Software Product Description

PRODUCT NAME: **Compaq RAID Software for OpenVMS, Version 2.5** **SPD 46.49.08**

DESCRIPTION

Compaq RAID Software for OpenVMS® is a software product that uses RAID technology to manage groups of disk drives as arrays. The product supports RAID Level 0 arrays (Disk striping) for enhanced I/O performance and RAID Level 5 arrays (Disk striping with parity) for enhanced data availability on both VAX and Alpha platforms. RAID Software also allows partitioning or segmentation of a RAID Array into multiple virtual devices.

RAID Software for OpenVMS Capabilities and Features

RAID Software for OpenVMS manages groups of between 1 and 32 physical disks (between 3 and 32 for RAID Level 5) as arrays. Applications use a virtual disk as if it were a physical disk.

A maximum of 50 such arrays per VMScluster system are supported, in any mixture of RAID Level 0 and RAID Level 5.

RAID virtual disks may be accessed directly from any member of a VMScluster system for which a valid license is in effect. (All VMScluster systems may access virtual disks created using the Storage Concurrent Use license QL-0MGAA-3B.) Virtual disks may not be MSCP® served.

The disks in a RAID Software for OpenVMS array may be of different types, although disks of a single type are recommended for consistent performance and optimal use of storage capacity.

RAID Software for OpenVMS virtual disks may not be used to boot the OpenVMS Operating System, nor may they serve as VMScluster quorum disks. They may, however, contain OpenVMS page and swap files.

RAID Software for OpenVMS may be used in conjunction with OpenVMS Volume Shadowing (Phase II only). OpenVMS shadow sets may be made up of RAID Software for OpenVMS array members (RAID Level 0 only), however, virtual disks may not be members of OpenVMS shadow sets.

A RAID Level 0 array whose members are shadow sets is a high performance, high data availability storage solution for most applications.

Partitioning is the process of dividing a RAID array into one or more RAID virtual devices. The RAID Software allows you to specify how many partitions are to be used in a given RAID array and how large each partition should be. One or more partitions can be created on a single-member RAID Level 0 array or multiple-member RAID Level 0 or RAID Level 5 arrays. The maximum number of partitions for any array is 64. The maximum size of one array is 1 TB.

Features Applicable to RAID Level 0 Arrays

The usable capacity of RAID Level 0 array is approximately given by:

Usable Capacity = N * 0.99 * CS

Where N is the number of physical disks in the array.

CS is the storage capacity of the smallest disk in the array.

The purpose of RAID Level 0 technology is to provide I/O intensive applications with greater I/O performance from a given I/O hardware configuration than would normally be achieved by using the disks as individual volumes. This is also referred to as Disk Striping. Depending on the application, enhanced I/O performance may be delivered as:

- more I/O requests serviced per unit time due to probabilistic load balancing, or
- higher data transfer rate due to concurrent transfer of data to or from more than one disk to satisfy a single request.

Features Applicable to RAID Level 5 Arrays

The usable capacity of RAID Level 5 array is approximately given by:

Usable Capacity = (N-1) * 0.99 * CS

Where N is the number of physical disks in the array.

CS is the capacity of the smallest disk in the array.

RAID Software for OpenVMS protects against loss of data and loss of data accessibility due to the failure of any single disk in a RAID Level 5 array. If a disk in a RAID Level 5 array fails, RAID Software for OpenVMS provides continued service to applications by regenerating the failed disk's data using information from the array's remaining disks. (For full protection against loss of data availability due to single hardware failures, RAID Software for OpenVMS software can be used in conjunction with redundant hardware and supporting software throughout the system.)

While a RAID Level 5 array is reduced by a failed disk, data can be read and written, but no redundancy is provided. A second disk failure while an array is reduced prevents application access to the data stored on the array, and may result in data loss.

RAID Software for OpenVMS reconstructs the contents of a failed disk if a replacement disk is assigned to it. Reconstruction does not interrupt application access to data on the array, although performance may be affected. Replacement disks may either be assigned to RAID Software for OpenVMS by the storage administrator (using a DCL command) or they may be placed in a spareset associated with one or more RAID Level 5 arrays. If a disk in a RAID Level 5 array with an associated spareset fails, RAID Software for OpenVMS automatically acquires a replacement disk from the spareset and performs reconstruction without storage administrator intervention.

Using RAID Software for OpenVMS

To use RAID Software for OpenVMS, the storage administrator first creates an array using DCL functions supplied with the software. This destroys any data previously stored on the disks and creates the data structures required to manage the array. The member disks of a RAID Software for OpenVMS array are ODS-2 structured volumes, so OpenVMS mechanisms protect against inadvertent misuse of members for the life of the array. However, the virtual disk units created by RAID Software can be initialized as FILES-11 ODS2 or ODS5 or any other volume structure.

Each virtual disk created by RAID Software for OpenVMS is a single management entity. The storage administrator should use appropriate storage management procedures (e.g., backups) with virtual disks, which can be considerably larger than typical physical disks. Once a collection of physical disks is bound into an array, it is not possible to retrieve data directly from the array's individual member disks.

Performance of RAID Software for OpenVMS

The primary purpose of RAID for OpenVMS RAID Level 0 arrays is to enhance application performance by improving I/O request processing and/or data transfer rate. RAID Level 0 technology normally implies a reduction in data reliability. The storage administrator can improve data reliability by increasing backup frequency or using RAID Software for OpenVMS in conjunction with Volume Shadowing for OpenVMS.

The primary purpose of RAID Software for OpenVMS RAID Level 5 arrays is to improve data reliability. It may provide the secondary benefit of improved performance (due to load balancing) for applications whose I/O workload consists largely of reading data. For applications with mostly write I/O workloads, RAID Software for OpenVMS RAID Level 5 arrays may provide lower I/O performance than conventional disks because it must update redundant information each time an application writes data.

The storage administrator should understand application I/O characteristics and weigh the relative priorities of performance, equipment cost, and data reliability to determine whether RAID Software for OpenVMS is appropriate for use with a given application.

HARDWARE REQUIREMENTS

RAID Software for OpenVMS is supported when used with the VAX and Alpha processors and VMScluster systems supported by OpenVMS. See the Software Requirements section for the qualified OpenVMS versions. RAID Software may be installed in a VMScluster configuration of any size supported by OpenVMS Software, but the RAID Software has been qualified to run on a maximum of 20 nodes within a single VMScluster configuration.

RAID Software for OpenVMS requires a minimum of 1 (for RAID Level 0) or 3 (for RAID Level 5) and a maximum of 32 physical disks for each array. Up to 50 arrays may be created in a single VMScluster system. Disks, storage elements, (and the subsystem configurations that contain them) are supported by the OpenVMS Operating System Versions listed above through the following device drivers shown in Table 1.

Table 1

Supporting Device Drivers

Device Drivers	Description
DUDRIVER	For Digital Storage Architecture (DSA) disks, including MSCP-served Disks.
DKDRIVER	For SCSI disks
DRDRIVER	For StorageWorks RAID Array 200 series controllers, also known as SWXCR
DKQDRIVER	For HGx connected disks

Table 2

Disk Space Requirements

Disk Space	VAX-based	Alpha-based
During installation	3500 blocks (1.70 megabytes)	5000 blocks (2.44 megabytes)
For permanent use	2500 blocks (1.22 megabytes)	4000 blocks (1.85 megabytes)

SOFTWARE REQUIREMENTS

RAID Software for OpenVMS requires the OpenVMS VAX Operating System (Version 5.5-2, 6.2, 7.1, 7.2 and 7.3) or OpenVMS Alpha (Versions 6.2, 7.1-2, 7.2-1, 7.2-2 and 7.3) as a prerequisite. No other prerequisite software is required.
RAID Software Version V2.5 will be the last version to qualify OpenVMS VAX version 5.5-2.

Mixed-architecture VMScluster systems (i.e. containing both VAX and Alpha systems) are supported as long as all VMScluster members are running compatible versions of the OpenVMS operating system qualified by RAID Software. For a chart of the compatible versions of the operating systems, refer to the VAXcluster Software for OpenVMS VAX Software Product Description (SPD 29.78.xx) and the VMScluster Software for OpenVMS Alpha Software Product Description (SPD 42.18.xx).

RAID Software for OpenVMS is compatible with OpenVMS 7.2-* and 7.3 with the following restrictions:

SYSGEN Parameter MSCP_SERVE_ALL bit 3 must be set to prevent the serving of Host Based Raidsets to other members of the cluster. Bit 3 enables the pre-V7.2 behavior of not serving Raidsets to other cluster members.

In order to bind RAID arrays, all physical disks that comprise the RAID arrays must be accessible, (local or MSCP served), on all nodes in a VMScluster having the RAID software running.

If RAID Level 0 arrays with OpenVMS shadow sets as members are required, a valid OpenVMS Volume Shadowing license must be in effect on every VMScluster node running the RAID Software. Shadow sets may not be used as members of RAID Level 5 arrays.

DISTRIBUTION MEDIA

This layered product is only available as part of the OpenVMS Consolidated Software Distribution on CD–ROM for VAX (QA-VWJ8A-A8) and on the Digital CD–ROM Software Library for OpenVMS Alpha (QA-03XAA-H8).

ORDERING INFORMATION

Three licensing options are available:

RAID Array Access License:

VAX: QL-0MHA*-AA

Alpha: QL-2YFA*-AA

This license option provides the purchaser with the right to use the RAID Software for OpenVMS on a single VAX or Alpha system to create and use up to the supported number (50) of RAID arrays. One RAID Array Access License is required for each VAX or Alpha system in a VMScluster system on which RAID Software for OpenVMS is to execute.

Storage Concurrent Use License:

QL-0MGAA-3B

This license option provides the purchaser with the right to include a single disk, storage element, or shadow set in an array. One Storage Concurrent Use License is required for each disk, storage element, or shadow set to be included in a RAID Software for OpenVMS array. Once an array is created, it may be accessed by any VMScluster VAX or Alpha system.

For purposes of the Storage Concurrent Use License, the measure of use is equal to a single disk, storage element, or shadow set to be included in an array, no matter how many VMScluster CPUs have access to that array. Each shadow set used as a member of a RAID Level 0 array requires a single Concurrent Use License, regardless of the number of physical disks in the shadow set.

Disks, storage elements, and shadow sets that are members of sparesets do not require Storage Concurrent Use Licenses.

Documentation:

VAX: QA-0MGAA-GZ
Alpha: QA-0MGAA-GZ

Software Product Services:

Array Access (VAX): QT-0MHA*-**
Array Access (Alpha): QT-2YFA*-**
Storage: QT-0MGA*-**

SOFTWARE LICENSING

This software is furnished only under a license.

For more information about Compaq licensing terms and conditions, contact your local Compaq office.

License Management Facility Support

RAID Software for OpenVMS software uses the OpenVMS License Management Facility.

License Units for the RAID Software for OpenVMS RAID Array Access License are allocated on a CPU-capacity basis.

License Units for the RAID Software for OpenVMS Storage Concurrent Use License are independent of CPU capacity. One Storage Concurrent Use License is required for each disk, storage element, or shadow set included in an array, no matter how many VMScluster CPUs have access to the array.

For more information on the License Management Facility, refer to the OpenVMS Operating System Software Product Description (SPD 25.01.xx) or the OpenVMS Operating System documentation.

SOFTWARE PRODUCT SERVICES

A variety of software product service options are available from Compaq. For more information, contact your local Compaq office.

SOFTWARE WARRANTY

This software is provided by Compaq with a 90 day conformance warranty in accordance with the Compaq warranty terms applicable to the license purchase.