



# Enterprise OS Software Version 11.4 Release Notes

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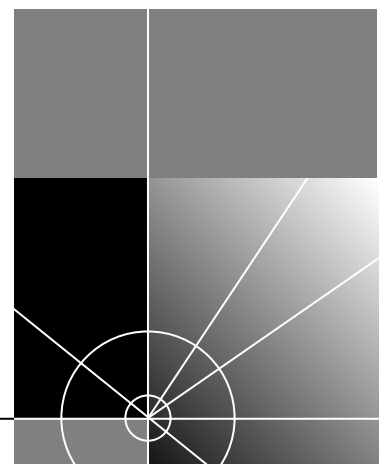
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Additionally, all documentation for Enterprise OS software version 11.4 is located on the 3Com website:

<http://infodeli.3com.com/infodeli/tools/bridrout/index.htm>

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# CONTENTS

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## ENTERPRISE OS SOFTWARE VERSION 11.4 RELEASE NOTES

|  |    |
|--|----|
| Encryption Packages Notice                                       | 7  |
| Supported Platforms  | 8  |
| OfficeConnect NETBuilder and SuperStack II NETBuilder SI Release | 9  |
| Platforms Not Supported  | 9  |
| New Features and Feature Enhancements                            | 9  |
| JAVA Runtime Environment   | 9  |
| VPN and Security Features  | 9  |
| Routing Support Features   | 11 |
| Traffic Shaping & QoS Features                                   | 14 |
| Dial Service Features  | 17 |
| Voice & Multiservice Features                                    | 17 |
| Network Management Features                                      | 18 |
| Transcend VPN Application Suite                                  | 21 |
| 11.4 Software Packages   | 23 |
| NETBuilder II Bridge/Router                                      | 23 |
| SuperStack II NETBuilder SI                                      | 26 |
| PathBuilder S5xx Series Switch                                   | 29 |
| PathBuilder S400 Series Switches                                 | 32 |
| OfficeConnect NETBuilder Bridge/Routers                          | 34 |
| OfficeConnect NETBuilder 10/ST                                   | 37 |
| SuperStack II NETBuilder Token Ring                              | 40 |
| Upgrade Management Utilities                                     | 43 |
| Downloading Upgrade Management Utilities                         | 43 |
| UNIX Files   | 43 |
| Windows Files  | 43 |
| Executing profile.bat  | 44 |
| Version 11.4 Upgrade Management Utilities                        | 44 |
| Upgrading to 11.4 Utilities with Transcend Upgrade Manager       | 44 |
| Transcend Enterprise Manager                                     | 44 |
| Upgrade Management Notes   | 45 |
| bcmdiagnose Error Message  | 45 |
| SuperStack II NETBuilder Token Ring Upgrades                     | 45 |
| bcmdiagnose and HP-UX  | 45 |
| bcmfdinteg   | 45 |
| File Conversion Considerations                                   | 46 |
| UNIX Platform Symbolic Links                                     | 46 |
| Upgrading From Release 8.3 or Earlier                            | 46 |

|   |    |
|---|----|
| Upgrade Link and Netscape Browser Scroll Bars                     | 46 |
| Upgrade Link Window Resizing                                      | 47 |
| IBM Protocols and Services Notes                                  | 47 |
| APPN  | 47 |
| APPN Connections to 3174 through Token Ring                       | 47 |
| APPN CP-CP Sessions and SNA Boundary Routing                      | 47 |
| APPN CP-CP Sessions on Parallel TGs                               | 47 |
| APPN DLUr Connections to 3174 Systems                             | 47 |
| BSC and Leased Lines  | 47 |
| Boundary Routing and NetView Service Point                        | 48 |
| Configuring BSC and NCPs  | 48 |
| DLSw Circuit Balancing  | 48 |
| DLSw and CONNectUsage Parameter Default Change                    | 48 |
| DLSw Prioritization   | 48 |
| DLSw and IBM Boundary Routing in Large Networks                   | 48 |
| Front-End Processor/Frame Relay Access for LLC2 Traffic           | 49 |
| HPR and ISR Configurations  | 49 |
| IBM Boundary Routing Topology Disaster Recovery                   | 49 |
| IBM-Related Services in Token Ring                                | 50 |
| LAN Network Manager with NETBuilder II Systems                    | 51 |
| LLC2 Frames and PPP   | 52 |
| Maximum BSC Line Speed  | 52 |
| SHDLC Half-Duplex Mode  | 52 |
| SDLC  | 52 |
| SDLC Adjacent Link Stations for APPN                              | 52 |
| Source Route Transparent Bridging Gateway (SRTG) Interoperability | 52 |
| SDLC Ports and NetView Service Point                              | 52 |
| UI Response Time With Large SDLC configuration                    | 52 |
| VTAM Program Temporary Fixes                                      | 52 |
| ATM Services Notes  | 53 |
| ATM Emulated LANs   | 53 |
| ATM LAN Emulation Clients and Large 802.3 Frames                  | 53 |
| ATM Connection Table  | 53 |
| Deleting ATM Neighbors  | 53 |
| Source-Route Transparent Gateway                                  | 53 |
| WAN Protocols and Services Notes                                  | 53 |
| ACCM Not Configurable   | 53 |
| Asynch Tunnelling on Serial Ports                                 | 53 |
| Automatic Line Detection  | 53 |
| Auto Start-up Does Not Include Async                              | 54 |
| Bandwidth-on-Demand Timer Precedence                              | 54 |
| Baud Rates for WAN Ports in DCE Mode                              | 54 |
| BSC Cabling and Clocking  | 54 |
| Changing the Transfer Mode Parameter Default Value                | 54 |
| Compression Requirements  | 54 |
| Dial Idle Timer   | 55 |
| Disaster Recovery on Ports Without Leased Lines                   | 55 |

|   |    |
|---|----|
| DTR Modems  | 55 |
| Dynamic Paths   | 55 |
| Frame Relay Congestion Control                              | 55 |
| History-Based Compression Negotiation Failure               | 55 |
| History Compression Not Allowed With Async PPP              | 55 |
| Multilink PPP Configurations                                | 55 |
| SPID Wizard Detection Errors                                | 56 |
| STP AutoMode Does Not Select the Right Mode                 | 56 |
| Supported Modems  | 56 |
| Routing Protocols and Services Notes                        | 56 |
| BGP Configuration Files                                     | 56 |
| CPU Utilization with XNS Protocol                           | 57 |
| IPX to Non-IPX Configuration Error                          | 57 |
| IPX Routing, Route Receive and Route Advertisement Policies | 57 |
| Managing IP Address Assignment                              | 57 |
| NAT Service - Many to One Outbound Translation              | 57 |
| NAT Service - TCP/UDP Port Mappings                         | 57 |
| OSPF Route Advertisement                                    | 57 |
| PIM-Sparse Mode   | 57 |
| PIM-SM Enterprise OS/Cisco Incompatibility                  | 57 |
| PIM-SM Register Checksum Formats                            | 57 |
| PM-SM Not Supported Over NBMA Media                         | 58 |
| RouteDiscovery  | 58 |
| VRRP Configuration  | 58 |
| Network Management System and Services Notes                | 58 |
| ASCII Boot  | 58 |
| Boot Cycle Continuous Loop                                  | 58 |
| BootP Server and Autostartup                                | 58 |
| Bootptab File   | 58 |
| Capturing Commands to boot.cfg File                         | 59 |
| Change Configuration and Diagnostic Menu                    | 59 |
| CPU Utilization Statistic                                   | 59 |
| File System Error   | 59 |
| Firmware Configuration                                      | 59 |
| Firmware Update   | 59 |
| IP Quality of Service Bandwidth                             | 59 |
| IP Quality of Service Configuration                         | 59 |
| Multiple Paths to BootP Server                              | 59 |
| Remote Access Default Change                                | 60 |
| Scheduler RunOnBootFail Completion                          | 60 |
| V.25bis Modem Setup   | 60 |
| Web Link Documentation Path                                 | 60 |
| Web Link Login Support                                      | 60 |
| Zmodem Time Out   | 60 |
| VPN Protocols and Services Notes                            | 60 |
| ACE Security Server   | 60 |
| Total Control Security and Accounting Server Availability   | 60 |
| Microsoft MPPE Patches and Updates                          | 61 |

|   |    |
|---|----|
| PKI: Entrust CA Installation Notes  | 61 |
| PPTP Tunnel Security Validation   | 62 |
| RSA Signature for Phase 1 Authentication  | 62 |
| Windows NT MS-CHAP Authentication   | 62 |
| Platform Notes  | 63 |
| OfficeConnect NETBuilder and SuperStack II NETBuilder SI Additional Memory Requirements | 63 |
| Approved DRAM SIMMs   | 63 |
| Supported PC Flash Memory Cards   | 64 |
| Line Error Reporting on PathBuilder S5xx Series Switch Statistics Display               | 64 |
| T3 Bandwidth Limitation   | 64 |
| MBRI Ownership During Board Swapping  | 64 |
| Multiport MBRI Module SNMP Management   | 64 |
| Token Ring+ Modules   | 64 |
| Token Ring Auto Start-up  | 64 |



# ENTERPRISE OS SOFTWARE VERSION 11.4 RELEASE NOTES

These release notes provide information on the following topics for Enterprise OS software version 11.4:

- Encryption Packages Notice
- Supported Platforms
- Platforms Not Supported
- New Features and Feature Enhancements
- 11.4 Software Packages
- Upgrade Management Utilities
- Upgrade Management Notes
- IBM Protocols and Services Notes
- ATM Services Notes
- WAN Protocols and Services Notes
- Routing Protocols and Services Notes
- Network Management System and Services Notes
- VPN Protocols and Services Notes
- Platform Notes

If you have questions about the software, the guides, or these release notes, contact 3Com or your network supplier.

For information on the command syntax used in these release notes, see "About This Guide" in *Using Enterprise OS Software*.

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## Encryption Packages Notice



***The Enterprise OS software version 11.4 may contain strong data encryption that cannot be exported outside the United States or Canada. It is unlawful to export/re-export or transfer, either physically or electronically, the encryption software or accompanying documentation (or copies thereof) or any product(s) utilizing the encryption software or such documentation without obtaining written authorization from the US Department of Commerce.***



***Do not place Enterprise OS version 11.4 packages with encryption on networks or servers that are accessible to users outside of the U.S. and Canada.***

Software packages with encryption include the following:

- PathBuilder™ S5xx series switch

- Multiprotocol Router with 40-bit Encryption (PL)
- Multiprotocol Router with 56-bit Encryption (PE)
- Multiprotocol Router with 128-bit Encryption with 3DES (PS)
- PathBuilder S400 switch
  - Multiprotocol Router with 40-bit Encryption (ML)
  - Multiprotocol Router with 56-bit Encryption (ME)
  - Multiprotocol Router with 128-bit Encryption with 3DES (MS)
  - IP/IPX/AT Router with 40- and 56-bit Encryption (XE)
  - IP/IPX/AT Router with 128-bit Encryption with 3DES (XS)
- NETBuilder II®
  - Multiprotocol Router with 40-bit Encryption (DL)
  - Multiprotocol Router with 56-bit Encryption (DE)
  - Multiprotocol Router with 128-bit Encryption with 3DES (DS)
- SuperStack® II NETBuilder® SI
  - IP/IPX/AT Router with 40- and 56-bit Encryption (NE) (SI model)
  - IP/IPX/AT Router with 128-bit Encryption with 3DES (NS) (SI model)
  - Multiprotocol Router with 40-bit Encryption (CL) (SI model)
  - Multiprotocol Router with 56-bit Encryption (CE) (SI model)
  - Multiprotocol Router with 128-bit Encryption with 3DES (CS) (SI model)
- SuperStack II NETBuilder
  - Multiprotocol Router with 56-bit Encryption (TE) (Token Ring models 327 and 527)
- OfficeConnect® NETBuilder
  - IP/IPX Router (JW)
  - IP/IPX Router with 56-bit Encryption (JE)
  - IP/IPX Router with 128-bit Encryption with 3DES (JS)
  - IP/IPX/AT Router with 40- and 56-bit Encryption (NE)
  - IP/IPX/AT Router with 128-bit Encryption with 3DES (NS)
  - Multiprotocol Router with 56-bit Encryption (OE)
  - Multiprotocol Router with 128-bit Encryption with 3DES (OS)
- OfficeConnect 10 NETBuilder
  - Router (RW)
  - Router with 56-bit Encryption (RE)
  - Router with 128-bit Encryption with 3DES (RS)

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## Supported Platforms

Enterprise OS software version 11.4 is available for the following platforms:

- NETBuilder II
- SuperStack II NETBuilder models 327 and 527
- SuperStack II NETBuilder SI models 43x, 44x, 45x, 46x, 53x, 54x, 55x, and 56x
- OfficeConnect NETBuilder models 11x, 12x (K and T variants), 13x, 14x (U and ST variants) and 10/ST



- PathBuilder S5xx series switch models S500, S580, S593, S594, S598 and S599
- PathBuilder S400

### **OfficeConnect NETBuilder and SuperStack II NETBuilder SI Release**

Due to increased memory requirements, the OfficeConnect NETBuilder and SuperStack II NETBuilder SI will be released after the general release of Enterprise OS Software version 11.4. The general release will include support for the following platforms: NETBuilder II, SuperStack II NETBuilder Token Ring, PathBuilder S50x, S58x, S59x, and PathBuilder S400 devices. Watch for special release announcements for the OfficeConnect NETBuilder and SuperStack II NETBuilder SI devices.

See "OfficeConnect NETBuilder and SuperStack II NETBuilder SI Additional Memory Requirements" on page 63 for details about memory requirements for the OfficeConnect NETBuilder and SuperStack II NETBuilder SI devices.

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### **Platforms Not Supported**

The Enterprise OS software version 11.4 does not support the following bridge/routers:

- Model 227 SuperStack II NETBuilder Router (Ethernet)
- Model 427 SuperStack II NETBuilder Router (Ethernet, ISDN)
- Model 120 OfficeConnect NETBuilder (FRAD)
- Model S574 and S578 PathBuilder Switch

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### **New Features and Feature Enhancements**

Enterprise OS is the system software that operates within the NETBuilder and PathBuilder WAN products. Enterprise OS devices supported by this release include the NETBuilder II, SuperStack II NETBuilder, OfficeConnect NETBuilder bridge/router, PathBuilder S5xx tunnel switch (models S500, S580, S593, S590, S594, S598, S599), and the PathBuilder S400 WAN convergence switch.

This section highlights the new features and enhancements contained within Enterprise OS software version 11.4.

#### **JAVA Runtime Environment**

With 3Com Enterprise OS software version 11.4, in the /tools/jre subdirectory is the MS Windows 95/98/NT version of JRE (Java Runtime Environment) written by Sun Microsystems. This JRE archive file is a self-extracting executable that contains the Java virtual machine, runtime class libraries, and Java application launcher that are necessary to run programs written in the Java programming language. The JRE is needed to run the following Enterprise OS applications:

- Voice Wizard in Web Link (embedded web interface) on the PathBuilder S400 devices
- PKI Manager (part of the Transcend VPN Application Suite)

For more information or to download the UNIX version, see Sun's website: <http://java.sun.com/products/jdk/1.2/runtime.html>

#### **VPN and Security Features**

VPN and Security features provide Public-Key Infrastructure, Non-Broadcast, Multi-Access (NHRP) for VPN Tunnels, IP Payload Compression Protocol (IPComp), and Tunnel Switching Between Different Tunnel Types.

## Public-Key Infrastructure (PKI) Implementation

Applications like IP Security (IPsec) and Internet Key Exchange (IKE) employ public-key technology for such security purposes as identifying oneself to remote entities, verifying a remote entity's identity, or initiating secure communications with remote peers. Such applications require a public-key infrastructure (PKI) to securely manage public keys for widely-distributed users or systems. The implementation of PKI is based on the X.509 standard.

New also is PKI Manager, a graphical management application to aid Enterprise OS devices in obtaining PKI certificates and Certificate Revocation Lists (CRLs) from various Certificate Authorities (CAs). PKI Manager works as a proxy between the device and the CA. It is responsible for collecting the certificate requests from the devices and generating the CA-specific certificate request syntax (CRS), which in turn is sent to the CA. After the CA issues the certificate, PKI Manager retrieves it from the CA and send it to the Enterprise OS device. The CAs that are supported with this first release are Verisign and Entrust. The application is currently supported only on Windows NT. See the "Transcend VPN Application Suite" section of this release note for more information.

## Non-Broadcast, Multi-Access (NHRP) for VPN Tunnels

With the Non-Broadcast, Multi-Access (NBMA) characteristics of a Point-To-Multi-Point (P2MP) VPN tunnel (also called IP-Over-IP tunnel), an IP packet must be forwarded via a routed tunnel path. These tunnel paths must be configured statically between each pair of neighbors. All VPN traffic is allowed to flow only through the configured neighboring paths. This makes routing inefficient since data forwarding may not always be using the best route with the shortest hops. To solve this, the user would have to go to the trouble of configuring a fully-meshed VPN so packets could be forwarded with one hop.

With the Next Hop Resolution Protocol (NHRP) implemented in 11.4, tunnels are now established dynamically. NHRP enhances the Point-To-Multi-Point (P2MP) VPN tunnel by eliminating the need to statically configure each and every end-point virtual port on the device. NHRP resolves the next hop when forwarding data through tunnels. The Enterprise OS device will "automatically" discover its short cut path for routing, without having to manually configure every neighboring path.

## IP Payload Compression Protocol (IPComp or IPPCP)

Enterprise OS software supports data compression to ease bandwidth problems. However, in previous software releases the compression mechanism was not effective when a data stream was encrypted at layer 3. With 11.4, by using IP Payload Compression Protocol (IPComp), RFC 2393, to first reduce the size of the IP datagram by compressing the data, then performing encryption, the size of IP datagrams has been reduced. This is extremely useful when IPsec encryption is applied to IP datagrams, since compression of outbound IP datagrams is done before any IP security processing, and the decompression of inbound IP datagrams is applied after the completion of all IP security processing. Only dynamic negotiations of the IPComp Association (IPCA) via IKE and one compression algorithm (LZS) is supported for 11.4. Any negotiation of IPComp is always combined with a negotiation of ESP, AH, or both.

## Tunnel Switching Between Different Tunnel Types

So that tunnel switching between two sessions of different tunnel types can be easily implemented and maintained, Enterprise OS software version 11.4 has been re-structured to support tunnel switching from PPP over Ethernet (PPPoE) to PPTP, and from PPPoE to L2TP. Users can now dial-in through a PPPoE tunnel and “switch out” through a PPTP or L2TP tunnel. This enables the Enterprise OS device to have the flexibility of switching between tunnels of different tunnel types.

## Routing Support Features

Routing support features include OSPF External Route Aggregation, Protocol Independent Multicast-Sparse Mode (PIM-SM), Multicast Border Router (MBR), IGMPv2 Enhancements, PPP over Ethernet (PPPoE), Virtual Router Redundancy Protocol (VRRP) for ATM Ethernet LAN Emulation, Virtual Router Redundancy Protocol (VRRP) for Virtual LAN (VLAN), Many-to-One NAT Enhancement, BGP-4 & IPv6 added to multiprotocol packages for OfficeConnect NETBuilder and SuperStack II NETBuilder SI, PathBuilder S400 devices, and RSVP and RSVP Proxy added to software packages for OfficeConnect NETBuilder and SuperStack II NETBuilder SI and PathBuilder S400 devices.

### OSPF External Route Aggregation

With OSPF, the user can import routes from external routing sources (for example, BGP, RIP, static routes, and directly connected networks). These imported routes become OSPF external routes. In some networks, the number of external routes to be advertised can cause traffic congestion on the backbone and subsequently to all areas.

Because version 11.4 aggregates the type5 external routes, the user can define external route ranges. With user-defined external route ranges, if the external route is within the defined range, only then will the network be advertised. This reduces the number of external routes advertised in the backbone and regular areas.

### Protocol Independent Multicast-Sparse Mode (PIM-SM)

The periodic broadcasting of information by DVMRP and MOSPF to identify the location of interested receivers for a specific multicast session is only useful in networks where bandwidth is plentiful or when there is a large number of senders and receivers for a multicast session. When senders and receivers to multicast sessions are distributed sparsely across a wide area such schemes are not efficient. They waste bandwidth on expensive WAN links and require the maintenance of “routing-state” on routers that are not on the forwarding tree for the multicast session. Protocol Independent Multicast-Sparse Mode (PIM-SM), implemented in 11.4, is an intra-domain multicast routing protocol designed to resolve some of the inadequacies with these other multicast protocols.

PIM-SM is “protocol independent” in that it can work with any unicast routing protocol. It builds a per-group (or per multicast session) shared multicast distribution tree centered at a rendezvous point, and requires receivers to explicitly join to this shared distribution tree prior to receiving data traffic. Since a “shared-tree” mechanism could result in suboptimal paths for data traffic from a source to the receivers of a multicast session, PIM-SM also supports the ability to switch to a source specific distribution tree if the data traffic warrants it. The implementation of PIM-SM supports IPv4 in this release (IPv6 is not supported in this release).

### **Multicast Border Router (MBR)**

To allow sources and receivers inside multiple autonomous multicast routing domains (each running a different multicast routing protocol -- DVMRP, MOSPF, or PIM-SM) to communicate, the regions must be connected by multicast border routers (MBRs). The primary role of the MBR is to pull down the traffic from one domain to the another domain. This MBR functionality is implemented in the Enterprise OS device to allow the efficient interoperation among independent multicast routing protocols. A common forwarding cache to forward the multicast data packets has been implemented. MBR makes it easier to have a unified forwarding table for multicast data traffic. The multicast routing protocols will maintain protocol specific routing states and create forwarding entries in the unified forwarding table for multicast traffic.

### **IGMPv2 Enhancements**

Adding to the IGMPv1 support, 11.4 will be adding support for IGMPv2 (RFC 2236). Feature enhancements include the following:

- Allowing a host to inform a multicast router when it no longer wants to receive traffic for a given multicast group.
- Defines a new procedure for electing the multicast querier on a LAN; the multicast router with the lowest IP address is always chosen as the querier.
- Defines a new type of Query message, called the Group-Specific Query. This type of message allows a router to transmit a query to a specific multicast group rather than all groups that reside on a directly attached subnet.

### **PPP over Ethernet (PPPoE)**

With 11.4, PPP over Ethernet (PPPoE) is available to offer a seamless integration of broadband access technology into the existing infrastructure and operational model of remote access. As specified in the informational RFC 2516, PPPoE encapsulates PPP packets over Ethernet. It is intended for use by a host PC to interact with a broadband modem (e.g. xDSL, cable, and wireless access devices) to achieve access to high-speed data networks. The PPPoE offering is targeted at Carriers, ISPs, and NSPs with an ATM backbone for use in a VPN environment for broadband access.

Ethernet is the most proven, familiar, and cost effective LAN technology that exists today. PPP is the most popular dial-up transport, created to define negotiating connectivity parameters, authenticate users, dynamically assign IP addresses, and support multiprotocol environments. In a remote dial-up environment, besides the traditional analog and ISDN modems, there are server other high-speed, broadband CPEs being rapidly deployed (for example, xDSL, cable, and wireless access devices). All high-speed, broadband access equipment requires end users to be knowledgeable in their technologies, connectivity, and configuration characteristics. With PPPoE, much of the complexity of these broadband devices is hidden from the user. In addition to ease of configuration and use for the end user, PPPoE also simplifies provisioning, installation, and management for the service provider.

Advantages of PPPoE:

- Supports multiple hosts and users across a dedicated broadband connection and a single ATM or Frame Relay PVC with the same Ethernet infrastructure.

- Provides end users with ease of installation and configuration; no special configuration of the PC or modem is needed.
- Provides services providers with ease of provisioning, services, and management.
- Operates independent of access device (that is, works for xDSL, cable, or wireless devices) which shields end users from the need to learn complicated technologies (for example, ATM).
- Preserves the applications that have been built around Microsoft Windows Dial-Up Networking (DUN). A simple PPPoE client driver is used with an interface and functionality familiar to the user.

### **Virtual Router Redundancy Protocol (VRRP) for ATM Ethernet LAN Emulation**

In addition to supporting Virtual Router Redundancy Protocol (VRRP) on Enterprise OS platforms with Ethernet, Fiber Distributed Data Interface (FDDI), and Token Ring interfaces, 11.4 now supports ATM Ethernet LAN Emulation (ATM LANE).

LANE operates by maintaining a set of mappings from MAC addresses to ATM addresses. When running VRRP on a LANE network, the LANE protocol must be notified when a new master router is elected so that it can update the MAC address to ATM address mapping within the ELAN for the virtual router's MAC address. In essence, while running VRRP over LANE, a virtual MAC address may change location from one LEC to another.

For more information regarding VRRP, consult the Internet Drafts for VRRP (draft-ietf-vrrp-spec-v2-03.txt) and VRRP Operation over ATM LAN Emulation (draft-ietf-vrrp-lane-01.txt).

### **Virtual Router Redundancy Protocol (VRRP) for Virtual LAN (VLAN)**

In addition to supporting Virtual Router Redundancy Protocol (VRRP) over a physical LAN, with 11.4 comes support for VRRP for the Virtual LAN (VLAN).

A VLAN can be seen as a group of end-stations, perhaps on multiple physical LAN segments that are not constrained by their physical location and can communicate as if they were on a common LAN. With VRRP for VLAN, network operation is ensured since dynamic responsibility for a virtual router is transmitted to one of the VRRP routers on a VLAN.

When VRRP is used over a physical LAN, an owner of the Virtual Router ID (VRID) may change the MAC address to the Virtual MAC (VMAC) address without transitioning to promiscuous mode. For the VLAN implementation, when a VRRP router becomes the master (the router that is forwarding the virtual IP packets), the VLAN interface will always be in promiscuous mode.

### **Many-to-One NAT Enhancement**

When executing large file transfers with a block size that is greater than the underlying media can handle, IP will fragment the UDP packet. Since only the first fragment contains the UDP header (which indicates the source and destination port required by NAT to map to a NAT IP address), the subsequent fragmented packets do not contain the UDP header. This results in NAT not having the UDP ports to map to the NAT IP address. In previous releases, this condition would

occur during, for example, TFTP file transfers using Large Blocksize Negotiation (RFC 1783).

Each fragmented packet contains an IP Identification (ID) number that is used for re-assembly. When the first fragment arrives, the ID is stored in the NAT session that has already been setup for the TFTP file transfer, so when subsequent fragments arrive with no UDP header, a search is made for the session by ID and the relevant IP address. After the session is found, the destination and source ports are known and NAT can translate.

#### **BGP-4 & IPv6 added to Multiprotocol Packages for OfficeConnect NETBuilder & SuperStack II NETBuilder SI & PathBuilder S400 devices**

Previously, BGP-4 & IPv6 was available only on the NETBuilder II and PathBuilder S5xx devices. Starting with 11.4, BGP-4 and IPv6 are supported on the OfficeConnect NETBuilder and SuperStack II NETBuilder SI (Ethernet only) bridge/routers, as well as on the PathBuilder S400 WAN convergence switch. BGP-4 and IPv6 will be available only on the multiprotocol packages for these platforms.

#### **RSVP & RSVP Proxy added to Software Packages for OfficeConnect NETBuilder & SuperStack II NETBuilder SI & PathBuilder S400 devices**

Previously, RSVP was available only on the NETBuilder II and PathBuilder S5xx devices. Starting with 11.4, RSVP and RSVP Proxy are supported on the OfficeConnect NETBuilder and SuperStack II NETBuilder SI (Ethernet only) bridge/routers, as well as on the PathBuilder S400 WAN convergence Switch.

### **Traffic Shaping & QoS Features**

Traffic shaping and Quality of Service (QoS) features include Bandwidth on Demand with Incoming Traffic, and IP Quality of Service (IPQoS).

#### **Bandwidth on Demand with Incoming Traffic**

Bandwidth on Demand is a facility that provides supplementary bandwidth above the normal bandwidth levels specified by the user whenever traffic congestion is detected. In previous releases, only the transmitted traffic load was used to control this feature; with the 11.4 release, incoming traffic is also monitored. The need to monitor incoming traffic for Bandwidth on Demand appears in such situations as when a router that is connected to an ISP downloads a web-page. The incoming traffic bandwidth consumption would be high; it would be desirable at this point to add more bandwidth to accommodate the desired burst in traffic.

#### **IP Quality of Service (IPQoS)**

With the enormous growth in network traffic, robust QoS is required to ensure mission-critical and real-time application traffic will get adequate network resources to traverse the network regardless of the competing demands for bandwidth by other applications.

Policy-based QoS management will enable network managers to control bandwidth allocation and service levels on IP traffic flows. Traffic flows can be metered and policed on a per policy base to ensure its bandwidth consumption does not exceed the defined rate limits. When multiple flows are aggregated into a service class, *rate limiting* protects conforming flows from the aggressive flows hogging network resources that may lead to a denial of service. Flows can also be policed to ensure correct marking of the IP/TOS-byte in the IP header as per policy.

Given the scalability problems associated with RSVP, the emerging IETF standard for scalable end-to-end QoS—IP Differentiated Service is supported. Incoming traffic flows can be classified into service classes for each defined QoS policy with the routers providing the service level that corresponds to the Differentiated Services Code Point (DSCP), bits 0-5 in the TOS-byte, via the Class-Based Queue (CBQ) packet scheduler and Random Early Detection (RED) congestion avoidance mechanisms. These queue management policies will only be supported over the slower FR and PPP WAN links.

Brief descriptions of additional QoS features are listed below. For further information on IPQoS, consult RFC 2474 (Definition of Differentiated Service Field in IP Headers) and RFC 2309 (Recommendations on Queue Management & Congestion Avoidance in the Internet).

#### ■ Policy-based QoS Management

Flexible QoS control is configured via the IPQoS Service as port specific policies. QoS policies can be applied to the inbound traffic at the ingress port and/or the outbound traffic at the egress port. QoS policies are associated with flows.

Policies are stored in the user-defined precedence order in the QoS policy database. The policy action associated with the first matching policy found for the packet will be applied. Flow can be defined as either an aggregated flow or a specific application flow between two end systems. Flows are classified via the generic packet classification service provided by IP.

A network manager can define the following types of QoS policy:

- Bandwidth control - If rate limiting is specified in a QoS policy, the associated traffic flow will be metered and policed. Rate limiting can be applied to traffic transmitted or received on an interface. User may also define actions, such as forward/discard/remark TOS-byte, to handle traffic that conforms to or exceeds the rate limit.
  - TOS control - TOS can be set to a specified TOS value. This allows incoming packets to be classified into a small number of DSCP-based classes. TOS-byte can also be remarked for forwarding to another administration domain with a different IP/TOS convention.
  - Service class control - A specific service class can be assigned to a flow independent of the DSCP value in the TOS byte. By default, the 6-bit DSCP value is mapped into a CBQ service class at the outgoing WAN port.
  - Traffic redirect - traffic can be redirected at the ingress port.
- IEEE 802.1P Prioritization

When the ingress port is connected to a VLAN-aware switch that does the layer-2 packet classification and 802.1P user priority support is enabled on the ingress VLAN port, the 802.1P user priority of the incoming IP packet will determine the IP/TOS value based on the default or user-configured mapping.

When the egress port is connected to a layer-2 VLAN-aware switch that **does not** support packet classification and 802.1P support is enabled on the egress VLAN port, the IP/TOS value will determine the 802.1P priority of the outgoing packet based on the default or user-configured mapping

IP traffic can also be classified via a QoS policy to be tagged with a specific 802.1P priority.

- Class-Based Queuing (CBQ) Management

Class-Based Queuing (CBQ) is a link-sharing packet scheduler which is an enhanced version of the existing Protocol Reservation queuing policy. It performs priority scheduling and supports specific traffic class characteristics, such as the average transfer rate. It supports a hierarchy of service classes, each associated with a set of QoS attributes (such as, average rate, priority, and max delay) and a packet queue to hold packets marked for the service class.

CBQ provides weighted (based on the allocated bandwidth) round robin scheduling when the class is not congested, but switches to the link sharing mode during periods of congestion. It regulates each class queue to its allocated bandwidth, but allows a congested class to borrow bandwidth from its under-utilized parent class.

When a class queue builds up due to packet arriving at higher rate than the class's allocated bandwidth, CBQ employs a packet drop policy to manage the queue length/latency. By default, the simple "tail drop" is invoked to discard the most recently arrived packet for the congested queue/class. The more effective RED dropper can also be optionally enabled on a CBQ class queue.

CBQ also supports traffic prioritization. Higher priority classes are serviced first, classes with the same priority are then serviced based on weighted round robin. Borrowing is allowed only if a class is configured to allow borrowing from its parents.

The network manager may define any number of CBQ classes. Policies can be defined that map the DSCP in the TOS-byte to a specific service class to provide the desired QoS. Initial RSVP support will restrict RSVP flows to the well-known "RSVP" service class.

Given the significant per packet overhead, CBQ does not scale well with multi-level class hierarchies and would perform best with a small number of classes in a shallow tree structure on lower speed WAN links.

CBQ will be supported on PPP/FR ports only.

- RED Congestion Avoidance

Random Early Discard (RED) actively manages the queue size by dropping arriving packets using probability as follows. The probability of packet drops increases as the estimated average queue size grows. The average queue size is computed using a simple exponentially weighted moving average estimator. RED starts dropping arriving packets when the queue size exceeds the defined minimum threshold (in number of packets), and the drop probability increases linearly with the queue size until the defined maximum threshold (in number of packets) is reached - at which point all arriving packets are dropped.

Weighted Random Early Discard (WRED) implements an additional drop-precedence based preferential discard mechanism. The drop-precedence value is used to determine the minimum and maximum thresholds—such that packets tagged with a higher drop-precedence value has a higher drop probability. The drop-precedence value is determined by the amount of traffic in excess of the rate limit.

RED congestion avoidance scheme actively manages the queue length to efficiently reduce both packet drops and queue latency, resulting in lower delay and better service. The random packet drop also effectively breaks up the traffic synchronization due to TCP's "slow start than speed up" behavior, which



may cause some flows to be locked out of bandwidth if a simple tail drop is employed when the queue becomes full. However, RED works well only with compliant TCP implementations that backs off when network congestion is detected. It has no effect on non-IP or UDP traffic.

RED is supported on CBQ class queues only.

**Dial Service Features** Dial service features include increased asynchronous baud rate for the all Enterprise OS platforms.

In releases prior to 11.3, the maximum baud rate for asynchronous ports was 57.6 kbps. With the 11.3 release, the maximum baud rate has been increased to 115.2 kbps only for the OfficeConnect NETBuilder platform. With the 11.4 release, this feature is expanded to support all other platforms with FlexWAN interfaces. This includes the NETBuilder II with the 4-port HSS module, SuperStack II NETBuilder SI, PathBuilder S5xx, and PathBuilder S400 devices.

**Voice & Multiservice Features** Voice and multiservice features include voice over Frame Relay, and voice over VPN. These features are currently available on the PathBuilder S400 platform only.

#### **Voice Over Frame Relay (VoFR)**

With Frame Relay already providing a flexible and efficient means of transferring data, Voice Over Frame Relay (VoFR) consolidates voice and voice-band data (for example, analog modems and fax messages) with data services. VoFR lowers the cost of calls while increasing the utilization of network resources and maintaining the reliability of an existing Frame Relay network.

With 11.4, VoFR is available in the PathBuilder S400 WAN convergence switch. The VoFR capabilities will handle peer-to-peer (end-user to end-user) VoFR voice call signaling across the network, providing real-time delivery of voice signals without excessive delay.

Features of the 3Com implementation of VoFR:

- All voice payloads are encapsulated in the FRF.11 formats. Voice and data share the same virtual circuit (VC) based on the FRF.11 Annex J (The Use of Reserved Subchannels) capabilities as authored by 3Com.
- Fragmentation can consume CPU processing power resulting in degraded system performance. Unlike other vendors implementation of VoFR, 3Com's proprietary Fragmentation Control Protocol (FCP) is designed to support dynamic fragmentation control to turn on-and-off fragmentation at each communicating endpoint.
  - 3Com proprietary VoFR signaling based on Q.931 allows dynamic call connection and teardown.
  - VoFR recovery is built into VoFR signaling to handle system or network outage.
- Voice call establishment is regulated by bandwidth requirements of voice compression between two communicating DSP peers, as well as by the available bandwidth (CIR) of the VC at each end.
  - Voice calls between remote offices can be switched through central site VoFR.

- Up to 250 calls can be supported within each VC subject to available bandwidth.
- Support for FXS and FXO voice ports.
- Support for FAX data over the voice call.

### **Voice Over VPN (VoVPN)**

Due to the interaction between VPN (L2TP or PPTP) and VoIP when they are sharing the same system IP (sysip) address, voice calls do not get tunneled over L2TP or PPTP. The reason for this is when a VPN tunnel is established with the sysip address, the endpoint's sysip address is in each endpoints routing table. If an application subsequently uses the same address that is used by the tunnel, the routing table would force the packet out on the interface, and not through the tunnel. The packet would leave the device unencapsulated.

To overcome this, voice calls originating from the system will continue to use the sysip address as before (in order to utilize the redundancy feature of the sysip). In addition, the voice call will also have an option to use a different source-destination pair for those calls that need to be tunneled via VPN. After the source address is defined, it is linked to the virtual port that represents the VPN tunnel, allowing the voice call to get tunneled across the VPN.

## **Network Management Features**

Network management features include Upgrade Utilities and Upgrade Link, Web Link Enhancements, Autotargeting for SLA Monitoring/Remote Polling, Console Output in Telnet Sessions, Multiple SYSLOG Server Support, Audit Log Messaging Enhancements. and Domain Name Use in FTP and TFTP Commands.

### **Upgrade Utilities & Upgrade Link**

With the upgrade utilities, you will be able to perform upgrades of all your Enterprise OS devices (NETBuilder, PathBuilder S5xx, and PathBuilder S400 devices) from an older version of software to a newer version. The version you can upgrade to will match your version of the upgrade utilities (for example, with the Upgrade Management Utilities version 11.4, you will be able to upgrade a device running 8.x, 9.x, 10.x, 11.0, 11.1, or 11.2 to any version 9.x, 10.x, 11.0, 11.1, 11.2, 11.3 or 11.4). Engineered to be reliable and simple to use, the utilities can be executed via command line, via the GUI-interface in Transcend® Upgrade Manager, or the GUI-interface in Upgrade Link, or via user-defined scripts.

Enhancements to Upgrades Utilities version 11.4:

- File Transfers via HTTP
- Faster installation of Enterprise OS software images into Upgrade Manager for Windows95
- Flexibility of installing the upgrade files into a directory besides /usr/3Com
- Added support for PathBuilder S400 WAN convergence switches

### **Web Link Enhancements**

Web Link is an embedded Web-based interface for management of the NETBuilder bridge/router (or PathBuilder S5xx tunnel switch starting with 11.1.1). Web Link is available on all router platforms running version 11.0 or later. To access Web Link, use Netscape 4.08 or later, or Internet Explorer 4.x or later.

- Voice Wizard

Starting with 11.2.2 and with enhancements made in 11.4 for the PathBuilder S400 WAN convergence switch, Web Link provides a new Wizard configuration tool to aid in the configuration of the voice parameters. The Voice Wizard eases the task of configuration by creating a dial plan that can be viewed and later edited.
- Performance Management

Currently available statistics are:

  - System Performance
  - Interface Performance: physical path statistics and port and virtual port statistics
  - Protocol Performance: Routing protocols
  - IP Routing Protocol: Total IP packets and IP packets per interface
  - IPX Routing Protocol: Total IPX packets
- IPX Packets Per Interface
  - Frame Relay WAN Protocol
- New Statistics for 11.4
  - VPN Performance: VPN tunnels and total active tunnels
  - IPsec Performance: Encrypted packets, authenticated packets, encrypted-authenticated, packets and discarded packets
  - Voice Performance
- Total Successful Calls
  - Total Packets
  - Total Bytes

### **Autotargeting for SLA Monitoring/Remote Polling**

In 11.2, Remote Polling was introduced which provided a mechanism to periodically poll a list of up to 100 target devices. By pinging a target list of devices for connectivity, logs could be generated and statistics gathered to measure latency between devices and to determine service levels. Statistics could also be gathered using the 3Com remote polling MIB (3com0019.mib), which can give the statistical result of each poll. The MIB variables can be used with 3rd party applications, like InfoVista to provide service level monitoring, analysis, and reporting. A maximum of 100 target devices can be polled.

In 11.4, the requirement to manually configure up to 100 target devices that the administrator remotely polls has been eliminated. Four predefined "target groups" will be used:

- RAS targets are automatically added when a RAS user session is established
- VLL targets are automatically added when a virtual leased line is configured
- Tunnel Peers including PPTP/L2TP/IPIP/DNL are automatically added
- Static targets can still be manually configured, if desired

## Console Output in Telnet Sessions

With 11.4, all system messages can be displayed to a Telnet session as well as through a terminal attached to the local console port. Administrators will be able to view all important status messages from the Telnet session improving manageability.

## Audit Log Messaging Enhancements

Many enhancements are added in the 11.4 release regarding the logging of events. These include:

- In previous releases, only one SYSLOG server on the network could be sent the audit log messages from an Enterprise OS device. With 11.4, the administrator can configure each Enterprise OS device to send it's audit log messages to up to six SYSLOG servers.
- In previous releases, only one SYSLOG server on the network could be sent the audit log messages from an Enterprise OS device. With 11.4, the administrator can configure each Enterprise OS device to send it's audit log messages to up to six SYSLOG servers.
- Persistent logging of events across reboots now available across all platforms. Previously this feature was available only for NETBuilder II and PathBuilder S5xx devices (those devices which could support the partial dump feature). With 11.4, the partial dump feature is extended to the stackable devices (OfficeConnect NETBuilder, SuperStack II NETBuilder SI, and PathBuilder S400 devices), so reasons for spontaneous failures will be logged both on the device and within audit log messages sent to the SYSLOG server(s).
- To provides a clearer understanding of audit log messages, the format of the messages has been changed. There is a different format for those messages sent to a SYSLOG server vs those saved on the device's local audit log buffer. Redundant information was removed and comprehensive definitions are provided. A field was added to indicate message severity (0-7 indicating Emergency, Alert, Critical, Error, Warning, Notice, Info, and Debug).

Changes to audit log messages sent to SYSLOG server(s):

- For the SYSLOG messages, a unique message identifier (starting with 100) has been added. Specific services have been assigned a range of identifying numbers. For example, 100-199 identifies audit log file access status messages ... dial history messages are 400-499 ... IPsec messages are 600-649 ... and Web Link messages are 1400-1499.
- A new message format will have identifying labels. The new syntax is as follows:

```
priority Seq:SeqNumber Sev:Severity From:Entity/Source Msg:Text
```

Changes to audit log messages saved on the device's local audit log buffer:

- The new message format will have identifying labels. The new syntax is as follows:

```
<priority> Seq:SeqNumber Date/Time Sev:Severity From:Entity/Source  
Msg:Text
```

- Audit Log Message Filters are now supported. In previous releases, all audit log messages were sent to the designated SYSLOG server. With 11.4, the administrator can set a LogFilter, whereby specific messages can be sent to specific SYSLOG servers. Messages can be filtered based on service, priority,

message identifier(s) and /or SYSLOG server. The action to send all messages to the SYSLOG server is still the default when auditing is enabled.

- The audit log messages can also be sent out through an SNMP trap to be received by the configured SNMP trap manager(s).

### **Domain Name Use in FTP and TFTP Commands**

Starting with 11.4, a domain name can be used in the FTP commands of GET and PUT, as well as the TFTP command of COpy to specify the name of the FTP or TFTP server. Previously, only the IP address of the FTP or TFTP server could be used for these commands. This function assumes that there is a Domain Name server on the network with the name/address mapping configured; the Enterprise OS device continues to act only as a FTP/TFTP client.

### **Transcend VPN Application Suite**

With more VPN management applications available and planned for the future, Secure VPN Manager and the new PKI Manager tools have been bundled together—one part number to use for ordering, one CD-ROM to use for installation. The new package will be called *Transcend VPN Application Suite*.

### **Secure VPN Manager version 2.2**

Secure VPN Manager is a graphical web-based network management tool that presents key information about your virtual private network (VPN). Secure VPN Manager provides the assistance necessary to monitor the VPN tunnels terminated by the NETBuilder bridge/router or the PathBuilder S5xx series of devices. These analyses are possible through the monitoring of the VPN tunnel established for remote access (client-to-LAN) connections) and site-to-site (LAN-to-LAN) connections. The application is supported only on the Windows NT Server platform currently.

Secure VPN Manager supports the following Microsoft devices as tunnel initiators:

- Window 95 with Microsoft Windows 95 Dial-Up Networking 1.3 Upgrade or later
- Window NT with Service Pack 3 and above

Secure VPN Manager supports the following 3Com devices as tunnel initiators and tunnel terminators:

- PathBuilder S5xx series devices running software version 11.3 or later
- NETBuilder bridge/routers running software version 11.3 or later
- PathBuilder S400 series devices software version 11.4 or later

### **PKI Manager version 1.0**

PKI Manager is a graphical, management application to aid Enterprise OS devices in obtaining PKI certificates and Certificate Revocation Lists (CRLs) from various Certificate Authorities (CAs). PKI Manager works as a proxy between the device and the CA. It is responsible for collecting the certificate requests from the devices and generating the CA-specific certificate request syntax (CRS), which in turn is sent to the CA. Once the CA issues the certificate, PKI Manager will retrieve it from the CA and send it to the Enterprise OS device. The CAs that are supported with this first release are Verisign and Entrust. The application is supported only on the Windows NT Server platform currently.

### Features of PKI Manager version 1.0

- *Multi-Enterprise PKI Management:* Administrators can use the application to manage multiple enterprises (or different business units of an enterprise) separately.
- *Limited RA functionality:* The application uses a proprietary Enrollment key mechanism to authenticate Enterprise OS devices.
- *Certificate proxy:* To eliminate the need of each device talking to the CA, PKI Manager negotiates the certificates from the CAs on behalf of the device. PKI Manager will receive a generic (PKCS#10) certificate request from the device and wrap it into a CA- specific CRS (for example, Verisign uses PKCS#7). The certificate request will be sent to the CA using the protocol supported by the CA (for example, Verisign uses HTTP).
- *Certificate Management:* The administrator can view the CRLs and certificate status (for example, valid/about, expire/expired/revoke, requested/revoked/installed, or not installed) using the different views of the application.

### System Requirements for Secure VPN Manager version 2.2 and PKI Manager 1.0

- *Computer:* Pentium Processor with 300 MHz minimum clock, minimum 128 MB of RAM, and minimum 4 GB hard disk space for initial installation & database storage
- *Operating System:* Microsoft Windows NT server 4.0 with Service Pack 3 or later, with the TCP/IP stack enabled. Microsoft Windows NT SNMP service loaded and active on the server
- *Web Server for Secure VPN Manager:* Netscape's FastTrack Web Server version 3.x or Microsoft's Internet Information Server (IIS) version 3.0
- *Client for Secure VPN Manager:* Web browsers that supports Java applets,
  - Netscape Navigator 4.08 or later
  - Netscape Communicator 4.5.1 or later
  - Microsoft Internet Explorer 4.01 or later

## 11.4 Software Packages

The tables in this section list the features in the packages available in software version 11.4 for the NETBuilder and PathBuilder platforms.

### NETBuilder II Bridge/Router

The NETBuilder II bridge/routers are supported with the following packages:

- AC–APPN Connection Services Router
- DW–Multiprotocol Router
- DL–Multiprotocol Router with 40-bit Encryption
- DE–Multiprotocol Router with 56-bit Encryption
- DS–Multiprotocol Router with 128-bit Encryption and 3DES

Table 1 lists the software features of each package for NETBuilder II bridge/routers.

**Table 1** NETBuilder II Software Features

| Feature                          | Software Packages |    |    |    |    |
|----------------------------------|-------------------|----|----|----|----|
|                                  | AC                | DW | DL | DE | DS |
| Voice Support (Analog)           |                   |    |    |    |    |
| FXO                              |                   |    |    |    |    |
| FXS                              |                   |    |    |    |    |
| Voice/FAX over IP                |                   |    |    |    |    |
| Voice/FAX over Frame Relay       |                   |    |    |    |    |
| Core Features*                   | X                 | X  | X  | X  | X  |
| Boundary Routing® central node   | X                 | X  | X  | X  | X  |
| Boundary Routing leaf node       |                   |    |    |    |    |
| 40-Bit Encryption (IPSec)        |                   |    | X  | X  | X  |
| 56-Bit Encryption (IP Sec)       |                   |    |    | X  | X  |
| 128-Bit Encryption (IP Sec)      |                   |    |    |    | X  |
| IPCP                             |                   |    |    |    |    |
| IPv6/BGP                         |                   | X  | X  | X  | X  |
| VRRP (Ethernet/FDDI/Token Ring)  | X                 | X  | X  | X  | X  |
| VRRP for DLSW                    | X                 | X  | X  | X  | X  |
| VRRP over VLAN                   | X                 | X  | X  | X  | X  |
| RSVP, RSVP Proxy                 | X                 | X  | X  | X  | X  |
| Multicast IP, PIM, IGMP, MBR     | X                 | X  | X  | X  | X  |
| IP/OSI Connection Services       | X                 |    |    |    |    |
| IPX                              | X                 | X  | X  | X  | X  |
| XNS, OSI                         | X                 | X  | X  | X  | X  |
| Appletalk                        | X                 | X  | X  | X  | X  |
| VINES, DECnet, Ph-IV, Ph-IV/V GW |                   | X  | X  | X  | X  |
| DLSW                             | X                 | X  | X  | X  | X  |
| NetView Service Point            |                   | X  | X  | X  | X  |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/ Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 1** NETBuilder II Software Features (continued)

| Feature  | Software Packages |    |    |    |    |
|--|-------------------|----|----|----|----|
|  | AC                | DW | DL | DE | DS |
| BRITSS   |                   | X  | X  | X  | X  |
| APPN   | X                 |    |    |    |    |
| LSM  | X                 | X  | X  | X  | X  |
| LAA  | X                 | X  | X  | X  | X  |
| Token Ring in Fast Ethernet (IOS not supported)                                | X                 | X  | X  | X  | X  |
| ISDN BRI   | X                 | X  | X  | X  | X  |
| ISDN PRI   | X                 | X  | X  | X  | X  |
| ISDN T1/E1   |                   |    |    |    |    |
| ISDN CT1/CE1   |                   |    |    |    |    |
| ISDN T3/E3   |                   |    |    |    |    |
| ISDN CT3/CE3   |                   |    |    |    |    |
| Data over Analog (Call Originate only)   |                   |    |    |    |    |
| CSU/DSU Loopback   |                   |    |    |    |    |
| SDLC/SHDLC/Polled Async/Bisync   | X                 | X  | X  | X  | X  |
| BSC Conversion   |                   | X  | X  | X  | X  |
| QLLC/LLC2 Conversion   |                   | X  | X  | X  | X  |
| Frame Relay  | X                 | X  | X  | X  | X  |
| SMDS   | X                 | X  | X  | X  | X  |
| X.25 Switching/Tunneling   | X                 | X  | X  | X  | X  |
| WANExtender  | X                 | X  | X  | X  | X  |
| MP6E Module  | X                 | X  | X  | X  | X  |
| Fast Ethernet 100Base  | X                 | X  | X  | X  | X  |
| ATM Module/ LANE   | X                 | X  | X  | X  | X  |
| PPPOE  | X                 | X  | X  | X  | X  |
| MPOA Server/Client   | X                 | X  | X  | X  | X  |
| ZMODEM Support in Software   | X                 | X  | X  | X  | X  |
| Flash Load   |                   |    |    |    |    |
| LDAP Policy Engine/Client  | X                 | X  | X  | X  | X  |
| Auto Startup   |                   |    |    |    |    |
| DES Crypto   |                   |    |    | X  | X  |
| 3DES /3DES 3 KEY   |                   |    |    |    | X  |
| RC5 Crypto   |                   |    |    | X  | X  |
| MPPE/RC4   |                   |    | X  | X  | X  |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPPCP |                   |    |    | X  | X  |
| IP/IPX RAS, Radius, traps  |                   | X  | X  | X  | X  |

\* Core Features include: Bridging (MLN & SRTG in NBI), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/ Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.



**Table 1** NETBuilder II Software Features (continued)

| Feature   | Software Packages |          |          |          |          |
|---|-------------------|----------|----------|----------|----------|
|   | AC                | DW       | DL       | DE       | DS       |
| MS-CHAP   |                   |          | X        | X        | X        |
| EAP Authentication  |                   | X        | X        | X        | X        |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel<br>Switch PPTP/L2TP (R2R, VLL)   | X                 | X        | X        | X        | X        |
| IP (Routing, FireWall, NAT, Proxy,<br>ARP, DHCP, DHCP Proxy, Traffic<br>Director, Internal IP Ports, IPQoS)   | X                 | X        | X        | X        | X        |
| IP OSPF   | X                 | X        | X        | X        | X        |
| IPX NLSP  | X                 | X        | X        | X        | X        |
| Virtual Ports   | 512               | 512      | 512      | 512      | 512      |
| Restricted Number of DHCP<br>Addresses  |                   |          |          |          |          |
| Max Physical Voice Ports  |                   |          |          |          |          |
| Max Physical Data Ports   | 128               | 128      | 128      | 128      | 128      |
| <b>Memory Requirements</b>  |                   |          |          |          |          |
| DRAM  | 40/80 MB          | 40/80 MB | 40/80 MB | 40/80 MB | 40/80 MB |
| Flash memory (Minimum required<br>for Enterprise OS 11.4)   | 10 MB             | 10 MB    | 10 MB    | 10 MB    | 10 MB    |
| Flash memory (Minimum required<br>for Dual Images)  | 20 MB             | 20 MB    | 20 MB    | 20 MB    | 20 MB    |
| * Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP<br>RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/ Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP),<br>MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on<br>Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels. |                   |          |          |          |          |

### NETBuilder II Firmware Requirements

The NETBuilder II I/O modules require firmware upgrades to support the Enterprise OS software version 11.4 (see Table 2 for firmware requirements).

You can determine your I/O module firmware version through the software by entering:

```
SHow -SYS IOI
```

**Table 2** NETBuilder II Firmware Requirements

| Module                | 11.4 Firmware Version Strings        |
|-----------------------|--------------------------------------|
| DPE                   | FW/DPE-BOOT1,1.7<br>FW/DPE-BOOT2,1.7 |
| MP Ethernet 6-port    | FW/6ETH-FW,1.4.0.70                  |
| Fast Ethernet 100Base | FW/ETH100-FW,1.9                     |
| 8-port HSS BRI        | FW/8BRI-FW,1.5                       |
| MP ATMLink            | FW/ATM-FW,1.1.0.70                   |
| HSS 3-port (V.35)     | FW/HSS3-V35,1.1.11                   |
| HSS 3-port (RS-449)   | FW/HSS3-449,1.1.11                   |
| HSS 3-port (RS-232)   | FW/HSS3-232,1.1.11                   |
| HSS 4-port            | FW/4PORTWAN-FW,1.5                   |

**SuperStack II  
NETBuilder SI** SuperStack II NETBuilder SI bridge/routers are supported with the following packages:

- BF– Boundary Router
- NW–IP/IPX/AT Router
- NE– IP/IPX/AT Router with 56-bit Encryption
- NS–IP/IPX/AT Router with 128-bit Encryption and 3DES
- CF–Multiprotocol Router]
- CL–Multiprotocol Router with 40-bit Encryption
- CE–Multiprotocol Router with 56-bit Encryption
- CS–Multiprotocol Router with 128-bit Encryption and 3DES
- AX–APPN/Connection Services

Table 3 lists the software features of each package for SuperStack II SI bridge/routers.

**Table 3** SuperStack II NETBuilder SI Software Features

| Feature                          | Software Packages |    |    |    |    |    |    |    |    |
|----------------------------------|-------------------|----|----|----|----|----|----|----|----|
|                                  | BF                | NW | NE | NS | CF | CL | CE | CS | AX |
| Voice Support (Analog)           |                   |    |    |    |    |    |    |    |    |
| FXO                              |                   |    |    |    |    |    |    |    |    |
| FXS                              |                   |    |    |    |    |    |    |    |    |
| Voice/FAX over IP                |                   |    |    |    |    |    |    |    |    |
| Voice/FAX over Frame Relay       |                   |    |    |    |    |    |    |    |    |
| Core Features*                   |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| Boundary Routing® central node   |                   |    |    |    | X  | X  | X  | X  |    |
| Boundary Routing leaf node       | X                 |    |    |    |    |    |    |    |    |
| 40-Bit Encryption (IPSec)        |                   |    | X  | X  |    | X  | X  | X  |    |
| 56-Bit Encryption (IP Sec)       |                   |    | X  | X  |    |    | X  | X  |    |
| 128-Bit Encryption (IP Sec)      |                   |    |    | X  |    |    |    | X  |    |
| IPCP                             |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| IPv6/BGP                         |                   |    |    |    | X  | X  | X  | X  |    |
| VRRP (Ethernet/FDDI/Token Ring)  |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| VRRP for DLSW                    |                   |    |    |    | X  | X  | X  | X  | X  |
| VRRP over VLAN                   |                   |    | X  | X  | X  | X  | X  | X  | X  |
| RSVP, RSVP Proxy                 |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| Multicast IP, PIM, IGMP, MBR     |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| IP/OSI Connection Services       |                   |    |    |    |    |    |    |    |    |
| IPX                              |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| XNS, OSI                         |                   |    |    |    | X  | X  | X  | X  | X  |
| Appletalk                        |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| VINES, DECnet, Ph-IV, Ph-IV/V GW |                   |    |    |    | X  | X  | X  | X  |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 3** SuperStack II NETBuilder SI Software Features (continued)

| Feature  | Software Packages |    |    |    |    |    |    |    |    |
|--|-------------------|----|----|----|----|----|----|----|----|
|  | BF                | NW | NE | NS | CF | CL | CE | CS | AX |
| DLSW   | X                 |    |    |    | X  | X  | X  | X  | X  |
| NetView Service Point  |                   |    |    |    | X  | X  | X  | X  |    |
| BRITSS   |                   |    |    |    | X  | X  | X  | X  |    |
| APPN   |                   |    |    |    |    |    |    |    | X  |
| LNLM   |                   |    |    |    |    |    |    |    |    |
| LAA  | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| Token Ring in Fast Ethernet (IOS not supported)                                | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| ISDN BRI   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| ISDN PRI   |                   |    |    |    |    |    |    |    |    |
| ISDN T1/E1   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| ISDN CT1/CE1   |                   |    |    |    |    |    |    |    |    |
| ISDN T3/E3   |                   |    |    |    |    |    |    |    |    |
| ISDN CT3/CE3   |                   |    |    |    |    |    |    |    |    |
| Data over Analog (Call Originate only)   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| CSU/DSU Loopback   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| SDLC/SHDLIC/Polled Async/Bisync  | X                 |    |    |    | X  | X  | X  | X  | X  |
| BSC Conversion   |                   |    |    |    | X  | X  | X  | X  |    |
| QLLC/LLC2 Conversion   | X                 |    |    |    | X  | X  | X  | X  | X  |
| Frame Relay  | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| SMDS   |                   | X  | X  | X  | X  | X  | X  | X  |    |
| X.25 Switching/Tunneling   |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| WANExtender  |                   |    |    |    |    |    |    |    |    |
| MP6E Module  |                   |    |    |    |    |    |    |    |    |
| Fast Ethernet 100Base  | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| ATM Module/ LANE   |                   |    |    |    |    |    |    |    |    |
| PPPOE  |                   |    |    |    |    |    |    |    |    |
| MPOA Server/Client   |                   |    |    |    |    |    |    |    |    |
| ZMODEM Support in Software   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| Flash Load   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| LDAP Policy Engine/Client  |                   | X  | X  | X  | X  | X  | X  | X  | X  |
| Auto Startup   | X                 | X  | X  | X  | X  | X  | X  | X  | X  |
| DES Crypto   |                   |    | X  | X  |    |    | X  | X  |    |
| 3DES /3DES 3 KEY   |                   |    | X  | X  |    |    |    | X  |    |
| RC5 Crypto   |                   |    |    | X  |    |    | X  | X  |    |
| MPPE/RC4   |                   |    | X  | X  |    | X  | X  | X  |    |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPSPC |                   |    | X  | X  |    | X  | X  | X  |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 3** SuperStack II NETBuilder SI Software Features (continued)

| Feature   | Software Packages |       |       |       |       |       |       |       |       |
|---|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|   | BF                | NW    | NE    | NS    | CF    | CL    | CE    | CS    | AX    |
| IP/IPX RAS, Radius, traps   |                   |       |       | X     | X     | X     | X     | X     |       |
| MS-CHAP   |                   |       | X     | X     |       | X     | X     | X     |       |
| EAP Authentication  |                   |       | X     | X     | X     | X     | X     | X     |       |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel<br>Switch PPTP/L2TP (R2R, VLL)   |                   | X     | X     | X     | X     | X     | X     | X     | X     |
| IP (Routing, FireWall, NAT, Proxy,<br>ARP, DHCP, DHCP Proxy, Traffic<br>Director, Internal IP Ports, IPQoS)   |                   | X     | X     | X     | X     | X     | X     | X     | X     |
| IP OSPF   |                   | X     | X     | X     | X     | X     | X     | X     | X     |
| IPX NLSP  |                   | X     | X     | X     | X     | X     | X     | X     | X     |
| Virtual Ports   | 48                | 48    | 48    | 48    | 48    | 48    | 48    | 48    | 48    |
| Restricted Number of DHCP<br>Addresses  |                   |       |       |       |       |       |       |       |       |
| Max Physical Voice Ports  |                   |       |       |       |       |       |       |       |       |
| <b>Memory Requirements</b>  |                   |       |       |       |       |       |       |       |       |
| DRAM  | 16 MB             | 16 MB | 16 MB | 16 MB | 24 MB | 24 MB | 24 MB | 24 MB | 16 MB |
| Flash memory (Minimum required<br>for Enterprise OS 11.4)   | 8 MB              | 8 MB  | 8 MB  | 8 MB  | 12 MB | 12 MB | 12 MB | 12 MB | 12 MB |
| Flash memory (Minimum required<br>for Dual Images)  | 8 MB              | 8 MB  | 8 MB  | 8 MB  | 12 MB | 12 MB | 12 MB | 12 MB | 12 MB |
| * Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP<br>Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner,<br>SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels. |                   |       |       |       |       |       |       |       |       |

## PathBuilder S5xx Series Switch

The PathBuilder S5xx Series Switches support the following software packages:

- PW–Multiprotocol Router
- PE–Multiprotocol Router with 56-bit Encryption
- PL–Multiprotocol Router with 40-bit Encryption
- PS–Multiprotocol Router with 128-bit Encryption and 3DES

Table 4 lists the software features in each package for the PathBuilder S5xx series switches.

**Table 4** PathBuilder S5xx Series Switches Software Features

| Feature                          | Software Package |    |    |    |
|----------------------------------|------------------|----|----|----|
|                                  | PW               | PL | PE | PS |
| Voice Support (Analog)           |                  |    |    |    |
| FXO                              |                  |    |    |    |
| FXS                              |                  |    |    |    |
| Voice/FAX over IP                |                  |    |    |    |
| Voice/FAX over Frame Relay       |                  |    |    |    |
| Core Features*                   | X                | X  | X  | X  |
| Boundary Routing® central node   | X                | X  | X  | X  |
| Boundary Routing leaf node       |                  |    |    |    |
| 40-Bit Encryption (IPSec)        |                  | X  | X  | X  |
| 56-Bit Encryption (IP Sec)       |                  |    | X  | X  |
| 128-Bit Encryption (IP Sec)      |                  |    |    | X  |
| IPCP                             |                  |    |    |    |
| IPv6/BGP                         | X                | X  | X  | X  |
| VRRP (Ethernet/FDDI/Token Ring)  | X                | X  | X  | X  |
| VRRP for DLSW                    | X                | X  | X  | X  |
| VRRP over VLAN                   | X                | X  | X  | X  |
| RSVP, RSVP Proxy                 | X                | X  | X  | X  |
| Multicast IP, PIM, IGMP, MBR     | X                | X  | X  | X  |
| IP/OSI Connection Services       |                  |    |    |    |
| IPX                              | X                | X  | X  | X  |
| XNS, OSI                         | X                | X  | X  | X  |
| Appletalk                        | X                | X  | X  | X  |
| VINES, DECnet, Ph-IV, Ph-IV/V GW | X                | X  | X  | X  |
| DLSW                             | X                | X  | X  | X  |
| NetView Service Point            | X                | X  | X  | X  |
| BRITSS                           |                  |    |    |    |
| APPN                             |                  |    |    |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 4** PathBuilder S5xx Series Switches Software Features (continued)

| Feature  | Software Package |    |    |    |
|--|------------------|----|----|----|
|  | PW               | PL | PE | PS |
| LNM  |                  |    |    |    |
| LAA  | X                | X  | X  | X  |
| Token Ring in Fast Ethernet (IOS not supported)                                | X                | X  | X  | X  |
| ISDN BRI   |                  |    |    |    |
| ISDN PRI   | X                | X  | X  | X  |
| ISDN T1/E1   | X                | X  | X  | X  |
| ISDN CT1/CE1   |                  |    |    |    |
| ISDN T3/E3   | X                | X  | X  | X  |
| ISDN CT3/CE3   |                  |    |    |    |
| Data over Analog (Call Originate only)   |                  |    |    |    |
| CSU/DSU Loopback   |                  |    |    |    |
| SDLC/SHDLC/Polled Async/Bisync   | X                | X  | X  | X  |
| BSC Conversion   | X                | X  | X  | X  |
| QLLC/LLC2 Conversion   | X                | X  | X  | X  |
| Frame Relay  | X                | X  | X  | X  |
| SMDS   | X                | X  | X  | X  |
| X.25 Switching/Tunneling   | X                | X  | X  | X  |
| WANExtender  |                  |    |    |    |
| MP6E Module  |                  |    |    |    |
| Fast Ethernet 100Base  | X                | X  | X  | X  |
| ATM Module/ LANE   |                  |    |    |    |
| PPPOE  | X                | X  | X  | X  |
| MPOA Server/Client   |                  |    |    |    |
| ZMODEM Support in Software   |                  |    |    |    |
| Flash Load   | X                | X  | X  | X  |
| LDAP Policy Engine/Client  | X                | X  | X  | X  |
| Auto Startup   |                  |    |    |    |
| DES Crypto   |                  |    | X  | X  |
| 3DES /3DES 3 KEY   |                  |    |    | X  |
| RC5 Crypto   |                  |    | X  | X  |
| MPPE/RC4   |                  | X  | X  | X  |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPPCP |                  |    | X  | X  |
| IP/IPX RAS, Radius, traps  | X                | X  | X  | X  |
| MS-CHAP  |                  | X  | X  | X  |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 4** PathBuilder S5xx Series Switches Software Features (continued)

| Feature   | Software Package |        |        |        |
|---|------------------|--------|--------|--------|
|   | PW               | PL     | PE     | PS     |
| EAP Authentication  | X                | X      | X      | X      |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel<br>Switch PPTP/L2TP (R2R, VLL)   | X                | X      | X      | X      |
| IP (Routing, FireWall, NAT, Proxy,<br>ARP, DHCP, DHCP Proxy, Traffic<br>Director, Internal IP Ports, IPQoS)   | X                | X      | X      | X      |
| IP OSPF   | X                | X      | X      | X      |
| IPX NLSP  | X                | X      | X      | X      |
| Virtual Ports   | 2048             | 2048   | 2048   | 2048   |
| Max Physical Voice Ports  |                  |        |        |        |
| Max Physical Data Ports   | 18               | 18     | 18     | 18     |
| <b>Memory Requirements</b>  |                  |        |        |        |
| DRAM  | 160 MB           | 160 MB | 160 MB | 160 MB |
| Flash memory (Minimum<br>required for Enterprise OS<br>11.4)  | 16 MB            | 16 MB  | 16 MB  | 16 MB  |
| Flash memory (Minimum<br>required for Dual Images)  | 16 MB            | 16 MB  | 16 MB  | 16 MB  |
| * Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP<br>RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP<br>(PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS,<br>Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP<br>tunnels. |                  |        |        |        |

## PathBuilder S400 Series Switches

The PathBuilder S400 series switches support the following software packages:

- XW–IP/IPX/AT Data/Voice Router
- XE–IP/IPX/AT Data/Voice Router with 56-bit Encryption
- XL–IP/IPX/AT Data/Voice Router with 40-bit Encryption
- XS–IP/IPX/AT Data/Voice Router with 128-bit Encryption and 3DES
- MW–Multiprotocol Data/Voice Router
- ME–Multiprotocol Router with 56-bit Encryption
- ML–Multiprotocol Router with 40-bit Encryption
- MS–Multiprotocol Router with 128-bit Encryption and 3DES

Table 5 lists the software features in each package for the PathBuilder S400 series switches.

**Table 5** PathBuilder S400 Series Switches Software Features

| Feature                          | Software Package |    |    |    |    |    |    |    |
|----------------------------------|------------------|----|----|----|----|----|----|----|
|                                  | XW               | XL | XE | XS | MW | ML | ME | MS |
| Voice Support (Analog)           | X                | X  | X  | X  | X  | X  | X  | X  |
| FXO                              | X                | X  | X  | X  | X  | X  | X  | X  |
| FXS                              | X                | X  | X  | X  | X  | X  | X  | X  |
| Voice/FAX over IP                | X                | X  | X  | X  | X  | X  | X  | X  |
| Voice/FAX over Frame Relay       | X                | X  | X  | X  | X  | X  | X  | X  |
| Core Features*                   | X                | X  | X  | X  | X  | X  | X  | X  |
| Boundary Routing® central node   |                  |    |    |    | X  | X  | X  | X  |
| Boundary Routing leaf node       |                  |    |    |    |    |    |    |    |
| 40-Bit Encryption (IPSec)        |                  |    | X  | X  |    | X  | X  | X  |
| 56-Bit Encryption (IP Sec)       |                  |    | X  | X  |    |    | X  | X  |
| 128-Bit Encryption (IP Sec)      |                  |    |    | X  |    |    |    | X  |
| IPCP                             | X                | X  | X  | X  | X  | X  | X  | X  |
| IPv6/BGP                         |                  |    |    |    | X  | X  | X  | X  |
| VRRP (Ethernet/FDDI/Token Ring)  | X                | X  | X  | X  | X  | X  | X  | X  |
| VRRP for DLSW                    |                  |    |    |    | X  | X  | X  | X  |
| VRRP over VLAN                   | X                | X  | X  | X  | X  | X  | X  | X  |
| RSVP, RSVP Proxy                 | X                | X  | X  | X  | X  | X  | X  | X  |
| Multicast IP, PIM, IGMP, MBR     | X                | X  | X  | X  | X  | X  | X  | X  |
| IP/OSI Connection Services       |                  |    |    |    |    |    |    |    |
| IPX                              | X                | X  | X  | X  | X  | X  | X  | X  |
| XNS, OSI                         |                  |    |    |    | X  | X  | X  | X  |
| Appletalk                        | X                | X  | X  | X  | X  | X  | X  | X  |
| VINES, DECnet, Ph-IV, Ph-IV/V GW |                  |    |    |    | X  | X  | X  | X  |
| DLSW                             |                  |    |    |    | X  | X  | X  | X  |
| NetView Service Point            |                  |    |    |    | X  | X  | X  | X  |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.



**Table 5** PathBuilder S400 Series Switches Software Features (continued)

| Feature   | Software Package |    |    |    |    |    |    |    |
|---|------------------|----|----|----|----|----|----|----|
|   | XW               | XL | XE | XS | MW | ML | ME | MS |
| BRITSS  |                  |    |    |    | X  | X  | X  | X  |
| APPN  |                  |    |    |    |    |    |    |    |
| LNLM  |                  |    |    |    |    |    |    |    |
| LAA   | X                | X  | X  | X  | X  | X  | X  | X  |
| Token Ring in Fast Ethernet (IOS not supported) | X                | X  | X  | X  | X  | X  | X  | X  |
| ISDN BRI  | X                | X  | X  | X  | X  | X  | X  | X  |
| ISDN PRI  |                  |    |    |    |    |    |    |    |
| ISDN T1/E1                                      | X                | X  | X  | X  | X  | X  | X  | X  |
| ISDN CT1/CE1                                    |                  |    |    |    |    |    |    |    |
| ISDN T3/E3                                      |                  |    |    |    |    |    |    |    |
| ISDN CT3/CE3                                    |                  |    |    |    |    |    |    |    |
| Data over Analog (Call Originate only)          | X                | X  | X  | X  | X  | X  | X  | X  |
| CSU/DSU Loopback                                | X                | X  | X  | X  | X  | X  | X  | X  |
| SDLC/SHDLC/Polled Async/Bisync                  |                  |    |    |    | X  | X  | X  | X  |
| BSC Conversion                                  |                  |    |    |    | X  | X  | X  | X  |
| QLLC/LLC2 Conversion                            |                  |    |    |    | X  | X  | X  | X  |
| Frame Relay                                     | X                | X  | X  | X  | X  | X  | X  | X  |
| SMDS  | X                | X  | X  | X  | X  | X  | X  | X  |
| X.25 Switching/Tunneling                        | X                | X  | X  | X  | X  | X  | X  | X  |
| WANExtender                                     |                  |    |    |    |    |    |    |    |
| MP6E Module                                     |                  |    |    |    |    |    |    |    |
| Fast Ethernet 100Base                           | X                | X  | X  | X  | X  | X  | X  | X  |
| ATM Module/ LANE                                |                  |    |    |    |    |    |    |    |
| PPPOE   |                  |    |    |    |    |    |    |    |
| MPOA Server/Client                              |                  |    |    |    |    |    |    |    |
| ZMODEM Support in Software                      | X                | X  | X  | X  | X  | X  | X  | X  |
| Flash Load                                      | X                | X  | X  | X  | X  | X  | X  | X  |
| LDAP Policy Engine/Client                       | X                | X  | X  | X  | X  | X  | X  | X  |
| Auto Startup                                    | X                | X  | X  | X  | X  | X  | X  | X  |
| DES Crypto                                      |                  |    | X  | X  |    | X  | X  | X  |
| 3DES /3DES 3 KEY                                |                  |    |    | X  |    |    |    | X  |
| RC5 Crypto                                      |                  |    |    | X  | X  |    |    |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/Incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 5** PathBuilder S400 Series Switches Software Features (continued)

| Feature   | Software Package |       |       |       |       |       |       |       |
|---|------------------|-------|-------|-------|-------|-------|-------|-------|
|   | XW               | XL    | XE    | XS    | MW    | ML    | ME    | MS    |
| MPPE/RC4  |                  |       |       | X     | X     |       |       |       |
| IP/IPX RAS, Radius, traps   | X                | X     | X     | X     | X     | X     | X     | X     |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPCCP  |                  |       | X     | X     |       | X     | X     | X     |
| MS-CHAP   |                  |       | X     | X     |       | X     | X     | X     |
| EAP Authentication  |                  |       | X     | X     |       | X     | X     | X     |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel Switch PPTP/L2TP (R2R, VLL)  | X                | X     | X     | X     | X     | X     | X     | X     |
| IP (Routing, FireWall, NAT, Proxy, ARP, DHCP, DHCP Proxy, Traffic Director, Internal IP Ports, IPQoS)   |                  |       | X     | X     | X     | X     | X     | X     |
| IP OSPF   | X                | X     | X     | X     | X     | X     | X     | X     |
| IPX NLSP  |                  |       |       |       |       |       |       |       |
| Virtual Ports   | 256              | 256   | 256   | 256   | 256   | 256   | 256   | 256   |
| Max Physical Voice Ports  | 12               | 12    | 12    | 12    | 12    | 12    | 12    | 12    |
| <b>Memory Requirements</b>  |                  |       |       |       |       |       |       |       |
| DRAM  | 32 MB            | 32 MB | 32 MB | 32 MB | 64 MB | 64 MB | 64 MB | 64 MB |
| Flash memory (Minimum required for Enterprise OS 11.4)  | 16 MB            | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB |
| Flash memory (Minimum required for Dual Images)   | 16 MB            | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB |
| * Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels. |                  |       |       |       |       |       |       |       |

**OfficeConnect  
NETBuilder  
Bridge/Routers**

The OfficeConnect NETBuilder bridge/routers support the following software packages for the specified models:

- JW-IP/IPX Router
- JE-IP/IPX Router with 56-bit encryption
- JS-IP/IPX Router with 128-bit encryption and 3DES
- BF-Boundary Routing
- NW-IP/IPX/AT Router
- NE-IP/IPX/AT Router with 56-bit Encryption
- NS-IP/IPX/AT Router with 128-bit Encryption and 3DES
- AF-APPN Router
- OF-Multiprotocol Router
- OE-Multiprotocol Router with 56-bit Encryption
- OL-Multiprotocol Router with 40-bit Encryption
- OS-Multiprotocol Router with 128-bit Encryption and 3DES

Table 6 lists the software features in each package for the OfficeConnect NETBuilder bridge/routers.

**Table 6** OfficeConnect NETBuilder Bridge/Router Software Features

| Feature   | Software Packages |    |    |    |    |    |    |    |    |    |    |    |
|---|-------------------|----|----|----|----|----|----|----|----|----|----|----|
|   | JW                | JE | JS | BF | NW | NE | NS | AF | OF | OL | OE | OS |
| Voice Support (Analog)                          |                   |    |    |    |    |    |    |    |    |    |    |    |
| FXO   |                   |    |    |    |    |    |    |    |    |    |    |    |
| FXS   |                   |    |    |    |    |    |    |    |    |    |    |    |
| Voice/FAX over IP                               |                   |    |    |    |    |    |    |    |    |    |    |    |
| Voice/FAX over Frame Relay                      |                   |    |    |    |    |    |    |    |    |    |    |    |
| Core Features*                                  | X                 | X  | X  |    | X  | X  | X  | X  | X  | X  | X  | X  |
| Boundary Routing® central node                  |                   |    |    |    |    |    |    |    |    |    |    |    |
| Boundary Routing leaf node                      |                   |    |    | X  |    |    |    |    |    |    |    |    |
| 40-Bit Encryption (IPSec)                       |                   | X  | X  |    |    | X  | X  |    |    | X  | X  | X  |
| 56-Bit Encryption (IP Sec)                      |                   | X  | X  |    |    | X  | X  |    |    |    | X  | X  |
| 128-Bit Encryption (IP Sec)                     |                   |    | X  |    |    |    | X  |    |    |    |    | X  |
| IPCP  | X                 | X  | X  |    | X  | X  | X  | X  | X  | X  | X  | X  |
| IPv6/BGP  |                   |    |    |    |    |    |    |    | X  | X  | X  | X  |
| VRRP (Ethernet/FDDI/Token Ring)                 |                   |    |    |    | X  | X  | X  | X  | X  | X  | X  | X  |
| VRRP for DLSW                                   |                   |    |    |    |    |    |    | X  | X  | X  | X  | X  |
| VRRP over VLAN                                  |                   |    |    |    | X  | X  | X  | X  | X  | X  | X  | X  |
| RSVP, RSVP Proxy                                | X                 | X  | X  |    | X  | X  | X  | X  | X  | X  | X  | X  |
| Multicast IP, PIM, IGMP, MBR                    |                   |    |    |    | X  | X  | X  | X  | X  | X  | X  | X  |
| IP/OSI Connection Services                      |                   |    |    |    |    |    |    |    |    |    |    |    |
| IPX   | X                 | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| XNS, OSI  |                   |    |    |    |    |    |    |    | X  | X  | X  | X  |
| Appletalk                                       |                   |    |    |    | X  | X  | X  | X  | X  | X  | X  | X  |
| VINES, DECnet, Ph-IV, Ph-IV/V GW                |                   |    |    |    |    |    |    |    | X  | X  | X  | X  |
| DLSW  |                   |    |    | X  |    |    |    | X  | X  | X  | X  | X  |
| NetView Service Point                           |                   |    |    |    |    |    |    |    | X  | X  | X  | X  |
| BRITSS  |                   |    |    | X  |    |    |    |    | X  | X  | X  | X  |
| APPN  |                   |    |    |    |    |    |    | X  |    |    |    |    |
| LNLM  |                   |    |    |    |    |    |    |    |    |    |    |    |
| LAA   |                   |    |    |    | X  | X  | X  | X  | X  | X  | X  | X  |
| Token Ring in Fast Ethernet (IOS not supported) | X                 | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| ISDN BRI  | X                 | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| ISDN PRI  |                   |    |    |    |    |    |    |    |    |    |    |    |
| ISDN T1/E1                                      | X                 | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| ISDN CT1/CE1                                    |                   |    |    |    |    |    |    |    |    |    |    |    |
| ISDN T3/E3                                      |                   |    |    |    |    |    |    |    |    |    |    |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 6** OfficeConnect NETBuilder Bridge/Router Software Features (continued)

| Feature   | Software Packages |     |     |    |    |    |    |    |    |    |    |    |
|---|-------------------|-----|-----|----|----|----|----|----|----|----|----|----|
|   | JW                | JE  | JS  | BF | NW | NE | NS | AF | OF | OL | OE | OS |
| ISDN CT3/CE3  |                   |     |     |    |    |    |    |    |    |    |    |    |
| Data over Analog (Call Originate only)  | X                 | X   | X   | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| CSU/DSU Loopback  | X                 | X   | X   | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| SDLC/SHDLCL/Polled Async/Bisync   |                   |     |     | X  |    |    |    | X  | X  | X  | X  | X  |
| BSC Conversion  |                   |     |     |    |    |    |    |    | X  | X  | X  | X  |
| QLLC/LLC2 Conversion  |                   |     |     | X  |    |    |    |    | X  | X  | X  | X  |
| Frame Relay   |                   |     |     | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| SMDS  |                   |     |     |    | X  | X  | X  | X  | X  | X  | X  | X  |
| X.25 Switching/Tunneling  |                   |     |     |    | X  | X  | X  | X  | X  | X  | X  | X  |
| WANExtender   |                   |     |     |    |    |    |    |    |    |    |    |    |
| MP6E Module   |                   |     |     |    |    |    |    |    |    |    |    |    |
| Fast Ethernet 100Base   |                   |     |     |    |    |    |    |    |    |    |    |    |
| ATM Module/ LANE  |                   |     |     |    |    |    |    |    |    |    |    |    |
| PPPOE   |                   |     |     |    |    |    |    |    |    |    |    |    |
| MPOA Server/Client  |                   |     |     |    |    |    |    |    |    |    |    |    |
| ZMODEM Support in Software  | X                 | X   | X   | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| Flash Load  | X                 | X   | X   | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| LDAP Policy Engine/Client   |                   |     |     |    | X  | X  | X  | X  | X  | X  | X  | X  |
| Auto Startup  | X                 | X   | X   | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPPCP                        |                   | X   | X   |    |    | X  | X  |    |    |    | X  | X  |
| DES Crypto  |                   | X   | X   |    |    | X  | X  |    |    |    | X  | X  |
| 3DES /3DES 3 KEY  |                   | X   | X   |    |    |    | X  |    |    |    |    | X  |
| RC5 Crypto  |                   |     | X   |    |    | X  | X  |    |    |    | X  | X  |
| MPPE/RC4  |                   | X   | X   |    |    | X  | X  |    |    | X  | X  | X  |
| IP/IPX RAS, Radius, traps   |                   |     | X   |    | X  | X  | X  |    | X  | X  | X  | X  |
| MS-CHAP   |                   | X   | X   |    |    | X  | X  |    |    | X  | X  | X  |
| EAP Authentication  |                   | X   | X   |    | X  | X  | X  |    | X  | X  | X  | X  |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel Switch PPTP/L2TP (R2R, VLL)  | X                 | X   | X   |    | X  | X  | X  | X  | X  | X  | X  | X  |
| IP (Routing, FireWall, NAT, Proxy, ARP, DHCP, DHCP Proxy, Traffic Director, Internal IP Ports, IPQoS) | X                 | X   | X   |    | X  | X  | X  | X  | X  | X  | X  | X  |
| IP OSPF   |                   |     |     |    | X  | X  | X  | X  | X  | X  | X  | X  |
| IPX NLSP  |                   |     |     |    | X  | X  | X  | X  | X  | X  | X  | X  |
| Virtual Ports   | 10                | 10  | 10  | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| Restricted Number of DHCP Addresses   | 256               | 256 | 256 |    |    |    |    |    |    |    |    |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 6** OfficeConnect NETBuilder Bridge/Router Software Features (continued)

| Feature   | Software Packages |       |       |       |       |       |       |       |       |       |       |       |
|---|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|   | JW                | JE    | JS    | BF    | NW    | NE    | NS    | AF    | OF    | OL    | OE    | OS    |
| Max Physical Voice Ports  |                   |       |       |       |       |       |       |       |       |       |       |       |
| <b>Memory Requirements</b>  |                   |       |       |       |       |       |       |       |       |       |       |       |
| DRAM  | 16 MB             | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB | 16 MB |
| Flash memory (Minimum required for Enterprise OS 11.4)  | 4 MB              | 4 MB  | 4 MB  | 4 MB  | 8 MB  | 8 MB  | 8 MB  | 8 MB  | 8 MB  | 8 MB  | 8 MB  | 8 MB  |
| Flash memory (Minimum required for Dual Images)   | 8 MB              | 8 MB  | 8 MB  | 8 MB  | 12 MB | 12 MB | 12 MB | 12 MB | 12 MB | 12 MB | 12 MB | 12 MB |
| * Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels. |                   |       |       |       |       |       |       |       |       |       |       |       |

**OfficeConnect  
NETBuilder 10/ST**

The OfficeConnect NETBuilder 10/ST bridge/router supports the following software packages:

- RW–Multiprotocol Router
- RE–Multiprotocol Router with 56-bit Encryption
- RS–Multiprotocol Router with 128-bit Encryption and 3DES

Table 7 lists the software features in each package for OfficeConnect NETBuilder 10/ST bridge/router.

**Table 7** OfficeConnect NETBuilder 10/ST Bridge/Router Software Features

| Feature                        | Software Packages |    |    |
|--------------------------------|-------------------|----|----|
|                                | RW                | RE | RS |
| Voice Support (Analog)         |                   |    |    |
| FXO                            |                   |    |    |
| FXS                            |                   |    |    |
| Voice/FAX over IP              |                   |    |    |
| Voice/FAX over Frame Relay     |                   |    |    |
| Core Features*                 | X                 | X  | X  |
| Boundary Routing® central node |                   |    |    |
| Boundary Routing leaf node     |                   |    |    |
| 40-Bit Encryption (IPSec)      |                   | X  | X  |
| 56-Bit Encryption (IP Sec)     |                   | X  | X  |
| 128-Bit Encryption (IP Sec)    |                   |    | X  |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 7** OfficeConnect NETBuilder 10/ST Bridge/Router Software Features (continued)

| Feature   | Software Packages |    |    |
|---|-------------------|----|----|
|   | RW                | RE | RS |
| IPCP  | X                 | X  | X  |
| IPv6/BGP  |                   |    |    |
| VRRP (Ethernet/FDDI/Token Ring)                 |                   |    |    |
| VRRP for DLSW                                   |                   |    |    |
| VRRP over VLAN                                  |                   |    |    |
| RSVP, RSVP Proxy                                |                   |    |    |
| Multicast IP, PIM, IGMP, MBR                    |                   |    |    |
| IP/OSI Connection Services                      |                   |    |    |
| IPX   | X                 | X  | X  |
| XNS, OSI  |                   |    |    |
| Appletalk                                       |                   |    |    |
| VINES, DECnet, Ph-IV, Ph-IV/V GW                |                   |    |    |
| DLSW  |                   |    |    |
| NetView Service Point                           |                   |    |    |
| BRITSS  |                   |    |    |
| APPN  |                   |    |    |
| LNМ   |                   |    |    |
| LAA   |                   |    |    |
| Token Ring in Fast Ethernet (IOS not supported) | X                 | X  | X  |
| ISDN BRI  | X                 | X  | X  |
| ISDN PRI  |                   |    |    |
| ISDN T1/E1                                      | X                 | X  | X  |
| ISDN CT1/CE1                                    |                   |    |    |
| ISDN T3/E3                                      |                   |    |    |
| ISDN CT3/CE3                                    |                   |    |    |
| Data over Analog (Call Originate only)          | X                 | X  | X  |
| CSU/DSU Loopback                                | X                 | X  | X  |
| SDLC/SHDLC/Polled Async/Bisync                  |                   |    |    |
| BSC Conversion                                  |                   |    |    |
| QLLC/LLC2 Conversion                            |                   |    |    |
| Frame Relay                                     |                   |    |    |
| SMDS  |                   |    |    |
| X.25 Switching/Tunneling                        |                   |    |    |
| WANExtender                                     |                   |    |    |
| MP6E Module                                     |                   |    |    |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 7** OfficeConnect NETBuilder 10/ST Bridge/Router Software Features (continued)

| Feature  | Software Packages |       |       |
|--|-------------------|-------|-------|
|  | RW                | RE    | RS    |
| Fast Ethernet 100Base  |                   |       |       |
| ATM Module/ LANE   |                   |       |       |
| PPPOE  |                   |       |       |
| MPOA Server/Client   |                   |       |       |
| ZMODEM Support in Software   | X                 | X     | X     |
| Flash Load   | X                 | X     | X     |
| LDAP Policy Engine/Client  |                   |       |       |
| Auto Startup   | X                 | X     | X     |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPPCP   |                   |       | X     |
| DES Crypto   |                   |       | X     |
| 3DES /3DES 3 KEY   |                   |       | X     |
| RC5 Crypto   |                   |       |       |
| MPPE/RC4   |                   |       | X     |
| IP/IPX RAS, Radius, traps  |                   |       | X     |
| MS-CHAP  |                   | X     | X     |
| EAP Authentication   |                   | X     | X     |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel Switch PPTP/L2TP (R2R, VLL)   | X                 | X     | X     |
| IP (Routing, FireWall, NAT, Proxy, ARP, DHCP, DHCP Proxy, Traffic Director, Internal IP Ports, IPQoS)  | X                 | X     | X     |
| IP OSPF  |                   |       |       |
| IPX NLSP   |                   |       |       |
| Virtual Ports  | 5                 | 5     | 5     |
| Restricted Number of DHCP Addresses  | 50                | 50    | 50    |
| Max Physical Voice Ports   |                   |       |       |
| Max Physical Data Ports  |                   |       |       |
| <b>Memory Requirements</b>   |                   |       |       |
| DRAM   | 16 MB             | 16 MB | 16 MB |
| Flash memory (Minimum required for Enterprise OS 11.4)   | 4 MB              | 4 MB  | 4 MB  |
| Flash memory (Minimum required for Dual Images)  | 8 MB              | 8 MB  | 8 MB  |
| * Core Features include: Bridging (MLN & SRTG in NBI), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels. |                   |       |       |

## SuperStack II NETBuilder Token Ring

SuperStack II Token Ring bridge/routers support the following packages for the specified models.

- CF–Multiprotocol Router
- TE–Multiprotocol Router with 56-bit encryption

Table 8 lists software features for each package for the SuperStack II Token Ring bridge/routers.

**Table 8** SuperStack II NETBuilder Token Ring Software Features

| Feature                          | Software Package |                  |                  |                  |
|----------------------------------|------------------|------------------|------------------|------------------|
|                                  | CF for model 327 | TE for model 327 | CF for model 527 | TE for model 527 |
| Voice Support (Analog)           |                  |                  |                  |                  |
| FXO                              |                  |                  |                  |                  |
| FXS                              |                  |                  |                  |                  |
| Voice/FAX over IP                |                  |                  |                  |                  |
| Voice/FAX over Frame Relay       |                  |                  |                  |                  |
| Core Features*                   | X                | X                | X                | X                |
| Boundary Routing® central node   | X                | X                | X                | X                |
| Boundary Routing leaf node       |                  |                  |                  |                  |
| 40-Bit Encryption (IPSec)        |                  | X                |                  | X                |
| 56-Bit Encryption (IP Sec)       |                  | X                |                  | X                |
| 128-Bit Encryption (IP Sec)      |                  |                  |                  |                  |
| IPCP                             | X                | X                | X                | X                |
| IPv6/BGP                         |                  |                  |                  |                  |
| VRRP (Ethernet/FDDI/Token Ring)  | X                | X                | X                | X                |
| VRRP for DLSW                    |                  |                  |                  |                  |
| VRRP over VLAN                   |                  |                  |                  |                  |
| RSVP, RSVP Proxy                 |                  |                  |                  |                  |
| Multicast IP, PIM, IGMP, MBR     | X                | X                | X                | X                |
| IP/OSI Connection Services       |                  |                  |                  |                  |
| IPX                              | X                | X                | X                | X                |
| XNS, OSI                         | X                | X                | X                | X                |
| Appletalk                        | X                | X                | X                | X                |
| VINES, DECnet, Ph-IV, Ph-IV/V GW | X                | X                | X                | X                |
| DLSW                             | X                | X                | X                | X                |
| NetView Service Point            |                  |                  |                  |                  |
| BRITSS                           | X                | X                | X                | X                |
| APPN                             |                  |                  |                  |                  |
| LNLM                             |                  |                  |                  |                  |
| LAA                              | X                | X                | X                | X                |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.



**Table 8** SuperStack II NETBuilder Token Ring Software Features (continued)

| Feature  | Software Package |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|
|  | CF for model 327 | TE for model 327 | CF for model 527 | TE for model 527 |
| Token Ring in Fast Ethernet (IOS not supported)                                |                  |                  |                  |                  |
| ISDN BRI   |                  |                  | X                | X                |
| ISDN PRI   |                  |                  |                  |                  |
| ISDN T1/E1   |                  |                  |                  |                  |
| ISDN CT1/CE1   |                  |                  |                  |                  |
| ISDN T3/E3   |                  |                  |                  |                  |
| ISDN CT3/CE3   |                  |                  |                  |                  |
| Data over Analog (Call Originate only)   |                  |                  | X                | X                |
| CSU/DSU Loopback   |                  |                  |                  |                  |
| SDLC/SHDLC/Polled Async/Bisync   | X                | X                | X                | X                |
| BSC Conversion   |                  |                  |                  |                  |
| QLLC/LLC2 Conversion   | X                | X                | X                | X                |
| Frame Relay  | X                | X                | X                | X                |
| SMDS   | X                | X                | X                | X                |
| X.25 Switching/Tunneling   | X                | X                | X                | X                |
| WANExtender  |                  |                  |                  |                  |
| MP6E Module  |                  |                  |                  |                  |
| Fast Ethernet 100Base  |                  |                  |                  |                  |
| ATM Module/ LANE   |                  |                  |                  |                  |
| PPPOE  |                  |                  |                  |                  |
| MPOA Server/Client   |                  |                  |                  |                  |
| ZMODEM Support in Software   |                  |                  |                  |                  |
| Flash Load   | X                | X                | X                | X                |
| LDAP Policy Engine/Client  | X                | X                | X                | X                |
| Auto Startup   | X                | X                | X                | X                |
| DES Crypto   |                  |                  |                  |                  |
| 3DES /3DES 3 KEY   |                  |                  |                  |                  |
| RC5 Crypto   |                  | X                |                  | X                |
| MPPE/RC4   |                  |                  |                  |                  |
| IKE/IPsec - KEK/ISAKMP Tunnel Mode/Fast Tunnel/Policy UI/Policy Manager, IPPCP |                  |                  |                  |                  |
| IP/IPX RAS, Radius, traps  |                  |                  |                  |                  |
| MS-CHAP  |                  |                  |                  |                  |
| EAP Authentication   |                  |                  |                  |                  |
| VPN/PPTP/L2TP/L2TP (FP) Tunnel Switch PPTP/L2TP (R2R, VLL)                     | X                | X                | X                | X                |

\* Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels.

**Table 8** SuperStack II NETBuilder Token Ring Software Features (continued)

| Feature   | Software Package |                  |                  |                  |
|---|------------------|------------------|------------------|------------------|
|   | CF for model 327 | TE for model 327 | CF for model 527 | TE for model 527 |
| IP (Routing, FireWall, NAT, Proxy, ARP, DHCP, DHCP Proxy, Traffic Director, Internal IP Ports, IPQos)   | X                | X                | X                | X                |
| IP OSPF   | X                | X                | X                | X                |
| IPX NLSP  | X                | X                | X                | X                |
| Virtual Ports   | 28               | 28               | 28               | 28               |
| Max Physical Voice Ports  |                  |                  |                  |                  |
| Max Physical Data Ports   | 18               | 18               | 18               | 18               |
| <b>Memory Requirements</b>  |                  |                  |                  |                  |
| DRAM  | 12 MB            | 12 MB            | 12 MB            | 12 MB            |
| Flash memory (Minimum required for Enterprise OS 11.4)  | 4 MB             | 4 MB             | 4 MB             | 4 MB             |
| Flash memory (Minimum required for Dual Images)   | 8 MB             | 8 MB             | 8 MB             | 8 MB             |
| * Core Features include: Bridging (MLN & SRTG in NBII), Telnet, RADIUS Authentication, IP RIP, IP RIPv2/NTP, FTP, TFTP, HTTP Server/Web Link/Web Link Health Monitor/ HTTP client, PPP (PAP/CHAP), MLP, CCP, X.25, Dial, ASCII Boot and ASCII Capture, Login Banner, SLAMS, Bandwidth on Demand/incoming, SLAM Autotargeting, Domain Name Support, NHRP for IP tunnels. |                  |                  |                  |                  |

## Upgrade Management Utilities

This section includes information about Enterprise OS software version 11.4 Upgrade Management Utilities. The Upgrade Management Utilities can be executed using the command line, via the GUI-interface in Transcend Upgrade Manager, the GUI-interface in Upgrade Link, or via user-defined scripts.

The Enterprise OS software version 11.4 Upgrade Management Utilities support upgrades from NETBuilder bridge/routers running version 8.x through 11.4. If you need to upgrade from version 7.x to 11.4, you need to perform the upgrade in two steps. The first step requires upgrading from 7.x to 9.3.1. After the NETBuilder bridge/router configuration files have been converted to 9.3.1, they can then be further upgraded to support the 11.4 release. The 9.3.1 Upgrade Utilities and manual are available on the 3Com InfoDeli website.

## Downloading Upgrade Management Utilities

The Upgrade Management Utilities are shipped on the CD-ROM with every Enterprise OS software release. In addition, these utilities can be downloaded from the FTP site ([ftp.3com.com](ftp://ftp.3com.com)), from the World Wide Web access through <http://infodeli.3com.com/>, or from the 3Com bulletin board service (BBS) under Software Downloads, System Software.

### UNIX Files

The Upgrade Management Utilities are UNIX files compressed with the UNIX compression utility. To use the downloaded files, you must first expand the files using the UNIX expansion utility. For instructions on how to download and expand the utilities, see the `ruu114.txt` file.

The UNIX files are as follows:

- `ruusol114.Z` Contains the UNIX-compressed Upgrade Management Utilities for the Solaris 2.5 platforms.
- `ruuhp114.Z` Contains the UNIX-compressed Upgrade Management Utilities for the HP-UX 10.x platforms.
- `ruuaix114.Z` Contains the UNIX-compressed Upgrade Management Utilities for the IBM AIX 4.1.1 through 4.2.X platforms.
- `ruu114.txt` Contains the instructions for downloading and expanding the Upgrade Management Utilities and Upgrade Link. This file also contains instructions on how to integrate the utilities into the Transcend Network Control Services application.

### Windows Files

The Upgrade Management Utilities are Windows files compressed with a compression utility. To use the downloaded files, you must first expand them using the decompress utility PKUNZip. PKUNZip can be downloaded from the following URLs:

<http://www.pkware.com>

or

<http://infodeli.3com.com/infodeli/swlib>

For instructions on how to decompress and install the utilities, see the `ruu114.txt` file.

The Windows files are as follows:

- ruu114.zip Contains the compressed Upgrade Management Utilities for Windows95/98 and Windows NT platforms.
- ruu114.txt Contains the instructions for downloading and expanding the Upgrade Management Utilities and Upgrade Link. This file also contains instructions on how to integrate the utilities into the Transcend Network Control Services Manager application.

### **Executing profile.bat**

When using the Upgrade Management Utilities from a Windows command line, you must execute the profile.bat (/user/3com/common/data/profile.bat) file. This file sets up the path to \usr\3com\common\bin where the utilities reside. Alternatively you can reboot your system so that the changes in the autoexec.bat file can take effect.

### **Version 11.4 Upgrade Management Utilities**

The upgrade utilities, can be integrated into Transcend Network Control Services Manager for Windows 95 version 6.1, and Transcend Network Control Services Manager for Windows NT are available for use on Windows 95 and Windows NT platforms. These utilities can also be integrated into Transcend Enterprise Manager for UNIX version 4.2.1 and 4.2.2 and are shipped preinstalled in Transcend Network Control Services for UNIX 5.0. The utilities are pre-shipped with Transcend Network Control Services for Windows version 6.2 and Windows NT 1.1. The Upgrade Management Utilities are designed to work with or without Transcend Network Control Services Manager Network Admin Tools. See *Upgrading Enterprise OS Software* for details about integrating the Upgrade Management Utilities into the Transcend Network Control Services Manager.

### **Upgrading to 11.4 Utilities with Transcend Upgrade Manager**

The proper installation order for integrating the Upgrade Management Utilities into Transcend is:

- 1 Stop Transcend.
- 2 Install the Upgrade Management Utilities using bcmsetup. Do this if Transcend does not have the Upgrade Management Utilities bundled or if you want to install a newer version of the Upgrade Management Utilities.
- 3 Start Transcend. The Transcend Upgrade Manager, Baseline Manager, and Alarm Manager will then support the latest Enterprise OS software version.

### **Transcend Enterprise Manager**

The following notes apply to users of the Transcend network management application.

#### **BCMUSEFTFP Environment Variable**

Transcend Enterprise Manager for Windows and Transcend Enterprise Manager for UNIX 4.x users should set the BCMUSEFTFP environment variable to 1 to force the Upgrade Management Utilities to use TFTP file transfer during upgrading. The environment variable can be set by executing or adding the following line to the autoexec.bat or .login file:

```
set BCMUSEFTFP=1
```

## EncryptionLicenseRead Environment Variable

Transcend Enterprise Manager for Windows Upgrade Manager and Transcend Enterprise Manager for UNIX Upgrade Manager 4.2.x will not allow you to upgrade 3Com NETBuilder bridge/routers with encryption technology unless you set the EncryptionLicenseRead environment variable to 1. Setting this variable implies that you have read and agree to the export regulations enforced by the US Department of Commerce. This environment variable can be set by executing or adding the following line to the autoexec.bat or .login file:

```
set EncryptionLicenseRead=1
```

## Upgrade Management Notes

This section contains known upgrade management issues.

### bcmdiagnose Error Message

When you execute bcmdiagnose on HP-UX and the TFTP server is configured to use the Safe Directory method, the error message "No TFTP user found in /etc/passwd. You must add an entry" can be ignored.

Installation of a new version of the Remote Upgrade Utilities onto a UNIX NMS saves an existing /usr/3Com/bcmutil.conf, into /etc/3Com/bcmutil.conf.backup. This file is used by the Transcend Enterprise Manager for UNIX (TEM/U). If a user has made modifications to this file, they must either restore their original file or add the changes to the new file.

If you are using the Remote Upgrade Utilities in stand-alone mode or with the Transcend Enterprise Manager for UNIX (TEM/U), you can specify SNMP community strings of different devices in /etc/snmp.cfg file. More information about the snmp.cfg file can be found in the help pages (file:///usr/3Com/bcm/gui/hlp/bcm-intro.html).

### SuperStack II NETBuilder Token Ring Upgrades

If SuperStack II NETBuilder systems that are running software version 8.3 have a boot image named "bundle.68K," the SuperStack II NETBuilder Token Ring system is not upgradeable to software version 11.4 unless the sys file is present on the flash drive. To work around this, either rename the image to "boot.68k," or copy the 8.3 sys file to the primary boot directory on the NETBuilder bridge/router.

### bcmdiagnose and HP-UX

If you are using HP-UX and have difficulties passing the tftp portion of bcmdiagnose, you may need to modify the /etc/passwd file. Follow the instructions printed during bcmsetup. You may need to add the following line to the /etc/passwd file:

```
tftp::510:200:,,,:/tftpboot:/bin/false
```

See the HP-UX tftpd man page for more information.

### bcmfdinteg

Read the following warning regarding the bcmfdinteg utility.



**WARNING:** Do not use the bcmfdinteg utility. The bcmfdinteg utility is used internally by the bcminstall utility. The bcmfdinteg utility should not be used by itself, because by default it removes all files from the current directory.

## File Conversion Considerations

This section describes file conversion considerations for APPN, bridge static routes, DLSw, the PROfile service, and X.25 SVCs.

### APPN

APPN file conversion is supported in software version 8.2 and later. Upgrading from software versions prior to 8.2 requires manual configuration.

High Performance Routing (HPR) is a new feature for the NETBuilder bridge/router after software version 8.3. If you use the Upgrade Management Utilities to convert your APPN data file from version 8.3 (or later) to 11.4, be sure to turn on HPR if HPR is desired using:

```
SETDefault !<port> -APPN PortDef = <DLC type> HPR=yes
```

### Bridge Static Routes

A static bridge route configured with the off option does not convert properly. You must manually reconfigure this route.

### DLSw

Initial Bandwidth for Peer is a new parameter for software version 8.3 and later. The default for version 11.0 is 8000. If you use the Upgrade Management Utilities to convert your DLSw data files from version 8.3 (or later) to 11.4, be sure to set the value of the parameter to the desired value using:

```
SETDefault <tunnel id> -Dlsw PEER = <IP address> <PrioMode> <8000 | other value>
```

## UNIX Platform Symbolic Links

When installing Enterprise OS software version 11.4 from a UNIX platform, do not follow symbolic links to reach a particular file (image or tar file) when using the "Browse" option. Double-clicking a directory name that is a symbolic link will not connect to the directory. To open a directory, type the directory name and press "Enter."

## Upgrading From Release 8.3 or Earlier

If you are upgrading a bridge/router from software version 8.3 or earlier, you must disable user verification by specifying the -NA flag on bcmnbrus or Upgrade Link. For example:

```
bcmnbrus -NA
```

or

```
UpgradeLink -NA
```

Otherwise, an error dialog box is returned with the message "Could not verify user."

If you use tftp, the "Verify Upgrade Services" step does not need the user or password to be verified, so those entries as well as the FTP Client User Name and Password, should be ignored.

## Upgrade Link and Netscape Browser Scroll Bars

Netscape version 4.05 with AWT patch 1.1.5 has the Java support required by Enterprise OS software version 11.4 Upgrade Link. Certain problems have been found with this Netscape patch release, such as sometimes the Netscape browser

fails to add scroll bars with text fields. If you experience this or other problems, you may want to use a later version of Netscape when it becomes available.

### **Upgrade Link Window Resizing**

Since Enterprise OS software version 11.4 Upgrade Link cannot resize the browser window, you should maximize the browser window so that all of the Upgrade Link dialog boxes are fully visible without scrolling.

---

## **IBM Protocols and Services Notes**

This section describes notes, cautions, and other considerations to be aware of when using the Enterprise OS software when with IBM protocols and services. The topics are presented in alphabetical order.

**APPN** In software version 11.4, APPN does not support SMDS.

### **APPN Connections to 3174 through Token Ring**

When you connect to a 3174 on a token ring, you may need to enable transparent bridging on the bridge/router. The 3174 may send exchange identification (XID) as a non-source routed frame.

### **APPN CP-CP Sessions and SNA Boundary Routing**

If you set up APPN routing in an SNA Boundary Routing configuration from a NETBuilder II bridge/router to a leaf node bridge/router, CP-CP sessions between the remote site PC and the NETBuilder II bridge/router are established before you can configure the Boundary Routing configuration on the NETBuilder II bridge/router. However, after you set the -BCN CONTROL parameter for IBM traffic and enable the -BCN Service, the NETBuilder II bridge/router no longer receives the CP-CP sessions. To work around this problem, first turn off BOOTP on the NETBuilder II port at the central site. An alternative work around is to configure APPN with DLSw at the central site and to use the CEC's MAC address at the remote site.

### **APPN CP-CP Sessions on Parallel TGs**

When parallel transmission groups (TGs) are configured between 3Com network nodes and both TGs support CP-CP sessions, a CP-CP session on one TG does not switch to the other TG if the user disables the port or path. This happens because both sides learn about the link failure at different times. The network node with the disabled port or path learns about the link failure right away and tries to bring CP-CP sessions up on the second TG. However, the second network node does not learn about the link failure until LLC2 times out; because it thinks the link is still up, the second network node does not allow CP-CP sessions to start on the second TG. After five attempts at bringing up CP-CP sessions on the second TG, the second TG will be flagged as not supporting CP-CP sessions, preventing CP-CP sessions from coming up on that second TG. To prevent this situation, manually stop the first TG by entering the SET -APPN LinkStaCONTROL <LinkName> Deactivate command before disabling the port/path. By doing this, both network nodes will learn that the link has gone down at the same time, and CP-CP session can be activated on the second TG.

### **APPN DLUr Connections to 3174 Systems**

When you configure an APPN dependent LU requestor (DLUr) connection from a NETBuilder II bridge/router to a 3174 cluster controller, the NETBuilder II network node and the 3174 must be on the same ring. In this configuration, the NETBuilder II token ring port must be set to transparent bridging only.

### **BSC and Leased Lines**

The BSC pass-through feature is limited to leased lines and cannot use dialup links.

## Boundary Routing and NetView Service Point

When configuring NetView Service Point in a Boundary Routing environment, note that the SSCP-PU session actually flows over LLC2 rather than DLSw, even though the -SNA PortDef parameter is defined as DLSw. As a result, the session does not show up as a DLSw circuit.

## Configuring BSC and NCPs

When connecting a NETBuilder bridge/router to an Network Control Program (NCP) for a BSC configuration, be careful when disabling the 3780/2780 EP lines. If you try to pull the cable out, the NCP may go into a state that will require the NCP to be rebooted. Check with your IBM service representative for additional details.

## DLSw Circuit Balancing

Circuit balancing does not work properly if WAN links are set to different speeds. For circuit balancing to work properly, you must have WAN links of the same speed. If the WAN links are different speeds, for example, T1 and 64 K, the bridge/router with circuit balancing learns the route from the T1 link before learning the route from the 64 K link. All circuits are directed to the DLSw tunnel on the T1 link instead of being distributed on both 64 K and T1 DLSw tunnels. Only after alternate routes are in the circuit-balancing router cache will subsequent session establishment be balanced.

## DLSw and CONNectUsage Parameter Default Change

The default value of the -SYS CONNectUsage parameter is High for NETBuilder bridge/routers with a DPE module. The default value of CONNectUsage for all other platforms is Low. This difference simplifies DLSw configurations.

When the DPE module is used in a non-DLSw configuration, a small amount of memory is allocated (226 K of approximately 12 MB). Non-DLSw configurations in very large networks running OSPF and BGP may require that the CONNectUsage parameter be changed to Low to recapture this 226 K of memory. For all other configurations, this additional small memory allocation should have no effect.

## DLSw Prioritization

The FLush -SYS STATistics command does not flush DLSw priority statistics. You must use the FLush -DLSw PRioritySTATistics command.

## DLSw and IBM Boundary Routing in Large Networks

The following considerations are related to DLSw in large networks.

### Leaf Node Sessions Support

When a leaf node has more than 50 end stations, use the following tuning parameters:

```
SETDefault !<port> -LLC2 TransmitWindow = 1
SETDefault !<port> -LLC2 RetryCount = 20
SETDefault !<port> -LLC2 TImerReply = 10000
```

Use these parameters for the leaf node and central node WAN ports.

### Number of DLSw Circuits

The -SYS CONNectUsage parameter controls the maximum number of DLSw circuits. The default value of the CONNectUsage parameter is High for NETBuilder bridge/router with a DPE module and for the boundary router peripheral node, but the default value is low for all other NETBuilder bridge/router platforms. Change this value using:

```
SETDefault -SYS CONNectUsage = Low | Medium | High
```



You must reboot the bridge/router before this change takes effect. Table 9 shows the maximum number of circuits possible with the different CONNecTionUsage parameter settings. The practical limit may be lower and depends on the traffic load, CPU, and memory usage by other services.

**Table 9** DLSw Circuit Maximums with CONNecTionUsage Parameter Settings

| System  | Maximum Number of DLSw Circuits |        |      |
|---|---------------------------------|--------|------|
|   | Low                             | Medium | High |
| OfficeConnect and SuperStack II<br>NETBuilder bridge/routers    | 190                             | 390    | 790  |
| Boundary router peripheral node*<br>NETBuilder II bridge/router | n/a                             | n/a    | 790† |
| DPE modules   | 390                             | 790    | 7990 |

\* The CONNecTionUsage parameter is set to High by the Boundary Router Peripheral node software; it cannot be changed.

† The IBM Boundary Router peripheral node uses two LLC2 circuits to support one LLC2 end system. Therefore, the maximum number of LLC2 end systems supported by an IBM Boundary Router peripheral node is 395.

### Number of TCP Connections

3Com LLC2 tunneling uses one TCP connection for each LLC2 session. DLSw scales to large networks better than LLC2 tunneling because it multiplexes all LLC2 sessions over one TCP connection per tunnel. Each Telnet session also uses one TCP connection. Table 10 shows the maximum number of TCP connections possible with the different CONNecTionUsage parameter settings. The practical limit may be lower and depends on the traffic load, CPU, and memory usage by other services.

**Table 10** TCP Circuit Maximums with CONNecTionUsage Parameter Settings

| System  | Maximum Number of TCP Circuits |        |      |
|---|--------------------------------|--------|------|
|   | Low                            | Medium | High |
| OfficeConnect and SuperStack II<br>NETBuilder bridge/routers    | 32                             | 256    | 512  |
| Boundary router peripheral node*<br>NETBuilder II bridge/router | n/a                            | n/a    | 790  |
| DPE module  | 32                             | 512    | 2048 |

\* The CONNecTionUsage parameter is set to High by the Boundary Router peripheral node software; it cannot be changed.

### Front-End Processor/Frame Relay Access for LLC2 Traffic

The maximum number of FradMap entries that may be defined for each Frame Relay port is 50.

### HPR and ISR Configurations

High Performance Routing (HPR) is enabled by default. Therefore, if you are configuring APPN Intermediate Session Routing (ISR), you must disable HPR on both the PortDef and the AdjLinkSta parameters by setting HPR = No.

### IBM Boundary Routing Topology Disaster Recovery

In an IBM Boundary Routing topology that uses disaster recovery through PPP (when two paths are mapped to one port), a disruption to existing SNA and

NetBIOS sessions occurs if the primary link fails and the redundant link is activated. If this happens, end users need to log on and initiate another session.

### IBM-Related Services in Token Ring

IBM-related services such as DLSw and APPN are affected by parameter settings in the BRIDGE, SR, and LLC2 Services. Table 11 shows the required settings in source route (SR), source route transparent (SRT), and transparent bridging environments for each of the IBM-related services. When a NETBuilder bridge/router token-ring port is configured for both an IBM service such as DLSw and transparent bridging or SRT bridging, connectivity problems and frame copy errors can occur. For this reason, 3Com recommends configuring token ring ports for source route only when possible.

In Table 11, DLSw refers to data link switching, and LNM refers to LAN Net Manager. The settings are shown in abbreviated form. 3Com-recommended configurations are shaded and shown in **bold**.

**Table 11** IBM-Related Feature Settings for Token Ring Ports

| Services             | Port Configuration | Source Route Bridging (-SR SRB) | Transparent Bridging (-BR TB) | Bridging (-BR CONT) | Route Discovery (-SR RD) | LLC2 CONTROL (-LLC2 CONT) | Frame Copy Errors |
|----------------------|--------------------|---------------------------------|-------------------------------|---------------------|--------------------------|---------------------------|-------------------|
| <b>Bridging only</b> | <b>SR</b>          | <b>SRB</b>                      | <b>NTB</b>                    | <b>B</b>            | <b>NoLLC2</b>            | <b>Disable</b>            | <b>None</b>       |
| Bridging only        | SRT                | SRB                             | TB                            | B                   | NoLLC2                   | Disable                   | Low # Possible    |
| Bridging only        | T                  | NSRB                            | TB                            | B                   | NoLLC2                   | Disable                   | Low # Possible    |
| <b>LNM</b>           | <b>SR</b>          | <b>SRB</b>                      | <b>NTB</b>                    | <b>B</b>            | <b>LLC2</b>              | <b>Enable</b>             | <b>None</b>       |
| <b>DLSw</b>          | <b>SR</b>          | <b>SRB</b>                      | <b>NTB</b>                    | <b>NB   B</b>       | <b>LLC2</b>              | <b>Enable</b>             | <b>None</b>       |
| DLSw                 | SRT                | SRB                             | TB                            | NB*   B*            | LLC2                     | Enable                    | High # Possible   |
| DLSw                 | T                  | NSRB                            | TB                            | NB*   B*            | NoLLC2                   | Enable                    | High # Possible   |
| <b>APPN</b>          | <b>SR</b>          | <b>SRB</b>                      | <b>NTB</b>                    | <b>NB   B</b>       | <b>LLC2</b>              | <b>Disable</b>            | <b>None</b>       |
| APPN                 | SRT                | SRB                             | TB                            | NB   B              | LLC2                     | Disable                   | None              |
| APPN                 | T                  | NSRB                            | TB                            | NB   B              | LLC2                     | Disable                   | None              |
| Default Setting      | SRT                | SRB                             | TB                            | NB                  | NoLLC2                   | Disable                   | None              |

\* 3Com recommends that you disable global bridging for this configuration. However, with global bridging disabled, the token-ring hardware does not filter unwanted transparent packets. The token-ring hardware copies each transparent packet for processing by the Enterprise OS software. This can generate many frame copy errors (see Token Ring Frame Copy Errors below for more information.) If you are seeing many Frame Copy Errors, consider setting global bridging on, which allows the hardware to learn and filter unwanted transparent packets. Since DLSw cannot block bridging loops, you must insure that none exist. As an alternative, you can prevent the bridge from forwarding by entering the following command: SETDefault -BRIDGE CONTROL = NoForward. The NoForward parameter allows the hardware to filter unwanted transparent packets, allows DLSw to send and receive LLC2 SNA and NetBIOS packets, but prevents these and other packets from bridging.

The row in Table 11 labeled DLSw with port configuration SR represents DLSw in a source-route-only port configuration. The entries in this row expand to the following Enterprise OS software configuration syntax:

```
SETDefault -BRIDGE CONTROL = Bridge | NoBridge
SETDefault !<port> -SR SrcRouBridge = SrcRouBridge
SETDefault !<port> -BRIDGE TransparentBridge = NoTransparentBridge
SETDefault !<port> -SR RingNumber = <number> (1-4095) | 0x<number> (1-FFF)
SETDefault !<port> -SR BridgeNumber = <number> (0-15) | 0x<number> (0-F)
SETDefault !<port> -SR RouteDiscovery = LLC2
SETDefault !<port> -LLC2 CONTROL = Enable
```

In this configuration, global bridging (-BRIDGE CONTROL) can be set to either Bridge or NoBridge. Transparent bridging is disabled on token ring ports, source routing

and route discovery are configured, bridge numbers must be unique for each bridge/router on the same ring, and LLC2 is enabled on token ring ports.

### Token Ring Frame Copy Errors

For transparent bridge or source route transparent configurations, token ring end systems may generate a small number of MAC frame copy error reports when the NETBuilder II bridge/router token ring interface is initializing or when the bridge/router ages out a MAC address from its bridge table.

For the bridge/router to learn the MAC addresses of transparent end systems on the token ring, it copies a packet with an unknown source address and sets the address-recognized (A) and frame-copied (C) bits in the Frame Status (FS) field. A problem occurs when the FS (A) and (C) bits have been set and the destination of the frame is an end system on the local ring. The destination end system expects the (A) and (C) bits to be zeros. When it receives a frame with these values already set, it reports an error. The end system counts these errors and accumulates them until the MAC layer Soft Error Report Timer period is reached; the default is two seconds. A MAC Report Error packet is then sent to the Ring Error Monitor (REM) Network Management entity.



*A source route only configuration eliminates frame copy errors. Frame copy errors do not occur in source route only environments when the NETBuilder bridge/routers are configured properly. This is because the NETBuilder bridge/router hardware filters source-routed packets based on the route information field, not the MAC address. If the bridge/router is configured for source route only, it never copies frames destined for a station on the local ring. Frame copy errors can be eliminated by running in source-route-only mode.*

Table 12 shows the features supported on the NETBuilder II and NETBuilder SuperStack II token ring bridge/routers.

**Table 12** 3Com Bridge/Routers and Supported Features

| Platform                            | Source Route Transparent Bridging | Routing | Source Route Transparent Gateway | Source Routing |
|-------------------------------------|-----------------------------------|---------|----------------------------------|----------------|
| NETBuilder II                       | Yes                               | Yes     | Yes                              | Yes            |
| SuperStack II NETBuilder Token Ring | No                                | Yes     | No                               | Yes            |

### Frame Copy Errors under LAN Net Manager

Whenever LAN Net Manager is enabled, the token ring driver is set to N-way bridging mode, which means the bridge/router copies all frames that match the bridge number specified on the receiving port. If two NETBuilder bridge/routers are connected to the same ring with the same bridge number, frame copy errors will occur. To prevent this problem, do not configure two NETBuilder bridge/routers with the same bridge number on the same ring.

### LAN Network Manager with NETBuilder II Systems

If you have previously configured your LAN Network Manager to use the NETBuilder II system as a virtual ring, and you want to use it as a physical ring, you must set your virtual ring number back to None.

**LLC2 Frames and PPP**

LLC2 frames are not sent or received over PPP unless global bridging is enabled using the SETDefault -BRIDGE CONTROL = Enabled command. You must enable LLC2 on the port using:

```
SETDefault !<port> -LLC2 CONTROL = Enabled.
```

If bridging is enabled and you do not want bridging, either set the -BRIDGE CONTROL parameter to NoForward, or disable bridging on individual ports by setting the following command:

```
SETDefault -BRIDGE TransparentBridge = NoTransparentBridge
```

**Maximum BSC Line Speed**

For V.35 and RS-232 links, the maximum baud rate supported for BSC traffic is 38.4. If the baud rate is higher, BSC traffic suffers errors and retransmissions.

**SHDLC Half-Duplex Mode**

SHDLC does not support physical half-duplex mode.

**SDLC**

SDLC requires the following:

- XID spoofing must be turned on if the IBM Communication Manager is used for 3270 communications and is defined as a PU type 2.0. Use the following syntax:

```
SETDefault !<PU name> -SDLC CUXid = <value> (8 Hexadecimal digits)
SETDefault !<PU name> -SDLC CUXidDefined = Yes
```

- SDLC end-to-end through local switching (conversion to a single LLC2 LAN connection between two NETBuilder bridge/routers) requires different virtual ring numbers in the LLC2 Service.

**SDLC Adjacent Link Stations for APPN**

When you configure SDLC adjacent link stations for APPN, if an active link becomes inactive and you change the port definition using the PortDef parameter, the link remains inactive. If you try to reactivate the link using the SET -APPN LinkStaCONTROL command, the link reactivates within 30 seconds. To activate the link immediately, you must enable the APPN port using the SET -APPN PortControl = Enable command.

**Source Route Transparent Bridging Gateway (SRTG) Interoperability**

The NETBuilder II bridge/router cannot interoperate with Cisco or IBM routers if the NETBuilder bridge/router is configured using Source Route Transparent Gateway (SRTG) with Source Route bridging on the token ring LAN port and Transparent Bridging on the PPP or Frame Relay WAN ports. In this configuration, the NETBuilder II bridge/router is sending using PPP bridge encapsulation 802.5 token ring format, while the IBM 6611 and the Cisco 400 router are using PPP bridge encapsulation 802.3 Ethernet format.

**SDLC Ports and NetView Service Point**

An SDLC port defined for NetView Service Point cannot be used for SDLC-to-LLC2.

**UI Response Time With Large SDLC configuration**

When NETBuilder bridge/router is configured with many SDLC PUs, SETDefault commands may take a long time to complete. Using the Defrag command to streamline the flash that contains the configuration files can fix the problem.

**VTAM Program Temporary Fixes**

VTAM Program Temporary Fixes (PTFs) are required on a mainframe when APPN DLU services are used. Mainframe network management (NetView) services will not function for downstream physical units (PUs) if the PTFs are not installed.

VTAM Version 4.2 requires PTF #UW20787. VTAM Version 4.3 requires PTF #UW20788.

Visible symptoms of this problem can be seen as a lack of network management data for PUs that are downstream of a NETBuilder II bridge/router using APPN DLU services. The NetView message "AAU251I AAUDRTIB 02 UNEXPECTED SENSE CODE X'1002' ENCOUNTERED FOR TARGET=pu\_name" is printed in the log file when this problem occurs.

---

## ATM Services Notes

This section describes notes, cautions, and other considerations to be aware of when using the Enterprise OS software with ATM services. The topics are presented in alphabetical order.

### ATM Emulated LANs

Enterprise OS software supports a system maximum of 32 ATM emulated LANs.

### ATM LAN Emulation Clients and Large 802.3 Frames

This release of LAN emulation software does not support large 802.3 frame encapsulation as specified in the LANE standard 1.0. When IP routing is used from FDDI to an emulated LAN, packets larger than 1500 are sent fragmented per IP fragmentation rules.

### ATM Connection Table

In a LAN Emulation environment with many LAN Emulation Servers (LEs), a performance drop may occur when the NETBuilder bridge/router is able to connect to the LAN Emulation Configuration Server (LECS), but many of the LEs are down or unreachable. Disabling the ETHATM virtual ports corresponding to the unreachable LEs will alleviate this situation.

### Deleting ATM Neighbors

Bridge ATM Neighbors must be deleted before the associated virtual ports can be deleted.

### Source-Route Transparent Gateway

The source-route transparent gateway is not currently supported on ATM LAN emulation ports.

---

## WAN Protocols and Services Notes

This section describes notes, cautions, and other considerations to be aware of when using the Enterprise OS software with WAN protocols and services. The topics are presented in alphabetical order.

### ACCM Not Configurable

The ACCM (Async Control Character Map) used for Async PPP cannot be configured. During LCP negotiation, the NETBuilder bridge/router always proposes an ACCM of all zeros and agrees to whatever the peer negotiates.

### Asynch Tunnelling on Serial Ports

For best results, set the LineType parameter to Leased and set the SuperStack II NETBuilder bridge/router model 32x connector type for the universal port to RS-232. For the path to come up, the bridge/router must see a DTR or DSR control signal from the device. Or, if the device does not generate a control signal, a loopback connector should be used to supply the control signal.

### Automatic Line Detection

When set to the value of Auto, the -PATH LineType parameter first attempts to bring up the path as a leased line by raising the data terminal ready (DTR) signal. If the path comes up but a DTR-base dial modem is attached to the path, the modem does not hang up until brought down manually with the HangUp command. To avoid this situation, set the -PATH LineType parameter to Dialup.

### Auto Start-up Does Not Include Async

Automatic detection of the line type (LineType=Auto) and link protocol (OWNer=Auto) do not include recognition of Async PPP and AT dial. For Async PPP and AT dial (which must be used together), the following parameters must be explicitly configured:

```
-PATH LineType=Dialup
-PATH DialMode=ATdial
-PATH ExDevType=Async
-PORT OWNer=PPP
```



*The PATH service parameter TransferMode should not be changed from its default value of AUto. Other settings of this parameter are reserved for future extensions.*

### Bandwidth-on-Demand Timer Precedence

Two PORT Service parameters are used to configure bandwidth-on-demand ports. The DialIdleTime parameter sets the time in seconds before all dialup lines in a port are disconnected if the port is not in use. The DialSamplPeriod parameter sets the time (in seconds) to sample before taking an action to bring additional paths up or down, based on traffic load for bandwidth-on-demand. The value specified for the DialIdleTime parameter takes precedence over the value specified for the DialSamplPeriod parameter.

### Baud Rates for WAN Ports in DCE Mode

The following baud rates are supported in DCE mode (synchronous, internal clocking):

- |        |          |
|--------|----------|
| ■ 1200 | ■ 112 K  |
| ■ 1800 | ■ 128 K  |
| ■ 2400 | ■ 256 K  |
| ■ 3600 | ■ 384 K  |
| ■ 7200 | ■ 448 K  |
| ■ 9600 | ■ 768 K  |
| ■ 19 K | ■ 1344 K |
| ■ 38 K | ■ 1536 K |
| ■ 56 K | ■ 1580 K |
| ■ 64 K | ■ 2048 K |

If you configure a baud rate that is different from those listed, the system will fall back to the nearest lower supported rate.

### BSC Cabling and Clocking

The data communication equipment (DCE) cable for SuperStack II bridge/routers should be 07-264-000-01 (rev. 1) to work in BSC internal clocking mode.

### Changing the Transfer Mode Parameter Default Value

The PATH service parameter TransferMode should not be changed from its default value of AUto. Other settings of this parameter are reserved for future extensions.

### Compression Requirements

Compression must use the same configuration at both ends of the connection. If one side of a connection is configured as per-packet and the other is configured as history, the PPP link does not come up.

- Dial Idle Timer** The dial idle timer is not accurate and it will take a client longer to idle out than is configured. For a 180 second dial idle time it takes approximately 8.5 minutes for the client to idle out if no traffic is ever sent. To work around this problem, disable bootp on !0 by entering the following command:
- ```
Setd !0 -bootp control=disable"
```
- Disaster Recovery on Ports Without Leased Lines** The Port Service DialControl parameter controls port attributes for a dial-up port in the event the bandwidth set for a leased line drops below what has been set as the normal bandwidth. Setting this parameter to DisasterRecovery for a port without leased lines prevents port idle out.
- DTR Modems** DTR modems should not be configured as a dynamic path and a dial pool.
- Dynamic Paths** Dynamic paths might not be released back into the dial pool from the port if an incoming call arrives during a disconnect state. If the SHow -Port PAtHs command indicates that a path from the dial pool is attached to a port but is no longer in use, it can be released by re-enabling the port.
- Frame Relay Congestion Control** The current implementation of Frame Relay congestion control requires that you set the committed burst size (Bc) and the committed information rate (cir) to the same value so that the time interval (Tc) equals 1 second using the formula  $Tc = \frac{Bc}{cir}$ . If Tc is not 1 second, the Frame Relay frames may be erroneously dropped due to the incorrect calculation of the throughput rate threshold.
- History-Based Compression Negotiation Failure** If you are using history-based compression on a line with excessive errors and the negotiation attempts exceed the retry count, the device must be rebooted to clear the condition and reset the retry count.
- History Compression Not Allowed With Async PPP** A port using Async PPP (AT dial) cannot be configured for history compression. The user interface will not prevent you from configuring the port for history compression, however, if history compression is selected the path will not come up.
- Multilink PPP Configurations** Multilink PPP (MLP) is supported for multiple WAN links connected to the same port running PPP.
- When configuring MLP:
- For maximum performance on a NETBuilder II bridge/router, 3Com recommends that similar hardware interface types be configured for each MLP bundle. For instance, bundle HSS modules with HSS modules, and bundle HSS 3-port module links with HSS 3-port module links.
  - For the best performance, use MLP on interfaces with matched line speeds. Avoid mismatched baud rates of ratios greater than 10 to 1 for bundled links.
  - If your baud rate ratios on two links are greater than 4 to 1, the MLP feature automatically turns off fragmentation. For baud ratios of less than 4 to 1, you may choose to turn off fragmentation for performance considerations. Turn off fragmentation using the MlpCONTRol parameter in the PPP Service.
  - MLP does not support the HSSI module.
  - Before you re-enable a port running MLP, disable the port and allow the remote port to go down. This action prevents loss of packet sequence numbers

synchronization, which causes packets to be dropped when the MLP port is enabled.

### SPID Wizard Detection Errors

If the two routers are connected to a single NT-1, SPID Wizard cannot detect the correct switch type and corresponding SPIDs. To work around the problem, disconnect one of the routers from the NT-1 before running SPID Wizard. Reconnect the router after SPID Wizard completes the detection process.

### STP AutoMode Does Not Select the Right Mode

When a NETBuilder II TI is connected over X.25 to a NETBuilder II bridge/router that has Ethernet or token ring, and the Ethernet is transparent bridging to other routers over X.25 and the token ring interface requires source route bridging to the NETBuilder II TI, STP does not select the right mode when the default value is AutoMode. Set the STP value to SRTMode.

### Supported Modems

Table 13 lists asynchronous and Table 14 list synchronous modems supported by 3Com.

**Table 13** Supported Asynchronous Modems

| Modems                        |
|-------------------------------|
| Hayes (Accura 33.6)           |
| Motorola (ModemSURFR 33,600)  |
| 3Com/USR (Courier, Sportster) |
| Multitech (MT1932ZDX)         |
| 3Com/USR (Impact IQ)          |

**Table 14** Supported Synchronous Modem

| Modem              |
|--------------------|
| 3Com/USR (Courier) |

### Routing Protocols and Services Notes

This section describes notes, cautions, and other considerations to be aware of when using the Enterprise OS software and routing protocols and services. The topics are presented in alphabetical order.

#### BGP Configuration Files

Prior to software version 10.1, BGP configuration files were written to flash memory every 10 SETDs, ADDs, or Deletes. Beginning with version 10.1, BGP configurations are saved to flash memory immediately after each change, which practically eliminates the need for the SAVEbgp command.

3Com recommends that you pay special attention to bridge/router platforms running software version 10.1 and greater with pre-10.1 releases in the same network. Always enter the SAVEbgp command on any bridge/router running software previous to version 10.1 to make sure that all the BGP configurations are written to flash memory. Failure to do so may result in all the BGP configurations being lost after the next reboot.

Prior to software version 10.1, all IGP routes except OSPF External routes were imported into the BGP routing table by default. Beginning with software version 10.1, the "import" of IBP routes into BGP is controlled by the BGP IntPolDefault parameter.



|                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CPU Utilization with XNS Protocol</b>                           | When the PathBuilder S5xx switch is configured for 2048 tunnels and XNS protocol, very high CPU utilization will occur.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>IPX to Non-IPX Configuration Error</b>                          | A mechanism does not exist to prevent adding a path from a non-IPX routing port to an IPX routing port. If this situation occurs, the router stops routing IPX traffic, even though the primary port has been up the whole time. To restart IPX routing, re-enable the port.                                                                                                                                                                                                                                                                                                             |
| <b>IPX Routing, Route Receive and Route Advertisement Policies</b> | When you route IPX over a Frame Relay meshed topology and configure the SAP Route Receive and Route Advertisement policies on the Frame Relay port, these policies do not take effect until the SAP table is flushed.                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Managing IP Address Assignment</b>                              | When assigning IP address to virtual ports of directly connected networks, it is important to ensure that the assigned address is valid. As LCP supports multiple Network Control Protocols (NCPs), IP does not verify that the address is valid before bringing the port state up or down, as there may be other protocols which are utilizing that port. It is possible to have an UP port state, yet have a lack of IP connectivity.                                                                                                                                                  |
| <b>NAT Service - Many to One Outbound Translation</b>              | NAT Many to One Outbound does not translate properly when multiple addresses, on LHS, are specified using comma (,) notation. But NAT Many to One Outbound translates properly when multiple addresses, on LHS, are specified in 10.3.1.0/24 notation.                                                                                                                                                                                                                                                                                                                                   |
| <b>NAT Service - TCP/UDP Port Mappings</b>                         | When the NETBuilder bridge/router is configured to use TCP/UDP Port Mapping from port 23 (Telnet) to any other port number, the first command executed over the session will fail due to extra characters inserted into the command string. All subsequent commands issued for that session will succeed. If you encounter this problem, execute the command again.                                                                                                                                                                                                                      |
| <b>OSPF Route Advertisement</b>                                    | If your network is expecting more than 4000 OSPF routes you need to set the ospfholdtime variable to 30.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>PIM-Sparse Mode</b>                                             | <p>In Release 11.4, PIM-SparseMode does not look into the BGP routing table for RPF (reverse path forwarding) lookups. RPF lookups for IP addresses reachable only via BGP will result in RPF failures.</p> <p>This has the following implications.</p> <ul style="list-style-type: none"><li>■ A PIM-SM router will drop multicast data packets sent from a source reachable only via BGP.</li><li>■ PIM-SM Rendezvous Points which are reachable only via BGP will not get added to the local RendezvousPoint set (the set of routers capable of functioning as PIM-SM RPs).</li></ul> |
| <b>PIM-SM Enterprise OS/Cisco Incompatibility</b>                  | Cisco IOS currently forwards the boot strap router (BSR) message packets without modifying the source IP address field. This implementation is incompatible with 3Com Enterprise OS and there is no workaround when a PIM-SM domain contains both Cisco IOS and 3Com Enterprise OS devices.                                                                                                                                                                                                                                                                                              |
| <b>PIM-SM Register Checksum Formats</b>                            | Cisco IOS currently sends register packets with register checksum on the entire IP payload, and IOS rendezvous points (RPs) also expect register checksums done on the entire IP payload. However, 3Com Enterprise OS devices generate register                                                                                                                                                                                                                                                                                                                                          |

checksums on the PIM headers only. Enterprise OS devices, when acting as RPs, are capable of accepting register checksums in both formats. In the scenario where Cisco IOS devices are the RPs and Enterprise OS devices act as sender designated routers (DRs), a super user command 'SU PIM RegCksum FullPayload' is required on the Enterprise OS devices.

### **PM-SM Not Supported Over NBMA Media**

Currently PIM-SM is not supported over non-broadcast, multiaccess (NBMA) datalink media. Such media include IP-IP Point-to-Multipoint (P2MP) tunnels and Frame Relay configured on parent ports.

### **RouteDiscovery**

If RouteDiscovery is enabled on all protocols (-SR RouteDiscovery = All), in the maximum packet forwarding rate drops significantly during route discovery. 3Com recommends that you enable RouteDiscovery only for the protocols you use. Increasing the value of the -SR HoldTime parameter minimizes the drop in forwarding rate for these protocols.

### **VRRP Configuration**

VRRP cannot coexist with DECnet, LAA, OSI, or IPv6.

---

## **Network Management System and Services Notes**

This section describes notes, cautions, and other considerations to be aware of when using the Enterprise OS software when working with network management system services. The topics are presented in alphabetical order.

### **ASCII Boot**

When using the ASCII Boot feature on a NETBuilder II bridge/router with intelligent I/O modules or a PathBuilder S5xx series switch, configuration commands that apply to the physical ports on the intelligent I/O modules or to the physical ports on the PathBuilder may not get configured correctly if they are the first commands executed in the boot.cfg file. There is a small timing window where the commands affecting the physical ports will not execute successfully because the software drivers have not finished initializing the ports.

This problem can be avoided by either including a PAuse command at the beginning of the boot.cfg file to delay the execution of the first configuration command by a few seconds or by putting the configuration commands that do not apply to the physical ports at the beginning of the boot.cfg file. The intelligent I/O modules on the NETBuilder II bridge/router are the HSS 4-Port WAN Module, the MP ATMLink Module, the MP Ethernet 6-Port 10BASE-FL Module, and the HSS 8-Port BRI Module. Support for the PAuse command by the ASCII Boot feature (and LoadConfigs) is new with the Enterprise OS software version 11.4.

### **Boot Cycle Continuous Loop**

If the OfficeConnect bridge/router fails to complete the boot cycle and enters a boot cycle loop (for example, if the boot image is corrupted), press the ESC key to interrupt the boot cycle and enter monitor mode.

### **BootP Server and Autostartup**

To use the Enterprise OS software version 11.4 Autostartup feature, you must upgrade the remote node, the central site, and if you are using the 3Com BootP server, you must upgrade that as well. Autostartup supports a non-3Com BootP server if the remote node is identified by its MAC address.

### **Bootptab File**

The 3Com BOOTP Server for Windows does not read the bootptab file for any date greater than 2000. The problem resides in Microsoft's system libraries. A patch can be downloaded from Microsoft. This patch can be found at the following URL:

<http://www.microsoft.com/windows95/downloads/default.asp>

- Capturing Commands to boot.cfg File** When using Capture to save commands to the boot.cfg, the commands are not immediately written to the boot.cfg file. A system crash or reboot may occur at a time when commands that have been executed have not been written to the boot.cfg file causing these commands to be lost.
- Change Configuration and Diagnostic Menu** The options on the Change Configuration and Diagnostic menu do not apply to the model 1x1 OfficeConnect bridge/router because ISDN ports are not present on this system.
- CPU Utilization Statistic** For the NETBuilder Remote Office bridge/routers, the CPU utilization statistic indicates a high percentage of utilization regardless of actual use. CPU utilization is displayed on the first line of the response to the SHow STATistics command. This incorrect display statistic will be fixed in a future release of the Enterprise OS bridge/router software.
- File System Error** Occasionally a false file system error message telling you to format and restore configuration files will appear on the console. These false errors appear when the background processing in the NETBuilder bridge/router is performing file operations and you attempt a write operation (such as a SETDefault command, DEFrag command, and FORMAT command). In these programmatic lockouts rather than media related error conditions, the flash file system will NOT need to be reformatted. Examining the results of the attempted command (such as SHow to examine the results of the attempted SETDefault) can indicate whether the file system error is a false indication or not.
- Firmware Configuration** To select BootP as your Address Discovery protocol, you must set all five IP address options to None.
- Firmware Update** The bridge/router updates firmware as part of its software boot process. In some cases, some text is displayed during the firmware upgrade process, which appears similar to the following:
- ```
>>>>updating firmware boot bank A
>>>>famd_blk_erase: block addr less than 512K: 0x10000
>>>>famd_blk_erase: block addr less than 512K: 0x20000
>>>>Firmware boot bank update is complete.
```
- These messages do not indicate a problem and can be ignored.
- IP Quality of Service Bandwidth** There is a bug in the software that exhibits itself when setting the bandwidth of a QoS Policy to be 8k or lower. The workaround is to assign a bandwidth greater than 8k to the policy.
- IP Quality of Service Configuration** When using the IP Quality of Service (IP QoS) features, there are two methods for configure priority queueing. The older method uses the IP Filter Service and the new method uses the IPQoS Service. Assigning a priority to IP packets in IP QoS does not work. For the 11.4 release, if you wish to create a policy to configure priority queueing use the IP Filter Service Policy command to establish filtering policies.
- Multiple Paths to BootP Server** Multiple paths to a BootP server may cause a BootP reply to fail. If a BootP reply is transmitted by a BootP server and not received by the router, flush the IP Routing

table and re-enable BootP on the port waiting for the IP address. BootP must be re-enabled before route update are received.

### **Remote Access Default Change**

To increase network security, the default value for the NetAccess parameter in the SYS Service is set to NoRemote. This means that by default, no remote connection attempts will be accepted by the bridge/router. If you are accustomed to or want to use remote access, you must specifically set the value of the NetAccess parameter to Remote.

### **Scheduler RunOnBootFail Completion**

When RunOnBootFail is specified, event-based macro execution (EBME) is enabled when the primary connections fail to establish within 5 minutes after the switch boots. After the initial 5 minutes, PortDown event processing happens at the rate of approximately one port per second. When the PathBuilder S5xx series switch is configured for 2048 virtual ports it takes about 45 minutes after the system initializes for the RunOnBootFail processing to be completed on all ports.

### **V.25bis Modem Setup**

If you are using a V.25bis modem with a NETBuilder boundary routing leaf node, and you configure the line type explicitly as dial rather than auto, be certain to also set the DialMode to V.25bis rather than use the default of DTR.

### **Web Link Documentation Path**

When you set the DocumentPath parameter in the WebLink service to a local file, drive C for example ("file:///c:"), the Web Link assumes that access to the NETBuilder bridge/router takes place only from the computer to which the file is local. If Web Link is used from any other computer, the browser looks on its local "C" drive for the help pages. If the computer is a UNIX machine and these files are not present as expected, unpredictable browser behavior will result.

### **Web Link Login Support**

When you access the Web Link application for the first time, you are prompted to enter a username and password. This username and password remains valid on the NETBuilder bridge/router for two hours. Because most browsers cache user login information, it is recommended that you log out of Web Link by selecting the "Logout" icon on the home page.

### **Zmodem Time Out**

A Zmodem file transfer from a PC to a SuperStack II or OfficeConnect bridge/router can take a long time. To minimize the possibility that the PC Zmodem software will time out during the download, run the DEFrag command on the SuperStack II bridge/router before beginning the file transfer. The DEFrag command reclaims *dirty* space in flash memory. Dirty space is memory that has been written on and cannot be used again until it has been erased.

---

## **VPN Protocols and Services Notes**

This section describes notes, cautions, and other considerations to be aware of when using the Enterprise OS software with VPN protocols and services. The topics are presented in alphabetical order.

### **ACE Security Server**

When interoperating with the ACE Security Server for Token-based login support, you may need to change the RAS Retransmit Timer value to a higher value (for example, 7) to prevent access-request time-outs.

### **Total Control Security and Accounting Server Availability**

The Total Control™ Security and Accounting Server provides call authentication, authorization, and accounting for your Enterprise OS devices. At the time of publication of these release notes, the required version number of the SAS server

was unavailable. To determine the required version, refer to the online version of these release notes available on the 3Com website:

<http://infodeli.3com.com/infodeli/tools/bridrout/index.htm>

### **Microsoft MPPE Patches and Updates**

Microsoft has acknowledged performance problems with their original implementation of MPPE. You should use MSDUN1.2c or later for Windows 95 and apply Hot Fixes in article Q162230 for Windows NT. Contact your Microsoft service provider for additional information and updates when they become available.

### **PKI: Entrust CA Installation Notes**

A Certificate Authority (CA) product can be purchased separately from Entrust. This packaged CA server must be installed and configured on a Windows NT 4.0 system. This package actually consists of two Entrust products:

- Entrust/PKI 4.0 Authority/Admin/Directory is installed on a Windows NT 4.0 server. This product provides the CA server, a facility to administer the CA, and an optional local LDAP-compliant directory that can serve as a repository for certificates and CRLs. This product should be installed first.
- Entrust/PKI 4.0 VPN Connector can be installed with Entrust PKI 4.0 Authority/Admin/Directory on a Windows NT 4.0 server, or installed separately on a Windows NT 4.0 workstation with network connectivity to the Entrust CA server. This product provides a front-end to the Entrust CA server for enrolling VPN devices such as routers with the Entrust CA in order to obtain certificates for those devices. This product must be installed after the Entrust/PKI 4.0 Authority/Admin/Directory product is installed.

The following are some guidelines for installing the Entrust/PKI 4.0 Authority/Admin/Directory product:

- The Entrust installation guide gives instructions for installing the Entrust/PKI 4.0 Authority/Admin/Directory product. It is recommended that the Entrust directory be installed with the CA server. The installation guide specifies the exact system requirements. It is strongly recommended that the installation guide be reviewed carefully before attempting the installation.
- The Entrust CA environment assumes a hierarchy of security personnel that manage various aspects of operation of the CA, although all of the various management roles can be assumed by a single person. It is recommended that the various passwords for the various personnel be carefully recorded, and the records placed in a secure location. The installation provides various worksheets, and the information requested in these must be determined prior to the installation.
- A Windows NT server administrator password must be set prior to the installation. Do not use an empty password consisting only of a carriage return.
- After installation, if the Entrust directory was installed with the Entrust CA software, by default, the directory records for certificates and CRLs will be stored internally in an ASCII format. The directory records should be stored in a binary format. To change the format, edit the Entrust ENTMGR.INI file and Bridge/Router PKI Configuration search for the line "serverType = Entrustslapd". Change this line to read "serverType = External". See Appendix D of the Entrust/PKI 4.0 Administration Guide for more information. After editing this file, run the Master Control application and invoke the Restore to

Directory operation to reinitialize the directory in binary mode. See Chapter 2 of the Entrust/PKI 4.0 Administration Guide.

- The following are guidelines for installing the Entrust/PKI 4.0 VPN Connector product:
  - n The Entrust installation guide provides instructions for installing the Entrust/PKI 4.0 VPN Connector product. The installation guide specifies the exact system requirements. It is strongly recommended that the installation guide be reviewed carefully before attempting the installation.
  - n The installation provides various worksheets, and the information requested in these must be determined prior to the installation.
- The CEP features of VPN Connector are not required in a 3Com bridge/router PKI environment. Skip those steps relating to the CEP installation and configuration.

### **PPTP Tunnel Security Validation**

Authentication problems may occur when connecting a Windows 95 or NT client via a Total Control™ hub to a NETBuilder II bridge/router where the Total Control hub is setting up a PPTP tunnel to the bridge/router.

This problem is a combination of the security protocol between the client and the LS (in this case the Total Control Hub) and the time it takes to validate a Radius request on the Radius server. In addition, the setting of the DefaultAptCtl parameter needs to be considered because this determines which security protocol the NETBuilder bridge/router will use.

If the client and the LS negotiate to use PAP, the client will send PAP configure requests but at that time the LS is busy setting up the PPTP tunnel and will forward the PAP requests to the NETBuilder bridge/router. The bridge/router by default sends CHAP challenge to the client and normally the client responds immediately. Then the NETBuilder bridge/router sends a request to the Radius server for validation.

If there is another PAP request from the client to the bridge/router while the bridge/router is waiting for validation from the Radius server, the bridge/router will send a PAP NAK to the client and the session is terminated. If the CHAP success message is received before the next PAP message, the PAP message is discarded and the connection is established.

Solutions include disabling CHAP on the NETBuilder DAC or disabling PAP between the client and the LS.



*This situation does not arise when the NETBuilder bridge/router is using internal security because it is fast enough to check the CHAP response before the next PAP message is generated.*

### **RSA Signature for Phase 1 Authentication**

When using RSA Signature for phase 1 authentication, and an IP address is used for Distinguished Name Common Name or Subject Alternate Name, the only port on the device that will perform IPsec is the one that corresponds to that IP address. Using a domain name for the Distinguished Name Common Name or Subject Alternate Name does not impose this limitation.

### **Windows NT MS-CHAP Authentication**

Although the 11.4 RAS service supports 64 character user names and passwords, any Windows NT user with a password greater than 14 characters long will fail MS-CHAP authentication. Per the IETF MS-CHAP v2 draft current versions of Windows NT limit passwords to 14 characters.

**Platform Notes**

This section describes the supported PC flash memory cards, approved DRAM SIMMS, notes, cautions, and other considerations to be aware of when using the Enterprise OS software on the various NETBuilder bridge/router and PathBuilder platforms. The topics are presented in alphabetical order.

**OfficeConnect  
NETBuilder and  
SuperStack II  
NETBuilder SI Additional  
Memory Requirements**

In order for OfficeConnect NETBuilder and SuperStack II SI NETBuilder bridge/routers to support selected Enterprise OS software version 11.4 packages, the minimum memory requirements must be met for DRAM and FLASH. These requirements are mentioned in Table 15 and in the Software Features table for the specific platform in "11.4 Software Packages" on page 23. The upgrade kits that available to meet these memory requirements are listed in Table 16. New equipment shipped pre-loaded with Enterprise OS software version 11.4 has adequate DRAM and Flash memory installed prior to shipment.

**Table 15** Memory Requirements for OfficeConnect NETBuilder and SuperStack II NETBuilder SI

| Platform                    | Description                     | Package ID           | 11.4 DRAM Requirements | 11.4 FLASH Requirements | 11.4 Dual Image FLASH Requirements |      |
|-----------------------------|---------------------------------|----------------------|------------------------|-------------------------|------------------------------------|------|
| OfficeConnect NETBuilder 10 | IP/IPX Router                   | RW, RE, RS           | 16MB                   | 4MB                     | 8MB                                |      |
| OfficeConnect NETBuilder    | IP/IPX Router                   | JW, JE, JS           | 16MB                   | 4MB                     | 8MB                                |      |
|                             | IP/IPX/AT Router                | NW, NE, NS           | 16MB                   | 8MB                     | 12MB                               |      |
| OfficeConnect NETBuilder    | Multiprotocol Router            | OF, OL, OE, OS       | 16MB                   | 8MB                     | 12MB                               |      |
|                             | Boundary Router                 | BF                   | 16MB                   | 4MB                     | 8MB                                |      |
|                             | APPN/Connection Services Router | AF                   | 16MB                   | 8MB                     | 12MB                               |      |
|                             | SuperStack II NETBuilder SI     | IP/IPX/AT Router     | NW, NE, NS             | 16MB                    | 8MB                                | 8MB  |
|                             |                                 | Multiprotocol Router | CF, CL, CE, CS         | 24MB                    | 12MB                               | 12MB |
| SuperStack II NETBuilder SI | Boundary Router                 | BF                   | 16MB                   | 8MB                     | 12MB                               |      |
|                             | APPN/Connection Services Router | AX                   | 16MB                   | 12MB                    | 12MB                               |      |

**Table 16** Order Numbers for Memory Upgrade Kits

| 3C# of Kit | Description  |
|------------|--|
| 3C8104     | 4MB FLASH for OfficeConnect NETBuilder & SuperStack II NETBuilder SI |
| 3C8108     | 8MB FLASH for OfficeConnect NETBuilder                               |
| 3C8080     | 8MB DRAM for OfficeConnect NETBuilder                                |
| 3C8105     | 16MB DRAM for SuperStack II NETBuilder SI                            |

**Approved DRAM SIMMs**

Table 17 lists 3Com-approved vendors of the 32 MB DRAM SIMM for upgrading the NETBuilder II DPE 40 module.

**Table 17** 3Com-approved DRAM SIMMs

| Size  | Vendor and Description | Part Number     |
|-------|------------------------|-----------------|
| 32 MB | NEC                    | MC428000A32B-60 |
|       | Toshiba                | THM328020S-60   |
|       | Toshiba                | THM328020B5-60  |

## Supported PC Flash Memory Cards

Table 18 lists 3Com-approved vendors of the PC flash memory card.

The 20 MB flash memory card has a formatted capacity of 19.86 MB. For dual image and full dump capability, 3Com recommends using a 20 MB card used in the NETBuilder II bridge/router.

You can also purchase the blank flash memory card from 3Com:

- DPE 20 MB card is 3C6086

**Table 18** 3Com-approved 20 MB Flash Memory Cards

| Vendor and Description | Part Number |
|------------------------|-------------|
| Intel Series 2         | iMC020FLSA  |
| Intel Series 2+        | iMC020FLSP  |
| AMD Series D           | AmC020DFLKA |

## Line Error Reporting on PathBuilder S5xx Series Switch Statistics Display

The PathBuilder series switch reports FSI CRCs under the path statistics. This entry reflects line errors after hardware error assisted recovery has taken place. The number of actual line errors present before hardware error assisted recovery has taken place may be much higher.

## T3 Bandwidth Limitation

Due to a driver limitation you cannot combine two T3 paths to double the bandwidth.

## MBRI Ownership During Board Swapping

Port ownership and port/path naming inconsistencies can occur as MBRI boards are swapped in and out of a NETBuilder II bridge/router chassis. Replacing an MBRI board with a non-MBRI board in the same slot requires that the NETBuilder II bridge/router be rebooted. After the bridge/router is rebooted, there are no port/path naming problems.

## Multiport MBRI Module SNMP Management

The Multiport MBRI module cannot be configured using SNMP.

## Token Ring+ Modules

The maximum physical frame size that can be forwarded by the Token Ring+ modules with Enterprise OS software is 4,500 bytes. This software limitation affects routing, source route bridging, and transparent bridging.

## Token Ring Auto Start-up

The Token Ring and Token Ring+ modules may enter the ring at the wrong speed with certain MAU or station configurations. You can manually configure the -PATH BAud value to 16,000 or 4,000 to avoid this situation.



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