NETWARE 4

Planning and Implementation

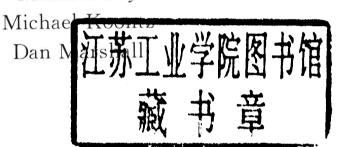
Sunil Padiyar

NETWARE 4 规划与实现



NetWare 4: Planning and Implementation NetWare 4: 规划与实现

Sunil Padiyar Michael Day



清华大学出版社 Prentice-Hall International Inc.

(京)新登字 158号

内 容 提 要

本书从应用和技术两方面来介绍 NetWare 4,堪称一本完善的指南。书中阐述了 NetWare 4.0 技术的基本概念,并讨论为什么选择 Novell 的 NetWare 来解决网络环境应用中的组合计算问题。本书主题是 NetWare 4.0 的规划与实现。主要内容为:1. NetWare 4.0 和组合计算,包括应用前景,NetWare 的进展,了解 NetWare;2. NetWare 4.0 的特征,包括 NetWare 4.0 产品特征,详细了解 NetWare 4.0 服务程序;3. 深入探讨 NetWare 4.0,包括 NetWare 目录服务程序,NetWare 保密性,文件系统和媒体管理,安全性审计,全局时间同步,通信服务程序;4. 低级版本升级到 NetWare 4.0,包括规划 NetWare 4.0 网络,安装和升级到 NetWare 4.0,管理 NetWare 4.0。

本书适用于计算机专业师生及软件开发等技术人员。

©清华大学出版社/Prentice Hall Inc. 1994 版权所有.

本书任何部分之文字,未经出版者书面同意, 不得用任何方式抄袭、节录及翻印. Original edition published by New Riders Publishing. Copyright © 1993. This reprint jointly published by Tsinghua University Press/Prentice Hall. This edition is authorized for sale in mainland China only.

中国〔大陆〕版 NETWARE 4:

Planning and Implementation NetWare 4: 规划与实现

Sunil Padiyar et al

清华大学出版社
Prentice-Hall Inc.
北京 清华园
清华大学印刷厂印刷
新华书店总店科技发行所发行

开本:787×1092 1/16 印张:23.5
1994年5月第1版 1994年5月第1次印刷 印数:0001—1000
ISBN 7-302-01505-8/TP・609 定价:52.00元

About the Authors

Sunil Padiyar is Vice-President of Engineering at Artisoft, Inc., in Tucson, Arizona. He worked at Novell, Inc. (Provo, Utah) until March, 1993. As Director of Software Engineering, Padiyar oversaw the development of the NetWare 4.0 operating system and other state-of-the-art fault-tolerance technologies (such as SFT III). He has been involved with NetWare 4.0 from the very beginning, and has worked with Drew Major, Kyle Powell, and other engineers to define and manage several key technologies of NetWare 4.0.

Michael Day is a documentation engineer for the NetWare 386 development program at Novell, Inc. He works as a programmer and as a technical writer, specializing in network operating systems and network programming. Day has written books on NetWare workstation troubleshooting and LAN Manager troubleshooting, and has published more than 150 articles on networking subjects. He is the former chief technical editor for *LAN Times*.

Michael Koontz is a technical writer for Novell, Inc., specializing in documentation for NetWare 3.x and 4.x. For the past three years, he has been involved in documenting the use of NetWare core OS. Koontz also coauthored a book on NetWare Loadable Module (NLM) programming. He received B.A and M.A. degrees from Brigham Young University.

Daniel Marshall worked as a business applications programmer for five years before joining Novell, Inc. as a programming instructor. He developed and taught NetWare courses for six years before becoming a technical writer. Marshall has co-authored a book on NetWare Loadable Module (NLM) programming. He attended Brigham Young University and the University of Utah, and is a Certified NetWare Engineer (CNE) and a Certified NetWare Instructor (CNI).

Table of Contents

Inti	roduction	1
	Who Should Read This Book? How This Book Is Organized Part One: NetWare 4.0 and Corporate Computing Part Two: Features of NetWare 4.0 Part Three: NetWare 4.0 in Depth Part Four: Upgrading to NetWare 4.0 Conventions Used in This Book New Riders Publishing	1 2 2 3
Par	t One: NetWare 4.0 and Corporate Computing	5
1	The Business Perspective	7
	Understanding Today's Computing Needs Personal Computer Market Advantages of NetWare 4.0 Understanding the Client/Server Paradigm Summary	8 8 9
2	The Evolution of NetWare	.13
	Understanding the File and Print Market Understanding the Workgroup Market Exploring the Enterprise Market Mastering the Art of Leveraging Defining "Co-opetition" Fitting the MIS Model Summary	.14 .15 .18 .18 .18
3	Understanding NetWare	.21
	Building the Consummate Network Operating System Focusing on Network Services Integrating Network Resources Looking to the Future NetWare 4.0 and the Future Understanding the NetWare Architecture Understanding NetWare Service Layers Understanding the Protocol Environment The Link-Support Layer Protocol Stacks	.22 .24 .26 .27 .28 .30 .30
	The Multiprocotol Operation	.34

	Understanding File Services	.34
	File-Service Design Goals	.35
	File-Service Protocols	.40
	Understanding Print Services	
	Associating Printers, Print Servers, and Print Queues	.42
	Understanding Print-Service Protocols	
	NetWare 4.0 Print Services	.43
	Future Enhancements to Print Services	.43
	NetWare Bindery	.43
	Unhooking Naming Services	.45
	Understanding Security	.46
	Components of NetWare Security	.46
	User Authentication	.47
	User-Privilege Enforcement	
	Session Authentication	
	Auxiliary Security Features	.48
	Understanding NetWare Application Services	.49
	Understanding NetWare Loadable Modules	.49
	New Application Services	.50
	Understanding Network Management	.51
	NetWare as a Proactive Management Platform	.52
	Network-Management Information in NDS	.52
	Supporting Wide-Area Networks (WANs)	.52
	NetWare 4.0 WAN Support	.53
	Understanding Messaging Services	.53
	Summary	.54
Pa	rt Two: Features of NetWare 4.0	55
Δ	NetWare 4.0 Product Features	57
1		
	Becoming a Foundation for the Enterprise Network	.57
	Scaling NetWare from the Workgroup to the Enterprise	.58
	Extending Fault Tolerance	.58
	The NetWare Directory Services (NDS)	.61
	High-Performance Network Operating System	.65
	Memory Management	
	Storage Management of On-Line and Off-Line Devices	
	Auditing of Server and Network Information	
	Security of the Server and the Network	
	Optional Memory Protection	.73
	WAN Enhancements	
	Internationalization	.77

	Print Services Backup Services Image-Enabled Server An Enhanced and Expanded Set of NetWare Utilities On-Line Documentation An Easier Platform to Develop NLMs Summary	.80 .82 .85 .85
5	Understanding NetWare 4.0 Services in Detail	91
	Understanding Memory Management and Protection Page-Based Memory Allocation RPC-Based Memory Protection Avoidance of Page Faults Understanding the NDS Schema Defining the Schema Object Classes	.94 .95 .96 .97
	Attributes Syntaxes Object Instances Inheritance Object Orientation	.98 .98 .98 .99
	Understanding the Media Manager	.99 101
	Understanding Data Migration Migrating NLM Data Migration Support Module Migration and Retrieval Image-Enabled NetWare	102 103 103 104
	Understanding Auditing Information Provided by Auditing The Auditor The Audit Log Generating Audit Records Security Provided by Auditing Data Provided by Auditing	105 105 105 105 106 106
	Understanding the NDS Printer Object Class Understanding Storage Management Services (SMS) SMS Implementations Archiving NDS Summary	109 110 111

Par	t Three: NetWare 4.0 in Depth	113
6	NetWare Directory Services	115
	Comparing the Directory to the Bindery	.116
	Exploring the Hierarchical Nature of NDS	
	Understanding the Organization of Information Stored in NDS	
	Naming Objects in NDS	
	Full Name or Distinguished Name (DN)	
	Relative Distinguished Names (RDNs)	
	Partial Names	
	Default Name Types	.124
	Alias Objects	
	Understanding Authentication Services Provided by NDS	.127
	Initialization	.127
	Authentication	.129
	Understanding the Distributed Operations of NDS	.131
	Partitions	.132
	Replicas	.133
	Tree Walking	.134
	Understanding the Services Provided to Applications by NDS	
	Providing Backwards Compatibility with Bindery Emulation	
	Using the Interoperability Features of NDS	
	Summary	.140
7	NetWare 4.0 Security	141
	Understanding the Details of Class F2 Security Certification	.141
	Identification and Authentication	.141
	Administration of Rights	
	Verification of Rights	
	Auditing	
	Object Reuse	
	NetWare 4.0 Implementation of Class F2	
	Components of NetWare 4.0 Security	
	Understanding NetWare 4.0 Authentication	.144
	RSA Public-Key Cryptosystem	.145
	Login Authentication	.146
	Background Authentication	.147
	Examining NDS Security Architecture	.147
	ACL Rights Mask	
	Object Property ACL	.150
	The ACL in Action	
	The ACL in Action	

	Groups	.151
	Rights Inheritance	. 152
	Login Restrictions	152
	Exploring File-System Security Architecture	.153
	File Ownership	155
	File Attributes	
	New NetWare 4.0 File Attributes	.156
	Learning About NetWare 4.0 Auditing	. 156
	Understanding NCP Session Authentication	.158
	RSA MD4 Message Digest	.158
	Summary	.159
8	File Systems and Media Management	
	The NetWare 4.0 File System	
	The Volume	162
	The File Allocation Table	163
	The Directory Table	165
	File-Caching	167
	File-Cache Integrity	160
	Elevator Seeking	171
	More About Transaction Tracking	172
	Purpose of Transaction Tracking	172
	How TTS Works	173
	TTS and NetWare 4.0 Directory Services	177
	Exploring NetWare 4.0 File-System Limits	.178
	Ensuring Good File-System Performance	178
	Using NetWare 4.0 File-System Extensions	179
	Block Suballocation	.179
	Background File Compression	.180
	File Monitoring	.180
	Installable File System	.181
	Media Manager and Data Migration	.181
	Read-Ahead Cache	.182
	Summary	.183
9	NetWare 4.0 Auditing	185
	Understanding the Auditing Feature	
	Viewing the Auditcon Utility's Initial Menu	187
	Auditing NDS	189
	Auditing a Server Volume	194
	Audit Files Maintenance	194
	Auditing Reports	195
	Auditing Configuration on a Server Volume	197
	Summary	203

Understanding Why NetWare Needs Global Time Synchronization 205 Understanding Time-Server Hierarchy 207 Understanding the Synchronization Process 207 Configuring Time Servers 212 SAP Configuration 212 Custom Configuration 212 Summary 213 11 Communication Services 215 The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (IPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets	10	Global Time Synchronization	205
Understanding Time-Server Hierarchy 207 Understanding the Synchronization Process 207 Configuring Time Servers 212 SAP Configuration 212 Custom Configuration 213 11 Communication Services 215 The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange (I (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 228 NetWare for Macintosh 230 Exploring Other Communication Technologies 230 Exploring Other Communication Technologies 230 Exploring Other Communication Technologies 230 Parket Burst Te		Understanding Why NetWare Needs Global Time Synchronization	205
Understanding the Synchronization Process 207 Configuring Time Servers 212 SAP Configuration 212 Custom Configuration 212 Summary 213 11 Communication Services 215 The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange (IPX) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 <t< td=""><td></td><td>Understanding Time-Server Hierarchy</td><td> 207</td></t<>		Understanding Time-Server Hierarchy	207
Configuring Time Servers 212 SAP Configuration 212 Custom Configuration 212 Summary 213 11 Communication Services 215 The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 </td <td></td> <td>Understanding the Synchronization Process</td> <td>207</td>		Understanding the Synchronization Process	207
SAP Configuration 212 Custom Configuration 212 Summary 213 11 Communication Services 215 The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange (IFX) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for SAA 228 NetWare for Macintosh 228 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 12 Planning a NetWare 4.0 Network 239		Configuring Time Servers	212
Custom Configuration 212 Summary 213 11 Communication Services 215 The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (IPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare		SAP Configuration	212
Summary .213 11 Communication Services .215 The NetWare Operating System Communication Architecture .216 The NetWare Kernel .216 STREAMS .218 Open Data-Link Interface .219 Understanding Fundamental NetWare Communications .222 Internetwork Packet Exchange (IPX) .223 Sequenced Packet Exchange (SPX) .223 Sequenced Packet Exchange II (SPX II) .224 NetWare Core Protocol .225 Expanding NetWare Communications .227 NetWare for UNIX .227 NetWare for Macintosh .228 NetWare for Macintosh .229 Other Protocols .230 Exploring Other Communication Technologies .230 Exploring Other Communication Technologies .230 Packet Burst Technology .231 Large Internetwork Packets .232 Tunneling .232 VLM Implementations .234 Summary .236 Part Four: Upgrading to NetWare 4.0 237		Custom Configuration	212
The NetWare Operating System Communication Architecture 216 The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for SAA 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 12 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning in a Large Organization 243 Introducing Major NDS Concepts 245			
The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 223 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 12 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Maj	11	Communication Services	215
The NetWare Kernel 216 STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 223 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 12 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Maj		The NetWare Operating System Communication Architecture	216
STREAMS 218 Open Data-Link Interface 219 Understanding Fundamental NetWare Communications 222 Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for Macintosh 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 12 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 245 Introducing Major NDS Concepts 245 Con		The NetWare Kernel	216
Understanding Fundamental NetWare Communications Internetwork Packet Exchange (IPX) Sequenced Packet Exchange (SPX) Sequenced Packet Exchange II (SPX II) NetWare Core Protocol Expanding NetWare Communications NetWare for UNIX NetWare for SAA NetWare for Macintosh Other Protocols Exploring Other Communication Technologies Packet Burst Technology Large Internetwork Packets Tunneling VLM Implementations Summary Part Four: Upgrading to NetWare 4.0 Part Four: Upgrading to NetWare 4.0 Planning a Hypothetical Enterprise-Wide Organization Planning in a Large Organization Planning in a Large Organization Planning Major NDS Concepts Container Objects 222 223 224 A NetWare 4.0 A NetWare 4.0 A Network A Network A Network A Network A Network A Planning in a Large Organization A Network A N			
Understanding Fundamental NetWare Communications Internetwork Packet Exchange (IPX) Sequenced Packet Exchange (SPX) Sequenced Packet Exchange II (SPX II) NetWare Core Protocol Expanding NetWare Communications NetWare for UNIX NetWare for SAA NetWare for Macintosh Other Protocols Exploring Other Communication Technologies Packet Burst Technology Large Internetwork Packets Tunneling VLM Implementations Summary Part Four: Upgrading to NetWare 4.0 Part Four: Upgrading to NetWare 4.0 Planning a Hypothetical Enterprise-Wide Organization Planning in a Large Organization Planning in a Large Organization Planning Major NDS Concepts Container Objects 222 223 224 A NetWare 4.0 A NetWare 4.0 A Network A Network A Network A Network A Network A Planning in a Large Organization A Network A N		Open Data-Link Interface	219
Internetwork Packet Exchange (IPX) 222 Sequenced Packet Exchange (SPX) 223 Sequenced Packet Exchange II (SPX II) 224 NetWare Core Protocol 225 Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for SAA 228 NetWare for Macintosh 229 Other Protocols 230 Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 Part Four: Upgrading to NetWare 4.0 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Major NDS Concepts 245 Container Objects 246			
Sequenced Packet Exchange (SPX) Sequenced Packet Exchange II (SPX II) NetWare Core Protocol Expanding NetWare Communications 227 NetWare for UNIX 227 NetWare for SAA 228 NetWare for Macintosh 229 Other Protocols Exploring Other Communication Technologies 230 Exploring Other Communication Technologies 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 238 Part Four: Upgrading to NetWare 4.0 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Major NDS Concepts 245 Container Objects 246		Internetwork Packet Exchange (IPX)	222
NetWare Core Protocol		Sequenced Packet Exchange (SPX)	223
Expanding NetWare Communications		Sequenced Packet Exchange II (SPX II)	224
NetWare for UNIX		NetWare Core Protocol	225
NetWare for SAA NetWare for Macintosh Other Protocols Exploring Other Communication Technologies Packet Burst Technology Large Internetwork Packets Tunneling VLM Implementations Summary 236 Part Four: Upgrading to NetWare 4.0 Planning a NetWare 4.0 Network Introducing a Hypothetical Enterprise-Wide Organization Planning in a Large Organization Planning in a Large Organization Planting Major NDS Concepts Container Objects 229 230 230 231 232 232 232 234 234 235 236 237 237 237 237 238 239 239 239 239 239 239 239		Expanding NetWare Communications	227
NetWare for Macintosh		NetWare for UNIX	227
Other Protocols			
Exploring Other Communication Technologies 230 Packet Burst Technology 231 Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 Part Four: Upgrading to NetWare 4.0 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Major NDS Concepts 245 Container Objects 246			
Packet Burst Technology			
Large Internetwork Packets 232 Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Major NDS Concepts 245 Container Objects 246		Exploring Other Communication Technologies	230
Tunneling 232 VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Major NDS Concepts 245 Container Objects 246			
VLM Implementations 234 Summary 236 Part Four: Upgrading to NetWare 4.0 237 12 Planning a NetWare 4.0 Network 239 Introducing a Hypothetical Enterprise-Wide Organization 239 Planning the NDS Tree 241 Who Should Plan and Why 243 Planning in a Large Organization 243 Introducing Major NDS Concepts 245 Container Objects 246			
Part Four: Upgrading to NetWare 4.0 12 Planning a NetWare 4.0 Network		Tunneling	232
Part Four: Upgrading to NetWare 4.0 12 Planning a NetWare 4.0 Network		VLM Implementations	234
12 Planning a NetWare 4.0 Network239Introducing a Hypothetical Enterprise-Wide Organization239Planning the NDS Tree241Who Should Plan and Why243Planning in a Large Organization243Introducing Major NDS Concepts245Container Objects246		Summary	236
Introducing a Hypothetical Enterprise-Wide Organization239Planning the NDS Tree241Who Should Plan and Why243Planning in a Large Organization243Introducing Major NDS Concepts245Container Objects246	Par	t Four: Upgrading to NetWare 4.0	237
Introducing a Hypothetical Enterprise-Wide Organization239Planning the NDS Tree241Who Should Plan and Why243Planning in a Large Organization243Introducing Major NDS Concepts245Container Objects246	12	Planning a NetWare 4.0 Network	239
Planning the NDS Tree			
Who Should Plan and Why		Planning the NDS Tree	2/1
Planning in a Large Organization		Who Should Plan and Why	242
Introducing Major NDS Concepts		Planning in a Large Organization	2422
Container Objects		Introducing Major NDS Concents	245
Domition on Doubletin		Container Objects	<u>4</u> 3 246
Partitioning and Replicating		Partitioning and Replicating	246

	Meeting the Major Objectives of Planning	250
	Performance and Ease of Use	250
	Fault Tolerance	
	Security	258
	Backward-Compatibility	259
	Integration and Distribution of Multiple Applications	
	Defining the Role of Central IS	262
	Planning and Partitioning the Corporate Tree	263
	Providing Standards, Guidelines, and Concepts	266
	Conducting Training	
	Coordinating Server-Addressing Schemes	268
	Coordinating WAN Links and Routers	268
	Planning and Administering Time Synchronization	
	Administering Security Auditing	
	Establishing a Schedule for Upgrading the Corporate Tree	271
	Defining the Role of Local IS in Planning	272
	Providing Information	272
	Cleaning Up, Preparing, Backing Up	
	Hardware Requirements	
	Installing Servers	274
	mistalling servers	
	Summary	
13	Summary	275
13	Installing and Upgrading to NetWare 4.0	275 277
13	Installing NetWare 4.0	275 277 277
13	Installing NetWare 4.0 Installing a Single 4.0 Server	275 277 277
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations	275 277 278 279
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation	275277278279279
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations	275277278279279
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server	275277278279279279
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options	275277278279279279300300
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation	275277277278279279297300301
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation	275277278279279279300301301
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation Upgrading 2.1x and 3.1x Servers to NetWare 4.0	275277278279279279300301301
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation Upgrading 2.1x and 3.1x Servers to NetWare 4.0 Preupgrade Preparation	275277278279279297300301301302
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation Upgrading 2.1x and 3.1x Servers to NetWare 4.0 Preupgrade Preparation In-Place Upgrades	275277278279279297300301301302303
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation Upgrading 2.1x and 3.1x Servers to NetWare 4.0 Preupgrade Preparation In-Place Upgrades Same-Server Upgrades	275277278279279297300301301302303
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation Upgrading 2.1x and 3.1x Servers to NetWare 4.0 Preupgrade Preparation In-Place Upgrades Same-Server Upgrades Across-the-Wire Upgrades	275277278279279300301301302303305308
13	Installing and Upgrading to NetWare 4.0 Installing NetWare 4.0 Installing a Single 4.0 Server Hardware Recommendations Server Installation Installing Workstations Installing a Server from Another Server Using Other Installation Options Macintosh, NFS, and SAA Installation TCP/IP Installation Upgrading 2.1x and 3.1x Servers to NetWare 4.0 Preupgrade Preparation In-Place Upgrades Same-Server Upgrades	275277277279279300301301302303305308

14	Managing NetWare 4.0 for NetWare Administrators	315
	Using NetWare Management Tools	316
	NetWare Administrator	
	Menu Utilities	327
	Command-Line Utilities	334
	Management NLMs	336
	Understanding Administrative Functions	338
	Partition Management	338
	Object Management	339
	Directory Security	340
	Learning to Manage NetWare 4.0	
	Summary	
Ind	lex	343



Because NetWare met its customers' needs when it was introduced, it literally sold itself. As NetWare conquers new frontiers, however, there is a need for a book such as *NetWare 4: Planning and Implementation* to put NetWare in current perspective.

This book gives you, the reader, a basic understanding of the NetWare 4.0 technology. It also discusses reasons for choosing NetWare and Novell to solve the corporate computing problems of your business, large or small.

Who Should Read This Book?

The topics covered in *NetWare 4: Planning and Implementation* make it appropriate for corporate executives and MIS managers who are evaluating NetWare 4.0 as a platform for their computing needs.

This book answers questions both in terms of business and technology, and has sufficient technical depth for any reader who wants to gain an understanding of the NetWare 4.0 technology.

How This Book Is Organized

Netware 4: Planning and Implementation is divided into four parts. The following is an overview of the book's organization.

Part One: NetWare 4.0 and Corporate Computing

Chapter One, "The Business Perspective," begins the book by giving you a good business perspective on Novell and NetWare.

Chapter Two, "The Evolution of NetWare," is an overview and history of the topic.

Chapter Three, "Understanding NetWare," discusses NetWare, both as a product and as a computing environment.

Part Two: Features of NetWare 4.0

Chapter Four, "NetWare 4.0 Product Features," describes all the features of the NetWare 4.0 operating system. This chapter is a microscopic view of what is covered in this book.

Chapter Five, "Understanding NetWare 4.0 Services in Detail," discusses some key services offered by the NetWare 4.0 operating system, including print and backup services.

Part Three: NetWare 4.0 in Depth

Chapter Six, "NetWare Directory Services," gives an architectural overview of the NetWare 4.0 Directory (NDS) technology.

Chapter Seven, "NetWare 4.0 Security," explains all the security features provided by NetWare 4.0, and describes in particular the security features offered by NDS and those of the NetWare 4.0 file system.

Chapter Eight, "File Systems and Media Management," describes the NetWare 4.0 file system and many of the new features offered, including background file compression and block suballocation. Also discussed is the new media-management feature of NetWare 4.0.

Chapter Nine, "Security Auditing," explains the new auditing technology that is part of NetWare 4.0. The scope and depth of the auditing features are covered, and the chapter draws attention to global auditing that is enabled through NetWare Directory Services.

Chapter Ten, "Global Time Synchronization," discusses in depth the timesynchronization technology offered by NetWare 4.0 that keeps all clocks of all computers in a NetWare network close to the correct network time.

Chapter Eleven, "Communication Services," gives you a detailed overview of the communication technologies under NetWare 4.0, and covers IPX and SPX in detail.

Part Four: Upgrading to NetWare 4.0

Chapter Twelve, "Planning the NetWare 4.0 Network," is perhaps the most important chapter in this book. Planning a network under NetWare 4.0 requires thorough top-down planning, and this chapter gives you important guidelines and suggestions.

Chapter Thirteen, "Installing and Upgrading to NetWare 4.0," walks you through the installation process of NetWare 4.0, and gives concrete suggestions on upgrade considerations from all previous versions of NetWare.

Chapter Fourteen, "Managing NetWare 4.0 for NetWare Administrators," discusses the new utilities provided by NetWare 4.0 under DOS and Windows environments.

Conventions Used in This Book

As you work through this book, you will notice special typeface conventions that show you, at a glance, what actions to take.

- All NetWare commands, names of files and directories, and screen messages appear in this special typeface.
- ❖ Information that you type appears in this bold, special typeface.
- All variable elements appear in this italic typeface.

This book also uses special icons to help you identify certain parts of the text.



TIP

A **tip** gives you "extra" information that can boost productivity, or provides a shortcut for your tasks.



WARNING

A warning serves as a caution to help prevent you from losing data or work.



SOAPBOX

A soapbox is a story from the author. It gives you glimpses of the people who built NetWare and

visions of the future of the network-computing industry.

New Riders Publishing

The staff of New Riders Publishing is committed to bringing you the very best in computer reference material. Each New Riders book is the result of months of work by authors and staff, who research and refine the information contained within its covers.

As part of this commitment to you, the NRP reader, New Riders invites your input. Please let us know if you enjoy this book, if you have trouble with the information and examples presented, or if you have a suggestion for the next edition.

Please note, however, that the New Riders staff cannot serve as a technical resource for NetWare/NetWare-related questions, including hardware- or software-related problems. Refer to the Novell documentation for help with specific problems.

If you have a question or comment about any New Riders book, please write to NRP at the following address. We will respond to as many readers as we can. Your name, address, or phone number will never become part of a mailing list or be used for any other purpose than to help us continue to bring you the best books possible.

New Riders Publishing Paramount Publishing Attn: Associate Publisher 11711 N. College Avenue Carmel, IN 46032

If you prefer, you can send a FAX to New Riders Publishing at the following number:

(317) 571-3484

We welcome your electronic mail to our CompuServe ID:

70031,2231

Thank you for selecting NetWare 4: Planning and Implementation!

PART

