digital

Software Product Description

PRODUCT NAME: DECnet-11D, Version 2.0 **SPD 10.70.5**

DESCRIPTION:

DECnet-11D, Version 2.0, allows a suitably configured RSX-11D system to participate as a Phase II DECnet node in point-to-point computer networks. DECnet-11D offers task-to-task communications, network file transfer and network resource-sharing capabilities, using the DIGITAL Network Architecture (DNA) protocols. DECnet-11D communicates with adjacent nodes over synchronous and asynchronous communication lines, and parallel interfaces. Access to DECnet-11D is supported for RSX-11D user programs written in MACRO-11 and FORTRAN.

DECnet-11D is a Phase II network product and is warranteed for use only with Phase II DECnet products supplied by DIGITAL.

The functionality available to an RSX-11D user depends, 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-11D nodes have the full functionality described in this SPD. Networks that mix DECnet-11D nodes with other DECnet products may limit the functions available to the DECnet-11D user because some DECnet-11D features may not be supported by all DECnet products.

The Phase II products and functions available to users on mixed networks can be determined by comparison of the SPDs for the component products. An overview of DECnet and common functionality available with mixed networks can be obtained from the General Phase II DECnet SPD (10.78).

Task-to-Task Communication

Using DECnet-11D, a RSX-11D user program written in MACRO-11 or FORTRAN can exchange messages with other user programs using Phase II DECnet DNA protocols. The two user programs can be on the same or adjacent DECnet nodes. (Adjacent nodes control opposite ends of a point-to-point communication line.) If on adjacent nodes, the second node can be any Phase II DECnet System that supports synchronous communication lines or parallel interfaces.

The DECnet messages sent and received by the two user programs can be in any data format. A compatible non-priviliged user interface is provided for DECnet-11D Version 1 programs.

Network File Transfer Utilities

Using DECnet-11D utilities, a user can transfer sequential ASCII files between Phase II DECnet nodes. Files can be transferred in both directions between locally supported RSX-11D File Control System (FCS) devices and the file system of an adjacent DECnet node.

The DECnet-11D file transfer utilities support sequential file transfers for File Control System (FCS) supported devices under Files-11.

In addition, other types of files may be transferred where formats between the Phase II DECnet nodes are compatible.

Additional facilities allow system command files to be submitted to a remote node where the list of commands must be in the format expected by the node responsible for the execution. Also, DECnet-11D allows system command files to be received from other systems and executed.

DECnet-11D does not support network file spooling. A user can only request one file transfer at a time, and only single files can be transferred with each command. Wild carding is not permitted nor are directory listing commands implemented.

Network Resource Access:

File Access

File access is supported to and from remote DECnet systems by explicit subroutine calls in FORTRAN and MACRO tasks.

READ, WRITE, OPEN and CLOSE, and DELETE operations can be initiated by local FORTRAN and MACRO tasks for sequential files residing at remote DECnet systems. Other nodes supporting File Access can exercise this capability for files located on the RSX-11D node. Fixed and variable length record formats are supported. Further, files accessed remotely can contain either ASCII or binary information.

Down-Line System Loading

Initial memory images for DECnet-11S nodes in the network can be stored on RSX-11D file system devices and loaded into adjacent nodes. Load requests can come from the local RSX-11D operator or from the remote node. Initial memory images for DECnet-11S systems to be down-line loaded can be generated on a RSX-11D system.

Down-Line Task Loading

Programs to be executed on DECnet-11S nodes in the network can be stored on the DECnet-11D system and loaded on request into adjacent nodes. In addi-

tion, programs already executing on the adjacent node may be checkpointed to the local file system and later restored to main memory of the DECnet-11S node. This and the preceding feature simplify the operation of network systems which do not have mass storage devices, by allowing such systems to use remote mass storage devices in a convenient and straightforward manner.

Network Control Program

The Network Control Program (NCP) performs three primary types of functions: displaying statistics, controling network components, and testing network components.

Using the DECnet-11D NCP utility, a operator can display the status of DECnet activity at the local node. The user may choose to display statistics related to both node and communication lines, including data on traffic and errors. Output can be directed to the terminal or to a report file.

Using the DECnet-11D NCP utility, the local console operator can also perform many network control functions such as loading and unloading DECnet components, starting and stopping lines, activating the local node, and down-line loading DECnet-11S systems.

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

Terminal Communication Utility

The DECnet-11D TLK utility allows a user at a DECnet-11D node to send messages to adjacent DECnet nodes that support the same feature. Messages can be directed to a specific terminal or to the operator's console at the destination node. TLK dialogue mode allows users on the two systems to type messages to one another.

Communications

DECnet-11D Version 2.0 supports the DIGITAL Data Communications Message Protocol (DDCMP) Version 4.0 for full- or half-duplex transmission in point-to-point operation using serial synchronous or asynchronous facilities. DDCMP provides error detection/correction and physical link management facilities. Parallel facilities are also supported in point-to-point operations.

The minimum number of point-to-point links that can be supported by a RSX-11D node is one and the maximum is sixteen (this is based on CPU, type of communications interface and speed of interfaces). Only one physical link may connect any pair of nodes.

DECnet-11D Operation

DECnet-11D is implemented as a device handler under RSX-11D with DIGITAL-supplied user-level tasks and subroutines. Minimum memory residency requirements for one driver and network code are 10K words, and at least 1K words for temporary data storage. Consequently, the user should plan to dedicate at least 11K words of memory storage to network control functions. Additional memory will be required for user written network tasks and any DECnet utility functions to be invoked (file transfer, network, control, down-line loading, etc.). The additional memory required for the DECnet-11D Version 1 compatible interface is approximately 1.5K words.

DECnet-11D Configuration

The process of configuring a DECnet-11D node is based primarily on trade-offs of cost, performance, 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 peculiar to that node ("local" conditions). Thus, node performance depends on many factors, including:

- CPU power
- number of device interrupts per unit time
- communication line characteristics
- number and size of buffers
- message size and frequency
- "local" applications

It is important to note that the rate at which user data may be shipped ("throughput") over a communications line may sometimes approach, but will never equal or exceed, the actual line speed; the same may be said for multiple lines as well. The reason, simply stated, is that the actual throughput is a function of many factors, including application(s), network topology, protocol overhead, and the factors cited at the beginning of this section.

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

- The DMC11 is a direct memory access (DMA) device. Also the DDCMP line protocol is executed in microcode by the DMC11 communication controller, thus off-loading the PDP-11 CPU. Thus, the only DECnet load the processor sees is completed incoming and outgoing messages.
- Devices such as the DQ11 and DV11 are DMA devices. Since DDCMP is in the PDP-11 software, CPU cycles are required for DDCMP line protocol processing.
- With character interrupt devices such as the DUP11, CPU cycles are required not only for the DDCMP processing, but also for each character sent and received.

The following table shows the various communications devices, by category and the maximum line speed of each.

DECnet-11D DEVICE GROUPS

Device Group	Maximum Line Speed/ Kilobits/sec
Character Iterrupt	
DP11,	9.6
DL11	9.6
DU11	9.6
DUP11	9.6
DZ11	9.6
DMA	
DQ11-DA	9.6
DV11	9.6
KMC11 (DUP11)	9.6
KMC11 (DZ11)	9.6
DMC11	
DMC11-AR, -DA	19.2
DMC11-AL, -MD	56.0
DMC11-AL, -MA	1000.0

These tables describe the physical hardware configurations supported by DECnet-11D in terms of CPU class and communication interface device group. It should be noted that the attachment of such devices as A/D converters and timesharing terminals may reduce the maximum number of communication lines which can effectively be supported.

NOTE:

In the tables given below the rated bandwidth is stated for a single device type. The maximum bandwidth for an intermix of device types cannot be calculated from these tables.

Maximum Line Configurations On 11/34-11/60 CPUs

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	8	14.4	FDX
Interrupt	8	28.8	HDX
DMA	8	28.8	FDX
	8	57.6	HDX
DMC11-AR, -DA	16	307.2	FDX, HDX
DMC11-AL, -MD	6	336.0	FDX, HDX
DMC11-AL, -MA	2	2000.0	FDX, HDX

Maximum Line Configurations On 11/70 CPUs

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	8	19.2	FDX
Interrupt	8	38.4	HDX
DMA	16	38.4	FDX
	16	76.8	HDX
DMC11-AR, -DA	16	307.2	FDX, HDX
DMC11-AL, -MD	6	336.0	FDX, HDX
DMC11-AL, -MA	1	1000.0	FDX, HDX

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. In the preceding tables, the columns have the following meanings:

Maximum Number of Lines

The largest number of physical lines which can be attached and driven by the DECnet-11D system.

Maximum Device Bandwidth

The maximum total number of bits per second which can be handled by a CPU when all communication devices of a single given type, such as character interrupt, are added together. For example, DECnet-11D on a PDP-11/45 can accommodate three full duplex character-interrupt device at 4.8KB lines or six at 2.4KB. Maximum device bandwidth should be calculated for all lines known to operate concurrently.

Maximum Line Speed

The fastest clock rate at which the device can be driven under DECnet-11D. This means that even if specific devices have the ability to operate at a maximum rate, they must be configured subject to the "maximum device bandwidth" restriction above.

Mode

This indicates whether the line is operating in either half-duplex (a single-bit stream) or full-duplex (two concurrent bit streams) mode. In some instances in

the tables, a half-duplex line is quoted as having maximum bandwidth approximately double that of the comparable full-duplex line. This reflects the single bit stream character of half-duplex lines, and the fact that two of them place a load on the CPU roughly equivalent to one full-duplex line with traffic in both directions.

MINIMUM HARDWARE REQUIRED:

Any valid RSX-11D system configuration with:

- a minimum of 11K words additional available memory for the DECnet-11M software and data storage.
- PDP-11/34 through PDP-11/70 central processor with one or more of the following communications devices:
  - DP11-DA low speed synchronous interface
  - DU11-DA low speed synchronous interface
  - DUP11-DA low speed synchronous interface
  - DQ11-DA NPR synchronous interface
  - DMC11-AR-DA high speed synchronous EIA interface
  - DMC11-AL-MD high speed local synchronous interface
  - DMC11-AL-MA high speed local synchronous interface
  - DL11-E asynchronous interface with modem control
  - DL11-C asynchronous interface, 20mA current loop (1)
  - DL11-WA asynchronous interface, 20mA current loop (1)
  - DZ11-A, B multi-line asynchronous interface for EIA interfaces (2)
  - DZ11-C, D multi-line asynchronous interface, 20mA current loop (1, 2)
  - DA11-B UNIBUS link, local cable
  - DA11-AL UNIBUS link, long cable

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

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

OPTIONAL HARDWARE:

- KG11-A Communications Arithmetic Element (may be used in conjunction with DP11, DU11, DQ11-DA, DZ11, DL11)
- KMC11-A (may be used in conjuction with up to 8 DUP11s or with up to a 16-line DZ11)
- H319 optical isolator
- DV11-AA/AB multi-line NPR synchronous interface (1)

  NOTE: (1) All lines on this interface must be dedicated as DECnet links.

PREREQUISITE SOFTWARE:

RSX-11D operating system, Version 6.2

OPTIONAL SOFTWARE:

None

TRAINING CREDITS:

None

SUPPORT CATEGORY:

A — Software Support will be provided as stated in the Software Support Categories Addendum to this SPD.

Installation under Category A support will convert the RSX-11D system into a node with connection potential to a DECnet Phase II network. This installation does not include a demonstration of network connection.

The Customer may purchase DECnet-11D licenses with options that do not include support services. The category of support applicable to such software is Category C. When a DECnet-11D product option that does not include support services is connected to a DECnet network, the category of support applicable to all DECnet products in that network is Category C.

CUSTOMER RESPONSIBILITIES:

Before installation of the Software, the Customer must:

1. Install or have installed all hardware, including terminals, to be used on the system.
2. Make available to DIGITAL personnel all hardware, including terminals, to be used during installation for a reasonable period of time each day, as mutually agreed upon by DIGITAL and the Customer, until installation is complete.

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

PREREQUISITE SUPPORT:

A Network Profile and DECnet Customer Support Plan are required to be jointly prepared by the customer and DIGITAL covering all intended network nodes and their support.

UPDATE POLICY:

Software Updates, if any, released by DIGITAL during the one (1) year period following installation, will be provided to the customer for a media charge (includes no installation). After the first year, updates, if any, will be made available according to then prevailing DIGITAL policies.

ORDERING INFORMATION:

All binary licensed software, including any subsequent updates, 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 the DIGITAL copyright notice and any DIGITAL proprietary notices on the software) only for use on such CPU. All source licensed software is furnished only under the terms and conditions of a separate Software Program Sources Agreement between Purchaser and DIGITAL.

Standard options with no support services are only available after the purchase of one supported license. When a software license is ordered without support services, the category of support applicable to such software is Category C.

A single-use license only option is a license to copy the software previously obtained under license, and use such software in accordance with DIGITAL's Standard Terms and Conditions of Sale. The category of support applicable to such copied software is Category C.

Source and/or listing options are only available after the purchase of at least one binary license and after a source license agreement is in effect.

The following key (D, E, F, R, T, Z) represents the distribution media for the product and must be specified at the end of the order number, e.g., QP680-AD = binaries on 9-track magnetic tape.

D = 9-track Magnetic Tape
E = RK05 Disk Cartridge
F = 7-track Magnetic Tape
R = Microfiche
T = RK06 Disk Cartridge
Z = No hardware dependency

Standard Options

QP680 -A— Single-use license, binaries, documentation, support services (media: D, E, F, T)

QP680 -C— Single-use license, binaries, documentation, no support services (media: D, E, F, T)

QP680 -D— Single-use license only, no binaries, no documentation, no support services (media: Z)

Update Options

Users of DECnet-11D Version 1.1 whose specified Support Category warranty has expired may order under license the following software update at the then current charge for such update. The update is distributed in binary or source form on the appropriate medium and includes no installation or other services unless specifically stated otherwise.

QP680 -H— Binaries, documentation (media: D, E, F, T)

QP680 -N— Sources update (media: D, E, F, T)

Users of DECnet-11D Version 1.1 whose specified Support Category warranty has not expired may order under license the following software update for the then current media charge. The update is distributed in binary or source form on the appropriate medium and includes no installation or other services unless specifically stated otherwise.

QP680 -W— Binaries, documentation (media: D, E, F, T)

QP680 -L— Source update (media: D, E, F, T)

Source/Listing Options

QP680 -E— All sources (media: D, E, F, T)

QP680 -F— Listings (media: R)

Miscellaneous Options

QP680 -G— Pre-delivery kit (media: Z)

ADDITIONAL SERVICES:

QS680 -S— DECnet Level I Services (media: Z)

Level II services are also available. Consult the DECnet Phase II Products SPD (10.78) for a description of Level I and Level II services.