Software
Product
Description

DESCRIPTION

DECnet-11S allows a suitably configured RSX-11S system to participate as a routing or nonrouting (end) node in DECnet computer networks. DECnet-11S is a Phase IV network product and is warranted for use only with supported Phase III and Phase IV products supplied by DIGITAL.

DECnet Phase IV networks can contain up to 1023 nodes per network area given proper planning. Phase III nodes participating in Phase III/IV networks are limited to the Phase III routing capability of 255 nodes. Phase II nodes are not supported.

DECnet-11S offers task-to-task communications, utilities for network file operations, homogeneous network command terminal support, and network resource-sharing capabilities using the DIGITAL Network Architecture (DNA) protocols. DECnet-11S communicates with adjacent nodes over synchronous and asynchronous communication lines, Ethernet Local Area Networks (LANs), and parallel interfaces. Access to DECnet-11S is supported for RSX-11S tasks written in MACRO-11, FORTRAN IV, FORTRAN-77, which have been assembled/compiled and subsequently linked on a host system.

The functions available to an RSX-11S user depend, in part, on the configuration of the rest of the network. Each DECnet product offers its own level of functionality and its own set of features to the user. Networks consisting entirely of DECnet-11S nodes can have the full functionality described in this SPD. Networks that mix DECnet-11S nodes with other DECnet products can limit the functions available to the DECnet-11S user because some DECnet-11S features are not supported by all DECnet products. Some supplied optional features require hardware configurations larger than the minimum supported systems.

The DECnet products and functions available to users on mixed networks can be determined by comparison of the SPDs for the component products.

Adaptive Routing

Adaptive routing is the mechanism by which one or more nodes in a network can route or forward messages between another pair of nodes in the same network. This routing capability will forward such messages even if no direct physical link exists between the pair of nodes apart from the sequence of physical links that includes the routing node(s).

A DECnet-11S node must function as a routing node whenever multiple lines are used simultaneously by that node. DECnet-11S end nodes provide all the capabilities of DECnet-11S routing nodes except that end nodes cannot route messages on behalf of other nodes in the network. Since end nodes do not route messages, they do not need to store or update routing databases.

Consequently, end nodes use less system resource and generate less network traffic than routing nodes.

For this same reason, end node operation consumes less processing power then routing node operation. The Full Function DECnet-11S software must be installed on a node in order for that node to operate as a routing node. For a node to operate as an end node either the Full Function or the End Node DECnet-11S software must be installed on that node. Full Function DECnet-11S software allows a node to be set up as either a routing node or as an end node.

Although two adjacent routing nodes can be connected by more than a single physical link, messages will be sent over only one of the links. All other lines will serve as "hot standbys", such that the least cost path available between two nodes is the one that will be used for message traffic. A line cost parameter set by the system manager determines the line over which all messages will be sent from node to adjacent node.

In addition to adaptive routing, which all DECnet Phase IV implementations use, DECnet-11S supports Area Routing. Area Routing is a method by which DECnet can send and route messages between the nodes in the same or different areas of the network. If the network manager chooses to separate the network into areas, up to 63 (Area 1 through Area 63), with up to 1023 nodes per area, may be defined. For single area networks, Area 1 is the default. Area-based DECnet networks are hierarchical networks and some restrictions apply to communications from nodes in one area to nodes in another. For example, Phase III nodes in area-based networks can communicate only with nodes within their own areas. Proper network planning is essential when using Area Routing or configuring large networks.

Task-To-Task Communication

Using DECnet-11S, an RSX-11S user program written in MACRO-11 or one of the supported high level languages can exchange messages with other network user programs. These two user programs can be on the same node, or on any other Phase III or Phase IV node in the network. The messages sent and received by the two user programs can be in any data format.

Network Resource Access

File Access

File access is supported to and from remote DECnet systems by explicit subroutine calls in the supported high level languages. READ, WRITE, OPEN, CLOSE, and DELETE operations can be initiated by local tasks for sequential files residing at remote DECnet systems. Fixed and variable length record formats containing either ASCII or binary data are supported.

Network Command Terminal

DECnet-11S supports DIGITAL's Terminal Services Architecture Command Terminal Protocol (CTERM) giving the terminal user the ability to establish a virtual connection to remote Phase IV DECnet systems which provide similar support. This utility is particularly useful for doing remote program development and allows terminal users on small application oriented systems to utilize the resources of larger development oriented systems.

DECnet-11S provides a utility (RMT) that allows a terminal user to establish a virtual connection to another Phase IV DECnet-RSX or DECnet-Micro/RSX system. DECnet-11S also provides an **unsupported** utility (RVT) that allows a terminal user to establish a virtual connection to Phase III/ IV DECnet-VAX systems. This utility is provided only as a courtesy from DIGITAL, with no implied support services offered, as is the case with other mentioned DECnet-11S capabilities. **RMT and**

RVT are provided only for compatibility with previous DECnet releases and will not be included in future releases of DECnet-11S.

Down-Line System Loading

Initial memory images for RSX-11S nodes in the network can be stored on RSX-11M, RSX-11M-PLUS, Micro/RSX, or VAX/VMS file system devices and loaded into nodes across point-to-point, multipoint (DMP/DMV only), and Ethernet links. Generation of initial memory images of DECnet-11S systems for down-line loading is supported by VAX/VMS, RSX-11M, or RSX-11M-PLUS. Down-line system loading requires the use of an appropriate bootstrap loader (Refer to the Optional Hardware section) in conjunction with certain devices. Down-line system loading across multipoint links requires multipoint communication hardware (DMP/DMV). Memory images including those greater than 124K words are supported.

Upline Dumping

Memory images can be upline dumped to DECnet hosts (DECnet-11M, DECnet-11M-PLUS, DECnet-Micro/RSX, and DECnet-VAX). A crash dump analyzer program can be used to aid in problem resolution.

Down-Line Task Loading

Programs to be executed on DECnet-11S nodes in the network can be stored on host RSX-11M, RSX-11M-PLUS, Micro/RSX, or VAX/VMS file system devices and loaded on request into memory partitions of DECnet-11S systems. In addition, programs already executing on DECnet-11S nodes can be checkpointed to the host file system and later restored to main memory of the DECnet-11S node. These features simplify the operation of network systems that do not have mass storage devices.

Network Management

The Network Control Program (NCP) performs three primary functions: displaying statistical and error information, controlling network components, and testing network operation. These functions can be performed locally. An operator can display the status of DECnet activity at the local node. The user can choose to display statistics related to both node and communication lines, including data on traffic and errors. DECnet-11S also provides local network event logging to the console and/or to a remote node.

NCP can also be used to test components of the network. NCP can be used to send and receive test messages over individual lines either between nodes or through other controller loopback arrangements. The messages can then be compared. NCP allows performance of a logical series of tests that will aid in isolating problems.

Communications

DECnet-11S supports the DIGITAL Data Communications Message Protocol (DDCMP) for full- or half-duplex transmission in point-to-point and multipoint operation using serial synchronous or asynchronous facilities. DDCMP provides error detection/correction and physical link management facilities. In addition, an auto-answer capability is provided if supported by the modem in use.

Multipoint and auto-answer function with EIA-type devices only. Parallel communication devices use special link protocols (not DDCMP) optimized for their characteristics.

The Ethernet bus interfaces, when used in conjunction with DIGITAL's Ethernet transceivers, or DELNI, allow DECnet-11S to utilize Ethernet as a data link transmission medium.

The maximum number of physical links that can be supported by a DECnet-11S node is sixteen, depending on CPU, type of communications interface, and speed of interfaces.

DECnet-11S multipoint will support up to a maximum of twelve tributaries on a single multipoint line. Aggregate bandwidth of tributaries is limited to that of the control station device. The communication path to each tributary counts as a link with respect to the limits on number of links specified above. Multipoint line configurations will be supported for the following devices:

Multipoint Devices

Devices	Multipoint Control Station (Master)	Multipoint Tributary Devices (Slave)
DL11/DLV11	YES	YES
DUP11	YES	YES
DUV11	YES	YES
DPV11	YES	YES
DZ11/DZV11/DZQ11	YES	NO
DHU11/DHV11	YES	NO
KMC11 (DZ11)	YES	NO
KMC11 (DUP11)	YES	YES
DV11	YES	YES
DMP11*	YES	YES
DMV11*	YES	YES

*   Multipoint communication hardware device

Direct Line Access

User written MACRO-11 tasks will be provided with Direct Line Access (DLX) support to all supported devices (including Ethernet Controller). DLX will allow direct control of the communications lines, bypassing the logical link control and transport mechanism provided by the DECnet software. User programs are required on both ends of the link in order to use this interface.

DECnet-11S Configuration

The process of configuring a DECnet-11S node is based primarily on trade-offs of cost, perfor-
mance, and functionality, within the realm of satisfying the user's application requirements. It can
be readily expected that network applications will run the full gamut from low-speed, low-cost
situations to those of relatively high performance and functionality. The performance of a given
DECnet node is a function not only of the expected network traffic and resultant processing
("global" conditions), but also of the amount of concurrent processing specific to that node (local
conditions). Thus, node performance depends on many factors, including:

* CPU type and Memory Size

* Number of device interrupts per unit time

* Communication line characteristics

* Number and size of buffers

* Message size and frequency of transmission

* Local applications

* Size and frequency of route-through traffic

Note that the rate at which user data can be transmitted (throughput) over a communications line
may sometimes approach, but will never equal or exceed, the actual line speed. The reason is
that the actual throughput is a function of many factors, such as the network application(s), topol-
ogy, protocol overhead and line quality, as well as the factors cited above.

Note: Careful analysis is required when configuring routing nodes with 124K words or less.

Six basic groups of communications interfaces are presented in the tables below. They differ in
many respects, particularly in their effect upon CPU utilization.

* With character interrupt devices such as the DUP11, CPU cycles are required for not only the
  line protocol processing (DDCMP), but also for each character sent and received.

* Devices such as the DV11 are direct memory access (DMA) for both transmission and recep-
  tion. Since the line protocol (DDCMP) is in the PDP-11 software, CPU cycles are required for
  its processing.

* Devices such as the DHV11 are direct memory access (DMA) on transmit, and character inter-
  rupt on receive. While CPU cycles are consumed for line protocol processing, and for each
  character received, the load is reduced for messages transmitted.

* The DMR11, DMP11, and DMV11 are DMA devices with the line protocol (DDCMP) executed
  in microcode, thus off-loading the PDP-11 CPU. The only DECnet load the processor sees is
  completed incoming and outgoing messages.

* The PCL11-B is a high speed DMA device which uses local parallel communications lines. It
  has its own line protocol and does not use DDCMP. CPU cycles are only required for process-
  ing of incoming and outgoing data messages and to perform control functions.

* The DEUNA, UNIBUS-to-Ethernet, and DEQNA, QBUS-to-Ethernet controllers are high speed
  DMA controllers supporting CSMA/CD protocol. CPU cycles are only required for processing
  of incoming and outgoing messages.

The following tables describe the physical hardware configurations supported by DECnet-11S in terms of CPU type and communication interface. The numbers given in the tables are "load costs". Maximum line speeds (the fastest clock rate at which the device can be driven under DECnet-11S relative to the load cost), expressed in kilobits per second, are shown in parentheses.

Device loading provides a method by which one can compute a maximum system configuration for a variety of communications devices. The load cost indicates the maximum load that a device can put on a particular type of CPU. The load cost limit for each CPU type is 16.

For communications devices which support half/full dupelx, the load costs in the tables are for full duplex configurations. The load cost for a half duplex configuration can be calculated as one half of the load cost in the table except at very low speeds, in which case the load cost is the same as in the full duplex case.

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DECnet-11S UNIBUS Device Load Table

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Device Type	Processor Type			
	11/24	**11/44**	**11/70**	**11/84**
DEUNA (10meg)	16	16	16	16
PCL (4meg)	16	16	16	16
DMP (to 19.2K)	2	1	1	1
DMP (56K)	3	3	3	3
DMP (1meg)	16	16	16	16
DMR (to 19.2K)	2	1	1	1
DMR (56K)	3	3	3	3
DMR (1meg)	16	16	16	16
DV (to 9.6K)	4	3	3	3
DHU (to 9.6K)	2	2	2	2
DL (to 9.6K)	2	2	2	2
DU (to 9.6K)	2	2	2	2
DUP (to 9.6K)*	2	2	2	2
DZ (to 9.6K)	2	2	2	2

*   Maximum 4.8Kbps for 11/24 processor

Note: For processor types not shown, use the load costs associated with the PDP-11/24 to compute device loading

DECnet-11S QBUS Device Load Table

	Processor Type		
Device Type	11/23	11/23-PLUS	11/70
DEQNA (10meg)	16	16	16
DMV (to 19.2K)	2	2	1
DMV (56K)	3	3	3
DHV (to 9.6K)	2	2	2
DLV (to 9.6K)	2	2	2
DPV (to 9.6K)	2	2	2
DUV (to 9.6K)	2	2	2
DZV (to 9.6K)	2	2	2

Maximum Line Configurations Guidelines
(Multipoint)
Maximum Line Speed
(Kilobits per Second, half- or full-duplex)

Device Group	19.2	56	250	500	1000
DMV11 (All Options)	2/8	2/8			
DMP11					
(RS232-C, V.35)	†4/8	2/8			
(local)		2/8	1/12	1/12	1/12
(RS422/449)	†4/8	2/8	1/12	1/12	1/12*

*   half-duplex

†   11/24 is limited to 2 controllers

Note: Left side of slash (/) indicates number of controllers per node and right side indicates total number of tributaries per control node.

Total number of circuits not to exceed 16 per node.

Number of tributaries on lines should be carefully configured for performance consider-ations.

In order to achieve a viable configuration, the user and/or a DIGITAL software specialist must perform a level of application analysis which addresses the factors above.

MINIMUM HARDWARE REQUIRED

Any valid RSX-11S system configuration and any valid RSX-11M, RSX-11M-PLUS, or VAX/VMS system for RSX-11S and DECnet-11S generation with:

- The following additional memory must be available:

  DECnet-11S end node - 18KW
  DECnet-11S routing node - 20.5KW

  Ethernet support will add 3 KW to the above memory requirements.

- The following additional number of disk blocks must be available for DECnet-11S network software:

  DECnet-11S end node - 4000
  DECnet-11S routing node - 4500

- PDP-11/24, PDP-11/34, PDP-11/40, PDP-11/44, PDP-11/45, PDP-11/55, PDP-11/60, PDP-11/70, or PDP-11/84, central processor with one of the following communications devices:

DUP11	low-speed synchronous interface[4]
DMP11	synchronous UNIBUS interface (RS232-C/RS423A, CCITT V.35/DDS, or RS449/RS422)[4]
DMP11	local synchronous UNIBUS interface[4]
DMR11	synchronous UNIBUS interface (RS232-C/RS423A, CCITT V.35/DDS, or RS449/RS422)[4]
DMR11	local synchronous UNIBUS interface[4]
DL11	asynchronous EIA interface with modem control[4]
DL11	asynchronous 20mA current loop interface[2,4]
DZ11	multiline asynchronous EIA interface[2,4]
DZ11	multiline asynchronous 20mA current loop interface.[1,2,4]
DHU11	multiline asynchronous interface[2,4]
DV11	multiline NPR synchronous interface[2,4]
PCL11-B	multiple CPU link
DEUNA	UNIBUS-to-Ethernet controller

- PDP-11/23, 11/23-PLUS or Micro/PDP-11 (11/23, 11/73) central processors with one of the following communications devices. **Note that the KDJ11-A 11/73 option is not supported.**

DMV11	synchronous QBUS interface (RS232-C/RS423A or CCITT V.35/DDS) [4,5]
DMV11	local synchronous QBUS interface[4,5]
DUV11	low-speed EIA synchronous interface[4]
DLV11	asynchronous EIA interface with modem control[4]
DZV11	multiline asynchronous QBUS EIA interface[2,4]
DZQ11	multiline asynchronous QBUS EIA interface[2,4]
DHV11	multiline asynchronous QBUS interface[2,4]
DPV11	synchronous QBUS interface[4]
DEQNA	QBUS-to-Ethernet controller

OPTIONAL HARDWARE

- Additional lines and/or communication interfaces (from above) up to maximum as defined in Device Load tables for mapped systems.

- KG11-A Communications Arithmetic Element (3) (may be used in conjunction with DV11, DZ11, and DL11)

- KMC11-A (can be used in conjunction with up to eight DUP11s or with one sixteen line DZ11)

- Appropriate hardware for down-line load

  — M9301-YE: w/bootstrap for DECnet on DL11-E and DUP11
  — M9301-YJ: w/bootstrap for DECnet on DMR11
  — MR11-EA: M9312 and all current bootstrap ROMs
  — M9312: bootstrap terminator with empty ROM sockets and MR11K-Ax ROM set for use on M9312 option where x denotes DUP11 or DEUNA
  — BDV11: w/bootstrap for DECnet on DLV11 and DUV11

Notes:

(1) Requires either the H319 option for optical isolation or one side of the 20mA line to be in passive mode.

(2) All lines on this interface must be dedicated as DECnet links.

(3) These products are no longer marketed by DIGITAL and may not be supported in future releases of DECnet-11S.

(4) With appropriate FCC-compliant cabinet option.

(5) Not supported on the PDP-11/23.

Bootstrap Support for Down-Line System Loading

	Remote Load Detect	Power-On Boot	Console Boot
DMP11	(1)	(1)	N/A
DMV11	(1)	(1)	N/A
DEUNA	(1)	(1)	(2)
DMR11	(3)	(3)	(3)
DL11-E	N/A	(3)	(3)
DUP11	N/A	(3)	(3)
DLV11-E/F	N/A	(4)	(4)
DUV11	N/A	(4)	(4)
DEQNA	N/A	(5)	(5)

(1) Device configuration (switch settings) required.

(2) M9312 with appropriate ROMs required.

(3) M9301 or M9312 with appropriate ROMs required.

(4) BDV11 required on PDP-11/23; appropriate hardware included in KDF11-B based systems.

(5) Not available for 11/23; appropriate ROMs required for KDF11-B.

N/A Not available.

PREREQUISITE SOFTWARE

RSX-11S Operating System, Version 4.2

OPTIONAL SOFTWARE

FORTRAN-77/RSX
FORTRAN IV

SOFTWARE WARRANTY

Warranty for this software product is provided by DIGITAL with the purchase of a license for the product. There is no additional charge. This software product is warranted to conform to the Software Product Description (SPD). This means that DIGITAL will remedy any nonconformance when it is reported to DIGITAL by the customer during the warranty period.

The warranty period is ninety (90) days. It begins when the software is installed or thirty (30) days after delivery to the end user, whichever occurs first and expires ninety (90) days later. All warranty related support for this software will end 180 days after release of the subsequent version.

Warranty is provided in the country of purchase. DIGITAL will provide a service location which will accept reporting (in a format prescribed by DIGITAL) of a nonconformance problem caused when using the licensed software under normal conditions as defined by the SPD. DIGITAL will remedy a nonconformance problem in the current unaltered release of the licensed software by issuing correction information such as: correction documentation, corrected code, or notice of availability of corrected code; or a restriction or a bypass. The customer will be responsible for the preparation and submission of the problem report to the service location.

Warranty Exclusion

DIGITAL DOES NOT WARRANT THAT THE SOFTWARE LICENSED TO CUSTOMER SHALL BE ERROR FREE, THAT THE SOFTWARE SHALL OPERATE WITH ANY HARDWARE AND SOFTWARE OTHER THAN AS SPECIFIED IN THIS SPD, THAT THE SOFTWARE SHALL SATISFY CUSTOMER'S OWN SPECIFIC REQUIREMENTS, OR THAT COPIES OF THE SOFTWARE OTHER THAN THOSE PROVIDED OR AUTHORIZED BY DIGITAL SHALL CONFORM TO THE SPD.

DIGITAL MAKES NO WARRANTIES WITH RESPECT TO THE FITNESS AND OPERABILITY OF MODIFICATIONS NOT MADE BY DIGITAL.

IF THE SOFTWARE FAILS TO FUNCTION FOR REASONS STATED ABOVE, THE CUSTOMER'S WARRANTY WILL BE INVALIDATED AND ALL SERVICE CALLS WILL BE BILLABLE AT THE PREVAILING PER CALL RATES.

INSTALLATION

Only experienced customers should attempt installation of this product. DIGITAL recommends that all other customers purchase DIGITAL's Installation Services. These services provide for installation of the software product by an experienced DIGITAL Software Specialist.

DIGITAL's Installation Services can be purchased as a separate service.

Courtesy Installation Service

This software product will be installed by DIGITAL at no additional charge if you purchase it concurrent with a Startup Service Package that includes installation service. Both the operating system and this product must be installed concurrently.

ORDERING INFORMATION

Single-Use licensed software is furnished under the licensing provisions of DIGITAL's Standard Terms and Conditions of Sale, which provide in part that the software and any part thereof may be used on only the single CPU on which the software is first installed, and may be copied, in whole or in part (with the proper inclusion of DIGITAL's copyright notice and any proprietary notices on the software) for use on such CPU.

You will need a separate license for each CPU on which you will be using the software product (except as otherwise specified by DIGITAL). Then you will select the Materials and Service Options you need to utilize the product effectively. **IF YOU ARE ALREADY FAMILIAR WITH THESE OPTIONS, YOU MAY OBTAIN THE ORDERING INFORMATION DIRECTLY FROM THE SOFTWARE OPTIONS CHART.** In most cases, you will want to review the following descriptions to determine what options you require.

LICENSE OPTIONS

Single-Use License Option

The Single-Use License is your right to use the software product on a single CPU and it includes your 90 day warranty.

For your first installation of this software product you must purchase as a **minimum:**

- Single-Use License Option, and
- Distribution and Documentation Option

The license gives you the right to use the software on a single CPU and the Distribution and Documentation Option provides the machine-readable software and related documentation.

To use this software product on additional CPUs, you must purchase for each CPU as a **minimum:**

* Single-Use License Option

In addition to the right to use, the license gives you the one-time right to copy the software from your original CPU installation to the additional CPU. Therefore, the Distribution and Documentation Option is not required, but optional.

MATERIALS AND SERVICE OPTIONS

Distribution and Documentation Option

The Distribution and Documentation option provides the machine-readable software in binary form and the basic documentation. You must have, or order, a Single-Use License to obtain this option. You will need this option to install the software for the first time. When revised versions of this software product become available, they may also be obtained by purchasing this option again.

If you prefer to receive automatic distribution of revised versions for this product, you must purchase a Software Product Service Agreement.

Software Revision Right-To-Copy Option

The Right-To-Copy Option allows a customer with multiple CPUs to copy a revised version of a software product from one CPU to another. Each CPU must be licensed for that product. You first install the revised software on one CPU; then you can make copies for additional CPUs by purchasing the Right-To-Copy Option for each additional CPU.

If you prefer to automatically obtain the right-to-copy, you must purchase a Service Right-to-Copy for each additional CPU; this is a service added to a Software Product Service Agreement.

Documentation-Only Option

You can obtain one copy of the basic documentation by purchasing the Documentation-Only Option.

Installation Service Option

DIGITAL's Installation Service is provided by a DIGITAL Software Specialist and accelerates your productive use of this product. For more information on what is included in this service, please obtain the appropriate Service Description from your local DIGITAL office.

Installation Service will be provided at no additional charge (Courtesy Installation) under the conditions described in the Installation section above.

Installation Services

For a fixed price a DIGITAL Software Specialist will assure that the customer's system is ready for installation, install the software, and familiarize the customer with its operation.

Installation for DECnet-11S will consist of the following:

* Verification that all components of DECnet-11S have been received.

- Verification that the necessary versions of the RSX-11S software and documentation are available
- Verification of the appropriate sysgen parameters.

Note: Should a software specialist be required to modify the previously installed operation system parameters, a time and materials charge will apply.

- Define and create a local node DECnet database.
- Generate and install (down-line load) DECnet-11S software
- Verify the proper installation of DECnet-11S by running a series of tests to show connectivity (demonstrated by the use of the post installation checkout procedure) to a designated node.

Connectivity to all other nodes within the network is the responsibility of the customer.

Pre-Installation Procedures Required

Before DIGITAL can install the software, the customer must:

- Ensure that system meets the minimum hardware and software requirements (as specified in the SPD).
- Obtain, install, and demonstrate as operational any modems and other equipment and facilities necessary to interface DIGITAL's communication equipment:
- For multi-node networks, designate one adjacent node to verify installation/connectivity.
- Make available for a reasonable period of time, as mutually agreed upon by DIGITAL 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.

NETstart Services Options

NETstart Services help you "start-up" operation of your DECnet networking environment quickly by accelerating the learning process of your staff. It includes direct assistance, documentation review, discussion and hands-on experience provided on-site by a DIGITAL Networking Specialist. NETstart is designed to benefit first time users, as well as experienced network computer users.

There are two levels of NETstart Services. NETstart I is the most comprehensive start-up service, followed by NETstart II.

You should be experienced with your appropriate operating systems prior to scheduling these services. Contact your DIGITAL representative for more details on NETstart Services.

Software Product Service Agreements

DIGITAL offers licensed customers annual Software Product Service Agreements to maintain their software:

DECsupport Service is the most comprehensive level of service offering critical problem on-site assistance and scheduled preventative maintenance. You receive telephone support that gives you timely answers and solves most software problems. In addition, you get revised versions of the software and documentation, and system newsletters or dispatches.

BASIC Service is ideal for customers who have a staff whose experience and expertise enables them to analyze and communicate a software problem to DIGITAL remote support centers. You receive telephone support that gives you timely answers and solves most software problems. In addition, you get revised versions of the software and documentation, and system newsletters or dispatches.

Self-Maintenance Service is designed for customers who require revised versions of the software and documentation from DIGITAL. In addition, you get system newsletters or dispatches and may submit software performance questions.

A variety of service options may be added to an existing Software Product Service Agreement, such as service for multiple-like systems. Contact your DIGITAL representative for additional information and ordering details.

The Prerequisite Software, as specified by this SPD, must have the equivalent level Software Product Service.

For more information on what is included in these agreements, please obtain the appropriate Service Description from your local DIGITAL office.

Training From Educational Services

To ensure customer success with DIGITAL products, Educational Services sells training for the installation, maintenance and/or management of DIGITAL software. Course formats vary from seminars to packaged training materials that include self-paced instruction and computer-based instruction to traditional lecture/labs at DIGITAL's worldwide Training Centers.

For a complete listing of course schedules and prices, refer to the *DIGEST,* Educational Services' quarterly publication. For curriculum-specific information, training recommendations and assistance in planning training programs, please contact your Educational Services Representative.

Professional Software Services

DIGITAL Software Specialists are available on a per-call or resident contract basis to help in all phases of software development or implementation. Specialists are available to serve as technical consultants, decision support consultants or business systems analysts. Resources are available to:

- Supplement your programming staff
- Assume project management responsibility
- Develop software
- Augment a system start-up service package with tailored services to meet specific needs

Contact your DIGITAL representative for additional information and ordering details.

SOFTWARE OPTIONS CHART

The distribution Media Codes used in the Software Options Chart are described below. You specify the desired Media Code at the end of the Order Number, e.g., QJ762-HD = binaries on 9-track 800 BPI Magtape (NRZI).

D = 9-Track 800 BPI Magtape (NRZI)   T = RK06 Disk Cartridge
H = RL02 Disk Cartridge   V = RK07 Disk Cartridge
M = 9-track 1600 BPI Magtape (PE)   Z = No hardware dependency
Q = RL01 Disk Cartridge

	ORDER NUMBER FULL FUNCTION	ORDER NUMBER END NODE
LICENSE OPTION: A LICENSE IS REQUIRED FOR EACH CPU.		
Single-use license	QJ762-UZ	QJ763-UZ
MATERIALS AND SERVICE OPTIONS:		
Distribution and Documentation Option	QJ762-HD QJ762-HH QJ762-HM QJ762-HQ QJ762-HT QJ762-HV	QJ763-HD QJ763-HH QJ763-HM QJ763-HQ QJ763-HT QJ763-HV
Software Revision Right-to-Copy Option	QJ762-HZ	QJ763-HZ
Documentation Only Option	QJ762-GZ	QJ763-GZ
Documentation Update Service	QJ762-KZ	QJ763-KZ
Installation Service Option	QJ762-ID QJ762-IH QJ762-IM QJ762-IQ QJ762-IT QJ762-IV	QJ763-ID QJ763-IH QJ763-IM QJ763-IQ QJ763-IT QJ763-IV
DECsupport Service	QJ762-9D QJ762-9H QJ762-9M QJ762-9Q QJ762-9T QJ762-9V	QJ763-9D QJ763-9H QJ763-9M QJ763-9Q QJ763-9T QJ763-9V
Basic Service	QJ762-8D QJ762-8H QJ762-8M QJ762-8Q QJ762-8T QJ762-8V	QJ763-8D QJ763-8H QJ763-8M QJ763-8Q QJ763-8T QJ763-8V
Self-Maintenance Service	QJ762-3D QJ762-3H QJ762-3M QJ762-3Q QJ762-3T QJ762-3V	QJ763-3D QJ763-3H QJ76303M QJ763-3Q QJ763-3T QJ763-3V