Rapid Backup/Restore with CommVault Galaxy QiNETIX & Silver Peak NX Series Appliances

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Introduction

Backup applications are required to transfer increasingly large amounts of data between data centers for the purpose of business continuity. This makes backup applications susceptible to limited bandwidth and high latency on the WAN links that connect these locations. The result can be unacceptably long transfer times, or an inability to complete backup procedures during well defined windows.

Leading backup and replication solutions, such as CommVault QiNetix Galaxy software, have helped improve (i.e. shrink) backup window times by using data compression and other techniques that minimize the amount of data being stored and retrieved. This enables more data to be backed up in less time.

While the above techniques are extremely effective, enterprises can further improve the performance of remote backups by deploying CommVault in conjunction with a dedicated WAN optimization solution, such as Silver Peak's NX series appliances. Silver Peak employs a variety of optimization techniques that further improve application performance and maximize WAN utilization in a CommVault environment, including disk based data reduction (called Network Memory™), Quality of Service (QoS), TCP acceleration, and loss mitigation. The result is reduced recovery times and improved recovery point objectives, which are critical to business continuity plans.

The objective of this solutions guide is to illustrate how Silver Peak's NX Series Appliances can be deployed in conjunction with CommVault's QiNetix solution. It highlights best practices for deployment and illustrates sample performance metrics that can be observed in real enterprise environments. Readers of this document will learn how best to maximize performance and security, achieving 97% data reduction in some instances with 10-20x average improvements in backup and restore times.

CommVault Backup/Restore Software Overview

QiNetix software provides a set of tools that help move and manage critical data. These tools enable backup and restore of data associated with computer systems in an enterprise.

The QiNetix software consists of integrated software modules that can be grouped together in a CommCell™. Each CommCell consists of the following main components:

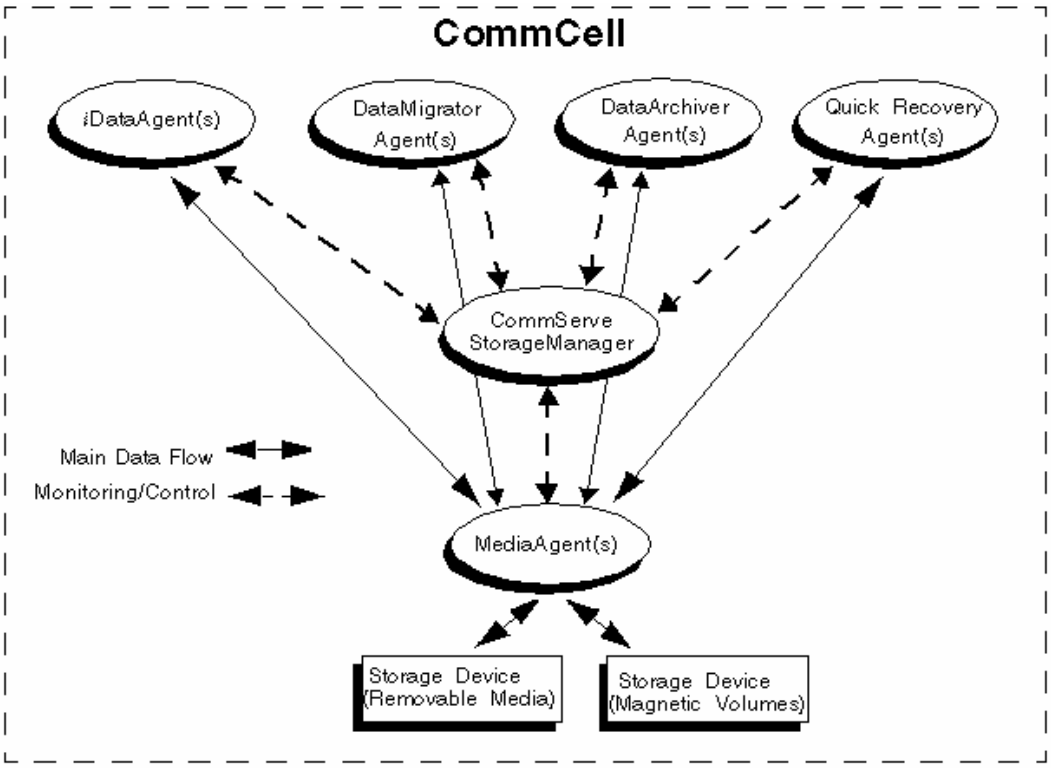
One or more of the following Client Agents:

- DataAgents™ that perform the backup and restore operations
- DataMigrator™ agents that perform the data migration, archival and recovery operations
- Quick Recovery (QR) agents that create and recover QR volumes
- DataArchiver Agents

The Common Technology Engine (CTE) components consisting of:

- One CommServe StorageManager™
- One or more MediaAgents™

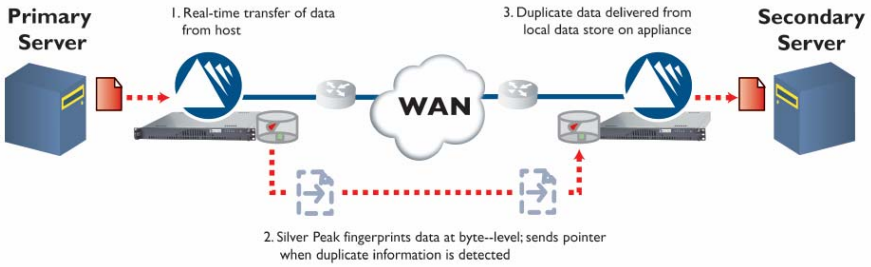
Once installed and configured, these CommCell elements can be controlled and monitored from a single unified CommCell Console™ .



Silver Peak Technology Overview

Silver Peak is a leader in high performance Wide Area Network (WAN) acceleration. Silver Peak NX Series Appliances leverage the following technology components to accelerate all enterprise applications securely and reliably:

- Network Memory inspects all traffic sent between clients and servers, storing information as a local instance in Silver Peak appliances. Repetitive information is delivered locally rather than sent across the WAN, improving application performance and WAN utilization

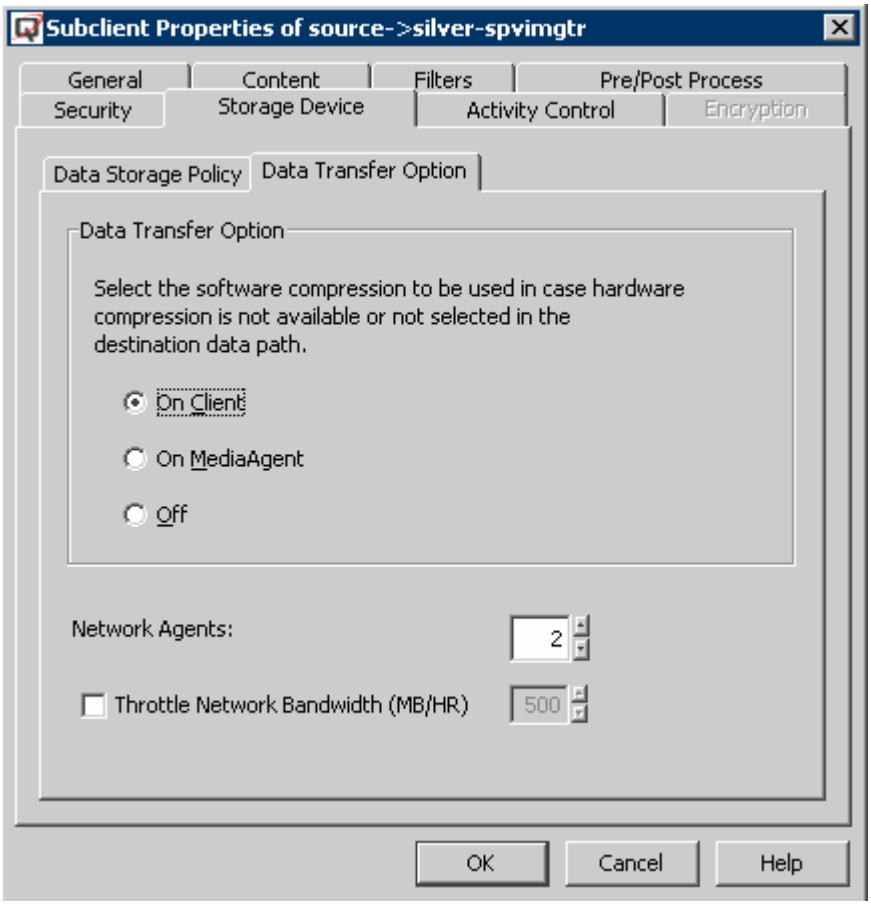


- Advanced compression: Cross-flow payload and header compression ensure that data transmission across the WAN is as efficient as possible.
- Quality of Service: Silver Peak appliances support several QoS techniques, including advanced queuing/scheduling and application-based policies.

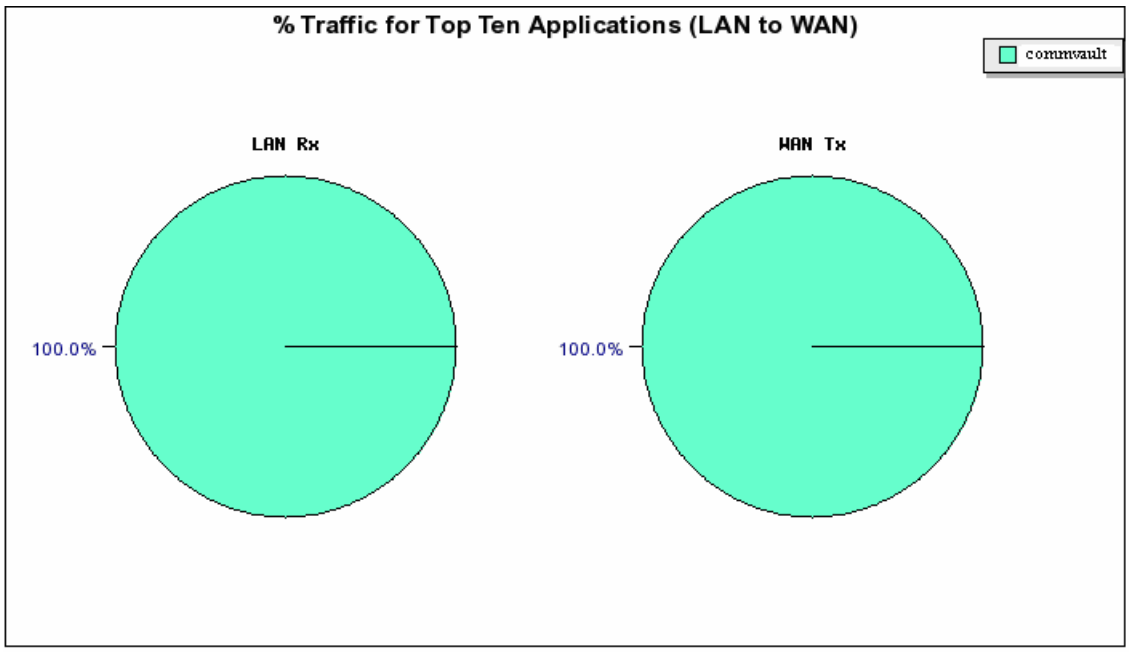
- Latency and Loss mitigation: Silver Peak uses TCP acceleration techniques, such as variable window sizing, to compensate for poor performance on high latency links.
- Secure Content Architecture™ : Silver Peak keeps enterprise data secure. All NX appliances are equipped with hardware-based AES encryption to protect local data stores and data “in transit” between devices

Scenario #1: CommVault Compression Enabled; No Optimization from Silver Peak

In the first scenario, compression is enabled in the CommVault solution, as is indicated by the following screen capture.

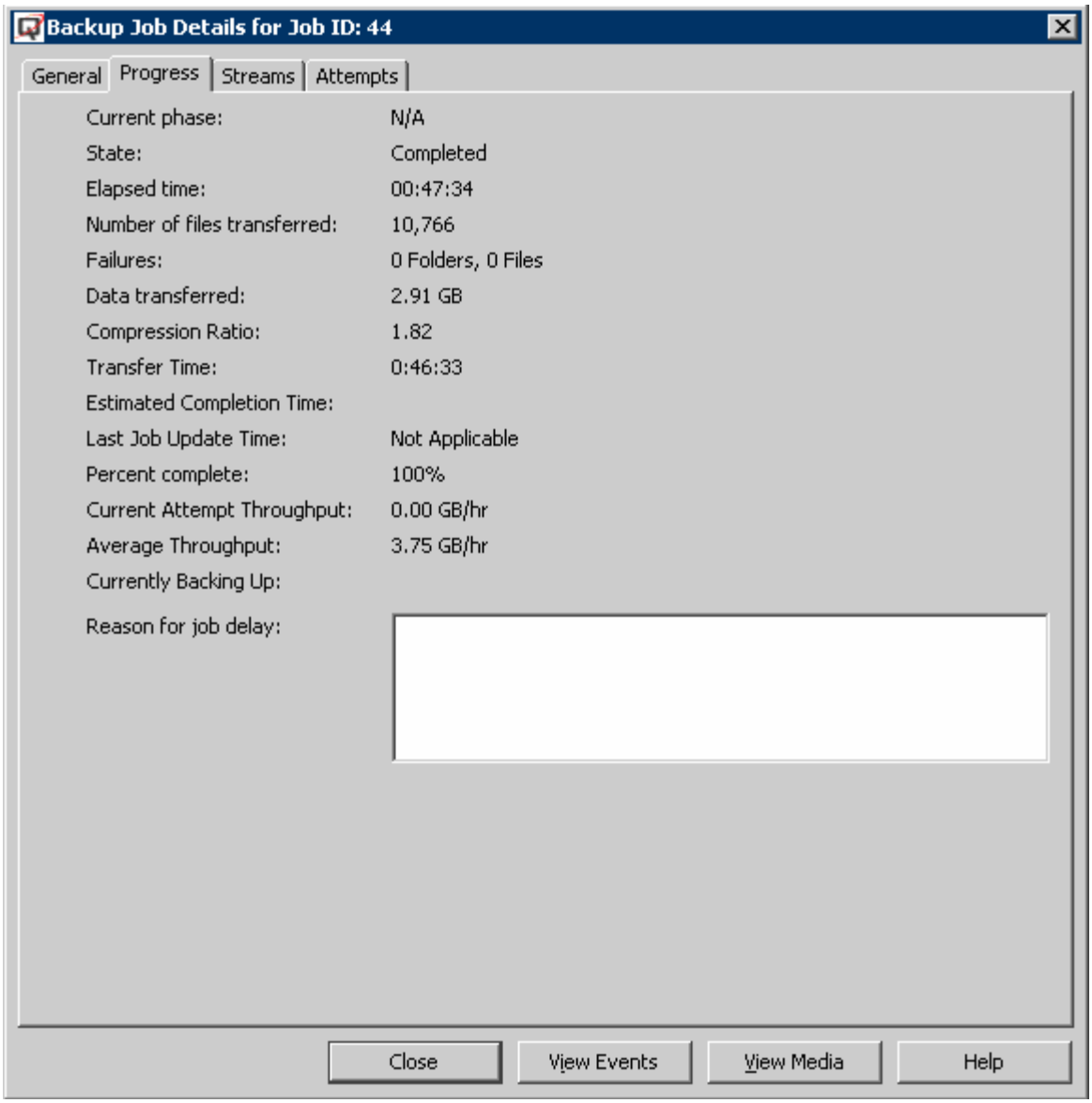


Silver Peak is setup in “bypass” mode, meaning that none of the CommVault traffic is being optimized by the NX appliances. This is indicated by the following screen shot, where the Silver Peak appliances show a 1:1 ratio of LAN:WAN traffic



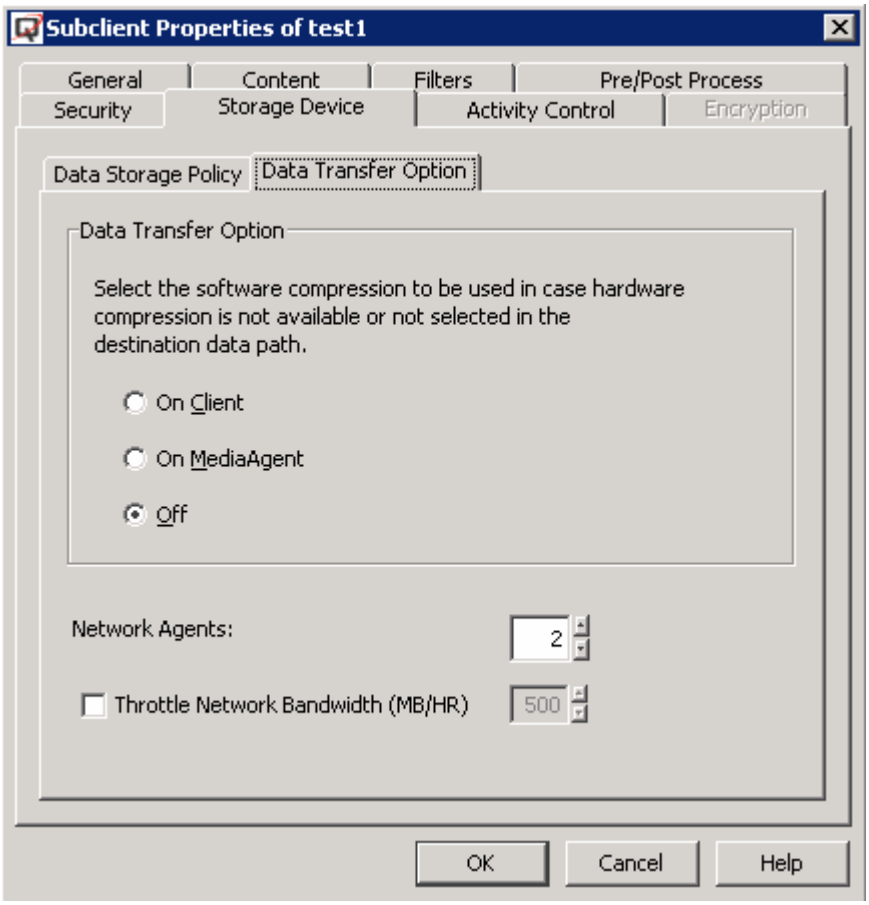
Application	LAN Traffic	WAN Traffic	LAN Rx Bytes	WAN Tx Bytes	Ratio (X)	Reduction
commvault	100.0%	100.0%	1,818,640,829	1,818,640,829	1.0	0.0%

Under this configuration, CommVault provides a compression ratio of 1.82 for 2.91GB of data set and a completion time of 46 minutes. This is shown in the CommCell console screen shot below:

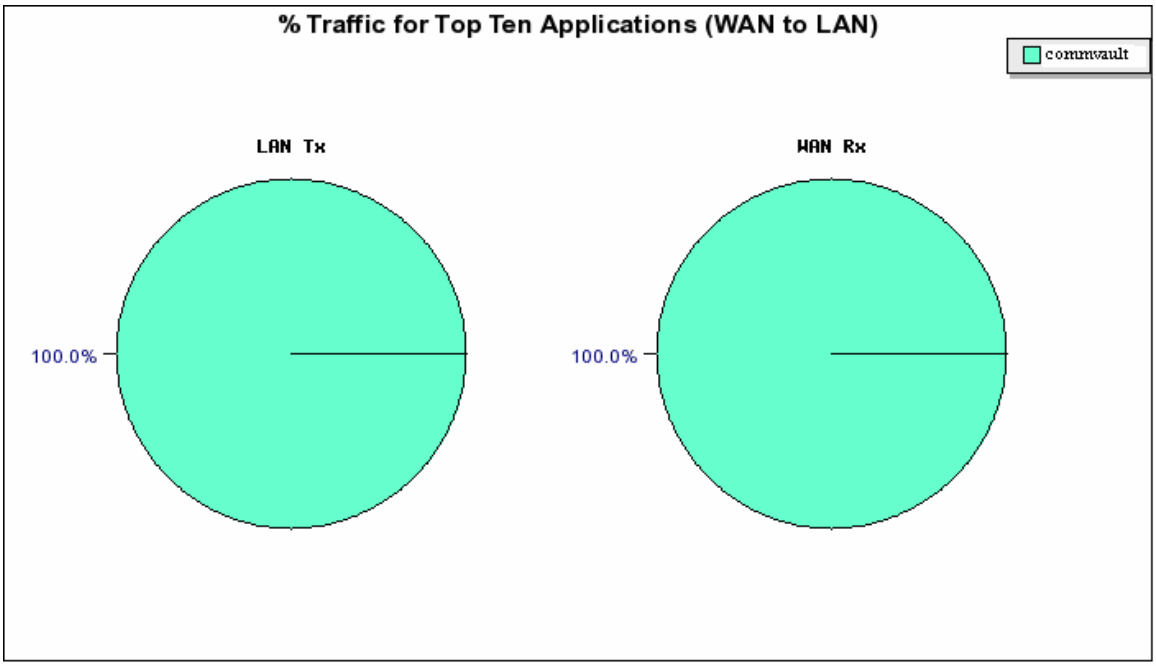

Backup Job Details for Job ID: 44
General
Progress
Streams
Attempts
Current phase: N/A
State: Completed
Elapsed time: 00:47:34
Number of files transferred: 10,766
Failures: 0 Folders, 0 Files
Data transferred: 2.91 GB
Compression Ratio: 1.82
Transfer Time: 0:46:33
Estimated Completion Time:
Last Job Update Time: Not Applicable
Percent complete: 100%
Current Attempt Throughput: 0.00 GB/hr
Average Throughput: 3.75 GB/hr
Currently Backing Up:
Reason for job delay:
Close
View Events
View Media
Help

Scenario #2: CommVault Compression Disabled; Silver Peak Optimization Enabled

To turn off compression on CommVault, right click on the subclient representing the backup job and click properties. Under “Storage Device” tab select the Data Transfer Option and click “Off”



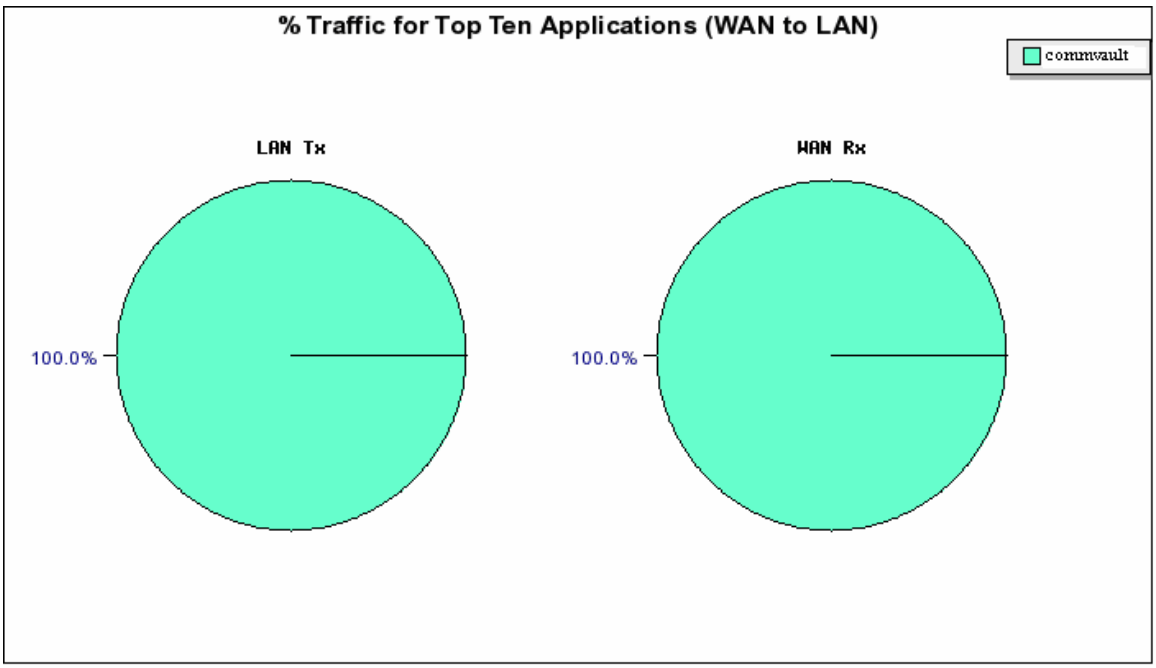
When backup data is sent for the first time through the Silver Peak appliance (with compression disabled on the CommVault software), 54.7% data reduction is achieved. This is slightly better than the 45% reduction using CommVault only compression, primarily due to the fact that full optimization is turned on the Silver Peak Appliance and compression happens to just a subset of full featured optimization.



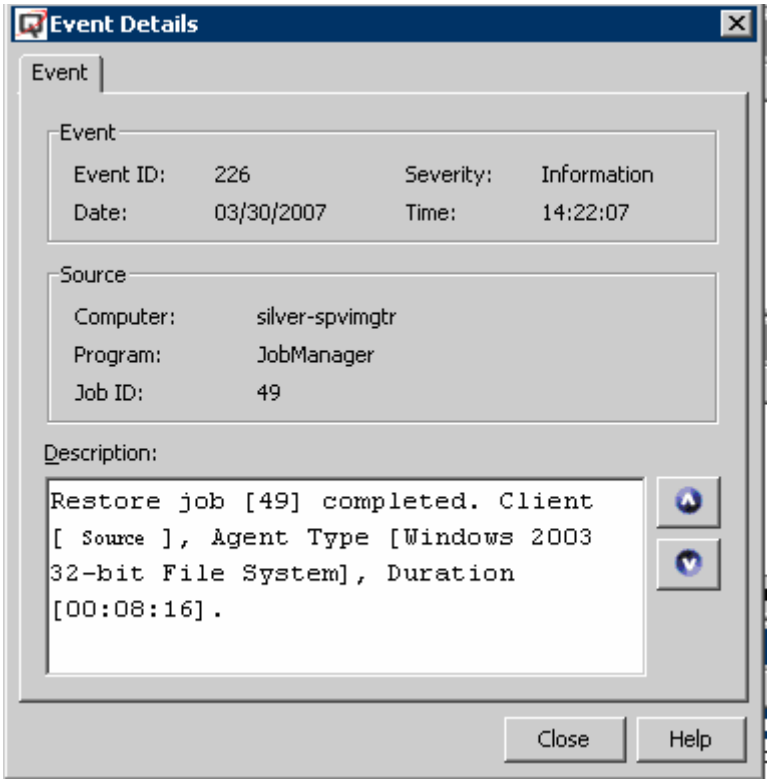
Application	LAN Traffic	WAN Traffic	LAN Tx Bytes	WAN Rx Bytes	Ratio (X)	Reduction
commvault	100.0%	100.0%	3,290,760,637	1,489,110,562	2.2	54.7%

Restore results using Silver Peak Optimization turned on

When data is restored in the opposite direction, it is viewed as a second pass to the Silver Peak appliances. This leads to a dramatic increase in performance – greater than 97% data reduction. The restore time was reduced from 46 minutes to 8 minutes, a 5.5x improvement as shown below. The significant increase in performance is largely due to Silver Peak's Network memory technology, which delivers all repetitive information locally rather than re-transmitting it across the WAN.



Application	LAN Traffic	WAN Traffic	LAN Tx Bytes	WAN Rx Bytes	Ratio (X)	Reduction
commvault	100.0%	100.0%	3,278,557,984	93,729,798	35.0	97.1%



Test Results Summary 1 – Performance Improvement with Compression Turned off

Below is a summary of the results, using a 3GB dataset that included standard windows install files.

Configuration • 3GB Data • 50Mbps link • 50ms latency	CommVault ONLY compression / SP in BYPASS mode		SP Only Optimization – NW memory + TCP Optimization CommVault compression turned off	
	Ratio / Data Reduction	Completion Time	Ratio / Data Reduction	Completion Time
Backup [First Pass]	1.8 / 45%	46 minutes	2.2 / 54%	37 minutes
Restore [Second Pass]	1.8 / 45%	45 minutes	35 / 97.1%	8 minutes

Scenario #3: CommVault Encryption; Silver Peak Optimization Enabled

Below is a summary of the results with and without encryption in CommVault software, using a 3GB dataset that included standard windows install files.

Configuration • 3GB Data • 50Mbps link • 50ms latency	CommVault encryption + SP Optimization turned on		CommVault compression turned off + SP Optimization turned on	
	Ratio / Data Reduction	Completion Time	Ratio / Data Reduction	Completion Time
Backup (First Pass)	1.1 / 9.9%	128 minutes	2.2 / 54%	47 minutes
Restore (Second Pass)	1.1 / 9.9%	128 minutes	35 / 97.1%	8 minutes

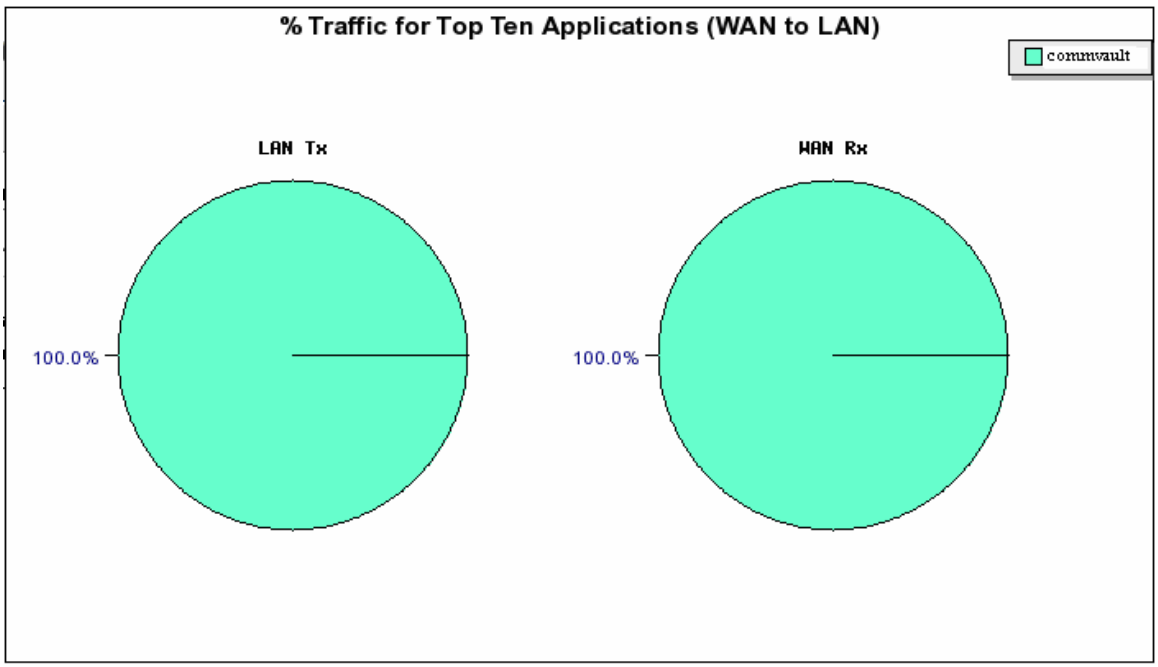
The above results indicate that with CommVault encryption turned off, Silver Peak Appliance can achieve 6x more data reduction and reduce the backup time from 128 minutes to 47 minutes and reduce the restore time by a factor of 16x.

Scenario #4: CommVault with Image Level Backup; CommVault Encryption & Compression Disabled; SilverPeak Optimization Enabled

The Image Level Backup agent captures and replicates block level incremental updates on a scheduled basis. Depending upon the rate of change, the WAN bandwidth and the WAN latency, incremental backup jobs can be scheduled hourly, six-hourly or daily. The goal is to complete replication of the backup deltas captured over a period of time in a backup window before the next backup job is scheduled to start. Even though the data de-duplication feature of the Image Level Backup agent reduces the amount of data being sent over the WAN by replicating only deltas, enterprises still generate significant amount of this delta data to transport justifying speeding up the transfer of data for reducing stringent RPO (Recovery Point Objectives)

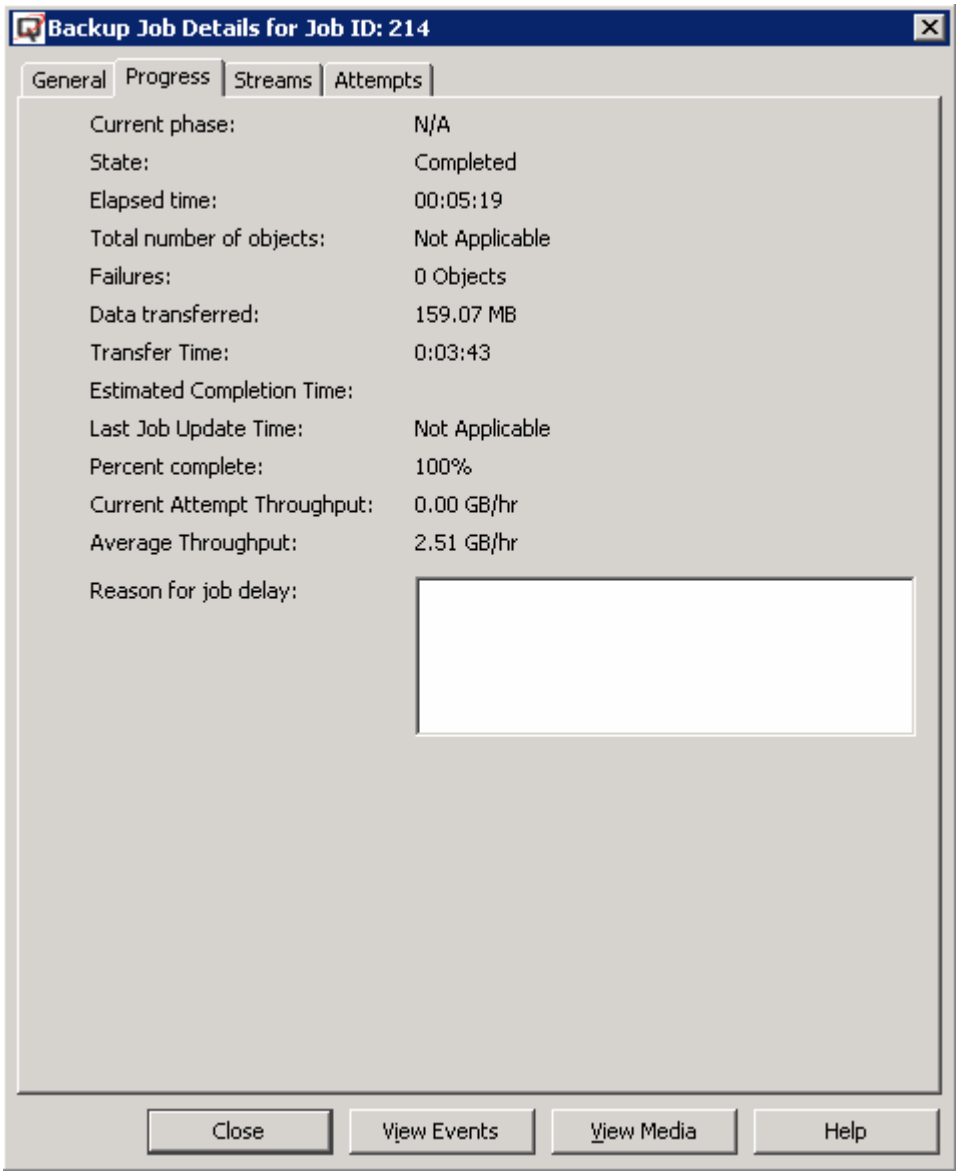
The test setup consisted of a base data set of 10GBytes generated using IOMeter and replicated over a 50ms latency link on a 5Mbps WAN bandwidth and 0.5% packet loss.

The results below shows 93.7% data reduction on a 4.7GBytes of deltas generated during the test. IOMeter was constantly generating changes at the rate of approximately 1 (One) MBytes/sec. The Image Level Backup agent was set to replicate the generated deltas every 5 minutes and the test was run over a period of 2 hours (24 cycles).



Application	LAN Traffic	WAN Traffic	LAN Tx Bytes	WAN Rx Bytes	Ratio (X)	Reduction
commvault	100.0%	100.0%	4,762,863,413	299,258,564	15.9	93.7%

Here is a screen capture of one replication schedule, wherein, 159.07 MB of deltas was replicated in 5min 19sec, reflecting a throughput of 2.51GB/hr OR 5.71Mbps



"Best Practice" Configuration Recommendations

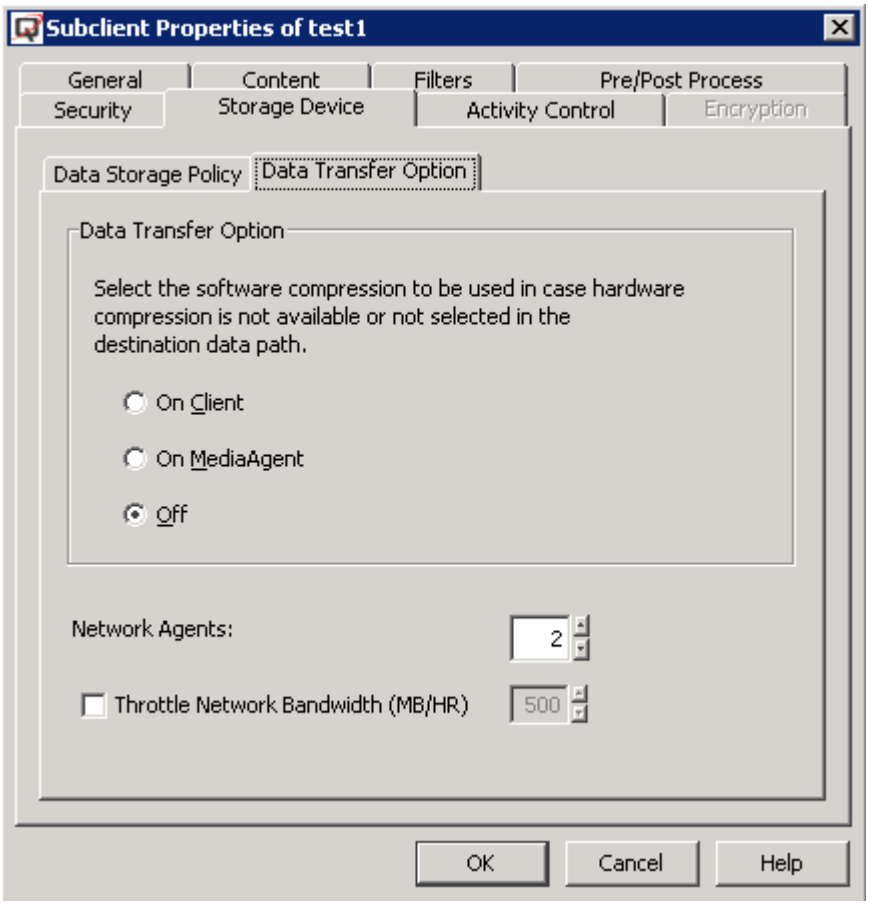
The following procedures can be performed to maximize performance when Silver Peak is deployed in conjunction with CommVault software based on the performance results from earlier sections

1. Disable compression within the CommVault software

The best performance results were achieved when compression was disabled on the CommVault server. This enables Silver Peak's compression and data reduction capabilities to reach their maximum potential. In addition, it offloads CPU intensive process from the backup server, which can lead to better scalability.

The granularity of turning compression on and off is per subclient configured for each backup job.

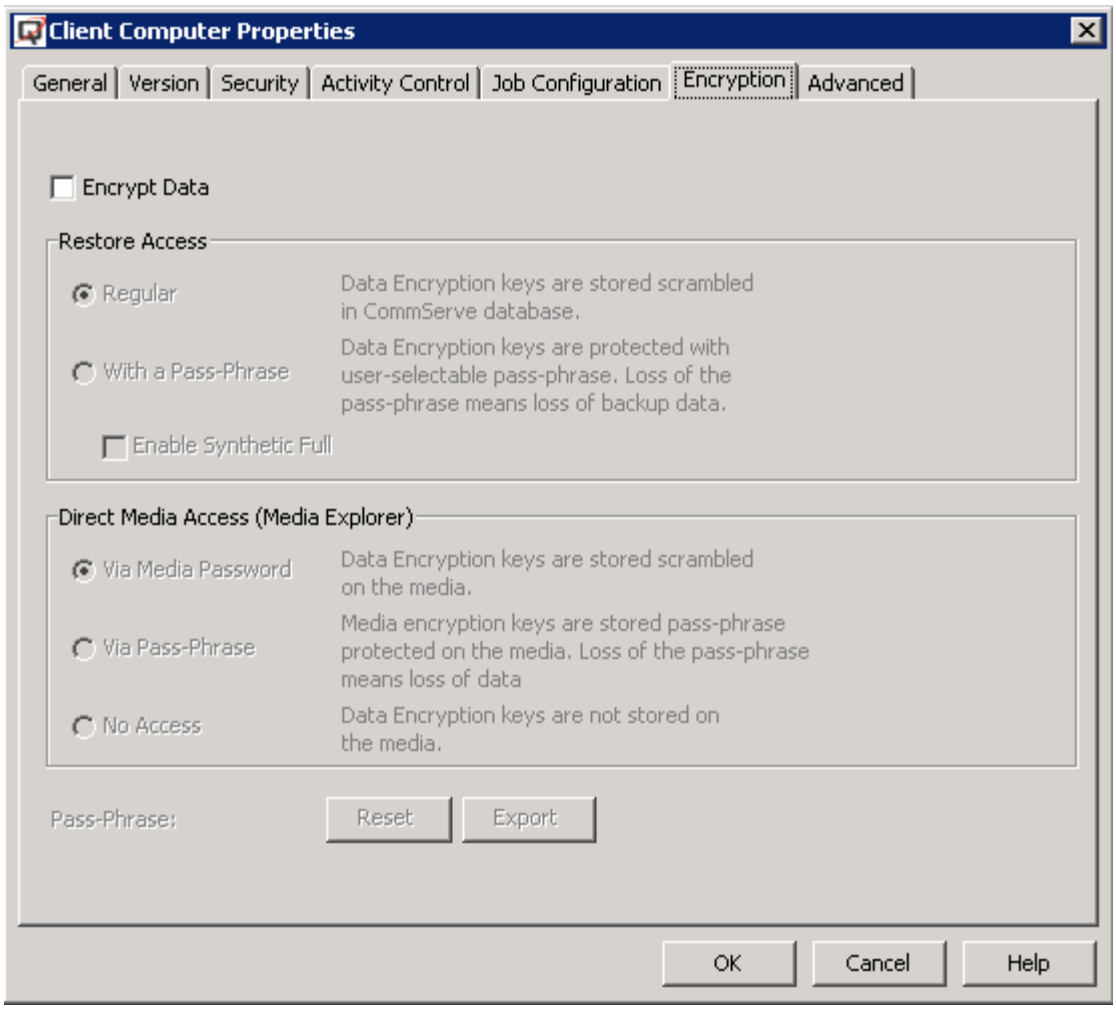
To disable compression, right click the subclient representing the backup job and click “properties”, under “Storage Device” tab. Select the Data Transfer Option and click “Off” as shown below:



2. Turn off transport encryption within CommVault

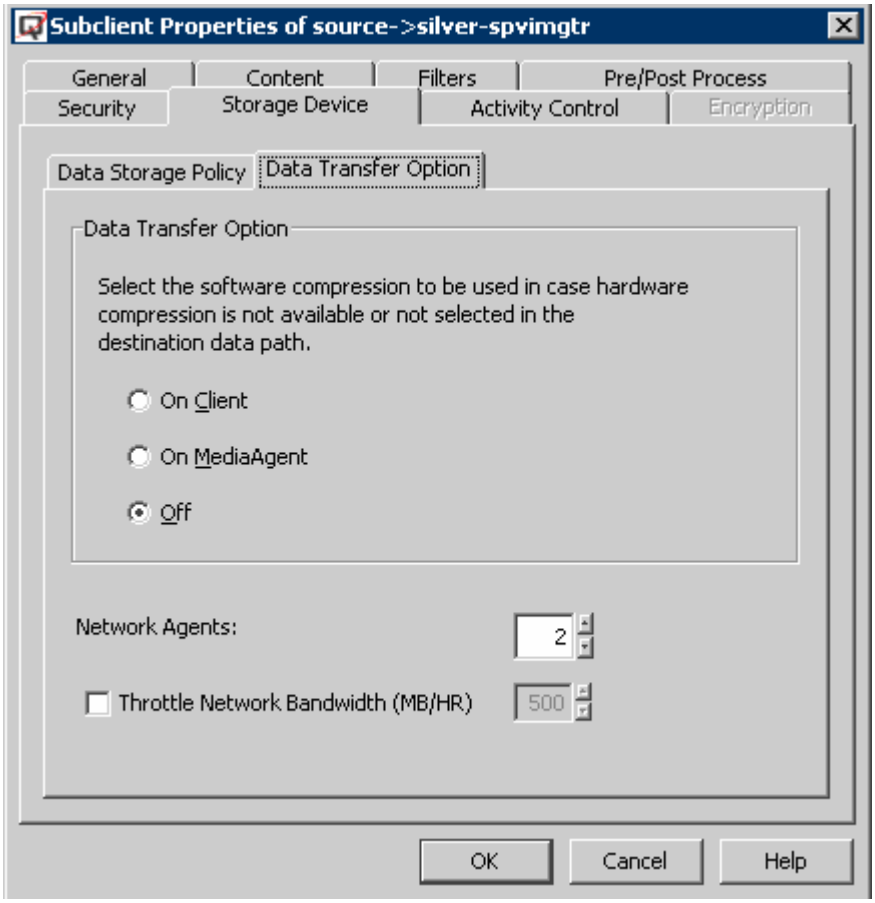
Encryption obfuscates payload data from downstream devices, such as WAN optimization controllers, preventing them from performing a wide range of functions, such as data reduciton. Therefore, it is recommended that transport encryption be disabled on the CommVault software when deployed with Silver Peak Appliances. If data encryption is desired, IPsec can be enabled between Silver Peak appliances for secure transport across the WAN.

The granularity of turning encryption on and off is determined on a per client basis. In other words, encryption will be turned off for all backup jobs. To turn off encryption, right click the client host entry in the CommCell console and under the “Encryption” tab, uncheck the “Encrypt Data” checkbox.


Client Computer Properties
General
Version
Security
Activity Control
Job Configuration
Encryption
Advanced
Encrypt Data
Restore Access
Regular
Data Encryption keys are stored scrambled in CommServe database.
With a Pass-Phrase
Data Encryption keys are protected with user-selectable pass-phrase. Loss of the pass-phrase means loss of backup data.
Enable Synthetic Full
Direct Media Access (Media Explorer)
Via Media Password
Data Encryption keys are stored scrambled on the media.
Via Pass-Phrase
Media encryption keys are stored pass-phrase protected on the media. Loss of the pass-phrase means loss of data
No Access
Data Encryption keys are not stored on the media.
Pass-Phrase:
Reset
Export
OK
Cancel
Help

3. Increase network throughput

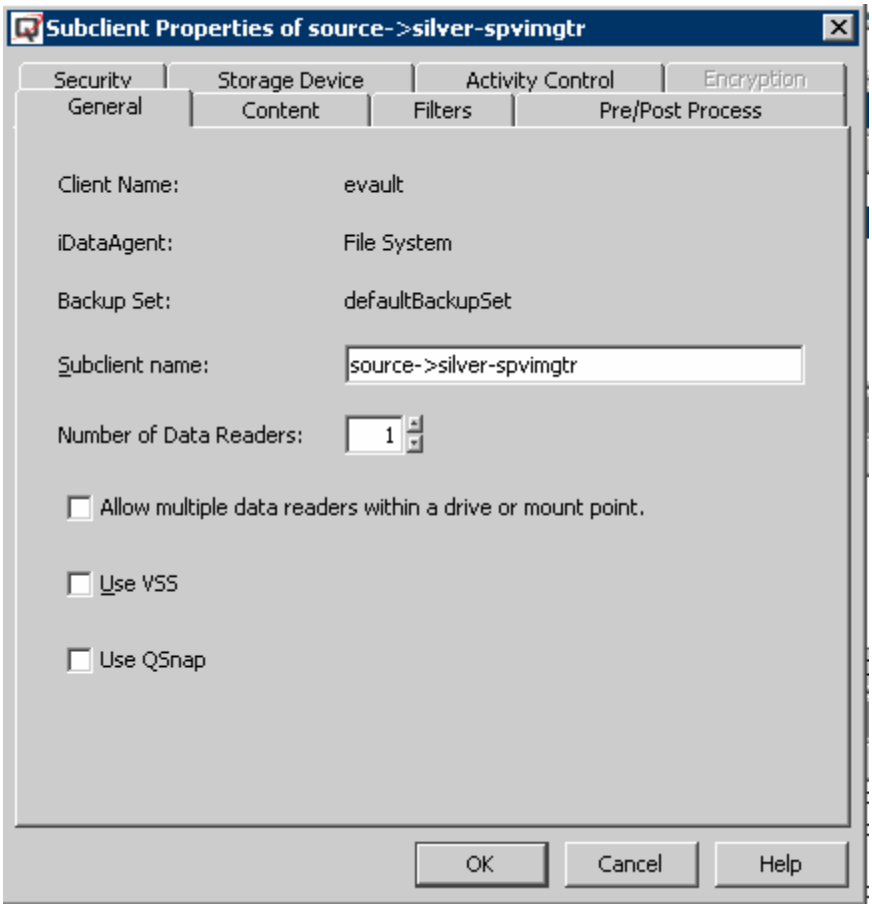
CommVault software allows users to specify multiple network flows per backup job for increasing the overall replication throughput as shown below under the field “Network Agents”. The maximum value is 3. If your environment can support it, it is recommended that this value be increased to its maximum. Note that this setting is per subclient and affects a single backup job, by default, the client software will create a single network flow for each backup job.



4. Increase backup throughput

CommVault software also allows users to configure the number of data readers for a given backup operation. Ideally users should leave this to 1 per physical drive. However, in NAS/SAN environments where the logical drives are configured using RAID, this number can be increased to increase the read throughput thereby potentially speeding up back operations. For instance:

- If the backup source logical drive is configured using RAID0 (disk striping) across 3 disks then increasing this number to 3 will result in 3x improvement in read throughput
- If the backup source logical drive is configured using RAID5 across 5 disks then increasing this number to 5 will result in ~2-3x improvement in read throughput

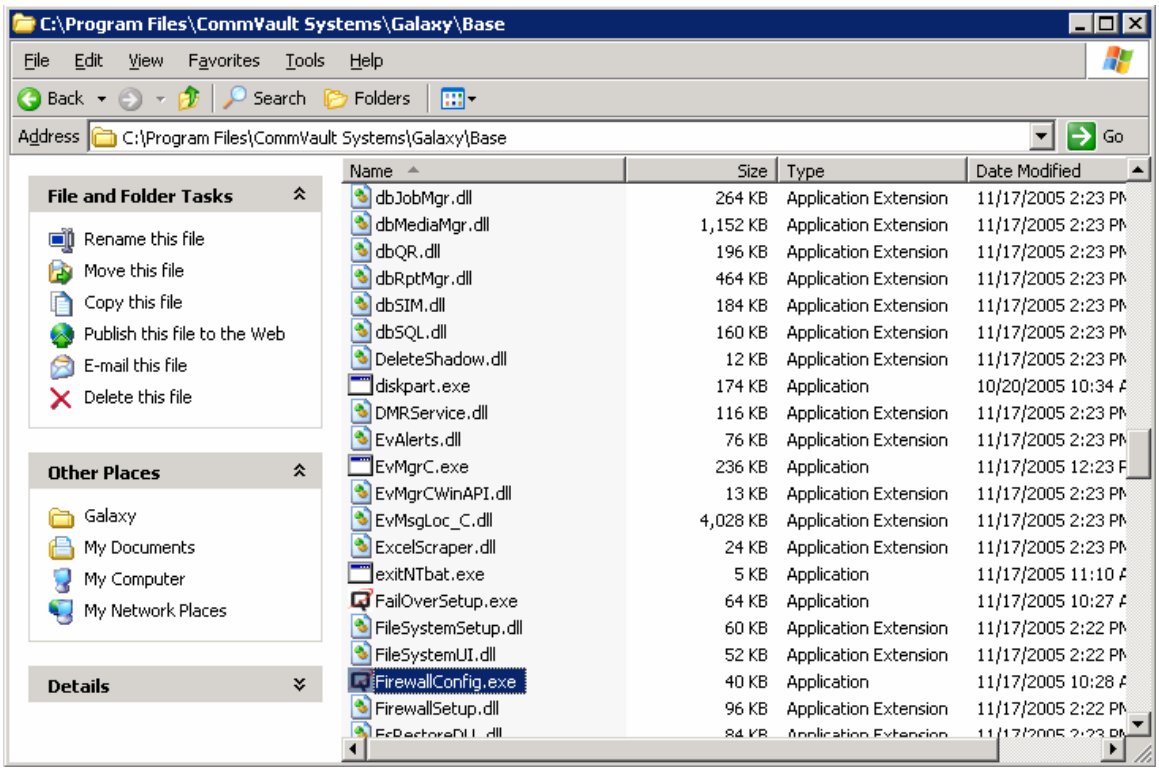

Subclient Properties of source->silver-spvimgtr
Security
Storage Device
Activity Control
Encryption
General
Content
Filters
Pre/Post Process
Client Name:
evault
iDataAgent:
File System
Backup Set:
defaultBackupSet
Subclient name:
source->silver-spvimgtr
Number of Data Readers:
1
Allow multiple data readers within a drive or mount point.
Use VSS
Use QSnap
OK
Cancel
Help

5. Reconfigure CommVault Clients and Media Agents to specify port range

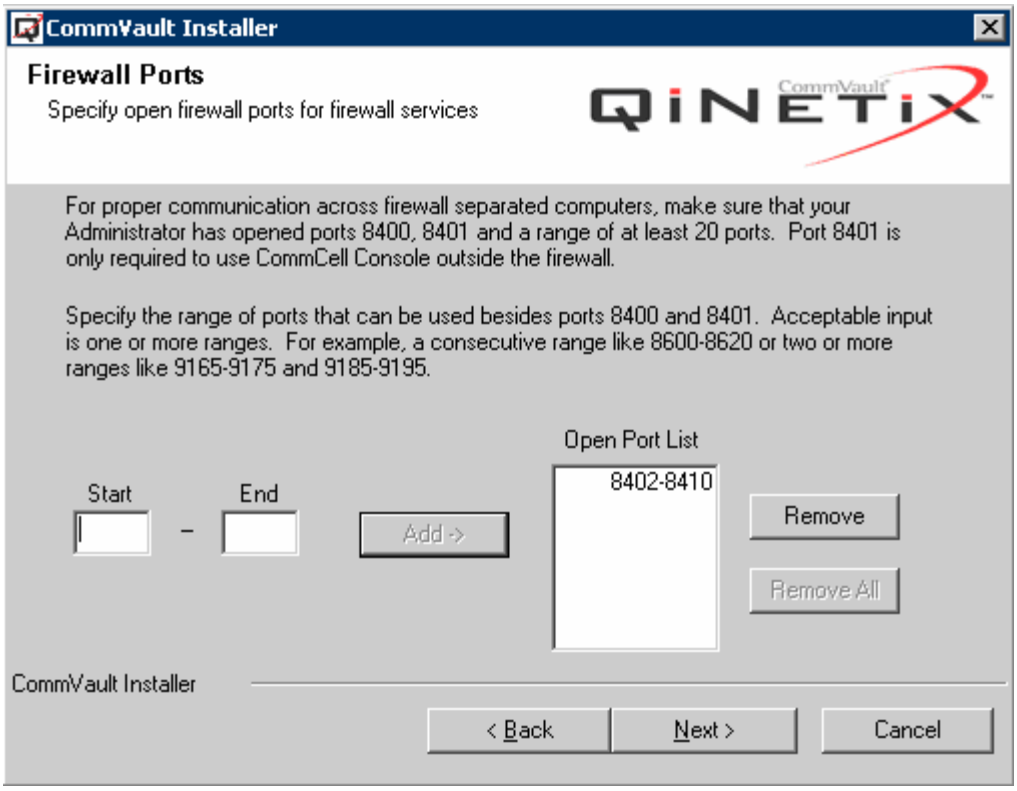
By default the CommVault QiNetix client agents and media agents use random TCP ports for data transfer. In order for Silver Peak Appliance to identify this traffic, it needs to know what ports are being in use for data replication. CommVault QiNetix allows users to specify a port range that the software should use for data replication during software install. By specifying this variable, Silver Peak can be used to apply QoS and other policies.

Please see the screen shots below for how to configure TCP ports on the CommVault solution.

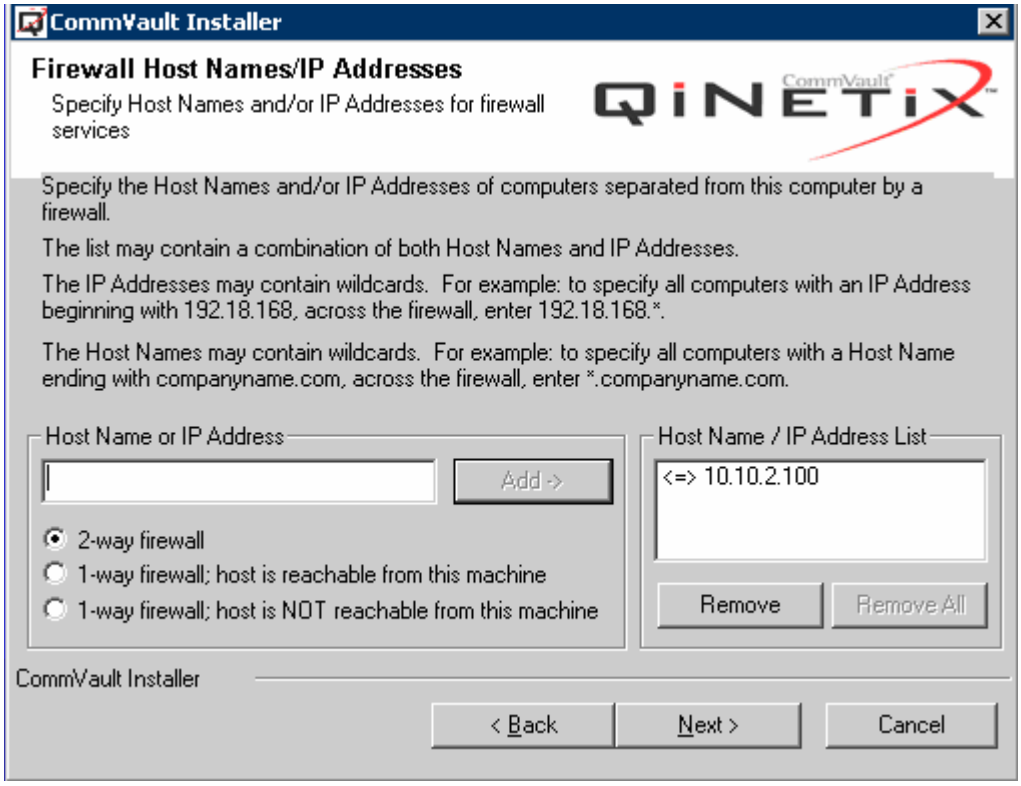
STEP1: Browse to the Base directory under CommVault install directory and double click FirewallConfig.exe



STEP 2: Specify the port range that you wish to dictate to the CommVault QiNetix CommCell member hosts [clients & media agents] to use for control and data replication traffic



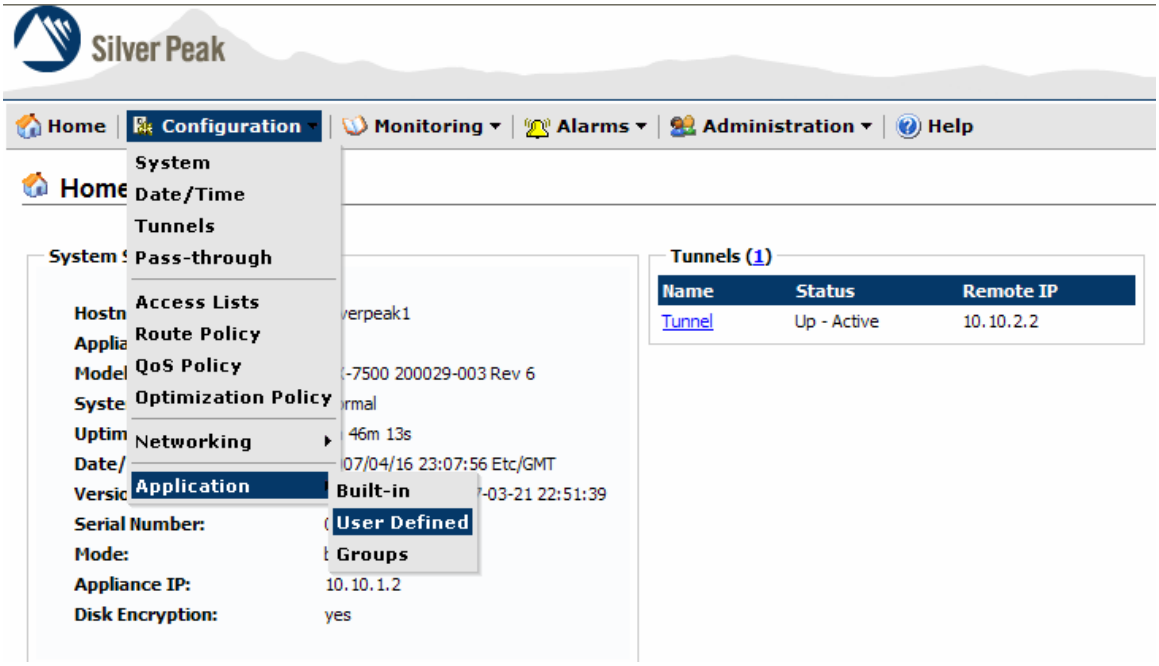
STEP3: On the next page, specify the hostname/IP address of all the CommVault hosts running either the CommVault QiNetix CommCell Server and/or the CommVault media agents that this particular hosts needs communicate with through the firewall



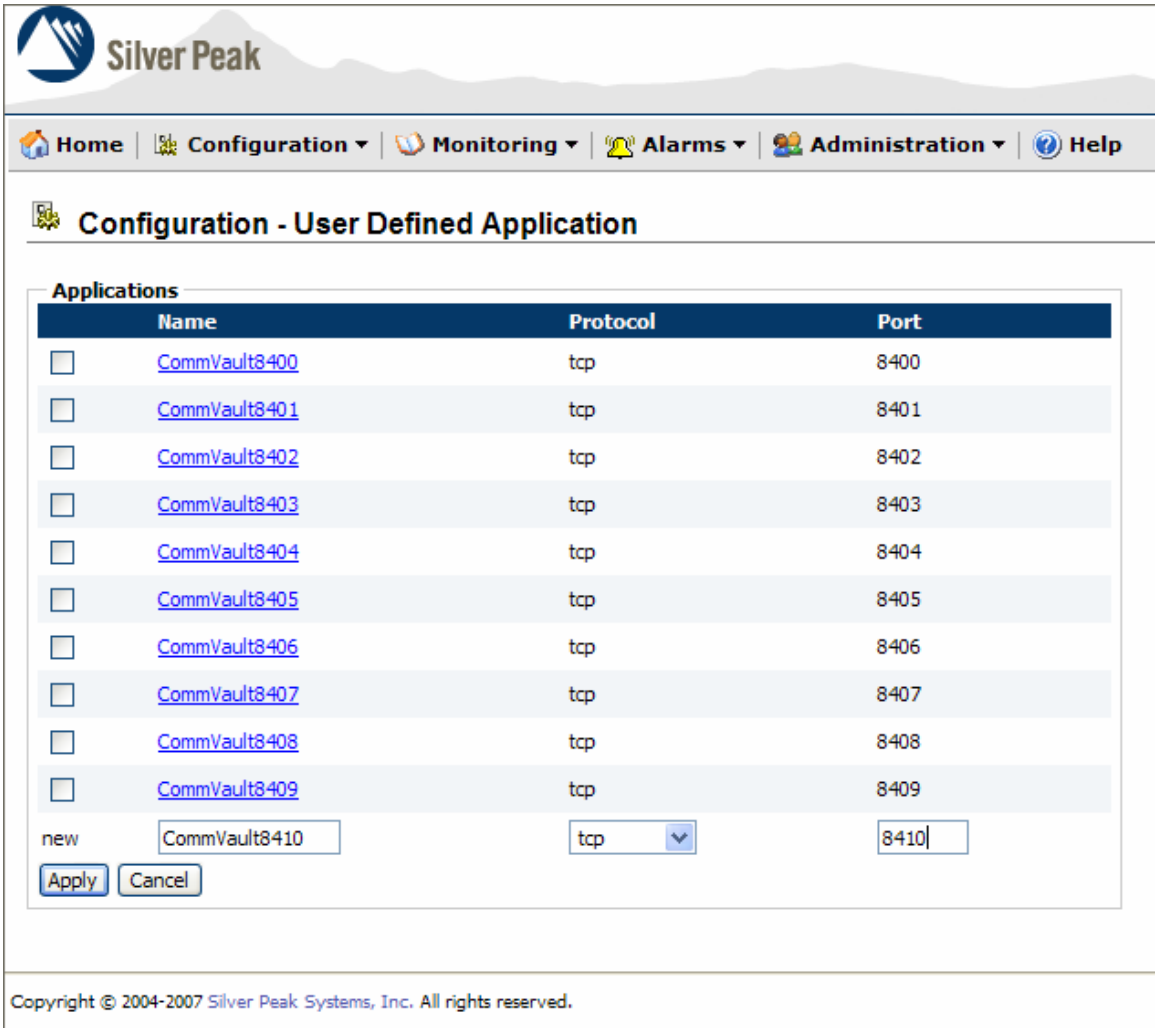
6. Configure Silver Peak Appliances to recognize CommVault application

Custom application entries should be created on each Silver Peak Appliance that specify the name and port number the CommVault QiNetix client and media agents.

This is accomplished by pointing a web browser to the Silver Peak Appliance "https://<ApplianceIPAddress>" and select "Configuration->Application->User Defined" as show below.



On the resulting window, create as many entries as # of ports reserved for CommVault above in order for Silver Peak Appliance to be able to detect and report the CommVault traffic.



Summary

IT organizations can reduce the time required for backup operations substantially by implementing a solution for rapid backup and restore using Silver Peak's NX Series Appliance in conjunction with CommVault Galaxy QiNetix software. The combined solution helps offload the CPU intensive operations from the backup application, while introducing a variety of optimization techniques that can significantly accelerate the backup and restore processes. The result is more data transferred in less time, which helps enterprise better achieve their stringent business continuity objectives.