

Evaluation of Enterprise Data Protection using SEP Software

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Backup & Disaster Recovery

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Executive Summary

Data protection is an ongoing challenge in IT environments of all sizes. For most organizations, the complexity of their environments, coupled with the size and the amount of data that needs protection are the primary challenges. For IT organizations, without dedicated staff to perform data protection, a concern is the complexity of the software used for data protection.

Large, enterprise backup applications have many features, but are often very difficult to utilize, understand and optimize. In contrast, data protection software designed for smaller organizations typically have far fewer features, reducing the complexity, but also limiting their usefulness and often imposing performance limitations.

Evaluator Group tested and validated several features and capabilities of the SEP sesam data protection software. These included the ability to protect both physical and virtual systems, along with rapid restoration capabilities and the performance of the software. All of these features are relevant for organizations ranging from small businesses up to the largest enterprise.

This evaluation is detailed in the following report, highlighting the configurations and environment utilized, along with the results and the implications of the findings. This report can serve as a first level evaluation guide for IT administrators who wish to compare SEP sesam to their existing product, or for IT Architects and IT management as an outline for performing an evaluation of backup products. The results of the testing are summarized in the [Evaluation Summary on page 15](#).

The remainder of this document provides details of the tests, the results and findings, along with Evaluator Group commentary and opinions and detailed appendices.

Evaluation Process

Testing occurred in August 2014, focusing on features and performance, along with operational efficiency characteristics. The test cases were designed to recreate actual enterprise use cases in order to create an accurate assessment of the configurations used in enterprise environments.

This test validation was performed in order to provide IT administrators and IT architects with actual data points to help them evaluate and consider the trade offs of choices available for protecting modern, enterprise IT environments, particularly those with mixture of both physical in virtual server environments.

The following aspects were the primary evaluation criteria:

- Performance of the application as workloads and clients scale
- Ability to protect both physical and virtual systems
- Protection and restore capabilities for VMware virtual machines

The storage utilized was high-speed SSD based system with FC, SAN attachment to the servers. This provided a test bed that removed most hardware performance bottlenecks, reducing the impact of the servers, SAN and storage systems on performance results.

Evaluator Group performed all testing in our labs, using Evaluator Group and loaner equipment for the testing. This report details the testing process, equipment and other findings.

Enterprise Backup Software

Enterprise data protection is often synonymous with backup applications. The primary point for managing data protection within companies is a backup application, which tracks and catalogs each system being protected, each data protection point in time and where the data is located. The policy and catalog capabilities of backup software provide significant value over other data protection methods such as disk based snapshots or replicas. Additionally, data protection software should facilitate off-site copies of data in order to provide disaster protection capabilities.

There are currently several backup applications that are designed and sold into large enterprises. These applications are complex, expensive and difficult to use and manage. However, their features are extensive and IT users often specialize in running a specific application. More general-purpose backup applications are often easier to use, are less expensive but don't have the features of larger enterprise backup software.

Additionally, another class of data protection software designed exclusively for virtual machines has arisen over the past decade. These backup applications are fundamentally different in their architecture, as they are designed to protect only virtual systems, and the storage retention media supported is typically only local disk. This offers several advantages, but presents challenges and limitations as well.

Evaluator Group Comments: We found that SEP sesam is designed to provide enterprise backup features, while supporting both physical and virtual systems. Additionally, SEP's traditional backup heritage enables flexible storage protection targets, including deduplicating storage, disk, tape and other media.

This evaluation was designed to test and validate the ability to perform a variety of data protection and data restoration tasks, as commonly found in enterprise environments today.

These validation tests included:

1. Test the performance of backing up multiple clients simultaneously
 - a. Backup 8 clients, each with 30 GB of unique data to a SEP repository
2. Backup of multiple client types
 - a. Physical client
 - b. VMware based VM client

- c. Hyper-V based VM client
3. Perform single instance file recovery of a VMware VM
4. Perform an instant recovery of a VMware VM

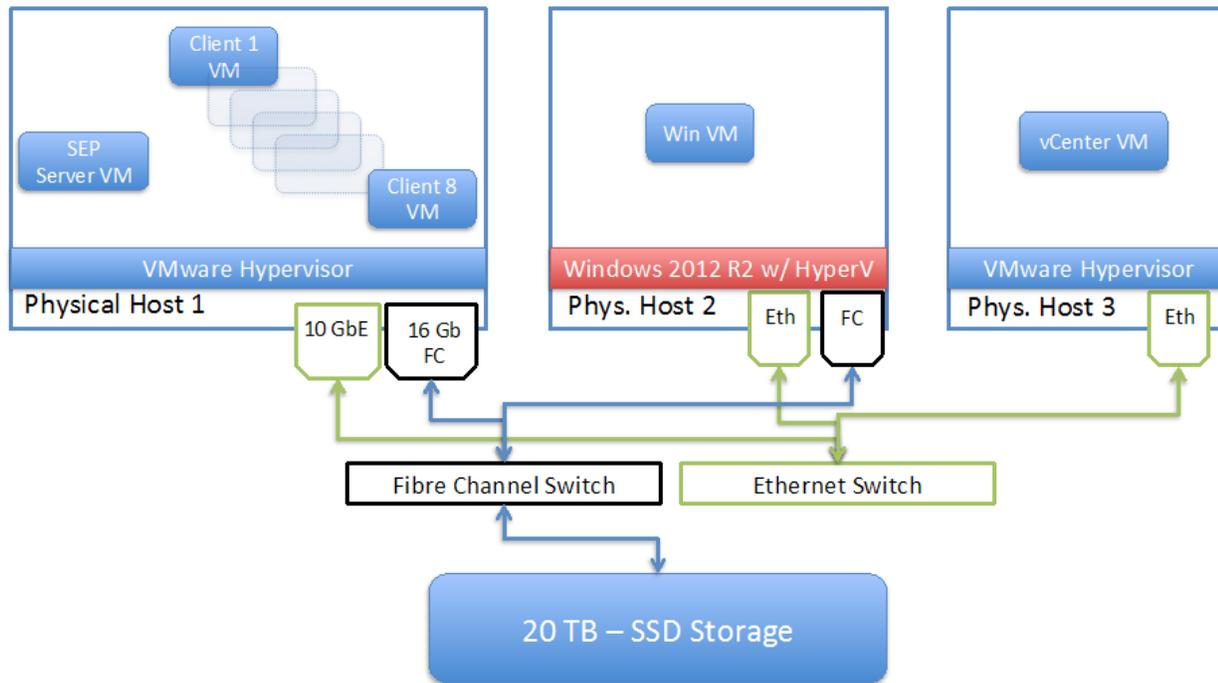


Figure 1: Test Configuration

Application Environment

The application environment consisted of three physical servers, with a hypervisor loaded onto each of them. An overview is shown above in Figure 1, and detailed more extensively in Appendix A.

One of the hosts used Hyper-V, and as such was also used as a physical host when accessing the host OS itself, Windows Server 2012 R2. Both the clients and the server were hosted on the same physical host, which reduced the SAN and LAN overhead of server to client communications.

Validation Overview

The testing occurred at Evaluator Group labs, using Evaluator Group equipment and personnel. All tests were configured and run by Evaluator Group, with assistance from SEP only when configuration issues occurred. The SEP software used for testing was supplied by SEP for this evaluation.

Evaluator Group Comments: SEP was found to be easier to use than most other enterprise backup applications, while providing the features necessary to support both physical and virtual systems running a variety of applications. The scale and performance of SEP was good, delivering nearly native maximum throughput of the underlying backup server. Our testing did not require the use of documentation for most tasks, making it well suited for environments with smaller IT staff.

Test Cases

1. Test the performance of backing up multiple clients simultaneously
 - a. Backup 8 clients, each with 30 GB of unique data to a SEP repository
2. Backup of multiple client types
 - a. Physical client
 - b. VMware based VM client
 - c. Hyper-V based VM client
3. Perform single instance file recovery of a VMware VM
4. Perform an instant recovery of a VMware VM

Validation Objectives

The testing was both quantitative and qualitative in nature. The quantitative testing measured specific values for performance and time to accomplish major tasks. The qualitative elements were evaluated based upon experience and comparisons with similar products, and our informed opinion of how features should operate.

- Validate that SEP is able to back up physical and virtual clients at high speed
 - Back up 8 virtual server instances measuring backup speed
- Demonstrate the ability to back up both physical and virtual hosts
- Verify the ability to perform a single file recovery of a guest VM
- Validate the ability to perform a near instant recovery of a virtual machine from a backup

Evaluator Group comments: The testing focused on operational use of SEP software, concentrating on interactions and use cases that would be typical with mid-sized and enterprise deployments.

This report highlights similarities and differences in test results. Evaluator Group commentary provides context and a narrative assessment of the results as experienced by Evaluator Group personnel.

The results of the tests follow the testing outlined, with results detailed in the remainder of this report. The configuration details for both environments are provided in Appendix A.

Test Findings

Test 1 - Backup Performance of Multiple Clients

Performance is a major consideration for any data protection technology. The ability to scale to support large environments depends upon two primary factors. The ability to scale a single server up in capacity and performance, along with the ability to scale out to multiple backup servers are both important factors.

In order to test the performance of a single backup server, a virtual machine was configured with multiple CPU's and 8 GB of RAM. A total of 8, logical devices were provisioned to the virtual machine. Each logical device was a LUN from the SAN attached storage system. This provided a pool of disk resources for the SEP sesam backup server to utilize.

An IO load generation tool was run on the virtual machine to determine the performance limitations. A 100%, random write workload was created, with 64KB block size. There was one task for each disk and a queue depth limit of 32 set. The limitation found was 1.4 GB/s, or 5 TB an hour.

Test 1

The performance test was run with 8 clients, all backing up data simultaneously. In order to reduce the impact of LAN traffic, a LAN free backup method was used.

VMware Backups

When the clients were backed up as VMware virtual machines, it is possible to perform a copy, or a full backup. One method uses VMware VADP API's, to enable change block tracking (CBT). Additionally, in a SAN environment, the physical host is reconfigured to mount the datastore containing the client VM's data onto the same physical host as the backup server.

This enables a LAN free backup, by using the ability of VMware to share a datastore between multiple physical hosts.

Results and Issues

The aggregate data rate achieved when backing up multiple clients was found to be limited by the performance of the backup server itself. In the test configuration, the backup server was a virtual machine, using multiple virtual disks, each configured as a SEP sesam Data Store. Details of the configuration and performance are provided in the appendices.

Relevance in Enterprises

SEP uses intelligence to determine the best available method for moving data between clients and the backup server. If LAN free data movement is possible, it will utilize these capabilities. This is an important consideration in many environments, and one reason that many IT environments maintain a separate SAN.

The performance achieved was nearly as high of transfer rate to local disk as achieved by a synthetic workload tool. Since these tools are designed to move data without overhead, they often represent a best case scenario. Thus, the SEP server appeared to be limited only by the underlying hardware available, rather than the SEP sesam software architecture. This is important for large enterprise environments.

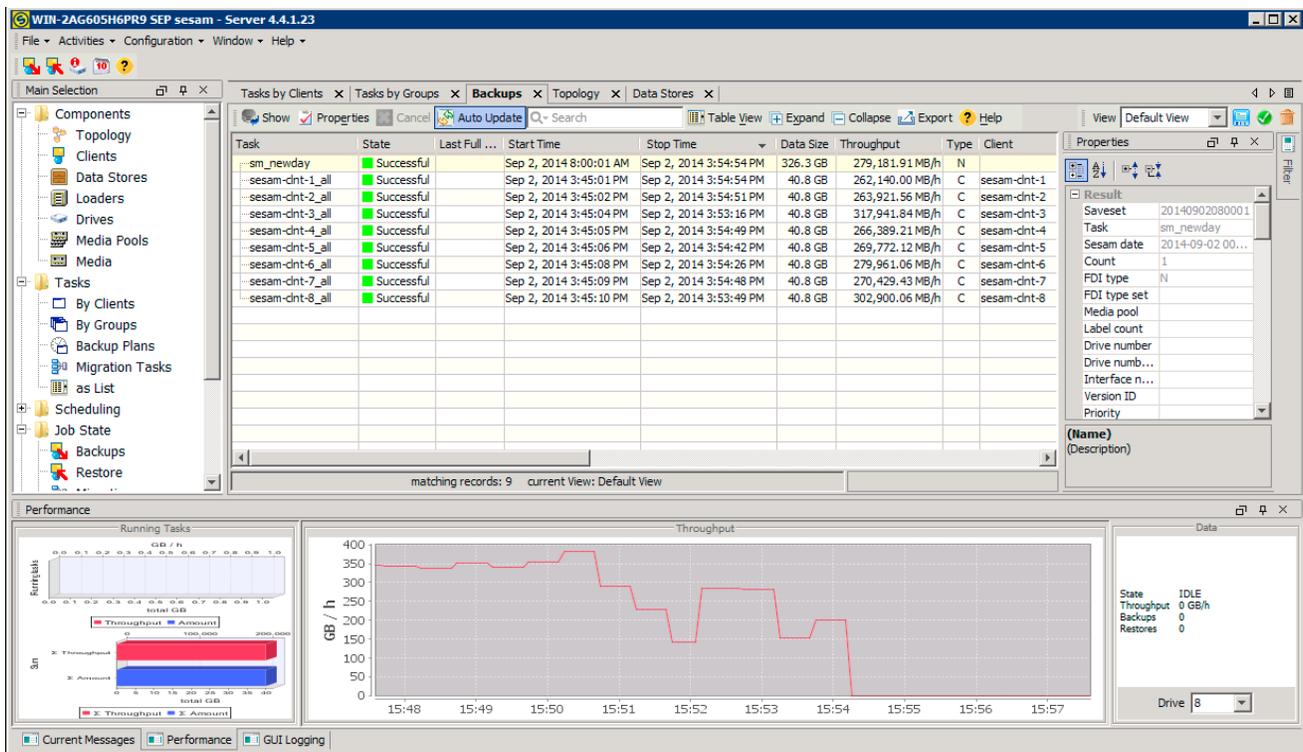


Figure 2: Multiple Client Backup (Sesam UI)

Evaluator Group comments: As seen above in the SEP sesam UI, the aggregate performance for all eight clients was 2.23 TB per hour. A total of 326 GB was backed up in approximately 9 minutes. This data correlates directly to the performance chart shown in Figure 3 for the VMware vCenter UI on the following page.

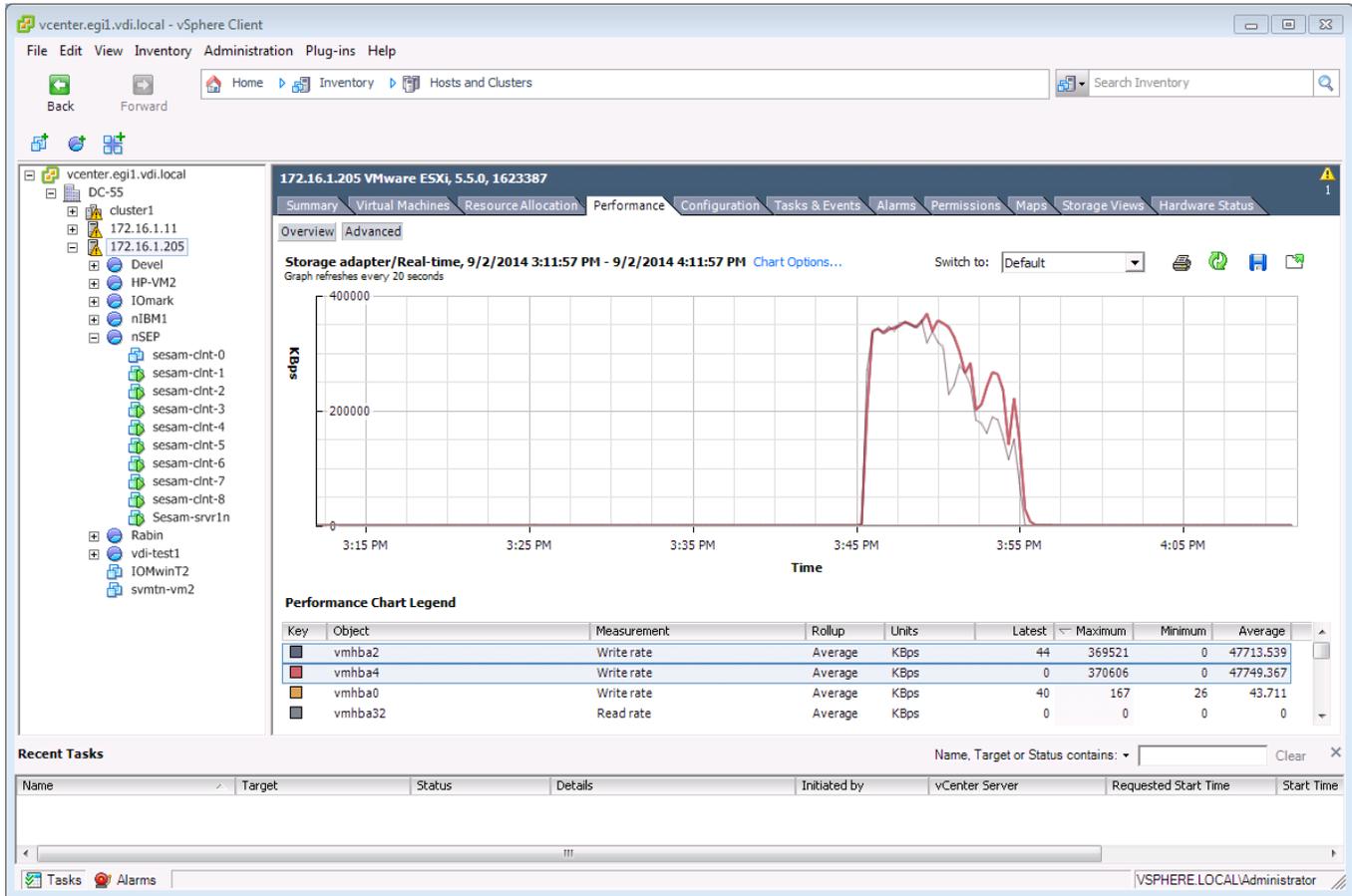


Figure 3: Multiple Client Backup (vCenter UI - Performance Chart)

Additionally, it was verified that an additional backup media server could be utilized. This is known as an “RDS” or remote data server in the SEP sesam nomenclature. This capability enables scale-out performance capabilities.

Evaluator Group comments: Attaining near native speed on a backup server is one important factor for high-speed enterprise backups. However, limitations always exist with any single server, which is why supporting scale-out backups is also important. The capability to use remote data movers, with an SEP RDS server is an important factor in considering the enterprise performance and scalability of backup applications.

Test 2 - Back Up Physical and Virtual Systems

Test

A functional test was performed to verify that multiple system types could be backed up. These included the following:

1. A virtual machine in a VMware ESXi vSphere environment
2. Physical Host, consisting of a Windows Server 2012 R2 system
3. A Hyper-V virtual machine

SEP sesam supports other OS and hypervisors, along with multiple applications running on the OS, however those items were not tested.

Results and Issues

All three types of systems were successfully backed up using SEP sesam version 4.4. There were no issues or concerns noted for this test.

Relevance in Enterprises

Protecting multiple system types is important for IT organizations, regardless of their size, budget or expertise. In order to reduce complexity, finding a tool that provides the data protection mechanisms for a variety of physical and virtualized hosts is important. It is also important that the protection of virtual systems leverages the capabilities the hypervisor affords, in order to take full advantage of virtual system protection methods.

Evaluator Group comments: Support for both physical and virtual systems is an important consideration in most IT environments. Data protection applications that support virtual only environments require additional tools and procedures for physical systems, increasing the cost and complexity of data protection.

Test 3 - Perform Single File Recovery of a VM

Test

A functional test was performed to verify that a VMware virtual machine backed up using the “Copy” method could be restored quickly. In SEP sesam and other backup literature, vendors refer to this as “Instant Recovery” although the term “instant” is relative. The test included the following steps:

1. A virtual machine in a VMware ESXi vSphere environment
2. The VM has previously had a backup using the “Full” backup method in SESAM with “Single File Recovery” option selected
3. The backup server is running Windows Server 2008 R2 with the NFS server service configured
4. The drive containing the backed up client image is exported via NFS on the SEP server

5. The SEP restore process for a file on the VM is initiated
6. The desired file is browsed for, and selected using SEP sesam GUI
7. The file is restored to the desired location

Results and Issues

This procedure was relatively straightforward, and worked without issue. The critical factors to consider are that the backup method selected previously was correct to support this restoration method. Additionally, the NFS mounting process must be in place, ideally using a Linux OS as the SEP backup server, or utilizing Windows Server 2012 R2 as the OS, due to the automated NFS capabilities of these operating systems.

The file selected was able to be restored quickly, once the prerequisite steps 1 - 4 have been performed. Specifically, steps 5 - 7 were performed in less than 2 minutes.

Relevance in Enterprises

The ability to rapidly restore a file, or small subset of files from a particular system is perhaps the most common restoration operation used by IT personnel. It is important that this capability is utilized and also that the use is practiced often, so that rapid restorations are performed correctly when required.

Test 4 - Perform Instant Recovery of a VM

Test

A functional test was performed to verify that a VMware virtual machine backed up using the “Copy” method could be restored quickly. In SEP sesam and other backup literature, vendors refer to this as “Instant Recovery” although the term “instant” is relative. The test included the following steps:

1. A virtual machine in a VMware ESXi vSphere environment
2. The VM has previously had a backup using the “Copy” backup method in SEP sesam
3. The backup server is running Windows Server 2008 R2 with the NFS server service configured
4. The drive containing the backed up client image is exported via NFS on the SEP server
5. The SEP restore process for the VM is initiated
6. SEP configures the VMware host to mount the clients image via the NFS export
7. The VM is created, using the NFS mounted image

Results and Issues

The test was performed successfully several times. However, the configuration and procedure were critical in order for the test to work properly. As a new feature, this capability may not be as robust as other features. It is recommended that administrators practice this restoration method several times before using it when under duress.

It is important that the configurations and documented procedures are followed closely in order to have this capability operate correctly. SEP has indicated that this capability is an area of focus and will continue to see enhancements with subsequent updates.

Relevance in Enterprises

This is a new feature in SEP sesam version 4.4. The capability to nearly “instantly” restore a virtual machine, using the backup image is a powerful feature. This has been one of the primary features being advocated by virtual client only backup products. By adding this feature, this provides IT administrators with most of the benefits of new virtual only backup products, while still supporting all the traditional backup environments that SEP has supported over the years. This is a significant enhancement and makes SEP a strong contender as the primary backup application for mixed physical and virtual IT environments.

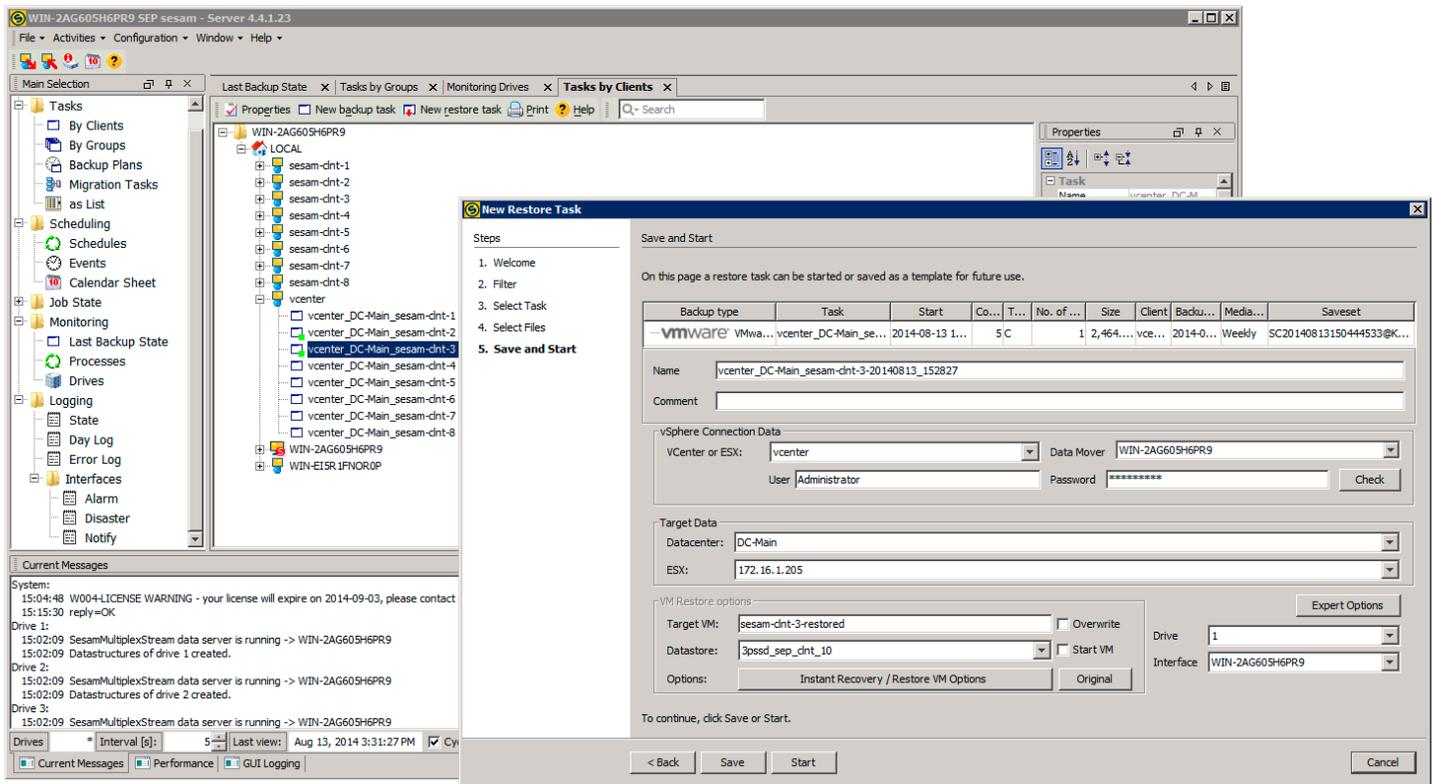


Figure 2: Instant Recovery (SEP sesam GUI: Step 3 of 4)

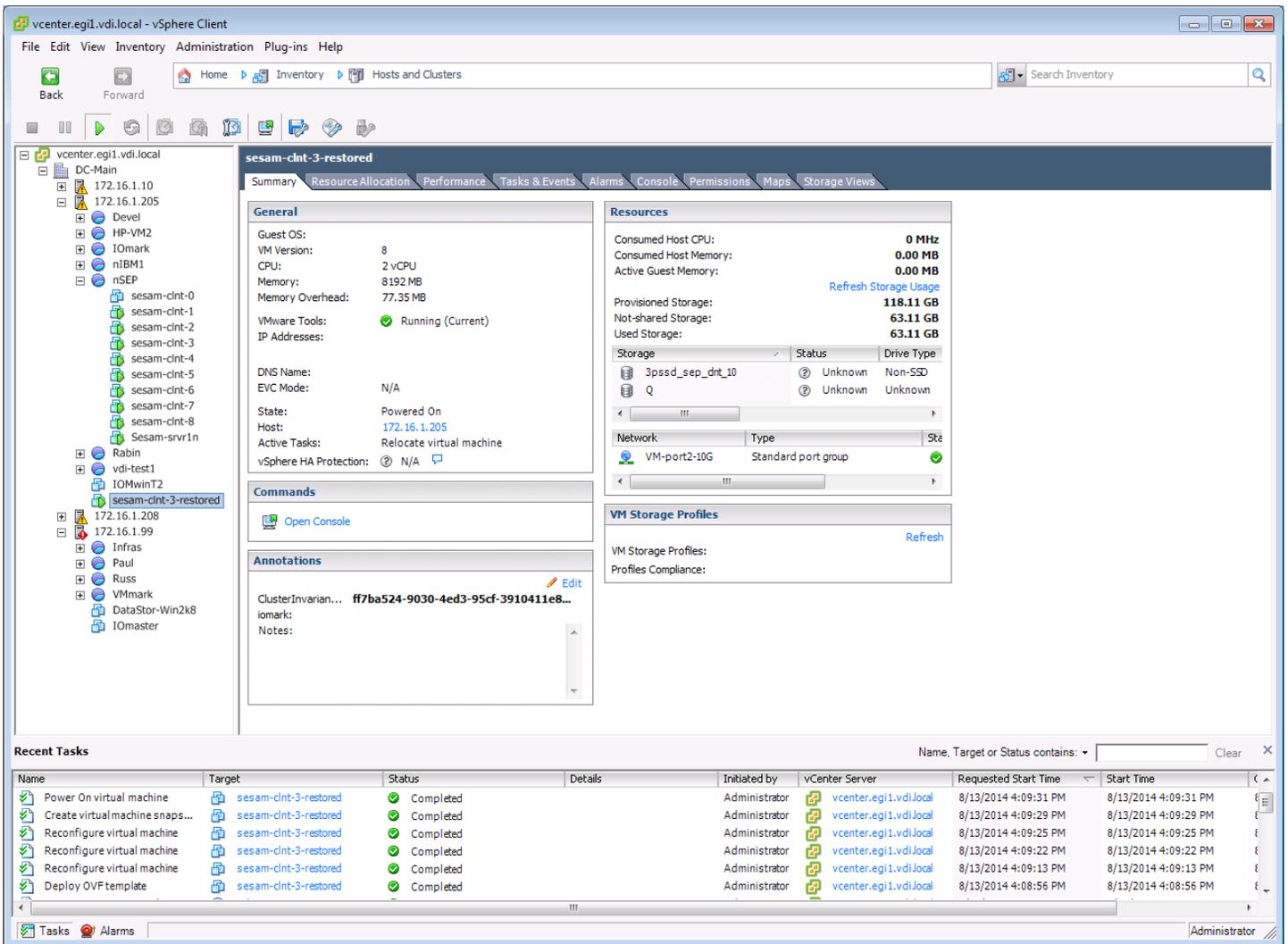


Figure 3: Instant Recovery (vCenter: Step 4 of 4)

SEP sesam Features

The SEP sesam version 4.4.23 was used for testing, which includes several new features release in version 4.4.

New features available with version SEP sesam 4.4 include:

- Support for single item recovery of a file within a VM
- Support for instant Recovery of a VMware VM
- Native, deduplicating disk target for Linux backup servers
- Support for SAP HANA

General features include:

- Agentless Technology
- SAN Data Backup (LAN Free)
- Single File Restore for VSS on Windows, Linux and Unix Guests
- Server Snapshots on Linux and VSS for Windows
- Restore to Other Hosts, HA Clusters or Pools
- Maintain Disaster Recovery Site in Sync for a Hot or Cold Availability Solution
- Convert Between Virtual and Physical Servers [V2P and P2V]
- Encryption

Supported environments and applications include a wide variety of operating systems, hypervisors, databases and applications. For a complete list of all supported OS, Hypervisors and Applications, please refer to the SEP website¹.

These applications are both representative of common applications within enterprise environments, but also represent a workload that requires more than 80% of a 16 Gbps FC link for both read and write operations. The tested workloads vary over time, similar to how enterprise workloads behave.

¹http://wiki.sepssoftware.com/wiki/index.php/SEP_sesam_OS_and_database_support_matrix

Evaluation Summary

This evaluation was designed to test the enterprise capabilities of SEP sesam. For large enterprises, the ability to support a wide variety of operating systems, hypervisors and applications is of primary concern. Also significant are the performance and scalability features of a product.

Additionally, the testing was designed to highlight the ease of use, which factor into use in smaller environments. While large enterprises often have a team dedicated to managing and monitoring backups, smaller IT organizations often do not have dedicated personnel. In this case, ease of use is of paramount importance.

Our evaluation found that SEP sesam is well suited both to mid-market and large enterprises. The scale, performance and wide range of OS and hypervisor supported make the product a good fit for large enterprises. The relative ease of use factors are also important, although more so for environments without dedicated backup staff. Although SEP was not simplistic, it was found to have significantly less of a learning curve than other, large enterprise backup applications that Evaluator Group has used.

SEP was found to be easier to use than other enterprise backup applications that Evaluator Group has used. It was also found to provide the features necessary to support both physical and virtual systems running a variety of applications. The scale and performance of SEP was very good, delivering nearly native maximum throughput of the underlying backup server.

As with other enterprise software products, training, support and consulting services are available to help reduce the learning curve for new users.

Performance

SEP sesam was able to back up multiple clients at high data rates that approached the physical limitations of the server. The backup performance increased as additional clients were added up to the server's physical limits.

Additionally, the scale-out architecture that enables the use of remote data servers (RDS servers) was verified to scale performance with additional RDS nodes. The ability to scale performance indicates SEP should work well in environments ranging from small to very large enterprises.

As a comparison, an I/O load was placed onto the backup server using open source performance tools. The SEP backup software was able to provide nearly the same level of I/O as the underlying infrastructure. Thus, the limitations with the environment for our setup appeared to be the hardware and hypervisor configurations, rather than the SEP software.

Features

Evaluator Group tested a majority of the new features available in the 4.4 release, including the ability to use change block tracking incremental backups with VMware VM's, the ability to perform single file recovery of files within a VM and the ability to perform an "instant recovery" of a virtual machine. All of these features worked as expected, delivering significant new functionality. One new feature not tested includes support for using a local disk pools as a deduplicating target on Linux.

Overall, the new enhancements focused primarily on enhancing the backup and restore capabilities for virtual machines. We found that SEP sesam supports virtual environments to nearly the same level as dedicated "virtual only" applications, while still retaining full functionality for protecting physical servers, the use of tape media as a retention media and many other capabilities.

Issues and Concerns

During testing, several problems were encountered. We tested the most recent release provided by SEP Software and we found a few minor issues. We were supplied with a subsequent release to resolve these issues and retesting showed that they had, indeed, been corrected.

Additionally, there were problems encountered when performing the Virtual Machine "Instant Restore." The error occurred due to lack of capacity on the restored volume. The option was chosen to restore the VM to an alternate location. However, the restoration operations did not place the restored VM into the requested location until after the restore was complete.

It should be noted that in particular the "Instant Recovery" is a new feature and requires detailed procedures in order to accomplish the process successfully. It is recommended that these operations be practiced in order to create a workable set of procedures for accomplishing the tasks in a production environment.

Final Observations

The large set of features, functions and environments supported by SEP sesam is substantial. In particular, the new features for virtual environments combined with support for physical systems and a wide variety of media makes SEP a strong candidate for enterprise data protection. SEP sesam retains relatively easy to use in comparison to other enterprise data protection products, while offering many more features than typical mid-market data protection applications.

Appendix A - Configuration Overview

Application Environment

Hypervisors

- VMware vSphere Enterprise, version 5.1
 - Includes vCenter version 5.1
- Microsoft Hyper-V, 2012 R2
 - Includes MS SC VMM (Windows 2012 server)

SEP sesam Software

- SEP sesam, Version 4.4.23
- Software installed on Server, clients and RDS server

Operating System

- Windows Server 2008 R2
 - All SEP servers and clients ran Windows Server 2008 R2
 - vCenter Server used Windows 2008 R2
- Windows Server 2012 R2
 - Hyper-V server used Windows 2012 R2

Infrastructure

Servers

- Total of 3 servers
- High performance server (Physical Host #1)
 - 32 CPU cores, 192 GB RAM
 - 2 x 16 Gb FC HBA connections to SAN
 - 2 x 10 Gb NIC connections to LAN
- General server (Physical Hosts #2 and #3)
 - 8 CPU cores, 32 GB RAM
 - 4 Gb FC attach via FC HBA
 - Dual, 1 Gb NIC

Networking

- SAN: Brocade Gen5 - 16 Gb 6510 FC Switch
- LAN: 10 Gb Cisco Nexus 5020 10 Gb switch with extended 1 Gb switch

Storage

- Total of 4 controllers, SSD storage with 20 TB capacity
- Total of 4 @ 8 Gb FC connections to Brocade FC SAN Switch

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