Index

A

Actual Area Address
  calculating the, 6-6
actualAreaAddress, 6-8
actualMaxPacketSize, 4-13
Addressing issues
  IS-IS compared with NLSP, 9-1
Adjacencies
  defined, 4-1
  maintaining between routers and neighbors, 2-2
  maintaining over a LAN, 4-6
Adjacency database
  packet structures, 4-14
Adjacency database operation, 2-2
adjacencyStateChange, 4-14
allL1Routers, 4-11
Area addresses
  in routing areas, 2-17
  in Routing Domain, 2-19
areaAddressesOfNeighbor, 4-13
areaMismatch, 4-14
Asynchronous dial-up circuit, 2-5
Authentication, 9-4
Auto mode of RIP and SAP, 7-1

B

badChecksum, 5-26
badIntChecksum, 5-26
bcastHelloInt, 4-12
Bibliography, 11-1
Broadcast function, 2-21
Broadcast Network reliability, 2-11
Byte order, 2-27

C

Call collisions, 3-16
Canonical form, 10-1
Checksums
  generating and checking LSP, 5-2
  IPX, 2-25, 2-28, 2-30
  NLSP, 2-11
Circuit Group, 2-19
Circuit Pacing, 5-21
circuitID, 4-13
Circuits
  activation of, 7-11
  deactivation of, 7-11
  defined, 2-5
Client-router connection, 3-1, 3-13
Complete Sequence Number Packet, see CSNP
Complete SNP interval expiration, 5-19
Configured IW2 Values, 3-17
Congestion avoidance, 5-21
cost, 5-26
Costs, default, 5-12
Counters, 8-1
CSNP packet structure, See Level 1 CSNP

D

Data corruption
  confining impact of, 2-11
Data packets
  forwarding, 2-2, 6-8
Data-link
  header, 2-27
  trailer, 2-27
Data-link issues
  IS-IS compared with NLSP, 9-3
Database
  IW2, 3-17
  maintaining adjacencies, 2-2
Database overload, See LSP database overload
Databases
  Link State defined, 5-1
  validating, 5-24
Decision Process
  building a RIP route, 7-7
  calculating actual area address, 6-6
  constructing a Link State graph, 7-6
  determining best router, 2-12
  information not used, 6-4
  LAN partitions, 6-5
  load splitting, 6-3
  products of the, 6-5
  reaching end nodes, 6-4
  rebuilding the Forwarding database, 2-7
Decision Process database values, 6-8
DefineJitteredTimer procedure, 2-21
Delay, 2-12, 3-18
Delay Request, 3-4
Delay Response, 3-4
Designated Routers

defined, 2-4
determining and constructing pseudonodes, 2-3
election process, 4-10
maintaining pseudonode LSPs, 7-3
multicasting CSNPs, 2-11
preparing to become, 7-3
Diagram conventions, 1-3
Dijkstra's algorithm, 2-7
elements of, 2-8
in Pseudocode, 6-1
drBcastHelloInt, 4-12
duplicateInternalNet, 5-27
duplicateLSPSystemID, 5-27
Dynamic IW2 values, 3-17

E

End node support
IS-IS compared with NLSP, 9-3
End nodes
communicating with RIP, 2-13
enteringL1DatabaseOverload, 5-27
Error statistics, 8-1
Ethernet 802.2, 10-3
Ethernet II, 10-4
Ethernet Raw 802.3, 10-4
Ethernet SNAP, 10-4
Event handling
defined, 2-21
Events, 2-21
NLSP, 4-13
Exit Router, 6-7
exitingL1DatabaseOverload, 5-27
External routes, 2-14

F

Faster flooding, 5-21
FDDI 802.2, 10-6
FDDI SNAP, 10-6
Flooding, 2-3, 5-21
Forwarding database, 2-6
and load-splitting, 2-10
building a, 2-8
network number, 6-5
next hop, 6-5
Forwarding Group, 2-20
Frame Relay
network, 3-3
switches, 3-3

G

General Packet Acceptance Tests, 2-23
Graph Group, 2-20

H

Hierarchical routing, 2-15
holdingTimeMultiplier, 4-12
holdingTimer, 4-13

I

Information Request, 3-4
Information Request/Response subfields, 3-7
Information Response, 3-4
Internal network numbers, 2-17
internalNetworkNumber, 3-17
Internetwork Packet Exchange, See IPX
Internetworks
containing RIP and NLSP routers, 2-14
Interpacket gaps
maintaining proper, 7-15
IP Relay
defined, 3-3
IPX, 2-23
operating over WAN media, 3-1
IPX Address, 2-28
IPX Addressing and Routing, 2-17
IPX Checksum, 2-25
IPX Header, 2-28
packet length, 2-28
using checksums, 2-28
IPX MIB, 2-20, 8-5, 8-12
IPX Network layer address
parts of, 2-17
IPX Network layer packet structure, 2-27
IPX Ping, 2-30
IPX Ping Protocol, 2-26
IPX RIP/SAP support, 7-1
IPX WAN version 2, See IW2
ipxOutNoRoutes, 6-8
ipxWanNetworkNumbers, 3-17
IS-IS
compared with NLSP, 9-1
terminology, 9-1, 9-2, 9-3, 9-4, 9-5
IW2
checking and recovery features, 3-15
media-dependent functions, 3-2

packet structure, 3-19
stages of operation, 3-4
IW2 database, 3-17
IW2 exchanges
recalibrating delay, 3-16
recalibrating throughput, 3-16
IW2 Packet Structure
fields, 3-19
IW2 packets
types of, 3-4

J

Jitter
imposing on Timed Operations, 2-21
operating in NLSP, 2-21

K

Known Set in Dijkstra's algorithm, 2-8

L

LAN adjacencies
detecting new, 4-9
maintaining, 4-10
maintaining existing, 4-9
updating statistics, 4-9
LAN circuits
enabling, 4-6
LAN frame types, 10-1
LAN Hello packets
receiving, 4-8
sending, 4-7
LAN Level 1 Hello packet structure, 4-18
LAN Partitions
in Decision Process, 6-5
LAN pseudonodes, 5-6
LAN State Machine, 4-10
lanL1DesRouterChange, 5-26
LANs
maintaining adjacencies, 4-6
receiving Hello packets, 4-8
sending Hello packets, 4-7
lastSent, 5-26
Latest information, 5-22
Level 1 CSNP, 5-33
Level 1 LSP packet structure, 5-27
Level 1 Non-pseudonode LSPs, 5-8
Level 1 Pseudonode LSPs
generating, 5-13
Level 1 routing, 1-1
Level 2 Routing, 6-7
Level 2 routing, 2-16
Level 3 routing, 2-16
Link State, 1-1
defined, 2-1
routing, 2-1
Link State Database
example, 2-5
Link State database, 5-24
and pseudonodes, 2-4
coping with system bugs, 2-11
defined, 5-1
flooding, 5-1
handling LSPs, 5-1
managing overload, 5-24
receipt confirmation, 5-1
relationship to receiving RIP/SAP, 7-3
relationship to RIP/SAP, 7-3
relationship to sending RIP/SAP, 7-5
running the Decision Process, 6-1
synchronizing replicas, 2-10
Link State database values, 5-25
Link State flooding, 2-3
Link State graphs
building a RIP route, 7-7
changes in, 7-11
Link State packets, See LSP
Link State protocol
overview, 5-1
Links
maintaining WAN, 4-1
NLSP support characteristics, 2-21
Load-splitting, 6-3
defined, 2-10
localCircuitID, 4-12
localHoldingTimer, 4-12
localMaxPacketSize, 4-12
LSP
use of checksums, 2-11
LSP checksums
checking, 5-3
generating and checking, 5-2
generating process, 5-3
overview, 5-2
partial precomputation, 5-4
symbols and conventions, 5-2
LSP confusion, 5-22
LSP database overload, 2-11, 5-24
LSP Group, 2-20
LSP packet structure fields, 5-29
LSP series, 5-1, 5-4

LSP transmission interval expiration, 5-20
lspBufferSize, 5-25
LSPdatabase, 5-26
LSPs
aging out, 5-7
content changing events, 5-8
designating database overload, 2-11
determining latest, 5-22
determining newer, 5-5
generating Level 1 pseudonode, 5-13
in Link State database, 5-1
managing database overload, 5-24
manipulating values, 5-22
multiple, 5-4
need for multiple, 5-4
periodic generation, 5-7
propagation of, 5-14
purging superseded, 5-7
receipt of, 5-14
resolving confusion, 5-22
storing new, 5-17
synchronizing expiration, 5-23
values in Level 1 pseudonode, 5-13
variable length field in Level 1 pseudonode, 5-13
ways to process, 5-15

M

MAC Information field, 10-2
malformedOption, 4-13
Management Information Base, See MIB
manualAddressDroppedFromArea, 6-8
manualAreaAddresses, 4-12
Mask, 2-17
Master/Slave roles
for packet exchange, 3-5
maxAge, 5-25
maxHops, 2-24
Maximal Splitting Degree, 6-8
maximumCompleteSNPInterval, 5-19, 5-26
maximumLSPGenerationInterval, 5-25
Media types and codes, 5-11
MIB
authoritative, 8-11
definitions, 8-11
IPX, 8-5, 8-12
NLSP, 8-8, 8-27
RIP/SAP, 8-7, 8-23
types of, 2-20
using to determine data paths, 8-10
using to determine network topology, 8-3
using to identify and locate problems, 8-3
minimumCompleteSNPInterval, 5-26
minimumLSPGenerationInterval, 5-25
minimumLSPTransmissionInterval, 5-25
minMTU, 3-17
minMTUAllowed, 4-12
mismatchedNetworkNumber, 4-14
mismatchedNodeAddress, 4-13
missingOption, 4-13
MSD, 6-8
MTU size, 2-12
Multicast
addresses, 2-27
function, 2-21
Multiple LSPs, 5-4

N

NAK, 3-4
NDS
use with SAP, 2-15
neighborNICAddress, 4-13
neighborPriority, 4-13
Neighbors Group, 2-20
neighborSystemID, 4-13
neighborSystemType, 4-13
NetWare Directory Services, See NDS
NetWare Link Services Protocol, See NLSP
Network management, 2-19, 8-1
Network number, 2-17, 2-28
Newer LSPs, 5-5
NLSP
advantages, 1-1
area addresses, 2-17
compared with IS-IS, 9-1
compatibility with RIP, 2-13
defined, 1-1
enhancing, 2-15
fault tolerance features, 2-11
link support, 2-21
load splitting, 6-3
load-splitting support, 2-10
maintaining RIP/SAP information, 7-2
recovering from system bugs, 2-11
reliability features, 2-10
response to SAP request, 2-15
RIP/SAP support, 7-1

routes defined, 7-6
terminology, 9-1, 9-2, 9-3, 9-4, 9-5
using jitter, 2-21
using multicast addressing, 2-21
NLSP Delay, 2-13
NLSP Delay subfield
calculating, 3-11
defined, 3-11
NLSP MIB, 2-20, 8-8, 8-27
groups in, 2-19
NLSP routers
and SNMP, 2-19
composing RIP broadcasts, 2-14
NLSP Throughput, 2-13
NLSP Throughput subfield
calculating, 3-11
defined, 3-11
nlspDelayOverride, 3-17
nlspThroughputOverride, 3-17
Node number, 2-17, 2-28
nodeNumber, 3-17
noMulticast, 4-13
nonBcastHelloInt, 4-12

O

On-Demand, Static Routing, 3-1, 3-8
Operating with database overload, 2-11
Order of preference of routes, 6-2
Overload, See LSP database overload

P

paceRate, 5-21
Pacing, 5-21
Packet Acceptance Tests, See General Packet Acceptance Tests
Packet format and framing
IS-IS compared with NLSP, 9-4
Packet structure
IW2, 3-18
LAN Level 1 Hello, 4-14
Level 1 CSNP, 5-27
Level 1 LSP, 5-27
Level 1 PSNP, 5-27
WAN Hello, 4-14
Packet transmission, 5-18
Packet Type, 2-28, 2-30, 3-16
packetRxSmall, 4-13
Packets
receiving RIP and SAP, 7-13
Parameters
end user configuration, 2-20
Partial Sequence Number Packet, See PSNP
Partial SNP interval expiration, 5-20
partialSNPInterval, 5-26
Ping, 2-26
Point-to-point links
acknowledging a Send Routing Message, 2-10
setting a Send Routing Message, 2-10
Point-to-Point Protocol, See PPP
Potential pseudonode, 7-3
PPP
establishing links, 3-2
priority, 4-12
Pseudonodes
constructing, 2-3
defined, 2-4
representing LANs, 2-4
types of, 5-6
PSNP packet structure, 5-35

R

Reconnection, 3-13
References, 11-1
Remaining lifetime, 5-7, 5-16, 5-23
remainingInL1DatabaseOverload, 5-27
Remote System Identifier, 3-9
RIP
Communicating with end nodes, 2-13
Delay values, 7-7
implementing split horizon, 7-9
with load splitting, 7-7
RIP filtering, 2-14
RIP Link Delay, See ticks
RIP Routes
building from Link State database, 7-7
RIP XRoutes
constituent values, 7-2
defined, 7-2
RIP/SAP database values, 7-16
RIP/SAP MIB, 2-20, 8-7, 8-23
RIP/SAP support, 7-1
RIP/SAP WAN Link Delay subfield, 3-12
ripAgeMultiplier, 7-16
ripPacketSize, 7-16
ripState, 7-16
ripUpdate, 7-16
Router, 1-1
routerName, 3-17
Routers

acknowledging LSPs, 2-10
activation of, 7-12
aging out LSPs, 5-7
aging XRoutes, 7-8
and LSPs, 2-3
and the Decision Process, 2-6
becoming Designated, 4-11
calculating actual area address, 6-6
composing Timer request packets, 3-5
constructing pseudonodes, 2-3
deactivation of, 7-12
Decision Process, 5-4
decision-making, 2-12
Designated, 2-3
determining best path, 2-12
determining Master/Slave roles, 3-5
encountering LAN partitions, 6-5
events causing LSP generation, 5-8
fail-stop operation, 2-11
forwarding, 2-6
forwarding IPX data packet, 6-8
generating Level 1 non-pseudonode LSPs, 5-8
generating Level 1 pseudonode LSPs, 5-13
generating LSPs, 5-14
generating periodic RIP updates, 7-9
generating triggered RIP updates, 7-10
how they function, 2-1
initiating LSP generation, 5-14
locating nearest Level 2 router, 6-7
maintaining adjacencies with neighbors, 2-2
managing LSP database overload, 5-24
operating with Level 1 and Level 2 routers, 6-6
preparing to become Designated, 7-3
processing IPX packets, 2-23
processing LSPs, 5-15
purging superseded LSPs, 5-7
regenerating CSNPs, 5-8
regenerating LSPs, 5-7, 5-8
reliability, 2-11
replying to RIP requests, 2-13
resolving LSP confusion, 5-22
routing to Exit Routers, 6-7
running the Decision Process, 6-1
sending RIP packets, 7-2
sending SNPs, 5-17
storing new LSPs, 5-17
synchronizing Link State information, 2-2
synchronizing LSP expiration, 5-23
tests upon LSP receipt, 5-14
tests upon receipt of a PSNP/CSNP, 5-17
transmitting packets, 5-18
user interaction, 2-20
using the Decision Process, 6-1
Routing
and IPX Addressing, 2-17
Decision Process and forwarding, 2-6
Level 2, 2-16, 6-7
Level 3, 2-16
mechanism for optimizing, 2-12
purpose of, 2-1
Routing Domain
using area addresses, 2-19
Routing Information Protocol, See RIP, See RIP
Routing issues
IS-IS compared with NLSP, 9-2
Routing protocols
covered in IW2, 3-1
Routing types
(Numbered) RIP, 3-7
NLSP, 3-9
Unnumbered RIP, 3-8
RSI, 3-9

S

SAP
constituent values, 7-2
processing broadcasts, 2-15
types of services, 7-2
use with IPX, 2-14
use with NDS, 2-14
SAP filtering, 2-15
sapAgeMultiplier, 7-16
sapPacketSize, 7-16
sapState, 7-16
sapUpdate, 7-16
Send Routing Message flag, 5-2
Send Sequence Number flag, 5-2
SendCSNPflag, 5-19, 5-26
Sending RIP/SAP
relationship to Link State database, 7-5
Sequence Number Packets, See SNP
Sequence Numbers
operation of, 5-22

Service Advertising Protocol, See SAP, See SAP
Services
  aging, 7-8
  changes in, 7-10
  changes in XRoutes, 7-10
  values, 7-2
Services Group, 2-20
Simple Network Management Protocol, See SNMP
Single source shortest path spanning tree, 2-10
SNMP
  managing NLSP, 2-19
  MIBs, 2-19
Socket, 2-28
Socket number, 2-17
Source Address, 2-29
Spanning tree, 2-10
Split horizon, 7-9
SRMflag, 5-2, 5-26
SSNflag, 5-2, 5-26
state, 4-13
Static routing, 3-1, 3-8
Synchronizing
  replicas, 2-10
Synchronizing LSP expiration, 5-23
System Group, 2-19
System integrity issues
  IS-IS compared with NLSP, 9-4
System management
  IS-IS compared with NLSP, 9-5
systemID, 4-12

T

Throughput, 2-12, 3-18
Throughput Request, 3-4
Throughput Response, 3-4
Ticks, 3-18
  measurement criterion, 2-13
Timed Operations
  imposing jitter, 2-21
Timer Request, 3-4
Timer Response, 3-4
Token Ring 802.2, 10-5
Token Ring SNAP, 10-5
tooManyAdjacencies, 4-14
Translation Group, 2-20
Transmitting packets
  avoiding circuit congestion, 5-21
  LSPs, 5-20
  with complete SNP interval expiration, 5-19
  with SNP interval expiration, 5-20
Transport Control, 2-28, 2-30
Typographic conventions, 1-2

U

Universal Address Representation, 10-1
Unnumbered RIP, 3-1
Upstream RIP Delay, 7-7
Upstream route, 7-7

V

Variable Length fields, 3-19

W

Waiting state, See LSP database overload
waitingTime, 5-24, 5-26
WAN Adjacency State Machine, 4-3
WAN Hello Packets
  receiving, 4-2
WAN Hello packets
  sending, 4-2
WAN Link Delay subfield, 3-7
WAN links
  maintaining, 4-1
WAN pseudonodes, 5-6
WAN State Machine, 4-3
WANs
  establishing adjacencies, 4-1
  maintaining adjacencies, 4-1
  receiving Hello packets, 4-2
  sending Hello packets, 4-2
Workstation connectivity, 3-1, 3-13
wrongSystemType, 4-14

X

X.25, 2-4
  establishing links, 3-2
  Switched Virtual Circuits, 3-2
XRoutes
  aging, 7-8
  aging services, 7-8
  changes in, 7-10
  constituent values, 7-2
  defined, 7-2
  in the Decision Process, 7-6

Z

zeroAgeLifetime, 5-25