WHITE PAPER

VERITAS™

Improving SAN Backup Performance with ServerFree Option

VERITAS Backup Exec™ 10 *for Windows Servers*

ServerFree Option

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EXECUTIVE SUMMARY

KEY BENEFITS

- Virtually eliminates server utilization on the backup server
- Releases computing process
- Improves backup performance, thus reopening the backup window

The introduction of Storage Area Networks (SAN) has provided the computer industry the ability to consolidate data and share storage between devices on the network. Now, administrators are tasked with optimizing their SANs to manage and protect the business-critical data that is growing at an exponential rate while backup windows are shrinking.

Storage consolidation is a reoccurring theme among businesses with volumes of information stored on networks. Networked-attached storage (NAS) and SANs will eventually replace Direct Attached Storage (DAS) for daily operations within medium to large organizations. According to Charlotte Rancourt, the storage systems research director at IDC:

> "Data continues to grow at unprecedented rates, and IDC has forecasted that purchase of new capacity for deployment in external storage systems will grow at a compound annual growth rate (CAGR) of 70% from 2002 to2006. With this rate of growth, direct-attached storage solutions will become increasingly difficult to manage and will no longer adequately meet the needs of many organizations. In fact, by 2006, IDC expects networked storage solutions, such as NAS and SAN, to represent 65% of the money end users spend on new disk-storage systems."

Companies moving to these technologies find substantial economical benefit by reducing total cost of ownership (TCO) and maintaining storage centralization.

A recent technological advancement in the reduction of TCO for SAN deployments is off-host backup, which is also called *third party copy* and *server-free backup*. Server-free technology offloads the CPU- and memory-intensive process of moving the data through the network and moves these efforts to an off-host data-moving engine within the SAN hardware. The intelligence of moving the data remains inside the storage software, but the copy effort is moved to the SAN hardware.

The ServerFree Option for VERITAS Backup Exec *for Windows Servers* helps protect mission-critical data in SAN environments by moving backup processing operations from the server to third-party off-host hardware solutions installed within the SAN. By virtually eliminating server utilization on the backup server, the VERITAS ServerFree Option delivers faster backups and releases computing processing for application, database, and other critical needs.

As SAN technology matures, customers will benefit from technologies such as off-host backup, which help meet the increasing demand for high performance and scalability of storage applications and will provide support for the latest storage technologies.

SERVERFREE HIGHLIGHTS

- Online backup. The ServerFree Option provides an advanced backup solution with limited impact on the server.
- Leveraging SAN investments. It fully exploits the SAN architecture by taking advantage of the ability to move data directly from disk to tape.
- Selectable snapshot methods. It provides the flexibility to choose from the system-provided frozen-image or snapshot backup method or to leverage the VERITAS FlashSnap Option within the SAN environment.
- Advanced mapping technology. By mapping the logical files to the physical blocks, the ServerFree Option handles unforeseen system events while maintaining data integrity.

BENEFITS OF SERVERFREE BACKUP

REDUCING SERVER CENTRAL PROCESSING UNIT (CPU) USAGE

Traditional server backup operations, for both SAN and direct-attached systems, involve reading the data into the computer memory, processing the information, and then writing it to the secondary storage device. The computational efficiency is heavily dependent on the CPU and amount and type of system memory. At times, the resource drains on CPU processing and memory caching during traditional backup methods can make the machine sluggish or, in some cases, completely unusable during backup.

By moving the backup transactions to an off-host hardware solution, server processing on the backup server is kept to a minimum. The majority of the processing done by the backup server is at the initiation of the backup job; and the duty of moving data from the fibre channel disk array to a secondary storage device falls upon the *data mover.* A data mover is not a new dedicated component added to the fabric, but a new capability embedded in fibre-to-SCSI bridges/routers or in the SAN-attached disk array. The net result is very low CPU and memory usage on the backup server, which is now free to use its processing power for other important business operations.

REDUCING YOUR SERVER BACKUP TIME

The ServerFree Option works with other VERITAS Backup Exec high-performance options, including the SAN Shared Storage Option (SAN SSO) and a point-in-time snapshot provider such as the VERITAS Volume Snapshot Provider™ (VSP). Combined, these technologies create a point-in-time view of the data on the target server, create a compressed image file, and then send it directly to the storage device via the data mover.

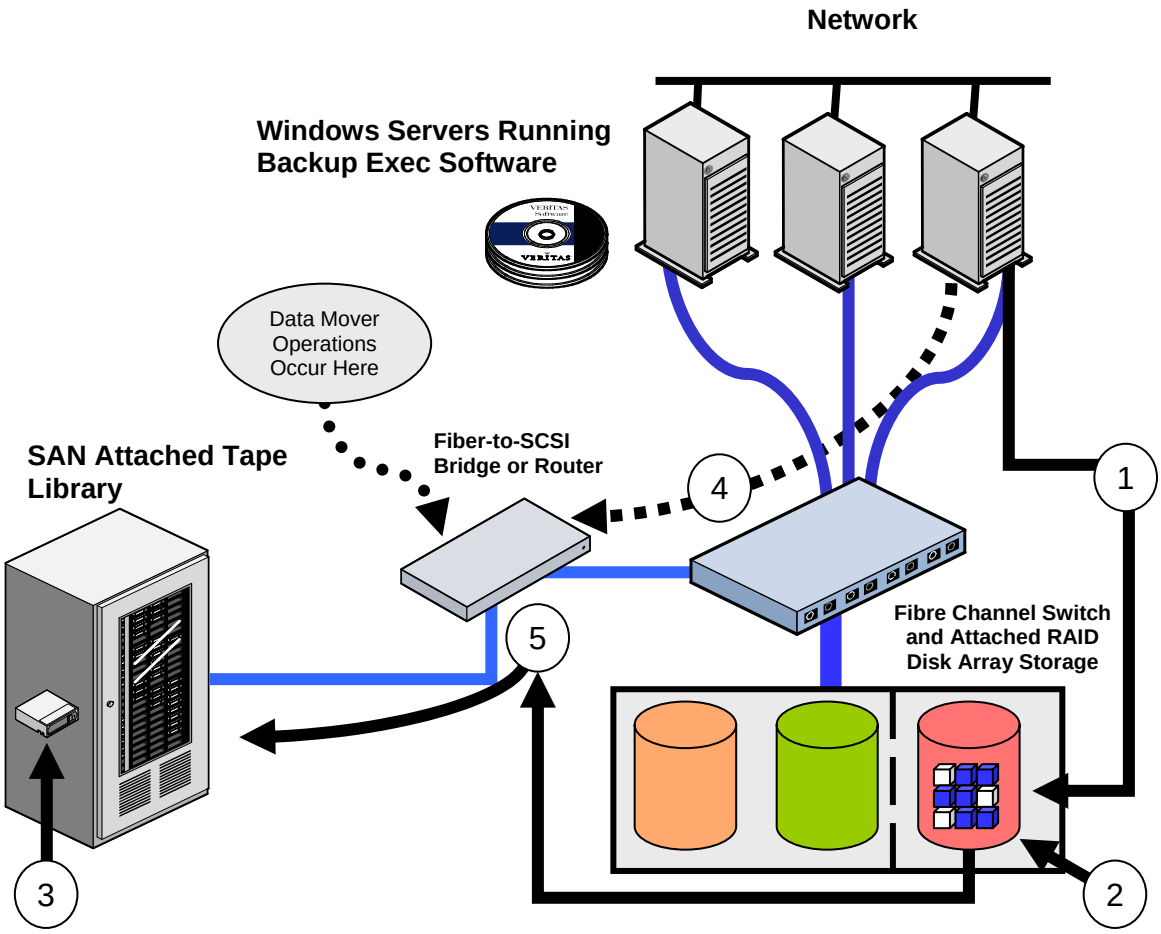
SERVERFREE OPTION TECHNOLOGY

HOW SERVERFREE BACKUP WORKS: TECHNICAL OVERVIEW

In a traditional SAN environment, the Backup Exec media servers on the network are networked to the SAN with a fibrechannel disk array and a SAN-attached tape library. Communications and data movement occur between the devices via the fibre-to-SCSI bridge or router.

The process depends on the data mover installed in the SAN. In most cases the data mover resides in the fibre-to-SCSI bridge or router, but the data mover could reside in any hardware component in the SAN, such as a tape library with built-in routing functionality. The hardware maker decides where this capability resides, and its location does not affect the operations or dataflow process.

Depiction of a standard Backup Exec Software ServerFree configuration.



HOW THE SERVERFREE OPTION MOVES DATA IN A SAN

The following steps depict the process by which the Backup Exec software works in concert with a data mover to accomplish server-free backup:

Step 1: Once the backup job has been created and the job is scheduled, the ServerFree Option initiates a request to create a point-in-time snapshot, also known as a frozen image, of the volume being protected on the fibre disk array. The frozen image ensures that the backup operation will complete using a consistent set of the data at the moment the backup job is submitted. Depending on your method of creating the frozen image, a split mirror may be used. A split-mirror operation interrupts mission-critical systems for a few seconds while the frozen image is created.

The ServerFree Option uses one of two products to create the snapshot: either the included VERITAS Volume Snapshot Provider (VSP) or the optional VERITAS FlashSnap™ Option available with VERITAS Storage Foundation *for Windows*. More details on the methods and differences between these two products are covered in “Supported Snapshot Methods“section.

Step 2: When the Backup Exec software starts the backup job, the ServerFree Option creates a map of the blocks on the volume and/or files to backup as part of the job.

Step 3: The Backup Exec software then allocates the necessary tape media in the library. Image-backup control information is written to tape. Data is formatted on the tape using imaging technology to create an efficient format before the actual data transfer starts.

Step 4: The Backup Exec software then sends the list of data blocks to backup to the data mover using the SCSI extended-copy command. The Backup Exec software coordinates with the data mover on how many blocks can be transferred at a time; which largely depends on the memory buffer size in the data mover. The Backup Exec software needs to send data only once the data mover runs out of blocks to move. The Backup Exec software continuously fills the buffer with new data as the buffer empties during data transfer. No backup CPU activity takes place while the data mover is transferring the data from disk to tape.

Note: In this depiction, the data mover resides in the fibre-to-SCSI bridge or router. The data mover could also be a third-party copy-enabled RAID array. When additional requests are sent to move data from the backup server, there is only a small hit on CPU processing.

Step 5: As part of the backup process, the data mover reads the data blocks directly from the storage array and writes them to the tape(s) that the Backup Exec software had allocated in step 3.

Upon backup completion, the frozen image is released, freeing up the reserved space for future backup jobs. In the event that a split mirror is used, after the mirror is broken off for the backup, the original and backup mirrors are rejoined and the original volume is prepared for the next backup job.

REQUIREMENTS FOR USING THE SERVERFREE OPTION

Consider these three key components when designing a SAN with off-host backup:

- The physical hardware to be used — does it support server-free backup?
- Are the SAN components proven compatible?
- Is the hardware solution certified to run with the software running the operations?

APPROVED HARDWARE

To use the VERITAS Backup Exec ServerFree Option technology, the SAN must have certified hardware that supports off-host data movement operations. Data-mover technology is provided by the hardware manufacturer. Each deployment should begin with a thorough review of the hardware vendor's list of required components. Hardware components that may require updating may include:

- Fibrechannel host bus adapter (HBA)
- Fibre-to-SCSI bridge or router
- Tape library containing a fibre-to-SCSI bridge or router

Note: New device drivers, updated firmware, or new hardware may be needed for data-mover operations.

VERITAS Software has posted a list of SAN-certified components that form a LAN-free network topology tested for compatibility and reliability. VERITAS certifies new solutions as they become available from hardware vendors, and it maintains a list of tested or certified solutions on its Technical Support web site at http://support.veritas.com/dsl/dslselect_ddProduct_BEWNT.htm. For more information on whether the hardware vendor supports SAN and ServerFree technology, and to review a complete list of requirements, please contact the hardware vendor directly.

OPERATING SYSTEM AND SOFTWARE REQUIREMENTS

The Backup Exec ServerFree Option supports the latest operating-system platforms supported by Microsoft Windows 2000 Server and Windows Server 2003. It requires data-mover hardware in a SAN.

To leverage ServerFree backup operations with the Backup Exec software, the following components are required:

Operating System:
- Windows 2000 Server or Windows Server 2003

VERITAS Software products for each backup server:
- VERITAS Backup Exec 10 *for Windows Servers*
- Library Expansion Option, for each shared drive on the SAN
- SAN Shared Storage Option
- ServerFree Option

Optional VERITAS products for each backup server:
- VERITAS Volume Manager™ *for Windows 2000*
- VERITAS Storage Foundation *for Windows*
- VERITAS FlashSnap

SUPPORTED VERITAS BACKUP EXEC AGENTS AND OPTIONS

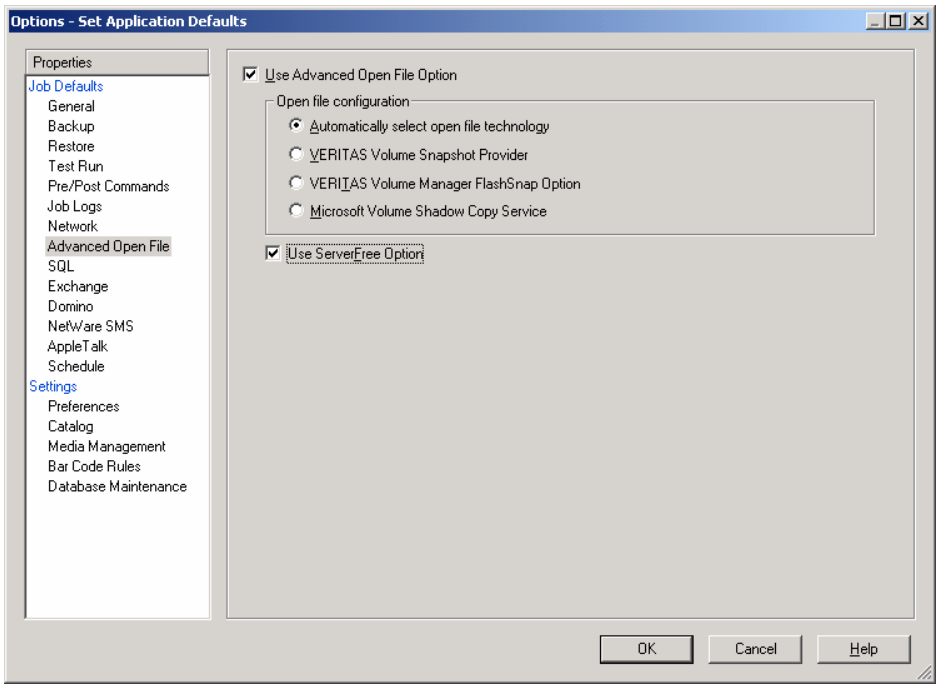
The ServerFree Option supports backup only of local file systems. The ServerFree Option can leverage split-mirror backups of SQL server databases when performed by the optional VERITAS FlashSnap software, which acts as the frozen-image provider. ServerFree backup of Exchange, SAP, Lotus Domino, and Oracle is not currently supported, though that may change in future releases.

SETTING UP SERVERFREE BACKUP

You configure the ServerFree Option once the SAN and the Backup Exec software, with the SAN Shared Storage Option, have been configured and tested. To properly set up the ServerFree Option, enter the Set Application Defaults from the Backup Exec **Tools** tab: Choose Tools > Options > Advanced Open File in the Backup Exec *for Windows Administrator Client*.

To apply ServerFree backups for all backup jobs performed from this server, select the Use Advanced Open File Option and then the Use ServerFree Option.

Setting the ServerFree default options from the Set Application Defaults screen.



As previously mentioned, the Backup Exec software uses imaging technology to create an efficient format before the actual data transfer starts. Regardless of which frozen-image method is chosen, this imaging technology will also package the data in preparation to moving it to the storage device. When selecting the desired frozen-image technology, if the Use Advanced Open File Option configuration is set to "Automatically select open file technology," the ServerFree Option will use VERITAS Volume Snapshot Provider (VSP) by default. The only other frozen-image technology available for use with the ServerFree Option is VERITAS FlashSnap™.

At this time, the Microsoft Volume Shadow Copy Service (VSS) used by Windows Server 2003 is not supported with ServerFree backups. If this option is selected while the "Use ServerFree Option" checkbox is also enabled, the Backup Exec software will default the snapshot process to VSP.

SUPPORTED SNAPSHOT METHODS

The VERITAS Backup Exec ServerFree Option supports two frozen-image products to make snapshots of the selected volumes for backup: the included VERITAS Volume Snapshot Provider (VSP) and the optional VERITAS FlashSnap software. The Microsoft Volume Snapshot Service (VSS) is not supported for the Backup Exec software's ServerFree backup.

VERITAS VOLUME SNAPSHOT PROVIDER (VSP)

This is the default option for creating a frozen-image backup. The VSP software-based snapshot solution creates a frozen image, or picture, of the system's volume at the time of the backup. By capturing the volumes at a given instant and mapping that data to a scratch disk, the data to be backed up to tape is guaranteed to be free of open files, creating a "crash-consistent" backup.

Key advantages of VSP include:

- VSP can take snapshots of all volumes on the target client, rather than one at a time. Executing a single snapshot captures the entire system data at the very moment of the backup and ensures that the system can be recovered to that very point in time, with all volumes intact.
- Copy-on-write technology is embedded as part of the snapshot procedure. This enables a snapshot of a volume that packages only the changes made to the volume as part of the snapshot, rather than a full snapshot of the volume, saving on scratch disk space and enabling faster backups.
- Another upside is the ability to restore just those changes made to the volume, rather than having to restore an entire volume — again saving time and space during the recovery.
- VSP works with Windows 2000 and Windows 2003 Servers, providing operating-system flexibility.

Customers should choose the VSP technology for those SANs that are:

- Operating in a mixed Windows-server environment
- Have data spanning multiple volumes being captured as a single job
- Sensitive to adding additional hardware
- Have concerns over available disk space to execute the snapshot

Note: More details on operations of the VERITAS Volume Snapshot Provider can be found in the VERITAS "Advanced Protection for Open Files" white paper available at http://www.veritas.com/products/listing/ProductDownloadList.jhtml?productId=bews#whitepapers.

VERITAS FLASHSNAP

VERITAS FlashSnap is an option of VERITAS Storage Foundation *for Windows*™ and is included in VERITAS Edition™ for Microsoft Exchange 2000, which also includes VERITAS Volume Manager. VERITAS FlashSnap is similar to VSP in that it facilitates the creation of point-in-time snapshots of data but requires that VERITAS Storage Foundation *for Windows* software be installed on the same system as the Backup Exec software.

The FlashSnap software is built on the VERITAS Volume Manager™ technology, which efficiently manages storage resources and serves as the foundation of the VERITAS Software storage virtualization platform. Storage virtualization lets companies logically manage storage environments without regard to the underlying physical hardware location or vendor type.

The key difference between the FlashSnap software and VSP is that FlashSnap creates a split-mirror snapshot instead of a software-based frozen image, which depends on the original data. In some environments, creating a split mirror may benefit the user because it has the added benefit of using independent hardware, which can be imported on any system connected to the SAN. This lowers the performance impact on the target server by isolating the mirror to another server, so it can be backed up when convenient. Also, because it is a truly independent copy of the original data, it provides fault tolerance so that, in the event of a disaster, an extremely

fast recovery is possible. Once the backup is completed, the VERITAS FlashSnap FastResync™ technology allows the resynchronization of the split mirror so that it is available for future backups.

The technology offered by the VERITAS FlashSnap software is ideal for those customers that require the least amount of impact on the application server being protected. Using the split-mirror technique leverages disk capacity to minimize the backup impact on mission-critical applications. Another key advantage is the integration with VERITAS Storage Foundation *for Windows,* which enables dynamic allocation of disk space to virtualize disk space across the network. For disaster recovery, being able to restore from the mirror is very fast compared to restoring from tape.

PREPARING FOR BACKUP

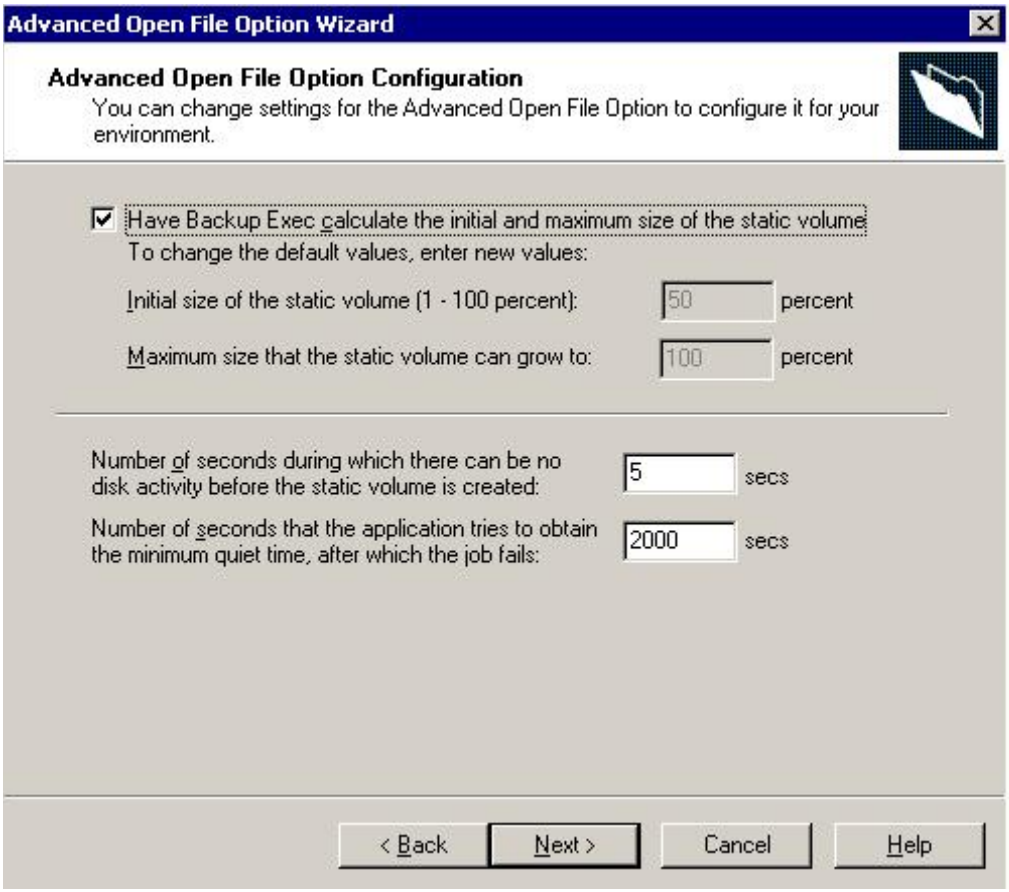
CONFIGURING THE ADVANCED OPEN FILE OPTION

The final step before using the ServerFree Option is to ensure the frozen-image provider is configured with enough space before executing the backup. The Backup Exec software provides the Advanced Open File Option Wizard to simplify the setup of the required space for the static volumes.

If you use VERITAS Volume Snapshot Provider™, the default settings may be sufficient. To view the current settings, run the Advanced Open File Option wizard from the Backup Exec Administration Console, under Tools/Wizards. The current settings for creating the frozen image will be displayed here. The wizard walks through the process of specifying where the frozen image is to reside, defining its size and determining how long to wait for no disk activity.

Detailed setup and management can be found in FlashSnap software documentation and at http://www.veritas.com/products/listing/ProductDownloadList.jhtml?productId=volumemanagerwin#whitepapers.

Settings in the Advanced Open File Option configuration wizard.

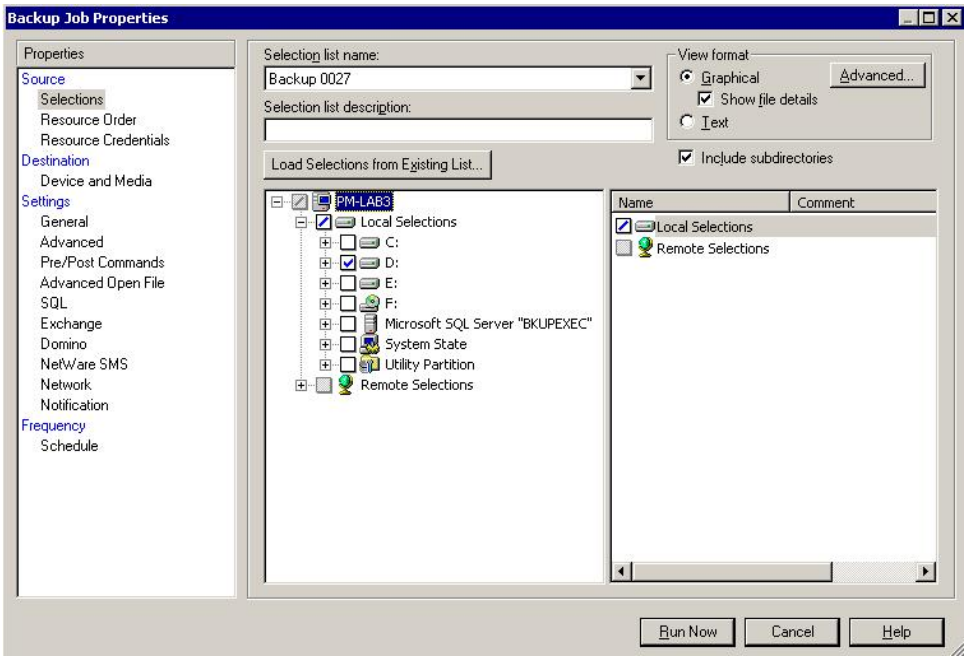


SUBMITTING A BACKUP JOB

Once the certified SAN hardware and data-mover configurations have been verified and the Backup Exec ServerFree Option software has been installed and configured to run with the snapshot provider, the next step is to create and submit the backup job. This procedure involves exactly the same steps as creating a traditional Backup Exec job. Keep in mind is that fibre arrays connected to the same data path as the data mover will use the ServerFree Option technology for the backup operation.

For more information about submitting a backup job, see the VERITAS Backup Exec *for Windows Servers* Administrators Guide.

Backup Exec Backup job properties screen.



USING SERVERFREE FROM THE COMMAND LINE

The Backup Exec software includes a Command Line Interface (CLI) for many server operations. This gives administrators the flexibility to execute backup and recovery from a system prompt from any computer on the network, rather than use Backup Exec's graphical user interface from a specific computer. Below is an example of how you might use this CLI to do a ServerFree Backup.

```
bemcmd –o2 -j"Operations Weekly" –s"D:\*.*" –fi:2
```

- `-o2` is the operation to create a backup job.
- `-j` specifies the name of the backup job; because the job name is alphanumeric, quotation marks are required around the job name.
- `-s"D:\*.*"` specifies to backup all files and subdirectories under the D:\ drive.
- `–fi:2` specifies use of the Intelligent Image Option and execute a ServerFree backup if the method is available.

For more specific information on using CLI options, please review the CLI section of the VERITAS Backup Exec *for Windows Servers* Administrators Guide or type `BEMCMD.EXE /?` at a command prompt.

SERVERFREE BACKUP BEST PRACTICES

The ServerFree Option works with local traditional NTFS file systems and supports server-free backup of SQL server applications and databases when using VERITAS FlashSnap. Future releases of the ServerFree option will support other database applications such as Exchange server, Oracle, SharePoint Portal server, and Lotus Domino.

When submitting a ServerFree backup, it is recommended that the administrator select only data that is supported by the ServerFree feature. If you want to protect an entire server that contains both data supported and not supported by the ServerFree option, create two different jobs. When the Backup Exec software detects that selected data is incompatible with the ServerFree Option, Backup Exec will default to a standard backup.

For example, if you select a local machine with user shares and Exchange server data:

- Create one job for the user shares. You can use ServerFree with this backup job.
- Create a second job for the Exchange data. Backup Exec will use its standard backup approach.

Note: Select the Advanced Open File Option and uncheck Use ServerFree Option for the second job.

RESTORING A SERVERFREE BACKUP

You recover a file, volume, or entire server from a ServerFree backup the same way that you would a traditional file-by-file restore with the Backup Exec software. The recovery process does not use the data mover, so a file or system recovery will impact server memory and CPU usage.

Note: Consult the Backup Exec Administrator Guide for details on submitting a restore job.

TROUBLESHOOTING

There are two sources to confirm the success or failure of the ServerFree Option backup job. Backup Exec software will report in the job log whether a ServerFree backup was successful, and it will also display the result as an exception on the Backup Exec summary screen. Details of any problems will also be in the job log. In the case of hardware errors, these may show up in the Windows System Event logs.

Should the ServerFree backup job fail, the cause is usually one of the following:

- The frozen-image method did not work or did not complete properly.
- The data mover is not functioning properly.
- The SAN hardware is experiencing problems or is improperly configured.

Begin by checking the settings for the selected frozen-image method used for the backup. In the case of VERITAS Snapshot Provider (VSP), be sure enough quiet time is specified and that the volume on the specified drive to create the frozen image has enough available disk space to hold the snapshot. If you used customized settings, rerun the Advanced Open File Option Wizard if necessary to prompt for system recommendations. Run the job again and check for success. Modify from the default settings as necessary to customize the resources used for the backup.

Troubleshooting the SAN is time-consuming. System cohesion is tied heavily to hardware compatibility, so be sure the SAN configuration is certified by VERITAS. Finally, make sure that the latest component drivers have been downloaded and installed.

Because the data mover is likely the newest hardware component in the SAN, you should check it thoroughly. Be sure the data-mover feature is enabled on the hardware component and installation adheres to the hardware

manufacturer's guidelines. If necessary, consult the hardware manufacturer if there is any doubt on how to completely check the SAN setup and data-mover configuration.

PURCHASING THE VERITAS SERVERFREE OPTION

The VERITAS ServerFree option is available only through Hewlett-Packard. To purchase the VERITAS ServerFree Option, contact your Hewlett-Packard sales representative; VERITAS ServerFree Option is listed on the HP Services Compatibility Price List. To find your local HP sales representative, log on to the HP Web site at http://welcome.hp.com/country/us/eng/contact_us.html.

SUMMARY

Storage consolidation is a reccurring theme among businesses with volumes of information stored on networks. Networked-attached storage (NAS) and storage area networks (SANs) will eventually replace direct-attached storage (DAS) for daily operations in medium to large organizations. This is occurring because these solutions reduce total cost of ownership and both centralize and consolidate storage. Companies using NAS and SAN solutions can benefit from server-free backup by addressing the increasing demand for high-performance and scalability of storage applications and developing support for the latest storage technology. With the ServerFree option for Backup Exec *for Windows Servers*, VERITAS helps organizations protect mission-critical data, as companies simultaneously seek improved data management and reduced cost of ownership.

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