc on any standards you were planning on implementing. For more information on standards see Chapter 8, "Defining Standards."

If you let your pilot become too large you may also find yourself very busy with supporting the pilot infrastructure and will not be able to spend time working on the full deployment plans. This will often lead to the pilot becoming production. You definitely do not want this to happen. The point of the pilot was to gain experience with an initial trial and then use what you learned from mistakes and experiences to produce a solid production environment. If your pilot turns into production, you will end up having to live with some of the mistakes that were made, or trying to change things later when your environment is much larger in size.

Make the Pilot a Realistic Experience

During the pilot try to simulate a production environment as much as possible. Keep the servers up and running and when you need to bring them down notify the users. Use groups in database Access Control Lists (ACLs), check the log files daily, tune Domino and the operating system for performance, and plan out upgrades.

For more information on managing a Domino environment see Part Four, "Systems Management."

Rolling out the Servers and Clients

Again the point here is to gain experience. Practice the following:

- Configuring workstations
- Configuring servers
- Registering users
- Applying restrictions
- Using Lotus or third-party tools
- Applying binding Service Level Agreements (SLAs)
- Anything else that applies to your organization

Again, try to be as “real-life” as possible while performing all of the rollout activities. This includes the following:

- Using the software distribution tools that you will be using for the full rollout
- Using “standard” workstation configurations
- Keeping the servers up 24x7 where required
- Tuning Domino and the operating system for performance
- Creating and sticking to a rollout plan

The full details of creating a rollout plan are covered in Chapter 16 and it should be read before you construct a pilot rollout plan. We will only cover the differences between a pilot and a full deployment plan here.

Number of Servers

You will obviously need a smaller number of servers for the pilot than for the full deployment. In fact, in most cases you will only require one server in order to support the users in your pilot.

We do suggest however, that you have more than one server in your pilot environment if you plan on having more than one server in your production environment. This is especially true if you plan on using either partitioning or clustering. The configuration of these Domino services is more involved and will therefore require more practice to implement them properly.

While practicing make sure to keep the pilot users' main server operational so as to minimize service interruption to the users. If possible, you may want to have two or more machines so that one machine can be dedicated to the pilot users with a goal of 24x7 operation and one or more machines for administrative testing. This will allow you to practice both keeping a server up and installing and configuring new servers.

Number of Users per Server

While piloting servers in a test environment you will most likely not be able to support as many users on each server as you would be able to in a production environment. This is usually due to the following reasons:

- The limited resources of pilot machines (RAM, processor, hard drive space, etc.)
- High administrative load while testing different configurations
- The servers being temporarily hooked to small-bandwidth network connections for administrative ease, such as the box sitting on your desk
- The machine not being optimized for performance

The concern here is that a heavily loaded machine will yield poor performance for your pilot users and thus affect their opinion of Notes. As mentioned above, it is a good idea to have one or more servers dedicated to users and treated as production machines and a separate set of servers for administrative testing.

Procuring Hardware

When setting up a pilot you will most likely be working with a very small budget or possibly no budget at all. This makes procuring hardware difficult.

If you have chosen NT, Solaris, or Linux running on Intel hardware and have a small pilot group, you might be able to use an extra desktop workstation or an older server. It might also be possible for you to get a demo server from a manufacturer such as Dell or IBM Netfinity depending on the relationship you have built with them, or the number of servers you will be purchasing for the full deployment. You should try to use the same hardware you will be using for the full deployment so that you can test it and become comfortable with it.

The larger platforms can be more of a problem. Your organization probably does not have a spare AS/400, S/390, or HP-UX available for you to experiment with because of the higher cost of those machines. It is, however, getting more and more popular for companies to furnish loaner machines for these larger platforms. This is especially true for long-time customers or large clients.

IBM for example, will often come out to your site, set up and configure the machine, give a short demo and overview, and provide a certain amount of ongoing phone support. This is an excellent way to try out a large-scale platform without making a big investment. If you are interested in one of the large Domino platforms we strongly encourage you to contact the platform company for details on possible trial programs.

Security

During a pilot security is usually rather relaxed. This is usually OK because there is little sensitive data or mission-critical data. It is acceptable to run a less secure environment during the pilot but we encourage you to at least experiment with the different security features of Domino. If you wait until the full deployment to study and test security aspects, you run the risk of security holes or locking your users out of servers or data in your production environment. Again, the pilot should be used to learn as much as you can about Domino.

For a detailed description of security see Chapter 14, "Security," and Chapter 11, "Designing an Application Infrastructure."

Support

During the pilot your support infrastructure is most likely not yet in place. This means that you, the Domino manager and/or administrator, will be responsible for all Notes-related support. This includes end-user support ranging from "I forgot my password" to "Notes is breaking my computer." As soon as the help desk hears the word "Notes," they will send the user to you.

You should be prepared to handle the calls and troubleshoot many areas, including network problems, operating system problems, and user mistakes. Keep this in mind when you are determining the size of your pilot and the pilot users' technical competence. If the pilot is large, try to personally train a help desk member or designate a junior administrator to handle some of the more basic questions. This will allow you to concentrate on other things.

For information on troubleshooting see Chapter 23, "Troubleshooting."

Backup

During a pilot there is usually not any critical data that you need to back up. As mentioned earlier you will want to make your users aware of a possible instability inherent in the pilot process and discuss with them the precautionary measures available.

Even though the pilot data may not be critical, you will still want to test the backup software and hardware you are planning to use in the production

environment. This will give you a chance to evaluate different products and become familiar with the backup procedures (see Chapter 22 for details).

It will also give you the opportunity to identify any potential problems, such as open file issues, which may become serious in the rollout if not identified here and planned for. Yet again the point of the Domino pilot is to learn as much as possible so that you are prepared for the full deployment.

Policies and Procedures

You will want to have some type of policies and procedures in place for the Domino pilot. This not only gives you a chance to practice for the final deployment, but it is also important for other reasons. When a company brings Domino into their organization it is often to give their employees more communications reach and greater access to information. Access to the Internet is usually a large part of this extended reach. This could include Internet mail, the World Wide Web, and newsgroups to name a few.

If you do not have some type of policy in place before giving users this type of new access you may be setting yourself up for a fall. If managers see a reduced level of productivity (too much time spent surfing the Web for example), or users complain of inappropriate content being viewed or distributed, your Domino deployment could be severely hampered.

Another major concern is that you might end up having to take away something from the users when you move from the pilot to the production environment. Doing this will not be received very well by some users.

It is best to put policies in place, and enforce them, right from the start.

See Chapter 17 for more information on policies and procedures and Chapter 15 for more information on acceptable use policies.

Production versus Experimentation

From the discussions above you can probably start to see a pattern evolving. We are referring to the constant struggle between keeping a production quality service and experimenting and learning as much as possible during the pilot phase.

One of the main ways to handle this has been mentioned several times. Try to keep a production-level server or servers for your pilot users and a separate set of servers for administrative testing. This way you can try out different configurations and tools without interrupting service to your users.

This also gives you the opportunity to practice making changes and scheduling outages to your simulated production environment while minimizing user interruptions. Examples of interruptions include Domino and operating system software upgrades, hardware upgrades, scheduled maintenance, and backup.

For more information on managing a Domino environment see Part Four, “Systems Management.”

Evaluating the Results

As covered in the preceding sections, you will have defined the evaluation and success criteria before the pilot started. When the pilot is over, either because an absolute date has passed or you feel it is time to finish, you should sit down with the project manager to evaluate the success of the pilot.

You should use the pilot deployment plan as a sort of checklist to review all of the steps taken and their outcomes. Write down the issues that came up at each step, the things that were learned, and the adjustments that should be made for the full deployment.

You should also interview the end users to find out what their opinions are on the pilot. Ask them what they liked and disliked, what adjustments they would like to see, and their overall feeling of Notes. Evaluate each of the problems that are raised and write down the possible ways, if any, around them.

Tip Create a Notes discussion database for users to post their thoughts and experiences with Domino/Notes during the pilot. This will give you a record of issues to address both during the pilot and after the pilot for the full deployment. It also gives the pilot users an application to experiment with.

You should then present all this information to the manager. Together you will decide on which parts of the pilot were successful and which parts should be adjusted. At this point, it is still safe to make changes to just about any area of the deployment, so do not be afraid to do so. It might be some more work upfront but it will ensure the deployment is done right in the end.

If you do decide to make major changes you may need to re-pilot. The two biggest examples would be a change of platform and a change of client. The impact caused by each of these changes is large enough that you should go through the pilot process again to gain experience with the new platform or client and make sure it is the right one for the organization. You may find just as many, or more, problems with your second choice and decide to stick with the first choice after all.

Summary

In this chapter we discussed the issues involved in running a Domino pilot. This included why a pilot should be set up, how to build a pilot team, developing a pilot deployment plan and strategy, rolling out servers and clients, and evaluating the results.

We learned that the main objective of the pilot was to gain experience. The experience gained will help you during the full deployment by giving you a good idea of the factors you will have to face and the benefits you will see when Notes becomes a part of your business.

Part Three. Notes/Domino Design and Deployment

Chapter 7

Designing a Hardware Infrastructure

Now that you have completed your Domino pilot and have made a firm decision on the server platform or platforms to use, you need to specify, size, purchase and install the actual hardware for your Domino servers.

As mentioned in the platform chapter, there are tools and sources of information to assist you in sizing the hardware needed to support your organization, but these cannot provide you with everything. They are useful guidelines; however, they are based on lab simulations rather than real life, and cannot fully account for the fact that each organization has different needs and plans for Domino. Factors such as the number of mobile users, the number and types of applications, and your network topology, can all affect the amount, and type, of load on your servers.

In addition, most of these tools are based on benchmarks which don't totally mimic reality for either your Domino servers or your Notes clients. For example, NotesBench mail workload benchmark results specify which Domino server tasks are running for the duration of the benchmark. The vendors who run these benchmarks want their hardware to look as good as possible, so they remove server tasks which are not needed to complete the benchmark. Thus a mail test may not have the replicator task running. This is not what you might normally do in a production environment, but it is the basis for most mail benchmarks.

Mail benchmarks would normally avoid things like view or full-text indexing, compacting, and the like — all of which are real-world tasks that happen in a production environment — in order to make the benchmark optimize the number of clients that it “appears” to support and to minimize the response time seen by the simulated client drivers.

Also, NotesBench benchmarks have certain “rules” which must be followed for the results to be audited and, if they pass, eventually published. You may have stricter or less strict rules for your objectives in terms of mean and peak response times, server CPU utilization, network utilization, disk configuration, and the like.

The benchmarks are still valuable since they allow you to compare various hardware platforms and to select one or more platforms based on an “apples-to-apples” comparison. These benchmarks should not, however, be used to size Domino servers in a vacuum, unless you have validated the

relationship between your actual workload and the benchmarks on a consistent, predictable basis. For new implementations of Domino, as well as existing implementations, this means that you will need to make some rough estimates and then monitor, measure, predict, and track to see what your server capacity needs will be.

Therefore, since there is no way for us to tell you exactly what you will need in terms of hardware, our point with this chapter is to give you some general guidelines to follow, general issues to consider, and places to go for more information, so that you will be able to make your own, informed, decision.

This chapter covers the following topics:

- Determining what you need
- Sizing the hardware
- Making the purchasing decision
- Increasing the complexity
- Presenting the hardware recommendation
- Making adjustments
- Summary

Determining What You Need

While making a platform decision you drew up some high-level Domino infrastructure layouts to help you get an idea of how each of the different platforms might fit into your company's infrastructure.

You will now need to make a more detailed drawing that will serve as the basis for your future decisions. This drawing will not be static but will continuously grow and change as you learn more about Domino and your organization.

Elements of the Drawing

You want to use the initial platform drawing, the information you gathered about your environment as outlined in Chapter 3, and your experiences from the pilot, to help you start to produce an initial drawing.

Start by drawing bubbles, for each of the offices that you will need to support and the number of users in each office. Then draw in the network connections that currently exist between the offices, or if there are plans for upgrades, what the new connections will be and what the live dates are for them.

Then, for each of the office bubbles write in what the platform or platforms will be for that office. If there will be no server at a particular location, draw in a line designating which server or servers those users will be accessing and over which connection.

Next, for each of the platforms you listed at each of the locations make a list of what the server or servers will be required to do (don't worry about the number of servers there will be yet). This includes the following:

- Total number of users
- The Domino services used (mail, calendaring, HTTP, replication, etc.)
- Any add-in tasks to be used (third-party monitoring tools, fax software)
- The number and size of applications that will be used
- A guess as to the amount of concurrent user traffic
- Other non-Domino tasks to be run on the servers, although not generally recommended for the smaller servers
- Any other relevant information

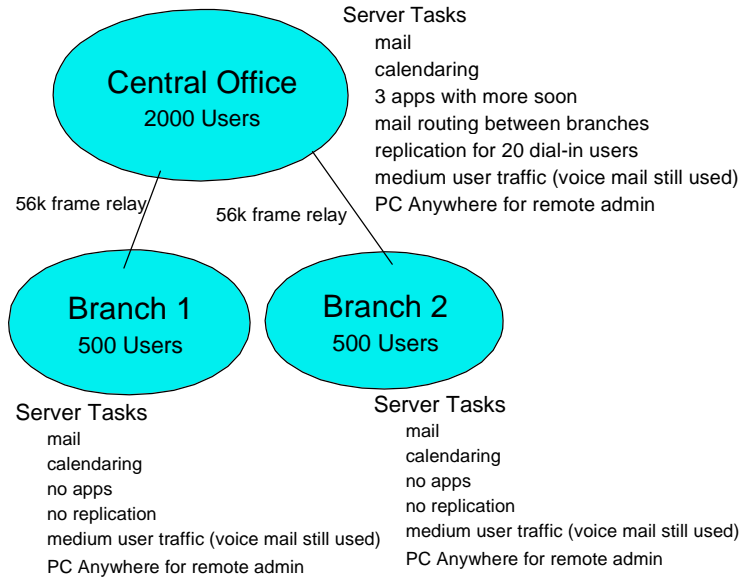
This should give you a clear picture of everything the server or servers at each location will need to do.

An Example

We will use a fictitious company as an example throughout this chapter to help illustrate the topics covered.

Our sample company has a central office with 2000 mail users and two branch offices with 500 mail users each. The central office has a few small Notes applications to start with while the branches have no applications initially. The network connections between the offices are small (56K or less with no plans for upgrades). Our example uses a single platform, NT/Intel, for simplicity. Most of the considerations discussed with this example also apply to other platforms.

Following the steps outlined above, we construct the start of our drawing for our sample company.



Notice that we have not drawn anything technical yet. We have not determined whether or not there will be servers in each location or how many servers there will be in each location. We are only concerned with getting an idea of what we are going to need and where.

Knowing the Domino Infrastructure Elements

It may be that you have some difficulty preparing the above drawing and list of tasks and services your Domino servers will need to perform. This is because such a drawing requires you to understand all of the different parts of Domino and how they fit together, which you are not likely to know yet if you are new to Domino.

You may want to draw on your experience from the platform decision and pilot phases. Also, it is recommended you read the rest of the chapters in Part Three of the book, as well as consult the sources they reference, while making your infrastructure drawing. Start your drawing in this chapter and then refine it as you make your way through the rest of the chapters in this book.

Consulting an Expert

If you have limited experience with Domino you should also consider bringing in an experienced Domino consultant to help you construct the Domino infrastructure drawing. A consultant can help you fill in the blanks in your drawing, supply information based on real life experience, and serve as a double check for your plans. We do encourage you to try and make the drawing yourself first, however, as it will be a very valuable learning experience.

Sizing the Hardware

We now need to take a side step and try to get a picture of what some of the different hardware for your particular platform is capable of. You will use this information to first get rough numbers for determining the number of servers for each particular location, and later to help you build specific machine configurations.

There are a number of things to consider when researching hardware including the following:

- The number of physical machines
- The number of logical Domino servers
- The number and speed of the CPUs
- The amount of RAM
- The number and speed of network cards
- The number of hard drive controllers and hard drives
- The speed of the disks
- The RAID configuration, if any
- The backup hardware

Each platform has its own answers to the above items. A full discussion of the details for each hardware or operating system platform is beyond the scope of this book. Our goal here is to point you towards specific sources of hardware sizing information for each of the hardware or operating system platform choices, and to give you some additional information that we have not seen anywhere else.

Sources of Information for All Platforms

In addition to the comments in the introduction to this chapter about *not* using benchmarks to size servers, there are some general things to consider and some sources to reference that apply to all of the platforms.

Things to Consider while Researching

As mentioned earlier, at the time of writing this book, finalized Domino R5 performance numbers were not yet available. Most of the sources listed below are therefore based on Domino Release 4.5 or 4.6. Some of them are in the processes of being updated and should be released soon. When researching your hardware look for an updated version of the source.

The other thing to consider when reviewing sources of information on hardware sizing is that the numbers given in benchmarking reports are often based on simulations and do not necessarily reflect real-life situations. You may very well have more tasks (replication, etc.) executing in your real-world server environments, and actual workloads may vary from estimated workloads.

For more information on research considerations check the “What to Look for in Performance Reports” and “Domino Performance and Scalability: A Guide to Capacity Planning” papers available at the Web site www.lotus.com/performance

General Sources of Information

Here is a list of general sources of information:

- IBM Domino redbooks
www.redbooks.ibm.com/solutions/sk2t8039.html
www.lotus.com/redbook
- Consultants
- Lotus representatives
- Server.Planner
Ships with Notes
- Server.Load
www.lotus.com/performance
- www.lotus.com/performance
- ProActive Tools
www.g2sys.com

- Lotusphere presentations
www.notes.net/ls99.nsf
- Other Domino professionals (through forums such as notes.net)

Sources of Information for NT

Here is a list of sources of information for NT to consult:

- www.notesbench.org
- www.ibm.com/support/techdocs
- Redbook *Netfinity and Domino R5.0 Integration Guide*, IBM form number SG24-5313
- Redbook *High Availability and Scalability with Domino Clustering and Partitioning on Windows NT*, IBM form number SG24-5141, Lotus part number CT6XMIE
- Redbook *Clustering and High Availability Guide for IBM Netfinity and IBM PC Servers*, IBM form number SG24-4858
- Your local IBM representative for IBM Netfinity servers

Sources of Information for AS/400

Here is a list of sources of information for the AS/400 platform to consult:

- www.notesbench.org
- www.as400.ibm.com/lotus_notes/
- Redbook *Lotus Domino for AS/400: Performance Tuning and Capacity Planning*, IBM form number SG24-5162
- Redbook *Lotus Domino for AS/400 - Installation, Customization, Administration*, IBM form number SG24-5181
- Redbook *Using Lotus Notes on the Integrated PC Server for AS/400*, IBM form number SG24-4779
- Redbook *AS/400 Server Capacity Planning*, IBM form number SG24-2159
- Redbook *Mail Integration for Lotus Domino 4.5 on the IBM Integrated PC Server for AS/400 V3R2 or V3R7*, IBM form number SG24-4977
- Your local IBM representative for AS/400

Sources of Information for S/390

Here is a list of sources of information for the S/390 platform to consult:

- www.s390.ibm.com/nc/
- Redbook *Lotus Domino for S/390 Performance Tuning & Capacity Planning*, IBM form number SG24-5149
- Redbook *Deploying Domino in a S/390 Environment*, IBM form number SG24-2182
- Redbook *Lotus Domino for S/390 R4.6: Installation, Customization and Administration*, IBM form number SG24-2083
- Redbook *Enterprise Integration with Domino for S/390*, IBM form number SG24-5150
- Your local IBM representative for S/390

Sources of information for RS/6000

Here is a list of sources of information for RS/6000 to consult:

- www.notesbench.org
- www.rs6000.ibm.com/resource/technology/notesSPcfg/
- Redbook *Lotus Domino R5 for IBM RS/6000*, IBM form number SG24-5138
- Redbook *High Availability and Scalability with Domino Clustering and Partitioning on AIX*, IBM form number SG24-5163, Lotus part number CT7JONA
- Redbook *Lotus Domino Release 4.6 on IBM RS/6000: Installation, Customization, and Administration*, IBM form number SG24-4694
- Your local IBM representative for RS/6000

Sources of Information for OS/2

Here is a list of sources of information for OS/2 to consult:

- www.software.ibm.com/os/warp/library/
- www.software.ibm.com/os/warp/library/h3b1.html
- www.software.ibm.com/os/warp/domino/dows.exe

Sources of Information for Solaris

Here is a list of sources of information for Solaris to consult:

- Sun white paper “Implementing Lotus Domino on Sun”
www.lotus.com/performance
- www.notesbench.org

Sources of Information for HP-UX

Here is a list of sources of information for HP-UX to consult:

- www.hplotussolutions.com
- eproducts.hp.com

Making the Purchasing Decision

Now that you know what you need and what the hardware can do, you need to put the two together to decide what you are going to purchase for your organization.

The First Step

First, take out the infrastructure drawing you started at the beginning of the chapter. You should now be able to start making a list of the hardware you will need to support the platform, or platforms if you chose to use a combination, at each of the locations you specified in the drawing.

Start by just listing the number of physical machines and logical Domino servers you will need for each platform at each location. Determine and use some rough numbers from the information you collected above to get you started. We will continue with our sample organization to help explain.

From our research let's say that we decide that a good rough number for a single Domino server on an NT server is 1000 registered users if the users are mail-only users. This is assuming that about 30-35% of the users are connected to the server at the same time (so-called concurrency rate), which is fairly typical for Domino. With this estimate we start our drawing by putting two physical machines, running one Domino server each in the central office. The 2000 mail users will be split evenly between the two servers (1000 on each).

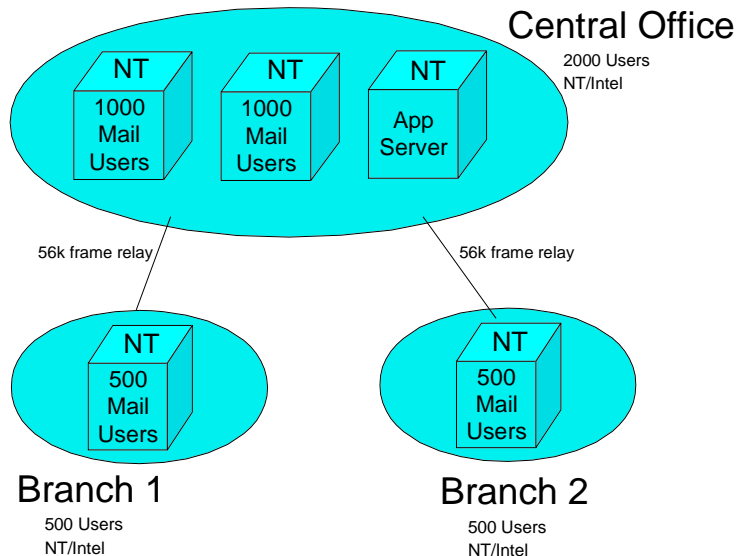
In our example we expect the number of applications to grow in the near future, so we decide to draw in a third physical machine with one Domino sever on it, strictly for applications. This gives us a total of three machines running a total of three Domino servers in the central office — two mail servers and one application server.

The Second Step

Let us now look at the branch offices. We said that there are about 500 mail-only users in each of the branch offices. So, for each of the branch offices we draw in one physical machine with one Domino server, to support the 500 mail-only users.

This gives us a total of five physical machines running a total of five Domino servers — four mail servers and one application server.

Our drawing now looks like this:



The Third Step

The third step is to define specific hardware for each of the machines described above. In our example we estimated that we need two machines that can handle about 1000 registered mail-only users each for the central office, assuming a concurrency rate of roughly 35%; one small-scale application server for the central office; and two machines that can handle about 500 registered mail users each, one for each branch office.

We go back to consult the sources listed above to get an idea of the configurations that have been used by others to support the types of loads we have. Be aware that when sizing your hardware you will probably never find an exact match in any example and that the numbers given are sometimes based on simulations, so there will always be some educated guess work involved.

In addition, the workload generated by your clients may be twice, three times, ... or more times the benchmark data you are consulting. Don't forget to use experience or a consultant/expert to help you do a reasonable first estimate.

Requirements for the Mail Servers in the Central Office

We decide that the two NT/Intel mail servers in our example required to support 1000 users will need to be powerful machines. The hardware specification for each of these servers might look something like this:

- Four of the fastest processors available (currently 550MHz Pentium III or Pentium III Xeons)
- 1 to 2GB of RAM, or higher
- One disk controller with two 4.5GB hard drives — one for the operating system and page files and one for the Domino program files
- One 4.5GB hard drive and separate disk controller for the transaction log. Lotus strongly recommends that you consider using two drives on different adapters to “mirror” the Domino transaction logs since the transaction log is a file which is key to the proper execution of Domino. See Chapter 21 for details on Transaction Logging.
- A RAID or storage farm subsystem for the Domino data files. See Chapter 21 on performance for helping you to choose a storage subsystem.

Requirements for the Mail Servers in the Branch Offices

The two branch office mail servers to support 500 mail-only users would not need to be as powerful as the 1000-user machines unless the branches were expected to grow in size. These machines might look something like this:

- Two of the fastest processors available (currently 550MHz Pentium III or Pentium III Xeons).
- 0.5 to 1GB of RAM, or higher.
- One disk controller with two 4.5GB hard drives — one for the operating system and page files and one for the Domino program files.
- One 4.5GB hard drive and separate disk controller for the transaction log. Lotus strongly recommends that you consider using two drives on different adapters to “mirror” the Domino transaction logs since the transaction log is a file which is key to the proper execution of Domino. See Chapter 21 for details on transaction logging.
- A RAID or storage farm subsystem for the Domino data files. See Chapter 21 on performance for helping you to choose a storage subsystem.

Requirements for the Application Server

The one application server for the central office would not need to be as powerful as the mail servers to start with, but it should have the ability to grow. The machine would look something like this:

- One fast processor (Pentium II or III — the faster the better).
- 256 to 512MB of RAM, or higher.
- One disk controller with one 9GB hard drive — one for both the operating system and page files and Domino program files (this can be separated out to separate hard drives later on when the server needs to grow).
- One 4.5GB hard drive and separate disk controller for the transaction log. Lotus strongly recommends that you consider using two drives on different adapters to “mirror” the Domino transaction logs since the transaction log is a file which is key to the proper execution of Domino. See Chapter 21 for details on Transaction Logging.
- A RAID or storage farm subsystem for the Domino data files. See Chapter 21 on performance for helping you to choose a storage subsystem.

You might have the need for dedicated mail routing hubs and/or replication hubs, and so you may need to draw in possible mail routing and replication topologies at this stage. You should read the rest of part three before adding this material. We will come back to the drawing to add more detail in

Chapter 16, “Planning for the Rollout,” and Chapter 17, “Producing Documentation,” after we have covered more information on infrastructure design.

Note The above configurations are samples and should not be treated as de facto standards. Use the sources of information listed earlier in this chapter to help you determine more exact numbers for your particular organization. The reasoning behind the exact hardware configurations (such as using multiple controllers and hard disks) has a lot to do with performance, which is covered in Chapter 21, “Performance.”

Planning for Growth

When designing your hardware configurations you should always plan for growth. For example, if you decide to start out with two processors you might be tempted to purchase a machine that can have a maximum of two processors. If you do this, then when your user base outgrows those two processors you will need to buy a whole new machine that can use more processors. Thus, an extra initial expenditure may be more cost effective than having to upgrade later.

It might be better to purchase a four processor capable machine and only put two processors in it to start with. It will then be relatively painless to upgrade to four processors when the time comes.

The same holds true for RAM capacity. It might be better to buy a machine that can expand to 2 or 3GB but only has 1GB to start with, than to max out a server that can only handle 1GB of RAM total. You may also need to purchase the initial memory in sizes that allow this expansion, rather than filling all memory slots and having to “throw away” your initial memory in order to accommodate larger memory sizes.

Planning for growth also applies to disks, especially relating to mail servers.

Increasing the Complexity

The example configuration given above is an extremely simple case. We did not consider clustering, partitioning, or any of the larger platforms. As with anything, as the scale of the project increases, so does its complexity. If you will need to support tens or hundreds of thousands of users, with 24x7 availability, your infrastructure will be large and complex. The key here is to start small and build from there — unless you have a requirement to plan big from the start, of course.

Hardware Planning for Large Deployments

You will want to use the same basic concepts as above. Start with a simple drawing showing where all of your users are located and how they are connected. Even if you have a large number of total users, you will usually find that there are much smaller numbers of users in any one particular location.

Each of these smaller individual locations may have to be treated as a mini-organization with its own platforms, topologies, support teams, and expertise. You can use a custom solution for each location based on its needs, as long as you make sure all of the smaller pieces can fit together well as a whole.

To ensure all of the pieces work together, most organizations deploy Domino in stages. This usually means getting the central office up and running first, and then start deploying to each of the satellite offices one by one. You will, however, want to have a general initial idea of how each of the satellite offices will be set up to ensure that all of the pieces will fit together in the end.

The other key to large deployments is delegation. You will not be able to do it all yourself. You need a solid team to help you get it all done right and on time. A lot of the team members will be from other departments, which can be difficult to manage, but you need their skills and level of access to do the job. Work as a team! For details on building a rollout team see Chapter 16, “Preparing for the Rollout.”

Clustering and Partitioning Considerations

Clustering refers to a loosely-coupled set of systems and/or application instances that are coordinated to provide higher availability and scalability, and to enable more efficient use of resources than is possible from a single application instance and/or system.

There are both Domino and non-Domino based clustering options.

Domino server partitioning lets you run multiple Domino servers on a single computer. You can then purchase a single, more powerful computer and run multiple Domino servers on that single machine.

Your options for clustering and partitioning Domino servers vary for each platform. Domino clustering is an option for all of the platforms, but there are also platform-specific options such as HACMP for RS/6000 and Wolfpack for NT that should be considered, as well as LPARs on the S/390.

Use the platform-specific sources of information listed previously to research your options and help you choose a solution. Some of the same criteria you used to decide on a platform will again be used when choosing a clustering and partitioning solution. These include the following:

- The current infrastructure (skills currently in-house, as well as those that will need to be developed or contracted out)
- Plans for the future
- The organization's business model
- Scalability
- Availability
- Performance
- Cost

Presenting the Hardware Recommendation

After you have an infrastructure drawing you feel comfortable with you need to present it. This is usually presented to executive management who will approve, and budget for, the money required to purchase the hardware.

You are the salesperson in this situation and need to sell your plan to your management. You need them to accept, and have confidence in, your plan to ensure you get the hardware you require.

To ensure success, follow these guidelines:

- Be very specific

Bring a clean, professional looking drawing of the infrastructure you are proposing, along with a detailed breakdown of each piece of hardware that is required and an estimate of what each piece will cost. Also, include specifics on any in-house hardware that will be used or upgraded (if you are going to use an existing S/390 for example).

Don't worry too much about simplifying the presentation. Some of the managers in the audience will probably be technical and will like to see that you have done your homework. This does not mean you have to explain every detail, but you should be able to answer detailed questions when asked.

Use the drawing to explain how all of the pieces fit together and where all of the hardware will be located. Use different drawings with different level of details if necessary.

- Double-check everything

Before you walk through the manager's door make sure you have double- or triple-checked everything. This means not just the specific things you plan on covering but the items that led you to those decisions and topics.

Check the validity of the numbers and the plan with consultants, colleagues, other Domino users, and IBM or Lotus representatives, for example.

The main goal though is making sure you did not miss anything or make any mistakes that could have been avoided.

- Be in a position to explain all of the details

Take the time to make sure you can explain the details of each topic you are going to cover. Some of the topics you cover will be accepted and understood easily, while others will require some additional explaining. You never know what will pique your manager's interest.

Again the point here is to show that you know what you are talking about and that you have done your homework.

- Cover your organization's goals for Domino

In Chapter 1 we looked at what your company wants to accomplish. It was decided that Domino could, and would, be used as the tool to accomplish at least a subset of the identified business requirements.

Make sure you cover each one of the items that Domino was supposed to address, since they will be key in the manager's mind. There is a good chance that there are some items that will not be covered, some that might have to be adjusted, and some that could be covered but it would be too cost-prohibitive to do so. Make your recommendations on alternatives and ask for suggestions.

- Clarify decisions

Clarify before you leave, the stance or direction that will be taken on each of the issues discussed. Be clear about any ramifications on those decisions.

A good example is 24x7 availability. Everyone would like their servers to always be available. It is possible to achieve near-perfect uptime, but it will cost you money. If your manager says "I want 100% uptime" make sure they understand that there is, realistically, no such thing as "100% uptime," but that you *can* maximize the uptime to almost any level management desires, depending on the costs involved in making this happen. Explain to them that you might be able to get a bit less uptime for a fraction of the cost. (Domino clusters versus having full hot backup machines, for example, can keep costs down).

At the end of the meeting take the time to summarize the main topics covered, any of the decisions that have been changed, any further information that needs be gathered, and the next steps to be taken. Get commitments to time frames on decisions and purchases, and commit to time frames for things you need to do. You want to leave the meeting with commitments to make sure the ball keeps rolling.

Making Adjustments

No matter how good your presentation is, you may only get a subset of the hardware you asked for. The main reason for this is, of course, money.

You will usually be told to either choose a subset of the hardware in your original specification or that you will be allocated a set amount of money and need to come up with a solution for that amount. The decision of what to cut and what to keep can be a very difficult one. Each one of the items in your original specification was put there for a reason and you would like to have them.

Your first step is to make an ordered list of the most important issues for your company. Common examples include: performance; scalability (ability to handle growth); and availability.

The next step is to redraw your Domino infrastructure based on the restrictions imposed on you. Consult your list of important issues during each decision and keep a list of the restrictions having to be imposed on the infrastructure. Look for ways to cut cost without cutting functionality like asking around the company for hardware that is not currently being used or utilized to the fullest. We would not suggest using low-grade hardware as a way to cut costs.

Once you have constructed an adjusted hardware list, represent it to your manager. Make sure everyone is aware of the limitations that have been imposed due to the restrictions and what those limitations mean to the organization. For example, the original specification was designed to handle approximately a 10% user growth before new hardware would be required, while the new plan will only be able to support a 1% user growth.

Also point out areas where you were able to lower the initial cost, but because of the change, the long-term cost will be higher.

You need to make sure that management understands the restrictions of the new specification so that impossible expectations are not put on the Domino infrastructure, or you, in the future.

Summary

This chapter addressed the issues involved when determining the hardware needed for your Domino infrastructure. Since there is no way for us to tell you exactly what you will need in terms of hardware, our point with this chapter was to give you some general guidelines to follow and places to go for more information, so that you will be able to make your own, informed, decision.

We started the chapter by determining what your organization needs. Next, we looked at determining what the hardware was capable of. We then brought the two together to determine what you need to buy. Next, we talked about presenting the hardware to the manager in charge of approving the hardware. Finally we covered how to adjust your hardware recommendation because of budget or other constraints.

Before you make your final hardware recommendation you should read the rest of part three to get an idea of all the things your Domino servers will need to do and how it all fits together.

Chapter 8

Defining Standards

This chapter will address some of the more generic standards that should be considered when designing and planning your Domino environment.

Our goal in this chapter is not necessarily to provide you with a comprehensive list of specific recommendations but rather some general guidelines and issues to consider. One recommendation is not necessarily better than another. The important thing is to have standards and then be consistent in applying them.

Weigh the information we give you against the requirements of your organization to come up with a set of standards that will work for you.

Standards for specific topics such as messaging, database management, security and administration will be dealt with in more detail in their relevant chapters throughout this book. We will concentrate instead on areas that are important to the Domino environment but may not necessarily be covered in the other chapters.

The following topics are covered:

- Are standards so important?
- What to consider
- Hardware and software
- Domino directory structures
- Naming conventions
- Default Access Control Lists
- Mail file sizes
- Summary

Are Standards So Important?

Taking the time to properly plan and document a set of standards at the start of a deployment project will ensure that you build a robust and flexible Domino environment. Standards will ensure consistency and integrity of data across the organization and maximize the efficient use of the Domino infrastructure. Standards will help you to do the following:

- Facilitate the integration of new technologies into existing infrastructures.
- Deploy applications that are readily accepted by the user community.
- Assist in establishing an infrastructure that is easily managed, maintained and supported.
- Serve as the basis for the quality of service you deliver.
- Ensure compatibility across support organizations and platforms.
- Save time and productivity during implementation and maintenance and thereby reduce costs.
- Make troubleshooting easier. Without a level starting point, it will be very difficult to determine what your problems are or could be.
- Make it easier for new administration staff to learn the environment.
- Provide a central source of information that all support teams can refer to (and possibly your end users, if appropriate).

It's important to note that in order to gain maximum advantage from standards, they must be developed and observed across all disciplines of the IT infrastructure and supported throughout all levels of management. Without this, there is a danger of implementing a disjointed and potentially unmanageable Domino environment.

What to Consider

Start work on a set of standards as early as possible in a Domino deployment. Waiting until the Domino infrastructure has already been rolled out and established will be too late. People naturally resist change and will not welcome the introduction of a new way of doing things, or worse still, the removal of features that they have come to rely on.

Having said that, it is not impossible to implement standards after deployment, nor should this be used as an excuse not to implement them. It will simply make your job a little more challenging.

When thinking about standards, remember that they should:

- Be flexible enough to allow people to perform their jobs
- Not completely limit or deny creativity or flexibility
- Be clearly documented in a central area that is accessible by all relevant parties
- Be a living document that is updated as new technology emerges and the environment changes
- Be developed in conjunction with all support teams, with the opportunity for review and feedback throughout the process
- Be enforced

Having said all this, remember to develop and document a process for requesting, reviewing, and granting exceptions to the documented standards for special cases.

Hardware and Software

In the sections below we will discuss some standards and guidelines for key components of the overall Domino environment.

First, let's take a look at two areas external to Domino itself that will have a direct influence on the performance and integrity of your servers by discussing standards in relation to hardware and software.

Hardware and software standards will vary depending on the type of equipment used and the server function to be implemented. A mail server for example, will be set up and configured differently than an application server or a replication hub. There are however, some general rules that apply.

Hardware

Deciding on a standards based hardware configuration will help to ensure that your Domino environment is running at peak performance and improve manageability and maintenance.

There will always be exceptions. However, being able to rely on a minimum hardware configuration will provide the ability to integrate and easily swap and change parts in cases of system failure. It will also make life easier for your support teams if they can depend on a set of common hardware configuration utilities.

As an example, a base hardware configuration should include the following:

- Model and type of machine
- Size, quantity and type of disk
- Amount of memory
- Number and speed of processors
- Number and type of network cards

The other important consideration here is to decide whether to separate different functions over a number of different Domino servers.

The function and utilization of mail, Notes application, and Web application servers can differ dramatically. Likewise, tuning parameters and recommendations will not necessarily apply to all types of servers. Having dedicated Notes application servers and Web application servers also minimizes the potential for impact to users on production mail systems if things should go wrong.

If your organization can provide for it, we highly recommend the use of separate and dedicated mail, Notes application, and Web application servers for stability and performance reasons.

Software

It would not be beneficial for an organization to have many different types and levels of software running across various platforms and machines. The main reasons being, it has the potential to affect performance of the Domino environment and makes troubleshooting much more difficult.

A standard software configuration should specify the following:

- Minimum software levels for the Domino server code
- Operating system (levels of code)
- Service packs and patches
- Monitoring tools
- Remote access tools
- Backup software
- Software settings

Domino Directory Structures

The term directory structure refers to the way in which the Domino application directories are defined on the hard drives of Domino servers. Directory structures can be addressed from a number of different perspectives.

First, it is common practice to place data and executable code in different directories or hard drives for performance reasons. However, there are additional layers of directories within the Domino application itself that should also be considered.

For instance, what are you going to call your /notes/data directory? What about all those ID files that your Domino system administrators generate? Maybe you want to consider several mail directories versus just one mail directory, for example, for performance and/or manageability reasons.

Notes/Data Directory

The default installation path for data files in R5 is now /lotus/domino. This is adequate as long as you will be running single instances of the Domino server on each machine in your organization.

However, if you decide to run partitioned Domino servers on a machine you will need to configure separate data directories for each set of Domino server data files. A standard we have found useful in these cases is to use something like /lotus/<server name> or notes/<server name> for older releases of Domino.

If you were going to use two Domino partitions on one RS/6000 server, for example, you would need a separate data directory for each logical server instance. For manageability reasons, you may wish to have two separate AIX user IDs own these servers, for example, acme1 and acme2.

You might then make the two Domino server data directories /acme1/domino and /acme2/domino. Or, you might make them /lotus/acme1 and /lotus/acme2. Or, you might make them /lotus/acme1/domino and /lotus/acme2/domino. The important thing is to propose some standards, evaluate which ones make sense, and then decide on which standard you will move forward with.

Standardizing on a name for the /notes/data directory is also important for another reason. Let's use an example where a product or tool external to the Domino application is required to support or maintain your servers. This is often the case when implementing backup solutions.

It is quite possible that these tools will use generic sections of code that depend on certain components of the Domino system always being the same. If these tools need to be customized to cater for a different directory structure on each Domino server it will be a waste of your time, cause frustration and more than likely lead to error.

The important point to note here is that regardless of whether you choose to stay with the default or go with something else, make sure that when you have made a final decision it is implemented across the entire Domino infrastructure.

Underneath the /notes/data directory you will then need to think about a standard directory set up for mail and application servers.

ID Files

Where do you put all those ID files that you need to send to users? You should establish a policy which takes into account security, manageability, and having a backup for the ID files.

For instance, some customers have a security policy that forbids ID files from being attached to the user's person document located in the Domino directory. Therefore, they need a place to put the ID files when the user is registered. One possibility would be to use a directory called /lotus/domino/IDfiles to contain all the newly-generated ID files.

Other customers have a firm policy of writing the ID files to diskettes or writable CDs in order to allow for off-site backup. You should decide what your needs are and establish a standard policy for how ID files are generated, stored, and backed up.

Tip For backup and recovery purposes, you may also want to consider using the new feature in R5 that lets you recover a user's lost password. If so, you should establish this as a standard and make its implementation part of your end-user training exercises if possible.

Mail Servers

By default, user mail files will all be placed in a subdirectory called /mail underneath the /notes/data directory in older releases of Domino or /lotus/domino in R5. If your Domino environment contains a small number of servers and users and you don't anticipate much growth, this may not be a concern. However, what happens if you begin to add a large number of users or the size of mail files grows beyond initial estimates?

In large-scale deployments, the size and number of mail files has been known to grow to such an extent that it has become difficult to schedule time for tasks such as indexing to run to completion outside of business hours or during maintenance windows.

To work around this problem consider using a number of mail file subdirectories underneath the /notes/data directory. These subdirectories can be given generic names such as mail1, mail2, mail3 and then populated with a limited number of user mail files. You will need to tell the users which mail directory their mail file is in — especially if it moves due to disk reorganization as a result of server workload balancing or disk tuning, for example.

Program documents can then be used to schedule tasks like indexing or compact to run at various non-critical intervals throughout the week on individual subdirectories.

Tip Avoid using alphabetical breakdown of mail file directories, such as a_dir, b_dir, c_dir etc on mail servers. Users inevitably change their last names or you may encounter spelling errors in the registration process. This approach will also generally lead to an uneven distribution of files across directories. In the end, you will be adding unnecessary administration overhead for moving mail files by adopting this standard.

Lastly, depending on the size and capacity of your Domino servers it may also be a good idea to distribute mail files across multiple disks. This minimizes the risk of a single point of failure so that at least some of the users in your organization can continue to work if one disk fails. In addition, if you are using a disk architecture which allows for tight control of directory and file placement, you can improve the performance of your I/O subsystem by using different logical volumes and file systems for each physical volume.

Notes Application Servers

On application servers, you need to decide where your Notes application databases will reside. Again there are a number of standards that you may wish to adopt.

Most companies choose to create a number of subdirectories based on business function or department. If your organization is fairly static and is not likely to change its business structure this will probably be the most logical choice. If there is any likelihood however, that the organization will undergo restructure think carefully before implementing this standard.

An alternative method is to use an alphabetical breakdown of subdirectories based on filenames. The advantage here is that filenames tend to remain static, whereas business units or departments may change over time.

The downside of this approach is that users will not always know the filename of the application they are trying to locate and this may lead to a lot of wasted time and frustration.

Either way, the objective should be to provide an easily identifiable method for determining a database location while at the same time minimizing the risk of having to move databases to different subdirectories.

This subject is so important that Chapter 11, “Designing an Application Infrastructure,” is devoted to this topic.

Web Application Servers

If you set it up to do so, a Domino server can make a Domino/Notes database available to users who use a Web browser. These users could be Internet users from outside your company, or intranet users who are using a Web browser from inside your corporate network, or a combination of these. Domino servers which perform this function are called Web application servers.

For Domino Web application servers, you need to decide who will be allowed access, what level of access will be allowed for unauthenticated or anonymous users, what the default access level will be, and what roles (if any) Web users will have versus Notes users.

You also need to decide if any Notes users, outside of administrators, application designers/developers, and Notes database managers, will be allowed to access the Domino-based Web application servers as Notes users.

You will need to decide whether the Domino-based Web application server sits inside of, or outside of, your corporate firewall. Other security considerations concern whether or not two-way replication with other Domino servers in your Domino domain is allowed, whether you want to set up a separate Domino domain, or use the existing one.

These topics are so important that we have devoted Chapter 13, “The Internet,” and Chapter 14, “Security,” to them.

Naming Conventions

The primary concern when addressing standard naming conventions is to use something that will be flexible enough to allow for growth in the Domino environment and will remain easy to maintain. Try to use naming conventions that will remain fairly constant.

The naming conventions you settle on will be closely influenced by your organizational structure. That is, whether you have decided on a centralized or distributed approach and possibly the geographical spread of your offices and staff, to name just a few.

Talk to management; find out what their plans are. If the organization is about to be restructured you don't want to have to recertify all of your servers and users because the names you chose are no longer relevant.

Just remember that it is very easy to decide on a name and you will frequently have a wide range of options to choose from. However, once you have made a decision, try to stick with it. It will be much more difficult to change once your Domino environment has been established.

Tip A good idea when deciding on naming conventions is to first locate or create an organizational chart for your company. This will, more often than not, determine many of your choices in planning a meaningful and relevant naming scheme.

We will discuss below each of the essential topics that must be considered when formulating naming conventions and standards for Domino. These are as follows:

- Domains
- Certifiers
- Servers
- Network and port names
- User names
- Short names
- Group names
- Cluster names

For detailed technical information on set up and configuration, consult the Lotus Domino R5 Administration manuals as well as the R5 Administration help database.

Domains

A domain is a group of Domino servers or users that share a common Domino directory. The Domino directory is used to manage all of the servers and users in a domain as well as to manage administration and security tasks.

If you have a relatively small organization, it will probably be easier to centralize control of the Domino environment in one Domino domain. Alternatively, if your organization is large and spans a number of different geographical locations or business units, you may have decided on a decentralized method of support. In this case, you may want to consider creating a number of Domino domains for manageability reasons.

Most people tend to use a domain name that identifies their company. If you have a long company name such as Oklahoma International Banking Corporation try to condense it by using initials. In this case, the domain name could be OIBC.

The main thing to keep in mind here is that the choice you make will have an influence on the mail routing and replication topologies for your organization. The simpler and easier it is to use and remember, the better.

Certifiers

Certifiers are used to structure the names of servers and users in a Domino domain. They are broken down into a number of different components. That is organization, organizational unit, common name and in some cases, country code certifiers.

The easiest way to illustrate this to use an example of a user name such as John Doe/Marketing/OIBC. In this case, OIBC is the organization, Marketing is the organizational unit and John Doe is the common name.

The Lotus Domino R5 Administration manuals contain specific details on how to configure and set up certifiers in an organization. In this section, we will be addressing some standards to apply when naming certifiers.

Let's look at each component in a little more detail below:

- Organization

The organization name is appended to every user and server name created in your domain.

This would normally be your business name or an abbreviation of it and is most frequently the same name that is used for the domain.

Note If your company has decided to use a number of Domino domains, it is still possible to retain one high-level organization certifier. This will allow authentication without the need for cross certification in your organization, while at the same time simplifying the management and administration of the Domino environment.

- **Organizational unit**

These are generally used to distinguish a geographic location or business unit or department within your organization. It is possible to create up to four levels of organizational unit certifiers, however, we would generally only recommend the use of one or two to simplify administration.

Many people decide on the use of departmental names when creating organizational unit certifiers, for example, Sales, Marketing and Human Resources. This is a sound approach if the structure of your business is not likely to change and staff do not transfer or relocate from one department to another very often. Be aware though, that if this is likely to happen your administrators will spend a great deal of time recertifying users and potentially moving mail files from one location to another.

An alternative to this approach is to use geographic names or regions for your organizational unit certifiers. The advantages of this approach are that these are more likely to remain static and therefore alleviate the workload on your administration staff.

In reality, a combination of both these standards will probably be the most manageable approach to adopt. Again, talk to management and refer back to an organizational chart if one is available. It could potentially provide a good, high-level illustration for how to name your Organizational Unit certifiers.

Tip Consider the use of a different organizational unit certifier for contract staff, for example, /contr. This would result in a registered contractor name similar to Joe Bloggs/marketing/contr/ACME. This provides an easy method for restricting access to sensitive areas intended for the use of permanent employees only.

- Common name

Typically, this refers to the first and last name of a user but is also used to identify a server name. We will discuss common name standards as they apply to both servers and user in further detail below.

- Country code

This is an abbreviation for the country, for example US. Country codes are rarely used in most Domino installations.

If you choose to use a country code as part of your hierarchical naming structure, you will end up with more complex user names like John Doe/Marketing/OIBC/US. While it might seem useful to have the country code as a higher-level qualifier, for example, to be able to tell at-a-glance where someone is located, using geographic designators as one or more parts of the organizational unit can accomplish the same goal and keep names of servers and users much simpler and friendlier. Plus, in today's acquisition- and merger-oriented world, who knows which country your headquarters will end up in?

Servers

The naming standards you decide on for Domino servers will once again be closely influenced by the structure of your organization.

Common Name

The common name portion of the Domino server name does not necessarily need to be related to the business in any way, however this is probably the best idea.

It is possible to choose a common name as simple and generic as mail01 or mail02 . Alternatively, you might adopt a geographical slant like Sydney01, London01 or even choose cartoon or TV characters, for example, Bart, Marge, or Homer. A combination approach can also be a good idea. For instance, something along the lines of sydmail01 or ibmmail01 helps identify the server and its function.

The key consideration is to use something unique, easily recognizable, and that users will remember. Also remember that the server name you choose may be seen by external companies. It can raise concerns as to the professionalism of your organization if you have chosen to use something frivolous.

Tip Avoid using product names or standards that will date or otherwise limit flexibility at a later stage. For example, R5mail01 would not be a good choice for a server name when the next release of Domino hits the market. Renaming a server is a difficult and cumbersome task, which is best avoided if at all possible.

Organizational Unit Name

You may also want to consider the use of a separate organizational unit certifier for server names based on the type of function they perform, for example:

M or mail = Mail server

A or app = Application server

H or hub = Hub server

G or gway = Gateway server

A fully qualified server name would then be something like dallas01/m/ACME or dallas01/mail/ACME, where dallas01 identifies the location of the server, m or mail identifies it as a mail server and ACME identifies the organization name.

Also, keep in mind that even if the physical placement of Domino servers has been centralized to one major site, you may still choose to register users on different Domino servers based on their geographical or business locations. For instance, all of the users in your Dallas office would be registered on one mail server and all of the users in San Diego placed on another server.

Note There is a downside with registering users to one server based entirely on their location. If there is a lot of movement in your organization, in terms of staff transfers for instance, the Domino administrator could spend a great deal of time relocating user mail files from one server to another. Also, if the server crashes, all of the users in that location will be affected, as opposed to only a limited number of users had they been distributed across a number of different Domino servers.

The trick, in the planning stages, to deciding on standards is to carefully weigh the different alternatives available to you; then pick something that will work best for your organization.

Network and Port Names

One of the first things you will learn as a Domino administrator is the definition of a Notes Named Network and its relevance to the flow of mail within your organization. Notes Named Networks also dictate what your users will see when they use the File - Database - Open dialog box to locate a Domino application, for example.

Servers in the same Notes Named Network do not require connection documents for mail routing purposes (provided they are physically connected and running the same protocol). This can therefore have a significant positive impact on your mail routing topology by minimizing the number of connection documents required and the amount of time your

Domino administrators have to spend defining, maintaining, and (possibly) debugging Notes Named Networks.

Try to consolidate wherever possible.

It is a good idea to use both a location and protocol when implementing naming conventions for Notes Named Networks. For example, you might use something like SYD_TCP for Domino servers in Sydney running the TCPIP protocol or HKG_SPX for servers running the SPX protocol in Hong Kong.

User Names

With the advent of R5 all user names are now hierarchical. Basically, this ensures the generation of unique user names to avoid confusion, enhance security and ensure the efficient delivery of mail. Some guidelines to remember when registering and changing user names are as follows:

- A person's first name does not have to be used if they would prefer to use a nickname by which they are more commonly known. The primary concern must be to keep names unique and this may in fact assist in cases of users with very common names.
- Generally speaking, we would not recommend the use of a middle initial unless it is also used to uniquely identify an individual. Also, when addressing mail, other users on the system will rarely remember to include a middle initial and this can result in confusion and delivery failures.
- Avoid the use of a "." (period) after middle initials or in any other part of a user name. It may cause unexpected results when parsed through various mail gateways.

Group Names

Groups are lists of users, groups and servers that usually have a common trait. Groups will be used for mailing purposes, setting up database ACLs, to enforce security and to simplify administration tasks.

When you first install and set up Domino in your environment, you should create a couple of groups in the Domino directory as standard practice. Firstly, you will need to set up a group for your Domino administrators, usually something as simple as Admins or Administrators. This group will be used in server documents and database ACLs to provide manager access to your Domino environment. It is much simpler to update the members of the group if an administrator leaves than to have to look for and remove every occurrence of an individual name in server documents and ACLs.

Next, you will need to create a group that will contain all employees in your organization who leave the company. This group is usually called *Terminations* and should be added to the *Not Access server* field of all server documents to prevent unauthorized access to your Domino domain by a former employee.

It's also a good idea to set up groups for inclusion in the *Create databases* and *Create Replica databases* fields in server documents.

When defining groups to be used in database ACLs it's a good idea to use something descriptive of both the application and the level of access that is required. For example, if you wanted to create a group for author access to a database called HR News, you would call it HR News Authors.

As a general rule, you should also consider the following standards when selecting group names:

- Do not use server names as group names.
- Do not include the characters underscore ('_'), ampersand ('&'), tilde ('~'), forward slash ('/'), backward slash ('\'), at sign ('@'), plus sign ('+'), semicolon (';'), comma (',') and equal sign ('='). The dash ('-') should also not be used within any components of the group name as it is reserved for delimiting the component parts.
- The group name can vary in length. While it is important to keep the group name short, recognition of which group of users (or servers) this group name applies to is more critical.

Cluster names

Cluster names are used to designate the server members of a cluster and added to the server document of each Domino server in a cluster. Servers can be added or removed from a cluster as required.

It doesn't really matter what you decide to call the cluster name. For instance, you might choose something along the lines of ACMECL01 to define the first domino cluster in the ACME organization or an alternative as generic as cluster01, cluster02.

Always remember the golden rule that applies to all naming standards. Be consistent. Choose a standard that will accommodate growth and change in your organization and most importantly, once you have decided on a naming convention, stick to it.

Default Access Control Lists (ACLs)

The use of a standard, minimum set of default ACLs is considered good practice for a number of reasons. The most obvious ones being, it reinforces sound security standards by determining who is allowed access to a database and minimizes administration overhead.

Important Use groups in ACLs wherever possible. The use of individual names in ACLs is not recommended because it is prone to error, becomes outdated and is quite unmanageable.

Default ACL standards should be developed and implemented for the following Domino databases at a minimum:

- Domino directory
- Domino log
- The Domino “mailbox” (mail.box)
- User mail files
- Templates
- Statistics reporting
- Statistics & events

As a starting point for most databases, consider the ACL standards described in the following sections.

Default

Default access should be set to No Access on all Domino databases in your domain.

Reader

As a general rule, reader access can be provided through the use of wildcards and high-level certifiers to enable the most efficient and secure method for accessing databases. For example, a company with the organization certifier of ACME would include */ACME as an unspecified reader group in the ACL of their Domino directory. If this needs to be restricted further, simply include additional layers of organizational unit certifiers. For instance, */HR/ACME or */Sales/ACME.

Reader access should not be the default on any databases with highly sensitive or critical information.

In cases where another organization requires access to your databases, always make use of wildcards and certifiers in the ACLs. It is not a good

idea to rely on the default access being set to Reader as it will expose you to the risk of data being made available to the wrong people.

Editor

Editor access should be used sparingly. The more people with the ability to edit any document in a database the higher the likelihood of replication conflicts and loss of integrity in information.

Use roles to further restrict the level of editor access allowed to a database. For example, the ability to delete documents could be deselected in most cases where editor access is granted.

Designer

Designer access should also be used with discretion and generally only provided to staff who are responsible for design updates or changes to application databases. Generally, this is either the Domino developers or administration groups. In fact, our recommendation would be to restrict designer access to developers working on development or test servers. The Domino administration team should be the only group given designer access or above to databases on production servers.

Domino servers that need to replicate database content but not ACL changes should also be included as Designers through the use of either the LocalDomainServer group or another dedicated server group.

Important Design changes to Domino application databases should only be conducted in conjunction with an established change control process. See Chapter 18, “Support and Communications,” for more information on change control.

Manager

Manager access should be provided to an extremely limited number of staff or servers.

Manager access must be provided to the Domino administrator(s) to perform their jobs. Use an Administration Group in the ACL to do this.

If there are a number of replica copies of a database located on different servers throughout your domain, Manager access must also be provided to a hub server. This is so that the hub server has the ability to push ACL changes on the database out to any spoke servers. It also provides the Domino administrator with a “last resort” way to change the ACL in emergency cases where all else has failed.

These are really the only two groups that need to be delegated this level of access to a database.

Maximum Internet Name and Password

This setting is located on the Advanced Tab section of the Access Control List dialog box and is often overlooked.

By default it is set to Editor access. If the application is not going to be used by a browser, make sure that this is set no higher than Reader, or preferably set to No Access.

It is an additional safety check to prevent unauthorized access to your data.

Mail File Sizes

One of the most politically sensitive issues you will face in determining standards for an organization will be whether or not to implement limits on mail file sizes.

Domino environments that allow unlimited growth on their user mail files will encounter huge overheads and problems in terms of system performance, manageability, and administration. The larger the mail files, the more server resources required to support them. Consider also the costs involved in having Domino administrators move files from place to place as disk space is consumed. This is a wasteful use of time and resource that could be used much more proactively in good capacity planning and performance tuning tasks.

We strongly recommend that a limit is placed on all mail file sizes. A realistic and acceptable standard is probably around 50MB per user. However, this is entirely dependent on your organization's requirements and budgetary constraints. There are many pros and cons to the issue of adding more disk to your Domino servers as opposed to implementing a solution which limits mail file sizes. Be aware, however, that you probably can't keep adding disk indefinitely and that your backup systems and network will also require additional capacity to be able to cope with the extra load. It might be better to limit mail file sizes instead.

Limiting mail file sizes can be achieved by implementing database quotas and thresholds from the Domino Administrator. See the Domino 5 Administration Help database for more information. It is also possible to write more customized solutions that will merely send warning notes to users, if appropriate, on a regular basis rather than restricting the growth of their mail file entirely. Your Domino developers are a good starting point if you want to explore this option further.

Tip You can allow selected users to have unlimited mail file sizes if that is important. For example, you could let Domino administrators, developers, and key executives have larger mail files than the default mail file size limits would normally allow.

Whatever you decide, keep in mind that once you have provided a user with the capacity for unlimited growth on a mail file it will be virtually impossible to then take it back from them and implement limited mail file sizes.

Tip Not all information distributed through Domino needs to be sent using mail. Instead, consider using Domino databases for things like corporate news and/or policies and procedures manuals. To minimize the amount of mail file space needed, establish standards which encourage users to subscribe to corporate news databases. If a particular news item should be disseminated quickly and widely, the person creating the news item could send a brief note with a pointer, for example, a doclink or a URL, to the important news item — thereby saving a significant amount of space across all corporate users. Likewise, users can be given access to corporate policies and procedures manuals but can be notified of pervasive, important changes to these manuals by using the same technique, such as a doclink or a URL.

Summary

This chapter covered standards that need to be considered when designing and planning your Domino environment.

First, we discussed why standards are so important and highlighted some basic considerations to observe when designing standards. We then went on to explore some guidelines and recommendations in relation to hardware and software, Domino directory structures, naming conventions, default ACLs and mail file sizes.

Chapter 9

Designing a Messaging Infrastructure

The Domino messaging infrastructure is based on security, directory, mobility, administration, Internet standards, and replication. The core part of messaging is e-mail, but it also includes mail-based workflow, calendaring & scheduling, and real-time sharing.

In this chapter we will concentrate on e-mail. We also include some information about directory services and mobile support. Most of the other elements of the Domino messaging infrastructure mentioned in the previous paragraph are covered elsewhere in this book.

This chapter covers the following topics:

- Overview of the Domino R5 messaging architecture
- Implementing mail routing
- Customizing and enhancements
- Summary

Overview of the Domino R5 Messaging Architecture

This section covers the following topics:

- Mail clients
- Domino server
- Directory services of Domino
- Domain Name Service

Mail Clients

The following provides details on the Notes mail clients.

Notes Client — Works with any Server

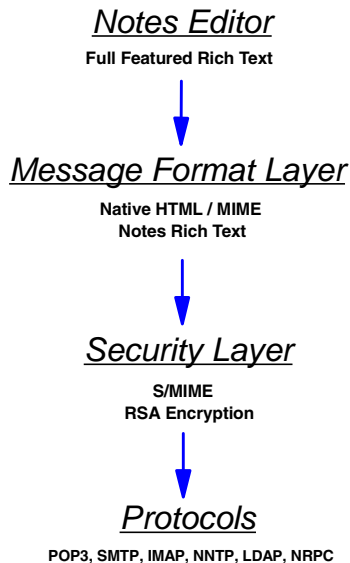
Notes R5 provides wide support of messaging-related security standards and protocols as follows:

- Native MIME support — MIME (Multipurpose Internet Mail Extension) is the standard message format for Internet mail. It is a “container” protocol that is used to define types of message content and how they are encoded for transport. For example, MIME allows you to send a mail item that could include one or more graphical images. By implementing this standard, Notes R5 delivers the richest highest fidelity Internet mail content possible.
- S/MIME support — For years, Notes has delivered a superior Public Key Infrastructure (PKI) very much like that provided by S/MIME security. Thus S/MIME extends Notes native security to include secure messaging to non-Notes mail recipients.
- Fully-integrated X.509 certificates — X.509 is the open-standard certificate format for inter-application authentication. Notes users can now take advantage of either the traditional Notes certificates or X.509 v3 certificates.
- Native address support — In Notes R5, standards-based Internet addresses are treated as a parallel native address form. This means that Notes R5 users can address mail using either the Internet address format and/or the Notes hierarchical address format, and that both the Internet and Notes hierarchical address of senders and recipients is included in an R5 mail message.
- POP3 and SMTP (Post Office Protocol Version 3 and Simple Mail Transfer Protocol) — the most widely used protocols for receiving and sending electronic mail on the Internet. POP3 allows you to access incoming mail, and SMTP allows you to send mail. The protocols are about as simple as they can be — in general, you maintain your mail files locally, and the servers act only as temporary storage for unretrieved messages.
- IMAP4 (Internet Message Access Protocol) — the “newer” mail protocol that supports more features than POP3; you can choose to maintain your mail file either locally or on the server, for example. IMAP support is managed through a separate mail template and an IMAP account document in the Personal Name and Address Book.

- NNTP (Network News Transfer Protocol) — the standard behind USENET newsgroups, the Internet’s favorite discussion databases. Many companies use NNTP for internal discussion and notification databases as well.
- HTML (Hypertext Markup Language) — the standard for encoding information about how to display a Web page. An HTML parser is the central piece of a Web browser — the engine that reads the HTML code; applies it to the text, graphics and program code that make up the page; and displays the result on the screen.
- LDAP (Lightweight Directory Access Protocol) — the protocol that supports interaction with X.500 directories. The protocol is “lightweight” because it doesn’t include the overhead for supporting some of the features of the X.500 standard. The Notes client has full support for LDAP. Any address lookup can be done using LDAP so a user can address e-mail using any of the external, public LDAP directories. In addition, local address books can be accessed via LDAP queries.

Notes Messaging Architecture

The following figure shows the Notes R5 messaging architecture, starting out with the full-featured Notes editor and ending with the protocols supported:



Mobile Support

Notes has always offered superior off-line use. Wherever you are, you still have access to and control over a wide variety of information. The Notes mobile support includes things such as:

- Disconnected use — Off-line browsing and management of mail, Web pages, and news. Simplified mobile configuration and setup. Easier replica management with bookmarks.
- Remote, connected use — This allows you to use Notes with your existing Internet service provider.
- Mobile directory catalog — Storing an optimized local copy of your enterprise directory means fast response time as you access critical information about the people in your company; whether you are connected or not, and regardless of how large your organization is.
- Mobile location enhancements — Connection documents and dial-up networking entries are created for new users automatically as they complete the location document dialog. We now provide end-users with a connection configuration wizard to facilitate setting up remote access connection documents. The wizard can configure connections to servers on an intranet over dial-up networking, to servers on the Internet, or to remote Domino servers using Notes direct dialup over X.PC.
- Native PDA support — Notes R5 fully supports Personal Digital Assistants to replicate mail, contacts and calendar information.
- User input during async script execution — Notes provides a scripting command, Promptuser, which allows Notes to pop up a password dialog box during a connection call, so that users do not have to re-dial when their passwords expire.
- Passwords hidden in connection documents and dial dialogs — Passwords are now hidden in the server connection documents and dial dialog boxes, which provides users with an additional level of security.
- Network dial-up connection document enhancements — Users can enter area codes, country codes, and calling card numbers in network dial-up connection documents. This leverages the extensive dialing support for network dial-up currently available for X.PC.

Other Mail Clients

In addition to Lotus Notes clients you can implement three types of clients with the Domino R5 mail server:

- IMAP clients, for example, Microsoft Outlook
- POP3 clients, for example, Eudora
- Web browsers, for example, Netscape Communicator and Microsoft Internet Explorer

IMAP Clients

IMAP clients can download mail to a local mail file or manage mail directly on a Domino server that runs the IMAP service. They use the IMAP protocol to read and manage mail, use SMTP to send mail, and use LDAP to access the Domino directory.

Note In the Domino R5 server there is a specific mail template for IMAP clients. Also, the Lotus Notes R5 client supports IMAP.

POP3 Clients

POP3 clients can download mail to a local mail file and interact with it there, as well as leave a copy of the mail in their file on the Domino server. POP3 clients retrieve mail from a Domino server that runs the POP3 service, use SMTP to send mail, and use LDAP to access the Domino directory.

Note Lotus Notes R5 can be a POP3 client.

Web Browsers

All tasks and actions of the Web clients are transmitted to the server over HTTP and performed by the server. Web clients do not have local mail files.

Note Lotus Notes R5 can be a Web client.

Domino Server

As we described in the previous section on mail clients, the Domino server works with any client.

In this section we discuss the following topics:

- Internet messaging
- Working with other mail systems
- Migration
- Native SMTP/NRPC router

Internet Messaging

In Domino R5 there are several enhancements in the area of Internet messaging:

- Native Internet addressing
- Native MIME content support
- Native SMTP routing
- Multiple character set support

Native Internet Addressing

Domino understands Internet addressing rules and interprets them, along with existing Notes addressing rules.

Native MIME Content Support

Message content is now stored as either Notes rich text or MIME, and Domino translates between formats as needed. Notes users who choose MIME format require no message translation when sending mail to and from Internet users. In a mixed environment of R5 and pre-R5 Notes users, no translation is required because the R5 Notes client can render MIME or Notes rich text.

Native SMTP Routing

The Domino router now implements the SMTP protocol to transport Internet/intranet messages, along with Notes mail routing protocols for compatibility with previous releases. The SMTP MTA, which was included in previous releases, is no longer needed.

When deploying R5 Domino with R5 clients, message conversion between MIME and Notes rich text is eliminated at the routing layer because the Notes client fully supports MIME. If configured, both SMTP and Notes mail routing protocols coexist within the same server. The Domino router implements the base SMTP standard plus SMTP service extensions (ESMTP) (such as 8-bit MIME and SMTP pipelining) to deliver optimal SMTP performance. In addition, other extensions such as the delivery status notifications specifications allow Notes and Domino SMTP to provide message delivery information to the Notes client.

Multiple Character Set Support

When converting between Notes rich text and MIME, the Domino mail router can now support all character sets when sending and receiving messages. Previously, several SMTP MTAs were required to provide support for multiple character sets.

Working with Other Mail Systems

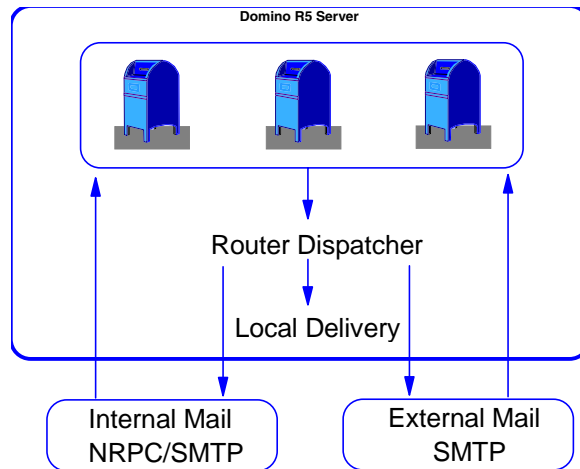
Domino interoperates with other mail servers and systems through its support of Internet standards and message transfer agents (MTAs) for X.400 and cc:Mail systems.

Migration

You can easily migrate users from an existing mail system to Domino. Domino includes tools that you use to migrate users and mail files from, for example, Lotus cc:Mail, Microsoft Exchange, Microsoft Mail, Novell GroupWise, Microsoft Windows NT, and files in LDIF (LDAP Interchange Format) format to Domino. In addition, there are now open APIs for Lotus Business Partners and third-party developers to create custom Domino Upgrade Services.

Native SMTP/NRPC Router

See the Domino R5 message routing flow in the following figure:



As you can see in the preceding figure, internal mail can be NRPC- or SMTP-based, while external mail is only SMTP. Still, router dispatcher divides outgoing mail to three parts: Local delivery, internal mail, and external mail. Local delivery means that the mail message stays in the server box, that is, it's a recipient's home server. Internal mail stands for mail within your organization and local Internet domains, while external mail stands for mail to external Internet domains.

Directory Services of Domino

Domino includes the following directory services:

- Domino directory
- Directory catalog
- Directory assistance
- LDAP

Domino Directory

The Domino directory, which previous releases referred to as the Public Name and Address Book or Name and Address Book, is the main directory service within Domino. It provides complete support for LDAP v3.

The Domino directory serves two purposes. It is a directory of information about users, servers, groups, and other objects that you might include in the directory yourself — for example, printers.

It is also a tool that administrators use to manage the Domino system. For example, administrators create documents in the Domino directory to connect servers for replication or mail routing, to register users and servers, to schedule server tasks, and so on. It contains all information necessary to route mail in your infrastructure except for the Domain Name Service (DNS), which is maintained separately.

A Domino directory is associated with a Domino domain. When you set up the first server in a Notes domain, Domino automatically creates the Domino directory database and gives it the file name NAMES.NSF. When you add a new server to the domain, Domino automatically creates a replica of the Domino directory on the new server.

The Domino directory uses Domino database technology, and benefits from the Domino R5 improvements in this core technology. These benefits include transaction logging, online and in-place compaction, faster online view re-indexing, and other specific performance enhancements.

Directory Catalog

The Domino directory has grown in size over the years as the feature set for Notes and Domino has grown. However, when addressing your mail, you're interested in only a small subset of the data stored in the Domino directory. The mobile directory catalog — a single database that contains all of the directories in an enterprise — compresses the Domino directory down to its minimal addressing information. It is fully LDAP-enabled, and can be searched using standard LDAP clients.

By using this database locally, you can quickly look up the mail address for anyone in your enterprise. This new directory occupies minimal disk space,

so that mobile users can easily maintain a copy on their local hard disks for error-free mail addressing while disconnected from the network.

The mobile directory catalog contains partial replica information in a compressed form, with each user entry measuring about 100 bytes in size. It doesn't include some important data, like public keys for encrypting messages. For POP3 and IMAP messages, this doesn't matter, and for Notes messages, the Domino server compensates by doing just-in-time encryption as the message replicates from the client to the server.

Directory Assistance

The Directory assistance is a Domino database that enables users and servers to locate information in a directory that is not a server's primary Domino directory. You can set up directory assistance for secondary Domino directories and for LDAP directories — for example, for third-party LDAP directories. The Domino R5 server can reference group definitions stored in third-party LDAP directories, and use those groups for determining Web user access to Domino applications.

LDAP

LDAP, or Lightweight Directory Access Protocol, is a protocol that uses TCP/IP to allow clients to access directory information. LDAP defines a standard way to search for and manage entries in a directory, where an entry is one or more groups of attributes that are associated with a distinguished name. A distinguished name is a name that uniquely identifies an entry within the directory tree. A directory can contain many types of entries.

To enable the LDAP service on a Domino server, you start the LDAP task on it. Clients that run the LDAP protocol and are set up to connect to the server — for example, Notes R5 clients that have accounts for the server, Microsoft Outlook Express clients, and Netscape Communicator clients — and LDAP-enabled applications can then query the Domino server to retrieve information about entries in the Domino directory that meet specified criteria.

Domain Name Service

The Domain Name Service (DNS) is a directory used by SMTP to convert a name, such as acme.com, to a list of servers that can receive connections for that name and to find the IP address of a specific server. By looking up a destination server's address in the DNS, the sending server can properly route a message to a recipient.

You must correctly configure DNS to support your use of SMTP. A DNS uses two kind of records: MX records and A records. An MX record maps a domain name to one or more host names, while an A record maps a host name to the IP address of a server.

Implementing Mail Routing

Domino presents many possibilities for configuring your mail system infrastructure, whether you want to use Notes routing, SMTP routing, or both, for internal and external messages. However, before you set up mail routing, there are a number of decisions and factors to consider:

- What types of clients will access the Domino server?

See “Mail Clients” earlier in this chapter.

- How is internal mail routed?

Internal mail is mail within your organization and local Internet domains. The router uses both SMTP and Notes protocols to route mail and handles both MIME and Notes format messages. So, you can choose Notes routing or SMTP routing for internal mail.

Note The Notes routing is in use by default. For SMTP routing, you must enable the SMTP listener task in the Basics tab of the server document. If both SMTP and Notes routing are enabled, the router chooses the optimal protocol to use to move the message to its destination.

- How is external mail routed?

To route mail to external Internet domains, you must set up at least one server to connect to the Internet and route mail over SMTP. You can choose how many servers route mail directly to the Internet.

In the following sections, we help you to find the answers to the questions above.

Server Topologies

The following sections cover aspects relating to server topologies.

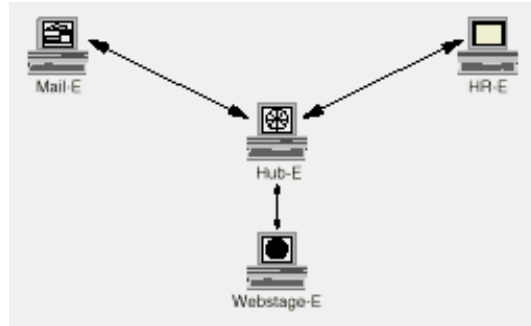
Hub-and-Spoke

A hub-and-spoke topology establishes one central server as the hub and other servers as the spokes. In organizations with more than one hub, hub servers communicate with each other or with master hub servers.

Hub-and-spoke topology works best in large organizations; it minimizes network traffic.

Note Hub-and-spoke topology is vulnerable to a single point of failure if the hub is not working.

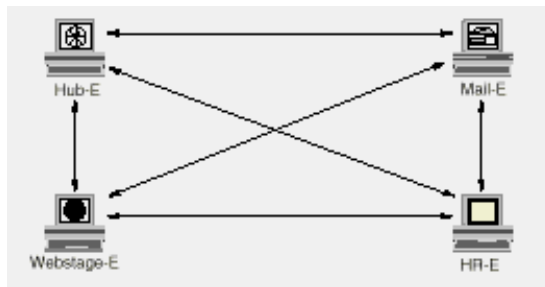
For an example of hub-and-spoke, see the following figure:



Peer-to-Peer

A peer-to-peer topology connects every server in your organization to every other server. This topology works best in companies that have only a few servers to connect.

For an example of peer-to-peer, see the following figure:



Based on your server topology, you can create one or more of these connections:

- Connecting two servers on a LAN
- Connecting a server to a Notes direct dial-up (dial-up modem) server
- Connecting a server to a network dial-up server
- Connecting a server to a passthru server
- Connecting servers to servers on the Internet

Mail Routing Documents in the Domino Directory

The following documents available in the Domino directory have an effect on the mail routing:

- Configuration settings document

- Connection documents
- Domain documents
- External Domain network Information document

Configuration Settings Document

Using a configuration settings document you, as an administrator, can set up mail routing on multiple Domino servers using one document. The configuration settings document includes settings that affect both Notes routing and SMTP routing. Use one configuration settings document for:

- All Domino servers in the Domino domain
- Servers in a specific group
- A specific server

Tip Use fully qualified host names in fields on the configuration settings document instead of IP addresses. While IP addresses will work and are fully supported, it is easier on you to change things once in the Domain Name Service (DNS).

Connection Documents

In addition to the Local Area Network connection type there are several remote connection and other connection types.

Remote Connection Types

Here are the remote connection types:

- Notes direct dial-up

This connection uses modems and the X.PC protocol to let servers that are not physically connected on a LAN connect to other Domino servers. You can use a direct dial-up modem connection to connect servers using an asynchronous communication script.

- Network dial-up

This connection is similar to a Notes direct dial-up connection except that the server uses a remote access connection to carry a network protocol instead of the X.PC protocol. After the connection is made, the server has access to Domino servers and can use network services, such as printing.

- Passthru (with Notes direct dial-up)

This connection lets a server specify an intermediary server that acts as a “stepping stone” to gain access to a destination server. For an X.PC dial-up connection, the destination server does not need a modem if the passthru server has a modem and can route traffic to it. As an administrator, you might set up a passthru server to enable mobile users to use one phone connection to access multiple servers.

To use passthru for a remote connection, you need to create a Notes direct dial-up connection document for the passthru server to establish the remote connection.

- Hunt group (with Notes direct dial-up)

This connection lets workstations dial into a hunt group of modems on more than one passthru server. A hunt group is a collection of telephone extensions that is assigned one phone number. Any passthru server in the hunt group can receive a call and route it to the destination server. To use this feature, your telecommunications infrastructure must support hunt groups.

To use a hunt group for this type of configuration, you create a Hunt group connection document to establish the remote connection.

Other Connection Types

Here are some other connection types.

- X.25: Sets up direct connections to an X.25 network.
Note An additional software driver and additional hardware are needed.
- SMTP: Sets up connections to Domino servers Release 4.6 or earlier
- X.400: Sets up connections to servers running the X.400 protocol
- cc:Mail: Sets up connections to servers running cc:Mail
- SNA: Sets up connections to IBM and compatible servers that use SNA
Note An additional software driver is needed.
- News/NNTP Feed: Sets up connections to servers running NNTP

Domain Documents

When you create a domain document, you can choose from the following domain types:

- Adjacent domain document
- Non-adjacent domain document
- Foreign domain document

- Foreign X.400 domain document
- Foreign cc:Mail domain document
- Foreign SMTP domain document
- Global domain document

Adjacent Domain Document

You create an adjacent domain document when you need to apply restrictions to messages routing to the adjacent domain. Restrictions for the adjacent domain set on this document apply only to the From domain of the previous hop. These restrictions work in conjunction with those in the configuration settings document. Domino always defaults to the most restrictive entry.

Non-Adjacent Domain Document

You create a non-adjacent domain document to indicate a path between servers that are located in Domino domains that connect to each other only by going through an intermediary domain, known as the adjacent domain. You also use adjacent domain documents to connect the non-connecting domains to the intermediary domain. Assuming that all servers in the domain are using the same Domino directory, you need only one non-adjacent domain document for each non-adjacent domain, not one per server.

Restrictions that you set on a non-adjacent domain document apply only to the From domain of the previous hop. These restrictions work in conjunction with those in the configuration settings document. Domino always defaults to the most restrictive entry.

Foreign Domain Document

You create a foreign domain document to indicate a path between a Domino domain and an external application such as a fax or pager gateway. A foreign domain document identifies the server that routes to the gateway. Just as Domino treats a group of servers as a domain, it treats a group of computers in a foreign mail system as a domain. Foreign domains are mostly used for third-party applications but can be used for transferring messages between an R5 server and a Notes Release 3.x SMTP server.

Restrictions that you set in this foreign domain document apply only to the From domain of the previous hop. These restrictions work in conjunction with those in the configuration settings document. Domino always defaults to the most restrictive entry.

Foreign X.400 Domain Document

You, as an administrator, must create a separate foreign X.400 domain document to direct the messages to the X.400 system through an X.400 MTA.

Note You need at least one Domino Release 4 server running the X.400 MTA to connect your Domino system to the X.400 system.

Foreign cc:Mail Domain Document

You, as an administrator, must create a separate foreign cc:Mail domain document to direct the messages to cc:Mail through a cc:Mail MTA.

Note You need at least one server running the cc:Mail Message Transfer Agent (MTA) to connect your Domino system to the cc:Mail system.

Foreign SMTP Domain Document

You create a foreign SMTP domain document for any one server that needs to send messages via SMTP but is not set up to use SMTP.

On the foreign SMTP domain document you specify where to route messages addressed to those Internet addresses. For example, based on your routing topology, you might set up the foreign SMTP domain document to route all outbound SMTP mail to another Domino domain. Then a server that is in that domain and that is enabled to send outbound SMTP mail routes the mail to the Internet.

If a foreign SMTP domain document specifies *.* as the reachable group of outbound Internet addresses, then all outbound mail matching *.* — for example, acme.com and mail1.acme.com — routes to the destination specified in the foreign SMTP domain document. If you use a wildcard, you can still restrict messages to specific Internet domains by specifying restrictions in a configuration settings document.

Global Domain Document

If your organization uses more than one Internet domain name, you must create a global domain document to define the various Internet domain names to which inbound mail might be addressed.

Note Make sure you already have a configuration settings document for the server(s) to be configured. You must also ensure that the DNS is set up to include all the Internet domain names that your company uses.

Your organization must have a primary Internet domain name — for example, acme.com — by which it is known to the rest of the world.

Using multiple Internet domain names typically results when:

- An organization changes names.
- An organization acquires another company that already has an existing Internet domain name, and users continue to use the other Internet domain in their addresses.
- You set up a mail topology to route messages addressed to other subsidiaries through your firewall before routing the messages to the Internet or another private network.
- You set up a mail topology specifically to include more than one Internet domain name.

External Domain Network Information Document

Domino servers can also use information gathered from an external domain network information document to make a connection to non-Domino mail systems. As an administrator, you configure this document to retrieve names and addresses of servers in another domain so that there is no need for a foreign domain document or connection documents in the Domino directory to that particular domain.

Notes Routing and Required Documents

The following sections describe what type of documents are needed for specific mail routing scenarios.

Servers in the Same Notes Named Network

You do not need to create connection documents to set up routing between servers in the same Notes Named Network (NNN), because in this case Domino automatically routes mail.

A Notes Named Network is a group of servers that share a LAN protocol and are connected by a LAN or by modem connections.

Servers in Different Notes Named Networks but in the Same Domino Domain

Two connection documents are required to ensure that mail routes in both directions.

A Domino domain is a group of servers that share the same Domino directory.

Servers in Adjacent Domino Domains

Two connection documents, one in each Domino domain, are required to ensure that mail routes in both directions.

In addition, one adjacent domain document is possibly needed to apply restrictions. There are two fields in the Restrictions tab of the adjacent domain document: "Allow mail only from domains" and "Deny mail from domains."

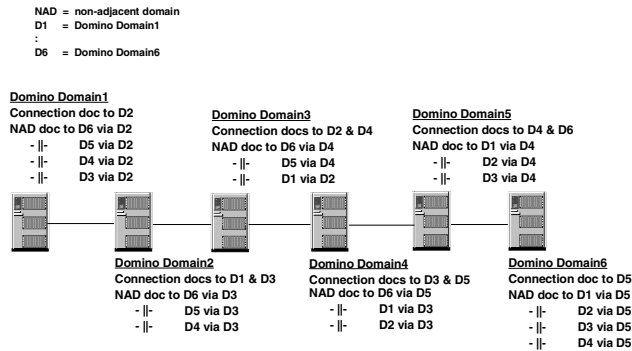
Servers in Non-Adjacent Domino Domains

Two connection documents are needed, one in each Domino domain that connects to the adjacent Domino domain.

Two non-adjacent domain documents, one in each Domino domain that is not adjacent, are needed to link the intermediary domain to the first and third domain.

Note The chain of Domino domains can be longer than three domains; see the following figure:

Mail Exchange Between Six Domino Domains



Routing Mail to a Gateway Using a Foreign Domain

One foreign domain document is required to identify the foreign domain for non-mail messaging systems such as fax or pagers.

Routing Mail to an SMTP-Enabled server

One foreign SMTP domain document is needed to identify the location to send messages to the Internet, if you do not have SMTP routing implemented on all your servers.

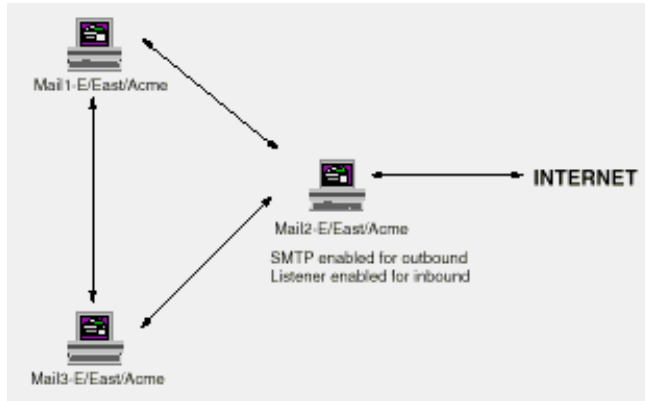
Also, one SMTP connection document is required to specify the SMTP-enabled server.

SMTP Routing Scenarios

The following sections describe possible SMTP mail routing scenarios.

One Server for All Internet Messages

The following figure gives an example of one server handling all Internet messages:



Configuring these servers requires:

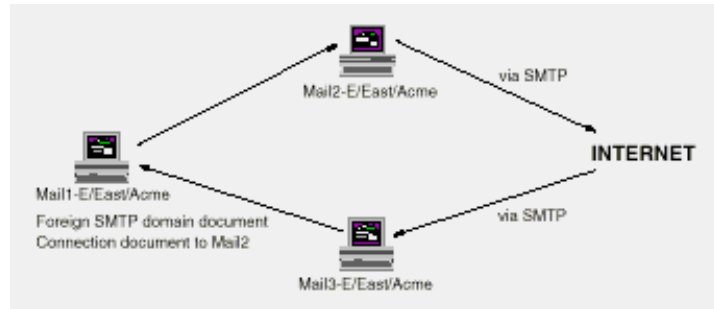
- Enabling “SMTP used when sending messages outside of the local Internet domain” for Mail2-E/East/Acme
- Enabling the SMTP listener task for Mail2-E/East/Acme
- Setting up DNS correctly to list Mail2-E/East/Acme as the connecting server for the acme.com domain for inbound mail
- Either enabling “SMTP allowed outside of the local Internet domain” for Mail1-E/East/Acme and Mail3-E/East/Acme and listing Mail2-E/East/Acme as the relay host or creating a foreign SMTP domain document and SMTP connection document that link to Mail2-E/East/Acme

A relay host is a server within your organization (or an Internet Service Provider, ISP) that routes messages outside the local Internet domain. Often the same server acts as a firewall through which your organization funnels all messages outbound to the Internet. It can be a Domino server or another type of server — for example, a UNIX sendmail server.

To configure a relay host, you use two fields in the configuration settings document of the sending server. Add its DNS or host name to the “Relay host for messages leaving the local Internet domain” field and enable “SMTP used when sending messages outside of the local Internet domain.”

One Server for Inbound and one Server for Outbound Messages

The following figure shows one server for inbound messages and another server handling outbound messages:

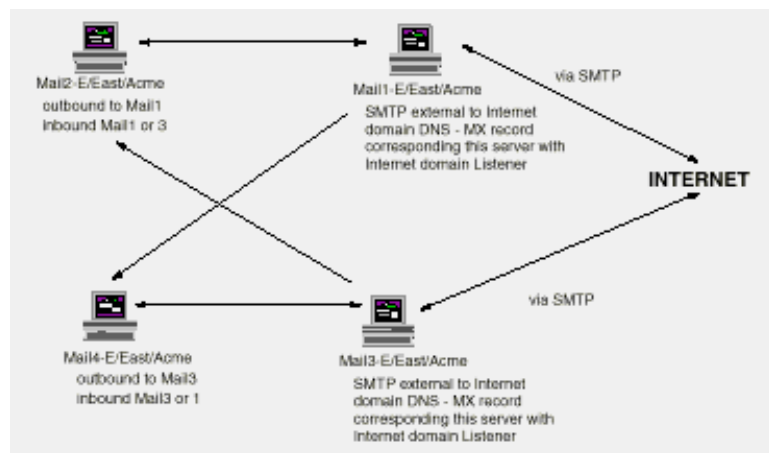


Configuring these servers requires:

- Enabling “SMTP used when sending messages outside of the local Internet domain” for Mail2-E/East/Acme
- Enabling the SMTP listener task for Mail3-E/East/Acme
- Setting up DNS correctly to list Mail3-E/East/Acme as the connecting server for the acme.com domain for inbound mail
- Either enabling “SMTP allowed outside of the local Internet domain” for Mail1-E/East/Acme and listing Mail2-E/East/Acme as the relay host or creating a foreign SMTP domain document and SMTP connection document that link to Mail2-E/East/Acme

Two Servers to Balance Internet Mail Load

The following figure shows how two servers can balance Internet mail load:

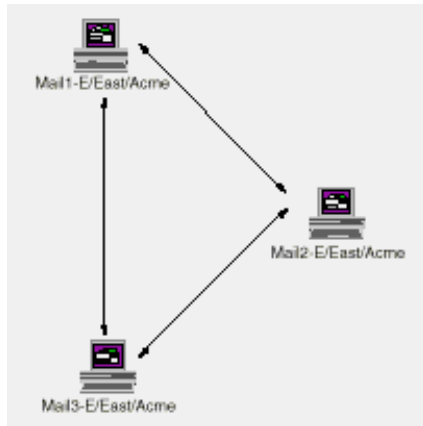


Configuring these servers requires:

- Enabling “SMTP used when sending messages outside of the local Internet domain” for Mail1-E/East/Acme and Mail3-E/East/Acme
- Enabling the SMTP listener task for Mail1-E/East/Acme and Mail3-E/East/Acme
- Setting up DNS correctly to list Mail1-E/East/Acme and Mail3-E/East/Acme as the connecting servers for the acme.com domain for inbound mail
- Either enabling “SMTP allowed outside of the local Internet domain” for the internal mail servers Mail2-E/East/Acme and Mail4-E/East/Acme and listing Mail1-E/East/Acme or Mail3-E/East/Acme as the relay host or creating a foreign SMTP Domain document and an SMTP connection document that link to Mail1-E/East/Acme or Mail3-E/East/Acme

Mail Routing in the Local Internet Domain

The following figure shows how mail routing works in a local Internet domain:



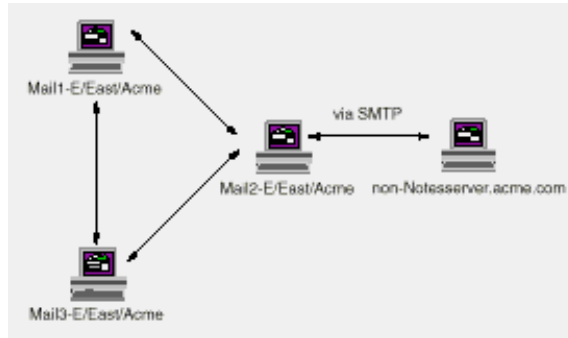
Configuring these servers requires:

- Enabling the SMTP listener task for Mail1-E/East/Acme, Mail2-E/East/Acme, and Mail3-E/East/Acme
- Setting up DNS correctly to list Mail3-E/East/Acme as the connecting server for the acme.com domain for inbound mail
- Enabling “SMTP allowed within the local Internet domain” for “MIME messages only” for Mail1-E/East/Acme, Mail2-E/East/Acme, and Mail3-E/East/Acme

- Either having all three servers in the same Notes Named Network or enabling “Servers within the local Notes domain are reachable via SMTP over TCPIP” for each server.

Mail Routing Between a Third-Party Server and Domino in the Same Internet Domain

The following figure shows how mail routing is managed between a third-party server and the Domino server within the same Internet domain:



Configuring these servers requires:

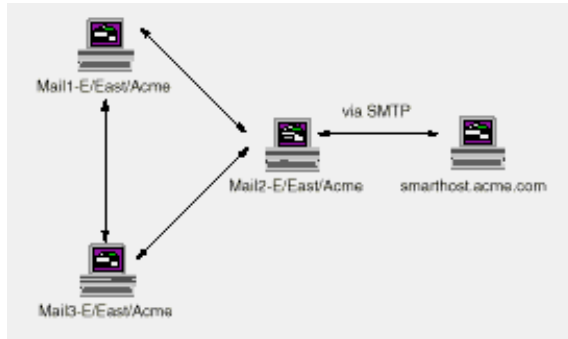
- Enabling the SMTP listener task for Mail2-E/East/Acme
- Setting up DNS correctly
- Creating a foreign SMTP domain document for “*.non-Notesserver.acme.com” and an SMTP connection document that links to Mail2-E/East/Acme

Smart Host

A smart host is a host to which SMTP-routed messages are sent when the message recipient cannot be found in the local Internet domain’s directory. When a message is received, the router looks for the recipient’s address to see if it is in the local Internet domain or in an alias Internet domain. If they are, then the router checks the person document to see where to send the message.

If your organization uses other mail systems, users of those systems may not be in the Domino directory. In that case, you can set up a smart host. For example, if some users are on a UNIX sendmail system but their messages are routed through the Domino mail system, you can set up a smart host.

The following figure shows how mail routing via a smart host works:

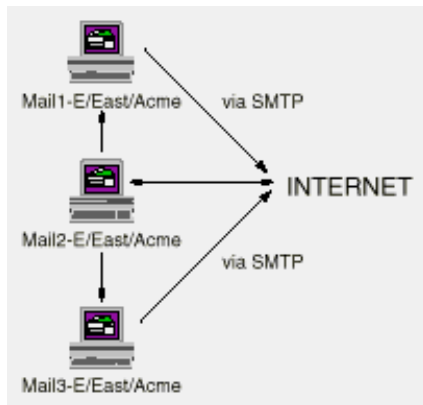


Configuring these servers requires:

- Setting up DNS correctly
- Enabling “SMTP allowed within the local Internet domain” for “MIME messages only” for Mail1-E/East/Acme, Mail2-E/East/Acme and Mail3-E/East/Acme
- Listing “smarthost.acme.com” as the “Local Internet domain smart host” for Mail1-E/East/Acme and Mail2-E/East/Acme

All Servers Route Outbound Mail and One Server Routes Inbound Mail

The following figure shows all servers routing outbound mail while only one server routes inbound mail:



Configuring these servers requires:

- Enabling “SMTP used when sending messages outside of the local Internet domain” for all three servers
- Enabling the SMTP listener task for Mail2-E/East/Acme
- Setting up DNS correctly to list Mail2-E/East/Acme as the connecting server for the acme.com domain for inbound mail

Note Changing the mail routing topology later in the process is not necessarily difficult, but laborious.

Four Types of Mail Routing

The following four types of mail routing are available to choose from when you set up the server connection document in the Domino directory:

- Push only
- Pull only
- Push/pull
- Push wait

Push Only

The Push only mail routing is the default configuration for NRPC and SMTP routing. The source server just sends messages to the destination server.

Pull Only

In the Pull only mail routing the source server just issues the destination server a request to initiate. The destination server gets the trigger, sends the queued messages to the specified domain, and closes the connection.

Push/Pull

The Push/pull mail routing is a low-cost alternative when using a dial-up connection, for example, to/from an Internet service provider (ISP). This bi-directional routing supports NRPC and SMTP.

The source server issues the destination server a request to initiate and then sends messages waiting to be routed. The destination server gets the trigger, receives incoming messages and sends the queued messages to the specified domain, and closes the connection.

Push Wait

In the Push wait mail routing the source server waits for the destination server to signal the request to initiate. The source then sends the queued messages to the destination server.

Customizing and Enhancements

In this section we cover the following topics:

- Multiple mail boxes
- Shared mail
- Mail filtering options
- Anti-spam controls
- Restricting who can use your system to relay Internet mail
- Mail monitoring
- Controlling message transfer

Multiple Mail Boxes

Each Domino mail server uses a MAIL.BOX database to hold messages that are in transit. Users and servers use both SMTP and Notes protocols to deposit messages into MAIL.BOX. The router on the server reads the messages and either delivers them to a mail file on that server or transfers them to the MAIL.BOX database on another server.

In previous releases of Domino, the router used only a single MAIL.BOX database. In Domino R5, you can continue to use a single MAIL.BOX database or create multiple MAIL.BOX databases. Any process trying to write to MAIL.BOX needs exclusive access to the database. With multiple MAIL.BOX databases, Domino uses multiple concurrent processes, which improves performance.

Because disk contention is rarely an issue for MAIL.BOX, you do not need to put the multiple MAIL.BOX databases on different disks. However, you should spread user mail files across multiple disks to ensure that all mail files and MAIL.BOX databases are not on the same disk.

Note If you add only one additional MAIL.BOX database, you see large performance improvements. You gain additional benefit with each additional MAIL.BOX database, though the marginal benefit decreases with each additional mailbox.

For information on how to change the number of mailboxes see Chapter 21, "Performance," in this book.

Shared Mail

After you set up Notes mail, you can set up a shared mail database on each mail server. A shared mail database is a space-saving feature that stores a single copy of mail messages that are addressed to multiple recipients. When multiple recipients whose mail files are on the same server receive a message, the shared mail database stores the message content, while each recipient's mail file stores the message header.

Using a shared mail database is completely transparent to users. When a recipient opens a message, a link between the mail file and the shared mail database causes the message to appear in its entirety. Users can delete, reply, change the view or folder, edit, save, resend, and perform all the same tasks on a mail message stored in a shared mail database as they would with the same message stored in their own mail files. Each user can edit, save, and resend the original message, without affecting how the message is presented to the other users.

Note Shared mail works for all messages, regardless of the mail client used to send or receive the message. That means that users who use a POP3, IMAP, Web browser, or Notes mail client and who have a mail file on the Domino mail server can all use shared mail.

Using shared mail appears to have significant benefits to organizations because, for a message which has multiple recipients, a single copy of the message is kept with pointers to that copy in each recipient's in-basket.

However, shared mail databases can become fragmented easily and quickly. In addition, a user's mail file can contain pointers to several different shared mail databases. To see why, consider what happens to a message when it has five recipients. One user deletes his or her copy, that is, they really only delete the pointer from the in-basket. The "use count" in the shared mail database goes from 5 to 4 at this stage. Only when all five recipients have deleted their copy or rather their pointer to the common copy, does the actual message become eligible for deletion.

In the meanwhile, the shared mail database grows. Good Domino administrators would monitor the size of any shared mail databases regularly. When they get too large (by whatever standard the administrator chooses), the administrator would set up a new shared mail database, where all new shared mail would be stored. The old shared mail would still be available to users who have valid pointers from previously-received mail. Eventually, most organizations which use shared mail end up with several to many shared mail databases.

Now imagine that a user's mail file needs to be backed up. This implies that, when backing up that user's mail file, the backup will only contain the pointer — not the shared object. So, backup immediately becomes more complicated.

Worse yet, imagine that this user somehow deletes his or her entire mail file. No problem — you have a backup. But, now you also have to restore all the backed-up shared mail databases, too, including those which might have gone to zero (0) use count on many documents. Otherwise, the user won't really get all his or her mail back. So, while shared mail has some benefits, there is the potential for increased administrative and operational overhead as well.

Mail Filtering Options

These are the mail filtering options available in R5:

- Mail agents
 - Pre-delivery mail agents
 - Post-delivery mail agents
- Router controls
- Mail template rules

If you use all of the mail filtering options, the options execute in the following order:

1. The router controls verify that a message is allowed to route through the domain.
2. The pre-delivery mail agent processes the incoming message.
3. The action specified in the mail template rules occurs.
4. The post-delivery mail agents process the message.

Mail Agents

Mail agents in R5 come in two types according to when they run: Before new mail arrives or after new mail arrives.

Although you can use both types of mail agents in the same mail database, you can enable only one pre-delivery mail agent at a time. You can have an unlimited number of disabled pre-delivery mail agents. In addition, you can have an unlimited number of enabled and disabled post-delivery agents.

Pre-Delivery Mail Agents

The new pre-delivery mail agents are identified by the new agent trigger "Before new mail arrives."

With the pre-delivery mail agents you can do things like:

- File newly-delivered messages into a folder other than the Inbox when those messages meet certain conditions. Because the agent runs when the message is delivered, the user does not see the message appear in the Inbox and then move to another folder.
- Remove large attachments from messages before delivering those messages to the user's mail box. The agent removes the attachment before the entire message writes to the user's mail box; thus, you can conserve disk space and eliminate the need to replicate extra data.
- Determine that the message should not be delivered and delete it. For example, you may want to delete messages from a known "spam" user. Again, you can save both your disk and replication resources.

Post-Delivery Mail Agents

These old-style Notes Release 4 mail agents are still supported in Domino R5, and are now identified by the agent trigger "After new mail arrives."

Router Controls

You can use the built-in router controls to perform the following tasks:

- Allow mail only from designated domains
- Allow mail from designated organizations
- Deny mail from designated organizations
- Impose size restrictions on incoming mail

Mail Template Rules

With the mail template rules, you can specify to watch for messages from a certain sender or messages that contain a certain subject, and then select what to do when those messages arrive (copy or move them to a folder, delete them, or change the importance of the message).

Anti-Spam Controls

Basically anti-spamming is keeping unwanted mail from using valuable resources. Unwanted mail can be, for example, ads or “earn a million in-a-week” kind of mail messages.

Domino R5 provides diversified controls to anti-spam. You can specify these controls in the server configuration documents of your Domino directory. First choose Router/SMTP tab, then Restrictions and Controls tab, and finally the SMTP Inbound Controls tab. The following document appears:

Inbound Relay Controls	
Allow messages from external internet domains to be sent only to the following internet domains:	<input type="checkbox"/>
Deny messages from external internet domains to be sent to the following internet domains:	<input type="checkbox"/>
Allow messages only from the following external internet hosts to be sent to external internet domains:	<input type="checkbox"/>
Deny messages from the following external internet hosts to be sent to external internet domains:	<input type="checkbox"/>
Inbound Connection Controls	
Verify connecting hostname in DNS:	<input type="checkbox"/> Disabled
Allow connections only from the following SMTP internet hostnames/IP addresses:	<input type="checkbox"/>
Deny connections from the following SMTP internet hostnames/IP addresses:	<input type="checkbox"/>
Inbound Sender Controls	
Verify sender's domain in DNS:	<input type="checkbox"/> Disabled
Allow messages only from the following external internet addresses/domains:	<input type="checkbox"/>
Deny messages from the following internet addresses/domains:	<input type="checkbox"/>
Inbound Intended Recipients Controls	
Allow messages intended only for the following internet addresses:	<input type="checkbox"/>
Deny messages intended for the following internet addresses:	<input type="checkbox"/>

Restricting Who Can Use Your System to Relay Internet Mail

You can control which incoming messages from hosts outside the local Internet domain are accepted for recipients outside the local Internet domain. Setting this kind of restriction prevents people from trying to use your messaging system as a mail relay.

To prevent unauthorized use of your system as a mail relay, the router checks whether the machine sending the message is within the local Internet domain. The router checks the “Local primary Internet domain” and “Alternate Internet domain aliases” fields in the global domain document to determine which Internet domain names your company uses. If the message is not from a server within your organization, the router checks each recipient address to see if the recipient is within the local Internet domain. If not, Domino uses the restrictions that you configure to determine relay access in the configuration settings document (see figure above in the Anti-Spam Controls section).

Mail Monitoring

Domino provides three tools that you can use to monitor mail.

- Message tracking allows you to track specific mail messages to determine if the intended recipients received them.
- Mail usage reports provide the information you need to resolve mail problems and improve the efficiency of your mail network.
- Mail probes test and gather statistics on mail routes.

For further information about these tools see the Administration Guide provided with Lotus Domino.

Controlling Message Transfer

To control how messages are transferred between servers in your Domino system, you can:

- Restrict transfer based on message size
- Route large messages during the low-priority mail time range
- Customize transfer controls — for example, change the number of transfer threads and the retry interval
- Customize advanced controls — for example, change the logging level and specify when to ignore message priority
- Customize the text of failure messages

For further information about these controls see the Administration Guide provided with Lotus Domino.

Summary

In this chapter, we started out by introducing the Domino R5 messaging architecture. We told you about the powerful features of Notes and Domino: Notes works with any server as well as with any client. We also included some information about the directory services.

Next we covered the design aspects of the mail routing implementation. We discussed server topologies and mail routing scenarios, and presented some examples of them. We also described different types of connections for mail routing, and explained which types of documents are needed in each of the mail routing scenarios.

In the following sections, we provided information on how to customize and enhance the Domino mail system. We included information, for example, on the anti-spam controls, and on mail monitoring and filtering.

Chapter 10

Designing a Calendaring Infrastructure

This chapter covers the following topics:

- Introduction
- Planning considerations
- A new look-and-feel of the calendar view
- Owner Actions and Participant Actions buttons
- Calendar preferences
- Calendar printing
- Group calendar
- Holiday definitions
- Improved invitation management
- Resource management
- Enhanced alarm support
- Integrated task management
- Improved performance
- Synchronizing with Personal Information Managers (PIM)
- Summary

Introduction

Calendaring & scheduling, as an addition to e-mail, is one of the key areas to implement from the end-user's point of view. You need calendaring features to organize your professional life.

With calendaring & scheduling, you can do things such as:

- Create calendar entries like appointments, anniversaries, reminders and events
- Reserve rooms and other resources
- Send meeting invitations
- Make to do lists

Notes R5 calendaring & scheduling refers to the Calendar and the To Do views, which are part of your Domino mail file. You can view them side-by-side. You can even create any type of calendar entry directly from your Inbox view. You can access these views by clicking the appropriate bookmarks at the left side of your Notes R5 desktop.

The calendaring & scheduling features use the schedule manager (sched server task), the calendar connector (calconn server task), and the free time system (a combination of the sched and calconn server tasks) to operate.

Planning Considerations

There is nothing much to deploy regarding calendaring & scheduling. It comes free with the Domino product, the calendar is in every user's mail file, all required server tasks are in use by default, and so on. If you already have Domino in your organization, or if you are planning to deploy it, it is just a matter of deciding whether or not to use calendaring & scheduling. Of course, you may still need to consider providing training for your users.

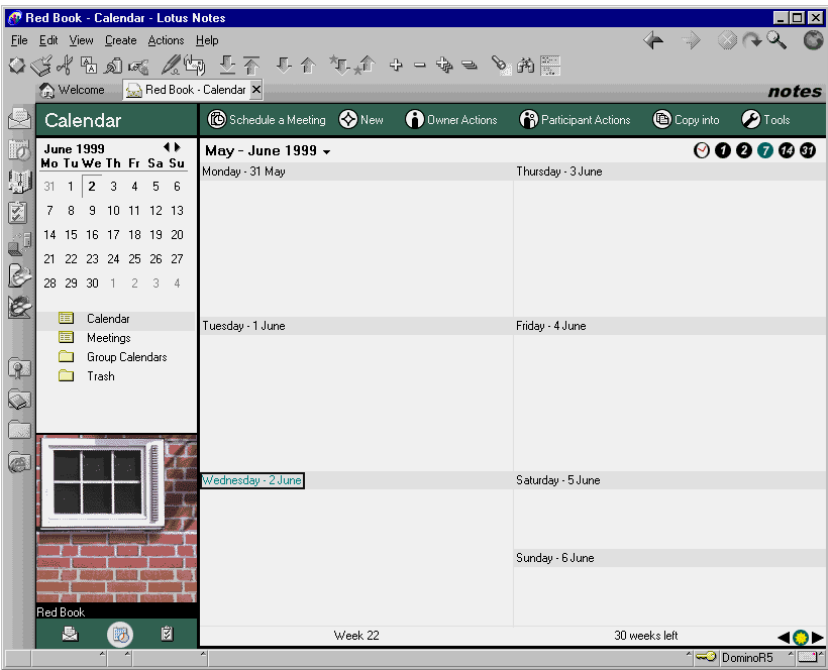
In this chapter we will explore the calendar features so that you can see the power of them. You will see how the calendaring & scheduling fits in every organization. There are only few design aspects in calendaring & scheduling, mainly regarding clustered free-time databases and free-time search to other organizations. These will be discussed in this chapter too.

A New Look-and-Feel of the Calendar View

In Notes R5, a calendar of the current month is shown in the left column, with the current day highlighted. The right side of your screen shows, by default, your current week with all your meetings, appointments, anniversaries, events, or reminders. You can use new pop-up action buttons to manage your calendar entries.

To switch between your mail, calendar and to dos just click on the toolbar in the bottom-left corner.

The new calendar view looks like this:



Owner Actions and Participant Actions Buttons

In Notes Release 4, you had to open an individual document and select options to manage a calendar entry. In Notes R5, you simply select an entry and click either the Owner Actions button or the Participant Actions button to choose the action you want.

See the Owner Actions and Participant Actions buttons provided at the top of the calendar view in the previous figure.

Calendar Preferences

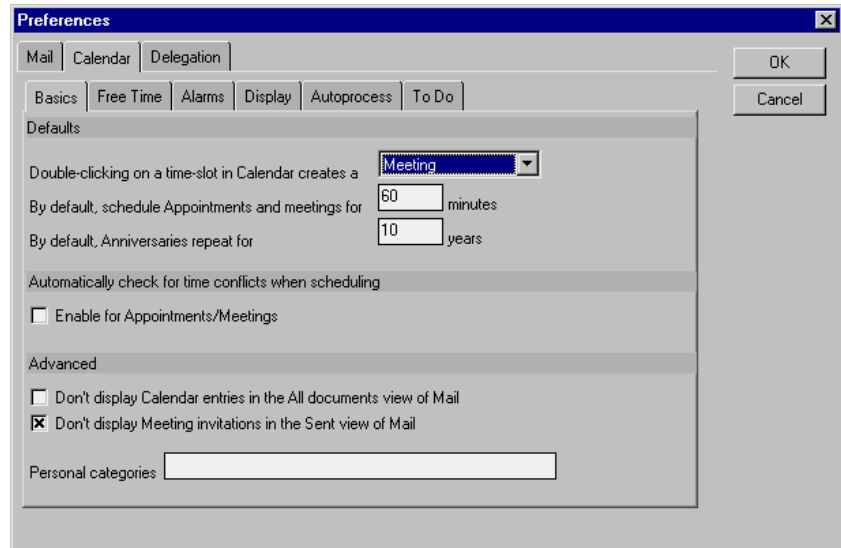
You can now use the same Preferences dialog box where you set your mail preferences to define the following settings:

- Basic settings
- Free time allocation
- Alarm options
- Customize calendar views
- Autoprocess meeting invitations
- Do you want to display your to dos with your calendar

To set your calendar preferences, follow these steps:

1. Open the Calendar view of your mail file.
2. Choose Action - Tools - Preferences.
3. Choose the tabs (Basics, Free Time, Alarms, Display, Autoprocess, To Do) one-by-one by clicking them and setting the preferences you want.
4. Click OK.

The Calendar Preferences dialog box, with the Basics tab selected, looks like this:



Calendar Printing

Yes, you can print calendar views in a selection of different styles.

To print a calendar view, perform the following steps:

1. Open the appropriate calendar view.
2. If you want times to be visible in your calendar days, click the clock symbol in the upper right corner of your calendar view.
3. Choose File - Print.
4. Make the required modifications in the dialog box.
5. Click OK.

Tip You can change the view by clicking the symbols available in the upper right corner of your calendar view. The following options are available:

- 1 refers to a one-day view.
- 2 refers to a two-day view.
- 7 refers to a weekly view.
- 14 refers to a two-week view.
- 31 refers to a monthly view.

Group Calendar

You can view multiple users' schedules at the same time, and view or edit the details of individual calendars depending on your access privileges. You can easily define as many group calendars as you want to, and get an overview of the entries in several calendars.

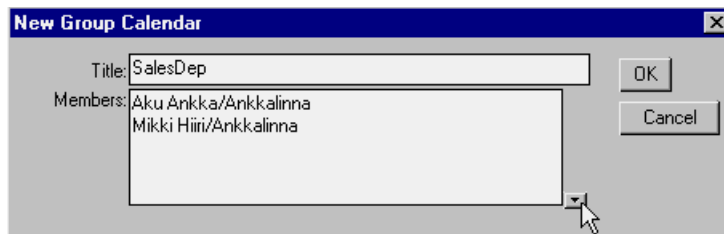
To add a new group calendar, follow these steps:

1. Open the Group Calendars view in your calendar.
2. Click the New Group Calendar action button at the top of the view.
3. In the dialog box, first enter the title, then move the cursor to the Members field and enter the members.

Tip Click the down arrow in the bottom-right corner of the Members field so that you can pick the members from address books (see the figure below with the mouse pointer).

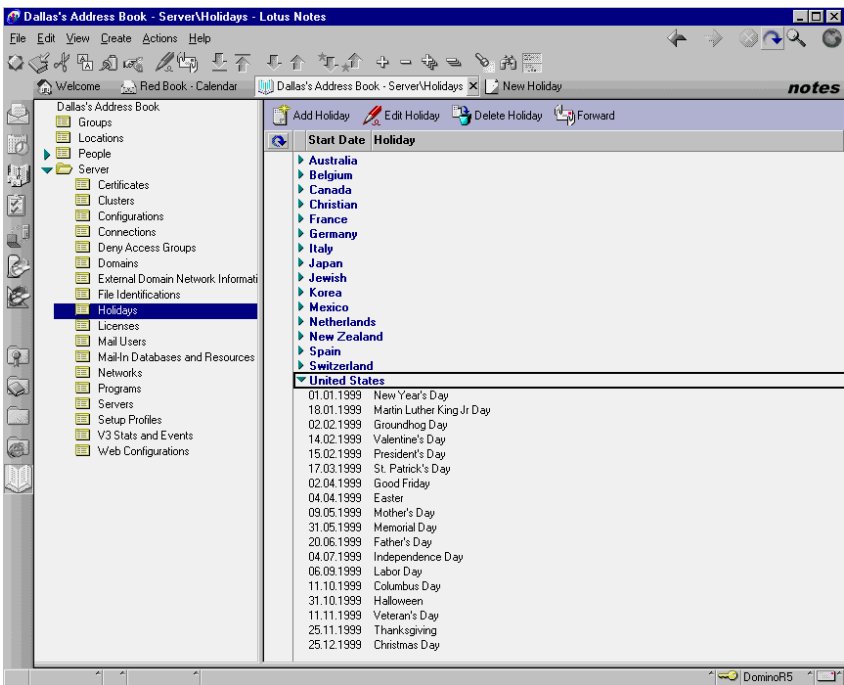
4. Click OK.

The New Group Calendar dialog box looks like this:

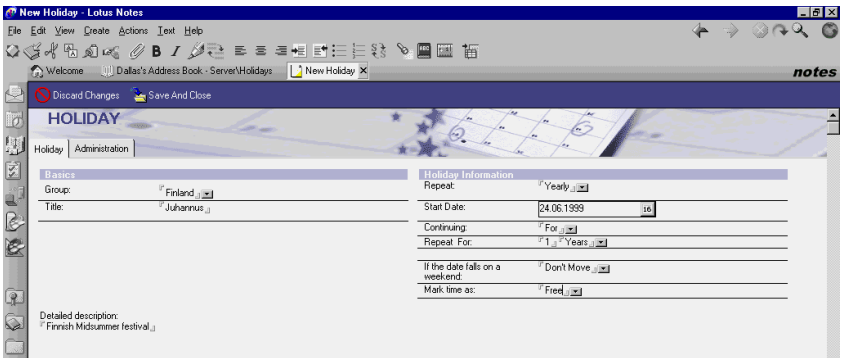


Holiday Definitions

There are pre-determined holiday definitions available in the Server - Holidays view of the Domino directory. It looks as follows:



An administrator can create additional geographic and/or religious definitions for holidays by clicking the Add Holiday action button located at the top of this view.



Improved Invitation Management

When creating a meeting invitation, you can search for free time for the following groups of resources:

- Users who are part of the same Domino mail server and domain
- Users who are in different Domino domains
- Users who use different scheduling applications

Clustered mail servers can be part of any of the choices listed above.

Users Who Are Part of the Same Domino Mail Server and Domain

When you issue a free-time search for users who are part of the same Domino mail server or who are within the same Domino domain, a free-time query is sent to your mail server. The free time system looks for the invitee's name in the free time database (BUSYTIME.NSF) and the information is sent back to you.

Note Domino creates an entry in the free time database for each user who has filled out calendar preferences and whose mail file is on that server or on one of the clustered servers. If there is no entry the query fails.

Users Located in Different Domino Domains

When you address an invitation to users located in different Domino domains, you have to specify the invitee's domain. Your Domino directory is then searched for a document that matches the invitee's domain. One of the following will happen:

1. If the free time system doesn't find any domain documents, the query fails.
2. If there is an adjacent domain document, the Calendar server name field in that document is searched for the name of a server that accepts calendar queries for the invitee's domain. The query is then forwarded to this server. If the Calendar server name field is empty, the query fails.
3. If there is a non-adjacent domain document, the "Route requests through Calendar server" field of the document is searched for the name of the server that accepts calendar queries for invitee's domain. The query is then forwarded to this server. If the "Route requests through Calendar server" field is empty, the query fails.

Note The Calendar server in an intermediate domain must be adjacent to both the querying and the target domains. In addition direct LAN connections with reasonable network response times need to be in place.

If your organization has Domino mail connections to other companies, it is usually possible to create calendar connections so that users in different organizations can perform free-time searches.

This is easy to implement, if the source and target domains are adjacent. If they are not, there is the following technical restriction: the intermediate domain must be adjacent to both source and target domains. So the chain cannot be longer than a total of three Domino domains. In the case of two or more companies with internal and external Domino domains implemented in each, you would have more than three Domino domains. So in this situation, the free-time search across domains would not work. However, the free-time search across domains is most typically used inside a big company with several Domino domains.

Users with Different Scheduling Applications

Calendaring & scheduling works with Lotus Organizer and IBM OfficeVision. You need to set up a Foreign Domain document in the Domino directory for each instance of these alternative calendar systems.

If you have a department in your organization where no PCs are used but, for example, OfficeVision is in place, then these users can also be part of the Domino R5 calendaring & scheduling. If your organization has users who prefer to use the host calendar system, you can reach them too with the Domino R5 calendaring & scheduling.

Free Time Search in Clustered Mail Servers

You can perform free-time searches across clustered mail servers. The advantages of doing this are as follows:

- Schedule information is always available, even when the user's home server is down.
- You will get improved performance and reduced server traffic. Each clustered server has a replica of the free time database, which stores information about the users whose mail files exist on servers in the cluster. So the server that receives a query does not have to search another server's free time database.

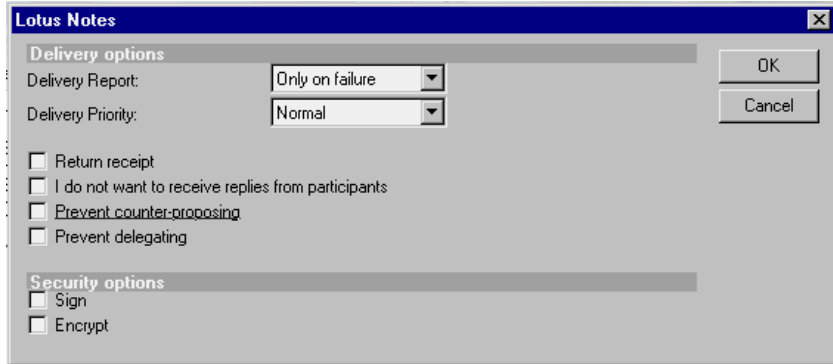
The disadvantage is that you will need additional hardware, software, and licences. Therefore we do not necessarily recommend to build a cluster for free-time search only, but if your organization already has clustered servers implemented, then you should also consider having clustered free-time databases.

Note The file name of the clustered version of the free time database is CLUBUSY.NSF.

Creating a Meeting Invitation

When you create a meeting invitation, you can designate the meeting as required, optional, or for your information (FYI) only. You can also specify delivery options for meeting invitations. These include options such as “Prevent Delegation” and “Prevent counter proposal.”

The Delivery Options dialog box for meeting invitations looks like this:



When receiving an invitation, you can add comments when declining or rescheduling the meeting. You can also continue to receive meeting updates even if you have declined the meeting

Note If the invitation is for a repeating meeting, Notes R5 creates only one single document that contains all the meeting days.

Resource Management

Users schedule and manage meeting resources, such as conference rooms and equipment, in the resource reservations database. This database contains three types of documents:

- Site Profile — identifies the site where particular resources are located
- Resource — defines the resource name
- Reservation — defines the reservation of the particular resource

In Domino/Notes R5, there is now greater access control available for resources using the concept of “resource owner.” All requests for a resource are sent to the resource owner. The owner can restrict who can reserve a resource, or how the resource is reserved.

The schedule manager tracks the free time of a resource the same way it tracks the free time for users. You can also reserve resources across domains.

Enhanced Alarm Support

Alarms (for example .WAV files) can be set for to dos and appointments. You can also send alarms to invitees.

Integrated Task Management

The to dos function just like other calendar entries. You can automatically add to dos to your calendar, create alarms for them, and specify if incomplete to dos should follow you from day-to-day. You can also mark to dos as private.

There are full workflow capabilities for to dos: the To Do owner can reschedule or cancel tasks, and the To Do assignee can either accept, delegate or request modifications to the task.

Note In Lotus Domino Release 4, to dos are called Tasks.

Improved Performance

In Lotus Domino Release 4, the calendar features were mostly coded with LotusScript, and they were included within the mail template. Now the calendar-related code has been ported to C and moved into the core product. This has a positive performance influence on both e-mail and calendaring.

Synchronizing with Personal Information Managers (PIM)

Notes R5 calendaring & scheduling and e-mail are compatible with your Palm Pilot (or Palm Pilot compatible devices such as IBM's WorkPad).

Just slide your WorkPad into the HotSync cradle connected to your PC and push the synchronization button. The EasySync software from Lotus ensures that you can take your calendar data as well as e-mail with you on the road. All the necessary information is available to you.

Summary

In this chapter, we started out by introducing the new calendar view available in Domino/Notes R5.

Next we covered how you can now print calendar views selecting different styles. You can change the view just by clicking the symbols provided for a one-day view or a monthly view, for example.

We then discussed how group calendaring works. You can open the calendar of several people at the same time and view or edit their calendars depending on your access privileges. You can easily define as many group calendars as you want to.

There are pre-determined holiday definitions available in the Domino directory. To help users maintain their free and busy time information an administrator can create additional geographic and/or religious definitions for holidays.

In the following sections, we provided information on the improved invitation and resource management. We also included some information on free-time search in clustered mail servers.

Chapter 11

Designing an Application Infrastructure

Domino is a very effective communication tool. It can provide a quick and easy solution for collecting and publishing information to a wide audience. The Internet in particular, is changing the way we do business, allowing organizations to share information and transact business on a much larger scale than ever before.

Once people begin to realize the positive gains and advantages that a Domino application can deliver, they will begin to think up new ways of taking advantage of this technology. The demand for development of new applications will increase rapidly and a lot of time and resource will be invested in this area.

In a lot of ways, that is exactly what you will want to see happen in order to leverage your investment in Domino. However, the situation can soon get out of hand if applications are deployed without any attention to the impact they may have on the overall health of the Domino infrastructure. It is therefore critical that a disciplined approach is taken to both the development and deployment of Domino applications.

This chapter will take a look at some steps you can take to improve the deployment process and quality of the Domino applications you deliver. We'll discuss some things you should know before you get started and other fundamental aspects of database management. That is:

- The life cycle of a Domino database
- Thinking about database development standards
- Managing Domino databases using an application registry
- Implementing a successful replication strategy
- Defining roles and responsibilities
- The importance of test and development domains
- Some final words of advice

First, let's take a look at what is really involved in deploying a Domino application by walking through the life cycle of a database.

The Life Cycle of a Domino Database

We should start by saying that this section is not meant to be a step-by-step guide for things you should do every time you want to deploy a Domino database.

There will be many occasions where a simple Domino database could and should be fast tracked and implemented with minimum fuss to capitalize on your Domino investment. Databases like team rooms, discussion databases, bulletin boards and frequently asked questions (FAQ's) can often be set up very quickly from a standard template and provide a quick win, low-cost solution to your organization.

When the scope of a database widens however, it is time to start considering the actual processes involved in developing, and then deploying, a database.

Our aim in this section is to provide you with enough information to make sure that you have all bases covered. The basic principles behind these processes are borrowed from a methodology commonly known as Rapid Application Development (refer to www.whatis.com/rad.htm for more information) and will apply no matter how large or small your application. The key consideration as always is common sense and sound judgment.

Starting with an Idea

Every application is born with an idea. It may be stating the obvious but, if you are going to the effort of developing and implementing an application, first have a good concept of what it is that you actually want to achieve and how your business will benefit from investing in this solution.

Once you have established this, try to find out if there is already another application available within your organization to suit your needs. A good way to do this is to make use of an application registry (refer to the section titled, "Managing Domino Databases Using an Application Registry," later in this chapter). It will save time and effort if you can make use of an already existing application or some of its components.

Documenting the Requirements

Once you have the idea firmly established in your mind, document the requirements. At this stage you are not documenting specific technical details of an application but rather a set of business requirements for which you need a solution.

Note You should not be assuming at this point that your idea will end up as a Domino application. It may well be that once you have fully documented your requirements it is better suited to another product. There are some things that Domino is not suitable for, as we have already discussed in

Chapter 2. Focusing only on the business case and requirements will help to define the most appropriate product for your needs.

Obtaining Approval to Proceed

When you have documented your business requirements, present them to management for approval and funding. This does not have to be a rigorous and formal process depending on the size of your organization. It is however, an important exercise to go through for a number of reasons.

- No matter how simple the application is, it will still require someone's effort and attention to put it together, test it and then deploy it. At the end of the day, this all equates to time and productivity which equals a cost to your business.
- It prevents duplication of effort. Why "reinvent the wheel" if there is already another application or product available that does the job? Even if you are not aware of another application that would be suited to your needs, hopefully the person in charge of approving the work will. (See the section titled, "What Is an Application Registry," later in this chapter).
- It guarantees a consistent approach to content, design and distribution. It will be much more efficient and less stressful for people using Domino applications throughout your company to work with something that looks and feels familiar.
- It ensures full management backing and support when the time comes to move the application into production.

When putting your case forward for approval, it's a good idea to have some concept of the cost and scope of the application. By that we mean:

- How long will it take to develop, test and deploy? If you are talking about a simple discussion database, this may require only a few hours worth of effort. On the other hand, a complex and sophisticated workflow application may take many days to complete. The length of time it takes to complete the application will have a direct influence on the overall cost to your organization.
- What is the size and scope of your target audience? Is this a small database targeted at a few people in one department or is it a company-wide application spanning a number of servers and locations? This will affect business focus and priorities and subsequently resources that are allocated to the design and deployment of the application.

Designing the Application

After you have received management approval and funding to move forward, it is time to start the design process. This could be something as simple as making a list of the forms and views required in a database. At the other end of the scale, it may entail putting together a formal proof of concept document including architectural diagrams and workflow analysis.

Regardless, be as specific as possible. You don't want to end up with an application that does not deliver an effective solution for your particular requirements. The application owner and developer should work together closely during the design stage to ensure that all of the business requirements are accounted for in the design of the application.

Important If this is a large application, it is absolutely critical to the success of your application to have the infrastructure teams (including Domino administrators and network support personnel) and the users involved at this stage of the process. They will offer a unique perspective and understanding as to what will actually work in the real world, making their feedback invaluable.

Developing the Application

By the time you have worked through the design phase, you should have everything you need to actually start development work. If the application will be developed internally make sure that an area of the development domain has been reserved for use (see the section titled, "The Importance of Test and Development Domains," later in this chapter).

Make sure the developers working on the application are fully aware of the development standards that they must adhere to. Refer to the Best Practices Guide at www.notes.net/notesua.nsf for more information.

Allow plenty of time for reviews and modifications to the original design. As work progresses it may become apparent that there are some steps missing in the original analysis or not required at all. Be flexible where possible. Allow room for input and change if it will deliver a better solution.

A close working relationship must be established between the application developer, the application owner and the database administrator throughout the development phase. The application owner will understand the business requirements and the database administrator will be able to advise on the capacity of the existing infrastructure to support and maintain the application. The application developer may or may not have a thorough understanding of these areas but will know how the application works. At the end of the day, a team effort will produce the best results.

Reviewing the Application Design

A review of the application is required at least once during the development process and unfortunately this is frequently neglected or overlooked altogether.

If it's at all possible, try to get an independent party to perform any application reviews. Once you have been working in-depth on an application, it can sometimes become difficult to spot mistakes or flaws in the design. Another person will help to introduce a fresh, more objective perspective to the review process and should be focused purely on the business requirements.

Again, depending on the size and complexity of the application this may be required at several points throughout the development process.

Piloting the Application

Once the bulk of the design work has been completed and the code has been reviewed, it is time to pilot the application. Again, don't assume that once you reach this stage, design work is finished. The whole point of a pilot is to flush out the bugs and problems that have so far gone undetected as well as to gain user acceptance and feedback.

Before the application can be piloted, a thorough set of working instructions and documentation should have been completed by the developer. The instructions should contain details for specific requirements in setup and a basic overview of the application and how it works. It will also be necessary to have documented instructions targeted at the end user for usability testing and review.

Notify the pilot users in advance of the pilot start date. Give them a firm timeframe in which to provide their feedback. Also, provide the pilot users with a method for submitting feedback such as a Project database or checklist of questions.

At the end of the pilot period, evaluate the feedback that you have received and if necessary ask the developers to make the appropriate modifications. In many cases it may be necessary to circle back and complete various steps of the design and review process again but that is all a part of a thorough design and deployment process. It will pay off in the form of a much more robust and usable application.

Important Pilot the application on a test server or domain if you have one (see the section titled, "The Importance of Test and Development Domains," later in this chapter). If serious problems are encountered the application is then contained within an isolated environment and will not impact your daily production environment or servers.

Moving the Application into Production

Before an application can be released into production, design documentation must have been completed and handed over to the support teams. If something goes wrong they need to refer to documentation to have a good chance of fixing the problem.

To move an application into production, the Domino administrator will use the information contained in the application registry to obtain the specific requirements for setting up the database.

A non-replica copy of the database should be used to avoid any obsolete or test data from finding its way into production. At the same time, a template should be created to allow for more efficient control of design changes to the “live” database.

This is also the time when a formal announcement or application launch is made. The use of an internal bulletin board or database is always a good method for communicating this sort of information to people.

Making Modifications to the Application

Making modifications to existing applications must be handled with care. It must be remembered that by now there will be a number of active users working on the application at any point in time. Any changes you make to the application could affect their ability to use it effectively.

Handle all modifications to a production application database through change control and use templates to control the flow of design changes and modifications into production. Changes should first be introduced and tested in a development or test environment and promoted to production only when you are sure that they are completely safe.

We strongly recommend making modifications to applications outside of core business hours. This allows time for further testing during non-critical periods and an opportunity to back out of the change if needed.

Tip Consider removing the design task from the server to control design changes to your production environment. The design task can be loaded manually as required allowing you more control. If the application has a number of replica copies on other servers, run the design task on a replication hub or central server first, and then allow scheduled replication to propagate the changes.

Sunsetting the Application

Nothing stays the same forever. Requirements change over time and so too will the need for some applications. There are many reasons why an application may reach the limit of its usefulness, but when it does you need to ensure that it is removed from production servers as soon as it is no longer required.

An application may appear to be sitting idle on a server but that does not mean it is not consuming resources. It will still be indexed and compacted, agents may continue to run, replication may still take place in the background. To maximize the performance of your servers it is essential that these applications are identified and removed.

Check the User Activity and Database Usage views in the Domino log database (LOG.NSF) for a good indication of the number of users accessing the database and the amount of traffic being generated by the database.

Try to automate as much as possible. Remember too that application owners don't always advise or realize themselves that the application is no longer used. Don't archive or remove any database without first advising them. They will have the final say on what should be done with their database.

Thinking About Database Development Standards

We have already touched on some of the most obvious reasons for the importance of designing and implementing standards in the Domino infrastructure throughout various chapters of this redbook.

There are a great many sources of reference materials available covering the topic of application development standards in detail and we do not intend to cover a full discussion of these standards in this redbook. Our aim is to provide you with some reliable reference points to get you started and to stress the importance of having a documented set of standards available to your development community.

Adherence to development standards will ensure that quality applications can be developed and deployed in a minimum amount of time while at the same time gaining the most widespread acceptance and utilization by end users.

Some good reference sources for more information include the following:

- IBM Redbooks on www.lotus.com/redbooks or on www.redbooks.ibm.com
- *Lotus Domino Release 5.0: A Developer's Handbook*, IBM form number SG24-5331, Lotus part number CT6HPIE
- Lotus Web sites www.lotus-developer.com and www.lotus-dev.net
- Best Practices Guide on www.notes.net/notesua.nsf

What Are Your Objectives?

Development requirements will vary from organization to organization as will the set of development standards that you decide to adopt. The most important point is that you have a clear understanding of what it is that you are trying to achieve by implementing Domino development standards.

For example, the implementation of a clearly-defined and well-publicized set of development standards will:

- Provide a standard set of guidelines for the development of Domino applications across an organization.
- Encourage a consistent design approach that will lead to a common “look and feel” in all applications deployed throughout the organization.
- Improve quality of service and support.
- Minimize costs in terms of education and support.
- Maximize the efficient use of infrastructure equipment such as servers, network and client hardware.
- Establish a process for the re-use of common components in standard design procedures.
- Leverage the return on your investment in a Domino solution.
- Encourage the exchange and sharing of information throughout areas of the organization that may not have a great deal of experience in application design.
- Assist in the review of application design and require business justification for a departure from the norm.

Important The use of any standards needs to be supported and reinforced at all levels of management. Once you have established a set of standards, leverage off management “buy-in” and make sure that they are clearly communicated to all areas of the organization. The standards won’t do you any good if nobody knows about them.

Managing Domino Databases Using an Application Registry

As we mentioned at the beginning of the chapter, one of the major selling points in favor of Domino is that it can be used to quickly and easily produce applications that promote the sharing of information within an organization.

What may start out as small informally-developed applications can quickly become part of critical business processes. If people are provided with a tool they will generally use it and the demand for application design and deployment will grow accordingly.

However, it would be wise to impose some order and control to this process.

Why Use a Domino Application Registry

The easiest way to illustrate what an application registry is and the benefits it provides is to use an example.

Let’s briefly look at a situation where anyone is allowed to develop and deploy databases with only limited control and guidelines and the potential issues this may cause:

- It is unlikely that all of the staff in your business will be Domino developers. Therefore, the time spent on the development of Domino databases will likely result in a loss of productivity. They will be performing a task that is not their job and potentially take longer to do it as they try to figure out all of the steps involved.
- If there is no coordination of development across an organization it will be difficult to establish what sort of work is being undertaken at any point in time. This will result in duplication of effort where similar databases have already been developed and placed into production.
- The load on Domino servers will increase and it will rapidly become quite difficult to locate and maintain any sort of logical distribution of database on the servers.

- Without an effective method for establishing the content of an application it is impossible to gauge the potential impact it may have to the environment. It will then become extremely difficult for an administrator to manage the servers as they will have no idea what is running on them.
- If applications do not have any sort of common “look and feel” in an organization how can you guarantee “user friendliness” to your target audiences?

The end result will be a large number of applications in an organization serving no real business benefit, overloaded systems and network, unhappy users and unhappy management.

The way to control and manage this is to use an application registry or at a minimum observe the processes involved in using an application registry.

What Is an Application Registry

Before an application registry can be set up you need to think about what you want to achieve by using it. It should contain a high-level summary of the application’s intended purpose and enough information to enable administrators to deploy it and for support staff to maintain it.

Some organizations use an application registry as part of their change control procedures — development teams or other staff who want databases to be placed on a live server must complete details in the registry before the operational teams will consider putting the application onto a live server.

It can also be the place where application owners can make requests for new applications.

Important Once again, a common sense approach is best - it is vital to have proper controls and disciplines, but you do not want to make the process so difficult or lengthy that it puts people off — you want your organization to use Domino!

Depending on the size and complexity of your organization your application registry can be as simple as a form in a database with a checklist, or it may be a sophisticated workflow process.

Either way, think about including the checkpoints outlined below. Working your way down the list, you will see how many of the points relate to major milestones in the life cycle process of a database:

- Criticality

Must the application be available 24 x 7? Will its availability be linked to any Service Level Agreements that are in place? This will have implications with respect to server maintenance work and hours of support.

Is it mission critical? Should it be on two or more clustered servers?

- Availability of documentation

This should be a mandatory field! Where is the documentation to describe what the database does? Good developers should be in the habit of documenting their applications, and you as the implementor should demand this.

- Distribution

Does the application require the use of a dedicated server or a preferred server, or a specific location?

- Estimated shelf life

How long is the database likely to be actively used? Some databases, such as discussions, have a short shelf life after which they can be archived or deleted.

- Estimated maximum size

You should find out whether the database is expected to grow significantly after it has been put onto the live server.

- Network impact analysis

How much network traffic do you expect the application to generate? This is a particularly important aspect and unfortunately often overlooked. Network bandwidth is not always freely available in some organizations. It would therefore be costly to invest in an application that will cripple your network resources.

Developers or application owners may not be familiar with network issues and they may have difficulty providing you with this information. You might need to help them by asking the right questions.

- Access Control List

What level of access is required, by who, and what roles should they have?

In a controlled environment you will normally want to remove the developers from the ACL once the database goes live, or at least reduce their access from Designer to Reader. If they need to make further design changes they should go through a controlled procedure. You should be wary about allowing developers to make changes to applications on the live servers that you are responsible for.

- Full text index requirements

Is one required and if so, are there any specific requirements on the index, for example stop word files?

- Archiving/purging requirements

If the application will contain a large amount of data, can some of this be archived or purged at regular intervals? For instance, financial applications may contain data that can be archived after the end of the financial year.

- Target audience

What is the intended size and scope of the target audience? How many users will be accessing the application and where are they situated? Is the application aimed at a limited number of people in one department or targetted for use by the entire organization?

- Database owners

The name of the application owner(s). Will this person or a delegate be authorizing ACL changes?

- Profile document details

Include the name of the person responsible for maintaining them.

- Links to other databases

Does the application contain any links to other databases? You want to ensure whenever possible that nothing is hard-coded. If something changes, such as a database being moved to another server, the links in this application should not stop working.

- Agents

Do you have restricted and/or unrestricted agents? What do they do and how frequently should they be run? Have they been tested on a server as well as on a client machine? What is the security impact of the level of restriction you have implemented?

- Details of testing
This includes, but is not limited to, details of Year 2000 (Y2K) testing.
- Adherence to development and design standards
Will the application be written to comply with development standards?
Has it undergone review or quality assurance testing?
- Replication/save conflicts
Who will resolve them? Should field level replication be set to merge?
- Any other particular database design details or requirements?
This can include requirements for any special fonts, colors or assurance of code page neutrality in the case of an international deployment.

Implementing a Successful Replication Strategy

There are many approaches that can be taken in implementing a replication strategy for a Domino environment and these are well documented in Chapter 6 of the Lotus manual, *Administering the Domino System*.

In terms of applying a replication strategy to the deployment and maintenance of Domino application databases there are a few key points to bear in mind:

- Plan carefully.
Implementing a realistic replication schedule from the start will avoid many problems in the future.
- Create replicas only where necessary.
The decision on where to place replica copies of databases should not be determined strictly by location unless network bandwidth is poor or the number of concurrent users is expected to be extremely high.
Try to use a centralized approach where possible. This will minimize the resources required in terms of support, the occurrence of replication conflicts and will help to ensure the integrity of data.
- Minimize the number of connection documents needed to distribute information across the organization.
If you have replica copies of a database distributed across a number of servers, it would be placing additional load on your servers to have one connection document from each server to the other. It is also an extremely difficult approach for administrators to support.

- Use a hub-and-spoke replication topology wherever possible to maximize server resources.

The pros and cons of using this approach are well documented in various publications, including the Lotus Domino R5 Administration manuals. It has been our experience that this is generally the most efficient and most easily-supported strategy to implement.

- Consider the use of database priority settings.

Once you know that a database needs to be replicated, you will need to decide on how frequently to replicate it. There will be some “mission-critical” databases containing information crucial to all employees and these will need to be replicated throughout an organization at frequent intervals. Likewise, some databases will contain information that is not time-critical at all.

It would be inefficient to replicate all of these databases together at the same time utilizing the same connection documents.

An easy way to separate the replication schedule of one type of database from the other is to implement connection documents based on database priorities.

- Use dedicated replication hubs where possible.

Replication is an extremely resource-intensive task. Dedicated replication hubs can be used to alleviate the workload on application servers and thereby optimize performance of the applications.

- Use a “follow the sun” replication strategy in international organizations.

If your company spans a number of different countries across multiple time zones, it presents a challenge in determining how to distribute information so that it is available at the appropriate time of the day in all countries. One way to address this is to design your replication topology so that it distributes data across your organization from east to west in time for core business hours in each region.

- Use replication settings with care.

These can be extremely useful when used with discretion, however they can also produce unexpected results and generate additional workload for the database administrators.

- Use of database replicas versus database copies.

If you do not want information flowing freely from one replica of a database to another across your organization, use database copies instead of database replicas. A good example here is the use of templates to control when design changes are propagated out to spoke servers. Database copies can be made of templates to ensure that, if the design task runs on one server, you will not see it mistakenly replicated out to the other databases in your Domino environment.

- Use of clustered replication versus standard replication.

Clustered replication is event-driven and is used to provide failover and to avoid interruption to service. It is not the same as scheduled replication. Many people think it is and overlook the fact that connection documents for scheduled replication are still required to ensure reliable distribution of data.

Defining Roles and Responsibilities

After reading the sections above it should have become quite obvious that ensuring an application's smooth transition from development into production can require the coordination and cooperation of a number of different resources and groups.

It is important then to have a clearly defined and documented set of roles and responsibilities defined from the outset of any Domino deployment project.

We have provided some general guidelines below that you may want to consider for your organization:

Application Owner

This is typically the person who has requested development of the application in the first place. They are responsible for determining the business requirements of an application and would therefore normally hold a management position or equivalent responsibilities. An application owner would generally be expected to:

- Document the business requirements for the application.
- Obtain approval to proceed with development. This should include ensuring that the appropriate resources and funding are in place.
- Provide input and feedback during the design phase in terms of what the application should achieve and generally how it should look and feel.

- Be responsible for the content and integrity of data in the application. By this we mean they own the information in the application and will have final say about what stays and what goes. This goes beyond the initial deployment and carries over to daily maintenance of the database. This would generally also include the responsibility for resolving replication and save conflicts.
- Determine the target audience for the application and the level of access they require. They will also authorize any ongoing changes to the level of access to the application.

Important It should be noted here that this does not mean making changes directly to the Access Control Lists (ACLs) of databases. This in fact should always be discouraged and changes should be made only to the appropriate groups in the Domino directory. Changes made directly to the ACLs require manager access to the database. This automatically provides the ability to do many other things, including deleting the database altogether, changing replication settings and enforcing consistent ACLs. The Domino administrators will be unable to effectively control the performance of the Domino systems if this level of access is granted to more than a very restricted group of people.

- Define the frequency with which application data should be distributed throughout the organization. If your organization spans a number of different locations it may be necessary to replicate databases from one server to another. Note that while an application owner may determine the business requirement for replication it will be the administrator's responsibility to advise on a practical and realistic replication solution.
- Be responsible for communicating the availability of the application to the target audience. This includes design refreshes, maintenance outages or anything that has the potential to interrupt service.
- Advise the Domino administrator when a database is no longer required and may now be archived or removed.

Note The application owner may or may not choose to perform all of these tasks but they should have the ability to delegate responsibility and ensure that the work is carried out to completion.

Application Developer

The application developer is responsible for the overall creation and design of a Domino database. Throughout the design process, the application developer should be working closely with the application owner and at times, the database administrator to ensure that the final product meets business requirements. The responsibilities of an application developer should include:

- Identifying the need for an application in the first place. An application developer is often well placed to distinguish when an application should be used to automate or enhance system processes. They may often be the first person to float the idea for a new application.
- Assisting with the initial business analysis to create a formal document for sign-off and funding
- Preparation of the initial design specifications. This may require a number of detailed discussions with the application owner to establish their specific requirements.
- Adherence to database design standards
- Testing and piloting the application
- Documentation and handover to support teams for business as usual
- Modifications and changes to design as requested by the application owner

Domino Database Administrator

The database administrator has overall responsibility for the actual implementation of the Domino database and the impact that application has to the Domino service. Again, they should not be acting independently (with the exception of emergency maintenance). Any work that is performed on a database should be done with the full knowledge and consent of the application owner.

Because your Domino databases are applications that affect different areas of your enterprise, you may have more than one Domino database administrator. In fact, don't forget to assign more than one database administrator per Domino/Notes application so that you have some backup in case the primary database administrator is ill or on vacation, for example.

A Domino database administrator's duties include:

- Moving the application from test to the pilot environment and then on to production
- Creating templates for the application

Note All design refreshes or modifications to production databases should only be carried out through the use of a database template and by adhering to standard change control procedures. See Chapter 18, “Support and Communications,” for more information on the change control process.

- Defining and creating groups in the Domino directory for access to the application (as specified by the application owner)

The application owner or their delegate may then be provided with the ability to update the contents of the group in a secure and controlled fashion.

Note We strongly recommend against providing anyone but the database administrators with manager access to Domino databases.

- Setting up groups with the appropriate level of access in the ACLs of the database
- Setting up replication schedules in the Domino directory in accordance with the application owner’s requirements
- Implementation of database management features such as quotas and thresholds
- Implementation of full text indexes as specified by the application owner and application developer

Note The use of full-text indexes can have significant implications on the performance of your Domino servers and applications and should be used with discretion.

- Setting up program documents for specific tasks that need to be run on the application
- Responsibility for performance tuning in relation to the application. There may be times when performance of the application begins to suffer and requires attention. This may be due to design considerations of the application or to server load. Either way, the Domino administrator should investigate and recommend on performance tuning techniques where possible.
- Perform routine maintenance and housekeeping functions (see Chapter 19, “Administering your Domino Environment”)
- Move databases from one server or directory to another as required
- Archiving and deleting databases that have reached their shelf life

Application Reviewer

This is the person responsible for assuring that all Domino applications meet a minimum set of design standards. This role could be most closely aligned to the quality assurance phase of the design process. An application reviewer would not generally be a part of the actual design process so that they may provide a certain degree of objectivity to the review process.

The application reviewer's role is to:

- Review the application for conformance to design standards. This should include reviewing the Help and About documents, the validity of the help information at the field level, and checking that the database functions correctly on all the required platforms.
- Document and make recommendations for improvement
- Perform a sanity check

It is possible to design a number of features into a Domino application that may result in severe performance problems when placed into a production environment. The application reviewer should assess the impact of these features with a view to the acceptable response times and server capacity/performance and then advise accordingly.

Pilot Users

Again, this role should be independent of the development process so that pilot users can assess the application without any bias.

Pilot users will have responsibility for:

- Testing the functionality of the application
- Providing feedback on the general usability of the application
- Commenting on the overall look-and-feel of the application
- Suggesting additional functionality, for example, additional views

Note It may not always be possible to accommodate these suggestions within the scope of the current project. They can still be retained, however, for potential future enhancements to the application.

The Importance of Test and Development Domains

The purpose of these environments is not always clearly understood and, in fact, when you start talking about test and development domains, a lot of people will assume they are one and the same. This is decidedly not the case.

Before any application is placed into a production environment, it should be fully tested on a server or in an environment that is as close as possible to a mirror image of the production domain and conforms to the same standards. That is called the test domain.

It is also where you can test out the performance impact and functionality of new releases of code, such as Domino R5, in an environment that will not affect the quality of service to your users. Refer to Chapter 24, “Upgrading and Consolidating,” for more details.

A development domain on the other hand, will be used primarily by your developers during the initial phases up to, and including, testing. It may or may not accurately reflect what is in the production environment and probably won’t be subject to the same standards. Developers will often be making many changes throughout the course of the day that could make it difficult for users to reliably test other applications.

If you can afford it and have the resources to support it, it may be a good idea to think about separating the two different functions.

Standards for Test or Development Domains

Some basic standards and guidelines to consider for test and development domains include the following:

- Separate the function of test and development work away from the production environment. That is, your mail and application servers. If something goes wrong or causes unanticipated load on the servers, damage can be contained and isolated away from the users.
- Domain names for the test and development areas can be a logical extension of the production domain name. For example, if the domain for a company is ACME, the development domain name could be called ACMEDEV and the test domain could be called ACMETEST.
- Use the same organizational and organizational unit certifiers as in production. Even though the development or test environments can be contained within a separate domain, it is still possible to use the same certifiers. This way you will not need to rename or recertify components when you move into production.

- Avoid replication from the test or development domain to the production environment. If this is required for any reason, then use non-replica copies of critical databases like the Domino directory to avoid replication conflicts or the propagation of damaging data.
- Minimize mail routing between the test, development, and production domains. If a problem occurs, such as a mail routing loop, you may then have time to find it before too much damage is done.
- If a user needs to be in the Domino directory in either the test or development domains, copy and paste their Person Document from the production copy of the database, edit the appropriate details and create a new mail file. That way, they will be able to use the test or development areas without any impact to their own mail files.

Some Final Words of Advice

As well as providing a proper application development server environment, you should also consider how you implement change control and quality control for the deployment of applications.

- To control access to design elements of databases by developers, you may consider using one of the components of TeamStudio CIAO provided by Ives Development, Inc. (see www.teamstudio.com for more details). Developers have to “check out” a design element, such as a form, before they can modify it. If it is already checked out they cannot access the design element. When the work is complete, they check it back in.
- Remember to sign your databases. Always ensure that developers or someone else in the implementation process is responsible for ensuring that all design elements of a database are signed correctly. This must be done before the application goes live; this step is often overlooked, causing users to see unnecessary warnings on the screen about cross-certificates and ECL messages.
- When preparing application documentation it’s a good idea to include a modification history with version numbers in the About document. That way it will be easy to tell which version of the application a user has when dealing with support issues.

Note Remember to ensure that the About document is set to inherit its design from the template.

Summary

This chapter began with a short discussion of the importance of taking a disciplined approach to the deployment of Domino applications. We discussed the actual steps involved in deploying a database and provided some guidelines to consider at critical points throughout the process. We touched on the subject of development standards and told you where you could go to get more information on this topic.

We explained how you can introduce a level of consistency and control in the deployment process by using an application registry and we provided an overview of the information that should be captured in an application registry.

We discussed some strategies for implementing an efficient replication topology and how it relates to the deployment and maintenance of Domino application databases.

Next, we outlined the roles and responsibilities of the key players involved in the design, development and deployment of an application.

Lastly, we talked about the role of test and development domains in a Domino infrastructure and some basic standards that could be applied.

Chapter 12

Designing a Client Infrastructure

In Chapter 5, we discussed the factors involved in deciding which client to deploy for Domino — the Notes client, a browser, or a combination of the two.

In this chapter, we will cover the installation, configuration and maintenance of Notes clients and browsers, and we will look at ideas for providing a customized desktop with a corporate home page.

Installing the Notes Client

The hardware requirements for Notes clients are specified in the following. You should bear in mind how these relate to the workstation hardware that is currently deployed in your organization. When planning for the Domino deployment it will help if you have made an inventory of the physical workstation machines in the organization, as was suggested in Chapter 3.

Hardware and Protocol Requirements

The following sections list the hardware and protocol requirements for the Notes client.

Disk Space

The disk space requirements for the Notes client options (full and minimum) are:

- Notes client 160MB full 69MB minimum
- Administrator client 182MB full 78MB minimum
- Designer client 236MB full 70MB minimum

The “full” installation is with Help, Notes Minder, DECS and spell checker.

RAM Requirements

The RAM requirements for all clients are as follow:

- Microsoft Windows 95/98 — stated minimum is 8MB, 32MB or more recommended.
- Microsoft Windows NT 4.0 — stated minimum is 16MB, 32MB or more recommended.

Important You are strongly recommended to use 32MB or more of RAM on your Notes client machines.

Processor

Minimum Intel Pentium, 133MHz or higher recommended.

Protocols

The following protocols are supported:

- TCP/IP
- Banyan VINES (not with Win98)
- NetBIOS over NetBEUI
- NetBIOS over IPX
- SPX
- SPX II (NT only)
- X.PC

Software Requirements

These are the software requirements for the Notes client:

- Windows 95
- Windows 98
- Windows NT Workstation 4.0
- MacOS for Macintosh System 7.6 & 8.1 Power PC*

* The Notes R5 Client is, at the time of writing, only available for Windows 32-bit platforms, although a beta version exists for the Macintosh with the release of the gold version expected later in the year.

Additional Requirements for Mobile Users

Mobile users will also require a properly configured modem and appropriate dial-up software such as Microsoft dial-up networking or, alternatively, they can connect directly via the Notes client.

Installation

With any client desktop software, distribution and maintenance is always an issue; it is rarely feasible to have someone visit every workstation to perform the installation process. There are many products available to assist with software distribution such as Novell's Zen Works, Tivoli NetView Distribution Manager, or Microsoft's SMS.

When planning how you will deploy the Notes client software you should be aware that in R5 both the Lotus Domino server and the Lotus Notes client now use InstallShield™ as their installation program. InstallShield is the standard installation program for Windows applications. Below is a description on how you can use InstallShield to automate your client installations.

Installing the Notes Client Using an InstallShield Response File

InstallShield is scriptable, allowing the automated, "silent" installation of software. Thus, an administrator can perform an installation which records responses to all installation questions in a response file for each client installation type (for instance Notes client only versus Notes client plus Domino Designer). The response file can then be packaged with the client install kit on the network, where it can be accessed from the client workstations. Users can run the installation package, which will automatically use the response file as input.

Note If you have customized any standard templates, (such as bookmark.ntf as described later in the section on creating a Corporate Home Page) you should insert these into the client install kit on the network drive.

The steps to perform the installation using a response file are:

1. From the installation directory run SETUP -R. This will create a response file called SETUP.ISS (in the WINDOWS or WINNT directory, depending on the operating system).
2. Go through the setup, performing an actual installation. All the responses you make during the install will be recorded to the response file .
3. Copy the client installation files and also the response file to a shared network drive or other software distribution location.
4. The installation can then be run on the target workstations from the network drive, in silent mode, using the response file that is also on that drive. Since the installation runs in silent mode you can also use the /f2 parameter to record the installation status to a log file. This can be examined later in case there are any problems.

For example if drive x: were the shared network drive and drive f: were the user's home network drive, you could run the following command to perform the installation and write a log to the root of the users home drive.

```
x:\setup -s -f1x:\setup.iss -f2f:\notesins.log
```

Important The syntax of this command is important; for example, there should be no spaces between the f1 and f2 switches and the paths that follow them.

Checking the Setup Log

This section describes the setup log; you may wish to analyze it later.

Tip If you used the user's network home drive to store the log, it should be possible to analyze it remotely. You might even write a procedure to analyze all logs and record installation status information in a central place to enable you to monitor the progress of installations.

An example of a setup.log file for a successful silent installation of InstallShield is shown below:

```
[InstallShield Silent]
Version=v5.00.000
File=Log File
[Application]
Name=InstallShield5
Version=5.00.000
Company=InstallShield
[ResponseResult] ResultCode=0
```

The first section, [InstallShield Silent], identifies the version of InstallShield Silent used in the silent installation. It also identifies the file as a log file.

The second section, [Application], identifies the installed application's name and version, and the company name.

The third section, [ResponseResult], contains the result code indicating whether or not the silent installation succeeded. An integer value is assigned to the ResultCode keyname in the [ResponseResult] section.

InstallShield places one of the following return values after the ResultCode keyname:

<i>Return Value</i>	<i>Description.</i>
0	Success.
-1	General error.
-2	Invalid mode.
-3	Required data not found in the Setup.iss file.
-4	Not enough memory available.
-5	File does not exist.
-6	Cannot write to the response file.
-7	Unable to write to the log file.
-8	Invalid path to the InstallShield Silent response file.
-9	Not a valid list type (string or number).
-10	Data type is invalid.
-11	Unknown error during setup.
-12	Dialogs are out of order.
-51	Cannot create the specified folder.
-52	Cannot access the specified file or folder.
-53	Invalid option selected.

For more information on InstallShield go to www.installshield.com

Location of the Notes Data Directory

Another consideration in planning the Notes client deployment is the location of the Notes data directory. In a standard Lotus Notes client installation the product will be installed to the workstation hard drive; in Notes R5 this is usually c:\lotus\notes for the Notes program files, and c:\lotus\notes\data for the personal data files (or c:\notes and c:\notes\data for earlier releases). This is the standard for installations and will be suitable for many organizations.

However, because all the files, including the ones containing personal settings, such as the ID file, the bookmarks database and the Personal Name and Address book, are stored on the local workstation, this means that users are somewhat restricted to that particular machine.

A great number of organizations require more flexibility than this allows; they want a more portable “roaming” setup and they achieve this by placing the Notes data directory on the user’s personal network (“home”) drive rather than on the workstation hard drive. For example, instead of c:\lotus\notes\data, this might be f:\notes\data.

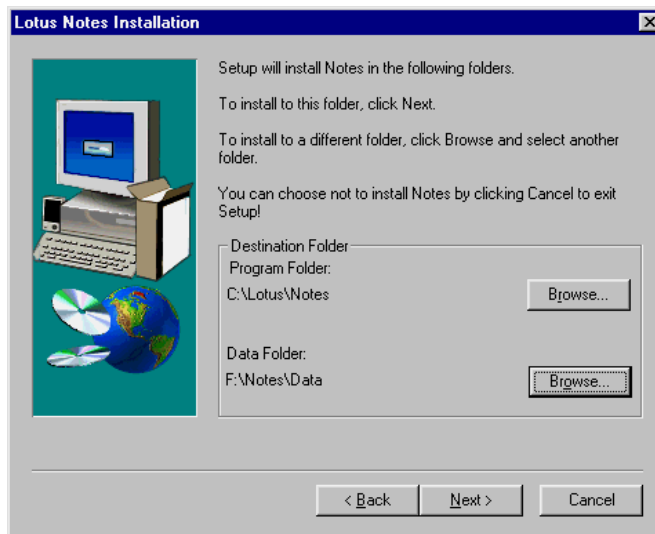
The advantages to this are:

- The users can use Notes at any PC — wherever they log on they get their own Notes settings, via their home drive.
- Assuming that the home drive is being backed up, which would normally be the case, then the backup of these important personal files is taken care of too.
- The home drives are potentially accessible from a central point, which can be useful for system maintenance tasks.

The disadvantages to this are:

- Although many companies choose this type of setup, Lotus does not fully endorse the use of roaming Notes profiles.
- There can be problems if network connections are unreliable — if the link to the home drive gets broken temporarily, the user will see error messages such as “invalid file handle” and may have to restart Notes to continue.
- It takes up space on the user’s file servers.
- Notes cannot be used if the file server is unavailable.

The easiest way to put the data directory on the home drive is to simply specify it as the data folder during your installation process. The following example shows the F: drive as the location for the data folder.



Location of Notes Program Files

It is also possible to install and run the Notes program files on a shared network drive, though this is less common than just storing the data directory on the network. This is achieved by choosing the “Shared Installation” option during an installation.

The advantages to this are:

- It is much easier for maintenance — you have a central place to install and upgrade the code.
- Users save disk space on local hard drives by running a shared version of the program. The program files remain on the file server, where they are shared among all users. As users run Notes, the program files are read into memory on their workstations.

The disadvantages are:

- Performance is inferior to a local hard drive installation. This is the main reason why shared installs are not commonly used.
- If the file server is unavailable, users cannot run Notes.
- Lotus does not recommend running in this manner.

Configuring the Notes Client

The following sections provide information on configuration aspects for the Notes client.

The Workstation Setup

After the Notes client software has been installed your next step is to complete the workstation setup.

In some organizations the users perform these steps themselves, in others it is done by IT support staff or members of the rollout team. This really depends on the level of computer knowledge that the users have.

Pre-Setup Checks

During the workstation setup two particular items of information have to be supplied.

1. The location of the user ID file.

The response to this will depend on decisions you make on how to register users — see “Distributing User IDs,” in Chapter 19.

2. The name of the user’s Domino server.

This should be the full name of the home server the user has been registered on and should have been supplied to whomever is performing the workstation setup by the Domino administrator.

Important During the setup the Notes client will need to access the Domino directory on the users' home server. To prevent problems at that point you should ensure that network connectivity from the workstation to the server is enabled. With TCP/IP this generally means being able to ping the server by its common name (not just by IP address). For instance, if the server is named server2/silbank, when you enter the command ping server2, you should receive a Reply from type response similar to the example below.

```

MS-DOS Prompt
6 x 8
Microsoft(R) Windows 95
(C) Copyright Microsoft Corp 1981-1996.
C:\WINDOWS>ping server2
Pinging server2 [9.180.34.106] with 32 bytes of data:
Reply from 9.180.34.106: bytes=32 time=148ms TTL=248
Reply from 9.180.34.106: bytes=32 time=144ms TTL=248
Reply from 9.180.34.106: bytes=32 time=141ms TTL=248
Reply from 9.180.34.106: bytes=32 time=141ms TTL=248
C:\WINDOWS>_

```

If you get an error you should sort out the issue before proceeding with the workstation setup. Some common errors when running ping are listed in the following table:

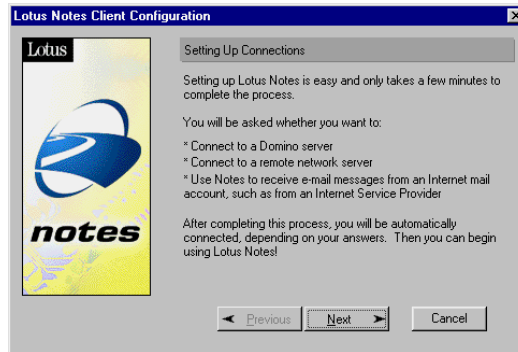
Error Message	Meaning
Bad IP address	The TCPIP address of the server name could not be resolved. A DNS or host file entry is probably required — contact your network administrator if you don't know how to resolve this.
Destination host unreachable	The TCPIP address of the server name was resolved but the server did not respond. This is probably either a network problem or else the server is down.
Bad command or file name	The probable cause here is that TCPIP is not even installed on the workstation.

Performing the Workstation Setup

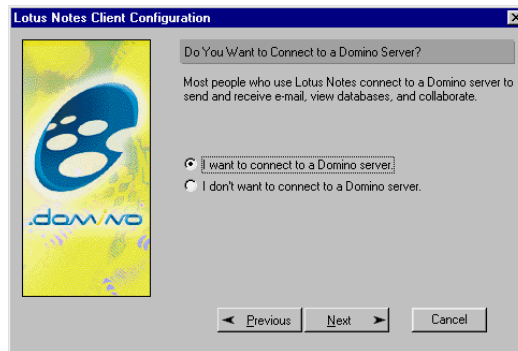
When you have completed the pre-setup checks described in the previous section, launch Notes on the workstation. The client configuration wizard guides you through the workstation setup.

These are examples of the screens that are displayed and the responses usually required.

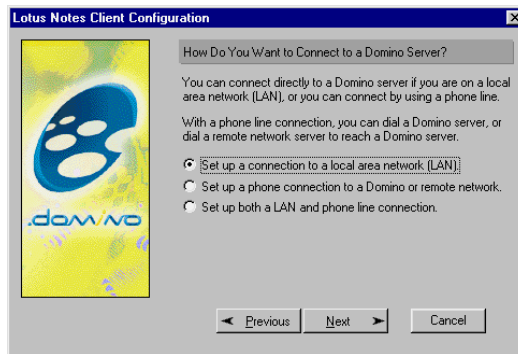
- Click Next at the introductory screen.



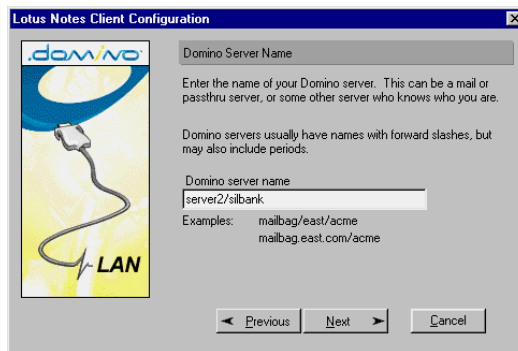
- At the next screen you would typically specify “I want to connect to a Domino Server” unless you intended to install Notes for stand-alone use only.



- Next, choose the appropriate connection method. Typically you would choose a LAN connection for a LAN based office user, a phone connection on a laptop for a mobile user, or both for mobile users who also connect their laptops to the LAN.

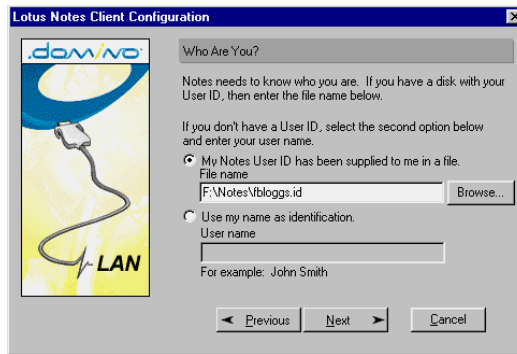


- Next, specify the full name of the Domino server. This should have been supplied by the administrator who registered this user.

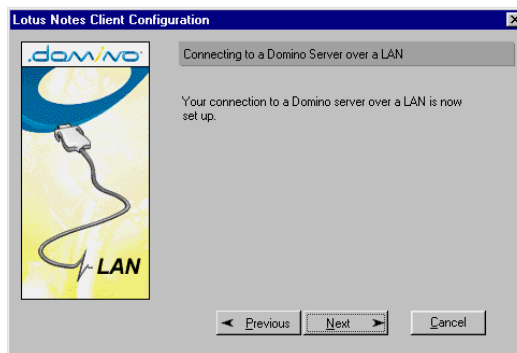


- Next, specify whether the ID file has been stored in a file or is stored in the Domino directory. Normally the user ID will be supplied in a file by the administrator, and you would choose that file now. Use the Browse button if necessary to locate the file, which may have been supplied on a diskette, or may have been placed on the user's home drive.

The "Use my name as identification" option is for those situations when the user ID has been stored in the Domino directory rather than as a file. This method is not generally recommended as the ID files can be less secure when stored in the Domino directory.



- Click Next at the next screen.



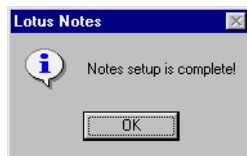
- If the Notes client will also be used for Internet mail, choose the “I want to create an Internet mail account” option and follow the instructions, noting the additional information that will be required regarding SMTP, POP and IMAP servers. Otherwise choose the “I don’t want to create an Internet mail account” option as in this example.



- Click on Finish.



- A progress indicator will then display as the setup continues; when a message tells you that the Notes setup is complete, click OK.



Post-Setup Tasks

Following the setup, you should:

- Test that Notes works correctly.
- Advise users to change their password if an initial default password was used for their ID.

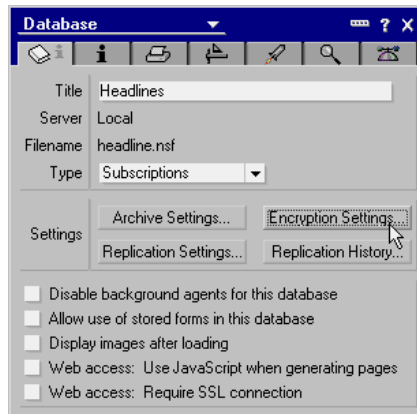
Important For security reasons, if you are using an initial default password, you should store the ID file in a location only the intended user will have access to. If you store it in the Domino directory instead, any user who knows what the default initial password is will be able to get the ID file and get into another user's mail, which is a serious security exposure. For this reason, many customers store ID files in a location other than the Domino directory. Also, creating this file outside the Domino directory allows you to create an initial backup of the user's ID file in case it is accidentally erased from its intended location.

Additional Considerations for Mobile Users

If you are setting up laptops on behalf of mobile users there are some extra tasks you may need to perform:

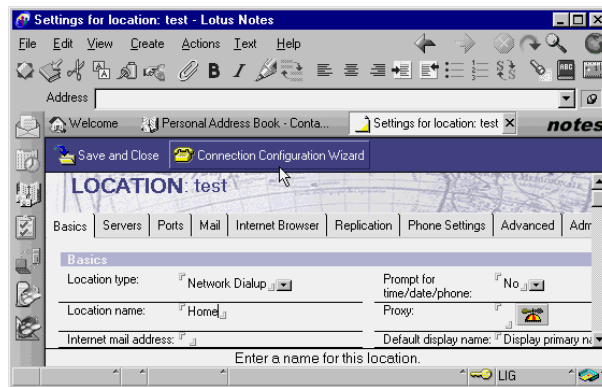
- Create local replicas of mail and other databases to be used when disconnected.

Important For security reasons the local replicas should be encrypted with the appropriate user ID to prevent unauthorized access if the laptop is stolen. You can do this via the Encryption Settings button on the database properties InfoBox.



- Make any company-specific modifications to location documents in the Personal Address Book, for example to specify the name of a passthru server if used.

Tip In Notes R5 this has been greatly simplified with the connection configuration wizard, which is available on the action bar in the Personal Address Book when you are creating a location document.



- Configure any dial-up software to be used, such as the IBM Global Network Dialer, or Microsoft dial-up networking.
- *Test.* The last thing a mobile user wants is to discover that something doesn't work when they are in some distant location. You should ensure that they will be able to create local mail, dial in, replicate databases, route outbound mail, and receive incoming mail. You should also ensure that the performance while doing this is acceptable.
- If the user will be going abroad, they may need specific assistance regarding connecting from that destination, such as country-specific modem settings. In addition, you may need to ensure that they are taking the appropriate version of Notes client software if they are traveling outside of the U.S. or Canada.

Maintaining the Notes Desktop

The following sections cover how to maintain the Notes desktop.

Domino User Setup Profiles

A very important enhancement in Domino R5 is the fact that user setup profiles can now be modified and redistributed dynamically, and not just as a one-off exercise when a user is first set up. This provides you with an excellent tool to maintain the user's desktop and bookmarks, allowing new bookmarks and other client changes to be "pushed" out to the desktop at any time. After any changes to the user setup profile the users will receive the changes the next time they authenticate with the home server specified in their current location document.

For more information on user setup profiles see Chapter 5 in the Lotus manual *Administering the Domino System* that comes with the product. This manual is also available online in the Printed Books view of the Domino R5 Administration Help database.

A Corporate Home Page

With R5 there are now some great possibilities to customize the Notes desktop for your organization and create a corporate home page.

One way to achieve this could be to use Domino Designer to create a database that will be your corporate home page, for example, *corphome.nsf*. In that database, you could then create a frameset to include your chosen combination of Web pages and Domino databases, including the user's mail database. Then you could create an amended version of the standard

bookmarks template bookmark.ntf, with a new frameset and delete all but one frame in that frameset. You would then set that frame to load up the corporate home page frameset in the corphome.nsf.

For new clients you could replace the bookmark.ntf in the install kit with your customized bookmark.ntf, so all new installs will get this new home page by default.

To implement this feature on existing clients, you could shut down the client, delete bookmark.nsf and then restart with the new bookmark design that will point to your centralized home page.

If you have disconnected mobile users, they may need a local replica of corphome.nsf.

For an example of a corporate home page see the Lotus WaterWorksDemo at waterworks.lotus.com

Configuring and Maintaining Browsers

One of the advantages of using browsers is that they are simpler to deploy and maintain, often coming pre-installed with the desktop operating system. Also, users are often already familiar with browser software and feel comfortable using it.

However, most organizations still demand proper control, and in reality, some maintenance effort is still required. For internal deployments of browsers, especially for use with company intranets, many organizations need to “lock down” the browser so that their users always have the correct settings and cannot alter them.

Using a Jump Page

Sometimes this is achieved by using a “jump page.” This is where the browser menus and toolbars are removed altogether by code that is placed in the start page of the application, with all the required navigation features, such as “back,” “reload,” “print,” and “home” buttons being provided by the intranet application itself. This is also known as running in “kiosk mode.”

Here is an example of how a jump page might be created using JavaScript for use with Netscape Navigator. This script closes the existing window and opens a new window with no toolbar or status bar.

```

<HTML><HEAD><TITLE>Acme Intranet</TITLE>

<SCRIPT LANGUAGE="Javascript1.2">

function jumpToHomePage() {

var ow=screen.availWidth;

var oh=screen.availHeight;

var w =window.open("/intranet/home.nsf/homepage.html", "w1", "screenX=0,
screenY=0, outerWidth="+ow.toString()+",outerHeight="+oh.toString()+
",toolbar=no,resizable=no,status=no");

window.close();

}

</SCRIPT></HEAD>

<!--<BODY onload="move = setTimeout('jumpToHomePage()', 5000)">⇒
<BODY onload="jumpToHomePage()">

<CENTER><H1>Loading ACME Intranet - Please Wait.</H1></CENTER>

</BODY></HTML>

```

Other Tools for Configuring and Managing Browsers

Browsers also work in conjunction with other software — such as plug-ins and helper applications; these have requirements for deployment and maintenance like any other desktop software.

For more comprehensive browser management, Netscape and Microsoft provide tools to assist with browser deployment and maintenance, as described in the following sections.

Netscape Mission Control

For managing Netscape Communicator, the Netscape Mission Control product provides:

- Central configuration

Netscape Mission Control Desktop allows the setting or locking of browser preferences to prevent end users from misconfiguring their client.
- Company-wide deployment

The Install Builder can be used to easily create a customized Communicator installer to be distributed to end users. This can include company specific settings such as bookmarks.

- Central management

After deployment Netscape Console can be used as a single point of administration for the software.

- Maintenance

Using the SmartUpdate feature, managers can automatically install and upgrade Communicator.

For more information on Netscape Mission Control see

home.netscape.com/communicator/missioncontrol/v4.5/index.html

Internet Explorer Administration Kit

For Internet Explorer users, the Internet Explorer Administration Kit (IEAK) allows the creation of a customized browser that can be deployed across the organization.

With IEAK, it is possible to customize and lock down most settings and there are enhanced setup and deployment options, such as On-Demand Install.

For more information on the Internet Explorer Administration Kit see

www.microsoft.com/windows/ieak/en/corp/features/default.ASP

Summary

In this chapter we have covered the installation, configuration and maintenance of Notes clients and browsers. We have described hardware and software requirements, how to perform an automated Notes client install using InstallShield, and have included considerations for maintaining Notes client and browser workstations, once deployed. We have also looked at providing a customized desktop with a corporate home page.

Chapter 13

The Internet

Technologies and standards that were originally developed for the Internet are steadily making their way into the business world. These technologies and standards are influencing the software and hardware industries, and also the way companies do business.

As a result you are probably looking at implementing these technologies and standards in your organization, if you have not already done so. In this chapter we will discuss some of the benefits to using Internet standards in your organization and how they relate to the Domino server and the Notes client.

The following topics are covered:

- Why should I use Internet standards?
- The Internet side of the Domino server
- The Internet side of the Notes client
- Summary

This chapter assumes a basic working knowledge of the Internet concepts and terminology.

Why Should I Use Internet Standards?

Using Internet technologies and standards is becoming strategically important for the reasons explained in the following sections.

Easy to Connect to Other Companies

In order for you to exchange data with another company you both need to agree on a way to exchange that data. You would have to go through this process with every company you wanted to exchange data with, and could end up with a number of different systems to support both your company and the other company.

The advantage of using the Internet standards is that each company could use standard Web browser technology to process the data. Also, if most companies are making their data Web enabled then most companies will have Web browsers installed already. This means that making data available to another company could be as simple as giving a URL.

This is why the Internet standards are becoming so popular. A standard approach makes data exchange cheaper and easier.

A simple example of using an Internet standard to facilitate inter-company business is e-mail. There are a number of different internal e-mail products on the market that each have their own formats and rules.

Most of them also have the ability to communicate via the SMTP mail standard. This allows companies to exchange e-mail with other companies without worrying about what the other company is using internally.

Ease of Integration Between Products

When you have a number of different products running in your organization there can be issues exchanging data. One example of how Internet standards and technologies are being used to address this is Lightweight Directory Access Protocol (LDAP).

Many companies have file servers for general file sharing, an e-mail package for e-mail, and a Web server for their intranet. Each of these systems might have its own list of user names and passwords that it uses for security (validating who you are and if you have rights to access the resource). This means that the company has to maintain a list of its employees (users of the systems) in several places. Every time a user is added, moved, or changes a name, the update must be done several times.

A goal of many companies is to consolidate all of their different address books into one address book that is accessible by all of the different packages used. LDAP is an Internet standard for address books. If all of the different address books can speak LDAP then they will all be able to communicate with each other or access a single master LDAP address book. Having such a “universal address book” saves companies time in maintenance since changes only need to be made in one place. New software that is LDAP-compliant could be quickly integrated into the company.

Choices

A very large number of the new products coming to the market use Internet standards or technologies. This means that if you use Internet technologies and standards in your organization you will have a lot of options, and having many options gives you flexibility and possibilities.

Expanded Reach: e-Business

Having a world wide audience and being able to communicate with customers directly gives the organization a potentially huge customer base. As well as being able to more easily maintain accurate and up-to-date information about your products and services, there is also the possibility of reaching new customers that you could not reach by any other medium.

Being able to communicate with your customers directly allows you to give better customer service and reduce overhead as well as costs. Your customers can check the status of an order, get product details, read Frequently Asked Questions (FAQ's) to resolve problems, and get company information. Reducing the need for telephone contact saves customers' time, and reduces your overhead.

A major area where e-business has paid off is in reservation-handling. Some major industries taking advantage of the Internet have been hotels, airlines, and car rental agencies. Customers can now get details on policies and procedures, check availability, check price, and then make a reservation all online without having to worry about busy signals or office hours. This makes the customer happy and saves money for companies.

Online shopping and online banking are just a couple of the business opportunities the Internet opens up for you.

Intranets

Companies are using the successful tools of the Internet to distribute information within their organizations through intranets. An intranet uses the same technologies as the Internet (such as browsers and TCPIP) but uses them internally, on a company's private network. Effectively, it's a private Web site used for internal communication. For instance, it can allow employees to do things such as read company policies (including benefit packages), apply to open positions, read company news, give feedback and ideas for improvements, and voice concerns to name a few.

The Internet Side of the Domino Server

Over the last few years Lotus has tightly integrated Internet standards into every aspect of the Domino server. The purpose of this section is to give you a brief overview of the major Internet components of Domino as well as links to sources for more information on each topic.

There is a group of sites that contains information for all of the topics covered below and they are listed here once. Specific chapters or parts of the sources listed here will be given in each of the following sections where appropriate, but all sources should be checked when researching a topic.

- The Domino Administration Help Database
- The Lotus Domino Administration yellow books
www.notes.net/notesus.nsf
- www.notes.net/today.nsf
- The IBM redbooks
www.redbooks.ibm.com or www.lotus.com/redbook
- www.lotus.com
- www.w3.org
- Lotus Developer Central
www.lotus-developer.com
- www.notes.net/cookbook.nsf
- www.notes.net/about.nsf

The HTTP Server Task

With Domino Release 4.5 the HTTP task became part of the standard server. Since then the HTTP server task has become a core piece of the server and the server itself is now called the Domino server.

You have no doubt seen the letters HTTP in your Web browser location bar. HTTP stands for HyperText Transfer Protocol and is the standard for serving and retrieving HTML or Web pages. Thus you can think of an HTTP server as a Web server and an HTTP client as a Web browser.

The HTTP server task in Domino translates Notes databases including forms, views, and documents, into HTML so that they can be viewed by a Web browser. This translation is done on-the-fly for each request by a Web browser. The HTTP server task is also capable of serving standard HTML files.

If you are not going to use a Web browser to access any of your Notes databases, then you will not need to run the HTTP server task. The HTTP task is only called into action when a Web browser asks the server for a particular Notes construct such as a document or view.

The HTTP server task has matured to the point that Lotus is now offering the option to use either a Notes client, a Web browser, or both, to access a Domino server. There are differences between the two and each should be evaluated thoroughly when making a client decision. See Chapter 5, “Choosing a Client” for a comparison between using the Notes client and the Web browser for accessing the Domino server.

One of the major misconceptions about the HTTP server task is that it opens up your organization to the Internet. Just because a Web browser can access the Domino server and its databases, does not mean that your server is magically connected to the Internet. If your network is connected to the Internet then the Domino server is available to the Internet. If there is no connection from the Internet to your Domino server, then the server is not available to the Internet, regardless of whether or not the HTTP server task is running.

For more details on the HTTP server task and what it can give you, consult the following sources:

- Chapter 5, “Choosing a Client,” in this redbook
- Chapter 23, “Setting Up the Domino Web Server,” in the yellow book *Administering the Domino System*
- Administration Help Database

SMTP Mail Routing

Simple Mail Transfer Protocol (SMTP) mail routing is now a native part of Domino. This means that Domino can exchange mail with any other SMTP compatible mail server. SMTP is a standard for mail servers on the Internet to communicate with each other.

If your organization has plans for sending and receiving Internet (SMTP) mail with Domino you should look at the following sources of information:

- Chapter 9, “Designing a Messaging Infrastructure,” in this redbook
- Chapters 16, 17, 18 in the yellow book *Administering the Domino System*

LDAP

Lightweight Directory Access Protocol (LDAP) is the standard for address books on the Internet. Domino R5 is fully LDAP version 3 compliant for both accessing other LDAP sources and for allowing LDAP clients to access the Domino directory.

For further information, see the following sources:

- Chapter 14, “Setting Up the LDAP Service,” in the yellow book *Administering the Domino System*
- Chapter 15, “Managing Multiple Directories,” in the yellow book *Administering the Domino System*
- www.lotus.com/home.nsf/welcome/directory

The DIIOP Server Task

The DIIOP (Domino Internet Inter-ORB Protocol) server task turns Domino into an Object Request Broker. An Object Request Broker (ORB) is part of the Common Object Request Broker Architecture (CORBA) which is an architecture and a specification for creating, distributing, and managing distributed program objects in a network. The ORB piece of CORBA is the programming that acts as a “broker” between a client request for a service from a distributed object or component and the completion of that request.

For further information, see the following sources:

- www.mitre.org/research/domis/reports/UNO.html
- www.omg.org/library/c2indx.html
- Lotus Developer Central
www.lotus-developer.com/central/home.nsf/Data/Document1752
- www.lotus.com/world/norway.nsf/7754aa658b5d644f852566580057ecfb/8944df08ca9421d3c12566f600515069?opendocument

The NNTP Server Task

NNTP (Network News Transfer Protocol) is the predominant protocol used by computers (servers and clients) for managing the articles posted on USENET newsgroups. The NNTP service for Domino enables you to send and receive news articles from USENET newsgroups as well as create, moderate, and manage private newsgroups. USENET is a distributed bulletin board system that specializes in online group discussions on a variety of topics.

The NNTP task also enables users to obtain newsfeeds from the Domino server and to read news articles in a Notes database. Administrators can use Domino security, such as access control lists to control access to newsgroups.

For further information, see the following sources:

- Chapter 26, “Setting Up the NNTP Service” in the yellow book *Administering the Domino System*
- notes.net/today.nsf/f01245ebfc115aaf8525661a006b86b9/f11a4dc0391603ba852567050073cb5b?OpenDocument
- info.internet.isi.edu/in-notes/rfc/files/rfc977.txt

The POP3 Server Task

POP3 is a client-server protocol in which e-mail is received and held for you by your Internet server. Periodically, you (or your client e-mail receiver) check your mailbox on the server and download any mail.

You can use the Domino POP3 server task to allow POP3 compatible clients to connect to the Domino server and download mail as is done for Internet mail at an ISP.

For further information see Chapter 20, “Setting Up the POP3 Service,” in the yellow book *Administering the Domino System*.

Secure Sockets Layer (SSL)

Secure Sockets Layer (SSL) is a program layer created originally by Netscape for managing the security of message transmissions in a network. You can use SSL with Domino server tasks that operate over TCP/IP to provide privacy and authentication.

SSL has become the standard for secure communications over the Internet, and is used for activities such as online purchasing on the Internet. It is also often used by companies as a way to facilitate secure communications over the public Internet backbone.

For further information see the following sources:

- Chapter 34, “Setting Up SSL on a Domino server,” in the yellow book *Administering the Domino System*
- Chapter 35, “Setting Up Clients for S/MIME and SSL,” in the yellow book *Administering the Domino System*
- *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, IBM form number SG24-5341, Lotus part number CT6TPNA
- Chapter 14, “Security,” in this redbook
- www.netscape.com/security/techbriefs/ssl.html
- home.netscape.com/eng/ssl3/index.html

The Internet Cluster Manager

The Internet Cluster Manager (ICM) extends the traditional failover and load balancing capabilities of Domino clustering to Web browsers. Domino clustering provides “content-based routing” — that is, Domino performs intelligent failover and load balancing based on the content requested by the user. To do this, Domino uses event-driven cluster replication to ensure that all replicas of databases are always kept in sync. Then, the Domino Cluster Manager maintains information on the replicas and on the server availability in order to route users to the best server.

For further information, see the following sources:

- Notes.net/today.nsf/f01245ebfc115aaf8525661a006b86b9/e7e0ccb4e059f077852566500055951c?OpenDocument
- Chapter 6, “Using Clusters Over the Internet,” in the *Administering Domino Clusters* yellow book
- www.lotus.com/home.nsf/welcome/cluster
- *High Availability and Scalability with Domino Clustering and Partitioning on AIX*, IBM form number SG24-5163, Lotus part number CT7JONA
- *High Availability and Scalability with Domino Clustering and Partitioning on Windows NT*, IBM form number SG24-5141, Lotus part number CT6XMIE

Domino for IIS

In R5, Domino now lets you use a Microsoft Internet Information Server (IIS) to process HTTP requests for Domino databases by browser clients. IIS receives all URL requests and passes to Domino any requests that include the file extension .NSF. IIS processes any other requests for example, HTML files and Active Server Pages (ASP) using IIS.

For further information see the following sources:

- Chapter 24, “Setting Up the Domino for Microsoft Internet Information Server,” in the yellow book *Administering the Domino System*
- www.microsoft.com/iis/

Domino Certificate Authority

A Certificate Authority (CA) is the link that allows a server and client to use SSL to communicate and to use S/MIME to exchange mail. A CA vouches for the identity of a server and client by issuing Internet certificates that are stamped with the CA's digital signature.

The digital signature assures the client and server that both the client certificate and the server certificate can be trusted. If the client and server authenticate, that is, identify the digital signature on the certificate, they can establish a secure SSL session or exchange a secure S/MIME message.

If the client and server cannot authenticate each other, they cannot establish a secure session or exchange a secure message.

To set up a Domino CA, you can use a third-party, commercial certifier, such as VeriSign or you can use the Domino Certificate Authority application template (CCA50.NTF).

For further information, see the following sources:

- Chapter 34, "Setting Up SSL on a Domino server," in the yellow book *Administering the Domino System*
- Chapter 35, "Setting Up Clients for S/MIME and SSL," in the yellow book *Administering the Domino System*
- *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, IBM form number SG24-5341, Lotus part number CT6TPNA
- Chapter 14, "Security," in this redbook
- www.netscape.com/security/
- www.verisign.com

The IMAP Server Task

IMAP (Internet Message Access Protocol) is a standard protocol for accessing e-mail from your mail server. You (or your e-mail client) can view just the heading and the sender and then decide whether to download the mail. You can also create and manipulate folders or mailboxes on the server, delete messages, or search for certain parts or an entire e-mail. This is the opposite of POP3 where mail is immediately downloaded to your computer and no longer maintained on the server.

You can use the IMAP server task to allow IMAP-compatible clients to connect to the Domino server and access mail just as is done for Internet mail at an ISP.

For further information, see Chapter 21, "Setting Up the IMAP Service," in the yellow book *Administering the Domino System*.

The Internet Side of the Notes Client

The Notes R5 client is server-independent — as well as using it with Domino R5 servers, it can be used to access other Internet-standard servers, such as the ones your Internet Service Provider (ISP) may use. For example, you can read and send messages to Internet mail servers, read and post topics to Internet newsgroups, search Internet directories, and view HTML from Web servers. Each of these operations can be done from within the Notes client without the help of a Domino server.

We will briefly discuss the different options available in the Notes client in terms of Internet technologies and protocols here. For details on setting up the Notes client to use these Internet technologies, see the online client help.

Mail

The Notes client supports the protocols required for working with Internet mail including POP3, IMAP, and SMTP. POP3 and IMAP are for accessing your Internet mail accounts, and SMTP is for sending Internet mail.

To access a POP3 or IMAP mail account from within the Notes client, you create an account document in your Personal Address Book specifying your Internet mail server, login name, protocol, and so on. Here is an example of an account document for accessing a POP3 mail server:

Save and Close

ACCOUNT My ISP mail

Basics | Protocol Configuration | Advanced

Basics

Account name: My ISP mail

Account server name: mail.mycompany.com

Login name: juser

Password: xxxxxx

Protocol: POP SSL: Disabled

Only from location(s): ☒ * Demo

You can either send your outgoing mail through a Domino server (which also supports SMTP), or send it directly to the Internet. If you select to send mail directly to the Internet, you must also create an account document in your address book for the outgoing SMTP mail server. Again, you enter your login name, password, and account server.

Web Pages

The Notes client supports HTML allowing you to browse Web pages from within the client. Web pages are displayed as windows just as Notes documents. An example is shown here:



You can use the Notes HTML rendering engine or use the Microsoft Internet Explorer rendering engine if it is installed on your computer.

Directories

The Notes client supports the Lightweight Directory Access Protocol (LDAP) for searching directories for information, such as e-mail addresses, telephone and fax numbers, postal addresses, and so on. You can use the Notes client to search any LDAP directory, whether it's a public LDAP directory (such as BigFoot or InfoSpace), or an internal LDAP directory such as Netscape Directory Server. You set up connections to LDAP directories by creating Account documents just as is described previously for POP3, IMAP, and SMTP.

Newsgroups

The Notes client supports the Network News Transfer Protocol (NNTP) for reading and posting articles in Internet newsgroups (for example USENET). You set up connections to NNTP servers by creating account documents just as is described previously for LDAP, POP3, IMAP, and SMTP. You then view newsgroups through a Notes database that looks much like an ordinary Notes discussion database.

Summary

In this chapter we first discussed some of the benefits to using Internet standards in your organization. Following this, we covered the Internet technologies and standards available in the Domino server and the Notes client.

Chapter 14

Security

This chapter covers the following topics:

- Introduction
- Choosing a security policy
- Security in Information Technology
- The Domino security model
- Physical security
- Network security
- Internet security
- ID file security
- Server security
- Application security
- Application design element security
- Workstation security: Execution Control List (ECL)
- Summary

Introduction

A strong security infrastructure has always been an essential part of Notes and Domino. In this chapter we will explore the versatile security features of Notes and Domino.

We will try to help you make decisions. In those cases where we are not going to provide a lot of detail, we try to at least give you directions, where to find more information. We will give you hints and tips on how to implement the security features of Notes and Domino. For example, there are some firewall decisions to be made. You also need to decide whether or not to use Secure Sockets Layer (SSL) on the Domino Web server.

It is important to understand how Notes and Domino R5.0 fully support today's open Internet security standards (X.509, SSL, S/MIME, etc). Whatever your security needs are, Notes and Domino will meet them. The Domino infrastructure can be part of security solutions that go beyond single systems, single platforms and single companies.

Choosing a Security Policy

When implementing Domino security features you should follow the security policy of your organization. Every organization should have a clear and documented security policy; a loose policy, a tight policy, or something in-between. If you decide in favor of a tight security concept, you should keep in mind that one of the major purposes of using Domino is to share data.

Choosing a security policy is always a compromise: You need to consider access needs versus security requirements. Even though Domino is an information sharing tool, its security features are so powerful, that it is possible to share information safely. For example, banks, intelligence agencies, and military forces around the world use Domino widely.

Security in Information Technology

You can divide aspects related to security in information technology into two main parts:

- Protection
- Integrity

This is discussed in the following sections.

Protection

First, let's look at protection. Protection of information technology means protection of information and hardware.

The protection of information means that there is no unauthorized access to information.

The protection of hardware means that there is no risk of hardware being stolen.

Integrity

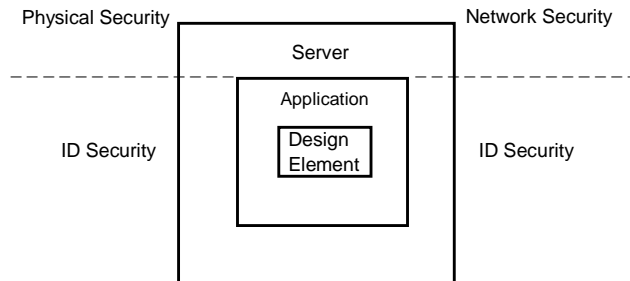
Data integrity means that the information is timely, accurate, complete, and consistent and when transmitted over a computer network, that it has not been compromised during transmission.

The Domino Security Model

There are six components in the Domino security model:

- Physical security
- Network security
- Server security
- Application security
- Design element security
- ID security

The following figure illustrates the Domino security model:



As you can see in the previous figure, ID security has an effect on the server, the application level, and the design element level while physical and network security has an impact on the server security component only.

Physical Security

This section covers aspects relating to the physical security layer.

Secure Room

You should always locate a Domino server in a locked, restricted-access room with a sufficient amount of ventilation. Be very careful about who is allowed access to this room.

Hardware Locks and Passwords

Lock the casing of the Domino server so that hard disks cannot be removed.

You can enable a power-on password on most machines.

Note With a power-on password enabled you cannot remotely reboot the Domino server. Also the automatic reboot in error situations will hang and wait for the password to be specified.

Operating System Level

Use operating system features such as file protection to secure data files.

When you are not working at the server, keep the keyboard locked.

Lotus Domino Level

You can password-protect the Domino server ID.

Note If the server ID is password-protected you cannot remotely reboot the Domino server. Also the automatic reboot in error situations will not start the Domino server but will require the password to be specified.

You can use the Local Security option to encrypt databases on the server with the server ID. Then the databases at the server are locally available only to those who have access to the server ID.

Note This is applicable only if the server ID is password-protected.

In addition, you can use the Set Secure console command to password-protect the Domino console. In this way you can restrict what can be done while the server is running. For example, you cannot quit or restart the Domino server without the password.

Network Security

This section discusses aspects relating to network security.

Firewalls in General

A firewall is a system that is designed to control access to applications on a network. Typically, a firewall controls unauthorized access to a private network from the public Internet. A firewall is especially important when you want to allow some information to pass between the private network and the public Internet, but you do not want to give unauthorized users full access to the private network.

Packet Filtering

A packet-filtering firewall examines the destination and content of each packet, which is a piece of information transmitted over a network. It then checks whether the network allows delivery to that destination and allows that type of information to enter or exit your network. If the packet passes these tests, the packet-filtering firewall allows the packet to proceed to the destination. You typically use network router software to implement a packet-filtering firewall.

Tip Consider employing a packet filter for a Web server even if the server is not connected to a private network. Hackers may use tools such as port scanners to probe a server for unsecured services or known application bugs. By placing a packet filter in front of the server, you can avoid this kind of attack.

Services and Default Ports

The following table lists available services and the associated port numbers as well as SSL port numbers:

<i>Service</i>	<i>Port</i>	<i>SSL Port</i>
HTTP	80	443
POP3	110	995
IMAP	143	993
SMTP	25	465
LDAP	389	636
NNTP	119	563
NRPC	1352	---
IIOP	53148	53149
Telnet	23	---
FTP	21, 79	---

Application Proxy

An application proxy firewall is a server program that understands the type of information that you are transmitting and controls the flow of information between internal and external clients and servers. An application proxy works the same as a packet filter except the application proxy delivers the packet to the destination.

You can set up a Domino passthru server as an application proxy for Notes and Domino Remote Procedure Calls (RPCs), or you can use an HTTP proxy to communicate using HTTP, Internet protocols secured with SSL, or Notes and Domino RPCs.

Domino Passthru NRPC Proxy

The Domino Passthru NRPC Proxy is an application-level proxy whose default port is 1352. It provides Notes application services through NRPC. It can also be configured to be a multi-hop proxy, in the sense that it can act as an intermediary proxy and pass requests to another Domino Passthru NRPC proxy.

A passthru server provides all levels of Notes and Domino security while allowing clients who use dissimilar protocols to communicate through a single Domino server. It does not allow other Internet protocols — for example, HTTP, IMAP and LDAP — to use a Domino passthru server to communicate.

The following sections describe two typical Domino passthru situations:

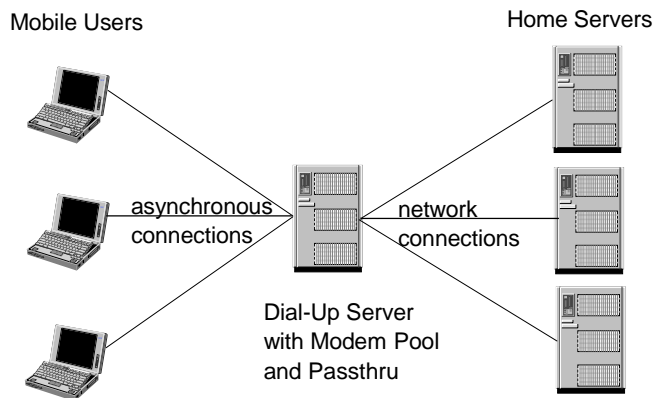
- Dial-Up passthru
- Internet passthru

After that, we will also discover the power of the Domino passthru feature.

Dial-Up Passthru

One clear advantage of the dial-up passthru is that you have a single point where all your modems are. This is much easier to administer. The users can also connect to all necessary Domino servers with just one phone call.

The following figure shows a typical dial-up passthru situation:

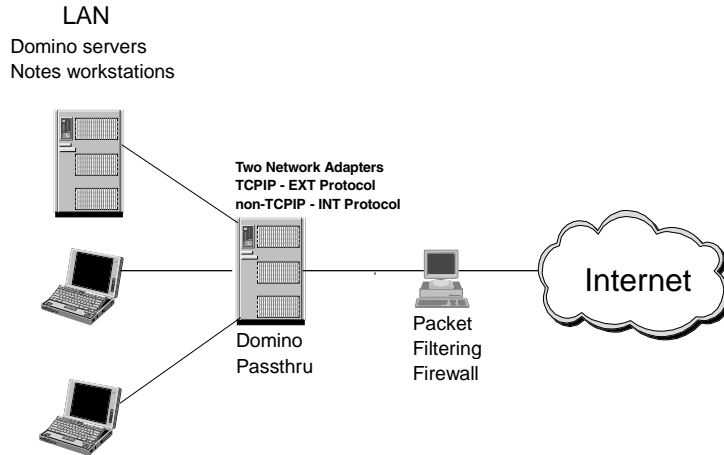


Note Users must have a valid ID for both the passthru server and the home server. They also need the appropriate passthru rights (see the server security section later in this chapter).

Internet Passthru

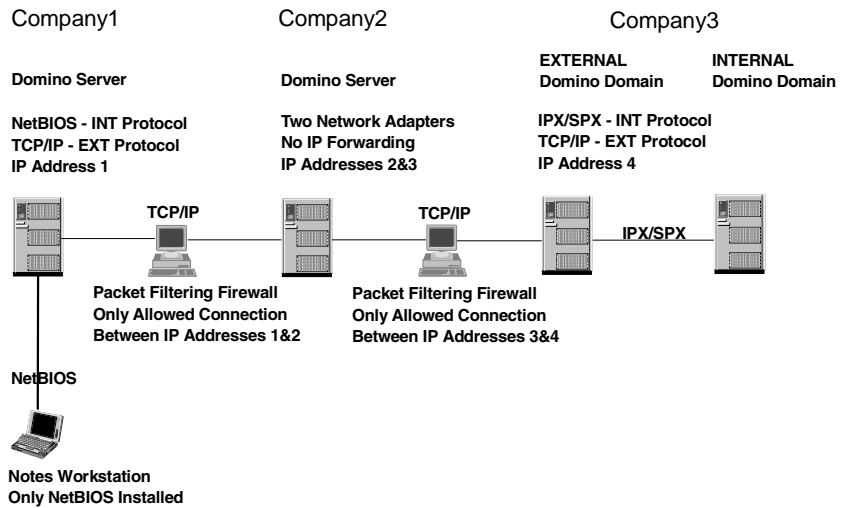
Domino Internet passthru provides an additional security feature when communicating with the Internet. The following figure shows a typical

Internet passthru situation:



The Power of Domino Passthru

The following figure illustrates the power of the Domino passthru feature:



When a Notes workstation of Company1 tries to gain access to the internal Domino server of Company3, this is what happens:

- The Domino security is in place all the time:
 - The Notes workstation must have a valid Notes ID for all the Domino servers shown in the figure.
 - The Notes workstation must have the appropriate passthru rights to all the Domino servers shown in the figure.
- The workstation runs the NetBIOS protocol only, while the internal Domino server of Company3 runs only IPX/SPX. Still the workstation can access the server.
- There are two adapters available on the Domino server of Company2, with no IP forwarding implemented. Normally this means that no IP routing can take place on a multi-homed system. However the workstation is still passing thru.
- In both packet-filtering firewalls, the only allowed connection is between the two nearest IP addresses. Still the workstation can access the target server of Company3.

Note You need to create the following passthru server connection documents in the Personal Address Book of the workstation:

- To Company2 via Company1
- To Company3 external via Company2
- To Company3 internal via Company3 external

Note If you are passing thru both Ethernet and Token Ring networks, there might be some packet size issues in the firewalls.

Also, something else to watch out for is that if the workstation of Company1 has also rights to run unrestricted agents on the internal Domino server of Company3, the consequences can be unpredictable. You need to make sure that you have people on-board who are familiar with the different features of Domino, in addition to people who are responsible for the LAN security system.

Circuit-Level Proxy (Socks Server)

A circuit-level proxy is similar to an application proxy, except that it does not need to understand the type of information that you are transmitting. For example, a SOCKS server can act as a circuit-level proxy.

You can use a circuit-level proxy to communicate using Internet protocols with TCP/IP. You cannot use a circuit-level proxy for Notes and Domino RPCs or Internet protocols secured with SSL.

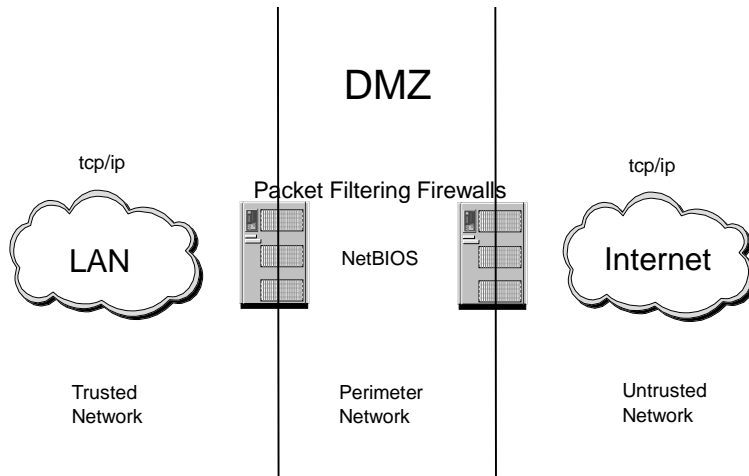
The Demilitarized Zone (DMZ)

There are many possible firewall designs, depending on the requirements being addressed. However, most mid-to-large-sized enterprises have common requirements which lead to firewall configurations that are generally similar to each other.

The common requirements are as follows:

- Provide secure access to Internet services for users within the enterprise. This includes at least Web (HTTP) access and FTP access, and any number of other services (NNTP, Telnet, etc.).
- Provide servers that can be accessed by external Internet users. This involves usually at least a Web server.
- Provide a gateway for Internet mail.

The recommended solution to these requirements is a demilitarized zone (DMZ) configuration. The following figure shows a DMZ configuration:



For the sake of simplicity, the previous figure does not show proxies or gateways. However, the DMZ can be further enhanced by building within it different networks and restricting access to specific services on specific networks within the DMZ.

Tip To have an even more secure zone, run TCP/IP within the LAN and out on the Internet, however within the DMZ, the packet filtering firewalls should communicate through a non-TCP/IP protocol.

Directory Links

Most operating systems provide the ability to share directories with other computers. Access to the drives and directories can be controlled by passwords and access levels. However, for security reasons, we do not recommend that you implement this kind of linking on Domino servers.

Remote Control

There are several products which provide remote control capabilities for all kinds of machines, including Domino servers. These products allow you to log in to a remote machine. The desktop of that machine is displayed in a window on your workstation. With that window active, your keyboard and mouse become a keyboard and mouse of the remote system as if you were sitting at the remote machine.

The remote machine runs a specific server program. Usually there is a need for a corresponding client program, but there are also implementations where you can take control of the remote machine with any Java-capable browser.

All of these products have their own security functions. You have to first log in to the remote control program of the remote machine. After that there is still the local security of the remote machine, for example, keyboard lock.

The remote control programs are extremely powerful, and therefore potential security risks. We do not recommend that you run these programs on your Domino servers.

Virus Protection

Virus protection is a part of data integrity, and any computer security policy should include the implementation of virus-scanning software.

There are several products which you can install on your firewall to check SMTP-type mail. There are also products available which can scan mail attachments in router mailboxes of your Domino server before the messages are sent to the recipients.

Note It is recommended to also have virus-scanning software installed on every workstation, because a lot of viruses come from floppy disks.

For further information about the virus protection products suitable for Domino, visit the Lotus Partner Software Solutions Web site, partners.lotus.com/lpss.nsf

Internet Security

This section covers aspects relating to Internet security.

Name and Password Authentication

First, let us look at name and password authentication.

HTTP Basic Authentication

HTTP basic authentication uses a basic challenge/response protocol to ask users for their names and passwords and then verifies the accuracy of the passwords by checking them against those stored in person documents in the Domino directory.

If you want to assign database access to a browser client based upon Domino Access Control List (ACL) security, you must create a person document for that client in the Domino directory. Clients who do not have person documents are considered Anonymous and can only access servers and databases that allow Anonymous access.

The person document with the Basics tab open looks like this:

The screenshot shows a Domino web browser interface for a person document titled 'PERSON: Web User'. The 'Basics' tab is selected, showing fields for Name, User name, and Internet password. The 'Name' section includes First name (Web), Middle initial, Last name (User), and User name (Web User). The 'Internet password' field contains a hexadecimal string: (9AC806D623B38E33C3F78CE4A5233281).

PERSON: Web User	
Basics Mail Work/Home Other Miscellaneous Certificates Administration	
Name	
First name:	Web
Middle initial:	
Last name:	User
User name:	Web User
Alternate name:	
Short name:	WUser
Personal title:	
Generational qualifier:	
Internet password:	(9AC806D623B38E33C3F78CE4A5233281)

Note Domino asks for a name and password only when a browser client tries to access a restricted database on the server. This differs from the Notes client trying to access the Domino server: If so defined, a Domino server always asks a Notes client or another Domino server for a name and password, when the client or server initially attempts to access the server.

The risk involved in HTTP basic authentication is that the user ID and password are included in the packet header with no encryption. This means that they can be captured by anyone with a network sniffer or trace tool at any place in the session path.

Session-Based Name-and-Password Authentication for Browsers

A session is the time during which a Web client is actively logged onto a server. You use the server document in the Domino directory to specify settings that enable and control session authentication.

Session-based name-and-password security includes the following additional functionality that is not available with HTTP basic name-and-password security:

- You can customize the HTML log-in form.
- You can specify a default log-out time period to log the Web client off the server after a specified period of inactivity. Automatically logging a user off the server prevents others from using the Web client to impersonate a user if a Web client leaves the workstation before logging off.
- You can specify the maximum number of user sessions allowed on the server at the same time. If the server performance is slow, you can reduce the number of active, concurrent user sessions.

Note To use session-based authentication, Web clients must use a browser that supports cookies. Domino uses cookies to track user sessions.

Controlling the Level of Authentication for Browsers

In the Domino directory and in LDAP directories, you can select the level of restriction Domino uses when authenticating browser users. The following two options are available on the Security tab of the server document:

- More name variations with lower security (default)
- Fewer name variations with higher security

For further information about these options, see the Administration Guide provided with Lotus Domino.

Domino Web Server API (DSAPI)

DSAPI is similar to ISAPI (Internet Server Application Programming Interface supported by IIS of Microsoft) in structure and operation. However, it has different data structures, functions, and events. DSAPI allows for creation of Web server filters. A filter is a compiled C library (for example DLL file).

Filter is notified when one of the following occurs, for example:

- A request is received
- A user is authenticated
- A user's group is created
- A request is completed

DSAPI allows for customers to replace Domino's HTTP authentication with their own customized authentication scheme. Some examples of this are:

- Three strikes you're out
- Password expiration

It is also designed for name translation, specialized logging, error handling and interfacing with external devices. DSAPI is available on all Domino certified platforms.

X.509 Certificate

Although there have been several proposed formats for public key certificates, most commercial certificates available today are based on the international standard ITU-T recommendation X.509.

X.509 certificates are used in secure Internet protocols like:

- Secure Sockets Layer (SSL)
- Secure Multi-purpose Internet Mail Extension (S/MIME)

Certificate Authority (CA)

A CA is the link that allows a server and client to use SSL to safely communicate and to use S/MIME to sign and encrypt mail. A CA vouches for the identity of a server and client by issuing Internet certificates that are stamped with the CA's digital signature. The digital signature assures the client and server that both the client certificate and the server certificate can be trusted. If the client and server authenticate — that is, identify the digital signature on the certificate — they can establish a secure SSL session or exchange a secure S/MIME message.

You can use a third-party, commercial certifier, such as VeriSign. Or you can set up a Domino CA. Using a Domino CA, you avoid the expense that a third-party CA charges to issue and renew client and server certificates.

Secure Socket Layer (SSL)

SSL is widely implemented in most Internet-based client/server software. SSL makes use of a number of cryptographic techniques, such as public key and symmetric key encryption, digital signatures, and public key certificates.

SSL, version 3.0, can do things such as:

- Encrypt information sent over the network from client and server (confidentiality)
- Validate that the message sent to a recipient was not tampered with (data integrity)

- Authenticate the server, using RSA public key methods (authentication)
- Authenticate the client identity (authentication)

SSL is usually considered a way of securing HTTP traffic. However SSL has the advantage of being application protocol independent, which means that it can be run on top of any TCP/IP application protocol, for example, IIOP, NNTP, LDAP, and mail protocols IMAP, SMTP, and POP3.

Note SSL connections use a different port number for each application protocol that it is encrypting.

You can set up SSL on a Domino server so that clients and servers that connect to the server use SSL to ensure privacy and authentication on the network. You set up SSL on a protocol-by-protocol basis. For example, you can enable SSL only for mail protocols, but not for others.

For more information about setting up SSL on a Domino server, see the Administration Guide provided with Lotus Domino.

Secure E-mail Messaging with S/MIME

S/MIME is a protocol used by clients to sign mail messages and send encrypted mail messages to users of mail applications that also support the S/MIME protocol. The Notes client uses an Internet certificate — the same certificate used for SSL — in the Notes ID file and the public key stored in the Domino directory to encrypt and sign messages. The Notes client must also have each recipient's public key in the Domino directory in order to send encrypted mail messages to others.

Telnet

Telnet allows users almost the same level of access as if they were physically sitting at the machine. This can be very useful for administrative purposes, but is definitely a potential security risk.

Domino R5 also provides the ability to use any UNIX or NT workstation to Telnet (or remotely log in) to the server console of a Domino UNIX server. This allows you to see the history of what is happening on the server console, and you can type server commands at the console from the remote workstation.

We recommend that you do not run the Telnet daemon in your Domino servers.

FTP

FTP is an application which allows remote users to send files to, and receive files from, an FTP server. Every machine with the running FTP daemon is a FTP server.

For security reasons, we recommend that you do not run FTP daemon in your Domino servers.

ID File Security

This section covers aspects relating to Notes ID files security (the public key infrastructure).

User ID, Server ID, Certifier ID

Domino uses ID files to identify users and to control access to servers. Every Domino server, Notes certifier, and Notes user must have an ID. When you register users and servers, Domino automatically creates their IDs. An ID file contains the following:

- The owner's name. A user ID file may also contain one alternate name. A certifier ID may contain multiple alternate names.
- A permanent license number. This number indicates that the owner is legal and specifies whether the owner has a North American or an International license to run Domino or Notes.
- At least one Notes certificate from a certifier ID. A Notes certificate is an electronic stamp added to a user ID or server ID. This stamp, which is generated from the private key of a certifier ID, verifies that the name of the owner of the ID is correctly associated with a specific public key.
- A private key. Notes uses the private key to sign messages sent by its owner, to decrypt messages sent to its owner, and, if the ID belongs to a certifier, to sign certificates.
- (Optional Notes client only) An Internet certificate. This certificate is used to secure SSL connections and encrypt and sign S/MIME mail messages. An Internet certificate is issued by a Certification Authority (CA) and verifies the identity of the user.
- (Optional) One or more encryption keys, created and distributed by users to allow other users to encrypt and decrypt fields in a document.
- (Optional) A password if the owner of an ID creates one. The password generates a key that encrypts the private data on the ID.

The certifier ID is used only for certifying other Notes IDs. Therefore, it is much more important than other IDs for the organization.

Tip The certifier ID should be stored on a floppy disk in a safe place. Do not store it on a server hard disk where unauthorized users may be able to access it.

ID files created with Release 5 cannot be used with Release 3. If your organization needs to use ID files with Release 3, retain at least one Release 4 client to generate new ID files that can be used with Release 3.

Also, keep in mind that Domino R5 cannot create new flat IDs. However, flat ID maintenance is still supported by R5 for compatibility with earlier versions. If your organization wants to use a flat ID with Domino R5, you must retain at least a prior version of a Lotus Notes client to create a new flat ID.

Certificates

A certificate is a unique electronic stamp that identifies a user or server. Server and user IDs contain one or more Notes certificates. In addition, user IDs may contain an Internet certificate that identifies users when they use SSL to connect to an Internet server or send a signed or encrypted S/MIME mail message.

The certificate contains:

- The certificate owner's name and details
- The certificate owner's public key
- The certifier's name and details
- The certifier's public key
- The certificate expiration date

Certificates are stored in ID files and in person, server, and certifier documents in the Domino directory.

Validation and Authentication

Whenever a Notes client or Domino server attempts to communicate with a Domino server for replication, mail routing, or database access, two security procedures use information on the client's ID to verify that the client is legitimate.

Validation, the first procedure, establishes trust of the client's public key. If validation occurs successfully, authentication, the second procedure, begins. Authentication verifies the identity of the user and is based on Notes certificates. Authentication uses the public and private keys of the client and the server in a challenge/response interaction.

In addition, administrators can choose to allow authentication through a trusted third-party directory over LDAP. Domino directory assistance enables administrators to specify trusted third-party LDAP directories used to look up users and groups for authentication and access control.

For information on how to switch off certificate-based authentication, see the Anonymous Server Access section later in this chapter.

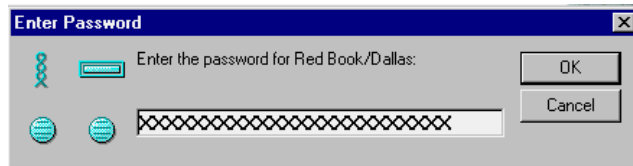
Password Protection

Although you can create a user, server, or certifier ID with the minimum password length of zero, which means no password, we suggest password-protecting all IDs to ensure the security of the Domino system. When you password-protect an ID, a key that is derived from the password encrypts the data on the ID. Then, when you attempt to access mail, open a server-based database, or examine ID file information, you are prompted to enter a password.

Time-Delay and Anti-Spoofing Password Dialog Box

To defeat dictionary or brute force attacks on ID file passwords and to reduce the risk of password capture, Notes employs a time-delay and anti-spoofing password dialog box. This means that, if users enter an incorrect password, Notes waits for several seconds before allowing them to try again. This delay increases with each incorrect attempt to a maximum of thirty seconds.

The dialog box has also a series of hieroglyphic symbols on the left side that change as users enter their password. The password dialog box with the hieroglyphic symbols looks like this:



These dynamic symbols make it more difficult to substitute a false dialog box that captures passwords in place of the Notes dialog box.

Tip Tell users to be alert to the symbols as they enter their passwords — if they notice that the symbols do not change or are not present, they should stop entering their password and click Cancel.

Password Quality

To limit password guessing or dictionary attacks in Domino R5, administrators can control the quality of passwords used to protect the Notes ID. Administrators have a choice of 16 quality levels; the higher the level, the more complex and difficult-to-guess the password must be.

Note To change a password quality-checking level assigned to an ID, you must recertify the ID.

Verifying Passwords During the Authentication

By default, Notes and Domino use passwords only to protect information stored in ID files.

However, you can configure servers to verify passwords and public keys during authentication, which reduces the unauthorized use of IDs. When password checking is enabled, information dependent on the user's password and the date the password was provided is kept on the server in the Person document. The user must enter the password corresponding to the stored information to gain access to the server.

Note Along with verifying passwords, you can set up servers to require users to change their password periodically.

User ID and Password Recovery

If you have ID and password recovery in place, when a user loses an ID file or forgets the password to the ID file, a group of administrators can work together to recover the ID file.

Note Losing an ID file normally prevents users from accessing servers and reading messages and other data that they encrypted with the ID. Using the ID file recovery feature, administrators can prevent this loss of access and prevent unauthorized users from illicitly recovering IDs.

Assigning Multiple Passwords to Server and Certifier IDs

If you want to avoid giving authority for a certifier ID to one person, or if you just want to provide tighter security in general for certifier and server ID files, you can assign multiple passwords to an existing ID. Doing this lets you require that more than one person act together when using the ID.

Note You can specify that only a subset of the assigned passwords be required to access the ID. For example, you can assign five passwords to access the ID, but require only any three of the five passwords to access the ID.

Cross-Certification

To allow users and servers from the different hierarchically-certified organizations to access servers in the other organization, you use cross-certificates. Each organization cross-certifies an ID from the other organization and then stores the cross-certificate in the Domino directory. If the server finds a valid cross-certificate, it then checks whether a user or another server is allowed to access the server.

Servers store cross-certificates in the Domino directory. To access servers, users store copies of the cross-certificates in their Personal Address Books, so only the user who owns the cross-certificate can use it.

The cross-certification can occur at various levels of an organization. For example, you can have a cross-certificate for the other's organization certifier, or you can have a cross-certificate just for an individual user or server ID.

Note Two way cross-certification does not need to be symmetric, but it can occur in different levels.

Tip To allow your organization to access servers in another organization but prevent that organization from accessing your servers, exchange cross-certificates as required but then set up server access lists on all servers to prevent access by the other organization.

You also use cross-certificates to verify the digital signature of a user from another organization. Note that to verify signatures, cross-certification is necessary in only one direction; the verifier needs a cross-certificate for the signer.

Encryption and Electronic Signatures

This section covers aspects relating to encryption and electronic signatures.

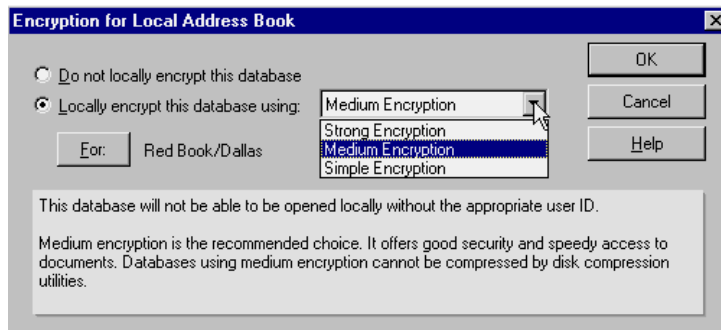
Encryption

Encryption protects data from unauthorized access, which increases the data confidentiality. Using Notes and Domino, you can encrypt the following:

- Databases can be encrypted with a user or server ID by using the Local Security option. This protects the database from being accessed by an unauthorized user who has gained access to the workstation the database is stored on, or who has made a copy of the database by using the operating system. To locally encrypt a database do the following:
 1. Open the appropriate database.
 2. Choose File - Database - Properties.
 3. Click the Encryption Settings button.

4. Choose Simple, Medium, or Strong encryption.
5. Click OK.

The encryption settings dialog box looks like this:



- Field encryption using special encryption keys created and distributed by the database designer can be used to limit access to fields by authorized users.
- Documents can be encrypted using private or public keys. Keys can be added to the form causing every document created with the form to be encrypted, or by letting users encrypt documents with their own encryption keys.
- Network port encryption allows unencrypted data to be encrypted at the port level for safe transport through the network. Network port encryption can be enabled for a user's workstation or at a server by selecting File - Preferences - Ports to modify the port definition to encrypt network data.

Note Network data is encrypted only while it is in transit. Once the data has been received and stored, network encryption is no longer in effect.

Also, network data encryption occurs if you enable network data encryption on either side of a network connection. For example, if you enable encryption on a TCP/IP port on a server, you don't need to enable encryption on the TCP/IP ports on servers that connect to the server.

Public and Private Keys

Domino uses public and private keys for all types of encryption - except network port encryption — so that data encrypted by one of the keys can be decrypted only by the other. The public and private keys are mathematically related and uniquely identify the user. The public and private keys are stored in the ID file. The public key is also stored in the Domino directory, where it is available to other users.

Domino uses two sets of public and private keys — Notes and Internet. You use the Notes public and private keys to encrypt fields, documents, databases, and messages sent to other Notes users. You use the Internet public and private keys to send and receive encrypted S/MIME messages and to encrypt SSL sessions between Notes workstations and Internet servers.

To create the public and private keys, Domino uses the dual-key RSA Cryptosystem and the RC2 and RC4 algorithms for encryption. To create the Internet public and private keys required for S/MIME, Domino uses the x.509 certificate format, which is an industry standard format that many applications, including Domino, understand.

Note The bit size of public encryption keys depends on whether the user has a North American or an International Notes license. The North American license has a stronger encryption. When an international user exchanges encrypted mail with a North American user, the smaller key is used. This applies to both Notes and Internet keys.

For further information about S/MIME, SSL, and X.509, see the Internet section of this chapter.

Mail Encryption

Users of Notes mail can encrypt the following:

- Mail messages sent to other Notes users
- Mail messages sent to users of other mail applications that support the S/MIME protocol — for example, Outlook Express and Netscape Communicator
- Mail received by other Notes users
- All documents saved in a mail database.

Note Notes uses the recipient's public key to encrypt outgoing and saved mail. Only the body of a mail message is encrypted, the header information is not encrypted.

Mobile Notes users, who don't keep certificates in their Personal Address Book or don't have certificates in their local directory catalog, can encrypt e-mail when it is replicated to the server.

Electronic Signature

An electronic signature (also known as Digital Signature) verifies that the person who originated the data is the author and that no one has tampered with the data. An electronic signature increases the data integrity. A database designer controls whether or not fields and sections of a database are signable; individual users can choose to sign mail messages.

Users can sign mail messages sent to other Notes users or to users of other mail applications that support the S/MIME protocol — for example, Outlook Express and Netscape Communicator. Domino uses the same keys used for encryption — the Notes and Internet public and private keys — for electronic signatures.

Server Security

To control user and server access to other servers, Domino uses the settings you specify in the server document and the rules of validation and authentication. If a server validates and authenticates the Notes user or server and the settings in the server document allow access, the user or server is allowed access to the server.

The validation and authentication features were discussed in the ID File Security section earlier in this chapter. In this section we mainly concentrate on the server document and its security settings.

Note You cannot use the server document to control the access that browser clients have to a server. Instead, you use application security (see the Application Security section later in this chapter) to allow or deny the access that browser clients have to specific applications.

Also note that applying server access restrictions will activate an additional security code that uses server processing cycles and can increase the time taken for a user to gain access to the server.

The following figure shows the server document with the Security tab open:

SERVER: DominoR5/Dallas	
<div> <div>asics</div> <div>Security</div> <div>Ports</div> <div>Server Tasks</div> <div>Internet Protocols</div> <div>MTAs</div> <div>Miscellaneous</div> <div>Transactional Logging</div> <div>Administration</div> </div>	
<div> <div>Security Settings</div> <div> Compare Notes public keys against those stored in Directory: <input type="radio"/> Yes <input checked="" type="radio"/> No Allow anonymous Notes connections: <input type="radio"/> Yes <input checked="" type="radio"/> No Check passwords on Notes IDs: <input type="radio"/> Enabled <input checked="" type="radio"/> Disabled </div> </div>	
<div> <div>Web Server Access</div> <div> Web server authentication: More name variations with lower security </div> </div>	
<div> <div>Server Access</div> <div> <div>Who can -</div> <div>Only allow server access to users listed in this Directory: No</div> <div>Access server: */Dallas, Cessi Eli/Malenka</div> <div>Not access server: Leavers</div> <div>Create new databases: Administrators/Dallas</div> <div>Create replica databases: Administrators/Dallas</div> <div>Allowed to use monitors: *</div> <div>Not allowed to use monitors:</div> <div>Administer the server from a Web browser: Fred Book/Dallas</div> </div> </div>	
<div> <div>Passthru Use</div> <div> <div>Who can -</div> <div>Access this server: */Dallas</div> <div>Route through: Administrators/Dallas</div> <div>Cause calling: Administrators/Dallas</div> <div>Destinations allowed:</div> </div> </div>	
<div> <div>Agent Restrictions</div> <div> <div>Who can -</div> <div>Run personal agents:</div> <div>Run restricted LotusScript/Java agents: */Dallas</div> <div>Run unrestricted LotusScript/Java agents: Administrators/Dallas</div> </div> </div>	
<div> <div>IIOP Restrictions</div> <div> <div>Who can -</div> <div>Run restricted Java/Javascript: */Dallas</div> <div>Run unrestricted Java/Javascript: Administrators/Dallas</div> </div> </div>	

Next, we will discuss several security-related fields of the server document shown in the previous figure.

Only Allow Server Access to Users Listed in this Directory

If you choose Yes for this field, you deny access to all servers, users, and groups that are not listed in the Domino directory. If you want to allow only specific servers to access the server, you must add the server names to the Access server field.

If you choose No, which is the default, you grant access to users, servers, and groups that are not listed in the Domino directory.

Access Server Field

If there are names of users, servers, and groups in this field, only these can access the server. You can use an asterisk, followed by a certificate name to allow all users certified by a particular certifier to have access.

Tip To improve log-in performance for a group of frequent users, create a group and enter that group name first in the “Access server” field. If Domino finds a user in the group first, it doesn’t check the Domino directory for the individual name.

If you leave this field blank, all users can access the server.

Not Access Server Field

Names entered in this field take precedence over names entered in the Access server field. For example, if you enter the same name in both fields, the user will not be able to access the server.

If you leave this field blank, all names entered in the Access server field can access the server.

Deny Notes User Access to all Servers in a Domain

To deny Notes users access to all servers in a domain, lock out their user IDs and enable password checking. When locked-out users try to access the server, Domino tries to verify the passwords they enter by comparing them against those stored in person documents. Domino denies the users access because their IDs are locked out.

Note This procedure applies only to Notes users, not to Internet users attempting to access a Domino server.

Tip To ensure that users cannot view a list of names that have been denied server access, lock out user IDs instead of using the Not access server field.

Anonymous Server Access

When a server is set up for anonymous access, Notes users and Domino servers do not need a valid certificate to access the server, since the server does not validate or authenticate them. Use anonymous access to allow users and servers outside your organization to access a server without first obtaining a certificate for the organization.

Allow Anonymous Notes Connections Field

The default setting in this field is No.

To allow anonymous access, open the server document in the Domino directory, select the Security tab, and modify the field Allow anonymous Notes connections of the security settings as follows.

Security Settings	
Compare Notes public keys against those stored in Directory:	<input type="radio"/> Yes <input checked="" type="radio"/> No
Allow anonymous Notes connections:	<input checked="" type="radio"/> Yes <input type="radio"/> No
Check passwords on Notes IDs:	<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled

Note If the Access Server field contains entries, enter the word Anonymous there too. Also note that if you allow anonymous access to a server, you can still control access to databases.

Access to a Specific Network Port

Use a port access list to allow or deny user and server access to a specific network port.

Note If you use a port access list and a server access list, users and servers must be listed on both to gain access to the server.

To control access to a specific port, use the following notes.ini settings:

- Allow_Access_portname = names
- Deny_Access_portname = names

where portname is the name of the port, and names is a list of users, servers, and groups, which must be contained in the Domino directory.

For example, you can deny access to some users when they dial into the server but allow access when they use TCP/IP to connect to the server.

Creation of Databases and Replicas

You can control the creation of databases and replicas with the following two fields contained in the server document:

- Create new databases
- Create replica databases

Create New Databases Field

If you leave this field blank, you allow all users who can access the server to create databases on it. If you put the names of specific users, servers, or groups in the field, only they can create new databases.

Create Replica Databases Field

If you leave this field blank, you allow only a user working directly at the server machine to create replicas on the server.

Note The servers, users, and groups who cannot create new databases on the server cannot create replicas.

Database Monitoring

Users can set up their headlines to search databases automatically for items of interest. If many users use this feature, server performance may be slow.

You can control this feature with the following two fields of the server document:

- Allowed to use monitors
- Not allowed to use monitors

In both fields the default setting is blank, which means that all users who can access the server are allowed to use monitors. If you put some names of the users, servers, or groups in the Allowed to use monitors field, only these can use monitors.

Note You can also restrict users from monitoring an individual database.

Passthru

A passthru server allows users and servers to use a passthru connection to connect to another server. The server to which users connect is called a passthru destination. You can control which users and servers can access a passthru server and passthru destination.

Note The browsers cannot use passthru.

You can control this feature with the following four fields of the server document:

- Access this server
- Route through
- Cause calling
- Destinations allowed

Access This Server Field

If you leave this field blank, you prevent users and servers from using a passthru connection to access the server. If there are names in the field, only those can access the server using passthru.

Note This field does not take precedence over other access fields — for example, the Not access server field.

Route through Field

If you leave this field blank, you prevent users and servers from a passthru access. If there are names, only those can passthru the server.

Note Any users or servers listed in this field can use the server as a passthru server, regardless of whether or not they are also included in the Access server or Not access server fields.

Cause Calling Field

Any users or servers listed in this field can instruct the server to place a phone call to another server in order to establish a routing path to that server. If no names are entered, no calling is allowed.

Destinations Allowed Field

In this field you can specify names of destination servers to which this server may route clients. If no names are specified, all servers may be routed to.

For further information about passthru, see the network section in this chapter.

Server Agents

To control the types of agents users can run on a server, set up restrictions to server agents with the following three fields of the server document:

- Run personal agents
- Run restricted LotusScript/Java agents
- Run unrestricted LotusScript/Java agents

Run Personal Agents

If you leave this field blank, all users and groups are allowed to run personal agents.

Run Restricted LotusScript/Java Agents

If you leave this field blank, nobody is allowed to run agents created with a specific set of LotusScript and Java features.

Run Unrestricted LotusScript/Java Agents

If you leave this field blank, nobody is allowed to run agents created with all LotusScript and Java features.

Browsers that Use Java and JavaScript

Domino restricts whether authenticated browser clients using Java or JavaScript can run Java or JavaScript programs on the Domino server. This setting also determines whether browser clients can run Java programs created using the Notes Java classes with the Domino IIOP (DIIOP) task. The DIIOP task sends the request from the browser to the Domino ORB, and the Domino ORB returns the result to the browser.

You can control this setting with the following two fields of the server document:

- Run restricted Java/JavaScript
- Run unrestricted Java/JavaScript

Run Restricted Java/JavaScript

Leave the field blank (default) to deny access to all users and groups to run server programs created with a specific set of Java and JavaScript features.

Run Unrestricted Java/JavaScript

Leave the field blank (default) to deny access to all users and groups to run server programs created with all Java and JavaScript features.

Browser Access to Server Files

You can use the following security features to control browser access to files on the servers:

- File protection documents
- Web realms

File Protection Documents

To protect files on a server's hard drive, you can create a File Protection document. File Protection documents control the access that Web browser clients have to the files. You can enforce file system security for files that browser users can access — for example, HTML, JPEG, and GIF — specify the level of access for these types of files and the names of the users who can access them.

Web Realms

A Web realm is a protected area in a page tree, similar to an access-restricted directory on an operating system. With a Domino Web realm, you can specify a string of text that is displayed when users try to access a certain drive, directory, or file on a Web server. When the browser prompts the user for a name and password, the browser authentication dialog displays the realm text string. The browser uses the realm to determine which credentials (user name and password) to send to which location (the drive, directory, or file specified) with subsequent requests. The browser caches credentials for different realms to avoid prompting the user again for the same credentials. They are stored in the cookie files of the browser.

For further information about file protection documents and Web realms, for example, how to create them, see the Administration Guide provided with Lotus Domino.

Application Security

Every database (application) has an Access Control List (ACL) that specifies the level of access that users and servers have to a database. ACLs are for Notes clients as well as browsers — which is a unique security feature for Domino.

Access Control List (ACL)

For each user name, server name, or group name entry in an ACL, you can specify the following:

- An access level
- Access level privileges
- A user type
- Roles

Also, on the database level, you can define an anonymous access, administration server, consistent ACL, and a maximum Internet name & password access.

Access Levels

There are seven levels of access that can be assigned in the ACL:

- No Access: Do nothing with the database
- Depositor: Create new documents only
- Reader: Can read documents
- Author: Can read all documents and edit those documents that list the person in the Authors field
- Editor: Can read and edit any document
- Designer: Can change the design of database plus read and edit any document

Note A browser user cannot change the design of the database.

- Manager: Can do the same as a designer plus change the ACL and delete the database

Note A browser user cannot change the ACL of a database.

The ACL with the Access level pop-up menu open looks like this:



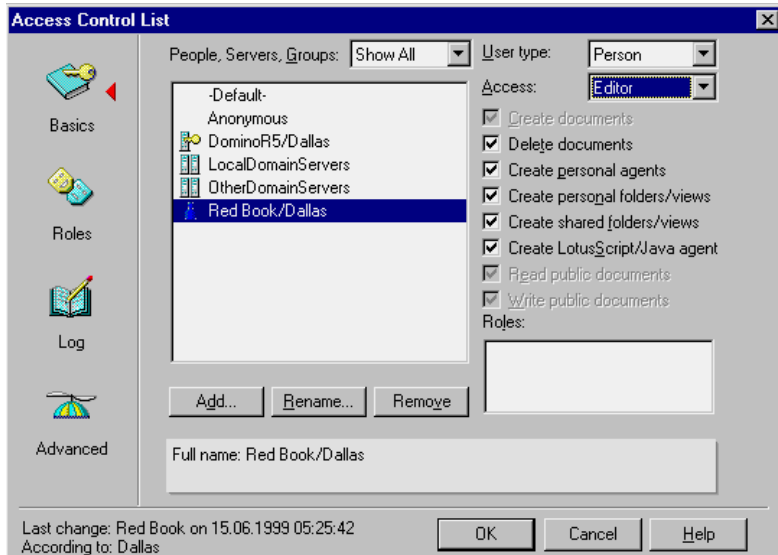
Access Level Privileges

A database manager selects the access level for each user, group, and server, and then enhances or restricts this level as needed by selecting or deselecting the additional privileges within an access level.

An ACL contains the following access level privileges:

- Create documents
- Delete documents
- Create personal agents
- Create personal folders/views
- Create shared folders/views
- Create LotusScript/Java agents
- Read public documents
- Write public documents

The access level privileges are on the right side of the ACL dialog box as the following figure shows:



User Types

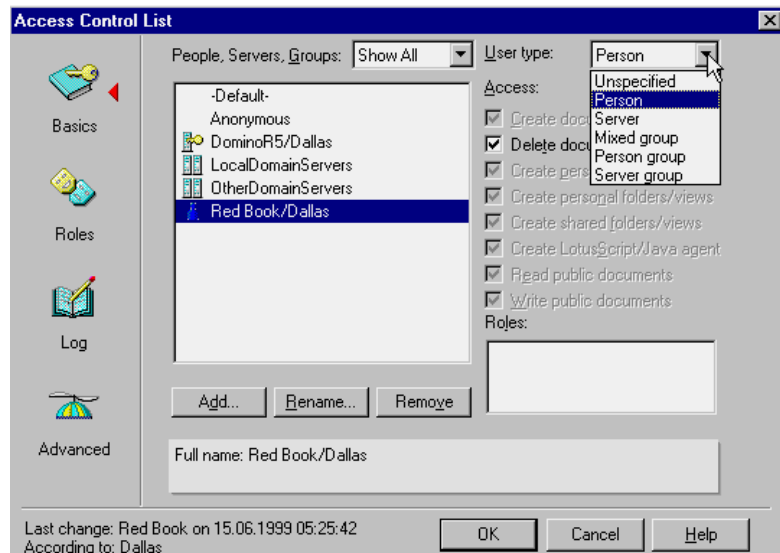
You can specify names in the ACL as a person, server, person group, server group, mixed group, or unspecified.

Assigning user types as a person, server, or server group provides additional security because it prevents one from:

- Creating a group in the Domino directory with the same name and adding his or her name to it to access the database through the group name.
- Accessing the database from a Notes workstation using the server ID.

Note There are third-party programs which allow a workstation to behave like a server so that the Domino server thinks the counterpart is also a server.

The ACL with the User type pop-up menu open looks like this:



Roles

A role lets you define a subset of users, servers, or both to provide controlled access to database design elements or to some database functions. A role is similar to a group, but is created in the database ACL. A role applies only to the database in which it was created. You must have Manager access to manage roles in the database ACL.

Anonymous Access

You can handle anonymous users in one of the following two ways:

- Define an anonymous entry in the ACL and specifically define access privileges for anonymous users.
- Allow anonymous users the same access as the Default entry in the ACL. In this case there is no need for an anonymous entry in the ACL.

Tip Always define an anonymous entry in the ACL for a Web application.

Note To apply ACL database security to an Internet user, you must create a person document in the Domino directory for that user. Otherwise, the Internet user can access only databases that allow Anonymous access.

Administration Server

The ACLs of the database replicas are updated automatically when the administration process is run on the administration server.

Consistent ACL

You can ensure that the ACL of a database remains the same on all replicas by selecting the advanced ACL option “Enforce a consistent Access Control List across all replicas of this database.” This ensures not only that the ACL remains consistent across server replicas, but also on local replicas on workstations.

Note There are third-party tools that can bypass an enforced ACL on a Notes workstation.

Maximum Internet Name & Password Access

In advanced ACL options, you can also specify a maximum access level for users that have been authenticated with the Internet name and password (browser users). This means that a browser user cannot get higher access than the one specified.

Note This setting overrides individual settings in the ACL.

Application Design Element Security

This section covers security aspects relating to the application design element layer.

Form Access Control

The form is the skeleton provided to users to enable them to enter data, either by typing or by using buttons. There is usually at least one form in a database, although a typical business application will have many forms, each targeted to the type of information that the user wants to save in the database. The form contains all the design elements.

When you open a form of the database in the Domino Designer, there are the following security options available under the security section of the form properties dialog box:

<i>Option</i>	<i>Use</i>
Default read access for documents created with this form	Allow only a subset of users in the database ACL to read documents created with a specific form. Documents created with this form will have this subset of users as the default document reader access list.
Who can create documents with this form	Allow only a subset of users with author access or above in a database ACL to use this form to create documents.
Default encryption keys	Encryption keys are generally created by database managers and distributed to the appropriate users. Specifying this will cause all encryptable fields to be encrypted when a document is saved with this form.
Disable printing/forwarding/copying to clipboard	This feature is an aid to users to keep them from accidentally including sensitive data when reproducing a document. It is not a very secure measure so it should not be relied on for true security.

Document Access Control

The creator of a document can determine who can read the document by using the security section of the document properties box. You can choose to allow all people with reader access or above to read the document or restrict read access.

Note Documents inherit their read access property from the form used to create the document. If you can edit the document, you can also change the document read access property.

Each document can have the following fields defined within it that control access to the document:

- Reader fields
- Author fields
- Signed fields

Reader Fields

Reader fields can be created on a form to allow read access restrictions to documents. A reader field consists of names of users who are allowed to read the document. It can be used in conjunction with form and document read access lists. If that's the case, a user must be in both lists to be able to read the document.

Note A user listed in the Reader field for a document can only gain read access to the document if the user also has at least Reader access to the database containing the document. On the other hand, the Reader field can prevent read access from a user who has reader rights or more in the database ACL and could normally read the document.

Author Fields

Author fields can be created on a form to give users with author access edit capability to a document they didn't create. Similar to Reader fields, Author fields contain names of users.

Note Author fields are applicable only to users with author access to the database.

Signed Fields

Signed fields can be created on a form to allow a digital signature to be attached when a document is saved or mailed. Digital signatures verify that authors are identified correctly and guarantee that the data in the document has not been changed. The private key in an author's ID file generates the signature. When a user opens the document containing the signed field, Notes verifies the signature by comparing it with the author's public key in the Domino directory.

Restricting Access to Sections or Layout Regions within a Document

Sections and layout regions can be hidden based on whether a document is in read or edit mode, or based on a formula.

Note You can only hide a section or a layout region from a view. They are not protected from update by agents, actions, or access from another form.

Field Access Control

Fields in the document can be encrypted with an encryption key. To decrypt and read the document, the same key is required.

Fields may also be protected during form design from update by authors after the initial document is created.

In addition, field property security options include an option that allows you to specify that a user must have at least editor access to use the field.

For more information, see Chapter 8 “Securing Your Application” in the redbook *Lotus Domino R5.0: A Developer's Handbook*, IBM form number SG24-5331, Lotus part number CT6HPIE.

Workstation Security: Execution Control List (ECL)

An ECL limits the actions of formulas, scripts, Java applets, and JavaScripts when they run on a workstation. For example, it is normally wise to prevent another person's code from accessing your file system.

An ECL looks for the signature on databases and templates before they are opened on the workstation. Then the ECL checks that signature against its settings to determine what level of access to grant.

Every database and template shipped with Notes and Domino contains a signature of Lotus. The templates and databases that your organization designs should also contain the signature.

As an administrator, you can allow users to modify their ECL, or you can control the changes. The client setup program copies the administration ECL from the Domino directory to the Notes client. Before you register users, edit the administration ECL to create a modified workstation ECL for users. As an administrator, you can also update a workstation ECL afterwards.

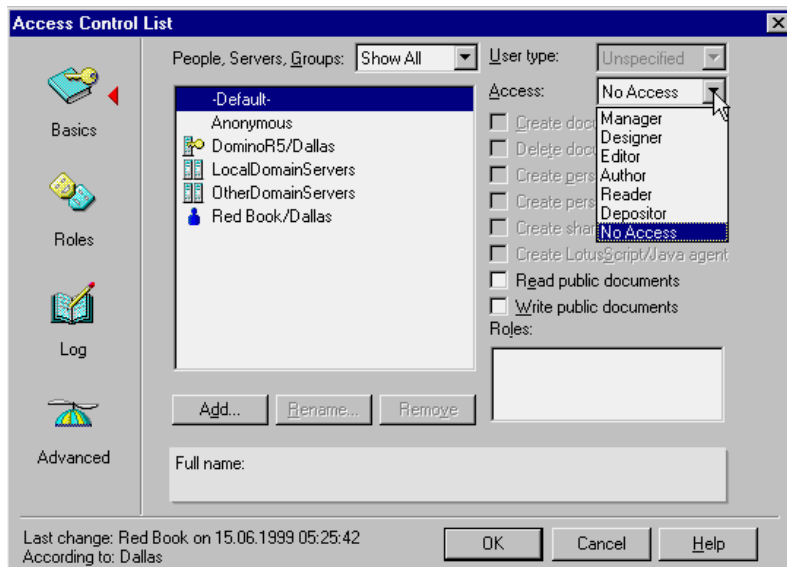
Creating a Workstation ECL

To create a workstation ECL do the following:

1. Open the Domino directory (names.nsf).
2. Choose Actions - Edit Administration ECL.
3. Select - Default - and then select access options.
4. Select - No Signature - and then select access options.
5. Click Add, enter the name of a person or server, and then click OK.

Note You can use an asterisk (*). For example, enter * to allow access to all users, even those not listed in the Domino directory. Or enter */Certifier to allow access to users certified by a particular certifier.

6. To let users modify the ECL on their workstations or enable Java applets from trusted senders, select Allow users to modify, and choose the appropriate option.
7. Click OK.

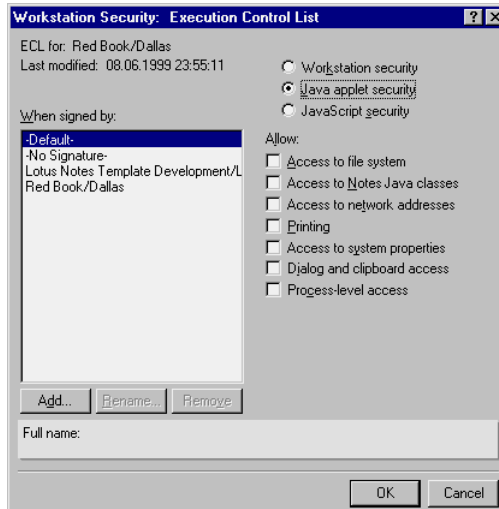
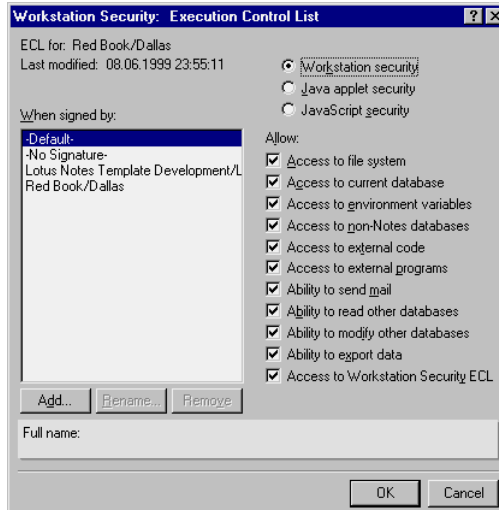


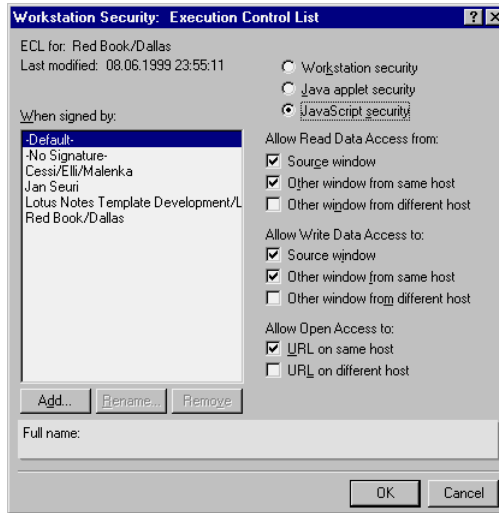
Opening the Workstation ECL

To open the ECL of a workstation do the following:

1. Choose File - Preferences - User Preferences.
2. Click the Security Options button.

The following three figures show the three ECL elements — Workstation security, Java applet security, and JavaScript security — with their associated default settings.





Note As you can see, the default settings of the ECL allow a lot of functions to be performed. You may want to consider disabling some of those functions.

Summary

In this chapter, we started out by discussing the topic of security policy. Then we introduced security as it relates to information technology in general.

Next we covered in detail the Domino security model. We looked at the security layers implemented within Domino by starting out with physical security and network security.

We then discussed Internet security, and showed you how Domino satisfies all the demands of the Internet world by supporting, for example, the X.509, SSL, and S/MIME security standards.

In the next sections, ID security and public key infrastructure, which is the backbone of Domino security, were covered. Then we introduced server security features.

Finally, we provided information on application security and application design element security. We also included information on workstation security and the Execution Control List.

Chapter 15

Training

In today's world of fast-paced change, if an organization's people are not continually being trained, that organization is falling behind. If you want to stay competitive, you must train your users well and often. Training is a key element in any Notes/Domino deployment; it is not an incidental requirement.

This chapter covers the following topics:

- Understanding the need to train
- Devising a training plan
- Analyzing the training needs
- Describing the training goals
- Choosing a training method
- Deciding who will provide the training
- Developing a training model
- Developing the courseware
- Implementing the courseware
- Evaluating the training
- Sample training plan
- Summary

Note While building the training plan may begin early in the overall project life cycle, training needs to continue beyond the initial deployment project. Think of training as something which existing staff and future staff will need on an ongoing basis, not just something to complete as a project milestone.

Tip Examine the sample training plan at the end of this chapter before reading the chapter. Then, as you read the chapter, think about how your organization's needs will translate into a similar document.

Understanding the Need to Train

We train people to improve their performance at their job. This may mean training new personnel to perform their job, introducing a new technology, or bringing an employee up to company standards. In this chapter we will focus on introducing a new technology, namely Lotus Notes/Domino.

When a project rollout like the introduction or upgrade of Notes/Domino is occurring, it is an ideal time to train or retrain people. Habits are usually formed, for better or worse, within three days of when a person is first introduced to a new software package. People learn a specific way of doing things, which generally will stick with them until it is consciously unlearned. It is therefore vital to take advantage of the opportunity to form good habits and practices from the outset.

In addition to task-based training, teach end users the concepts of groupware and how it can benefit the organization. Tell them about Notes/Domino and how it functions. Introduce them to Notes in such a way that they will be able to use the product in its entirety. It will be the end users who will generate the business improvements that Notes is intended to achieve.

Benefits of Training

The benefits of training are as follows:

- Increased productivity and profit per employee trained
- Higher morale, from reduced employee frustration
- Higher degree of project success because it's easier for people to "buy in" when they understand what they're "buying"
- Reduced employee turnover
- Reduced support calls

Danger of Not Training

Notes/Domino is similar in some ways to other products on the market. Failing to train people may mean they interpret the success of a Notes/Domino deployment in terms with which they are already familiar. For example, users who come from a mainframe or other mail background will sometimes say "it's not a very fancy e-mail package." This could be because they have not been trained properly.

Also, what they do not see, if they have not been trained, is all the other things Domino can do beyond messaging. If people incorrectly interpret the purpose of Notes/Domino, it can mean the failure of the deployment.

Devising a Training Plan

“If you don’t know where you are going, any road will take you there,” said the Cheshire Cat in Lewis Carroll’s *Alice’s Adventures in Wonderland* (1865).

A training plan is simply a document which collects the answers to questions you pose about your training program. These questions are addressed in the following sections.

Analyzing the Training Needs

The following sections cover what you need to consider when analyzing your training needs.

Deciding When to Train

First, let’s discuss aspects related to the timing of the training.

Technical Staff

System administrators and support staff should all be trained well in advance of implementation. How far in advance depends on your implementation strategy. We recommend that you train these people at least one month before you plan to pilot Notes/Domino.

Timing the training for application developers will depend on whether you will be rolling out custom applications immediately. Be sure to give your developers plenty of time to put together a good pilot application. Also be sure to hire some experienced developers, if you are “growing your own” developers.

Other Staff

As mentioned before, habits are usually formed within three days of when a person is first introduced to a new software package. Therefore, users should receive training within 48 hours of having Notes installed on their workstation. Whether they are trained just before the installation or just after does not matter, as long as they are trained very near their installation date.

If trained too early, users will forget much of what was taught. If trained too late, they will be frustrated and will likely experience errors. Since it can take a while to break a habit, it is far better to teach people good habits from the start, than to have to re-form good habits later on. One key to a successful deployment, then, is to take advantage of the opportunity to form good habits and practices from the outset.

Tip Stagger training throughout the rollout. For example, schedule the sales team for training just before the implementation date of the sales server. This ensures that you get value from Notes/Domino from an early stage. Consider not allowing users to receive user IDs unless they have attended a training course, encouraging the formation of good practices and habits from the start.

Deciding Who to Train

Next, let's look at the different user groups to be trained.

Everyone affected by the deployment project is going to require some type of training. The training may simply be a review of how to use the new Lotus Notes client or it may be in-depth technical training enabling someone to support and maintain the new Lotus Domino environment. A list of the groups who require training is below. Each group's training objectives are covered in more detail later in the chapter.

- Basic users and power users, whose training will be staggered by installation date
- Mobile users
- Executives
- Administrators
- Application developers
- Help desk personnel (if applicable)
- Training team

Assessing the Skill Level

Each type of user listed previously has specific needs and different goals for training. Accordingly, scheduling must accommodate these differing groups. We would not want to schedule an experienced application developer in the same class with someone who is learning to use a GUI interface, for instance. Account for the current level of expertise for each person, as well as what they need to be trained in, when scheduling sessions.

Tip Splitting end users into groups, such as basic users, power users, and mobile users, will greatly improve people's satisfaction with your training program. The power users won't be bored and the basic users won't be lost if the two groups are separated, and the training sessions are geared accordingly. You may need to perform a skill set evaluation prior to training, if the current skill levels of users are unknown.

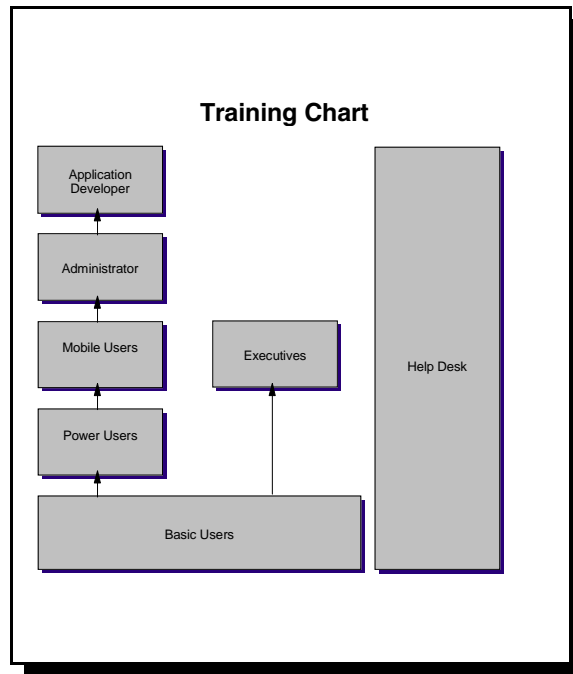
Describing the Training Goals

The goals outlined in each of the following sections are by no means exhaustive. Rather, they are meant to provide some of the topics to cover when developing training for each group.

Tip You may want to check the Lotus Web site for information on the complete curriculum provided by Lotus Education and the Lotus Authorized Education Centers. The URL is: www.lotus.com

In the following, each section builds on the one before. So, a power user will need to know everything a basic user does, a mobile user will need to know everything the power user (and therefore the basic user) knows, and so on. This is illustrated in the following graphic.

The help desk must know something about what everybody else knows, so they are shown in parallel. The graphic also illustrates that, ideally, executives will attend training with basic users, in addition to their individual training, which will give them other skills such as replication which mobile users need.



Basic Users

Basic and power users are the best candidates for in-class group training, as they will greatly benefit from the interaction with other class members. They will need to learn the following features:

- Become familiar with a graphical operating system (OS)
- Understand e-mail options, and particularly Notes e-mail options
- Understand the first applications that will be installed
- Have a clear understanding of why Notes/Domino is being installed
- Know how to get help, especially online help
- Know how to log in
- Know good password practices, such as minimum number of characters; combination of words, characters, and numbers
- Know the structure of the Notes network, such as how servers are organized, and where they should store their own files
- Know security, such as don't share passwords, log out when they walk away from a workstation, and the dangers of storing files on a floppy disk
- Know their restrictions, for example, available disk space

Power Users

Power users are also best trained in classes. Power users will need to do everything basic users can. In addition they should be able to:

- Create personal agents
- Create personal views
- Search databases
- Encrypt databases
- Understand replication
- Understand basic troubleshooting techniques

Mobile and Remote Users

Mobile users have some special considerations you need to think about. For instance, is it more cost-efficient to bring remote users “in” or send trainers “out,” or use automated training like Web-based training (see “Choosing a Training Method” later in this chapter), or even self-study? Training mobile and remote users will be more costly and requires more planning than training centrally located staff. In addition, this group requires thorough training, because they will have limited access to the help desk and other means of support.

In addition to basic user and power user skills, mobile users need to acquire the following skills:

- Laptop security
- Create replicas and replicate changes
- Create and use different locations
- Understand and manage database security
- Manage a Personal Address Book

Executives

Executive training is a special case, something like mobile users. They are often too busy to attend regular classes, but if they can they should be encouraged to do so. It helps non-management staff morale and also aids in the “buy in” to the project.

One-to-one training is typical for executives or senior management. Most prefer to be trained in their offices. They tend to ask many business-related questions, like “Have you seen any benefits from using Notes?”. Consider the following:

- Assign one person from the support team to each executive; when the executive has a question, they know exactly who to call, which will reinforce support of the project.
- Have them attend regular training with the staff; this reinforces management’s commitment to Notes/Domino.
- Make sure that redesigning collaborative processes is covered, since redesigning collaborative processes goes beyond normal business process re-engineering. For instance, redesigning a process which involves the consensus of a group of actuaries and marketing people, at varying stages of the process (in other words a fairly fluid process), is quite different from redesigning a supermarket check-out process. The supermarket process has clearly defined start and end markers, and clear success factors. A collaborative process may not always be so clear.

Administrators

Systems administration people may be able to study from standard materials available from Lotus Education or the Lotus Authorized Education Centers. They tend to be experienced at self-paced learning, but will also benefit from Computer-Based Training (CBT), in addition to On-the-Job Training (OJT) during the deployment.

For best results, send them to off-site technical training classes. Topics administrators will need to know, in addition to the topics covered under basic, power, and mobile users, include:

- Basic networking concepts
- How to control server tasks
- Replication
- Mail routing
- Indexing
- How to install clients and servers
- Notes/Domino security
- How to create personal agents and views
- Notifying relevant parties in the event a server goes down
- The basic concepts of application development

Application Developers

Application developers will need to attend technical training, because learning Rapid Application Development (RAD) independently may not be practical in every case. Developers need to understand the fundamentals of administration, and also:

- An application development methodology for prototyping
- LotusScript
- Notes API, if developing applications in C++
- Agents
- Database searching
- Notes design elements (navigators, folders, views, documents, sections, subforms, and forms)
- Workflow concepts

- Must have a sense for the load that applications will place on a Domino server
- Knowledge of mainframe and Relational Database Management Systems (RDBMS), to know when to use Notes/Domino and when to use other systems for data integration purposes

Help Desk Personnel

As the first point of contact for problems, help desk staff require a good working knowledge of Notes. They need to understand the following aspects:

- All basic, power, and mobile user items
- The fundamental issues of both system administration and application development
- Which Domino databases they support
- The access level they have to specific databases
- How to gather feedback from users to develop appropriate training
- Walking users through finding their home server
- The Domino directory and how to use it when checking security
- The Access and Deny Access fields in the server document
- The setup of Group and Person document information
- How to escalate calls to the system administration group
- To ask the end user to check for typing mistakes, for example, ensuring the server name is typed correctly when trying to open a database on a remote server (IRVLN01 looks much the same as IRVLNo1)
- The differences between save and replication conflicts and how to solve them

Training Team

An often-overlooked area of training is that of the training team itself. Since you will probably not have the skills in-house, as yet, to train the trainers, you will likely need to send your training team off-site for instructor-led, specialized, train-the-trainer courses. Consider having at least some of your trainers trained to the level of Certified Lotus Instructors (CLI). Your support staff will greatly benefit from this, as will everyone trained by the CLIs.

Acceptable Use Policies

Since Internet access is an integrated piece of Domino, a clear set of guidelines for the use of the resources that this access provides are needed for the guidance of the organization. Both the organization as a whole and each individual within it require a clear understanding of what is acceptable and what is not.

There are many legal, moral, and ethical issues related to the development of acceptable use policies. Our advice is to thoroughly research the issues before putting a policy together. Then research some more. Look at what other organizations are doing. Be sure, when formulating your policy, to make it relevant to your organization, and clear it with both senior management and the legal department before implementing it.

Tip Distribute the acceptable use policy during Notes/Domino training. It is an excellent opportunity to outline the rationale behind an acceptable use policy and thus minimize the risk of controversy and litigation.

Below is an example of the types of items to include in an Acceptable Use Policy:

Acceptable Use Guidelines

Introduction:	The organization provides access to computing, networking, and information resources for employees and directors in support of the organization's mission. When activating an account, a user implicitly affirms that s/he will: abide by the broadest interpretation of the following policies; failure to follow policies may result in loss of computing privileges; the organization may monitor computer use to protect the system; and the account of anyone may be terminated if it is determined his or her access has been used for unlawful for unethical purposes or in contravention of this policy.
Legal and Ethical Computer Use:	Four concepts lie behind the policy herein. It is unethical and illegal, without proper and valid authorization, to: 1. Obtain access to services and data that do not belong to you; 2. Consume/ utilize services that do not belong to you; 3. Alter or destroy data that belongs to the organization or any other organization; 4. Interfere with the rights of others.
Disciplinary Action:	Misuse of computing resources will be reported to the Director of Information Services. The Director may impose restrictions on the offender's computer access, and may report misuse to the user's manager and/ or the civil authorities, as appropriate. Be advised that computer crimes can be felonies, and therefore may carry severe penalties including, but not limited to, fines, prison sentences, and loss of employment.
Common Sense Rules:	<ul style="list-style-type: none">✱ Never share your password✱ Do not use computing facilities to:<ul style="list-style-type: none">✱ gain unauthorized access to a computer system✱ infringe on the privacy or copyright of others✱ use computing facilities to harass or do mischief✱ send commercial mail not related to the organization's regular and customary business, or for personal profit -- "spamming"✱ perform personal tasks✱ seek access to that which is not yours✱ endanger or interfere with the operation of any computing system✱ run a program unless you know and trust its source
	Ensure this document is customized for your organization and approved by your legal department and senior management before distribution.

For more examples of Acceptable Use Policies in the United States visit:

gopher://chico.rice.edu:1170/11/More/Acceptable

Choosing a Training Method

Many decisions you make during a project will focus on cost. This is especially true of training. Although the Return on Investment (ROI) of training is generally considered to be very high, it can be difficult to measure ROI for training. This means that budgets allocated for training can be low, in the context of the overall project. The underlying reason for the lack of budget is usually measurability. Often there is no baseline measure of productivity to compare with post-training figures; many organizations do not possess the tools to accurately measure productivity, and therefore do not try.

For more discussion on ROI of training, see the American Society for Training & Development (ASTD)'s Web site: www.astd.org

Types of Training

There are five basic types of training:

- Instructor-led, either in class or one-to-one
- Computer-Based Training (CBT), either in class or individually
- Training videos, either in class or individually
- Web-based training (WBT), for individuals
- Self-paced books, for individuals

Since our discussion is focusing on a deployment project, it's pretty safe to assume that you will have enough people to justify classroom-based, instructor-led training. Each of the other types of training has a definite place in an overall training program, though. Many of the technical staff will need to attend off-site technical classes, for instance. Later on, new hires will need to be trained, and a video of an instructor-led class is a great way to achieve that goal. Use your creativity and keep in mind the culture of your organization when choosing a training method.

Because each person learns in a slightly different way, a good training program will incorporate several different types of training methods at once. For example, in an instructor-led class, there may be portions which are presented on video tape, some portions may be interactive exercises done via CBT, and other exercises or reference material may be book-based. The greater the mix of listening, watching, and doing, the more the learners will retain.

Web-Based Training (WBT)

Web-based training (WBT) is a new twist on an older idea. In WBT, Computer-Based Training (CBT) is altered to incorporate the technologies of the World Wide Web. This type of training may be presented over the Internet, within an intranet, or over an extranet. The content may be dynamically delivered, and generally allows self-paced training in a familiar interface, the browser. It tends to be multimedia, with the ability to evaluate, adapt, and correct, all independent of operating system or platform.

WBT is ideal for delivering training to individuals anywhere, any time.

Tip One of the greatest strengths of WBT is that it can be made extremely relevant to the person's own job duties. The best training is always that which is relevant.

For further information, check the Web-Based Training Information Center at: www.filename.com/wbt/index.html

Deciding Who Will Provide the Training

In many organizations, this decision may have already been made for you.

In-House Training

If your organization has a training department, you will probably want to develop your own Notes training material, particularly for training people in custom applications. Training internally provides you with the opportunity to show end users how the Domino network is structured within your organization. You can tell them what their particular home server is and how it fits within the Domino network.

If you will be developing your own training, you could use the core services provided by Lotus Education as a starting point. They offer the following:

- Curriculum development and customization
- Education needs analysis
- Technology-Based Training (including CBTs and Lotus ScreenCam)

Other companies also provide similar services.

Other Options

In other organizations, there may simply be a training coordinator, or training may need to be outsourced. If you do not have a training department, you may want to look into an external training company which has been certified as a Lotus Authorized Education Center (LAEC) or check directly with Lotus.

For further information, look at: www.lotus.com/education

Developing a Training Model

After analyzing the training needs and developing training goals, it is time to develop a training model and then a curriculum (or courseware). It is not possible to delve into these topics in great detail here, but there are many other resources available to guide you in these processes.

There are many different models which can help you in designing a training plan. A really good method is called Instructional System Design (ISD), and can be found at: www.nwlink.com/~donclark/hrd/sat1.htm © 1995, revised 1996 and 1997.

Whatever model you choose, it should focus on the skills people will use in their jobs. Lessons should be sequential and logically ordered. The delivery system needs to be easy to modify, so that it can be adapted as materials are updated. The training will change over time, as student feedback is incorporated into the material.

We recommend you use the issues previously discussed in the Analyzing and Goal setting sections as a springboard, and customize them for your particular organization.

Developing the Courseware

After your model is complete, only the mechanics of developing the courseware remains to be done. Questions to consider during this phase of the training project are:

- How much time will you have to prepare training materials?
- How much time will you have to present the training?

Here are some suggestions:

- Consider creating “quick reference” materials, for users’ future reference. This gives people a quick and easy way to refresh their memories, as needed. It can also reduce support calls significantly. The quick reference materials can take the following form:
 - Short reference manual
 - Workbook, where students can fill in information or complete exercises during class, and refer to them later
 - One-sheet quick reference page or card
- Conduct training in a lab, where users can try things out without fear of downtime.

- Tape a video, so you don't have to repeat yourself every time someone new is hired.
- Course certificates may be given to students as they complete a course

Implementing the Courseware

Once you have developed the courseware, you must begin scheduling courses and registering students for those courses. See the section titled, "Deciding When to Train" for more information on the timing of courses.

Scheduling should include creating a tracking system to ensure that everyone scheduled for training actually attends. Student rosters should be created for each class and each student's attendance recorded.

Tip Consider handing out class evaluations for students to fill in. If the evaluations are anonymous, they won't be of any use in tracking attendance, but you will get more accurate feedback on the quality and value of the courses.

Evaluating the Training

At each stage of the process, it is useful to review your goals. When you review your goals frequently, you tend to stay on track. Once the training for the deployment project is complete, you will also want to evaluate the efficacy of the training program as a whole. The purpose of this is to ensure that future training is more useful and to point out the successes of the project.

Use feedback gathered from formal and informal evaluations of the courses to revise your courses, as necessary. It is best to begin this process after the training for the pilot project is complete. That way all the "bugs" are worked out before you train the majority of users.

Give students the opportunity to apply their training at their jobs, and then ask them to complete a second evaluation to gauge the effectiveness of the course and the relevance of the material covered. This should be done within a week of their training course. These evaluations should be reviewed and any changes made to the course content if needed.

Sample Training Plan

The following is a sample table of contents from a training plan. It is meant to offer an idea of the types of topics which may be covered in the training plan document.

Table of Contents

1.0	Introduction
1.1	Purpose
1.2	Overview
1.3	Training Concept
2.0	Training Methodology
2.1	Types of Training
2.2	Training Methods
2.3	Immediate Training Strategy
2.4	Sustainment Training Strategy
3.0	Student Training Categories
3.1	Basic Users
3.2	Power Users
3.3	Mobile or Remote Users
3.4	Executives
3.5	Administrators
3.6	Application Developers
3.7	Help Desk
4.0	Mobile Training Team Support
4.1	Training Materials
4.2	Logistic Support
5.0	Responsibilities
5.1	Staff
5.2	Management
5.3	Site Training Coordinators
6.0	Training Panel
6.1	Purpose
6.2	Procedures
6.3	Organization
6.4	Meetings
7	Training Plan Approval
Appendix A	Course Descriptions
Appendix B	Training Points of Contact
Appendix C	References

Summary

In this chapter we discussed the need for developing a thorough training plan which addresses the needs of everyone in the company affected by the deployment project. We described the basic steps of training an organization's workforce, from devising a training plan to what to cover during training, and how training fits into the deployment project's life cycle.

Making sure appropriate training is received by all users will contribute to the success of the project. Ignoring any of these training needs will negatively impact the project and overall company operations.

Chapter 16

Preparing for the Rollout

This chapter focuses on planning the tasks that need to be accomplished to complete the rollout of Domino in the organization. You have identified how Domino will fill your business requirements, gleaned complete information on the current environment, confirmed your budget, chosen your platform, piloted a deployment, and finalized your design specifications. You have also completed the training plan, so as to allow users to be trained around the same time as the client is installed on their desktops.

You should now be ready to plan the rollout of Notes/Domino. The topics you will need to cover are:

- Assembling the rollout team
- Creating a rollout plan

Then, you can create the formal document of your deployment plan (see Chapter 17) and actually implement Domino.

Assembling the Rollout Team

Forming the project team will be a critical step in the deployment project. The reason it is so critical is that if you miss a key person or department, the acceptance of the project can be seriously damaged. Without adequate acceptance and cooperation, the project may fail. The reasons behind this are discussed in more detail in Chapter 6 on setting up the pilot, since this is the best time to prevent such problems.

Criteria for Team Members

Aside from technical ability, these are some suggestions which may help when creating the rollout team:

- The managers impacted by the rollout should participate in selecting the team members from their area.
- Make sure that the team members are good team players, well-respected for what they do, and able to think creatively about problems.

- Include someone on the team who is objective about the rollout. This could be an outside consultant, or someone from an outside but affiliated organization who does not have political considerations in the rollout.
- Choose people to achieve the objectives of the project, not only to represent the functional areas.
- Make sure the members of the core team, at least, are devoted to the rollout full time. Preferably the entire team should be dedicated full time to the rollout.

Roles to Include

Some of these roles are the same as those covered in Chapter 6 on the pilot. The reason they are repeated here is for the sake of completeness. They may in fact be the same people as those who were chosen for the pilot, but they do not have to be.

Key Roles

There are two key managers in the deployment project.

- Executive sponsor: Will probably be the same sponsor identified during the pilot.

It is worth repeating that your sponsor should be as high up in the company as possible. The CEO's sponsorship means a lot more than a junior manager's sponsorship.

- Project manager (PM): Responsible for managing the deployment. This may or may not be the same person who handled the pilot. The PM need not be a technical person, but must have a firm understanding of managing a technical project. If the PM is not technical, it is imperative that the core team members, who are technical, be heavily involved when identifying and scheduling technical issues.

Choose these two managers carefully, as the success of the project will largely depend on them. In many companies, the choice may have been made for you.

In addition to the team members described in detail above, other rollout team members will include:

- Domino server administrator
- Domino database manager
- Domino application developer
- At least one "typical" end user to advise from the user perspective
- Trainer

- Help desk staff
- Network operations staff and/or operating system specialists
- Specialists in software from which you are migrating, if applicable

With this diverse a group, you should have no major gaps in your deployment plan. Having a relatively large rollout team allows for different business perspectives, and a greater knowledge base. However, it carries some costs (see the section “Sizing the Team,” below).

Choosing Representatives from Every Area

Part of forming the team is determining the company’s structure. An organizational chart may not be enough, because you need to be sure you involve every area of the organization in the rollout, to some degree. Someone from Human Resources may be useful in identifying any gaps for you.

Participation from each department is important so that nobody feels left out. It’s also key in making sure you know all of the facts before you begin the rollout. For example, it has sometimes happened that during client rollouts users have overwritten critical data on their hard drives, because of lack of information — the users were supposed to be saving data on the network, but an entire department was skipped in network training. They were saving everything to their C:\ drives because they didn’t know they had network drives. Don’t let this kind of thing happen to you!

Timing the Rollout

Timing the rollouts for each department is also important. You wouldn’t want to schedule a rollout for the accounting department at the end of a quarter, for instance, because that is their busiest time. Departmental input is key in making these types of determinations.

Sizing the Team

The overall size of your team will depend, to some extent, on the size of your company. Generally, expect larger teams in larger companies. While large teams offer a broad perspective, remember that the most effective teams are small, they all work at the same location, and are all dedicated to the project. High-performing teams also tend to have aggressive performance objectives, and the necessary time to apply themselves to those objectives.

We recommend you keep the team small, fewer than 7 people for smaller organizations and fewer than 12 for larger organizations. The reason is that if you choose more, it is difficult to reach consensus, which causes the rollout planning to take much longer. If the team is too large, it will become unmanageable.

Tip If you require more than 8 people, establish a small core team of 3–4 people to handle the overall rollout. Then, divide into sub-teams of 2–4 members each. The core team can then report back to the larger representative team, which includes everybody, periodically.

When each role has been assigned to a person or to several people, proceed to create your rollout plan. One person may fill more than one role. For example, the project manager may also be a Domino Administrator. It is possible to begin creating the plan before all the roles are assigned to actual people.

Creating a Rollout Plan

Now that you have assembled a group of people to do the work and you have determined how and when it should be done, it's time to actually plan the rollout. The rollout is the first time the production environment will be affected, so it must be planned carefully.

Rollout plans serve two main purposes. As a planning tool for the project team and sponsor, it can be used to negotiate and reach agreement on key project issues. As a communication vehicle for sharing the rollout with others, it is a great way to share the objectives and measures of success of the project with the organization at large.

Must-Do Items

The following list contains must-do items:

- Communicate frequently with rollout sponsors when identifying objectives and measures for success.
- Include diagrams in the rollout plan. These should indicate not only technical items (such as network diagrams), but also the scope of the rollout. Clearly indicate what's in and what's out in terms of processes, departments, and systems. Validate your choices with the rollout's sponsors.
- Keep it short (4–5 pages in length, excluding diagrams).
- Talk frequently and candidly with rollout sponsors to clarify expectations, as the project progresses.

Potential Pitfalls

Here is a list of potential pitfalls:

- Early drafts of the plan are widely distributed in the organization, causing unnecessary fear or confusion. You may want to wait until you have a more final version of the plan available before distributing it.
- The rollout plan is shared with employees prior to their management, potentially creating mistrust between these managers and the rollout team.
- The project leaders work on the plan for an extended period of time (3–4 weeks) before sharing drafts with the rollout sponsors, missing valuable opportunities for clarifying objectives and expectations.
- The plan is so long nobody takes the time to actually read it.

Each of the following subheadings can be considered essentially a step in the planning process. You should keep the preceding points in your mind as you complete these steps.

Reviewing Your Design Document

In previous chapters, the infrastructure was planned and then presented to senior management and project sponsors. This presentation is probably the nicest copy of the design document you have. It may have changed, though, due to hardware availability, or other factors. Make sure, at this point, that this document is accurate. If it is, then reviewing it now will keep it fresh in your mind as you continue planning your deployment. If it isn't, update it to reflect whatever changes have been made, so you are working from a correct document.

The technical design specifications will form a large part of the final deployment plan document (see Chapter 17, “Producing Documentation”).

Reviewing Success Criteria

An original set of success criteria were defined for the pilot project, and you should review them now. Are they still appropriate, in light of lessons learned during the pilot project? If so, include them in your deployment planning. If not, discuss the success criteria with senior management and update the criteria so they continue to be relevant. The success criteria will also be included in the final deployment plan document.

Developing a Rollout Plan

This is the real meat of this chapter. You know what you need and you know how your success will be judged. Now you need to determine how, precisely, you are going to accomplish the goals you have set.

Planning Tools

Consider using project management software to help you define and track your rollout. Resources, availability, time restrictions, dependencies, and cost factors can be identified. People's vacations can be accounted for easily using that type of software.

You will be able to identify and define critical paths and dependencies to reduce risks. If you are over time in one area, the entire plan can be pushed back easily, too.

The best thing about software, though, is being able to quickly share the tasks for which an individual will be responsible, without a great deal of administrative time.

Note For further information on project management training and tools, go to www.pmi.org

Putting the Infrastructure in Place

Before you can roll out Domino, you need to be certain that all the prerequisites of the Domino rollout have been completed. Be sure that servers, network cabling, and other infrastructure is in place prior to beginning implementation. It will be difficult to install and configure clients if there is a problem with network connectivity, for instance.

It may be the case that all of this is handled by another area of the IT department, but it is critical the project manager understand what needs to happen, so that he or she can ensure it has been completed.

A partial list of infrastructure considerations follows, which will need to be tailored to your rollout:

- Network: Bandwidth, routing, interference, firewalls, name resolution
- Software: Operating system upgrades, network clients
- Hardware: Inventory including operating system release, memory, disk space, CPU type, remote access
- Applications: Critical applications and dependencies, release and patch level

- Processes: Description of business processes and dependencies, critical processes
- Organization: Department information, contact list, office locations
- Timing: System availability, realistic yet convenient time schedule
- Access (evening/weekend): Passwords, keys, backup facilities

Rollout Strategy

Strategy is referred to in some project planning guides as the project methodology. In many companies, the methodology is chosen for you. In others, this can be the most political issue of the rollout.

There are basically two methods used to roll out Domino, each of which is discussed below. Variations on these methods will be called different things, but pretty much every strategy is a variation of some type of these two, in technical projects.

The important thing to remember is that the strategy's success will depend on good planning more than the method you choose. As always, you should be prepared for unforeseen events.

Staged Rollout

In this type of rollout, the rollout team takes a step-by-step approach. This approach is quite common in smaller companies, where person-power may be limited. For example, if you have just two people to handle the rollout, there are limits as to the number of machines they can get ready in a day.

The staged rollout is also used in larger companies, if the rollout can be subdivided neatly.

The major advantage to this approach is that the risk of any given step going wrong is minimal, since it is only a fraction of the total project. The biggest disadvantage is that the total project can take a long time to implement since it tends to be the case that a short span of time is left between each step to determine the step has been successfully implemented before performing the next step.

There may also be some inconveniences during the rollout, which will of course last during the entire staged rollout. For instance, if you have two mail systems which are incompatible in some way, the longer the stages take to complete, the longer the period where you have groups of people who cannot communicate properly with each other.

“Big bang”

This refers to a methodology where the entire rollout is done all at once, in one major step. Several underlying or background steps may have been performed prior to the rollout, though.

The biggest advantage with this type of rollout is that there is no lasting period of inconvenience. Be advised that for this type of rollout, management needs to be prepared for downtime. The downtime is needed to perform several steps all at once. If you choose a big bang approach, management needs to be prepared for the possibility that there will be problems encountered along the way (like an operating system that refuses to install in a stable manner) and can cause the project to take a long time. Most big bang projects are scheduled to run over a weekend or long weekend, and if there are problems, it may run into Tuesday or even Wednesday. Management needs to know this is possible.

Reality Check

In the real world, you rarely have the luxury of having a system down during production hours. At the same time, management will not want to have a project which drags on interminably. Therefore, most rollouts end up falling somewhere between the extremes of “big bang” and “staged.”

Consider performing whatever you can separately, in controllable steps, to minimize risk. Do as much as you can at a time, after hours. In this way you will benefit from doing big chunks at once, time-wise, but without the required production downtime a big bang requires.

Scheduling the Rollout

The actual detailed decisions of who should do what and when are outside the scope of this book. There are numerous guides to planning the actual details of Domino installation. For example, consult any Notes/Domino magazine (such as “The View,” “Group Computing,” or “Lotus Notes & Domino Advisor”) and you will find details on both new deployments and upgrading from previous releases.

There are also several IBM/Lotus redbooks which cover these topics in great detail (refer to the section “Related Publications” at the back of this book for some of these titles). In the yellow books that come with Domino, there are step-by-step instructions for installing servers, registering users, and other tasks you will need to know how to perform. These tasks should also have been covered in your Domino training. In fact, most redbooks cover how-to info with lots of hints and tips and real-life experience that is usually not covered by the yellow books.

Quite apart from the fine-grained details of deployment, there are a number of issues you should consider when scheduling your rollout:

- Keep the schedule realistic, building in contingency time.
- Ensure you clearly communicate any needed downtime for production systems with the users involved; schedule the downtime with them well in advance.
- If one task finishes before it is scheduled to complete, use the remaining time wisely: Assist with other tasks, or prepare for your next step.
- Where timing has to be rigid, avoid assuming the ideal case — in other words, be prepared for the worst.
- Although you will want to roll out after hours as much as possible, there may be circumstances where required resources are only available during production hours.
- Working after hours has some disadvantages, aside from staff scheduling: Depots and workshops are closed, service contracts may not cover the off hours time, testing must often wait until the following day, or your rollout may interfere with nightly backups.
- Schedule users by branch, department, or region, depending on the organization.
- Be sure that a stable condition has been reached before proceeding to the next step.
- Provide time for administrative tasks, such as regular status reports.
- Be sure to build in time for back-out procedures, if necessary. Plan for partial and full back-outs.

Tip A team of 5 technical people can add 50 to 100 users per week, including support time. Other staff, such as trainers, are not included in these scheduling estimates.

The following figure shows the elements to include in a rollout plan:

Sample Rollout Plan

Get infrastructure in place (Chapter 6):	Plan purchase of and order servers for Domino Hire additional staff, if required Install server operating systems Be sure firewall servers are in place Be sure required bandwidth is available
SMTP (Chapters 8, 11):	Provide external access -- plan the method Redirect mail coming into legacy system
Current technology to Domino:	Mail Migration Bulletin Board coexistence Batch operations
Training (Chapter 14):	Train the trainer Determine training location End User Dress Rehearsal Support Personnel/ Help Desk Schedule end user training
Support orientation (Chapter 17):	Help Desk Administrators Integration with existing systems
Applications (Chapter 10):	Create suggestion/approval path for applications Develop intranet applications
External feeds (Chapter 11):	Stock quotes Weather News Other Web access, including Acceptable Use
Documentation (Chapter 16):	Create Administration Manual Create Developer Manual
Establish Domino R5 production environment (yellow books):	Establish Test Environment Install & configure First Server Install test users Test Admin Client Prepare Custom Desktop
Determine desktop rollout (Chapter 12):	Choose a rollout product Create the desktop template Roll out the desktop software
Final user installs (Chapters 12, 18):	Migrate initial 4.6 users to R5 Test initial install with users Install remaining users
Application implementation (Chapters 10, 24):	Home Page Phone Book Policies and Procedures Manual Fax Gateway Org Chart Job postings and descriptions

Other Issues to Consider

There are a number of other issues which you need to consider in your rollout plan. These are issues which can make your rollout tremendously successful if you plan well, or they can cause problems.

Distributing Client Software

Depending on the platform you use, there are different tools available for software distribution. More appear on the market regularly, so have a good look around.

On Intel platforms, within the enterprise, there are a multitude of tools available, such as Microsoft's SMS, Novell's ZENworks, Wise's Installation Manager, and Seagate's WinInstall. Clearly, your Network Operating System will play a part in this choice. An option for the larger company is Tivoli.

Note For more information on NT software distribution, go to www.softdist.com and www.ntsoftdist.com or do an Internet search for more sites.

The basic idea behind automated software distribution is to make multiple installations more efficient. This is generally done using some kind of

template file, or a profile, which is set up once and then “pushed” to the user’s desktop. Then, the only tasks left in the client installations are the user-specific setup items.

Unless you work in a fairly small company, strongly consider using some kind of automated installation for the client installation, at the very least. Domino server installations are generally best done one at a time, but server operating systems may be installed using a tool like Ghost with good results.

Remote Sites

If you will be installing to remote sites, there are tools designed for extranets, like Marimba. This software performs installations outside the organization, where SMS, ZENworks, and most other software, is only helpful in the internal organization.

If you use a tool like this, you will not have to contend with as much telephone support for remote users, who may have to be walked through an installation step by step. It also means they can be upgraded in a more timely fashion, as they will not have to wait for a CD to be shipped to them. It also gives you control over the timing of the upgrade, rather than depending on the user to initiate the process.

User Administration

Apart from the installation of the client software on the user’s desktop, users may also have to be registered (created). There are a number of third-party tools available for making the mass-creation of users more efficient. Most operate on principles similar to that used in software distribution tools. A profile is built, which is then used to create users, one after another. The advantage is that several to many steps per user are saved, which saves several minutes and potential errors per user.

Tip Double-check your profiles before registering users. If you have made an error in the profile, it will have to be corrected for each user you have created.

User Migration

In addition to registering new users, you may also have to bring users over from another mail system. This could be from a mainframe system or a LAN-based messaging system. At www.lotus.com/migration you will find various resources, including automated tools for making migrations easier. Also look at redbooks such as *Eight Steps to a Successful Messaging Migration: A Planning Guide for Migrating to Lotus Notes and Domino*, IBM form number SG24-5335, Lotus part number CT6HINA and other redbooks specific to your mail package. These go into detail about the precise issues you need to consider in user migrations. They also cover issues like coexistence strategies.

Note For a list of mail migration redbooks, refer to the section “Related Publications” at the back of this book.

Dealing with Special Cases

No matter how well you plan your rollout, there will always be those people, usually senior management, who need to be handled individually. When you are planning your rollout, you need to think about who is likely to require special handling. You will also need to consider that these special cases will require extra time, both for installation and for training, and need to be planned accordingly. Chapter 17 covers this topic from the point of view of documenting these exceptions.

Backup and Disaster Recovery

One of the most common errors made in Domino rollouts is not beginning backups until after the entire rollout is complete. We cannot stress enough that this is a bad idea. If you need to back out of changes that were made on a particular day, you will need a good backup from the day before, to accomplish this.

So, you should do a full system backup every night during your rollout. You should also begin to plan your long-term backup strategy at this time. For more information on this topic, see Chapter 22, "Contingency Planning."

Training

It is very important to coordinate your rollout with end user training. Accordingly, your rollout plan may be impacted by other events which are occurring simultaneously. For instance, the training department may have other scheduled commitments during your project, and so may not be available for Notes training for part of your rollout project.

You will need to make sure that your plans mesh neatly with those of other departments on whom you will be depending. The only way to do this is by applying excellent and regular communication.

For more information on training see Chapter 15, "Training."

Summary

This chapter has looked at the issues you need to consider when doing the fine-grained planning of your rollout. Of course, it will be up to you to determine who does what and when. However, there are many factors which will influence those decisions, such as the composition and size of your rollout team, your technical design, your success criteria, the methodology you choose for the rollout, and other issues like integrating your rollout with the schedules of other departments, handling exceptions, backups and fallback planning, and migration from other e-mail systems.

Chapter 17

Producing Documentation

One of the basic tenets of network management is to document the network. While this is an important thing to do, it is something which tends to get pushed to the bottom of the list. The reality is that when you are faced with a choice between fixing the CEO's quirky e-mail dictionary or documenting the network, the choice often makes itself.

While this chapter will focus on documenting the Domino aspects of your network, virtually the same techniques may also be applied to the larger network. From here on, the "network" refers to the Domino installation.

We recommend that you place a pretty high priority on your network documentation, for the following reasons:

- If you are promoted, leave the organization, or are otherwise removed from your current position, your successor will need good records of what was done and why.
- New or additional administrators may be oriented to the network more quickly.
- In the event of a disaster (fire, flood, theft, earthquake, or locust plague) printed copies of documentation may be all you have from which to rebuild your network (see Chapter 22 for more information on disaster recovery). Making the insurance claim is a lot easier if you know what you had and where it was.
- Reporting to senior management becomes less painstaking — just generate a report from your database.
- Accurate inventory and auditing become possible.
- Tracking problems and gaps in the infrastructure becomes possible, which can make justifying new hardware or software purchases easier.
- Planning upgrades, migrations, or company mergers, is more straightforward (see Chapter 26, "The Changing Enterprise").
- In some instances, good documentation assists in troubleshooting.

There are several types of documentation with which you should be concerned during and just after a deployment effort. We will cover most of these in this chapter. The types of documentation we will discuss in this chapter are:

- The deployment plan: How to formalize it
- Creating policies and procedures
- Help desk handbook
- Electronic documentation
- Ongoing documentation needs
- Documenting special cases
- Summary

Throughout this chapter, we will discuss how Domino documentation fits into overall network documentation.

Formalizing the Deployment Plan

The deployment plan document is going to build itself, to some extent, based on the planning process. Once the planning phase has been finalized, all documentation created as part of the planning process should be reviewed for completeness. The project team must ensure all areas of the new environment have been documented.

These documents should then be reviewed by or shared with others involved in the project. Before releasing any documentation, review it with the project sponsor and corporate management to ensure they concur and to correct any misunderstandings.

The most critical thing to remember when building the formal document is to write it in such a way that someone who had *no part* in the deployment project is able to follow it. This is important for a couple of reasons:

- People who have no active involvement with the deployment will read it during the project: Board members, senior management, or other non-technical staff
- When you come to review it yourself in 12 months' time, you will not recall the details as you do now. Now, you're living and breathing this project; then, you won't be.

If you look at the chapter outlines in the table of contents of this book, they give you a rough guide as to how to manage the project overall. Similarly, these same chapter outlines can be used, more or less in order, when formalizing your design document and deployment plan. Of course, you will want to customize the document per your own organization's requirements. Roughly speaking, though, your formal plan should contain the following sections:

1. The business requirements for your organization
2. Why Domino was chosen to fill those requirements
3. Information on the current (pre-Domino) environment
4. Project budget and cost projections
5. Domino platform choice, at a high level
6. Pilot deployment project summary, making sure to identify any issues which arose during the pilot which need to be addressed in the larger project.

Success criteria are often identified at this stage, and should be included in the formal deployment plan document.

7. Technical design specifications (the design document), which should normally be the largest section of the deployment document.

This section should contain not only verbiage, but also network diagrams, specification sheets for hardware, and any other type of information which would help explain the design to a novice.

8. Summarize plans for pilot application development projects, being sure to reference any documents fully outlining those plans.
9. Summarize the training plan, being sure to reference the completed training plan.
10. Mechanics of deployment: Building on the experience of your pilot project and your design document, this section will detail who will do what and when.

This section is the real nuts and bolts of the deployment effort. The design work is complete, some lessons have been learned from the pilot, and now you're ready to roll Notes/Domino out to the organization. Use as much detail as you can here, and you will be better able to accurately schedule your resources. Be sure to build in contingency time.

Tip If you think an installation will take 4 hours, schedule 6 (or even 8 if possible). If you do it in 4, you'll be a hero!

11. When the project is completed, add a commentary to the end of it which outlines the success of the project, based on the success criteria identified in the early planning phases; this may come in handy for your next project. It may also be useful when you have your next Performance Review.
12. Update existing network documentation to reflect the changes to the infrastructure. Make sure the Domino installation is accurately reflected in relevant network diagrams and documents.

Creating Policies and Procedures

Policies and procedures are separate from the deployment plan and the documentation of the network itself. The deployment plan covers the design of the Domino network, how it will be rolled out, and how Domino fits into the existing infrastructure. The network documentation is a snapshot, at a given point in time, of the network infrastructure; hopefully, it is kept up to date regularly, or as changes are made.

Policies and procedures, by contrast, are the day-to-day operating documents the help desk, analysts, and other technical staff will use to maintain standards of network operations.

Policies

A policy is a document which outlines an idea which is enforced throughout the company. For example, an Access Control List (ACL) change policy may outline the database managers for each database in the organization. When a change to the ACL of a given database is requested, this policy would be consulted to determine if anyone needs to be contacted prior to making the change and, if so, who needs to approve it. It may also outline the requirement to document such a change, for auditing purposes. There would be a related work instruction which would detail how to actually change the ACL. We will not cover policy documents in any more detail in this book.

Tip For the kinds of issues to cover when creating policies, with respect to Notes/Domino, see Chapter 8, “Defining Standards.”

Work Instructions

A work instruction is a step-by-step set of instructions for a given task. For example, the work instruction “Installing the Notes R5 Client” might contain instructions on how to install the client on an NT 4.0 workstation.

It is generally a fairly brief, specific document (no more than 2 pages). The “Installing the Notes R5 Client” document, for example, would not contain information on when to use R5 on NT 4.0, just the specifics of how to perform the task.

Work instructions are typically the meat of a help desk handbook or similar day-to-day how-to guides (for more information on help desks see Chapter 18). These documents should be simple, clear, and contain as many screen shots as possible. Screen shots help people visualize how what they are doing *should* look. Work instructions should contain tasks in a step-by-step fashion, including each mouse click and key stroke made during a task.

Procedures

A procedure is a fairly detailed document that outlines not only the steps involved in performing a specific task, but also the rationale behind performing the steps, and perhaps when they should be performed. For example, “Installing a Domino R5 Server” might cover not only the specific tasks of installing the server, but also what steps need to be performed prior to installing the server, such as the network manager’s permission, and background on what additional materials may be required during installation.

The difference between a procedure and a work instruction can be subtle, but it is important. Keep work instructions for everyday tasks, and combine them to form an operations handbook for technical staff. Procedures, by contrast, may be kept in a separate location, and used on a more occasional basis. This will depend to some extent on the culture of your organization — many companies don’t make a distinction between the two.

The best time to create work instructions and procedures is during the deployment project. As work is performed, take notes on what you did, and in what order. Later, formalize it in a standard format, which will make it easier for others to repeat what you did, if the need arises. This also makes the task of creating the documents much less daunting, because the work of figuring out which step comes before which step has already been done. All you have to do is type it up.

There are automated policy and procedure creation tools on the market which can make this process much quicker and more standardized with less effort on your part. For one product, go to www.comprose.com. They have several sample documents on their Web site, which may give you some ideas. Their links to other related sites can also be helpful. Another useful resource for this topic is <http://techwriting.about.com>, which has links to many Web-based resources.

Tip Be as complete as possible and be sure not to skip steps when writing procedural documents. Words, names, titles, and messages that are intuitive to you may not mean anything to someone unfamiliar with the tasks. For example, if an “OK” dialog box appears, make a note of it, even though it may seem obvious to you that you simply need to click “OK.”

Sample Procedure Outline

The general layout for work instructions, policies, and procedures is the same, although the specific sections may differ somewhat. For instance, in a policy document, you would not have a set of detailed instructions. The following figure shows a sample procedure outline.

General Description

Description/ Scope	How to install Domino Server software on an Intel platform. This procedure includes instructions for installing the necessary drivers, file rights, install instructions, and second level support.
Responsibilities:	Lotus Notes Architect
Department:	Server Support
When to Perform:	As needed, with Network Manager's approval

Requirements

Materials:	Network client drivers Domino CD
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Overview of Steps

1. Verify network connectivity
2. Install network operating system
3. Install Domino server
4. Configure the Domino server
5. Test the Domino server

Detailed Steps

1	Detail exactly what needs to be done, in each step.
1.1	Record each mouse click or keyboard entry.
1.2	Use screen shots (Print Screens) to make the documentation as clear as possible.
2	Describe step two here, adding steps as required

Related Procedures

Associated Policy/ Procedure/ Work Instruction, Form, or Flow Chart

Distribution/ Routing List

The persons listed should receive a controlled copy of this document once it is approved
--

Document Control

Contributing Authors, Document Type (Procedure, for example), Last Update, Revision Level, Title, Filing Instructions, Document Retention

Help Desk Handbook

Help desk handbooks are helpful for use in the network as a whole, or if used by a Notes-specific support group. For information on setting up a help desk, see Chapter 18, “Support and Communications.” This section covers only the documentation aspects of a help desk.

The kinds of things which should be included in a help desk handbook are:

- Overview of how the help desk operates
- Policies, procedures, and work instructions
- Records of official policies, such as whose authority is required for certain procedures
- Procedures for charging departments for services, if applicable
- Login procedures to get into problem-tracking software
- How to use the problem-tracking software
- Step-by-step procedures for fixing common user problems
- Procedures for installing or upgrading Notes and Domino
- A troubleshooting guide, preferably with flow charts

This type of document is a valuable reference tool, and may represent the sum of knowledge of several support people. Aside from being a great knowledge management showpiece, the handbook will be useful for training new help desk employees.

Sample Help Desk Handbook Table of Contents

Following is a figure showing the kinds of topics you would cover in a help desk handbook. It contains topics not directly related to Lotus Notes, but its emphasis is on Notes/Domino issues.

Help Desk Handbook

1.0	Introduction to the Acme Help Desk
1.1	How we're organized
1.2	The tools we use
2.0	Logging In
2.1	To the phone system
2.2	To the network
2.3	To the problem tracker
2.4	To the modem pool
3.0	Using problem-tracker
3.1	Main menu
3.2	Transferring incidents
3.3	Updating status
3.4	Closing out an incident
4.0	Authorization Procedures
4.1	Which requests require pre-authorization?
4.2	Valid approver list
4.3	Valid cost centre numbers
5.0	Common Problems and Solutions
5.1	Resetting passwords (What we can and can't do)
5.2	Creating new user accounts
5.3	Salvaging deleted files, including mail files
5.4	Changing a user's name
5.5	Changing the size of a memory swap file
5.6	Changing print drivers
6.0	Installing/ Upgrading Lotus Notes/Domino
6.1	Workstation Licence
6.2	Server
6.3	User Configuration
7.0	Troubleshooting Guide
7.1	Flow Chart: Server
7.2	Flow Chart: Workstation
7.3	Common issues
7.4	Tips and Tricks

Electronic Documentation

A relatively new idea in technical documentation is the idea of creating an electronic distribution method, rather than producing printed copies of manuals for each individual. That way, manual users always have the most up-to-date copy of information, and can easily be notified of changes. It's also more environmentally friendly.

Tip Try using a Lotus Notes database, so that you can quickly update the manual. When a significant change is made to a document, it is quick and easy to send out a doclink to a predefined distribution list.

Useful Information to have in a database:

Hardware and Software Purchases

Product:	Enter the product's name here
Serial number:	Enter the product's serial number here
Version number:	Enter the version number, including minor point, if applicable
Vendor name:	Enter the name of the vendor who sold you the product here
Address:	Enter vendor's address here Enter address line 2 here
Phone:	Enter vendor's phone number here
Fax:	Enter vendor's fax number here
Manufacturer name:	Enter the name of the manufacturer here
Address:	Enter manufacturer's address here Enter address line 2 here
Phone:	Enter manufacturer's phone number here
Fax:	Enter manufacturer's fax number here
Purchase date:	Enter the date of purchase here
Purchase order number:	Enter the purchase order number here
Purchase price:	Enter the price paid here
Warranty card sent in?	Yes _____ No _____ Not applicable _____
Length of warranty:	Enter the length of the warranty or maintenance agreement on the product
Current location of product:	Enter the product's current location. Don't forget to update this periodically!
Comments:	Enter other comments, such as reference to a service record or maintenance contract

Server Installation and Configuration

Server name:	Enter the server's name here
Make and model:	Enter the make and model of the server here
Current location:	Enter the server's current location. Don't forget to update this periodically!
Serial number:	Enter the server's serial number here
Memory:	Enter the amount and configuration (for example, 4x64MB SIMM = 256)
Tree or domain name:	Enter the name of the tree or domain in which the server exists here
Position:	The server's position in the network structure (for example, its NDS context [Novell])
Server's time zone:	Enter the time zone in which the server exists here
Protocols:	IPX/SPX _____ TCP/IP _____ AppleTalk _____ NetBEUI _____ ISDN _____ Other _____
Network Board 1:	Type: _____ Driver: _____ Frame type: _____ Settings: _____ IP or node address: _____ Subnet Mask: _____
Network Board 2:	Enter same information as Network Board 1 here
Hard disk size:	Disk 0 Size _____ Partitions _____ Mirrored? Yes ____ No ____ Duplexed? Yes ____ No ____ Part of a RAID array? Yes ____ No ____ Disk 1 Size _____ Enter same information as Disk 0 here
Disk Controller Board:	Name: _____ Disk drive name: _____ Settings: _____
Other boards:	Name: _____ Settings: _____
	Enter information for additional boards here
Domino:	Operating System installed: _____ Version: _____ Domino version installed: _____ Add-ons: attach a separate sheet
Comments:	Enter other comments, such as reference to a service record or maintenance contract
This form to be used in conjunction with Hardware/ Software Purchase	

Caution Just because something is electronic, it doesn't mean you can skimp on quality. Consider your overall content, writing style, layout, and page design, just as you would with a printed document. The less users need to scroll, the better.

Keep your electronic document management simple. It is important that the maintenance of manuals not become a chore. If you are using an HTML-based medium, this may mean ruling out the use of frames, and keeping layout tweaks to a minimum. If you are using a Lotus Notes database, this will not be as much of an issue, because there will be little or no back-end coding required.

Tip Consider putting key pieces of your documentation in a Frequently Asked Questions (FAQ) database in Lotus Notes (make sure it is ready for the Web!). This way, it is accessible to a wider audience than the complete manuals will be, and may reduce support calls.

Ongoing Documentation Needs

The things you will need to document on an ongoing basis have been discussed in the preceding sections. However, it is worth repeating that documentation is not something which you can do once and then never do again. For instance, each time a workstation is moved, its new location should be noted in the inventory database, and the workstation's ID added to the floor plan drawings of your physical network (and removed from its old location).

There are companies who will come into your organization to perform inventories, and compile the baseline set of network documents. From that point, it is up to you to update the drawings either as changes are made to the network or on a regular basis.

Keep records of repairs as part of ongoing documentation:

Maintenance History

Product:	Enter the product's name here
Serial number:	Enter the serial number here
Repair date:	Enter the date of the repair here
Repair tracking number:	Enter any tracking numbers (such as RMA or bill of lading) here
Purchase order number:	Enter the original purchase order number here; you may also need to generate a PO for the repair cost
Repair vendor name:	Enter the name of the vendor who will repair the product here
Address	Enter repair vendor's address here Enter address line 2 here
Phone:	Enter vendor's phone number here
Fax:	Enter vendor's fax number here
Repair cost:	Enter the amount the repair cost here
Repaired under warranty?	Yes _____ No _____
New warranty granted?	Yes _____ No _____
Warranty expiration date:	Enter the new warranty expiration date here
Comments:	Enter other comments, such as reference to a service record or maintenance contract
This form to be used in conjunction with Hardware/ Software Purchase	

We recommend that you set aside a regular time, every quarter, to update your network diagrams. Make sure that each time you make a change you make a note of it in a specific location (a network notebook, a database, it doesn't matter as long as you are consistent). This notebook is what you use to make your quarterly updates.

Then, once per year, do a check on your inventory to ensure things really are where you think they are. Many systems management tools, such as SMS from Microsoft or ManageWise from Novell for Intel platforms, can help with inventory tasks. Even with such tools, it doesn't hurt to do an eyeball accuracy check against what the system is telling you should be there, and it's a great way to get new technical staff familiar with the network quickly.

Tip Be sure to integrate your efforts in this area with the LAN department or equivalent in your organization, to avoid duplicating effort.

Consider formalizing your technical manual review process. This can be as simple as semi-annual in-process reviews. Develop some type of document maintenance procedures. For instance, if your company has standardized on Windows NT 4.0 with the Notes R5 client on the desktop, all the documents relating to Windows 3.1 and cc:Mail or Eudora mail can be archived. You'll likely only weed out this type of document with regular reviews. Once you have established an archive, also consider how you will retrieve documents from the archive.

Tip Supplement your internal manuals with a catalogue of software-specific technical information and a database of useful Web sites related to specific software.

Documenting Special Cases

Most networks have standards — we all try to enforce them. Then reality sets in. For instance, the entire company has Windows 98, except for the CFO, who insists on NT because she is concerned about security. Or, perhaps the only browser allowed is Netscape 4.5, except for the San Francisco office, which uses Explorer 5. The important thing to remember about exceptions is to document them.

Special cases and exceptions can be a problem. If the person who allowed the exception is not available at the time a problem occurs, there may be no way to troubleshoot problems for the user. Generally, users with exceptions made for them are senior management. Therefore, problems with them are bad problems, because they will eventually end up back at your door.

Keep records of special cases:

Workstation Installation and Configuration

Workstation name:	Naming workstations is helpful in troubleshooting	
Make and model:	Enter the make and model here	
Current location and primary user(s):	Enter the workstation's current location, as well as the primary user. Don't forget to update this periodically!	
Serial number:	Enter the serial number here	
Memory:	Enter the amount and configuration (for example, 2x32MB SIMM = 64)	
Protocols:	IPX/SPX _____	TCP/IP _____
	AppleTalk _____	NetBEUI _____
	ISDN _____	Other _____
Network Board:	Type: _____ Driver: _____ Settings: _____ IP or node address: _____	
Hard disk size:	Disk 0 Size _____ Disk 1 Size _____	
CD-ROM drive?	Yes _____ No _____	
Other boards:	Name: _____ Settings: _____	
	Enter information for additional boards here	
Operating System:	Windows type: _____ Version: _____ Other type: No _____ Yes _____ (If yes, provide details in comments below)	
Network client:	Client type: _____ Version: _____	
Notes:	Notes client? Yes _____ No _____ Version installed: _____ Browser client? Yes _____ No _____ Browser details: _____	
Comments:	Enter other comments, such as reference to a service record or maintenance contract	
This form to be used in conjunction with Hardware/ Software Purchase		

Before making exceptions, think about ways to accommodate the request without making an exception. If you can't, then consider how difficult it will be for someone else to troubleshoot any future problems. Then make sure you make notes on what you did that is different from the standard, and why.

Be sure to note special workstation installs, special server situations, special backup situations, special policies or setups for specific users. For example, if 9 of your 10 servers use DLT drives, but one uses a DAT drive, make sure this is noted somewhere. Or, if most of your users have a specific set of Execution Control Lists (ECLs), but a select group of users require fewer restrictions, be sure to document what that group can do that the others cannot do, and why.

Summary

When adequate documentation exists, administrators, developers, end users, executives, and other interested parties are able to understand the technical architecture you have put in place. This can reduce support calls, increase project buy-in at many levels, and help things run more smoothly. It can also aid in the transition time and training of new technical staff.

Develop systematic ways of handling documentation, to eliminate the randomness which often accompanies the management of this area of IT management.

Part Four. Systems Management

Chapter 18

Support and Communications

Domino may very well alter the way your organization does business. Think about messaging and calendaring alone and the potential these features have to change and improve the way staff can work. Users will rapidly come to depend on the availability of these tools and have high expectations of their performance.

One of the keys to providing a good support service is to anticipate the worst and be ready for it. It would be nice to think that there will never be problems. However, the truth is that things don't always go according to plan and when there is a hiccup, it must be resolved as quickly as possible or productivity in your business will be impacted and customer satisfaction will start to fall. Once that happens you run the risk of staff not using the product or at a minimum using it ineffectively.

With that in mind, you simply can't afford not to have an appropriate support structure in place before commencing your Domino rollout.

This chapter will discuss some key topics that you will need to address in order to provide a first-class support service and ensure return on your Domino investment.

We'll start off by discussing some fundamental processes and procedures that you will need to consider, including:

- Setting up Service Level Agreements (SLAs)
- Assessing the impact of a problem
- Negotiating maintenance windows
- The importance of change control

We'll then move on to the actual resources involved in supporting a Domino rollout by talking about:

- Integrating Domino into a support infrastructure
- Looking at the help desk
- Building your support teams
- Developing a communications strategy

Setting up Service Level Agreements (SLAs)

The first topic that should be addressed in a support situation is Service Level Agreements or SLAs. The quality of the service that is delivered to an organization is dependent on them.

An SLA is an agreement drawn up between the people paying for a service and the parties responsible for delivery of the service, usually the support teams. SLAs should set acceptable measurements of performance that realistically reflect what the business wants to receive, in this case, from a Domino solution.

The difficulty in defining and setting an SLA comes with deciding what sort of measurements to include in the agreement. If you give someone a choice, they will normally ask for everything that opens and shuts: The best service, the best equipment, the best support. Then they see the costs and reality hits.

This does not mean that you have to settle for a second-class solution. The truth is that you may not need 24 x 7 service if no one in your company ever does shift work and you are not reliant on the availability of after-hours processing of data.

When it come to negotiating an SLA, be realistic and practical. There's no sense paying for a service that you will not use. Likewise, don't sign an SLA that is completely unattainable. As a service provider, be fully apprised of the challenges that an SLA will present and be prepared to meet them.

Note It is quite likely that penalties may be imposed for missed SLAs so it is a good idea to read the fine print first.

What Does It All Mean?

In a nut shell, an SLA will help to manage customer expectations and set realistic deliverables.

An SLA will provide you with the means to measure and assess the quality of the service that is actually delivered to an organization. The information derived from these measurements can then be used to:

- Make recommendations for modifications and improvements
- Assess the stability and performance of your Domino infrastructure during periods of growth and transition
- Assist in capacity planning
- Improve user satisfaction

What Should an SLA Include?

An SLA should be referred to by support teams and customers any time there is a question as to the type of service that is offered to an organization and should contain detailed information on the following:

- Hours of operation that will be supported
- Availability of service
- Acceptable mail turnaround time
- Acceptable application response times
- Critical application availability
- Restoration times
- ID registration and turnaround times
- Password reset time
- Acceptable network response times
- Infrastructure requirements for “out of hours” monitoring, paging and support
- The percentage of problems to be resolved by first-level support at the Help desk
- Target turnaround time for problem resolution, for example, 24 hours for a severity 1 problem, 10 days for a severity 3 problem.

Assessing the Impact of a Problem

Before you can think about resolving a problem, you need a way of assessing the impact it will have on your business and the Notes user community in general. If you experience a server crash, you want to be sure that it is dealt with as a matter of urgency and priority. What would happen if your support team dealt with all problems on a first in/first out basis? You would face the potentially disastrous situation of having critical services unavailable while minor problems are being resolved.

Consider setting some basic standards that your support teams can use to prioritize problems and then some acceptable turnaround times for resolution. This is more commonly known as defining target resolution times and severity levels.

This will enable you to deliver a quality service and build customer confidence in your support teams.

Defining Target Resolution Times and Severity Levels

Generally speaking severity levels and response times can be split into four major categories based on impact to business as follows:

Severity 1

<i>Definition</i>	<i>Total system failure or service interrupted to an entire site. Would normally page support staff out on this sort of problem.</i>
Impact	Missed SLA
Resolution	Within 24 hours, with updates to client at half hourly intervals

Severity 2

<i>Definition</i>	<i>Failure of a critical system component(s) that results in performance degradation but not necessarily loss of service unless left unattended.</i>
Impact	Missed SLA
Resolution	Within 48 hours

Severity 3

<i>Definition</i>	<i>Problem affecting a single or small number of customers. May affect their ability to work but a work around can be provided.</i>
Impact	No impact to SLA
Resolution	Within 10 days

Severity 4

<i>Definition</i>	<i>Minimal impact to customer. Annoying but can continue to work and is not time critical.</i>
Impact	No impact to SLA
Resolution	Within 20 days

Negotiating Maintenance Windows

Remember Murphy's Law. If something can go wrong it will, problems will always come up, things will break, ongoing maintenance work will still need to be done. The important thing in a support situation is to deal with issues as quickly and efficiently as possible with minimum disruption to the customer.

The problem with this scenario however, is that it's not uncommon these days to have an SLA that insists on 24 x 7 service with 99.5% availability. So when are you going to be able to perform critical maintenance work without fear of failing your SLA?

The answer is to negotiate some clearly defined maintenance windows with management. Maintenance windows set aside a block of time each week or month when service can be unavailable while work is carried out on your Domino infrastructure. Maintenance windows are normally based on a two to four hour outage, outside of core business hours. If your organization is widely distributed you may also have to factor in multiple time zones to avoid impact to other sites.

Where possible, we recommend that you try to agree on a weekly maintenance window to allow for routine maintenance work. If there is no work to be done that week then there is no need to bring down the system. Remember, once a maintenance window has been established it will be much harder to negotiate additional time at a later stage.

You can use these windows to perform hardware and software upgrades, backups or any other activities that require the Domino server to be down. The window should be extended to all IT disciplines, including operating system and network, to minimize impact to the organization as a whole.

Finally, once you have agreed to a window make sure that everyone knows about it. Publicize all outages on a company bulletin board or Web page, tell the help desk and most importantly, don't forget to use change control.

The Importance of Change Control

We've referred to change control on many occasions throughout this redbook so it would probably make good sense to tell you what it's all about.

Change control is the process that consists of planning, scheduling, approving and then monitoring any changes that may affect the delivery of service to your organization. It sounds more intimidating than it really is, but the basic concept is quite simple.

The main goal is to ensure that anyone who could potentially be affected by a change, knows about it beforehand and has the opportunity to raise concerns and feedback as to the impact on delivery of service.

Take the example of a network team that needs to perform some maintenance work on a router. The Domino servers will continue to function normally during this time, however users will be unable to connect to them. Even though they have no direct involvement in the work that is being carried out, it would be absolutely critical to inform the Domino administrator and help desk of the change beforehand. The Domino administrator can check that the outage doesn't conflict with any work they may be doing at the same time and the help desk can advise users of the outage.

Change control is not meant to hinder or obstruct the work you are trying to perform in a production environment. On the contrary, if used properly, it should help to ensure that any changes that are made are carried out successfully and with minimum disruption to the entire organization.

We strongly recommend using a change control process for any changes that are made to a production environment. Remember too, that this is a process that must encompass all disciplines and departments in your IT organization. If not, it simply won't work.

Adopting a Change Control Process

A successful change control process is highly dependent on having good communication channels established between support teams and we will discuss this topic later in the chapter.

The change control process can use something as simple as a Domino database accessible by all support teams or an alternative approach as complex and sophisticated as you like. Regardless of the tool you choose, a thorough change control process should include the following components:

- Details of all the staff members who are authorized to raise and approve change records
- The date and time of the change (recommended inside maintenance windows)
- Duration of the change
- A detailed description of the change
- The components affected by the change (for example, the name of the Domino servers)
- Potential impact to end users
- Details of any testing that may have been carried out
- Onsite contact for the change, including pager or cell phone number
- Backout plan where appropriate
- Separate section for detailed documentation if required

The change should be reviewed and approved by all affected parties. Think outside the square, the world does not begin and end at your doorstep. If the work you are doing has the potential to impact another group, tell them about it beforehand.

Give people a deadline to confirm their acceptance of the change and make comments. Don't assume that if you have not heard from them, it is all right to proceed. A change should not go ahead until all approvers have formally

indicated their agreement. That way, if there is a problem further down the track they cannot avoid responsibility by saying that they weren't advised.

Once the change has been completed, close it out with an indication of whether or not it was successful. If it failed, list the reasons why and how you recovered from the problem. It may be useful information to learn from regarding any future work you do.

As always, once you've established the process, document it, make sure everyone knows about it and has the tools they need to use it.

Integrating Domino into a Support Infrastructure

For the purposes of this redbook, we're assuming that you already have some kind of support infrastructure in place. If that is not the case, then you're going to have to build one either on your own or with the assistance of a specialized consultant to advise on suitable requirements for your organization.

There are a number of reference sources available on the topic of help desks from www.amazon.com. You can also obtain the names of reputable consultants and business partners from www.lotus.com/home.nsf/welcome/partners and domino.siteatlas.com

The main thing you will need to think about now is the integration of Domino into your existing environment and delivering a quality service that ensures user satisfaction and productivity.

The following sections will provide you with some guidelines to think about when introducing Domino into the mix of your support environment.

Looking at the Help Desk

The help desk is the focal point of your entire support organization. When problems occur, it should serve as the single point of contact for your entire organization. Help desk staff will be the troops on your front line. They are the ones who are going to get bombarded with questions and problems and coordinate problem resolution between the various support teams.

If users can't get through to them or are unable to get the help they need, they will very quickly turn away from using Domino or not use it to full advantage. You will begin to lose money on your Domino investment and face the wrath of a very frustrated user community.

Anything you can do to streamline help desk processes with a focus on Domino should be given careful consideration in the planning stages of your rollout strategy.

Ensure Early Involvement

Get the help desk team involved as early as possible in a Domino deployment. Ideally, they will participate in the initial pilot phase.

It is essential that the help desk has some say in how the Domino environment will be structured as they are the ones who are going to be taking the calls. Domino is just one of many products that they will be dealing with and they may be able to provide advice and insight as to the impact it may have on other services.

Putting Staff in Place

In the early phases of the Domino pilot, calls may have gone directly to the Domino administrator to ensure that there were no holdups and that the project proceeded smoothly.

You will now need to ensure transition to the “business as usual” support teams. This will probably mean that you need to think about increasing the number of staff on your help desk. Don’t skimp on costs here. Remember that you are introducing a product that has the potential to significantly change the way staff can conduct business. It is only natural that they will have a lot of questions and problems during the early stages.

Contract staff or consultants are a good source of resources for times such as this. You will pay more for them, but remember that they are providing short-term relief and should come equipped with the skills and experience you need so that you do not have to spend time in training them.

When the project has stabilized and settled, their services can be discontinued. In the meantime hopefully, they can also share their knowledge and experience with other members of the support team and train them up to the required skill level.

Education and Training

Training is another area that cannot be skimmed on and is discussed in more detail in Chapter 15.

The bottom line is that help desk staff must be trained in all aspects of a Domino deployment in order to be able to handle the most common questions they will have to face.

They will need to understand enough about the way in which Domino works in order to perform basic troubleshooting and assess where to send a call for resolution.

The natural tendency is to log any call that contains the word “Notes” or “Domino” directly to the Domino administrator. This is not always the correct course of action to take. With training and education, help desk staff will understand that “network operation timeout error” for example, does

not necessarily mean a Domino server is down and is more likely to indicate a network problem. The faster help desk staff can troubleshoot and diagnose a problem, the faster it will be resolved.

If you cannot afford to send everyone on training, then nominate a key person who can come back and share their skills. Also, encourage help desk personnel to get Notes/Domino certification. It is a good baseline for measuring skills and raises the standard of service that your customers will receive. You can check the Lotus Web site for information on the complete curriculum provided by Lotus Education and the Lotus Authorized Education Centers. The URL is: www.lotus.com/education

Tools and Resources

Seamless integration and consistency are the key words to keep in mind here. In order to perform their jobs effectively, your help desk team will need a tool or product to log problems, track their progress and then generate reports. It is preferable to use a single, centralized database as opposed to a range of problem-reporting tools across different support groups.

As you work your way through the problem determination process it is not unusual to hand problems on to another team for resolution. What may start out looking like a Domino problem can easily end up being a hardware or network error. It will be counter-productive to have the Domino administrator using a Notes database and the network people using a completely different product if they are unable to share information as to the history of the problem and if the help desk cannot keep track of any progress that has been made.

A centralized database can then also be used to identify recurring problems and trends, measure responsiveness and to produce reports for trends analysis and future planning.

Whatever you decide on, make sure that all of your support teams can access the tool and are trained appropriately in how to use it.

Contacting the Help Desk

If the help desk is to be the first point of contact in your organization, it's a good idea to provide users with a range of choices to contact them other than just the phone. Use whatever technology is available to deliver the service.

A lot of problems don't need immediate assistance or require human intervention. If you can provide users with either the ability to resolve the problem themselves or to use an alternate method for logging non-critical calls, it will save them the frustration of waiting in queues on the phone and hopefully also reduce the load on your help desk staff. Some of the most popular options for contacting the help desk are described in the following sections.

Telephone Systems

This is obviously going to be the most conventional and heavily utilized method for contacting your help desk, particularly in the startup stages of the Domino deployment project.

Use one single, easy-to-remember phone number that is well publicized to all areas of your business.

An intelligent phone service or Voice Response Unit is a good idea. VRUs provide users with a range of options to choose from to streamline the process of reaching a subject matter expert who can resolve their particular problem. If you don't already have something in place, talk to your communications people and find out if it would be feasible and cost-efficient to implement.

The telephone system can also be updated during periods of lengthy outages to include messages with details of the problem and an anticipated time for return of service.

Log Problems Direct to a Database

An alternative approach to using the telephone system is to have users log problems themselves directly to a centralized Domino database for resolution. This would normally only be recommended for non-critical problems and would need to be checked regularly in order to meet SLAs.

Nonetheless it provides a cost-efficient alternative to ringing the help desk and logging a call and also forces users to think through the problem themselves first and take some responsibility for the initial troubleshooting process. This method also provides them with the ability to record exact error messages or use screen captures to illustrate a problem.

Frequently Asked Questions (FAQ) Databases

Why call anyone if you can sort the problem out for yourself by simply looking in a database of Frequently Asked Questions? The database can be made available to a traditional Notes client or Web browser as required. This sort of database usually contains a comprehensive list of the most common problems users encounter, with detailed instructions as to how to resolve them. If you are going to use something like this, delegate ownership to a senior help desk person with advanced skills. They should check it regularly to ensure that the content is up to date and correct.

Bulletin Boards and Web Pages

Make use of bulletin boards or Web pages wherever possible to publish known outages to the system. They can be updated quickly and will reach large sections of your target audience in a minimum amount of time. Users can look there first for details before ringing the help desk.

Web pages also provide a good mechanism for publishing links to other reference sources, self-help tips and reports.

Hours of Operation

It may be stating the obvious, but make sure that the hours of operation on your help desk match the hours of operation agreed to in your SLA.

Also, allow room for expansion and change. Hours of operation may start off with only 8 x 5 support in place, but as your Domino environment matures and your user community starts to rely more heavily on Notes, it may become more critical to extend the hours of support.

On-Call and After-Hours Support

If you are supporting a 24 x 7 solution then on-call procedures need to be clearly defined and understood. The help desk needs to be advised of the process, know the points of contact for all teams and which numbers to call at all times. Staff may be on rotating shifts so don't give out home numbers. Use pagers or mobile phones that can be shared amongst on call staff.

Ensure consistency and make sure that all platforms are represented. There is no point having operating system people on call if a problem ends up being Domino-related and the administrator is not available until business hours.

Level of Access

There are a lot of tasks that can be delegated to help desk personnel to reduce the workload on other support teams. You will need to decide how much control you feel comfortable with allocating to the help desk and the level of access you provide them to your Domino infrastructure.

For example, do you really want your Domino administrator tied up taking calls to reissue passwords or IDs when there are server outages or other critical problems to deal with? Similarly, if the help desk can first check the Domino log databases for error message or mail boxes for pending mail as part of their troubleshooting routine, it will potentially save the Domino administrator time at a later stage.

Use of “Champions/Power Users” as First-Line Support

Another way to minimize the frequency of calls to the help desk is to consider using “Notes champions” or “power users” as first-line support. These can be highly skilled users in each department who are nominated to look after the other users in their team and provide assistance where they can. The advantage of this approach is that it will help to resolve problems much faster in the first instance without the need for having to call the help desk.

The downside is that you will not be able to track how many problems are actually occurring for trends analysis or ensure adherence to SLAs. Still, depending on the individual requirements of your organization, it may prove a valid option.

Communicating Your Problem Resolution Process to All Users

From the very start of the Domino deployment process, make sure that one message is clearly communicated to all areas of your business. That is, if you have a problem, contact the help desk first for assistance. You can reinforce this message in company newsletters, Web pages and FAQ databases.

Try to avoid situations where users ring the support teams directly. When that does happen, encourage support team members to politely but firmly redirect any calls they get, back to the help desk for resolution.

Points of Escalation

A good support process will be dependent on the ability to escalate calls through various levels of the support organization while still maintaining SLAs. To do this you need to build a set of clearly defined communication and support processes between teams.

Always call the help desk first. They should aim to resolve as many problems as possible with the first phone call, 80% is a good figure to strive for. This has a couple of advantages. It will obviously keep your user community happy and confident in the product and support they are receiving. It will also alleviate the load on your Domino administrator who can concentrate their attention on more critical or proactive work.

If first-level help desk are unable to resolve the problem, it can be passed on to second-level support. This can be either a more senior help desk person or the support team responsible for the problem area. If they are unable to resolve the call then it's a good idea to have a technical specialist available in each functional area as a last resort.

What If You Cannot Fix the Problem?

Problems will always arise that despite your best efforts, you cannot resolve. When that happens you need to know where to go next for assistance.

If you have exhausted all avenues within your organization there is a number of reference sites you can go to for help. These include:

- Web sites
www.support.lotus.com/csserv.nsf/linkfr/search
www.notes.net
- News groups
- Online help

- Formal support agreement with Lotus or another external support provider
- Books and magazines

For a comprehensive list of reference sites, refer to Chapter 23, “Troubleshooting.”

Building Your Support Teams

Care must be taken to obtain representation from all IT departments within an organization when building or consolidating the support teams for a Domino rollout. For more information, see Chapter 16, “Preparing for the Rollout.”

You will first need to identify key points of contact in each area, then decide on roles and responsibilities and finally the number of staff you will need.

At a minimum, the following teams should be represented:

- Help desk
- Domino administration and deployment
- Domino development
- Operating system
- Deskside support
- Network support

Roles and Responsibilities

By now, it should be obvious that a number of support teams and roles will be needed to effectively support a Domino infrastructure. This is the time to clearly define roles and responsibilities to avoid confusion. Your aim should be to make sure that all teams clearly understand their role in the support process and can own a problem through to resolution.

There will be many occasions when boundaries will be blurred and it will be difficult to make the distinction as to which team should be contacted for support and ownership of a problem. This is when conflicts can occur and the problem resolution process will suffer while the various teams debate who really should have responsibility of the problem. The end result quite often being that the problem is not addressed at all until it is escalated to management by an angry and frustrated user.

The following roles and responsibilities should give you a good starting point to consider when putting together your job descriptions. They are not

intended to provide a comprehensive list for all of the teams involved in the support of a Domino infrastructure. However, they are key points that we have identified as critical to a Domino deployment project.

It should be noted that, ideally, all of these roles require people with excellent communication skills, patience, a courteous and friendly manner and above all a willingness and eagerness to learn. It is desirable also that staff employed in these positions have demonstrated troubleshooting and analytical skills in previous roles. They should be team players with an understanding of the importance of sharing and communicating information to their peers and able to work under pressure.

Help Desk

Your help desk provides a single point of contact for inquiry, requests and problem calls from end-users regarding desktop computer products. You will need a mix of skills in the help desk area. These staff will not only be responsible for resolving Domino problems but will need skills in all disciplines covered by your IT infrastructure.

Realistically, it will be extremely difficult to source staff with all of the skills you require across all areas. When integrating Domino into your existing environment, try to locate one or two Domino support specialists. Their role will be to deal with all of the Domino problems that cannot be resolved by first-level support and to cross-train other members of the support team to ensure that skills are dispersed throughout your organization.

Their role should encompass the following responsibilities:

- Logging and categorizing reported problems
- Assigning levels of severity for problem resolution in accordance with the severity codes
- Performing first-level problem resolution
- Coordinating the dispatch of desktide support to end-users as required
- Monitoring the status of problems to ensure problem closure within the defined service level criteria
- Managing escalations if problems have not been resolved in accordance with agreed service levels
- Reporting as required on number of calls, performance against service levels, problem trend, problem resolution times
- Coordinating the allocation and reissue of TCP/IP addresses, LAN IDs and Notes IDs to new users
- Provide interface between end users and other support teams

Domino Administration and Deployment

The Domino administrator has overall responsibility for the actual implementation and performance of the Domino service in your organization and their responsibilities include the following:

- Administrative, technical and on-call support for problems referred by the Help desk
- Implementing and administering database replication schedules
- Administration and maintenance of Domino mail routing
- Maintaining and managing Domino directories
- Performance monitoring and capacity management of Domino servers
- Management of and reporting on Domino licenses
- Administration and adherence to Domino security policies
- Providing support with regard to the management of Domino application Access Control Lists and groups
- Installing and configuring new Domino servers
- Creating and managing user and server IDs
- Planning for and supporting Domino server code upgrades
- Receiving and processing authorized requests for all end user registrations
- Processing termination requests
- Maintenance of Domino directory mailing lists and groups
- Reviewing the profile of new applications planned for deployment
- Making recommendations to the organization about the impact of implementing new Domino applications
- Implementing new Domino applications

Domino Development

The application developer has all-round responsibility for the creation and design of Domino databases in your organization. The responsibilities of an application developer are covered in Chapter 11, “Designing an Application Infrastructure,” and should include:

- Preparation and design of Domino database applications
- Identifying the need for a Domino application in the first instance
- Adherence to Domino database design standards

- Documentation and handover to support teams for business as usual
- Modifications and changes to Domino database designs

Operating System

The operating system specialist has responsibility for delivery of service specifically related to all aspects of the operating system at the server level. Their role will possibly also extend to responsibility for the operating system installation and maintenance on firewalls and DNS servers. Their primary responsibilities include:

- Assisting with the configuration and quality assurance of hardware and software installation
- Administrative, technical and on-call support for problems referred by the Help desk
- Advising on capacity and performance issues at the operating system level
- Planning for and supporting upgrades, systems management and new product implementation
- Backup and recovery

Deskside Support

The person responsible for deskside support has a role similar to that of the help desk but with more interpersonal involvement with the clients. Again, they require more than just Domino skills as they will be asked to assist with a wide range of desktop application problems. They should be trained in the fundamental aspects of Domino and know when it's time to refer a problem back to the help desk if it cannot be resolved in a relatively short period of time. Their duties include the following:

- Dispatching deskside support to the end-user site when problems cannot be resolved by the Help desk or another second-level support group
- Monitoring the problem tracking system to receive calls from the help desk
- Routing calls back to the help desk when unable to resolve the problem

Network Support

The network support teams have responsibility for the end-to-end management and performance of the network infrastructure in an organization. Their roles should encompass the following:

- Monitoring and maintaining network equipment
- Managing DNS names and IP address allocation

- Managing DNS proxy/firewall servers
- Performing problem management tasks
- Performing problem determination on network lines, hardware and software
- Monitoring and tuning network components to meet service level requirements
- Recommending hardware, software modifications or additional bandwidth to improve network performance
- Tracking network usage and provide information for use in determining future network capacity requirements
- Notifying customer when any network element reaches high utilization levels and requires additional capacity to maintain service levels
- Projecting growth and capacity requirements and recommending improvements required to manage network load
- Providing network utilization, response time, availability reports and other negotiated performance reports at regular intervals

Developing a Communication Strategy

A good communications strategy is the glue that holds the entire support process together. The success of support is so dependent on communications that it is impossible to separate the two topics.

Clearly for any undertaking the size and complexity of a Domino deployment project, you need an effective communication strategy to ensure success and win support throughout the organization.

Communicating within the Organization

Communication channels need to be established and developed to reach every section of the organization. Staff should be made aware of the benefits they will receive from adopting and using Domino. You've spent quite a lot of money rolling out a Domino infrastructure. It's now time to recoup some of your investment.

How will Domino help staff in your organization to do their jobs better? What are some common hints and tips they can use to work more efficiently? Where should they go for help? How can you communicate all this new information to them quickly and efficiently? Read on for some ideas and guidelines.

Executive Sponsorship

The importance of having management and departmental “buy in” or sponsorship cannot be emphasized strongly enough. The executive in your organization need to be among the first to adopt Domino and start spreading the word in the form of personal communications and addresses to the general community.

Their early enthusiasm for and support of the product will help to shape and direct the successful integration of the Domino product into your organization.

Domino Databases

Domino ships with a large range of database templates that can be used to quickly disseminate information throughout your organization. Discussion databases, hints and tips databases, Frequently asked Question databases can all provide a “quick win” solution to the business in the form of easily maintained, cost-efficient methods of communication.

These databases contain lists of the most common questions and problems users will encounter in Domino, with detailed instructions as to how to resolve them. They are usually made available to the entire Notes community so that users can refer to them for assistance at any time.

The following lists provides a sample of the sort of information that could be included:

- How to request a Domino user ID
- How to set up a laptop for mobile use
- How to get your Domino password reissued
- How to set up local replication
- How to manage the size of your mail file by removing attachments and deleting unwanted mail
- How to implement security features on your Domino workstation

System Support and Reference Databases

Another good idea is to set up separate databases containing technical information specifically targeted at each specialist support team. Because of the detailed nature of the information contained in these databases, they are not generally made available to the end user community. However, they can be indexed and searched to quickly provide an invaluable source of reference material to support staff, particularly new starters.

An example of a support database for Domino administrators could contain some of the following information:

- Installation and configuration procedures for Domino servers
- Network design and topology of the Domino infrastructure
- Domino naming conventions
- Replication topology and schedules
- Mail routing topology
- Standard notes.ini parameters
- Security considerations and requirements
- Daily operational procedures and tasks
- Monitoring and reporting requirements
- Backup and recovery policies and procedures

Application Registry

The application registry is discussed in detail in Chapter 11, “Designing an Application Infrastructure.” Suffice to say that it can be used by the employees in your organization to check on the type of databases that are available to them on your Domino system. It can provide them with the ability to quickly review and locate a database for a specific requirement and the contact details for access to the database.

Alternative Communication Methods

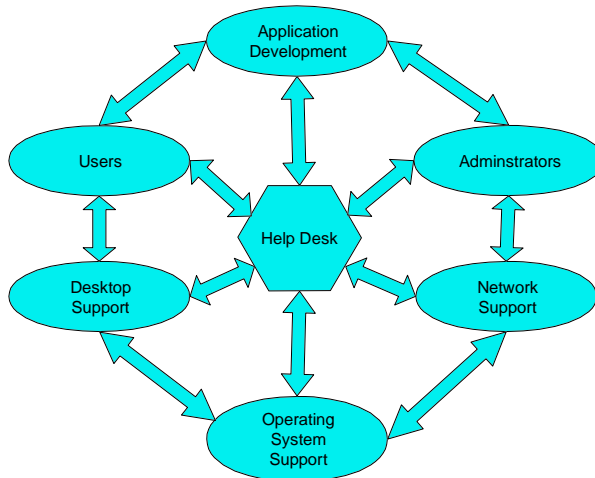
The range of communication options that are available to choose from will be limited only by your imagination. Be creative, take advantage of new technologies, ask for input and feedback from all areas of your organization, have competitions for the best suggestion of the week. Some popular ideas could include but are certainly not limited to the following:

- Marketing packs
- New starter kits
- Web pages
- Internal newsletters
- Company videos
- Training courses

Communications between Support Teams

Developing a strong working relationship between support teams is key to the success of your support strategy. Many of their areas of responsibility will overlap so closely that without clear and constant communication between the teams you will face the risk of problems taking longer to resolve or not being attended to at all.

The following diagram shows how the help desk is the key element of the entire support structure, playing the central role in coordination and communication between the support teams.



It's essential then to build on partnerships. If it's possible, try to locate your support teams as close to each other as possible. It's much easier to work with someone that you have met face to face. You are less likely to brush them off when you know who it is that you are talking to at the other end of the phone.

Consider rotating staff from one team to another to promote cross-training and the distribution of knowledge and information. It's always beneficial to see "how the other half lives" and this can provide support teams with invaluable insight in their troubleshooting roles. If this isn't feasible, try setting aside days where key individuals from one team can spend time in another area to pick up ideas and meet other team members.

It's not always easy to keep track of staff movements in support teams. At any one time, they can be attending to server problems, tied up in meetings or talking a user through a particularly tricky problem.

For the help desk personnel who need to talk to them, it is an absolute necessity that they be able to contact someone at all times who can assist with critical problems. Think about setting up telephone hot lines and hunt groups so that the help desk can quickly locate the first available team member for support.

Last but not least, if your support teams encounter a situation that they know is going to affect performance or interrupt service altogether, make sure that the information is broadcast throughout your organization appropriately. If you know a server is going to be down, the staff on the help desk will be your life-long friends if you call them first and let them know. Likewise, once service is restored don't forget to tell them. They can coordinate and relay information to the business, freeing up your support teams to get on with the business of maintaining and providing essential services.

Summary

This chapter started off by discussing the importance of establishing a good support infrastructure and how that relates to the seamless integration of any new product into an organization and subsequently overall user satisfaction.

We discussed how Service Level Agreements can be used to set realistic support deliverables and to manage customer expectations and we then gave some guidelines as to what they should include.

We went on to explain how you can assess the impact of a problem on the business by defining a set of target resolution times and severity levels. Setting up maintenance windows and change control procedures were discussed as a way of managing and performing routine changes to the infrastructure without impacting service to the business.

We then moved on to the actual resources involved in supporting a Domino rollout by reviewing Help desk and support team requirements. A sample list of roles and responsibilities for the key support elements was provided as a guideline to establishing and consolidating your own support teams.

Finally, we talked about the communication process and how it is central to the continuing success of your support organization. We gave you some ideas for how to communicate with the organization and emphasized the need to build strong and open communication channels between support teams to guarantee the highest level of support to the customer.

Chapter 19

Administering Your Domino Environment

Now that the hard work of planning and installing your Domino system is complete, it's time to hand over to the support teams for "business as usual." Before this can be done though, you need to give some serious consideration to the ongoing needs of your administration team and exactly what they will need to perform their jobs effectively.

Monitoring, performance tuning and backups are all critical and ongoing aspects of managing your entire Domino environment; these will be discussed in detail in the next chapters. However, there are many other day-to-day activities involved in making sure your Domino environment stays up and running at peak performance.

It would be virtually impossible to cover in detail every administration task that a Domino administrator will be called on to perform, and that is certainly not our intent in this chapter.

We have chosen instead to focus our discussions on a set of core Domino administration tasks that will need to be performed on a regular basis and some processes and tools that can be used to support them.

The following topics are covered:

- Managing your Notes user community
- Managing your Domino server infrastructure
- Tools to make your life easier
- Summary

Managing Your Notes User Community

Work does not stop after the initial registration and rollout of new Notes servers and users in a Domino environment. At any given time, people join and leave a company, change their names, may require access to a different organization and make a multitude of other requests to administration staff. You will need to develop and document processes to efficiently deal with these day-to-day requests and the subsequent workload it places on your Domino administrator.

In the following sections, we'll discuss how much ongoing work is really involved in setting up and maintaining your Notes users and ID files by reviewing the following topics:

- Setting up new users
- Managing user ID's
- User name changes and recertifications
- The termination process

Setting Up New Users

A request to register a new Notes user does not begin and end with the Domino registration process. You will need to collect information, decide what each user will need on their workspace, create a user ID, distribute the ID file and set up their workstation. Let's take a more detailed look at the actual steps involved below.

Gathering Information

Firstly, you probably won't want ad hoc requests coming directly to your Domino administrator. It's time-consuming and inefficient to register users one by one as opposed to registering a batch of users at a time. It would be a much better idea to coordinate requests in a more manageable fashion by recording new user information in a centralized location.

Before deciding exactly how to do this, make sure that you check for any processes that may already exist within the organization. Have a chat with the Human Resources people, they are the best source of information you have when it comes to getting personnel details. If they already have a procedure in place that records new employee details, try to capitalize on it or integrate the information into a Domino database.

We recommend collecting information in a centralized system like a Domino database for a number of reasons:

1. You can ensure that mandatory details are captured “up front” and you will not have to waste time going back to your users for more information.
2. You can confirm the request is legitimate and has management approval by having the employee’s manager, their delegate, or a Human Resources staff member complete the initial registration form.
3. You can easily extract information in the required format for input into a batch registration text file.
4. The information can be used by more than just one department in your organization, saving duplication of effort. For instance, HR may input the initial data and then the Domino, desktop, operating system and network teams can use the information they need to set up a new user. It will streamline the amount of time it takes to get a new user started and working productively in the organization.

Obviously, if you choose this approach, you will need to take care in implementing strict security measures on the database, but that should not prevent you from establishing a usable and efficient system for the entire organization.

Setting Default User Information

After you have collected the information required to register a person, you will need to think about how you want their Notes workstation to look when it is set up.

For instance, would you like all users to have a specific set of databases on their workspace? Should contract staff see the same set of databases as permanent employees? Do passthru servers need to be defined in location documents for every mobile user?

User Setup Profile Documents

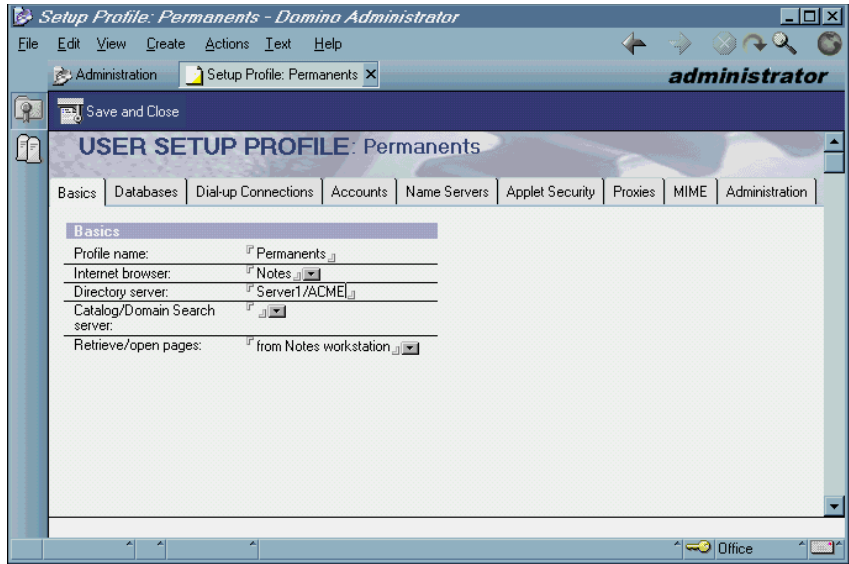
Consider using the R5 user setup profile documents to specify the default settings a person will have when they first open Notes. Profile documents will help to streamline the registration process and ensure that all users in your company are set up, initially at least, in a consistent manner.

They can also be used at a later date to push new settings and information out to the Notes clients. The user setup profile documents are created from the People and Groups tab on the Administration client enabling you to define:

- Workspace settings
- Specific databases that will appear on a workspace
- Default bookmarks

- Mobile directory catalog to be added to the workspace
- Connection information for Internet and passthru servers

The following figure shows you an example of a user setup profile document:



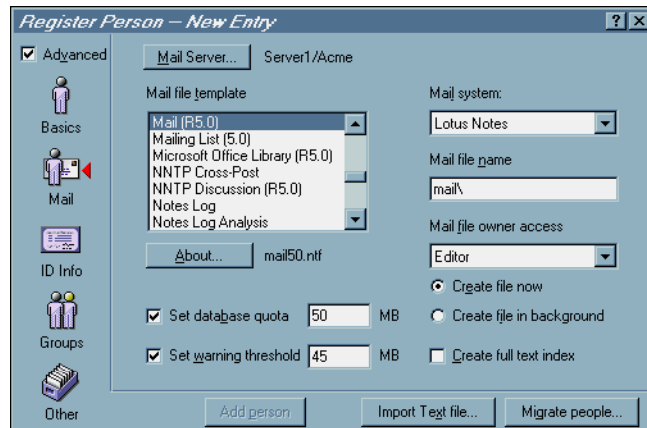
It's a good idea to set up different profiles for functional groups of employees with slightly different requirements. That is, one for regular full-time employees, another for contract staff and executives and yet another for mobile employees.

Registration Process

The information specified in user setup profile documents will affect the way a person's workstation looks when they first open Notes. However, before you go ahead and register users you will also need to give careful thought to specific settings that should be applied to their actual mail files.

For instance, do you want to apply quotas to every user mail file? Would you like to allow users to have Alternate Name Language support? Would your company like users to have only Editor access to their mail file rather than Manager access?

All of these settings can be specified during the registration process, either in the Advanced user registration dialog box (see the following figure) or in a registration text file.



The main thing to remember here is that there can be a lot of information to collect and specify and it's good practice to ensure a consistent approach in the registration process. There may also be a number of other steps that must be completed prior to distributing the ID file. For example, if you have a clustered server environment, you will need to make sure that a copy of the user mail file exists on the clustered servers.

To avoid mistakes and ensure that critical details aren't overlooked, put together a user registration checklist specifying the default settings that should be applied to user mail files and any other steps that need to be completed during the registration process. Store it in a central location where administrators can refer to it as needed.

Distributing User IDs

Once you have completed all of the steps in the registration checklist, you will need to distribute the user ID files.

Important For security purposes, we do not recommend storing user IDs in the Domino directory. Anyone browsing the directory will be able to detach the ID. If they are subsequently able to figure out the password, there is a high likelihood that your Domino environment will be exposed to unauthorized use or fraudulent attacks.

There are a number of ways to distribute user ID files depending on the size of your organization and your security requirements. You can choose any combination of the following examples:

- Send the ID in an encrypted Notes mail message to the person responsible for setting up the Notes workstation. This may be the Domino administrator or deskside support.
- Send the ID in an encrypted Notes mail message to the person's manager or another trusted individual who will then have the responsibility for coordinating the Notes workstation setup.

- If you have the workstation data directory on the network, distribute the ID directly to the user's home drive. Refer to Chapter 12, "Designing a Client Infrastructure," for more information.
- Look at the existing infrastructure of the organization. If you have an existing software distribution system, you may be able to integrate the distribution of Notes ID files with an already established process.
- Use the database where the original request was made to store the ID file. The ID can be attached to a form in a view with the appropriate security measures to protect against unauthorized access. Make use of encryption, roles in ACLs, restricted views and forms to effect database integrity.
- Don't forget mobile users. They will probably have special requirements in that they may not always be available in the office or able to connect to the LAN. You may therefore need to think about using floppy disks to distribute their IDs or have them bring their laptops in for installation. If IDs are sent on floppy disks in the mail, take the added precaution of sending them by registered post.
- Use a directory on a server that is locked down and only available to a nominated group of people like the administration or workstation setup staff.

Important Whatever method you select, it is important not to send or include passwords with the ID files. If the document or message goes astray, it will present an open invitation to someone to misuse your Domino system. If necessary, send a separate encrypted mail message containing password details.

Managing User IDs

It's a fact of life. IDs will get lost, damaged or go astray. Passwords will be forgotten. When that happens you need to be able to retrieve a backup copy of the ID file or password so that your users can continue to work.

One word of advice here is to delegate the responsibility for this process to another group separate from your Domino administrators. The help desk is an obvious choice, since they will be the ones to take the initial phone call. It will save a significant amount of time if they are given the responsibility for reissuing passwords and ID files. It will also help to alleviate the workload on your Domino administrator.

You will need to store backup copies of all Notes user IDs in a secure location. You can do that by:

- Storing a copy in a secure database on your network
- Storing the ID in a hidden file system on the network
- Use the ID and password recovery feature in R5 (refer to Chapter 29 in the Lotus Domino 5 Administration manual for details)

Note As a last resort if you cannot locate a backup copy of the ID file, you can always re-register a person and issue a new ID file. However, this will mean that any encrypted mail messages or encrypted data that had been stored or received using their old ID file will then be lost, since the user will no longer be able to read that mail. Also, any certificates they may have held in their old ID will need to be reissued.

User Name Changes and Recertifications

User name change and recertification requests will come in to your administration team with monotonous regularity. When this happens you will need to have documented procedures in place for your administration team to follow. Initially you will also need to check the following details (refer to the Lotus Domino 5 Administration manuals or the Online Help for more information):

- Make sure that the adminp process is set up correctly and that replica copies of the admin4.nsf database exist on all servers in your Domino domain. If a replica copy of the admin4.nsf database does not exist on a server for some reason, the adminp process will be unable to successfully run to completion.
- Make sure that a copy of the certification log (certlog.nsf) database exists in your domain. This may sound obvious but if it has been overlooked in the initial registration and setup of your Domino environment it will present enormous difficulties when it comes time to rename users. The certlog.nsf database contains a permanent record of all user IDs that have been registered plus details about their certificates. You cannot go back and add these user details after the fact. In this case people will need to be recertified manually.
- When the recertification process is complete, remember to make a backup copy of the newly recertified ID files. Remove the original ID file containing obsolete details to avoid confusion.

Tip It's a good idea to manually add a person's name to the ACL of their mail file database before you begin the recertification process. This is a precaution in case anything goes wrong with the administration process. Once you have successfully tested the new ID, remove the person's old name from the ACL of their mail file for security purposes and to avoid confusion.

The Termination Process

When a person leaves an organization, it is absolutely essential that their Notes user name be placed in a Terminations group to prevent unauthorized access to your Domino environment. A process must be put in place so that this can be acted on as a priority.

Coordinate with the Human Resources department to receive updated and timely reports on staff who have left the company. If staff are off the payroll, they should be denied access to your Domino servers immediately. Once again, try to integrate with any existing processes to avoid duplication of effort. Whenever possible, aim to record information once for the entire organization in one central repository.

Placing a user name in the Terminations group is only half of the exercise. The remaining step is to decide what to do with their mail file. Check with management to see what sort of policy they would like to adopt. Many companies choose to leave mail files on a server for a number of weeks in case they need to obtain specific information.

Also people often resign in the heat of the moment and then decide to come back or you may have legal obligations that prevent you from removing a mail file.

If you do decide to leave mail files on the server for a limited period after an employee has been removed from the Domino system, make sure that you have a reliable follow-up process in place. You'll need to be sure that these files are deleted after an agreed time so that they do not consume valuable disk space when they are no longer required.

Contractor IDs

Many businesses these days are employing contract staff whose details do not get recorded anywhere in the company Human Resources system. Most of the time, administrators must rely on the contractor's manager to advise that they have left. There is quite often a delay of days or even weeks or the managers are not aware of their responsibility to pass on this information.

For this reason it is a good idea to register contractor user IDs with a limited expiration date. By default, Notes user IDs expire after two years. After that, they need to be recertified so that staff can continue to use them. When you register contractor user IDs it's a good idea to think about limiting the expiration date to a much shorter period of time. When a request comes in for a contractor ID, part of the information collected should include the length of their contract. If the contract is for six months, only validate the Notes user ID for six months. If the contract is extended, the user ID can be recertified for the appropriate length of time.

Managing Your Domino Server Infrastructure

A significant amount of time in a Domino administrator's day is consumed in the performance of routine maintenance tasks and procedures. This is quite commonly referred to as daily operations. Routine checks are usually carried out to minimize the risk of potential problems and ensure that your Domino servers continue to function reliably.

It is important that these tasks are not overlooked and are completed with attention to detail. The information that is gathered each day can be recorded in a central location and also used to provide some of the data you will need to successfully troubleshoot problems and perform capacity planning and trends analysis for your Domino infrastructure.

As your environment grows, however, it will take up a significant amount of time to perform these checks manually. Any time you can save by streamlining processes or developing an automated approach can be invested in more proactive activities.

Routine Maintenance Procedures

The tables listed in the following section will provide you with some basic guidelines for the activities that must be performed on a regular basis by your Domino administrator(s). The tables include activities that, based on our own experience, we have found to be the most critical in terms of daily operations. You may choose to remove or add tasks from these lists according to your specific requirements.

Review them with your administration team and take the time to document procedures and processes first. Select tasks that will ensure you can maintain a stable working environment and commit to Service Level Agreements (SLAs). You should have at least one experienced Domino administrator on staff to provide advice on these activities. If not, talk to an experienced consultant.

Remember too that your requirements will change over time and so too will your Domino infrastructure. Be prepared to make modifications to your processes as your environment settles.

Also, if you have more than one administrator overseeing the Domino environment, consider breaking up responsibilities for day-to-day tasks between the team members. The more junior team members can perform the routine and mechanical tasks while they are still learning. The senior administrator is then freed up to perform more proactive work and concentrate on optimizing the environment, troubleshooting and planning for the future.

The help desk is also a good source of resources for tasks such as reissuing passwords and IDs. Your aim should be to relieve your more experienced staff of the day-to-day operations so that they can attend to the more pressing issues.

Operations Checklists

The following tables have been categorized into daily, weekly, monthly and periodic tasks. They include a list of the suggested tools that you might use to perform each activity. Tools will then be discussed in more detail in the following section.

Daily

The following tasks should be performed on a daily basis:

<i>Daily Activities</i>	<i>Tool</i>
Check status of Domino servers.	Administration client
Ensure all domino servers are responding.	Third-party monitoring tool
Check status of Domino server tasks for availability. For example, router, replica, HTTP, update.	Administration client Third-party monitoring tool
Check Domino log databases for error messages that may indicate database corruption or unauthorized access attempts.	Administration client Log Analysis tool Web Administrator
Search on key words and phrases such as "corrupt", "error", "warning", "unable", "attempt to access....."	
Also check for unexpected outages in the last 24 hours.	
Ensure replication of critical Domino system databases and application databases has completed successfully.	Administration client Replication Event View in the Domino log database Event notification
Confirm mail is routing correctly by checking the mail boxes on each server for dead and pending mail.	Mail.box databases Message Tracking Center Administration client Web Administrator Event Notification
Check Domino directory for replication conflicts.	Manually check all views in the Domino directory.
Ensure backups on all Domino servers have completed successfully overnight.	Backup utility logs Transaction logs

continued

<i>Daily Activities</i>	<i>Tool</i>
Review and resolve outstanding problem reports, trouble tickets and event notifications in accordance with SLAs.	Problem Tracking and Management system Statistics and Events
Ensure all modem connections are active and available.	Domino Log database Miscellaneous Events View Phone Calls View
Perform daily requests as required. Register new users. Perform name changes and recertifications. Action termination requests. Move mail files.	Administration client Administration Requests database Web Administrator* Third party tool

* The Web Administrator does not provide the full functionality of the Administration client in terms of registering and recertifying Domino users. Refer to the Lotus Domino 5 Administration manual for full details.

Weekly

Once a week, the following tasks should be performed:

<i>Weekly Activities</i>	<i>Tool</i>
Ensure adequate disk space on Domino servers.	Administration client Web Administrator
Perform routine maintenance tasks. Ensure that weekly housekeeping tasks, such as upcall, fixup and compact have run.	Program documents Domino log database
Prepare weekly reports in accordance with client requirements.	Administration client Statistics and Reporting database

Monthly

The following activities should be performed on a monthly basis.

<i>Monthly Activities</i>	<i>Tool</i>
Shut down all Domino servers. Run routine maintenance tasks on critical system databases that are normally open at all times. This should include running upcall, fixup and compact on the Domino directory, log database, mail boxes, statistics and reporting database.	Command line prompt
Review, update and modify system documentation as appropriate.	Domino administration and guidebook database

Periodic

The following tasks should be performed on a periodic basis, for example at quarterly intervals.

<i>Perform clock changes as required for daylight savings changes.</i>	<i>Command line prompt</i>
Perform periodic audit and review of Domino server infrastructure. Preferable that this be undertaken by an external party. Results should be recorded and distributed to Domino administrator(s) for action as required.	Various third-party tools Administration client Domino system databases such as the Domino directory, log, statistics and reporting.
Review Domino server capacity. Undertake performance tuning initiatives as appropriate. Procure and install new hardware as required.	Administration client Decommission server analysis tool
Evaluate QMRs, QMUs, other new releases and add-on products	Test environment
Review and validate integrity of test environment Conduct review with Help Desk, check for any major recurring problems. Train users and junior team members on new databases or other Domino system changes as required.	
Perform clock changes as required for daylight savings changes.	Command line prompt

Tools to Make Your Life Easier

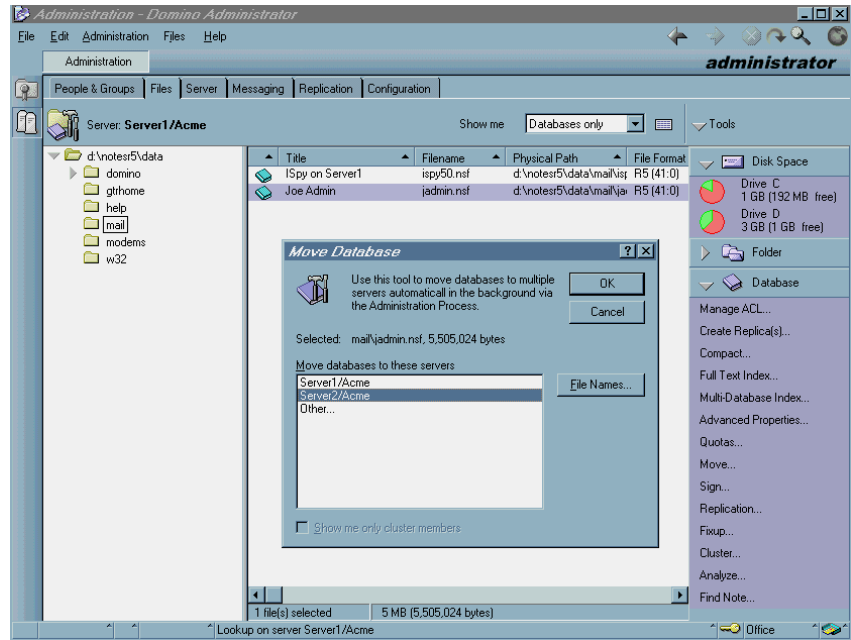
There are many tools and databases available in R5 to assist in the management of Domino servers and users and for performing regular administration tasks. You will need to have good working knowledge of them, take the time to test them out and familiarize yourself with their available features. They will play a big part in your daily operations.

Detailed technical information on how to set up, configure and use the tools discussed below can be obtained from the relevant chapters of the Lotus Domino 5 Administration manuals. The online help is also very useful.

Our goal in this section is to make you aware of some of the choices that are available and where you can go to find out more information.

R5 Administration Client

The Administration client will be the primary tool that administrators will use to manage the Domino environment. It looks like this:



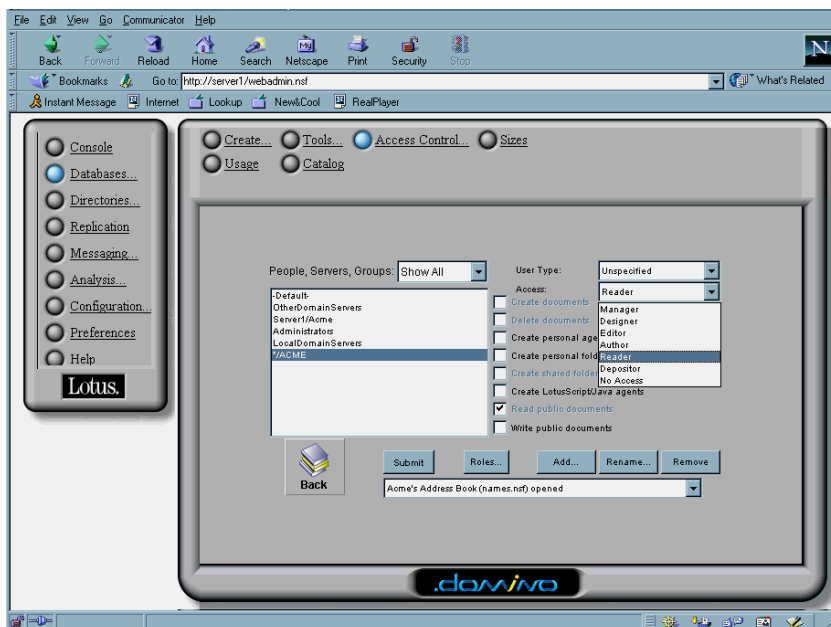
Using this client you will be able to perform the majority of day-to-day server administration tasks to ensure that the Domino infrastructure is running smoothly.

This includes the following:

- Registering users and servers
- Maintaining groups
- Managing ACLs
- Moving databases (see diagram above)
- Checking on the status of servers
- Managing and monitoring mail
- Managing and monitoring replication
- Checking the server console
- Checking on disk information
- Using database tools

Web Administrator

The Domino Web Administrator is handy to use if a Notes client is unavailable. The interface looks like this:



You can use the Web Administrator to perform the following server administration tasks on any server running the HTTP task from a browser:

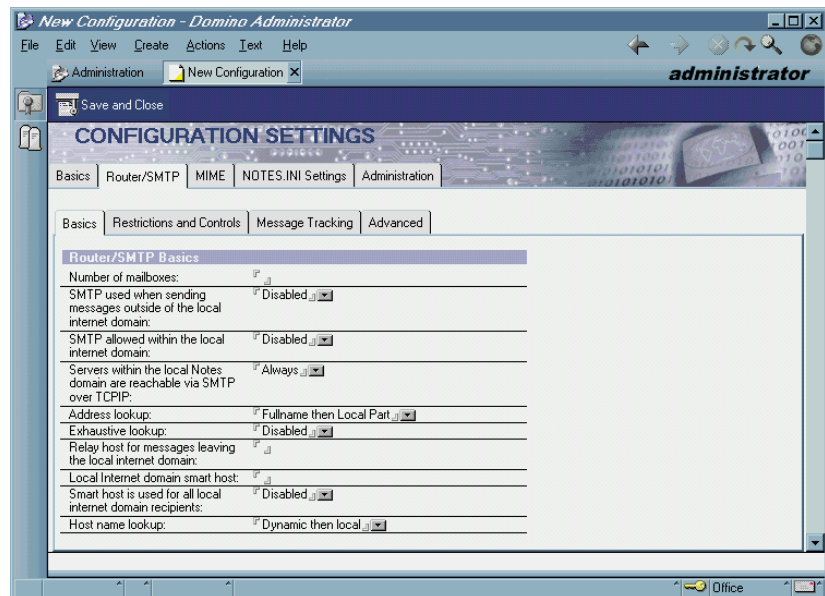
- Monitor dead and pending mail
- Monitor server memory and disk space
- Monitor server requests and commands
- Analyze server messages and view the log file
- Enter commands at the remote console
- Create group and person documents
- Manage Access Control Lists (see previous figure)
- Manage databases
- Create new databases
- Edit system files

- Track mail messages
- Generate a mail usage report

Refer to Chapter 11, “Setting Up the Web Administrator,” in the yellow book *Administering the Domino System*.

Server Configuration Document

The server configuration document will be used to configure default information for one or multiple Domino servers in your domain. It can be accessed via the Server/Configurations view in the Domino directory.



Use it to set configuration parameters for:

- Mail/SMTP tasks
- MIME settings
- Notes.ini settings

Program Documents

Program documents should be used to schedule regular maintenance and housekeeping tasks. For example, program documents to run updll, fixup and compact should be scheduled on a weekly basis to run on all of the Domino servers in your domain.

Server Tasks

The server tasks, Updall, Fixup and Compact will also be used regularly by administrators to maintain the integrity of Domino databases. They should be run on an as needed basis whenever view or document corruption problems are encountered in a Domino database.

Updall

Corrupt views can be fixed in the majority of cases by running updall or in more serious cases updall -r.

Caution Be selective when running updall -r on a production server. It can be quite resource-intensive depending on the size of the database and the number of views and may therefore impact performance on your server. If necessary, wait until after hours before running it.

Fixup

Fixup can be used with a number of different switches to resolve document corruption problems.

Compact

It's always a good idea to run compact after running updall or fixup on a particularly troublesome database as an added safety check.

Domino System Databases

The following list of Domino databases all contain information that will be helpful in the performance of routine administration and maintenance tasks:

- The Notes log (log.nsf)
- Administration Requests (admin4.nsf)
- Statistics and Events (events4.nsf)
- Statistics Reporting (statrep5.nsf)
- Mail Router mailbox (mail.box)
- Certification log (certlog.nsf)
- Catalog (catalog5.nsf)
- Domino Directory (names.nsf)
- Domino MailTracker Store (mtstore.nsf)
- Domino Web Server Configuration (domcfg.nsf)
- Domino Web Server Log (weblog.nsf)
- Reports (reports.nsf)

- Notes log analysis (loga4.nsf)
- Cluster analysis (clusta4.nsf)
- Agent log (alog4.nsf)

For a detailed description of each of these databases, and how they are used, see the Lotus Domino 5 Administration manuals and the online help databases.

Documentation

We have mentioned several times throughout this chapter that it is a good approach to document and store information in a central location.

Specifically, we recommend setting up a database that the Domino administration team can refer to at any time for details and procedures on the server and user environments they will be supporting.

The database should serve as a one-stop shop for new team members trying to get quickly up to speed on the infrastructure. It will also help to ensure that existing team members do not overlook critical details in their daily activities.

As an example, you may want to include detailed information on processes and procedures such as:

- Registering new users
- Reissuing passwords
- Retrieving an ID file
- Backup procedures
- Checklist for setting up a new server
- Default ACL settings for critical system databases
- Troubleshooting steps for server crashes
- Daily procedures
- Generating reports
- Domino security requirements
- Network diagrams
- Mail routing topology diagrams
- Replication topology diagrams

Resources and References

For a comprehensive list of resources and reference sites that will provide valuable information relating to your daily administrative tasks, refer to Chapter 23, “Troubleshooting.”

Summary

In this chapter we looked at the issue of managing and administering your Domino environment on a day-to-day basis. There are a great many tasks that must be performed on an ongoing basis to ensure that the Domino infrastructure continues to run smoothly.

We discussed some ideas to streamline and improve processes and how these could be applied to some of the most common tasks an administrator is asked to perform.

We talked about the importance of performing routine checks and maintenance and gave you some recommendations on how to apply these to your daily operations.

Finally, we reviewed some tools and resources that help you to carry out regular administrative activities. We also pointed out where you might go to obtain more information.

Chapter 20

Monitoring and Reporting

Implementing an effective monitoring and reporting strategy for your Domino environment requires careful consideration and planning.

This chapter discusses some of the key issues you will need to address, including:

- Why monitoring is important
- Determining the scope of your monitoring requirements
- What to monitor
- Tools for monitoring Domino
- Virus checking
- Reporting
- Summary

Why Monitoring Is Important

Monitoring is a vital component of good systems management for a number of different reasons. The most obvious one being, if Notes/Domino stops working, so too potentially will large sections of your business. Once this happens, you will start to lose money on your Domino investment and user satisfaction will fall dramatically.

It is essential then, to weigh the costs in terms of downtime very carefully against the costs of providing a satisfactory monitoring and management solution to your business.

An effective monitoring strategy will assist in:

- Detecting problems
- Meeting Service Level Agreements (SLAs)
- Improving quality of service
- Reducing the costs of support

- Minimizing lost productivity due to problems
- Improving customer satisfaction

Determining the Requirements

The challenge that you will face in planning a Domino monitoring solution will be to design a strategy that minimizes overhead and cost but at the same time delivers a solution that satisfies your business needs.

Before you develop a monitoring solution though, you first need to take a step back and determine the scope of your requirements from both a business structure perspective and support perspective.

Your aim should be to build as detailed a picture as you can of what your current infrastructure looks like and the level of service that you will be expected to provide. There are no shortcuts. It is only by understanding what it is that you have and where you want to be, that you will be able to tailor a monitoring solution that truly fits the needs of the organization.

The following sections discuss some of the aspects that are likely to influence the design of your monitoring solution and ultimately the product that you will choose to fulfill your monitoring needs.

Existing Infrastructure

If your organization already has an existing monitoring solution, then a major part of your decision will have been made.

Priority should always be given to integrating with existing infrastructures as seamlessly as possible. However, even if you are going to be able to capitalize on an existing monitoring solution, you will still need to factor in the ability of the product to send and receive Domino events and alerts. Is there any customization required? How much work will be involved? Will you require additional resources for support?

If your organization does not have an existing solution, then you will need to move on and consider a number of other key points.

Number of Domino Servers

If you have a relatively large organization with many servers, you may want to invest in an enterprise-wide systems management solution like Tivoli's TME 10 Enterprise Console. However, if you have a relatively small organization with only a few servers, then it may make more sense to choose a centralized Domino-based monitoring solution.

Service Level Agreement Commitments

Try to establish the level of service that will be demanded from your Domino environment by reviewing and understanding any Service Level Agreements that may be in place.

For instance, does your organization require 24 x 7 support or can problems wait until business hours to be resolved?

If you require 24 x 7 support, think about the additional requirements involved in maintaining this solution. It's more than likely in this case that you will need an enterprise console for receiving alerts, operations and on-call staff and paging gateways. This will all add to the overall complexity and cost of a monitoring solution.

Organizational Structure

If your organization is located in a small number of sites it may make more sense to centralize a monitoring solution to minimize resource and support costs.

On the other hand, if your organization is fairly distributed you will be faced with the question of how to effectively monitor and manage a Domino infrastructure that is distributed across a number of different sites, or even countries with potentially different languages and time zones. We'll expand on these points in the next two sections.

Centralized or Distributed Management

Your primary design consideration will probably boil down to whether or not to centralize a Domino monitoring solution because this will have the most direct effect on costs and quality of service to your organization.

By this we mean, should you locate management systems at each site within your organization or is it better to centralize this function in one location? This will have major ramifications in terms of support costs, training and quality of service. Can you be sure that the staff located at each site have the skills to support your Domino infrastructure and respond to any problems that are detected?

How do you guarantee consistency in problem resolution and detection if each location is responsible for providing its own monitoring and support solution?

Do you need staff available onsite to confirm the status of your Domino servers and possibly restart them in the case of critical problems or do you already have remote management tools in place to handle this situation?

Going Global

This is a further extension of the issues posed above but adds complexity to the scenario by introducing language and time zone differences.

Does your organization have a requirement to support different languages and time zones?

Consider the example of a company with offices in New York and Beijing. How do you ensure that a problem detected in Beijing during critical business hours is effectively resolved when your support team is sound asleep because it's the middle of the night in New York?

On top of that, factor in the language differences. Do you have support staff available and on call who can speak Mandarin or do you expect staff in China to conduct business in English?

Either way you will need to make provision for off-hours support, but you may have to extend this to include a certain degree of local presence in order to effectively resolve problems in a timely manner.

Network Capacity

The capacity of your network backbone will have a major influence on the design of your systems management platform.

If you have extremely limited bandwidth, it will probably not make a great deal of sense to centralize your monitoring solution. In order to effectively detect and correct problems, most system management processes and products rely on the transport of probes, messages and alerts across the network. A lack of bandwidth will make it extremely difficult to remotely manage this sort of solution.

If this is a problem, take some time to investigate how much it would cost to upgrade your network to a satisfactory level. It is possible that upgrading may be easier and more cost effective than paying for the costs associated with distributed management.

Support Structure

Another aspect is whether your support structure is already established or not. Is it centralized or decentralized? Monitoring and reporting is critically dependent on communication and resources provided by a good support structure. There is no point investing in the best monitoring solution money can buy if you don't have anyone available who can respond to problems.

Do you have enough support staff available to adequately manage a monitoring solution?

You may need to provide for additional resources and training. In some cases, skills may be extremely difficult to find or unavailable altogether. Again, this may add to the overall costs and complexity of implementing a monitoring solution in your organization.

Reporting Requirements

Another question you may want to check into is whether management wants to receive regular reports as to the availability and health of the Domino infrastructure. Will you need to provide these reports on a weekly, monthly, quarterly basis? Does information need to be “rolled up” to various levels of the organization, for example by department, branch, head office? Is there a requirement for historical data for performing trends analysis?

What to Monitor?

Once you have established the scope of your organization’s monitoring requirements, you can begin to drill down to the next level of your planning process. That is, determining exactly what it is that you want to monitor.

Careful consideration needs to be given to exactly how much monitoring you are going to perform. The tendency when first implementing a monitoring solution is to monitor every available aspect of your Domino infrastructure. Resist the impulse to do this. It will likely have a significant impact on the performance of your Domino infrastructure and generate large volumes of data that you have neither the time or the inclination to review.

The level of monitoring you should in fact choose to perform will be dependent on your SLAs. Make sure that you review them before making any final decisions. Remember why you are implementing a monitoring solution in the first place and relate this back to your business requirements at all times.

Monitoring Tasks Outside of Domino

While this chapter will be addressing issues specifically related to the monitoring of Domino, we also need to discuss some areas external to the Domino server that will have a major influence on the performance and health of your infrastructure.

Briefly, any monitoring strategy that you are planning to implement should also take into account the following:

- Operating system(s)
- CPU utilization
- Memory utilization

- IO activity
- Disk capacity

You should also ensure that monitoring systems for the network (LAN and WAN), firewalls, or any other back-end processing systems that connect to or rely on Domino, (for example, DB2 and MQSeries) are in place.

Monitoring Domino

Deciding exactly what to monitor in your Domino environment can become quite confusing. A good monitoring strategy should provide the ability to:

- Monitor the health of all critical components of the Domino system
- Send alerts in cases of system failure or where thresholds are hit
- Provide historical data to enable trend analysis based on system performance

The list of items discussed in the following sections should serve as a single reference for critical Domino server functions to be monitored in any organization. We have chosen to categorize this list in accordance with severity levels that may be assigned to these problems if they were reported to your help desk. Refer to Chapter 18, “Support and Communications,” for more information on severity levels and target resolution times.

The functions that we have listed are not intended to provide a comprehensive list of the tasks that can be implemented for a Domino monitoring solution.

They are simply a list of items that from our own experiences we have found the most useful and critical to monitor. Review them against the specific requirements for your Domino infrastructure. If you need more information, the Lotus Domino 5 Administration Manuals contain a complete list of Domino statistics and events. You may want to check this before making a final decision.

Note As you can see, many of these checks are and will become quite repetitive, mechanical and time-consuming. If you can find a way to automate them, then we strongly recommend that you do it. An automated approach can run efficiently in the background at regular intervals throughout the day when administration staff are busiest.

Severity 1

These are functions that must be closely monitored at all times, as they will result in complete system failure or loss of availability to major sections of your Notes user population:

Domino Server Availability

Is the server up or down? You don't want the first indication of a problem to be the users phoning the help desk, although unfortunately this is often the case.

Domino Server Tasks

Domino can run a wide variety of server tasks and they can each fail independently without causing the entire server to fail. At a minimum, tasks such as replication and routing must be monitored for availability at all times.

Domino Server Connectivity

Ensure that the Domino servers are actually accessible via the network. Domino can use a number of different ports to carry traffic to and from the outside world. For example, by default normal Domino user traffic is carried over port 1352, port 80 carries HTTP traffic and port 119 delivers NNTP traffic. Depending on the services that are enabled on your Domino servers you may need to test connectivity over a number of different ports.

Mail Routing and Delivery

The efficient delivery of mail will become the cornerstone for conducting business throughout your organization. The mail boxes (mail.box) on each mail server need to be monitored at all times for dead mail and a buildup of pending mail. The logs on the Domino servers can also be monitored for indications of other mail routing problems.

Severity 2

These are functions that will result in severe performance degradation but not necessarily in immediate loss of service unless left unattended.

Disk Space

Disk space is critical to the efficient performance of the Domino servers and should be closely monitored on all drives containing Domino code, user mail files and application databases. As Domino adds and removes documents from databases, indexing and other background processing will occur. This cannot happen successfully if there is not sufficient disk space. In a worst-case scenario, mail will stop routing altogether if the disk containing your users' mail files reaches 100% capacity.

In cases such as this, where disk space cannot be reclaimed, it will be necessary to migrate mail files from one server to another or potentially even add extra disk capacity. This all takes time and resources and it is good preventative practice to be alerted and prepared with as much notice as possible.

Mail File and Application Database Sizes

Domino R5 databases now have the ability to grow to an unlimited size. Testing to date, has been successfully conducted on databases as large as 64GB. In practice however, it would not be a good idea to allow databases, particularly mail files, to grow to this extent. Response times will start to slow as indexing in particular takes place. It will also become almost impossible to effectively locate, manage and archive mail or documents in a database of this size.

Monitoring the size of Domino databases and listing them by size, from largest to smallest, is a good idea for two reasons. It will not only give you a good indication of usage patterns and trends for capacity management, but also allow you to target specific users and application owners for housekeeping assistance and education where appropriate.

Successful Replication Events

This is an area that may not be critical to the stability of a Domino environment but still requires attention. At a minimum, it is essential to ensure that person documents are replicated from one Domino directory to another when setting up new users.

Replication events can be monitored by checking the appropriate views of the Domino logs. However, due to the volume of data contained in this database, it is probably not going to be practical to perform manual checks unless your organization is quite small.

It is possible to set up automated processes to monitor for potential problems in the logs, using the replication monitor in Statistics and Events or you can purchase a third-party product to do this depending on the scope of your requirements. DYS Analytics (www.dysanalytics.com) in particular has an excellent replication monitoring tool available called DYS Control.

Severity 3

These are functions that will not necessarily cause immediate degradation of performance but if left unattended for any length of time may cause serious problems in the future.

Tip Use the information collected in the following three items for capacity planning purposes.

Number of Users

To effectively assess the capacity of your Domino servers, it is essential to know how many users are accessing your system at any one time. The number of concurrent users in particular can increase quite dramatically as the Notes user community matures and Domino becomes more heavily utilized in your business.

With this information, as well as the response times and the number of transactions discussed in the following, you will be able to determine when it is time to upgrade or add new servers.

Response Times

This figure is closely related to the number of users accessing a server and will tend to increase as the number of active users grow. When a server nears capacity, it is not uncommon to see occurrences of “network operation timeout” errors. These errors may not always be related to network performance but in fact can be an indication of an overloaded server.

Tip It is possible to measure response times using PING, but a more accurate probe will open a Domino database on the server to see if it’s actually functioning.

Number of Transactions

Here’s some useful information that you may not have been aware of in terms of server load and number of transactions on Domino servers:

Heavy Users	>5000 transactions per week Average transactions per week is 8000 8% of all users are considered heavy users Heavy users make up 35% of the server load
Moderate Users	2500 - 5000 transactions per week Average transactions per week is 3500 19% of all users are considered moderate users Moderate users make up 35% of the server load
Casual Users	<2500 transactions per week Average transactions per week is 800 73% of all users are considered casual users Casual users make up 30% of the server load

ACL Changes

This is important to critical system databases, such as the Domino directory and log.nsf. Monitoring ACL changes would not generally be enabled on databases that would not impact system performance or operability. Changes to the ACLs of databases can affect replication, the ability to run agents, the ability to modify the design and remove documents or databases altogether.

Potential Security Breaches

Checking the logs for a number of key words that could indicate problems or attempted security breaches is always a good idea to ensure the integrity and security of your Domino environment. As an example, you can look for text strings such as “Attempt to access Server1/ACME by Bill Jones/IBM was denied.”

Depending on your security concerns, it could be useful here to set up an agent that runs on a weekly or nightly basis to check for occurrences of

potential breaches and then sends an e-mail with the results to the Domino administrator the next day.

NOTES.INI Changes

Whether or not you choose to monitor changes related to the notes.ini file will depend on the size and security concerns of your organization, the number of administrators and the degree of decentralized management and control at the Domino server level.

Changes to the notes.ini of the Domino server can be easily made through the use of server configuration documents or remote consoles.

Implementing those changes may have a severe impact on the performance and reliability of the Domino service. If this is not centrally controlled, then consider implementing some sort of alerting system to notify a senior, trusted administrator of any modifications. It's a safety check that may well pay off if mistakes do occur.

Tools for Monitoring Domino

In order to effectively detect and resolve problems or more importantly, anticipate or prevent them from occurring altogether, you need monitoring tools.

There are two main approaches that you can consider in selecting a tool for monitoring Domino. That is, use either Domino itself or a third-party product.

It is beyond the scope of this book to recommend one product over the other. Your decisions will be influenced by the scope of your monitoring requirements and by determining exactly what it is that you want to monitor in Domino.

Instead, we will concentrate on the availability of features that R5 offers. If the requirements extend beyond the boundaries of R5, we will then go on to provide you with a list of evaluation criteria that may be used for selecting a third-party product.

What Domino Can Do

It is possible to manage all or almost all of your monitoring requirements from within Domino itself. This is known as "in-band" monitoring.

R5 now includes a number of powerful new monitoring features that were previously incorporated into the NotesView product, making this an extremely functional option.

When determining how to set up and use R5 to monitor your Domino servers, refer back to the information that you have gathered from the first

part of this chapter (“Determining the Requirements”). Decide whether you want to monitor domino from a central location or on a decentralized basis. You will then need to look at exactly what it is that you want to monitor in Domino based on the information provided in the second section of the chapter (“What to Monitor”).

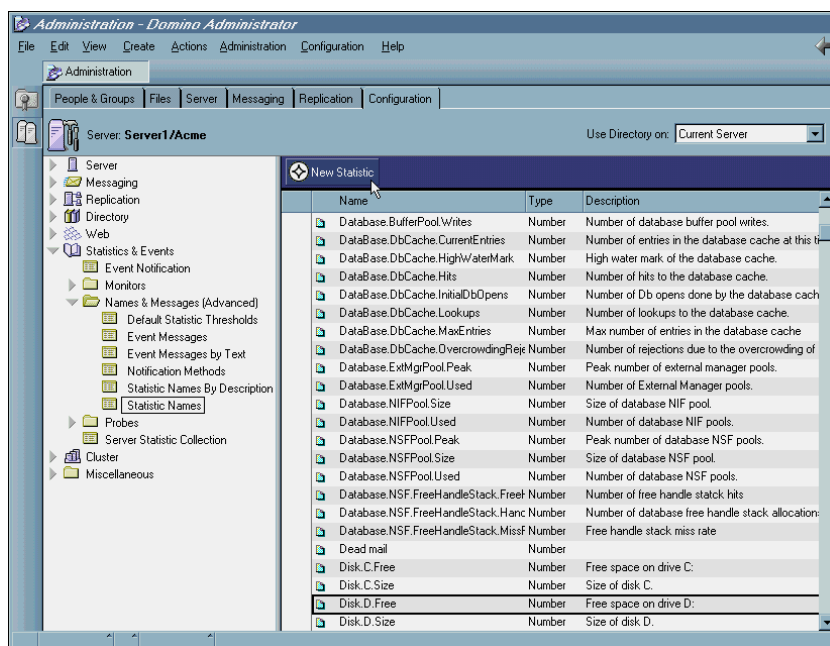
There are a number of tools available in Domino that can be used to effectively monitor core tasks. These tools can be centrally managed from the Domino Administration client. Let’s take a more detailed look at what they are below.

Statistics and Events

Domino includes “out of the box” a fairly comprehensive mechanism for the automatic recording of statistics, and automatic notification of events. For example, the amount of free disk space falling below a particular threshold.

Statistics and Events is controlled by two server tasks, EVENT and COLLECT, and two databases, STATREP.NSF (where statistical information is logged) and EVENTS4.NSF (where event handling and statistic monitoring is configured).

From the Statistics & Events view on the Configuration tab of the Administration client (see the following diagram), you can configure, create, collect and report information on all of the Domino servers in your environment.



By default, statistics are collected every hour and recorded in STATREP.NSF.

Monitors

You can create monitors from the Domino Administration client to track server resources and network and system activity. Each monitor has an associated threshold. When the threshold is reached, the monitor then generates an event.

There are four types of monitors available in R5. These are:

- ACL change monitor

Monitors changes to the Access Control Lists on specified databases for database security.

- Replication monitor

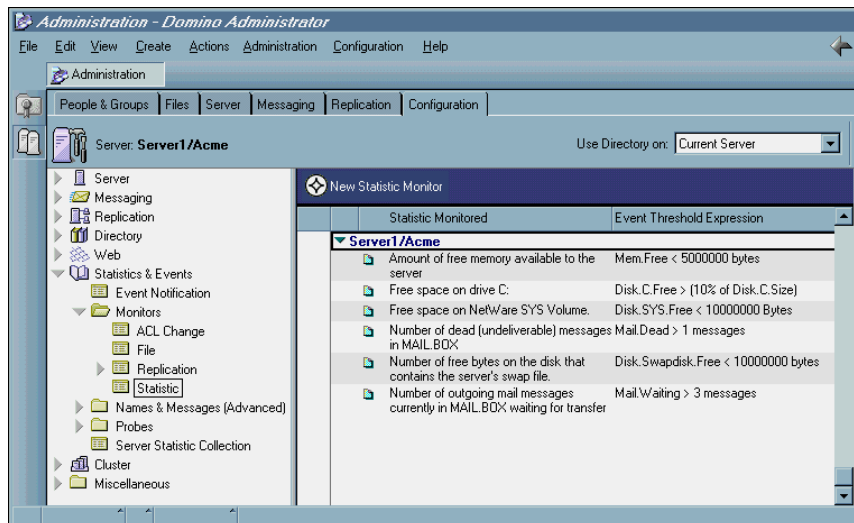
Monitors replication activity on specified databases for the frequency and success of database replication.

- File monitor

Monitors database usage and free space.

- Statistic monitor

Monitors a specified statistic for the Domino system. This is probably one of the most useful monitors. The following figure shows how you can set up monitoring for events such as dead mail in the mail boxes of your Domino servers, the amount of pending mail and available memory.

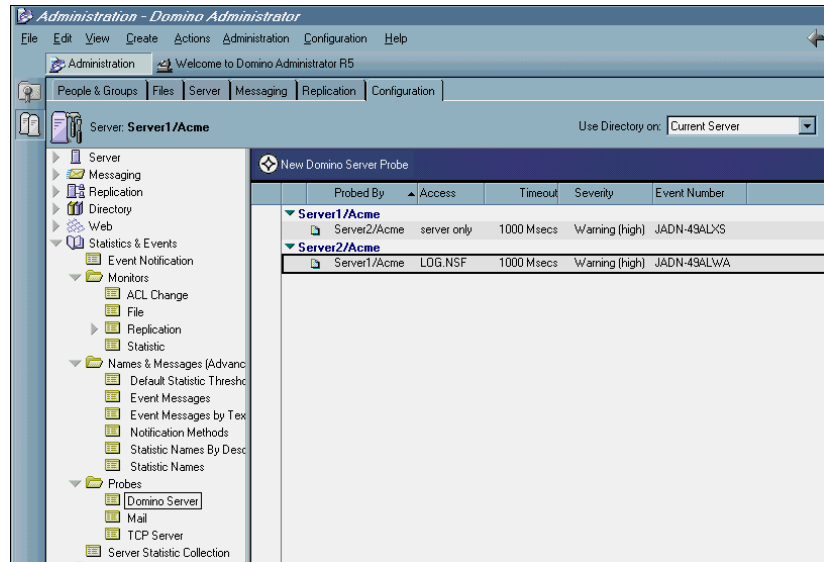


Probes

The Domino server also contains a number of probes which you can configure from the Administration client. These are as follows:

- Domino server probe

Used to check the connectivity and port status of the Domino servers in your environment (see the following figure).



- Mail probe

Used to test and gather statistics on mail routing using ISpy.

- TCP/IP server probe

Used to verify the availability of Internet ports (TCP services) on Domino servers.

Event Notifications

The Event task monitors the events happening on the Domino servers in your environment and performs a filtering process to watch for events that match a particular criteria. When an event occurs which causes a specified threshold to be reached, for instance, free disk space on drive c: falling below 10%, you can then use event notifications to automatically notify the Domino server administrator or operator that there is a problem.

Domino provides a number of different mechanisms for sending alerts to either your Domino administrator or an operator, including:

- Logging or mailing a message to a predefined database, typically statrep.nsf
- Mailing a message directly to the Domino administrator
- Sending a message to the administrator's pager number
- Generating an SNMP trap to a server management system such as Tivoli's TME 10 Enterprise console

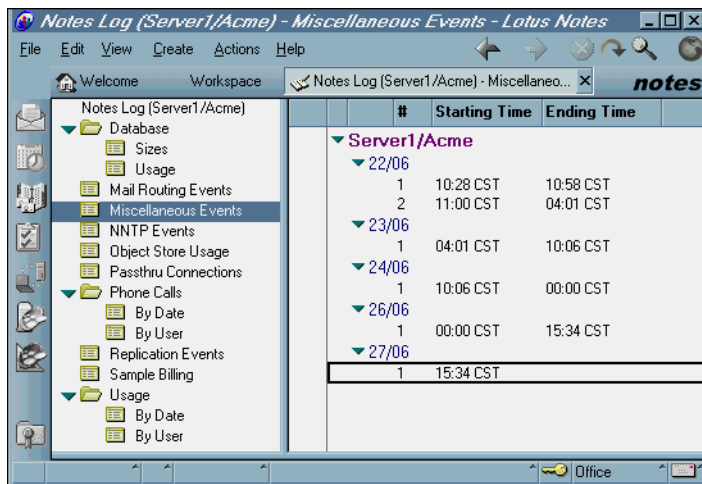
Note If mail routing isn't working at the time an alert is generated, the warning message obviously will not be delivered to the Domino administrator.

Domino Logs

The log databases on your Domino servers contain a huge amount of information providing you know where to look.

Depending on which view you select (see the following figure) it is possible to perform the following functions:

- Confirm if replication is working correctly
- Check the size of databases on your server
- Check the most frequently used databases
- Look into databases that need to be compacted
- Find out how many users are accessing the server
- Take a look at how much mail traffic is being generated
- Check for database corruptions.



There are a number of different notes.ini parameters that may be used to determine how much detail is logged. However, do use these with caution as they may rapidly grow the size of the log database, can affect performance and generate way too much information.

The main drawback in manually checking logs is that there is a lot of information that does need to be filtered in order to be useful. One possible solution here is to think about using the Domino or Web administrator to analyze the log for you and automatically report on occurrences of specified words and phrases.

Statistics Reports

Providing the collect task is running, the Domino server continuously monitors and updates system statistics and records the information in a centralized database, called the Statistics Reports database (statrep.nsf). This database can be viewed at any time to obtain a wide variety of reports on the following statistics:

- Calendaring and scheduling
- Cluster
- Communications
- Mail and database
- Network
- Single copy object store
- System statistics
- Web server and retriever

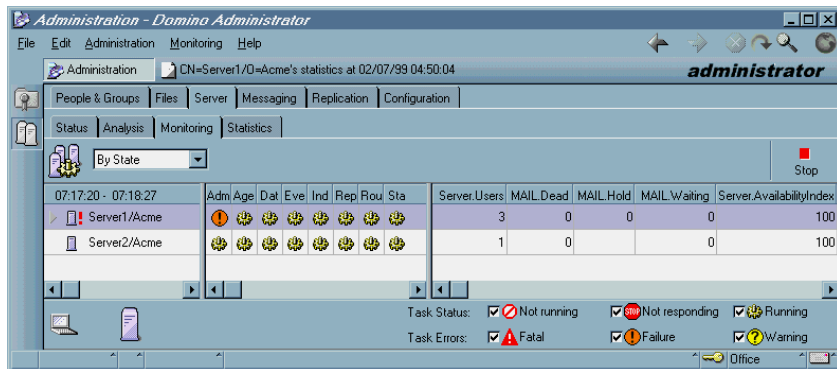
You can use the information collected in the Statistics Reporting database to generate reports on system load, user activity, disk utilization and the amount of network traffic a server is handling to name just a few.

Domino Server Monitor

Last but not least, Domino includes a server monitor that provides a visual representation of the status and availability of selected Domino servers, tasks, real-time system statistics and status indicators.

This provides a particularly useful tool for troubleshooting and quickly identifying tasks that may have failed on a server. For example, if you were troubleshooting a mail routing problem you might select this function to see at a glance if the router task is running on all Domino servers in your environment.

The following figure indicates a problem with the adminp process on Server1/ACME.



Detailed information on how to set up and configure the R5 monitoring features can be found in Chapter 36 of the Lotus Domino R5 Administration manuals.

You will need to spend some time familiarizing yourself with the information, testing the tools out, assessing their functionality against the scope of your monitoring requirements to see if the R5 monitoring tools can adequately address your business needs. For many organizations, this will provide a simple-to-use and cost-efficient monitoring solution.

As useful as these tools are though, it is necessary to point out that Domino does have its limitations. For example, what happens if a Domino server or tasks crashes or is not responding? If you are monitoring your Domino servers using R5 monitoring tasks, you may lose the ability to receive alerts or to detect where problems are occurring.

This is an important consideration to bear in mind when you are deciding on the level of monitoring that you will need to meet your business commitments.

Third-Party Products

The advantage of using third-party products is that they can provide the ability to monitor much more than just the Domino product. They can, however, be very expensive and challenging to manage and maintain.

If you are going to be monitoring your entire IT environment, including a variety of different products and platforms, consider the financial and support costs involved in deploying a number of monitoring solutions for each area.

It may be worth outlaying the additional costs and resources required to implement a fully integrated enterprise solution that monitors, alerts and reports on all components of your infrastructure.

There are a large number of third-party products available to choose from in the marketplace today. Some popular and reliable choices include but are certainly not limited to:

- Patrol by BMC Software (www.bmc.com/patrol)
- IntelliWatch Monitor and IntelliWatch Analyzer by Candle (www.candle.com)
- Tivoli Manager for Domino and Tivoli Manager for Domino IT Director Edition (www.tivoli.com/products)
- NetIQ's AppManager for Lotus Domino/Notes (www.netiq.com/products/domino.asp)

Evaluation Criteria

If you intend to go through the exercise of evaluating a third-party product, take the time to decide on and document a set of monitoring requirements, specific to your organization.

Whichever product you are evaluating will have its good points and bad points. Shop around for the best deal. Compare the pros and cons of a number of different solutions. These can then be assessed against your business requirements to build up a picture of the most appropriate tool for your needs.

In the section below, we'll discuss some key areas to be considered when evaluating a third-party product for a Domino monitoring solution:

Cost

This includes the initial hardware and software required to support the product but can also entail hidden costs that aren't always taken into consideration. Support costs (initial and ongoing) and maintenance agreements are the most obvious things that come to mind.

Multi-Platform

Does the product have the ability to run on and monitor all of the different platforms and products in your existing environment? This is especially true for your Domino server platforms.

Ease of Installation

How much fine-tuning is required? Does the product require a great deal of time and resources to configure and customize or will it work straight "out of the box."

Can Be Easily Customized

It would be extremely rare to find a product that can be installed in your environment and meet all of your requirements without any customization. If some modification or customization is required, you don't want to have to be a rocket scientist to figure out how to do it.

Demonstration Software

The vendor should be happy to provide demonstration software for pilot purposes as well as support and guidance during the initial setup and testing phases.

Ease of Use

This is an extremely important factor to consider in terms of cost and ongoing maintenance. For example, how many staff are required to support the product? Is it fairly intuitive and easy to learn? If not, how much training will administrators need to effectively manage the system? Do those skills already exist in your organization or will you need to employ extra staff?

Capability for “Out-of-Band” Monitoring

If Domino fails, will you still receive alerts or meaningful statistics and data? If not, it defeats the purpose of purchasing a third-party tool.

Footprint on Domino Servers

Does the product require any add-on tasks to run on the server? If so, what is the performance impact to Domino?

Ability to Monitor and Report on All R5 Components

The product should provide the ability to monitor partitioned servers, clustering, Web functions, multiple mail boxes to name a few.

Ability to Monitor and Report on Earlier Releases of Domino

This is important in an environment that is going through a migration phase. It is also highly likely that you will have back levels of code on different servers across your organization at various points in time.

Ability to Collect and Store Historical Data

This applies to both Domino and any other product you may decide to use. The product should provide the ability to store or export large volumes of data for reporting purposes. This will more than likely be a relational database that allows for more sophisticated manipulation of data. If so, also think about how much disk space will be required.

Ability to Scale

How many servers, tasks, and users can the product effectively support before you need to consider adding additional hardware and software?

Ability to Monitor and Alert on Real-Time Events

Can the product alert on events or errors as they occur or must you wait until the next poll cycle before a notification message is triggered?

Reputable Vendor

Is the vendor a certified Lotus Business Partner? How long has the company been established? How many staff do they have? Can they provide reference sites to confirm the success of their product?

Support Agreements

How much support is the vendor willing to provide on an on-going basis ?
What are the costs? How frequently is this subject to renegotiation?

Virus Checking

In the interests of delivering a comprehensive discussion on what to monitor in your Domino environment and some tools that you might select to perform these functions, there is one more area external to the Domino server that should also be reviewed. That is, deciding on whether or not to monitor your Domino servers for viruses.

A virus is a piece of programming code that is written to adversely affect one's computer without permission or knowledge of the computer owner. Viruses are usually transmitted by one of three ways.

- Downloading infected files from Internet Web sites
- Infected e-mail attachments
- Copying infected files from one computer to another

The source of the infected file is usually unaware the file is infected and unintentionally spreads the virus to other computers. The virus will lay dormant until certain conditions are met which execute what is called the "payload." Some viruses have harmless payloads, like playing a beep every hour, while others are devastating and can take down entire computer networks. Most recently, the "Worm.explore.zip" virus caused many corporations to take their entire e-mail infrastructure down until the virus could be cleaned, costing millions of dollars in lost productivity and unrecoverable files which were destroyed by the virus.

There are several products available on the market that you can install on your firewall to check smtp mail and also products which can scan mail attachments in the mailboxes of your Domino server before messages are sent to recipients. Information about anti-virus software designed specifically for Lotus Domino can be found at the following Web sites:

- Trend Micro Anti-Virus Products: www.trendmicro.com
- Symnatec Corporation: www.symnatec.com

Be sure that the product you select is available for all Domino server platforms you wish to monitor. Also, be sure that the selected product works with the release(s) of the Domino server you have implemented or will soon implement. In short, test in a realistic environment before finalizing your product choice.

It is important to note that some virus checking software can cause performance problems on your Domino servers. Take the time to carefully assess and test the merits of these products against any performance hits you may see at the Domino server level before proceeding with installation in a production environment.

Reporting

Once you have reached the stage where you've actually implemented a Domino monitoring solution and have begun collecting information, the next question will be, "Now that I have all this information, what should I actually do with it?"

Why You Should Prepare Reports

By now, management in your organization has undoubtedly invested a considerable amount of time and resources into implementing a Domino solution. There will be a lot of attention focused on exactly what it is they are getting for their money and how well everything is working.

For example, managers will want to know things like, how many mail messages are being sent, how many users have been registered, the number of hits on your company home page, in an attempt to gauge how successfully Domino is extending the business.

You will be asked to prove how well the servers are performing against what has been agreed to in SLAs so that they can measure the quality and reliability of service that is received.

If things start to go wrong, and they always will, accurate reports will also help to separate emotions from reality in what can sometimes be very sensitive situations. Is the system really performing poorly or is that simply a perception?

Then there's the question of performance and capacity management. If all you do is respond to problems and resolve them, it is not easy to spot trends in the types of problems encountered or assess if your servers are running at peak performance. It is also unlikely that you will have the time or the information to effectively predict how things are going to change in the future.

Reporting will help build a picture over time of how your system is performing and whether you need to expand or consolidate services. When improvements need to be made it will help to build a stronger case with management if you can back up your arguments with supporting data. Likewise, you will then be able to demonstrate the performance improvements you have been able to achieve.

What You Should Report On

You can go to great lengths preparing and generating reports on just about any statistic or fact you can think of. Don't go overboard. Think about who is really going to have the time to read them and how relevant they are going to be to the business. Key items that should be included in reports include:

- Server availability

What is the percentage of time that Domino servers are available for use? This will be measured against SLAs to assess if the service provided is meeting business requirements.

- Server utilization

How many users are accessing the servers? What is the peak number of concurrent users? How much disk space is available?

- Response times

What are the response times when you ping a server? How long does it take open a database or Web page?

- Number of transactions

How many transactions are servers performing on a daily, weekly, monthly basis?

- Mail

How many mail messages are being sent? How large are they? Who are the Top 10 mail users? What is the response time for sending a mail message to another user, to another organization or out to the Internet? Do you have dead mail or large numbers of pending mail sitting in your mail boxes for any great length of time?

- Replication traffic

What is the success rate on critical application databases?

- Database growth and sizes

What is the growth rate on mail files and application databases?

Some Guidelines

The following are some general guidelines that you may wish to consider when setting up reports for your Domino infrastructure:

- Produce monthly reports showing performance against targets.
- Make a comparison of current figures against previous monthly and quarterly reports.

- Produce trend reports at regular intervals throughout the year. Quarterly or six monthly intervals should suffice.
- Ensure that the reports are readable and easy to follow.
- Try to provide an executive level summary at the beginning of monthly reports. Management will not always have the time or the inclination to wade through volumes of data to find the key piece of information that they require. A summary of the vital statistics will be well received.
- Produce a variety of charts.
- Use color for emphasis.
- If possible, try to provide the ability to dynamically manipulate the data. There will always be requests to present reports in a slightly different fashion. If the person viewing the reports can rearrange data to suit their own needs, it will save you a lot of time and energy.

How to Store and Access the Information

The information contained within your Domino system reports can remain valid for a considerable period of time and provide valuable trending information for future planning.

You will need to provide a place to store all of the information that is collected. Make sure that you have adequate disk space to cater for this and if necessary investigate archiving solutions for the data bearing in mind that it may need to be referred back to at regular intervals.

A database accessible via the Internet is probably the best vehicle for delivering reports to a large audience. If you are going to be collecting large amounts of information, you can also think about interfacing with a back-end relational database to provide a more robust and sophisticated analysis tool.

Summary

We began this chapter by discussing why monitoring is important in a Domino environment. We then went on to explore some factors that are likely to influence both the scope and design of a Domino monitoring solution, before discussing in detail what to monitor at the Domino server level.

We explained how you could use the information gathered in determining the scope of your monitoring requirements combined with details of what to monitor to evaluate the best tool to meet your organization's specific Domino monitoring requirements.

We wrapped up the chapter by talking about the value of reporting and gave you some suggestions for the type of reports that should be prepared and some guidelines for setting them up.

Chapter 21

Performance

This chapter discusses what to do when you need to improve the performance of Domino. It covers performance issues in general, and then looks at Domino server performance, Notes client performance, and Domino application performance.

The chapter also covers performance tuning at the platform operating system level, but it is recognized that, particularly in larger organizations, this might not be the responsibility of the same team that manages Domino (though the two sides should still talk to each other). If you are a smaller site, you may have to handle it all.

Tip For further information on Domino-related performance topics, go to www.lotus.com/performance

General Performance Considerations

The first thing to stress is that performance tuning is not a substitute for proper planning or proper housekeeping, both of which have been covered earlier in this redbook. Hopefully, if you planned your deployment as much as you could, with the information that was available to you at the time, and you are regularly monitoring your system and performing proper housekeeping tasks (such as compacting your databases, and checking your server logs for errors) you may not have to worry too much about performance tuning.

However, situations change. Companies expand, and demand for applications can grow or change. Despite your best efforts, it may not have been possible to predict exactly how Domino would be used in your organization. A really successful deployment can result in a much higher take-up of the product than could have been anticipated. If your users start to experience bad response times you will have to look at performance tuning if you want to keep them happy.

Performance tuning is not always rocket science. Sometimes it can be quite simple. Basic problem-solving abilities and techniques can be as important as expensive software or hardware tools. Often all you need to have is a systematic approach, eliminating different factors one by one, only changing one thing at a time, and observing the results.

For instance, to take a real-life example, a customer reports that their users are complaining of slow response creating mail memos on the server. They are thinking they should buy some more memory for the server. You decide to time how long it takes the users on average to create a new memo. Then you make a local copy of their mail database and perform the same tests again. You find that the time taken using the local database is only marginally faster than on the server. In one simple action you have eliminated the server and the network, and you can focus your efforts on looking at where the problem really lies — on the user's PC.

Unfortunately, it is not always so straightforward. Sometimes performance tuning can be a complex procedure, and the problems may be due to not one factor, but a combination of factors.

The next thing to consider is, what is bad performance? When evaluating performance you need to consider what are you measuring against. Often performance can be a subjective issue. If a user is impatient to complete a task they may perceive a performance problem which does not really exist. The best way to address this is to know how your system performs when no problems are being reported. You should use the tools and techniques described in the following to monitor performance *before* it gets bad.

Basics of Performance

The basic component resources of client-server computers are CPU, memory, disk input/output (I/O) and network resources. Although we will talk later about higher level issues such as server performance and database performance, most performance issues are usually related to some kind of underlying contention for one or more of these resources. This may be because the availability of that particular resource is genuinely inadequate, as in the case of a server with insufficient memory, or it may be due to some design factor, such as a rogue application, which is consuming too much of the available resources.

Also, these resources continually interact with each other, in such a way that it can sometimes be difficult to differentiate the symptom from the cause. For example, on the face of it, a server which is running flat out at 100% CPU utilization all the time would appear to require a CPU upgrade. However, a more common reason for this scenario is that the CPU is spending all its time swapping data in and out of virtual memory — because the server really needs more memory.

Domino Server Performance

This section looks at ways to tune performance on Domino servers. When measuring performance you will have to consider both Domino-specific performance issues and platform-specific operating system aspects of server performance.

Each of the major platforms have their own tools to monitor performance and these will often be the first port of call when looking into performance problems. For example, there is the Windows NT Performance Monitor, and the UNIX utilities `vmstat`, `iostat`, `sar` (useful for SMP servers), and `netstat`. The AS/400 and S/390 also have their own built-in performance monitors. Refer to your platform-specific documentation for details.

Domino Tools for Server Performance Planning and Measuring

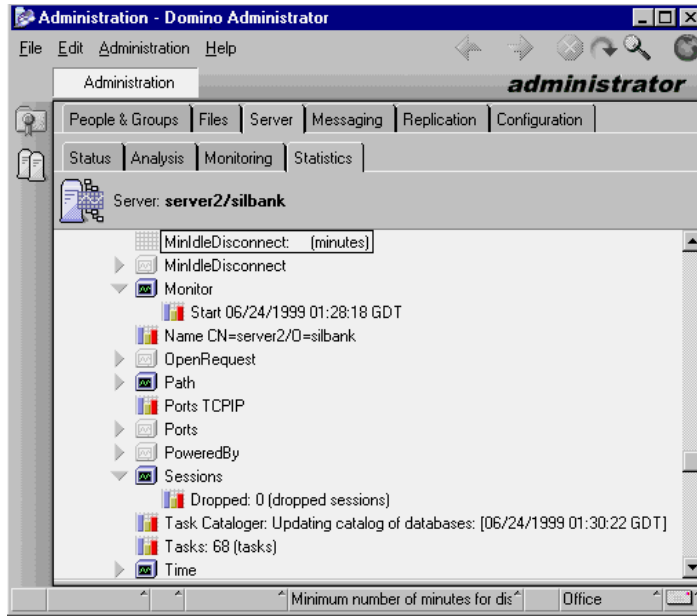
Now let's take a look at some of the tools available for measuring server performance provided by Domino.

Domino Statistics and Events

Domino servers can produce much statistical information. As well as being used for administrative monitoring of conditions such as disks filling up, as described in Chapter 20, this data can also be useful for performance tuning.

Many statistics are available including ones on mail throughput, replication, HTTP server activity, user sessions and databases. To see what is available use the `show statistics` command at the server console or look at the

Server - Statistics tab in the Domino administrator client, as shown in the following figure.



Domino Server.Load

Domino Server.Load is included with the Domino server. It lets you run a simulated workload on your servers to assess capacity and response times.

NotesBench

NotesBench™ was created by Lotus to provide Domino customers with quality workload and performance data they could use when planning their Domino deployments. Major hardware vendors such as IBM, Compaq/Digital, Hewlett Packard and Sun post NotesBench reports to the NotesBench Consortium Web site at www.notesbench.org. To use NotesBench you must be a member of the NotesBench Consortium; however, free guest registrations are available. These reports are independently audited and certified for accuracy.

NotesBench generates workloads in a test environment to simulate user activity. There are different kinds of workloads which can be tested, such as mail only, mail with other database usage, and power usage. For R5 there are new POP3, IMAP, SMTP, and HTTP workloads.

After a NotesBench simulation has run, a number of results are generated including the maximum number of users that were supported and the average response time to the client.

NotesBench is an advanced tool that provides very useful information, but you should bear in mind that NotesBench is still a lab simulation — it is not real life. If you make estimates based on NotesBench reports, you should err on the conservative side.

Domino Server.Planner

Domino Server.Planner is another tool that provides performance planning information via vendors through the NotesBench Consortium.

CPU Considerations

If your server's CPU is being continually over-utilized then the server may be "CPU bound." This is when if it is definitely a lack of CPU power (rather than this being a symptom of another problem) that is slowing the server down. In this situation, you should consider upgrading or adding CPUs. Also the higher the amount of level 2 cache the better. However, as mentioned earlier, it is important to distinguish between a genuinely CPU-bound server and one on which the CPU is being kept busy because of excessive paging (a condition known as "thrashing").

To check CPU activity on NT, you would check the "% Total Processor Time" counter using NT Performance Monitor. On UNIX, you may use the `vmstat` or `sar` command.

When you buy servers, although you may not initially need extra processors it is a good idea to buy servers that are capable of symmetric multiprocessing (SMP), so that you have the ability to add extra CPUs in the future.

In Domino, activities which are particularly affected by processor speed are indexing, replication and database transactions.

Memory Considerations

In Domino, memory particularly affects the number of possible concurrent client sessions, and the size of caches (areas of memory used to store data temporarily to provide faster access).

When memory is low, excessive paging or page faulting may occur. Items in memory are then written out to virtual memory on disk. On Windows NT, if the counter "Page reads per second" is consistently over 5 this can indicate that you are low on memory. On UNIX you can use the `vmstat` command to look at memory usage.

Disk Input/Output (I/O) Considerations

The time taken to access data from disk is far greater than the time to access it from memory, so anything you can do to speed this up will benefit server performance. You should always buy the fastest disks you can afford for your servers.

Contention for disk resources is a common cause of bad performance. When different processes are trying to access data on the same disk the disk heads have to move across the disk more, which takes time. The best way to minimize this is to distribute frequently-accessed data across more disks to increase the chance that the contending processes can access their data in parallel to each other. The data also has to go through the disk controller unit, so if you can put the disks on different disk controllers you can distribute the traffic even more.

A typical configuration which might be used to optimize disk performance could be:

- One disk controller with two hard drives — one for the operating system and page files and one for the Domino program files
- One hard drive on a separate disk controller for the Domino transaction log
- A RAID or storage farm subsystem for the Domino data files

On some operating systems, disk fragmentation can become an issue. This occurs when portions of files get spread around the disk as data grows, and the operating system has to use different parts of the disk to find free space. Fragmentation again causes extra disk head movement that slows down performance. You should refer to your operating-system specific documentation for more information on dealing with disk fragmentation.

In Domino, activities which are particularly affected by disk I/O are the speed of database and view opening, and the number of maximum possible database connections.

Network Considerations

You should consider using high-performance network cards in a server, such as Ethernet 100 Mbps or higher.

If you use Domino clustering (see the later section on Load Balancing for more information on this) consider using separate network cards, connected to separate network segments, for cluster traffic and non-cluster traffic.

Choose the TCP/IP protocol. Not only has TCP/IP become the de facto world-standard protocol, it also provides the best performance and most efficient use of network adapters for Domino. TCP/IP is also required if you plan to make full use of Domino clustering.

A network-related performance issue, which can sometimes affect Notes users on Token Ring networks, is where a TCP/IP node may send small amounts of data (typically less than 1500 bytes) with no difficulty, but transmission attempts with larger amounts of data hang, and then time out.

Often this is observed as a unidirectional problem: For instance, mail replication between a client and server may work one way but not the other. This problem may occur because of underlying network routing problems, which should be investigated.

However, a fix for this can sometimes be to reduce the maximum packet size or MTU (Maximum Transmission Unit) that the Windows client uses. The default is 1500 but improvements have sometimes been achieved by reducing it to a value of 1024. A description of this can be found in the article “Adjusting IP MTU, TCP MSS, and PMTUD on Windows” at www.fr.ibm.com/france/servres/mtu.htm

Don't Run Things You Don't Need

To optimize a Domino server's performance, don't install or run anything on it that you don't need. For example, you may want to carefully look at the following:

- Many server tasks are started by default, as defined in the `Servtasks=` line in the server `notes.ini`. However you can change this line to prevent server resources being wasted. For instance:
 - Remove Router if you are not using mail on the server for end users, mail-enabled applications, mail-in databases, or event notification.
 - Remove HTTP if no one needs to connect to the server with a browser.
 - Remove Calconn and Sched if you are not using the server for calendaring and scheduling.
 - Remove Collect if you are not monitoring server statistics (though in most circumstances you should be).
- Don't inadvertently install Message Transfer Agents (MTAs) if you don't use them.

- Use specialized servers rather than general-purpose ones. Applications, mail, and specialized functions like domain search, will generally perform best on dedicated servers. This allows you to optimize each server to suit the tasks it performs, for example, by not running the Router task on a replication hub. It also makes it easier to identify the causes of problems.
- Don't run MTAs on servers that provide other functions such as mail and application servers.
- Don't enable protocols you won't use.
- Don't install or run other products on the server that are not related to its function as a Domino server.
- Don't use a Domino server as a file server.

Note On some platforms there are specific options to optimize *either* for file serving (where more memory is allocated to the operating system) *or* for application serving (where more memory is allocated to the applications running on it). A Domino server is an application server.

- Disable operating-system specific features that are not required for Domino. On NT, for example, you should disable the Computer Browser and the Spooler services.
- Replication — if you use replication hubs make sure that they initiate the replication, and that they use PULL PUSH replication to ensure that the replicator tasks on the hubs handle the work rather than the spokes.
- Idle sessions — you can limit the number of idle user sessions being maintained on the server using the notes.ini parameters SERVER_SESSION_TIMEOUT, SERVER_MAXSESSIONS and SERVER_MAXUSERS. These allow the server to close idle client sessions and free up memory resources. The users are not affected — if they access the server again a new session will be created and all they will probably notice is that they have to re-enter their password.

Note Do not set these limits too low, however, or Domino could use more resources disconnecting and reconnecting users than are saved by this in the first place.

Don't Use Excessive Logging

The following explains what we mean by excessive logging, and how to disable it.

Domino Server Log

Domino servers write information to a database called log.nsf. This database is required by the server and if it does not exist the server will create it at startup.

While logging is necessary for analyzing the usage of your system and for troubleshooting, excessive logging of information can be detrimental to server performance. You can disable specific types of information from being logged by changing the values of the log variables in the server notes.ini.

For example, to disable logging of replication events, change LOG_REPLICATION=1 to LOG_REPLICATION=0, or to disable logging of individual user sessions, change LOG_SESSIONS=1 to LOG_SESSIONS=0.

HTTP Logging

If the HTTP task is used, much information can be logged, such as the TCP/IP addresses of browsers, or the details of pages accessed. This data can be logged either to a database, domlog.nsf, or to text files, depending on settings in the HTTP server section of the server document. If you do not need HTTP logging, you can improve performance by turning it off altogether. Alternatively, logging to text files rather than domlog.nsf can be more efficient.

Mail Performance

In order to improve mail performance consider the following:

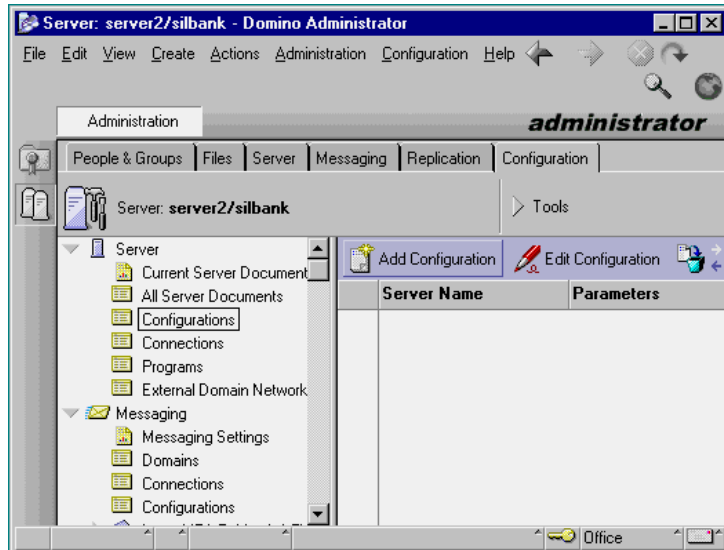
- Changing the number of mail boxes. A major new feature in R5 is the ability to define more than one mail box (mail.box) on a single server. This can improve mail routing performance significantly, as a single mail box can become a bottleneck on a busy mail server.

You should particularly consider this if you have large queue lengths on mail routing. This can be indicated when you often see large numbers of pending messages in mail.box. For a more detailed investigation of whether the mail.box database is becoming a bottleneck you may use the new R5 SHOW DBS console command which is described later in this chapter, in the Database Performance section.

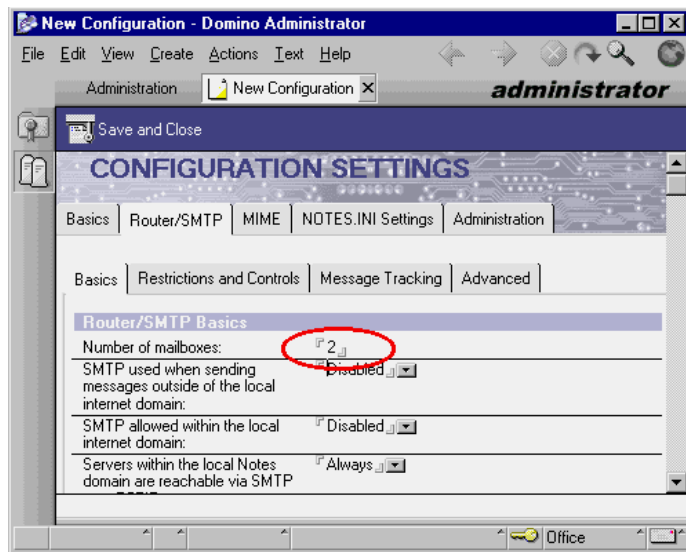
Note The number of mail boxes is not the only reason why mail queues can build up. Other factors, such as poor network performance, have also been known to cause this. However, increasing the number of mail boxes is very easy to do, and is therefore a good starting point.

To change the number of mail boxes:

- In the Lotus Domino administrator select the server to be administered.
- Select the Configuration tab.
- Select Server \ Configurations.
- Select Add Configuration.



- Enter the number of mail.box databases.



- Select Save and Close to save the new configuration.
- Restart the Domino server to apply the change.
- There are a number of server configuration settings that can be adjusted when looking to improve mail performance, such as MailMaxThreads, which determines the number of threads the mail router task can create to deliver mail on the server. But bear in mind that usually Domino manages these threads well on its own, based on available resources. For more information, see Chapter 42 in the Lotus manual *Administering the Domino System* that comes with the product.
- Use the new R5 directory catalog feature. This is a highly compressed directory which is populated from, and is a subset of, the Domino directory. The directory catalog has advantages for mobile users, who can store the directory locally on their laptops. In addition, you can create a directory catalog for server use so that servers can use one database to search for names in multiple Domino directories and improve mail addressing performance.
- Shared mail. Shared mail is a feature that allows mail messages (or parts of mail messages) that are addressed to several people on the same server to be stored in a shared database, known as the Single Copy Object Store. This can have benefits in terms of reducing the disk storage requirements of mail but can sometimes slow down mail routing performance.

When considering the use of shared mail you should be aware of this possible trade-off between disk space and performance. In addition, a user's mail file, while appearing to be unified in one "file," can now be spread across several "versions" of the shared mail files. This can make recovery (from shared mail backups) of deleted documents challenging as well.

- Local mail databases. To improve mail performance some companies, particularly ones with low-speed WAN links, or in countries where network links are more restricted, use mail databases stored locally on the client workstations. Users perform replication to the server to send and receive mail.

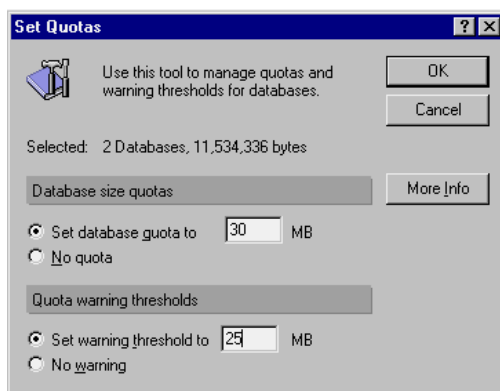
However, this is a practice normally reserved for mobile users who connect by modem. In a networked environment it should be reserved for extreme circumstances as it does not fully exploit the client/server features of Domino, and may sometimes even be slower as the local client has to do more processing.

- Use quotas on mail. Mail database sizes can increase dramatically if quotas are not used, to the detriment of performance.

Note Ideally you should implement quotas early on in a deployment. On some very large systems, if you apply quotas later, when there can be many mail databases which are already at or above your newly imposed size limit, performance may actually be made worse as the server tries to deal with all the quotas that are being exceeded.

To set quotas on mail or other databases:

- In the Lotus Domino administrator select the server to be administered.
- Select the Files tab.
- Select the database or databases.
- Choose the Tool bar on the right.
- Select the Quotas tool.
- In the dialog box that appears choose an appropriate quota size, and optionally a warning threshold (which causes a message to be written to the server log when the warning threshold size is reached).



Domino Directory

Ways to improve performance with respect to the Domino directory are:

- Implementing a directory catalog as described above will reduce the load on the Domino directory.
- You can improve the time it takes for frequent users to authenticate with the server by adding them to a group and then specifying the group name in the Access Server field in the server document.
- Two of the R5 On-Disk Structure (ODS) database properties, “Don’t maintain unread marks,” and “Document table bitmap optimization,” described in the section on Database Performance later in this chapter, are particularly appropriate for improving Domino directory performance.

Transaction Logging

New in R5, transaction logging is a feature that causes every change (such as new documents or folder changes) made to a database to be captured by Domino and written also to a transaction log. In the event of a server or disk failure the transaction log can be used to reapply all completed transactions as part of the database recovery.

In addition to providing data recovery features, transaction logging also improves Domino server performance — often by a factor of 10% to 20% for I/O transactions, if properly implemented. By allowing the writing of database updates to be deferred for a short period when the server is busy, transaction logging optimizes the way disk I/O is performed to Domino databases. It can do this because the transaction is already captured in the transaction log, and as this is a sequential file it is faster to write to than a Domino database.

Transaction logging can be configured in one of three ways:

- Favor Runtime — this maximizes the use of deferred updates to put the emphasis on faster runtime performance.
- Favor Faster Recovery Time — this reduces the use of deferred updates by writing to databases more frequently, which favors faster recovery when restoring data and faster server restarts.
- Standard — this is a compromise between the above two settings.

As we mentioned in the disk I/O section above, to gain the most from transaction logging it makes sense to place the transaction log on a different disk and controller than the one where the Domino databases are.

Agents

Agents consume server resources. They are a necessary part of Domino but if they run too frequently or if an agent gets out of control, it can affect overall server performance.

There are many settings in the Domino server document and in the server notes.ini you can use to control how often agents can run, and for how long. For full details see Chapter 42 in the Lotus manual *Administering the Domino System* that comes with the product.

When an application is being deployed on a production server, part of the implementation procedure should be to examine and document what the different agents in the database do.

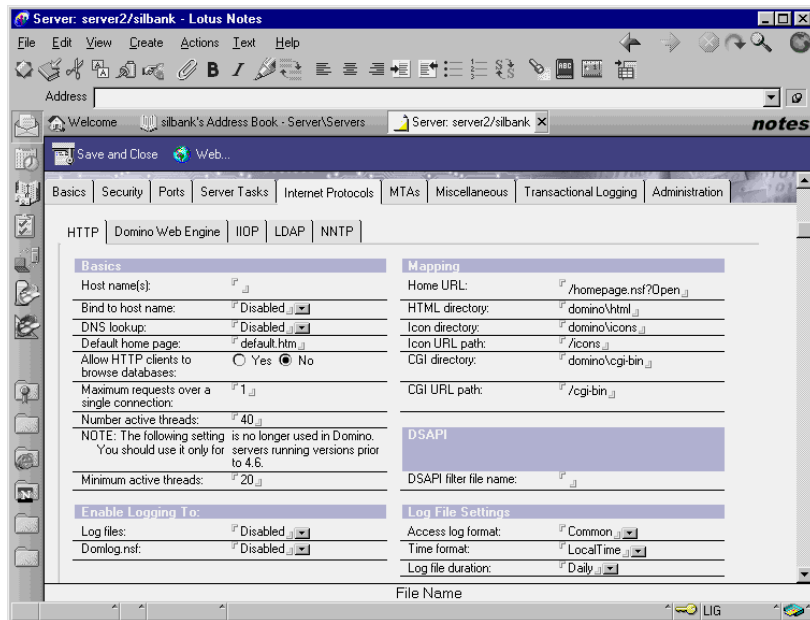
HTTP Performance

If HTTP server performance is a problem, you should look at the following:

- Optimize the number of HTTP threads.
 1. As a starting point, set this to 10% of the estimated number of HTTP users in the server document as displayed in the Number active threads field in the following screen shot (the default value for this field is 40).
 2. At the server console, monitor the peak number of threads by typing: show statistic server.threads.active.peak
 3. If this value regularly reaches the setting you chose for HTTP Threads increase the number of threads and monitor again.
 4. If you reach a point at which the average peak value is less than the maximum number of threads in the server document you can settle on a maximum value which is slightly above the average peak.

Note Do not be tempted to simply set the maximum threads to an artificially high value. While this will not affect CPU performance, it does increase memory and disk utilization.

- As mentioned earlier, consider not logging, or logging to files rather than domlog.nsf. HTTP logging settings are also shown in the Enable Logging To section in the following screen shot.



Load Balancing

One way to manage server performance better is to consider Domino clustering. One of the features of clustering is load balancing. When thresholds are reached on servers, clients are directed to another server in the cluster.

As future server demands grow, with a cluster you can incrementally add more servers, up to a maximum of six servers per cluster to keep in line with demands.

For information on clustering see the Lotus manual *Administering Domino Clusters* that comes with the product.

Semaphores

A semaphore is a software switch, or flag, that programs in multi-tasking operating systems use to control the sharing of common resources.

For instance, if the indexer task on a Domino server needs to completely rebuild an index, it locks a semaphore so that other tasks cannot use the index until it is rebuilt. However, if something goes wrong and that lock never gets released, a condition known as a semaphore timeout will occur if another task has to wait for the semaphore. For every 30 seconds that the other task has to wait, another semaphore timeout is recorded.

Many Domino administrators will never see semaphore timeouts, but on some badly performing servers, or ones where an unusual problem is occurring, they may occur.

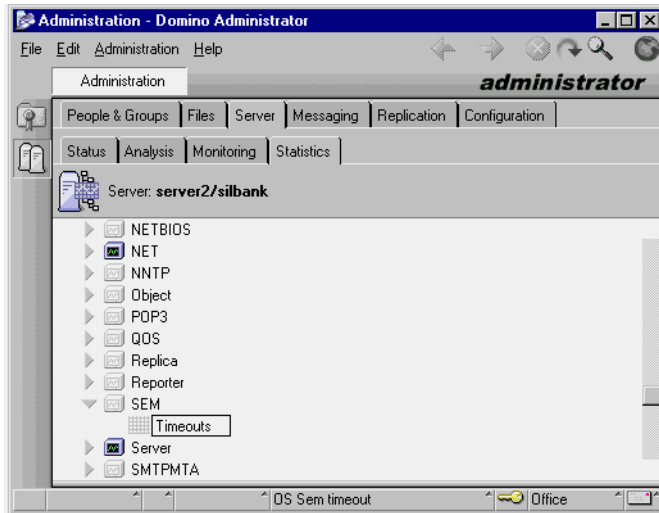
To see if any semaphore timeouts have occurred on a Domino server, you can do one of the following:

- Type the command `show stat sem timeouts` (or `sh stat sem` for short) at the server console. If no semaphore timeouts have occurred, this will return the message “SEM not found in stat table”. If, however, a line such as

```
Sem.Timeouts = 430D:58 0A0B:42
```

appears then, in this example, that would mean that there had been 58 timeouts for semaphore type 430D and 42 timeouts for semaphore type 0A0B since the server was started.

- Look at the SEM item of the Server - Statistics view in the Domino administrator client. It looks like this:



Generally a small number of semaphore timeouts (say less than 10) is nothing to worry about, but if you regularly see more than this, then it indicates that there is an underlying problem that you should investigate further.

Some common semaphore issues are:

- 430D (name lookup) semaphores. This can be an early warning that you have a corrupt Domino directory.
- 0A0B (session table) semaphores. This can be due to network routing or protocol issues, for instance when the server has trouble replying to client sessions.
- 030B and 0309 (collection and collection queue) semaphores. These can indicate that the CPU and memory are a resource bottleneck.

You can find more information on the subject of semaphore timeouts in Technote number 112710 in the Lotus Knowledgebase. Also, at the time of writing this redbook, Iris Development was planning to publish a detailed article on semaphores - check www.notes.net for details.

Client Mix

It helps, when looking at Domino server performance, to know about the mix of client types you have. The requirements of mail users tend to be more disk-intensive, whereas users of advanced groupware applications will be more CPU-intensive. Web browsers can be more CPU-intensive than Notes clients, as they require the server to do more of the work.

It helps to have as much information as possible about the different types of mail users you have. These can range from light users with small mail databases, who work mostly with text messages rather than attachments, to the heavy “power users” who have large mail databases, with lots of attachments, and who use the calendaring and tasking features a lot.

Notes Client Performance

Much of the discussion about Domino performance tends to center on server performance. However, the performance of the client workstation can also play a big part in contributing to poor response time. And at the end of the day the user does not usually know, or care, where the problems lies, so long as it is fixed.

Workstation Specification

Usually client performance problems are down to the specification of the hardware, and the configuration of the software, so the issues are the same as for other desktop products. However, Notes is often the most heavily used and relied upon, and hence the most visible, application in an organization, and when response is slow it sometimes gets an unfair share of the attention.

IT departments often have the newest, and most highly specified machines in an organization. However, to prevent workstation-related performance problems, you should check that all the required functionality of Notes performs satisfactorily on the *minimum* specification of workstation that is in use in your organization. You should account for how the Notes client is used in different areas, and what products the users have open alongside Notes.

Also, if your organization uses several different PC builds, or various protocols, you should be aware of them. The client workstations in your organization should meet the minimum requirements of the products they support. For information on the workstation requirements for the Notes client, see Chapter 12.

Workstation Configuration

For the best performance, workstations should be configured and maintained correctly in terms of operating system and network software.

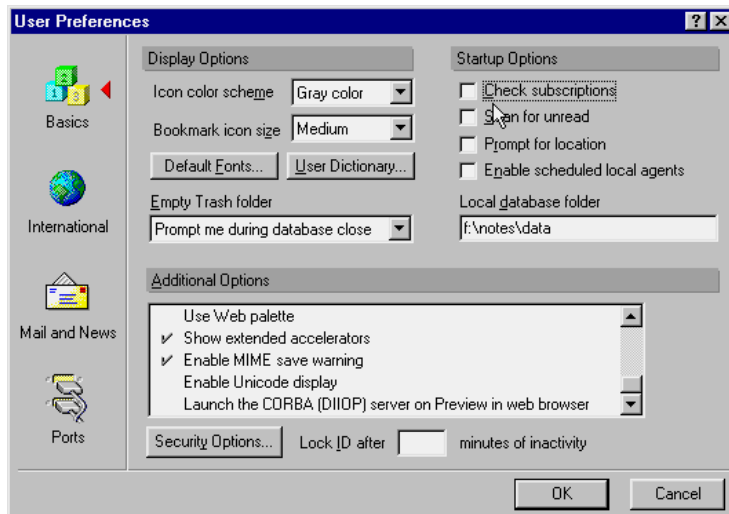
Often desktop products are not installed and uninstalled in a systematic fashion, and users have the remnants of obsolete applications on their machines, left over from previous users. You should have a policy for routine maintenance of the workstations in your organization which includes tasks such as removing old products, ensuring system settings cannot be tampered with, and defragmenting hard drives.

As with managing server performance, it helps to have as much information as possible about the different types of users there are in the organization. The hardware needs of the “power user” will differ from that of the occasional user.

Database Subscriptions

You can subscribe to a Domino database and Notes will retrieve information and updates that you specify on a regular basis to stay informed of current events within your company or on the Web. To subscribe to a database, the database must support subscriptions.

While this is a very useful feature for disseminating information, overuse of database subscriptions can affect client performance. The feature is enabled or disabled using the “Check Subscriptions” check box in Notes User Preferences, as shown in the following figure.



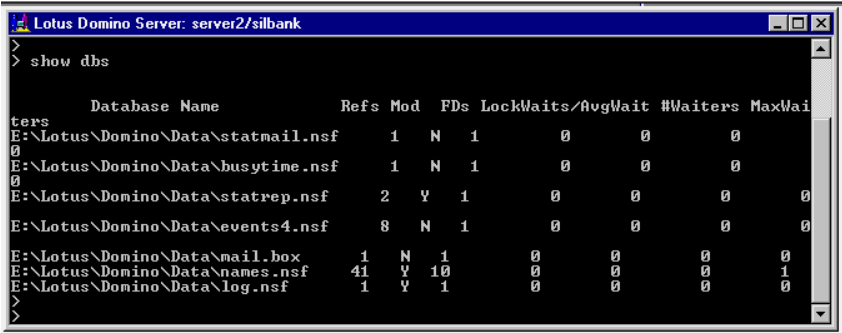
Database Performance

The following sections discuss aspects related to database performance.

Heavily-Used Databases

Database performance may be reduced because the database is being used too heavily. If this is the case, you may want to consider spreading the traffic across more than one server by putting replicas of the database onto other servers and directing some of your users to those servers.

One way you can investigate database performance is with the new R5 server console command `show dbs`, as shown in the following example:



```
Lotus Domino Server: server2/silbank
> show dbs

Database Name      Refs  Mod  FDs  LockWaits/AvgWait  #Waiters  MaxWaiters
-----
E:\Lotus\Domino\Data\statmail.nsf      1    N    1         0         0         0
E:\Lotus\Domino\Data\busytime.nsf       1    N    1         0         0         0
E:\Lotus\Domino\Data\statrep.nsf        2    Y    1         0         0         0
E:\Lotus\Domino\Data\events4.nsf         8    N    1         0         0         0
E:\Lotus\Domino\Data\mail.box            1    N    1         0         0         0
E:\Lotus\Domino\Data\names.nsf          41    Y   10         0         0         1
E:\Lotus\Domino\Data\log.nsf             1    Y    1         0         0         0
>
```

This command is a tool for monitoring the performance of a database, and returns the following information:

- Refs — the number of times the database has been opened (the DBHANDLE count for the database).
- Mod — whether the database has been modified, but not yet flushed to disk.
- FDs — the number of file descriptors currently being used for the database.
- LockWaits — the number of times a user has had to wait for a lock on the database (read or write).
- AvgWait — the average wait time in milliseconds for each wait.
- #Waiters — the number of waiters currently on the database lock. (This number changes rapidly.)
- MaxWaiters — the maximum number of waiters ever on the database lock.

Note To display LockWaits and AvgWait values, you must temporarily add the setting `COLLECT_DB_LOCK_WAITS=1` to your server's `NOTES.INI` file. This setting consumes server resources, so you should remove it after you have finished viewing Show DBS statistics.

Database Design

Sometimes bad performance may be due to one or more badly designed “rogue” applications. Database designers should always consider performance as well as aesthetic aspects. For example, developers may find that their graphics display instantly when the database is accessed on the LAN, but the experience might not be the same for an end user accessing the database on a laptop over a 28.8 Kbps modem link.

Coding techniques used in LotusScript, Java and @Formulas, can also make a huge difference in performance.

Views

Database designers should design views with performance in mind. For instance, the use of time-related functions like @Now and @Today can cause views to be rebuilt every time these functions are executed.

If large views taking a long time to open is a particular problem, you may consider increasing the setting for `NSF_BUFFER_POOL_SIZE` in `NOTES.INI` on the server.

Note This setting is more commonly used on partitioned servers and you should use it cautiously, as it can also have an adverse effect on performance. Do not increase this value above 25% of the servers physical memory.

Tip Temporarily setting the `notes.ini` log setting `LOG_VIEW_EVENTS=1` will write extra information to the server log on which views are being rebuilt and when. Always remember to turn off extra logging settings when you no longer need them, as they add their own overhead to server performance.

Indexes

Avoid over-frequent refreshing of indexes as this is CPU intensive on the server. That is not to say that you should avoid indexing when it is needed, but designers should consider using the “Auto, at most every n hours” and “Discard Index if inactive for” options in the View properties. This is shown in the following figure:



Full Text Indexes, while useful, can be expensive in terms of server resources. You should question whether a database really needs one. Also the default lifetime that an unused full text index is retained on the server is 45 days. You can reduce this by setting the notes.ini parameter

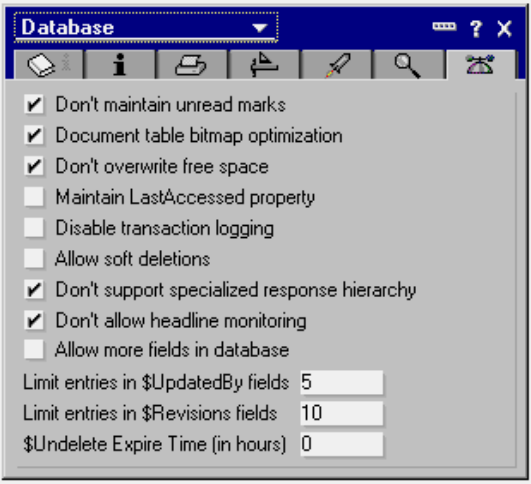
Default_Index_Lifetime_Days = nn where nn is the number of days.

Tip Temporarily setting the notes.ini log setting LOG_UPDATE=2 will write extra information to the server log about indexing activity on the server. Always remember to turn off extra logging settings when you no longer need them, as they add their own overhead to server performance.

Further information on good application design practices can be found in the redbook *Lotus Domino Release 5.0: A Developer's Handbook*, IBM form number SG24-5331, Lotus part number CT6HPIE.

Make Use of the New R5 ODS Features

The new R5 on-disk structure (ODS) has extra features for improving the performance of databases. You can view and change these properties by choosing File - Database Properties for a particular database as shown in the following example. The settings are contained in the Advanced tab.



Note The database must be on the R5 ODS. This does not apply to Release 4 format databases.

The main properties relating to database performance are summarized in the following table:

<i>Property</i>	<i>What This Does</i>	<i>Action to optimize performance</i>
Don't maintain unread marks	By default Domino maintains unread marks - what documents have been read by who. While this feature is important in some databases, like discussions, it carries a performance overhead and should be turned off with databases such as the Domino directory and LOG.NSF.	Select
Document table bitmap optimization	Domino refers to tables of document information to determine which documents appear in an updated view. While there is a slight performance cost to maintaining this association, this setting speeds updates of small views in large databases significantly.	Select

continued

<i>Property</i>	<i>What This Does</i>	<i>Action to optimize performance</i>
Don't overwrite free space	As a security feature, Domino overwrites free space when data is deleted from a database. This carries a performance overhead. If security is not an issue with the database select this setting.	Select
Maintain Last Accessed property	If you set a database to delete documents based on intervals without activity, select the "Maintain LastAccessed property." Otherwise, leave this option deselected for best performance.	Deselect
Don't support specialized response hierarchy	Documents store information about their parent or response document, which is used only by the @functions @AllChildren and @AllDescendants. In databases that don't use these @functions in views, select this property to improve database performance.	Select
Don't allow headline monitoring	Users can set up their headlines to search databases automatically for items of interest. If many users do this, database performance can slow. To prevent a database from being monitored, select this setting.	Select
Limit entries in \$UpdatedBy fields	The names of users and servers that have edited a document are stored in a \$UpdatedBy field. This overhead can be excessive on heavily accessed documents. If you don't need this information you can reduce the number of entries.	Select the option and specify the number of entries \$UpdatedBy fields can contain.
Don't maintain unread marks	By default Domino maintains unread marks - what documents have been read by who. While this feature is important in some databases, like discussions, it carries a performance overhead and should be turned off with databases such as the Domino directory and LOG.NSF.	Select

Six Top Performance Tips

Here is a list of the six top performance tips:

- Be aware of the basic factors of server performance — CPU, memory, disk I/O and networking.
- Be systematic in your performance tuning — change one thing at a time and monitor the effect.
- Monitor performance regularly, not just when there is a problem.
- Use transaction logging (and on a dedicated disk) — besides a 10% to 20% performance benefit, you get improved data integrity.
- Use TCP/IP — it performs better, and the use of other protocols and of NetBIOS for Domino is on the wane.
- Don't ignore client workstation performance.

Finally, don't forget that Domino was not intended to do certain types of applications. If you are trying to force-fit an application onto Domino and it can reasonably be expected to cause a performance problem, maybe you should consider another application base, for example, transaction systems, to meet this need.

Summary

In this chapter we looked at performance as it relates to Domino. We described some of the tools you can use. Sometimes performance problems can be complex, caused by a combination of factors, and sometimes it comes down to common sense — a systematic approach is vital.

We discussed performance tuning in the context of:

- Domino servers
- Notes clients
- Databases

Performance tuning is not a substitute for planning and maintenance, and prevention is always better than cure. It is important to collect and analyze information regularly and not just when problems occur.

Chapter 22

Contingency Planning

There is one thing that cannot be stressed enough about this topic: Plan for disaster ahead of time!

In this chapter the following topics are covered:

- Recovery planning
- Backups
- Power protection
- Protecting against viruses
- Data decay
- Recovery

Recovery Planning

This type of planning goes by many names: Disaster Recovery Planning, Emergency Preparedness, Data Integrity Planning, Business Resumption Planning, or various other terms which all mean basically the same thing, in our context.

The name doesn't matter, since the concept is fundamentally the same — saving the organization from losing data. We will use the term recovery planning, for the sake of consistency. Really, the type of disaster you are trying to be prepared for does not matter, either. If you're prepared for the worst (which is generally regarded to be an earthquake), you can get back to normal much faster.

Consider the following statistics regarding data loss, taken from *Computing Canada*, March 1997, and *Canadian Underwriter*, May 1998:

- Critical business functions cannot continue for more than 4.8 days without a data recovery in process.
- 50% of all companies that do not recover their data within 10 business days of initial loss never fully recover.
- More than 150 tenant companies failed in the World Trade Center, after the 1993 bombing, because their systems were no longer operational.

- 43% of North American companies which experience a data loss disaster (without a recovery plan in place) never reopened for business.
- 93% of firms that did not have a recovery plan in place went out of business within five years after a data loss disaster.
- More data is destroyed every year by inept recovery attempts or disk utilities than by actual drive failures or malfunctions.

We perform backups, protect our servers from power inconsistencies, secure our networks, and check for viruses to try and prevent these types of loss. As you can see from the statistics above, a recovery plan can literally save the entire organization.

Issues to Consider

There are many issues you will need to consider when formulating a recovery plan.

- After a disaster, you can only proceed with data recovery once all your people, and perhaps customers, are safe and your premises are declared sound.

Your organization should have a wider plan to handle this aspect of disaster planning, including the possibility of having to relocate an entire building worth of people and resources quickly. You should be mainly concerned here with your “own little corner of the world,” but you may want to ask if such a plan exists in your organization and tailor your plans for a Domino restoration accordingly.

- How long will you have to recover after a disaster?

72 hours is the general rule-of-thumb, though the importance of your data will cause this figure to vary somewhat. This figure should be discussed with senior management, to meet or alter their expectations.

- What your local support agencies will do to help and what they will not do.

Will you be guaranteed temporary workers, for instance, to help you? If so, how much time before they can be expected to arrive and how much will they cost? What will their skill level likely be?

- How much can your own people handle?

Consider your resources, how you will communicate with each other if the phone lines are down and cellular traffic is being restricted to emergency crews, who will do the damage assessment, and how your recovery teams will be divided.

- Remember that 85% of all help given in an emergency is from bystanders or coworkers, not emergency response crews. In any case, there is no such thing as an emergency data response team. You are on your own.

What Can Really Go Wrong?

There are many ways in which data can be damaged. Someone may accidentally delete a document, and discover they need it back. A database may become corrupted and can no longer be used. The hard disk containing Domino databases in a server may fail and have to be replaced. Users may inadvertently delete their mail files (this should be less of a problem in R5 than in previous versions of Notes). Think about the types of emergencies you can expect to occur most often in your area, which may include any or all of the following:

- Storms, fires, earthquakes, floods, toxic spills, power outages, theft, viruses, employee damage (intentional or inadvertent), hackers, infestations of vermin (yes, this does happen).

Tip The dangers of employee sabotage are often overlooked. For example, there is a case of a worker who was denied a weekend off and who sabotaged 6 months of data by running a simple program which crashed the hard disk.

All these questions, and any others you can think of, should be answered in your restore procedure, with clear guidelines on how and when restoration should happen, as described in the following sections.

Documenting a Recovery Plan

It is a good idea to have your disaster plan not only thought about but also documented. When people are running around you, probably yelling, it is not the time to be wondering where you put that NIC driver diskette. You need to know and you need to know now.

The easiest way to ensure this is to have a disaster kit. Have two complete kits, updated regularly, each in its own waterproof plastic storage container, in different buildings. You will want to keep one in your building, away from the server room (in a vault, if you have one), and one in your home or another building of the company (this will depend on the sensitivity of your data), so you can get to at least one in case of disaster. It's not a good idea to keep the kit in your car for security reasons, though on the surface it seems useful.

Write everything you can think of related to your data integrity down in a brainstorming session, then consult this book and lists from other sources to be sure you have not neglected any key issues.

The contents of your disaster kit might look like the following figure. You will want to develop it based on the discussions which follow the figure:

Disaster Recovery Kit Contents

Key personnel:	Who to call in case of emergency: Administrators People who perform backups Security personnel
Order in which you will restore service:	Critical departments Key individuals Which servers need to be restored first Which services and databases will be needed first
Network records:	Password list Hardware inventory Purchase orders, for insurance purposes Backup logs Diagrams, which highlight the critical components A minimum configuration list, assuming your usual machine is dead
Backup information:	Location of backup media Work instructions for restoring files A copy of the backup rotation schedule
Software:	Operating system, including copies of patches Boot floppy or setup floppies Emergency rescue diskette, if applicable Driver diskettes Backup software UPS software Network client software, if applicable Domino software Add-on software Key databases, server.id, cert.id, yourname.id, names.nsf, and desktop.dsk (on CD-ROM)
Instructions:	Key work instructions, sufficient for a novice to restore the server to its former state Key troubleshooting documents, which illustrate previous installation problems
Toolkit:	Screw drivers (Phillips head) Screws Extra NIC Spare cabling Replacement floppy and CD-ROM drive Spare UPS battery
The really critical stuff:	6-pack of your favorite soda Local take-out menus and a snack Portable breakfast food -- you'll be there for breakfast

Tip Keep print screens of critical information, like DNS tables, and machine configurations, in your disaster kit.

The kinds of issues you will want to consider when planning for disaster are:

- Exactly what to do when disaster strikes
- Key people to call in case of disaster
- The priority of services provided by Domino, so you can restore critical services first. Your Domino responsibility may be departmental or company-wide; if departmental, be sure it meshes with what other departments are doing; also be sure to coordinate with the rest of the IS team.

- Location of servers, modems, and other equipment. See Chapter 17 for more information on documenting your Domino installation.
- Make sure someone else knows how to execute the plan in case you are not available. Be certain that your work instructions in the disaster kit are so clear that when disaster strikes, and you are on the beach in Jamaica, your brand-new assistant can handle it.
- Get the plan approved by senior management.

Caution A disaster plan is a moving target. You will need to revisit your plan every so often and update it. See also the section “Recovery,” later in this chapter, for information relating to testing your plan.

Preventing Disaster

There are many things you can do to prevent disaster. Among them are backing up data regularly, protecting systems from power disturbances, virus checking, regular security audits, and regular file restores. All of these are discussed in subsequent sections of this chapter. In addition, keep the following tips in mind:

- Make your network as stable as possible, paying special attention to physical and software security, profiles, and policies.
- If you have multiple locations, keep critical data in as many locations as you can.
- Provide fault tolerance, making use of RAID arrays, disk mirroring, and failover servers wherever possible. The more redundancy you build into your network, the fewer problems you will have when a crash occurs. For more information on hardware considerations, see Chapter 7.
- Always check the obvious first (power, cables, configuration information).
- Change one thing at a time, especially when troubleshooting. Then test to see if the problem has disappeared.
- Perform regular maintenance on hardware.
- Check logs regularly to discern problems before they become serious.
- Record the exact wording of any error messages for future reference.

Is Recovery Planning Worth It?

The Return on Investment (ROI) for recovery planning for most companies is quickly realized. Work out the following numbers for your company. The worksheet comes from APC, a UPS (Uninterruptible Power Supply) manufacturer.

Tip When you are trying to justify a complete disaster recovery package to senior management, this type of calculation can be a critical factor in showing that the initial costs are worth it.

Return On Investment (ROI) worksheet

1) Calculating the value of lost data

How often is the system backed up?

How many users depend on the system either directly (word-processors, for instance) or indirectly (CEO who needs daily reports)?

A

What percent of data is not recoverable after system crash?

B

Company size (gross revenue)?

C

Number of employees?

D

Employee contribution
Company's gross revenue/number of employees

E=C/D

Employee hourly contribution
Employee contribution / total business hours in year

F=E/2000

Cost of day's worth of data
(Employee hourly contribution * # of users on LAN) * (8 hr. day)

G=(F*A)*B

Total cost of data loss
(Cost of day's worth of data) * (% of data not recoverable)

H=G*B

2) Calculating personnel downtime

Type of failure?

Mean time to repair (hours)?

I

Average hourly wage of users?

J

Salary cost
Average wage of users * # of users * mean time to repair

K=J*A*I

Consultant or overtime cost?

L

Total cost
Salary cost + overtime cost, if applicable+ consultant's cost, if applicable)

M=L+K

3) Calculating company image loss

Number of alternate suppliers of same service or product?

Estimated failures per year?

N

Estimated % of customers who will select another supplier if unable to get service/ product because of system problems?

P

Total image loss
Company's gross sales * (% of turn-aways)

Q=C*P

Total costs per failure

Total =
(Cost of data loss) + (Cost of personnel downtime) + (Cost of image)

R=H+M+Q

Estimated # of failures over five years

S=N*5

Total losses over five years

Total =
(Total cost per failure) * (Estimated # of failures over five years)

T=R*S

Source: American Power Corporation.

Backups

It is amazing that the same people who will not leave their driveway without a spare tire in the trunk will generate data for months, or even years, without a second thought. Until that day. The day when you had that presentation to the Board, and your hard drive crashed with six weeks of critical data on it. Data which you had slaved over, poured your soul into, and now it's gone. ALL gone. And all you have to show for your effort is a blank screen which reads "Drive 0 failure."

Could you have been saved hours of torture trying to explain to the Board how you, an IS person no less, are unprepared? Yes — with backups. Regular, preferably daily, backups of key data and system files.

You have two choices for backing up Domino. You can use the traditional method of making backup copies of files, discussed in some detail below, or you can use transaction logging.

What to Back Up

You should back up every file on your server regularly. At a minimum, you need to back up all Domino server data files including databases, template files, the notes.ini file, and ID files, during a daily backup, and other files perhaps weekly. This will depend on your organization's wider backup strategy. Many organizations do full backups daily.

Below is a sample backup schedule:

Backup Schedule

Server name:	Enter the name of the server being backed up here
Server location:	Enter the location of the server here
Backup server:	Enter the particulars of the server which performs the backups here
Backup system used:	Drive type: _____ Drive serial number: _____ Media type: _____ Part number for ordering: _____ Software: _____ Version: _____ Number of licenses owned: _____ Open file agents? Yes _____ No _____
Location of media:	Enter the location (current and archived) of backup media
Backup schedule:	Briefly outline the philosophy of the schedule (is it grandfather-father-son, tower of hanoi, round robin, etc.)
Full backup:	Enter the repeating period for full backups here
Incremental backup:	Enter the repeating period for incremental backups here, if applicable
Differential backup:	Enter the repeating period for differential backups here, if applicable
Custom backup:	Briefly outline custom backups here If custom backups are done, describe in detail here
Media rotation schedule:	Describe how and when media are rotated, including details of any off-site storage schemes
Media labeling instructions:	Describe the standard for labeling and naming media
Primary backup administrator name:	Enter the name and title of the person who has primary responsibility for backups
Phone numbers:	Enter the phone numbers of the primary backup administrator and anyone else who may be needed in an emergency situation
Comments:	Enter any relevant comments here
This form to be used in conjunction with Hardware/ Software Purchase	

If you have laptop or desktop users who have local databases (in other words, those databases do not exist on any server) you should ensure their hard drives are backed up regularly, as well. Products such as Cheyenne's ArcServe allow backups to occur of a PC's hard drives as long as the PC is connected to the network.

Tip If you have many users with local databases, you may need to consider scheduling their backups in rotation. Depending on your network's bandwidth, it may not be possible to back up more than a fraction of the users in one particular night. For instance, users with last names A - C are backed up Monday night, D - H Tuesday night, and so on.

Who Should Perform Backups?

Domino backup is more involved than a file server backup and probably should not be left to people who don't have a full understanding of Domino. Whoever is responsible for backing up your Domino system should know how Domino treats database files, especially system databases like the Domino directory (see "Open Files" in this chapter).

Archiving

Backup is not the same as archival. Archives are copies of data (or databases) moved out of the production system, and retained for reference purposes or legal reasons.

Sometimes archival is used as a way to reduce the size of a Notes database, usually for performance improvement, but this should not be confused with backup. Different databases generally have different archive policies and so the archival of each database is the responsibility of each database owner. See Chapter 11, “Designing an Application Infrastructure,” for more information.

Replication

In addition to the traditional backup systems described in the following, there is a feature specific to Domino which some people use as a rudimentary form of backup. Basically, replication is the act of copying a database from one location to another. It can be one-way or two-way (in other words, you can change information in either copy, and it will be replicated to the other).

Caution Never rely only on replication as your method of database backup. A damaged or accidentally changed database may replicate, and then your only recourse is to recover the database from a server backup tape.

For more information on replication, see Chapter 11, “Designing an Application Infrastructure,” and also the Domino Administration Help database (help5_admin.nsf).

Types of Backup Systems

There are many different types of systems which provide backup. The most common is magnetic tape, most often either DAT (Digital Audio Tape) or DLT (Digital Linear Tape). With the reduced cost of CD-ROMs, some companies are using them for backup, particularly in “new media” organizations. Other options include glass storage, and other forms of backup which are geared towards the larger enterprise.

The most important thing about a backup system is to have one and use it. The type is less important, though you should do some research before making your choice, to choose a system which will meet your needs, so you will use it.

Hot Sites

If your company acts as a data host, or otherwise cannot afford to have downtime, ever, you may want to investigate “hot sites.” These are companies which are in the business of hosting other people’s data, and are ready to provide complete enterprise-wide fail over in the event of a disaster.

The services are expensive, but can be much cheaper than going out of business for failing to meet Service Level Agreements (SLAs) with customers.

A related concept is data silos, which are covered in more detail in the following section. Where hot sites will actually act like another, off-site, IS department for you, data silos will get your data back to you, somewhat like a backup tape.

Data Silos

There are some difficulties inherent with backup tape systems, which are the most common form of data storage. Often, the tapes are stored at the same location as the organization's servers, an obvious problem in case of natural disasters like fire or flood. Alternatively, they generate costs in terms of off-site storage.

Using readily available Electronic Data Interchange (EDI) or other communications means, however, organizations can load files onto secured "data silos," capable of storing hundreds of terabytes of information.

Similar to tape backups, data silos offer regular scheduling, generally automatically performed, with the option of backing up manually as needed. Since the information is not onsite, "online" restore is also simplified. Most providers guarantee a set of CD-ROMs with current data within 24 hours of a reported system outage.

The speed of the backup may not be sufficient for your needs, however, depending on the bandwidth you have in place. And the cost of the service can be more, over the long term, than a traditional tape backup system. However, the potential gains may be worth it for your organization. Vendor information on this type of service can be found at www.telebackup.com

Automated Systems

The biggest point of failure in backup systems tends to be the human element, so it may make sense to consider an automated tape library system. Consider a "hands-free" backup solution if several of the following are true of your organization:

- Your network files are backed up, archived, or restored by having someone manually switch cartridges.
- You have trouble backing up all your data during your backup window.
- Your data requires more than one cartridge.
- When files need to be recovered, you have to search multiple tapes.

- Users, not trained administrators, are administering the backup of any of your data servers or the recovery of lost files.
- It takes more than 10 minutes to recover a lost file.
- You are making tape-to-tape copies of your data files for off-site storage or disaster planning.
- Important data has been overwritten because the wrong tape was inserted.
- Empty backup tapes were discovered, which should have been full.
- Cartridges have been found which are unlabelled or inaccessible.
- Your organization spends more than 3 hours per week managing system backups.

Using Backup Methods with Domino

To choose a backup product for your Domino system you need to consider how Domino treats databases. If a file is being accessed during a backup, that file is unable to be copied or backed up. There are certain Domino databases and files which are always being accessed, like LOG.NSF, NAMES.NSF (the Domino directory), MAIL.BOX and the server ID file.

Overnight, when backups typically occur, many databases are being replicated or compacted or other system maintenance is occurring, which may impact your backup software's ability to take an accurate backup. Backup products refer to these as open files. You need to plan how you are going to back up these databases.

Open Files

If your backup utility cannot back up open files, you must shut down the server before you create the backup file. A better solution is to use an Open File Agent (OFA), on Intel-based systems, such as St. Bernard Software's Open File Agent. This agent now comes bundled with or is sold as an add-on to several other backup packages. The advantage to using an OFA is that the server can run continuously, even during a backup. Corruption of databases is somewhat reduced, as is server downtime.

Transaction Logging

A Domino-specific type of backup is transaction logging and recovery. With this feature enabled, the system captures database changes and writes them to a transaction log. Then if a failure occurs, you can use the transaction log and a third-party backup utility to recover your databases.

Transaction logging offers three main benefits:

1. Generally, you will no longer need to run Fixup to recover databases following a system failure. This will result in quicker server restarts, since Fixup must check every document in each database, while transaction log recovery applies or undoes only those transactions not written to disk at the time of the system failure.
2. Transaction logging saves processing time because it allows Domino to defer database updates to disk during periods of high server activity. Transactions are recorded sequentially in the log files, which is much quicker than database updates to random, non-sequential parts of a disk.
3. Using transaction logging simplifies your daily backup procedure. You can use a third-party backup utility to perform daily incremental backups of the transaction logs, rather than perform full database backups.

Caution Transaction logging works with R5 databases but not with earlier releases. To check database formats, use the Files tab in Domino Administrator.

To use all of the features of transaction logging and recovery, you need a third-party backup utility that supports Domino Release 5 and transaction logging, such as those described above.

Tip At the time of writing, neither third-party utilities nor ADSM included support for transactional logging in Domino R5. See also the following section for more information.

Tivoli Data Protection for Lotus Domino

ADSM is being rebranded under the Tivoli name. Expect the new product out some time in 1999, called Tivoli Data Protection for Lotus Domino.

At time of writing, a new ADSMConnect agent for Domino R5 is being developed which exploits the new backup APIs provided in R5. This will include support for logged databases as well as backing up the transaction log if archival logging is enabled on the Domino server.

Power Protection

Protect each server and other key equipment (like inter-networking equipment and your PBX) with a power-conditioning Uninterruptible Power Supply (UPS). The goal here is to minimize the number of times the system goes down due to power problems.

If you are in a rural area or simply have unreliable power, protect key workstations, too (ideally, you would protect every piece of equipment, but cost will probably prevent this). With a product like Domino, power protection is especially critical, since power fluctuations can easily corrupt a database.

Tip A common misconception is that only power surges or complete outages are dangerous. In fact, power sags or “brown outs” can be more damaging, since they can result in random database corruption which may not be discovered for some time.

The Problems with Power

The following table shows possible events, their causes and effects, as they relate to power problems:

<i>Events</i>	<i>Causes</i>	<i>Effects</i>
<u>Sags or brownouts</u> : a short term decrease in voltage; account for 87% of all power disturbances	The startup demands of many electrical devices. Utilities use rolling brownouts as a means of handling lack of capacity.	Frozen keyboards, unexpected system crashes, loss or corruption of data and databases, reduced life span of equipment.
<u>Blackout</u> : total loss of power	Excessive demand on the power grid, lightning, ice storms, downed poles, earthquakes.	Loss of current work in RAM or cache, possible FAT loss resulting in total loss of data stored on drive.
<u>Spike or impulse</u> : instantaneous increase in voltage	Nearby lightning strike, when utility power comes back on line after being off for a time.	Entering equipment through AC, network, serial, or phone lines, causes catastrophic damage to hardware. Loss of data.
<u>Surge</u> : short term increase in voltage, lasting at least 1/120 of a second	Air conditioners, or other high powered motors, when switched off, cause extra voltage.	Will stress delicate components and cause premature failure.
<u>Noise</u> : EMI or RFI interference, which may be intermittent or chronic	Lightning, load switching, generators, radio transmitters, industrial equipment.	Introduces glitches and errors into executable programs and data files, particularly databases.

As you can see from the previous table, the “three Ds” of power quality — disruption, degradation, and destruction — can cause anything from minor data loss to massive, system-wide crashes. Performance can be badly impaired, but a well-planned power quality program can prevent this from ever occurring. Identify your key equipment (during a hardware inventory is a good time to do this) and protect it according to its priority in your system.

Tip While dedicated lines will ensure there are not too many loads on a line to cause circuit overload, and an isolated ground will assure a good ground connection, neither will eliminate “noise” from poor quality or damaged lines. Noise can cause database corruption (see previous table).

To effectively manage the power being drawn in your organization, you must understand how computers, energy efficient lighting, and other electric items draw power. The reason is that the energy wave forms of electronic equipment can cause erratic operation, overheating, and damage to wiring and distribution equipment.

Once you have identified key equipment, understanding how it all draws power will help you strategize a power protection plan. If you do not possess the expertise internally, hire someone from outside to analyze your power consumption patterns and areas of potential weakness or failure.

Calculating UPS Size

Here is an example of how you can calculate UPS size:

1. Check the amperage rating on the manufacturer’s nameplate on the back of your computer (A) and monitor (B).
2. $A + B = C$.
3. Multiply C by your line voltage (120 in Canada and the US) = D, your VA rating.
4. Match the VA rating of your equipment with the VA rating of a UPS. Try to keep the VA rating of the UPS double your own rating.

For example, if your VA rating is 400, purchase a UPS with a rating of 800. In this example, if you choose a UPS with a rating below 400, you will overload the unit and trip its circuit breaker.

Tip Do not consider printers and scanners when doing this calculation. They require surge protection, but not generally power protection (their VA ratings are too high to make running on battery practical).

While it is outside the scope of this book to go into depth about the features available for a UPS, there are many features you may want to look for when purchasing a UPS, such as:

- The ability for the hardware to communicate with server-based software.
- Management software (preferably SNMP). Many UPS manufacturers offer an intelligent UPS, which comes with software which will, for example, shut down the operating system when the battery in the UPS reaches a level you set (for instance, 30% power). It may also monitor such things as UPS status, battery run-time, and line voltage.
- The ability to configure the system to react to power and environmental anomalies.
- A self-diagnosing system, which will notify you if there is a problem with the UPS or its software.
- Accessories which allow the room's ambient temperature and humidity level to be measured.
- Look for out-of-band management abilities, so that if your own network is down, you may still dial into the UPS to diagnose problems and shut down servers, routers, or PBX systems sooner than the management software will.

Caution Be sure the power management software you choose is certified as compatible with your operating system.

With the average computer subject to more than 120 power problems each month, according to a study performed by IBM, with results ranging from keyboard lockups to burnt motherboards, it is probably well worth your while to pay serious attention to protecting your servers by protecting their power supply.

Protecting against Viruses

Viruses are real. Although it is true that software bugs cause more problems — statistically speaking — than viruses each year, when you are hit by a virus, it can devastate your entire system (ask anyone who was hit by the Melissa virus in 1999). In this section, we discuss how to protect Domino and other systems from viruses.

What Is a Virus?

A virus is a piece of software code which self-replicates. In other words, it is a program which somebody wrote, and its main purpose is to copy itself, over and over and over. There are several kinds of viruses:

- Boot sector viruses: Infect the boot sector of a floppy diskette, or the partition (or boot) sector of a hard disk.
- Executable viruses: Infect program files, on local or network drives.
- Macro viruses: Infect the macros within word processing and spreadsheet files.
- E-mail viruses: Infect an entire e-mail system.

Tip One type of virus uses SMTP relay to send out ever-increasing numbers of mail messages, until your server crashes. Be sure you turn SMTP relay off to prevent this from happening to your Domino mail servers. Consult <http://maps.vix.com> for more information on mail system abuses.

- Payload viruses: Carry a message, screen dump, or executable to damage data files; these usually require a trigger, such as number of reboots or system date, before dumping their payload.

Caution Remember that virus authors do not have to check their code for functionality, like software vendors do. This means viruses may have unintended effects, as well as intended ones.

Identifying Virus Threats

There are many potential sources of viruses within an organization:

- Floppy diskettes and CDs brought into an organization or shared from one location to another
- Home desktop PCs (when people take documents home to work on them)
- Laptop PCs
- E-mail attachments that can be viruses or contain viruses
- Internet access (all types, whether the Web, usenet, or an online service), especially file downloads

There may be additional sources of threat within your organization. Brainstorm about the potential threats to your organization and plan your strategy accordingly. You may, for instance, have a system policy which prevents users from accessing their floppy disk drives, which would eliminate the threat from user floppy drives.

Tip In Domino, using an Execution Control List (ECL) you can control which formulas and scripts created by another user can run on your workstation; this can help control viruses, too.

By default, scripts and formulas, whether signed or unsigned, cannot execute on your workstation without displaying a warning message. However, scripts and formulas which are run from any database created with a template that ships with Notes, and are signed "Lotus Notes Template Development/Lotus Notes" have complete execution access.

Neutralizing Viruses

You will probably not completely escape viruses. However, you can be prepared for them, and have a plan in place for those times when one slips through the cracks. Make sure your anti-virus policies include the following:

- Taking regular backups of your system (see Backups earlier in this chapter), to ensure that you are able to restore data if it becomes corrupted due to a virus.
- Be sure to keep clean copies of all programs on CD; if they are on floppies, be sure they are write-protected.
- Ensure incoming software is from reputable sources. Know how your company is choosing software to be sure they choose wisely (and try to minimize the influence of non-technical people in this type of decision).
- Formulate anti-virus and floppy disk policies and share them with end users in a training session and formal policy documents, such as:
 - Write-protecting all floppies
 - Not leaving disks in the drive when powering off
 - Powering off and rebooting if they accidentally leave a floppy in the drive rather than continuing the boot
 - Making users responsible for the integrity of the data on their own systems
 - Changing the CMOS settings so that C: boots before A: to prevent booting from a floppy (have your help desk do this one)
- Manage network access, choosing to restrict end user access to "execute only" rather than "write" where possible. Remember that viruses have the same network access as the users who spread them.
- Use a PC which is disconnected from the network to test all incoming media (floppies, CDs, and so on).
- Be sure that you are finding "no viruses" because there aren't any, and not simply because the anti-virus software is faulty in some way. To do this, use an alternate anti-virus tool periodically.

- Monitor feedback between the various parts of your anti-virus system and recognize that if there is no feedback, that in itself may indicate a problem. Ensure that your reporting is as centralized as possible, so data gathering is meaningful.
- Designate someone to check periodically to ensure users have not disabled their anti-virus software and that all servers are running the latest patches and pattern files.
- Give those users who pose the greatest risk special treatment (and document the exceptions). These users may be network supervisors, outside technicians or service people, contractors, consultants, sales reps, or anyone who is known to have imported a virus. Have a “one strike” policy for identifying high-risk people.
- Every PC, desktop, laptop, and server should be running anti-virus software. That way, there are two levels of protection: server and client.
- Ensure you have an adequate virus scanning tool (see the next section).

Choosing Anti-Virus Software

Your anti-virus software should allow you to accomplish the goals mentioned in the preceding sections. These are general goals, which apply to pretty much any PC or network. In addition, you will want to ensure you have an anti-virus package which can scan the Domino database structure and look for virus activity, particularly in the mail databases. Vendors such as McAfee and Dr. Solomon offer Domino-specific solutions, which are well worth purchasing, with the advent of viruses such as Melissa and its subsequent variants. Consider the following when choosing your anti-virus package:

- The more your anti-virus strategy is removed from the hands of users, the better. The most effective systems do not allow user intervention, offer automated upgrades and installations, and prevent users from disabling virus checking.
- Be sure the package offers free maintenance for a period of time. New viruses are released to the wild all the time, and to be effective, you will need to update your anti-virus “pattern file” (the list of viruses currently in the wild) regularly.
- Your package should detect lab viruses and heuristic viruses as well as “simple” viruses.
- The software should be able to automatically notify you when there is a problem.

- The software should automatically self-repair, if it becomes infected itself.
- The software should be modular (so you can choose varying levels of protection for the server and client) and cross-platform.

With sound policies, high-caliber software, and people periodically checking that the automated system you have created is working correctly, you can greatly minimize your exposure to risk from viruses.

Data Decay

Many people believe that, once data is stored on a medium, such as a magnetic backup tape or a CD-ROM, it will be safely backed up for ever more. However, that may not truly be the case. When was the last time you used an 8" floppy disk, or even a 5.25" floppy, for instance? Chances are, it has been some time. Obsolete media, in addition to the deterioration of media, are largely overlooked problems with data archiving systems.

When you archive data on media, be sure to keep records, taking into account the retention periods for that data. For instance, if you are responsible for the archived data of a financial institution which must retain records for several years, you should probably not store that data on floppy diskettes. Or on anything else whose format or standard is likely to change during that span of time. If you do, be very sure that you have a means of retrieving that data.

Even NASA, often at the bleeding edge of technology, is not immune to data decay. "Up to 20% of the information carefully collected on Jet Propulsion Laboratory computers during NASA's 1976 Viking mission to Mars has been lost," says Marcia Stepanek in her article "From Digits to Dust," published in *Business Week*, April 1998. And NASA is not alone.

The life-span of digital media, when stored in less-than-optimal conditions, is probably shorter than you think. CD-ROMs, for instance, deteriorate as quickly as newsprint, in as little as 5 years. Tapes stored under good conditions may keep data safe for as much as 10 years. The biggest problem with digital media is that they do not show decay until it is too late.

The biggest dangers your data faces are stray magnetic fields, oxidation, extreme heat and cold, and humidity. And even if you don't have damaged media, if you need to retrieve data some time in the distant future, the software needed to read it may no longer be available. Data transfer, when you switch from one medium to another to preserve data in a current format, tends to lose a percentage of the data, too (try converting an Ami Pro 1.2 file with graphics to MS Word sometime).

What can you do? Keep records of how and roughly when your data was created. If you have migrated data to a new format, keep records of how the migration was completed. Try to use simple formats, which are most likely to be readable 20 years from now, rather than proprietary systems. Make preservation of data a priority when investing in new systems.

Tip A great feature of the Notes client is its ability, through the use of the Outside-In Viewer, to read a wide variety of formats, which you may not otherwise have access to on your system.

You won't ever be able to preserve 100% of your company's data over the long term, but at least you can minimize your exposure to decay with some common sense and good preventive practices.

Recovery

"Trust, but verify." — Russian phrase

So, you're convinced that protecting your data is important. You know, for instance, that your mainframe is priority one, followed by Domino e-mail, followed by your Domino customer service database. You have a plan of attack when disaster (whether it's lightning or a virus) strikes. It's even written down, formally, in multiple locations (but kept secure, so unauthorized people cannot duplicate your network).

Now, you need to think about how you would actually recover your data in a disaster.

The IT department of the hospital system in Los Angeles credits their ability to continue to offer services throughout major disasters to their disaster plan testing. When their disaster plan was first formulated, they ran a simulated disaster and found several major gaps in their plan.

Rather than looking on this as a failure in their planning process, they took the opportunity to fill the gaps. Having continued to offer service through earthquakes, fires, and the power outages that accompany them, their systems are able to survive more or less intact through nearly any calamity, for a known period of time.

This is what you should strive for in your disaster planning.

Once you have formulated your plan, you need to test it. Make sure you haven't forgotten an entire Domino application server in your backups, for example. Be sure your restore process works, because your backup tapes will be useless if they cannot be restored. Then refine the plan and do another run through. And be sure your disaster kit is kept up-to-date to reflect any changes you make as a result of a failed test of your disaster plan.

Tip It is a common failing of a backup system that a test restore is not regularly scheduled. Doing restores regularly ensures that your system is *verifiably* working properly, all the time.

Be sure that your disaster kit, standard network manual, and Frequently Asked Questions (FAQ) database contains detailed instructions of how and when to perform a restore from a backup tape. As well, it should contain the locations of the backup media, and the name, phone number, and the company's account number of any off-site storage facilities.

Hard Disk Recovery

You will often be able to restore individual files from a backup tape to an extant disk, but there will also be times when you will need to recover or rebuild an entire disk. Following are some tips to follow when doing disk restorations:

- Do not try to restore your backup to the original drive. If it is invalid, you will be overwriting critical information needed for recovery.
- If possible, confirm the validity of your backup on another system.
- Confirm drive spin-up by listening or vibration, *not* by opening the drive.
- Determine if a faulty drive is physically recognized by the system as a device.
- Do *not* reinstall the operating system or partitions until all data is backed up.
- If the drive is physically accessible but your files or the file system are gone, use extreme caution with disk utilities. Let disk utilities examine and identify the problems only — not fix them.
- If you absolutely must recover your data, do not let anyone run any disk utility unless the drive has been successfully mirrored. Test to see that at least several files open on a client machine before proceeding.
- Do not boot from or run any programs from a damaged device.
- Set up an alternate system. People may be able to get back to work on new data while old files are being restored. This is especially useful if you have had to fall back to a “minimum configuration” situation, where your primary hardware is temporarily completely unavailable.

Restoring Domino

There are four different types of restore specific to Domino. Hopefully, you will only ever have to perform document and database restorations.

- Document restore
- Database restore
- Server restore
- Full system restore

Document Restore

This is the most common type of restoration you will likely encounter. You may need to do this if a document in a database is corrupted, or if a user deletes a document by mistake.

One way to restore the document is to find a replica copy of the database which has not yet replicated the changes you wish to reverse, and copy and paste the appropriate data from there. You should look into this option before restoring by other methods since it is usually quick and easy.

If you are using any other backup method, you must restore the whole database to another file or directory, then copy and paste the required document into the original database. Be sure your backup product has the flexibility to handle this type of restore.

You should define the circumstances under which you will perform a document restore. Your users will be happy to know that if they do accidentally delete something important, they can get it back. However, it takes up a lot of administration time for what may be trivial documents, so you will need to balance these factors.

Database Restore

You may need to restore an entire database if the database itself is corrupted or mistakenly deleted, or if a disk drive fails.

Again, first check if you can use a replica copy. If not, use your backup software to restore the file to its original location. In the case of a failed disk drive, you would need to replace and reformat the drive before restoring the files (see “Hard Disk Recovery” earlier in this chapter).

Server Restore

If all the disk drives on a server fail, or if the machine fails and the drives cannot be used in another machine, you will need to restore the entire server. With some backup products there are fast restore facilities which can quickly restore all the data if you have backed up everything on the machine. In other cases there are several more steps involved before you can restore your Domino databases.

Run Domino setup, making sure you set the server up as an additional server in your organization. If you have more than one server in the domain, make a replica of the Domino directory from an already running server. Otherwise you will have to create a new Domino directory, and then overwrite it with the correct one.

It is important that you have a copy of the server ID file, or the setup program will create a new one. You can recreate a server ID file, but you will lose access to any databases encrypted using the server ID.

Full System Restore

You will only need to restore your whole Notes system in severe and rare circumstances, such as those discussed as catastrophic events elsewhere in this chapter.

If you have a full or partial duplicate system for this eventuality, you can provide a temporary Domino system, until you have rebuilt the original. You may have to go through several steps to get the duplicate system up and running, depending on how much function this system has.

If you don't have a disaster recovery plan then you will find it difficult and time-consuming to get your system back up and running. You will need to set up one server as the first in the organization, then replace the Notes system databases and server ID file with your backups. You will then need to follow the server restore process for each server until you have all your new servers back up and running.

Retrieval of ID Files

ID Files are the cornerstone of Domino security. Without these files, users cannot access their mail or other databases. The loss or corruption of each type of ID file will have different consequences, some of which have changed in R5.

User ID

In previous versions of Notes/Domino it was not possible to recover a user's forgotten password unless there was a physical backup copy of the user's ID file and the original password was known. With R5, Lotus now offers administrators the ability to recover user passwords.

However, before users can recover their ID files, you must set up a centralized mail or mail-in database to store encrypted backups of ID files and specify information about which administrators are allowed to recover IDs. You must perform these steps before anyone loses or corrupts an ID.

For detailed instructions on performing these tasks, search Domino R5 Administration Help (help5_admin.nsf) and search for ID recovery.

Server ID

If a server ID file is corrupted, you can recreate the server ID by registering the server again. You need to make sure you copy the original server document, and paste it back in once the new ID has been created.

Certifier ID

By far the worst ID files to lose are the certifier IDs. Each hierarchical certifier ID has an encryption key stored within it. If the certifier ID is recreated, the name of the certificate may be the same but the encryption key will be different. Anyone cross-certified with the new certifier will not be able to access servers certified with the old certifier. This means all servers and users certified with the lost certifier ID will have to be recreated using a new certifier ID.

Tip Store all certifier and server IDs securely and store backups of these IDs in a separate place. Also make sure they are quickly accessible by Domino Administrators who need to have access to them, but not end users or unauthorized persons.

Summary

Planning for disaster is a complex process. In particular, the first time you examine a disaster recovery plan is an excellent time to examine the efficiency and security of your Domino system.

When planning for disaster, you need to consider not only physical issues such as relocating servers and not placing servers where they can be damaged by sprinkler systems, but also issues like power fluctuations, virus and mail system invasions, data decay, and user errors.

You will also need to carefully plan how to recover files — which happens fairly often — and entire disks as well as considering how you will recover from a major catastrophe.

With proper planning, your organization can survive.

Chapter 23

Troubleshooting

No matter how well your Domino infrastructure is designed and maintained, problems are likely to arise. They might be caused by user error, administrator error, hardware failure, software failure, poor communication, or any other number of things. While troubleshooting a problem, you are not concerned with who is at fault for the error, but only with how to fix it now and how to prevent it from happening again in the future.

This chapter does not aim at listing every possible error and corresponding solution that you might encounter in your Domino environment. Our purpose with this chapter is to show you some things you can do upfront to make your troubleshooting easier, give you a list of sources to consult while troubleshooting, introduce some utilities to use while troubleshooting, and give you some inside information we have learned over the years.

The following topics are covered:

- Steps to troubleshooting a problem
- How to prepare for potential problems
- Tools and utilities
- Sources of information
- Summary

Steps to Troubleshooting a Problem

Let us take a look at the steps you go through when troubleshooting a problem from a technical perspective during the operation of your Domino system. You will find that some problems are related to running a Domino system while others are not.

Defining the Problem

The first step most people take is to clearly define the problem. You need to ask the user or yourself to tell you everything they can about their difficulty. Most users will simply say to you, “It’s not working.” This, of course, does not give you much to deal with. You need to ask them what they are exactly

trying to do and what is happening when they are doing it that tells them it is not working. If there is an error message, you need to find out what it says exactly.

User-Reported Problems

If possible you should go to the user's desk to see exactly what they are doing and the error they are getting with your own eyes. It is very common for the problem to be a user type of error and you will be able to see this immediately if you are watching them perform the operation.

If you cannot be at the user's machine you should follow the steps the user is taking at your own machine. Have the user describe the steps one by one and perform them at your own machine. This will let you see what the user is seeing and simulate you watching the user.

While performing the steps you will either discover a place where the user is making an error, find that the error occurs on their machine but not yours, or find that the error is also occurring on your machine.

If it is the case that the user is doing something wrong you can simply explain to them the proper procedure and you are done. If you find that the error is specific to the user's machine the next step is to find out what is different between the user's machine and yours.

If you find the error also occurring on your machine, then the error is probably affecting most, or all, of the users and you need to find out the cause. At this point you have either solved the problem (if it was a user error), or you have seen the problem for yourself.

Help Desk Support

The above steps are usually handled by the help desk. You will usually not be dealing with end users directly while troubleshooting. You will be called in only when it is determined that the problem is not a user error and the help desk cannot solve the problem. You will, however, need to get a clear definition of the problem from the help desk. You should use the same procedures above when you receive a call from the help desk, so that you have a clear definition of the problem and see it first hand.

Administrator-Reported Problems

You might also need to use the above procedure when receiving a call from another administrator. This might be a first-level administrator who originally took the call from the help desk, an administrator from another location, or an administrator who is trying to fix or configure a server or workstation.

Communicating the Status

Once you understand the problem, tell the person needing help that you now understand the situation and that you will need time to find and implement a solution.

Give the person an exact time when you hope to solve the problem or when you will give them a status update. If the problem looks simple, tell them you hope to have it fixed by the end of the day. If it looks like it might take some time, tell them you might need a couple days and that you will contact them with a status update on a specific date. If you give a date that a problem will be fixed and you find later that you will not make that date, contact the person and let them know the current status and give them a new date when you hope to have the problem solved.

Determining the Cause

Once you have a clear picture of what the problem is and who it is affecting, you need to determine the cause.

Getting More Information

You will often know the problem off the top of your head because you have seen or heard of it before. If you have seen it before you will probably have a standard solution to use and will be able to implement it immediately. If you have not tried the solution before you should test it before you implement it. The procedure for implementing changes is covered in detail later in the chapter.

If you have not seen the problem before, your next step should be to gather information. First, ask the person what they are exactly trying to do. You might be able to sidestep the problem by offering another method of accomplishing their goal. If you agree that they are using the right method to solve their problem, then find out what they have tried so far and what the results were. Once you have discussed what they have tried and what the results were, you should have a very solid idea of what their problem is.

If you are dealing with a server problem, then you are probably the user with the problem. You should treat yourself as a user and follow the same steps above. Ask yourself exactly what you are trying to do and what you have tried so far.

Process of Elimination

Once you have gotten all of the information from the person with the problem, or if you are the person with the problem, it is now up to you to determine the cause of the problem.

Make a list of all of the possible causes to the problem. This could include both Notes and non-Notes items. For example, here is a list of possible causes for the workstation error "Server not responding."

- Workstation operating system software error (network drivers corrupt, files deleted, bug in software)
- Workstation operation system configuration problems (drivers changed, IP number changed, DNS server changed, DHCP server is down)
- Workstation hardware error (network card failed)
- Physical network cable problems (cable was cut or was disconnected from the back of the machine)
- Router or hub problems (a router or hub crashed, configuration changes occurred)
- Notes software configuration problems (the user changed to the Island location, user is typing the server name wrong)
- Notes file corruption (files were deleted, Novell servers where data files are kept is down)
- DNS server is down
- Domino server is down (for any number of reasons)

As you can see, the list can become quite long. Some problems are Notes related while many are not.

You should not be constructing such a list every time you run into this error. You should keep a database of possible causes for common errors and possible solutions for each cause for your organization. You can then use the database as a quick checklist when working on problems. You might also want to consider making this database available to the help desk for reference and additions.

Another database to use is one that lists all of the changes made to the system by date. You can look in this database at the date when the problem started and see what changed on or near that date. We will discuss such databases in more detail later in the chapter.

Once you have a list of possible causes, you need to start eliminating some of the possibilities. You do this by using different tools and utilities. As an example for our sample situation above, we could use the ping program to test connectivity problems. If we ping the Domino server from the user's machine and it tells us "Request timed out," we know that it is not a Notes program problem. Thus we have eliminated nearly half of our list in one step. We would continue in this manner using different tools and utilities until we have eliminated all but one possibility. Different tools and utilities to use will be covered later in the chapter.

For more obscure problems, it is possible that you will not be able to narrow your list down to one or two possibilities. If this happens you need to consult other sources. This could include bringing in another person in your organization or searching the Internet. A list of sources to consult is given later in the chapter.

Finding Possible Solutions

Once you have determined what the problem is, you need to find a solution.

If you decide that the problem is not Notes related you should use the proper support channels in your organization to solve the problem. This usually means contacting other departments, for example, the group responsible for running the network. People from these other departments are the experts in their field and will often know the answer right away.

Also, even if you did find a solution you would probably not be able to implement it. You would not have access to the other department's systems. For more information on working with other departments while troubleshooting see Chapter 18, "Support and Communications."

If you decide it is a Notes problem, you might know the solution right away. If not, you will have to look for an answer. The first thing you should try is an internal problem database as mentioned in the previous section. This database would have a list of common errors along with a list of possible causes and possible solutions for each, or at least most, of the causes. The construction, content, and maintenance of the database is discussed later in this chapter.

If the problem or its solution is not in the database, you will need to find a solution yourself. You can usually start by asking your coworkers to take a look at the problem. They may see something you do not see, or maybe they have seen a similar situation before. Everyone has unique experiences and therefore unique possibilities and insight to offer.

If both of these methods fail, you will need to look for outside help. This could be online help, Web sites, discussion groups, books, or support organizations you have agreements with. These sources of more information are covered in detail later in this chapter.

Tip Try the easy solutions first. A lot of problems are solved by restarting Notes or rebooting the machine. The other most common cause is mistypes. Check to make sure everything is spelled correctly and the caps lock key is not on.

Implementing the Best Solution

If you find a solution that has never been used in your organization before you should test the solution before implementing it. This is especially important if you decide to implement the solution for the entire organization. The solution to one problem could easily cause another.

If it is a workstation change, test the change on your own machine or a standard test machine first, before putting it on a user's machine. You do not want to install or change anything that will further interrupt service to the user. Also, check with other departments for possible problems the change could cause them.

If you decide the change needs to be made to every workstation in the organization, you need to carefully determine how to implement the change. You should treat such a change as an upgrade (and it might in fact be an upgrade), and reference the change control issues covered in Chapter 24, "Upgrading," and in Chapter 18, "Support and Communications."

If a server change is required, you need to be very careful when implementing the change. All changes to production servers should be carefully researched and tested on a test environment to make sure the change does not affect any other aspect of the operation of the server. Any mistake made on the server could affect a lot of users. Once you actually decide to make a change to the production server, you should schedule it to take place during non-business hours. Again, you can treat the change as an upgrade and reference the change control issues covered in Chapter 18 and in Chapter 24.

If you find that there are a couple of different possible solutions to the problem, you should test each solution and evaluate its pros and cons. Choose the solution that works best for your particular organization.

After you implement the change and solve the problem, document the solution in your solutions database. This way if the problem comes up again it can be quickly diagnosed and fixed.

How to Prepare for Potential Problems

It can happen that administrators turn into firefighters. That is, they spend all of their day running from one problem to the next. If this starts happening to you then there is something wrong with the setup of your Domino infrastructure.

If your Domino infrastructure was designed properly and is being maintained properly it should run quite smoothly. If your servers are constantly going down then perhaps they have not been set up properly, there could be hardware or software problems, possibly they are over capacity, or maybe they are not monitored properly. If your help desk is getting swamped by calls, then maybe there was not enough training done for the end users or your workstations were not configured properly.

Monitoring the System

Even if your Domino infrastructure is implemented perfectly, there might still be problems.

The point is that when there are problems, you should be prepared for them. You should have monitoring set up so that you are the first one to know when there is a problem. You should never get a call from a user or the help desk, telling you your server is down. You should be watching your servers closely enough that you will be the one to call the help desk to let them know a server is down and when it will be back up.

For information on monitoring see Chapter 20, “Monitoring and Reporting.”

Documentation

Another major topic is documentation. You should document everything you change and all of your procedures. This information is extremely valuable when troubleshooting. One idea mentioned earlier in the chapter is to keep a database of system changes by date. This way, when solving a problem you can look up what has changed since the last time the system worked. Having documented procedures helps reduce the number of user errors (because they can look up the answer themselves) and thus calls to the help desk.

Another good documentation idea is a database containing a standard list of problems and solutions. Having such a database allows problems to be solved quickly and easily without wasting time by reinventing the wheel. You should review this database often too see if there are problems that you could eliminate by making changes to your infrastructure.

For more information on producing documentation, see Chapter 17 earlier in this book.

Tools and Utilities

There are a number of tools and utilities you can use when troubleshooting a problem. All of them are used to help you determine the source of the problem and possibly to help you solve it.

The technical details of how to use the different tools and utilities covered here is beyond the scope of this book. Our goal is to make you aware of the different tools you have available to you and where to find more information on them.

Domino Databases

There are two different types of Domino databases to consider.

The first type are the ones that you make yourself. Two important examples were given above. One was a database to track problems and their solutions and the other was to track changes to your infrastructure. Both of these databases are easy to do in Notes and will be invaluable for troubleshooting.

Other examples include the following:

- A procedures database that stores standard procedures to follow
- A database that describes the current Domino infrastructure
- A database that lists point of contacts for each department
- A Frequently Asked Questions (FAQ) Database.

Each of these can be used for troubleshooting or for helping to reduce the amount of user support calls. For more information see Chapter 17, "Producing Documentation."

The other type of Notes databases that can be used for troubleshooting are the Domino system databases. These include:

- The Notes log (log.nsf)
- Administration Requests (admin4.nsf)
- Statistics and Events (events4.nsf)
- Statistics Reporting (statrep5.nsf)
- Mail Router mailbox (mail.box)
- Certification log (certlog.nsf)
- Catalog (catalog5.nsf)
- Domino directory (names.nsf)
- Domino MailTracker Store (mtstore.nsf)

- Domino Web Server Configuration (domcfg.nsf)
- Domino Web Administration (webadmin.nsf)
- Domino Web Server Log (weblog.nsf)
- Reports (reports.nsf)
- Notes log analysis (loga4.nsf)
- Cluster analysis (clusta4.nsf)
- Agent log (alog4.nsf)

For a detailed description of each of these databases, and how they are used, see the Administration Guide that is provided with Lotus Domino, as well as the online help databases.

Domino Utilities

There are a number of troubleshooting and maintenance utilities built into Notes/Domino including the following:

- Trace connections utility (Notes client)
- Notes.rip files
- Notes.ini debug variables
- Updall
- Compact
- The Domino Administrator client
 - Message tracking center
 - Mail trace
 - Domino statistics
 - Mail topology maps
 - Replication topology maps
- Administration process
- Replication history
- Server commands
- Ispy

- Notes Connect
`www.notes.net/sandbox.nsf`
- NotesView
- NotesPeek

For a detailed description of each of these tools and how they are used see Chapter 43, “Troubleshooting,” as well as other chapters in the Administrator’s Guide provided with Lotus Domino, and the online help databases.

Operating System Logs

Each operating system has a set of logs that track the activity of the operating system, for example, the Event Viewer in NT or the error logs and server reports on AIX.

For a detailed description of the logs available for each of the different operating systems, see the documentation for that specific operating system.

Operating System Utilities

There are a number of different troubleshooting utilities built into the different operating systems. Some of the generic examples we have found very useful are ping and trace route.

For a detailed description of the different tools available for each of the different operating systems see the documentation for that specific operating system.

Third-Party Tools

There are a number of third-party monitoring and reporting tools that can be used for Notes/Domino. Each of them has functions and features that can help greatly while troubleshooting your Domino infrastructure. For a detailed description of the different features available for each of the third-party tools see the documentation for the tool.

Choosing a third-party monitoring tool is also covered in Chapter 20, “Monitoring and Reporting.”

Sources of Information

If you, or someone in your organization, has difficulty finding the answer to a problem you are having you will need to go looking for help. The main sources to search for more information are internal databases and reports, online help, books, magazines, Web sites, and support providers.

Internal Databases and Reports

As mentioned above, you should maintain a database of common problems and their solutions in a Domino database. This database should be the first thing you check whenever you have a problem and the first thing you update after you solve a problem.

You should also maintain a database to track all changes to your infrastructure. You should log the details of what was changed and why along with the date and time of the change. This way, when there is a problem you can consult the database to see what changed around the time the problem started. This change may very well be the cause of your problem.

Another database that is useful for troubleshooting is a database that describes your current infrastructure. This database would include such things as a current infrastructure diagram, backup and recovery procedures, and upgrading procedures. Details on this database are covered in Chapter 17, "Producing Documentation."

Reports are also very useful for troubleshooting. They can help you determine the events leading up to the problem, and the time the problem first occurred. For example, a mail routing report would show you if mail started to back up right before a crash or if a large attachment was sent before a crash. There are a number of different reports to produce and a number of different ways to produce them. For a more detailed discussion on reporting see Chapter 20, "Monitoring and Reporting."

Online Help

There are three help databases that ship with the Domino server and the Notes client. They are .nsf files and are viewed through the Notes client or the Web browser. They can also be accessed at different times by pressing F1 (giving context-specific help).

The three Domino help databases are:

- Notes help (help\help5_client.nsf)
- Administration help (help\help5_admin.nsf)
- Designer Help (help\help5_designer.nsf)

Another database useful for troubleshooting that ships with Notes/Domino is the Release Notes (help\readme.nsf).

Books

There are a number of books that can aid in troubleshooting. Some are produced by Lotus, some by IBM, and some by independent publishers. The following is a list of books we have found useful, with places where you can get them.

Lotus

- The Lotus Domino yellow books

To order printed copies: www.lotus.com/store

In PDF form: www.notes.net/notesua.nsf

IBM

- IBM redbooks

To order printed copies, see the end of this book

In PDF form: www.redbooks.ibm.com or www.lotus.com/redbook

Independent Publishers

There are many books available from independent writers and publishers. We suggest searching booksellers such as www.amazon.com or your local retail center and see if there is something you need. Also check www.keysolutions.com/NotesFAQ/bookson.html for a list of Domino/Notes specific books.

Magazines

There are a number of magazines dedicated to Domino. A partial list includes the following:

- The View (www.eview.com)
- Domino Advisor (www.advisor.com)
- Domino Power (www.dominopower.com)
- Groupware and Communications (www.group-ware.com)

Web Sites

There are a number of Web sites that contain useful information for troubleshooting and for general information. Some are run by Lotus, IBM, or Iris Associates while some are run by independent organizations or people. We have included links here for both Domino specific, and non-Domino specific, sites that we have found useful.

Note Stars (*) have been placed next to sites we have found particularly useful.

Domino Specific Web Sites

- Lotus (www.lotus.com)
 - Notes Knowledge Base *
 - orionweb.lotus.com/basic.html
 - Also available on CD
 - www.lotus.com/r5
 - www.lotus.com/performance
 - www.support.lotus.com
 - www.lotus.com/developers/redbook.nsf *
 - www.lotus-developer.com
 - www.lotus-dev.net
 - stdev.databeam.com
 - www.globebyte.co.uk/clp.nsf
 - www.waterworks.com
- Iris Associates (www.notes.net) *
 - notes.net/cafe.nsf *
 - notes.net/today.nsf *
 - notes.net/about.nsf *
 - notes.net/notesua.nsf *
 - notes.net/sandbox.nsf
- IBM (www.ibm.com)
 - www.redbooks.ibm.com *
 - www.redbooks.ibm.com/solutions/sk2t8039.html
 - www.ibm.com/support
- Independent
 - www.keysolutions.com/NotesFAQ/ *
 - www.looseleaf.net
 - www.dominocafe.com
 - lotus.researchgroup.co.uk
 - www.disaster.com/lnotes1/lnotes1.htm

- www.binarytree.com/misc/dominokb.nsf/catNav
- www.dominoaddict.de
- www.notes411.com
- domino.siteatlas.com
- members.tripod.com/~notesbud
- News groups
 - comp.groupware.lotus-notes.misc
 - comp.groupware.lotus-notes.admin
 - comp.groupware.lotus-notes.programmer
 - comp.groupware.lotus-notes.apps

Non-Domino Specific Web Sites

- IBM (www.ibm.com)
 - www.as400.com
 - www.rs6000.com
 - www.s390.com
 - www.pc.ibm.com/us/netfinity/
- Microsoft (www.microsoft.com)
 - technet.microsoft.com
 - www.microsoft.com/ntserver/
- HP (www.hp.com)
 - www.businessservers.hp.com
- Sun (www.sun.com)
 - www.sun.com/solaris/
- www.zdnet.com/zdhelp/linux_help/linux_help.html
- www.dejanews.com
- www.whatis.com
- www.developer.netscape.com

Support Providers

You might decide at some point that you need the help of an external resource. Your two main options are Lotus Support and independent agencies.

For details on your options with Lotus Support check their Web site at **`www.support.lotus.com`**

Independent agencies options could include phone support contracts, e-mail support contracts, or on-site consulting to name a few.

For a list of Lotus business partners check the partner Web site at **`www.lotus.com/home.nsf/welcome/partners`**

For other possible providers check **`domino.siteatlas.com`**

Summary

In this chapter we discussed what you can do upfront to make your troubleshooting easier. We gave a list of sources to consult and introduced some utilities to use while troubleshooting.

Part Five. Growing and Changing

Chapter 24

Upgrading and Consolidating

This chapter covers the following aspects of upgrading and consolidation:

- Upgrading or consolidating server hardware
- Upgrading operating system software
- Upgrading Domino

Upgrading or Consolidating Server Hardware

You will typically consider upgrading your hardware for one or more of the following reasons:

- To improve performance or capacity
- Growth and expansion
- To consolidate your server infrastructure
- A change in policy

Performance

The first thing to consider is that a poorly performing server may not actually need a hardware upgrade. It may be that the operating system, the Domino server, or the Domino applications themselves need some tuning or redesign work. An NT-based server with too small a paging file will run badly; a Domino server that is running tasks it doesn't need will be wasting server resources; and an application with too many views might be slower than it should. The problem might not even be related to the server — for instance there may be a need to look at the performance of the network, or the problem could be with the client workstations.

For more information on performance tuning, see Chapter 21.

However, if all the necessary tuning has been done and there is still a problem, you will need to identify where the problem lies, and then consider upgrading accordingly: your server or client machines, your network, or your applications.

Growth and Expansion

As you have read in Chapter 20, “Monitoring and Reporting,” part of your regular procedures should include looking at the usage and growth trends of Domino in your organization. The amount of data will increase, and the number of users may swell.

Disk Space

A common situation is running out of disk space. If you performed proper sizing and implemented quotas on mail, as described in earlier chapters, this should not be a problem you encounter often. But in the real world it does happen, at least occasionally. Despite all your best intentions, you may have been forbidden to put quotas on the mail databases of your senior managers, or requirements for major new applications might have come along that were never anticipated.

“So what? Disk space is inexpensive these days,” your manager tells you. Well this is true to an extent, and if you allowed capacity to add more disks when you specified your server platform, it should not be a big issue. If not, you may have to consider adding another server, or using external disk units.

Backups

Another factor your manager forgot was that the data that ends up on those new, inexpensive disks still has to be backed up. So your backup system needs to be able to cope with it, and also your network if you perform backups across it. If you use replication hub servers, there will need to be corresponding capacity there as well.

Consolidating Your Server Infrastructure

We discussed the considerations regarding distributed or centralized systems, and the choice of server platforms in earlier chapters, so hopefully you were able to decide on the right platform for your deployment. However, in considering the growth and change possibilities of the future, there may come a time when you will want to consider consolidating your servers onto a smaller number of machines, using one of the “high-end” platforms.

Many companies do this in order to gain financial and administrative benefits. This trend is known as server consolidation, and is becoming more prevalent, not just in the Domino arena but in the server markets generally, as organizations look at ways of reducing the Total Cost of Ownership (TCO) of their server infrastructure. TCO was discussed in more detail in Chapter 4, “Choosing a Domino Server Platform.”

Server Partitioning

Often, organizations which began small and then grew significantly will reconsider the ongoing operational expenses of managing tens and hundreds of individual smaller NT or UNIX servers. Either the number of logical Domino servers may be reduced, or, by using Domino server partitioning, just the number of physical servers. Domino partitioning is a feature that lets several logical Domino servers run on one physical machine. This is especially advantageous when using a Domino server for HTTP applications. Some hardware platforms also include their own partitioning options, such as logical partitioning (LPAR) on the AS/400 and S/390, which may also be used.

Consolidation Options

If the company already has an S/390 mainframe, it may make sense to leverage the existing expertise in this area and migrate Domino onto that platform. Other benefits to gain by doing this might be incorporating Domino into the S/390 backup system, or the ability to use the Resource Access Control Facility (RACF).

For the small and medium size enterprises, AS/400 and Netfinity are IBM's leading servers for consolidating NT server farms and reducing the total cost of ownership. The AS/400, RS/6000 and the S/390 server platforms should be considered for the large to very large enterprises.

RS/6000s or S/390s may also be considered in small to medium enterprises if your organization has existing hardware with spare capacity. The same may be true if you already have a support infrastructure for one of these platforms and your support staff feels most comfortable with it.

As an example in consolidation, the IBM Rochester deployment consolidated 50 PC-based OS/2 servers onto three AS/400s. This action resulted in higher availability for 7,500 Domino users as well as significant savings. An article describing this deployment can be found at www.as400.ibm.com/notes

Tip Domino R5 includes a new Decommission Server Analysis Tool which facilitates a server consolidation exercise by analyzing the configurations of the servers to be combined and writing the results to a database. This produces a comprehensive report, including items such as database name conflicts that would arise, and it can be used to build your consolidation plan.

For more information on consolidation topics see the following IBM redbooks:

- *AS/400 Consolidation Strategies and Implementation*, IBM form number SG24-5186
- *High Availability and Scalability with Domino Clustering and Partitioning on AIX*, IBM form number SG24-5163, Lotus part number CT7J0NA.

A Change in Policy

Another factor which can dictate that you upgrade your server hardware is a change in company policy. For example, if your company has retendered and chosen a new preferred vendor for servers and your existing hardware is nearing the end of its asset life, this may lead to a decision to change the hardware platform. Or changes in the availability or cost of particular skills in your geographical area might have caused your company to reconsider the direction it takes. In this situation it may also be a good time to consider the server consolidation options described above.

Upgrading Operating System Software

It is beyond the scope of this redbook to discuss in much detail about upgrading a particular operating system on your Domino servers, but generally you should endeavor to be on the correct maintenance release of your chosen platform. For example, on NT that may mean the latest ServicePak, or on AIX you will need to have the correct patches installed.

Typically, you will have installed the operating system and the Domino server software in such a fashion as to be able to independently maintain them. On an NT server, for example, you would normally install NT and Domino in their own separate disk partitions.

Refer to your vendor's documentation for details on how to upgrade the operating system software.

Upgrading Domino

Every two to three years Lotus has produced a major new release of Domino, and on a quarterly basis there are maintenance releases.

Minor Releases (QMRs and QMUs)

Lotus releases scheduled, quarterly updates to the major releases. These are known as QMRs (Quarterly Maintenance Releases), and generally contain an accumulation of enhancements and fixes since the last QMR was issued. In addition, when specific problems occur between releases, these are addressed in QMUs (Quarterly Maintenance Updates).

QMRs and QMUs are often issued in the form of incremental installers. These are much simpler to apply than a normal installation or upgrade. Usually there is just a single executable program to run (which can normally be obtained from the Download section on www.notes.net) which patches the Domino code "in situ."

If you are upgrading by more than one minor release you would normally apply all the intermediate QMRs in order (but you should check the specific Release Notes to ensure this still applies). For example, if you wanted to go from 5.0 to 5.0c, you would apply 5.0a, then 5.0b and finally 5.0c.

Important These are relatively minor upgrades, which you are advised to apply, but when planning to install a QMR or QMU you should still first familiarize yourself with the list of fixes and changes for the release. Sources for this information include:

- Release Notes
- www.lotus.com
- www.notes.net
- The Lotus Knowledgebase — this is a Domino database that is available through Lotus Authorized Resellers, or directly from Lotus, and contains thousands of Lotus' technical documents including technotes, common support questions, tools, call scripts, press releases, product information, product updates, and information on other sources of technical information. Knowledge Base is included with the Premium Plus Support Plan purchased through the Lotus Passport Program.

Planning a Major Release Upgrade

Upgrading to a new major release of Domino will require more effort. In this section we will cover the areas you'll need to consider in planning and implementing a major release upgrade in general, and an R4 to R5 upgrade in particular. You can also find information from Lotus on upgrading to R5 at www.lotus.com/r5

A major goal during an upgrade should be to minimize the downtime, while at the same time making the process as transparent as possible to the users. You will probably want to schedule your upgrades for low-usage periods such as evenings or weekends.

You will probably be eager to explore a new release on your test servers, but where your critical servers are concerned you should avoid trying to be among the first sites to use a new major release unless you have very specific reasons to do so. These may include factors such as:

- You are waiting urgently for a specific new feature (such as the new maximum database size in R5).
- You have a critical issue which you know is fixed in the new release.
- You are participating in a beta trial.

Plan Resources

For a major upgrade you might consider the need for some assistance from a third party. Even if you do have all the skills and resources in-house to manage and perform the upgrade, you may still gain value by engaging Lotus Professional Services, IBM Global Services, or a Lotus or IBM business partner resource for a day to validate your upgrade plan. They may point out something that you missed, and even if not, you can proceed with more confidence, and it may keep an overanxious manager at bay.

Establish the Team

You will need to establish your upgrade team and this should contain representatives from all interested areas — managers, administrators, developers, help desk and other support staff, trainers, and user departments.

Development teams will need to plan ahead. They will want to train on the new release, and they will probably be pushing to incorporate features from the new release into existing and planned applications. They may also be responsible for testing existing applications against the new release.

Create an Upgrade Plan

Establish a detailed upgrade plan taking into account:

- Time scales
- Availability of staff involved in the upgrade or the testing
- Critical application availability
- Your internal change control procedures
- Your Service Level Agreements (SLAs). You may want to check if there are any key company activities that will occur during the upgrade period which could force you to change your plans, such as financial year-end activity.
- Changes being planned by other teams. For example, you would not want to arrive on a Saturday morning expecting to upgrade a server, only to find that half the network is down for some maintenance work.
- Lead times for any extra hardware or software you are incorporating
- Training (for technical staff as well as for users)

Assess the Impact of the New Release

A key part of the planning phase is to assess and test the impact of the new release. We will discuss building a test environment later in the section, but the areas to consider are:

- Applications

Although most applications should work unchanged on the new release there is always the possibility that some feature might not, perhaps if use has been made of undocumented features, or of features which are potentially release-specific. For example, at the last major release, during R3 to R4 migrations, applications that performed lookups to the People view in the R3 Public Name and Address Book no longer worked correctly since that view was changed in R4.

Tip When reviewing your existing applications, this could be an opportunity to archive and/or delete any unused Notes databases. Also, if you don't already have an application registry (as described in Chapter 11), this would be a good time to set one up. You could include fields and views to indicate whether the applications have been tested on the new release.

- Domino servers

- You should ensure that your server hardware and operating system software still meets the specified requirements for the new release.
- With R5, there is no longer support for the Novell server platform. The supported server platforms are:

- Windows NT 4.0/Intel
- Windows NT 4.0/Alpha
- AIX 4.3.1
- HP-UX 11.0
- Solaris/SPARC 2.6
- Solaris/Intel 2.6
- OS/2 Warp Server 4
- AS/400 V4R2
- S/390 V2R6

Each of these environments will have their respective requirements for additional fixes beyond the operating system level specified. Check the Release Notes or Notes Net (www.notes.net) for details.

- Disk space requirements

While most databases that are converted to the R5 On Disk Structure (ODS) will still be roughly the same size, changes to full text indexing will mean larger full text indexes.

Also, the new mail template will mean that a new empty mail database on R5 will be about 5MB as opposed to 2MB on R4.6.

If you plan to use the new transaction logging feature of R5 this will also require more disk space, and it is recommended that this be on a different physical disk from the Domino data. Otherwise, performance could suffer compared to Release 4.x as well as when compared to Domino R5's potential.

- Users

What impact will the new release have on your user community? How much retraining will be required? The R4 workspace can still be accessed in R5 and you may consider retaining the old interface until training can be completed, or until the users feel comfortable with the new interface.

Note If you expect to be registering a lot of new users during the upgrade period you may want to revise your plans and consider putting them straight onto the new release. This will require extra planning in terms of your server upgrades and your training schedule, but may be preferable to upgrading and retraining these users when they are still getting used to the previous release.

- Customizations

This concerns customizations you have made to the standard templates, such as mail, discussions or the Domino directory. You will need to assess not only what will be required to ensure that these customizations continue to work, but whether enhancements in the new release will now remove the need for them altogether — this may be the opportunity to revert to a standard design.

- Client machines

As well as server performance, consider also client workstation performance. The minimum specification will probably have changed (for details of the R5 client workstation requirements see Chapter 12). At the last major release some customers found that machines which comfortably supported R3 of Notes could not support R4. This will be covered in more depth in the Upgrading Client Software section later in this chapter.

- New features and existing features of the old release which may no longer exist.

Communication

You should keep everyone informed well in advance when you are about to make major changes that will affect them. Publicize the reasons for the upgrade, and the advantages it will bring, to the users individually and to the organization as a whole, as well as just letting them know about scheduled downtime.

Many users are resistant to change and see it only as an obstacle in the way of getting their job done. However, if they are kept informed, and can see the benefits of an upgrade in terms of new features or improved performance, they will feel happier about making the change.

If you can identify some departmental “local experts” — people who are comfortable with and enthusiastic about new technology — and train them in the new release, this can help to convey a positive message and alleviate concerns. These people can also help with problem solving and can reduce the workload for the upgrade team and the helpdesk.

Tip As with an initial deployment, there may be opportunities here for some quick wins — maybe some new showcase applications you can roll out, along with the new release, that exploit the new features.

There may be certain stages during a major release upgrade when communication with users will be particularly important to prevent misunderstandings and manage expectations. For example, some users may wonder why some of their colleagues have the new release while they themselves don’t. Also, at the stage after your servers and clients are on the new release, but before the mail files have been upgraded, the users may be confused if they see examples in the R5 Help that don’t tie up with the earlier mail design.

Build a Test Environment

You will need to create a test environment to experiment with the new release, and it should be as close as you can reasonably make it to your live environment. It should include servers with copies of all your critical applications on them. It should also include some client machines. If you support several different PC builds, or different desktops with different combinations of software on them, or if you use various protocols, these should all be represented in your test environment.

We recommend that you check that all the required functionality of the new release performs satisfactorily on the *lowest* specification of workstation that is to be used for R5 in your organization.

In your testing you should use the Notes client in the same ways as the users do, open up the same databases, and create mail and calendar entries. You should also do tests with the same products open alongside Notes that the users will have, and you should test out printing.

Tip You may want to design a test script and draw up a checklist of tasks to be performed on every workstation type you wish to test. These can be completed by the testers and stored for reference. Here is an example:

R5 Upgrade Testing Worksheet	
Date: 29th June 1999	
Tested By: Fred Bloggs	
PC Make and Model: Acme Reliant model XL5	
Desktop Build: The Customer Services Department Build	
Processor: PII 233Mhz	
RAM: 32MB	
Hard Disk Size: 4GB	
Windows Version: W95 OSR2	
Comments: Ran well at first but slowed down a little when everything was loaded. We could recommend that they close down some apps, but they say they need them all open at the same time. We know the Customer Services Enquiry System uses a lot of memory, so we are recommending that Customer Services PCs will be upgraded to 64MB RAM, which works fine for this combination of applications.	
Task	Checked?
Load Windows	✓
Load the Customer Services Enquiry System	✓
Load Notes R5	✓
Load MS Word, Lotus 123 and Lotus Freelance	✓
Read Notes Mail	✓
Create Calendar Entry	✓
Open Domino directory	✓
Open 8 other Domino databases	✓
Press F1 to open Help	✓
Print the Notes Calendar	✓
Print from other applications	✓
Close Notes R5	✓
Start and Test Notes Minder	✓
Restart Notes R5	✓

For testing applications you should give your developers or other testers access to the test environment as early as possible to allow them to ensure that applications still function properly, and that things like forms and views display correctly. If applications are accessed from browsers this should also be tested, using the same versions of browsers as the users have.

Letting Domino administrators and developers be part of your early test groups for new versions has the advantage that they will gain experience of the new release. Other people to include in the test group are departmental “local experts,” and people involved in training.

Caution These people will be keen to use the new release but you should make sure you keep the two environments separate. Your developers may still be working on applications for the earlier release as well. Be careful to ensure that they don’t produce applications using the new release that are intended for use on the earlier release. Also be careful that administrators don’t cause problems, for instance, by registering new users and creating mail databases with the wrong design.

In addition to testing the functionality of the new release, you should test out all the stages in the upgrade process — of both servers and of clients, including upgrading of the mail template. This will also require an intermediate upgrade to the 4.5.7 or 4.6.3b mail design; — see the section on upgrading mail later in this chapter.

Perform a Pilot

After your testing is complete you should consider piloting the release with a group of users. This need not be as extensive or time-consuming as your initial pilot when you deployed Domino, but it should include a cross-section of users, not just the power users who are keen to try out the new release.

With any pilot, you should evaluate what happened, what went well and what didn’t go as well as you would have liked. Collate feedback in a database and modify your plans if necessary.

Implementing a Major Release Upgrade

Major releases tend to have specific new features that will determine how the upgrade is performed. It is not possible to write a totally generic upgrade guide that will apply in every case. However, the R4 to R5 upgrade strategy recommended by Lotus is more or less the same as it was for R3 to R4, so if you were involved with an R4 upgrade you will be able to reuse much of the knowledge you gained then.

Note For full technical details on upgrading Domino, see the Lotus R5 manual *Moving to Notes and Domino Release 5* that comes with the product.

Recommended Strategy for Upgrading from R4.x to R5

The generally recommended order for upgrading from R4.x to R5 is:

1. Upgrade the first server.
2. Prepare and distribute the new Domino directory to other servers in the domain.
3. Upgrade the Administration server of the Domino directory.
4. Upgrade remaining servers.
5. Upgrade clients.
6. Upgrade mail.
7. Upgrade calendaring and scheduling.
8. Upgrade other applications.
9. Implement new R5 features.

The following sections provide an overview of the steps listed above.

Upgrading the First Server and the Public Address Book

Depending on your priorities and your testing beforehand, the first server you upgrade may be a production server or a less critical server in the domain. If you choose a replication hub server, pay particular attention to the point below about templates, as the effects of inadvertent replication will be potentially much wider.

Some Considerations Before Upgrading a Server

Before upgrading a server:

- Ideally, make a full backup of the server before you start. At a minimum you should make backups of the Release 4 Public Name and Address Book and other important Domino files such as notes.ini, ID files, DESKTOP.DSK and any templates that you have customized. Store them safely in a place where you can access them easily, but also where they will not replicate. For example, you could store them on a Domino server but in a directory which is not in the Notes data path.
- Update the server's notes.ini file.
 - The Reporter task is not used in R5 so it should be removed from the Servertasks= line.
 - Because of Domino scalability changes, it is recommended that any stabilizing parameters, such as the following, be removed or commented out:
NSF_BUFFER_POOL_SIZE
SERVER_SESSION_TIMEOUT
SERVER_MAXSESSIONS

SERVER_MAXUSERS

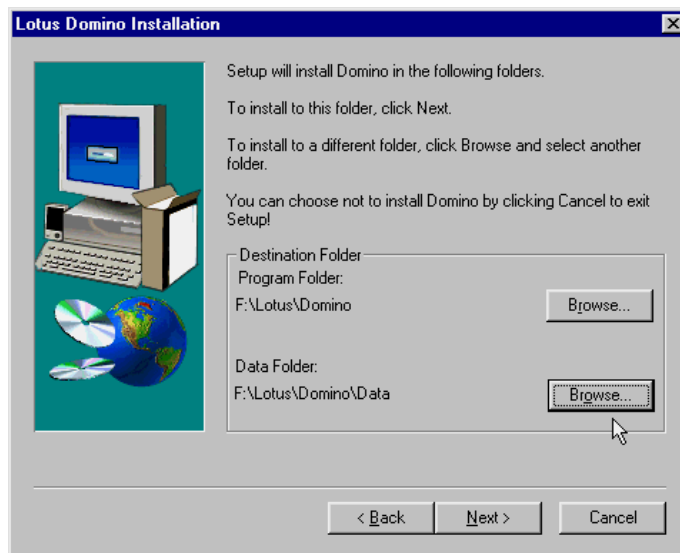
NSF_DBCACHE_MAXENTRIES

SERVER_NAME_LOOKUP_NOUPDATE

- Remove any debugging entries. These may not be valid in R5 and, in general, should not be used without guidance from Lotus Support.
- If connection documents for replication between this and other servers exist, you may want to disable these until after the upgrade.
- Take into consideration folder name changes on Win32 platforms. Unlike earlier releases, R5 now officially supports installing and running both the client and the server on one PC. Before, if you installed both the Domino server and the Notes client into the same folder (usually \Notes), you had to manage the resulting issues, such as complications with locations.

In R5 this configuration is supported, so the norm is to install into separate directories. The Domino server normally goes into \Lotus\Domino, and the Notes client goes into \Lotus\Notes. This is also more intuitive (why have Domino in a directory called \Notes?).

However, if you are upgrading an existing server rather than building a new one, and you choose to use the new folders, Domino will be installed alongside the old release, which is probably not what you want. For an upgrade, you should install into the existing Domino folder, which is typically the \Notes directory.



- Check your templates. When you install a new release, the standard design templates on the server will be replaced with newer ones. However, they may still have the same replica ID as the templates from the old release, and this can cause problems when the upgraded server later replicates with servers on the old release.

Tip Some people when upgrading prevent this by making new database copies (as opposed to replicas) of the standard templates, and then deleting the originals. This ensures that each template has a unique replica ID and so will not inadvertently be replicated. If you haven't done this previously you could perform this exercise immediately after upgrading the first server, before any replication occurs. Then as each subsequent server is upgraded you could copy the templates to it from the first server.

The Major Steps

Broadly the main steps to follow will be:

1. Shut down the Domino server.
2. Back it up.
3. Install the R5 server software.
4. Launch the Domino R5 server.
5. Since this is the first server, choose Y when prompted to upgrade the Public Name and Address Book (now called the Domino directory in R5) to the R5 design. On subsequent servers you should have already pushed the new Domino directory to them so then you would choose N.

Preparing and Distributing the New Domino Directory

The next stage will be to prepare the new Domino directory for use by rebuilding the view indexes and, on the upgraded server, compacting it to implement the R5 On-Disk Structure (ODS). You will then need to distribute the new Domino directory to other servers in the same domain.

Some Considerations before Distributing the New Domino Directory

- When preparing the new Domino directory for distribution to other servers in the Domino domain which are still running Domino Release 4.x, one thing to remember is that the R5 Domino directory will work on most R4 servers.

Important A possible exception to this could be Domino Release 4 servers running certain types of gateways or Message Transfer Agents (MTAs) such as the cc:Mail MTA or the SMTP MTA. You should check in the specific product documentation, or with the vendor, before distributing the R5 directory to these servers. If the new design is not supported on these servers you should prevent it from replicating to them by setting the ACL on their Public Name and Address Books accordingly.

New R5 features will be largely ignored by the Release 4 server and clients until they are upgraded. There may be some cosmetic differences seen in some of the documents in the Domino directory that are used by administrators (such as server documents and locations), as the new Domino directory design uses a new feature called tabbed tables which do not display very aesthetically to a Release 4 client.

- File-level copying. Some of the stages below may take some time with a large Domino directory. Replication is the method Lotus recommends to distribute that new Domino directory and this should be the normal choice. However there may be some situations, with a large Domino directory, when the subsequent time taken to re-index on each server becomes a problem. If this happens you may consider performing tests to see whether copying at operating system level file could be faster, as you will be starting with a re-indexed directory on each server.

However the following points should be kept in mind:

1. Using file-level copying would not work between servers that have different operating systems or different file structures. For example, copying from NT on Intel to NT on Alpha would still require that the indexes be rebuilt.
2. The replication histories would be lost, causing replication with other servers to take longer the first time.
3. Using file-level copying assumes that the Domino directory is intended to be the same on all servers (that is, with the same design and with no selective replication formulas in use).
4. You should ensure that the Domino server is shut down on both source and destination servers, and you should ensure that no updates have occurred to the Domino directory on the destination server since it last replicated with the source server.
5. You should not use this technique in the future if you subsequently implement Domino transaction logging.

The Major Steps

The steps to take when preparing and distributing the Domino directory are as follow:

1. Quit the Domino server using the quit or exit command at the server console.
2. If you are planning to distribute the Domino directory using replication, compact the upgraded Domino directory now.

If you are planning to distribute the directory using file-level copying, you must leave the compacting until later, since compacting will convert the directory to the R5 On-Disk Structure (ODS). The ODS is not something

which can replicate, but it would be transferred in a file level copy, which would cause problems on your Release 4 servers. Release 4 servers must retain the Release 4 ODS since they “do not understand” the R5 ODS.

To compact the Domino directory, from the command line of your server operating system enter the appropriate command. For example, the command line syntax would be `ncompact names.nsf` on Windows NT, or `icomcompact names.nsf` on OS/2 Warp, or `compact names.nsf` on UNIX.

3. Rebuild views indexes in the Domino directory. To prevent delays when users first access the new Domino directory, Lotus recommends rebuilding the views `$ServerAccess` and `$Users`. Examples of the commands to achieve this would be, on Windows NT:

```
nupdall names.nsf -t (“$ServerAccess”) -r
```

```
nupdall names.nsf -t (“$Users”) -r
```

Or, on OS/2 Warp:

```
iupdall names.nsf -t (“$ServerAccess”) -r
```

```
iupdall names.nsf -t (“$Users”) -r
```

Or, on UNIX:

```
updall names.nsf -t (“$ServerAccess”) -r
```

```
updall names.nsf -t (“$Users”) -r
```

4. Restart the Domino server. Access the new Domino directory from several workstations at once and test thoroughly.

Open various views, and create and address a mail memo. There should be no significant delays. If there are, you might consider rebuilding *all* views in the directory before you make it available to users, using the `-r` and `-c` parameters of `updall` (for example `nupdall names.nsf -r -c` on Windows NT or `updall names.nsf -r -c` on UNIX). Otherwise, if there are view indexes that still need rebuilding when the users start connecting, this can cause a serious deterioration of server performance. Rebuilding all indexes ahead of time helps avoid this problem.

5. Distribute the new Domino directory to the other servers in the domain. You can do this one of two ways, both of which will require some downtime on the destination servers:
 - By replication. If you use this method you must repeat the index rebuilding exercise described above on the destination server after the replication has finished.
 - By copying the Domino directory at the operating system file level, as described earlier.
6. If you chose the file level method of distribution, compact the Domino directory now on the R5 server, as described above.

Upgrading the Administration Server of the Domino Directory

To take advantage of new R5 Administration Process features, it is recommended that you upgrade the administration server of the Domino directory next.

For steps on how to upgrade the administration server, see the Lotus documentation referenced earlier in this chapter.

Upgrading the Remaining Servers

It is recommended that you upgrade your remaining servers in the following order:

1. Hubs
2. Mail servers
3. Application servers
4. Other servers such as those running add-ons or gateways.

If you have an SMTP MTA running on Release 4, you can now consider upgrading to R5. An R5 server can handle messages in MIME and SMTP natively, and the MTA is no longer required.

Tip You may want to consider delaying the MTA upgrade until either all clients are on R5, or all Release 4 clients are on Domino R5 servers. This is due to the inability of the Release 4 client/server to handle certain types of mail (for example, HTML-based), which the Release 4-based SMTP MTA can handle for them.

For other types of servers it might be necessary to remain on the old release until an R5 version of the particular add-on or gateway is available.

Upgrading Clients

There are now three different client products:

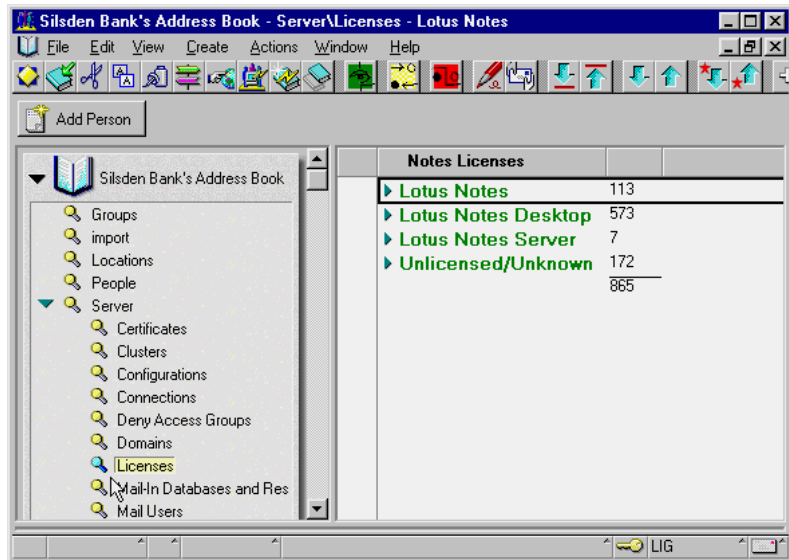
- **Lotus Notes.** The main R5 client is for use by all R5 users. Other license types for end users (for example, Notes Mail or Notes Desktop licenses) no longer exist in R5.
- **Lotus Domino Designer.** Now a separate program, this is for use by those who need to design Domino applications. Installing this also installs the Lotus Notes client.
- **Lotus Domino Administrator.** Now also a separate program, this is for use by those who will administer Domino. This should be installed where needed in addition to the Lotus Notes client.

Considerations Before Upgrading the Clients

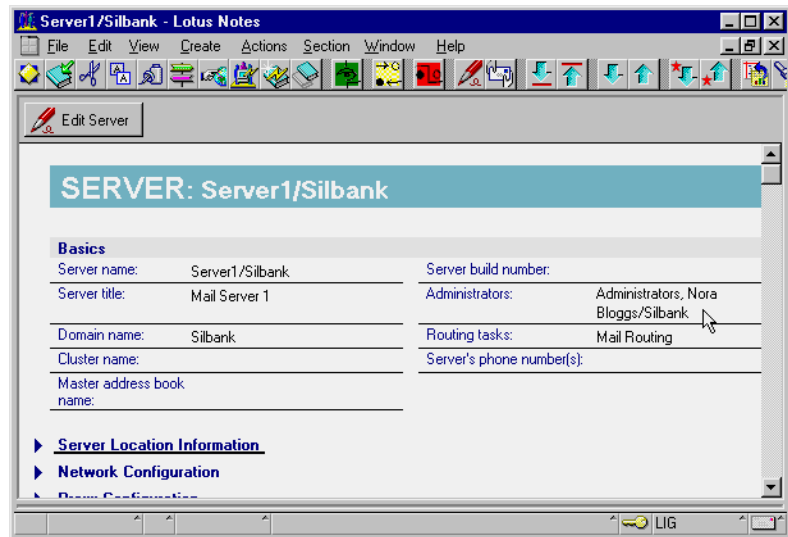
Some specific points to consider before upgrading your clients to R5 are:

- Identifying who needs which client.

If you don't have up-to-date records, you can find out who will potentially need the Domino Designer or the Domino Administrator by using the Server\Licenses view in the Release 4 Public Name and Address Book. The entries which have a Lotus Notes license type rather than Lotus Notes Desktop (which no longer exists in R5) are all possible developers and/or administrators. In this example there are 113 potential developers and/or administrators:



You are probably already aware who the administrators are, but if not you can get this information from the Release 4 Public Name and Address Book too, by looking in the Administrators field in the server documents, as in the following example:



Tip Remember that some administrators will also need Domino Designer.

- Client operating system

There is no R5 Notes client for the Windows 3.x, OS/2 Warp or UNIX platforms. If your organization has some of these clients, you will need to upgrade them to Windows 95/98 (or move to Macintosh System 7.6 or 8.1 Power PCs which will be supported in the near future). You can let those users continue to use Release 4.x clients if the function they need will work with that client in an R5 environment.

- Performance

As mentioned in the testing phase earlier in this chapter, we recommend that you check out all the functionality you will be using from the new release, and make sure that it performs satisfactorily on the *minimum* specification of workstation that is in use in your organization.

- Footprint

Separating the Notes client from the Designer and Administrator clients has reduced the overall disk space required for the Notes client. However, bear in mind that the old desktop.dsk file is now replaced by two files, desktop5.dsk and bookmark.nsf, which combined may end up larger. Also locally stored mail files may be bigger.

- Coordinate with Training.

The new R5 client is more browser-like. Some users may find this intuitive to use, but some will require full training — the changes to the interface are not trivial (see the earlier section, “Assess the Impact of the New Release”). The client upgrades should be coordinated with the retraining program, and you should bear in mind the benefits of using “local experts” as described earlier in the chapter.

- Notes.ini location

Something to keep in mind is that notes.ini is now installed in the Notes directory rather than the WINDOWS or WINNT directories.

- Folder name changes

R5 (unlike Release 4), now officially supports installing and running both the client and the server on one PC. Folder name changes, which were discussed in the section “Upgrading the First Server” earlier in this chapter, also apply to client upgrades.

- Release 3 clients

The R5 installation will ignore a Release 3 desktop.dsk file, resulting in an empty bookmarks database. If you have any Release 3 clients you should upgrade them to at least Release 4.1 first.

- Execution Control Lists (ECLs)

If you have not previously implemented ECLs, or if you wish to implement a change to the current administration ECL, this would be a good time to do so, since the workstation ECL will be set when the Notes client is first started after the upgrade. ECLs have been extended in R5 to include the execution of Java applets and JavaScript.

- Time-handling changes

In earlier releases Notes did not fully synchronize with the operating system time zone and daylight savings time (DST) settings. In some countries this meant you had to include a “DSTLaw” environment variable in the client notes.ini for DST changeovers to occur smoothly. In Notes R5 the time zone, DST and DST Law are coordinated and shared with the operating system.

The Major Steps

More detail on how to upgrade clients can be found in the Lotus R5 manual *Moving to Notes and Domino Release 5*, but the main steps to follow are:

1. Back up important files.
2. Install the R5 software.
3. Launch Notes.

At this point the R4 workspace is converted to bookmarks, and the design of the Personal Name and Address Book is upgraded. For more details on installing and configuring Notes R5 clients, see Chapter 12.

Upgrading Mail

The next stage will be to upgrade users' mail databases to R5.

Existing Mail Template Versions

If you use Release 4.5.x, your mail databases should be at the design template for at least Release 4.5.7. If you use 4.6.x, they should be on 4.6.3b or above. If not, you need to apply the relevant mail template design first.

To do this, acquire the 4.6.3b or the 4.5.7 client CD, perform an installation on a spare workstation. After installing the client or server, copy the relevant template, MAIL45.NTF or MAIL46.NTF to the Domino server, depending on which version of the Notes client you are upgrading from. Then you can load the Design task on the server for the design refresh to take place.

Note This does not mean that you need to upgrade your servers to 4.5.7 or 4.6.3b before upgrading them to R5. You are just, as an intermediate step, upgrading the mail design.

Mail Template Customizations

If you have customized the mail template, you will have to reapply your customizations to the new R5 template, and test that they all still work and that you have not otherwise affected the base functionality of the new mail template.

If they are complex changes this can take some time, and it is for this reason that it is generally recommended that you avoid customizing the mail template where possible.

There may be features in the new release that provide the things you added, so this may be the opportunity to revert to a standard mail design.

Upgrading the Mail Design to R5

To upgrade mail files to the R5 design there is a special mail conversion utility. This will replace the design of mail databases and also implement any other release specific changes that are required.

Normally you will upgrade mail databases on a Domino server at the server console as follows:

1. Shut down the router by typing `tell router quit`
2. Load the convert utility by typing `load convert (arguments)`
3. Restart the router by typing `load router`

For more details, including all the arguments you can pass to the convert utility, see the Lotus R5 manual *Moving to Notes and Domino Release 5*.

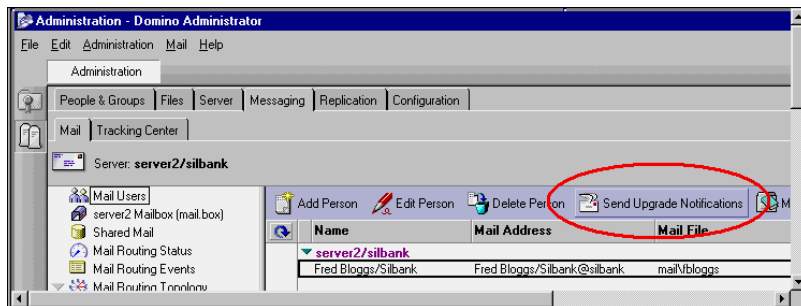
Upgrading Specific Mail Databases on the Server

If the order you are using to roll out the new client is not logically linked to users on particular Domino servers, making it impractical to select and convert the mail databases on your servers, you can create a text file on each server for the users whose mail you want to convert, and load convert using the -f parameter to read its input from the file. You could automate this with a program document.

Upgrading Mail by Sending Users an Upgrade Notification Message.

To send users an upgrade notification message, follow these steps starting from the Domino Administrator client:

1. From the People and Groups tab, click the Servers view for the Domino directory.
2. Then click Mail Users.
3. At the top of the Results pane, click Send Upgrade Notifications to open the Upgrade Message form as shown in the following figure.



4. In the next screen click Address on the action bar, and specify the users to send the upgrade message to.
5. A message will be sent to the selected users, which will guide them through an upgrade wizard.

Tip Full details on this topic are in the Domino 5 Administration Help database under Mail Migration - Migrating Personal Mail Data.

Running the Mail Convert Utility on the Client

The conversion utility, nconvert.exe on Windows 95/98/NT, is actually installed as part of the Notes client code and can be run on the workstation, though this method is less preferable to running the conversion on the server

One way you might run this is with a document in a database containing a button which calls LotusScript code to run nconvert.exe, passing to it the relevant parameters.

Note Running the conversion utility on the client will not work if you have reduced the user's access to their mail file to less than Designer access in the ACL. You also need to be careful about the mail file being accessed by other users, for example with delegated mail situations.

Upgrading Calendaring and Scheduling

Notes R5 offers many improvements in calendaring, scheduling, and Personal Information Management (PIM) functions. This will be the strategic Lotus client for calendaring and scheduling features. Organizer will not be integrated with R5, and is more aimed at the small business and standalone customers. Lotus recommends that, as customers plan their deployment of the Notes 5 client, they also plan to withdraw Organizer 97 GS/4.1.

Upgrading Applications

We discussed the importance of assessing the impact of a new release on your applications, and the need for testing this, earlier in the chapter. You should find, though, that most applications designed for R4 will work on R5 without modification. However, if you want to take advantage of new features in R5, you will need to do some redesign work. Keep in mind that any application using R5 specific features may not run properly on Notes R4 clients.

Implementing New Features

When you have fully upgraded to R5, you will want to start implementing some of the new features, such as:

- Directory catalog for a faster addressing, and a highly compressed directory that your mobile users can store on their laptops
- Transaction logging, for enhanced performance and recovery of data
- Online, incremental backup and restore
- Internet Cluster Manager, to add resilience for Domino HTTP servers
- Properties of the new On Disk Structure (ODS) that improve performance, as discussed in Chapter 21

Regression

When making changes to your production systems, you may be excused for problems caused by unexpected events, and hopefully even for the occasional human error. However, you are unlikely to be forgiven if you didn't consider how you would get back a working system in such a situation.

Usually, regressing to a major release will be a last resort. R5 is designed for backward compatibility with Release 4 clients and servers. Before its release it was subjected to stringent testing.

However, in the real world we still have to be prepared. If a problem occurs with a mission-critical application, something that did not come to light during your testing, you will have to react quickly. Depending on the problem, and the skills you have available in-house, you may be able to “fire-fight” the problem. But with any upgrade (or any other system change for that matter) you should always have a regression plan in case of problems.

Tip Consider creating a system administrator’s diary database in which you record all the system changes you make. Record the exact details of the change, and also how you would plan to regress, or undo, that change in the event of problems. You can create views categorized on server or on the date of the change. Then, when you have made a system change, if circumstances prevent you from being around later, your colleagues will know what you did and how to undo it, should there be a problem. This is especially useful when one or more administrators go on vacation, for example.

Using a Spare Server

A low-risk option in a major upgrade situation, if you can justify the cost (and this will very much depend upon the hardware and software platform you are using), is to build a completely new physical server on the new release. You then shut down Domino on the original server, copy your applications or mail files from the old to the new server at the operating system file level, and then bring the new server up in its place using the same server ID and network address.

If all goes well, after a suitable period of time when you are satisfied that you will not need to regress to the previous release, you can then rebuild the old server on the new release and use it for a repeat of the exercise with the next server to be upgraded.

Alternatively, if there are problems which cannot be fixed within acceptable time scales, the old server can simply be brought back into service and the new one shut down (though bear in mind that data will have changed and will therefore need restoring, either via replication from another server, or from a backup).

At the end of the upgrades you will have a spare server which you can retain for use in future upgrades, as a standby server, for additional capacity, or for testing.

Using a Clustered Server

Alternatively you might choose to upgrade one server in a cluster, and rely on failover to route clients to a server on the old release if there are problems. However, if this were to happen after the clients or the mail databases have been upgraded, there could be problems due to the reduced functionality supported on the older release server.

Summary

In this chapter we covered upgrading and consolidating your Notes and Domino environments. We discussed the reasons why you might upgrade the server hardware, or consolidate onto a smaller number of servers.

We then went on to briefly discuss operating system software upgrades, before covering Domino upgrades in more depth. We described the considerations for planning and implementing a major upgrade in general, and an R4 to R5 upgrade in particular, sometimes drawing on examples from issues in the last major release upgrade (R3 to R4).

Chapter 25

Expanding the Reach of Domino

This chapter will cover some of the more common ways of expanding the reach of your Domino system, both within and outside your organization. The products and ideas we discuss here are those with which we have had personal experience. There are many others available to you, and just because they are not covered here does not mean they do not have potential value to your organization.

The topics we will cover are:

- Extranets: Communicating with other companies
- Fax for Domino (FxD): Network-based fax capabilities to send and receive faxes and files from Notes clients, Web browsers or Windows applications
- Sametime: Offers real-time collaboration over Domino networks and AOL's Instant Messenger (AIM) service.
- Domino.Doc: Delivers distributed, enterprise-wide document management.
- QuickPlace: Lets you set up a Web-based, collaborative work area quickly.
- Workflow: Similar to business process automation
- Integrating with back-end data: Connecting Domino server applications with back-end systems: RDBMS, messaging and transaction processing systems, ERP applications, directory, and text/file source data.

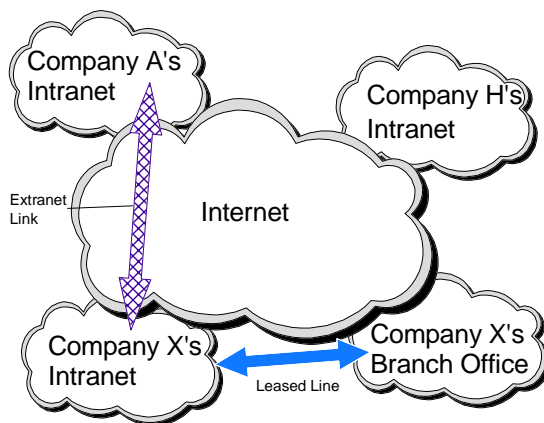
Extranets: Communicating with Other Companies

A few short years ago, many companies existed as isolated entities. Perhaps a few privileged people in the IT department had Internet access, to download drivers or exchange e-mail with colleagues.

Then, the SMTP gateway became a common feature so everyone in the organization could exchange e-mail with the external world. Today, use of all areas of the Internet (usenet, World Wide Web, FTP, and so on) is commonplace. The latest metamorphosis in extending our organizations is to include our suppliers, customers, and other business partners in what is termed an extranet.

What Is an Extranet?

In a nutshell, an extranet is a network over which you have only partial control. In your internal network (intranet) you have complete control over the cabling, servers, client workstations, and so on. In an extranet, by contrast, there are several components to consider, only some of which you can control, as shown in the figure below:



In this figure, Company X's main intranet and branch office intranet communicate directly over a leased line, outside of the Internet. This offers the most security and control over transactions, with Company X's administrators having complete control over both locations and the leased line.

Company A's intranet is connected to Company X's intranet via an extranet link which travels over the public Internet. This offers less security than the leased line, and Company X's administrator has no control over Company A's network.

Similarly, Company A's administrator has no control over Company X's network. Once the initial secure sockets layer (SSL) connection is made, additional levels of security to access internal network resources may be required at either or both ends.

Example

Companies A and X may be sharing a financial services application, for instance. In a traditional e-commerce system the transaction is one-way and not integrated with back-end systems. In the extranet example, both companies can share the same complete end-to-end application and business process, which integrates with back-end systems. This tends to result in increased efficiency in both companies.

Company H represents a potential business partner which has a connection to the Internet but no formal relationship with either Company A or Company X. Company H may be sending data to either or both companies through e-mail, or may communicate via a Web site and basic e-commerce applications.

It is possible for all locations of all companies to participate in an extranet relationship. Companies can also use extranet technology to link their own offices, which may be separated geographically or by differing network protocols.

Definitions

Here are some definitions for terms you may come in contact with.

- **Intranet:** The internal network over which the local administrator has complete control. Domino is commonly used as an intranet platform.
- **Internet:** The external (though this distinction is blurring) TCP/IP based network composed of millions of computers intermittently available, sharing a distributed naming system.
- **Extranet:** The network which spans parts of your internal network, parts of the Internet, and parts of the network(s) of other organization(s).
- **Potential future partner:** This is an entity which has Internet access, may or may not have an Intranet, but may be willing to do business with you through a shared infrastructure, such as an extranet.

Extranets are built to achieve process automation and also legacy integration. Where the goal of e-business so far has been to keep in contact with business partners and share data, the extranet allows you to share applications and business processes.

Domino applications lend themselves to this type of environment extremely well. This can result in savings through reduced repetitive work, such as the placing of an order at one end and the entry of the order into a legacy system at the other end.

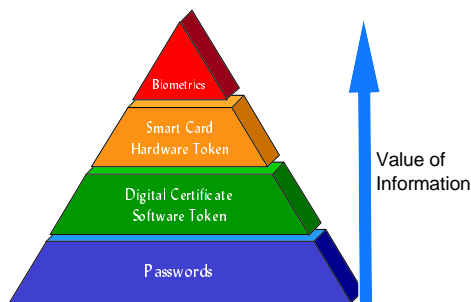
How Does an Extranet Work?

An extranet generally uses technology which already exists, such as widely available Internet technology. Extranets do not operate exclusively on Internet technologies, however. The extranet is more complex and secure than a Virtual Private Network (VPN), because it must be multi-layered. In contrast, the VPN is only one layer.

The extranet provides a sort of remote access, effectively creating an extension of your existing security perimeter. Unlike traditional remote access, where any users who will be granted access will be granted an internal level of trust, extranet users should have well-defined, tightly controlled access to data. Due to the nature of the data to which extranet users may be granted access, the screening processes and reciprocal agreements which are put in place are very important.

One of the most critical concerns of many enterprises when deploying an extranet is security. Because the extranet specifically prevents traditional gating functions, and connections continue right through to internal resources, some type of policy control technology is needed in extranets.

In addition to the initial SSL connection made via traditional Internet technology, it is possible to add additional layers of security to ensure your connections are relatively secure. For instance, try using a strong two-factor authentication system, such as a software token and password combination, which works somewhat like the combination of an ATM card and PIN number. You can use a combination of security features, depending on the sensitivity of your data, as shown in the figure below:



As the value of information increases, and the accompanying level of security is stronger, so too the cost of implementing the security increases. However, if you have extremely valuable or sensitive data, such as patient records or military secrets, the cost of even biometric technologies will be returned in terms of customer faith and loyalty.

Benefits of Extranets

Extranets are enabling technology for both new and legacy applications. They provide:

- A common baseline security platform for use by all needed partner applications.
- Required granularity without the need to develop for each application.
- Cheaper access than traditional remote access solutions, due to the availability of inexpensive high speed access.
- Low capital costs.
- An implementation solution for a large number of customized clients.
- Improved collaboration from sharing business processes and applications across organizations.
- Reduced costs for distributing information.

What to Watch Out For

Like most technologies, extranets do not fit all situations. There are times when the use of an extranet makes a great deal of sense for an organization and times when it does not. When the following applies, you may want to look for a solution other than an extranet:

- There is a single application to be deployed, especially if it is using only http technology.
- Traditional dial-up is required, perhaps due to lack of access to high-speed Internet connections.
- The company's interest is primarily cost driven.

Summary

Extranets operate primarily using Internet technologies. They can be an excellent way to improve the relationships you currently have with customers, suppliers, or other businesses in a "coopetition" environment. The extranet can introduce significant efficiencies into your business processes, by sharing an entire process, from end to end. This can result in significant cost savings to your company, after the initial capital expenditures are returned through new efficiencies and new business.

Fax for Domino

Implementing a Fax for Domino (FxD) server can be a good way to add value to your Domino deployment. Outbound faxing in particular is both simple to set up and can quickly bring Return on Investment since it saves users the time spent lining up at fax machines, feeding large documents in, or retrying busy numbers.

Implementing a fax server for inbound faxes takes a little more planning, but brings faxes directly to the desktop with confidentiality.

In this section we will cover:

- Benefits of a fax server
- Notes/Domino integration
- Advanced features
- How it works
- Fax for Domino system requirements
- Sizing a fax server

Benefits of a Fax Server

A summary of the major benefits of implementing a fax server are:

Saves Time

A fax server removes many of the costly and inefficient steps required to send and receive faxes manually, such as feeding large documents into the fax machine, re-dialing busy numbers or sending to multiple recipients.

Reduces Costs

With a central fax server you can reduce the number of fax machines you need to own, and save telephone and hardware costs.

Manageability

With a centralized fax solution you can have more control over faxing in your organization, for instance by ensuring that standardized company cover pages are used. Also, with the central logging features available, you have better information on how fax is being used in the organization, and what the costs are.

Entries in a translation database can be created to modify numbers on outbound faxes. For example this can be used to strip off any leading “9” the users may think they need to include if the lines on the server are on external lines. Or it can be used to prefix faxes with special internal phone numbers or translate them to use any special cost saving services your company uses.

Confidentiality

Inbound faxes are received with full confidentiality, even when you're on the road. Faxes arrive in your personal inbox where only you can view them.

Ease of Use

Users send and receive faxes and e-mails from the same mailbox. Inbound faxes are received as e-mail messages with attachments in a choice of formats (such as TIF or JPG), which can be viewed with any image viewer, such as the viewers provided with the Notes client.

Documents from Lotus SmartSuite®, Microsoft Office®, and Adobe Acrobat® applications can be faxed from Notes with no loss of fidelity, simply by attaching them to e-mail messages.

Using the Lotus Print-to-Fax driver (available for free download via the Web) users can fax directly from any Windows application with print capability.

Notes/Domino Integration

Lotus Fax for Domino integrates tightly with Notes/Domino. For instance, Fax for Domino:

- Uses the Notes mail client, or alternatively you may use a Web browser using Notes Mail if the mail database is on a Lotus Domino server.
- Allows fax to be enabled in other Domino applications, or with workflow automation.
- Allows users to modify cover page and other personal fax options from Notes.
- Enables Domino-based administration. Domino administration tools are used to configure and manage Fax for Domino, both locally and remotely. User profile information can be maintained in the Domino directory or in a separate database. Administrators can assign outbound fax priorities, default cover sheets and other configurable settings to groups of Domino users automatically.

Advanced Features

There are several advanced features of interest in Lotus Fax for Domino, such as:

- FxD is scalable and reliable. Multiple lines can be added to each server to increase performance.
- Dynamic load balancing. Clustered fax servers can give maximum efficiency. Outbound faxes can be automatically routed to the shortest queue based on throughput capabilities and the size of the queue.

- Flexible inbound routing. Fax for Domino fully supports modern telephone network features for automatic inbound routing, such as: Direct Inward Dialing (DID), Dialed Number Identification System (DNIS), Dual Tone Multi-Frequency (DTMF), ISDN/EuroISDN, CSID, fax port addressing, and manual routing.
- Scheduled transmission. There are facilities to automatically delay fax transmission until telephone rates drop.
- Prioritization. To ensure that the most important faxes are not delayed, outbound faxes are automatically prioritized based on senders' default priority levels, administrator-defined rules, and the time a fax has waited in the queue.

How It Works

The following sections describe how sending and receiving a fax works from within Notes.

Sending a Fax

To send an outgoing fax, the user composes a message and addresses it to the fax server, including the telephone number of the destination fax machine and using a name, such as @FAX, that has been set up for the fax server. The fax server periodically queries its Notes mailbox and processes any request it finds. It then generates a cover page, converts the documents to be sent into a fax file format and moves the request into a queue for transmission.

The fax server can notify the sender when the fax is successfully processed. If the destination fax machine is busy or unobtainable, the fax server will retry several times (you can customize this) before sending a failure report to the sender.

Tip This may be one of the occasions when it is worth considering modifying the Notes mail template. This can make fax even easier to use. You can add a custom form, called, for instance, Fax Memo, that has all the default features you wish to use for fax built in. Then the user simply has to choose Create - Fax Memo in their mail database to create a fax.

You may also want to use an addressing scheme other than @FAX, since @FAX is the standard FxD default, in order to keep outsiders from using your fax gateway to send faxes to other parts of the world, thereby incurring extra long-distance phone charges. You can do this by restricting which users can communicate with this machine and/or limiting which countries FxD can dial.

Receiving a Fax

The fax server receives incoming fax image files through the fax hardware. If routing code information is present, it searches user profile documents in its administration database, converts the image document to the file format specified for the user, and delivers the fax as an attachment in a message via Notes Mail. In the absence of routing information, the fax can still be sent to a designated mailbox, from where it can be manually distributed.

For displaying incoming faxes users can choose the standard viewer in the Notes client, or better still the Lotus Image Viewer or other image viewing software such as the Wang Imaging product that ships with Windows 95/98 and NT. This allows users to display, zoom, rotate and improve the quality of any image document. It also lets them print, fax, or process images using optical character recognition (OCR).

Incoming faxes can be routed to individuals automatically. Two common methods used are:

- Direct Inward Dialing (DID), a service provided by the local telephone company that allows a single telephone line to access more than one telephone number through the use of individual extensions.
- Dual Tone Multi Frequency (DTMF), the capability of some fax machines to allow senders to add a series of routing codes on the machine keypad as they send faxes.

Cover Pages

FxD also provides cover pages for faxes. It stores a default cover page and customized cover pages in a database. The default cover page includes all the standard information, including to and from, subject, and page count. Customized cover pages can be created using any of the form design tools available in Domino. Different users, or different parts of the organization, can be set up to automatically use their own separate custom cover page.

Fax for Domino System Requirements

Here are the system requirements for Fax for Domino.

Server(s)

We recommend running Fax for Domino on one or more dedicated servers of at least the following specification.

- Pentium Processor 166MHz or higher
- 80MB RAM minimum; 96MB or more preferred
- 4GB hard disk space
- Windows NT 4.0 with most recent stable service pack

- Domino Server 4.6.2 or higher
- Fax for Domino software

Fax Devices

You will need one or more supported fax devices. For a serious commercial installation intelligent fax boards should be used rather than fax modems. These devices have onboard processors to handle the faxing, which reduces the load on the server CPU. Some fax boards have multiple channels, so for instance if you decide you need 8 fax lines, you may only need to buy two 4-port fax devices.

With FxD there is a wide choice of supported fax devices for use in most countries.

Phone Lines

One or more analog or digital (ISDN or T1) phone lines or DID trunk lines, if using DID for inbound fax routing.

Sizing a Fax Server

You should try to estimate your current fax usage in your organization, in order to size the fax hardware and number of lines you will need. This will probably be easier and more accurate if you have access to this information via your internal telephony system.

As an example let's assume that in your organization:

- There are an average 10500 outbound faxes per 4-week period.
- There are an average 10000 inbound faxes per 4-week period.
- The average fax call duration is 1.5 minutes.
- You have a five-day working week, Monday to Friday.
- You have a 10-hour working day from 08:00 to 18:00 hours.

This then equates to 102.5 faxes per hour, or 153.75 minutes of fax transmission per hour. So, with this traffic divided across 3 lines each would be busy for about 51 minutes per hour, which would mean approximately 85% utilization.

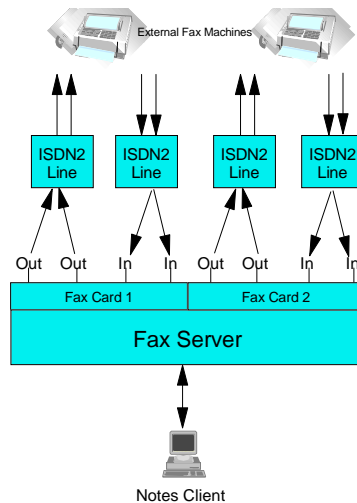
With 8 lines each line would be busy for about 20 minutes per hour - approximately 33% utilization. This assumes that the traffic is spread reasonably evenly through the day. In reality this is unlikely to happen, and there might be a potential for queues to build up at busy times causing some delays. This can be catered for by the prioritization features of FxD, to prevent the important faxes from being delayed.

However, in any sizing exercise you should allow for the peaks as well as the averages, so in our example, choosing the 8-line scenario would probably be the right choice.

A relatively low-cost single server configuration using 4-port fax cards, and with 8 lines based on our example above is shown in the following figure. Note that the inbound and outbound lines are configured across both fax cards to minimize the impact if a card should fail.

If later the demand were to grow or more resilience is required, you could add extra lines and fax devices, and spread the load across two or more servers.

The following figure gives you an example of a fax configuration. The external fax machines refer to machines outside your company.



Further Information

For full information on Fax for Domino, including a list of the supported fax devices, see www.lotus.com/products

Summary

This section has described the features of Fax for Domino and how it can add benefit to your Domino deployment. We have also described how the product works and how you might go about planning and sizing a fax implementation.

Sametime

Sametime is a set of applications that can be used for live, real-time communication. This includes technologies such as chat, audio and video conferencing, shared white boards, and shared applications. Sametime is a complete, independent product package which needs to be run on a standalone server. It is designed to be deployed in both Domino and non-Domino environments.

The Sametime Connect chat client is similar to AOL Instant Messenger (AIM), for example. It allows you to send short messages instantly and tells you when a user is online. If you have Domino in your organization you can use the Domino directory for name lookups in the Connect client.

Audio and video conferencing can be done using Microsoft NetMeeting or another product that supports the T.120 standard. The Sametime server acts as a NetMeeting server allowing NetMeeting clients to meet and communicate. For more information on NetMeeting see www.microsoft.com/netmeeting

Shared white boards and shared applications can be achieved using either NetMeeting or the Java applets which ship with Sametime. These Java applets can be used in either a Notes client or in a Web browser.

Using Sametime

In a test of Lotus Sametime 1.0, InfoWorld found that Sametime had the following features in its favor:

- Online status information
- Privacy options
- Instant messages
- Chat sessions
- Secure meeting environment
- Integration with Lotus Notes/Domino

The features they felt were lacking or problematic were:

- No UNIX version
- Lack of support for H.323 audio and video standard

Why Consider Using Sametime

The main reasons large organizations should consider Sametime are as follows:

- Sametime is secure, scalable, reliable, and manageable.
- It integrates well with your existing Domino infrastructure. In addition, if you have Domino Designer development staff, you can easily customize Sametime.
- The server's browser interface allows quick user setup, activity monitoring, and security management.
- Tests indicate that several thousand conversations can be handled simultaneously.
- Finding people online and invoking conversations are simple tasks.
- The client installs in less than two minutes and then presents a small desktop window with a clean design.
- You can add people from an existing Notes directory or import names from a separate server-based address book.
- Sametime Connect (the client) clearly indicates who is online and the user's current status (such as "I am away," "I am active," or "Do not disturb me").
- Users may specify a list of who can and can't see them, protecting privacy.
- Sametime servers can be cascaded to increase meeting capacity.
- Participants may view the same meeting from various clients — Web browsers, Sametime-enabled Notes clients, or other T.120 software, like Microsoft NetMeeting, so that people from outside your organization can still take part in your meetings run with Sametime.
- Several users may simultaneously annotate the white board.

Summary

"Managing security, hosting large conferences, and handling administration all worked quickly and reliably. This combination of features and manageability should make Lotus Sametime a strong candidate if you're building a new real-time collaborative system — or need to augment lower-end solutions," says Mike Heck in his article "Review: Sametime simplifies collaboration in real time," published in 1999 by InfoWorld Media Group Inc.

For more information on Sametime see www.lotus.com/sametime

Domino.Doc

This product can add such a tremendous amount of value to the Domino installation, it could not be omitted in this chapter.

What Is Domino.Doc?

Domino.Doc is a document management system, meaning that it is more than just a place to hold documents. It holds lots of documents, but it also has built-in workflow features such as document routing, document approval cycles, and so on. It is designed for a distributed network, just as Notes/Domino is, but adds some features needed for document management, such as the ability to check out a document, which is not possible in a traditional Notes database.

The great thing about Domino.Doc is the way in which it is organized. The metaphor of library, file rooms, file cabinets, binders, and documents makes it very easy for end users to begin using Domino.Doc quickly. They still require training in the correct usage of the system, but the metaphor is strong and clear in their minds, which makes it easier to navigate than some other document management systems.

Domino.Doc can be accessed from either a Web browser or a Notes client. A drawback of Domino.Doc to date has been that the combination of server release used and client release used is complex. In other words, certain combinations of server and client releases prevent the system from working properly. (For more information on which combinations work, consult the Lotus Notes Knowledge Base.)

Domino.Doc runs on top of a Domino server. It can run on a server which has other databases or applications running on it, or it can run on its own.

Tip Due to the amount of overhead which Domino.Doc needs to run efficiently, it is recommended you install Domino.Doc on its own server. When the document volume is high enough, you will need to allow for multiple servers to carry the load.

Domino.Doc Features

Domino.Doc has several features which add a great deal of value to your Domino system, such as:

- ODMA (Open Document Management API) support so users can work in applications like Microsoft Word™, with which they may already be familiar. The Desktop Enabler takes control of these applications, making it easy for users to save to Domino.Doc, without losing the ability to save to the file system, if desired.
- Tight security at the file cabinet (database), binder (folder), and document levels.
- Check-in and check-out features which ensure document integrity. For instance, if Leslie needs to make a change to form “123.doc”, and Laura also needs to make a change to it, Domino.Doc will only allow Leslie to check out the document and make the changes (because she asked first). After Leslie has checked “123.doc” back in, Laura may check it out and make her changes. If Laura is lucky, Leslie has just made the necessary changes for her!

Tip Laura can still view “123.doc” while Leslie has it checked out. However, only one user at a time can modify a document. Laura cannot see the changes Leslie is making, just the version of the document Leslie has checked out.

- Users are able to perform searches across multiple file cabinets, and receive a single screen with the results of the search.

Caution Searching in a single file cabinet is simple, but searching a single binder is more difficult. Consider this when setting up your library.

- Storing multiple versions of documents allows users to track revisions and provide an audit trail of activity.
- Documents can be captured using drag-and-drop.
- Server-to-server replication allows fast content distribution.
- Life cycle management takes a document from draft to review, approval, release, and finally to archive.

Architecture

Domino.Doc architecture is similar to Notes database architecture, since it is built upon the Notes foundation, but the terminology is different, as shown below:

<i>Notes</i>	<i>Domino.Doc</i>
Database	File Cabinet
Folder	Binder

In order to customize Domino.Doc, you will need to install the Desktop Enabler, or many features are not available to you.

A quirk of Domino.Doc is that for each file cabinet, two icons appear on the user's desktop. One icon holds the design elements of the database and the other holds the documents. This can be confusing to users, so you will need to cover proper navigation in training.

We cannot go into any detail regarding the application development aspects of Domino.Doc, except to say that in Domino.Doc 2.x there can only be one File Cabinet Template (filecab.ntf), which means that any design elements you want to appear only in one file cabinet, such as views specific to that file cabinet, will need to be created in the file cabinet database itself. This has two effects:

- It can cause some issues when modifying filecab.ntf for your environment, so plan this aspect carefully and document all changes that you make, since some changes will be lost when you “load design” at the server task or the software is reloaded or upgraded.
- You will spend much time copying design elements from one copy of the file cabinet database to the other, to ensure that everything functions properly. Keep this in mind when designing views and other file cabinet-specific features.

Tip To do most security-related tasks, you will need to use the checkout feature. For instance, to modify a binder's security, you first need to check it out, then you make your changes, then you check it back in again.

As always, we recommend attending training in the product before deploying it, as well as thorough test and pilot phases.

Planning for Domino.Doc

In the Domino.Doc Administrator's Guide, there is an excellent checklist of planning tasks, which we recommend you consult prior to embarking on an installation project. A similar checklist is presented below:

Determination of Environment

Will there be a mix of http and Notes clients accessing Domino.Doc?
Do all potential Domino.Doc users have Person documents in the server PNAB, or will there be outside users who do not yet have Person documents?
For the http users with Person documents, is their http password properly set up?
Do you use a Cascaded PNAB?
Is the Domino server dedicated to Domino.Doc, or is it used for other applications?
Do you have enough disk space to handle the expected volume of document traffic?
How many Domino.Doc users do you expect?
What is the site security policy for the domain's PNAB? Can Domino.Doc create users and groups?
Who will be responsible for administering Domino.Doc?
Who will be able to create File Cabinets?
What is the security policy for the Domino server? This is most critical for single-server organizations.
Will you be using ODMA-enabled applications? Will they be the primary mode of access to Domino.Doc, or secondary behind Notes clients?
Will you be using server replication?
Which server will be your Domino.Doc Master Server?
In which directory on the Master Server will you put your master library? The default is notes/data
Which server will contain your Domino.Doc replica databases?
In which directory will you place the replicas?
Will you replicate the library only, the file cabinets only, or both?
Will you be using the http protocol to access Domino.Doc on any server?
Are your servers set up for replication?
Is the PNAB replicating correctly between the two servers?
If you are using a Cascaded PNAB, is it replicating between the two servers?
Have the necessary Connection records for scheduled replication been created?
Are your servers included in the LocalDomainServers group?

In addition to the questions which will need to be answered before beginning the planning of the system, there are a number of pre-install tasks which need to be completed prior to installation. By answering these types of questions, you prevent many future problems. The pre-install task checklist is presented in the following figure:

Domino.Doc Pre-Install Tasks

Task	Date Completed	Completed By:
Check the Restrictions section of the Server document in the PNAB for each server and make sure that each server can access the others		
Check the Agent Manager section of the Server document in the PNAB for the destination server, and add the User ID used to install Domino.Doc to the list of people who can run Unrestricted LotusScript Agents. (This is the User ID used to sign the design elements in the Domino.Doc database).		
Name of the Domino server where you are installing Domino.Doc is:		
Names of people who will administer Domino.Doc:		
Host name for your http server, if Domino.Doc will be accessed through http clients is:		
The foreign domain to which you send Internet mail, if some users will be accessing Domino.Doc through http and never through Notes is:		
The name of a Cascaded NAB, if you use one is:		
Can you update the NAB (depends on security policy)? Yes/ No		
NOTE: Domino.Doc group names cannot be changed after installation.		

System Requirements

Windows NT 4.0 on Intel-based system
Domino 4.6 or later (4.6.2+ for full-text indexing)
64 MB RAM or more
4 GB Hard Disk or larger recommended; depends on document storage requirements
Client requirements are one or more of:
Lotus Notes Desktop Client 4.5.x or 4.6.x
Web browser
Domino.Doc Desktop Enabler
Windows 95/NT, 16 MB RAM, 5 MB Hard Disk space, 256 color display with 800 x 600 resolution

Installation Date: _____

One reason to use such a checklist is that, for instance, you should have only one instance of Domino.Doc per domain; otherwise, you run the risk of having the security groups overwrite each other in the Domino directory.

Tip Avoid the problem by giving each instance a unique name, so that each security group is obviously connected to a particular server. However, it is best to avoid having multiple installations in one domain.

Installing Domino.Doc

Be sure to read the installation instructions carefully. There are several important things which need to be done to ensure the system is set up correctly. For instance, the following choices made during installation will have an impact on future upgrades or system functionality:

- The user ID you choose for installation should be either a Domino.Doc Administrator or the server.id.
- The user ID you choose for installation must be added to the “Run restricted Lotus Script agents” field in the Agent Manager section of your server document.
- The install program modifies the Domino directory by default. It is optional, but for best performance, allow this modification to occur.

Important If you don’t allow the modification, you will not be able to use Domino.Doc until you make the modifications the install program would have made.

- Plan and provide for HTTP access from the outset, even if you don’t think you will need it.
- Some things during installation are fixable, but others are not, so be careful when entering information in the Setup screen.

Caution The Domino server name and the Domino.Doc group names cannot be changed after installation.

- After installation is complete, most organizations disable the ability to update the directory. This prevents users who need to be able to create file cabinets from creating new users, perhaps incorrectly, and most likely generating duplicate users and groups. See “About Domino.Doc Address Book Editors” in the Administration Guide for more information on this topic.
- When installing the Desktop Enabler in Windows NT 4.0, errors such as “Path to Gothres.dll not found in Registry, exiting ...” may occur. The issue occurs when more than one user shares the NT Workstation. The user that was logged on at the time of installing the Desktop Enabler will be able to run the Desktop Enabler without error. Other users who log on to that same NT Workstation will receive the error. To work around the issue, you will need to change the NT registry. Consult the Lotus Notes Knowledge Base Document 162127 for more information on how to prevent this from occurring.

Benefits of Domino.Doc

There are a number of benefits to using Domino.Doc, depending on what your particular organization is looking for. The most commonly cited benefits are:

- It is easy for users to access, since it is fully integrated with Notes/Domino.
- The ownership costs are lower than many other document management systems, since the same administrators who manage Domino can also manage Domino.Doc.
- The startup costs are relatively low, especially if you do not require customization, and the return on investment (ROI) is therefore very fast.
- Using Domino.Doc, highly focused applications can be built to enable efficient document processes.
- It moves away from the world of file system and e-mail based document storage, to a true document management system.

Summary

If you are detailed in your design and planning of the installation and customization of the product, your implementation should be problem-free. The ability to quickly and efficiently share an entire library of documents with the appropriate people and departments offers a tremendous opportunity for increased efficiency within the organization.

There are several areas of www.lotus.com which contain Domino.Doc information.

QuickPlace

Lotus QuickPlace is a teamware application that lets you create an instant electronic workspace where team members can collaborate and manage a project. An electronic workspace is a space that you can create on the Internet (or intranet) where you can publish, share, and track documents with a group of individuals. QuickPlace is used by teams to maintain all resources (files, thoughts, schedules, tasks, and so on) related to a common project in a shared space where everyone can be assured that they can find and respond to the latest information.

The unique thing about QuickPlace is that users can create their own workspaces on the QuickPlace server without administrative intervention. Users simply fill out a form giving their name, what the workplace will be used for, initial workspace style, and what they would like their

workspace to be called. The server then creates a Notes database (or group of databases) and gives the user a URL to that database such as www.myquickplaceserver.com/meetingsite. The user then has complete control over their workspace including style, user access, and layout. This makes it easy for teams to make a meeting place and start using it right away.

QuickPlace ships with the R5 Domino Enterprise Server or can be purchased separately. It runs as a standalone server but it can use the Domino directory for authentication.

The QuickPlace server can only be accessed through a Web browser (version 4 or higher) and cannot be accessed through the Notes client.

For more information see www.lotus.com/quickplace

Workflow

Workflow is the heart of Lotus Notes. It is the structured flow of information through an organization. Workflows most often route documents from one person or group to the next, while enforcing time limits, and restricting access to those who require it. Workflow generally involves the automation of a business process. Increasingly, business processes are designed to be completely automated, and may never have been done “manually.”

There are two types of workflow processes: Ad hoc, and rules-based and roles-based. Ad hoc processes tend to be user or team defined processes. They are generally for smaller projects or those of shorter duration. Rules-based and roles-based processes are typically driven by business rules, and often include organization and functional role analysis. Rules-based and roles-based processes tend to be fairly complex, and are modeled for either long-term projects, or processes which are repeated many times.

There are three workflow models: Send, share, and hybrid. The send model revolves around automatically routing documents to be reviewed from one person to the next. Using the send model requires administrators to maintain e-mail addresses for each role in each application. The share model involves people browsing a central database which stores the documents. Share depends on people checking the database to work well. The hybrid method uses a combination of the two, which tends to be the most useful.

Workflow is an integral part of Knowledge Management (KM) because it helps to capitalize on expertise and available information to improve productivity and responsiveness.

For many years, developers have created workflow applications, first in Notes, then in Domino. Products like Domino.Doc and databases like the Approval Cycle Template offered standardized ways to handle document

routing, upon which developers could build and customize specific applications. Now Lotus has introduced a specific product called Workflow 2.0 which builds on these foundations.

Building a Workflow

There are several major steps in building a workflow. The first thing which must happen is that a need for a process must be identified. In other words, the business must drive the technology — otherwise, “the tail wags the dog.” The high-level steps of completing a business process analysis and then building a workflow are:

1. Model the existing process.
2. Determine problems with the existing process.
3. Design the new process, being sure to test all critical paths.
4. Verify the process with the end users of the process.
5. Redesign and retest, if necessary. This step may repeat several times, depending on how complex the processes in question are.
6. Design an application (or a set of them) which can achieve the process.
7. Code the application(s).
8. Test the code.
9. Release the code to pilot users.
10. Release the code to the entire process.

Note that the majority of time is spent in the first 6 steps. The actual coding time is generally minimal, in terms of the total time it takes to design and implement the process. There are also many third-party tools which can help with the various stages, from process modeling tools to software which helps relate tasks to each other with links.

Summary

Numerous books have been devoted to business process re-engineering, and many others include information on the specifics of process development in Lotus Notes/Domino. In addition to written tools, and products like Domino.Doc as well as the Approval Process Template, Lotus now offers a Workflow add-on to Domino. This tool is expected to help ease the work load of developers when designing business processes.

Integrating with Back-End Data

Prior to R5 of Domino, the only way to integrate Relational Database Management Systems (RDBMS), Online Transaction Processing (OLTP) systems, or other back-end data into Lotus Notes/Domino was through the use of NotesPump or third-party products like Casahl Technology's *Replic-Action*. These products allow data to flow from Notes to the RDBMS/OLTP, or from the RDBMS/OLTP back to Notes. It could also be a two-way information flow.

Any solution like this was relatively costly, and generally required a specialist to implement. With R5 of Domino, Lotus has integrated what used to be NotesPump into the base Domino product, a significant added value to the customer. You may still need to look at third-party vendors, however, since they offer more connectors than Lotus.

The realms of Lotus Notes and enterprise-class database applications are different. The ways they handle data, their administration requirements, their hardware requirements, and so on, are all different. Lotus Notes databases, for instance, are not relational, which has an impact on how imported data from an RDBMS or OLTP can be structured. That makes trying to integrate these systems potentially challenging.

Why Integrate Back-End Data?

There are many possible reasons why an organization might choose to integrate their back-end data into Lotus Notes/Domino:

- Information is easier to distribute via Notes than via back-end systems.
- Access to data in a usable form is improved.
- Superior price-to-performance ratios are based on scalable server technology.
- End users are familiar with the product and its interface, resulting in a smaller learning curve.
- Licensing issues: It can be less expensive to distribute a subset of data via Notes than to give access to everyone via the back-end system.
- Front-end applications need to access the company's critical data. For example, if you have a customer who routinely does not pay for services, it is not a good idea to sell that customer more services. Alternatively, sales representatives may be able to identify sales opportunities from customer profile data, which they can only get from the back-end systems.

- Quality of service and response time are important issues to customers. Research shows that customers don't like to speak to several people to get what they want, and prefer phone and Internet transactions to face-to-face dealings. So, the relationship with the company and customer satisfaction can be improved using integration.
- Company productivity can be improved through people having to access only one system, rather than two.
- Application integration for the extranet offers real potential for beating the competition in terms of relationship management and transaction processing speed.

Ways to Integrate Back-End Data

Lotus Domino Connectors provide native access to a wide variety of RDBMS products, ODBC, the network file system, Enterprise Resource Planning (ERP) systems, and OLTP systems. There are two standard ways to get to back-end data: DECS and the LSX Lotus Domino connectors.

DECS

Domino Enterprise Connection Services (DECS) runs on a Domino server. It is a way to connect back-end data to Lotus Notes. DECS allows you to create queries in real-time to query an RDBMS.

What does this really mean? You can extract data out of your RDBMS and bring it into Notes in real-time (or pretty close to it), use it, and send back to the RDBMS any modifications you need to make.

At the time of writing, DECS supports the following data sources:

- DB2
- EDA/SQL
- ODBC (Open Database Connectivity)
- Oracle
- Sybase

Each of these data sources has specific needs and requirements which are beyond the scope of this book to provide. For more information on how to set up a DECS connection for any of these products, consult the printed book "Domino Enterprise Integration Guide," or online as DECSDOC.NSF, which is provided with the product.

LSX

LotusScript provides an integrated programming interface to Lotus Notes, and the LotusScript Extension (LSX) for Lotus Domino Connectors extends Notes through scripting to data outside of Notes. The programming model is independent of the individual Connector, which eliminates the need to learn each individual system. At the same time, experienced users may access the individual features of a specific system.

At the time of writing, the LSX LC supports access to the following Connectors:

- DB2/UDB
- EDA/SQL
- File System
- Notes
- ODBC
- Oracle
- Sybase

It is more difficult to find third-party utilities which add to the set of LSX LCs than DECS. The LSX LCs may be used alone or in conjunction with DECS. Together, these two technologies provide all the access you will likely need to external data.

The LSX LC is registered when the Domino Server is installed. You must load the LSX for LC using the UseLSX “*lsxl” statement in a script.

For more information on the LSX connectors, consult the “LSX for Domino Connectors Manual,” or online as LSXLC.DOC.

Definitions

Here are some definitions of terms you are likely to encounter:

- Metadata: Refers to a Connector’s data definition, which includes the names of data elements, their data types, and implies the order of the elements.
- Alternate Metadata: Available for some LCs, this is an alternate source for the data definition. For example, DB2 metadata is in the form of a “table,” while its alternate metadata form is an “SQL view.”
- Result Set: The results of an information request through a connection. It describes the collection of data or information from the connection which matched the input criteria. It does not actually return the actual data until fetched.

- Token: An integer used to identify a property of a connection.
- LSX LC Classes: Provide external data and system access to the Domino LotusScript environment.

Summary

The two primary ways to access back-end data are through DECS and the LSX Lotus Domino Connectors. Third-party tools exist to supplement the connectors available for these two tools. The best reasons for connecting to back-end data involve increased revenues, extending business processes, and increased efficiencies, all of which result in an improved bottom line.

Summary

In this chapter, we have looked at several ways to expand the reach of Domino, adding value to your initial Domino investment. We discussed extranets, Fax for Domino, Sametime, Domino.Doc, QuickPlace, and enterprise integration.

There are many other products available on the market which also add value in similar ways, such as the Lotus Pager Gateway, Lotus Wireless Domino Access, EasySync, Domino Media Connection Services, Lotus LearningSpace, and others.

To find out more about any of these products, visit the Lotus Web site at www.lotus.com/products and look for Domino R5 links.

Chapter 26

The Changing Enterprise

The chances are good that your organization will not remain static throughout its life span. Some organizations frequently acquire other companies, and others will merge one or more times due to one of the following scenarios:

- An industry matures and growth potential slows.
- The emergence of new markets, new industries, or new needs
- Companies prepare for globalization.

As the Domino administrator, your role when your company changes will become critical, assuring that the combined organizations' systems function efficiently. To aid you if this happens to you, this chapter will cover:

- Company mergers: Basic considerations
- Merging Domino infrastructures

Company Mergers: Basic Considerations

This section gives an overview of those topics that make many of us shudder when we think about them: Mergers, acquisitions, down-sizing, right-sizing. Research shows, however, that what is a nightmare for many departments in terms of shrinking headcount can actually turn into a departmental increase in headcount for the IT department. The reason, in short, is that the task of integrating two dissimilar systems is more people-intensive than maintaining each system independently.

What You Need to Know about IT Mergers

According to a survey of 212 IT managers conducted by "Information Week" in mid-1998, other factors which impacted IT staff and budgets were whether the deal was a true merger, and the industry the company was in. If the deal was a true merger of equals, then 40+% of companies saw increased combined budgets, and at least 30% maintained the same level of budgeting.

In contrast, less than 30% of acquired companies had increased IT budgets, while around 45% stayed the same. The post-deal workforce was impacted by the economic sector of the companies. Services companies were most

likely to see an increase in IT headcount, followed by computer industry companies, while the manufacturing sector was most likely to see a decrease (nearly 60% saw reductions).

The alignment of post-merger objectives was somewhat surprising, on the surface. Post-merger IT departments were most concerned with streamlining operations, followed by unifying data centers.

The driving force behind these priorities is implementing the efficiencies which were promised as a way to make the merger pay for itself. Ranking pretty low on the list were budgeting and headcount determinations, which would seem at first glance to be part of the efficiencies. These are not actually considered until much later, because the most important thing is finding new ways to reach customers and increase revenue.

Another interesting feature of the same survey is that the second most critical risk factor identified during pre-merger talks is the core business applications, ranking just behind financial systems. All but 14% of the CIOs surveyed had participated in risk analyses during pre-deal discussions, which means this is an area it is important to be familiar with, as an IT person, particularly since Domino frequently runs core business applications. You may be asked for your input, so be prepared!

Planning during a Merger

The following strategies may apply to projects other than Domino, but that is the focus here.

As a Domino network manager, you need to do several things when merger strikes:

- Take charge of the situation, to assist management in making the best possible decisions about infrastructure adjustments.
- Get friendly with the CFO, and try to understand the financial goals of the merger.
- Advise management to keep time horizons for major projects to eight quarters — no more. If you allow projects to take longer than this, the IT department will be seen as incapable of responding quickly to change.
- Get specific information on what has been promised to investors, so you can help achieve those objectives.
- Discuss the impact of the merger on any significant projects currently underway.

- Recognize that the business management is going to affect the technology.
- Be prepared for the possibility that the IT group, including Domino administrators, may be spun off into a separate revenue-generating group.

The steps to successfully navigating a merger are:

1. Determine a provisional management hierarchy.
2. Assess what equipment and assets each organization has already.
3. Identify problem areas in each company.
4. Determine which technologies should become the standards.
5. Design how the new organization's technology will look; create repeatable solutions, if at all possible.
6. Determine what needs to be discarded.
7. Determine the best methods of linking the business and IT strategies of the combined organization.
8. Determine the new management structure.

The most important thing to do in a merger situation is to speak with senior management to ascertain the company's goals; then, define your Domino/IT priorities based on common sense — worry about the fine details later.

Merging Domino Infrastructures

There are many books and white papers on migrating from another mail package to Domino (see Related Publications at the end of this book). Migration tools will work for you in many merger situations, since you will often have a non-Notes product to migrate from. In this case, you simply need to migrate the users from the non-Notes product using the correct migration tool. But what if the other company has Domino, too?

Something which is rarely covered is how to merge the Domino infrastructures of two companies, or two departments within the same company. It is the kind of thing you will probably never give much thought, until you are faced with the task of doing it. There are two major areas of such an undertaking: Strategizing and the details of the implementation.

The planning which is done for a rollout should also be done for this type of infrastructure merger. However, the reality of life is that in a merger situation, the IT department is under serious pressure to quickly produce results. This often means that adequate planning is not done prior to the

merger of the systems. We will proceed in this chapter on the assumption that you will formulate an appropriate plan, because if you have read through this book you know how important a good plan is to a successful project.

Merger Strategies

Most organizations will want to use one Notes domain and register all servers and users in one Domino directory, probably using tools which help you to move large numbers of users at once. However, you may decide to retain separate domains and separate directories, at least temporarily. If you opt for separate domains, it is important to plan a strategy for managing them.

Managing Multiple Directories

If you opt for multiple domains, you can set up a directory catalog and directory assistance to make it easier to extend name lookups and client authentication beyond the primary Domino directory. Creating a directory catalog, configuring directory assistance, and configuring directory servers all help in managing multiple directories. For more detailed information on this topic, consult Domino Administration Help (help5_admin.nsf).

A directory catalog consolidates the most frequently requested directory information from one or more Domino directories into a single, lightweight, quick-access database. There are two types of directory catalogs — mobile and server, which are described in detail in the online help.

Directory assistance extends Notes name lookups, LDAP searches, and Web client authentication to secondary Domino directories and to LDAP directories. To do this, you create a document for each directory you want to search. In the document, you specify the directory location and naming rules that reflect the names in the directory.

In previous versions of Notes/Domino this would all have been achieved using cascading Name and Address Books. However, we recommend that you set up both a server directory catalog and directory assistance instead of using cascading Domino directories. Cascading directories are still supported only for backward compatibility.

The mobile directory catalog, server directory catalog, and directory assistance provide similar functionality. This table compares the tasks that each feature supports (this table is taken from Domino 5 Administration Help).

<i>Task</i>	<i>Mobile directory catalog</i>	<i>Server directory catalog</i>	<i>Directory assistance</i>
Find entries in secondary Domino directories on behalf of Notes users for mail addressing.	Yes	Yes	Yes
Find entries in LDAP directories on behalf of Notes users for mail addressing.	No	No	Yes
Find entries in secondary Domino directories on behalf of LDAP clients.	No	Yes	Yes
Refer LDAP clients to LDAP directories.	No	No	Yes
Authenticate Web clients using entries from secondary Domino directories.	No	Yes	Yes
Authenticate Web clients using entries from LDAP directories.	No	No	Yes
“Recipient name type ahead” addressing.	Yes	Yes*	Yes

Creating One Domain

Merging two domains is a complex series of tasks, even in R5. You will most likely need to merge servers and you will need to migrate users from their current messaging system to Notes/Domino.

Combining Servers

The impact of combining servers is hard to imagine unless you’ve gone through it. To combine two servers (not domains, just servers) you need to:

1. Check each database for formulas that contain specific server name references.
2. Update Domino directory documents, such as Connection and Program documents, to reflect the new name.
3. Make sure that if the old server issued cross certificates, the new one does the same.
4. Notify foreign domains that access this server about the change.
5. Inform users about the new location for databases, including their mail database, if necessary.
6. Make sure the network protocols on the old and new servers match.
7. Make sure the new server runs the same server tasks as the old machine.
8. Replicate all the databases from the old server to the new one.
9. Update mail routing tables to ensure that mail gets delivered correctly.

As you can see from this list, combining servers is a pretty serious task, though the steps themselves aren't difficult. Consider using the Decommission Server Analysis tool (new to R5) to help you with this part of the merger, if applicable.

Cross-Certification

In addition to merging servers, you will have to migrate users from the old domain to the new one. We recommend that you use the cross-certification method rather than having to reregister all your users. You will need the following access to accomplish the tasks in either case:

- Editor with create documents access, or the UserModifier role, to the Domino directory
- At least Author with create documents access to the Certification Log
- At least Editor access to the Administration Requests database

To perform the cross-certification procedure, your Domino directory must contain cross-certificates between the organizations involved. Then, you need to perform the following steps:

1. From the Domino Administrator, click the People & Groups tab.
2. Select a user name.
3. From the tools pane, click People - Rename.
4. Click Request Move to New Certifier.
5. Choose the certifier ID and click Open.
6. Enter the certifier ID password and click OK.
7. Enter the name of the certifier to use to recertify the user's hierarchical name in the New Certifier field.
8. Click Submit Request and then click OK.
9. Click the Files tab and then open the Administration Requests database.
10. Choose View - Name Move Requests and select the name(s) to move. This view categorizes submissions by certifier.
11. Choose Actions - Complete Move for selected entries.
12. Select the certifier ID that will recertify the name(s) and click Open.
13. Enter the certifier ID password and click OK.
14. Accept the default certificate expiration date (two years from the current date) or enter a different date.
15. (Optional) In the New Qualifying Org. Unit field, enter a name to differentiate this user from another user with the same user name that is certified by the same certifier. This adds a differentiating component that

appears between the common name and the certifier name. Including this new level of Organizational Unit (OU), keep in mind that you are still limited to a total of four OU levels.

16. Click Certify. If your local Name and Address Book does not contain a cross certificate for the certifier, you are prompted to create one. To do so, click Yes.

17. Click OK.

No Cross-Certification

The procedure described in the previous section is the preferred method. However, there are third-party tools to remove some of the tedium of the procedure. (Be sure that the tool(s) you investigate are supported for all server platforms you will be using.)

If cross-certification is not possible, for whatever reason, take the following steps instead:

1. Working from the new server, establish replication between the “old” and “new” servers.

Important If this is not possible, in step 2, make a local replica of the mail file and work with that.

2. Make a replica of the user’s mail file from the “old” server.

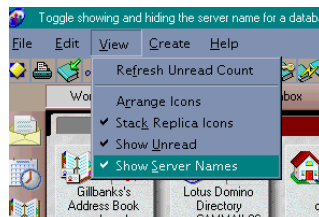
Tip If you are working on a server-replicated copy of the user’s mail, he or she can continue to work on his/her old mail until you are ready to “flip the switch.”

3. Register the user on the “new” server.

Tip Try to make the new name as close as possible to the old one.

4. Copy the replica of the user’s old mail file over the new one (ideally, the two files will have the same name, so the “new” will be overwritten by the “old”).

Tip Hold down the Shift key while clicking View - Show Server Names, as shown in the following figure, to see the file and server names. This allows you to quickly check that the file names match up in the two replicas.



5. Check the user's person document in the Domino directory, to be sure that all elements match, especially that the name of the mail file matches the actual mail file name, that the short name is correct, and so on. If you did not match the user's mail directory and mail filename exactly, modify the Domino directory to match what you actually chose to implement.
6. Be sure the user's mail domain and server are listed correctly.
7. Change the Access Control List (ACL) on the mail database to include the new user.
8. Remove the old user from the ACL.
Tip Some administrators wait to do this, to be sure the new access is correctly granted, before removing the old.
9. Replicate the mail again, if there has been a significant gap in time.
Note This may not be possible if you could not establish replication between the two servers, so you will have to work quickly.
10. Notify the user that their "new" mail is ready.
11. Delete the user's old mail account

Tips and Tricks of Implementation

Following are some ideas, tips, and tricks we have found useful during merger projects. These are generally of the most use when in the process of merging two domains into one.

- Consider temporarily rerouting mail using aliases. That way, users can give their e-mail address as "john.smith@newco.com" when really it is still "jsmith@oldco.com."
- Use functional roles during the transition time, such as "Transition.Supervisor@newco.com."
- Ensure both systems have SMTP mail servers capable of the extra load, since you will be routing a lot of mail back and forth, at least in the short term.
- Find some way of doing batch user registration. It may be using text files, a third party utility, or simply profiles to save a few steps for each user. Any of these will save a significant amount of administration time when you are registering hundreds or thousands of users.
- Try to find an import/migration utility which allows you to do a one-time import of a foreign directory, which you can then tweak as needed. There are tools available which allow you to do this from NT, Exchange, cc:Mail, ERP systems, and so on.

- Set up an external network information document, which will eliminate individual connection documents. This document exists in the Domino directory. It is new to R5.
- Use user profiles to introduce standard databases to everyone at once. However, be careful that you don't force remote users to create local replicas while users are traveling, which could result in several megabytes of data being downloaded over a relatively slow telephone connection.
- Design the headlines pages for Operations to announce changes in services, as they occur.
- By default, the migration tools for migrating users from a different messaging system to Notes/Domino are not installed with the Domino Administrator. If you did not install both the Domino Administrator and the migration tools when you first installed the Notes client, run the installation again and be sure to select Migration Tools.

Throughout your merger, be sure you communicate with everyone as often as feasible. The end users, Help Desk, Administrators, Developers, Management, and others will all need to be kept up to speed on any potential problems as they arise.

Summary

Mergers, acquisitions, and other consolidations are a great way to show your business acumen to senior management. They are also a great way to make an impact in helping your organization create a competitive advantage with Domino's workflow capabilities. Through either merging two separate domains or retaining them as cross-certified domains, you will be able to allow the two merging organizations to operate as one.

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This publication is intended to give decision makers and technical people a thorough understanding of all the aspects relating to a deployment of Lotus Domino in the organization. The information in this publication is not intended as the specification of any programming interfaces that are provided by Lotus Domino. See the publications section of the announcement for Lotus Domino and related products for more information about what publications are considered to be product documentation.

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- *The Three Steps to Super.Human.Software: Compare, Coexist, Migrate. From Microsoft Exchange to Lotus Domino. Part One: Comparison*, IBM form number SG24-5614, Lotus part number CT7QTNA
- *The Three Steps to Super.Human.Software: Compare, Coexist, Migrate. From Microsoft Exchange to Lotus Domino. Part Two: Coexistence and Migration*, IBM form number SG24-5615, Lotus part number CT7QWNA
- *Eight Steps to a Successful Messaging Migration: A Planning Guide for Migrating to Lotus Notes and Domino*, IBM form number SG24-5335, Lotus part number CT6HINA
- *The Next Generation in Messaging: Moving from Microsoft Mail to Lotus Notes and Domino*, IBM form number SG24-5152, Lotus part number CT7SBNA
- *The Next Generation in Messaging: Moving from Novell GroupWise to Lotus Notes and Domino*, IBM form number SG24-5321, Lotus part number CT7NNNA
- *The Next Step in Messaging: Upgrade Case Studies for Lotus cc:Mail to Lotus Domino and Lotus Notes*, IBM form number SG24-5100, Lotus part number 12992
- *Lotus Solutions for the Enterprise, Volume 1. Lotus Notes: An Enterprise Application Platform*, IBM form number SG24-4837, Lotus part number 12968
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- *Lotus Notes 5.0: A Developer's Handbook*, IBM form number SG24-5331, Lotus part number CT6HP1E
- *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, IBM form number SG24-5341, Lotus part number CT6TPNA
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- *Secrets to Running Lotus Notes: The Decisions No One Tells You How to Make*, IBM form number SG24-4875, Lotus part number AA0424
- *Deploying Domino in an S/390 Environment*, IBM form number SG24-2182, Lotus part number 12957
- *Developing Web Applications Using Lotus Notes Designer for Domino 4.6*, IBM form number SG24-2183, Lotus part number 12974
- *High Availability and Scalability with Domino Clustering and Partitioning on Windows NT*, IBM form number SG24-5141, Lotus part number CT6XM1E
- *From Client/Server to Network Computing, A Migration to Domino*, IBM form number SG24-5087, Lotus part number CT699NA
- *Lotus Domino Integration Guide for IBM Netfinity and IBM PC Servers*, IBM form number SG24-2102
- *Lotus Domino Release 4.6 on IBM RS/6000: Installation, Customization and Administration*, IBM form number SG24-4694, Lotus part number 12969
- *High Availability and Scalability with Domino Clustering and Partitioning on AIX*, IBM form number SG24-5163, Lotus part number CT7J0NA
- *AS/400 Electronic-Mail Capabilities*, IBM form number SG24-4703
- *Mail Integration for Lotus Notes 4.5 on the IBM Integrated PC Server for AS/400*, IBM form number SG24-4977
- *Using Lotus Notes on the IBM Integrated PC Server for AS/400*, IBM form number SG24-4779
- *Lotus Domino for AS/400: Installation, Customization and Administration*, IBM form number SG24-5181, Lotus part number AA0964

- *Lotus Domino for S/390 Release 4.6: Installation, Customization & Administration*, IBM form number SG24-2083, Lotus part number AA0963
- *Lotus Domino for S/390 Performance Tuning and Capacity Planning*, IBM form number SG24-5149, Lotus part number CT6XNIE
- *Porting C Applications to Lotus Domino on S/390*, IBM form number SG24-2092, Lotus part number AB1720
- *Enterprise Integration with Domino for S/390*, IBM form number SG24-5150
- *Managing Domino/Notes with Tivoli Manager for Domino, Enterprise Edition, Version 1.5*, IBM form number SG24-2104
- *Measuring Lotus Notes Response Times with Tivoli's ARM Agents*, IBM form number SG24-4787, Lotus part number CT6UKIE
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IBM Enterprise Storage and Systems Management Solutions	SK3T-3694

Other Publications

These publications are also relevant as further information sources:

- Yellow books provided with Lotus Domino R.5.
- C. Ellis, S. Gibbs and G. Rein, Groupware - Some Issues and Experiences, Communications of the ACM 34, 1991
- Steve Krantz, Building Intranets with Lotus Notes & Domino 5.0, Second Edition, Maximum Press 1999
- Barbara A. Bolin and R. Benjamin Ordonez, Lotus Notes: The Complete Reference, Osborne McGraw-Hill 1996
- Kevin Byrne, "Don't want disaster? Here are some tips," Computing Canada, March 1997
- Peter Jackman, "Crash Recovery Solution," Canadian Underwriter, May 1998
- Marcia Stepanek, "From Digits to Dust," Business Week, April 1998
- Michael Kendzierski, "Prepare for the Worst," MCP Magazine, September 1998
- Sarah Gordon, "The Anti-Virus Strategy System," Virus Bulletin 1995
- Caleb Barlow and John Paganetti, "Maintain and Monitor Your Service Level Agreements," presentation from Lotusphere 1999
- Mike Heck, "Review: Sametime simplifies collaboration in real time," InfoWorld Media Group Inc., 1999
- "Guide to Securing Intranet and Extranet Servers," www.verisign.com/whitepaper/onsite/server/ VeriSign Inc., 1998
- Thomas H. Davenport, "Some Principles of Knowledge Management," www.itmweb.com/essay538.htm
- Thomas H. Davenport and Laurence Prusak, "Working Knowledge: How Organizations Manage What They Know," Harvard Business School Press
- Yogesh Malhotra, Abdullah Al-shehri and Jeff J. Jones, National Information Infrastructure: Myths, Metaphors and Realities www.brint.com/papers/nii
- Scott C. McReady and Ann M. Palermo, "Lotus Notes: Agent of Change; The Financial Impact of Lotus Notes on Business," International Data Corp., 1994

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Index

A

- Access Control Lists, 124, 182, 250
- Access rights, 122, 125, 182
- Access to the server, 244
- Adjacent domain, 142
- Administering the Domino
 - environment, 325, 333, 336
- Administration client, 25, 337
- Agents, 248, 379
- Analyzing the training needs, 263
- Anonymous access, 233, 246, 254
- Anti-spamming, 156, 239
- Anti-virus software, 408
- Application
 - developer, 187, 268, 317
 - development, 26
 - infrastructure, 171
 - owner, 185
 - proxy, 227
 - registry, 179
 - servers, 115
- Archiving, 182, 399, 409
- Authentication, 69, 219, 233, 234, 238
- Author field, 256
- Automatic reboot, 226
- Availability, 7, 55, 181

B

- Backups, 288, 397
- Base hardware configuration, 112
- Basic users, 266
- Benchmarking, 89
- Benefits of training, 262
- Browser, 64, 65, 67, 68, 207, 218,
 - 249, 251
 - access, 233
- Building a deployment team, 76
- Building the training plan, 261,
 - 263, 273

C

- Calendar preferences, 162
- Calendar & scheduling, 160

- Casual users, 351
- Centralized monitoring, 345
- Centralized systems, 8, 56
- Certificate Authority, 219, 235
- Certificates, 238
- Certification log, 331
- Certified Lotus Instructors, 269
- Certifier ID, 238
- Certifiers, 118
- Change control, 176, 180, 182, 188,
 - 307, 308
- Checking logs, 357
- Checklists, 334, 442
- Choosing
 - a client, 63
 - a security policy, 224
 - a server platform, 49
 - a training method, 271
- Circuit-level proxy, 230
- Class evaluations, 274
- Cluster names, 123
- Clustered replication, 185
- Clustering, 24, 103, 381
- Coexistence with other systems, 10
- Combining server platforms, 57
- Communication, 280, 314, 319, 321,
 - 322, 323
- Company mergers, 485
- Computer-Based Training, 268
- Configuration settings
 - document, 140
- Configuring
 - browsers, 207
 - the Notes client, 199
- Connection documents, 121, 140, 183
- Consistency in standards, 123
- Consolidating servers, 434, 435
- Contingency planning, 391
- Contractor user IDs, 332
- CORBA, 216
- Corporate
 - culture, 6
 - home page, 206
- Cost factor, 7, 66
- Cost of ownership, 57
- Country code, 120

- CPU considerations, 371
- Creating
 - a meeting invitation, 166, 168
 - a rollout plan, 280, 282
 - an organizational chart, 117
 - groups, 122
 - monitors, 354
 - new databases, 247
 - replica databases, 247
- Cross-certification, 241
- Cultural change, 6

D

- Daily administration tasks, 334
- Data
 - decay, 409
 - integration, 34
 - integrity, 224
 - recovery, 410
 - retention, 9
 - silos, 400
- Database
 - administrator, 187
 - copies, 185
 - creation, 247
 - encryption, 226, 241
 - management, 171
 - performance, 385, 386, 388
 - quotas, 126
 - restore, 412
- Dedicated servers, 112
- Default access, 124
- Defining standards, 109
- Demilitarized Zone, 231
- Deploying Domino applications, 172
- Deployment plan, 290
- Design task, 176
- Designer access, 125
- Designing
 - a hardware infrastructure, 89
 - a messaging infrastructure, 129
 - the application, 174
- Developing
 - the application, 174
 - the courseware, 273

- Development standards, 177
- Dial-up passthru, 228
- Digital signature, 219, 241, 243
- DIIOF task, 216
- Directory
 - assistance, 137
 - catalog, 30, 136
 - performance, 378
 - structure, 113
- Disaster kit, 393
- Disk space, 54, 126
- Distributed
 - monitoring, 345
 - systems, 8, 56
- Distributing
 - client software, 286
 - user IDs, 329
- Document access control, 256
 - encryption, 242
 - management, 13
 - restore, 412
- Documentation, 181, 289, 298, 299, 341
- Domain documents, 141
- Domain search, 28
- Domains, 118
- Domino
 - administering, 325, 333, 336
 - and the Internet, 214
 - characteristics, 21
 - directory, 25, 136
 - infrastructure, 44
 - release upgrade, 437
 - rollout, 277
 - security model, 225
 - server, 22
 - users, 20
- Domino Enterprise Connection Services, 482
- Domino Enterprise Connectivity Services, 34
- Domino Server.Load, 370
- Domino Server.Planner, 371
- Domino Web Server API, 234
- Domino Workflow, 479
- Domino.Doc, 30, 472
- Down time, 55
- Dual platforms, 57

E

- e-business, 8
- Editor access, 125
- Electronic signature, 243

- Encrypting
 - databases, 226, 241
 - documents, 242
 - fields, 242
 - mail, 243
- Encryption, 241
- Engaging external services, 42, 59
- Environment
 - current assessment, 41
 - Domino, 325
- Event notifications, 355
- Excessive logging, 375
- Execution Control List, 257, 407
- Executive
 - overview, 19
 - sponsorship, 6, 278
 - training, 267
- Extranets, 460

F

- Fax for Domino, 464
- Field access control, 257
- Field encryption, 242
- Firewall, 226
- Flat ID files, 238
- Foreign domain, 142
- Form access control, 255
- Forming good habits, 262, 263
- Free time search, 166, 167

G

- Global domain, 143
- Goals of training, 265
- Group calendar, 164
- Groups, 122, 124
- Groupware, 4
- Growth and expansion, 434

H

- HACMP, 55
- Hard disk recovery, 411
- Hardware
 - infrastructure, 89
 - sizing, 93
 - standards, 111
 - upgrade, 433
- Heavy users, 351
- Help desk, 265, 269, 295, 309, 310, 311, 313, 316
- Hierarchical naming, 122
- Hot sites, 399

- HTTP
 - server performance, 380
 - task, 214
- Hub server, 125
- Hub-and-spoke topology, 138

I

- I/O considerations, 372
- ID file recovery, 240, 413
- ID files, 69, 114, 204, 237
- IMAP
 - clients, 133
 - task, 219
- IMAP4 support, 130
- In-band monitoring, 352
- In-class group training, 266
- Infrastructure
 - assessment, 42
 - drawing, 90, 97
- In-house training, 272
- Initial investment, 57
- Installing the Notes client, 195
- Integrating with back-end
 - data, 34, 481
- International license, 243
- Internet
 - Cluster Manager, 218
 - Information Server, 218
 - passthru, 228
 - protocols, 22
 - security, 233
 - standards, 211
- Intranet, 213
- Investment, 6
- Involving users, 174

K

- Keeping names unique, 122
- Knowledge Management, 12, 26

L

- Large deployments, 102
- LDAP support, 131, 137, 221
- LearningSpace, 28
- Legal requirements, 9
- Lightweight Directory Access Protocol, 34
- Limiting mail file sizes, 126
- Load balancing, 381
- Logging problems, 312

Logs, 356
Losing an ID file, 240, 330
LotusScript, 483

M

Mail
 data, 7
 encryption, 243
 file directories, 115
 file size, 115, 126
 filtering options, 154
 performance, 375
 requirements, 9
 routing, 138, 139
Maintenance windows, 306
Manager access, 122, 125, 188
Managing
 Domino, 25
 user IDs, 330
Mass storage, 54
Measuring server performance, 369
Meeting invitation, 166, 168
Memory considerations, 371
Mergers, 485
Merging Domino
 infrastructures, 487
Messaging
 features, 22
 infrastructure, 129
Microsoft Management Console, 25
Middle initial, 122
Migrating from other systems, 10
MIME support, 130, 134
Mobile users, 14, 30, 132, 137, 205,
 243, 267
Moderate users, 351
Monitoring
 Domino, 343, 348
 tools, 352
Monthly administration tasks, 335
Moving mail files, 121, 126
Multiple
 directories, 488
 mail boxes, 152, 375
 passwords, 240

N

Naming conventions, 117, 122, 123
Naming servers, 120
Network
 bandwidth, 56
 considerations, 372

 port encryption, 242
 security, 226
 topology, 43
Neutralizing viruses, 407
NNTP
 support, 131, 221
 task, 216
Non-adjacent domain, 142
North American license, 243
Notes
 client, 22, 193
 client and the Internet, 220
 client performance, 383
 data directory, 113, 197
 Named Network, 121, 144
NotesBench, 89, 370
Number of transactions, 351

O

Object Request Broker, 216
Open files, 401
Organization certifier, 119
Organizational
 unit, 119
 wants and needs, 3

P

Packet size issues, 230
Partitioning, 52, 103, 113
Passthru server, 31, 141, 227, 229, 247
Password recovery, 240
Passwords, 16, 114, 226, 239, 330
Peer-to-peer topology, 139
Performance, 33, 51, 54, 68, 89, 112,
 152, 169, 188, 367, 390
Physical security, 225
Pilot
 project, 7, 73
 team, 76
Piloting the application, 175
Planning, 7
 for growth, 101
 for large deployments, 102
 the rollout, 277
 tools, 282
Points of escalation, 314
Policies and procedures, 292
POP3
 clients, 133
 support, 130
 task, 217

Port
 access list, 246
 numbers, 227
Potential pitfalls, 281
Power
 protection, 403
 users, 266, 313
Power-on password, 226
Preventing disaster, 395
Printing calendar views, 163
Prioritizing problems, 305
Private keys, 242
Probes, 355
Producing documentation, 289,
 298, 299
Program documents, 339
Project
 manager, 278
 team, 277, 279
Proof of concept, 75
Protecting the Domino console, 226
Protocols, 50, 194
Public keys, 242
Pull only mail routing, 151
Push /pull mail routing, 151
Push only mail routing, 151

Q

Quarterly Maintenance Releases, 436
QuickPlace, 478

R

Rapid Application Development, 172
Reader
 access, 124
 fields, 256
Rebooting the server remotely, 226
Receiving a fax, 467
Recertifying users and servers, 119
Recovering
 a password, 114, 240
 data, 410
 the hard disk, 411
 the ID file, 240, 413
Recovery planning, 391, 396, 410
Redbook sites, 10
Redesigning collaborative
 processes, 267
Release upgrade, 437
Remote control, 232
Remote users, 267, 287
Renaming a server, 120

- Replication, 67, 183
- Required skills, 316
- Response times, 306
- Responsibilities, 316, 317, 318
- Restoring Domino, 412
- Return on Investment, 5, 20, 21, 271
- Roles, 125, 253
- Rollout, 277, 283, 284
 - plan, 280, 290
 - team members, 278
- Routine maintenance procedures, 333, 334
- Running agents, 248
- Running unrestricted agents, 230

S

- S/MIME support, 130, 236
- Sametime, 29, 470
- Sample
 - documentation, 296, 298, 299
 - help desk handbook, 296
 - procedure outline, 294
 - training plan, 261, 275
- Scalability, 52
- Scheduling estimates, 285
- Searching a domain, 28
- Security, 16, 35, 69, 116, 204, 223, 230, 232
- Semaphores, 381
- Sending a fax, 466
- Server
 - access lists, 241, 246
 - availability, 55
 - configuration document, 339
 - consolidation, 434, 435
 - documents, 123
 - monitor, 357
 - names, 120
 - performance, 369
 - platforms, 49
 - restore, 412
 - security, 244
 - tasks, 340, 373
 - topologies, 138
- Server.Load, 370
- Server.Planner, 371
- Service Level Agreements, 7, 304, 305
- Setting default user information, 327
- Setting up new users, 326
- Severity levels, 306
- Severity 1 items to monitor, 348

- Severity 2 items to monitor, 349
- Severity 3 items to monitor, 350
- Shared mail, 153
- Shared network drive, 199
- Sharing directories, 232
- Shelf life, 181
- Signed field, 256
- Signing databases, 191
- Size limits, 7
- Sizing the hardware, 93
- Skill set evaluation, 264
- Skills, 45, 50, 316
- Smart host, 149
- SMTP routing, 134, 215
- Software
 - considerations, 44
 - distribution, 286
 - standards, 111, 112
- SSL
 - port numbers, 227
 - support, 217, 235
- Staged rollout, 283
- Staggering training, 264
- Standards, 109, 117
- Statistics and events, 353, 369
- Statistics reports, 357
- Support
 - database, 321
 - infrastructure, 309
 - team, 315
- Supported protocols, 130, 194
- Supporting
 - Internet standards, 33
 - protocols, 50
- System
 - administrators, 317
 - databases, 340
- Systems management, 343

T

- Telnet, 236
- Terminations group, 123, 332
- Test environment, 175, 190
- Timing of the training, 263
- Timing the rollout, 279, 284
- Tivoli Data Protection for Lotus
 - Domino, 402
- Tivoli TME, 344
- Tools for monitoring, 352
- Total Cost of Ownership, 5, 57

- Training, 14, 65, 261, 265, 271
 - contents, 266, 267, 268, 269
- Transaction logging, 379, 402
- Transaction systems, 34
- Transactions, 351
- Troubleshooting, 415

U

- Uninterruptible Power
 - Supply, 403, 404
- Unrestricted agents, 230
- Upgrading
 - clients, 449
 - mail, 453
 - the first server, 444
 - the hardware, 433
 - the remaining servers, 449
- Use policies, 270
- User
 - administration, 287, 326
 - IDs, 329
 - name change, 331
 - names, 122
 - setup profiles, 206, 327
 - training, 264
 - types, 253
- Using periods in names, 122

V

- Virus protection, 232, 361, 405, 407

W

- Web
 - Administrator, 338
 - application servers, 116
 - browser, 64, 65, 67, 68, 218, 249, 251
 - browser access, 233
 - realm, 250
- Web-based training, 272
- Weekly administration tasks, 335
- Work instructions, 293
- Workflow, 13, 29, 479
- Workstation setup, 199

X

- X.509 certificates, 130, 235

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