HP Volume Shadowing for OpenVMS

High data availability for business-critical computing

Inaccessible or lost data in your critical production systems can mean lost revenue—and often lost customers. You need dependable, secure computing that ensures that your data is continuously available. Volume Shadowing for OpenVMS transparently provides high data availability for your users and applications—including business-critical applications running in a client/server environment.

In most computing environments, the potential for major data availability problems is always present. Media storage devices can deteriorate over time, and system components, such as controllers and interconnects, sometimes fail. If a failure occurs, data may be lost or inaccessible for hours or days, or response time may be so slow that your systems become, in effect, non-operational.

For many years, host-based Volume Shadowing for OpenVMS has ensured data availability for users who rely on OpenVMS systems. Volume Shadowing for OpenVMS is a premier, proven implementation of RAID technology, which ensures that data remains accessible in the event of media deterioration or of controller, device, or interconnect failure. With Volume Shadowing, you can confidently run your business-critical applications and know that your data will always be available when and where it is needed.

Highlights

- The set of devices on which the data is duplicated is known as a shadow set. A shadow set consists of up to three devices. Each device within the shadow set is known as a shadow set member. Data availability requires at least two devices in the shadow set.

- Shadowing the OpenVMS system disk increases not only data availability but also system availability.

- Shadowing plays a vital role in disaster-tolerant cluster configurations.

- Shadowing OpenVMS volumes increases application data availability.

- A shadowed cluster environment can be configured with no single point of failure, thereby providing the highest levels of data availability possible in the industry.

- Backup can occur with minimal or no interruption to operations, thereby allowing 24 x 365 datacenter up time.

- System manager determines access to files and data in the event of failure of controllers, devices, or interconnects, or of a site disaster.

- Data can be duplicated over great distances, thereby providing disaster-tolerant capabilities. For example, Fibre Channel currently supports distances of up to 100 km, achieved through use of interswitch links (ISLs) that use single-mode fiber. This capability ensures that data lost through disruption or disaster at one site can be accessed at another site.

- Volume Shadowing is supported on clustered and standalone systems, on low-end and high-end systems, and on OpenVMS Alpha and VAX systems. Maximum choice and flexibility are yours.

- Support for up to 500 multimember shadow sets ensures the availability of large amounts of data. The maximum number of single-member shadow sets is 10,000.

- Use of Volume Shadowing requires no change to applications.

Increased data availability

Volume Shadowing for OpenVMS transparently provides high data availability by preventing data loss from media deterioration, from controller, device, or interconnect failure, or from site disaster.

Data is synchronously recorded on multiple devices and remains accessible when one device is unavailable. Read and write operations to the volume continue transparently with the remaining shadow set members. Such data availability prevents storage subsystem components from becoming a single point of failure, which could interrupt system or application operations.

Access to a shadow set is achieved by means of a virtual disk mechanism. After a shadow set is created, applications and users access the virtual unit as if it were a standard, physical device.

Reliable data

Magnetic recording media can occasionally lose its ability to retain the pattern of magnetization that represents data. Natural phenomena can alter data on magnetic recording media. Mechanical failures, such as a head crash, can destroy information that is stored on magnetic recording media.

Many modern I/O subsystems have error-correction algorithms to deal with these situations. However, what if the corruption exceeds the limits of error correction designed into the algorithms? If the device is a member of a shadow set, Volume Shadowing for OpenVMS can retrieve the data from another member of the shadow set. The good data not only is returned to the process that requested it, but also is transparently written to a replacement block on the device with the corrupt block.

Enhanced system availability

A major benefit of Volume Shadowing is its ability to shadow the OpenVMS system disk, the central disk component of the OpenVMS operating system. This ensures that deterioration or failure of the system disk causes no interruptions to your computing operations. Your system disk need not be a single point of failure for any system that boots from that disk. This ability is especially valuable in OpenVMS Cluster systems with a common system disk (a system disk from which multiple systems boot).

24 x 365 datacenter uptime

For a datacenter to remain in operation on a 24 x 365 basis, you must be able to conduct routine backup operations without disrupting system operations. With Volume Shadowing, devices can be backed up while updates continue with minimal or no interruption to operations. Since Volume Shadowing supports three shadow set members, one member can be removed for backup using the minicopy feature. Stopping application write I/O, prior to dismounting a full member with minicopy qualifiers, is the responsibility of the user.

You can use the OpenVMS Backup utility with a shadow set as you would with non-shadowed devices. A backup operation using a shadow set member is no different from any other backup operation.

Disaster tolerance and multiple-site support

With Volume Shadowing, devices that are physically distant can be shadowed across an OpenVMS Cluster. This capability increases availability, enables disaster tolerance, and provides immediate or real-time access to current data at multiple sites. The distance depends on the interconnect chosen and whether interswitch links (ISLs) are used. Distances of up to 150 miles (242 km) are supported between members of a multiple-site OpenVMS Cluster. This distance can be increased by using Disaster Tolerant Cluster Services for OpenVMS. If devices in a shadow set located at one datacenter facility become inoperative or are destroyed, data can still be retrieved from other devices in the shadow set located at another facility. Also, data that has just been updated at one site (for instance, a factory) is immediately available at another site (such as an office).

Recovery from multiple-site interconnect failures

When an interconnect between sites is restored after a failure, if the Volume Shadowing minicopy feature was being used, it is possible to forgo doing full copy operations for critical shadow sets. When a shadow set member is removed with the minicopy qualifier, subsequent write operations are recorded in host memory. When that shadow set member is returned, only those writes operations are updated to that member. Typically this will result in a quicker copy completion time, and thus return the shadow set to a high availability state.

A RAID implementation

Volume Shadowing is an implementation of RAID technology. RAID (redundant arrays of independent disks) is a collective name for several techniques used to configure and manage multiple devices to achieve improvements in online storage availability and I/O performance at a reasonable cost.

Arrays of devices are managed by software and are made to look to operating systems and users like a single device. RAID arrays provide increased data availability and application performance without requiring code modifications.

Volume Shadowing for OpenVMS is an implementation of RAID 1 technology. HP also offers a host-based RAID 0 and RAID 5 product.

Complete transparency

Use of Volume Shadowing for OpenVMS is completely transparent to users and applications. A shadow set appears to be just another device and requires no change to applications. Commands that address data on non-shadowed devices can be used without change on a shadow set, and devices can be added to or removed from the shadow set during operation without affecting either the application or the end user.

The following table summarizes the use of Volume Shadowing for OpenVMS and RAID Software for OpenVMS in terms of RAID level, relative availability, and application types that benefit from the use of one or both products.

Product	RAID level	Description	Relative availability	Application type
RAID Software for OpenVMS	0	Striped data; no redundancy	Low	Applications requiring high performance for noncritical data
RAID Software for OpenVMS	5	Striped data and parity	High	High request rate, read-intensive, data lookup
Volume Shadowing for OpenVMS	1	Shadowing; full redundancy	Very high	System drives, critical files
Volume Shadowing for OpenVMS plus RAID Software for OpenVMS	0+1	Striped data; full redundancy	Very high	Critical files to which high-performance access is required

Maximizing performance

Because a shadow set can be made up of multiple devices containing the same data, the data can be read from any member of the shadow set, including a DECram device (a pseudo device in host system memory).

Volume Shadowing determines which device to read from for each read operation, using an algorithm that maximizes performance. As a result, at the same time that it provides increased data availability, Volume Shadowing typically provides improved read response performance.

Volume Shadowing ensures that write operations are duplicated on all shadow set members. For maximum performance, write operations are issued in parallel to full shadow set members. If a copy operation is in process between a full shadow member and a copy member (the device being added to the shadow set), the write operations are issued in parallel to the full shadow members first, then they are issued to the copy member.

Support for small to large systems

A primary advantage of Volume Shadowing is its ability to support a wide range of hardware configurations—from desktop systems to office systems to datacenter systems. Shadowed devices can serve a single system or can be located anywhere within an OpenVMS Cluster system.

Volume Shadowing for OpenVMS can be used on a variety of devices, including any DSA (Digital Storage Architecture) disks, Small Computer Systems Interconnect (SCSI) disks, and some third-party SCSI disks on any OpenVMS standalone system or OpenVMS Cluster. The Volume Shadowing software also supports a broad range of controllers and devices.

Flexible licensing

You can choose the Volume Shadowing licensing option that is most cost-effective for you—capacity licensing or per-disk licensing. A capacity license allows you to mount up to 500 devices in multimember shadow sets, or 10,000 single-member shadows sets, on any standalone system or node in a cluster. This is an economical way for customers with large numbers of disks to purchase Volume Shadowing.

Hardware requirements

Volume Shadowing software requires a minimum of one OpenVMS system and requires devices with the same amount of storage capacity. (Although a shadow set can consist of only one device, two devices are required to provide duplication of data.) The use of two separately controlled devices provides a further guarantee of data availability in the case of controller failure. Use of an OpenVMS Cluster system and multiple storage subsystems provides the greatest data redundancy and availability.

Service and support

HP offers a full range of consultation and services, as well as networking, training, and software support. A variety of full one-year product warranties let you tailor support according to your needs.

HP is a recognized leader in multivendor servicing, and its support professionals are located worldwide. In addition to a dedicated service staff, a talented corporate resource pool and a wide range of service partners are also available. Professionals are on hand to support you throughout the entire solution life cycle, from planning and design through implementation and ongoing management.

For more information

Volume Shadowing for OpenVMS is a System Integrated Product (SIP) and is included in the OpenVMS Base Operating System kit. The license and documentation are available under a separate order number.

For more information about Volume Shadowing, the OpenVMS operating system, and other OpenVMS software, contact your HP business partner or local HP representative.