



ActiveImage[™] 2.7
PROTECTOR

Whitepaper

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Product Summary

Rectiphy ActiVImage Protector™ is a hard disk backup / restore utility for Windows systems designed for corporate, small office/home office (SOHO) workstations, and home users. Rectiphy ActiVImage Protector Server Edition and Desktop Edition can take a hot image of your running system or an incremental backup, perform a bare metal recovery or disaster recovery of your system, and deploy a backup image to a virtual environment. Rectiphy ActiVImage Protector supports a broad range of backup media, from local disk to networked storage.

Rectiphy ActiVImage Protector 2.7 has enhanced support for VSS-aware Hyper-V™ host environments. It is an effective solution for the increasingly popular virtual environment, enabling users to back up the entire host environment and take snapshots of all running virtual machines, including VSS-compliant applications. Using the patent-pending ReZoom™ Wizard—available in the Rectiphy ActiVImage Protector for Hyper-V and IT Pro Technician editions—users can “ReZoom” the entire Hyper-V host, multiple guest VMs, or a single VM from a backup image of the host, without installing or separately backing up individual VMs.

In a vSphere ESX environment, after shutting down the virtual host, the entire environment can be backed up and later restored to restart the system. Even a single virtual machine can be retrieved from a backup file. The Virtual Environment Edition greatly economizes the cost of installing Rectiphy ActiVImage Protector on each guest VM.

As a practical deployment tool for Hyper-V or vSphere ESX virtual environments, a full license of the IT Pro Edition allows an IT professional to use Rectiphy ActiVImage Protector as often as needed on any computer. The intuitive user interface enables users to easily create backup jobs, ensuring that users can smoothly and safely restore systems back to optimal operation.

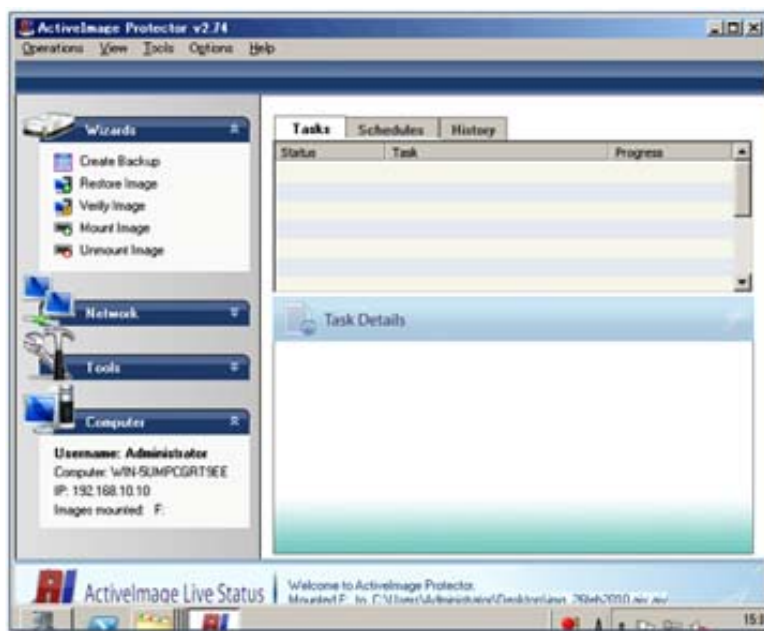


Fig. 1: Rectiphy ActiVImage Protector user interface

Basic Features: *Backup Function*

Imaging Backup

With cluster-by-cluster imaging technology, a partition and its cluster layout are saved in a backup file. The backup file is used to restore to the point when the backup image was created.

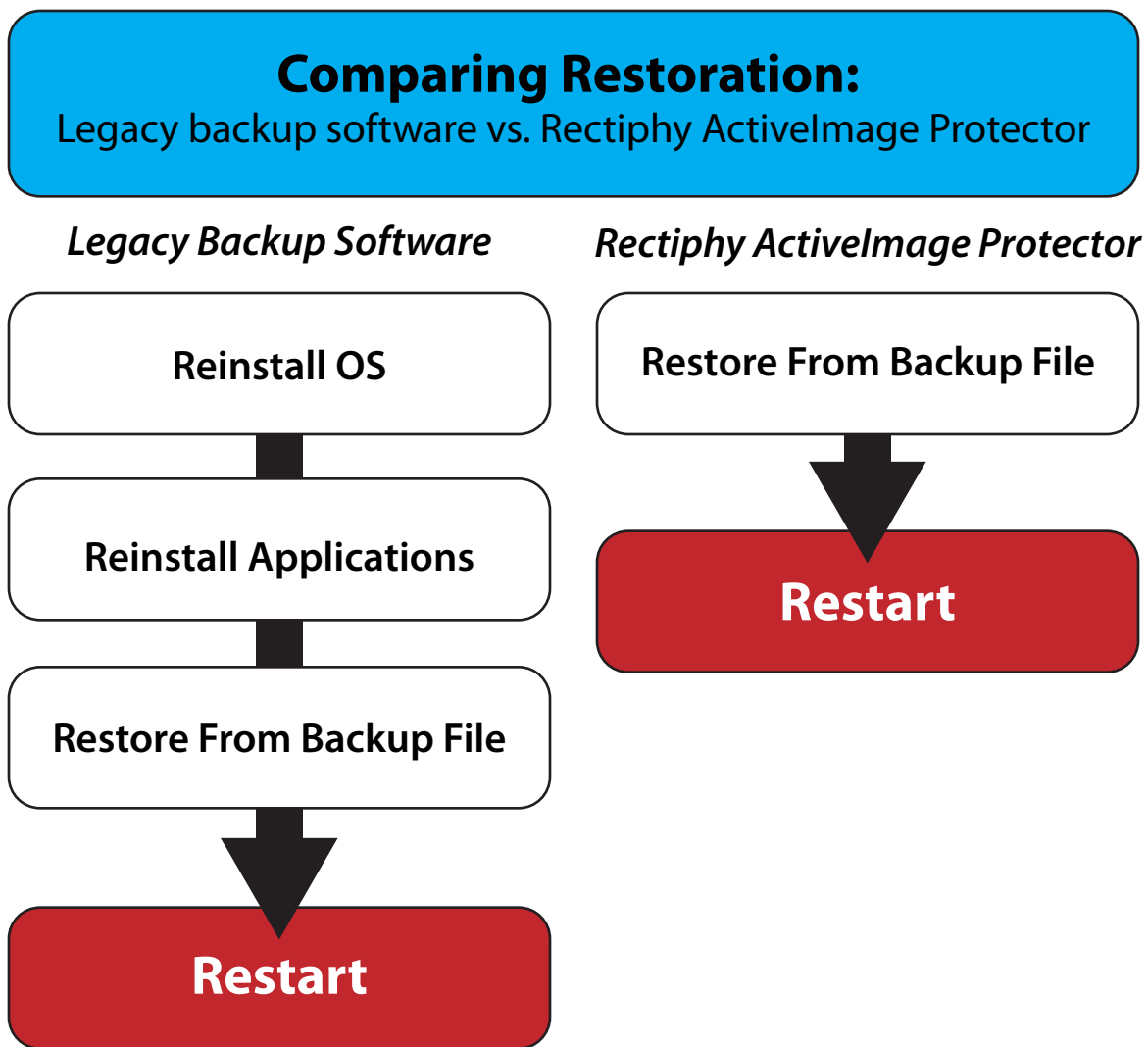


Fig. 2: Comparison with legacy backup software

Basic Features: *Backup Function*

Wizard-Based Operation

A backup wizard guides the user through the process of creating a backup file or backup schedule.

Users can select a disk or a volume to back up. An image file created on a disk-by-disk basis may include multiple volumes that can be restored to their original state with a single operation.

In addition, a backup schedule can be managed as a backup job.

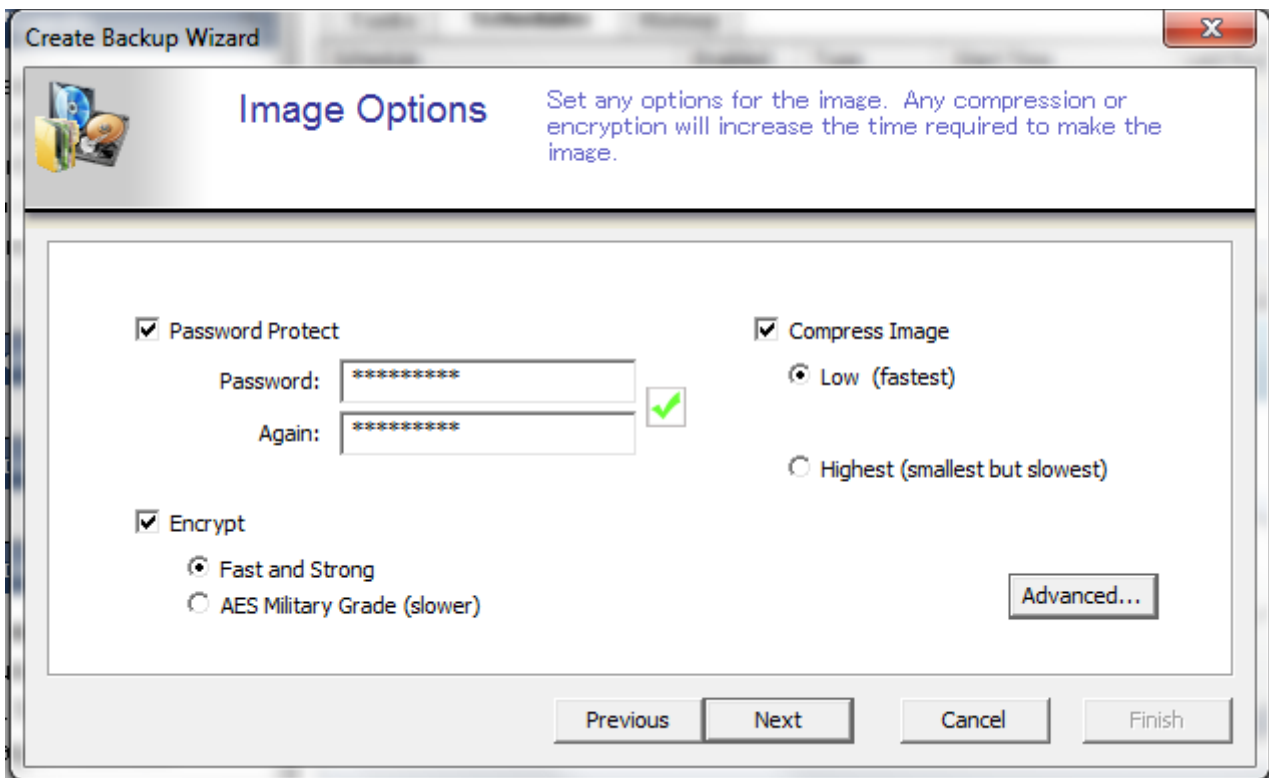


Fig. 3: Wizard-based user interface

Basic Features: *Backup Function*

Hot Imaging

Rectiphy ActivelImage Protector has a hot imaging feature that can take a snapshot of volumes while Windows is running so that a hard disk image file is created without bringing the system to a halt. The user does not have to shut down the system in order to back up the operating system.

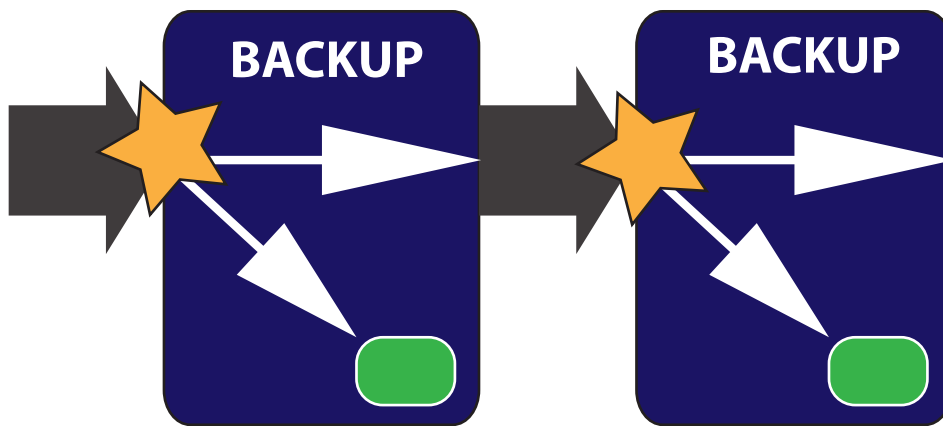


Fig. 4: Hot imaging allows backup of your system while Windows is running.

Incremental Backup

Rectiphy ActivelImage Protector supports incremental backup to create a backup image file of only those sectors that have changed since the last full or incremental backup image was created. To restore your system, you can select an incremental backup image. Rectiphy's integrated disk monitoring technology manages all changes to the disks and volumes, providing reliable incremental backups at blazing-fast speeds.

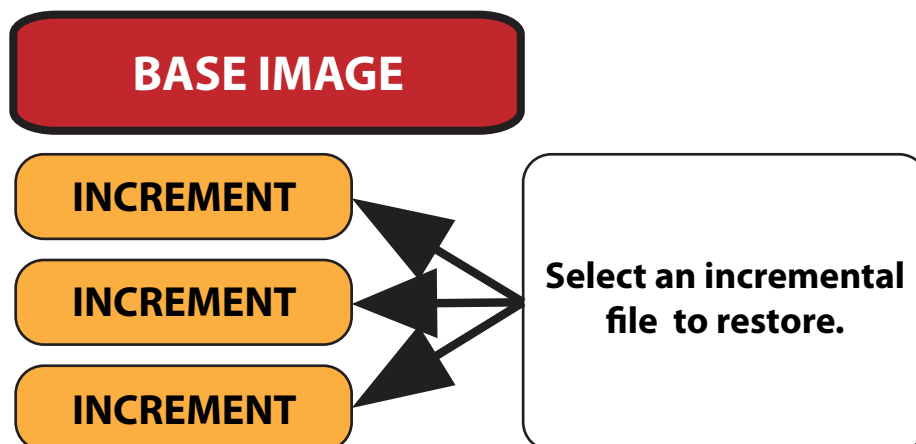


Fig. 5: Restore to the point when the incremental backup file was created.

Basic Features: *Backup Function*

Scheduled Backup

Rectiphy ActiImage Protector supports scheduled backups. For example, an incremental backup may be scheduled to execute every two hours from 09:00 to 18:00 from Monday through Friday, while a full backup may be scheduled to execute at 02:00 on Saturdays. You can configure the combined schedule of full and incremental backups to take advantage of convenient times.

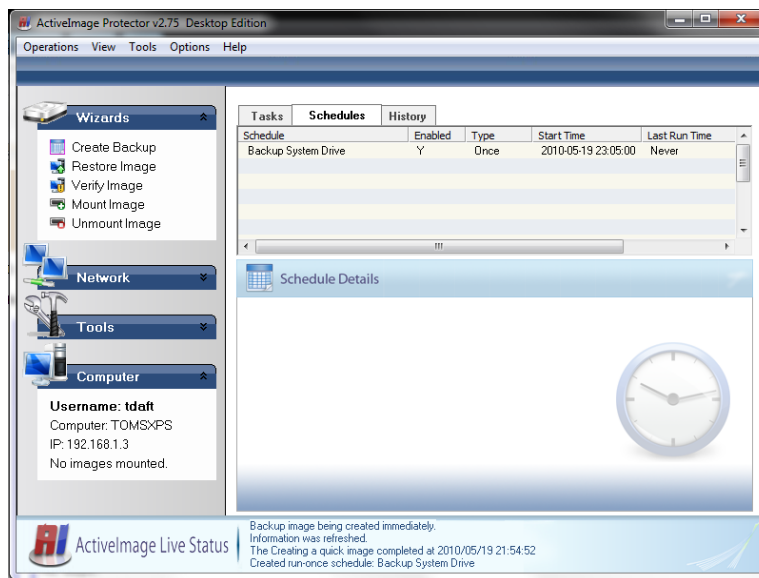


Figure 6: Schedule backups easily

User-Specified Command Execution After Taking a Snapshot

A user-specified command may be executed before and/or after a snapshot is taken or after an image file is created. For example, with a VSS-unaware database, executing a command to stop or start services before or after taking a snapshot enables flash transactions. Since creating a snapshot is completed instantaneously, executing a command hardly interferes with user operation. This feature is also useful when a command is executed to automatically move files after an image file is created.

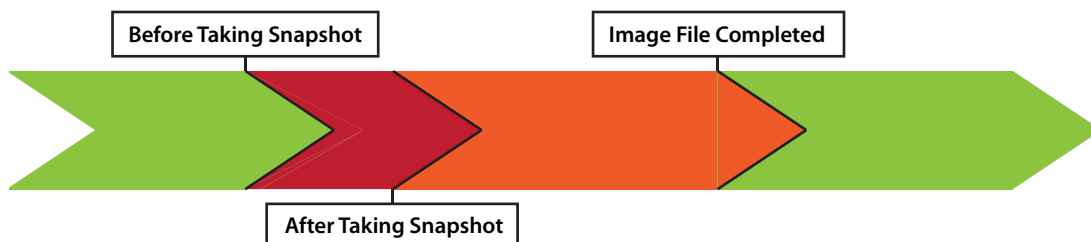


Figure 7: Snapshot during image file creation

Basic Features: *Backup Function*

Point-in-Time Snapshots of Multiple Volumes

Snapshots of multiple volumes may be taken at the same point in time. This feature is necessary when the database spans multiple volumes because its index and data files are stored in different volumes.

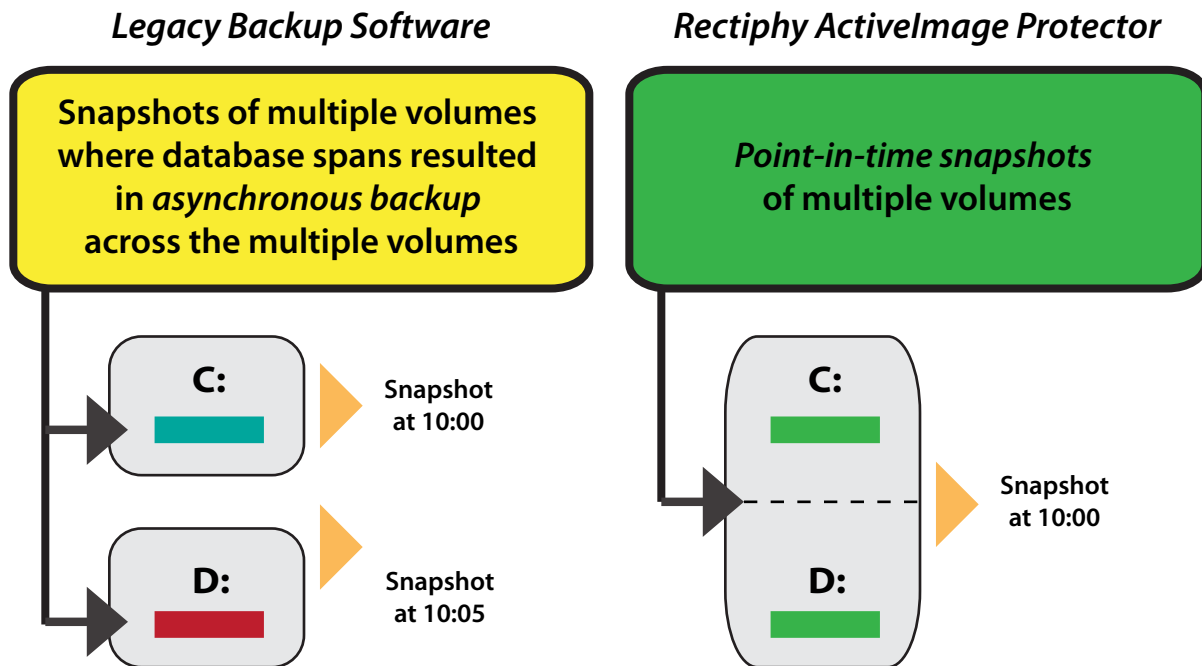


Fig. 8: Point-in-time snapshot capability is a necessity to ensure synchronicity.

In-House Developed Filter Driver

As we've mentioned before, Rectiphy AIP's integrated disk monitoring technology manages all changes to the disks and volumes, providing reliable incremental backups at blazing-fast speeds. This filter driver was developed in-house, and keeps track of data changes in a cluster.

Rectiphy ActiveImage Protector's built-in snapshot driver uses the Microsoft standard driver (Volsnap), included in Microsoft® Windows® XP or later versions, thereby ensuring simple, safe, and clean incremental backups in VSS-aware environments. Rectiphy Active-Image Protector is the world's first incremental backup imaging technology that uses the VSS snapshot driver and features sector tracking.

Cold Backup

Rectiphy ActiveImage Protector may be booted from the product CD to run on Windows PE, enabling users to create a backup image of a static server system or workstation.



Basic Features: *Backup Function*

Supported Backup Media

Rectiphy ActivelImage Protector supports storage devices that are accessible from Windows, as well as local drives and network storage.

Supported Devices / Interfaces:

Local hard disks (ATA, SATA, SCSI, eSATA), network drives, storage area network (SAN), and Serial Attached SCSI (SAS) are all supported. Because the recovery environment is built on the latest version of Windows PE, a wide variety of devices can be supported without installing device drivers.

Supported File Systems:

For NTFS, FAT, and FAT32 volumes, only used clusters are backed up. If the file system is Linux[®] Ext2, Ext3, Swap, Linux LVM, VMware[®] VMKCORE or VMware VMFS, backup of full clusters including unused space is taken.

Supported OSes:

Rectiphy ActivelImage Protector supports hot imaging and cold imaging on Windows Server[®] 2008 (including R2), Windows Server 2003 (including R2), Windows 7, Windows Vista[®], and Windows XP. In addition, cold imaging is supported on Windows 2000 Server (SP1).

Basic Features: *Restore Function*

Wizard-based Operation

The Restore Backup Image Wizard guides you through the process of restoring an existing image file to a hard disk. Because a backup of multiple volumes may be stored in one image file, the entire hard disk can be restored with a single operation.

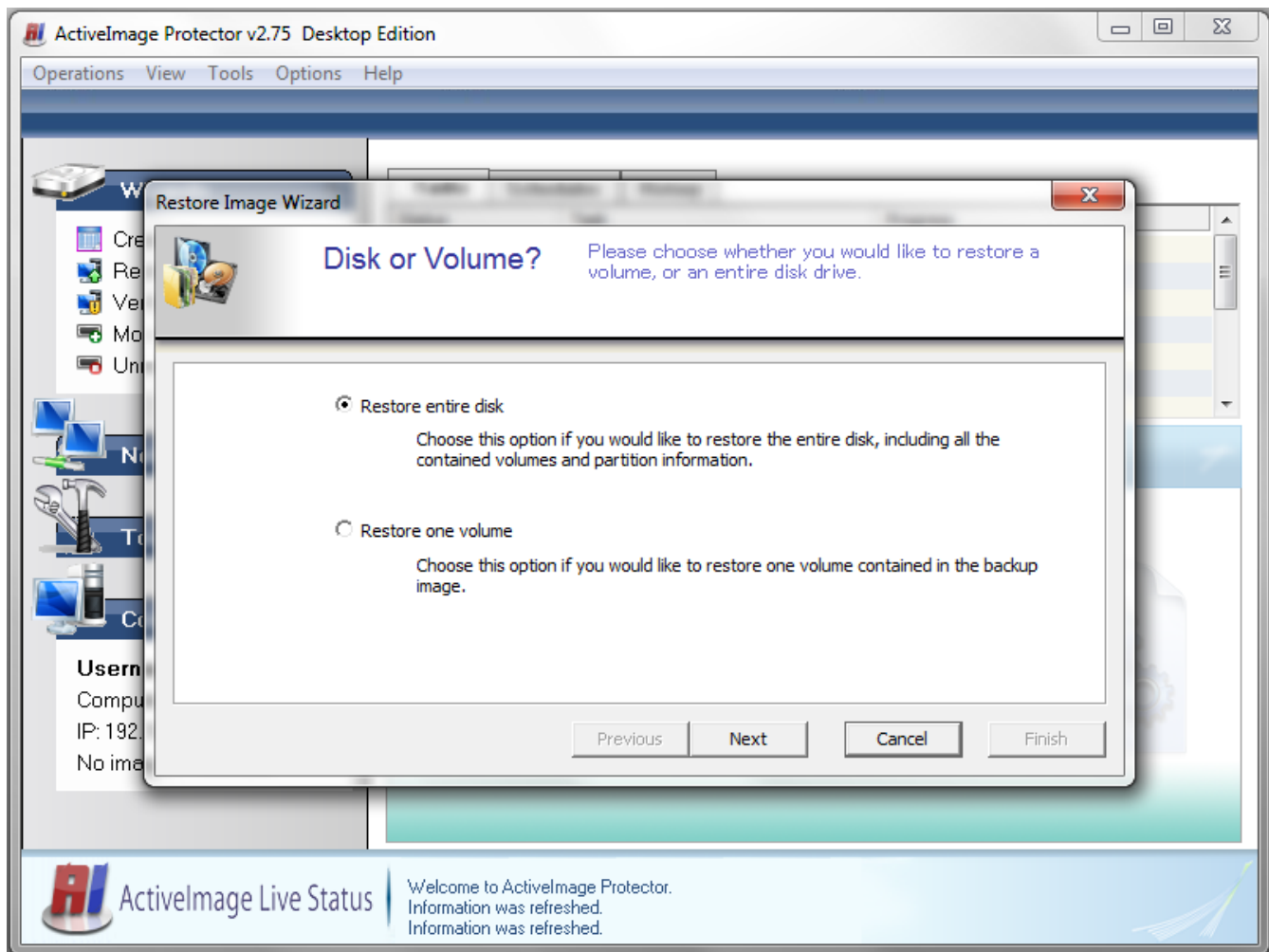
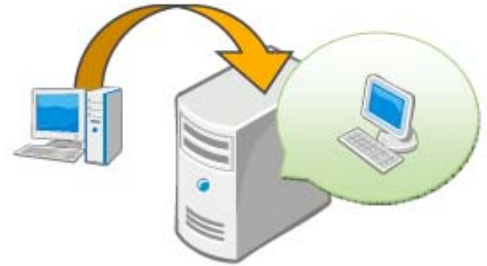


Fig. 9: Restore disk or volume

Basic Features: *Restore Function*

P2V (Physical to Virtual) Support

Rectiphy ActivelImage Protector can convert an image file into a virtual disk image file (.vmdk) to ease the migration of the image of a physical environment to a virtual (VMware) environment. For example, the system on legacy hardware may be migrated to a virtual environment running on the latest hardware.



In a virtual environment, multiple operating systems may be installed on a single machine to run simultaneously. As a result, server functions distributed over multiple servers may be consolidated into a single machine to simplify system resource management.

Bare Metal Recovery (Disaster Recovery)

Booting from the wizard-guided product CD (Windows PE) allows for either bare metal recovery to a new hard disk or disaster recovery when the operating system does not run. When restoring, the image may be restored in the same size as the original or expanded in size. Also, you can restore the Master Boot Record (MBR) or physical disk signature stored in a backup image file.

On-Demand Network Settings in Windows PE

Image files stored on network drives have presented problems during disaster recovery on some operating systems if the image file cannot be specified on an invisible network drive. The typical solution is to pre-configure network settings before booting Windows PE, and then execute the restore process. The Rectiphy ActivelImage Protector solution allows users to configure network settings on the fly to connect to the network drives to reduce boot time.

Install Device Drivers after Windows PE Boot

Because device drivers for storage or network interface cards (NICs) not included in the product CD (Windows PE) may be installed after Windows PE boot, many of these devices can be supported. Rectiphy ActivelImage Protector also provides a boot environment configuration tool.

Basic Features: *Enhanced Support of Virtual Environments*

Backup of a virtual environment may refer to a variety of backup patterns, such as backup of a single virtual machine, hypervisor-based virtual computing systems as a whole, or the entire storage in the virtual environment.

Rectiphy ActivelImage Protector, which supports hot imaging and VSS, enables users to back up running VSS-aware server applications (such as Microsoft SQL Server or Microsoft Exchange Server) on running virtual machines while ensuring consistency.

Backup of Entire Hyper-V Host Environment with Running Virtual Machines (Hot Imaging)

With a traditional backup imaging solution in a Hyper-V environment, the imaging of the entire host volume on which the hypervisor is running takes place without regard to the virtual machine status. This resulted in unexpected problems, such as backups being taken in the same state that a system crash or a blue screen error occurred. To avoid such problems, backups could be made only after every virtual machine was shut down, thereby compromising availability.

Because Rectiphy ActivelImage Protector supports the VSS-aware Hyper-V host environment, users can take clean snapshots and back up the entire host environment while running virtual machines, including all VSS-compliant applications running on the virtual machines. The individual virtual machine, when restored, can be restarted from the same condition as it was when imaged.

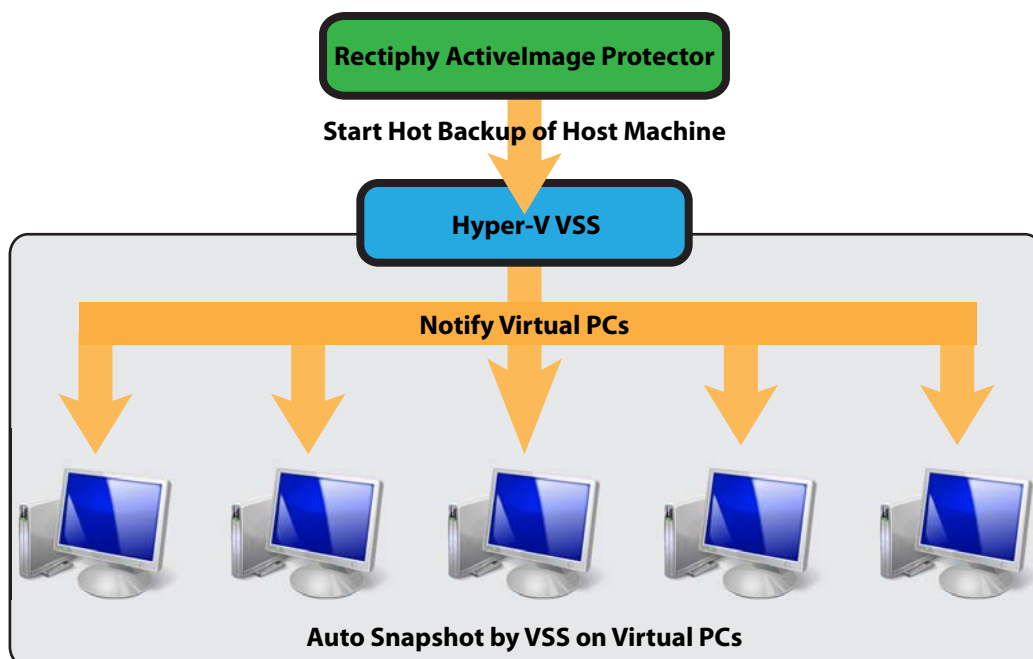


Fig. 10: Snapshot of virtual machines in Hyper-V environment



Basic Features: *Enhanced Support of Virtual Environments*

Back Up Entire ESX Host Environment in Shutdown Condition (Cold Imaging)

Backup of the entire vSphere ESX environment can be taken with the virtual host in a shutdown state. This backup may be restored to return the system to operation.

Back Up Respective Virtual Machines Running on Hyper-V or vSphere (Hot Imaging)

Rectiphy ActivelImage Protector installed on virtual machines enables users to back up the respective virtual machines in the same manner as backing up a physical machine. Because ActivelImage Protector supports hot imaging and VSS, users can back up running virtual machines together with VSS-aware server applications (such as Microsoft SQL Server and Microsoft Exchange Server) and consistency is ensured.

Useful for Deploying Virtual Environments (IT Pro Edition)

Because Rectiphy ActivelImage Protector supports backup and recovery of the entire Microsoft Hyper-V or vSphere host virtual environment, it provides system integrators with a useful tool to deploy Microsoft Hyper-V or vSphere ESX host virtual environments.

ReZoom One Or Many Virtual Machines (Microsoft Hyper-V Edition)

To back up individual virtual machines, users of currently available backup products have to install the backup software on each VM. Put another way: if a user has a host server with 15 guest VMs and wants to backup 5 of those VMs, the user would have to image each individual VM, using the VM-installed backup software, and restore each VM separately.

In Microsoft Hyper-V environments, users now have a time-saving alternative: ActivelImage Protector for Hyper-V. This special edition includes a patent-pending ReZoom Wizard that allows users to restore one or many VMs. Just install ActivelImage Protector for Hyper-V on the Windows 2008 Server or Windows 2008 Server R2 host server with Hyper-V (v.1.0 or v.2.0) and backup the entire host. Then use the ReZoom Wizard to select the guest VMs to restore. The user can ReZoom the entire host, several VMs, or just a one VM--all from a single image of the host. Once a full image of the host is created, guest VMs can be ReZoomed from subsequent incremental images.

VMs can also be ReZoomed to a host server on different hardware from the backup target host. (A separate license of ActivelImage Protector for Hyper-V is required for the destination host; a destination host different from the backup originating host must be on Windows Server 2008 R2 Hyper-V 2.0.) If the user wants to migrate VMs from one host server to another, Rectiphy ActivelImage Protector IT Pro Edition also includes the ReZoom Wizard, thereby offering users a fast and economical alternative to legacy backup products for easily migrating virtual machines to new or mirrored hardware.

Other Features

Mounting Image Files

You can mount the created image file and assign a drive letter to the mounted volume. You can select files in the image file to retrieve.

System Resource Throttling

ActivelImage Protector allows you to raise or lower the system resource settings (disk I/O) for backup processing. Its disk I/O usage may be reduced to not slow down other server services. This feature is important especially for resource-intensive full backup operations which take longer to complete.

Compression Feature

Backup image files may be compressed for storage.

Security

Rectiphy ActivelImage Protector contains security features such as password-protected access to the image files, encryption, and password-shielding of the image files (standard AES).

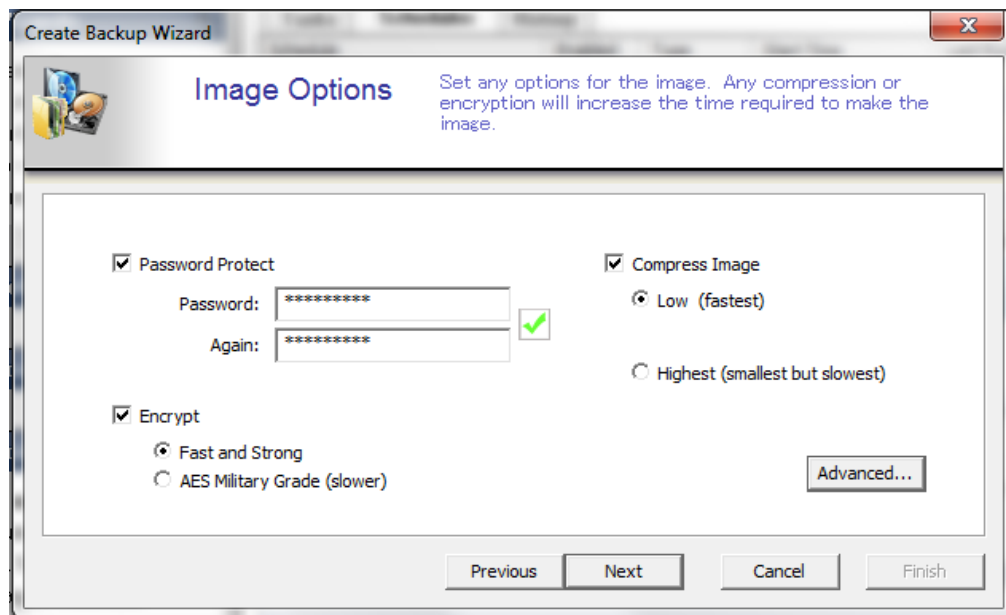


Fig. 11: Compress/encrypt capability

Other Features

Configuring Remote Settings

The Rectiphy Activelmage Protector service settings, such as backup settings or schedule settings, may be remotely configured on networked computers in the same manner as on a local computer.

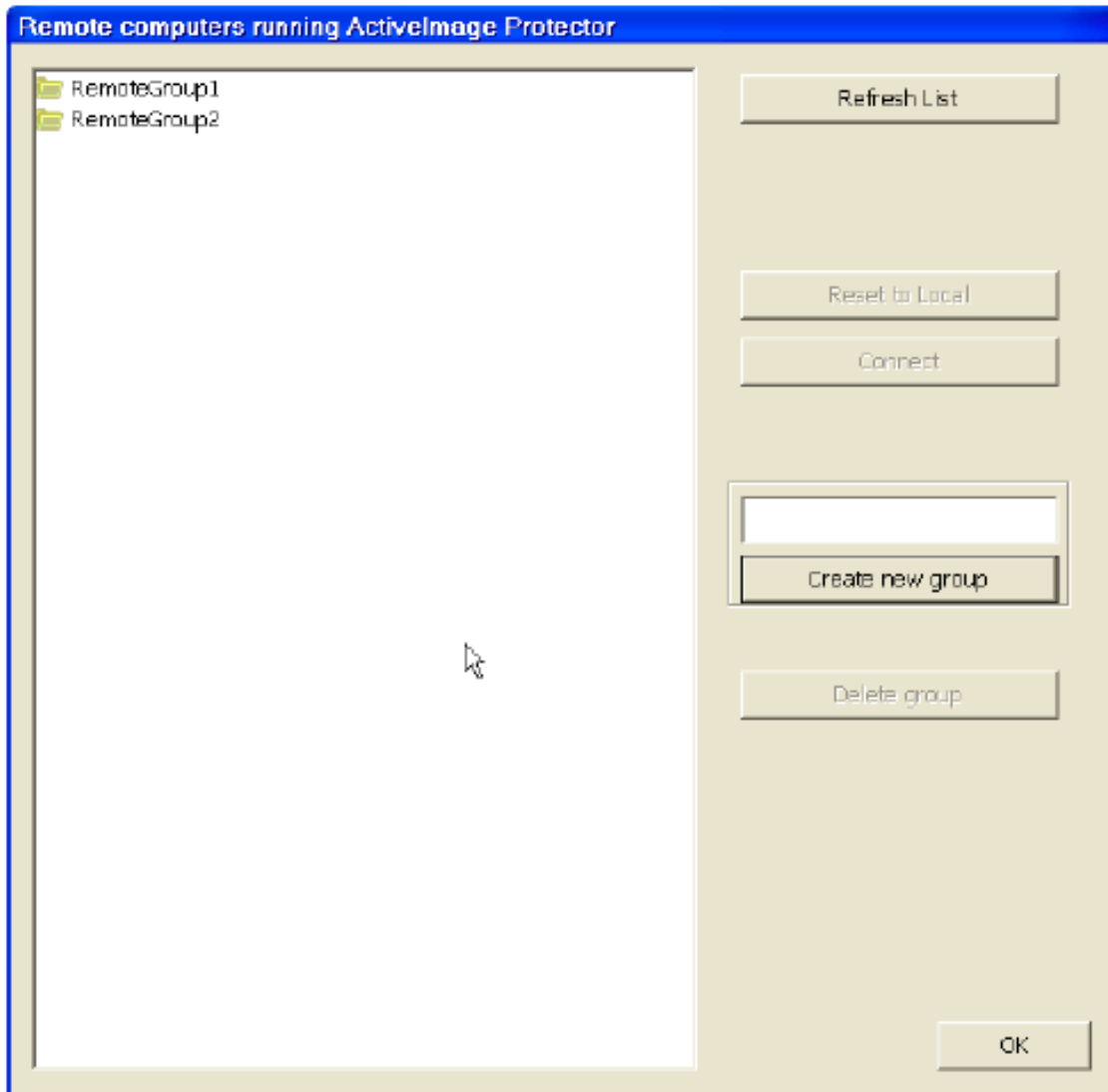


Fig. 12: Task management on network computers

Other Features

P2V Migration

Rectiphy ActiImage Protector enables you to convert a created image file to a virtual disk file for a virtual PC (VMware). The P2V migration utility enables users to migrate from a legacy operating system / PC to a virtual environment where backups may be systematically configured.

Split Image File

When an image file is copied to another location, the file may be split into smaller files and transferred to the destination to enhance error tolerance and to lower bandwidth use.

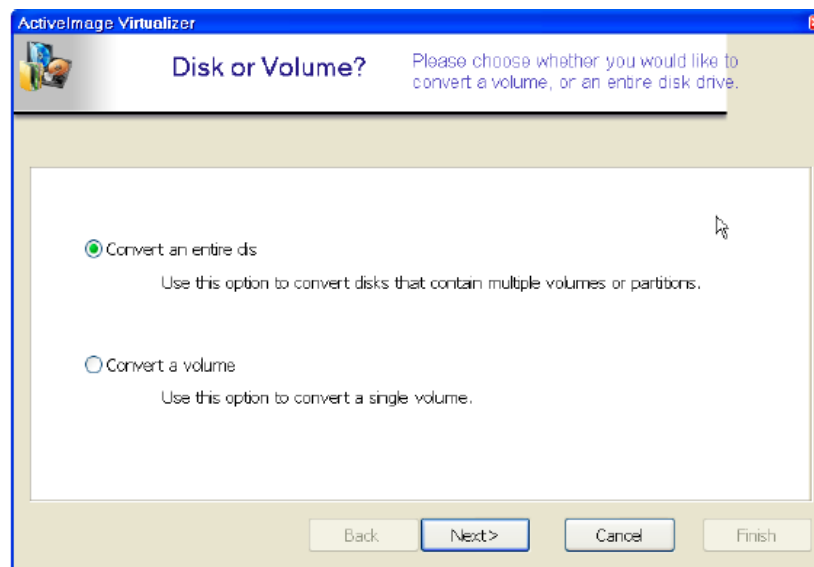


Fig. 13. Physical-to-virtual migration utility

Guide to Main Features

Architecture

Rectiphy ActivelImage Protector is composed of:

- A snapshot driver (Microsoft VSS)
- A filter driver
- An imaging service
- A mount service
- A scheduling service
- A GUI
- A CLI

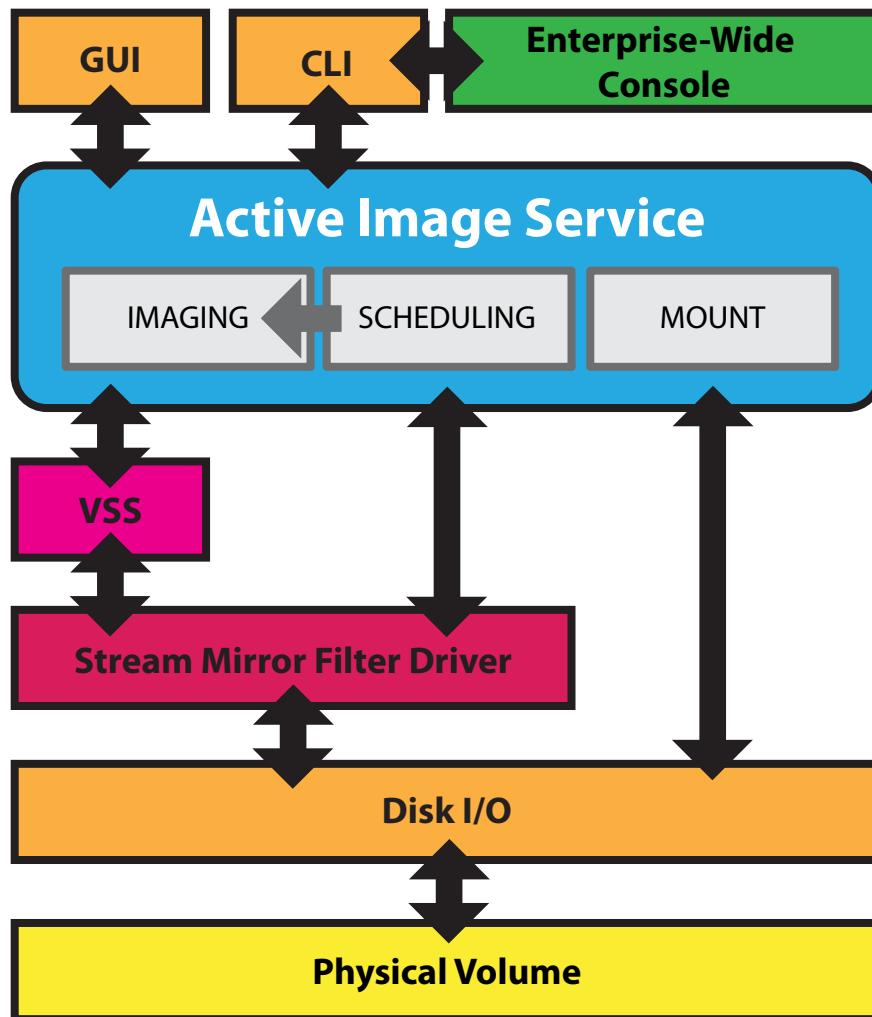


Fig. 14: Basic architecture of Rectiphy ActivelImage Protector

Guide to Main Features

Service Based Application

The functions of Rectiphy ActivelImage Protector are respectively executed when corresponding requests to the services are accepted. The backup engine, scheduling, mounting of image files or creating snapshots are provided as services.

The respective functions running as services allow abstract access from GUI, CLI, and UI-less agents (version 3 or later).

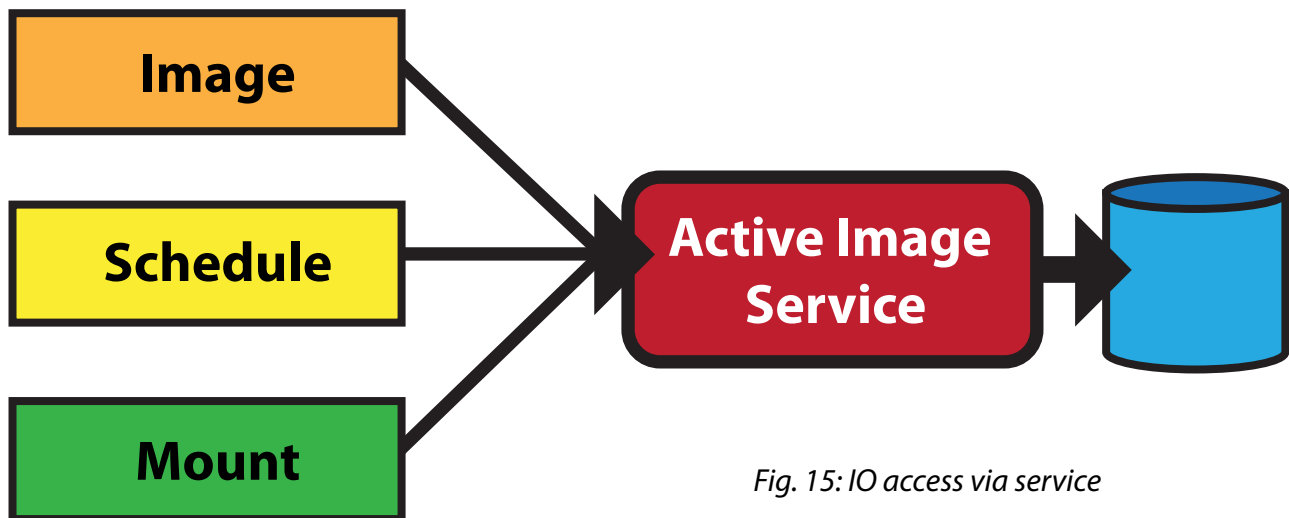


Fig. 15: IO access via service

Snapshot

While Windows is running, exclusive access to any file, sector or cluster cannot be assured. Because of this, traditional file-by-file backup solutions caused inconsistencies in backups of always-open files, such as system-related or database-related files. Eventually, a newer technology was developed to hold the entire volume in a snapshot state. This ensured that sectors remained in the same state as when the backup processing wastarted.

However, conflicts among multiple third-party drivers (as well as incompatibility with other device drivers and applications) remained a problem. Microsoft's snapshot driver (VSS), an OS function built into Microsoft Windows XP and later versions, is designed to eliminate conflicts with other VSS-aware applications and device drivers. Rectiphy ActivelImage Protector, which uses VSS as its snapshot driver, can offer safe and clean hot imaging, and minimizes risks to the server OS from installing low-level drivers.

Guide to Main Features

Support for VSS-Compatible Applications

Rectiphy ActivelImage Protector supports VSS-compatible applications. Rectiphy ActivelImage Protector works as a VSS requester in coordination with writer applications and can take consistent point-in-time backups of servers on which Exchange Server, SQL Server or Oracle® Server is running.

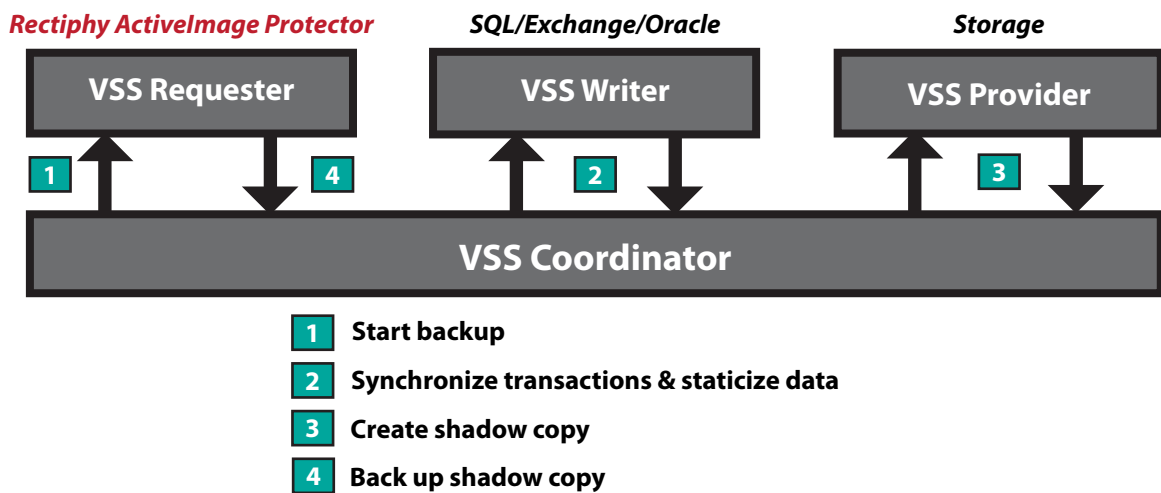


Fig. 16: VSS requester supporting VSS-compatible applications

In-House Developed Filter Driver

Rectiphy ActivelImage Protector’s new filter driver was developed based on technology that was designed for real-time mirroring. Unlike the traditional approach, the use of the new filter driver enables tracking of data changes in clusters through duplexed data streams.

The filter driver is designed to create incremental backup files in real-time, which provides a foundation for Continuous Data Protection (CDP).

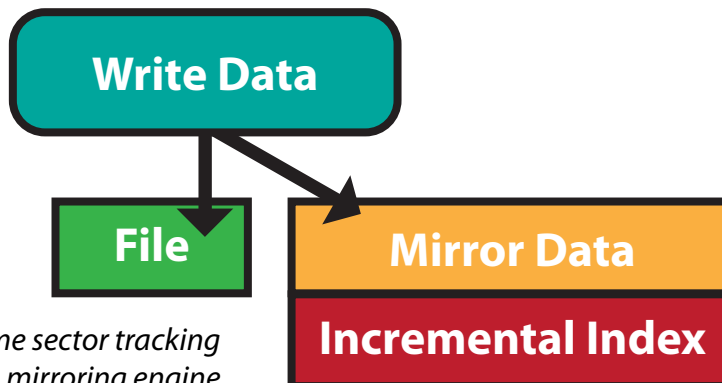


Fig. 17: Real-time sector tracking based on mirroring engine

Guide to Main Features

Incremental / Real-time Sequential Incremental Backup

Incremental backup, which includes only sectors changed since the last full or incremental backup image was written, saves both processing time and storage space. Rectiphy's integrated disk monitoring technology manages all changes to the disks and volumes, providing reliable incremental backups at blazing-fast speeds.

Moreover, an incremental image may be created to include the difference between a full backup and the current volume. Even if cluster tracking was not performed, an image set including incremental backup images may be created afterward.

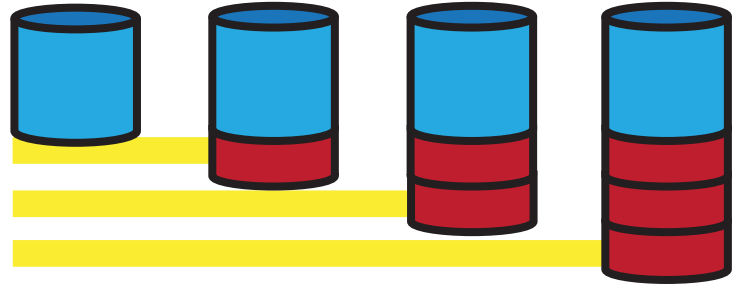
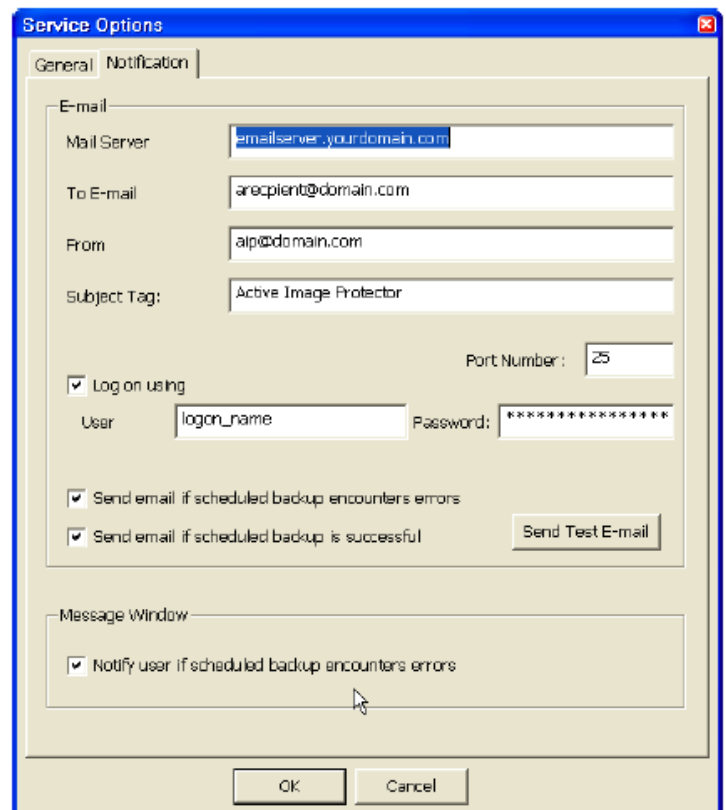


Fig. 18: Incremental backup: backup of changes since the last backup

E-Mail Notification

The following settings may be configured to send an e-mail notifying the result of a backup operation.

Fig. 19: Email notification



Guide to Main Features

Profile and Schedule

With Rectiphy ActivelImage Protector, a backup task is configured by a profile that defines backup settings combined with a schedule that defines the timing of backups.

The backup settings defined with a profile are stored in an .ini file (text file), and can be customized using a text editor. Profiles may be used with a schedule or with a command line tool, thereby simplifying backup management.

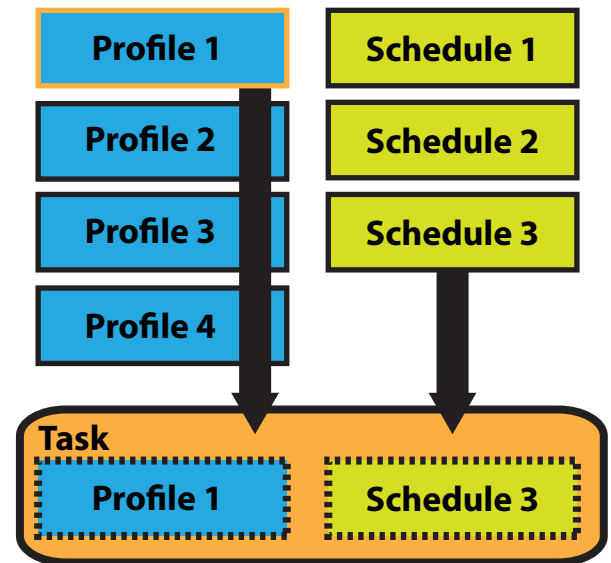


Fig. 20: Profiles and schedules

Command Line Interface

A backup job can be executed by specifying parameters for a command line tool such as those provided by system management tools, thereby offering flexibility in enterprise computing environments.

Example of Command Line Parameters:

```
AipControl.exe createimage testImage  
AipControl.exe mount C:\Test10.vol X:  
AipControl.exe restorevolume C:\Test10.vol F:  
AipControl.exe restoredisk C:\Test10.vol disk1 mbr
```

Use of Windows PE

When no functioning operating system is available to run a restore program, disaster recovery or a bare metal recovery has to be executed by booting the OS from a CD or other media. In the past, DOS or Linux-based boot media were commonly used to start a computer. However, DOS and Linux-based boot media had some problems; for example, insufficient support of device drivers, no native support of networking, out-of-memory problems, etc., and neither platform could support the most recent hardware or system environment. Rectiphy ActivelImage Protector uses Windows PE to provide the same user experience and connectivity as standard Windows.

Example of .ini file

[Main]

; Description of profile

Description=Backup all of drive 1

; Source drive number (0 based)

; If Drive>=0 then all volumes on the drive will be included.

; If Drive=-1 then Partitions is used

Drive=1

; Source volumes (only lettered volumes supported at this time)

; Separate multiple volumes by a semicolon with no spaces (e.g. D;E;H)

; Drive must be -1 or this must be empty

; All source volumes must be on same disk

Partitions=

; Destination Type (always 0 at this time)

DestinationType=0

; Location of target image - can be a local or UNC path

TargetLoc=C:¥

; Name of image file

ImageFileName=Test1.aiv

; File version number (always 1 at this time)

Version=1

[Options]

; Set to 1 if the image is to be compressed (not yet supported)

Compress=0

; Set to 1 if the image is to be encrypted or 2 if stronger/slower AES encrypted (not yet supported)

Encrypt=0

; DO NOT MODIFY, THIS IS GENERATED

Checksum=30A35E80C4528C60BAA2D546579B8DC3F7F14726114733AD7825949D1237445350B9746
D460C8E0DB2E9A6204D18956B7BAAEE8D2162C5BF61216D75
AES=0

[AdvOptions]

; Set to 1 to use the Sector Tracking driver to create the image.

Tracking=1

; Initial priority of create image task (not yet supported)

Priority=0

; Type of Backup: 0=Full, 1=Differential, 2=Incremental

BackupType=2

; Pre-SNAPSHOT Script. This command is run right before a snapshot is taken of the source.

preSnapshotScript=

; Post-SNAPSHOT. This command is run right after the snapshot is taken.

postSnapshotScript=

; Post-IMAGE. This command is run after the image is complete.

postImageScript=

; Image will be split to chunks of this size (not yet supported)

SplitMB=0

; Set to 1 if free space is to be included in the image (not yet supported)

IncludeFree=0

AutoExecute=0



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