

Windows Server 2008 and BackupAssist



WHITEPAPER

BackupAssist Version 6

www.BackupAssist.com

Cortex I.T.

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Contents

Introduction.....	2
Advantages and disadvantages of Windows Server Backup	2
How does BackupAssist help Windows Server Backup?	3
Restoring using the Windows Recovery Environment	4
Setting up a Windows Imaging backup	4
Best practices for backups	4
Example Windows Imaging backup scenarios	5
File and application restore	6
Bare-Metal Restore	8
Appendix I – Block level backup technology	11
Appendix II – Server 2008 and SBS 2008 comparison	13
Appendix III – backup reports	14
Appendix IV – hardware compatibility	15

Introduction

The backup functionality in Windows Server 2008 and 2008 R2 is a new backup system called Windows Server Backup that uses drive imaging technology. This represents a radically different approach to Disaster Recovery and a departure from the file-based method in Windows 2003 and prior.

BackupAssist allows you to take advantage of Microsoft's extensive R&D investment in drive imaging technology, while also addressing some of the drawbacks. The net result is a reliable, monitored and effective disaster protection system that otherwise would have cost many times more on Windows Server 2003.

Advantages and disadvantages of Windows Server Backup

Advantages	Disadvantages
<ul style="list-style-type: none"> • Fast disaster recovery from bare metal; you can create your own recovery CD. • Daily differential backups give you multiple points in time from which to restore and helps slash daily backup times. • Restore individual files by mounting the backup • Free with the operating system, compared with many hundreds or thousands of dollars payable for 3rd party imaging solutions. 	<ul style="list-style-type: none"> • No file-based backups. • No support for tape drives. • Not suitable for long term data archiving or compliance purposes. • On Windows Server 2008 you have to select entire drives to backup and cannot choose individual files or directories¹
	<p>Note: many of these disadvantages can be overcome using the other backup engines in BackupAssist.</p>

¹ On Windows Server 2008 R2 you can select individual files and folders to backup, except if the backup destination is a NAS device or rdx/REV drive)

VSS Integration

Windows Server Backup makes use of Volume Shadow Copy (VSS) and block-level backup technology to back up and recover your drives. Through block-level backup technology, Windows Server backup automatically performs differential backups based on your initial full backup. For more information regarding how Windows Server Backup block-level backups, please refer to [Appendix I](#).

How does BackupAssist help Windows Server Backup?

Just like NTBackup, it is possible to script Windows Server Backup to run scheduled backups. However, there will be some drawbacks and limitations when using the built-in Microsoft scheduler, just as is the case with NTBackup on Windows Server 2003, so BackupAssist adds significant management features to make sure that the backups are run properly and reliably.

- 1. Easy setup and scheduling:** using BackupAssist, you can setup and schedule jobs with the same brilliant simplicity that makes BackupAssist famous.
- 2. Support for selecting VSS applications:** BackupAssist provides fully integrated support for VSS application backup and restore. Microsoft applications such as Exchange Server, SQL Server, SharePoint and Hyper-V, can be safely backed up and restored. All running VSS applications will be automatically detected and listed for selection.
- 3. Support for removable disk cartridges:** proper management and integration with devices like the Tandberg QuikStor, Quantum GoVault, Iomega REV is available.
- 4. Support for local fixed disks:** BackupAssist allows you to backup to local fixed disks, which is not supported in the built-in Server 2008 and SBS 2008 wizards.
- 5. Support for eSata disks:** BackupAssist allows you to backup to eSata disks, which is not supported in the built-in Server 2008 and SBS 2008 wizards.
- 6. Support for NAS destinations:** BackupAssist allows you to backup to NAS destinations (NTFS file systems only) which is not supported in the built-in Server 2008 and SBS 2008 wizards.
- 7. Removable HDD management:** safely eject your HDD after the backup; automatic remapping of drive letter if incorrectly assigned.
- 8. Media rotation schemes:** automatically select from different rotation schemes (similar to the NTBackup schemes) to ensure that you have **multiple backups** to restore from; automatically check that drives have been rotated according to plan, and warn the user if it hasn't been done.
- 9. User reminders:** BackupAssist will send out user reminder messages – instructions to the backup operator on what drive to connect to the computer so that the media rotation strategy is correctly followed.
- 10. Reporting:** emailed reports inform you of progress, with important details and statistics on the backup result. For example, the media usage report shows you how much backup space is used by the last backup and previous backups, gives an estimate of how much space is left, and what backups are present on the disk. By comparison, there is no reporting in Windows Server 2008, and the SBS 2008 reporting is a rudimentary "Success" or "Failure" message.
- 11. Scripting:** with BackupAssist you can easily write scripts to run before and after the backup, including conditional scripts that run specific commands based on whether the backup failed or succeeded.

12. Other drawbacks that BackupAssist overcomes (as compared to configuring the backup without BackupAssist):

- USB HDD is “invisible” when formatted for use with Windows Server Backup – you cannot see its contents, use it for any other purpose, or share one device with multiple computers. BackupAssist overcomes this by using USB HDDs in NTFS mode, and by using its own management capabilities to assign drive letters, eject the disk, etc.
- Monitor the “live” progress of your backups – with BackupAssist you can monitor the live progress through its Administration Console.

Restoring using the Windows Recovery Environment

Backups made through BackupAssist’s Windows Imaging engine can be restored using the Windows Recovery Environment (WinRE), a set of tools available in Windows 2008 used to repair or restore operating systems. In addition to being installed on a hard-disk, WinRE can be run from the Windows Server 2008 installation CD, which makes bare-metal restoration a **simple process**. It is also possible to restore files and applications from the windows image backups using either Windows Server Backup or the BackupAssist Restore Console.

For information regarding performing bare-metal restorations please refer to [Bare-Metal Restore](#).

For information regarding file and application restoration refer to [File and Application Restoration](#).

Setting up a Windows Imaging backup

The BackupAssist set-up wizard takes users through a series of steps to help them configure their backup job. To set-up a Windows Imaging backup, just select the **Windows Imaging Engine** for your backup method in the set-up wizard. There are several backup destinations available for Windows Imaging backups and a variety of schedules tailored for each specific type of destination. For more information on backup destinations, please refer to the hardware compatibility matrix in [Appendix IV](#).

Best practices for backups

A good backup strategy is important to fully protect your company in every recovery scenario. There are several points to consider when setting up a backup strategy.

One very important factor to consider is that your backups should provide you with a **known good point for recovery**. Consider the following story.

A hacker has found and exploited a security vulnerability in the operating system, modified some system settings and uploaded a back-door for future access. The entire system is now compromised and the system has been infested with malware and Trojans. The actions taken by the hacker are unknown, and there is no easy way to know what changes were made.

Some malware / virus infections may go undetected for several days. If the infection happened 3 days ago, and the only backup available is last night’s backup, then the backup is effectively useless. However, if there is a backup from 3 days ago (just before the infection) then the server can be restored to the **last known good point**.

It is not always possible to know when your last known good point is – so for this reason it is important to have a variety of backups from a variety of times in history. That means you need more than one backup medium (ie. more than one disk to store your backups). These disks are then commonly divided into different sets - one set of

backup media (in this case, disk) for daily backups, and another set of backup media for weekly backups. BackupAssist also gives you the option of having monthly backup disks for additional security.

Multiple removable media

When using a backup destination such as USB hard-drives, rdx drives or REV drives, it is recommended that multiple disks/cartridges are used as part of the rotation strategy. Due to the nature of Windows Imaging backups, the number of different points in history that we can restore from is correlated to the number of devices used for the backups.

Backup Device	Recommended Number of Disks/Cartridges
USB Hard-drive	3 to 5 or more
rdx drive	5 or more
REV drive	5 or more

Offsite storage of backup media

In order to protect your company data from physical events like natural disasters or theft of hardware, backups should be taken offsite and kept in a secure location. Although it is important to keep some backups on-site to be able to restore data quickly, is equally important to keep at least one backup a week off-site.

A hurricane has gone through the city's business district and destroyed everything its path. Your company has been severely affected and all office equipment such as servers, personal computers, and lap-tops have been destroyed beyond salvage. The IT department implemented a backup strategy earlier in the year covering all the computers on the network. Unfortunately, all the backups were stored in a safe on-site and were also destroyed in the hurricane.

Keeping backups off-site enables users to restore their servers in the event of any such disasters. The convenience of being able to restore data immediately from on-site storage of backups should not deter users from also storing backups off-site.

We suggest that you store the daily backups on-site and the weekly backups off-site. (BackupAssist can even help you manage off-site backups using the Internet. For more information visit our Internet backups product tour page here: http://www.backupassist.com/BackupAssist/tour_Rsync.html)

Ensure backups are healthy by running a test restore

In addition to running backups successfully, the integrity of backups should be checked at least once a month to ensure that they are restorable. By frequently running a test restore using the backups, you can confirm that the backups are good enough to be used in a disaster recovery situation.

Example Windows Imaging backup scenarios

Imaging Daily

When running a Windows Imaging backup daily to a removable storage device, a good strategy would be to use 5 disks – for example, 2 for daily backups and 3 for weekly backups. The two *daily* disks can be rotated across the daily backups (i.e. Monday and Wednesday's backup goes to Daily 1 and Tuesday and Thursday's backup goes to Daily 2). The three *weekly* disks can be swapped across the three weeks and the most recent weekly backup can be stored off-site. With multiple disks for the backups, you have a variety of restore points from which to choose. It is possible to alter this strategy – for example, 3 daily backup disks and 2 weekly disks, or 3 daily disks, 1 weekly disk and 1 monthly disk.

Imaging Weekly

If there are constraints (excessive amounts of data, limited physical access to the server or procedural constraints) that make it impossible to image your system daily, then it is still possible to have an effective backup system in place by running a Windows Imaging backup on a weekly basis.

For example, this scenario will still enable you to recover a system in the event of a disaster:

- Perform the drive imaging backups on a weekly basis (with 3 or more drives to enable media swapping)
- Use a different backup engine, such as the File Replication Engine in BackupAssist, to backup your applications and data on a **daily** basis.

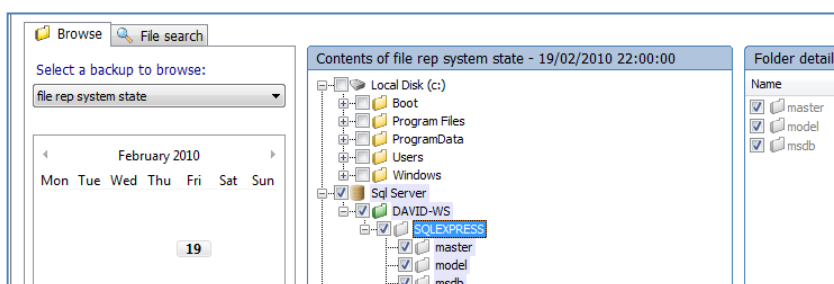
In the event of a disaster, you can restore your system to the last image and then “roll forward” your data and applications from your daily backup.

File and application restore

Files and applications can be restored using either the BackupAssist Restore Console or the Windows Recovery Environment on Windows 2008 from backups made through BackupAssist.

Restore file and applications using the BackupAssist Restore Console

1. Click **Restore** in the top navigation bar and then choose **BackupAssist Restore Console**.
2. The Restore Console will launch and you will be prompted with the 'Load backups' screen.
3. Click **Load all known backups** to load all backup catalogues located in the BackupAssist settings folder. Alternatively use the Browse option to locate the backup set from which you want to restore.
4. Choose the job that corresponds to the backup from which you want to restore a VSS application.
5. Use the calendar to select the date of the backup from which you want to restore.
6. Use the middle pane to expand the loaded backup set and select the application(s) or files and folders that you want to restore.



7. Click the **Restore to** button located on the bottom right of the window and follow the remaining prompts to your restore your VSS application(s) or files and folders.

How the VSS application restore works

VSS is designed to support live application restore. This means that you do not need to stop a live application before recovering a previous version of it from a backup.

If any Windows services need to be stopped and restarted during an application restore this will happen automatically. If, for example, you are recovering an SQL Server and the SQL database being restored is in use, SQL Server will automatically deny access to the database until the restore is complete. Databases that are not part of the restore will not be affected unless the master database is

being restored. If the master database is being restored, the entire SQL service will be stopped at the commencement of the restore and restarted after the restore has completed.

Similarly, during restore of an Exchange database, the Exchange Server will prevent client access to that database. So while we recommend that you notify all users to stop using any applications before commencing a VSS application restore, the restore process will not be affected if the applications are in use.

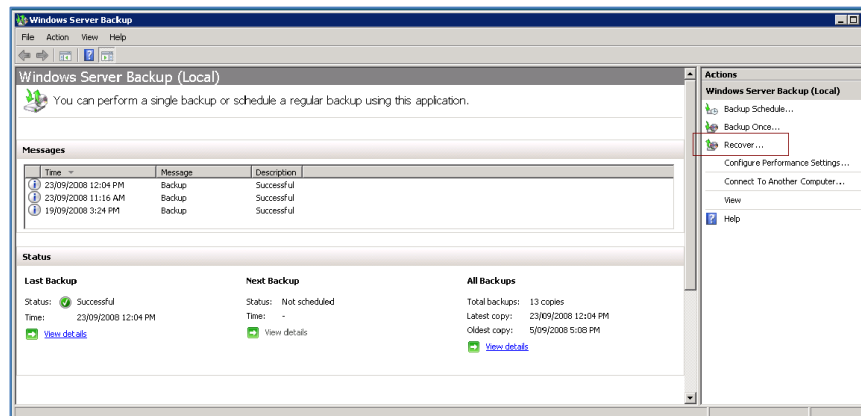
Restore using the Windows Recovery Environment

Please note: the instructions outlined here are available in the Windows Server Backup help file.

Before attempting to restore files and folders using Windows Server Backup from a drive image backup created with BackupAssist, make sure of the following:

- You are completing the restore with Windows Server 2008. Windows Vista only provides support for drive volume restore.
- The backup you wish to restore from is located on either an external hard drive or a remote shared folder (eg. on a NAS device). You cannot restore individual files and folders from a drive image backup located on an rdx or REV drive.
- To recover files and folders you must be a member of the Backup Operators or Administrators group, or you must have been delegated the appropriate authority.

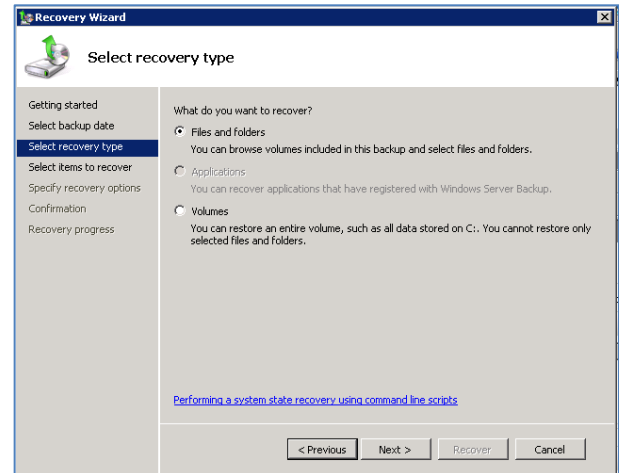
1. Launch BackupAssist and click **Restore** in the navigation bar.
2. Click Imaging restore. Windows Server Backup will then launch.
3. Click **Recover** under the *Actions* pane.



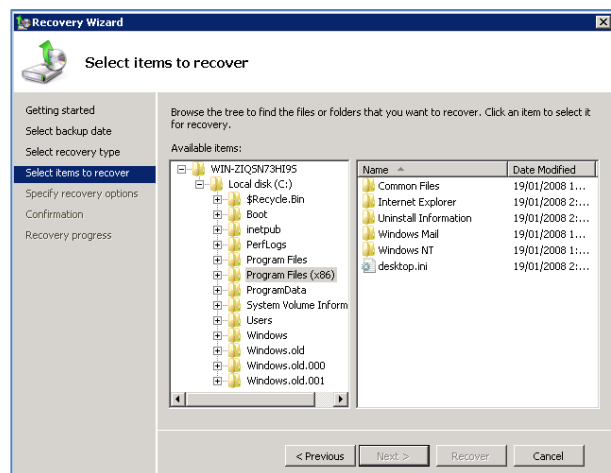
4. Specify whether you are restoring files from backups created on **this computer** or **another** computer, and click Next.
 - a. If you are restoring files and folders from backups stored on **another computer**, specify whether the backup that you want to **restore from is on a local drive** or a **remote shared folder** (eg. NAS device).
 - i. If you are restoring from a local drive, select the **location** of the backup from the drop-down list.
 - ii. If you are recovering from a **remote shared folder**, type the **path to the folder** that contains the backup. In the folder, the backup should be stored at **\\<RemoteSharedFolder>\WindowsImageBackup\<ComputerName>\<YourBackup>**
 - b. If you are restoring from a backup created on this computer, select the location of the backup from the drop-down list.

5. Select the date from the calendar and the time from the drop-down list of the backup you want to restore from. If you are recovering from this computer and the backup you select is stored on a removable media drive, you will be prompted to insert the relevant media.
Then click **Next**.

6. When asked what you would like to recover, choose the option for **Files and folders**, and click **Next**.



7. Under **Available items**, expand the list until the folder you want is visible.
Click a folder to display its contents and click each item that you want to restore, and then click **Next**.
 - o **Note:** use the **SHIFT** and **CTRL** keys to select a group or specific set of items to recover.



8. Under Recovery destination, complete one of the following, and click Next:
 - a. Click **Original** location.
 - b. Click **Another** location. Then, type the path to the location, or click **Browse** to select it.
9. Under "When Backup finds existing files and folders", click one of the following, and click **Next**:
 - a. Create copies so I have both versions of the file or folder
 - b. Overwrite existing files with recovered files
 - c. Don't recover those existing files and folders
10. Review the details, and click **Recover** to restore the selected items. You can then view the status of the recovery operation and whether or not it was successfully completed.

Bare-Metal Restore

Using the Windows Recovery Environment on Windows Server 2008 you can perform a bare-metal restore to recover your server operating system or the entire server itself.

An operating system restore will only recover critical drive volumes that contain system components. If you would like to restore all volumes, you will need to conduct a full server recovery.

Before attempting to complete an operating system or full server restoration from a drive image backup created with BackupAssist, make sure of the following:

- You have a Windows Server 2008 setup/installation disc.
- If you are recovering to a new hard disk, make sure the disk is at least as big as the disk that contained the volumes that were backed up, regardless of the size of those volumes. For example, if there was only one volume that was 100 GB on a 1 TB disk during backup, you should use a disk that is at least 1 TB when restoring.
- If you are recovering just the operating system, make sure that you have a backup available that contains at least the critical volumes of the server. If you are recovering the full server, make sure that you have a backup available that contains all volumes of the server.

Performing a bare metal recovery – step by step

1. Boot the Windows Server 2008 from the installation media and select the appropriate settings for:
 - a. **Language to install**
 - b. **Time and currency format**
 - c. **Keyboard or input format.**

When you've selected your settings, click on the **Next** button.



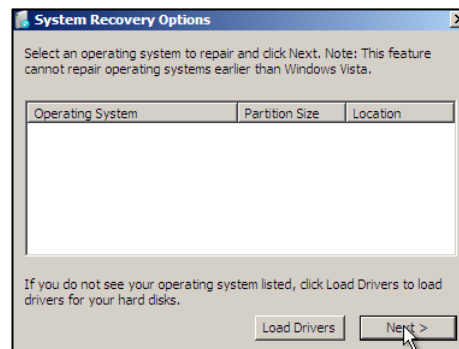
2. In the next window, select the **Repair your Computer** option from the lower left corner of the console.



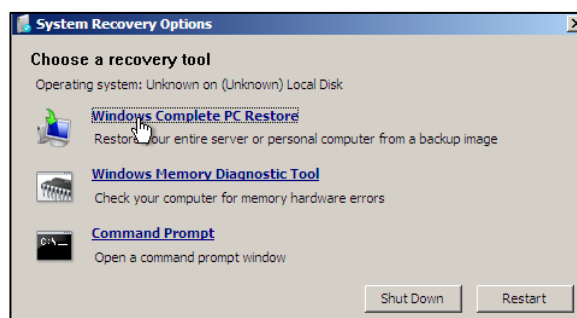
3. From the **System Recovery Options** window, you can choose to load any drivers required by your hard disk at this stage. After loading any necessary drivers, such as RAID drivers, click on the **Next** button.

Note that if you are performing a bare-metal restore to a brand new hard-disk, you will not see any Operating Systems listed as shown on the right.

If you are restoring a backup to a machine that already has Windows 2008, then it will be listed under Operating Systems.

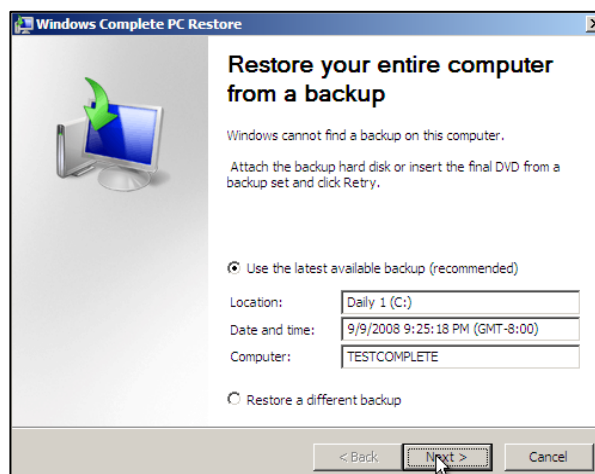


4. Under the **System Recovery Options** window, select the **Windows Complete PC Restore** option. This will invoke the **Windows Recovery Environment**.



5. Windows will then scan your machine for available backups. Please ensure that the media with your backup is connected to the machine. If Windows Complete PC Restore is unable to find the backup, please try un-connecting and re-connecting the backup device.
6. Once your backup disk has been detected, you may choose to restore the latest backup or another backup. Windows 2008 will automatically choose your latest backup by default.

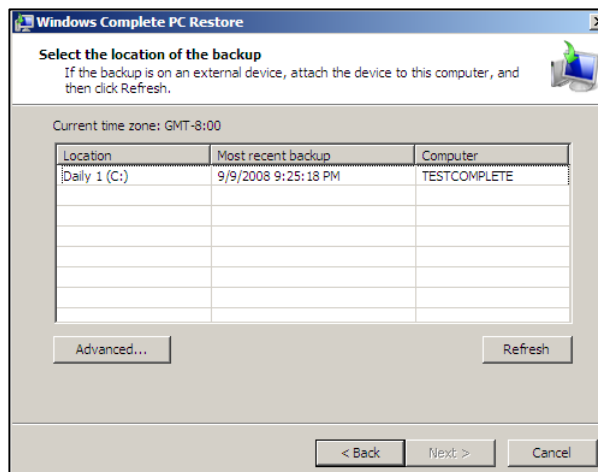
Select the backup you want to restore from and click on the **Next** button.



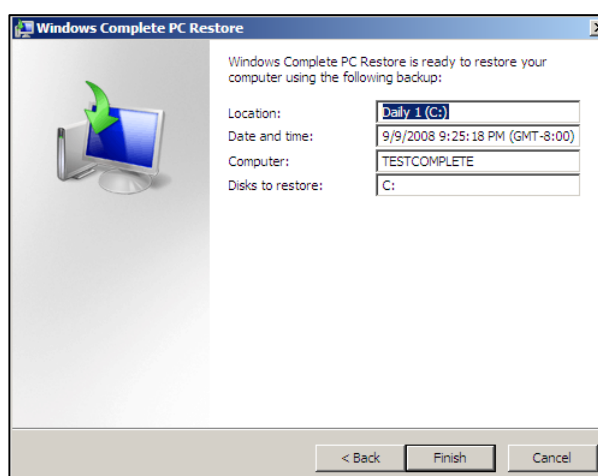
7. In the **Choose how to restore your backup** window, you have the following options:
 - a. Install any drivers for the disk you are restoring to by clicking on the **Install Drivers** button.
 - b. Exclude disks that you don't want formatted by clicking on the **Exclude disks** button.
 - c. Choose to restart the computer after the restore process and to automatically check and update error information by clicking on the **Advanced** button.

Once you have added the extra options, click on the **Next** button.

8. Select the location of your backup and click on the **Next** button.



9. Confirm your settings and click on the **Finish** button.



10. Windows Recovery Environment will ask you whether you want to let Windows Complete PC Restore format the disks and restore the backups you have chosen. Click on the **OK** button.
11. Your bare-metal restore of Windows Server 2008 should begin. Once done, your system should reboot and Windows will load. Congratulations – the procedure is complete!

Appendix I – Block level backup technology

The concept of full and differential backups through block-level backup technology is different to the traditional concept of full and differential backups found with file-based backups. When a backup of a disk is performed using block-level backup technology, the backup engine will create a full or a differential backup based on the comparison of the current state of the disk and any previous backups of that disk available on the backup destination. If there are no backups of the drive on the backup destination, the backup engine will create a full backup of the drive at that destination. Any subsequent backups of the drive to the same backup destination will be differential backups based on the differences between the current state of the disk and the backup on the destination.

Let us take a look at a situation where you are backing up C: drive to an external hard-drive on Monday (refer to *Monday's backup* in the figure below). If you imagine C: drive as being made up of blocks **A, B, C, D, E, F, G, H**, then the first block-level backup of C: drive to the USB hard-drive will be a **full backup**.

All subsequent backups of C: drive to the same external hard-drive will be differential backups where only the differences are backed up. If you run another backup of C: drive on Tuesday (refer to *Tuesday's backup* in the figure below), the differences will be backed up to the external hard-drive to create a new full backup.

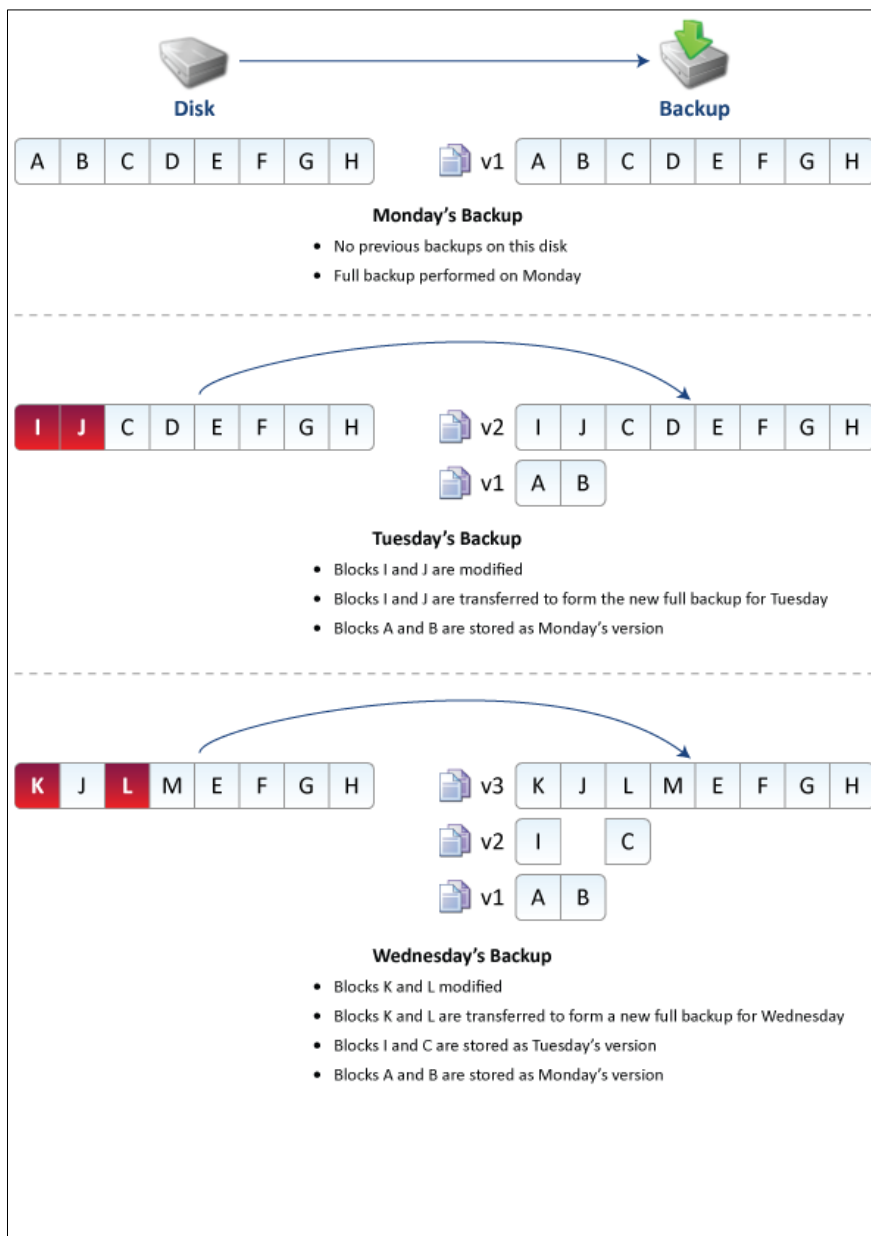
Upon examination of the backup destination (refer to *Tuesday's backup* in the figure below), you notice that:

- The most recent full backup (**I-J-C-D-E-F-G-H**) is always available.
- Past backup versions (**A, B**) are always available.

The advantage of block-level backup technology is that it is space efficient as only the block-level differences are stored. In addition, the previous backup versions get deleted as the drive gets filled up.

If you run a third backup of C: drive on Wednesday (refer to *Wednesday's backup*), the block-level backup engine will compare the current state of C: drive to the full backup on the backup destination and backup only the changes. Once again, the backup destination will show:

- The most recent full backup is always available. Now, it is **K-J-L-M-E-F-G-H**.
- Past backup versions are available. – (**A, B**), (**I, C**)



When your backup device fills up, the oldest backups are automatically discarded – for example, in the diagram above, the first backup v1 of blocks A & B would be deleted to free up more space. If more space is required, the second backup of blocks I & C would be deleted next.

Appendix II – Server 2008 and SBS 2008 comparison

BackupAssist offers a **vast improvement** over the wizards built into Windows Server 2008 and SBS 2008. The in-built wizards have several fundamental flaws and limitations that compromise the effectiveness of the backups:

Feature	Server 2008 Wizard	SBS 2008 Wizard	BackupAssist
Easy setup and scheduling	✓	✓	✓
Multiple backup jobs	✗	✗	✓
Hardware support			
Support for USB HDDs	✓	✓	✓
Support for eSata disks	✗	✗	✓
Support for removable disk (rdx, REV)	✗	✗	✓
Support for local disks	✗	✗	✓
Support for NAS	✗	✗	✓
Detect & inject HDDs before backup	✗	✗	✓
Safely eject HDDs after backup	✗	✗	✓
Media rotation			
In-built media rotation schemes	✗	✗	✓
Reminder notifications			
Remind operator to insert media	✗	✗	✓
Maintenance messages (eg. perform test restore)	✗	✗	✓
Reporting			
Report emailed to administrator	✗	✓	✓
Overall status of backup	✗	✓	✓
Notification if user inserts wrong disk	✗	✗	✓
Detailed log	✗	✗	✓
Media usage report	✗	✗	✓
Monitor the backup “live” as it happens	✗	✗	✓
Scripting before / after backup	✗	✗	✓
Run script before backup	✗	✗	✓
Run script unconditionally after backup	✗	✗	✓
Run script if backup succeeded	✗	✗	✓
Run script if backup failed	✗	✗	✓
Event log backup result	✓	✓	✓

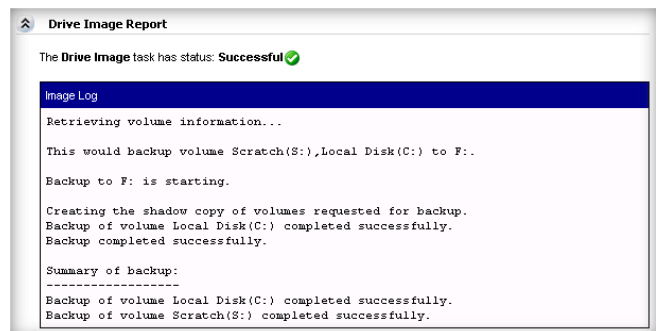
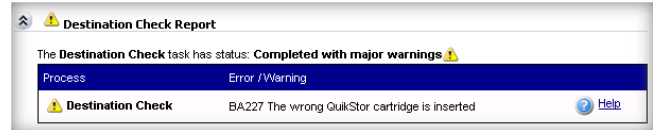
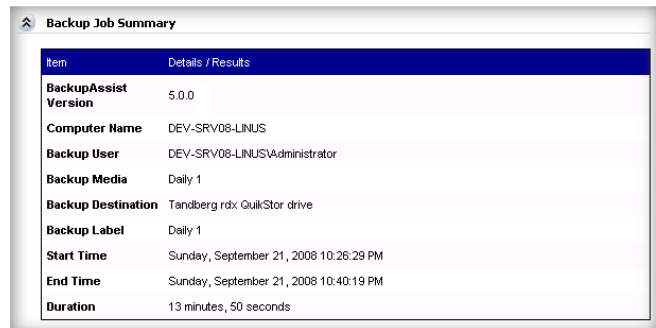
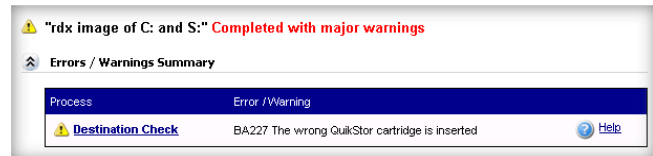
Appendix III – backup reports

The reporting abilities of BackupAssist greatly enhance the reliability and visibility of Windows Server Backup. The reports show you:

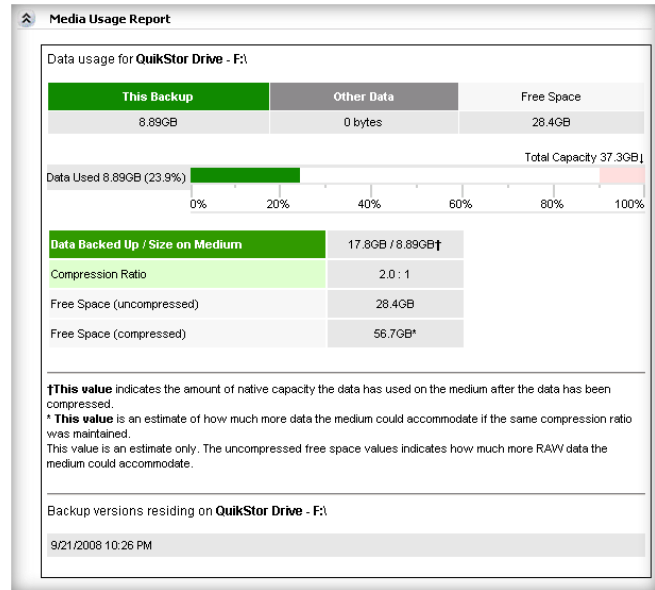
- How the backup process went (amount of data backed up, duration, media usage)
- Whether the media rotation strategy was followed (whether the correct disk was inserted/connected)

Backup Reporting by BackupAssist

1. **Errors / Warnings Summary** – shows the status of the backup, plus a list of any warnings or errors in the report. This is displayed at the top so you can see any important messages without scrolling.
2. **Job Summary** – showing the vital statistics of the backup, including the duration and media for the backup.
3. **Destination Check** – shows any problems with the backup device, such as:
 - a. Incorrect disk inserted (due to human error in the media rotation process)
 - b. No disk inserted (user forgot to insert or connect the disk)
4. **Drive Image Report** – shows a log of what happened during the backup.







5. **Media Usage** – shows usage of the media, including:
- Used space by this backup
 - Used space by previous backups (USB HDD / Local disk only)
 - Free space on media
 - Actual size of backup on disk, with compression ratio (rdx / REV only)
 - Backup versions on the media



Appendix IV – hardware compatibility

The implementation of Windows Server Backup on Windows 2008 is such that the hardware support varies considerably based on the backup device. Each device has its own level of restorability as well. Please consult the compatibility matrix below to choose the correct hardware device for you.

Feature	USB HDD	rdx	lomega REV	NAS
Native Windows / BackupAssist Support				
# backups per device	Multiple	1	1	1
Can use the BackupAssist VM Granular Restore Console?	Yes	No	No	Yes
Can backup individual files?	Windows 2008 R2 only	No	No	No
Compression	No	Yes	Yes	No
Backup method	Smart ¹	Overwrite	Overwrite	Overwrite
Can restore to bare metal?	Yes	Yes	Yes	Yes

Can restore to dissimilar hardware?²	Yes	Yes	Yes	Yes
Can restore volumes?³	Yes	Yes	Yes	Yes
Can restore individual files?	Yes ⁴	No	No	Yes ⁴
Can restore individual applications?	Yes ⁴	No	No	Yes ⁴

¹ Backup Method for USB HDD – the first backup that runs will be a full backup. All future backups will be incremental backups, with changes being merged into the original image. Past versions of the images will appear as shadow copies within the main backup. As the hard drive fills up, old versions will be automatically deleted off the device.

² Restore to dissimilar hardware – our testing has shown that complete server restores can be performed to dissimilar hardware. The restore wizard (on the Recovery CD) allows you to load up the drivers of the new hardware while restoring the system. We have run several different tests – physical to physical, physical to virtual (using VMware Server), and virtual to physical, using a range of desktop and server grade hardware (with RAID) and each test has been successful. However, you are strongly advised to perform your own testing to confirm our findings.

³ Restoration of volumes, individual files and applications – can be performed through the Windows Server Backup management console on Windows Server 2008.

⁴ Note that the restore of individual files and applications is not possible on Vista. However, you can use a 3rd party tool to mount the Microsoft Virtual Disk file to retrieve your data.