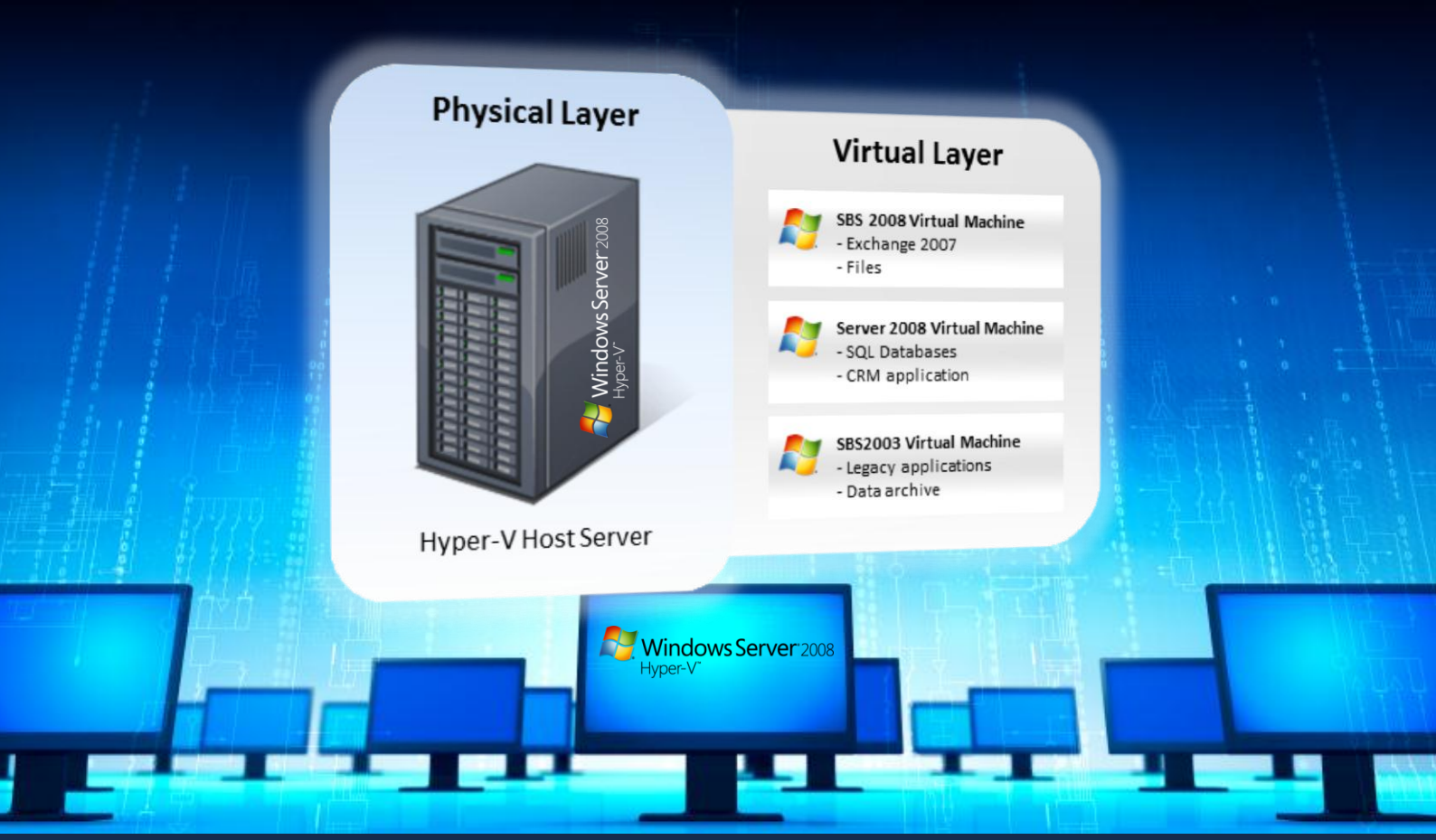

A review of BackupAssist within a Hyper-V Environment

BackupAssist™
Windows® Backup Made Easy!

By Brien Posey

Contents

Introduction

Although server virtualization has revolutionized the IT industry, one of its side effects has been that disaster recovery is far more complex than when using only physical servers. Some of the reasons for this relate to the way that Microsoft's Hyper-V is designed, while other complications stem from the limitations commonly found in backup applications.

Traditionally, there have been two options for backing up a server that's running Hyper-V. The first involves creating a backup of the host server. A host level backup will back up the host operating system and all of the virtual machines hosted on the server. This backup will include the configuration data for each virtual machine as well as all of the individual virtual hard drive files and virtual machine snapshots.

Although this type of backup sounds promising, it has major limitations. In particular, organizations wishing to perform a host level backup must first determine whether they can perform online backups or if offline backups are necessary. Although online backups can be made while virtual machines are running, numerous conditions must be met. While offline backups eliminate most of these conditions, they require virtual machines to be shut down before the backup of the host starts. The table below outlines the advantages (✓) and disadvantages (✗) of each type.

Online backups	Offline backups
✓ Can be made while VMs are running.	✗ Require VMs to be shut down.
✗ Requires all guest machines to run the Hyper-V Integration Services.	✓ Supports backup of non-Windows and legacy Windows operating systems that are not compatible with the Hyper-V Integration Services.
✗ Backup Integration Services must be enabled for each virtual machine.	✓ Backup Integration Services are not required.
✗ Guest operating systems must use NTFS volumes.	✓ No file system requirements for the VMs.
✗ Guest operating systems cannot use dynamic hard disks (this is different from dynamically expanding virtual hard disks, which are acceptable).	✓ Dynamic hard disks are permitted.
✗ The Volume Shadow Copy Service (VSS) must be enabled for all volumes containing virtual machine components.	✓ VSS is not mandatory (from an operating system standpoint), although many backup applications require it.
✗ Shadow Copy Storage must reside on its own volume (for example shadow copies of C: must reside on C:).	✓ Shadow Copy Storage is not a firm requirement.
✗ Applications running on virtual machines must provide application specific VSS writers to be	✓ There are no application requirements.

backed up properly.	

As you can see, numerous conditions must be met to run online backups at the host level. Offline backups do not have these requirements, but virtual machines must be stopped prior to running the backup, which can be a major problem for organizations that require their servers to be available 24 hours a day.

Even if you are able to meet the criteria for performing an online host level backup, the backup process is are not perfect. Windows Server Backup for example, does not include virtual networks in the backup. As such, you will have to manually recreate any virtual networks and reattach each virtual machine should you ever have to perform a bare metal restoration of a Hyper-V server. An even more significant limitation is that depending on what backup software you are using, you may have little control when restoring virtual machines. For example, Windows Server Backup restores data at the volume level, and does not allow you to restore individual virtual machines. Third party backup solutions may be able to restore individual virtual machines, but may not allow for granular restorations of data or applications within virtual machines.

The second option for backing up Hyper-V is to run guest level backups. A guest level backup runs at the virtual machine level rather than at the host operating system level. A guest level backup will provide for granular restoration of a virtual machine, but also has some major limitations, which are explained below:

Host level backup	Guest level backups
✗ Supports the restoration of entire VMs, but does not allow for restoring individual items within a VM.	✓ Allows for the granular restoration of individual items from within a VM, but cannot be used to restore an entire virtual machine.
✓ The backup software communicates directly with the host operating system and the backup hardware.	✗ The backup software may have trouble communicating with the backup hardware (especially if it is USB based) because the software runs from within a virtual machine.
✓ The host operating system is backed up.	✗ The host operating system is not backed up.
✓ Virtual machine snapshots are backed up.	✗ Virtual machine snapshots are not backed up.
✓ The virtual machine's configuration is backed up.	✗ The virtual machine's configuration is not backed up.

With the above challenges in mind, I wanted to assess whether BackupAssist was a suitable product for a small to medium sized business looking for a straightforward solution to the difficulties inherent in any Hyper-V backup and restoration strategy.

An Introduction to BackupAssist

BackupAssist v6 is an affordable backup application designed for small and medium sized businesses. Although BackupAssist has many features, I was particularly interested in the claims that it could simplify disaster recovery in a Hyper-V environment.

Prior to the release of BackupAssist 6, I had always recommended that my clients who use Hyper-V perform regular backups at both the host level and at the guest level. This approach provides comprehensive protection and does not require any extra investment in software, but it is time consuming and inefficient because every

server has to be backed up twice. When I read that BackupAssist claimed to be able to create a one-pass backup of a Hyper-V host that allowed for recovery at all levels, I knew I had to take it for a test drive.

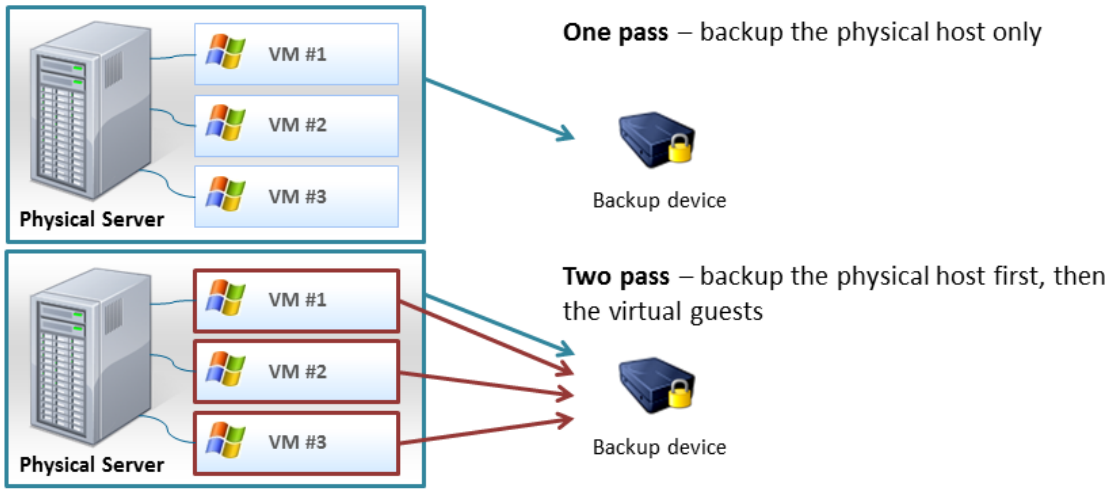

Figure A - *The difference between a one pass and a two pass backup of Hyper-V.*

Testing Methodologies

For my initial testing, I installed Windows Server 2008 R2 on a server and created three virtual machines. The table below lists the virtual machines hosted on the test server:

Virtual Machine Name	Server Operating System	Server Role
VM1	Windows Server 2008 R2	Domain Controller
VM2	Windows Server 2008 R2	Exchange Server 2010
VM3	Windows Server 2008 R2	File Server

Table A - *Virtual machine configuration on the Hyper-V test server.*

I installed BackupAssist v6.4.1 directly on the host server, but did not install any backup software on the virtual machines. I attached a two terabyte external hard drive to the host via a USB cable to use as the backup media.

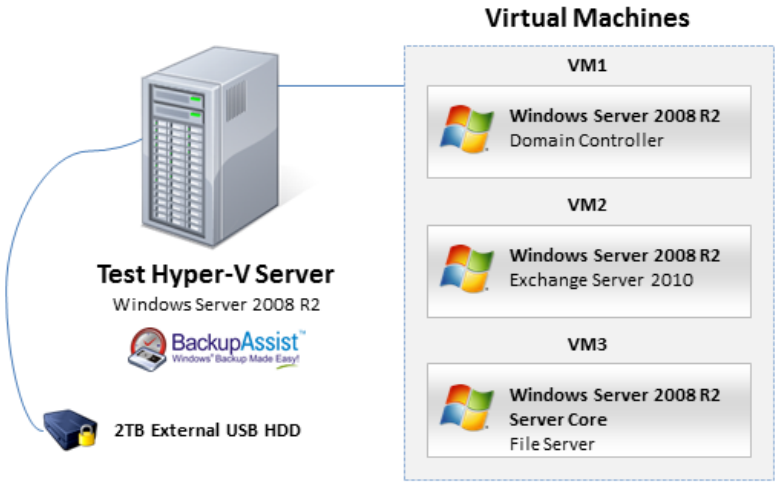

Figure B - *Testing setup used.*

Once the testing infrastructure was in place, I performed the following tests using BackupAssist.

Test 1: Restore a Virtual Machine's Configuration

The first test was to see if BackupAssist would allow me to restore a virtual machine's configuration without forcing me to restore the underlying virtual hard disk file (.VHD file). The reason for performing this test is that it is easy to accidentally delete a virtual machine when working within the Hyper-V Manager. When a virtual machine is deleted in this way, the .VHD file remains intact. A full restoration would not be desirable since it would revert the entire virtual machine to a previous state. Restoring the virtual machine's configuration and keeping the existing virtual hard disk file ensures that no data is lost.

I began by creating a VSS-based Windows Image backup of the entire host server, including all of the VMs residing on it. After the backup completed, I logged in to virtual machine VM3 and changed the background color of the Windows desktop. If the desktop retained its new background color after completing the test, it would prove that the VHD file had not been overwritten.

After modifying the Windows desktop color, I shut down virtual machine VM1, and then deleted it from within the Hyper-V Manager. I then used the BackupAssist Restore Console to restore VM1. After clicking the **Restore To** button, I configured the restore options so that existing files would not be overwritten.

The restoration worked without any issues, and the virtual machine retained its new desktop color. The virtual machine's configuration was restored, but the virtual hard drive file remained unchanged.

Although not one of my primary testing goals, I was curious to see if the virtual machine's static IP address and virtual network configuration were retained during the restoration. Often times after a Hyper-V virtual machine is restored, the virtual network configuration must be manually reset. In this case however, all of the virtual machine's network settings were retained.

Test 2: Restore a Single Virtual Machine and its Virtual Hard Drive File

For my second test, I wanted to see how well BackupAssist worked when restoring a virtual machine after the associated virtual hard disk file (.VHD file) had been deleted. For this test, I deleted virtual machine VM3 from within the Hyper-V Manager, and then deleted the corresponding VHD file.

I opened the BackupAssist Restore Console and selected the virtual machine that I wanted to restore from within the Microsoft Hyper-V VSS node. I did not attempt to select the virtual machine's VHD file for restoration because

I wanted to see what would happen if I selected the listing for the virtual machine itself rather than the virtual machine's individual components.

When the restoration completed, I verified that the virtual machine's VHD file and all of the corresponding support files had been restored, even though I had not explicitly selected them for restoration. This proved that BackupAssist is able to restore an entire virtual machine without requiring the administrator to manually select each individual sub-component for restoration.

When the restoration completed, the virtual machine was listed within the Hyper-V Manager, but was turned off. I turned the virtual machine on and it booted successfully. I was able to log in to the newly recovered server and verify that all of the system services were running and that the virtual network configuration had been retained.

Test 3: Granular Restore

One of BackupAssist's most unique features is that it allows you to perform granular restores without having to perform a guest level backup from within an individual virtual machine. I wanted to test BackupAssist's granular restoration capabilities to see how well they work.

BackupAssist doesn't make you do anything special to your backup job to enable granular restoration (aside from including the virtual machine in the backup), but the actual restoration process requires the use of the BackupAssist VM Granular Restore Add-on, which is not included with the base BackupAssist license.

Once the BackupAssist VM Granular Restore Add-on was been enabled, performing granular restorations was a breeze. BackupAssist scanned the backup media and displayed the backups that were present, and which virtual machines were included in each backup. Once I selected the backup that I wanted to restore, I simply specified which virtual machine and which volume I wanted to work with.

At this point, BackupAssist mounted the virtual hard drive from the backup as a drive letter on the host server. Once mounted, I was able to browse the virtual hard drive's contents, as shown below in Figure C. The software also provides the ability to export guest volumes as separate .VHD files, which is useful should you want to rebuild a virtual machine in the event of a major disaster scenario.

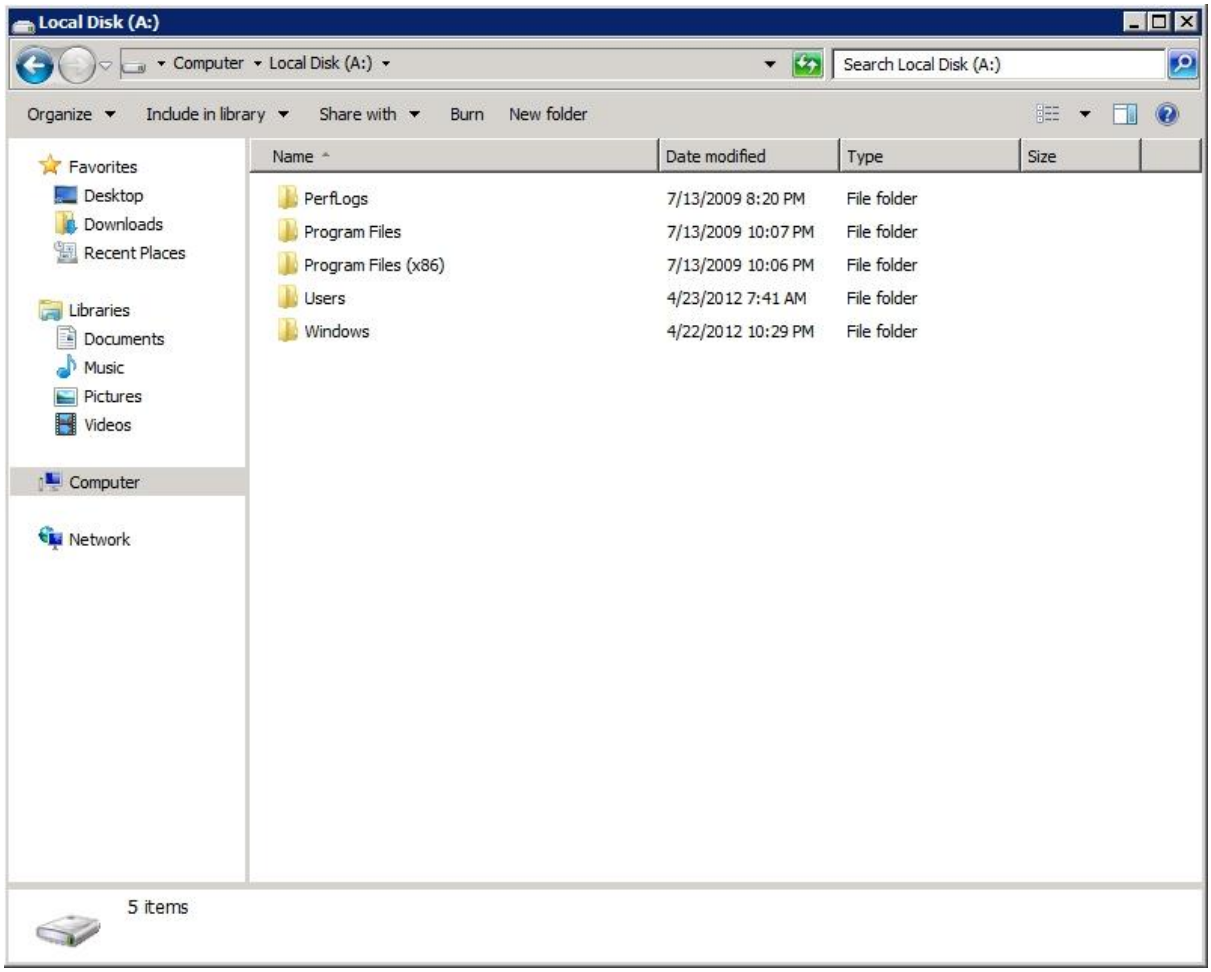

Figure C - *BackupAssist mounts backed up virtual hard drive and assigns it a drive letter in Windows.*

One issue that I did have with this approach is that because the virtual hard drive is mapped to a drive letter on the host server, it is not directly accessible from within the virtual machine. However, you do have a few options for restoring the data to the virtual machine, such burning the files to a DVD or sharing a folder to the network. Either of these methods can be used to transfer restored data to the individual virtual machine where it belongs.

Test 4: Restore Individual Virtual Machines to Another Server

Next, I wanted to find out if I could back up a collection of virtual machines and restore them to a different Hyper-V server running on dissimilar hardware. On my first attempt, the restoration server recognized the backup, but the restoration failed because the underlying hardware was too different. My original server had a second drive that was dedicated to storing the virtual machine's VHD files. This second drive did not exist on the restoration server, so the restore operation failed (as I would have expected).

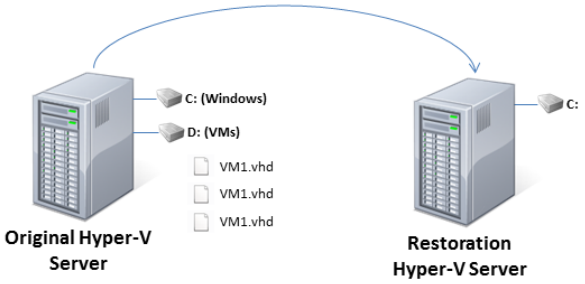

Figure D - *Restoration to dissimilar hardware.*

For my second attempt, I removed and recreated the virtual machines listed in the Table A, but this time I located the corresponding virtual hard drive files within a non-default location[1] on the C: drive. I backed up the server, and then attempted to restore my virtual machines to the secondary server, as shown in Figure E below.

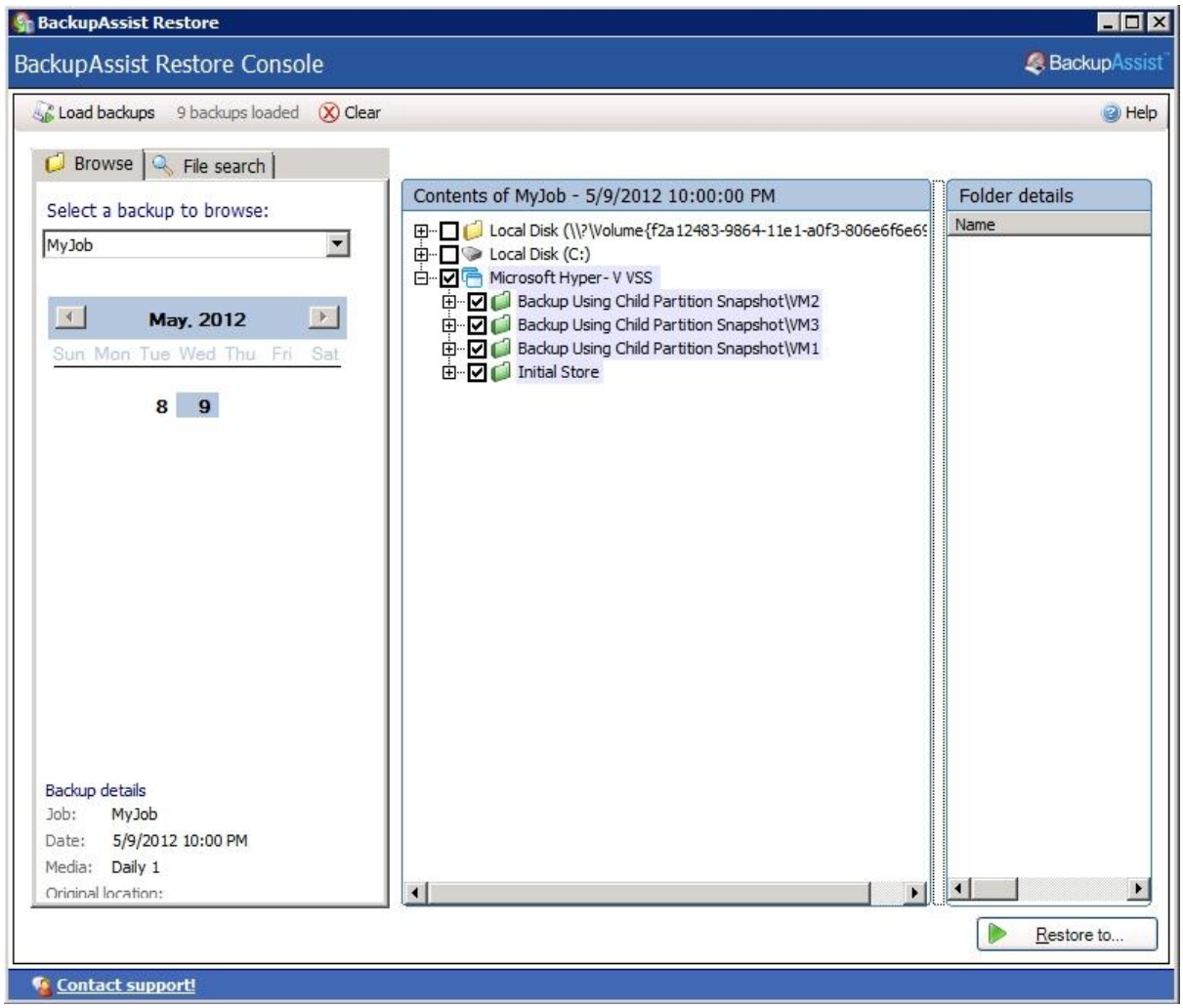

Figure E - *BackupAssist allows you to restore virtual machines to a different host server.*

The restoration proved to be simple and straightforward. The only issue that I encountered was that even though the server to which the virtual machines were restored had a network adapter that was identical to the one used in the server on which the backup was made, the virtual network settings had to be reconfigured after the restoration completed. This was due to a Hyper-V limitation, and had nothing to do with BackupAssist's capabilities. Once I reset the virtual network configuration however, the virtual machines started and functioned normally.

Test 5: Bare Metal Restore

The fifth test that I attempted was a full bare metal restore of the host server and everything on it. For this test, I created a Windows Imaging based backup job and configured BackupAssist to back up all local hard drives (excluding the external drive that was being used as backup media), the system state, and Microsoft Hyper-V.

[1] Default location VHD files is *C:\Users\Public\Documents\Microsoft Hyper-V\Virtual Hard Disks*.
Non-default location used: *C:\Virtual Hard Disks*

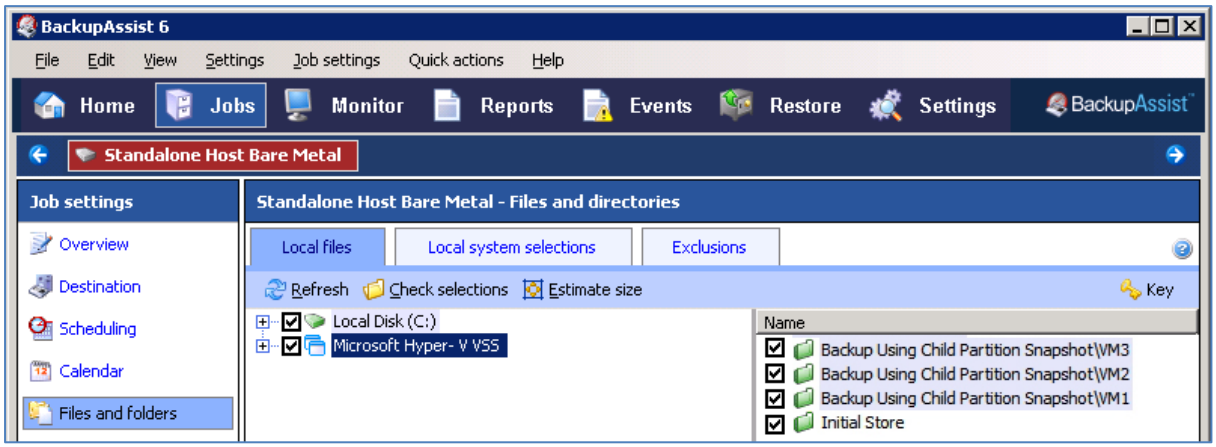

Figure F – *Preparing for a Bare Metal Recovery*

When the backup completed, I removed the server's hard drive and replaced it with an empty hard drive. I booted the server from the Windows Server 2008 R2 installation DVD, and chose the option to restore the computer from a system image. Windows Server had no trouble locating my backup on the external hard drive and proceeded with the restoration.

When the restoration completed, I was curious to check the state of my Exchange Server. I had intentionally neglected to configure BackupAssist to perform an Exchange Server specific backup when I created my backup job. Normally, this would violate Microsoft's recommended best practices because database corruption can occur if you do not back up Exchange Server properly, especially if there are multiple Exchange Servers on the network. In this case I was dealing with a single Exchange Server in a lab environment, so I was curious as to what would happen after performing a bare metal restore. Exchange Server is a complex application that is easy to break, so I wanted to see whether all of the various system services would start after the restoration.

The end result was that my host server and all of the virtual machines were restored perfectly. When I checked the Exchange Server, all of the Exchange related services were running, and the mailbox database had been mounted, which proved that the database had remained in a consistent state.

BackupAssist Cluster Shared Volume Support

One of the new features that was first introduced in BackupAssist version 6.3.0 is full support for backing up cluster shared volumes. As you can see in Figure G, the Create Job wizard includes an option for backing up cluster shared volumes. The wizard lists the clustered virtual machines that will be backed up and allows you to select your backup destination. Because of the way that backups of Cluster Shared Volumes work, you will have to supply a storage location that can act as an intermediate backup target. Backups of clustered virtual machines are written to this intermediate backup location first, and are then copied to the primary backup destination.

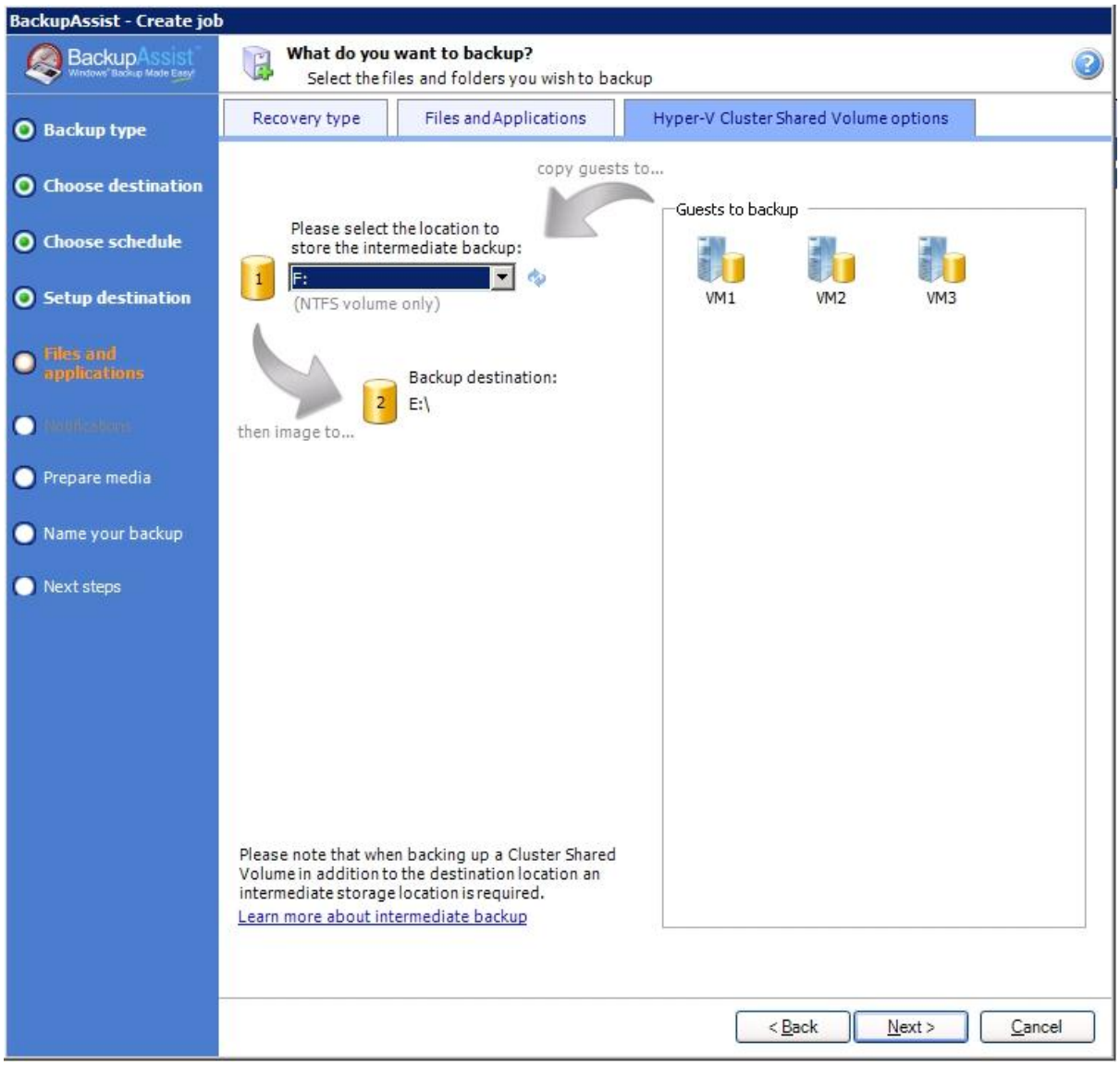

Figure G – The Create Job Wizard's Hyper-V Cluster Shared Volume options.

During my testing, I found the experience of backing up cluster shared volumes to be completely intuitive and reliable. Once my Cluster Shared Volume backup was complete, I performed several different types of restorations in an effort to determine how easy it would be to recover from various types of cluster related failures.

Failover Clustering Tests

After testing BackupAssist against standalone Hyper-V servers, I decided to see how it would perform when run on a Hyper-V server that was a part of a failover cluster. For these tests, I created a two node cluster running on Windows Server 2008 R2. A third server running Windows Storage Server 2008 hosted a volume that was used as shared storage by the cluster nodes. The individual cluster nodes communicated with the shared storage using iSCSI over a dedicated network segment. The Windows Storage Server also acted as a file share witness for the cluster since there were only two cluster nodes.

Once the cluster had been deployed and configured, I created three virtual machines, which were similar to the ones I had used in my tests on the standalone Hyper-V server. I performed three tests against the cluster.

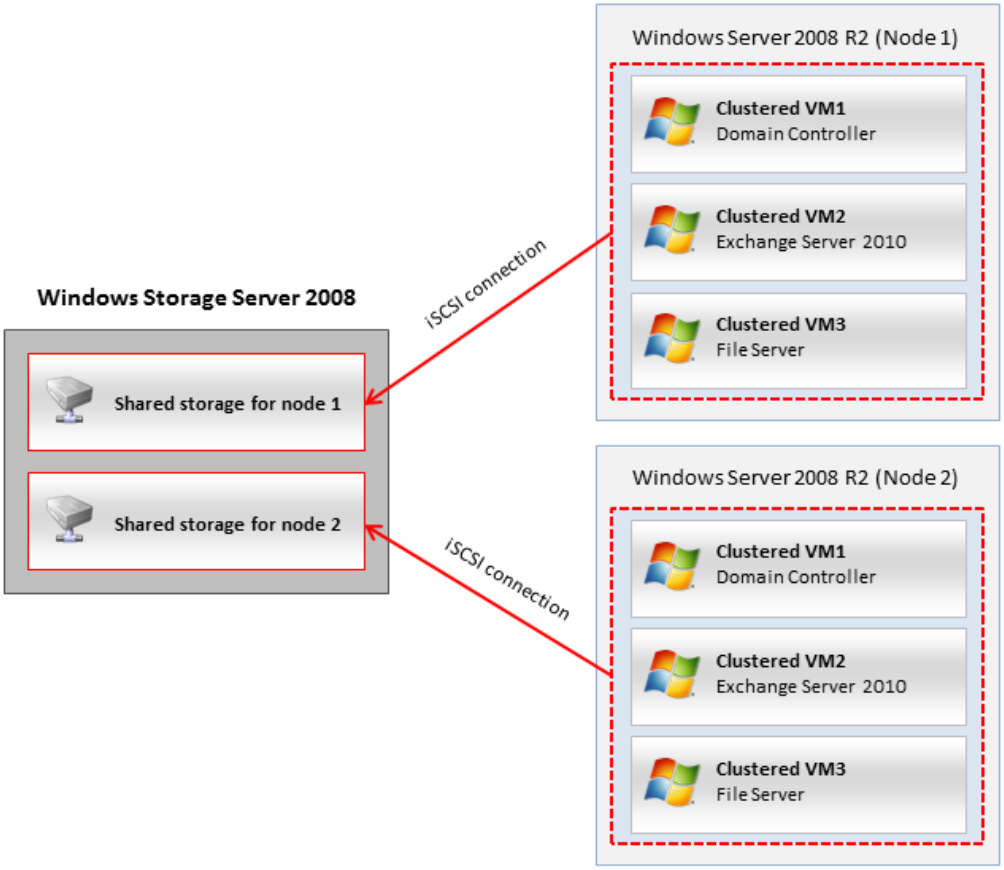

Figure H - *Testing setup used for cluster environment.*

Test 6: Granular Restoration Testing

The first of these tests was a granular restoration of some files from a clustered virtualized file server. The test was performed in exactly the same manner as when I tested a granular restoration of a virtual machine running on a standalone Hyper-V Server. As expected, the test yielded exactly the same results, with the granular restoration working perfectly.

Test 7: Recovering a Virtual Machine

The second test I performed was to see if I could recover a single clustered virtual machine. For this test, I deleted one of three virtual machines hosted on my Hyper-V cluster. After doing so, I also deleted the virtual hard drive file and the configuration files associated with the virtual machine.

Next, I opened the BackupAssist Restore Console, loaded my backup job, and selected the virtual machine that I wanted to restore. You can see my selections in Figure I below. In the figure, the Microsoft Hyper-V VSS section refers to the individual virtual machines. On the following screen, I told BackupAssist to restore the virtual machine to its original location.

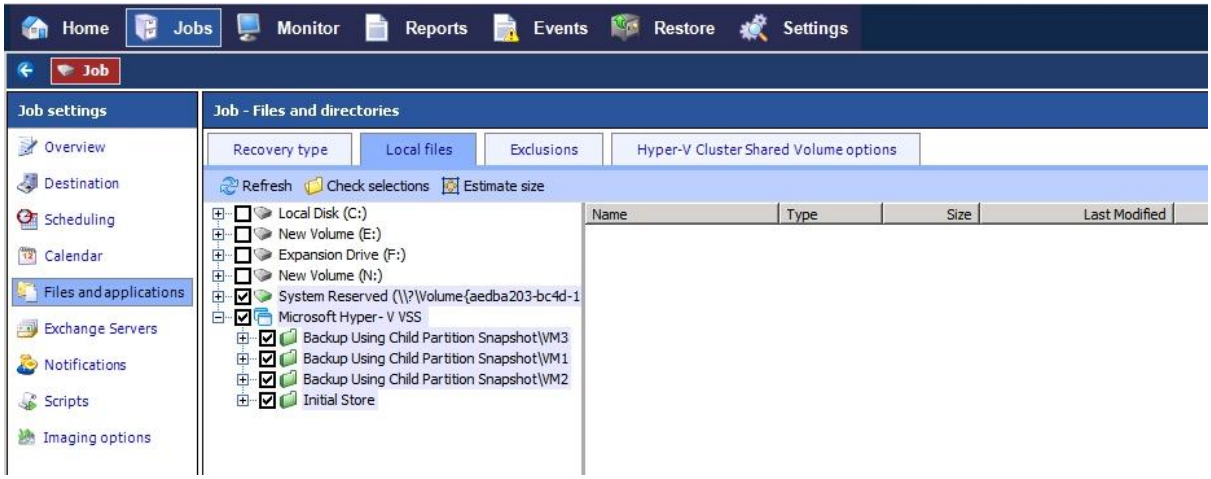

Figure I - *BackupAssist is able to backup and restore clustered virtual machines.*

When the restoration completed, the newly restored virtual machine appeared in Hyper-V Manager, and the associated files appeared in the correct location on the shared storage array. Hyper-V Manager showed the virtual machine as being turned off, as shown in Figure J, but I had no trouble starting it. Once the virtual machine started, I was able to log in to it and verify that it was functioning correctly. It is also worth noting that the virtual machine did not have to be reactivated.

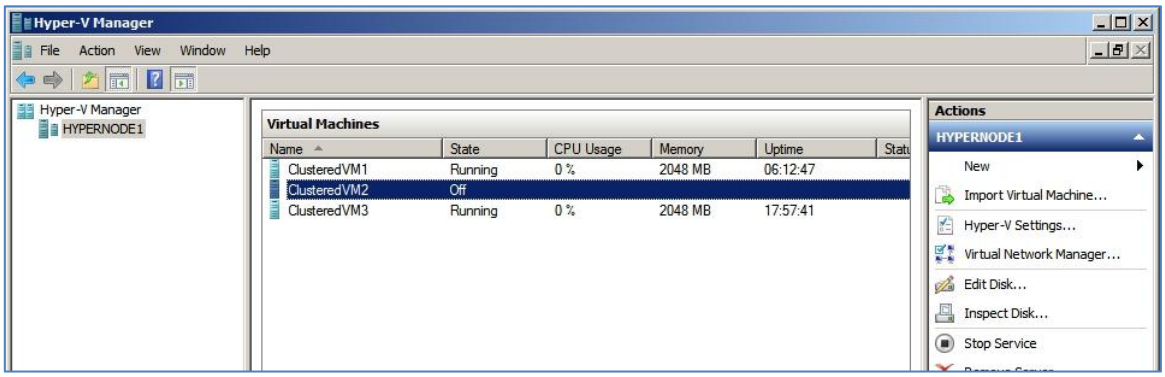

Figure J - *The virtual machine was restored, but had to be started manually.*

Although the virtual machine was listed within the Hyper-V Manager, it was not listed in the Failover Cluster Manager, which meant that failover was no longer available for the virtual machine. According to BackupAssist this behaviour is by design. If you want to give the newly restored virtual machine failover capabilities, simply open the Failover Cluster Manager, select the Services and Applications container, and then click on the Configure a Service or Application link (found in the Actions pane). This causes Windows to launch the High Availability Wizard. Select the Virtual Machine option and then select the name of the virtual machine that you want to make fault tolerant.

Test 8: Restoring a Cluster Node

For my last test, I wanted to find out what would happen if an entire cluster node failed and needed to be restored. For this test, I ran a Windows Imaging Backup job. I included the server's physical hard drives in the backup selections, but did not include the drive that was mapped to the shared storage array.

When the backup completed, I removed the hard drive from the server and replaced it with a brand new hard drive. I booted from the Windows Server 2008 R2 installation media and chose the option to perform a bare metal restoration. Windows had no trouble detecting the backup created by BackupAssist, and the restoration process completed without incident. The server booted and I had no trouble with any of the virtual machines.

Points to remember

The following is a summary of points to remember when using BackupAssist to back up your Hyper-V Host and Guest Virtual Machines.

- BackupAssist allows you to mount a virtual hard drive from a backup as a drive letter on the host server, but this drive it is not directly accessible from the virtual machine to which you are attempting to restore. You can, however, burn files to a DVD or share the folder on the network to transfer files.
- When restoring virtual machines to a different Hyper-V server running on dissimilar hardware, ensure that your restoration server has the same number of disks as the original server.
- Even if the server to which you are restoring your virtual machines has a network adapter identical to the one on which the backup was made, the virtual network settings will need to be reconfigured after the restoration is complete. This is due to a Hyper-V limitation.

Pricing

BackupAssist is priced in a way that should make it affordable for small and medium sized businesses. The base price of a BackupAssist license is $249, with various add-ons costing extra. Although some may criticize this pricing structure as “nickel and diming”, I think that the pricing structure makes sense in the SMB market because it allows businesses to purchase only the modules that they need, thus keeping the price low.

As of October 2010, the pricing for new BackupAssist licenses was as follows:

Product	Function	Commercial Price	Non Profit / Educational Price
BackupAssist	BackupAssist refers to the core backup product.	$249	$149
BackupAssist + 12 Month Upgrade Protection	BackupAssist can be purchased with a 12 Month Upgrade Protection Plan that guarantees free upgrades for a year.	$345.85	$206.85
BackupAssist + 24 Month Upgrade Protection	BackupAssist can be purchased with a 24 Month Upgrade Protection Plan that guarantees free upgrades for two years.	$378.35	$226.35
BackupAssist Exchange Mailbox Add-on	BackupAssist will allow you to back up your Exchange information store without purchasing additional add-ons. The BackupAssist Exchange Mailbox Add-on provides brick level backup and restoration capabilities for Exchange 2000, 2003, 2007 and 2010.	$129	$77
BackupAssist SQL Add-On	The BackupAssist SQL Add-On allows organizations to backup SQL servers either daily or on a nearly	$129	$77

	continuous basis. You can backup individual databases or entire servers.		
BackupAssist Zip to Tape Add-on	The Zip to Tape Add-on creates a ZIP archive of the files that were included in the backup.	$129	$77
BackupAssist VM Granular Restore Console Add-on	The BackupAssist VM Granular Restore Add-on allows you to restore individual files and folders from within virtual machines without having to perform a separate VM level backup.	$249	$149
BackupAssist for Rsync Add-on	The BackupAssist for Rsync Add-On allows BackupAssist to perform backups to any Rsync based cloud provider.	$129	$77
BackupAssist for Rsync (Standalone)	BackupAssist for Rsync (Standalone) is a special version of BackupAssist that is specifically designed to allow cloud backups using the Rsync protocol.	$173	$103

Additionally, BackupAssist offers a substantial discount to those who are upgrading from version 5. Upgrades from version 5 to version 6 cost $149 ($89 for educational / non-profit). Add-ons can be upgraded free of charge.

In writing this review, I used BackupAssist plus the BackupAssist VM Granular Restore Add-on, which would have had a total licensing cost of $498. By way of comparison, a Symantec Backup Exec license with one year of Basic Support retails for $1,115.40.*

* Prices was taken from the Symantec online store on May 10, 2012.

My Overall Assessment

In my opinion, BackupAssist is a must-have for small and medium businesses. Server virtualization has traditionally complicated disaster recovery, but this product cuts through that complexity and makes restoration a breeze. Throughout my tests the software never let me down regardless of whether I was restoring a host server, a virtual machine, or even a failover cluster node.

I think that what I really like most about BackupAssist is that it eliminates most of the guesswork from the disaster recovery process. Normally in a virtual machine environment an administrator must anticipate the types of failures that could potentially occur and then design a backup strategy that can cope with those failures. With BackupAssist, I simply configured a backup job without putting a lot of thought into it, and was able to use the backup in a variety of different disaster recovery situations.

I was also impressed that it is possible to buy such a flexible product at a reasonable price. Granted, I don't really think that BackupAssist would be appropriate for large enterprises because it lacks a central console for

managing multiple servers, but I do think that BackupAssist is a product that no small or medium sized business should be without.

A 30 day fully functional trial, including the VM Granular Restore Console, is available from the BackupAssist Web site, so if you're looking for a backup solution for Hyper-V, I recommend you give it a try.

About the author

Brien Posey is a freelance technical writer who has received Microsoft's MVP award eight times for his work with Exchange Server, Windows Server, IIS, and File Systems Storage.

Brien has written or contributed to dozens of IT books, and has written well over 4,000 technical articles and white papers for a variety of printed publications and Web sites. In addition to his writing, Brien routinely speaks at IT conferences and is involved in a wide variety of other technology related projects.

Prior to going freelance, Brien served as CIO for a national chain of hospitals and healthcare companies. He has also served as a Network Administrator for the Department of Defence at Fort Knox, and for some of the nation's largest insurance companies.

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