digital

Software Product Description

PRODUCT NAME: DECNET/8, Version 1, RTS/8 Network Software **SPD 6.1.1**

All references to DECNET/8 in this Software Product Description are to DECNET/8, Version 1.

SECTION A: DECNET/8 SPECIFIC INFORMATION

DESCRIPTION:

DECNET/8 extends the capabilities of the RTS/8 operating system by enabling RTS/8 to be interconnected with other DECNET/8 Systems running in a DECNET/8 environment. DECNET/8 can be used as a component of distributed networks, resource sharing networks and communications networks. The DECNET/8 implementation of Digital Network Architecture (DNA) allows the following functions to be performed:

- Tasks running in the RTS/8 environment can exchange data with other tasks executing under DECNET/8 on the same or other processors in the network.
- Tasks written in PAL8 can request the execution of programs in other systems in the network and can cause programs executing in remote systems to be terminated.
- The local operator can request that a description of current network status, including connected nodes and their state, be printed at a local terminal.
- The local operator can exchange messages with operators at remote terminals in the network.

In order to support these functions, DECNET/8 conforms to the current protocols which collectively define Digital Network Architecture (DNA). The features of the DNA which are implemented in DECNET/8 include:

- Support of the Digital Data Communications Message Protocol (DDCMP) for full and half duplex transmissions in point-to-point mode only, using synchronous, asynchronous and parallel facilities. DDCMP provides error detection/correction and line management facilities.

- Support of the Network Services Protocol (NSP) for point-to-point network connections. NSP allows tasks on DECNET systems to establish logical communications channels between themselves on a dynamic basis, and to transfer variable-sized messages on a requested or non-requested, that is interrupt, basis using these logical channels. Requested messages are limited to 192 bytes maximum; interrupt messages are limited to 16 bytes in length maximum. NSP multiplexes data through physical links on a message basis, thus allowing many logical channels to share a single physical link.

NOTE: Some changes to these protocols may occur and future releases of DECNET/8 may not be fully compatible with DECNET/8, Version 1.

DECNET/8 is implemented as a series of tasks and subroutines operating under RTS/8 in conjunction with communications device drivers included in the RTS/8 system. Permanent memory residency requirements are approximately 5K words for network code, plus 1K words for each line (including buffer and Interrupt Service Routine) to effectively handle the maximum NSP data message, plus an additional minimum 4K words required for the RTS/8 operating system. The utility routines which support many DECNET functions, together with low priority user tasks, can be stored on the system device and swapped into user-program partitions to be executed as required.

THROUGHPUT:

The throughput of DECNET/8 is a function of many variables, especially the communications interfaces used and the other activities executing concurrently in the RTS/8 environment.

The table below describes the maximum throughput of DECNET/8 when used with various communications devices. The columns have the following meanings:

Number of lines: The largest practical number of lines that can be driven by the DECNET/8 system, independent of the various throughput considerations given at maximum speed.

Maximum line speed: The fastest clock rate at which the device can be driven under DECNET/8.

Steady state throughput per line: The actual data rate, as measured by the user program, for a line running at the maximum line speed indicated above. This measured value obtained under double buffering with Software CRC Computation.

Aggregate line speed: The total permissible bandwidth of all communications devices of this type on the DECNET System. Aggregate line speed should be calculated for all lines known to operate concurrently.

Maximum aggregate throughput: The total data throughput, as measured by the user programs, of all lines on the DECNET/8 System, assuming each is to be operated at its maximum line speed, obtained under same conditions as Steady State Throughput.

Mode: This reflects the use of the line in either a half-duplex (i.e. one bit stream) or full-duplex (i.e. two concurrent bit streams) mode. The FDX Steady State figures indicate data throughput in one direction only.

Each row of the table indicates the maximum loading of the DECNET/8 system with communications related tasks operating at the highest software priorities.

NOTE:

Data Format: All network data manipulated by DDCMP and NSP consists of 8 bit bytes stored one per 12 bit PDP-8 Word.

DECNET/8 PERFORMANCE

	No. of Lines	Max. Line Speed FXD	Steady State Throughput Per Line One Direction	Aggregate Line Speed	Maximum Aggregate Throughput	Mode	%CPU Usage (For Max. Aggregate)
Processor: 8A, 8E							
Single line ASYNCH (KL8-JA, KL8-M)	4	9.6	5.9 5.9	38.4 38.4	24 22	FDX HDX	95% 90%
Multi Line ASYNCH (KL8-A)	4	9.6	5.9 5.9	38.4 38.4	24 22	FDX HDX	95% 90%
Single Line SYNCH (DP8-E)	4	9.6	5.9 5.9	38.4 38.4	24 22	FDX HDX	95% 90%
Parallel (DKC8-AA)	1	30*	20.0	30	20	FDX	85%

* Approximate.

NOTE: These figures were obtained with Software CRC Double Buffering and Maximum Message length. Throughput performance can be enhanced by approximately 20% using KG8-E hardware. Rates are given in K-bits per second.

MINIMUM HARDWARE REQUIRED:

Any valid RTS/8 System configuration with:

- 8K words additional memory
- one or more of the following communications devices:

  KL8-JA Asynchronous Serial Line Interface
  DKC8-AA I/O Option Board (Serial or Parallel Support)
  KL8-A Four Channel Asynchronous Serial Line Interface
  KL8-JA with KL8-M Modem Control
  DP8-E Synchronous Serial Line Interface

OPTIONAL HARDWARE SUPPORTED:

Additional communications devices from above (except DKC8-AA) up to a recommended maximum of 4 KL8-JA's or 2 KL8-A's or 4 DP8-E's
KG8-E Communications Arithmetic Element

Note: KG8-E is strongly recommended where Line Throughput is an important consideration.

PREREQUISITE SOFTWARE:

RTS/8 Operating System Version 2B or later

OPTIONAL SOFTWARE SUPPORTED:

None

TRAINING CREDITS:

None

SUPPORT CATEGORY:

B — Software Support will be provided as listed in the Software Support Categories Addendum to this SPD.

PREREQUISITE SUPPORT:

The customer is required to purchase installation services at each facility where DECNET/8 will be used. If additional DECNET/8 systems are present at the same facility, additional installation services may be purchased at the customer's option. The customer can purchase DECNET/8 licenses with NO services if an OEM Agreement or End-User Waiver of Support Agreement is in effect. The inclusion of any DECNET/8 software with a Category C classification causes the support classification for all DECNET software in the network to revert to Category C.

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. After the first year, updates, if any, will be made available according to then prevailing DIGITAL policies.

ORDERING INFORMATION:

This software is furnished under a license for use on a single CPU and can be copied and modified (with inclusion of DIGITAL's copyright notice) only for use on such CPU, except as may otherwise be provided in writing by DIGITAL.

Source and/or listing options are only available after a source license agreement is in effect.

The following key (C, R, Y) represents the distribution media for the product and must be specified at the end of the "Q" number, i.e., QF680-XY = sources on floppy disk.

C = DECtape
R = Microfiche
Y = Floppy Disk

Standard Options

QF680 -X— Single-use license, source license, sources, support services (media: C, Y)

Source/Listing Options

QF680 -F— Listings (media: R)

ADDITIONAL SERVICES:

None

SECTION B: DECNET GENERAL DESCRIPTION

DECNET is the collective name for the set of software products that extend various DIGITAL operating systems by enabling the user to interconnect these systems with each other to form computer networks. The DECNET user can configure a variety of networks, satisfying a variety of constraints, by choosing the appropriate CPU's, line interfaces (and speeds) and operating system software.

In order to satisfy these widely varying constraints, DECNET allows the user to build networks from a range of systems and communications components. DECNET allows users to interconnect systems using serial asynchronous, serial synchronous, and parallel facilities.[1] When configuring DECNET systems, it is important to remember that both ends of any given link must use the same type of communications discipline (e.g., synchronous, asynchronous or parallel) running at the same line speed.

DIGITAL Network Architecture

DECNET includes a set of network protocols, each of which is designed to fulfill specific functions within the network. Collectively, these protocols are known as the DIGITAL Network Architecture, or DNA. The major protocols, and their functions, are:

DIGITAL Data Communications Message Protocol (DDCMP): DDCMP handles the link traffic control and error recovery within DECNET. DDCMP operates over full and half duplex facilities, using synchronous, asynchronous and parallel facilities in a point-to-point and multidrop (polled) mode.[2] DDCMP has the following important characteristics:

- Operates over a wide variety of hardware types.
- Fully uses full duplex channel capacity.
- Allows transmission of all data types (including binary) with low overhead.
- Operates with conventional (e.g., character-oriented) communications hardware.
- Uses CRC-16 for error detection, with correction by retransmission.
- Effective on earth/satellite links (or other links) with long signal propagation delays.

A full specification for DDCMP is available on request. DIGITAL does not regard DDCMP as a proprietary protocol, and allows others to implement and use the protocol, providing they acknowledge its use in their public documentation.

[1] Not all DECNET systems support all three modes of interconnection.

[2] Not all DECNET systems support all DDCMP modes of operation.

Network Services Protocol (NSP). NSP handles network management functions within DECNET, including the routing of messages between systems, and the routing of messages within any given system. NSP makes it possible for two programs on different machines to establish a logical communications channel (or link) between themselves, and to exchange data using this link. These programs need not be aware of either the nature of the link (full/half duplex; parallel or serial) or the nature of the protocols supporting the link. NSP has the following important characterstics:[3]

- Dynamic creation of logical links between tasks.
- Exchange of data between tasks on a solicited basis.
- Exchange of data between tasks on a non-solicited (e.g., interrupt) basis.
- Route-through of message traffic within the network (e.g., two nodes can communicate through intermediate nodes which reroute messages to their ultimate destination).
- Dynamic management of network topology (e.g., each node in the network is kept informed on the current state of various other nodes and links in the network).

A full specification for the Network Services Protocol is available on request. NSP is not a proprietary protocol.

Data Access Protocol (DAP): The Data Access Protocol enables programs on one node of the network to use the I/O services available on other network nodes. Each operating system in DECNET provides facilities for translating its own unique I/O calls into the DAP standard, and vice versa. Thus, DAP enables data requests to be processed in a meaningful way by many (possibly heterogenous) operating systems. DAP's facilities include:[4]

- Remote file access, including OPEN, READ, WRITE, CLOSE and DELETE for sequential and random access files.
- Remote device access for unit record devices.
- Virtual terminal support (e.g., allowing an interactive terminal physically connected to one system in the network to operate (logically) as if it were connected to another system in the network).

[3] Not all DECNET systems support all NSP features.

[4] Not all DECNET systems support DAP.

It should be noted that each DAP function requires support at both ends of the network. At the local node, where the user program initiates a data request, the DAP support must package the request for transmission through the network. At the remote node (where the device or file resides), the DAP support must cause the appropriate actions to be performed. Not all systems support both local and remote portions of each DAP operation.

A full specification for the Data Access Protocol is available on request. DAP is not a proprietary protocol.

DECNET Functions

Digital Network Architecture, implemented across a wide range of operating systems and hardware configurations, enables users to build a variety of networks. Such networks have some common attributes, and individual systems in the network may have certain system-specific attributes. The common attributes include:

- Inter-program communication: Programs on one system can create logical channels and exchange data with programs on other systems in a real-time fashion.
- Inter-system resource sharing: Programs on one system can use files and devices physically attached to other systems in the network.

Additionally, many DECNET systems support other features which are useful in network environment. These include:

- Down-line System Loading: Initial memory images for other systems in the network can be stored on the local system, and loaded on request into other systems in the network. The remote systems usually require the use of a network bootstrap loader, implemented in read-only memory.
- Down-line Program Loading: Programs to be executed on other systems in the network can be stored on the local system, and loaded on request into other systems, under the joint control of the operating systems at both ends of the network. 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.
- Inter-system File Transfer: This facility allows an entire data file to be moved between systems, at either program or operator request.
- Cross-system Support: This facility allows program development activities to be performed on a system different than the one where the programs will be executed.
- High-level Language Interface: This facility allows programs written in compiler languages (e.g., FORTRAN, COBOL, BASIC) to access some or all of the network facilities.

Configuring DECNET Networks:

DECNET provides, as far as possible, a general interconnection mechanism between specific products, limited only by the technology and cost considerations which constrain each individual member of DECNET. These latter constraints make totally general interconnectability impractical. The reader should consult the individual product SPD's to determine whether any particular configuration violates the throughput guidelines for the individual product.

TRAINING CREDITS:

No training credits are included in DECNET Software License charges. Training courses on DECNET software are scheduled at regular intervals in DIGITAL Training Centers. Arrangements should be made directly with DIGITAL's Educational Services Department.

SUPPORT CATEGORY:

The support categories for the various DECNET software products are described in the individual SPD's.

UPDATE POLICY:

The update policies for the various DECNET products are described in the individual SPD's.

ORDERING INFORMATION:

This software is furnished under a license for use on a single CPU and can be copied and modified (with inclusion of DIGITAL's copyright notice) only for use on such CPU, except as may otherwise be provided in writing by DIGITAL.

When multiple systems are connected in a single network, then each individual system must be licensed separately with regard to both operating system and DECNET software.

ADDITIONAL SERVICES:

The following additional services are offered to enable users to gain the maximum benefit from their DECNET software.

Installation Service: The installation shall consist of:

- Verifying that the software kit contains all software modules and manuals offered.
- Generating the DECNET software.
- Demonstrating the use of the majority of operator commands and system utilities.
- Running a sample DIGITAL-supplied program.
- Introducing the customer to the sources of DIGITAL software information and services.
- Prior to and during installation of the software, the customer has the following responsibilites:
  1. Obtain, install and demonstrate as operational any modems, lines and other equipment and facilities necessary to interface to DIGITAL's communications interfaces and terminals.
  2. Have previously installed all hardware, including terminals, to be used on the system.
  3. Make available to all DIGITAL personnel all hardware, including communications facilities and terminals, for a reasonable period of time as mutually agreed upon by DIGITAL and the customer, that is to be used during installation.

Additional services are described in the individual SPD's as appropriate.