



# Software Product Description

**PRODUCT NAME:** HP DECnet-Plus for OpenVMS Alpha and OpenVMS I64, Version 8.3      **SPD**  
**50.45.19**

## Description

HP DECnet-Plus for OpenVMS is an implementation of Phase V of the DIGITAL Network Architecture (DNA) for the OpenVMS Alpha and I64 operating system.

HP DECnet-Plus integrates DECnet and Open Systems Interconnection (OSI) network protocols, allowing both stacks to share integrated network functions up to the Transport layer. Upper layers have been implemented as separate towers, allowing existing DECnet and OSI applications to share the integrated Transport layer. Existing DECnet Phase IV and new DECnet and OSI applications are supported by DECnet-Plus. In combination with TCP/IP protocol stacks, OpenVMS systems can participate in multivendor, multiprotocol networks adhering to open networking standards.

HP DECnet-Plus for OpenVMS features include:

- Support for OpenVMS LAN failover sets. LAN failover provides a mechanism to protect LAN applications against network interface card (NIC) failures. A LAN failover set is defined by the system manager and consists of a set of like adapters (all the same class) that support LAN failover. One adapter in the failover set is used for LAN traffic; one or more other adapters in the set remain idle. If the active adapter fails, one of the idle adapters in the set automatically takes over LAN traffic using the same address as the failed adapter.
- DECdns Server on I64 systems, Alpha systems, and VAX systems
- The ability to run DECnet and OSI applications over TCP/IP transports.
- Support for 64-bit addresses, allowing 64-bit network applications to take advantage of the P2 addressing of Alpha systems running OpenVMS Alpha Version 7.1 or later. Support for 64-bit addressing is limited to the DECnet-Plus \$QIO interface.
- Continued support for 32-bit network applications.
- Host-based routing, which includes communication with nodes running DECnet Phase IV and OSI protocols and FDDI large packets, and X.25 switched and permanent virtual circuits.
- FAST configuration option, which allows quick configuration upgrades from Phase IV to Phase V.
- X.25 network management interface, providing efficient wide area network (WAN) management.
- The ability to configure all members of a cluster from any cluster member.
- OSI application programming interfaces (APIs).
- Expanded naming options, allowing one or more of the following directory naming services: Local, DECdns, and/or DNS/BIND (referred to as Domain by DECnet-Plus software). These directory naming services can be searched in any order, as determined during configuration of the product.
- Routing segregated mode to allow the Routing layer to choose a Phase IV router for those packets having a Phase IV compatible address. (Packets having a Phase V extended address are sent to a Phase V router by default.) This is a configurable option.
- Reverse path caching to capture path information for later use in reaching remote systems.
- Increased network size, supported through the use of ISO OSI addressing.

- Simplified installation and configuration process.
- The Network Control Language (NCL). Network management is based on DNA CMIP, HP's implementation of the OSI international standard Common Management Information Protocol.
- A graphical network management user interface, net\$mgmt, for improved network management, using NCL.
- An NCP (Network Control Program) emulator to facilitate installation of layered products written for DECnet Phase IV.
- Installation using the POLYCENTER Software Installation utility.
- Support for topologies using multicircuit and multi-homed end nodes.
- Dynamic connections over X.25 networks.

*HP DECnet-Plus for OpenVMS* includes OSI implementation in accordance with current U.S. and U.K. GOSIP requirements:

- Application, Presentation, and Session layers
  - File Transfer, Access, and Management (FTAM) application
  - Virtual Terminal application
  - Application Service Elements (ASEs), including ACSE (Association Control Service Element)
- Transport layer classes 0, 2, and 4
- Lower layers
  - OSI addressing formats, supporting large network topologies
  - End system to intermediate system (ES-IS) routing
  - Connectionless Mode Network Service (CLNS) over local area network (LAN) and wide area network (WAN) , and X.25
  - Logical Link Control type 2 (LLC2) for Connection-Oriented Network Service (CONS) over LAN
  - Data Link layer, supporting High-level Data Link Control (HDLC) for wide area communications (Alpha only), ISO 8802-3 (Ethernet CSMA/CD) and FDDI LANs. HDLC support includes the LAPB (Link Access Protocol Balanced) protocol for X.25 communications. For Version 8.2, HDLC is supported only on OpenVMS Alpha systems.
  - Physical layer, with CSMA/CD, HDLC (Alpha only), and FDDI devices supported.

*HP DECnet-Plus for OpenVMS* offers task-to-task communications, file management, downline system and task loading, network command terminals, and network resource sharing capabilities using DNA, OSI, and TCP/IP protocols. DECnet-Plus for OpenVMS communicates with adjacent and non-adjacent DECnet Phase IV, Advanced Server/PATHWORKS, DECnet-Plus implementations on other OpenVMS systems and Tru64 UNIX systems, as well as systems running TCP/IP transports and on OSI-compliant systems from other vendors.

OpenVMS programs written in native-mode programming languages can use DECnet-Plus for OpenVMS capabilities.

Depending on the system configuration, networks combining *HP DECnet-Plus for OpenVMS* systems with other DECnet, OSI, and TCP/IP products may limit the functions available if all products do not support equal features.

### Data Link Layer

*HP DECnet-Plus for OpenVMS* uses Ethernet and FDDI communications controllers to interface with other network nodes.

LAN connectivity is provided by the CSMA/CD and FDDI controllers and drivers supporting ISO 8802-2 Logical Link Control (LLC) Type 1 connectionless service. *HP DECnet-Plus* also supports Ethernet Version 2 packet formats on CSMA/CD devices.

Use of FDDI packets larger than 1500 bytes requires a Phase V router on the FDDI LAN. The maximum Phase V FDDI packet size is 4352 bytes for use with other Phase V network nodes. As with cluster alias support, you can configure the Phase V router to run the Phase IV distance vector routing protocol or the Phase V link state routing protocol.

WAN connectivity is provided by optional X.25 software supporting host-based synchronous communications interfaces (Alpha-only).

All the synchronous devices support DIGITAL-HDLC (Alpha-only) and LAPB/E (Alpha-only) and data link protocols. X.25 for OpenVMS Alpha is required to establish host-based wide area connections.

*HP DECnet-Plus for OpenVMS* allows a maximum of 32 circuits on a full routing node and up to four circuits defined and operational on an end system. This capability allows a single end system to be connected to up to four separate LANs or WANs. HP recommends that the circuits be equal in capacity and connectivity.

The optional X.25 for OpenVMS software allows *HP DECnet-Plus for OpenVMS* systems to connect to PSDNs (packet switching data networks) conforming to CCITT Recommendation X.25 (1980 or 1984) and/or ISO 7776 and 8208, or through an X.25 relay system directly connected to a PSDN, or through an X.25 connector node (X.25 gateway), or over TCP/IP using RFC 1613 (XOT). The software allows process-to-process as well as terminal-to-process communications between Alpha systems and remote DTE (data terminal equipment) over a PSDN.

The X.25 software provides the Connection-Oriented Network Service (CONS) to allow mapping between a destination NSAP address and a destination DTE address according to ISO 8348.

Direct access to a PSDN (using the supported device drivers) requires an X.25 license. See the Optional Software section.

For more details on the X.25 software for OpenVMS, refer to the X.25 for OpenVMS Alpha and Integrity Systems Software Product Description (SPD 47.37.xx).

### Network Layer

*HP DECnet-Plus for OpenVMS* supports the Connectionless-Mode Network Service (CLNS) and the Connection-Oriented Network Service (CONS).

Exchange of routing information between end systems and routers uses the ISO 9542 ES-IS routing protocol. This protocol allows DECnet-Plus systems to autoconfigure as end systems with ISO 9542-conformant routers.

Addresses conform to the ISO 8348 Addendum 2 specification, allowing the support of large network topologies. As long as the system address stays within the addressing range of Phase IV systems (up to 1,023 systems per area and up to 63 areas per network), and uses the same initial domain part (IDP), you can use Phase IV or Phase V routers.

The Network layer supports the capability of an end system to be multicircuited and multihomed. Multicircuit support allows multiple circuits to be active simultaneously. This functionality increases network reliability and data throughput. Multihomed end-system support allows a system to have up to three network entity titles.

Segregated routing mode is a settable attribute. It directs routing to choose a Phase IV router for those packets having a destination address that can be translated to the Phase IV format. All other packets are sent to a Phase V router, if available.

The Routing layer is able to cache information about the paths that are used to reach remote nodes.

### Transport Layer

*HP DECnet-Plus for OpenVMS* provides support for:

- OSI Transport protocol as specified in ISO 8073
- RFC 1006 and RFC 1859 to allow OSI and DECnet applications to run over TCP/IP
- Network Services Protocol (NSP)

NSP, RFC 1006, and OSI transports support communications between DECnet, TCP/IP, and OSI systems. NSP provides backward compatibility with Phase IV DECnet systems.

RFC 1859 support for DECnet applications is provided by a kernel interface that is implemented on all TCP/IP stacks available for use on the OpenVMS operating system. The supported applications include all licensed DECnet applications as well as layered products and user-written applications that conform to the documented DECnet programming interfaces.

RFC 1006 is a specification for running OSI applications over TCP/IP. Operation of the FTAM and Virtual Terminal application over a TCP/IP network is supported along with other layered OSI applications such as X.400 and X.500.

A separate TCP/IP stack is required on the same system with DECnet-Plus. See the Optional Software section of this SPD for information on supported TCP/IP products.

OSI transport supports transport classes 0, 2, and 4 on connection-oriented networks and class 4 on connectionless networks.

OSI transport uses two types of network service:

- The Connectionless-Mode Network Service (CLNS) using the Internet protocol (ISO 8473) and ES-IS protocol (ISO 9542) to communicate across linked subnetworks.
- The Connection-Oriented Network Service (CONS).

### Upper Layers

*HP DECnet-Plus for OpenVMS* software provides the OSI upper layer stack consisting of Session, Presentation and Application layers. The Application layer provides Association Control Service Element (ACSE); File Transfer, Management, and Access (FTAM); and Virtual Terminal (VT).

*HP DECnet-Plus for OpenVMS* also provides a range of DECnet applications and services including file and record access, remote terminal access, mail, and phone.

## Applications

### Transport Options for Applications

You can run applications written to the DECnet upper layers over NSP or TCP/IP transports using RFC 1859. This includes the network applications that are licensed with DECnet-Plus as well as user-written applications that adhere to the documented DECnet programming interfaces.

You can run applications written to the OSI upper layers over OSI or TCP/IP transports using RFC 1006.

Existing DECnet and OSI applications require no modification to run over TCP/IP using RFC 1859 and RFC 1006.

### Remote File Transfer

*HP DECnet-Plus for OpenVMS* supports two upper layer protocols for remote file transfer: the OSI protocol's File Transfer, Access, and Management (FTAM) and the DECnet Data Access Protocol (DAP).

#### FTAM

FTAM supports file transfer, access, and management between a DECnet-Plus for OpenVMS system and other systems with software adhering to ISO 8571. In addition, FTAM is conformant with NIST Phase II and Phase III agreements and is certified as being conformant to the released specifications of U.S. GOSIP, U.K. GOSIP, and ENV41204.

In addition, FTAM:

- Provides users the ability to create, delete, rename, view, and copy files using DCL commands.
- Is implemented as an Application Service Element (ASE) of the OSI Application layer.
- Acts as the initiator or as the responder in a connection.
- Accesses and transfers files with both binary and character data. It supports FTAM-1, FTAM-2, FTAM-3, and NBS-9 document types.

*HP DECnet-Plus for OpenVMS* also supports gateway services between FTAM and DAP.

A full description of the FTAM services in DECnet-Plus for OpenVMS is provided in Appendix A of this document.

#### DAP

The DECnet Data Access Protocol (DAP) supports task-to-task communications, file and record access, and proxy access.

**Task-to-Task Communications:** For most applications, you can use task-to-task communications in a transparent manner where the remote task is treated as a full-duplex, record-oriented device. Transparent operation is provided with the following interfaces: system service calls, RMS calls (OPEN, GET, PUT, and CLOSE), and high-level language I/O statements (which are mapped to RMS calls). A nontransparent mode of task-to-task communications is offered by means of the system service interface that extends the capabilities provided by the transparent mode. These capabilities include support for interrupt messages and multiple in-bound connect requests.

Using *HP DECnet-Plus for OpenVMS*, an OpenVMS program written in a native mode programming language can exchange messages with other user programs.

**File Access:** File access is supported to and from remote DECnet-Plus for OpenVMS systems, transparent to native mode high-level language programs using RMS. User programs can sequentially read, create, and delete files on a remote node.

**Record Access:** User programs can perform record level operations such as GET, PUT, UPDATE, DELETE, FIND, and REWIND to access and modify files residing on a remote OpenVMS node. In addition to sequential access to a file, several other access methods are supported through RMS using DECnet-Plus for OpenVMS. These methods include random access by relative record number, random access by key value, random access by record file address (RFA), and block I/O access by virtual block number.

**Proxy Access:** Remote users can have access to up to 15 proxy accounts on a specific remote system. One proxy account should be designated as the default proxy account on the remote system.

### Command Language File Management

You can use most OpenVMS DIGITAL Command Language (DCL) commands to perform remote file operations. These commands include: ANALYZE, APPEND, BACKUP, CLOSE, CONVERT, COPY, CREATE, DELETE, DIFFERENCES, DIRECTORY, DUMP, OPEN, PRINT, PURGE, READ, SEARCH, SUBMIT, TYPE, and WRITE. The operation of these commands is transparent except for commands that invoke processing on a specific system (for example, SUBMIT/REMOTE and PRINT/REMOTE). Only a node name added to a file specification is required to invoke the network capabilities using one of these commands.

Using the COPY command, a user can transfer sequential, relative, and indexed-sequential (ISAM) files between DECnet-Plus for OpenVMS nodes that support compatible file structures and record formats. Users



can transfer sequential or relative files with fixed length, variable length, or variable length with fixed control field records between two DECnet-Plus for OpenVMS systems. Similarly, multikeyed indexed files with variable or fixed length records are supported.

The SUBMIT/REMOTE command allows command files residing on a remote node to be submitted for execution at the remote node. The command file must be in the format expected by the node responsible for execution. DECnet-Plus for OpenVMS allows OpenVMS command files to be received from other systems and executed.

The DCL command EXCHANGE/NETWORK allows the transfer of files to or from heterogeneous systems. This command gives users the option to transfer file types between MS-DOS, UNIX systems and OpenVMS systems regardless of record semantics. Unlike the COPY command, which preserves file and record organization during a file transfer, this command enables the user to modify file and record attributes during file transfer.

### OSI Application Programming Interfaces (APIs)

The OSI application programming interfaces enable users to write distributed applications that communicate over open networks and use the OSI services provided by DECnet-Plus.

The interfaces are provided under the Extended Function license and include:

- An interface to FTAM (File Transfer, Access, and Management)
- Interfaces to the ACSE (Association Control Service Element) and Presentation layers
- An interface to ROSE (Remote Operations Service Element)
- An interface to the OSI Session layer

The interfaces permit application writers to use the services of the OSI upper layers in their applications.

The APIs allow you to develop applications on DECnet-Plus systems. You must compile and link source code with the APIs. The APIs are required on the development system and the compile/link system. You can run the resulting application on any DECnet-Plus system with the appropriate operating system. The APIs are not required on these target systems. See Appendix B for details on the OSI APIs.

### Network Virtual Terminal

DECnet-Plus supports two upper layer protocols for terminal access: the OSI Virtual Terminal protocol and the DECnet Command Terminal protocol.

### Virtual Terminal

Virtual Terminal (VT) supports the ISO Virtual Terminal Protocol (ISO 9041). This protocol allows remote logins and access to remote applications between DECnet-Plus for OpenVMS systems and any remote system, including multivendor systems, that also run an ISO-compliant Virtual Terminal implementation.

Virtual Terminal is implemented as an Application Service Element (ASE) of the OSI Application layer.

Virtual Terminal may act as the terminal/initiator (for a local user) or as the host/responder (for the remote user).

A full description of Virtual Terminal features is provided in Appendix A of this SPD.

### Command Terminal

The DCL command SET HOST allows a terminal user on one DECnet-Plus for OpenVMS node to establish a logical connection to another DECnet-Plus or DECnet Phase IV node that uses the Command Terminal (CTERM) protocol. This connection makes the terminal appear to be physically connected to the remote system and the operator can use all the standard system and network utilities supported by that remote node. This capability is particularly useful for doing remote program development and allows the terminal users on smaller application-oriented systems to use the resources of larger development-oriented systems.

Other interfaces are included in DECnet-Plus for OpenVMS. You can develop programs and procedures based on these interfaces for functions such as file access and task-to-task communications on individual systems. Because the DECnet-Plus for OpenVMS interfaces stay the same, you can use the programs and procedures developed on an individual system in a network environment without modifying them.

## Services

### Downline Loading

*HP DECnet-Plus for OpenVMS* allows for the loading of an unattended system using the services provided by the Maintenance Operations Module (MOM). MOM provides a set of maintenance operations over various types of circuits by using the Maintenance Operations Protocol (MOP). A loadable system is a system that has a load device enabled for MOP service functions and for which a properly formatted load file is supplied. Downline loading involves transferring a copy of the load file image to a remote target node. Load requests can come from the local DECnet-Plus for OpenVMS operator or from the target node. Downline loading is supported for HP server products.

### Downline Task Loading

Initial task images for loadable systems can be stored on OpenVMS file system devices and loaded into remote nodes. Programs already executing on loadable systems can be checkpointed to the host OpenVMS file system and later restored to main memory in the node. These features simplify the operation of network systems that do not have mass storage devices.

### Upline Dumping

Memory images of adjacent nodes connected by *HP DECnet-Plus for OpenVMS* can be written or dumped into a file on an OpenVMS system. This facility provides assistance in troubleshooting in the event of a system crash. This facility is also supported for HP server products.

### Mail

The OpenVMS Mail utility allows transmission of text messages between users on systems supporting MAIL-11. The *HP DECnet-Plus for OpenVMS* software allows users to exchange mail with users of other DECnet-Plus and/or DECnet Phase IV systems.

### Phone

The OpenVMS Phone utility allows users to send and receive data interactively from one user's terminal to another user's terminal. DECnet-Plus allows users on different systems in the same DECnet-Plus network to exchange information.

### OpenVMS Cluster Alias

*HP DECnet-Plus for OpenVMS* supports the ability to access nodes in an OpenVMS Cluster using a separate alias node address, while retaining the ability to address each node in the cluster individually. Not all network objects can be accessed using this mechanism. The maximum number of nodes supported for a cluster alias is 92. Refer to the OpenVMS Cluster SPD (29.78.xx) for relevant restrictions.

DECnet-Plus no longer requires a cluster member to be configured as a router. Clusters in a DECnet-Plus environment require a reachable IS-IS compliant router on the LAN.

### Network Management

Network management is provided with the Network Control Language (NCL). Network management implements the DECnet-Plus layered model, based on the HP hierarchical structure called Enterprise Management Architecture (EMA).

Users can access NCL through either a command line interface or a graphical user interface (GUI) called net\$mgmt. The GUI allows network managers to view the status of network components and control those components from a Motif-based window interface.

The *HP DECnet-Plus for OpenVMS* network management software allows system and network managers to:

- Control and monitor the operation of a network and provide information related to network traffic and performance
- Configure network operating parameters
- Start up and shut down network components as needed
- Detect and isolate network problems, and return the network to service once repaired.

In addition, the network management software can provide information, warning network managers of faulty or failing network components, both hardware and software.

Network Command Language (NCL) is provided as a utility to the network manager to perform the operations described above.

Network managers can also use NCL to test specific components of the network. NCL enables transmission and reception of test messages either between systems or through controller loopback arrangements. The messages can then be compared for possible errors. NCL helps users isolate network problems.

*HP DECnet-Plus for OpenVMS* provides network event logging to a terminal device, disk file, or remote system. NCL users can enable and disable the event logging facility as well as optionally filter specific events.

NCL uses the DNA Common Management Information Protocol (CMIP), which permits entity management from a single location anywhere in the DECnet-Plus network.

The Common Trace Facility (CTF) allows the network manager to collect and display information about specific protocol exchanges between systems.

*HP DECnet-Plus for OpenVMS* supports an ISO CMISE application programming interface (API) conforming to the service definitions in ISO 9595. The API allows for development of applications that can communicate with other management applications conforming to ISO 9595 on remote nodes in the network.

DECnet-Plus supports the NCP Emulator for remote management of Phase IV DECnet systems.

## Name Service Options

*HP DECnet-Plus for OpenVMS* allows the use of one or more naming services. The available services are DECdns, DNS/BIND (referred to as Domain by DECnet-Plus software), and the Local namespace. TCP/IP host name and address information is maintained in DNS/BIND. DECnet node names and address towers are maintained in the DECdns and/or Local namespaces. If DECnet over TCP/IP is in use by the DECdns clerks and servers, then the IP towers will be automatically maintained in the DECdns namespace as well.

When you use more than one name service, a configurable search list defines the order in which the existing services are to be accessed.

### Local Namespace

Using the Local namespace, you can define up to 100,000 nodes in a local naming database. A migration tool is available to move the Phase IV database to the large local file format and/or DECdns format.

### DNS/BIND

DECnet can use TCP/IP naming and addressing information from the DNS/BIND name service.

### DECdns

*HP DECnet-Plus for OpenVMS* provides a global naming service called the DIGITAL Distributed Naming Service (DECdns).

The full DECdns service provides a consistent, network-wide set of names for network resources called the namespace. This namespace is maintained by one or more DECdns server systems. HP recommends that DECdns servers be installed on at least two systems in every LAN. This should provide adequate service and redundancy.

The features provided by DECdns include:

- A networkwide name-to-attribute mapping service that allows selected HP applications to create, read, modify, and delete names in the namespace
- A hierarchical structure permitting a large number of names to be stored and distributed across the network
- Access control to each name in the namespace
- Management and event logging

## Distributed Time Service

*HP DECnet-Plus for OpenVMS* provides a network time service with DECdts, the DIGITAL Distributed Time Service. DECdts provides precise, fault-tolerant clock synchronization for systems in a LAN or WAN. Time is provided in Coordinated Universal Time (UTC) and can be used across a global network. Several forms of time providers are supported, and a callable interface for applications allows users to add their own time providers, including NTP. DECdts can be used by distributed applications to determine event sequencing, duration, and scheduling.

### Operation

DECnet-Plus is implemented under OpenVMS as an ancillary control process (ACP) and a network device driver with HP-supplied executive-level components and user-level programs.

The normal OpenVMS protection has been incorporated in the operation of DECnet-Plus. For example, incoming connects, including file access and file transfer requests, are protected by the normal OpenVMS login and file protection mechanisms. Outgoing connects, including file access and file transfer requests, can include user password information that is implicitly specified by NCL, or explicitly specified by the user for verification on the remote node.

### Configuration and Performance

You can configure DECnet-Plus using either the BASIC or ADVANCED configuration options.

Cluster nodes are configurable from any node within the cluster.

As with any network protocol, the performance of a given DECnet-Plus for OpenVMS node is a function not only of the expected network traffic and resultant processing, but also of the amount of concurrent processing specific to that node. Thus, node performance depends on many factors including:

- CPU types
- Number and type of devices
- Number of device interrupts per unit time
- Communications line(s) characteristics
- Number and size of buffers
- Message size and frequency of transmission
- Applications in use

It is important to note that the rate at which user data can be transmitted (throughput) over a communications line can sometimes approach, but will never exceed, the actual line speed. This is because the actual throughput is a function of many factors, including the line quality, protocol overhead, topology, and network application(s), as well as the factors cited in this section.

The performance of DECnet-Plus is comparable to the performance of DECnet Phase IV. However, in a symmetrical multiprocessing environment the performance of DECnet-Plus can be far superior to that of DECnet Phase IV. With DECnet Phase IV the NETACP process can only execute on the primary CPU. With DECnet-Plus the NET\$ACP process can be scheduled on any available CPU, resulting in improved performance.

### Standards Conformance

*HP DECnet-Plus for OpenVMS* has been designed and implemented to conform to the following standards:

- ISO
  - 4335
  - 7776, 7809
  - 8073, 8208, 8327, 8473, 8571, 8650, 8802-2, 8802-3, 8823, 8878, 8881
  - 9314, 9542, 9041
  - 3309
- EN 41 204, 41 205, 41 206, 41 207
- CCITT Recommendation X.25 (1978, 1980, or 1984) using the LAPB or LAPBE variants of the X.25 packet level and data link protocols (Alpha-only)
- U.S. GOSIP V2.0
- U.K. GOSIP V4.0

Contact your local HP office for the most recent conformance certificates.

### Documentation

The documentation for HP DECnet-Plus for OpenVMS is supplied as follows:

- Online versions of the documentation are shipped as part of the OpenVMS Online Documentation Library on CD-ROM and on the OpenVMS layered product CD-ROM.
- Printed copies of the documentation are available as a separate order.
- An optional X.25 documentation set covering accounting, X.29, and X.25 Mail is available as a separate order.
- New features are documented extensively in the Release Notes.

### Installation

DECnet-Plus software is customer installable. Installation services are available for customers who request installation of the software product by an experienced HP software specialist.

HP requires that a customer's first use of X.25 include HP Installation Services. These services provide for installation of the software product by an experienced HP software specialist.

#### *Customer Responsibilities*

Before HP Services can install the software, the customer must:

- Ensure that the system meets the minimum hardware and software requirements (as specified in the relevant SPDs)
- Prior to installing HP hardware or software, obtain, install, and demonstrate as operational any modems and other necessary customer equipment or facilities to which HP's communications hardware or software will connect
- Designate one adjacent node to verify installation and connectivity
- Make available for a reasonable period of time, as mutually agreed upon by HP and the customer, all hardware communications facilities and terminals that are to be used during installation.

Delays caused by any failure to meet these responsibilities will be charged at the prevailing rate for time and materials.

Installation of *HP DECnet-Plus for OpenVMS* consists of the following tasks:

- Verify that all components of *HP DECnet-Plus for OpenVMS* have been received.



- Verify that the necessary versions of the OpenVMS software and documentation are available.
- Verify the appropriate SYSGEN parameters.  
**Note:** If a software specialist is required to modify the previously installed operating system parameters, a time and materials charge will apply.
- Create any necessary *HP DECnet-Plus for OpenVMS* accounts and directories.
- Enable software by registering the License Product Authorization Key (PAK) .
- Install the *HP DECnet-Plus* software on the target system using the POLYCENTER Software Installation utility .
- Verify the proper installation of *HP DECnet-Plus for OpenVMS* by running a series of tests to show connectivity to a designated node.

Connectivity to all other nodes within the network is the responsibility of the customer. HP recommends the use of NCL to help verify connectivity.

In some cases, the PSDN supplier (or PTT) may impose restrictions, limitations, or requirements on the proposed HP network configuration. The customer must understand and adhere to these controls for every network.

**Hardware Requirements**

Refer to the HP OpenVMS for Integrity Servers and HP OpenVMS Alpha Operating Systems Software Product Description (SPD 82.35.xx) for hardware requirements and processor support.

**Disk Space Requirements (Block Cluster Size = 1)**

The following 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.

Disk space required for installation:

- Base DECnet-Plus software: 89,000 blocks
- Base DECnet-Plus software with optional DECdns server and DECdts server software included: 104,000 blocks

*Supported LAN Adapters*

Refer to the HP OpenVMS for Integrity Servers and HP OpenVMS Alpha Operating Systems Software Product Description (SPD 82.35.xx) for a list of supported LAN adapters.

**Software Requirements**

HP DECnet-Plus for OpenVMS Alpha and I64 Version 8.3 requires OpenVMS Version 8.3 of the operating system.

**Optional Software**

*TCP/IP*

A separate TCP/IP protocol stack is required to use the DECnet over TCP/IP features in DECnet-Plus. This release contains support for Internet Protocol Version 4 (IPv4) and does not support Internet Protocol Version 6 (IPv6). The following TCP/IP product has been tested with DECnet-Plus:

- HP TCP/IP Services for OpenVMS Version 5.6.
- HP TCP/IP Client Software License: QL-0M2A\*-\*\*
- HP TCP/IP Services Software License: QL-0LXA\*-\*\*
- HP TCP/IP Client Upgrade License: QL-0PHA\*-\*\*
- SPD: 46.46.xx

*X.25 Optional License*

The DECnet-Plus for OpenVMS license grants the right to use the OSI applications for CONS over LLC2 or CLNS over DEC-HDLC (Alpha-only). All other X.25 software functions over LAPB (Alpha-only), LLC2, and RFC 1613 require the X.25 for OpenVMS license.

The X.25 for OpenVMS license is also required to enable the X.25 utilities, such as X.25 Mail and SET HOST/X.25, as well as the X.25 application programming interfaces (APIs). Version 2.0 of the X.25 for OpenVMS product is required for this version of DECnet-Plus.

Software Licenses:

Alpha	QL-0THA*-AA
I64	BA390AC

Media and Documentation:

Alpha	QA-03XAA-H8
I64	BA390AA

(See SPD 47.37.xx.)

**Growth Considerations**

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

**Distribution Media**

This product is available as part of the OpenVMS Consolidated Software Distribution on CD-ROM. The software documentation for this product is also available as part of the OpenVMS Online Documentation Library on CD-ROM.

**Ordering Information**

In the following table, asterisks (\*) denote variant fields. For additional information on available licenses, services, and media refer to the appropriate price book.

Software Licenses:

Alpha End System	QL-MTFA*-AA
I64 End System	Included in OE license
Alpha Extended Function	QL-MTGA*-AA
I64 Extended Function	BA406AC

Software Media:

Alpha	QA-03XAA-H8
I64	BA322AA BA323AA

Software Documentation:

Alpha	QA-MTFAA-GZ
I64	BA406-MN

Consolidated Distribution Services:

Alpha	QT-03XAA-*8
I64	Included in OE service offerings

**Software Licensing**

The DECnet-Plus licenses give users the right to use the software on a single CPU and include the delivery of a License Product Authorization Key (PAK) to enable the DECnet-Plus for OpenVMS software.

The End System license grants the right to use all the DECnet-Plus features with the exception of the cluster alias, the OSI application programming interfaces, the OSI applications gateway, and routing.

The Extended Function license grants the right to use the DECnet-Plus end-system features, OSI application gateways, OSI application programming interfaces, host-based routing, and the cluster alias. An Extended Function license is required on at least one node in every cluster configuration to enable the use of the cluster alias. The Extended Function License is also required to configure a node as a DECdts or DECdns server.

This software is furnished under a license only. For more information about HP's licensing terms and policies, contact your local HP office.

*License Management Facility Support*

This product supports the OpenVMS Alpha and I64 License Management Facility.

License units for this product are allocated on a CPU basis.

For more information on the License Management Facility, refer to the HP OpenVMS for Integrity Servers and HP OpenVMS Alpha Operating Systems Software Product Description (SPD 82.35.xx) or the *License Management Facility* manual of the OpenVMS Alpha operating system documentation set.

For more information about HP's licensing terms and policies, contact your local HP office.

**Software Product Services**

*Prerequisite Support*

For the use of X.25 with PSDNs, it is recommended that the customer and HP jointly prepare a Network Profile and Customer Support Plan covering all the intended network nodes, their usage of switched virtual circuits (SVCs), permanent virtual circuits (PVCs), and other network facilities, and their support. Without this Network Profile and Customer Support Plan, HP cannot support the network connections.

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

**Software Warranty**

This software is provided by HP with a 90 day performance warranty in accordance with the HP warranty terms applicable to the license purchase.

**Appendix A: File Transfer, Access, and Management (FTAM)**

FTAM software provides communications for the following file operations between open systems:

- Copying files between local and remote systems
- Appending, deleting, or renaming files
- Displaying information about files

An open system is a computer system that implements the standards for each of the seven layers of the Open Systems Interconnection (OSI) Reference Model for communications as defined by the International Organization for Standardization. An FTAM system is any open system containing an FTAM implementation that conforms to the FTAM standard and includes the implementations of the necessary underlying OSI services.

FTAM implements several standards that define the following components of these layers of the OSI Basic Reference Model: the FTAM service element and the Association Control Service Element (ACSE) of the Application layer, the Presentation layer, and the Session layer.

**Supported Standards**

FTAM conforms to the following OSI standards:

- ISO 8571 — File Transfer, Access, and Management service and protocol
- ISO 8650 — ACSE protocol
- ISO 8823 — Presentation protocol
- ISO 8327 — Session protocol

Table 1 compares the supported implementation profiles for different standards bodies and their relationship to each other.

**Table 1  
Standards and Implementation**

International Standardized Profiles (ISP) ISO 10607	NIST	CEN/CENELEC and EWOS
Part 1: Specification of ACSE, Presentation and Session protocols for use by FTAM	—	—
Part 2: Definition of document types, constraint sets, and syntaxes	—	—

Part 3: AFT11 — Simple File Transfer Service (Unstructured)	T1 — Simple File Transfer	A/111 — iENV 41 204
Part 4: AFT12 (DISP) <sup>1</sup> — Positional File Transfer Service (Flat) <sup>2</sup>	T2 — Positional File Transfer	A/112 — ENV 41 206
Part 5: AFT3 (DISP) <sup>1</sup> — File Management Service	M1 — Management	A/13 — ENV 41 205

<sup>1</sup>Draft ISP

<sup>2</sup>AFT12 is not supported by DECnet-Plus

**FTAM Component Software**

The component software includes the user facilities (initiators), responders, management tools, and problem determination tools.

**FTAM User Facilities**

Users access the FTAM user facilities by entering the following OpenVMS operating system commands: APPEND, COPY, DIRECTORY, RENAME, and DELETE. These commands operate on files stored on any FTAM system whose implementations are compatible with FTAM. You cannot use these commands to manipulate files directly on your local system.

**Support for Any File-Naming Convention**

A file designation is system-specific information that identifies a file to its storage system. FTAM software lets users specify files using the naming conventions of the systems where the files reside. FTAM supports the OpenVMS operating system RMS format for file specifications and a comparable style of file-specification format that accommodates non-RMS file designations.

**Support for Several File Types**

FTAM software can access and transfer files containing both binary and ASCII data. FTAM-1, FTAM-2, FTAM-3, and NBS-9 document types are supported.

FTAM-1 files are unstructured text files, FTAM-2 files are sequential text files, and FTAM-3 files are unstructured binary files. Table 2 shows the parameters supported by FTAM-1, FTAM-2, and FTAM-3 document types.

**Table 2**  
**FTAM Document Types**

Document Type	String Significance	Universal Class	Maximum String Length
FTAM-1	Not significant	IA5String GeneralString	Presence and absence of parameter
	Fixed	VisibleString GraphicString	Presence of parameter
	Variable	VisibleString GraphicString	Presence and absence of parameter
FTAM-2	Not significant	VisibleString GraphicString	Presence or absence of parameter
FTAM-3	Not significant		Presence or absence of parameter
	Fixed		Presence of parameter

NBS-9 files are NBS file directories.

#### **Flexible and Transparent Access for Local Files**

FTAM software treats local files the same way that the OpenVMS operating system file system treats them.

#### **File Transfers**

The FTAM COPY command transfers files between compatible FTAM systems without modifying the source file. The facility can transfer files in either direction between the local system and a remote FTAM system. The COPY command can also transfer files between two remote FTAM systems for a local FTAM user.

The COPY command also allows you to append one or more files to a single output file within or between FTAM systems.

#### **FTAM-DAP Gateway**

The FTAM-DAP Gateway lets you perform file operations from a non-OSI system that supports the DAP protocol to an OSI system supporting FTAM. Remote users of the gateway need not establish accounts on the gateway system to use its capabilities. The gateway does not support the APPEND functionality.

#### **File Deletion**

The FTAM DELETE command lets you delete one or more files on any combination of FTAM systems provided you have delete access to those files on the specific FTAM system.

#### **Renaming Requests**

The FTAM RENAME command allows you to rename files. The command works on files stored on remote FTAM systems (remote files). The command enables you to change the path name or file name of an existing file. For remote files, you must specify whatever type of information the remote FTAM system requires for specifying files.

#### **Directory Requests**

The FTAM DIRECTORY command lets you display the complete set of FTAM file attributes. Specific options allow you to vary the display of attributes that are meaningful in an OpenVMS operating system environment, for example, date and time of the last modification of file name.

#### **FTAM File Error Recovery**

FTAM provides file error recovery functionality, both in the COPY initiator command and in the FTAM responder. File error recovery is provided for classes 1, 2, and 3 errors as detailed in ISO 8571-4.

Class 1 file error recovery provides only the restart functionality, while classes 2 and 3 provide both the restart and recovery functionality as follows:

- If an internal error is detected in the data transfer regime, class 1 recovery restarts the data transfer regime by retransmitting the file data beginning at the negotiated checkpoint within the data transfer regime.
- Class 2 error recovery provides for the re-establishment of the select and open regimes, and also allows for the retransmission of file data beginning at a negotiated checkpoint within the data transfer regime.
- Class 3 error recovery provides full recovery by re-establishing a lost FTAM association and its select and open regimes. Class 3 recovery then restarts the data transfer regime by retransmitting the file data beginning at the negotiated checkpoint within the data transfer regime.

All restart and recovery operations and procedures are completely transparent to the user.

**Management and Problem Determination Tools**

FTAM software supplies a number of management tools, including an installation verification procedure (IVP), a tracing utility, event logging, and informational and error messages.

**FTAM Installation Verification Procedure (IVP)**

The FTAM IVP sets up outbound and inbound application associations. A connection is made to your local system (as a loopback test). The FTAM IVP checks that your installation is able to set up and release presentation and session connections. It tests the FTAM software by starting a responder and reading the attributes of a file with the DIRECTORY command.

**FTAM Tracing Utility**

The FTAM tracing utility (OSITRACE) is a tool for identifying problems in protocol exchanges between your local system and any remote FTAM system. The tracing utility captures protocol exchanges and transcribes them into easily read text; OSITRACE data is written to SYS\$OUTPUT.

The FTAM tracing utility monitors data exchanges for individual associations. The tracing utility can trace data originating from the following components: FTAM (DATA, PROTOCOL, and STRUCTURING), ACSE, Presentation, and Session.

**OSI Address Lookup Using X.500**

The FTAM software is capable of retrieving network addresses from the X.500 directory. You can use this functionality with or instead of retrieving addresses from a local repository.

**FTAM Event Logging**

For event logging, the FTAM responder writes records to OSIF\$RESPONDER.LOG.

**Requirements for Compatibility with FTAM**

FTAM lets an open system perform a specific set of file transfer, access, and management activities with any open system having a compatible FTAM implementation.

The Protocol Implementation Conformance Statement (PICS) provides more information about HP's FTAM implementation.

**Appendix B: Virtual Terminal**

DECnet-Plus Virtual Terminal (VT) is Hewlett Packard Company's implementation of the ISO Virtual Terminal Basic Class standard, which consists of the service definition (ISO 9040) and the protocol (ISO 9041). VT software adheres to these standards, thereby providing interactive access between DECnet-Plus systems and other multivendor terminal systems and host systems that also adhere to the ISO Virtual Terminal Basic Class standard.

VT is implemented as an Application Service Element (ASE) of the OSI Application layer.

VT can run over Transport layer classes 0, 2 or 4 over CONS, and TP4 over CLNS. VT can also run over TCP/IP networks using RFC 1006.

VT provides terminal/initiator (for a local user) and host/responder (for the remote user) capabilities. Terminal/responder and host/initiator are not supported.

**Supported Standards**

VT conforms to the following OSI standards:

- ISO 9041 — Virtual Terminal protocol - basic class
- ISO 8650 — ACSE protocol
- ISO 8823 — Presentation protocol
- ISO 8327 — Session protocol

**Virtual Terminal Features**

Virtual Terminal supports the following features:

- Basic class (character cell terminals) of service
- Asynchronous mode (A-Mode) of operation
- Profile Support
  - Default A-mode (per ISO 9040)
  - A-mode Generalized Telnet (adheres to OIW Stable Agreements)
  - A-mode Transparent (adheres to OIW Stable Agreements)
  - A-mode Telnet 1988 (adheres to OIW Stable Agreements)
- Functional Units
  - destructiveBreak
  - structuredCOs
  - urgentData
- Supported Gateways
  - Bidirectional VT/Telnet
  - Bidirectional VT/LAT



- Online Help

#### *OSI Address Lookup using X.500*

The VT software is capable of retrieving network addresses from the X.500 directory. You can use this functionality with or instead of retrieving addresses from a local repository.

#### *Command Mode*

Command mode allows you to execute commands that can modify the characteristics of the Virtual Terminal association with the remote application.

#### *Trace Utility*

The VT tracing utility (OSITRACE) is a tool for identifying problems in protocol exchanges between your local system and any remote system. The utility captures protocol exchanges and transcribes them into easily read text.

The tracing utility monitors data exchanges for individual associations. The utility can trace data originating from the VT, ACSE, Presentation, and Session components.

## **Appendix C: OSI Application Programming Interfaces**

### *FTAM API*

The FTAM API supports the OSI standard ISO 8571: Information Processing Systems, Open Systems Interconnection, and File Transfer, Access, and Management.

The FTAM API provides the interface to the FTAM protocol machine provided in DECnet-Plus. Communications between the application code and the FTAM protocol machine are carried out using ASN.1 encoded data structures. The API supports the following functions:

- Abort
- Begin-Group
- Cancel
- Change-Attributes
- Create
- Close
- Data
- Data-End
- Delete
- Deselect
- End-Group
- Initialize
- Open
- Read-Attributes
- Read
- Select
- Terminate
- Transfer-End
- Write

### *OSI Application Kernel (OSAK) API*

The OSAK API provides a direct interface to services at the ACSE and Presentation layer. The OSAK API supports the following OSI standards for the ACSE layer:

- ISO 8650: Information Processing Systems, Open Systems Interconnection, Protocol Specification for the Association Control Service Element
- ISO 8649: Information Processing Systems, Open Systems Interconnection, Service Definition for the Association Control Service Element

The OSAK API provides the interface to the ACSE services. It provides the following services:

- Associate
- Release
- Abort
- Redirect

The redirect service is not an ACSE service. The service allows applications to redirect an incoming association to another process on the local system.

The OSAK API also includes support for the OSI Presentation layer with support for the following OSI standards:

- ISO 8823: Information Processing Systems, Open Systems Interconnection, Connection-Oriented Presentation Protocol Specification
- ISO 8822: Information Processing Systems, Open Systems Interconnection, Connection-Oriented Presentation Service Definition
- ISO 8327: Information Processing Systems, Open Systems Interconnection, Basic Connection-Oriented Session Protocol Specification
- ISO 8326: Information Processing Systems, Open Systems Interconnection, Basic Connection-Oriented Session Service Definition

The Presentation layer services supported by the OSAK API are:

Alter-Context  
Data  
Capability-Data  
Expedited-Data  
Typed-Data  
Token-Please  
Token-Give  
Control-Give  
Sync-Major  
Sync-Minor  
Resynchronize  
Exception-Report  
Activity-Start  
Activity-Interrupt  
Activity-Resume  
Activity-Discard  
Activity-End

The OSAK API also supports (by pass through) the OSI Session layer services.

#### *Session Layer API*

The Session layer API, called the OSAK Session Programming Interface (SPI), supports the following OSI standards:

- ISO 8327: Information Processing Systems, Open Systems Interconnection, Basic Connection Oriented Session Protocol Specification
- ISO 8326: Information Processing Systems, Open Systems Interconnection, Basic Connection Oriented Session Service Definition.

The Session layer supports ISO Session version 1 and version 2. Session version 1 allows up to 512 octets of user data on a service. Session version 2 supports the restrictions imposed by the National Institute of Standards and Technology allowing up to 10,240 octets of data on a service.

*HP DECnet-Plus for OpenVMS Version 7.3* includes Version 3.0 of the OSAK SPI. Users of the OSAK SPI Version 1.1 should upgrade to Version 3.0.

The OSAK API provides the interface to the following connect and release services:

Connect  
Release  
Abort  
Redirect

The redirect service is not a Session service. The service allows applications to redirect an incoming connection to another process on the local system.

The Session layer services supported by the OSAK API are:

Data  
Capability-Data  
Expedited-Data  
Typed-Data  
Token-Please  
Token-Give  
Control-Give  
Sync-Major  
Sync-Minor  
Resynchronize  
Exception-Report  
Activity-Start  
Activity-Interrupt  
Activity-Resume  
Activity-Discard  
Activity-End

#### *ROSE API*

The Remote Operations Service Element (ROSE) supports the OSI standard ISO 9072: Information Processing Systems, Text Communication, and Remote Operations.

ROSE supports interactive applications in a distributed open systems environment. It is a service for multivendor distributed processing.

The ROSE functionality provides a mechanism that allows for encoding and decoding the remote operations protocol control information, as defined in ISO 9072, for the following services:

Invoke  
Result  
Error

Reject

The information in this document is valid at the time of release. Please contact your local HP office for the most up-to-date information.

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