Software Product Description

PRODUCT NAME: **MUXserver 300 Remote Terminal Server for VMS, Version 1.2** **SPD 25.E9.02**

DESCRIPTION

The MUXserver 300 Remote Terminal Server is a wide area terminal switch for Ethernet Local Area Networks. It has been designed to support interactive asynchronous terminal users, using data compression, background priority, and statistical multiplexing to optimize the network performance.

In general, the MUXserver/DECmux 300 provides the same terminal services to a remote workgroup as the DECserver products give to local users.

The term "MUXserver/DECmux 300" used throughout this document refers to a network built from MUXserver 300/310 and DECmux 308/316/332.

A MUXserver/DECmux 300 network provides a convenient method to connect workgroups of remotely located asynchronous terminals, printers, and computers to each other and to one or more service nodes (hosts) on an Ethernet.

MUXserver/DECmux 300 main features:

- LAT protocol
- 192 devices
- 96 concurrent sessions
- 64 concurrent users (MUXserver 300)
- 16 concurrent users (MUXserver 310)
- link speed 2400 bps to 64K bps
- Data Compression
- Background priority
- Statistical Multiplexing
- Optimized for remote echo terminals
- Host load balancing
- Multiple sessions
- Printer support
- Pass through
- Security
- On-line help
- Queuing

Features

Terminal Connection Management

Through the use of a simple command, users can establish a logical connection, called a session, to any service node that implements the LAT protocol on the same Ethernet LAN. This connection makes the terminal appear as if it were physically connected to the service node, and the terminal user can use standard system utilities and applications supported by that node. Each terminal connected to the DECmux 300 remote terminal multiplexer can connect to the same or a different service node on the Ethernet.

A service node can have one or more services that are offered to MUXserver/DECmux 300 network users. Services and nodes are identified by name. Users always connect to services, not to nodes, although often one of the service names will be the node name.

In a VAXcluster environment, the MUXserver/DECmux 300 sees each VAXcluster on the Ethernet as a collection of service nodes offering a common service. Each cluster node may also offer a service whose name is equivalent to its node name. In this case, a terminal user can connect either to the cluster service or a service associated with a particular cluster node.

Non-LAT Host Support

The MUXserver/DECmux 300 can be used to provide logical terminal connections to hosts that do not implement the LAT protocol. In this type of configuration, the server becomes the Ethernet connection and protocol support for these hosts. This expands the LAT network accessibility to include LAT hosts directly connected to the same Ethernet and hosts connected to the LAT network by means of the MUXserver/DECmux 300 network, and non-LAT hosts connected to the same Ethernet by means of a DECserver terminal server.

A host that supports XON/XOFF, ASCII standards, and EIA 232-D/CCITT V.24/V.28 interfaces can be connected to the MUXserver/DECmux 300. This provides

the terminal user with a transparent connection to the non-LAT host. It is strongly recommended that the server port and the host side port use modem control signals to signal the host automatically on session disconnection.

In this configuration, there is a one-to-one correspondence between the port on a MUXserver/DECmux 300 and the connection on the host. The server manager assigns service names to individual ports or groups of ports that connect the host interface to the server.

Load Balancing

When a connection is made to a service, the actual node for the connection is determined by load balancing. Load balancing is the process the server uses when more than one node offers the same service. Service nodes do not have to be configured in a cluster in order for load balancing to be used. Service nodes with the same names may be running different operating systems. Using the load balancing process, the server connects to the node with the highest rating for the service desired. This rating is based on the current loading on the nodes that offer the service.

Multiple Sessions

The MUXserver/DECmux 300 allows each user to establish and maintain up to eight sessions to one or more service nodes, up to a maximum of 96 per MUXserver/DECmux 300 network. Only one session per user can be active at a time. Through simple switching commands, the user can access the different sessions without repeating a login dialog each time. Some operating systems may impose limits on the number of LAT sessions such a host will support.

Multiple Session Management

The MUXserver/DECmux 300 server allows direct communication with devices that support the Terminal Device/Session Management Protocol (TD/SMP) protocol. This protocol provides the ability for the attached device to maintain screen and keyboard context for multiple LAT sessions.

Outbound Connection Queues

If a terminal user requests a connection to a service, and the requested service is currently in use, the terminal server users may opt to have the connection requested queued to the remote service. This feature will happen automatically whenever a connection fails for this reason if the user's port has been appropriately configured, and the service node is queuable. The connection request is queued at the service node end and is processed first-in/first-out until the user's connection request can be completed. This feature assists in the fair management of limited network resources. Once queued for connection, the user also has the option to cancel the queue entry and proceed with other sessions.

Inbound Connection Queues

The MUXserver/DECmux 300 may offer ports as services. If a request is received for a connection to a service and that service is being used, the MUXserver 300 may offer a queuing facility for incoming connect requests. Connect requests are granted on a first-come first-served basis.

Access Contention

A fully configured MUXserver/DECmux 300 network can provide physical connections for 192 terminals. The MUXserver 300 will provide access to the first 64 users on a first-come first-served basis. The MUXserver 310 will provide access to the first 16 users. Permanent logical connections may be assigned to specific ports to ensure access at all times. When a logical connection is not available, a status message is relayed to the port requiring access.

Welcome Identification

The MUXserver/DECmux 300 server standard welcome banner, which includes terminal server type, version number, internal baselevel, and protocol version number, is issued whenever a user successfully logs in to the server. The server will also print a server manager settable identification string. This can be useful for automatic server identification, or for small daily messages used for communication with the terminal server users.

Local Mode and Service Mode

For the most part, the environment provided by the MUXserver/DECmux 300 is identical to the environment the user would experience if attached directly to the service node. When operating in this mode, the user is said to be in Service Mode. Occasionally, such as during connection establishment, the user interacts directly with the MUXserver/DECmux 300. When operating in this mode, the user is in Local Mode.

In Local Mode, the terminal input is interpreted directly by MUXserver/DECmux 300 as commands to be performed by the server.

In Service Mode, the terminal input is passed directly to the connected service node with several exceptions. One exception, called the local switch character, allows the user to enter Local Mode from Service Mode. The <BREAK> key may also be used for this function. Other exceptions, called the forward and backward switch characters, allow the user to switch between sessions without the need to enter Local Mode. The switch characters are disabled by default but may be enabled by

command. Both CTRL/S and CTRL/Q are normally interpreted locally, but flow control using these characters can be disabled.

Autoconnection

Autoconnection is a function that automatically connects a user terminal to a service node when connection failures occur or on user login to the server. In conjunction with this function, a dedicated or preferred service can be specified for each terminal user.

If a dedicated service is specified, the MUXserver/DECmux 300 will attempt to connect to that service when a character is typed on the terminal keyboard or when an existing connection fails. In dedicated service mode, only one session is available. As this mode is designed to simulate a direct terminal connection, no local mode commands or messages are available to the terminal user. Ports with dedicated service can be automatically logged out of the server when the user logs out of the service node.

If a preferred service is specified, the MUXserver/DECmux 300 will attempt to connect to that service as with the dedicated service mode of operation. However, the terminal user can enter local mode and establish other sessions.

Automatic Session Failover

If a service is available on two or more service nodes and a connection to a service fails, the server will attempt to connect the user to another service node offering the same service. The user's context at the time of failure is not automatically restored and login to the new service is required.

Groups

Every terminal and service node in a LAT network is a member of one or more groups, which are specified by a list of numbers from 0 - 255. Groups allow an easy means of subdividing the network into what appears to be many smaller networks. A terminal user is only aware of the services that are offered by nodes in the same group(s).

The server manager can specify the authorized group(s) in which a terminal is a member. The authorized groups define the set of services that the user is allowed to access. In addition, a user can further restrict access to services by disabling some of the authorized groups using a non-privileged group command. The user-settable group codes are a subset of the authorized groups.

Groups provide a restrictive view of the network. This restricted view is mainly for user convenience, and although it also provides a form of security, it is not intended to be the primary form of access authorization or system security for a node.

Security

The MUXserver/DECmux 300 provides functions that enhance security features already available in the service nodes. These functions may be enabled as required by the server manager.

- Port login password.
- Port lock password. This allows the user to leave sessions running at the terminal without fear of security violations. When a terminal is locked, all input from the terminal is ignored until the lock password is re-entered.
- Secure Port allows a user to change only dynamic settings on that port.
- Non-privileged User can change dynamic and permanent settings on that port.
- Privileged User can change all settings. This mode is password protected.

On-line HELP Facility

A full on-line reference HELP facility is available. The server's HELP command provides information on the correct syntax and details about each command. In addition, a tutorial HELP feature allows new users to learn quickly the basics of MUXserver/DECmux 300 operation. Tutorial HELP can be entered when logging in to the server.

Directory Service

Any MUXserver/DECmux 300 user can obtain a directory of services available to that user with a SHOW SERVICES command. Services for which the user's port is not authorized will not be displayed.

Permanent Characteristics

The MUXserver/DECmux 300 maintains permanent characteristics in non-volatile memory that is retained even when the power is disconnected. Permanent characteristics are maintained for service and server parameters as well as per-port parameters. Permanent characteristics can be reset to factory defaults by pressing the software reset button on the hardware unit while plugging in the power cord.

Port Characteristics Configuration

Characteristics governing the operation of an individual port can be displayed by a non-privileged terminal user interactively from that user's terminal. Many of the characteristics may be set up by the user, but certain characteristics are privileged and can only be changed by the Server Manager.

Port parameters that can be set and displayed include: speed, character size, group codes, parity, terminal type, access, autobaud, modem, and password protection.

Port Access

A port on a MUXserver/DECmux 300 can be set up in different ways depending on the device attached to the port and its intended use. MUXserver/DECmux 300 supports EIA 232-D and DECconnect asynchronous devices operating at speeds up to 19.2K bps.

Port access is the characteristic that determines how a port may access or be accessed by interactive users and service nodes.

- Access Local - Designed for interactive terminals. This allows the device (typically an interactive terminal) attached to the port to CONNECT to LAT services. This type of access is also used for dial-in modems.
- Access Remote - Designed for applications-driven devices (like asynchronous printers) that are allocated by a service node process. This allows the implementation of certain shared printers by multiple service nodes. This type of access is also used for connections to dial-out modems and non-LAT host systems.
- Access Dynamic - Designed for devices (like personal computers or printers with keyboards) that require both Local and Remote access.
- Access None - Designed to allow the server manager to disable the use of a port.

Data Compression

Data Compression is automatically enabled and disabled on a per-port basis. It is dependent on the type of data being transmitted and is effective only on blocks of data. Therefore, compression efficiency will vary with the application.

Background Priority

Background priority is enabled on a per-port basis. Traffic to and from ports set to background is reduced in favor of other traffic. This feature is especially useful for ports that are used for printers.

Terminal Operation

The MUXserver/DECmux 300 software supports the simultaneous operation of asynchronous devices at speeds from 75 bps to 19.2K bps. The total aggregate throughput is dependent on network link speeds and will typically be less than the sum of the individual terminal connections. The software also supports:

- Full modem control support (on DECmux 300 EIA 232-D ports only)
- Data leads only support (on DECmux 300 EIA 232-D and DEC423 ports)
- XON/XOFF flow control
- CTS/RTS or DSR/DTR flow control (on DECmux 300 EIA 232-D ports only)
- Split speed (transmit and receive) terminal operation
- Modem fallback features (on DECmux 300 EIA 232-D ports only)
- Block Mode transfers
- Automatic line speed detection (equal receive and transmit speed only)
- Digital personal computer file transfer
- Data transparency mode
- Ability to pass break character and error notification
- Ability to assist in multiple session management by means of TD/SMP

Network Configuration

The MUXserver/DECmux 300 network is built from two basic options, the MUXserver 300/310, which connects to the Ethernet, and the remote unit, the DECmux 308/316/332.

MUXserver 300/310

Each MUXserver 300/310 can support up to two synchronous communications lines, and each line can support up to three DECmux 300s, thus supporting a maximum of six DECmux 300s.

The MUXserver 300/310 is connected to an Ethernet using a DELNI, DECOM, DESTA, H4000, or H4005, by means of a transceiver cable. The MUXserver 300/310 Ethernet port is compatible with Ethernet V2 and IEEE 802.3 Local Area Networks.

The MUXserver/DECmux 300 composite links use HDLC LAPB data link protocols and can be connected using the following physical link options. Network configuration, link types, and link speeds are automatically configured when the correct cables are used.

- EIA 232-D/CCITT V.28 at 2.4K to 19.2K bits per second
- CCITT X.21 bis /CCITT V.35 at 48K to 64K bits per second
- EIA RS-449/CCITT V.36 up to 64K bits per second
- CCITT X.21, leased-line only, up to 64K bits per second
- EIA RS-422 up to 64K bits per second

The MUXserver/DECmux 300 EIA RS-422 composite link can be used to connect two units together. Clocking signals are supplied by the MUXserver. Distances up to 1200 meters, or 4000 feet, are supported on suitable cable installations.

The MUXserver/DECmux 300 network is designed to operate over wide area network links that provide no significant delay and a transparent data path. Synchronous composite links operating over multiplexing equipment or satellite links are not supported.

DECmux 308/316/332

The DECmux 300 requires a synchronous connection to a MUXserver 300 for proper operation.

The DECmux units are available in the following configurations:

- Eight EIA 232-D/CCITT V.24 ports with modem control (DECmux 308)
- Sixteen EIA 232-D/CCITT V.24 ports with modem control (DECmux 316)
- Sixteen DEC423 ports, data leads only (DECmux 316-B)
- Thirty-two DEC423 ports, data leads only (DECmux 332)

The eight and sixteen port units are field upgradable using the following upgrade panels kits. After installation, the new configuration is automatically reconfigured and the DECmux is initialized to factory default settings.

- Eight EIA 232-D/CCITT V.24 ports with modem control
- Sixteen DEC423 ports, data leads only

The DECmux 300 EIA 232-D ports are compatible with the Digital family of modems and with Bell 100 and 200 series modems and their equivalents.

A BREAK feature is available and can be set on a per-port basis. This allows the DECmux 300 to force a break condition on connections to host interfaces. BREAK can also be passed through from a terminal connected on the server to the non-LAT host connected on the server.

Server Management

The MUXserver 300/310 supervisory port can accept directly connected asynchronous terminals with the following characteristics:

- DEC423 asynchronous start/stop transmission, having 8 data bits, 1 start bit, 1 stop bit, and no parity.
- Full duplex with XON/XOFF flow control
- Speed selectable from one of the following: 300, 600, 1200, 2400, 4800, 9600 baud, or AUTOBAUD

Several facilities exist for managing and troubleshooting server operation. The Server Manager in privileged mode can set up server identification information, change port characteristics, or fine tune the operating characteristics of the server. The Server Manager can also assign service names to groups of one or more ports that are connected to non-LAT hosts or modems. Troubleshooting facilities include diagnostic tests, a remote console feature, and online statistics.

A privileged user can diagnose Ethernet communications problems by looping messages to an Ethernet host and through the Ethernet hardware interface at the server. To diagnose terminal problems, users can execute a command to transmit test data to their terminal, or the server manager can send test data to any terminal.

A privileged user can also diagnose synchronous line problems by looping test messages between adjacent MUXserver 300/310 and DECmux 300 units.

The capability also exists for the server manager to test a service connection by sending data from the initiating port to the service node and back again. The data is then compared and any discrepancies reported. At the service node, the data can be looped back by the LAT protocol, or internally or externally at the service port. This feature is supported only by MUXserver/DECmux 300 service nodes; VMS service nodes do not support this service loopback capability.

The server maintains a variety of statistics and counters. These include the following: Synchronous composite data link statistics, Ethernet data link statistics, LAT protocol statistics, and port error statistics. This data can be displayed and zeroed by the Server Manager. Server

parameters that can be modified and displayed include the server identification, circuit timer, session limits, and login limits.

Remote Server Management

The MUXserver/DECmux 300 implements the console carrier feature, which enables access to the MUXserver/DECmux 300 local mode from a Phase IV DECnet host on the same LAN. With the exception of remote console port configuration, the entire local mode user interface is accessible to the remote console carrier user. This includes the privileged commands, if the user knows the server's privileged password. This capability allows centralized server management and remote server diagnosis.

Operation

The MUXserver ROM-based firmware provides the necessary maintenance operation protocols for down-line loading MUXserver software from a load host, over the Ethernet, into server memory. All self-test diagnostics are in MUXserver ROM; down-line loading is not a precondition for MUXserver self-test.

In the event of a bugcheck caused by a fatal error, the unit will normally attempt to up-line dump server memory to a DECnet Phase IV host. Following this, the unit will automatically initialize itself, execute the self-test routines, and if still operational, invoke a down-line load.

Once the MUXserver down-line load is complete, the network will self-configure and communications will be established with the remote DECmux 300.

The remote DECmux 300 operates on ROM-based firmware; operational characteristics are stored in nonvolatile RAM. The remote DECmux 300 does not require down-line loading but does require a connection to a MUXserver 300 for operation.

Configuration and Performance

The process of configuring the MUXserver/DECmux 300 network is based primarily on tradeoffs of cost and performance within the realm of satisfying user application requirements. The performance of a given network depends on several factors.

- Composite port speed
- Number of route through composite ports
- Number of terminals
- Number of host systems with active connections to the server
- Number of active connections to non-LAT hosts
- Terminal speeds
- Terminal user applications
- Number and size of host buffers
- Terminal workload
- Host workload

In order to achieve a viable configuration, the user and/or a Digital software specialist should perform a level of application analysis that addresses the factors above. The actual maximum data throughput cannot be calculated by multiplying the number of lines by the line speed since many factors may reduce the actual throughput.

Restrictions on MUXserver/DECmux 300 Usage

While terminal connections using the MUXserver/DECmux 300 have been designed to simulate direct terminal connections, a few differences exist because of the nature of the product. Under most circumstances, these differences are not noticed by terminal users or service node application programs. However, applications that are directly dependent on the following functions may not operate as with a direct connection:

- Setting the terminal speed, character size, and parity by manipulating system data structures
- Extremely fast response time (typically less than 200 ms) to operate
- Applications that use an alternate terminal driver in the service node
- Applications that expect incoming connections to have fixed device names

HARDWARE REQUIREMENTS

VAX, MicroVAX, VAXserver, or VAXstation configuration as specified in the System Support Addendum (SSA 25.E9.xx-x).

SOFTWARE REQUIREMENTS*

VMS Operating System or MicroVMS Operating System

DECnet-VAX

* Refer to the System Support Addendum for availability and required versions of prerequisite software (SSA 25.E9.02-x).

ORDERING INFORMATION

Software Media: QA-VT7A*-**
Software Documentation: QA-VT7AA-GZ
Software Product Services: QT-VT7A*-**

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

SOFTWARE LICENSING

The MUXserver 300 software is licensed to execute on the MUXserver 300/310 hardware and the license is supplied with the hardware. No additional license is required for either a load host CPU or a service host.

This product does not provide support for the VMS License Management Facility. A Product Authorization Key is not required for installation or use of the product.

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