Actiphy

ActiveImage™ 2018
PROTECTOR

# Product Summary

-Main Features of ActiveImage Protector-

Actiphy Inc.
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## 1. Summary of Product

ActiveImage Protector is a block-based disk imaging backup/recovery solution optimized for a variety of users ranging from enterprise, SOHO, workstation, home users. ActiveImage Protector is available in different editions that are designed to provide greater flexibility and fit your backup and disaster recovery needs widely from small to large scale system environment. The built-in wizards guide you through every steps to perform required operations for the main features, which eliminates training needs. No special knowledge is necessary for achieving safe and secure backup / recovery.

ActiveImage Protector has the capabilities of hot backup for backing up your running system, incremental backup for backing up only changes made since the last backup, bare metal disaster recovery for restoring failed system to a new hard disk, enhanced support for virtual environments. A broad range of backup media is supported from local disk to on-line storage using WebDAV.

Solving the problem of duplicated data blocks increasing on day to day basis, built-in Inline Deduplication Compression feature enables you to dramatically reduce backup storage space requirements.

Combined with ImageCenter LE (free image management tool), HyperBoot (free tool for booting a full or incremental backup image as a virtual machine), vStandby AIP (non-free instant availability solution creating an instantly bootable standby virtual replica machine from ActiveImage Protector backup image files), ActiveImage Protector offers you a true Disaster Recovery solution.

## 2. New Features of ActiveImage Protector 2018

### Post-backup Process

Post-backup Process feature enables you to execute a task upon completion of a backup task. Post-backup Process options include BootCheck™, Image Verify, Consolidation and Replication. Post-backup process may be scheduled to run at late-night so the local system performance is minimally impacted.

### File Recovery

In the event of system failure, as is often the case, you may only need specific files to restore in order to restart your duties. File Recovery feature allows you to restore a specific file or a folder from a backup image file using ActiveImage Protector GUI. You can select a recovery point (backup time) in selection of an image file. NTFS streams information and access rights assigned to files, which Copy function of Mount Image feature often fails to recover, are inclusively restored.

### Integrated vStandby Virtual Standby Availability Technology

vStandby, standby availability solution, was marketed separately from ActiveImage Protector. ActiveImage Protector 2018 integrates vStandby including the GUI to replicate your physical / virtual machines (virtual standby replica) in virtual environment, up-dating boot points with scheduled incremental snapshots of source physical/virtual machines. When a disaster strikes, the standby virtual replica can be instantly started from a specific boot point.

The standby virtual replicas can be started from the most updated snapshot without needing restore processing or settings. Traditional HA and replica machines have vulnerability that the replacement machine contain virus contamination such as ransomware, once attacked, or failed system update. Lengthy recovery from backup files is also a problem. Making up these vulnerabilities, virtual standby replica bootable from a specific boot point provides immediate switch-over recovery and optimum solution.

#### iSCSI Server (Server Edition only)

ActiveImage Protector backup images can be served as iSCSI targets to any local or remote iSCSI initiator to mount backup image files as local disks. The existing Image Mount feature enables to mount ActiveImage Protector backup image as a volume. Now that iSCSI disks can be handled as virtual disks on state-of-the-art hypervisors, iSCSI-connected disks can be used to boot up virtual machines. This technology was adopted in BootCheck,

HyperBoot booting a virtual machine from a backup image on a remote hypervisor. Additionally, VMware vMotion facilitates live migration on VMware ESXi hosts that move the entire state of a virtual disk from one physical host to another while the virtual machine is booted and live.

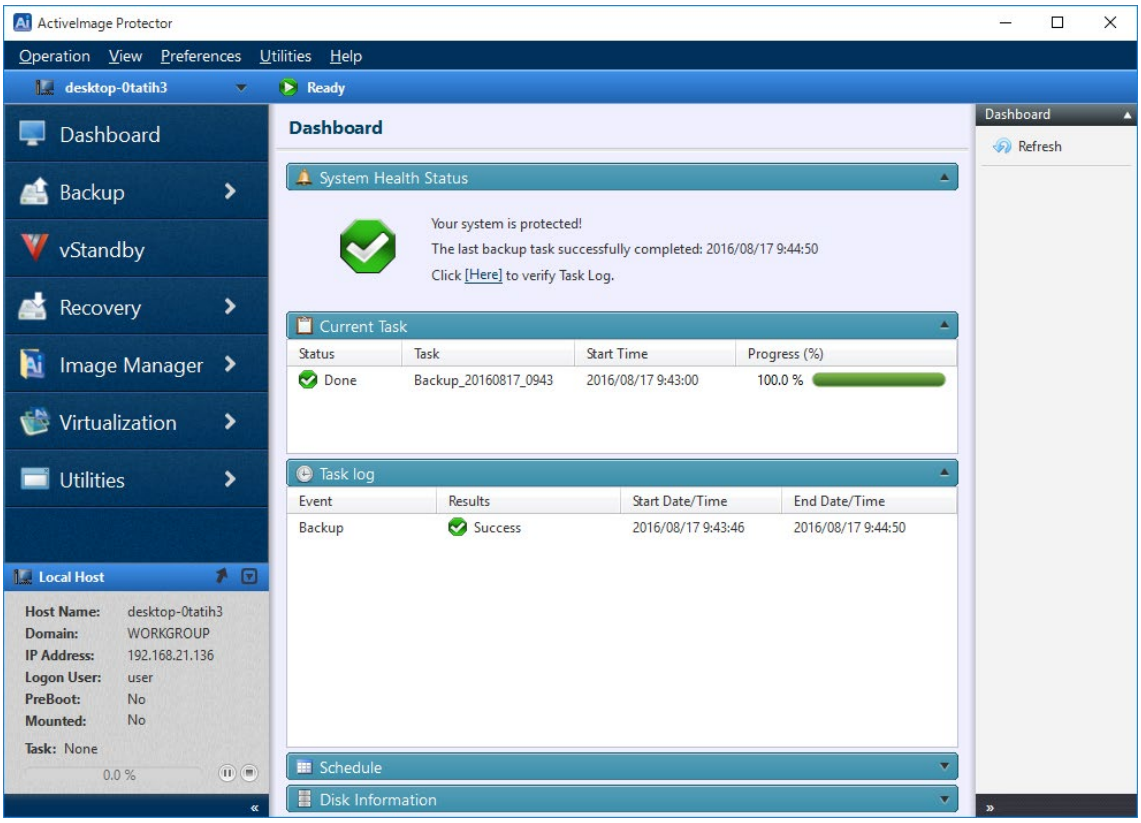
### Changed Block Comparison™ Technology (Update 7)

CBC is Actiphy's new proprietary Changed Block Comparison technology (Update 7) on hard disk. CBC technology analyzes a volume and its file system to identify blocks that need backing up instead of trapping write I/O to a volume. Since trapping write I/O is no more required, CBC does not require installation of filter driver and has a number of advantages, i.e., support for incremental backup of CSVFS volumes, keeping continuity in an incremental image set, not requiring a system restart upon completion of an install, update, or uninstall, all of which incremental backup using tracking driver does not provide. Currently NTFS volumes are supported.

## 3. Main Features of ActiveImage Protector

### New GUI

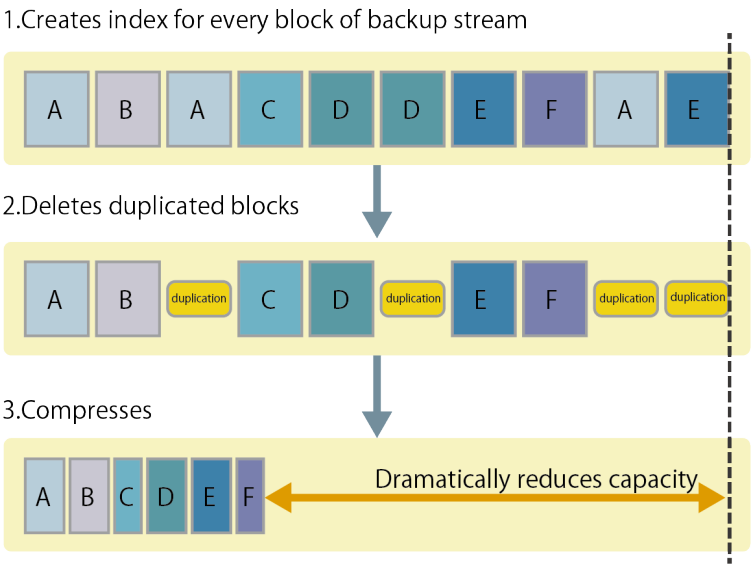
New GUI provides dashboard window, wizards windows supporting drag and drop actions, expanding/collapsing node in navigation pane, all of which make the software operation more intuitive.




**ActiveImage Protector GUI**

### Inline Data Deduplication and Compression

ActiveImage Protector offers built-in Inline Data Deduplication and Compression feature as standard. Inline Data Deduplication Compression (IDDC) occurs during (not after) the backup process (industry first according to our research). In general, Deduplication Compression, an optional feature, is included in high-end storage appliances. Since ActiveImage Protector provides Data Deduplication and Compression feature as standard, there is no need to invest in high-end additional storage to accommodate deduplication needs. As a part of backup process, ActiveImage Protector 's Inline Data Deduplication and Compression (IDDC) allows users to efficiently deduplicate data and compress image files, with significantly better results requiring less storage without paying extra cost.




**How Inline Data Deduplication and Compression works**

## Multi-disk Image File

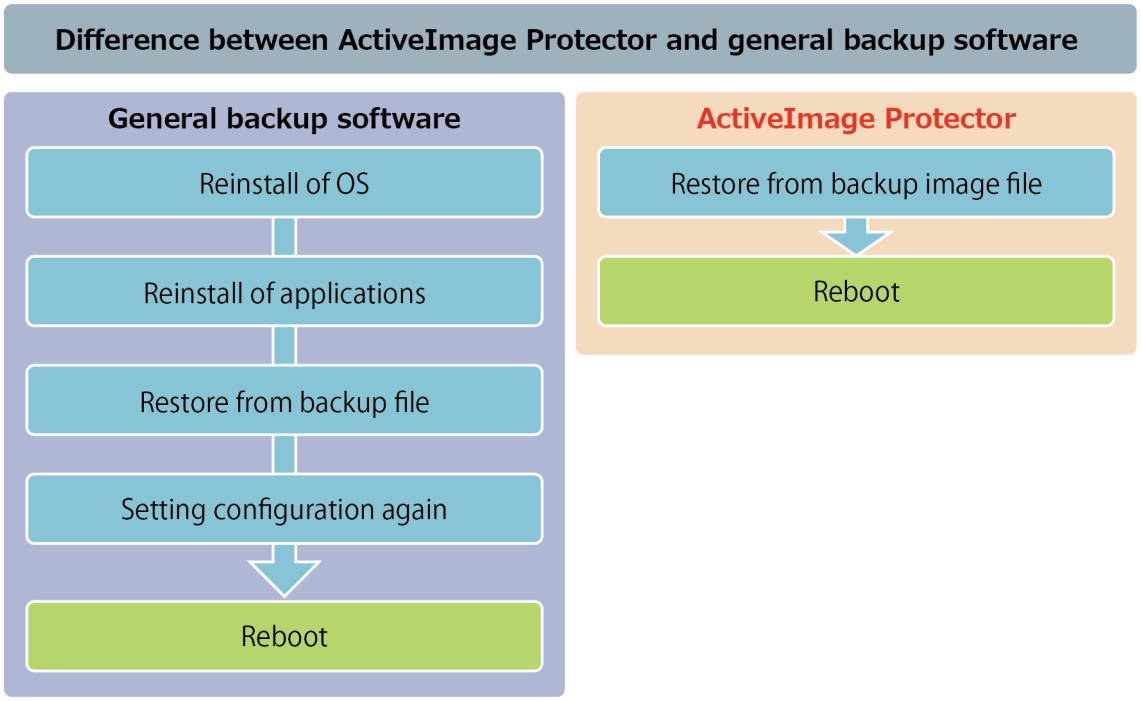
Multi-disk Image File feature allows collective backup of multiple disks in one image file, which enhances the efficiency of Data Deduplication and Compression feature.

## Backup

### Imaging Backup

ActiveImage Protector provides block-based disk imaging backup enabling users to back up the entire contents in hard disk into an image file. As traditional file-by-file backup caused inconsistency in backup of always-open files such as system-related files or database-related files, OS and applications had to be reinstalled. If the system configuration was customized to your individual needs, the customization is required every time the system was restored. Lengthy restore routines might take several hours to a couple of days.

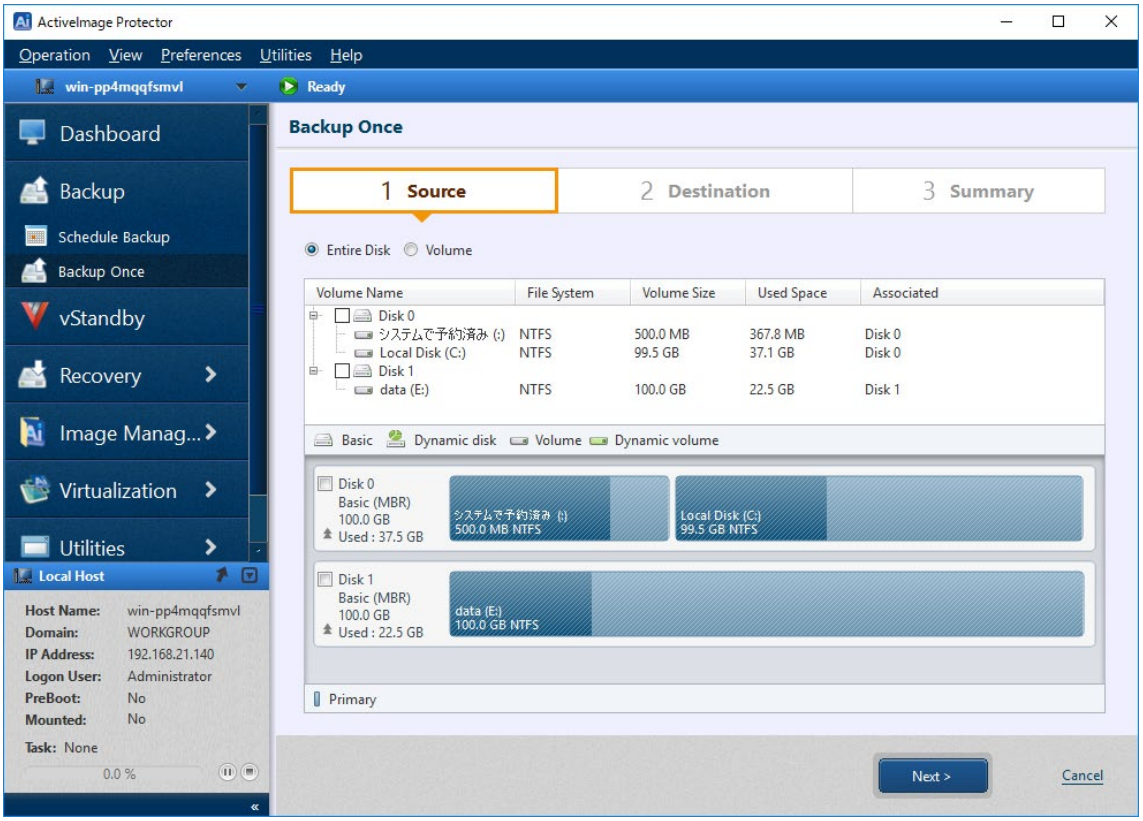
ActiveImage Protector's block-based disk imaging backup technology backs up the entire contents in partitions in original layout. Restoring the image file enables you to restore the partitions to the point in time the backup was taken.




**Comparison with Legacy Backup Software**

### Wizard-based Operation

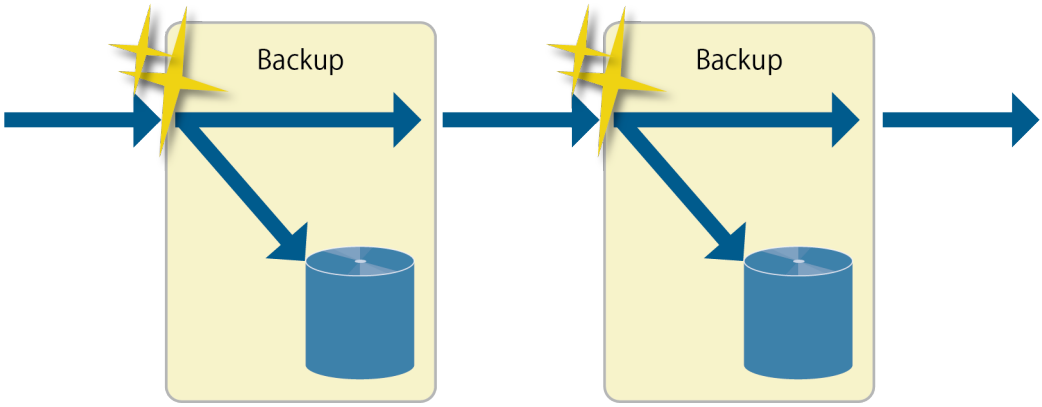
Backup Wizard guides you through the complete process of configuring backup and schedule settings. Backup type may be Entire Disk or By Volume to select as the backup source. The entire disk backed up in an image includes the entire volumes and may be restored by running a single restore task. The backup tasks can be executed according to the predefined schedule.




**Backup Wizard**

## Hot Imaging Backup

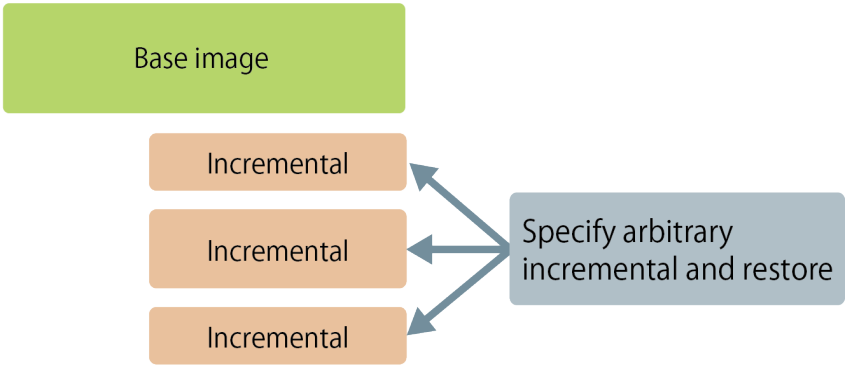
ActiveImage Protector provides hot imaging backup feature enabling to take a snapshot of volumes including OS while Windows is running so that a hard disk image file is created without bringing the system to a halt. You do not have to shut down the system in order to take backup of OS.




**Hot Imaging Backup**

## Incremental Backup

ActiveImage Protector supports incremental backup to create a backup image file including only changes made since the full backup image (backup image including the entire disk or a volume) was written, saving both processing time and storage space. Recurring execution of incremental backup tasks causes less impact on system performance than full backup. To restore your system, you can select an incremental backup image created at a specific point in time.




**Incremental Backup**

## Continuity in incremental image set

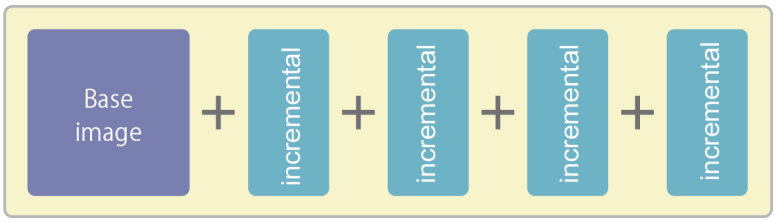
ActiveImage Protector' Scheduled Backup feature schedules recurring incremental backup tasks. After the first full (base image) backup is created, subsequently recurring incremental backups are scheduled. Retention Policy may be enabled to manage how many sets of base and incremental backup files to retain before deletion.

Incremental backup images created by recurring backup tasks have to keep sequency in an image set, however, you may encounter the instances that an incremental file becomes compromised, deleted, corrupted as a scheduled backup task may fail to complete. Then, a new image set has to be created starting from a full backup that increases storage needs and process time. CBC (Changed Block Comparison™) technology backs up the differences made from the lastly completed backup to the current status of the hard disk, keeping continuity in the incremental chain. CBC identifies changed blocks that need to be backed up by comparing volumes' previous and current states rather than real-time I/O monitoring, so that continuity of an incremental chain can be resumed even after the recurring incremental schedule was suspended or the destination storage of the backup images was changed.

## Archive and Consolidation of Backup Image Files

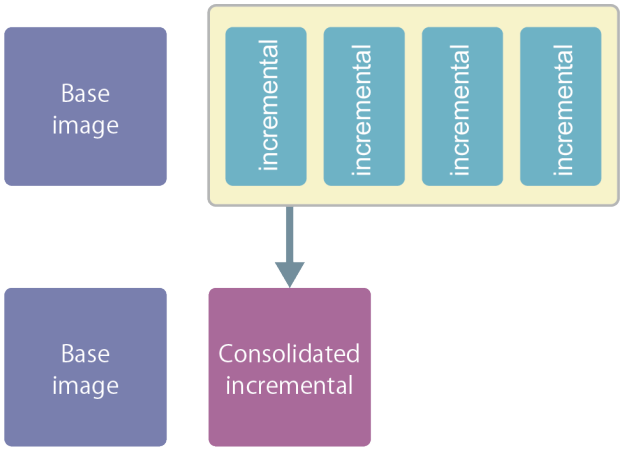
The incremental backup file is small in size and storage efficient, however, recurring scheduled backup tasks creates a growing and sometimes unmanageable number of incremental files. For example, if incremental back task is scheduled to run every hour, 8 image files (8 hours a day) are created a day, 40 files a week (5 business days a week) or 160 files a month.

ActiveImage Protector offers Image Manager Tools including Archive and Consolidation features that can consolidate an uninterrupted series of backup image files in the same generation set. Archive feature integrates an uninterrupted series of full baseline and incremental files in the full backup saved as a new file. To restore, you only need to select one backup file in the generation set.




**Archive feature integrates full and incremental backup files into one Full Backup File.**

Consolidation feature consolidates multiple incremental backup into a single incremental file, as a result, a base image file, one consolidated incremental image file and the rest of unconsolidated incremental backup image files are created.




**Consolidation feature creates a base and one consolidated incremental image file**

The resultant incremental backup file created by Consolidation task continues the incremental backup chain. On the other hand, Archive feature integrates the base and incremental back image files into a full backup file saved in a different name. Consolidation feature is designed to consolidate the incremental backup files by maintaining the continuity in incremental image set,

while Archive integrates the base and incremental back image files into a full backup file, saving the archived image in the specified location.

### Performance Setting

ActiveImage Protector provides 2 options for performance settings. Copy Engine's task execution priority setting is configured to prioritize other applications using the system resource. In the meantime, while the other applications are in idle state, Copy Engine works at the highest priority. The performance settings may be configured for the entire ActiveImage Protector, or each task. For example, the performance setting for the backup tasks scheduled during day time is set to low, and the backup tasks scheduled at midnight is set to the highest performance level.

### Throttling

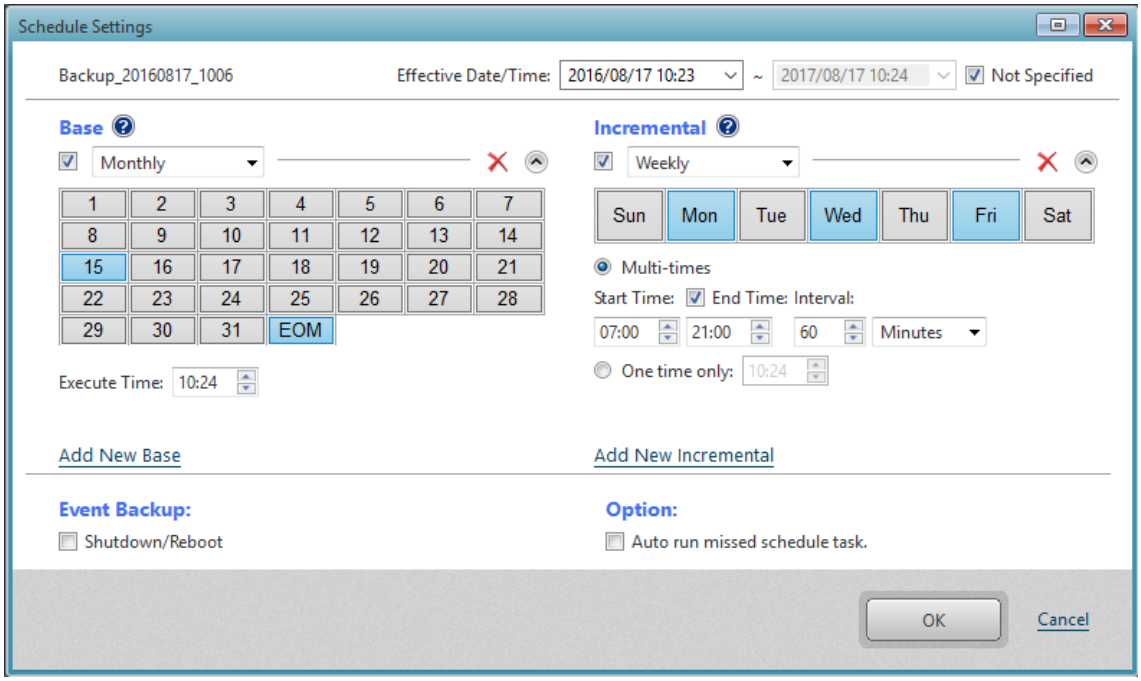
I/O (mainly for network) Throttling option is provided. If the destination drive is on a network share, use network throttle to define the maximum throughput in KB/second to reduce backup traffic over the network. By moving the slider or specifying the maximum throughput value, network throttle may be defined. When a backup task is executed while a mission-critical task is running, you can use network throttle to reduce backup traffic over the network. Combined use of task execution priority and network throttle, the system resource priority may be adjusted among mission-critical tasks and backup tasks.

### Ignore bad blocks

A backup task may be interrupted if encountering unreadable bad blocks on hard disk. Bad blocks, when detected during formatting a volume or check disk, are marked as "bad-block" and become unavailable. However, before the bad block is detected, you never know if it's bad or good unless you access it. A block in use by another file may be damaged and unreadable.
Backing up a volume including a bad block ends in read error and the backup task fails with an error. This is a security behavior, because the backup file as such cannot be properly restored.
Whatsoever the case may be, you often need to back up the hard disk. By enabling Ignore Bad Blocks option, the backup task will continue uninterrupted even if encountering unreadable blocks.

## Scheduled Backup

ActiveImage Protector supports scheduled backup. For both full and incremental backups, multiple schedule types may be combined to take backups at appropriate timings. For example, full backup may be scheduled to execute on the 15th and the end of every month while incremental backup tasks are scheduled every hour from 7：00 to 21：00 from Monday, Wednesday and Friday, as well as other incremental backup schedule.




**Scheduled Backup**

## Run Incremental Backup at System Shutdown

The situation may not allow you to run a backup task. By enabling this option, the backup task is automatically started upon system shutdown when leaving the office.

## Auto run missed schedule task

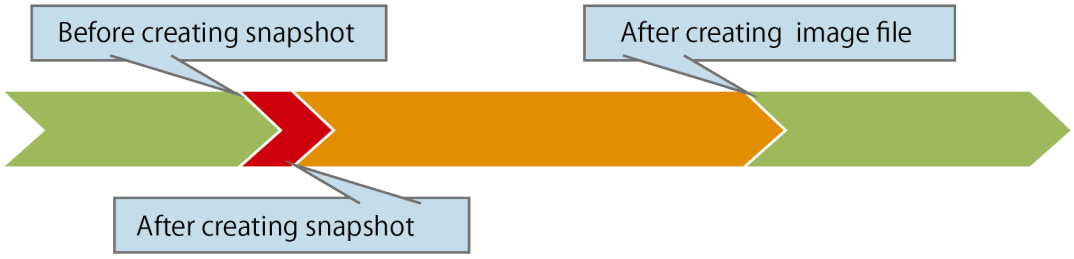
If a scheduled task is skipped for some reason, the skipped task is automatically executed whenever it turns out to be possible. For example, skipped task at system shutdown, if any, is automatically executed when the system is rebooted.

## User-specified Command Execution after Snapshot

A user-specified command may be executed before / after a snapshot is taken or after an image file is created. For example, with VSS-unaware database, command execution to stop / start services before / after taking a snapshot enables to flush transactions. Since creation of a snapshot completes in a moment, execution of a command hardly interferes user operation.

This feature is also useful in the operation where a command is executed to automatically move the image file when created.

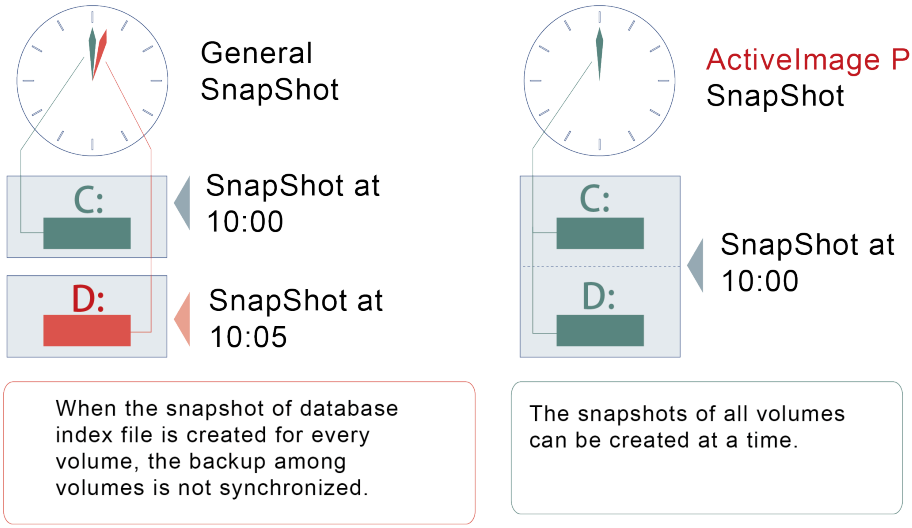
Scripts can be implemented to run separately for base backup and incremental backup.




**Scripting**

## Point in Time Snapshots of Multiple Volumes

Snapshots of multiple volumes may be taken at a point in time. This feature is necessary in such case that database spans across multiple volumes as its index and data files stored in different volumes.



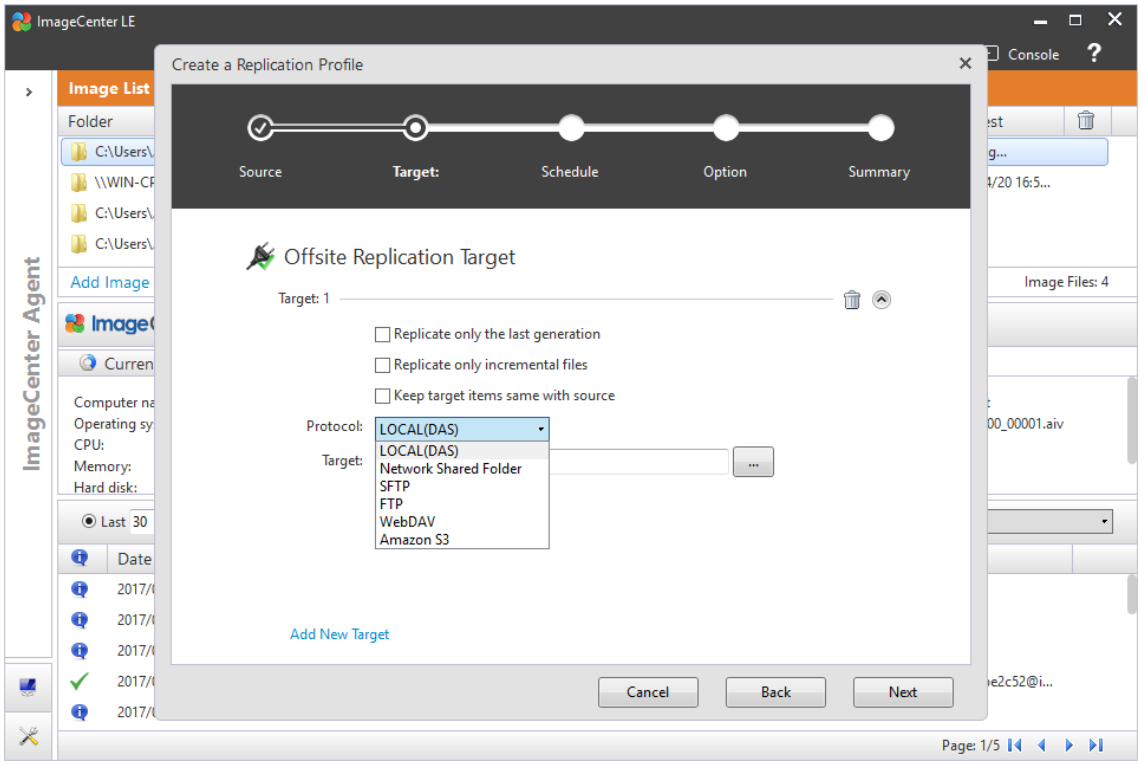

**How Point-in-Time Snapshot works**

## Cold Backup

ActiveImage Protector may be booted from the product CD to run in Windows PE or Linux environment. This enables to create a backup image of a clean static Windows server or workstation immediately after installation.

## Off-site Replication (ImageCenter LE)

With ImageCenter™ LE, off-site replication of backup image files to local or off-site high capacity data stores can be scheduled.




**ImageCenter LE Replicaiton Profile**

Replication target supports a local storage, a Network Shared folder (UNC), SFTP, FTP, WebDAV or S3 compatible storage.

## Remote Management

ActiveImage Protector services on the networked computers may be remotely managed for backup settings, schedule settings, etc., just in the same manner as on local computer.
ActiveImage Protector provides backup engine (service) and console (GUI) separately. The use of the network client management console allows to establish network connection and manage ActiveImage Protector agent on a remote host.

## Supported Devices / Interface

Local hard disk (ATA, SATA, SCSI, eSATA), network drive, SAN and SAS are supported as the backup images storage accessible from Windows.
Since the recovery environment is built based on the latest Windows PE, a wide variety of devices are supported without the need for installing device drivers in restore process.

## Supported File System

As for NTFS, CSVFS, FAT, FAT32 volumes, only used clusters are backed up. If the file system is Linux Ext2, Ext3, Swap, Linux LVM, full clusters including unused space are backed up.

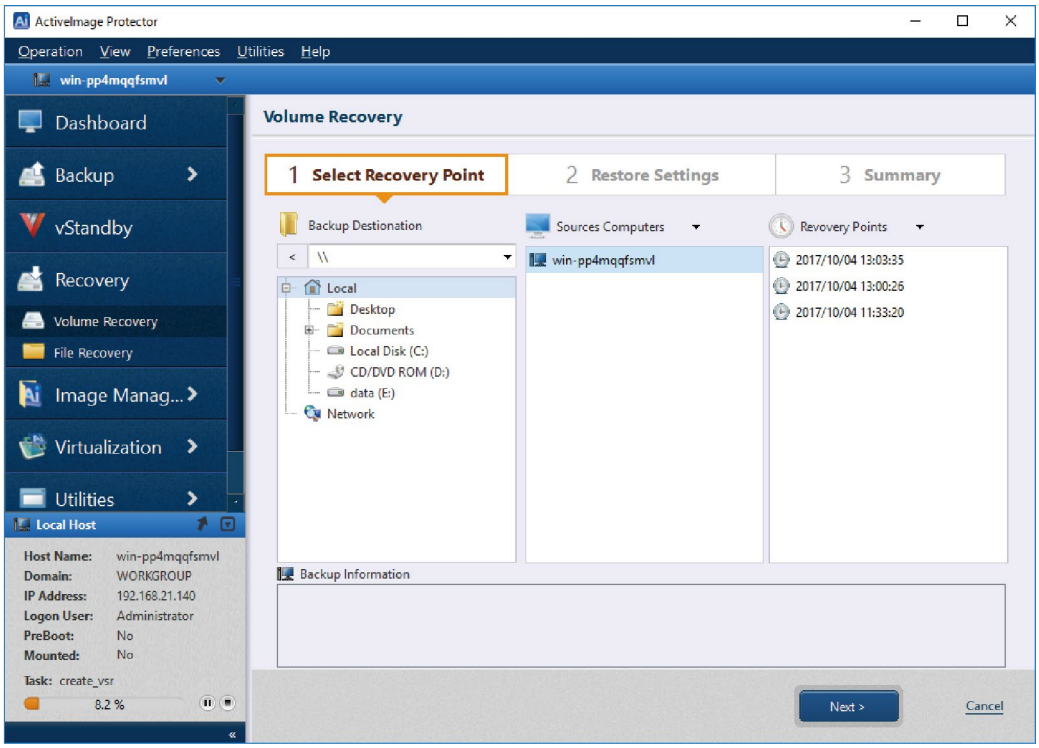
## Supported OS

ActiveImage Protector supports hot imaging and cold imaging on Windows Server 2008 R2/2012/2012 R2/2016/2019, Windows 7/8/10.

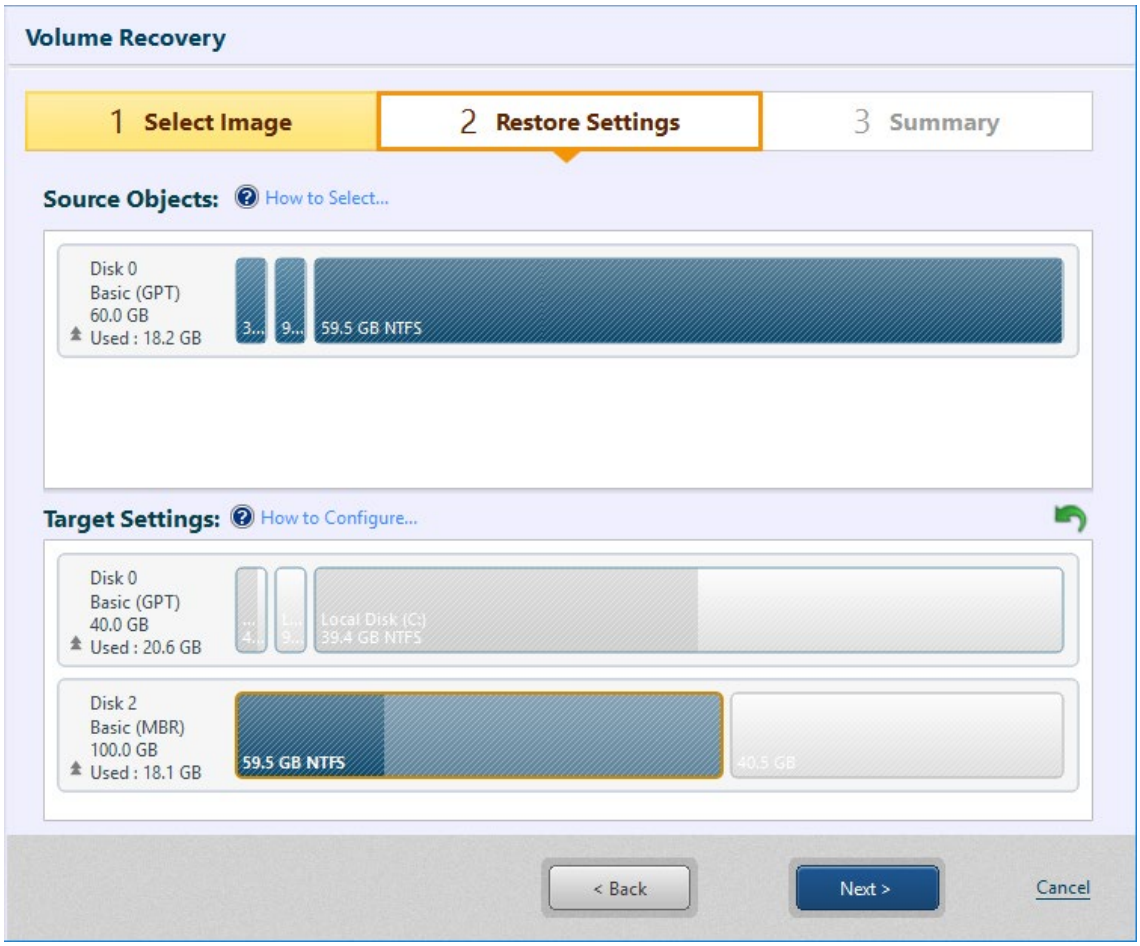
## Restore Feature

### Wizard-based Operation

Restore Backup Image Wizard is provided to guide you through the complete process of restoring a backup image file to hard disk. Since multiple volumes may be backed up in one image file, the entire hard disk can be restored with a single operation.



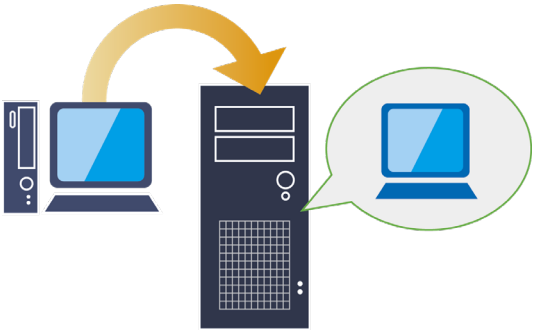

**Volume Recovery Wizard (Select Recovery Point)**



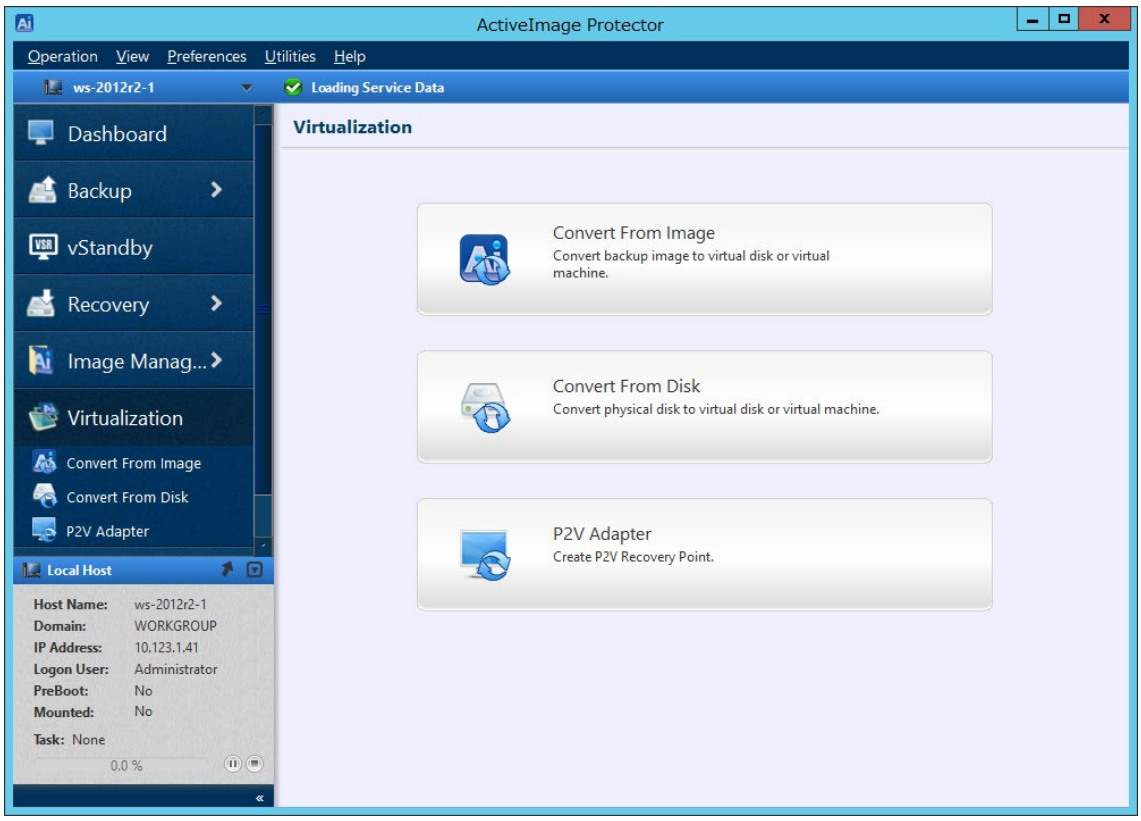

**Volume Recovery Wizard (Restore Settings)**

## P2V (Physical to Virtual) Conversion

ActiveImage Protector provides capabilities to virtualize the image of physical environment to virtual environment (VMware/Hyper-V). The system on legacy hardware may be migrated to virtual environment running on a latest hardware. In virtual environment, multiple operating systems may be installed on a single hardware to run simultaneously. As a result, server functions distributed over multiple server machines may be consolidated into a single hardware to simplify system resource management.



**Migrate physical server to virtual environment using P2V capabilities**



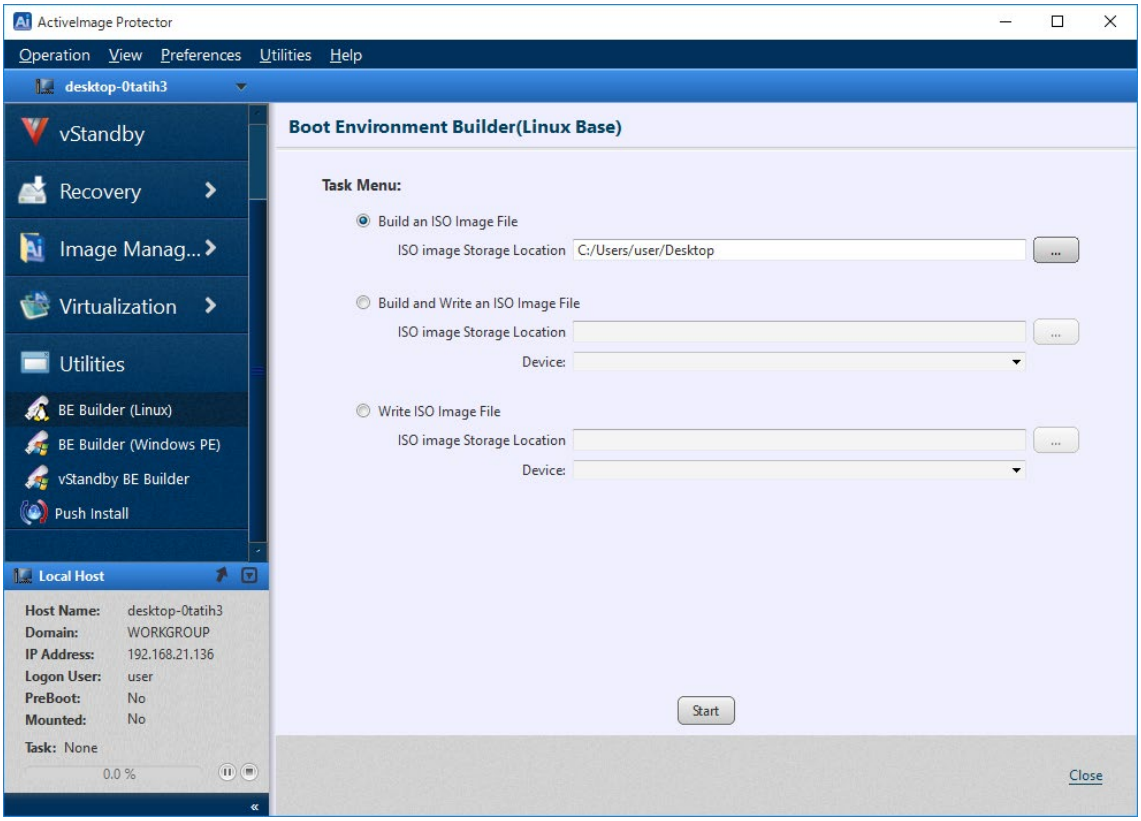

**Virtualization Wizard**

## A.I.R.

When you try to restore a backup image file to a new machine of different hardware architecture, on some occasions you may encounter the problems that a blue screen is displayed or that a device becomes disabled after booting up. To solve the problem, A.I.R. technology is built in ActiveImage Protector. If a backup image file is restored to a dissimilar machine, A.I.R. detects the difference of hardware when the system is booted for the first time and updates the backup image with the difference. Thus A.I.R. enables to restore a backup image of virtual machines to a physical machine, and migrate from physical to physical machine. In the event that the machine failed to boot up or you did not select A.I.R. option when configuring the restore settings, A.I.R. option may be enabled in boot environment.

## Bare Metal Recovery (Disaster Recovery) in Boot Environment (AIPBE)

Either bare metal recovery to a new hard disk or disaster recovery when OS does not boot up may be started in ActiveImage Protector Boot Environment (Windows PE or Linux environment), and the Restore Image wizard guides you through the complete process. The volume may be restored in the same size as the original or in expanded size. Also, MBR or physical disk signature, uEFI disk, GPT backed up in backup image file may be restored.



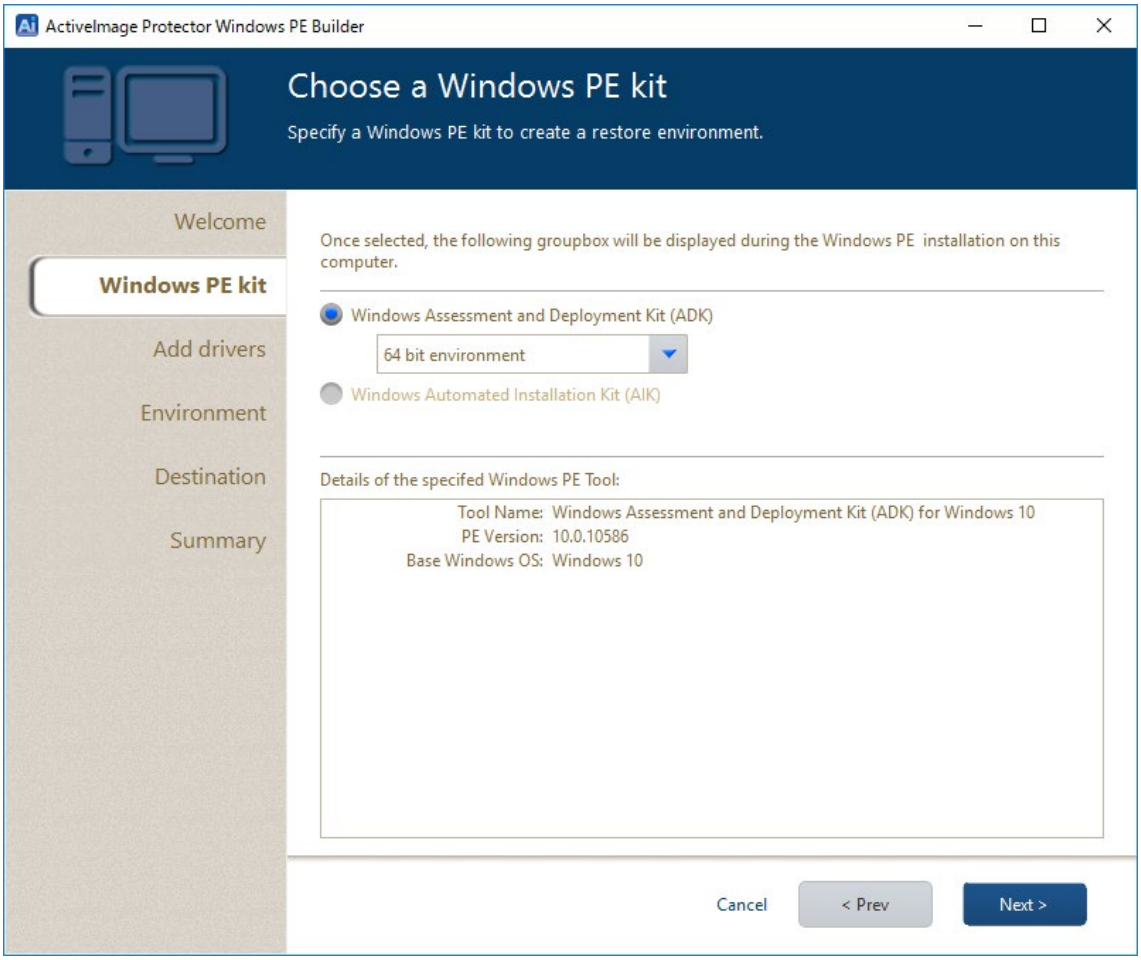

**Boot Environment Builder (Linux base)**

## Install Device Drivers in Boot Environment (Windows PE)

After booting up your machine into Windows PE-based boot environment, a device driver may be added to the boot environment. The drivers of storage devices or NIC are not included in the boot environment (Windows PE), however, a variety of devices are supported to add after the boot environment boots up.

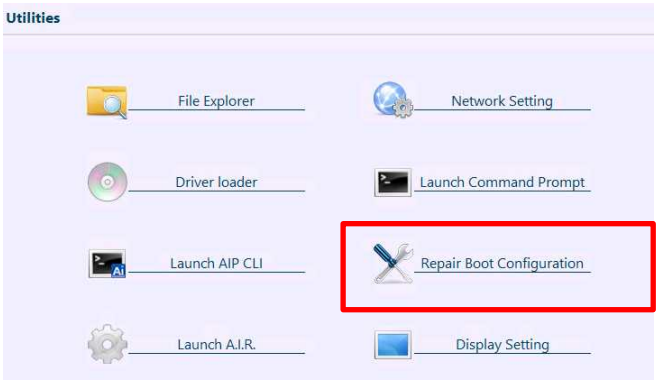
## Build and customize boot environment (Windows PE)

Windows PE-based Boot Environment Builder is provided to build the boot environment in ISO file or USB drive or optical media by selecting the Windows PE toolkit optimum to the operating system and the drivers to add.




## Repair BCD

Utilities include [Repair Boot Configuration] tool to restore MBR and create BCD in boot environment. In case you failed to back up boot partition or restored “C:” drive alone failed to boot up the system, you can restore BCD for the restored system to be bootable.



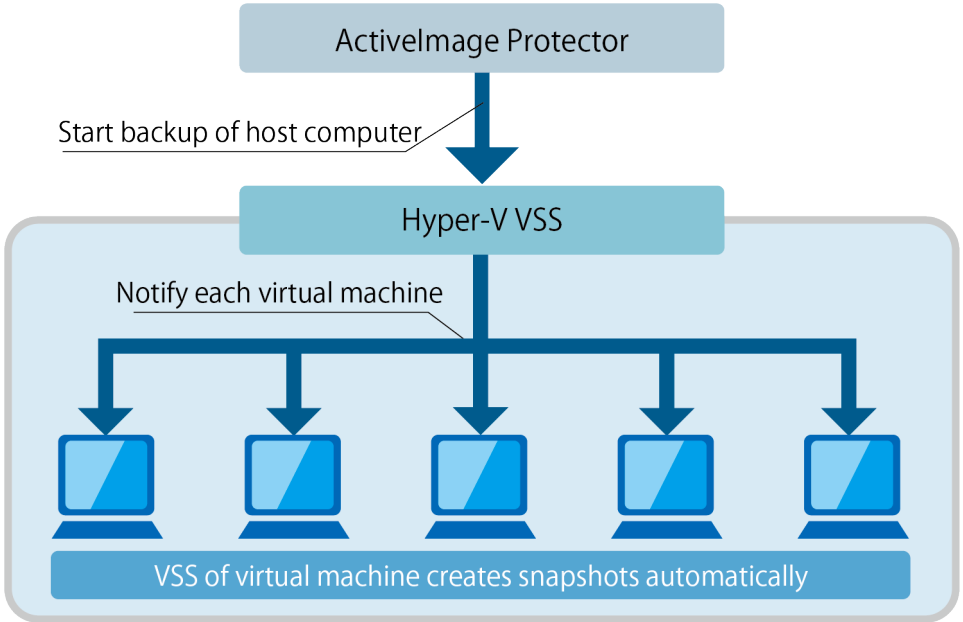

**Repair Boot Configuration tool in Utilities**

## 4. Enhanced Support of Virtual Environment

Backup of virtual environment may refer to a variety of backup patterns depending on the circumstances, such as backup of a single virtual machine, hypervisor based virtual computing systems as a whole, the entire storage in virtual environment, etc. ActiveImage Protector provides features meeting users' needs.

### Back up the entire Hyper-V host environment with running virtual machines (Hot Imaging)

With use of a traditional imaging backup solution, in Hyper-V environment, imaging backup of the entire host volume on which hypervisor is running may end up with an unexpected result. This is caused because the virtual machines are backed up in the state they were forcibly terminated instead of backing up the virtual machines in the current status. In certain cases, blue screen error may occur. In order to avoid those problems, backup must have been taken only after every virtual machine is shut down, which ruins the usability.
Since ActiveImage Protector supports VSS-aware Hyper-V host environment, it enables users to take snapshots and back up the entire host environment including running virtual machines and VSS-savvy applications running on the virtual machines. The individual virtual machines, when restored, can be restarted in the same condition as at the point of time they were backed up.



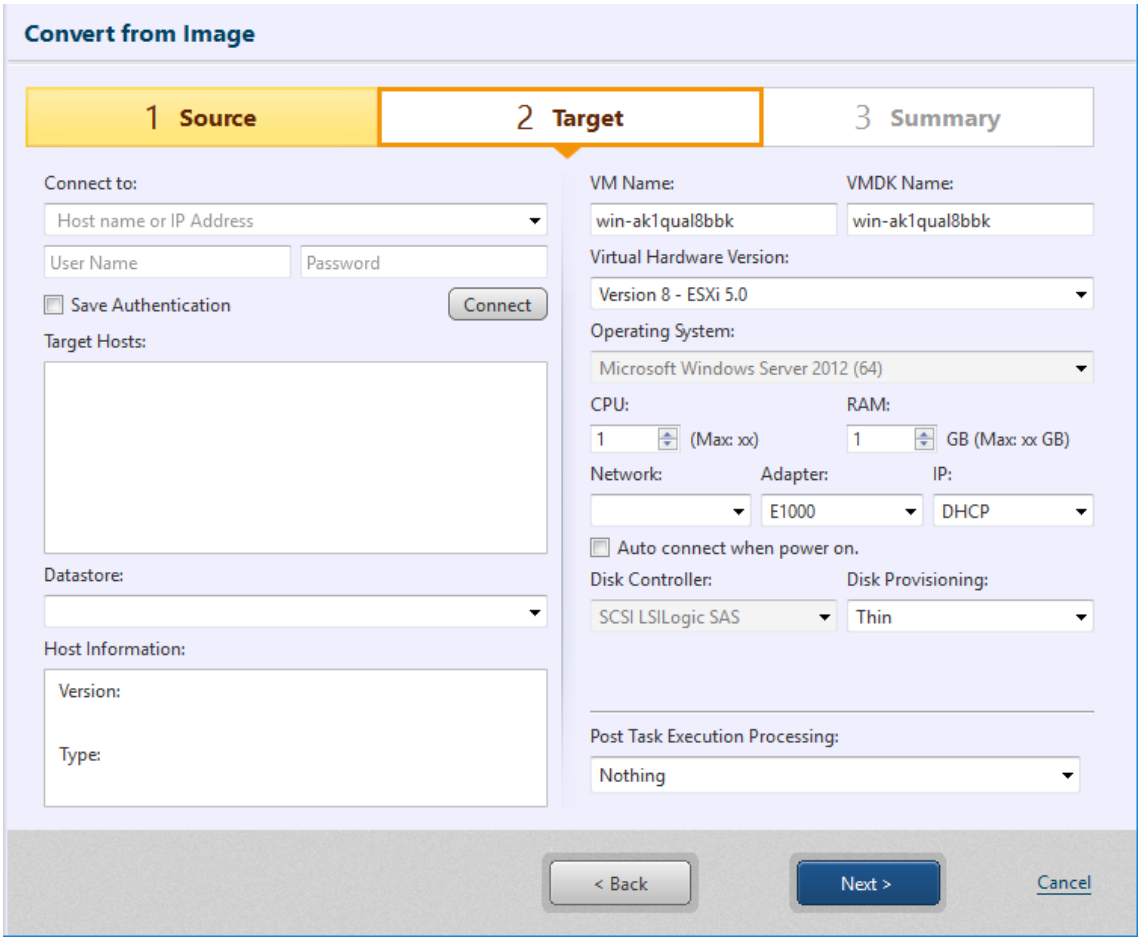

**Snapshot of virtual machines on Hyper-V host**

## Back up the respective virtual machines running on Hyper-V or vSphere (Hot Imaging)

Use of ActiveImage Protector installed on the respective virtual machines enables users to back up the respective virtual machines just in the same manner as to back up a physical machine. Since ActiveImage Protector supports hot imaging and VSS, it enables to back up running virtual machines together with VSS-aware server applications (ex. Microsoft SQL Server, Microsoft Exchange Server, etc.) while ensuring consistency.

## Virtual Conversion of Physical Disk

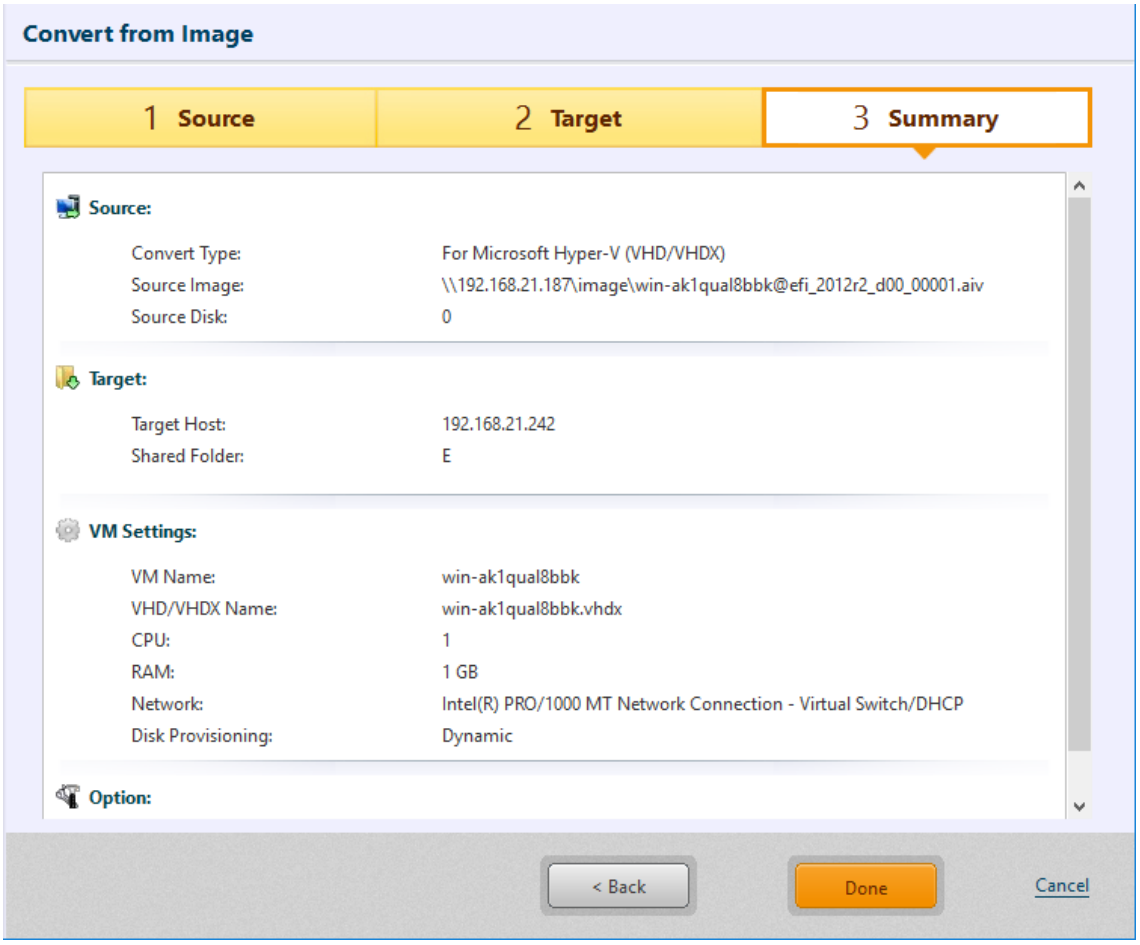
Virtualization feature facilitates virtual conversion from physical hard disk or a backup image file to a virtual disk. Attach the virtual disk to the virtual machine and boot up. ActiveImage Protector's virtualization process includes creation of a virtual machine and automatically attaches virtual disk to the virtual machine, so that the virtual machine can boot up immediately upon completion of conversion process. Virtualization feature supports VMWare Hypervisor (ESXi) and Hyper-V virtual environments.




**Convert from Image Wizard (Select Target)**

## Conversion of Image File

Conversion of Image File feature simplifies conversion of a created backup image file to a virtual disk file for virtual machine (VMware/Hyper-V). The advanced conversion feature includes creation of a virtual machine to automatically attach the virtual disk after conversion. Conversion from a physical machine to virtual machine (P2V) allows virtualization and backup of legacy OS / physical machine.




**Conversion of Image File**

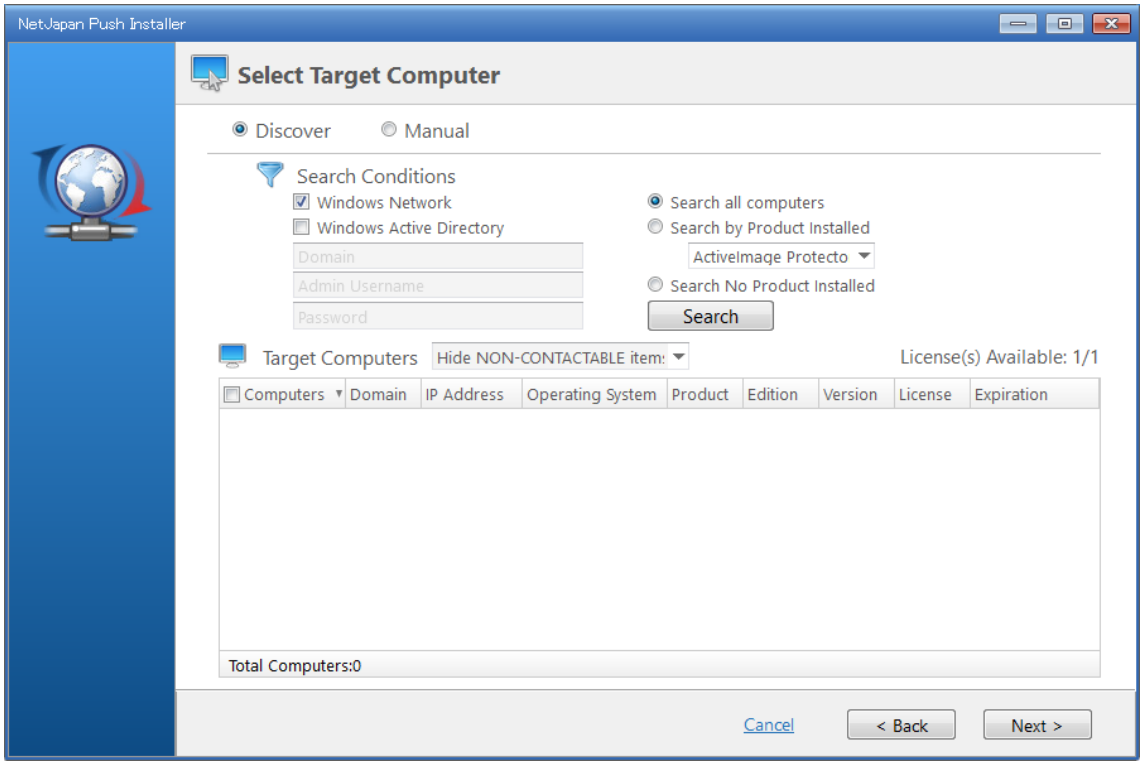
## Useful for deploying virtual environment (IT Pro Edition)

As ActiveImage Protector supports backup / 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 environment.

# 5. Other Features

## Push Installer

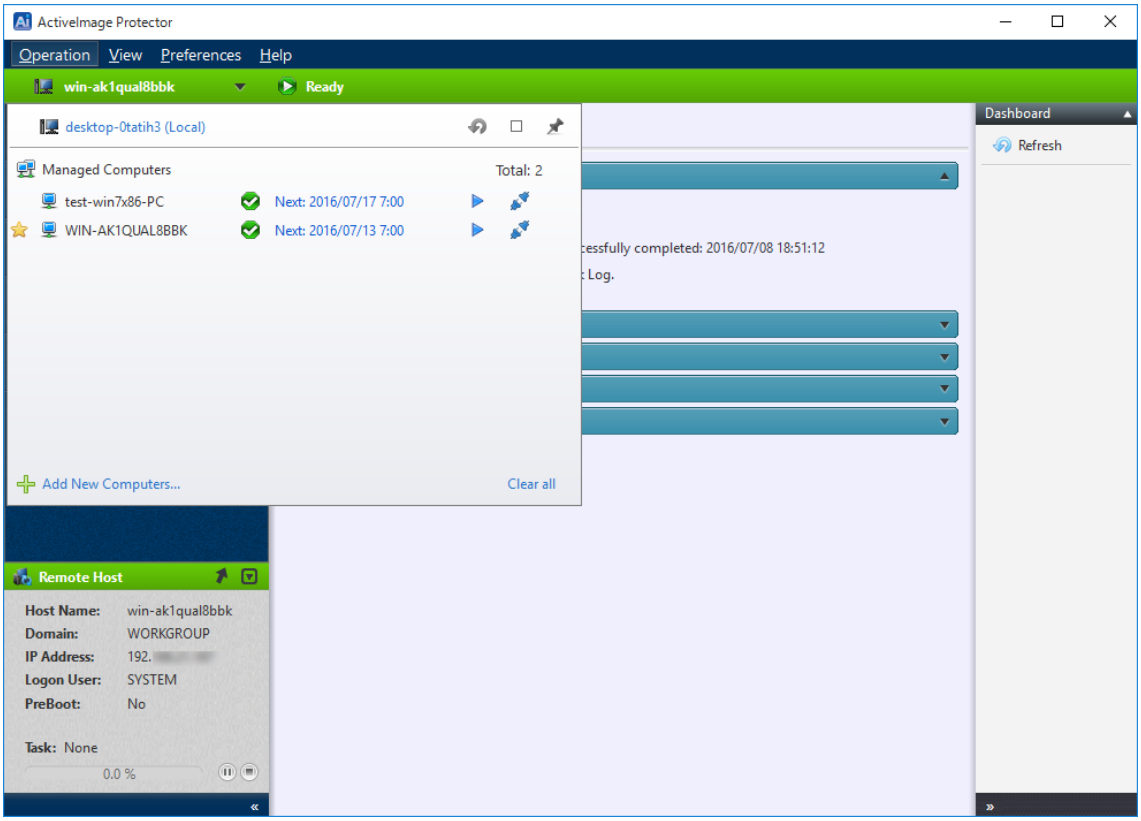
Push Installer feature is designed to push installation of ActiveImage Protector to the networked hosts. Push Installer feature searches for and communicates with computers over Windows network or by using Active Directory. A remote computer may be specified by entering IP address.




**Push Installer (Select Target Computer)**

## Manage Remote Agent

You can monitor remote agent and manage execution of backup tasks. Network Client Management Console provides the capabilities to remotely monitor the backup task status and execute the schedule backup task on remote managed computers. You can remotely use every feature in this menu by communicating with a remote agent and making transition to full control window.




**Manage Remote Agent**

## USB HDD Friendly Backup

While you specify a USB hard disk as the destination for scheduled backup, the USB device may be removed for some reason. A scheduled backup is skipped as the USB hard disk is removed. The next schedule runs the skipped backup task after the USB hard disk is re-connected. The use of USB HDD Friendly Backup feature runs the skipped backup task as soon as the USB hard disk is connected

## Mounting Image File

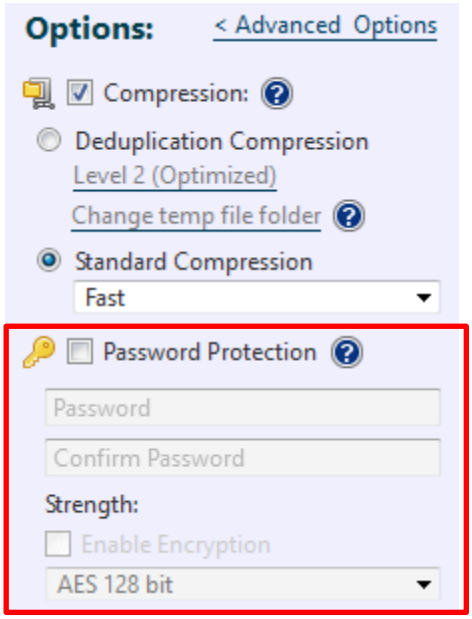
The created image file may be mounted to a drive on Windows. Files in a base or incremental image file may be selected to retrieve a specific folder/file. The changes made to the image file are saved in a differential image file after the volume is unmounted.

## Compression Feature

Backup image files may be compressed to store.

## Security

ActiveImage Protector has security features such as password protected access to the image files, encryption and password-shield of the entire image files (standard AES). AES option comes with two standard key sizes (128 and 256 bits).




## Split Image File

When copying a created image file to another location, the file may be split into small files and transferred to the destination in order to enhance error tolerance and to lower bandwidth occupancy.

# 6. Add-on Tool

## What is Add-on Tool?

Add-on tools for ActiveImage Protector are offered to provide enhanced and higher value-added functionality. NetJapan strives to continuously develop the backup technologies and image management tools, seeking for the product's quality enhancement and improved consistency.

## ImageCenter LE

ImageCenter LE is a stand-alone image management tool dedicated to post backup task processing such as consolidation and replication of ActiveImage Protector backup image files. ActiveImage Protector is built with an image management feature that runs on backup source machine, concentrating the load on the same system. ImageCenter LE, a stand-alone image management tool, can offload the consolidation and replication tasks to dedicated systems. ImageCenter LE provides schedule feature for recurring execution of replication and consolidation tasks separately from scheduled backup task execution.

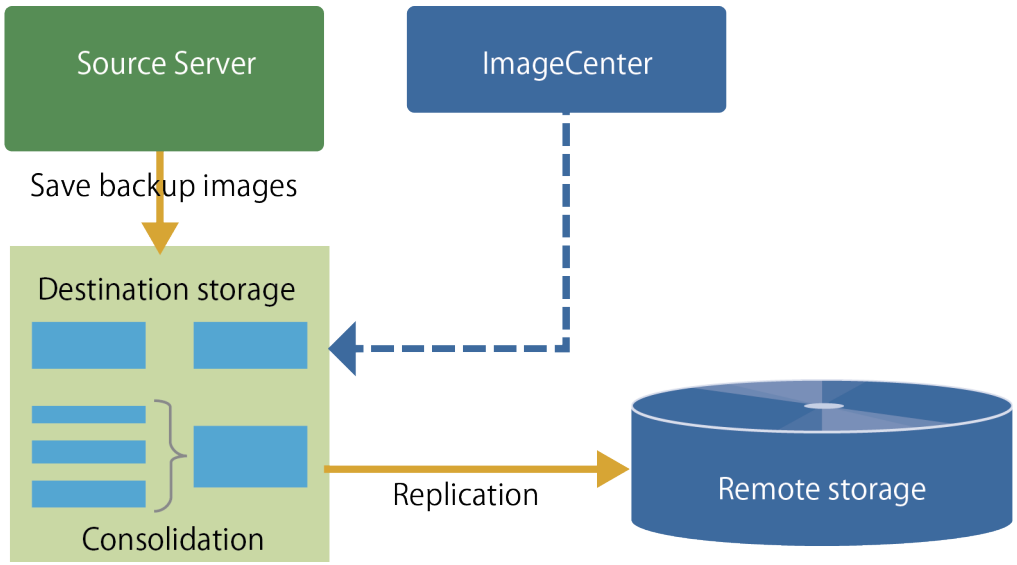
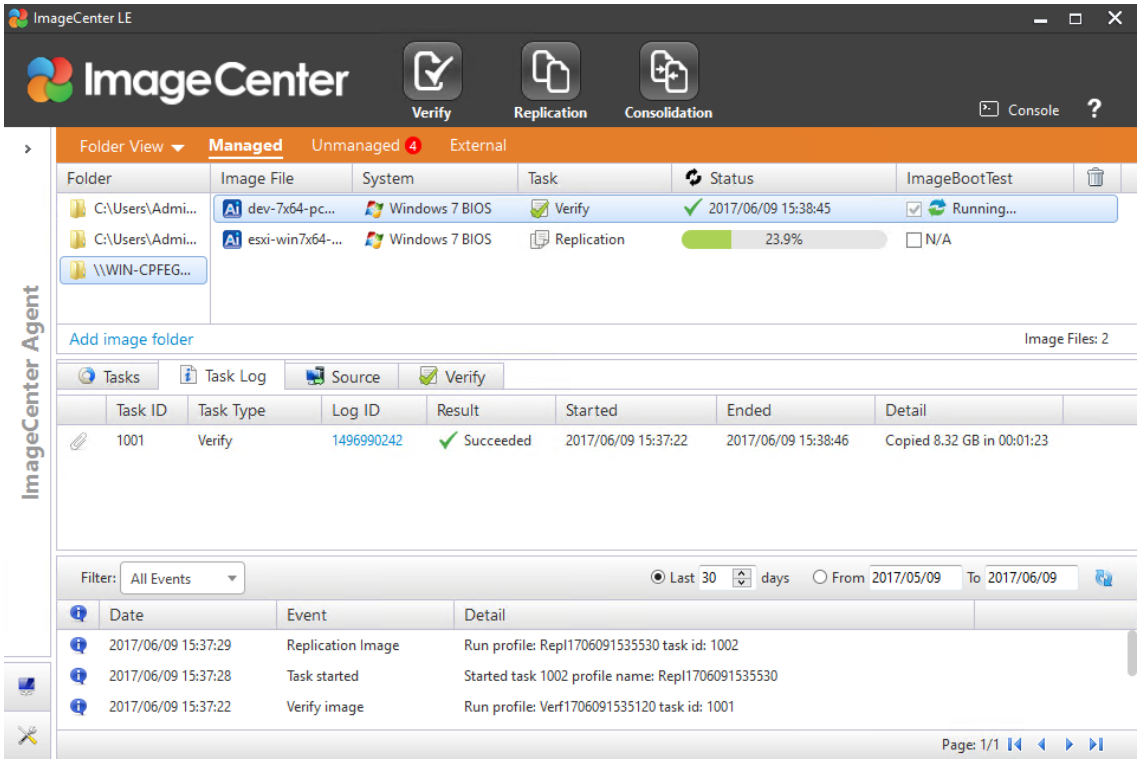


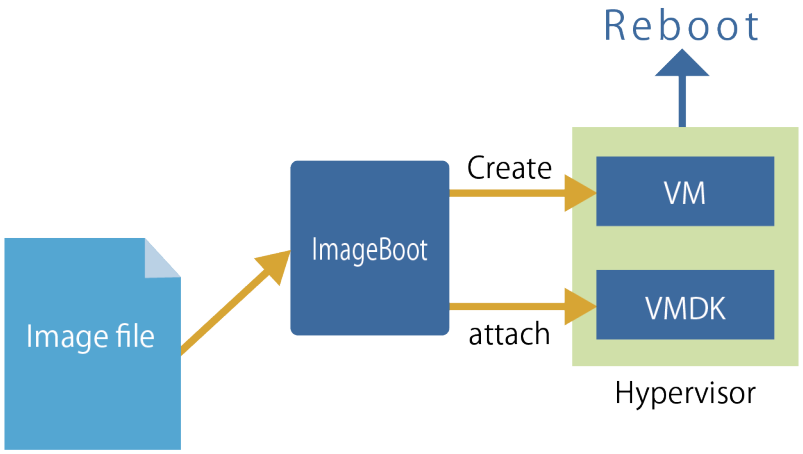

**Image Management Tool - ImageCenter LE**




**ImageCenter LE Console**

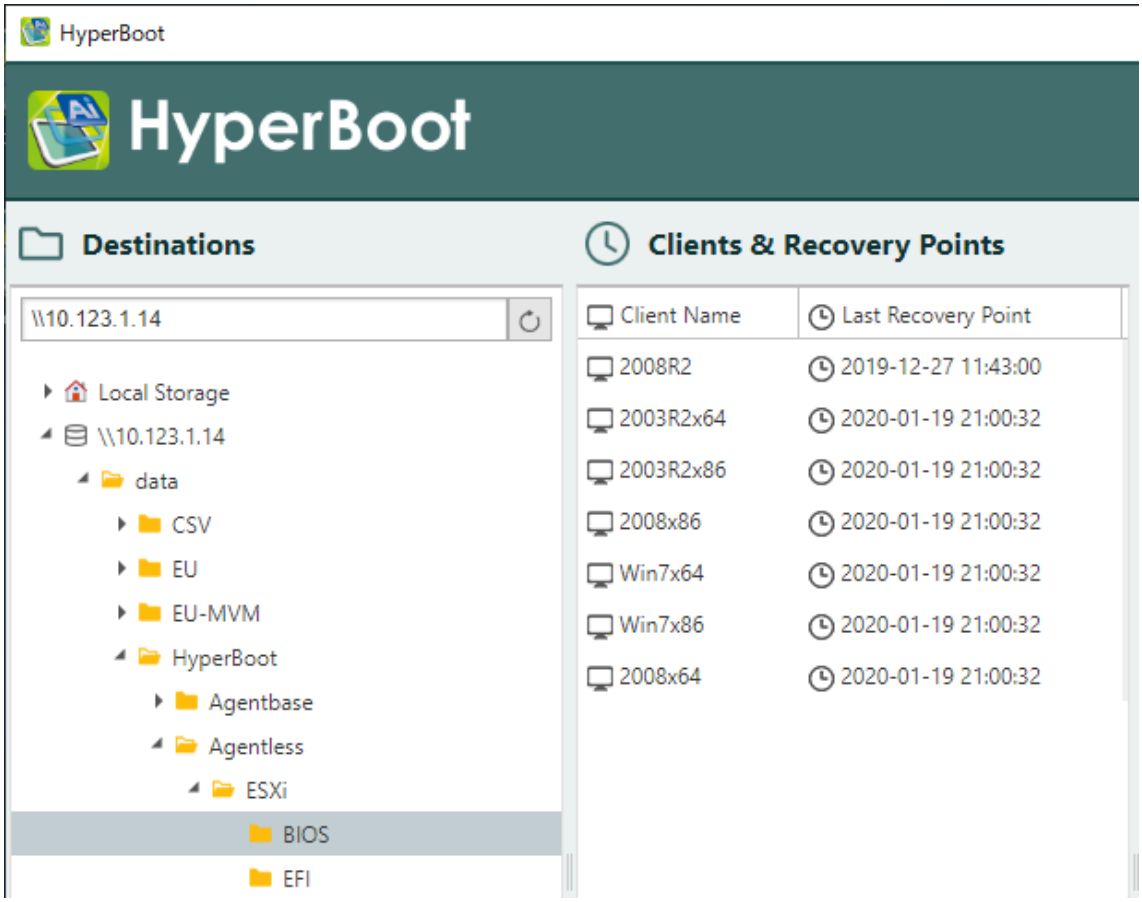
## HyperBoot (Instantaneously boot a backup image as a virtual machine)

HyperBoot immediately starts a virtual machine from any ActiveImage Protector backup image file. HyperBoot bypasses lengthy physical to virtual conversion and restore process by attaching a virtual disk to VMware Workstation, or Microsoft Hyper-V, Oracle VirtualBox virtual machine that can immediately boot.




HyperBoot **- Instantaneously boot a backup image**

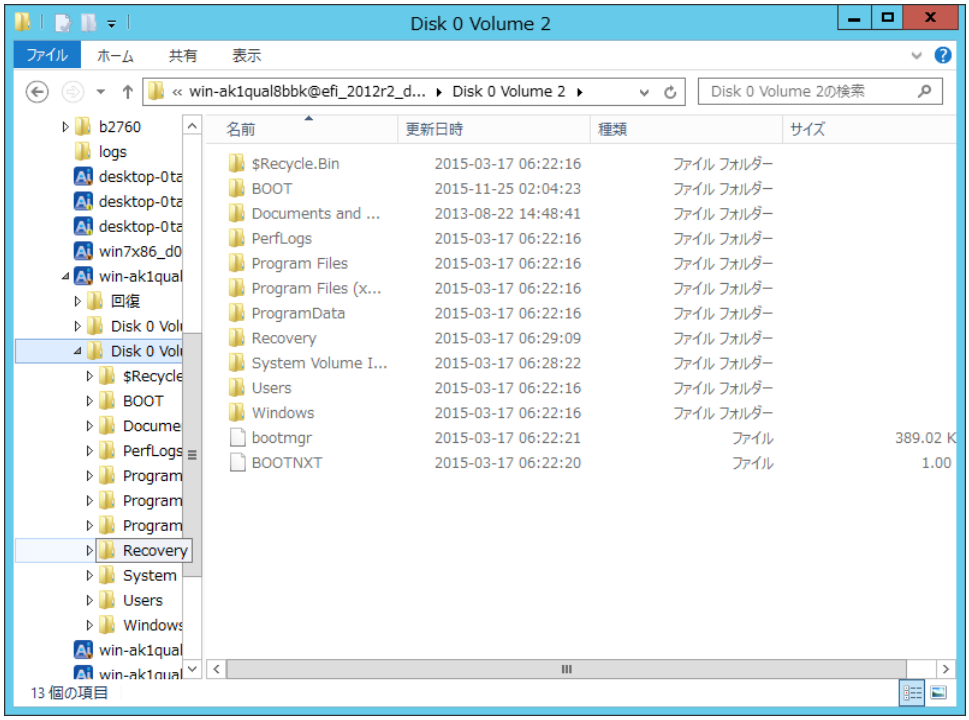
HyperBoot provides confidence that your backup images are bootable, bypassing restore process. It takes about two minutes on PC (depending on the machine performance) from booting HyperBoot to displaying a prompt message to log in operating system. The use of HyperBoot enables to check if the backup image file is bootable, eliminating the need for lengthy restore process. Besides, when you need to temporarily use the legacy machine you previously used, HyperBoot allows you to boot the backup image of the previous machine on the new machine, without the need for resource intensive and cumbersome physical to virtual conversion process. HyperBoot also provides a temporary replacement server of a crashed machine,




HyperBoot **- Select Recovery Point**

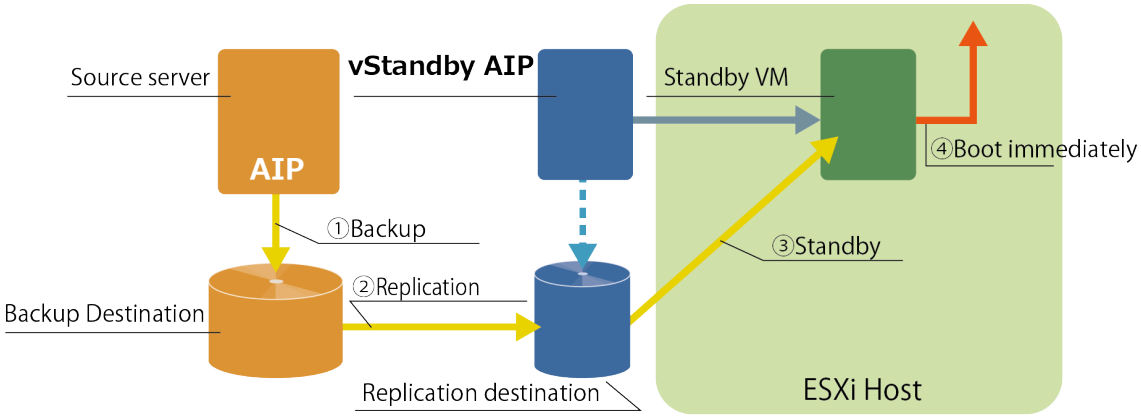
### Image Explorer

Installed as a Windows Explorer extension, Image Explorer allows you to open image files. In the absence of Image Explorer, you have to mount an image file to a drive in order to browse or copy a specific file or folder in the image file. ActiveImage Protector's Image Explorer, just in the same manner as you work with a ZIP file, enables you to open an image file and copy a specific file.



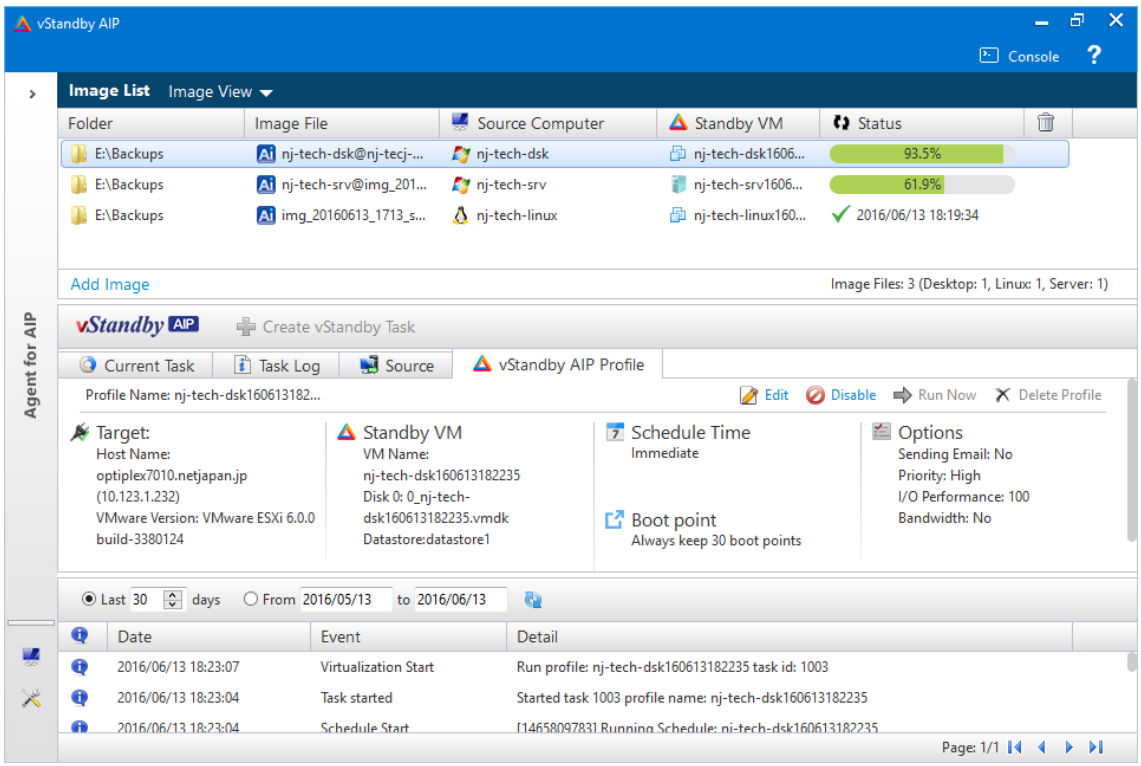

## vStandby AIP (non-free)

vStandby AIP creates and maintains dormant virtual replicas of your physical and virtual machines from the backup images. These standby virtual replicas are created directly on a VMware ESXi or Microsoft Hyper-V host. vStandby AIP is not just a virtualization tool. The virtual replicas are created and kept up-to-date using scheduled incremental snapshots. A virtual standby replica can be instantly started when switchover becomes necessary. vStandby AIP seamlessly creates virtual standby replicas while concurrently backing up physical machines.




①Save backup image files by using ActiveImage Protector
②Offsite replication by using ImageCenter
③Disk of vStandby VM is updated at any time from replication data by using Standby AIP
④Standby VM is always ready to boot

**How vStandby AIP works?**




**vStandby AIP Console**

# 7. Guide to Basic Features

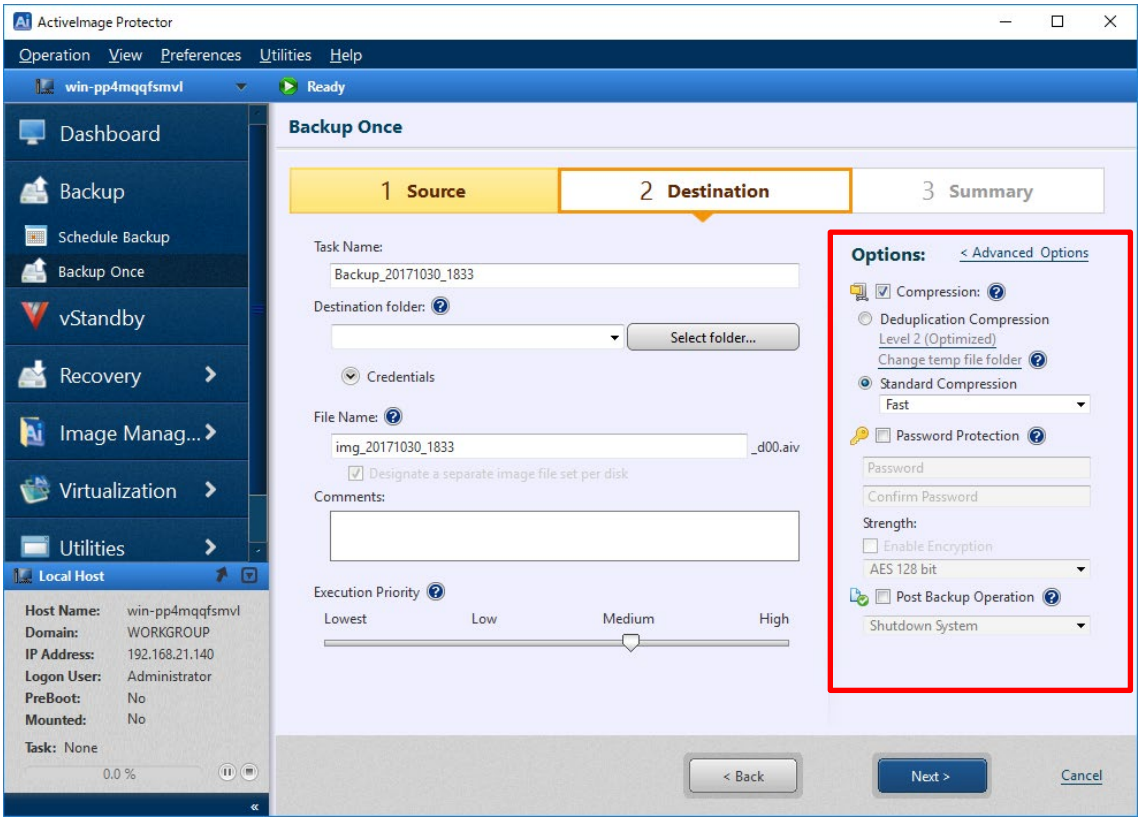
## Inline Deduplication Compression

“Deduplication Compression” means to exclude duplications in data blocks from backup source volume and compress the backup image file. Then, what does “duplicated data blocks” mean? How the “duplicated data blocks” are excluded? Duplicate File Elimination feature may present more simple example (note: ActiveImage Protector does not use this technology). When two files with the same name are detected, after comparison of the data blocks in the files as well as the file name, one file is saved and the other is deleted. Windows, depending on the version, has built-in Disk Cleanup or Performance-up utilities as standard. This technology is designed only to delete duplicated files according to the user’s judgment. If the user deletes an important file by mistake, it requires an unexpectedly long time and tedious effort to restore the deleted file.

Next, Deduplicate feature built in backup software is designed to detect duplicate files during the backup process and replaced with file link. The file link is automatically restored back to duplicate files. More enhanced deduplication technology is designed that the data blocks in the files are compared, and duplicate data blocks, if detected, are indexed with “Finger Print (FP)”. Thus, the data blocks indexed with “FP” and identified as duplicated are eliminated from backup source. The same process may be performed with a storage with inline deduplication feature, which means that the files, while saving in storage, are compared with the files already existing in the storage and detect the files including the data indexed with “FP” to deduplicate.

Another one is storage, media server based deduplication technology that compares the backup file and existing file as post-backup process. With this technology, used space can be reduced as a result, however, deduplication time takes long and extra space for backed-up file (for comparison with the existing files) are temporarily required. Storage media with inline deduplication feature provides hardware-level fast deduplication without a temporary storage needs but is quite expensive.

ActiveImage Protector’s Inline Deduplicaiton Compression feature eliminates duplications in data blocks in the backup source volume or disk during backup process and compress the created backup image file. As a result, the use of this feature enables to substantially improve storage usability.



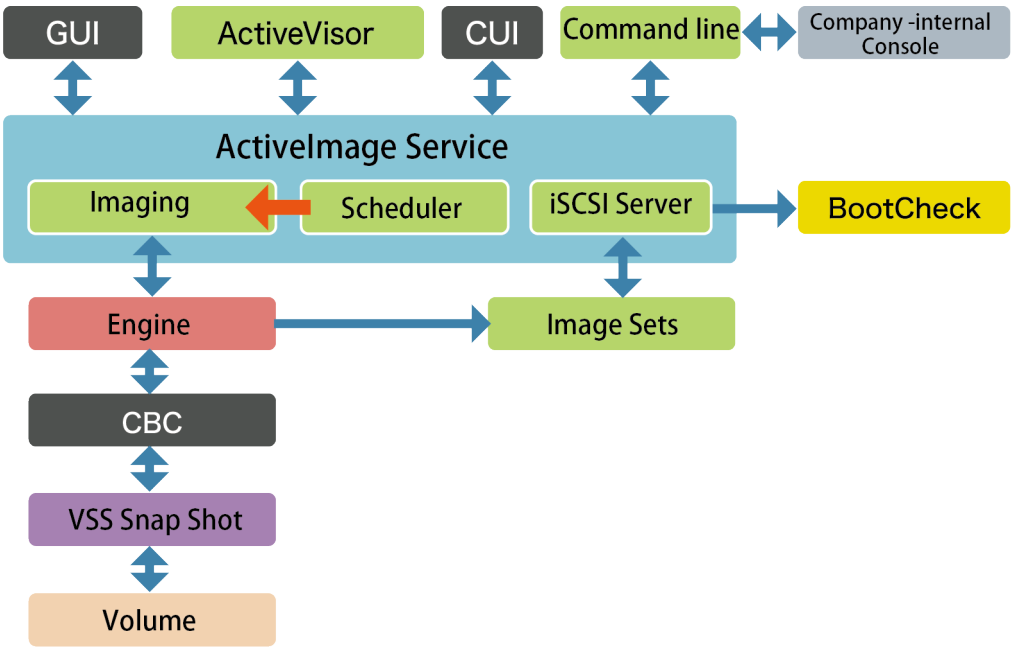

**Deduplication Compression setting - Backup Wizard**

## Boot image feature (ImageBoot technology)

ImageBoot technology is used to provide HyperBoot add-on tool and BootCheck™ post backup process feature. Mount feature, built in ImageBoot technology, is designed to mount an image file as SCSI disk instead of mounting an image file to a drive or a folder. Since the image file, when mounted, is recognized as a physical disk on PC, the image file attached as Raw disk from virtualization software may be directly booted as virtual machine, bypassing restore process.

## 8. Architecture

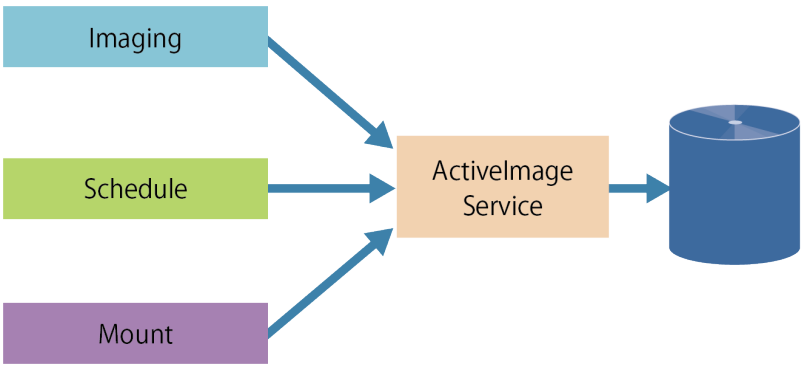
ActiveImage Protector is composed of the snapshot driver (Microsoft VSS), imaging service, mount service, scheduling service, GUI and CLI.




**Basic Architecture of ActiveImage Protector**

### ActiveImage Protector Service

ActiveImage Protector's functions are received as the requests to the services to run. ActiveImage Protector provides the backup engine, scheduling, mount and snapshot as the services.



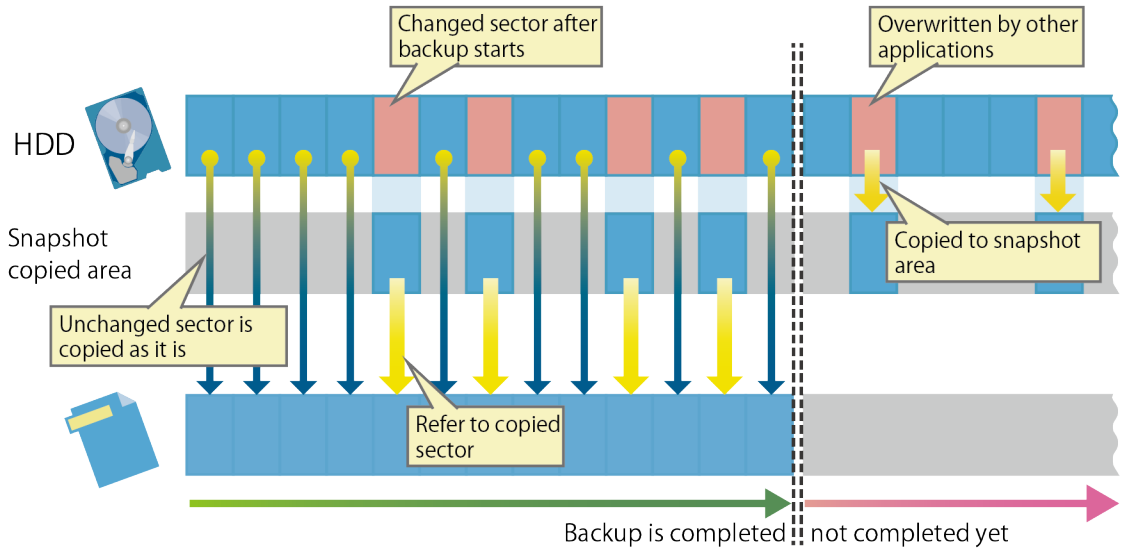

**I/O Access via ActiveImage Service**

Running ActiveImage Service enables to access from GUI, CLI, UI-less agent.

## Snapshot

For example, suppose that the backup file is in use, the file in the process of overwriting is backed up. Especially if backing up the system related files, you never know which file and which blocks are accessed while Windows OS is up and running. In other words, when backing up the entire disk including the system volume, the files are overwritten and backed up, thereby data integrity in the files are not secured.

To solve these problems, snapshot technology was developed to back up the entire volume ensuring the data integrity at the point in time the backup is taken. The use of snapshot technology enable to back up the backup source disk exactly at the point in time of backup, even if changes are made to the disk after snapshot is taken. In the meantime, the use of snapshot technology presented the problems in relation to the confliction among multiple third-party drivers, compatibility with the application, which caused system crash.

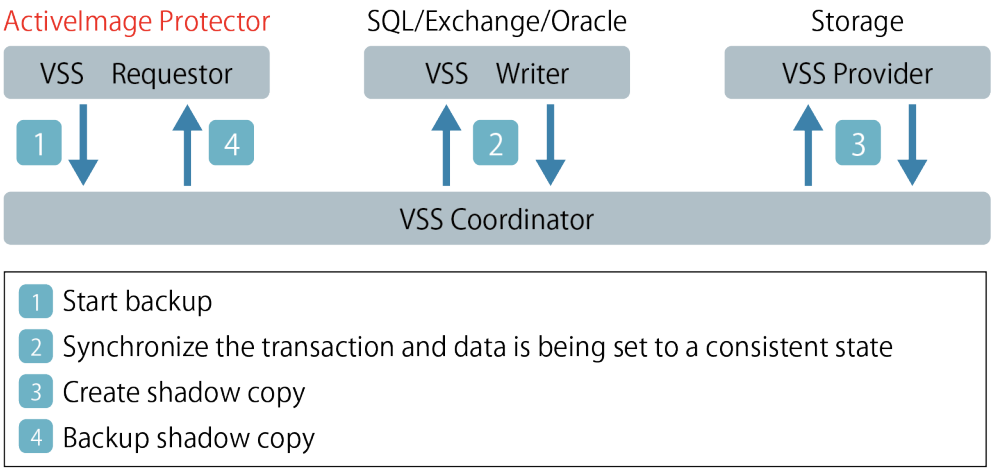



**Imaging Backup using Snapshot Technology**

Windows XP and later versions of the Windows operating system include snapshot driver (VSS). As it's provided as one of the OS features, VSS-savvy applications and device drivers must not conflict with each other. ActiveImage Protector is built with the proprietary snapshot driver using VSS and provides safe and clean hot imaging. The major benefit of the proprietary snapshot driver is that the risk involved in low-level driver installation to server OS can be minimized.

## VSS-savvy Applications

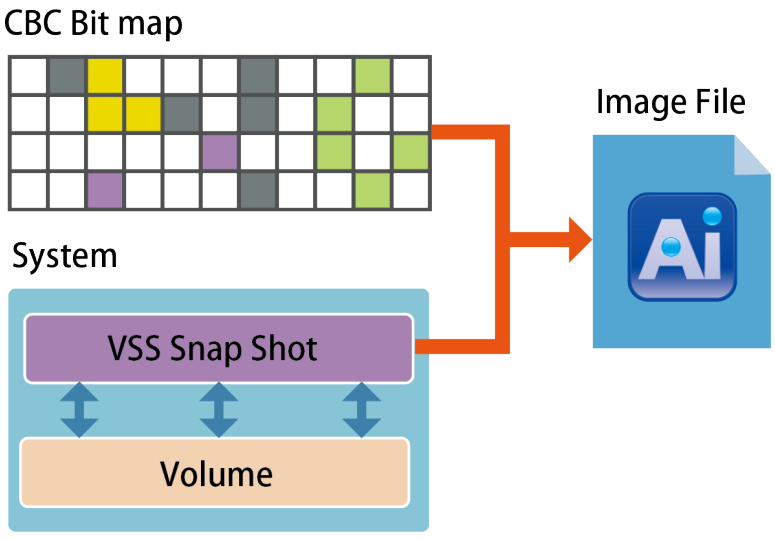
ActiveImage Protector, as VSS-requester, behaves consistent and cooperative with VSS-savvy applications and supports backup of the server on which Exchange Server, SQL Server or Oracle Server is up running, ensuring data consistency.




**Behaving as VSS requester, support for VSS-savvy applications**

## Changed Block Comparison

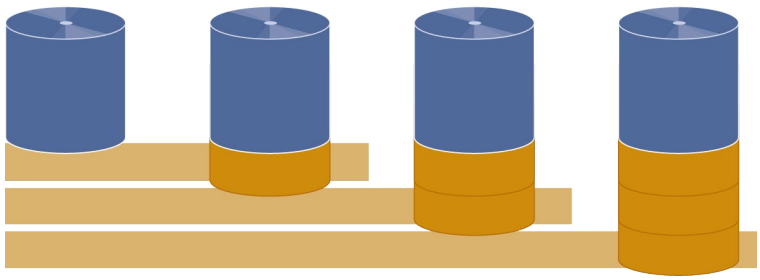
CBC analyzes a volume, a volume's file system, existing backup image file to identify blocks changed that need backing up. In comparison with the previously created backup, the changed blocks are saved in an incremental backup file. In contrast to write I/O trapping to a volume, CBC compares the static data, therefore, continuity of an incremental chain can be resumed should an incremental backup task be disabled.




**How Changed Block Comparison™(CBC) works**

### Incremental/Recurring Incremental Backup

Incremental backup includes only blocks that have changed from the last backup, saving both process time and storage space. After creating a base backup file for one time, you can schedule recurring incremental backup tasks. As recurring incremental backups create a growing and sometimes unmanageable number of incremental files and an incremental file may become compromised, you are recommended to regularly consolidate the created incremental files.



**Back up only changed blocks from the last backup**

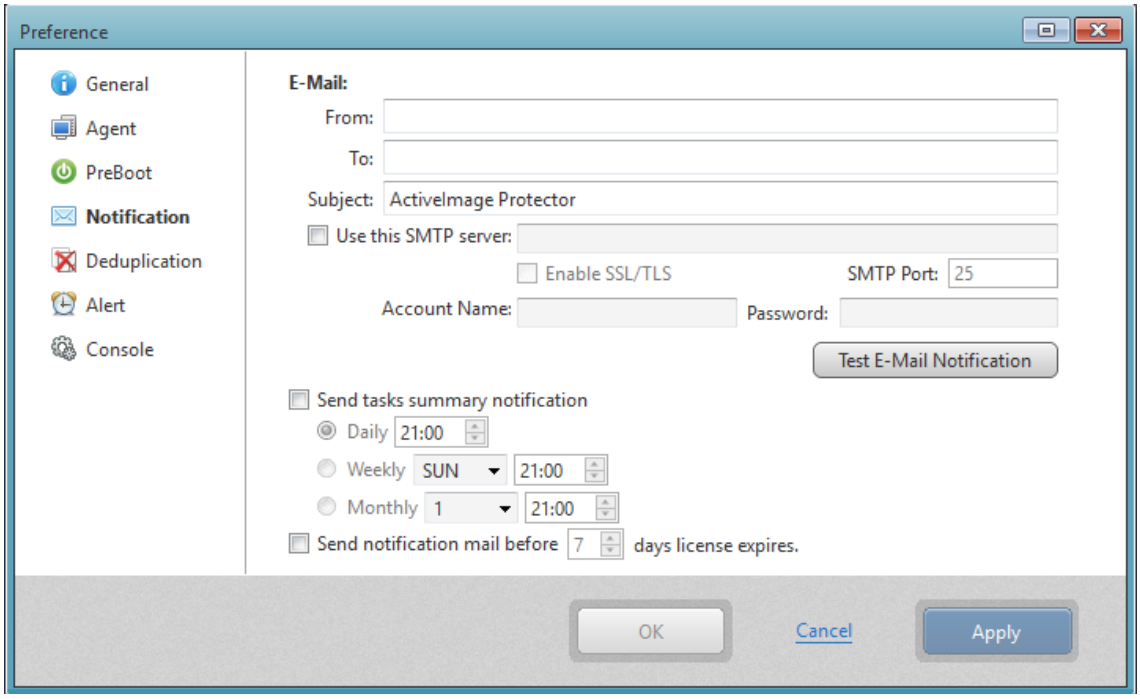
### Windows PE-based Boot Environment

Disaster recovery or bare metal recovery requires to boot into OS from USB or CD/DVD media instead of the hard disk since you cannot start ActiveImage Protector's Restore program on the failed or non-existent OS on the system volume. ActiveImage Protector offers Windows PE-based boot environment that provides Windows-like operation and connectivity.

The use of the ActiveImage Protector Boot Environment (Windows PE) is strictly limited to the licensed user. In view of the emergency case that you failed to prepare recovery environment, ActiveImage Protector includes Linux-based boot environment that can immediately boot up to use.

### E-Mail Notification supports mail server using SSL/TLS

ActiveImage Protector includes E-Mail Notification feature informing of a completed backup task or error occurrence. E-Mail Notification feature supports mail server using SSL/TLS connection as well as SMTP. Notification of abnormal end of AIP agent is also supported. E-Mail Notification provides the options to inform of task summary and notify the license status according to the predefined threshold for the remaining days of valid license.

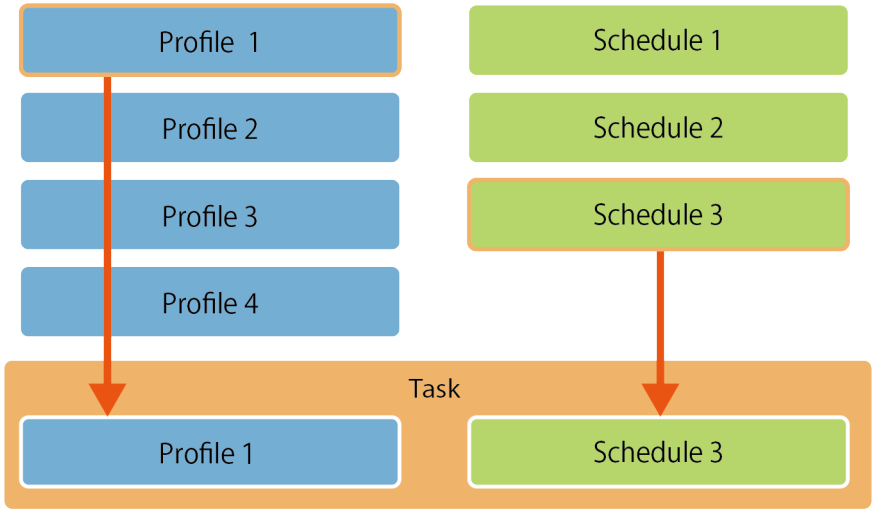



**E-Mail Notification**

## Profile and Schedule

With ActiveImage Protector, a backup task is configured with a profile that defines backup settings combined with a schedule that defines the timing of backup task execution.

The profile includes backup settings information described in text format and can be reused for other backup setting or command-line operation, which streamlines time consuming backup routines.




**Combine Profile and Schedule to configure the task setting**

## Command Line Interface

ActiveImage Protector provides command line interface for both Windows and Linux. By specifying parameters in command line tool, you can execute the command for backup task. Since the command line tool may be integrated in an installed management tool, it allows flexible use in enterprise computing.

The use of command line interface enables you to utilize the control structure of other tools, command file, shell script. For example, Consolidation task can be configured to execute by identifying the backup files' time stamp and transfer the consolidated file to an external storage. Another example is the use of command line interface built in the management console to run the built-in command for ActiveImage Protector's Backup feature.

For inquiry about ActiveImage Protector：

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