COMPAQ

Software Product Information

PRODUCT NAME: WANrouter 90/250, Version 1.3

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DESCRIPTION

The WANrouter 90/250 software runs on the DECwanrouter 90, DECwanrouter 90EW, and DECrouter™ 250 hardware platforms. These access router hardware platforms have a single Ethernet port and one or more wide area communication ports. Together, the hardware and software provide wide area routing services for host systems on an Ethernet LAN. In addition, the DECwanrouter 90 and 90EW can be used in the DEChub™ 90 /900 chassis to provide wide area routing services for host systems connected to the DEChub 90/900.

Overview

The WANrouter 90/250 software (referred to as WANrouter software for the remainder of this document) provides a routing service for:

- TCP/IP hosts

- Novell® NetWare® nodes

- DECnet™ Phase IV nodes

- DECnet/OSI® Phase V nodes

- OSI-compatible systems

Multiprotocol routing of IP, DECnet, and OSI is implemented using the Integrated Intermediate System to Intermediate System (Integrated IS IS) routing protocol. Routing of IP traffic is also supported using Routing Information Protocol (RIP) and Exterior Gateway Protocol (EGP). Routing of Novell NetWare is implemented on the LAN using native IPX protocols and over the WAN using encapsulation within IP.

The WANrouter software image is installed and configured on a host system called the load host. Once configured, the WANrouter software image and configuration file is loaded from the load

host system to the target DECwanrouter unit. The DECwanrouter 90EW has non-volatile (FLASH) memory so that subsequent software loads can be performed without the need for loading from a load host (flash loading).

The WANrouter software is managed using the Network Command Language (NCL) command line interface which can be run from any MS-DOS®, DIGITAL™ UNIX® (formerly called DEC™ OSF/1®), OpenVMS™ for Alpha, or OpenVMS for VAX™ system. Event logging and data tracing utilities are also available on DIGITAL UNIX, OpenVMS for Alpha, and OpenVMS for VAX systems to assist problem solving by logging network events and by tracing control messages received or sent by the WANrouter software.

The WANrouter software can be monitored from the POLYCENTER™/NetView® network management platform or any system supporting the Simple Network Management Protocol (SNMP). SNMP gets are supported for MIB-II variables.

IP Routing

The WANrouter software provides support for the following IP routing protocols:

- Integrated Intermediate System to Intermediate System (IS-IS) protocol for routing in pure TCP/IP and dual environments, as specified in RFC 1195.

- RIP (Routing Information Protocol) for routing in pure TCP/IP environments, as specified in RFC 1058. Note that in DECnet Phase IV areas, where DECnet Phase IV routing algorithms are used, RIP should be used instead of Integrated IS-IS.

- Exterior Gateway Protocol (EGP) as specified in RFCs 827, 888, and 904.

When using Integrated IS-IS, the software supports equal-cost path splitting of IP data over up to four equal-cost paths. Variable, but contiguous, IP subnet masks are also supported.

The WANrouter software communicates with IP hosts and gateways on the local LAN using the ARP protocol (RFC 826). Proxy ARP (RFC 1027) is also supported. The WANrouter can communicate directly with IP hosts or gateways over CSMA/CD circuits and can interoperate with other IP gateways using RIP or EGP on these circuits. IP Reachable Addresses may also be manually configured for static routes over CSMA/CD, PPP, HDLC, X.25 or Frame Relay circuits.

The WANrouter software supports IP routing over CSMA/CD, PPP, HDLC, DDCMP™, Frame Relay, dynamically assigned X.25 circuits or statically assigned X.25 circuits. The WANrouter supports IP routing over PPP data links in accordance with RFC 1332, and over X.25 data links in accordance with RFC 877. IP routing over Frame Relay circuits is implemented by using PPP encapsulation within the Frame Relay frame.

IP routing is managed using the WANrouter configuration utility and the NCL command line interface. MIB-II variables as defined in RFC 1213 can also be monitored using SNMP gets.

Novell NetWare Routing

The WANrouter software provides support of native Novell NetWare protocols using Ethernet, Ethernet-II, 802.2, Encapsulated Ethernet (802.2 SNAP), and 802.3 RAW (Novell) data link formats. The following Novell NetWare protocols are supported:

- Novell NetWare IPX Forwarding

- Novell NetWare Routing Information Protocol (RIP)

- Novell NetWare Service Access Protocol (SAP)

Novell IPX is supported over wide area links using IP encapsulation according to RFC 1234. Novell IPX routing is managed using the WANrouter configuration utility and the NCL command line interface.

DECnet Routing

The WANrouter software implements both the DECnet Phase IV routing algorithm (routing vector) and the DECnet/OSI Phase V routing algorithm (link state routing). The WANrouter software supports both intra-area routing (level 1) and inter-area routing (level 2). The software can run either the Phase IV or Phase V routing algorithm in either combination at each level. When running the Phase V algorithms at either level 1 or level 2, the routing software is still able to handle traffic generated by DECnet Phase IV end systems and performs any necessary address and header conversions.

The WANrouter software supports path splitting over up to four routing circuits. If the cost between the router and the destination node is the same on multiple WAN circuits, then the WANrouter software splits the traffic across all the circuits.

It is also possible to route IP traffic using RIP within a DECnet Phase IV only network by running RIP over the DECnet Phase IV level 1 or level 2 links.

The WANrouter supports DECnet routing over CSMA/CD, HDLC, DDCMP, and Frame Relay circuits, and over dynamically assigned X.25 circuits (DA) and statically assigned X.25 circuits (DLM).

DECnet routing is managed using the configuration utility and the NCL command line interface.

OSI Routing

The WANrouter software fully implements the requirements of an OSI Intermediate System. The WANrouter exchanges information about reachability of end systems using the OSI Intermediate System to Intermediate System (IS-IS) Intra-Domain Routing Exchange Protocol as specified in ISO/IEC 10589.

OSI-compatible end systems on the same Local Area Network can exchange information with the WANrouter 90/250 using the OSI End System to Intermediate System (ES-IS) Routing Exchange Protocol as specified in ISO 9542.

The WANrouter supports OSI Connectionless Network Protocol (CLNP) routing as specified in ISO 8473, over CSMA/CD, PPP, HDLC, DDCMP, Frame Relay and over dynamically assigned (DA) X.25 circuits, and statically assigned X.25 circuits. When operating over X.25 dynamic assigned cir-

cuits, the WANrouter can communicate with other routers and end systems that support the OSI connectionless network service over X.25 data links. The WANrouter software also supports OSI CLNP routing over PPP data links in accordance with RFC 1377.

OSI routing is managed using the configuration utility and the NCL command line interface.

Routing Over X.25

The DECwanrouter 90 and 90EW support routing over statically assigned X.25 circuits (DLM circuits). DLM circuits are established when routing is enabled and they remain established until routing is enabled/disabled. Both data and routing update messages are sent over DLM circuits. Note that the DECwanrouter 250 does not support routing over DLM circuits.

The DECwanrouter 90, 90EW and 250 also support dynamically assigned X.25 routing circuits (DA circuits). DA circuits are established only when there is information to send and are disconnected when there is no further information to send. Only data is sent over DA circuits. DA circuits are only supported between different areas using Level 2 routing.

The software supports routing over Switched Virtual Circuits (SVCs) only. When using DLM circuits, each X.25 virtual circuit can support multiple routing protocols. When using DA circuits, each X.25 virtual circuit can support only one routing protocol. In either case, different routing protocols can be run over separate X.25 virtual circuits on the same X.25 DTE connection. Refer to the Routing Circuits section of this SPI for the number of X.25 virtual circuits supported by the DECwanrouter hardware platforms.

Routing Over Frame Relay

Routing over Frame Relay is supported on the DECwanrouter 90 and 90EW only.

The WANrouter software supports connections over Frame Relay data links as specified in the Frame Relay Specification jointly developed by Digital Equipment Corporation, StrataCom Inc., Northern Telecom®, and Cisco® Systems Inc.

Multiple virtual circuits can be multiplexed over a single Frame Relay link using the Data Link Control Identifier (DLCI) field of the Frame Relay LAPD header. For details of the Frame Relay options implemented, refer to the CONFORMANCE TO STANDARDS section of this SPI.

Routing of IP, DECnet, and OSI protocols is supported over Frame Relay data links using PPP encapsulation within the Frame Relay frame. IPX can also be routed over Frame Relay within IP. The WANrouter Frame Relay implementation supports the LMI, ANSI-D and ITU-T Q.933 Annex A switch control procedures.

Routing Over Dial-up or Switched Circuits

The WANrouter software supports direct call/answer procedures for dialup access using the "raise DTR" method for outgoing and "Ring Indicate" for incoming calls. Switched circuits may be defined as:

- Static outgoing - calls are established when the circuit is enabled and stay established until the circuit is disabled. HDLC and DDCMP data links are supported for static outgoing dial-up circuits.

- Static incoming - calls are established by the remote router and stay established until the circuit is disabled locally or by the remote router. HDLC and DDCMP data links are supported for static incoming dial-up circuits.

- Dynamically assigned - calls are established on receipt of traffic and cleared on expiration of a timer when the circuit is idle. Only the HDLC data link is supported for dynamically assigned dialup circuits.

Failover Using Backup Circuits

Backup, or secondary, routing circuits can be defined such that a secondary circuit is enabled when the primary routing circuit fails. The primary circuit is constantly monitored and the secondary circuit enabled should the line be lost. Conversely, the secondary circuit is disabled and the primary circuit re-enabled should the primary line recover.

Primary circuits can be PPP, HDLC, DDCMP, X.25 DLM or Frame Relay circuits. Secondary circuits can be PPP, HDLC, DDCMP, X.25 DLM, X.25 DA or Frame Relay circuits. Note that Basic Rate ISDN connections can also be used as secondary circuits using a suitable ISDN T/A.

Data Link Support

Table 1 summarizes the data links supported by the DECwanrouter 90, 90EW, and 250.

Table 1: Data Links

Hardware	HDLC[1]	PPP[2]	DDCMP	LAPB	FR[3]
90	Yes	Yes	Yes	Yes	Yes
90EW	Yes	Yes	Yes	Yes	Yes
250	Yes	No	Yes	Yes	No

Note:
1. When operating over HDLC or DDCMP circuits, the WANrouter 90/250 can only interoperate with other WANrouter 90/250 and DECNIS™ routers.
2. When operating DECnet over PPP circuits, the WANrouter 90/250 can only interoperate with other WANrouter 90/250 and DECNIS routers.
3. When operating over Frame Relay circuits, the WANrouter 90/250 can only interoperate with other WANrouter 90/250 and DECNIS routers.

Routing Circuits

The WANrouter 90 and 250 have a single Ethernet port and therefore support one Ethernet routing circuit. In addition, the WANrouter 90 and 250 support a maximum of 8 wide area routing circuits. The WANrouter 90EW supports a maximum of 9 wide area routing circuits. The maximum number of each type of wide area routing circuit is shown in **Table 2**.

Table 2: Routing Circuits

Hardware	Sync Ports	Max WAN Circuits	HDLC, PPP, DDCMP	X.25 DA	X.25 DLM	FR
90	1	8	1	8	8	8
90EW	2	9	2	8	8	8
250	8	8	8[1]	8	---	---

Note:
1. The WANrouter 250 does not support the PPP data link.

Installation, Configuration, and Loading

The WANrouter software is installed and configured on a host system (termed a load host). A load host can be any of the following systems

- MS-DOS PC
- DIGITAL UNIX
- OpenVMS for Alpha
- OpenVMS for VAX

The minimum requirement is for one host to load the target router. However, WANrouter software can be installed on a number of load hosts. This helps to protect against loss of service if a single load host is unavailable, or unable to load the system for any other reason.

Once installed, the router software must be configured using configuration programs supplied with the product. The host configuration utilities allow the router hardware to be defined in the load hosts' net work node database. The router configuration utilities allow a unique initialization script file to be created for each router. Once configured, the software image and initialization script file are then downline loaded from the load host to the router hardware over the local or wide area network.

Loading over the local area network uses the Maintenance Operation Protocol (MOP). In addition, BOOTP/TFTP is also supported on the DECwanrouter 90EW and 250.

MOP can be used to load over the wide area network via a point-to-point HDLC link from a DECnet/OSI host, or from a DECNIS router that has been configured to use Agent Loading.

When using agent loading, the load host can be located anywhere in the Wide Area Network accessible to the Agent Loading router. This Agent loading router must be configured to copy the WANrouter software image and initialization scripts from the load host using DECnet/OSI and to load these over the direct point-to-point link with the target router using MOP.

Network Management

The WANrouter software conforms to both the IETF Structure of Management Information and the Enterprise Management Architecture (EMA). Simple Network Management Protocol (SNMP) or Cabletron Systems implementation of the Control Management Information Protocol (CMIP) are used to manage the WANrouters

The WANrouter software is managed dynamically from any MS-DOS, DIGITAL UNIX, OpenVMS for Alpha, or OpenVMS for VAX system using the Net work Command Language (NCL) command line interface. Dynamic management tasks that can be performed include:

- Management of connections, for example, set up the data links, enable and disable circuits.

- Monitoring of network traffic, for example, enable event logging, display counters.

- Problem solving, for example, test circuit availability, perform loopback tests.

Event logging and data tracing utilities are also available on DIGITAL UNIX, OpenVMS for Alpha, and OpenVMS for VAX systems to assist problem solving by logging network events and by tracing control messages received or sent by the WANrouter software.

The WANrouter software can also be managed dynamically from POLYCENTER/NetView network management platforms or from any system supporting the Simple Network Management Protocol (SNMP). SNMP gets are supported where appropriate for the variables defined in the Management Information Base MIB-II (RFC 1213). MIB-II interface support is provided for CSMA/CD, HDLC, PPP, LAPB, and DDCMP data links. SNMP can only be used to monitor MIB variables when IP routing is enabled.

The WANrouter responds to, but can not source, IP Pings and OSI Echo requests. The WANrouter can also forward echo requests and responses.

Dynamic management of the router provides only temporary changes to the router configuration. These temporary changes are lost when the hardware unit is re-loaded with the original script file.

Permanent changes to the configuration of the WANrouter software can be made by re-using the configuration utilities to create a script file and then downline loading these to the hardware unit.

Network Size and Supported Circuits

DECnet Phase IV networks are hierarchical networks that can be segmented into up to 63 areas, each containing up to 1,023 nodes. Note that these are maximum values permitted by the Digital Network Architecture, and that satisfactory operation in large networks requires proper network planning. DECnet/OSI Phase V Domains can be virtually unlimited. However, the actual size of a Domain is limited by the product's memory size and processor power.

Internet addresses are 32 bit quantities that can be divided into five different classes where the classes differ in the number of bits assigned to the network and host portions. Depending on the network class, different numbers of host systems can be supported within a network. Also, by using subnet masks, a further network hierarchy can be overlaid within a network.

Table 3 and Table 4 show the values of the parameters used to determine the size of the supported network for each hardware unit. Note that these figures are given as a guide only. Actual sizes experienced will depend on a number of factors including the topological characteristics of the network, the mix of protocols and data link interfaces, and the amount of routing control traffic generated by the network. Consult your local Compaq Sales office for more details and for assistance with network sizing and planning.

Table 3: Network Sizes

	Maximum Number		
Attribute	WR250	WR90EW	WR90
Total Areas in Domain[1]	200	200	200
Routing Addresses in Area	3200	3200	3200
Level 1 Routers in Area	100	100	100
Level 2 Routers in Domain	400	400	400
OSI Reachable Addresses[1]	100	100	100
Local IP Interface Addresses	15	15	15
IP Nets per Domain	500	500	500
IP Reachable Addresses	100	100	100
Total IPX Routes + SAP Services[2]	80	400	400
IPX Tunnel Circuits	8	8	8
X.25 DTEs	8	2	1
X.25 Virtual Circuits	32	16	16
Frame Relay Virtual Circuits	---	8	8

Note:
1. The total number of areas plus OSI reachable addresses cannot exceed 200. If not all OSI reachable addresses are used, then more areas can be supported up to the maximum stated above.
2. Note that there may be more than one reachable route to any IPX network.

Attribute Definitions

Total Areas in Domain	Number of area addresses in the routing Domain. This value, plus the number of OSI reachable addresses, is the total number of addresses which can be forwarded to, using Level 2 forwarding.
Routing Addresses in Area	Total number of addresses (IDs) which can be forwarded to, using Level 1 forwarding. Each router may have one or two addresses, each end system has one or more addresses (e.g., a Phase IV and a Phase V address, each one counts as a separate address).
Level 1 Routers	Number of Level 1 Routers in the Area.

Level 2 Routers	Number of Level 2 Routers in the Routing Domain.
OSI Reachable Addresses	Number of OSI reachable addresses that can be manually configured on the local router (when the local router is being used as a Level 2 Router).
Local IP Interface Addresses	Total number of IP addresses which can be configured for the local interface ports.
IP Nets per Domain	Number of unique nets/subnets reachable within the local routing Domain at Level 2. This number is the summation of IP subnets propagated from Level 1 IS-IS, IP subnets propagated from RIP and EGP, and IP Reachable Address Prefixes defined at Level 2.
IP Reachable Addresses	Number of manually configured IP nets/subnets.
X.25 Virtual Circuits	The maximum number of X.25 switched virtual circuits supported per system for routing.
Frame Relay Virtual Circuits	The maximum number of Frame Relay permanent virtual circuits supported per system for routing.

Table 4: Local Router Adjacency Attributes

Attribute	Maximum Number
LAN L1 Router Adjacencies	32
LAN L2 Router Adjacencies	32
LAN Endsystem Adjacencies	1024
Manual Endsystem Adjacencies	2
Endsystem Addresses	2080

Attribute Definitions

LAN L1 Router Adjacencies	Number of Level 1 Routers on the LAN (not including the local node). If a Level 1 Router has more than one connection to the LAN, each connection counts as a LAN L1 Router Adjacency. If a Level 2 Router has any Level 1 connections to the LAN, then each connection counts as a LAN Level 1 Router Adjacency.
LAN L2 Router Adjacencies	Number of Level 2 Routers on the LAN (not including the local node). If a Level 2 Router has more than one Level 2 connection to the LAN, each such connection counts as a LAN L2 Router Adjacency.
LAN Endsystem Adjacencies	Number of end systems on the LAN. If an Endsystem has more than one connection to the LAN, each connection counts as one LAN Endsystem Adjacency.
Manual Endsystem Adjacencies	Number of non-autoconfiguring end systems that can be manually created on a broadcast circuit.
Endsystem Addresses	Total number of addresses (IDs) of all end systems adjacently connected to the router. These include Endsystems on the LAN, manual Endsystem Adjacencies, and Endsystems connected to the serial ports over a single point-to-point link.

Performance

The DECwanrouter 250 can saturate all serial lines at the speeds shown in Table 7 with packet sizes of 128 bytes or greater.

The DECwanrouter 90 and 90EW have a maximum system performance of approximately 300 packets per second with packet sizes of 64 bytes or greater.

The actual performance of packets forwarded by any given WANrouter 90 /250 depends on many protocol and network topology considerations. Some of these considerations are:

- Mix of protocol types

- Type of traffic (routing updates or data packets) and data rates

- The proportion of leased line to X.25 traffic

- Communications line characteristics

- Frequency and type of errors on the synchronous or asynchronous links

- Network topology stability

- Protocol overhead

X.25 PSDNs

Table 5 shows the X.25 PSDNs supported by the WANrouter software.

Table 5: X.25 PSDNs Supported

Country	PSDN and ITU-T Revisions
Argentina	Arpac
Australia	Austpac
Austria	Datex-P
Belgium	DCS
Brazil	Renpac
Canada	Datapac (1980) DPN-NAS Faspac Infoswitch
Chile	VTRNET
China	CNPAC
Denmark	Datapak
Eire	Eirpac (1980)

Country	PSDN and ITU-T Revisions
Finland	Datapak
France	Transpac
Germany	Datex-P
Hong Kong	Datapak GDN INET Intelpak
Indonesia	SKDP
Italy	Itapac
Japan	ACE-Telnet CCVAN DDX (1976, 1980, 1984) INS-P Jaisnet Venus-P (1980) and Venus-LP TYMNET®
Luxembourg	LUXPAC
Malaysia	Maypac
Mexico	Telepac
Netherlands	Datanet 1
New Zealand	Pacnet
Norway	Datapak
Pakistan	Paknet
Philippines	Datanet
Portugal	Telepac
Singapore	Telepac
South Korea	Dacomnet
Spain	Iberpac
Sweden	Datapak
Switzerland	Telepac (1978, 1980)
Taiwan	Pacnet
Turkey	TURPAK
United Kingdom	PSS See Note 1 Mercury 500

Country	PSDN and ITU-T Revisions
United States	Accunet®
	Autonet®
	Bell Atlantic
	BT® TYMNET
	CompuServe®
	ConnNet
	Digipac
	Fedexitc
	Graphnet
	IMPACS
	Infonet
	Mark*Net Extended Service
	PPSNET
	Pulselink
	Sinet
	Telenet®
	TYMNET
	Western Union PTN-1
	Worldnet

Note:
1. PSS Extended Facilities are required.

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Connections to public networks not listed are not supported by Compaq at the time of publication of this SPI. Please consult your local Compaq office for information concerning other public X.25 networks.

In addition to the public PSDNs listed, certain private PSDNs are supported by the WANrouter 90 and 250. The appropriate profiles are included in these products.

Frame Relay Switches

The WANrouter software has been tested and is known to be compatible with the Frame Relay switches listed in **Table 6**.

Table 6: Frame Relay Switches

Item	Vendor and Switch
Switch	Cascade STDX 3000 and 6000

Please consult your local Compaq office for information concerning other Frame Relay switches and public Frame Relay networks.

CONFORMANCE TO STANDARDS

The WANrouter 90/250 software conforms to the following IEEE and ISO standards and ITU-T (formerly CCITT) Recommendations:

- ISO 3309 - High-level Data Link Control (HDLC) Frame Structure

- ISO 7776 - High-level Data Link Control (HDLC) Procedures: X.25 LAPB compatible DTE Data Link Procedures

- ISO 8208 - X.25 Packet Level Protocol for Data Terminal Equipment

- ISO 8348/Addendum 2 (Network Layer Addressing)

- ISO 8473 - Specification of Protocol to Provide the Connectionless mode Network Service

- ISO 8802-2 - Local Area Networks/Part 2: Logical Link Control

- ISO 8802-3 - Local Area Networks/Part 3: CSMA/CD Access Method and Physical Layer Specification

- ISO 9542 - End System to Intermediate System (ES-IS) Routing Exchange Protocol for Use in Conjunction with ISO 8473

- ISO/IEC 10589 - Intermediate System to Intermediate System (IS-IS) Intra Domain Routing Exchange Protocol for Use in Conjunction with ISO 8473

- ITU-T Recommendation X.25 (1978, 1980, 1984 or 1988) using the LAPB or LAPBE variants of the data link

The WANrouter software conforms to the following Internet RFCs:

- RFC 768-User Datagram Protocol (UDP)

- RFC 783 - TFTP Protocol (Revision 2)

- RFC 791-Internet Protocol (IP)

- RFC 792-Internet Control Message Protocol (ICMP)

- RFC 826-Address Resolution Protocol (ARP)

- RFC 827, 888, & 904-Exterior Gateway Protocol (EGP)

- RFC 877-Standard For the Transmission of IP Datagrams Over Public Data Networks

- RFC 922-Broadcasting Internet Datagrams in the Presence of Subnets

- RFC 950-Internet Standard Subnetting Procedure

- RFC 951 - BOOTSTRAP Protocol (BOOTP)

- RFC 1009-Requirements for Internet Gateways (Applicable Sections)

- RFC 1027-Using ARP to Implement Transparent Subnet Gateways

- RFC 1058-Routing Information Protocol (RIP)

- RFC 1155-Structure and Identification of Management Information for TCP/IP-based Internets

- RFC 1157-A Simple Network Management Protocol (SNMP)

- RFC 1195-Use of OSI IS-IS for Routing in TCP/IP and Dual Environment

- RFC 1213-Management Information Base for Network Management of TCP /IP-based Internets (MIB-II)

- RFC 1234 - Tunneling IPX Traffic through IP Networks

- RFC 1331 - The Point-to-Point Protocol (PPP) for the Transmission of Multi-Protocol Datagrams over Point-to-Point Links

- RFC 1332 - The PPP Internet Protocol Control Protocol (IPCP)

- RFC 1334 - PPP Authentication Protocols (PAP only)

- RFC 1377 - The OSI Network Layer Control Protocol (OSINLCP)

The WANrouter software conforms to the following Frame Relay standards:

- Frame Relay Specification with Extensions Document V1.0, September 1990

- Frame Relay Forum's (FRF) User-Network Interface (UNI) agreement

- ANSI T1.617 DSS1 - Signaling Specification for Frame Relay Bearer Service (including the PVC management procedures specified in Annex D)

- ANSI T1.618 DSS1 - Core Aspects of Frame Relay Protocol for use with Frame Relay Bearer Service

- ITU-T Q.922 ISDN Data Link Specification for Frame Mode Bearer Services

- ITU-T Q.933 ISDN Signaling Specification for Frame Mode Bearer Services (including the PVC management procedures specified in Annex A)

DECwanrouter HARDWARE

The WANrouter software is supported on the hardware devices listed in **Table 7**.

Table 7: Hardware Units

Product Name	Serial Ports	Ethernet Ports
DECwanrouter 90 (DEWAR)	1 x 128K	ThinWire or DEChub
DECwanrouter 90EW (DEWA2)	2 x 64K or 1 x 128K	ThinWire or DEChub

Product Name	Serial Ports	Ethernet Ports
DECrouter 250 (DSRVR)	8 x 19.2K or 2 x 64K or 1 x 64K + 4 x 9.6K	ThinWire or thickwire selectable

Serial Interfaces

Each serial interface can operate in either synchronous or asynchronous mode. When running in asynchronous mode, the DDCMP data link must be selected. The dial-out features listed in the section Routing over Dialup or Switched Services are not supported on the DECwanrouter 90 model when operating over asynchronous DDCMP connections. These features are supported on the DECwanrouter 90 when operating in synchronous mode and for the DECwanrouter 90EW and DECrouter 250 when operating in asynchronous or synchronous mode.

All serial ports operate in full-duplex mode and support full modem control for manual or auto dial/answer modems conforming to Bell standards and ITU-T Recommendations, including V.22, V.22bis and V.32.

Six of the DECrouter 250 ports are V.24/V.28 (EIA-232-D) and operate up to 19.2bps. The physical connection to these is via a standard ISO 2110 25 pin connector.

Two of the ports on the DECrouter 250 and all ports on the DECwanrouter 90/90EW modules utilize a multi-standard connector. These require use of an appropriate adapter cable to support one of the following electrical and physical interface standards:

Note that for all platforms, when any port is configured for V.28/V.24 (EIA-232-D/C) or asynchronous mode, the speed is restricted to 19.2Kbps maximum.

- V.28/V.24 (EIA-RS232-C/D) - ISO 2110

- V.36/V.11 (EIA-RS422/449) - ISO 4902

- V.35 - ISO 2593

- V.10 (EIA-RS423/449) - ISO 4902

- V.11 - ISO 4903 (for British Telecom 64K Kilostream™ service only)

- X.21 leased line - ISO 4902, DEWAR and DEWA2 only.

Serial Adapter Cables

Different adapter cables are required for the DECwanrouter 90 and DECrouter 250 (DEWAR/DSRVR), and DECwanrouter 90EW (DEWA2) models as shown in **Table 8** and **Table 9**.

Table 8: DEWAR/DSRVR Adapter Cables

Electrical Interface Type	Adapter Cable	Connector Pinout
V.28/V.24 (EIA-RS232-C/D)	BC23V-02	ISO 2110

Electrical Interface Type	Adapter Cable	Connector Pinout
V.10 (EIA-RS423/449)	BC19E-02	ISO 4902
V.36/X.27 (V.11, EIA-RS422/449)	BC19B-02	ISO 4902
V.35	BC19F-02	ISO 2593

The BC23V-02 cable provides the V.28/V.24 (RS232-D) interface, but is supplied with an adapter that allows it to be used for RS232-C as well.

Within the UK, an additional adapter cable is needed to allow connection to the British Telecom Kilostream as listed:

- BC22X-02

Table 9: DEWA2 Adapter Cables

Electrical Interface Type	Adapter Cable	Connector Pinout
V.28/V.24 (EIA-RS232-C/D)	BC12L-06	ISO 2110
V.10 (EIA-RS423/449)	BC12K-06	ISO 4902
V.36/X.27 (V.11, EIA-RS422/449)	BC12H-06	ISO 4902
V.35	BC12G-06	ISO 2593
X.21 leased line	BC12F-06	ISO 4902

Modem Support

All serial ports operate in full-duplex mode and support full modem control for manually dialed and auto-answer modems conforming to Bell standards and ITU-T Recommendations.

INSTALLATION

If the WANrouter is to be used for connection to a public X.25 or Frame Relay network, Compaq recommends that a customer's first purchase of the product include Compaq Installation Services. These services provide for installation of the software product by an experienced Compaq software specialist.

PREREQUISITE SUPPORT

A Network Profile and DECnet Customer Support Plan covering all intended network nodes and their support may be required by your Compaq office.

HARDWARE REQUIREMENTS

PCs Supported

Any Intel® 80386 or 80486 based PC is supported subject to the restrictions listed in the Processor Restrictions section of this SPI.

Alpha Processors Supported

Alpha	Digital AlphaStation™ 200 4/100, Digital AlphaStation 200 4/166, Digital AlphaStation 200 4/233, Digital AlphaStation 250 4/233, Digital AlphaStation 400 4/166, Digital AlphaStation 400 4/233, Digital AlphaStation 400 4/266, Digital AlphaServer™ 400 4/166, Digital AlphaServer 1000 4/200, Digital AlphaServer 2000 4/200, Digital AlphaServer 2000 4/233, Digital AlphaServer 2100 4/200, Digital AlphaServer 2100 4/233, Digital AlphaServer 2100 4/275, Digital AlphaServer 8200 5/300, Digital AlphaServer 8400 5/300 Digital 2100 Server Model A500MP, Digital 2100 Server Model A600MP DEC™ 2000 Models 300/500 DEC 3000 Models 300/300L/300LX, DEC 3000 Models 400/400S, DEC 3000 Models 500/500S/500X, DEC 3000 Models 600/600S, DEC 3000 Models 700/700LX, DEC 3000 Models 800/800S, DEC 3000 Models 900/900LX DEC 4000 Model 600, DEC 4000 Model 700, DEC 7000 Model 600, DEC 7000 Model 700, DEC 10000 Model 600, DEC 10000 Model 700

VAX Processors Supported

VAX	VAXft™ Model 110, VAXft Model 310, VAXft Model 410, VAXft Model 610, VAXft Model 612, VAXft Model 810
	VAX 4000 Model 50, VAX 4000 Model 100, VAX 4000 Model 100A, VAX 4000 Model 200, VAX 4000 Model 300, VAX 4000 Model 400, VAX 4000 Model 500, VAX 4000 Model 500A, VAX 4000 Model 600, VAX 4000 Model 600A, VAX 4000 Model 700, VAX 4000 Model 700A
	VAX 6000 Model 200 Series, VAX 6000 Model 300 Series, VAX 6000 Model 400 Series, VAX 6000 Model 500 Series, VAX 6000 Model 600 Series
	VAX 7000 Model 600 Series
	VAX 8200, VAX 8250, VAX 8300, VAX 8350, VAX 8500, VAX 8530, VAX 8550, VAX 8600, VAX 8650, VAX 8700, VAX 8800, VAX 8810, VAX 8820, VAX 8830, VAX 8840
	VAX 9000 Model 110, VAX 9000 Model 210, VAX 9000 Model 300 Series, VAX 9000 Model 400 Series
	VAX 10000 Model 600 Series, VAX 10000 Model 700 Series
	VAX-11/750, VAX-11/780, VAX-11/785
MicroVAX™	MicroVAX II™, MicroVAX 2000, MicroVAX 3100 Model 10/10E, MicroVAX 3100 Model 20/20E, MicroVAX 3100 Model 30, MicroVAX 3100 Model 40, MicroVAX 3100 Model 80, MicroVAX 3100 Model 90, MicroVAX 3100 Model 96 MicroVAX 3300, MicroVAX 3400, MicroVAX 3500, MicroVAX 3600, MicroVAX 3800, MicroVAX 3900

VAXstation™	VAXstation II, VAXstation 2000, VAXstation 3100 Model 30, VAXstation 3100 Model 38, VAXstation 3100 Model 40, VAXstation 3100 Model 48, VAXstation 3100 Model 76, VAXstation 3200, VAXstation 3500, VAXstation 3520, VAXstation 3540
	VAXstation 4000 VLC™, VAXstation 4000 Model 60, VAXstation 4000 Model 90, VAXstation 4000 Model 96
VAXserver	VAXserver 3100 Model 10/10E, VAXserver 3100 Model 20/20E, VAXserver 3300, VAXserver 3400, VAXserver 3500, VAXserver 3600, VAXserver 3800, VAXserver 3900
	VAXserver 4000 Model 200, VAXserver 4000 Model 300, VAXserver 4000 Model 500
	VAXserver 6000 Model 210, VAXserver 6000 Model 220, VAXserver 6000 Model 310, VAXserver 6000 Model 320, VAXserver 6000 Model 410, VAXserver 6000 Model 420, VAXserver 6000 Model 510, VAXserver 6000 Model 520, VAXserver 6000 Model 610, VAXserver 6000 Model 620, VAXserver 6000 Model 630

Processors Not Supported

MicroVAX I™, VAXstation I, VAX-11/725, VAX 11/730, VAX-11/782, VAXstation 8000

Processor Restrictions

Each PC on which the WANrouter software is installed must have:

- MS-DOS V5.0 or later installed and running

- At least 8 MB of free extended memory (RAM)

- At least 40 MB of hard disk space for installation and 24MB for permanent use

- 8 MB of hard disk space for each dump file

- A 3.5-inch floppy disk drive from which to install the software

- An Ethernet adapter that uses either a Digital native datalink (DLL) or an NDIS driver.

The following Digital Ethernet controllers have been tested with the WANrouter software:

- EtherWORKS™ and EtherWORKS 3 adapters

- DEPCA™ adapters

- DEPEA Personal Ethernet adapter

Note that Digital Ethernet NDIS drivers for the EtherWORKS adapters can also be used with the previous DEPCA adapters. Ethernet controllers other than those listed above that have their own NDIS drivers may work with the WANrouter software but have not been tested.

Each Alpha or VAX processor on which the WANrouter software is installed must have:

- A valid system configuration for the relevant operating system and where applicable the appropriate DECnet/OSI product (refer to the appropriate operating system SPDs)

    and

- A direct LAN or serial line WAN connection to the WANrouter hardware unit.

- An appropriate device from which to install the software:

- CD-ROM drive

    or

- TK™50 tape drive

Disk Space Requirements (Block Cluster Size = 1)

Load Host	Installation	Permanent Use
MS-DOS PC	40 MB	24 MB
DIGITAL UNIX	20 MB	16 MB
OpenVMS for Alpha	30,000 blocks	25,000 blocks
OpenVMS for VAX	35,000 blocks	30,000 blocks

These counts refer to the disk space required on the system disk. The sizes are approximate; actual sizes may vary depending on the user's system environment, configuration, and software options. The space indicated for permanent occupancy does not include the space required to receive an upline dump if that facility is enabled. The amount of space required for dumps depends on the exact hardware configuration. This could be from 4,000 to 16,000 blocks (2 MB to 8 MB) for each dump depending on the WANrouter configuration.

CLUSTER ENVIRONMENT

This layered product is fully supported when installed on any valid and licensed VAXcluster™* configuration without restrictions. The HARDWARE REQUIREMENTS sections of this product's Software Product Description detail any special hardware required by this product.

*VAXcluster configurations are fully described in the VAXcluster Software Product Description (SPD 29.78.xx) and include CI™, Ethernet, and Mixed Interconnect configurations.

SOFTWARE REQUIREMENTS

The WANrouter software requires at least one local or remote system to act as a load host. That system needs to be one of the following:

- An IBM® compatible PC running the MS-DOS operating system
- An Alpha system running the DIGITAL UNIX operating system
- An Alpha system running the OpenVMS operating system
- A VAX system running the OpenVMS operating system

Each MS-DOS system acting as a load host or dump receiver requires:

- MS-DOS Operating System V5.0 or later

When using the router configuration utility on a PC, the program needs at least 8 MByte of extended memory free for a typical configuration. For more complex configurations involving multiple circuits, more than this amount of free memory may be required.

Each DIGITAL UNIX system acting as a load host or dump receiver requires:

- DIGITAL UNIX Operating System V3.0 or later
- DECnet/OSI for DIGITAL UNIX V3.0 or later

Each OpenVMS Alpha system acting as a load host or dump receiver requires:

- OpenVMS Operating System V6.0 or later
- DECnet/OSI for OpenVMS V6.0 or later

Each OpenVMS VAX system acting as a load host or dump receiver requires:

- OpenVMS Operating System V6.0 or later
- DECnet/OSI for OpenVMS V5.8 or later

GROWTH CONSIDERATIONS

The minimum hardware/software requirements for any future version of this product may be different from the requirements of the current version.

DISTRIBUTION MEDIA

MS-DOS PCs:

RX™23K 2.0MB 3.5" floppy disks only

DIGITAL UNIX Systems:

CDROM only

OpenVMS for Alpha Systems:

  CDROM only

OpenVMS for VAX Systems:

  TK50 Streaming Tape only

ORDERING INFORMATION

Software Licenses

A software license is required for each hardware unit. This license is normally included in the price of the hardware package. A license letter shipped with the hardware unit, along with the invoice, serves as proof of license.

Software Media and Documentation

Software Media for DIGITAL UNIX Operating System:

  QB-366AD-WA

Software Media for OpenVMS for Alpha Operating System:

  QB-366AE-WA

Software Media for OpenVMS for VAX Operating System:

  QB-366AA-WB

Software License ALL operating systems:

  QM-366AA-BA

Software License Upgrade ALL operating systems:

  QM-366AA-BB

* Denotes variant fields. For additional information on available licenses, services, and media, refer to the appropriate price book.

The above information is valid at the time of release. Please contact your local Compaq office for the most up-to-date information.

SOFTWARE LICENSING

A WANrouter software license is required for each DECwanrouter hardware unit on which the WAN-router software is used.

This software is furnished under the licensing provisions of Cabletron Systems Standard Terms and Conditions. For more information about Cabletron Systems licensing terms and policies, contact your local Cabletron Systems office.

SOFTWARE PRODUCT SERVICES

A variety of service options are available. For more information, contact your local Compaq office.

SOFTWARE WARRANTY

Cabletron has designed or adapted the X.25 portion of this product to operate with equipment conforming to the standards as listed in this SPI, to the public PSDNs, and to certain private PSDNs, for which Cabletron has included specific PSDN profiles in this product.

Compaq cannot offer its standard warranty for this product unless it has been configured appropriately for the PSDN. If the product has not been configured appropriately, the product will not be supported by Compaq.

Each PSDN listed in this SPI indicates Compaq's commitment to supporting the WANrouter software for that public service. However, it does not imply that the appropriate networking authority has granted network certification for the product.

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