

List of Figures

I	Command format.....	1-xcvi
1-2	A typical login session for user BRUCE on router CMD	1-15
1-3	Using a Radius Server for User Authentication.....	1-23
1-5	The elements of an authentication system that uses token card authentication.....	1-30
1-6	Steps for logging into a client.....	1-35
1-7	Example output from the show SKEY SEQ=n SEED=seed command.....	1-36
1-8	The editor screen layout.....	1-44
1-9	Logging in to the router from a web browser.....	1-45
1-10	Router startup messages.....	1-54
1-11	Example output from the SHOW PIM RPCANDIDATE command... ..	1-64
1-12	Example output from the dump command.....	1-84
1-13	The editor screen layout.....	1-86
1-14	Example output from the show alias command.....	1-130
1-15	Example output from the show buffer command.....	1-131
1-16	Example output from the show buffer scan command.....	1-132
1-17	Example output from the show buffer scan command for a specified address	1-133
1-18	Example output from the show buffer scan queuemarkers command.....	1-133
1-19	Example output from the show config command.....	1-134
1-20	Example output from the show cpu command.....	1-136
1-21	Sample output from the show debug stack command after a software reboot	1-142
1-22	Sample output from the show debug stack command after a hardware reset.	1-142
1-23	Example output from the show exception command.....	1-143
1-24	Example output from the show feature command.....	1-144
1-25	Example output from the show feature command for a specified special feature licence	1-145
1-26	Example output from the show ffile command.....	1-146
1-27	Example output from the show file command.....	1-149
1-28	Example output from the show file=logfile.lfn command	1-149
1-29	Example output from the show flash command	1-150
1-30	Example output from the show flash physical command.....	1-152
1-31	Example output from the show gui command.....	1-153
1-32	Example output from the show http client command	1-154
1-33	Example output from the show http debug command.....	1-155
1-34	Example output from the show http server command.....	1-156
1-35	Example output from the show http session command	1-157
1-36	Example output from the show install command after a new release file is installed.....	1-158
1-37	Example output from the show ldap command	1-159
1-38	Example output from the show ldap request command	1-160
1-39	Example output from the show loader command.....	1-162
1-41	Example output from the show patch command	1-165
1-42	Example output from the show radius command	1-166
1-43	Example output from the show radius debug command	1-167

1-44	Example output from the show release command.....	1-168
1-45	Example output from the show skey command	1-169
1-46	Example output from the show skey seq=n seed=seed command	1-170
1-47	Example output from the show startup command	1-170
1-48	Example output from the show system command.....	1-171
1-49	Example output from the show system serialnumber command.....	1-173
1-50	Example output from the show tacacs debug command.....	1-174
1-51	Example output from the show tacacs server command	1-175
1-52	Example output from the show tacplus key command.....	1-175
1-53	Example output from the show tacplus server command	1-176
1-54	Example output from the show tacplus telnet command.....	1-177
1-55	Example output from the show tacplus user command	1-178
1-56	Example output from the show user command	1-180
1-57	Example output from the show user configuration command	1-181
1-58	Example output from the show user rso command	1-184
2-1	Format of user priority and VLAN data in an Ethernet frame.....	2-8
2-6	Example output from the show switch port command	2-30
2-7	Example output from the show switch qos command.....	2-31
2-9	Example output from the show vlan debug command.....	2-33
3-1	Format of user priority and VLAN data in an Ethernet frame.....	3-7
3-2	VLANs with tagged ports	3-10
3-3	VLANs with untagged ports	3-11
3-4	Example of router with default configuration	3-18
3-5	VLANs with untagged ports	3-19
3-6	VLANs with tagged ports	3-20
3-7	Example output from the show switch command.....	3-39
3-8	Example output from the show switch debug command.....	3-40
3-10	Example output from the show switch fdb command.....	3-43
3-13	Example output from the SHOW SWITCH QOS command.....	3-49
3-15	Example output from the show vlan debug command.....	3-52
4-1	Single Supplicant 802.1x Configuration	4-4
4-2	Multi-Supplicant 802.1x Configuration	4-5
4-3	Router as Both Supplicant and Authenticator	4-6
4-4	An Authenticator PAE	4-8
4-5	Authentication Messaging Exchange Initiated by the Supplicant.....	4-10
4-6	Example output from the show portauth command.....	4-36
4-7	Example output from the show portauth counter command.....	4-38
4-8	Example output from the show portauth port command	4-41
4-9	Example output from the show portauth port multisupplicant command	4-45
4-10	Example output from the show portauth timer command.....	4-47
5-1	Example summary output from the show classifier command.....	5-22
5-2	Example detailed output from the show classifier=2,3 command for classifiers that can be applied to software QoS	5-23
5-3	Example output from the show classifier=dynamic command.....	5-23
6-1	The VLAN tag field in Ethernet packets	6-7
6-2	The DSCP bits of the DS field in the IPv4 header.....	6-7
6-4	A simple traffic class tree	6-11
6-6	Order of classifier matching in a traffic class tree	6-13
6-7	Process flow for Dynamic Application Recognition (DAR).....	6-14
6-8	The points in the router that can be oversubscribed	6-15
6-9	A summary of the packet flow through the router	6-16
6-10	Detailed packet flow through the software QoS system.....	6-19
6-11	Single and two rate three colour marker meters	6-22
6-12	How the two rate three colour marker assigns bandwidth class.....	6-23

6-15	Example of when you may require software QoS on the switch instance	6-53
6-16	Firewall interface which requires post-NAT IP settings.....	6-58
6-21	Example output from the command enable sqos debug=engine	6-63
6-22	Example output from the command enable sqos debug=info	6-63
6-30	An example of a traffic class tree	6-90
6-31	Example output from the show sqos command	6-139
6-32	Example output from the show sqos counters classifiers command	6-142
6-47	Full example output from the show sqos red=0,2 full command	6-157
7-1	Format of an Ethernet frame.	7-7
7-2	Format of an Ethernet frame with SNAP encapsulation.....	7-8
7-3	Example output from the show asyn command.....	7-50
7-4	Example output from the show asyn counter command.....	7-53
7-5	Example output from the show asyn history command.....	7-54
7-6	Example output from the show asyn summary command.	7-54
7-10	Example output from the show eth counters=dot3stat command	7-60
7-11	Example output from the show eth counters=interface command	7-61
7-12	Example output from the show eth macaddress command	7-63
7-13	Example output from the show eth receive command.....	7-64
7-14	Example output from the show eth state command for 68360-based or SONIC-based hardware	7-64
7-15	Example output from the show eth state command for 100Mbps interfaces in the default configuration (with link speed auto-negotiation enabled)	7-65
7-16	Example output from the show eth state command for 100Mbps interfaces with link speed set manually	7-65
7-17	Example output from the show eth state command for virtual eth interface	7-65
7-18	Example output from the show interface command.....	7-67
7-19	Example output from the show interface command for a specific interface.....	7-68
7-20	Example output from the show interface counter command.....	7-69
7-21	Example output from the show interface priorityqueue command	7-70
7-23	Example output from the show syn counter=interface command.....	7-73
7-24	Example output from the show syn counter=syn command.....	7-74
8-1	Main network components for ADSL	8-4
8-2	ADSL frame	8-6
8-3	Basic ATM cell structure	8-8
8-4	Protocols configured over ATM and ADSL	8-14
8-5	Example configuration script for PPPoE over ATM over ADSL.....	8-16
8-7	Example configuration script for IP over ATM over ADSL (IPoA)	8-19
8-8	RFC 1483 Routed ATM over ADSL with DHCP configuration example	8-21
8-9	Example output from the show adsl command	8-36
8-10	Example output from the show adsl=0 command	8-36
8-11	Example output from the show adsl=0 counter command.....	8-38
8-12	Example output from the show atm command.....	8-39
8-13	Example output from the show atm=0 command.....	8-40
8-14	Example output from the show atm=0 channel=1 command	8-41
8-15	Example output from the show atm=0 counter command	8-43
8-16	Example output from the show atm=0 channel=1 counter command	8-44
9-1	Example network configuration for leased line backup.....	9-12
9-2	Example network configuration for bandwidth on demand	9-13
9-3	Example network configuration for dial-on-demand using modems	9-15
9-4	The Password Authentication Protocol (PAP) authentication process.....	9-22
9-5	The Challenge Handshake Authentication Protocol (CHAP) authentication process.....	9-23
9-7	Example network for configuring a PPP link	9-33
9-8	Example output from the show ppp command for a PPP link.....	9-35
9-12	Example configuration for leased line backup.....	9-41
9-13	Example configuration for bandwidth on demand.....	9-43
9-14	Example configuration for bandwidth on demand with leased line circuits and ISDN	9-45

9-15	Example output from the show ppp command for a PPP link.....	9-96
9-16	Example output from the show ppp config command	9-98
9-17	Example output from the show ppp count=interface command	9-104
9-18	Example output from the show ppp count=lcp command	9-106
9-19	Example output from the show ppp count=multilink command	9-112
9-20	Example output from the show ppp count=ncp command	9-113
9-21	Example output from the show ppp count=pppoe command	9-115
9-22	Example output from the show ppp debug command	9-117
9-23	Example output from the show ppp idletimer command.....	9-118
9-24	Example output from the show ppp Limits command	9-119
9-25	Example output from the show ppp multilink command.....	9-120
9-26	Example output from the show ppp nameserver command	9-122
9-27	Example output from the show ppp pppoe command	9-123
9-28	Example output from the show ppp template command.....	9-125
9-29	Example output from the show ppp template debug command.....	9-127
9-30	Example output from the show ppp txstatus command	9-128
9-31	Example output from the show ppp utilisation command.....	9-129
10-1	Model of a basic Frame Relay network	10-3
10-2	Format of the Frame Relay HDLC frame with RFC 1490 encapsulation.....	10-5
10-3	Format of the Frame Relay HDLC frame with Cisco Systems proprietary encapsulation	10-6
10-4	Frame Relay network with randomly selected but unique DLCIs.....	10-7
10-5	Frame Relay network with DLCIs as router identifiers.....	10-8
10-6	The effect of the slow-start mechanism on transmission rates	10-11
10-7	Congestion notification in a Frame Relay network	10-12
10-8	The effect of congestion control on the transmission rate into a congested Frame Relay network	10-14
10-9	Example configuration for a Frame Relay network without an LMI.....	10-20
10-10	Example output from the SHOW FRAMERELAY CONFIG command for a Frame Relay interface created with default parameters	10-21
10-11	Example output from the SHOW FRAMERELAY CONFIG and SHOW FRAMERELAY DLC commands for a Frame Relay interface configured with three DLCIs and no LMI.....	10-22
10-12	Example output from the SHOW IP INTERFACE command for a Frame Relay interface	10-23
10-13	Example output from the SHOW FRAMERELAY LI command for a Frame Relay interface with IP and ARP user modules.....	10-23
10-14	Example output from the SHOW IP ARP command for a Frame Relay interface configured with a static ARP.....	10-23
10-15	Example output from the SHOW FRAMERELAY CONFIG and SHOW FRAMERELAY DLC commands for a Frame Relay interface configured to use Q.933 LMI	10-24
10-16	Example output from the show framerelay command	10-50
10-17	Example output from the show framerelay cirutilisation command	10-50
10-18	Example output from the show framerelay config command.....	10-51
10-19	Example output from the show framerelay counter command	10-53
10-20	Example output from the show framerelay debug command	10-56
10-21	Example output from the show framerelay lmi command	10-57
10-22	Example output from the show framerelay utilisation command	10-58
10-23	Example output from the show framerelay dlc command	10-59
10-24	Example output from the show framerelay dlc command for a specific DLC.....	10-60
10-25	Example output from the show framerelay dlc counter command	10-62
10-26	Example output from the show framerelay li command	10-67
10-27	Example output from the show framerelay li command for a specific LI	10-67
10-28	Example output from the show framerelay li counter command	10-68
11-1	A typical ISDN Basic Rate Access circuit.	11-5
11-2	ISDN Primary Rate Access interface between the router and ISDN service provider.....	11-8
11-3	Multiframe structure used in the frame synchronisation process for Primary Rate (E1) Access.	11-9
11-4	Example output from the SHOW LAPD command for non-associated signalling.....	11-31
11-5	Example configuration for a basic ISDN network.	11-48
11-6	Example output from the SHOW ISDN CALL command for Head Office.....	11-54

11-7	Example commands and output to test the configuration of the central site router in a basic ISDN network.....	11-55
11-8	Example commands and output to test the configuration of the regional site router in a basic ISDN network.....	11-56
11-9	Example output from the ENABLE Q931 DEBUG=MDECODE command for a call initiated by the router.....	11-87
11-15	Example output from the SHOW BRI CONFIGURATION command.....	11-110
11-18	Example output from the show bri ctest command.....	11-116
11-19	Example output from the show bri debug command.....	11-117
11-20	Example output from the show bri state command for an S/T interface.....	11-118
11-21	Example output from the show bri state command for a U interface.....	11-120
11-22	Example output from the SHOW BRI TEST command for BRI interfaces using a PSB2186 transceiver.....	11-122
11-23	Example output from the SHOW BRI TEST command for BRI interfaces using a MC145572 transceiver.....	11-122
11-25	Example output from the SHOW ISDN CALL command for a specific call name.....	11-125
11-26	Example output from the show isdn clist command.....	11-128
11-27	Example output from the show isdn domainname command.....	11-128
11-33	Example output from the show pri configuration command.....	11-135
11-44	Example output from the SHOW PRI CTEST command for a E1 type interface.....	11-146
11-45	Example output from the SHOW PRI CTEST command for a T1 type interface.....	11-146
11-46	Example output from the SHOW PRI DEBUG command.....	11-147
11-49	Identifiable fault locations in a Primary Rate link between a TE and an NT.....	11-152
11-50	Example output from the SHOW PRI TEST command for an E1 interface with a Bt 8370 transceiver.....	11-153
11-51	Example output from the SHOW PRI TEST command for a T1 interface with a Bt 8370 transceiver.....	11-154
11-52	Example output from the SHOW Q931 command.....	11-156
11-53	Example output from the SHOW Q931 CALL command.....	11-158
11-54	Example output from the SHOW Q931 SPID command.....	11-159
12-1	X.25 DCE hunt groups.....	12-16
12-2	Example configuration for a basic X.25 network.....	12-19
12-6	Example configuration for an extended X.25 network.....	12-24
12-9	Example configuration for an X.25 network with hunt groups.....	12-31
12-10	Example output from the SHOW LAPB command.....	12-69
12-11	Example output from the SHOW LAPB CONFIG command.....	12-69
12-13	Example output from the SHOW LAPB IDLETIMER command.....	12-73
12-19	Example output from the SHOW X25C command.....	12-80
12-21	Example output from the SHOW X25C DTEADDRESS command.....	12-84
12-22	Example output from the SHOW X25C HUNTGROUPE command.....	12-85
12-24	Example output from the SHOW X25C ROUTE command.....	12-88
12-25	Example output from the SHOW X25C STATE command.....	12-88
12-26	Example output from the SHOW X25C TCPKEEPALIVE command.....	12-89
12-30	Example output from the SHOW X25T CPAR command.....	12-94
14-1	Format of an IP datagram.....	14-6
14-2	Subdivision of the 32 bits of an Internet address into network and host fields for class A, B, and C networks.....	14-8
14-3	Example configuration for VLAN tagging on Eth interfaces.....	14-30
14-4	Local router acting as a DNS relay for an Internet connection.....	14-33
14-5	Using finger to trigger mail downloads from a mail host.....	14-40
14-8	Example configuration for a basic TCP/IP network.....	14-53
14-9	Example configuration for IP filtering.....	14-59
14-12	Example output of the response to a finger query.....	14-128
14-13	Example output from the ping command when screenoutput is yes	14-130
14-14	Example output from the show bootp relay command.....	14-166
14-15	Example output from the show ip command.....	14-168

14-18	Example output from the show ip counter=arp command.....	14-173
14-19	Example output from the show ip counter=egp command.....	14-174
14-20	Example output from the show ip counter=icmp command.....	14-174
14-22	Example output from the show ip counter=ip command.....	14-177
14-25	Example output from the show ip counter=snmp command.....	14-180
14-26	Example output from the show ip counter=udp command.....	14-181
14-28	Example output from the show ip dns cache command.....	14-184
14-30	Example output from the show ip filter command.....	14-186
14-31	Example output from the show ip helper command.....	14-188
14-32	Example output from the show ip helper counter command.....	14-188
14-33	Example output from the show ip host command.....	14-190
14-34	Example output from the show ip icmpreply command.....	14-190
14-37	Example output from the show ip nat command.....	14-195
14-38	Example output from the show ip counter command.....	14-197
14-39	Example output from the show ip pool command.....	14-200
14-40	Example output from the show ip pool summary command.....	14-200
14-41	Example output from the show ip rip command.....	14-201
14-42	Example output from the show ip rip command (X.25, Frame Relay interface).....	14-202
14-43	Example output from the show ip rip counter=detail command.....	14-204
14-44	Example output from the show ip riptimer command.....	14-205
14-45	Example output from the show ip route command.....	14-207
14-46	Example output from the show ip route general command.....	14-208
14-47	Example output from the show ip route cache command.....	14-208
14-48	Example output from the show ip route count command.....	14-209
14-49	Example output from the show ip route full command.....	14-209
14-51	Example output from the show ip route multicast command.....	14-211
14-52	Example output from the show ip route preference command.....	14-212
14-53	Example output from the show ip route template command.....	14-213
14-54	Example output from the show ip route template command for a specific template.....	14-213
14-55	Example output from the show ip trusted command.....	14-215
14-56	Example output from the show ip udp command.....	14-215
14-57	Example output from the show ping command.....	14-216
14-59	Example output from the show tcp command.....	14-220
14-60	Example output from the show trace command.....	14-223
15-1	The IPv6 packet.....	15-6
15-2	The outgoing interface to specify when Pinging, Telneting or sending an SSH request to an IPv6 link-local address.....	15-19
15-3	Example output from the show ipv6 route command for a basic IPv6 network.....	15-23
15-4	Example for dynamic routing.....	15-24
15-5	The output of the show ipv6 route command on router A, showing the interface route.....	15-25
15-6	The output of the show ipv6 route command on router B, showing the interface routes.....	15-25
15-7	The output of the show ipv6 route command on router C, showing the interface route.....	15-26
15-8	The output of the show ipv6 route command on router A.....	15-26
15-9	The output of the show ipv6 route command on router C.....	15-27
15-10	Example of a dynamic tunnel.....	15-28
15-12	Output of the show ipv6 tunnel command for router A.....	15-30
15-14	Example showing host and router connections.....	15-32
15-15	Example output from the show ipv6 command.....	15-70
15-16	Example output from the show ipv6 counter command.....	15-72
15-18	Example output from the show ipv6 host command.....	15-78
15-20	Example output from the show ipv6 multicast command.....	15-81
15-21	Example output from show ipv6 ndcache command.....	15-82
15-22	Example output from the show ipv6 ndconfig command.....	15-83
15-23	Example output from the show ipv6 rip command.....	15-85
15-24	Example output from the show ipv6 rip timer command.....	15-85
15-25	Example output from the show ipv6 rip counter command.....	15-86
15-26	Example output from the show ipv6 route command.....	15-87
15-28	Example output from the show ipv6 route preference command.....	15-90
15-29	Example output from the show ipv6 tunnel command.....	15-91

16-1	The interaction between states and parameters for ping polling.	16-3
16-2	Example configuration for ping polling.	16-7
16-3	Example output from the show ping poll command.	16-17
16-4	Example output from the show ping poll full command.	16-18
16-5	Example output from the show ping poll counter full command.	16-19
17-1	Multicast environment.	17-4
17-2	Forwarding multicast data over a specified interface and port.	17-21
17-3	Multicast configuration example using IGMP and DVMRP.	17-26
17-4	Multicast configuration topology using PIM Sparse or Dense Mode.	17-31
17-5	Example output from the show dvmrp counters command.	17-67
17-6	Example output from the show dvmrp debug command.	17-68
17-7	Example output from the show dvmrp forwarding command.	17-68
17-8	Example output from the show dvmrp interface command.	17-69
17-9	Example output from the show dvmrp neighbour command.	17-70
17-10	Example output from the show dvmrp route command.	17-71
17-11	Example output from the show igmpsnopping routeraddress command.	17-72
17-12	Example output from the show ip igmp command.	17-74
17-13	Example output from the show ip igmp counter command.	17-75
17-14	Example output from show ip igmp debug command.	17-76
17-15	Example output from the show pim bsr candidate command for an elected BSR.	17-78
17-16	Example output from the show pim bsr candidate command for an unelected BSR candidate.	17-78
17-17	Example output from the show pim config command.	17-79
17-18	Example output from the show pim counters command for PIM Sparse Mode.	17-80
17-19	Example output from the show pim counters command for PIM Dense Mode.	17-80
17-20	Example output from the show pim debug command.	17-83
17-21	Example output from the show pim interface command for PIM Sparse Mode.	17-84
17-22	Example output from the show pim interface command for PIM Dense Mode.	17-84
17-23	Example output from the show pim neighbour command for PIM Sparse Mode.	17-86
17-24	Example output from the show pim neighbour command for PIM Dense Mode.	17-86
17-25	Example output from the show pim route command for PIM Sparse Mode, when the router is the RP.	17-87
17-26	Example output from the show pim route command for PIM Sparse Mode, when the router is not the RP.	17-88
17-27	Example output from the show pim route command for PIM Dense Mode.	17-91
17-28	Example output from the show pim rpcandidate command.	17-92
17-29	Example output from the show pim rpset command when the RP is statically configured.	17-93
17-30	Example output from the show pim rpset command when the RP is determined using the bootstrap mechanism.	17-94
17-31	Example output from the show pim staterefresh command.	17-95
17-32	Example output from the show pim timer command.	17-96
18-1	The IPv6 multicast environment.	18-4
18-2	MLD queries and responses.	18-6
18-3	Multicast configuration topology using PIM6 Sparse or Dense Mode.	18-14
18-4	Example output from the show ipv6 mld command.	18-41
18-5	Example output from the show ipv6 mld config command.	18-43
18-6	Example output from the show ipv6 mld counters command.	18-44
18-7	Example output from the show ipv6 mld debug command.	18-45
18-8	Example output from the show pim6 bsr candidate command for an elected BSR.	18-46
18-9	Example output from the show pim6 bsr candidate command for an unelected BSR candidate.	18-46
18-10	Example output from the show pim6 config command.	18-47
18-11	Example output from the show pim6 counters command for PIM Sparse Mode.	18-48
18-12	Example output from the show pim6 counters command for PIM Dense Mode.	18-49
18-13	Example output from the show pim6 debug command.	18-51
18-14	Example output from the show pim6 interface command for PIM Sparse Mode.	18-52
18-15	Example output from the show pim6 interface command for PIM Dense Mode.	18-52

18-16	Example output from the show pim6 neighbour command for PIM Sparse Mode.	18-53
18-17	Example output from the SHOW PIM6 NEIGHBOUR command for PIM Dense Mode.	18-54
18-18	Example output from the show pim6 route command for PIM Sparse Mode when the router is the RP.	18-55
18-19	Example output from the show pim6 route command for PIM Sparse Mode when the router is not the RP.	18-56
18-20	Example output from the show pim6 route command for PIM Dense Mode.	18-58
18-21	Example output from the show pim6 rpcandidate command.	18-60
18-22	Example output from the show pim6 rpset command when the RP is statically configured.	18-61
18-23	Example output from the show pim6 rpset command when the RP is determined using the bootstrap mechanism.	18-61
18-24	Example output from the show pim6 staterefresh command.	18-62
18-25	Example output from the show pim6 timer command.	18-63
19-1	Example output from the SHOW IPX SPXSPOOF command during an SPX connection request storm.	19-14
19-2	Example configuration for a basic Novell IPX network.	19-16
19-5	Example output from the SHOW PPP command for a basic Novell IPX network.	19-19
19-6	Example output from the SHOW IPX CIRCUIT command for a basic Novell IPX network.	19-20
19-7	Example output from the SHOW IPX SERVICES command for a basic Novell IPX network.	19-21
19-8	Example configuration for IPX dial-on-demand.	19-22
19-9	Example output from the SHOW IPX CIRCUIT command for the Head Office router in a dial-on-demand IPX network.	19-26
19-12	Example output from the SHOW IPX CIRCUIT command for the Remote Office router in a dial-on-demand IPX network.	19-28
19-15	Example output from the SHOW IPX command.	19-54
19-20	Example output from the show ipx circuit command.	19-60
19-23	Example output from the show ipx counter=ROUTES command.	19-64
19-24	Example output from the show ipx exclusion command.	19-65
19-25	Example output from the show ipx inclusion command.	19-66
19-26	Example output from the show ipx rip command.	19-67
19-28	Example output from the show ipx sap command.	19-69
19-29	Example output from the show ipx service command.	19-70
19-30	Example output from the SHOW IPX SPXSPOOF command.	19-72
20-1	Determining appropriate circuit costs.	20-6
20-2	Assigning an arbitrary cost to each link based on bandwidth.	20-7
20-3	Using interface costs to establish preferred routes between nodes in a DECnet network.	20-8
20-4	Example configuration for a basic DECnet network.	20-9
20-5	Example output from the show decnet route command for a basic DECnet network.	20-10
20-6	Example output from the show ppp command for a basic DECnet network.	20-11
20-7	Example output from Switch A with the show decnet gateway command.	20-11
20-8	Example output from the add decnet exclusion command.	20-14
20-9	Example output from the add decnet inclusion command.	20-15
20-10	Example output from the add decnet interface command.	20-17
20-11	Example output from the add decnet lpn command.	20-17
20-12	Example output from the set decnet command.	20-26
20-13	Example output from the add decnet interface command.	20-27
20-14	Example output from the show decnet command.	20-28
20-15	Example output from the show decnet counter=global command.	20-29
20-16	Example output from the show decnet counter=interface command.	20-30
20-17	Example output from the show decnet counter=route command.	20-30
20-18	Example output from the show decnet exclusion command.	20-31
20-19	Example output from the show decnet inclusion command.	20-32
20-20	Example output from the show decnet interface command.	20-33
20-21	Example output from the show decnet lpn command.	20-34
20-22	Example output from the show decnet route command.	20-35
21-4	Example output from the show service command for a port with Manager privileges.	21-25

21-6	Example output from the show sessions command.....	21-26
21-7	Example output from the show tty command.....	21-26
21-8	Example output from the show tty command.....	21-28
21-9	Example output from the show tty=all summary command.....	21-29
21-10	Example output from the show tty default command.....	21-30
21-11	Example output from the telnet command.....	21-31
22-2	Example output from the show lpd command for LPD queue	22-6
22-4	Example output from the show stream command.....	22-10
22-5	Example output from the show stream command.....	22-11
22-6	Example output from the show perm command.....	22-12
22-7	Example output from the show perm command for router 172.26.4.1	22-12
22-8	Example output from the show perm command for router 172.20.34.9	22-13
22-9	Example output from the show lpd command	22-22
22-10	Example output from the show perm command.....	22-22
22-11	Example output from the show stream command.....	22-23
23-3	A basic OSPF network	23-15
23-4	A basic OSPF network with an addressless PPP link.....	23-16
23-5	A OSPF network with a virtual link	23-18
23-6	Example output from the show ospf command	23-49
23-8	Example output from the show ospf area command for a specific area.....	23-52
23-11	Example output from the show ospf interface command for a specific interface	23-57
23-14	Example output from the show ospf neighbour command.....	23-64
24-1	An example bridged LAN	24-6
24-2	Example configuration of a WAN-to-WAN bridge.....	24-7
24-3	Example configuration for a basic bridged network.....	24-12
24-4	A bridged network with a mesh topology using the Spanning Tree Protocol to provide redundancy.....	24-14
24-5	A bridged network requiring the use of bridge filters	24-16
24-6	Example output from the show bridge command.....	24-36
24-7	Example output from the show bridge command.....	24-36
24-8	Example output from the show bridge counter command.....	24-38
24-9	Example output from the show bridge filter command	24-41
24-10	Example output from the show bridge group command	24-43
24-11	Example output from the show bridge port command for a port with the Spanning Tree Protocol disabled	24-44
24-12	Example output from the show bridge port command for a port with the Spanning Tree Protocol enabled	24-45
24-13	Example output from the show bridge protocol command	24-47
24-14	Example output from the show bridge spanning command.....	24-48
24-15	Example output from the show bridge station command.....	24-50
25-1	An RSA public key file in SSH format.....	25-15
25-2	An RSA public key file in NIQ format.....	25-15
25-3	An RSA public key file in HEX format.....	25-16
25-4	Example output from the show enco command for a router with a MAC card installed.....	25-28
25-5	Example output from the show enco command for a router without an encryption card installed.....	25-28
25-6	Example output from the show enco channel command.....	25-30
25-7	Example output from the show enco channel command for a specific channel.....	25-31
25-8	Example output from the show enco channel counters command.....	25-34
25-9	Example output from the show enco counters=aes command.....	25-37
25-10	Example output from the show enco counters=des command.....	25-38
25-11	Example output from the show enco counters=dh command.....	25-40
25-12	Example output from the show enco counters=hardware command	25-41
25-13	Example output from the show enco counters=hmac command.....	25-42

25-14	Example output from the show enco counters=ipsec command. (Not available on AR410 series routers.)	25-42
25-15	Example output from the show enco counters=queues command.....	25-43
25-16	Example output from the show enco counters=mac command.	25-44
25-17	Example output from the show enco counters=pred command.....	25-45
25-18	Example output from the show enco counters=rsa command.....	25-45
25-19	Example output from the show enco counters=ssl command.....	25-46
25-20	Example output from the show enco counters=stac command.	25-48
25-21	Example output from the show enco counters=user command.....	25-51
25-22	Example output from the show enco counters=util command.	25-53
25-23	Example output from the show enco key command.....	25-54
25-24	Example output from the show enco key command for a specific DES key.....	25-55
26-1	Pin wiring diagram for a cable to connect a terminal to an asynchronous port that is to be tested by the Test Facility	26-3
26-2	Pin wiring diagram for a cable to connect a terminal to a DB9 female asynchronous port that is to be tested by the Test Facility	26-4
26-3	Pin wiring diagram for a cable to connect a terminal to a DB9 male asynchronous port that is to be tested by the Test Facility	26-4
26-4	Ethernet AUI loopback plug wiring diagram	26-5
26-5	Ethernet twisted pair (TP) loopback plug wiring diagram	26-5
26-6	RJ45 loopback plug wiring diagram	26-6
26-7	DB9 male loopback plug wiring diagram	26-6
26-8	DB9 female loopback plug wiring diagram	26-6
26-9	Basic Rate ISDN loopback plug wiring diagram	26-8
26-10	Example output from the show bri test command.....	26-9
26-11	Primary Rate ISDN 120W loopback plug wiring diagram.....	26-10
26-12	Example output from the enable test interface more command for an asynchronous port.....	26-13
26-13	Example output from the enable test interface more command for a synchronous port	26-13
27-1	Network Model for the Network Time Protocol	27-3
27-2	Example network configuration for a network time service.....	27-5
27-3	Example output from the show ntp commands for the Head Office router in an example network time service	27-6
27-4	Example output from the show ntp command.....	27-9
28-1	Dialogue between a user and the router for a call made to an asynchronous port associated with the call definition "Async server"	28-4
28-2	Example output from the ADD ACC CALL command	28-19
28-3	Example output from the set acc call command	28-28
28-4	Example output from the show acc command	28-31
28-5	Example output from the show acc call command.....	28-32
28-6	Example output from the show acc domainname command	28-36
28-7	Example output from the show acc script command.....	28-36
29-1	Format of a packet with GRE encapsulation	29-2
29-2	A typical scenario for GRE encapsulation of IP over IP.....	29-3
29-3	Example configuration for multi-point GRE encapsulation of IP over IP.	29-7
29-4	Example output from the SHOW GRE command	29-19
29-5	Example output from the show gre tunnel command	29-20
29-6	Example output from the show gre tunnel command.....	29-21
30-2	The effects of different combinations of the after and before parameters in the create trigger and set trigger commands	30-9
30-4	Example output from the show trigger full command	30-22
30-5	Example output from the show trigger status command.....	30-24
30-6	Example output from the show trigger counter command.....	30-25
31-3	Example output from the show apple command	31-49
31-4	Example output from the show apple aarp command.....	31-50

31-5	Example output from the show apple circuit command	31-51
31-6	Example output from the show apple counter=aarp command	31-52
31-7	Example output from the show apple counter=atp command	31-53
31-8	Example output from the show apple counter=ddp command	31-53
31-9	Example output from the show apple counter=nbp command	31-55
31-10	Example output from the show apple counter=port command	31-55
31-11	Example output from the show apple counter=route command	31-56
31-12	Example output from the show apple counter=zip command	31-57
31-13	Example output from the show apple dlci command	31-58
31-15	Example output from the show apple port command for a specified port.	31-61
31-19	Example output from the show apple zone command	31-65
32-1	Illustration of an E1/T1 network.	32-3
32-2	A TDM star network.	32-4
32-3	Example output from the show tdm group command	32-12
33-1	Examples of syslog messages with syslogformat=normal	33-7
33-2	Examples of syslog messages with syslogformat= extended	33-8
33-3	Example configuration for a basic Logging facility.	33-10
33-4	Example output from the show log command	33-37
33-5	Example output from the show log full command	33-38
33-6	Example output from the show log counter command	33-40
33-7	Example output from the show log output command	33-42
33-8	Example output from the show log output full command	33-43
33-9	Example output from the show log queue command	33-45
33-10	Example output from the show log receive command	33-46
33-11	Example output from the show log status command	33-47
34-1	Example output from the show script command	34-13
34-2	Example output from the show script command for a specific script	34-13
35-1	Example output from the show dhcp command	35-27
35-2	Example output from the show dhcp client command	35-29
35-3	Example output from the show dhcp policy command	35-30
35-4	Example output from the show dhcp range command	35-31
36-1	Example configuration for a basic DHCPv6 network.	36-7
36-2	Example output from the show dhcp6 command	36-23
36-3	Example output from the show dhcp6 client command	36-25
36-4	Example output from the show dhcp6 counter command	36-26
36-5	Example output from the show dhcp6 interface command	36-29
36-6	Example output from the show dhcp6 key command	36-31
36-7	Example output from the show dhcp6 policy command	36-32
36-8	Example output from the show dhcp6 range command	36-33
36-9	Example output from the show dhcp6 server command	36-34
37-5	Example output from the show l2tp command	37-30
37-6	Example output from the show l2tp counter command	37-31
37-7	Example output from the show l2tp call command	37-34
37-8	Example output from the show l2tp ip command	37-35
37-9	Example output from the show l2tp tunnel command	37-36
37-10	Example output from the show l2tp tunnel command for a specific active call	37-38
37-11	Example output from the show l2tp tunnel counter command	37-41
37-12	Example output from the show l2tp tunnel call counter command	37-42
37-13	Example output from the show l2tp user command	37-44
38-1	Components of a network management system	38-3
38-2	The top levels of the Internet-standard Management Information Base (MIB)	38-5
38-3	Format of an SNMP message	38-10

38-4	SNMPv3 Entity Components	38-12
38-5	SNMPv3 Protocol Format	38-13
38-6	Example output from the SHOW SNMP command	38-45
38-7	Example output from the show snmp community command	38-48
38-8	Example output from the show snmp group command	38-49
38-9	Example output from the show snmp group command	38-50
38-10	Example output from the show snmp targetparams command.....	38-51
38-11	Example output from the show snmp user command	38-52
38-12	Example output from the show snmp view command	38-53
38-13	Example output from the show snmp view=readview command.	38-53
39-1	Traditional retail environment with asynchronous TPAD connections.	39-2
39-2	Router-based TPAD in a retail environment.	39-3
39-3	Diagnosing a missing or invalid X.25 NUI in a TPAD configuration.	39-14
39-4	Diagnosing an invalid X.25 logical channel number in a TPAD configuration.	39-15
39-5	Diagnosing an invalid X.25 logical channel number in a TPAD configuration	39-16
39-6	Example output from the show tpad command.....	39-25
39-7	Example output from the show tpad connection command	39-27
39-8	Example output from the show tpad counter command.....	39-29
40-1	RSVP sessions with multicast receiver addresses.....	40-3
40-2	RSVP Path messages travel from the sender to the receiver.....	40-3
40-3	RSVP Resv messages travel from the receiver to the sender.....	40-5
40-4	Example output from the show rsvp command	40-20
41-1	Example output from the show firewall arp command	41-14
41-2	Example of a HTTP filter file.	41-35
41-3	Example of an SMTP proxy spam sources file.....	41-50
41-4	Example output from the show firewall command.....	41-80
41-5	Example output from the show firewall accounting command.....	41-82
41-6	Example output from the show firewall arp command	41-83
41-7	Example output from the show firewall event command.....	41-85
41-8	Example output from the show firewall policy command.....	41-87
41-9	Example output from the show firewall policy counter command	41-93
41-10	Example output from the show firewall policy dynamic command	41-98
41-11	Example output from the show firewall policy list command.....	41-99
41-12	Example output from the show firewall policy user command	41-99
41-13	Example output from the show firewall policy attack command	41-100
41-14	Example output from the show firewall session command	41-102
42-3	Action names in the show upnp interface=interface command output.....	42-12
42-4	Example output from the show upnp command.....	42-15
42-5	Example output from the show upnp counter command.....	42-16
42-6	Interface instances in the output of the show upnp command.....	42-18
42-7	Example output from the show upnp interface=all command.....	42-19
42-8	Example output from the show upnp interface=interface command.....	42-20
42-9	Example output from the show upnp interface=all subscriptions command	42-22
42-10	Example output from the show upnp interface=interface subscriptions command	42-22
43-1	Example output from the show ssh command	43-16
43-4	Example output from the show ssh user command.....	43-24
43-5	Example output from the show ssh user command for a specific user	43-24
44-1	Star encryption key management architecture.....	44-6
44-2	Example output from the show star command.	44-16
44-3	Example output from the show star command for a specific star entity when a MAC card is installed	44-17
44-4	Example output from the show star counter command.	44-18
44-5	Example output from the show star counter command for a specific star entity.....	44-21
44-7	Example output from the show star netkey command.....	44-24

45-1	UDP Encapsulation for NAT-T	45-25
45-2	NAT-T peers negotiate traffic through a NAT gateway device	45-26
45-3	Network for VPN-only with ISAKMP/IKE key management	45-31
45-5	Example output from the show ipsec command	45-86
45-6	Example output from show ipsec bundlespecification command	45-87
45-7	Example output from the show ipsec bundlespecification command for a specific bundle. ...	45-87
45-8	Example output from the show ipsec counter=ah command	45-89
45-9	Example output from the show ipsec counter=alg command	45-91
45-10	Example output from the show ipsec counter=comp command	45-97
45-11	Example output from the show ipsec counter=esp command	45-99
45-12	Example output from the show ipsec counter=main command	45-101
45-13	Example output from the show ipsec counter=sad command	45-102
45-14	Example output from the show ipsec counter=setup command	45-102
45-15	Example output from the show ipsec counter=spd command	45-103
45-16	Example output from the show ipsec policy command	45-105
45-18	Example output from the show ipsec policy sabundle command	45-109
45-19	Example output from the show ipsec policy counter command	45-110
45-20	Example output from the show ipsec sa command	45-113
45-21	Example output from the show ipsec sa command for a specific SA.	45-114
45-22	Example output from the show ipsec sa counter command	45-117
45-23	Example output from the show ipsec saspecification command	45-120
45-24	Example output from the show ipsec saspecification command for a specific SA specification	45-121
45-25	Example output from the show isakmp command	45-122
45-26	Example output from the show isakmp counter=aggressive command	45-125
45-27	Example output from the show isakmp counter=general command	45-129
45-28	Example output from the show isakmp counter=info command	45-134
45-29	Example output from the show isakmp counter=ipsec command	45-136
45-30	Example output from the show isakmp counter=main command	45-137
45-31	Example output from the show isakmp counter=network command	45-140
45-32	Example output from the show isakmp counter=quick command	45-142
45-33	Example output from the show isakmp counter=sad command	45-147
45-34	Example output from the show isakmp counter=spd command	45-147
45-35	Example output from the show isakmp counter=transaction command	45-148
45-36	Example output from the show isakmp counter=xde command	45-150
45-37	Example output from the show isakmp exchange command	45-151
45-38	Example output from the show isakmp exchange command for a specific exchange in Main mode.	45-154
45-39	Example output from the show isakmp policy command	45-159
45-40	Example output from the show isakmp policy command for a specific policy.	45-160
45-41	Example output from the show isakmp sa command	45-163
45-42	Example output from the show isakmp sa command for a specific SA.	45-164
45-43	Example output from the show sa command	45-167
45-44	Example output from the show sa command for a specific security association.	45-168
45-45	Example output from the show sa counter command	45-170
45-46	Example output from the show sa counter command for a specific security association.	45-173
45-47	Example output from the show sa user command	45-175
46-1	Example output from the show pki command	46-29
46-3	Example output from the show pki certificate command	46-36
46-5	Example output from the show pki crl command	46-39
46-7	Example output from the show pki enrollmentrequest command	46-42
46-8	Example output from the show pki enrollmentrequest=name command	46-42
46-9	Example output from the show pki keyupdaterequest command	46-44
46-10	Example output from the show pki keyupdaterequest=name command	46-44
46-11	Example output from the show pki ldaprepository command	46-45
47-1	Example output from the show vrrp command	47-22

48-1	Two routers and one OSI area.....	48-8
48-2	Three virtual routers and three OSI areas.....	48-10
48-3	Example output from the show cns command.....	48-28
48-5	Example output from the show cns area command.....	48-30
48-6	Example output from the show cns circuit command.....	48-31
48-7	Example output from the show cns circuit command when no circuit value is specified.....	48-33
48-8	Example output from the show cns circuit counters command.....	48-34
48-9	Example output from the show cns counters command.....	48-36
48-10	Example output from the show cns detail command.....	48-37
48-11	Example output from the show cns ra command.....	48-39
49-5	Multi-homing to a single ISP.....	49-10
49-7	The structure of a route map.....	49-13
49-10	Example of a simple BGP-4 configuration.....	49-39
49-11	Example output from the show bgp command.....	49-111
49-12	Example output from the show bgp aggregate command.....	49-113
49-13	Example output from the show bgp confederation command.....	49-114
49-14	Example output of the show bgp backoff command.....	49-115
49-15	Example output from the show bgp import command.....	49-117
49-16	Example output of the show bgp memlimit command.....	49-118
49-17	Example output of the show bgp memlimit scan command.....	49-119
49-18	Example output from the show bgp network command.....	49-121
49-21	Example output from the show bgp peertemplate command.....	49-127
49-23	Example output from the show ip aspathlist command.....	49-131
49-24	Example output from the show ip communitylist command.....	49-132
49-25	Example summary output from the show ip prefixlist command.....	49-133
49-27	Example output from the show ip routemap command.....	49-135
50-1	Basic Server Load Balancing Operation.....	50-4
50-2	Route-Based Load Balancing with Firewalls.....	50-6
50-3	Basic HTTP Virtual Balancing.....	50-7
50-4	HTTP Load Balancing with SSL connection.....	50-9
50-5	Load Balancer Redundancy.....	50-10
50-6	Example configuration for a TCP virtual balancer.....	50-17
50-7	Example output from the show loadbalancer command.....	50-43
50-8	Example output from the show loadbalancer affinity command.....	50-45
50-9	Example output from the show loadbalancer connections command.....	50-46
50-10	Example output from the show lb redundancy command.....	50-47
50-11	Example output from the show loadbalancer resource command.....	50-49
50-12	Example detailed output of the show loadbalancer resource command.....	50-50
50-13	Example general output from the show loadbalancer respool command.....	50-51
50-14	Example detailed output from the show loadbalancer respool command.....	50-52
50-15	Example general output from the show loadbalancer virtualbalancer command.....	50-53
50-16	Example detailed output from the show loadbalancer virtualbalancer command.....	50-54
51-1	SSL Handshake Exchange.....	51-4
51-2	Example output from the show ssl command.....	51-10
51-3	Example output from the show ssl counters command.....	51-12
52-1	VoIP PIC Scenarios.....	52-4
52-2	H.323 components.....	52-8
52-3	Relationships between H.323 components.....	52-11
52-4	SIP operation.....	52-16
52-5	Example output of firmware download process.....	52-20
52-9	Example output from the show h323 command.....	52-51
52-11	Example output from the show h323 gateway command.....	52-53
52-12	Example output from the show sip command.....	52-54
52-13	Example output from the show sip gateway command.....	52-55
52-15	Example output from the show voip ap command.....	52-57

52-18	Example output from the show voip load command.....	52-62
52-19	Example output from the show voip phone command	52-63
A-1	Message number format.....	A-3

