

# Software Product Description

PRODUCT NAME: HSC Software, Version 6.5

SPD 30.52.07

## DESCRIPTION

HSC Software is the software component of a special-purpose hardware/software set that makes up a Hierarchical Storage Controller (HSC) and associated options. The HSC is an intelligent mass-storage server, interfacing one or more host computer systems to a set of mass-storage devices. HSC Software is the software executed within the I/O Control Processor and certain other peripheral processors of the HSC. The four hardware models utilizing HSC Software Version 6.5 are the HSC40, HSC70, HSC60, and HSC90. HSC Software Version 6.5 does NOT operate on the HSC50. HSC Software Version 6.0 and above is required to utilize the HSC Cache Option.

The HSC is an intelligent subsystem. Together with the devices it controls, it is seen by the host computers as a single high-level entity. The host computers send high-level I/O requests to the HSC subsystem and delegate to the subsystem the responsibility for all low-level operations required to implement the high-level requests. Internally, the HSC subsystem utilizes programmed processors to direct and to perform its detailed I/O operations.

## Features

The HSC arranges its software by function. Major portions of the software include: the Disk Server, which services all I/O requests for disk units; the Tape Server, which services all I/O requests for tape units; the Cache Server, which performs cache lookup and update functions; and the DUP (Diagnostics/Utilities Protocol) Server, which services the host-to-utility connection.

### *Multiple Host Connections*

The HSC attaches to host computer systems through the Computer Interconnect (CI). The HSC supports connection to the maximum number of CI nodes in any valid VAXcluster configuration.

The HSC also supports connections within valid VAX System V or ULTRIX configurations.

## *Supported Device Types*

The HSC connects to mass-storage devices from Digital Equipment Corporation's family of Standard Disk Interface (SDI) drives and tape devices from Digital's family of Standard Tape Interface (STI) drives. If the HSC is dedicated to disk support, the maximum number of ports for disk devices is: HSC40, 12 disks; HSC60, 20 disks; HSC70, 32 disks; and HSC90, 48 disks. STI tapes connected to HSCs actually have two restrictions that must be observed, the maximum number of ports allowable for tape per HSC and the maximum number of drives (masters and slaves) supported by HSC Software. The maximum number of ports available for tape formatters is: HSC40 and HSC60, 12 ports; HSC70 and HSC90, 24 ports. HSC Software Version 6.5 supports a maximum of 24 tape drives for all models of the HSC controller.

The HSC allows users to attach different mixes of Digital SDI disks and STI tapes, given the limitation of the data channel modules (4 ports for each HSC5X-BA/CA/DA and 8 ports on the HSC9X-FA), with up to a maximum of 8 data channel modules on an HSC70 and HSC90 and up to a maximum of 3 data channel modules on an HSC40 and HSC60. The specific listing of STI/SDI drives that are supported can be found in the *HSC User Guide* and *Release Notes*. The interaction between the HSC and the drive is entirely parameter-driven, the drive specifying its characteristics to the HSC when connected.

## *Optimized Device Management*

HSC Software converts host requests into device-specific requests. It manages the physical activity of the drives, supporting parallel transfers on multiple data channels. The HSC also implements deep buffering (the ability to interpret and prepare for transfer) of host commands.

For disk units, the HSC Disk Server performs overlapped seeks on multiple drives, even when transfers are in progress, and executes ordered seeks for requests on the same drive. The HSC also implements inter-unit Rotational Position Sensing optimization on

each data channel and intra-request Rotational Position Sensing optimizations for multiple-sector requests.

For tape units, the HSC supports overlapped positioning and other non-transfer commands on multiple drives, even when transfers are in progress.

Based on a typical VMS workload mix of variable request sizes and occasional request bursts, the best HSC performance would be seen at a request rate of up to approximately 80 percent of the maximum request rate. On an average HSC, this would be approximately 800 requests per second. If an HSC's request rate is significantly greater than 80 percent of the maximum request rate using the VTDPY metric "Work Requests/Sec," improved performance may be seen by moving some of the busier drives to another HSC. Using this metric provides reserve HSC processing power for peaks and bursts in the I/O workload and consistent high performance from the HSC.

#### *Error Detection and Recovery*

The HSC and the devices connected to it (hosts as well as disk and tape units) perform autonomous error recovery actions whenever a device error is detected.

Included for host interface detection are:

- Automatic retransmission of data detected as being in error
- Automatic retransmission on an alternate host path if the primary path fails
- Automatic detection of subsystem internal data path errors
- Thresholding of subsystem internal memory errors

For disk transfers, the HSC automatically:

- Corrects up to 8 errors (of up to 10 bits each) or one 80-bit error in each sector
- Retries erroneous reads
- Replaces bad blocks and redirects subsequent reads and writes to their replacements
- Detects and recovers some mechanical failures (such as mis-seeks)

For tape transfers, the HSC participates in formatter-directed recovery, permitting use of specific retry algorithms that are device dependent.

#### *Device Integrity Test Ability*

The HSC is capable of executing Device Integrity Test programs while continuing to service host requests. This capability is employed in three ways:

- Automatic Device Integrity Tests that are automatically executed when the HSC detects that one of its components (disk, tape, or HSC-internal devices) may be malfunctioning
- Demand Device Integrity Tests that are executed upon the direction of the operator
- Periodic Device Integrity Tests that automatically check certain functions of HSC components at regular intervals

#### *Error Logging*

Unrelated to a specific self-test, the HSC provides information describing faulty or failing disk or tape devices. The information is reported via messages to the HSC console device and messages reported over the CI to all hosts that have the device on-line or to the host that issued the failing command depending on the type of error. In addition, the HSC uses the same mechanism to report errors of faulty or failing modules within the HSC.

Errors relating to transfers (host read or write requests) and non-transfer related errors are all based on severity. Depending on the error, the severity is based either on a predetermined setting or set during run time. The messages displayed on the HSC console can be limited to specific levels of severity if desired.

#### *Volume Backup and Duplication*

The HSC can perform a disk-to-tape volume backup and a tape-to-disk volume restore. This can be completely relegated to the HSC, and need not occupy or consume host CPU and memory resources.

The HSC can also perform disk duplication, copying an SDI disk device to a like device.

#### *Shadowing*

At host request and definition, the HSC can maintain identical data on a set of disk drives (of like model and mode and with identical geometry) during ongoing host I/O operations. For shadowing specifications, refer to the operating system's Software Product Description (SPD).

#### *Alteration of Subsystem Parameters*

As part of HSC Software, the SETSHO utility allows the user to alter and display parameters that control internal operation, as well as display configuration-related information.

*Dynamic Status Display*

The utility VTDPY allows the user to view the status of critical system operation and parameters dynamically. This program can run on VT200, VT300, and VT400 Series video terminals while passing error log messages to a connected printer.

**HARDWARE REQUIREMENTS**

HSC Software requires any model HSC40, HSC60, HSC70, or HSC90. To perform I/O operations to a disk or tape unit, an HSC5X-BA Disk Data Channel, HSC5X-CA Tape Data Channel, HSC5X-DA Disk/Tape Data Channel, or HSC9X-FA Disk Data Channel is also required. To perform HSC data caching, the HSC6X-BA/BB (cache option for the HSC60) and HSC9X-BA (cache option for the HSC90) are required.

The HSC Software supports Disk or Tape Data Channels in any module combination up to a maximum of 3 (for HSC40/60) or 8 modules (for HSC70/90) as described below:

HSC Type	Maximum Module Configurations	
	4-Port Modules	8-Port Modules
HSC40	3	0
HSC60	1	2
HSC70	8	0
HSC90	4	4

**Note:** Configuration guidelines for the HSC are provided in the *HSC User Guide*, Chapter 5.

*Host Node Hardware and Software Required*

Any valid VMS, ULTRIX, or VAX System V configuration with CI Hardware Connection is required. A Digital customer service representative can advise which software version and hardware revisions are currently supported for HSC.

HSC Software Version 6.5 does not support HSC50. Support for the HSC50 is provided by a separate software release. Refer to the Software Product Description for HSC50 Software Version 4.0, SPD 32.96.xx. In addition, HSC Software Version 6.5 does not support 36-bit systems (refer to the SPD for HSC Software TOPS-10 /20, Version 3.60, SPD 38.05.xx).

**OPTIONAL HARDWARE**

Optional hardware for the HSC40/70 consists of the data channel cards HSC5X-BA/CA/DA.

Optional hardware for the HSC60/90 consists of HSC5X-BA/CA/DA and HSC9X-FA data channel cards, the HSC6X-BA/BB cache option for the HSC60, and the HSC9X-BA cache option for the HSC90.

**SOFTWARE REQUIREMENTS**

HSC Software Version 6.5 has no VMS prerequisite to run on HSC40, HSC70, HSC60 and HSC90. HSC60, HSC90, and HSC Cache have software prerequisites of HSC Software Version 6.0 and above, in conjunction with VMS Version 5.4-1A and above.

**OPTIONAL SOFTWARE**

HSC cache analysis tools and the HSC Enhanced FORMAT Utility are included on this media release.

**DISTRIBUTION MEDIA**

RX33 Floppy Diskette

**ORDERING INFORMATION**

Any order for an HSC40, HSC60, HSC70, or HSC90 includes HSC Software Version 6.5, which need not be ordered separately.

For self-maintenance customers, the software may be ordered separately as follows:

- Distribution and Documentation Option: QX926-H7
- Software Revision Right-to-Copy Option: QX926-HZ
- Self-Maintenance Option: QX926-37
- Installation Option: QX926-I7

For additional information on available licenses, services, and media, refer to the appropriate price book.

**SOFTWARE LICENSING**

The HSC Software License is included with the HSC Hardware.

**SOFTWARE PRODUCT SERVICES**

Software Service is covered under the terms and conditions of the Integrated Hardware and Software Customer Service Contracts.

**SOFTWARE WARRANTY**

Warranty for this software product is provided by Digital as defined in the Software Warranty Addendum of this SPD.

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