

# **digital**

# Software Product Description

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**PRODUCT NAME: DECnet-11S, Version 2.0**

**SPD 10.74.5**

## **DESCRIPTION:**

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

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

The functionality available to an RSX-11S 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-11S nodes have the full functionality described in this SPD. Networks that mix DECnet-11S nodes with other DECnet products may limit the functions available to the DECnet-11S user because some DECnet-11S 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-11S, a RSX-11S 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 or asynchronous 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-privileged user interface is provided for DECnet-11S Version 1 programs.

### *Network File Transfer Utilities*

Using DECnet-11S utilities, a user can transfer se-

quential ASCII files between a Phase II DECnet nodes. Files can be transferred in both directions between locally supported RSX-11S File Control System (FCS) device and the file system of an adjacent DECnet node.

The DECnet-11M file transfer utilities support sequential file transfers for FCS and supported devices.

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.

### *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-11S 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-11M, RSX-11D, and IAS file system devices and loaded into RSX-11S nodes. DECnet-11S systems can be generated under RSX-11M or RSX-11D (Down-line system loading requires the use of an appropriate bootstrap loader; see OPTIONAL HARDWARE below.)

#### *Down-Line Task Loading*

Programs to be executed on DECnet-11S nodes in the network can be stored on remote RSX-11M, RSX-11D and IAS file system devices, and loaded on request into memory partitions of DECnet-11S systems in response to programmed or operator requests in the DECnet-11S system. These images may be generated on a RSX-11M or RSX-11D system.

#### *Network Control Program*

The Network Control Program (NCP) under DECnet-11S allows the displaying of statistics and the starting of communications lines.

Using the DECnet-11S NCP utility, an 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.

*Terminal Communication Utility*

The DECnet-11S TLK utility allows a user at a DECnet-11M 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-11S Version 2.0 supports the DIGITAL Data Communications Message Protocol (DDCMP) 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. Auto-answer capability is also supported.

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

*DECnet-11S Operation*

DECnet-11S is implemented as an Ancillary Control Processor (ACP) under RSX-11S with DIGITAL-supplied executive-level components, user-level tasks and subroutines. Minimum memory residency requirements for one driver and network code are 10K words, and at least 1.5K 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-11S Version 1 compatible interface is approximately 1.5K words.

*DECnet-11S Configuration*

The process of configuring a DECnet-11S 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.

- With character interrupt devices such as the DUP11, CPU cycles are required for not only the DDCMP processing, but also for each character sent and received. CPU cycles are necessary for DDCMP processing as well as each character received or sent within the message.
- 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.
- 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.

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

<b>DECnet-11S DEVICE GROUPS</b>	
Device Group	Maximum Line Speed/Kilobits/sec
<b>Character Interrupt</b>	
DP11	9.6
DL11	9.6
DU11	9.6
DUP11	9.6
DZ11	9.6
DUV11 *	9.6
DLV11-E *	9.6

**DMA**

DQ11-DA	
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

\* only supported on 11/03

These tables describe the physical hardware configurations supported by DECnet-11S 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.

**DECnet-11S  
Maximum Line Configurations On 11/03 CPUs**

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	2	9.6	FDX
Interrupt	2	9.6	HDX

**DECnet-11S  
Maximum Line Configurations On 11/04-11/20 CPUs**

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	2	9.6	FDX
Interrupt	2	19.2	HDX
DMA	8	9.6	FDX

DMC11-AR, -DA	4	153.6	FDX, HDX
DMC11-AL, -MD	4	224.0	FDX, HDX
DMC11-AL, -MA	2	2000.0	FDX, HDX

**DECnet-11S  
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

**DECnet-11S  
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-11S 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-11S for a PDP-11/10 can accommodate one full duplex character-interrupt device at 9.6KB, or two at 4.8KB, or four 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-11S. 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 a 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-11S system configuration with:

- minimum of 11K words additional available memory for the DECnet-11S software and data storage.
- PDP-11/04 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 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
- PDP-11/03 central processor with one or more of the following communications devices:
  - DUV11-DA low speed synchronous interface
  - DLV11-E asynchronous interface with modem control

#### 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.

#### OPTIONAL HARDWARE:

- Additional lines and/or communications interfaces (from above) up to maximum as defined in Maximum Line Configurations tables.

- DV11-AA/AB multiline NPS synchronous interface (3)
- KG11-A Communications Arithmetic Element (may be used in conjunction with DP11, DU11, DQ11-DA, DZ11, DL11)
- KMC11-A (may be used in conjunction with up to 8 DUP11s or with up to a 16-line DZ11)
- BM873-YC Network bootstrap for DU11 (1,2)
- BM873-SH Network bootstrap for DL11-E (CSS hardware) (1,2)
- BM873-SE Network bootstrap for DQ11 (CSS hardware) (1,2)
- BM873-SF Network bootstrap for DA11-B (CSS hardware) (1,2)
- M9301-YJ Network bootstrap for DMC11 (1)
- M9301-YE Network bootstrap for DU11, DUP11, DL11-E (1)
- BDV11-AA Network bootstrap for DUV11-DA, DLV11-E (1)
  1. not supported on the 11/70
  2. not supported on the 11/04 or 11/34
  3. All lines on this interface must be dedicated as DECnet links.

#### PREREQUISITE SOFTWARE:

RSX-11S operating system, Version 2.1

#### 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-11S 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-11S licenses with options that do not include support services. The category of support applicable to such software is Category C. When a DECnet-11S 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 covering all intended network nodes and their support must be prepared jointly by DIGITAL and the Customer.

**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, R, T, Z) represents the distribution media for the product and must be specified at the end of the order number, e.g., QJ691-AD = binaries on 9-track magnetic tape.

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

*Standard Options*

- QJ691 -A— Single-use license, binaries, documentation, support services (media: D, E, T)
- QJ691 -C— Single-use license, binaries, documentation, no support services (media: D, E, T)
- QJ691 -D— Single-use license only, no binaries, no documentation, no support services (media: Z)

*Update Options*

Users of DECnet-11S Version 1.2 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 form on the appropriate medium and includes no installation or other services unless specifically stated otherwise.

QJ691 -H— Binaries, documentation (media: D, E, T)

QJ681 -N— Sources update (media: D, E, T)

Users of DECnet-11S Version 1.2 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.

QJ691 -W— Binaries, documentation (media: D, E, T)

QJ681 -L— Source Update (media: D, E, T)

*Source/Listing Options*

QJ681 -E— All sources (media: D, E, T)

QJ691 -F— Listings (media: R)

*Miscellaneous Options*

QJ691 -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.

ADDENDUM  
SOFTWARE SUPPORT CATEGORIES

Each software product (hereinafter 'SOFTWARE') with a designated Support Category A or B in the applicable Software Product Description (SPD) existing at the time of order will be the current release at the time of delivery and will conform to the SPD. DIGITAL's sole obligation shall be to correct defects (nonconformance of the SOFTWARE to the SPD) as described below. Any SOFTWARE with a designated Support Category C will be furnished on an 'as is' basis.

For SOFTWARE with a designated Support Category A or B, DIGITAL will provide the services set forth below without additional charge.

CATEGORY A

1. Upon notification by customer to the nearest DIGITAL office that the computer system, including all required prerequisite hardware and software, is ready for the installation of the SOFTWARE, DIGITAL will install such SOFTWARE in any location within the contiguous forty-eight (48) United States, the District of Columbia, or a country in which DIGITAL or a subsidiary of DIGITAL has a software service facility. The notification must be received by DIGITAL and the system must be ready for installation within thirty (30) days after the delivery of the SOFTWARE to customer or DIGITAL will have no obligation to install. Installation will consist of: (1) verification that all components of the SOFTWARE have been received by customer, (2) loading the SOFTWARE, and (3) executing a DIGITAL sample procedure.
2. During the ninety (90) day period after installation, if the customer encounters a problem with the current unaltered release of the SOFTWARE which DIGITAL determines to be a defect in the SOFTWARE, DIGITAL will provide the following remedial service (on site where necessary): (1) if the SOFTWARE is inoperable, apply a temporary correction (TC) or make a reasonable attempt to develop an emergency by-pass, and (2) assist the customer to prepare a Software Performance Report (SPR) and submit it to DIGITAL.
3. During the one (1) year period following installation, if the customer encounters a problem with the SOFTWARE which his diagnosis indicates is caused by a SOFTWARE defect, the customer may submit an SPR to DIGITAL. DIGITAL will respond to problems reported in SPRs which are caused by defects in the current unaltered release of the SOFTWARE via the Maintenance Periodical for the SOFTWARE, which reports SPRs received, code corrections, temporary corrections, generally useful emergency by-passes and/or notice of the availability of corrected code. Software Updates, if any, released by DIGITAL during the one (1) year period, will be provided to the customer on DIGITAL's standard distribution media as specified in the applicable SPD. The customer will be charged only for the media on which such updates are provided, unless otherwise stated in the applicable SPD, at DIGITAL's then current media prices.

CATEGORY B

During the one (1) year period following delivery, the services provided to the customer will be the same as set forth in 3 above.

CATEGORY C

SOFTWARE is provided on an 'as is' basis. Any software services, if available, will be provided at the then current charges.

DIGITAL shall have the right to make additional charges for any additional effort required to provide services resulting from customer use of other than current unaltered release of the SOFTWARE operated in accordance with the SPD.