N91-27037

SOFTWARE
PRODUCT
DESCRIPTION

Product Name: *MultiNet*, Version V2.2

Overview

MultiNet™ is a high-performance VAX/VMS multi-protocol networking environment currently supporting the TCP/IP family of protocols, the Xerox PUP protocol, and the CHAOSnet protocol. ***MultiNet*** supports the entire family of TCP/IP services and devices. An ***NFS Client*** and an ***NFS Server*** are available as options. ***MultiNet*** includes all of the tools you need for any configuration, from an end-node system with a single Ethernet interface to a fully functional gateway with multiple interfaces and routing protocols.

MultiNet uses state-of-the-art networking technology, utilizing the 4.3BSD TCP networking code running in the VAX/VMS kernel environment. ***MultiNet*** communicates directly with user processes via a $QIO interface, and directly with VMS device drivers at the kernel level. ***MultiNet's*** kernel-implementation of lightweight process threads delivers maximum application-to-application performance.

MultiNet installs quickly, using the VAX/VMS VMSINSTAL utility. ***MultiNet's*** configuration utilities get you on the air quickly and painlessly. For example, the ***MultiNet*** Network Configuration Utility interactively customizes ***MultiNet*** to your network environment and then generates all configuration files and the startup command procedure. The ***MultiNet*** SET and SHOW utilities allow a system manager to examine the state of the network, and examine and modify the ***MultiNet*** configuration without rebooting.

VMS users and system managers adapt quickly to the ***MultiNet*** environment and its services. All ***MultiNet*** applications and configuration management utilities include VMS-style interfaces with DCL commands, VMS HELP library entries, and clear, logical prompts. Additionally, ***MultiNet*** includes DECwindows support, providing users the ability to run DECwindows applications over TCP/IP in addition to DECnet.

Supported Configurations

MultiNet supports DIGITAL's VAX and MicroVAX computers in any valid VMS configuration. ***MultiNet*** runs under VMS versions from V4.5 and upward, and uses spinlock synchronization to support Symmetrical Multi-Processing (SMP) under VMS V5.

Supported Devices

Typically ***MultiNet*** is used with the DEC-supplied Ethernet controller provided with your VAX hardware. ***MultiNet*** supports all DEC Ethernet controllers using a standard kernel-level interface into any VAX/ VMS Ethernet driver. Using the driver's multiplexing features, ***MultiNet*** can share the controller with other protocols; for example, DECnet, LAT, and Local Area VAXclustering. Up to ten such Ethernet controllers per machine are supported.

MultiNet also supports the following network devices:

- ACC's LH-DH ARPAnet controller
- ACC's ACP-5100 and ACP-6100 HDLC T1 controllers
- ACC's ACP-5250 and ACP-6250 X.25 controllers
  The ACP-5250 and ACP-6250 may be used to connect to the Defense Data Network PSNs
- CMC's ENP family of Ethernet controllers
- Symbolics' CHAOSnet 4-Megabit controller
- IMP11-A ARPAnet controller

- DEC's DMR-11, DMC-11, and DMV-11 DDCMP controllers
- 3-Com's Ethernet controller
- Xerox's 3-Megabit Ethernet controller
- Excelan's EXOS UNIBUS and Q-bus controllers
- NSC's PI13/14 Hyperchannel controller
- Interlan's NI1010 Ethernet controller
- SLIP (Serial Line IP) using any VMS supported terminal multiplexer
- Proteon's proNET-10 and proNET-80 Token-Ring controllers

In addition, when ***MultiNet*** is configured to use more than one network device, it can serve as an IP gateway between those devices.

SERVICES

All inbound network connections are handled by the ***MultiNet*** Master Server process. This process is responsible for accepting or rejecting a connection, and for either performing or invoking the requested service. Using the Server Configuration Utility, the system manager can enable, disable, and add new services to the Master Server's configuration. The system manager can also have the Master Server restrict IP host and network access on a per-service basis. The Master Server can keep an audit trail of attempted, accepted, and rejected connections, which can be enabled on a per-service basis. The Master Server can log the times, source addresses and names, and the services requested.

MultiNet supports each of the following standard protocols. Unless otherwise stated, both client and server forms are supplied.

DOMAIN NAME SERVICE (RFC1034, RFC1035, RFC1101)

MultiNet provides Domain Name Service using Berkeley's BIND 4.8.1 nameserver running internal to the Master Server. No separate process slot is required, eliminating some scheduling overhead. BIND can function either as a caching-only nameserver to assist the resolver, or as a fully functional primary and secondary nameserver that advertises information about the hosts on your network. Domain Name Service under ***MultiNet*** also supports encoding of network names and numbers according to RFC1101. The NSLOOKUP utility is provided to assist in tracking and degugging Domain Name System configuration problems. All user utilities translate names to internet addresses using Domain Name Service.

MultiNet also supports the standard RFC952-format host tables, offering exceptionally rapid access. Instead of directly accessing the ASCII host table file, ***MultiNet*** compiles it, using a perfect-hashing scheme, and installs it in a global section. The host table scheme can be used in conjunction with Domain Name Service, allowing failed Domain Name System queries to be converted to host table lookups before being returned to the user.

TELNET (RFC854, RFC855, RFC856, RFC857, RFC1041, RFC1073, RFC1079, RFC1080, RFC1091)

MultiNet's TELNET virtual terminal utility provides login access between your machine and any other node on the IP network. Access through the network is quite transparent because the TERMINAL TYPE, WINDOW SIZE, DYNAMIC FLOW CONTROL, and BAUD RATE options are supported and negotiated automatically. ***MultiNet's*** TELNET client also supports the TN3270 protocol allowing VMS users to access IBM mainframes as a 3270 block mode terminal. The TELNET server directly connects the TCP network kernel to the VMS terminal class driver, providing efficiency on par with LAT or directly-connected devices. As there is no limit on the number of incoming TELNET sessions, and only about 500 bytes of memory are required per connection, ***MultiNet*** is ideally suited for terminal-server applications with hundreds of incoming sessions per machine.

DECwindows

MultiNet's DECwindows support provides users the ability to run DECwindows and X windows applications over TCP/IP in addition to DECnet. This support allows users to run applications between VMS systems and non-DEC computer systems that support X windows over TCP/IP. ***MultiNet*** supports DECwindows by providing a $QIO interface that emulates DEC's VMS/ ULTRIX Connection (UCX) product, effectively making DECwindows think it's running over UCX.

FTP (RFC959)

The File Transfer Protocol (FTP) utility provides high-speed reliable transportation of files. ***MultiNet's*** FTP includes two noteworthy extensions to the standard FTP protocol. A special mode pro-vides transparent and efficient transportation of any FILES-11 file (e.g., ISAM-indexed files) between any two VMS machines. Another extension provides on the fly Lempel-Ziv (L-Z) compression between the client and server to minimize network traffic, at the expense of additional host overhead. L-Z compression effectively increases the bandwidth of slow lines by 30-100% (typically 60-70%).

The FTP Server uses the standard VMS LOGINOUT utility for account validation and setup, thus fully supporting all related VMS security features such as ACLs, accounting, auditing, and break-in detection and evasion.

SMTP (RFC821, RFC822, RFC974)

MultiNet includes a Simple Mail Transfer Protocol (SMTP) mail system which interfaces to the VMS MAIL utility or the MM mail user interface, allowing VMS users to send and receive SMTP mail transparently. Outgoing mail is submitted to a VMS queue, where the Mail Symbiont immediately attempts delivery, and in the event of a network failure, requeues the mail for later delivery. When using VMS MAIL, all standard features are supported, including SET FORWARD and address aliasing. The ***MultiNet*** SMTP mail system itself supports an easy-to-configure address alias and mailing list database.

MM

The MM utility provides an alternative to VMS MAIL for electronic mail users. MM offers several useful features not available under VMS MAIL, including: the ability to save and restore messages before sending them; the ability to create user-defined headers; and a sophisticated message filing and manipulation scheme. MM can be used to send both SMTP and DECnet mail. Additionally, the MM utility can be used to send mail via the PMDF electronic mail gateway system available from Innosoft International, Inc.

RPC and NFS (RFC1057, RFC1094)

MultiNet includes the Sun Microsystems developed public-domain remote procedure call (RPC) library to allow users to develop their own RPC-based applications. ***MultiNet*** also includes the RPC Port Mapper and the RUSERS (display users logged-in to remote systems) and RWALL (broadcast a message to all users on remote systems) services.

The optional ***MultiNet NFS Client*** allows VMS applications to transparently access files stored on NFS servers. The ***NFS Client*** can remote mount file systems on ANY system having an NFS server. The ***NFS Client*** device driver provides a standard file system interface and is called automatically by the normal VMS Record Management Services (RMS). Remote NFS servers supporting full UNIX (NFS) file system semantics appear to VAX/VMS systems as fully-functional Files-11 ODS-2 file systems. This includes support for multiple file versions and arbitrary VMS (RMS) file attributes. Files created on the server system appear as Stream_LF files to the local VAX/VMS system; text files created by the local VAX/VMS system appear as normal "Stream" files on the server; and other VAX/VMS file types are stored on the NFS server as "raw" VMS data blocks. This permits other VAX/VMS clients to share these files on the NFS server and non-VMS systems to access the data, provided the non-VMS systems are capable of interpreting the "raw" VMS data blocks.

The optional ***MultiNet NFS Server*** is a high-performance server implementation of the Network File System (NFS) standard developed by Sun Microsystems. The ***NFS Server*** maps the complete UNIX file system semantics onto the VMS file system, including symbolic and hard links and device files, making a VMS file system look exactly like a UNIX file system. All VMS text files are type-converted to look like UNIX stream files for maximum interoperability. The ***NFS Server*** uses a file and directory cache between the file system and the network, to mask VMS bottlenecks from the requesting UNIX machine. The ***NFS Server*** runs in the kernel and uses a proprietary XDR serializer to move data directly between the file system cache and the net-work buffers. By default, the cache functions as a write-through cache, but it can be configured as a write-back cache to increase performance. The ***NFS Server*** can export all Files-11 ODS-2 VMS volumes, including shadow sets, bound volumes, and DFS-served disks. The ***NFS Server*** distribution also includes a PC-NFS authentication and print server (PCNFSD). It allows PCs and compatibles running PC-NFS client software to access NFS served filesystems as though they are local DOS disk drives. PCNFSD supports printing from PC clients to VMS print queues.

REMOTE PRINTER SERVICES

An LPD client and server allow ***MultiNet*** users to access printers on remote UNIX computers, and allow the UNIX users to access printers connected to the ***MultiNet*** computer. The LPD server transparently makes VMS printer queues appear to remote UNIX users as local printers. The VMS system manager can use the Server Configuration Utility to grant or deny access to the VMS machine's printers.

The LPD client runs as a VMS Print Symbiont. VMS users use the native VMS PRINT command to print files transparently to remote UNIX machines. The system manager uses the Printer Configuration Utility to automatically configure, initialize, and start these special VMS printer queues.

UNIX "R" SERVICES

MultiNet includes the popular UNIX "R" services RSHELL, REXEC, RCP, RLOGIN, and RMT.

The RSHELL utility allows VMS users to remotely execute commands from the VMS command line, either by specifying a password, or by using access based on previously provided credentials. Likewise, the RSHELL and REXEC servers allow remote users to execute DCL commands directly from their command interpreters, a shell for UNIX users and DCL for VMS users.

MultiNet's RCP client and server allow users to copy files between systems on the network. ***MultiNet's*** RCP supports the recursive copying of directory trees between systems, and the transparent transfer of all VMS file types (e.g., ISAM-indexed files) between VMS systems running ***MultiNet.***

MultiNet's RLOGIN provides an alternative to the standard TELNET for remote virtual terminal access. RLOGIN is an ideal protocol for communication with UNIX machines. RLOGIN includes support for dynamic window sizing and dynamic flow control negotiation and will pass the terminal type and speed to the remote server. Like the ***MultiNet*** TELNET Server, the RLOGIN Server directly connects the VMS terminal driver to the network.

MultiNet's Remote Magtape Server (RMT) allows UNIX users to access your VMS tape drives via the network. The UNIX system manager can use the "rdump" and "rrestore" utilities to backup a UNIX system via the network to a VMS tape drive.

TALK

The ***MultiNet*** TALK utility is a VMS PHONE-like utility that allows users to communicate with users of other systems that support the TALK protocol. Like VMS PHONE, TALK provides a split-window screen, with one window displaying what one user types, and the second displaying what the respondent types. For maximum interoperability, both the 4.2BSD "Old Talk" and 4.3BSD "New Talk" protocols are provided.

Network Time Protocol (RFC1059)

MultiNet supports the Network Time Protocol (NTP). NTP provides a mechanism to synchronize and coordinate time distribution in large, diverse LAN or WAN environments. Once configured, NTP automatically polls other NTP clock servers and uses complex estimations of the network delay to determine the local time to accuracies approaching ten milliseconds. As clocks drift apart, NTP initiates a clock skew, running the VMS clock 10% faster or slower until the time drifts back into synchronization.

With a few WWVB-synchronized NTP servers on your network (such as the servers on the DARPA Internet), NTP can synchronize all of your VAX clocks.

FINGER (RFC742)

MultiNet's FINGER utility provides a status report about the users of a system. Because FINGER is supported in both client and server form, it can also supply status reports about the users of remote systems.

WHOIS (RFC954)

MultiNet's WHOIS client is provided to access the Internet's network-wide user directory service, which is maintained by the DDN Network Information Center (NIC) at SRI International, on behalf of the Defense Communications Agency (DCA). WHOIS can deliver the full name, U.S. mailing address, telephone number, and network mailbox for any DDN user registered in the NIC database.

NETSTAT

The ***MultiNet*** NETSTAT utility displays detailed information from a remote machine, including the current configuration and operation of the network.

SYSTAT (RFC866)

The ***MultiNet*** SYSTAT Server allows remote users to display the output of a VMS "SHOW SYSTEM" command.

BOOTP (RFC951, RFC1084)

MultiNet supports the BOOTP protocol, using V2.1 of BOOTP. BOOTP runs internal to the Master Server and quickly responds to booting diskless nodes requesting their boot parameters. BOOTP supplies the booting node with its Internet Address, Gateway, and other information it needs to configure and load.

RARP (RFC903)

MultiNet supports the Reverse Address Resolution Protocol (RARP) to provide booting diskless workstations their Internet (IP) addresses.

TFTP (RFC783)

MultiNet's Trivial File Transfer Protocol is provided in both client and server form. The TFTP server generally is used only for booting diskless workstations (because FTP provides a superior and more sophisticated file transfer protocol). TFTP's lack of authentication has traditionally posed a security problem for system managers needing to run TFTP. Since, however, the ***MultiNet*** Server Configuration Utility can be used to limit the machines which can access the TFTP server, and the ***MultiNet*** Network Configuration Utility can be used to limit access to a particular directory tree on the server, the ***MultiNet*** TFTP server can be used to provide boot services without threatening system security. The ***MultiNet*** TFTP client is an invaluable tool for debugging TFTP server problems.

SNMP (RFC1066, RFC1098)

MultiNet has support for a Simple Network Management Protocol (SNMP) agent, which answers queries for information such as interface status, protocol statistics, and routing information. SNMP runs internal to the Master Server and quickly responds to queries for information from SNMP management stations.

GATEWAY ROUTING PROTOCOLS

MultiNet provides support for the EGP (RFC911), RIP (RFC1058), and HELLO routing protocols using GATED Version 1.9. GATED runs internal to the Master Server process, and therefore does not occupy a separate VMS process slot. Through a configuration file, the system manager can configure GATED to dynamically discover all routing information, and subject to any administrative restrictions, choose the best route to each network. GATED is always watching for changing network conditions (such as a failing gateway), and when IP traffic must be rerouted, GATED directly manipulates the ***MultiNet*** routing tables to effect the change.

NETCONTROL

The NETCONTROL server runs internal to the Master Server and allows the VMS system manager to control other services that run internal to the Master Server. Normally NETCONTROL can be accessed only from the local node, but if the default restrictions in the Server Configuration Utility for this service are eased, access can be allowed from any machine on your network. The NETCONTROL client includes a DCL command interface that offers the system manager direct and simple control of the various services. For example, to reload the Domain Name Server database:

```
$ MULTINET NETCONTROL DOMAINNAME RELOAD
```

DIAGNOSTIC TOOLS

The ***MultiNet*** PING utility allows ***MultiNet*** users or the system manager to diagnose network problems by measuring the packet loss rate and delay to any node on your network. PING uses an ICMP ECHO request to bounce packets off of the target node.

The ***MultiNet*** TCPDUMP utility allows ***MultiNet*** to function as an Ethernet protocol analyzer to assist in debugging of network or protocol problems. TCPDUMP is only supported on DEC Ethernet controllers.

The ***MultiNet*** TRACEROUTE utility allows the ***MultiNet*** system manager to dynamically determine the current topology of the network to which he is connected. TRACEROUTE sends UDP packets with increasing Time-To-Live values, and examines the resulting ICMP TIME EXCEEDED returns to discover each intermediate gateway to the target node.

MultiNet includes TCP and UDP variants of the important diagnostic services CHARGEN, DAYTIME, DISCARD, ECHO, and TIME for debugging potential network problems.

CHAOSnet Services

MultiNet includes QFILE and RTAPE servers that give Lisp Machines access to the VMS file system and the VMS tape drives. A CHAOSnet TELNET client and server allow remote logins to Lisp machines that are not also running TCP/IP. NAME, TIME, and UPTIME servers are also provided.

PUP Services

In addition to PUP TELNET client and server for remote login, ***MultiNet*** provides the LEAF protocol remote file access and Gateway and Name lookup services.

Support for Non-DEC Terminals

All ***MultiNet*** utilities use the standard VMS SMG$ routines to access display terminals. Any non-DEC terminal the system manager adds to the VMS TERMTABLE definitions file is fully supported by all ***MultiNet*** utilities, including the TELNET and RLOGIN TERMINAL TYPE negotiations.

DECNET INTEROPERABILITY SERVICES

In addition to sharing a DEC Ethernet controller side-by-side with DECnet, ***MultiNet*** allows layering of the IP and DECnet protocol stacks.

DECnet-over-IP allows the system manager to use the DECnet Circuit Configuration Utility to configure a point-to-point DECnet circuit between any two ***MultiNet*** machines across an arbitrary IP network. This feature is ideal for providing DECnet connectivity across an IP-based LAN or WAN, especially when the alternative is to build the entire network with dual-protocol routers or duplicate communications hardware. Once the DECnet circuit between two ***MultiNet*** machines is established, any DECnet machine can use it.

IP-over-DECnet allows the system manager to use the Network Configuration Utility to configure a point-to-point IP connection between any two ***MultiNet*** machines across an arbitrary DECnet network. Like DECnet-over-IP, this feature can provide IP connectivity where DECnet connectivity already exists.

PROGRAMMING LIBRARIES

MultiNet includes a $QIO interface that offers the VMS programmer full access to the asynchronous I/O features of VAX/VMS. For compatibility with applications developed for 4.3BSD UNIX, ***MultiNet*** also provides a shareable 4.3BSD-compatible socket library and an RPC library based on Sun's public domain RPC. These libraries are also used by programmers who do not require all of the asynchronous I/O features of $QIO.

Extensive online help (under HELP MULTINET PROGRAMMING) is available documenting the features and calling sequences of the $QIO interface and the 4.3BSD-compatible socket calls. For compatibility with applications developed for Excelan's EXOS product line, an EXOS-compatible $QIO interface is provided. For compatibility with applications developed to run over DEC's VMS/ULTRIX Connection (UCX) package, a UCX-compatible $QIO interface is provided.

DOCUMENTATION

MultiNet documentation includes:

- *Release Notes*
- *Introduction to MultiNet*
- *MultiNet Installation Guide*
- *MultiNet Users' Guide*
- *MultiNet System Administrators' Guide*
- *MultiNet Programmers' Reference Manual*
- *MultiNet NFS Server System Administrators' Guide*
- *MultiNet NFS Client System Administrators' Guide*

SUPPORT

MultiNet support services include hotline service, updates, and remote diagnosis. The first 90 days of support are included in the product warranty. An annual maintenance agreement may be purchased to extend the support period.

PREREQUISITE SOFTWARE

VAX/VMS V4.5 or later

OPTIONAL SOFTWARE

NFS/PCNFSD Server for ***MultiNet***
NFS Client for ***MultiNet***

LICENSING

MultiNet is available under license from TGV, Incorporated, or a TGV-licensed OEM or distributor. For pricing and licensing information, contact your authorized ***MultiNet*** distributor or TGV, Inc. at 603 Mission Street, Santa Cruz, CA 95060; call TGV at (408) 427-4366 or (800) TGV-3440; or by FAX at (408) 427-4365.

MEDIA

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digital review

THE INDEPENDENT NEWSPAPER & TEST LAB OF DEC COMPUTIN

TGV premieres first NFS client software for VAX/VMS systems

By Steven Kovsky

SANTA CRUZ, Calif. — The first software that permits VAX machines running VMS to connect as clients to Unix servers running NFS will become available next month from TGV.

NFS Client for VMS represents a breakthrough for VMS users who have been shut out from sharing files with Unix-based file servers that run NFS (Network File System), Sun Microsystems' file directory system, which has become a de facto standard in the industry, according to David Kashtan, inventor of NFS Client for VMS.

The NFS client software for VMS will give VAX users access to both Unix servers and VMS servers for the first time.

Kashtan and Kenneth Adelman, formerly software developers at SRI International of Menlo Park, Calif., founded TGV (Two Guys and a VAX) in 1988.

While still at SRI, Kashtan developed Eunice, "the first true Unix emulation for VMS," Kashtan said.

The Eunice project was followed by Kashtan's development of what TGV officials claim is the first TCP/IP-compatible networking software for VMS. This latter SRI product, called MultiNet, became TGV's first offering shortly after the company was formed, Kashtan said.

The initial release of the NFS Client for VMS offering will require that MultiNet, which puts TCP/IP networking protocols on VMS, reside on the VAX.

According to TGV's Kashtan, NFS Client for VMS is based on a carefully crafted "pseudodriver" that emulates VMS' extended queued I/O, ancillary control process (XQP/ACP), which allows files on the NFS server to appear to the VAX user like the contents of a locally installed DEC disk drive.

The NFS client software transparently converts the semantics of the VMS file system directly to NFS-compatible calls, Kashtan said.

The process of matching VMS clients with NFS hosts has proved so complex that Kashtan doesn't believe any competitor is close to providing a similar software product.

"It's not a situation where we have a two- or three-month lead before someone else releases a competitive product," Kashtan said. "The degree of difficulty is such that others who have tried [to develop it] have given up."

NFS Client for VMS will be priced at about $500 for VAXstations, and could be higher for other VMS computers, officials said. MultiNet for VAXstations or VAXservers is priced at $1,200.

Kashtan said the initial version of NFS Client for VMS will support file and record locking only to the extent that RMS does. The software will not allow a VMS client to connect to a VMS host via NFS, he said.

Full record locking to come

Full record locking and access to VMS hosts via NFS are expected in the next release, Kashtan said.

As an optional adjunct to MultiNet, TGV markets NFS Server, which lets NFS clients access VMS-based file servers.

TGV has also announced a trade-in program for MultiNet. Customers can receive a credit of as much as 50 percent toward the purchase of MultiNet in exchange for any other board-based or host-based TCP/IP implementation for VMS, said Paul Rasmussen, TGV's general manager.

Prices for MultiNet range from $1,200 for VAXstations to $24,000 for the VAX 9000 Model 210.

For additional information, TGV Inc. can be contacted at 605 Mission St., Santa Cruz, CA 95060, (408) 427-4366.

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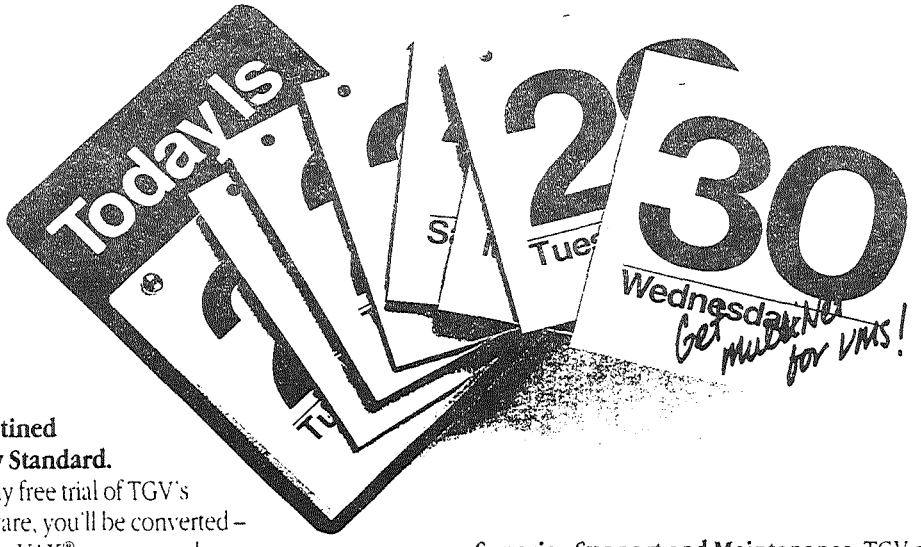
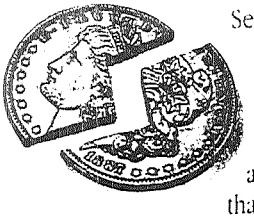
Try MultiNet TCP/IP, NFS Client & Server For Free.



MultiNet – Destined To Be The New Standard.
After your 30-day free trial of TGV's MultiNet™ Software, you'll be converted – just like the other VAX® managers who are enjoying MultiNet's unchallenged performance, lower maintenance costs, and simplified network management.

Effortless Installation. Installation is simple. We utilize VMSINSTAL. And our documentation follows the DEC® format. Our evaluation kit contains an installation tape and reference guide that leads you through 7 easy steps to complete installation and configuration of the industry's fastest TCP/IP.

Quality No-Risk Network Solution. MultiNet comes with a special kind of guarantee – the guarantee of a product implemented by the same experts who delivered the first TCP/IP for VMS,* the first VMS/NFS Server, and the world's first and only NFS Client for VMS. MultiNet's guaranteed quality means lower maintenance requirements. That means lower maintenance fees – as much as 50% lower maintenance than what you're paying now – a win-win situation.



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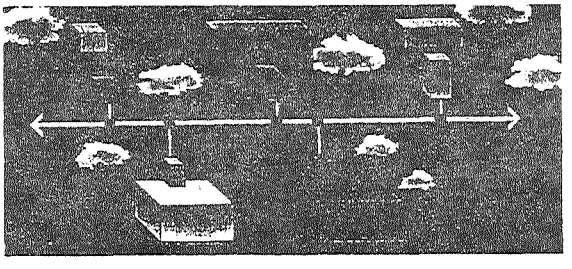

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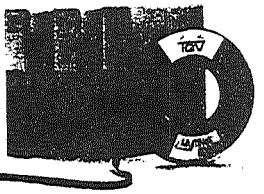

TGV™

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MultiNet

The Multi-protocol Networking Environment

Overview

MultiNet is a high-performance VAX/VMS multi-protocol networking environment. This environment enables the interconnection of VAX/VMS computers to other systems operating the TCP/IP, CHAOSnet, or Xerox PUP protocol suites. ***MultiNet*** supports the entire family of TCP/IP (Transmission Control Protocol/Internet Protocol) services.

MultiNet utilizes state-of-the-art network technology—4.3BSD networking software running in the VAX/VMS kernel environment, communicating directly with the user process via a $QIO interface, and directly with VMS device drivers at the kernel level. ***MultiNet*** delivers maximum application-to-application performance through its implementation of light-weight process threads in the network kernel.

Installation and configuration of ***MultiNet*** has been designed to be simple and straightforward for both the experienced and the novice system manager:

- ***MultiNet*** contains all the tools for any configuration from an end-node system to a fully functional gateway with multiple interfaces and routing protocols.
- ***MultiNet*** installs quickly with the VAX/VMS VMSINSTAL utility.
- ***MultiNet*** configures easily to your network environment and generates ali configuration files and the startup command procedure.
- ***MultiNet*** allows the system manager to examine the state of the network, and examine and modify the configuration without rebooting.
- ***MultiNet*** includes VMS-style interfaces with DCL commands, VMS HELP library entries, and clear, logical prompts for all applications and configuration management utilities.

Services

MultiNet's Master Server process is responsible for performing or invoking services for inbound connections. Many services normally performed in separate processes (e.g., BIND, GATED, SNMP) under other implementations are performed quickly and efficiently by the Master Server itself. Using the ***MultiNet*** Server Configuration Utility, the system manager can enable, disable, and add new services. The Master Server can also restrict IP host and network access; keep an audit trail of all connections; and log times, name and addresses, and services requested—all on a per-service basis. ***MultiNet*** services include the following and are all standard to the product:

- **Domain Name System**

  MultiNet includes version 4.8.1 of the Berkeley Internet Name Daemon (BIND) to provide Domain Name System (DNS) support. The ***MultiNet*** NSLOOKUP utility facilitates system tracking and debugging configuration problems.

- **TELNET**

  The TELNET network virtual terminal utility provides transparent access between your machine and any other node on the IP network. ***MultiNet*** has no architectural limit on the number of incoming TELNET sessions, and only requires approximately 500 bytes of memory per connection, making ***MultiNet*** ideally suited for terminal-server applications with hundreds of incoming sessions per machine. ***MultiNet's*** TELNET client supports the TN3270 protocol, allowing VMS users to access IBM mainframes as a 3270 block mode terminal.

- **DECwindows**

  MultiNet's DECwindows support provides users the ability to run DECwindows applications over TCP/IP in addition to DECnet.

- **FTP**

  The File Transfer Protocol utility transfers files between computers on an IP network. ***MultiNet*** supports two noteworthy extensions to the standard File Transfer Protocol specification: automatic negotiation of a mode providing efficient transparent transfer of any FILES-11 file (e.g., ISAM-indexed files) between VMS systems; and the use of Lempel-Ziv data compression, which can reduce network traffic and effectively increase the speed of slow lines by 30-100% (typically 60%). The ***MultiNet*** FTP Server uses the standard VMS LOGINOUT utility for account validation and setup, thus fully supporting all related VMS security features.

- **SMTP**

  The Simple Mail Transfer Protocol allows users to send and receive electronic mail over an IP network. Access to the ***MultiNet*** mail system is provided by both the standard VMS MAIL utility and the MM mail user interface.

- **MM**

  The MM utility provides an alternative to VMS MAIL for electronic mail users. MM offers several useful features not available under VMS MAIL including: the ability to save and restore messages before sending them; the ability to create user-defined headers; and a sophisticated message filing and manipulation scheme. MM can be used to send both SMTP and DECnet mail. Additionally, the MM utility can be used to send mail via the PMDF electronic mail gateway system available from Innosoft International, Inc.

- **LPR/LPD**

  The LPD protocol client and server allows ***MultiNet*** users to access printers on remote UNIX computers and vice versa. The LPD server makes VMS printer queues appear to remote UNIX users as local printers. The LPD client runs as a VMS print symbiont using the native VMS PRINT command to print files.

- **BSD "r" Services**

  MultiNet includes the popular UNIX "r" services RSHELL, REXEC, RCP, RLOGIN, and RMT.

- **TALK**

  The ***MultiNet*** TALK utility is a VMS PHONE-like utility which allows users to conduct on-line, interactive conversations with other users. Like VMS PHONE, TALK provides a split-window screen, with one window displaying text one user types, and the second displaying text the respondent types. For maximum interoperability, both the 4.2BSD "Old Talk" and 4.3BSD "New Talk" protocols are supported.

- **GATED**

  MultiNet provides support for the EGP (RFC911), RIP (RFC-1058), and HELLO routing protocols, using GATED Version 1.9.

- **SNMP**

  A Simple Network Management Protocol agent is included in ***MultiNet***, allowing network managers to query such information as interface status, protocol statistics, and routing information.

- **DECnet Protocol Layering**

  In addition to sharing a DEC Ethernet controller side-by-side with DECnet, ***MultiNet*** allows layering of the IP and DECnet protocol stacks. DECnet-over-IP allows the system manager to configure a point-to-point DECnet circuit between any two ***MultiNet*** machines across an arbitrary IP network. IP-over-DECnet allows the system manager to configure a point-to-point IP connection between any two ***MultiNet*** machines across an arbitrary DECnet network. These features are ideal for expanding connectivity to include both protocol families across a connection which only supports one protocol family.

Diagnostic Tools

The ***MultiNet*** PING, TRACEROUTE, and TCPDUMP utilities turn every VAX on your network into a network analyzer. PING measures the quality of a network connection. TRACEROUTE is used to trace the path of an IP datagram through your network to a specified destination. TCPDUMP is used to debug LAN problems by capturing, formatting, and displaying Ethernet datagrams.

Custom Applications

MultiNet includes a 4.3BSD-compatible socket library as well as a $QIO interface which allows users to develop custom applications.

Software Requirements

VAX/VMS V4.5 or greater. Uses spinlock synchronization to support Symmetrical Multi-Processing (SMP) under VMS version V5.

Supported Configurations

Digital Equipment Corporation's VAX and MicroVAX computers in any valid VMS configuration.

Supported Network Interfaces

Ethernet Interfaces

- All DEC Ethernet controllers currently supported by DEC; multiplexing features enable sharing with other protocols—DECnet, LAT, and Local Area VAXclustering.
- CMC's ENP family of Ethernet controllers
- Excelan's EXOS UNIBUS and Q-bus controllers
- Interlan's NI1010 Ethernet controller
- 3-Com's Ethernet controller
- Xerox's 3-Megabit Ethernet controller

DDN/ARPAnet Interfaces

- ACC's LH-DH ARPAnet controller
- ACC's ACP-5250 and ACP-6250 X.25 controllers, may be used to connect systems to the Defense Data Network PSNs
- IMP11-A ARPAnet controller

WAN Interfaces

- ACC's ACP-5100 and ACP-6100 HDLC T1 controllers
- DEC's DMR-11, DMC-11, and DMV-11 DDCMP
- SLIP (Serial Line IP) using any VMS-supported terminal multiplexer

Other LAN Interfaces

- Proteon's proNET-10 and proNET-80 Token-Ring controller
- NSC's PI13/14 Hyperchannel controller
- Symbolics' CHAOSnet 4-Megabit controller

Optional Software

NFS Client for ***MultiNet***
NFS Server for ***MultiNet*** (includes support for PC-NFS)

Product Packaging

MultiNet is distributed on a 1600 BPI magnetic tape or TK50 streaming cassette tape. Included with ***MultiNet*** software are the manuals: *Introduction to MultiNet, MultiNet Installation Guide, MultiNet System Administrators' Guide, MultiNet Users' Guide, MultiNet Programmers' Reference Manual,* and optionally the *MultiNet NFS Server System Administrators' Guide* and *MultiNet NFS Client System Administrators' Guide.*

Product Support

Product support is provided for ninety (90) days with ***MultiNet*** which includes new releases, documentation, telephone consultation, and remote diagnosis. Support can be extended to an annual basis with a software maintenance agreement. Contact TGV, Inc. for further information.

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MultiNet NFS Client & NFS Server for VMS

Overview

MultiNet is the first VAX/VMS networking environment to offer both ***NFS Client*** and ***NFS Server*** for VMS. These features enable the complete interconnection of VAX/VMS systems to any other system which supports NFS.

NFS Client

The ***MultiNet NFS Client*** allows VMS applications to transparently access files stored on NFS servers. The ***NFS Client*** can remote mount file systems on ANY system having an NFS server. The ***NFS Client*** device driver provides a standard file system interface and is called automatically by the normal VMS Record Management Services (RMS).

Remote NFS servers supporting full UNIX (NFS) file system semantics appear to VAX/VMS systems as fully-functional Files-11 ODS-2 file systems. This includes support for multiple file versions and arbitrary VMS (RMS) file attributes. Files created on the server system appear as Stream_LF files to the local VAX/VMS system. Text files created by the local VAX/VMS system appear as normal "Stream" files on the server and can, therefore, be shared with applications running on the NFS server and other (including NON-VMS) NFS clients. Other VAX/VMS file types are stored on the NFS server as "raw" VMS data blocks (as produced on the VMS system) plus information about the VMS (RMS) file attributes. This permits other VAX/VMS clients to share these files on the NFS server and non-VMS systems to access the data, provided the non-VMS systems are capable of interpreting the "raw" VMS data blocks.

On systems not supporting full UNIX (NFS) file system semantics, the local VAX/VMS system sees a restricted file system, which does not support multiple file versions or arbitrary VMS (RMS) file attributes. All remote files appear as VAX/VMS Stream_LF files, which permits the sharing of text files between systems.

NFS Server

The ***MultiNet NFS Server*** is a high-performance kernel implementation of NFS for VMS. The ***NFS Server*** maps the complete UNIX file system semantics onto the VMS file system, including symbolic and hard links and device files, making a VMS file system look exactly like a UNIX file system. When accessed from an ***NFS Client***, all VMS text files are type-converted to look like UNIX stream files for maximum interoperability. The ***NFS Server*** uses a file and directory cache between the file system and the network, to mask VMS bottlenecks from the requesting UNIX machine. The ***NFS Server*** uses a proprietary XDR serializer to move data directly between the file system cache and the network buffers. By default, the cache functions as a write-through cache, but can be configured as a write-back cache to increase performance.

The ***NFS Server*** can export all Files-11 ODS-2 VMS volumes, including shadow sets, bound volumes, and DFS-served disks.

The ***NFS Server*** distribution also includes a PC-NFS authentication and print server (PCNFSD). It allows IBM PCs and compatibles running NFS client software to access NFS served filesystems as though they are local DOS disk drives. PCNFSD supports printing from PC clients to VMS print queues.

Software Requirements

MultiNet V2.2 or greater and VAX/VMS V4.5 or greater. Uses spinlock synchronization to support Symmetrical Multi-Processing (SMP) under VMS version V5.

Supported Configurations

Digital Equipment Corporation's VAX and MicroVAX computers in any valid VMS and ***MultiNet*** configuration.

Product Packaging

MultiNet NFS Client and the ***MultiNet NFS Server*** are distributed on a 1600 BPI magnetic tape or TK50 streaming cassette tape as part of the normal ***MultiNet*** distribution. No separate installation is required.

Included with the software are the *MultiNet NFS Server Administrators' Guide* and the *MultiNet NFS Client Administrators' Guide*.

Product Support

Product support is provided for ninety (90) days with ***MultiNet*** which includes new releases, documentation, telephone consultation, and remote diagnosis. Support can be extended to an annual basis with a software maintenance agreement. Contact TGV, Inc. for further information.

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