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Macrium Reflect 7

These pages introduce you to Macrium Reflect, its capabilities and methods.

The first thing you should do is create rescue media. See The Macrium Rescue Environment.

With your rescue media in-hand, we recommend that you follow through some basic tutorials to learn the system and to gain some immediate security by backing up your Systems. We have a range of tutorials and videos covering many aspects of using Macrium Reflect.

To get you started the following are some useful tutorials and articles:

- Introduction to Macrium Reflect
- Backup, imaging and cloning
- Restoring and browsing
- Scheduling and Retention rules
- The Macrium Rescue Environment
- Macrium Image Guardian
- Macrium Changed Block Tracker
- Macrium viBoot
- Re-deploying to new hardware
- Macrium Reflect Server Plus for Exchange and SQL
- Command line operations with Macrium Reflect
- Generating scripts and batch files
- Backup Folder Synchronization
- Macrium Reflect Default settings
- PXE Deployment
- Standalone backup set consolidation
- Converting a Physical machine to Virtual Machine
- Automatic System Restore
- Logging file changes for Incremental and Differential Images
- Backup to the cloud with Azure File Shares
- How to add an auto restore xml file to the rescue media

Introduction to Macrium Reflect

Using Macrium Reflect you can backup whole partitions or individual files and folders into a single compressed, mountable archive file. You can use this archive to restore exact images of the partitions on a hard disk so that you can easily upgrade your hard disk or recover your system if it breaks. You can also mount images as a virtual drive in Windows Explorer to easily recover Files and Folders using Copy and Paste.

③ Summary

If you consider yourself non-technical this article should help you to start understanding the terminology, workings and concepts of imaging, backup and Macrium Reflect.

Inside a PC, the operating system, applications and all your files need to be kept somewhere when the power is off. This permanent storage is usually a hard disk drive containing a spinning magnetic platter. The information on the platter is recorded and read by read-heads. So that the read-heads can store and find recorded data, the disk is split into blocks, usually of 512 bytes, which are numbered from the start to the end of the platter.

So that the operating system can use different file systems or provide multiple volumes (like the C: drive, D: drive and recovery area), it partitions these blocks into volumes (sometimes also called partitions). These volumes and their file systems are the first thing you'll see when you start Macrium Reflect.



🔊 Macrium Reflect - Server Plus Edition [UEFI] – 🗖 🔀						- 🗆 🗙			
<u>File View Backup Restore Other Tasks</u>	<u>H</u> elp								
Backup Restore Log									
Backup Tasks	Create a	a Backup Backup Defin	ition	Files VBScript Files Pow	erShell Files MS-DOS Ba	tch Files Scheduled Ba	ckups		
Image selected disks on this computer.	Ů <u>Re</u>	fresh							
Create an image of the	R	GPT Disk 1 [4DE35055-08E	B-46C3	-8D02-E71FEB27680D] - Msft	Virtual Disk 1.0 <40.00	GB>			
partition(s) required to backup and restore Windows. Create a File and Folder backup.		1 - Recovery (None) NTFS Primary		2 - NO NAME (None) FAT32 (LBA) Primary	3 - (None) Unformatted Primary	4 - (C:) NTFS Primary		5 - (None) NTFS Primary	
~									
▷ Other Tasks		15.0 MB	•	25.5 MB	128.0 MB	16.82 GB		253.7 MB	
Exchange Tasks		300.0 MB	•	99.0 MB	128.0 MB	39.04 GB		450.0 MB	
Backup Microsoft Exchange		Actions 🗸							
 SQL Server Tasks 		Clone this disk		🥵 Image this disk					
Backup SQL Databases									
Continuous Backup									
Manage SQL Logins									
Details									
Recovery {62EA5380-70C2-4998-9A58-1095A									
File System: NTFS									
Free Space: 285.0 MB									
Total Size: 300.0 MB 🗸									

Macrium Reflect showing the backup task pane

More recently, magnetic disk drives have been replaced or augmented by other technologies like Solid-State Drives (SSD). These devices have slightly different restore requirements which Macrium Reflect handles seamlessly using features like SSD Trim support.

Rescue media and Windows PE

If you lose your Windows operating system, you can start your PC using Macrium Reflect rescue media on CD, DVD, or USB stick. This makes creating rescue media the first thing you need to do with Macrium Reflect. It contains a bootable, lightweight version of Windows and a full version of Macrium Reflect.

This lightweight version of Windows is called the Windows Recovery Environment (also known as Windows RE or WinRE) and is supplied with Windows 7 and later operating systems. For Windows XP, Vista and systems without WinRE, Reflect will download the Windows Pre-installation Environment (also known as Windows PE or WinPE) directly from Microsoft.

Disk imaging

Macrium Reflect creates an accurate and reliable Image of a hard disk or the partitions on the disk. In the event of a partial or complete system loss, you can use this image to restore the entire disk, one or more partitions, or even individual files and folders.

During the imaging process, Macrium Reflect copies the contents of entire volumes including a reference to their physical location on the storage device to an image file (.mrimg). You would normally store the image file on local or network drives, or removable drives connected using USB or eSATA.

We strongly recommend that you create an image of your system at regular intervals.

You can read more about how to use Macrium Reflect to image your PC in our KnowledgeBase article Creating a backup image of your computer, drive or partitions.

Macrium Reflect can help you create regular images by scheduling them for you. It can even tidy up after itself - see Scheduling retention and disk space.

Differential and incremental images

Macrium Reflect can create **Full**, **Differential**, and **Incremental** images to optimize backup speed and disk space requirements.

When you image a volume for the first time it is referred to as a **Full** image. A **Full** image file contains all of the data stored in the volume. Macrium Reflect provides two alternative methods of backing up your data after the initial full image has been completed:

- 1. A **Differential** image that backs up all the data that has changed on the volumes since the last Full image was taken.
- 2. An **Incremental** image that backs up all the data that has changed on the volumes since the *last* image was taken whether that is a **Full**, an **Incremental** or a **Differential** image.

These methods significantly reduce the amount of disk space and time required to create image files and make it possible to restore your system from intermediate points within the backup chain.

Note:In order to restore a differential image, you must have the original full and the differential image you wish to restore. To restore an incremental image, you must have the original full and all subsequent incremental images in the backup set.

If you want to learn how to create differential or incremental backups using Macrium Reflect, please see Differential and incremental disk images.

To learn more about backup sets, please see Backup, imaging and cloning.

File and folder backups

To create a **File and Folder** backup, select the files and folders you want to backup, apply File and Folder filtering criteria to include and exclude files and/or folders, and Macrium Reflect creates a compressed backup file (.mrbak) that can be restored directly or browsed using Windows Explorer. Storing backups in a single file is beneficial because it can be compressed, encrypted and stored elsewhere with ease.

As you can for images, you can also create **Differential**, and **Incremental** file and folder backups to optimize backup speed and disk space requirements.

File and folder backups are ideal if you only wish to backup specific documents, photos or music, rather than your whole system.

More information on how to backup files and folders is in our KnowledgeBase article Creating a backup image of your computer, drive or partitions.

Disk cloning

With Macrium Reflect, you can clone your system disks to enable you to swap failed disks out of your system and get things back up and running again in minutes.

Cloning is often confused with imaging. The process is identical but instead of storing data to a file, it replicates volume contents and disk structures to an alternative device. When the cloning process is complete, the target disk is identical to the original and contains a duplicate of all volumes, files, operating systems and applications.

Note: Any data on the target disk prior to the cloning process will be erased.

Cloning a disk is particularly useful to upgrade an existing hard disk and in the event of a hard drive failure, you can simply replace the failed disk with a clone and have your system up and running again in minutes. However, cloning a disk is not an efficient way of backing up your data if it changes frequently because the clone will only contain one point in time as there is no 'Backup Chain' history that is available with Disk Images. Also, Disk Images can be compressed and saved to any location.

More information on how to clone your disk is in our KnowledgeBase article Cloning a disk.

Backup Plans and Retention Rules

Macrium Reflect provides multiple **Backup Plan** options to create backup cycles in days, weeks or months that allow you to pick when you want your backup definitions to run and whether they should be Full, Differential or Incremental backups. Scheduled backups can run independently of whether anyone is logged into the computer.

Macrium Reflect provides an easy 3 step approach to editing backup plans for a backup definition:

- 1. First, optionally select a **Template** from a set that includes implementations of industry best practice like Grandfather, Father, Son (GFS) or Incremental Forever
- 2. Add, remove or change the schedules as needed for full, differential and incremental backups
- 3. Finally, define **Retention Rules** for each type of backup. Using the **Retention Rules**, you can retain a specific number of each type of backup or keep them for a number of days or weeks before cleaning up.

Options define whether to apply the retention rules to all the backups in the folder, whether to run the purge before backing up, and let you define a minimum amount of disk space to retain in gigabytes (GB) before automatically deleting the oldest *backup sets* in the destination folder to make space available for new backups.

Note: A backup set consists of a full backup and any Incrementals or Differentials with the same image ID. The image ID is the part underlined in the following example backup file name: <u>69B5FC3F39E0F9F5</u> -00-00.mrimg

Restoring files and folders

Macrium Reflect restores selected files and their folder structures from File and Folder backup .mrbak files. There are a number of ways to restore backups:

- You can restore individual files, for example, accidentally deleted spreadsheets or lost photos by browsing an Image or File and Folder Backup. This process mounts the image file in Windows Explorer as if it were an extra disk drive. After it is mounted, you can browse and open files and copy the files back onto your active file system whenever you like.
- 2. You can directly restore the contents of a file and folder backup using the Macrium Reflect file and folder restore feature.

You can find more information in Restoring a file and folder backup and Browsing Macrium Reflect images and backups in Windows Explorer.

Restoring images

Macrium Reflect restores disks or their partitions exactly as they were when the backup was taken. The restore process also enables you to expand or shrink partitions if the restore target is a new disk and a different size to the original.

If your whole system becomes corrupt, you can load Macrium Reflect and restore your image despite being unable to boot Windows. You can boot from the Macrium Reflect Windows PE rescue media and use Macrium Reflect to find and restore your images

The restore process is documented in the article Restoring a backup system image from Windows.

ReDeploy

From the rescue environment you can launch Macrium **ReDeploy** to adapt the recovered Windows system to its new environment whether that is a virtual machine or a different computer. With Macrium Reflect **ReDeploy**, you can restore an image to a replacement computer or even create virtual hard drives to virtualize the machine, a technique sometimes called Physical to Virtual or P2V.

Macrium **ReDeploy** is now included in all paid editions of Macrium Reflect. This excludes the Free Edition and 30 day trials.

VBScript, PowerShell and MS-DOS batch file support

Macrium Reflect stores backup definitions as XML files that are loaded using the Reflect command line. This enables powerful batch and scheduling processing using VBScript, PowerShell or MS DOS batch files.

Macrium Reflect includes a VBScript and PowerShell generator that creates template script files for programmable control over your backup cycles and Pre/Post backup events.

Further Reading

- Macrium Reflect Minimum System Requirements
- Macrium Reflect Feature Comparison Chart
- Licensing Policy
- New in Version 7
- New in Macrium Reflect 7.1
- New in Macrium Reflect 7.2
- Upgrade FAQ
- Installing Macrium Reflect
- Installing and updating Macrium Reflect offline
- Installing a Macrium Reflect v6 to v7 Upgrade
- Macrium Reflect Quick Start
- Windows Explorer shell integration
- Reviewing your backup history
- Removing your License key when Upgrading your PC
- What is VSS, how does it work and why do we use it?

- Rapid Delta Clone RDC
- Rapid Delta Restore RDR

Macrium Reflect Minimum System Requirements

PC and Windows

In order to run Macrium Reflect, you must have a system that has the following minimum system requirements:

- At least 512MB RAM (1GB min recommended)
- Windows XP Service Pack 3 or Windows Server 2003 Service Pack 2 or later
- A keyboard and mouse

To use the rescue media, you will need either a CD/DVD writing drive or USB pen drive.

Supported File Systems

Imaging clusters in use and changed clusters (intelligent copy) is supported by FAT16, FAT32, NTFS and Ext 2,3,4 file systems. All other file systems and unformatted partitions will be imaged on a sector by sector basis, i.e, every sector in the partition will be copied.

Incremental and Differential images have no file system dependencies. You can even create Incremental and Differential images of unformatted partitions.

Rapid Delta restore (RDR) and Rapid Delta Clone (RDC) is supported by NTFS file systems only. All other file systems will cause a Full restore or clone.

Feature \ Edition	Free	Home	Workstation	Server	Server Plus
Disk Imaging	✓	✓	✓	✓	✓
Disk Cloning	✓	✓	✓	✓	~
Access Images and File and Folder backups in Windows Explorer	✓	✓	✓	✓	✓
Schedule backups	✓	✓	✓	✓	✓
Windows PE 3.0, 4.0, 5.0, 10 and Windows RE	✓	✓	✓	✓	~
XP SP3/ Vista / 7 / 8 / 8.1 /10 / WHS compatibility	✓	✓	✓	✓	✓
Retention rules	✓	✓	√	v	✓
Recovery from Windows boot menu	✓	✓	✓	✓	✓
Differential backups	~	~	~	~	✓

Macrium Reflect Feature Comparison Chart

Feature \ Edition	Free	Home	Workstation	Server	Server Plus
Incremental backups		~	~	~	✓
File and Folder backup		✓	✓	✓	✓
Email notification of backup status		✓	✓	✓	~
Backup scripting		✓	✓	√	✓
Password protection and encryption		✓	✓	✓	~
Restore to dissimilar hardware with ReDeploy		✓	✓	✓	~
Backup file Ransomware Protection with Image Guardian		✓	✓	✓	~
Rapid Delta Restore (RDR) Rapid Delta Clone (RDC)		✓	✓	✓	✓

Feature \ Edition	Free	Home	Workstation	Server	Server Plus
Changed Block Tracker (CBT)		✓	✓	✓	~
Server 2003 SP2/2008 /2011/2012 /2012R2 /2016 compatibility				✓	✓
Windows Server cross- hardware restore				✓	~
Integrated Windows event logging				✓	~
Microsoft SQL & Exchange database backup & recovery					✓
Microsoft SQL database continuous backup					✓
Microsoft Exchange Mailbox restore (Granular Recovery)					✓

Feature \ Edition	Free	Home	Workstation	Server	Server Plu:
	Download	🍹 Buy Now	🏹 Buy Now	🏹 Buy Now	🏹 Buy

Licensing Policy

Macrium Reflect Licensing Policy Overview

Macrium Reflect licenses are perpetual: they do not have an expiry date or require an annual renewal.

Macrium Reflect v7 Home Edition, Workstation, Server and Server Plus for Exchange and SQL are licensed per machine - each PC must have it's own licensed copy of Macrium Reflect installed.

You may only transfer a Macrium license to another PC if it is a replacement for the original machine (due to hardware failure, for example). See Removing your License key when Upgrading your PC

Support & Maintenance

Macrium Reflect v7 Home Edition includes 12 months free developer level Technical Support. This will ensure that not only do you get a great backup tool for your home PCs, but you know that there is help if you need it. You also have full and permanent access to our active and helpful support forum.

Macrium Reflect v7 Workstation, Server and Server Plus for Exchange and SQL, all include 12 months free Support & Maintenance in the purchase of each license which is renewable for subsequent years. Support is provided via email and, if needed, remote access. This annual subscription includes Upgrade Protection - so Minor updates (i.e. v7.1 to v7.2) and Major updates (i.e. v7 to v8) are free. We also offer a Premium support option which includes priority response and telephone support.

If the Support & Maintenance subscription is not renewed the software will continue to function, Minor updates (i.e. v7.1 to v7.2) will remain free, and access to the Macrium Support Forum and KnowledgeBase will still be available for all customers.

You can read more about Macrium Support & Maintenance here:

The Macrium Reflect End User License Agreement can be found here:

Service Providers please see here: Macrium Services Provider License Agreement explained

Macrium Services Provider License Agreement explained

The Macrium Services Provider License Agreement (SPLA) license provides an alternative usage based charging model, available to high volume service providers where the normal perpetual license model does not make sense. It is currently being piloted with a selected customers. If it is of interest to you, please contact us for more information.

How it works

You are provided with a single key per edition. This can be installed on an unlimited number of machines hosted by you. You will pay a monthly charge based on the number of unique machines with the software installed that are active within the billing period.

The billing is automatically generated using data from a daily callback to our license server. You will need to ensure that the software has a network route to our server and provide us with an IP range (or ranges) that your machines will use to connect to our server.

Your monthy bill will include a report of usage broken down by machine. This will include the associated IP and MAC address of the interface used to contact the license server and also a user machine reference, if specified.

How to specify the user machine reference

This is configured during the install process and is purely for your convenience in interpreting your bill.

You can install in the usual way, just specifying your SPLA key. However, currently, you can only specify the user machine reference using the command line install method. Use the following, replacing the angle brackets with parameters relevant to you.

```
<installer>.exe /passive /l <log filename> LICKEY=<your spla key> LICOWNREF=<your machine reference>
```

Please read more about command line installs: Installing Macrium Reflect from the command line

End User License Agreement

PLEASE READ THIS LICENSE CAREFULLY. By clicking on the "Agree" button, you acknowledge and agree to be bound by its terms and conditions in relation to your use of Macrium Reflect® and the Documents. If you do not agree to its terms and conditions, or are unsure about their effect, click on the "Cancel" button.

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Interpreting this License

Definitions

The following terms are used repeatedly in this License, and in each case have the meaning set out below:

"Computer" means a computer or a software-emulated computer (otherwise known as a "virtualized" computer).

"Documents" means the documents supplied as standard with Macrium Reflect® (whether in printed or electronic form) together with any modified or revised versions of them and/or any supplementary documents that we supply to you from time to time.

"Image" is defined as an exact copy of the data stored on a Computer's built-in media.

"media" means optical disks of any kind, hard or flash drives, and any other media in or on which software and/or data can be loaded or stored on a temporary, volatile or permanent basis.

"**Macrium Reflect**" means the software supplied to you together with this License and PrimoBurner software together with any related updates, upgrades, patches or fixes we make available to you over time.

"We" and "us" means Paramount Software UK Limited, a private limited company registered in England and Wales with registered number 02973414.

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Under this License each express right we grant to you is subject to you complying with each express obligation or restriction upon you, save where the License expressly provides otherwise.

Where you have minimum rights protected by law which we cannot restrict, you may do anything concerning Macrium Reflect® and/or the Documents which is consistent with those rights.

No term of this License shall be construed to exclude or limit our liability for any loss, damage or or other liability which cannot be excluded or restricted under applicable law (including (a) in the United Kingdom only, liability for death or personal injury caused by negligence and liability for fraud, and (b) the statutory rights of persons dealing as a consumer).

All provisions set out in this License are substantive terms and not merely introductory. All obligations and restrictions upon you under this License are subject to the provisions of this "General" subsection.

Your right to use Macrium Reflect® and the Documents

Macrium Reflect® must be installed onto a Computer owned, leased or hired by you. Once you have installed Macrium Reflect® and entered your license key, you may not transfer your license key to any other Computer.

Macrium Reflect® enables you to make exact copies of the data stored on a Computer's built-in media ("Images"). All Images must be restored to the Computer from which they were taken.

There are two (2) permitted "fair use" exceptions to these obligations:

- If you permanently replace your Computer you may load Macrium Reflect® and your license key onto your new Computer provided you have removed Macrium Reflect® from your old Computer. Once you have done so, you can use Macrium Reflect® on your new Computer as normal and restore existing Images to it. However, you must not restore Images back to your old Computer.
- 2. If your Computer develops a hardware fault which makes it inoperable you may load Macrium Reflect® and your license key onto a substitute Computer on a temporary basis whilst the fault is being repaired. You may then use Macrium Reflect® on that substitute Computer as normal and restore existing Images to it.

Once the hardware fault has been repaired, you can re-load Macrium Reflect® and your license key back onto your repaired Computer (if required), and must promptly delete it from your substitute Computer.

Where we refer to using Macrium Reflect® 'as normal' above, we are referring to use in accordance with the terms of this License.

Your right to use Macrium Reflect® and the Documents is not exclusive. This means that we may grant to other persons the same or similar rights as are granted to you in this License

General Requirements

A software-emulated computer (otherwise known as a "virtualized" computer) is a separate Computer for the purpose of this License.

You must at all times take reasonable precautions to protect the Computers on which Macrium Reflect® is loaded from unauthorized use.

You must only use Macrium Reflect® for your own benefit and not to provide services for or on behalf of any other person including on a "service bureau" basis.

You must not transfer the rights you have under this License regarding Macrium Reflect® or the Documents to any other person, including by use of an assignment, license, sub-license, lease or trust. You must not sell, give, lend, rent, hire, distribute or otherwise make Macrium Reflect® or the Documents available to any other person or allow them to access or use Macrium Reflect® or the Documents in place of you.

Save as expressly permitted by applicable law, you must not do or try to do anything which would result in you understanding, at a technical level, how Macrium Reflect® works. This restriction prevents you from doing anything which may constitute decompiling, disassembling or reverse engineering. It also means you cannot do anything which would result in you obtaining the source code for Macrium Reflect®, or the algorithms or ideas in, or structure or organization of, Macrium Reflect®. In each case there is an exception for acts permitted by applicable law.

You must not, and must not try to, avoid, defeat, bypass, remove or deactivate any security measures included in Macrium Reflect®, including those that restrict its functions.

You must not modify Macrium Reflect® or the Documents or create anything that is derived from Macrium Reflect® or the Documents.

You may copy Macrium Reflect® for back-up purposes, which may be stored on any media you so choose in a safe location. You may only copy the Documents where reasonably necessary to enable your permitted use of Macrium Reflect®.

Ownership of Macrium Reflect® and the Documents

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New in Version 7

Introduction

Macrium Reflect v7 includes powerful industry leading technologies to reduce image creation time using 'Changed Block Tracking' (CBT). v7 also includes Macrium viBoot 'instant virtualisation' that enables creation of a Hyper-V Virtual Machine with just a couple of clicks.

The user interface changes from v6 have been kept minimal and upgrading from v6 will be an easy process.

The main new features are listed below:

Changed Block Tracking (CBT)

Macrium Reflect Changed Block Tracker (MRCBT) reduces the amount of time it takes to perform incremental and differential images by monitoring the changes to an NTFS formatted volume in real-time. This is especially relevant when a file system contains very large files, such as virtual hard disk (VHD) files, where speed improvements are significant and can reduce the Incremental image time from hours to minutes or even seconds.

Note:CBT is not available for Windows XP or Server 2003.

See here for more information on CBT

Macrium viBoot

Macrium viBoot enables you, to instantly create, start and manage Microsoft Hyper-V virtual machines using one or more Macrium Reflect image files as the basis of the virtual machine storage sub-system.

Note: viBoot only supports Microsoft's Hyper-V running on a minimum of Windows 8.0 or Windows Server 2012.

See here for more information on viBoot

Task Scheduler 2.0

This a 'behind the scenes' improvement over the Task Scheduler 1.0 implementation in Macrium Reflect v6.0 and overcomes the issues caused by problems with a Windows 10 Anniversary Update bug.

See here for more information

Task Scheduler 2.0

This a 'behind the scenes' improvement over the Task Scheduler 1.0 implementation in Macrium Reflect v6.0 and overcomes the issues caused by problems with a Windows 10 Anniversary Update bug. Existing scheduled backups will be upgraded to Task Scheduler 2.0 on first run of Macrium Reflect v7.

Inter Windows XP only supports Task Scheduler 1.0.

The scheduling options in Macrium Reflect are unchanged, however there are some important differences in the way scheduled tasks run.

All scheduled tasks, for all Windows Operating Systems including XP, now run using the built-in Windows SYSTEM account. It is no-longer necessary to specify an Admin user account when creating a scheduled task and the option has been removed from the Macrium Reflect defaults. A new lightweight process, 'ReflectMonitor.exe', runs in the background and is started at user login. This process monitors for running scheduled backups and creates a system tray icon in the notification area when a running scheduled backup is detected. This overcomes two issues with Macrium Reflect v6 and earlier:

- 1. The notification icon is visible whatever the user account is running the backup. Previously the icon was only visible if the current logged on user was running the backup, either on schedule or interactively.
- 2. The ReflectMonitor backup window will also be populated with log information for backups that start before the user logs into Windows.

The ReflectMonitor progress window is identical to the backup run wizard in Macrium Reflect, so there's nothing new to be aware of here:

2	Backup Definition File: Auto Verify:	c:∖c incrementals forever.xml N	*
• 🖓	Maximum File Size:	Automatic	
	Compression: Password:	Medium N	
	Intelligent Copy:	N Y	
	Power Saving:	Ň	
	Email On Success: Recipients:	Y nick@macrium.com	
	Email On Failure:	nick@macnum.com Y	
	Recipients:	nick@macrium.com	
	Total Selected:	348.10 GB	_
Retent	ion Rules		
	Incremental:	Rules will be applied to all matching backup sets in the destination folder Retain 10 incremental images	=
		Create a Synthetic Full backup if possible.	
	Incremental Backups:	10 found	
	Delete Inc File:	\\psnas\public\Nick\v6\Drive C Synthetic Full\9830F34B16F8066C-32-32.mrimg	- 11
Destin			
	Backup Type: File Name:	Incremental Append to recent image in directory '\\psnas\public\Nick\v6\Drive C Synthetic Full\'	
	no nano.	\psnas\public\Nick\v6\Drive C Synthetic Full\9830F34B16F8066C-43-43.mrimg	
Operat	ion 1 of 1		
	Hard Disk:	1	
	Drive Letter: File Svstem:	C NTFS	
	Label:	NH5	
	Size:	499.90 GB	
	Free:	151.80 GB	-
Overall P	Progress: 0%	Creating Snapshot. Please Wait	
JVCruin	rogress, one	Creating Shapshot, Prease Waith.	
			_

In the event of the notification icon not being visible you can show the monitor dialog by pressing hot keys 'Ctrl' + 'Alt' + 'M'. This always opens the dialog and shows the currently running backup or the status of the last backup if none is running.

The hot key can be configured or disabled in the Windows registry:

Кеу	Name	Туре	Value
HKLM\SOFTWARE\Macrium\Reflect\Settings	EnableHotKey	DWORD	0 or 1 - Default 0
HKLM\SOFTWARE\Macrium\Reflect\Settings	HotKey	DWORD	Virtual Key code - Default 0x4D

O Note: Virtual key code must be a letter or a number key. The default 0x4D is letter 'M'

New in Macrium Reflect 7.1

Macrium Image Guardian

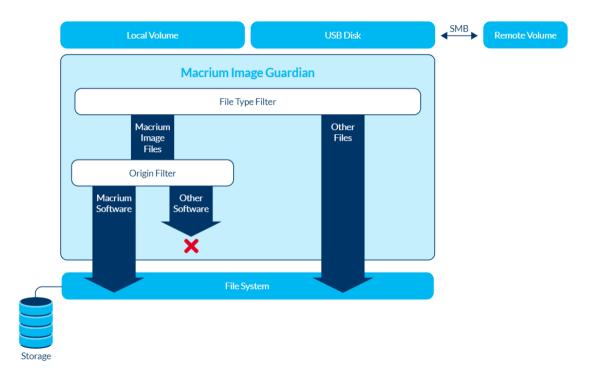
Macrium Image Guardian Overview



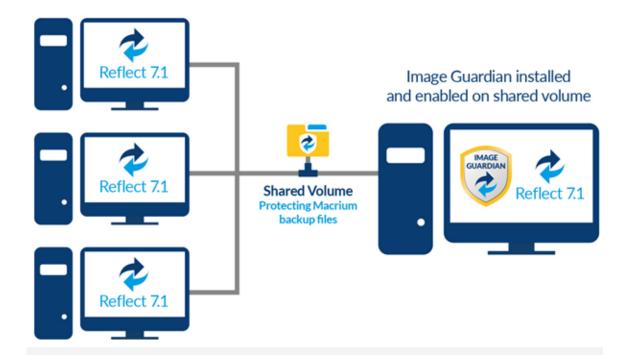
Macrium Image Guardian protects your backup files from unauthorised modification. MIG grants write access to existing backups file for Macrium Reflect 7.1, any image tools created by us, and optionally, MS RoboCopy. All other process attempting to update existing backup files will be denied access.

MIG protects local **NTFS** volumes and allows Macrium Reflect 7.1 and later to use the protected volume as a shared network resource.

Macrium Image Guardian protection architecture



Macrium Image Guardian protecting backups in a networked environment



In the above illustration, the PC sharing the backup repository (Shared Volume) has a full install of Macrium Reflect, including **MIG**. A local drive is shared over the network and **MIG** has been enabled on that drive in the Macrium Reflect user interface.

The other PC's on the network can backup to this shared drive and **do not** require MIG to be installed. Backup file write access is automatically granted to Macrium Reflect 7.1, and later, write access for earlier versions of Macrium Reflect and other processes will fail.

The PC hosting the share with **MIG** installed can be used as a standalone Macrium Reflect installation. The protected drive will prevent unauthorised access to backup files on that drive if the local PC creates backups to the protected volume.

Macrium Reflect Free Edition

Now licensed for commercial as well as personal use.

We've relaxed the licensing for the Free Edition and it is now permitted to install and use this popular product in a commercial environment. Please note that this is still an unsupported product and, as always, we encourage upgrading for full functionality and support. Please see Upgrade from Macrium Reflect 7 Free for more information on the benefits of upgrading.

Windows 10 Task Scheduler compatibility

Macrium Reflect Free Edition now uses Windows Tasks Scheduler 2.0 API to overcome the problems with Windows 10 and the previous TS 1.0 API.

Macrium viBoot

Instant virtualisation of Macrium Images is now included in the Free Edition installer.

New viBoot VHDX provider

When creating a new virtual machine **Macrium viBoot** will now create a Microsoft Virtual Hard Disk (.VHDX) file that's re-directed to an existing Macrium Image file (.MRIMG) and a differencing .VHDX that contains changes generated by the running Virtual Machine. Previously, a Macrium Image file was used to create a virtual SCSI disk which was then mounted in a Virtual Machine. The latest version is a huge improvement and offers greater persistence and performance. It also allows us to offer additional functionality in the future, such as compatibility with other virtualisation environments including VMWare and VirtualBox.

These new .VHDX files are stored in the designated Macrium viBoot Repository (default "C: \ProgramData\Macrium\viBoot" but configurable from within Macrium viBoot) and remain open until the Macrium viBoot virtual machine is deleted.

Improved handling of Volume Shadow copy Service (VSS) unresponsive errors

Previously, if VSS were to become unresponsive due to COM+ or VSS writer configuration issues then this could cause Images or File and Folder backups to hang indefinitely. When this happened, subsequent scheduled backups would permanently queue until either the hanging backup was ended in Task Manager or the PC rebooted.

7.1 includes a default 15 minute VSS timeout that will cause a "VSS Timeout" error message in the log followed by a retry without VSS Writers, or termination:

Backup aborted! - Failed To Create Volume Snapshot, VSS Timeout

Кеу	HKEY_LOCAL_MACHINE\SOFTWARE\Macrium\Reflect\VSS	
Name	CreateTimeOut	
Туре	DWORD	
Value	900 (Default) number of seconds	

The timeout can be changed by setting a registry entry. Please create this entry if it doesn't exist:

Macrium Reflect Workstation Edition now logs Windows Events

Previously, Macrium Reflect operational Windows Events were only logged for Macrium Reflect Sever and Sever Plus editions. Macrium Reflect Workstation edition now includes the same event logging.

New in Macrium Reflect 7.2

New Features

New Rescue Media builder includes Windows RE with WiFi Support

We've added a Rescue Media Builder (RMBuilder) application with support for Windows Recovery Environment (WinRE) as well as the existing PE environments supported by Reflect 7.1 and earlier. WinRE supports WiFi and is available on most |Windows installs without any further downloads.

Rescue Media Settings V Show more					nore
	Windows RE: Macrium Reflect:	Windows RE 10 Rele Server Edition (64-bit) Macrium Reflect editi Click 'Build' to update) Technician's License on has changed	v 7.2.3749 (Trial)	
elect	Device				
	Windows Boot M Add/change the b	enu oot menu for the select	ed Windows PE ver	ion	^
ø	Removable USB SanDisk SanDisk U	F lash Drive lltra - H: - 57.66 GB			
Ĵ,		Unsupported Disk) - E: - 931.51 GB - GPT f	ormat is not suppo	ted	
Ø	CD/DVD Burner (G:) - VXDV , BD-	HD-DVDRAM S15 v10.0	(1:1:0)		~
	escue Media options k for devices missing dri	vers on boot) - Recommended for your	r system.		
_	IE MUITI BOOT (MBR/UEFT	/ Recommended for your			

See Also:	Rescue Media Builder How It Works
	Creating rescue media

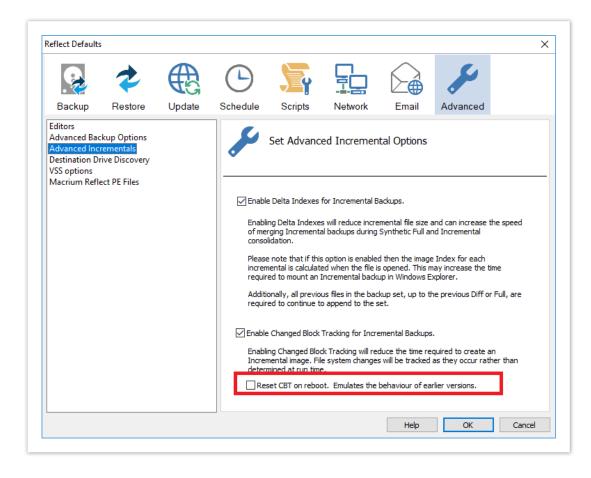
New Changed Block Tracker driver with support for Windows Restart Persistence

We've created a new Changed Block Tracker (CBT) driver that automatically upgrades the previous version when you install v7.2 with the CBT feature enabled....

Our original implementation of real-time block changes erred on the side of caution by resetting the tracking index whenever a volume was mounted. This meant that after Windows reboot an image was required to be created on a volume without using CBT before the benefit of CBT was available.

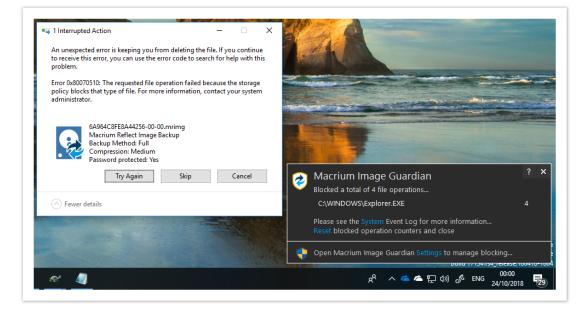
We've improved on this by reliably detecting whether NTFS volumes have been mounted without the CBT driver in the kernel stack. This applies to all Operating Systems that can mount NTFS volumes, including Linux. The operation of CBT has also been vastly improved by tracking changes in RAM rather than by flushing to disk. This also has a fail safe method to reset the CBT index should a power failure or other problem occur. We're confident that this implementation is class leading and robust.

With that said, we understand that some customers prefer not to monitor changes over a mount/reboot so we've added a check-box to make CBT behave in a similar way to the current (v7.1) implementation....



New Macrium Image Guardian driver with additional features and streamlined operation

MIG is now Windows kernel only!. Our Macrium Image Guardian (MIG) feature has been improved to remove the dependency on a Windows service and we've added popup notifications when a blocking event occurs. The popup shows blocking activity as it happens.



```
See Also: MIG Notifications
```

The Free Edition can now automatically 'convert' to a Trial by taking any of the features not available in the Free Edition

We realized that many of our Free Edition users are unaware that there are additional features available in the trial and paid for versions of Macrium Reflect. All 'premium' features, such as Image Guardian, Changed Bock Tracker, Incremental Images, Encryption.. etc..can now be activated and trialed for 30 days. After 30 days a further 7 day extension is offered. On expiration of the trial the functionality Macrium Reflect reverts to the Free Edition and Premium features will no-longer be available. We've tried to make this process as seamless and unobtrusive as possible without losing any of the functionality of Macrium Reflect Free.

See: Free To Trial upgrade dialogs

Macrium Reflect update notifications and downloads can now happen in the background

Recent history has shown that the current method of requiring Macrium Reflect to be running to alert of updates has proved ineffective. We've now added a systray icon in Window notification area to alert when an update is available to Macrium Reflect.

See: Macrium Reflect Updater Settings

New Warning and Cancelled backup completion results

We've also added the option for email notifications on Warnings as well as the existing Success and Failure results

See: Backup completion status

Minor Enhancements

New - Mounting incomplete backup sets

We've noticed that some customers have frustratingly been unable to extract files from backup sets where at least one backup file in the image chain is broken or missing. We've now added the ability to attempt to browse a backup set that contains missing files.

When browsing an incomplete set you will be prompted to continue with the mount:

	Missing file(s) in backup set			
-	'E6C0646D9DA1021A-05-05.mrimg' is part of a multi file image and at least one of the files does not exists in this directory.			
	The following file(s) cannot be opened or found: E6C0646D9DA1021A-03-03.mrimg			
				Continue and attempt to browse the image?
		Continue Cancel		

If the image set has missing backup files then it is possible that the data you are trying to recover is lost. It depends whether the missing file(s) contain critical data for mounting the file system and also whether the data you are attempting to recover was in the missing files. In most cases you may find that you files and data are completely recoverable.

New - Backup monitoring restriction

Customers with PCs and Servers that have multiple users, especial Windows Terminal Server customers, have complained that non-Administrators can interact with and cancel scheduled backups. We've now add an option to restrict ReflectUI.exe and REflectMonistor.exe to only run for users in the Administrators group.

To activate take Other Tasks' > 'Edit Defaults' > 'Advanced' > 'Advanced Backup Options' and select 'Only allow Administrators to monitor running backups'

Backup	Restore		Schedule	Scripts		Email	Advanced	
Editors Advanced Bac Advanced Incr Destination Dr VSS options	kup Options ementais	opulio		•	ed Backup C		Advanced	
Macrium Refle	ect PE Files		Ignore b	ad sectors whe	n creating images	;		
			Log	each bad cluster	r detail. Note: Thi	s may slow dowr	n the backup conside	rably.
			🗹 Display I	backup notificati	on delay for 20) 🔺 sec	onds (range of 0 to)	50)
			Disable	CD/DVD drive er	numeration, use if	f you experience	system lock-up issue	es
			Do not a	abort file and fol	der backup if roo	t folder is missing	3	
				-	or file and folder b nc' or 'Diff' if the o		ame doesn't exist	
			Create	CD Engine log file	e (restart require	d if enabling)		
			Only all	ow Administrator	s to monitor runn	ing backups		
			Report tran	nsfer rates in:	Mega Bits per Se	cond (Mb/s)	\sim	

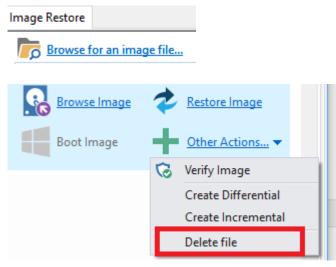
The default for password protection is now AES 128 Bit.

Previously the default password option was to exclude ecryption from backup files and images. To improve security we've now made the default AES 128 bit. As before, you can increase this to 256 bit or disable AES if you wish.

Default im	age and backup file password settings
Enable password prote	ection
Enter Password	•••••
Re-Enter Password	•••••
Note: Enter password	text \$PROMPT\$ to specify a password at backup time.
AES Encryption	Standard 128 Bit (8+ Character Password) 🗸 🗸
Encrypt stored pas	aswords

The 'Delete' functionality in Reflect is now available when 'Browse for an image file' is selected.

Previously the 'Other Actions' > 'Delete File' menu was unavailable when 'Browse for an image file..' was selected in the 'Restore Tab'...



This functionality is now available.

Bug fixes

Backup Running Mutex

To prevent multiple backups running at the same time and conflicting with VSS and I/O operations on the source or target it's only possible to run one backup at a time. Simultaneous backups backups are 'queued' and run asynchronously. With v7.1 and earlier the Backup Running Mutex, that prevents other backups from running. was held open while the backup dialog was open, even if the backup had finished. This could lead to a 'stall' in sheduled tasks if and interactive backup wasn't closed at the end. This has now been corrected and the next backup will start as soon as the current backup has completed.

ReflectMonitor improvements

ReflectMonitor is a standalone exe that communicates via IPC to the running Reflect application to duplicate the backup dialog when backups, clones or restores are running. We have made the integration tighter to prevent some of the progress bars and other glitches that previuosly existed.

Server Plus - Large Exchange Backups

Server Plus copies backup data to a 3TB virtual NTFS file system. Some customers have experienced backup failure if the size of the backup data exceeds 3TB. We've now made the virtual file system size dynamically based of the amount of data and size of the source volume to overcome this problem. We've also improved the error messaging on backup failure to make it easier to troubleshoot problems.

BitLocker drive without a drive letter

On systems with unlocked BitLocker drives that aren't assigned a drive letter, a 'BitLocker Live Restore' would always perform a 'Full Copy' restore rather than a 'Rapid Delta Restore (RDR)'. This has been resolved.

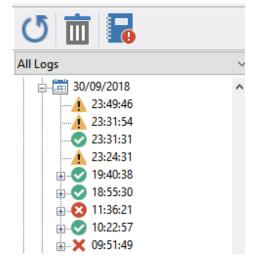
Backup completion status and email changes

v7.2 adds a Warning and Cancelled completion results for Images and File and Folder backups.

Warnings are generated for the following events:

- VSS failure and fallback to VSS without writers
- Bad sectors, if the default option is set to ignore them
- Consolidation failure for any reason
- Retention purge failure for any reason
- File and Folder backup file copy failure
- Incomplete backup set when creating non-delta incremental Images or File backups.

The Log tree now shows ¹ Warnings and [×] Cancelled backups...



And can be filtered...

Backup Restore Log
5 🛅 🖥
All Logs 🗸 🗸
All Logs
Successful Logs
Warning Logs
Cancelled Logs
Failed Logs
in
⊕ <>> 18:55:30
⊕ ✔ 10:22:57
i∃ X 09:51:49

Warnings are clearly displayed in the log...



Image ID - 4C0E7B7DEDB5220A

Backup Defin	ition File:	C:\Users\Admin\Documents\Reflect\Quick.xml
Auto Verify:		Ν
Maximum Fil	e Size:	Automatic
Compression	:	Medium
Password:		N
Intelligent Co	opy:	Y
Power Savin	g:	Ν
Email On Su	ccess:	Y
Recipients:		nick@macrium.com
Email On Warning:		Y
Recipients:	5	nick@macrium.com
Email On Failure:		N
Total Selected:		379.2 MB
Destination:		
Backup Type:		Incremental
File Name:		Append to recent image in directory 'F:\warning\' F:\warning\4C0E7B7DEDB5220A-01-01.mrimg
Operation 1 of 1		
Hard Disk		1
		nental images will also be deleted
Differential Backups:	0 found Nothing to de	lete
Incremental:		emental images
		cremental images may be consolidated
Incremental Backups: Consolidation:	3 found Meraina 'DC3	7737EC0847840-01-01.mrimg' to 'DC37737EC0847840-02-02.mrimg'
	Warning: Fai	led to open 'F:\warning\DC37737EC0847840-01-01.mrimg' - The process cannot access the file because it i
		y another process. recovered from failed consolidation
ail Notifications		
Recipients: Email notification sent		
al Edition	uning in 20 days	
This Trial License will ex Premium features will n		31 October 2018

And can be sent using email notifications...

Email Server Email Success Email Warning Default email settings for images or backups with warnings	eflect Defaults	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
		-		Send em	hail notifications ch log file ch VSS log file nt List user (Macrii	on backups with v Domain.com Im Reflect - Back	varnings up with Warnings		

Note: To ensure that existing backup email notifications don't miss warnings, if either a Success or Failure email notification is configured then the backup definition will be automatically upgraded to include Warning notifications.

Cancelled backups can be excluded from Failure email notification.

Email Success Default email settings for failed images or backups	eflect Defaults	*	æ	Ŀ	Ţ				×
Email Success Email Warning Email Failure Default email settings for failed images or backups Send Email Notification on Failed Backups Include Cancelled backups Attach log file Attach VSS log file Recipient List Enter a list of recipients, separate each email address with ; Subject Macrium Reflect - Backup Failed	Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Server Email Success Email Warning Email Failure			Send Email M Send Email M Include C Attach lo Attach V: Recipient Lis Subject	Notification of Cancelled ba g file SS log file t. Enter Macriu	on Failed Backups ckups a list of recipients Im Reflect - Backu	, separate each ei p Failed	mail address wit	

Note: Existing backup definitions will be upgraded to include Cancelled backup so the behaviour is unchanged.

()

Free To Trial

The following dialog is displayed when you take a premium feature option in the Free Edition if there has been no Trial key on the system before . In this example it's MIG Settings...

Macrium Image Guardian
Image Guardian protects backup files on local drives from Ransomware attack by blocking unauthorised write activity. Premium features are not available in the Free Edition of Macrium Reflect. Would you like to upgrade to a 30 day Trial License to use Premium features
Start Trial Not now
Macrium Reflect A reboot is required to complete this license change. Reboot now? Yes No
Macrium Reflect Trial Macrium Reflect Home Edition trial activated. Your trial will expire in 30 days. Expired trials will revert to Macrium Reflect Free Edition
OK (i) A reboot is required before Macrium Image Guardian (MIG) and Changed Block Tracker (CBT) functionality is available.

The following dialog is displayed at startup after the 30 trial has expired ...

Your 30 day trial period is over!
To continue using premium features of Macrium Reflect either purchase a license or extend the trial
Extend trial for 7 days
Purchase a license
Enter a purchased license key
Continue using the Free Edition

The following dialog displayed after 30 day trial has expired and you've reverted to Free when taking MIG settings in Free Edition ..

Your 30 day trial period is over!
To continue using premium features of Macrium Reflect either purchase a license or extend the trial
Extend trial for 7 days
Purchase a license
Enter a purchased license key
Continue using the Free Edition

The following dialog displayed at startup after the 7 trial extension has expired...



Continue as Free, reboot and take enable CBT on a volume...

Your Macrium Reflect trial is over!
CBT reduces the time it takes to perform incremental and differential images by monitoring changes to NTFS formatted volumes in real-time.
Purchase a license
Enter a purchased license key
Contact us for a trial extension
Continue using the Free Edition

'Contact us...' will show the following dialog...

ontact Us	2
To request a furth	er trial of Macrium Reflect please enter your details below
Email address:	user@domain.com
Tell us why: (Optional)	I didn't get a chance to test the trial
	OK Cancel

This will send an email to support@macrium.com with the following content..

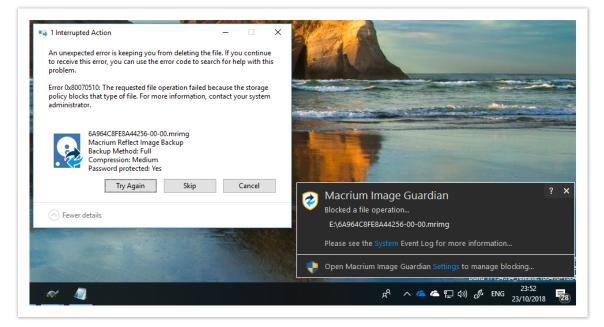
Subject: Trial Extension Request

Contents: user@domain.com - I didn't get a chance to test the trial

MIG Notifications

We've added real time popup notifications when Macrium Image Guardian blocks file access to a backup file.

When file access is blocked for the first time the file name is shown in the popup...



Click 'System' to open the Windows Event Viewer system messages showing a custom view of MIG events:

Event Viewer (Local)	Macrium Image Guard	lian Number of events: 719					
Gustom Views Administrative Events	V Number of events: 719						
macrium Image Guardian	Level	Date and Time	Source	Event ID	Task Category		
Windows Logs	A Warning	19/10/2018 13:15:03	MacriumImageGuar	320	None		
Applications and Services Logs	A Warning	19/10/2018 13:15:03	MacriumImageGuar	320	None		
Saved Logs	🔥 Warning	19/10/2018 13:14:02	MacriumImageGuar	320	None		
Subscriptions	🔔 Warning	19/10/2018 13:14:02	MacriumImageGuar	320	None		
	A Warning	19/10/2018 13:13:54	MacriumImageGuar	.320	None		
	Event 320, MacriumIma	ageGuardian					
	General Details						

Click 'Settings' to open the MIG disable settings dialog:

V	acrium Image Gu	uardian		
Prevent	unauthorised modifica	ation of Macrium Refle	ct backup files	
Settings	Events			
Image	Guardian Settings			
I	• Turn on Image 0	Guardian		
•	✓ Automaticall	y protect local backup dri	ves	
	Allow RoboC	Copy to sync and move ba	ackup files on protected volumes	
	O Turn off Image (Guardian (not recommen	ided)	
•	More Options	×		
	um Image Guardian prot ication.	tects your backup files on	local disks from unauthorised	
	Macrium Reflect v7.1 and k, .mrsql and .mrex file		s are granted access to write to .mrimg,	
	tion can be turned on o t disk view.	r off for individual drives	using the 'Actions' menu in the Macrium	1

Additional functionality over the v7.1 MIG settings dialog in Reflect include:

1. An Apply button to accept changes to the dialog immediately.

2. A 'More Options...' drop down in the 'Turn off' selection:

More Options	\sim
More Options	
1 Minute	
5 Minutes	
15 Minutes	
30 Minutes	
1 Hour	
2 Hours	
Until Reboot	
Permanently Off	
PW.	

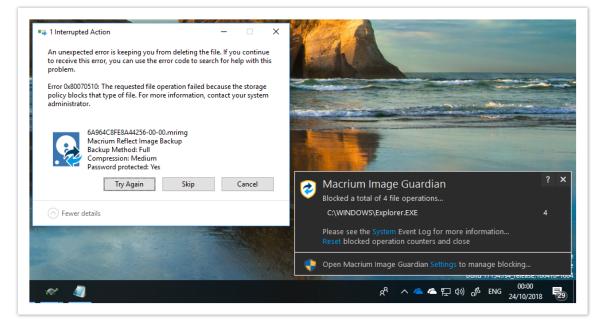
3. Live countdown if a temporary disable has been applied.

4. A **Re-Enable** button to cancel a temporary disable.

5. The MIG shield icons in the Reflect disk view will automatically update to Reflect the state of MIG.

Note: The same dialog can be displayed in Reflect by taking 'Other Tasks' > 'Macrium Image Guardian Settings'

When multiple access attempts are blocked the process that's been blocked will be shown in the popup. together with the number blocked attempts.



Click "Reset" to reset the blocked activity count.

Note: Windows Explorer deletion or modification activity may generate multiple blocked access events.

Why aren't you using the built-in Windows 10 toast notifications?

We decided to not use the built-in Windows 10 toast notifications because:

- 1. MIG blocking notifications should remain permanently on the screen until closed.
- 2. We need to support earlier Windows Operating systems.
- Most importantly, we can add additional functionality to the notification Window such as menus and buttons for directly interacting with MIG settings.

Macrium Reflect Updater Settings

In the Macrium Reflect Updater dialog take 'File' > 'Configure Check...'

Note: The same options in the Update Settingsdialog below are available by taking 'Other Tasks' > 'Edit Defaults...' > 'Update' and 'Help' > 'Configure update check..' in the Macrium Reflect UI

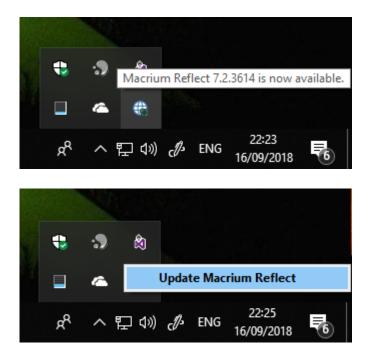
Macrium Reflect Updater		
Configure Check About	vailable	
Exit	Macrium Reflect v7.2.3685	^
Date 28th September	2018	
available for Macrium	il Notification tion to receive email notifications when an update is	
storage device. This Incorrect encryption The fist Incremental to revert to Full. This	n state change forcing Full image image after a Full could incorrectly cause the Incremental has been resolved r incorrect driver matching for XP	
	ell extension ent" column in Windows Explorer could display an empty t was longer than 255 characters. Comments in the	~
	Download Ca	ncel:

This displays the Update Settings dialog...

Software Upda	te Settings			
Hourly background chece Daily checks for softwar Send email when softwar user@domain.com Emails will not be sent ur Restart Macrium Reflect	e updates when th re update is availal htil SMTP settings a	settings		ch running
_	-	-	r to the pat	ch runnin

Setting	Description
Hourly background checks	The ReflectUI process will monitor for updates by checking every hour
Send email	 If background check is enabled then an email is sent to the supplied email address when an update is found. Only one email is sent for each update SMTP server settings are the same settings setup in the Macrium Reflect defaults. This can be configured by clicking the 'Settings' button,
Daily checks when Macrium Reflect GUI loads	A check is made once a day, when Macrium Reflect is started interactively.
Restart Macrium Reflect after patching	If the Reflect Updater process was launched by taking the 'Other Tasks' > 'Check for updates' menu in Reflect then setting this option will automatically launch Reflect when the patching completes.

If background checking is enabled then an update icon is shown in the Windows notification area when an update is available. If enabled, the updater checks every hour.



Click 'Update Macrium Reflect' to launch the 'Macrium Reflect Updater' dialog.

Unique Registration Code

Registering your installation of **Macrium Reflect Free or Trial of Home, Server or Server Plus** requires entering a **Unique Registration Code** to confirm your registration.

🚽 Macrium Reflect Se	erver Plus Edition v7.2.3623 64 bit Setup
Registration Macrium Reflect co	mmercial license registration Reflect 7
20	Commercial use of Macrium Reflect, including the Free Edition, requires registration
Email address	user@domain.com
Registration Code	G6TN-2HT8 Get My Code
	If you do not have a Registration code, click 'Get My Code' and an email will be sent with instructions
	Your details will only be used in regard to Macrium products. You can unsubscribe at any time. For details visit www.macrium.com/privacy

If you don't have a registration code or if you have previously registered but don't have the code handy then click 'Get My Code'.

If you haven't previously registered then you will be emailed a link to an online registration to continue:

For business users:

Enter Email	Add D	etails 3 Check Email
Please select the Edition you would like to dow	vnload.	
Server Plus		`
Please enter your email to register for trial sup	port, and optionally for Ma	crium offers and news
user@domain.com		
We will not use this to communicate with you until you ha time.	we indicated your preferences. W	e will never sell or pass on your details to any third parties and you can unsubscribe at any
First Name		Last Name
Job Title		
Company		
Enter a location		
Address Line 1		Postcode/Zip
City		State/Province/Region
United Kingdom		•
Phone		
Would you like to receive occasional news abo	ut Macrium software?	
Yes Please		
No Thank You		
You can read more about how we protect your privacy her		

For home users:

		2		3
	Enter Email	Add Details		Check Email
Please enter an e	email (optional) to register or do	ownload		
nick@glucom.co	m			
We will not use this to time.	o communicate with you until you hav	e indicated your preferences. We will never	sell or pass on your details to an	y third parties and you can unsubscribe at an
You can read more ab	oout how we protect your privacy here			

If you have already registered or after completing the form above you will receive an email containing your Registration Code to enter in the installer.

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Thank you for your interest in Macrium Reflect. Your Registration Code is : !*URC*! This code is paired with your email address. Use copy and paste to enter it when prompted in the installer registration page. For more information please see here: https://knowledgebase.macrium.com/display/KNOW7/Unique+Registration+Code We hope you find our software useful. The Macrium Team At any time, you can unsubscribe or update your communication options here. https://www.macrium.com/consent?id=!*URC*! Please read about how we protect your privacy here. https://www.macrium.com/terms-and-privacy-statement

Upgrade FAQ

Introduction

This FAQ covers some of the commonly encountered queries regarding transitioning from Macrium Reflect v6 to v7.

How do I download the v7 Installer if I've purchased an upgrade?

Enter your v7 key in the Macrium Reflect download manager. Your v7 key will begin with 56-, 57-, 58- or 59.

Please see Installing a Macrium Reflect v6 to v7 Upgrade

What's the difference between the Home Edition and the Workstation Edition of Macrium Reflect v7?

These two editions are functionally identical. The Workstation Edition includes an annual support and maintenance product. This adds continual support and free major version updates for the duration of the subscription. Year 1 is included in the the Workstation Edition product price.

Can v7 read and restore images created with Macrium Reflect v6?

Yes, v7 is backwards compatible with all Images and File and Folder backups created with earlier versions of Macrium Reflect.

Will I need to recreate my v6 backup XML definition files?

No, your v6 backup definition files will be loaded into v7 without any conversion.

Can Version 7 be installed over 6? Will both 6 and 7 be on the hard drive? Should 6 be uninstalled first?

Versions 6 and 7 will not exist on your system at the same time. The version 6 installer will uninstall version 5, as part of the install process.

Does Windows PE need to be reinstalled and new rescue CDs made? Will the old Rescue CDs still work?

Version 6 rescue media is compatible with version 7 images, however, we recommend that you update to the latest v7 rescue media after installation..

Why can't I change the install location?

For update installs, the facility to change install location is disabled as your scheduled tasks will fail as they reference the reflect program folder. If you do wish to change the install location

- 1. Remove any scheduled tasks.
- 2. Uninstall Reflect.

- 3. Install, note now you can change the install location.
- 4. Setup your scheduled tasks.

After purchasing an upgrade, can I continue to use my 6 license on another computer?

The v7 upgrade is discounted on the basis that you are upgrading your license. Therefore you still are only licensed to use reflect on a single computer. Your v6 license key will be revoked as part of the upgrade process.

Installing Macrium Reflect

① Release Notes

The latest release notes for Macrium Reflect v7 can be found here: http://updates.macrium.com/reflect/v7 /latest_release_notes.asp

I For additional information on upgrading v6 to v7 please see Installing a Macrium Reflect v6 to v7 Upgrade

This article explains how to install Macrium Reflect on an Internet connected PC using the Macrium Reflect download agent.

For a description on installing to an offline (non Internet connected) PC please see here

- Downloading Macrium Reflect Installer and PE Components
- Modifying the default selections
- Resolving Download Issues
- WinPE Download Locations

Downloading Macrium Reflect Installer and PE Components

- 1. Macrium Reflect Download Manager and run it
- 2. If you have purchased Macrium Reflect then **Click 'Full Software'** and **enter a valid license key** to automatically download your purchased product.



To download a 30 day trial Click 'Trial Software' and select the Macrium Reflect Edition from the dropdown list to the right.

3. Enter the folder where the downloads will be saved to or Click '...' to select a folder.

₽,	The most appropriate install package will be downloaded for your computer. select additional components for subsequent offline installs.	Click Options to
	Save to folder C:\Users\Nick\Downloads\Macrium\	
	Run installer directly after downloading	Options

4. Click 'Run installer directly after downloading' to run the installation package as soon as the download completes successfully.

Note: If you intend to install on another computer then leave this item unchecked.

*	The most appropriate install package will be downloaded for your computer. Click Options to select additional components for subsequent offline installs.		
	Save to folder	C: \Users \Nick \Downloads \Macrium \	
	✓ Run installer	directly after downloading	Options

5. Click Options to select different download options (see Modifying the default selections):

P	The most appropriate install package will be downloaded for your computer. Click Options to select additional components for subsequent offline installs.			
	Save to folder	C: \Users\Nick\Downloads\Macrium\		
	Run installer	directly after downloading	Options	

6. Click Download to start downloading your installation files.

Modifying the default selections

By default, the most appropriate installation for your PC will be selected for download. This is based on operating system, architecture, and existing rescue media components. For more options **Click 'Options'** on the main download agent window as seen at step 5 above:

Select download options and architecture.

et Download Options	
Select Download Architecture	
 64 bit 	
Select Download Option	
Reflect Installer and PE Component	s 🔹
Reflect Installer and PE Components Reflect Installer Only PE 3 (WAIK) Rescue Components O PE 4 (WADK) Rescue Components O PE 5 (WADK) Rescue Components O PE 10 (WADK) Rescue Components	nly Dnly Dnly
	OK Cancel

Option	Descrip	otion
Reflect Installer and PE Components		ads both the Macrium Reflect installer and the default Windows PE component currently running Windows OS:
	PE	Windows Version
	PE 3.1	Windows XP, Windows 7, Windows Vista, Server 2003, Server 2008, Server 2008R2
	РЕ 10	All other Windows versions.
Reflect Installer Only	This opt	ads the Macrium Reflect installer for the chosen trial or entered license key. tion will be defaulted if you have already downloaded the default Windows PE tent .zip file and it is located in the download folder.
PE 3 (WAIK)	Downloa	ads the Windows PE 3.1 components to file PE3x86.zip or PE3x64.zip
PE 4 (WADK)	Downloa	ads the Windows PE 4 components to file PE4x86.zip or PE4x64.zip
PE 5 (WADK)	Downloa	ads the Windows PE 5 components to file PE5x86.zip or PE5x64.zip
PE 10 (WADK)	Downloa	ads the Windows PE 10 components to file PE10x86.zip or PE10x64.zip

For more information on the different versions of Windows PE see this help page.

The default and most usual option is 'Reflect Installer and PE Components'. This downloads all the files to run Macrium Reflect and create your rescue media.

The 'PE 3, PE 4, PE 5 or PE 10 Components only' options can be used to download just the PE component files. The downloaded .zip file can be supplied when building the Windows PE rescue media or copied to a different PC.

Click 'OK' to return to main Agent Window.

Resolving Download Issues

Download Failures (Error Code: 1)

Download failures can generally be attributed to either an unstable internet connection or anti virus/malware software interfering with the download. Please try the following steps to resolve the issue

- Reboot the computer to clear any internet cache files
- Disable anti virus/malware software for the duration of the download and installation of Macrium Reflect.
- Download the Macrium Reflect installer on it's own. If the internet connection is unstable, the prolonged download of WinPE components can be postponed and attempted from within the Macrium Reflect software
- Perform a CleanBoot of Microsoft Windows (see: this link for more help) to remove any third party components possibly affecting the download
- Download the installer on another computer

MD5 Checksum Failures (Error Code: 2)

MD5 checksum failures can generally be attributed to either an unstable internet connection or anti virus/malware software. Please try the following steps to resolve the download issue:

- Reboot the computer to clear any internet cache files
- Anti virus/malware or another third party process has either locked or quarantined the downloaded file preventing the MD5 check. Temporarily disable these forms of software for the duration of the download an install process
- Perform a CleanBoot of Microsoft Windows (see: this link for more help) to remove any third party components possibly affecting the download

WinPE Download Locations

WinPE installations can be downloaded and installed manually from the following Microsoft links, negating the need to use the Macrium Reflect download manager for WinPE Components.

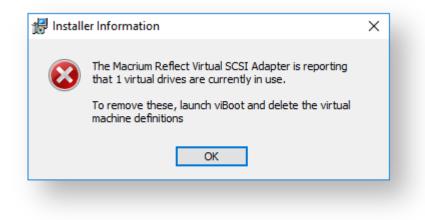
WARNING: These downloads from Microsoft will be very large and are generally in excess of 1GB

- WinPE 3 (WAIK) Recommended for Windows 7 and earlier
- WinPE 3.1 Update (WAIK) Recommended for Windows 7 and earlier
- WinPE 4 (WADK) Recommended for Windows 8 and later
- WinPE 5 (WADK) Recommended for Windows 8.1 and later
- WinPE 10 (WADK) Recommended for Windows 10 and later

viBoot installation error when upgrading from 7.0 to 7.1

Macrium Reflect v7.0 viBoot is not compatible with v7.1 viBoot. This means that any existing 7.0 viBoot Virtual Machines musty be deleted prior to installing 7.1.

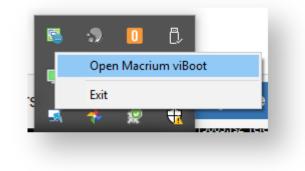
If existing 7.0 viBoot VMs remain during 7.1 installation then the installer will abort with the following message:



To correct this problem, **click 'OK'** to terminate the install and delete any existing VMs using the viBoot user interface.

To launch viBoot and delete Virtual Machines

Right click on the viBoot icon in the TaskBar and select 'Open Macrium viBoot'



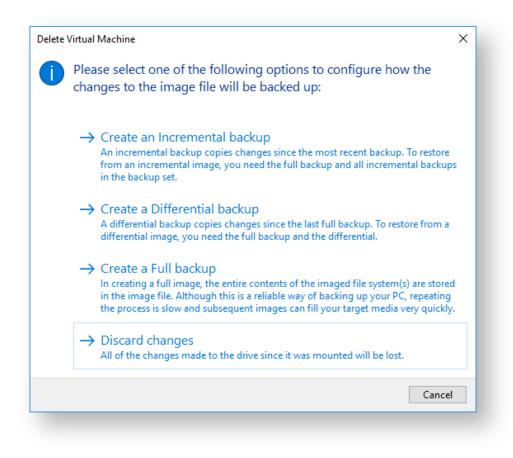
Or type 'viBoot' in the Windows search bar:

 Macrium viBoot Desktop app A viBoot 	ŵ	Best match
	0	
	ŝ	
	2	
		𝒫 viBoot

When the viBoot UI starts, right click on any existing VMs and select 'Delete...'

Name		
New Virtual N	Connect	-
	New	
	Backup	
	Delete	

You will then be prompted to backup or discard changes in the VM



Note: This will lose any changed data in the VM(s), so if necessary take a 'Backup' option prior to deleting.

The Macrium Reflect v7.1 installation can now be started again

Installing and updating Macrium Reflect offline

This article explains how to install Macrium Reflect on a PC that isn't connected to the Internet. For information on installing on an Internet connected PC please see here.

- Download the installer and PE components.
- Offline installation of your purchased license.
- Ensuring your software is up to date.
- How to identify the architecture of your target machine.

Macrium Reflect uses an Internet connection to:

- Download the installer and Microsoft components to enable building of the PE based rescue environment
- Validation of your license during installation.
- Notification and download of updates
- This article refers to the machine you wish to install Reflect on as the "target PC" and the machine connected to the Internet as the "online PC".

You will need access to a computer that is connected to the Internet and a device to copy files to the target PC.

Download the installer and PE components.

Download the Macrium Reflect Download Agent to your PC and run it.

Select Trial and choose the edition or select Full and enter your key.

Select Macrium Reflect software to do	wnload	
 Trial software 	Workstation	×
◯ Full software. Enter license key	Workstation Server Server Plus	

The download agent is automatically configured for the computer it is running on. You will need to reconfigure it to reflect your target PC instead. Do this by **clicking the Options button**.

et Down	load Options		
Select D	ownload Architecture		
🔘 32 b	it		
🧿 64 b	it		
	ownload Option		
	Installer and PE Components		-
	Installer and PE Components Installer Only		
PE 3 (M PE 4 (M PE 5 (M	/AIK) Rescue Components Onl /ADK) Rescue Components On /ADK) Rescue Components On WADK) Rescue Components C	ily ily	
		ОК	Cancel

Choose the download architecture - 32 or 64 bit - for your offline PC. See the "How to identify the architecture of your target machine" at the end of this article.

Option	Descri	otion
Reflect Installer and PE Components		ads both the Macrium Reflect installer and the default Windows PE component r currently running Windows OS:
	PE	Windows Version
	PE 3.1	Windows XP, Windows 7, Windows Vista, Server 2003, Server 2008, Server 2008R2
	РЕ 10	All other Windows versions.
Reflect Installer Only	This op	ads the Macrium Reflect installer for the chosen trial or entered license key. tion will be defaulted if you have already downloaded the default Windows PE nent .zip file and it is located in the download folder.
PE 3 (WAIK)	Downlo	ads the Windows PE 3.1 components to file PE3x86.zip or PE3x64.zip

Option	Description
PE 4 (WADK)	Downloads the Windows PE 4 components to file PE4x86.zip or PE4x64.zip
PE 5 (WADK)	Downloads the Windows PE 5 components to file PE5x86.zip or PE5x64.zip
PE 10 (WADK)	Downloads the Windows PE 10 components to file PE10x86.zip or PE10x64.zip

For more information on the different versions of Windows PE see this help page.

If you require the same PE version as the default Windows PE component files for this PC (see table above)

Select 'Reflect installer and PE components'. This will download the required files in one download step. Click OK, then un-check "Run installer directly after downloading", and Click download.

If you require a specific PE version

This will require **two** downloads. First, **select 'Reflect Installer Only', click OK,** then **un-check 'Run installer directly after downloading',** and **Click download.** After the first download is complete, **click 'Options'** again, choose the desired **'PE X rescue components only', click 'OK'** and then **Click 'Download'.**

Once the download(s) complete, you will find two new files in the folder saved to...

crium > 🗸 🗸	・ Ö Search Macri	um	Q
Date modified	Туре	Size	
26/02/2017 18:46	Compressed (zipp	432,602 KB	
26/02/2017 18:35	Application	59,069 KB	
	Date modified 26/02/2017 18:46	Date modified Type 26/02/2017 18:46 Compressed (zipp	Date modifiedTypeSize26/02/2017 18:46Compressed (zipp432,602 KB

The file names will vary dependent on your particular selections. There will be an installer .exe file and a

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PE components zip file.

Copy these two files to your target PC and run the installer ensuring that the zip file is in the same folder. You will then be able to install your software and generate PE rescue CDs.

Offline installation of your purchased license.

Note: This step is not necessary for the Free or Trial Editions of Macrium Reflect.

When you run the installer on your target PC, instead of the automatic activation, you will be given an activation code. **F95B-K9XV-8SZ** in the example below.

License key	Dot	flact 7
Please enter your	license key	flect 7
P	Failed to connect to the License server, please u offline activation service at http://www.macrium.com/activate using the act	
	30 day trial	
License key	56-7V2R-P 1K2-QYUQ-P 1K2-P 1K2-BCEP 1K2-	Сору
	Your Macrium Reflect License key	
Activation code	MAE4-NF72-YHV	Сору
	Your activation code	
Offline key		
	You will receive this from the offline activation se	ervice
To launch your brow	ser with the activation URL, click here ->	Launch
To copy the activatio	n url to the clipboard, click here ->	Copy URL
	Back Next	Cancel

Navigate to the registration server on your online PC and enter your license key and activation code.

icence Key	56-P1K2-PVB4-QYUQ-P1K2-P1K2-BCEP1K2	
Activation Code	MAE4-NF72-YHV	

Click 'Submit' and you will receive an offline key as shown below.

Registra	tion Successful
Licensee	Macrium
Order Number	24002542
Offline key	QRZT-HKDY-662D-A284-DUAQ-HK2T-7H

Enter the Offline key in the install dialog to complete installation.

Ensuring your software is up to date.

Note: For online installations, update notifications and patching is automatic.

Check the change log web page periodically for updates. If you see an update that is relevant to your system, follow the steps in 1. above, but **choose the 'Reflect Installer' option** in the download agent.

Set Downloa	ad Options	
Select Download Architecture 32 bit 64 bit		
Select Download Option		
Reflect Installer Only		×
Reflect Installer and PE Components	S	
Reflect Installer Only PE 3 (WAIK) Rescue Components O PE 4 (WADK) Rescue Components O PE 5 (WADK) Rescue Components O	Dnly	
	ОК	Cancel

How to identify the architecture of your target machine.

Run msinfo32 (type Windows Key + R and then type msinfo32) and note the system type.

x86-based PC indicates that the target machine is 32 bit and x64-based PC indicates a 64bit system.

ile Edit View Help		
System Summary	Item	Value
Hardware Resource	OS Name	Microsoft Windows Server 2012 Sta
E Components	Version	6.2.9200 Build 9200
Environme Environme	Other OS Description	Not Available
	OS Manufacturer	Microsoft Corporation
	System Name	OFFICE2
	System Manufacturer	ASUS
	System Model	All Corios
	System Type	x64-based PC
	System SKU	All

Installing a Macrium Reflect v6 to v7 Upgrade

This article explains how to download and install Macrium Reflect v7 using your v6 to v7 upgrade license key.

- License key format
- Upgrading to Macrium Reflect v7 from an existing v6 Installation with a free upgrade key.
- Upgrading to Macrium Reflect v7 from an existing v6 Installation using a purchased upgrade key
- Upgrading to Macrium Reflect v7 without an existing installation of v6
- Related articles

Macrium Reflect v7 includes powerful industry leading technologies to reduce image creation time using 'Changed Block Tracking' (CBT). v7 also includes Macrium viBoot 'instant virtualisation' that enables creation of a Hyper-V Virtual Machine with just a couple of clicks.

The user interface changes from v6 have been kept minimal and upgrading from v6 will be an easy process. See New in Version 7 for more information.

Upgrade to v7

Enter you email address or v6 license key in the upgrade page

License key format

Note: If you are unable to locate your v5 or v6 keys then please see this page http://www.macrium.com /account/myorders.aspx to request your order history

Macrium reflect v6 keys

Product	Key format
v6 Home	36-XXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXXXXXX
v6 Workstation	37-XXXX-XXXX-XXXX-XXXX-XXXXXXXXX
v6 Server	38-XXXX-XXXX-XXXX-XXXX-XXXXXXXXX
v6 Server Plus	39-XXXX-XXXX-XXXX-XXXX-XXXXXXXXXX

Macrium reflect v7 and v6 to v7 upgrade keys

Product	Key format
v7 Home	56-XXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXXXXXX
v7 Workstation	57-XXXX-XXXX-XXXX-XXXX-XXXXXXXXXX
v7 Server	58-XXXX-XXXX-XXXX-XXXX-XXXXXXXXXX
v7 Server Plus	59-XXXX-XXXX-XXXX-XXXX-XXXXXXXXXX

Upgrading to Macrium Reflect v7 from an existing v6 Installation with a free upgrade key.

Free upgrades to v7 from v6 are available to customers with an active Support and Maintenance subscription and for v6 keys purchased on or after 26th November 2016.

Before you begin, ensure that you are at the latest release of Macrium Reflect v6 by taking the 'Other Tasks' > 'Check for updates' menu option.

1. Take the 'Other Tasks' > 'Check for updates' menu option:

- Other Tasks
 Help

 Image: Solution of the state of th
- 2. The following message prompt is displayed:

Upgrade to Macrium Reflect v7			
e	Macrium Reflect v7 is available.		
Your v6 license key qualifies for a free upgrade to v7 Do you want to download and install Macrium Reflect v7?			
	Now Later Never		
Note: Upgrading to v7 will retain all settings and image data			

Click 'Now' to upgrade immediately.

Note: If you click 'Never' then further attempts to update your installation will only check for v6 updates. To override this hold the 'Ctrl' key down when you take the 'Check for updates..' menu option.

3. You new key will be shown in the following message box:

Upgrade to Macrium Reflect v7		
e	Your new v7 license key is:	
56-7G56-X2A4U-8NYR-X2A4-6BU2-EAX2A4N		
	Continue Copy	

To save your key for future reference, use the 'Copy' button to copy your new key to the Windows clipboard

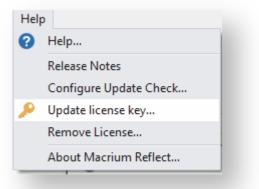
Clicking **'Continue' or 'Copy'** will download the Full Macrium Reflect v7 Installer for your purchased edition. The installer will start automatically.

Upgrading to Macrium Reflect v7 from an existing v6 Installation using a purchased upgrade key

You can enter your purchased v6 to v7 upgrade license key directly into your Macrium Reflect v6 installation. This process will automatically upgrade your v6 key without you having to type it in again in the installer.

Before you begin, ensure that you are at the latest release of Macrium Reflect v6 by taking the 'Other Tasks' > 'Check for updates' menu option.

1. Take the 'Help' > 'Update license key..' menu option.



2. In the dialog that opens **enter your purchased v6 to v7 upgrade key**. This key will begin '56-', '57-', '58-' or '59-' depending on the edition:

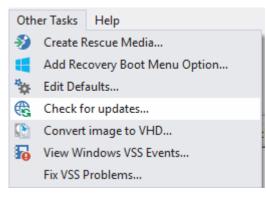
0

Home Edition Product Licensing	
Enter your license key	below, upgrade users will be prompted for further license keys
License Key	56-7V2R-P1K2-QYUQ-Z141-P1K2-BCEP1K2
	Help < Back Next > Cancel Finish

Click 'Next' and then 'Finish' to register your new v7 key.

3. The final step is to download and run the v7 Installer. You can do this immediately or at a later stage if you wish

Take the 'Other Tasks' > 'Check for updates' menu option:



The following message prompt is displayed:

Upgrade	Upgrade to Macrium Reflect v7			
e	Macrium Reflect v7 is available.			
	You have a valid v7 license key Do you want to download and install Macrium Reflect v7?			
	Now Later Never			
Note: Upgrading to v7 will retain all settings and image data				

Click 'Now' to download the Full Macrium Reflect v7 Installer for your purchased edition. The installer will start automatically.

Note: If you click 'Never' then further attempts to update your installation will only check for v6 updates. To override this hold the 'Ctrl' key down when you take the 'Check for updates..' menu option.

Upgrading to Macrium Reflect v7 without an existing installation of v6

If you have uninstalled v6 then you can download the installer using the Macrium Reflect download manager.

Note: This method will require you to enter the v6 key that you are upgrading the v7 installer

- 1. Download and run the Macrium Reflect download manager: Click 'ReflectDLFull.exe' to download.
- 2. Enter your v7 Key in the download manager to download and run the v7 installer:

0

ocrium R	eflect Download Agent
Select In	stallation Package
J	Select Macrium Reflect software to download
	○ Free/Trial software Free
	Full software. Enter license key 56-EATA-52BW-52BW-CG3V-52BW -45352BW
Download	d Location & Options
*	The most appropriate install package will be downloaded for your computer. Click Options to select additional components for subsequent offline installs.
	Save to folder C:\Macrium\
	Run installer directly after downloading Options
Registrat	tion Information
	Name N/A
77	Company Name N/A
Downloa	d Information
Æ	Selected Download: Reflect Installer Only
\mathcal{A}^{*}	OMB of OMB (0%)
	Pause
	Help Download Close

The Macrium Reflect installer and Windows PE rescue media files will be downloaded and the installer will start automatically .

Note: You must enter your v7 key. If you enter your v6 key you will download the Macrium Reflect v6 installer

3. The installer will require you to enter both your new v7 upgrade key and your existing v6 key.

In the installer License Key page enter your v7 Key you will then be prompted to enter your v6 key:

Macrium Reflect License key Please enter you	Home Edition v7.0.1983 64 bit Setup × ur license key
License Key	Please enter your License key. It uses the format XX-XXXX-XXXX-XXXX-XXXXX-XXXXX and should have been received by email shortly after purchase. 30 day trial 56-7V2R-PVBCE261N-Z141-P1K2-BCE261N Paste Macrium Reflect v7 license key
v6 Key	36-MSBC-9AVT-WC-BCE261N-1A3Q-ZVF3R19 Macrium Reflect v6 Home license key is required
	<u>B</u> ack <u>N</u> ext Cancel

Note: You are only required to enter your v6 license key once. After this first installation your v6 key becomes a Full key and your v6 key is deactivated.

Related articles

Upgrade FAQ Installing Macrium Reflect Installing and updating Macrium Reflect offline Troubleshooting installer issues

Macrium Reflect Quick Start

Macrium Reflect is intuitively designed and organised with simple to follow wizards guiding you through tasks. If you have never used backup software before, however, you might feel some trepidation, needing a little extra guidance to get you started.

- First create rescue media
- Imaging disks
- Backing up files and folders
- Cloning disks
- Scheduling, retention and disk space
- Restoring files and folders
- Restoring images
- ReDeploying computers
- Scripting backup processes
- Managing Macrium files in Windows

First create rescue media

We recommended that the first time you use Macrium Reflect, you create bootable rescue media before performing any other tasks.

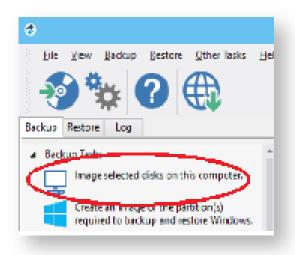
Click the Create bootable Rescue media icon to access the wizard.



For further guidance see Creating rescue media.

Imaging disks

Disk imaging is a **Backup** task and can be accessed from the **Backup** task bar.



For further guidance see Creating a backup of your computer.

Differential and incremental disk images

When your first full backup you can run differential and incremental backups to capture just the changes because it is quicker. Macrium then manages these backup sets for you.

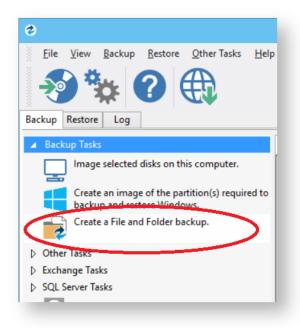
Right click the file you want to backup up and select the type of image to create.

•	Macrium Reflect - Server Plus Edition	(UEFI) — 🗆 🗙
File View Backup Restore Other Tasks Help		
▲ Backup Tasks	Create a Backup Backup Definition Files WBScript Files	PowerShell Files MS-DOS Batch Files Scheduled Backups
Image selected disks on this computer.		Filter list All
Create an image of the partition(s) required to backup and restore Windows.	File Name Path	Туре
Create a File and Folder backup.	My Backup xmlC\Users\Richard\Documents\Refle M Documents\Refle	ct\ Disk Image ct\ Disk Image
> Other Tasks		ct\ Disk Image
Exchange Tasks	M <u>E</u> dit s∖Refle s∖Refle s\Refle	ct\ Disk Image ct\ Disk Image
Backup Microsoft Exchange	M	ct Disk Image ct Disk Image
SQL Server Tasks	Validate	et obkindge
Backup SQL Databases		2rompt
Continuous Backup	Imag 🕒 Schedule	Eull
Continuous Backup	📠 🛜 Generate a <u>V</u> BScript File 🧧	Differential
Manage SQL Logins	Generate an MS-DOS Batch File	ncremental kup xml
	Generate a PowerShell Script File	
Details	Create a Desktop Shortcut	

For more information see Differential and incremental disk images.

Backing up files and folders

Creating full, differential, and incremental backups of specific files or folders can optimize backup speed and disk space requirements. The wizard can be accessed from the **Backup** task bar.

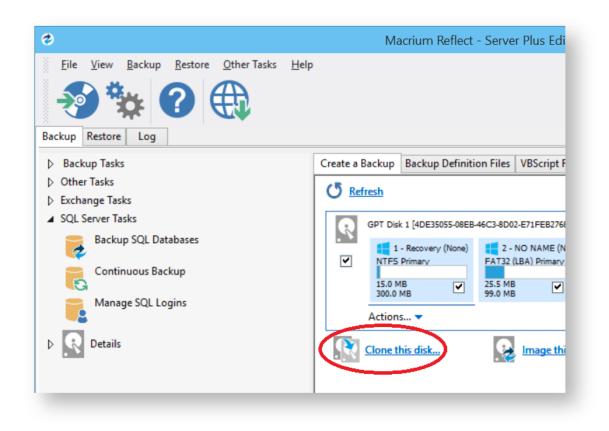


For more information see Backing up files and folders.

Cloning disks

Cloning is particularly useful if you are upgrading to a new, larger hard drive or if you need to quickly swap failed disks out of your system.

Select the the disk or partition you require from the Create a Backup screen and click Clone this disk.

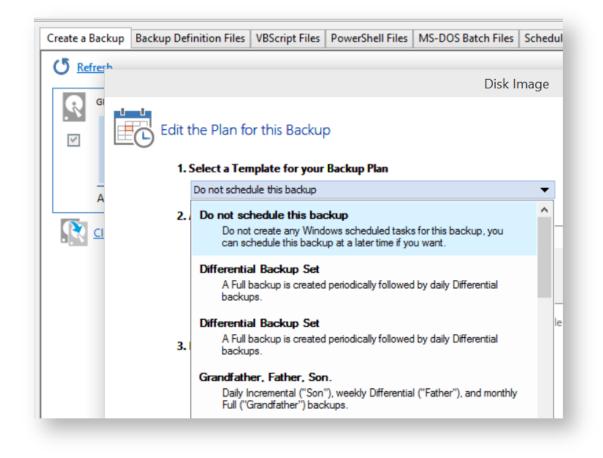


For more information see Cloning a disk.

Scheduling, retention and disk space

Whenever you create a backup, regardless of type you have the option to create a backup plan using the scheduling and retention wizard.

Click below **Select a Template for you Backup Plan** to select from industry best practice backup plans templates, quick-start backup plan templates or even templates that you have created. You can even skip over scheduling to simply take advantage of the retention rules for managing your disk space.



You can then customize the plan to suit your needs.

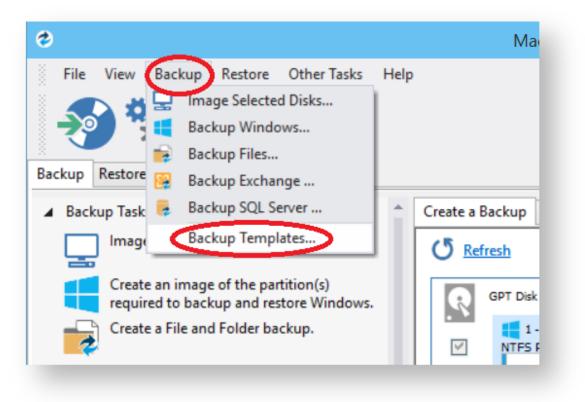
You can view, edit, cancel or run scheduled backups from the Scheduled Backups screen.

0	Macrium Reflect - Server Plus Edition [UEFI]	_ 🗆 🗡
Eile View Backup Restore Other Tasks Help		
▲ Backup Tasks	Create a Backup Backup Definition Files VBScript Files PowerShell Files MS-DOS Batch Files Scheduled Backups	>
Create an image of the partition(s) required to backup and restore Windows.	Name Schedule Next Run Time Last Run Time Status Last Result	User Account
Create a File and Folder backup.	Image - my Full At 18:00 every M 26/01/2015 18:00 19/01/2015 18:00 Ready 0x00 Successful	WIN-71VI3IRNFO
 Other Tasks Exchange Tasks 	Incremen At 18:00 every Tu 20/01/2015 18:00 16/01/2015 18:00 Ready 0x00 Successful Incremen Run at system sta Never Never Not yet run	WIN-71VI3IRNFO WIN-71VI3IRNFO
Backup Microsoft Exchange		
Backup SQL Databases	Referenced File - My Backup.xml	
Continuous Backup	Image Options XML View	
Manage SQL Logins	Imaging Summary - Run a full backup at 18:00 every mon of every week, starting 30/12/2014	^
Details	Backup Definition File: C-\Users\Richard\Documents\Reflect\My Backup xml N Auto Venfy: N Medium Password: N Intelligent Copy: Y Power Saving: N Total Selected: 15.0 MB	
	Retention Roles	~

Backup plan templates

Macrium Reflect includes templates for automating industry best practice backup plans that help you maximize retention for your available storage space. These can be accessed and modified, or you can create your own backup templates.

To manage backup plan templates click Backup and select Backup Templates... .



For more information about using backup templates see Scheduling backups.

For more information about retaining backups and backup plans see Retention and consolidation.

Restoring files and folders

To directly restore the contents of a file and folder backup use the Macrium Reflect file and folder restore feature.

👌 Macrium Reflect - Server Plus Edition [UEFI] – 🗆 🗙					
Eile View Backup Restore Other Tasks Help					
Restore Tasks Restore Tasks	Image Restore File and Folder Restore Microsoft Exchange Restore SQL Server Restore				
Browse for an image or backup file to restore	Browse for a backup file 🕐 Refresh 🛛 📷 Folders to search				
Open an image or backup file in Windows Explorer	Search backup files				
Detach a backup image from Windows explorer	Enter all or part of the file name. Separate multiple file names with a ';'	○ All files in view			
> Other Tasks	Modified	Selected file			
▷ Details	● All dates ○ Dates between: 20/01/2015 ✓ to 20/01/2015 ✓	Search			
	Sort by V Backup Date Location File Name	C Browse for a backup file			

For more information see Restoring a file and folder backup.

Restoring images

Select the Restore task bar, choose the image you want to restore and click Restore Image.

٢	Macrium Reflect - Server Plus Edition [UEFI] - 🗖	×
File View Backup Restore Other Tasks Help		
▲ Restore Tasks	Image Restore File and Folder Restore Microsoft Exchange Restore SQL Server Restore	
Browse for an image or backup file to restore	Browse for an image file 🕐 Refresh 🛛 🙀 Folders to search	
Open an image or backup file in Windows	GPT Disk 1 [4DE35055-08EB-46C3-8D02-E71FEB27680D] - Maft Virtual Disk 1.0 <39.99 GB>	
Explorer Detach a backup image from Windows explorer	1 - Recovery (None) NTFS Primary	
Other Tasks	11.0 MB 300.0 MB 99.0 MB 128.0 MB 39.04 GB 450.0 MB	
Details		
ID: 5874C256E2FE2DD7 Type: Incremental	Sort by 🕹 Backup Date Location File Name Images that contain drive: All Drives V	
Date: 20/01/2015 18:00	S874C256E2FE2DD7-01-01.mring Folder: C\Users\Richard\Documents\ Type: Incremental Incremental Date: 20/01/2015 18:00 Image ID: Image ID: S874C256E2FE2DD7	^
	5874C256E2FE2DD7-00-00.mrimg Folder: C\Users\Richard\Documents\ Type: Full Date: 19/01/2015 18:00 Image ID: 5874C256E2FE2DD7	
	287F697C3165B6FA-04-04.mrimg Folde: C:\Users\Richard\Documents\ Type: Incremental Date: 16/01/2015 18:00	*

For more information see Restoring an image from within Windows.

Note: If you are unable to boot Windows you can still restore an image by booting from the Macrium Reflect rescue media and using the temporary Macrium Reflect to find and restore images.

ReDeploying computers

Macrium ReDeploy is included in the Server editions of Macrium Reflect. With ReDeploy you can restore an image to a replacement computer or even create various types of virtual hard drives to virtualize the machine, a technique sometimes called Physical to Virtual or P2V. ReDeploy modifys an existing offline operating system to work with new hardware.

- Restore your system image to the PC being deployed before running ReDeploy.
 Note: There is no need to reboot your PC after restoring an Image and before you run ReDeploy.
- 2. Boot the target PC with the Windows PE rescue CD or USB equivalent. There is a link to a video on creating a Windows PE rescue CD at the bottom of this page.
- 3. On the Restore task pane, click ReDeploy Restored Image to new hardware.

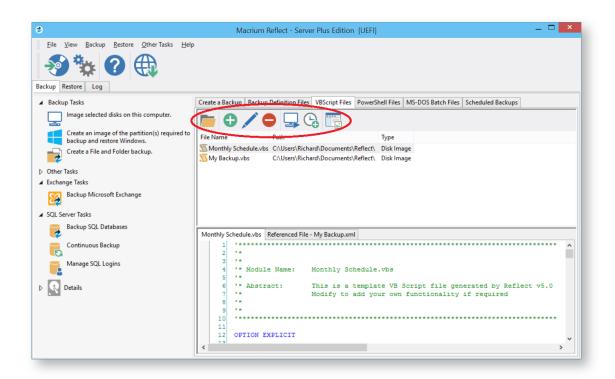
For more information see Re-deploying Windows to new hardware using Macrium ReDeploy.

Scripting backup processes

VBScripts, Powershell and MS-DOS batch file tabs are available when you select the Backup task bar.

0	Macrium Reflect - Server Plus Edition (UEFI) 🛛 🗕 🗖 🗙
<u>F</u> ile <u>V</u> iew <u>B</u> ackup <u>R</u> estore <u>O</u> ther Tasks <u>H</u> elp	
Backup Restore Log	
Backup Tasks	Create a Backup Backup Definition File: VBScript Files PowerShell Files MS-DOS Batch Files Scheduled Backups
Image selected disks on this computer.	
Create an image of the partition(s) required to backup and restore Windows.	File Name Path Type
Create a File and Folder backup.	Monthly Schedule.vbs C1\Users\Richard\Documents\Reflect\ Disk Image My Backup.vbs C1\Users\Richard\Documents\Reflect\ Disk Image
Other Tasks	
Exchange Tasks	
Backup Microsoft Exchange	
▲ SQL Server Tasks	
Backup SQL Databases	Monthly Schedule.vbs Referenced File - My Backup.xml
Continuous Backup	1 '**
Manage SQL Logins	3 '* 4 '* Module Name: Monthly Schedule.vbs
Details	5 '* Abstract: This is a template VB Script file generated by Reflect v5.0 7 '* Modify to add your own functionality if required 8 '* 9 '*
	<pre> OPTION EXPLICIT ·</pre>

In each tab you can manage files, run or schedule them to run later. You can even create a desktop shortcut for convenience.



Managing Macrium files in Windows

Wherever you browse for files in Windows programs or Windows Explorer, you can find Macrium Reflect functions by right-clicking on drives or Macrium files. If you have file extensions showing, Macrium files have the extensions . mring for images or .mrbak for file and folder backups. Otherwise, you can look for the icons.

With Macrium Reflect installed, directly from Windows you can:

- Image drives
- Run Macrium XML definition files
- Mount and unmount images for browsing
- View file Macrium properties in the file properties dialog
- See comments in Windows Explorer columns
- See a popup summary of the file contents by hovering the mouse pointer

Note though, the best way to view backup sets is in the Macrium Reflect interface itself where it can automatically collate the multiple files involved in incremental and differential backups and you can manage them as a set.

Windows Explorer shell integration

Macrium Reflect is integrated with Windows Explorer giving you the following features:

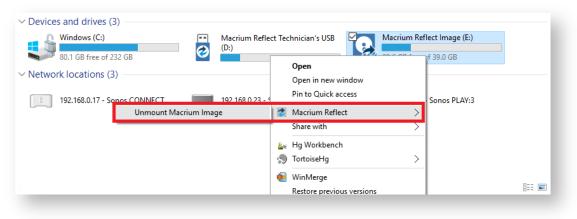
- Context sensitive menus
- Windows Explorer columns
- .mrimg and .mrbak file properties
- File Infotips
- Extended support for Reflect XML definition files

Context sensitive menus

Right-click on Reflect .mrimg and .mrbak files to Explore or Restore an image.

vista64-00-00.mrimg	Explore image
😡 vista64-02-02.mrimg	Restore
😡 vista64-03-03.mrimg	Open with
😡 vista64-04-04.mrimg	·

You can then right click on the disk to unmount the image



You can also image individual drives by **selecting the drive**, **right-clicking** and selecting the **Macrium Reflect** option then **Create a Macrium Image of this partition**

Macrium Reflect Release viBoot			
Open Open in new window Pin to Quick access Manage BitLocker			
👌 Macrium Reflect	>	Create a Macrium Image of this partition	
Share with	>		
≗a Hg Workbench			

Windows Explorer columns

You can add columns in Windows Explorer to show the Backup Method and the comments stored with the backups.

Open a folder containing Macrium Reflect backup files, **right click** on any Explorer column heading and **select 'More'**:

Name ^	Da	Size All Columns to Fit
F17F931EC65EFB4E-00-00.mrimg F17F931EC65EFB4E-01-01.mrimg	02, 02, 🗸	Name Date modified
		Туре
	~	Size
		Date created
		Authors
		Tags
		Title
		More

Scroll and select 'Backup Comment' and 'Backup Method':

Auto summary	^	Move Up
Availability		Move Down
Backup Comment Backup Method		Pieve Domit
		Show
Bcc addresses		Hide
Beats-per-minute		
Billing information		
Birthday		
Bit depth		
Bit rate Broadcast date		
Business address		
Business city		
Business country/region	~	
_		
dth of selected column (in pixels):	. 0	

The columns are then added to the Explorer view:

	Name ^	Date modified	Size	Backup Comment	Backup Method
*	😡 F17F931EC65EFB4E-00-00.mrimg	02/08/2015 18:43	23,237 K	System backup before new motherboard	Full
*	😡 F17F931EC65EFB4E-01-01.mrimg	02/08/2015 18:45	105 K	After new motherboard	Differential
*					

.mrimg and .mrbak file properties

Right-click and select **Properties** to view the Macrium Reflect properties pane on image and backup files. This gives information about the file such as the backup method and time of backup as well as volumes or folders that have been backed up.

ieneral	Macrium Ref	lect	Security	Details	Acronis	Recovery	Prev	ious Ve	ersions
Summar	ry								
Backup Compre	method Time	Incr Tue Med	ge Backup emental sday, Ma' lium		2 22:00:5	1			
	partitions ba								
- Den of									
·	e: ST3500320 XP (E:), Primai	ry Par	tition, NT						
) ⊡∵Drive		ry Par HD 50 1	tition, NT LJ CR 100	-11	FS				
) ⊡∵Drive	XP (E:), Prima e: SAMSUNG H	ry Par HD 50 1	tition, NT LJ CR 100	-11	FS				
) ⊡∵Drive	XP (E:), Prima e: SAMSUNG H	ry Par HD 50 1	tition, NT LJ CR 100	-11	FS				
) ⊡ Drive	XP (E:), Primai e: SAMSUNG H New Volume (H	ry Par HD 50 1	tition, NT LJ CR 100	-11	FS				
⊡) ⊡ Drive	XP (E:), Primai e: SAMSUNG H New Volume (H	ry Par HD 50 1	tition, NT LJ CR 100	-11	FS				
⊡) ⊡ Drive	XP (E:), Primai e: SAMSUNG H New Volume (H	ry Par HD 50 1	tition, NT LJ CR 100	-11	FS		~ ~		
⊡) ⊡ Drive	XP (E:), Primai e: SAMSUNG H New Volume (H	ry Par HD 50 1	tition, NT LJ CR 100	-11	FS		~ ~		

File Infotips

Hover the mouse over a Macrium image or backup file, you can get a brief summary of the file including the file type (Image or Backup), backup method, compression level and if the file is password protected.

333BA02B4A78B6D0 333BA02B4A78B6D0)-00-00.mrima B:22	Disk Partition image	167,590,73
🔛 333BA02B4A78B6D(Macrium Reflect Im	age Backup 2:20	Disk Partition image	254,948 KB
333BA02B4A78B6D(Backup Method: Fu Compression: Medi	II 2:18	Disk Partition image	205,726 KB
333BA02B4A78B6D0 Password protected	: No 2:18	Disk Partition image	1,082,438 KB
333BA02B4A78B6D0-04-05.mrimg	24/05/2012 09:08	Disk Partition image	809,844 KB
🔛 333BA02B4A78B6D0-05-06.mrimg	25/05/2012 08:10	Disk Partition image	203,253 KB
😡 333BA02B4A78B6D01-06-07.mrimg	27/05/2012 22:19	Disk Partition image	1,006,385 KB

Extended support for Reflect XML definition files

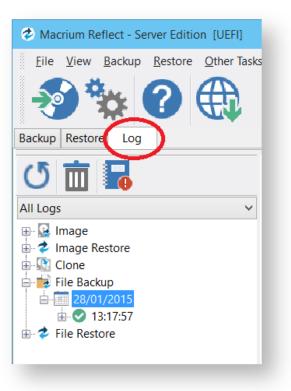
You can run full, differential and incremental backups by **right-clicking on XML definition files**. Select the Macrium Reflect option and then the backup type you wish to perform.

🕈 Quick access		Nar	me		Date modified	Туре	
📃 Desktop	*		System Back.xml		05/04/2015 21:50	XML File	
😻 Dropbox	*		Open				
🔏 Google Drive	*		Edit				
🗄 Documents	*	-	Move to Dropbox				
🕂 Downloads	*		Open with	>			
Pictures	*	2	Macrium Reflect	>	Create full back	up	
Macrium			Share with	>	Create increme	ntal backup	
Reflect					Create different	ial backup	
D 1		89	Hg Workbench	L			

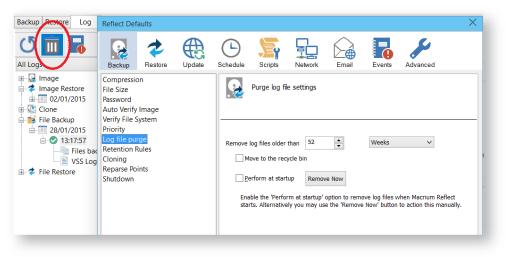
Reviewing your backup history

Macrium Reflect maintains an easy to access log of all types of backups and restores where you can review activities, purge the log files and view Windows VSS events.

1. In the main task bar click Log.



2. Clicking the **Delete old logs** icon will take you to the Log file purge settings, where you can select to remove old logs.



3. Make selection and click OK.

4. Select the activity you want to review.

<u>F</u> ile <u>V</u> iew <u>B</u> ackup <u>R</u> estore <u>O</u> t	ther Tasks <u>H</u> elp		
	D		
79 TO H			
ackup Restore Log	- •		
U 🔟 🖬		Image ID - 7AF	E0F9FF372357D
II Logs	~		Dismounting drives
iii 27/01/2015	Star	ting Restore - 02	January 2015 10:38
⊕- □ 26/01/2015 ⊕- □ 21/01/2015		Image File:	C:\Users\Richard\Documents\7AFE0F9FF372357D-03-03.mrimg
a a 20/01/2015		Image ID:	7AFE0F9FF372357D
iii 19/01/2015		Date: Time:	01 January 2015 18:00
h 16/01/2015		Image Type:	Incremental
± 13/01/2015		Source Disk:	GPT Disk 1 [4DE35055-08EB-46C3-8D02-E71FEB27680D] - Msft Virtual Disk 1.0 <
i 12/01/2015		Geometry: Destination Disk:	5221\63\512 GPT Disk 1 [4DE35055-08EB-46C3-8D02-E71FEB27680D] - Msft Virtual Disk 1.0 <
ia 🛅 09/01/2015		Verify:	N
07/01/2015		Delta:	N
⊕ 06/01/2015 ⊕ 05/01/2015		SSD Trim:	N
02/01/2015	Ope	ration 1 of 1	
01/01/2015		Restore Partition:	1 - Recovery
ii - 🛅 31/12/2014			NTFS 11.0 MB / 300.0 MB
· 30/12/2014		Drive Letter	None
· · · · · · · · · · · · · · · · · · ·		Start Sector: End Sector:	2,048 616,447
Image Restore		Partition Type:	Primary
		Loading Index:	7AFE0F9FF372357D-03-03.mrimg
- 🔝 Cione		Processing:	7AFE0F9FF372357D-00-00.mrimg
ackup ⊡ 11 28/01/2015		Processing:	7AFE0F9FF372357D-01-01.mrimg
i - ♥ 13:17:57		Processing: Processing:	7AFE0F9FF372357D-02-02.mrimg 7AFE0F9FF372357D-03-03.mrima
🗢 🏞 File Restore		rioccosing.	Restore completed successfully
		UpdateGPTMounte	dDevices - No modified GUID
	<		

5. If the activity has a VSS log, select to view VSS events, if required by clicking the **View window VSS events** icon.

Macrium Reflect - Server Edition [UEFI]		_
File View Backup Restore Other Tasks	Help	
All Logs	Backup Show events Select Range VSS Events All Events From: 28/01/2015 13:17:57 To: 28/01/2015 13:19:14 Version Version Version Information Events	Refresh Search Internet Clipboard Copy
	N Source Event ID Date P Microsoft-Windows-CAPI2 513 28/01/2015 13:18:42 P Microsoft-Windows-CAPI2 513 28/01/2015 13:17:58	Save to File Close

Removing your License key when Upgrading your PC

This article covers the procedure for removing a purchased license key from one computer so it can be transferred to another computer, such as when a computer is replaced due to upgrading your computer or so it can be restored to the same computer after a major upgrade.

Please note that a separate license key is required on each computer on which Macrium Reflect is installed. The transfer of a license key from one computer to another is only allowed for legitimate upgrade /replacement purposes.

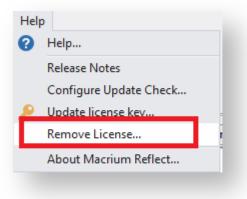
1. Make sure you have a record of your license key:

Your license key was sent by e-mail when you originally purchased. Your license key can also be found in the '**Help**' menu of Macrium Reflect by selecting 'About Macrium Reflect...'.

Lost keys can also be retrieved here:http://www.macrium.com/account/myorders.aspx

2. Remove your license key and uninstall Macrium Reflect:

Open Macrium Reflect in your old computer and making sure it is connected to the Internet, then in the ' Help' menu select 'Remove License...',



The following dialog is displayed:

0

Remove License X			
Remove your license from this computer and allow installation on a different computer.			
39-SZEU-ZC3			
This operation requires an active internet connection. Please ensure that Reflect isn't blocked by any firewall software.			
☑ Uninstall Reflect			
OK Cancel			

Ensure there is a tick against 'Uninstall Reflect' and click 'OK'.

Macrium Reflect will uninstall and your license key will be removed making it available to be used on your replacement computer or original computer after a major upgrade.

More information:

You can download installers and license keys by entering your email address here:http://www.macrium.com /account/myorders.aspx

You should create a new Windows PE rescue CD on your new hardware.

Backup Internals: What is VSS, how does it work and why do we use it?

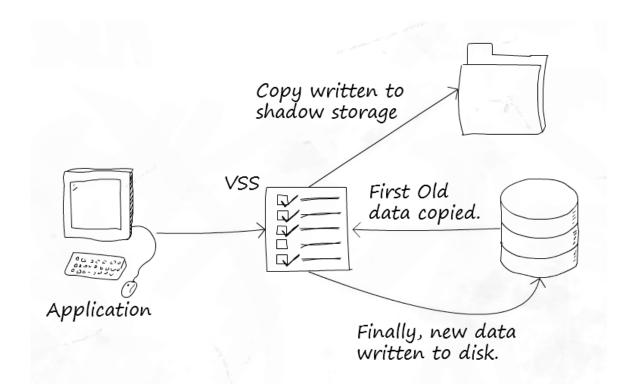
As happens sometimes, our more technically minded customers question a system that "just works". We like these sort of customers, as they keep us on our toes. In this specific case, the question was is it safe to continue using my computer during imaging and the answer is yes, although the longer explanation is much more involved. After the ensuing discussion, one of our community members suggested we write this information up as a FAQ entry somewhere and internally we felt it was worth preserving the information from that thread, so this blog post is an extended, polished version of our notes there.

Reflect can take an image of a live system. How does this work?

0 (1 : 2 (V) 0 : 2 : 2 (V) 0 : 2 : 2 : 0 : 0 : 0 : 0 : 0 : 0 : 0 :	Writes via OS.	
Application		Disk

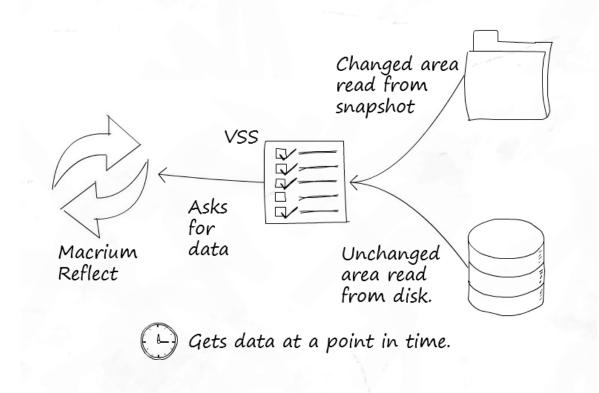
A simple disk write

Internally Macrium Reflect relies on a Microsoft Windows component called VSS, which stands for Volume Shadow Storage. Microsoft's VSS operates by taking what is called a copy on write snapshot of your system. This allocates a small temporary storage space. Then, every time you write to a part of your disk, the information on the disk is first copied to the snapshot before allowing the write to take place.



VSS in use

This technique makes VSS quite efficient. A snapshot only contains as much data as has changed since the snapshot started – you do not need an entire copy of your disk. Also, writes are only affected for used space – free space does not need to copy anything, as there is no original to preserve.



Reading data

However there is another side to this advantage. The more writes made after the snapshot springs into existence, the more VSS must store. So if you perform an excessive amount of disk activity during imaging, the snapshot storage space may become large. VSS imposes a cap on this space, and should a snapshot attempt to exceed it, VSS will stop its copy on write behaviour and delete the temporary storage.

Once the snapshot is finished with, the space can be freed up again – so the temporary storage space is only needed during use.

What determines where this storage space is?

There is no magic to this – VSS chooses sensible defaults based on your available drives. This configuration can of course be altered and Microsoft provide a tool for this called VSSAdmin.

Is the data taken at a point in time really consistent?

This is a difficult question to which there is no straightforward answer. As you may have realized already, if a copy is in progress when the snapshot starts, only the completed part of the copy will be included in the snapshot. The rest of it will count as new writes and the old, inconsistent blocks will be copied to the snapshot!

To understand how VSS gets around this we need to understand a little more about VSS architecture so I'll introduce three terms:

- Provider: in VSS land, a provider provides the VSS service and is responsible for all the co-ordination elements. Essentially this is the "core" of VSS. Microsoft include a VSS Provider with Windows, and Reflect uses this. (Technically speaking, there are two components, the co-ordinator and the provider, however, for simplicity we have combined these for the purposes of explaining VSS.)
- **Requester**: a requester is, as you might expect from the name, an application that requests a snapshot to be made. This request goes to the provider.
- Writers: these components provide a mechanism for applications to be alerted to the creation of a snapshot, so they can prepare their data for snapshotting. VSS providers can notify VSS writers that a snapshot has been created, and the VSS writer can then perform the appropriate action. Once the snapshot has been taken, the provider again notifies the writers, so they may let the applications resume.

VSS Writers are an important part of VSS for certain environments. Imagine you are running a heavily loaded database server in production, or a virtual machine cluster. The database server will have open and be manipulating its database files, processing transactions etc. while the VMs are continually performing disk operations for the virtualised OS. Taking a point-in-time snapshot might be fine but, due to the amount of IO, it is likely to catch one or more of these services off guard in an inconsistent state.

The role of writers is to inform these applications a snapshot is about to be created. The application can then perform any tidy up operations necessary to ensure what is on disk is consistent. The snapshot starts and the applications are then notified they can continue. Now the on disk state should be fine.

When do I need to check my applications are VSS aware? I.e. when do I need VSS writers?

You need VSS writers for applications that perform large amounts of IO and depend heavily on the state of the files they are writing if you wish to back them up. Virtual machine disk images are a perfect candidate for this – the running image could easily become inconsistent.

Most applications do not write to disk in quantities of data large enough to be a problem. Many applications from Microsoft are also VSS aware, which helps greatly.

What about current and previous snapshots?

VSS is smart enough to keep track of its temporary storage location, and will exclude anything in it, including the current temporary storage area and any persistent snapshots that have been previously created. So when the data is read by your backup software, you only get what you need.

When is VSS in use and when is it not with regards to taking a backup?

Now a question you may not have thought of – when is VSS in use? Well, VSS solves the problem of imaging a live system neatly, so whenever you image your system with Reflect you are probably using VSS.

There is one exception to this – we have a fall-back mechanism for live versions of 32-bit Windows client operating systems up to Windows 7 (so XP, Vista and 7) called pssnap.sys. Reflect can use this on these systems if VSS is unavailable. pssnap provides the same copy-on-write technique as VSS, but with fewer extra features (pssnap.sys is not a VSS provider and is independent from VSS). Why have both systems? Well, VSS is a core component of Windows and available on every edition of Windows greater than XP SP2. We know it will be there as Microsoft are committed to this feature and it makes sense to use it as it is highly reliable. Before VSS we had no such mechanism so we built our own. It is equally as reliable but we felt the feature additions of VSS and the support for writers for enterprise scenarios really meant VSS made sense.

However in the rescue environment we do not use, or need to use, either pssnap.sys or VSS. Why? Because the system is not in use so the data should be perfectly consistent at all times. Of course we may well end up including persistent snapshots if they exist because without VSS they are not excluded.

You keep saying VSS is a Windows feature, yet only Reflect uses it...

Actually, that's not true. Windows itself uses VSS for system restore points! These system restore points are the persistent snapshots that might exist in your shadow storage.

That's it. If you'd like to read about VSS directly from Microsoft, you can read their article on TechNet.

Macrium Rapid Delta Clone (RDC)

As with Rapid Delta Restore (RDR) the concept of RDR has been something that has been thought about for quite some time here at Macrium Software. We wanted to build a clone solution that would effectively and rapidly copy only the differences between the source and target file systems. The advantage of this is obvious, RDC offers similar a performance increase as an Incremental disk image offers over a Full image and enables regular clones to be a viable and fast DR solution.

How does it work?

The NTFS file system resident on the clone source is compared with file system on the target disk. The two file systems are first verified that they originated from the same format command and then the target NTFS file system structures are analyzed for differences. All the NTFS file system structures are copied to the target disk and any that do not exist or have been modified on the target disk cause the data records for each NTFS file or object to be copied as well. The result is an 'Incremental' clone applying only file system changes detected between the source and the target.

Note: RDC works with NTFS file systems only. All other file systems will perform a full clone

Note: RDC is not available when shrinking partitions during a clone.

Rapid Delta Restore - RDR

Macrium Rapid Delta Restore (RDR)

The concept of RDR has been something that has been thought about for quite some time here at Macrium Software. We were aware of competing technologies that offer fast restore capabilities but wanted to build something better...

Known state restore

This method performs a restore of an incremental image to a file system at a **known state**. The problem with this method is that the the 'know state' must be prepared before hand and the target disk cannot be accessed before the final 'rapid' restore. This means that the target disk for the restore cannot be the original 'live' disk and a previous restore of the same backup set must have been performed beforehand and the disk taken offline. Not very flexible.

Snapshot restore

Another method is to rely on an open Microsoft Volume Shadow copy Service (VSS) snapshot and use this to restore back to the state when the snapshot was created. Very quick, but only allows restoration **back to the same disk** and the **image must have been created with VSS**. Again, not flexible enough for real world DR.

Macrium RDR

Where Macrium RDR differs is that it isn't dependent on VSS and a delta restore can be perform to **any disk** that has a previous copy of the imaged file system, **no matter what it's current state.** This means that you can restore quickly back to the original disk (similar to the Open Snapshot) method, **and** have the flexibility to restore to a different disk that contains the same file system on it in any state.

How does RDR work?

Unlike 'Known State' and 'Snapshot' restore, the only dependency for RDR is that the target file system contains a formatted NTFS file system that is the same file system as was originally imaged. When the restore starts the disk image is loaded, again this can be an image taken at any time, and the target NTFS file system structures are analyzed for differences. All the NTFS file system structures are restored to the target disk and any that do not exist or have been modified on the target disk cause the data records for each NTFS file or object to be restored as well. The result is an 'Incremental' restore applying only file system changes detected between the image and the target.

Note: RDR works with NTFS file systems only. All other file systems will perform a full restore

Note: RDR is not available when shrinking partitions during a restore.

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Backup, imaging and cloning

Macrium Reflect creates File and Folder backups as well as disk images including cloning complete disks. The Macrium Reflect Server Plus for Exchange and SQL version adds MS Exchange and MS SQL Server backup capabilities to this.

A File and Folder backup is a useful way to backup your working files, personal files and precious data. Unlike other backup solutions Macrium Reflect can backup open and locked files by using Microsoft Volume Shadow copy Service (VSS). You can backup your *Documents* folder and save the backup configuration as an XML file for easy rerunning and scheduling.

A Disk Image stores the information required to completely restore disks (or their individual partitions) exactly as they were when the image was taken.

Cloning with Macrium Reflect creates an exact copy of partitions to a different drive. For example, Upgrading to a larger hard drive or moving from a large magnetic hard disk to a smaller and faster SSD. When you Clone a hard drive, you can boot from the target disk on the same system after cloning.

Important

Windows cannot boot from a USB connected drive. This is a restriction imposed by Windows. If you clone your system disk to a USB connected external drive then, to boot your clone, the physical disk must be removed from the USB caddy and attached to your Motherboard SATA port.

- Creating a backup image of your computer, drive or partitions
- Manually running a job from a configured XML backup definition
- How backup sets are created and maintained
- Backing up files and folders
- Cloning a disk
- Backing up Microsoft Exchange databases
- Backing up MS SQL Databases
- Creating a disk image of a single drive or partition
- Differential and incremental disk images
- Creating desktop shortcuts for full, incremental and differential backups
- Checking VSS events when backups fail
- Alternative Locations For Backups
- Advanced Options
- Verifying image and backup files
- How to backup Hyper-V Cluster Shared Volumes

Creating a backup image of your computer, drive or partitions

Using Microsoft Volume Shadow Copy Service (**VSS**) Macrium Reflect creates 'point-in-time' persistent images of your system. In Addition to creating backups of all partitions required to backup and restore Windows, you can backup all or selected drives and partitions on the PC.

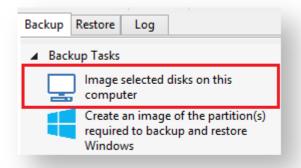
- Starting the Image Wizard
- Setting the Image destination
- Adding and Editing the Backup Plan
- Displaying the Image settings
- Saving the backup definition
- Best practises for saving Macrium Reflect backup definition files
- What's the problem?
- Create a Disk Image video

Starting the Image Wizard

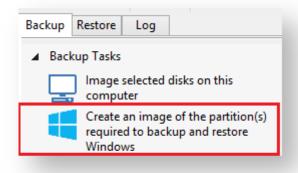
The Image Wizard can be started in multiple ways...

1. By selecting 'Image selected disks on this computer'.

Using this option will populate the Image Wizard with all selected disks and partitions in the application main Window.



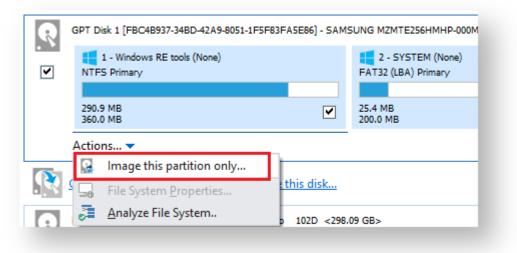
 By selecting 'Create an image of the partition(s) required to backup and restore Windows'. Using this option will choose all the partitions required to boot Windows. This may include hidden system partitions that are essential for Windows to start and run. See: Windows Partitions



3. By Selecting a disk in the application main Window and click 'Image this disk...'.

R	GPT Disk 1 [FBC4B937-348	3D-42A9-8051-1F5F83FA5E86] - SAM	SUNG MZMTE256HMHP-000M
	1 - Windows RE tool NTFS Primary	s (None)	2 - SYSTEM (None) FAT32 (LBA) Primary
	290.9 MB 360.0 MB	V	25.4 MB 200.0 MB
	Actions 🔻		
	Clone this disk	🧕 Image this disk	

4. By Selecting a disk in the application main Window, click on a partition, then click 'Actions' and select 'Image this partition only...'



Setting the Image destination

The first page of the Image Wizard shows the selected disks and partitions to be included in your Image and allows you to choose a destination.

	Disk Image									
Source	Select Source Drive(s) and Image Destination									
	GPT Disk 1 (F	BC4B937-34BI	D-42A9-8051-1F5	F83FA5E8	6] - SAMSUNG MZMTE2	56HMHP-000MV EXT41M0Q	<238.47 GB	>		
V	1 - Win NTFS Prim 290.9 MB 360.0 MB	dows RE tool ary	2 - SYSTE FAT32 (LBA) P 25.4 MB 200.0 MB		3 - (None) Unformatted Primary	4 - Windows (C:) NTFS Primary 107.67 GB 232.72 GB		5 - Recovery NTFS Primary 4.72 GB 5.08 GB	/ image (None	
Total Sele	ion	4.72 GB	n Backup\			×				
CD/DV	Folder E: \Macrium Backup\ v Alternative locations CD/DVD Burner									
Backup	Image ID as the file name. (Recommended) Backup filename: {IMAGEID} Image ID as the file name. (Recommended) E: Wacrium Backup \{IMAGEID}-00-00.mrimg									
†부† <u>Adv</u>	vanced Opt	<u>ions</u>			Help	< Back	Next >	Cancel	Finish .::	

1. In the **Destination** section, enter the target backup folder.

You can type the destination path or click the browse button to choose a folder. The destination path can be on a local drive or network share.

Alternative Locations can be used to provide backup rotations or as a fail safe for temporary unavailability of the primary backup destination.

Note: You cannot enter a path that is located in any of the partitions included in the Image.

The recommended name for your Image file is the unique backup set identifier {{**ImageID**}}. We recommend that you always use this recommended setting as choosing your own name can cause file name collisions. Please see How backup sets are created and maintained for more information on backup file naming.

Click 'Next'. to edit the Backup Plan for this image or click 'Finish' to save and/or run the Image now.

Adding and Editing the Backup Plan

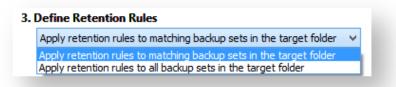
The second page of the Image Wizard is where you create or edit your 'Backup Plan'. This defines the backup schedules and retention rules for your backup.

1. Select a Templat	te for your i	васкир rian
2. Add/Edit Schedu	ıles	
Backup Type	Sche	edule
Add Schee		Edit Schedule
3. Define Retentio	n Rules ules to matchi	ing backup sets in the target folder ∨
3. Define Retentio	n Rules	
Define Retentio Apply retention re Full	n Rules ules to matchi Keep	ing backup sets in the target folder ∨ 12 → Backups ∨
Define Retention Apply retention re Full Differential	n Rules ules to matchi Keep Keep	ing backup sets in the target folder ∨ 12 → 4 → Backups ∨ Hackups ∨

The new Macrium Reflect retention rules provide a powerful and flexible way to manage the lifetime and storage space used by your backups.

Choose how backups are matched and retention rules are applied to the target folder

Retention rules are applied to the target folder of the backup by selecting one of two options:



1. Apply retention rules to matching backup sets in the target folder.

Disk Images are purged if they contain **exactly the same Partitions** as the current Image. Partitions are identified using the unique **Disk ID** stored in sector 0 of the disk and the **Partition sector offset**.

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Note: For GPT disks the unique GPT disk GUID is used instead of the Disk ID

For **File and Folder** backups retention rules are applied according to the '**Backup Set Matching'** option select in the '**Advanced Properties'** for this backup.

2. **Apply retention rules to all backup sets in the target folder.** All backup sets in the target folder of the same type (Disk Image or File and Folder) are purged according the retention rules.

Note: This option uses the same logic as Macrium Reflect v5

Select the age or number of backup types that you wish to keep

0

✓ Full	Кеер	12 📮 Backups 🗸
✓ Differential	Кеер	4 ▲ Backups ∨
✓ Incremental	Кеер	10 🛋 Backups 🗸
		Create a Synthetic Full if possible
Run the purge	before back	up.
✓ Delete the olde	st backup s	et(s) if less than 5 🚔 GB on the target volume (minimum 1GB)

Option	Description
Full	When deleting Full backups all linked incremental and Differential backups in the same backup chain (set) are also deleted This operation will delete the entire backup set.
Differential	When deleting Differential backups all linked incremental backups in the same backup chain (set) are also deleted.
Incremental	When deleting Incremental backups the integrity of the backup set is maintained by ensuring that the chain is never broken. This is achieved by merging older Incremental backups when required.
	In the example below, before retention, there is 1 Full backup , 1 Differential backup and 6 Incremental backups. The retention rules are set to retain 4 incremental backups. After retention, the most recent 4 incremental backups are retained. Deleting the oldest 2 incrementals would cause the backup chain to be invalid as the oldest retained incremental requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backups are consolidated with it to create a new incremental backup.
	F = Full D = Differential I = Incremental

Option	Description																
	м	т	w	т	F			м	т	W	т	F			м	т	W
	F							D	I	I	I	I			F	I	I
										->	I						
	-			ackuj	p . Thi	s is a	also	o knov	wn as	Increme	ental	Forev			d forv		
possible			ruii b	ackuj	p . Thi	s is a	alsc	o knov	wn as		ental	Forev					
Run the purge before the		t this No t	optior te: in culatic	n to ru Macriu on whe	n the um Ro en pu	rete eflec rging	entio ct v5 g be	on rule 5 the c	es befo curren the cu		urren) set v :kup.	t back vasn't In v6 t	er. up. inclu	udeo	d in th	ne pur ackup	set IS
possible Run the purge before the backup	Selec	t this No cald incl	optior te: in culatic luded.	n to ru Macriu on whe This	n the um Re en pu mean	reter eflec rging	entio et v5 g be at if	on rule 5 the c efore t you s	es befo curren he cu set the	Increme ore the c It backup rrent bac	urren set v kup.	t back vasn't In v6 t	er. up. inclu	udeo	d in th	ne pur ackup	set IS
Run the purge before the	Selec	t this No cal incl bac	optior te: in culatic luded. ckups	n to ru Macrii on whe This will be	n the um Ro en pu mean e dele the ol	reter rging s that ted a	ntio ct v5 g be at if and	on rule of the of fore t you s a ne	es befo curren the cu set the w Full	Increme ore the c It backup rrent bac e retentio	urren set v kup. n cou create	t back vasn't In v6 t int to r ed.	er. up. inclu the c 1 Ful	udeo curre	d in th ent ba ckup	ne pur ackup then	set I S all of

Click 'Next'. to view a summary of all settings for this image or click 'Finish' to save and/or run the Image now.

Displaying the Image settings

The final page of the Image Wizard displays all settings used for creating this image.

Imaging	Summary		^
*	Auto Verify: Maximum File Size: Compression: Password: Intelligent Copy: Power Saving: Total Selected:	N Automatic Medium N Y N 4.72 GB	
Schedu	les	None	
Retentio	on Rules	Rules will be applied to all matching backup sets in the destination folder	
	Full:	Retain 12 full images Linked incremental and differential images will also be deleted	
	Differential:	Retain 4 differential images Linked incremental images will also be deleted	
	Incremental:	Retain 10 incremental images The oldest incremental images may be consolidated	1
		Purge will be run after the image.	
	Free space threshold:	Delete oldest backup sets when free space is less than 5.00 GB	
Destina	tion: File Name:	E:\Macrium Backup\{IMAGEID}-00-00.mrimg	~
14	anced Options	Help < Back Next > Cancel Finish	

Click Finish to Run and/or save your Image definition.

Saving the backup definition

You are now given the opportunity to save the backup options.

The backup Save Options Dialog enables you to save your backup options as a re-usable XML definition file.

This is essential for many operations in Reflect including Scheduling and creating Incremental and Differential backups

Backup Save Options
What do you want to do now?
Run this backup now
Save backup and schedules as an XML Backup Definition File You can run this backup at any time by double clicking the saved XML file.
Enter a name for this backup definition.
System Image
C:\System Image.xml
Help OK Cancel

Option	Description
Run this backup now	Create a 'Full' backup now using the backup definition
Save to an XML file	 Saving your definition enables you to: Re-run the same backup without stepping through the wizard Run Incremental and Differential backups Schedule your backups Create a Desktop shortcut for running with one click
Name for this backup definition	Enter a meaningful name for this definition
	Choose a folder to save the XML definition to. Always save to a local folder. It isn't necessary to save the definition to the same folder as your backup target Note: Always save your definition to a local drive and never to a password protected network share.

See also: Manually running a job from a configured XML backup definition

Best practises for saving Macrium Reflect backup definition files

Regardless of your PC environment, leaving your backup definition files in an insecure location is bad practice. The effort required to ensure your files are secure is minimal and doesn't impede day to day usage of Macrium Reflect.

What's the problem?

Backup definition (.xml) files are used to initiate backups either interactively by using Macrium Reflect directly, or as scheduled tasks using the Windows Tasks Scheduler. If you save your backup definitions to a publicly accessible folder then these can be edited by standard users and could potentially compromise your system. In addition, it's also possible to create batch files, either MS-DOS, PowerShell or VBScript, to automatically run during your backups as described here. A restricted user with bad intentions could easily create a batch file to run with elevated privileges when a scheduled or interactive backup runs.

The default, and recommended, location for your backup definitions is folder 'C:\users\<USER NAME>\documents\reflect'. When running Reflect for the first time this location is created and defaulted when saving. See Backup Save Options for more information on how to save your definitions.

This folder is automatically restricted for standard users and can only be accessed by Administrators and the local SYSTEM account.

To see assigned NTFS permissions right click on any folder, select 'Properties' and click the 'Security' tab:

		-				
General	Sharing	Security	Previous Versi	ons	Customize	
Object	name: (:\Users\D	ev\Documents'	Refle	ct	
Group of	or user nan	nes:				
🚨 Sì	/STEM					
🙎 De	ev (WIN10	VM-5\Dev)			
SE Ac	Iministrator	s (WIN10V	/M-5\Administra	tors)		
To cha	nge permis	sions, click	Edit		E la	
	igo pointe				Edit	
Permiss	ions for S	YSTEM		Allow	Deny	,
Full o	ontrol			\checkmark		^
Modi	fy			\checkmark		
Read	d & execut	e		\checkmark		
List f	older conte	ents		\checkmark		
Read	ł			\checkmark		
Write	;			\checkmark		×
		sions or ad	vanced settings	s,	Advanced	d
For spe click Ad	wanceu.					
	wanceu.					
	ivanceu.					

In the above example only SYSTEM, Dev (the Macrium Reflect user) and the Administrators group can access files contained in the folder. Standard users are denied access and cannot modify or create files.

We strongly recommend that, if not using the default location. you ensure that NTFS permissions are used to prevent unauthorised modification and creation of files in your backup definition folders.

For more information on setting NTFS permissions for folders and files please see Microsoft TechNet - How IT works NTFS Permissions

Note: A popular misconception is that backup definition files should be saved to the same folder as your backup files. **This is incorrect.** Backup definitions are only required to create backups and have no other purpose. They are not required for restore.

If you want to run the backup at this point, select 'Run this backup now' and click OK.

Imagin	ng Summary		^
	Backup Definition File:	C:\Macrium\My Backup(1)xml	
- 🍲	Auto Verify:	N	
	Maximum File Size:	Automatic	
	Compression:	Medium	
	Password: Intelligent Copy:	N Y	
	Power Saving:	t N	
	Total Selected:	4.72 GB	
Destin	nation:		
	Backup Type:	Full	
	File Name:	E:\Macrium Backup\4140CC6F8C2906F0-00-00.mrimg	
Operat	tion 1 of 1		
	Hard Disk:	1	
	Drive Letter:	N/A	
	File System: Label:	NTFS	
	Label: Size:	Recovery image 5.08 GB	
	Free:	370.9 MB	
	Used:	4.72 GB	
Startin	ng Image - 11 Februar	2015 23:21:26	
	Initializing		~
verall F	Progress: 2% Tr	ansfer Rate: 267.7 Mb/s	Time remaining: 2 Minutes
urrent	Progress: 2%		Time remaining: 2 Minutes
	1 i <u>i</u>		
w iority		High Priority On completion No Shutdown V	le Cancel Pause

Create a Disk Image video

Windows Partitions

The Windows operating system requires various partitions for normal operation. This article explains which partitions are automatically selected when selecting 'Create an image of the partition(s) required to backup and restore Windows'.

Image selected disks on this computer Create an image of the partition(s) required to backup and restore Windows	▲ Back	up Tasks
required to backup and restore		-
		required to backup and restore

UEFI booting systems with GPT style disks

Introduced with Windows 8.0 and a few Windows 7 systems, GPT disks are the replacement for the legacy MBR disk format. GPT disks can have up to 128 partitions and have a maximum size of 9.4 ZB (9.4×10^{21} bytes)

Partition	Unique Identifier	Description
Windows Recovery	de94bba4- 06d1-4d40- a16a- bfd50179d6ac	There may be more than one Recovery Partitions: Windows RE Tools - Provides the 'Startup Repair' options for Windows recovery. Recovery Image - There may also be an additional manufacturer system recovery partition.
EFI System partition (ESP)	c12a7328-f81f- 11d2-ba4b- 00a0c93ec93b	Always formatted FAT32 and between 200 and 300 MB in size, this partition contains the boot loader that runs when the system starts. The critical files in here are the Boot Configuration Data (BCD) and the EFI micro-code.

https://en.wikipedia.org/wiki/GUID_Partition_Table

Partition	Unique Identifier	Description
Microsoft Reserved Partition (MSR)	e3c9e316- 0b5c-4db8- 817d- f92df00215ae	Usually 128 MB in size, this unformatted partition is reserved for MS data structures including the Logical Disk Manager (LDM) for dynamic disks. Every GPT disk initialized by Windows includes this partition.
Operating System (Windows C:)	ebd0a0a2- b9e5-4433- 87c0- 68b6b72699c7	Always formatted using NTFS, this partition contains the full Windows Operating System and is loaded using the BCD in the ESP,

0 Note: The Microsoft Reserved Partition (MSR) is not shown in the Windows Disk Management Console

Surface Pro 3 running Windows 10

Legacy MBR booting systems

MBR systems support a maximum disk size of 2TB and up to four primary partitions. In modern PC's this format has been superseded by the more flexible GPT disk format.

https://en.wikipedia.org/wiki/Master_boot_record

Partition	Description
Microsoft Reserved Partition (MSR)	For MBR disks, Windows 7 onwards, this is the 'Active' partition and contains the Boot Configuration Data (BCD). This partition provides the second stage for the MBR boot process after the MBR boot code. Windows XP and Vista do not use this partition.
Operating System (Windows C:)	This partition contains the full Windows Operating System. For Windows XP & Vista this is the 'Active' partition and is the only partition required to boot and start Windows.

Note: MBR systems may also contains proprietary system recovery partitions, however, there are no unique identifiers for these partitions and they are not automatically included.

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ndov	ws 7 MBR System			
	MBR Disk 1 [7A17827F] - Virtual HD)1.1.0 <500.00 GB>		
•	1 - System Reserved (None) NTFS Active		2 - (Ci) NTFS Primary	
	46.0 MB 100.0 MB		184.24 GB 499.90 GB	

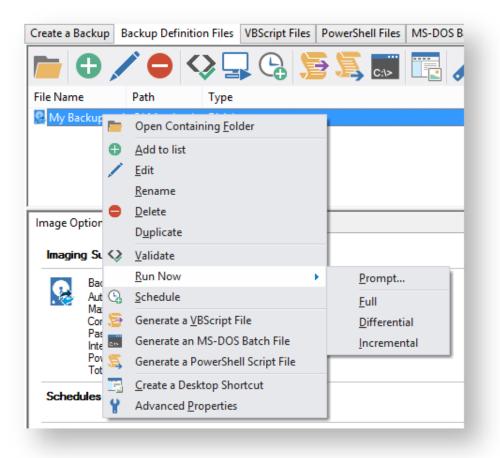
Manually running a job from a configured XML backup definition

Macrium Reflect saves backup configurations using XML. Using an XML Definition you can schedule a backup, generate a VBScript file for complex scenarios or simply create a desktop shortcut so you can instantly run your backup by clicking the shortcut icon.

1. Select Backup Definition Files, to view your saved XML backup configurations.

2	Trial - N				
File View Backup Restore Other Tasks Help					
🤧 🐎 🖓 🏀 🖊	\$				
Backup Restore Log					
▲ Backup Tasks	Create a Back p Backup Definition Files VI Script Files PowerShell Files MS-DOS Batch Files Sched				
Image selected disks on this computer	📁 🗗 🖊 🗗 🖓 🖵 🕞 🧏 🔜 🛅 🥍 Filter list All				
Create an image of the partition(s) required to backup and restore	File Name Path Type				
Windows	My Backup.xml C:\Macrium\ Disk Image				
Create a File and Folder backup					
Other Tasks					
Exchange Tasks					
SQL Server Tasks	Image Options XML View				
Details					
	Imaging Summary				

2. Right click on the XML file to view options including; run the backup, scheduling or creating a desktop shortcut.



How backup sets are created and maintained

This article explains how Full, Incremental and Differential images and backups are saved to the target folder specified in your backup definition file. Also, which backup set is chosen when you run a Differential or Incremental.

For information on how to create Incremental or Differential backups please see here: Differential and incremental disk images

How do I specify the backup target folder?

For disk images this is specified in the first page of the backup wizard:

s s	elect Sc	ource Driv	ve(s) and Ir	nage D	estination	1				
urce GP	PT Disk 1 [F	BC4B937-34BE	0-42A9-8051-1F5	F83FA5E8	6] - SAMSUNG	MZMTE2	56HMHP-000MV EXT41M0Q	<238.47 GB:	, ,	
•	1 - Win NTFS Prima	dows RE tool Iry	2 - SYSTE FAT32 (LBA) F		3 - (Non Unformatted		4 - Windows (C:) NTFS Primary		5 - Recover NTFS Primary	y image (None
	290.9 MB 360.0 MB	~	25.4 MB 200.0 MB	~	128.0 MB 128.0 MB	•	108.05 GB 232.72 GB	~	4.72 GB 5.08 GB	~
Folder	ì		hare\backups				v			
CD/DVD	Burner	Alternativ	elocations				~			
	ename:	Use the	Image ID as t }	he file nar	ne. (Recomm	ended)				
Backup file		Sa llas	er \share \backu	ps\{IMAG	EID}-00-00.m	rimg				
Backup file		🧏 \\serve					NG STORAG	0.1		

Similarly, for File and Folder backups, this is also on the first page of the backup wizard.

What is a backup set?

Backups are grouped into 'Sets'. A backup set contains first a Full backup and subsequent linked incremental and differential backups. This is sometimes referred to as a Backup Chain. You can see the links by looking at the default file name which is a unique backup set identifier, followed by a number pair:

Name	Date modified	Backup Method	Туре
🛃 A7D5FDD036A7B90B-00-00.mrimg	30/01/2013 23:26	Full	Disk Partition image
🛃 8AFF20FD7F2BFD9C-00-00.mrimg	29/01/2013 23:26	Full	Disk Partition image
🛃 4F6F6CACA58B077D-04-04.mrimg	28/01/2013 23:27	Incremental	Disk Partition image
🚱 4F6F6CACA58B077D-03-03.mrimg	27/01/2013 23:27	Incremental	Disk Partition image
🛃 4F6F6CACA58B077D-02-02.mrimg	26/01/2013 23:27	Incremental	Disk Partition image
🛃 4F6F6CACA58B077D-01-01.mrimg	25/01/2013 23:26	Incremental	Disk Partition image
4F6F6CACA58B077D-00-00.mrimg	24/01/2013 23:26	Full	Disk Partition image

The above folder contents shows (marked in red) a single backup set **{4F6F6CACA58B077D}** which contains a full image and 4 increments. The end of the image file contains a number pair? **'xx-yy.mrimg'**

'xx' is the increment number.

- 00 Full image
- 01 first incremental/differential
- 02 Second incremental/differential

'yy' is the file number and is always sequential. **00**, **01**, **02**, **03**... This will be different to the increment number only if files have been split. This can happen if files larger than 4GB are saved to a FAT32 file system or you are saving an image to multiple DVDs.

So the first file for a full image always ends with '00-00.mrimg'.

Note: The Image ID, file and increment numbers are also stored as data inside the files. Renaming a file does not affect the integrity of the set, Macrium Reflects ability to append to the set, or restoration of the files.

How is a set chosen when an Incremental or Differential backup is run?

Each backup set is grouped by similar backup types. This means that a single set will only consist of images of ***exactly the same partitions** or a File and Folder backups of **exactly the same selection criteria**.

*Note: A change in partition layout will cause a new backup set to be created even if the drive letters are consistent. The partitions must have the same disk offset and length and must be from the same disk, i.e, the disk must have the same Disk ID.

e.g, If you run an Incremental image of only drive 'C' and the target folder contains 4 image files:

6698CD700DF88DF4-00-00.mrimg Drives: C, D, E Created 1st Jan 2015 430D57E2CEEA8552-00-00.mrimg Drive: F Created 2st Dec 2014 1EB1112ABA7C3898-00-00.mrimg Drive: C: Created 1st Nov 2014 D407A9E1BF98D822-00-00.mrimg Drive: C: Created 1st Oct 2014

Then the newly created image file will be **1EB1112ABA7C3898-01-01.mrimg**. This is because file **1EB1112ABA7C3898-00-00.mrimg** is **the most recent full image in the target folder that contains exactly the same partitions as the current Incremental image**. The next Incremental (or Differential) image would be **1EB1112ABA7C3898-02-02.mrimg** and so on...

Note: If there was no existing backup set that contained only drive 'C:' then a new backup set (full) would be created.

Doesn't this get confusing if multiple backup types are saved to the same folder?

Not if you use the **'Restore' tab** in Macrium Reflect to view your images to mount and/or restore. The Restore Tab can be restricted to show only images that contain a particular drive and also be sorted by date. So, if you want to restore drive 'C' as it was last week than you can easily find it. In fact Backup Sets are an abstraction that you don't need to worry about when restoring data, **they are only relevant to optimizing backup speed and storage space**.

nage Re	estore File and Folder Restore Microsoft Ex	change Restore SQL Server Restore	
p Br	rowse for an image file 🗴 <u>Refresh</u>	Folders to search	
R	GPT Disk 1 [FBC4B937-34BD-42A9-8051-1F5F83FA5E 1 - Windows RE tools (None) NTFS Primary	E86] - SAMSUNG MZMTE256HMHP-000MV E	238.47 GB>
	286.9 MB 360.0 MB	200.0 MB	128.0 MB
ort by	Backup Date Location File I 52C2F7FB4904BA8E-00-00.mrim Folder: E:\Macrium Backup\ Type: Full Date: 07/01/2015 23:31 Image ID: 52C2F7FB4904BA8E	<u>Name</u> Images that contain drive	All Drives V
	072D3ED34B465445-02-02.mrin Folder: E:\Macrium Backup\ Type: Differential Date: 07/01/2015 02:00	ng	

Note: If you want to organize your backup sets so they are easier to find in Windows Explorer then we recommend that you save different backup types to different folders. e.g.

D:\Backups\Images of C

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D:\Backups\Images of D D:\Backups\Images of Disk 1

Additional Information

A differential backup saves **only the changes** made since the **last full** backup of the **same type** found in the target folder for the backup.

An incremental backup saves **only the changes** made since the **last** backup of the **same type** found in the target folder for the backup.

See also:

• How to delete backup files

How to delete backup files

If you create only Full images or Full File and Folder backups then you can safely delete your .mrimg or .mrbak files using Windows Explorer. However, if you create Differential and/or Incremental backup files then we suggest that you use the functionality built into Reflect to avoid breaking backup chains. For more information please see How backup sets are created and maintained.

Select the 'Restore' tab, select either 'Image Restore' or 'File and Folder Restore', select the file you want to delete, click 'Other Actions' and select 'Delete'.

Please note that the 'Del	ete file' option will only be prese	nted for a backup set.
mage Restore File and Folder Restore Microsoft Exch	ange Restore SQL Server Restore	
MBR Disk 1 [7A17827F] - Virtual HD 1.1.0 <499,99 GB>		
Sort by V Backup Date Location File Na 9427874FB039F667-57-57.mrimg Folder \\wb\yublic\Wick\vo\Drive C \\ynth Type: Incremental Date: 11/08/2015 03:09	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Image ID: 9427874FB039F667 9427874FB039F667-56-56.mrimg Folder: \wdvbpublic\Nick\v6\Drive C Synth Type: Incremental Date: 10/08/2015 03:12 Image ID: 9424784F8039F667	etic Full\No Delta\	Browse Image

Other Actions... • Create Differential

> Create Incrementa Delete file

This opens the 'Delete files from backup set' dialog to safely delete backup files:

9427874FB039F667-55-55.mrimg Folde:: \\wb\public\Nick\v6\Drive C Synthetic Full\No Delta\ Type: Incremental Date: 09/08/2015 03:10 Image ID: 9427874FB039F667

2

Image file folder: \\wb\public\Nic	k\v6\Drive C Synthetic F	Full\No Delta\	Number of files to remove: 2	
Place checks next to the files you v	want to delete		Disk space to be reclaimed: 1.12 G	В
Filename	Туре	Created File	Size Filename	Size
]9427874FB039F667-00-00.mrimg	⊿ Full	01/08/15 84.9	1 GB 9427874FB039F667-56-56.mrimg	841.8 MB
]9427874FB039F667-48-48.mrimg	– Incremental	02/08/15 857.	2 MB 9427874FB039F667-57-57.mrimg	308.2 MB
]9427874FB039F667-49-49.mrimg	– Incremental	03/08/15 764.	5 MB	
]9427874FB039F667-50-50.mrimg	– Incremental	04/08/15 571.	3 MB	
] 9427874FB039F667-51-51.mrimg	– Incremental	05/08/15 3.0	5 GB	
]9427874FB039F667-52-52.mrimg	– Incremental	06/08/15 430.	3 MB	
]9427874FB039F667-53-53.mrimg	– Incremental	07/08/15 1.5	4 GB	
]9427874FB039F667-54-54.mrimg	– Incremental	08/08/15 1.4	3 GB	
]9427874FB039F667-55-55.mrimg	– Incremental	09/08/15 1.1	4 GB	
9427874FB039F667-56-56.mrimg	L⊿ Incremental	10/08/15 841.	BMB	
9427874FB039F667-57-57.mrimg	L Incremen	. 11/08/15 308.	2 MB	

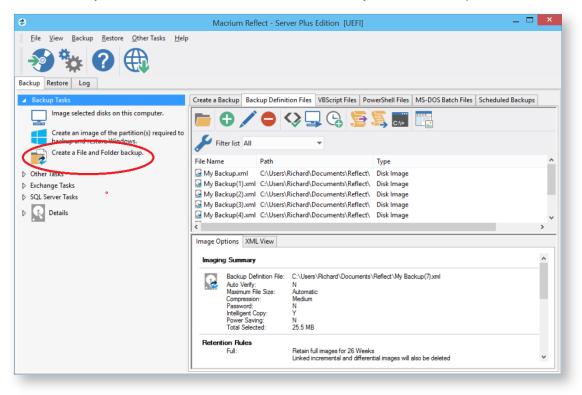
Along with the select file, any dependant files will automatically be included for deletion. In the above example Incremental image '9427874FB039F667-57-57.mmrimg' was also selected because it is dependant on the previous incremental 9427874FB039F667-56-56.mrimg.

Backing up files and folders

A file and folder backup is a useful way to backup your working files, personal files and precious data. Unlike other backup solutions Macrium Reflect can backup open and locked files by using Microsoft Volume Shadow copy Service (VSS). You can backup your Documents folder and save the backup as an XML file for easy re-running and scheduling.

To backup your Windows operating system, do not use a file and folder backup, use an image backup, see Creating a backup of your computer. A file and folder backup is not suitable for restoring your Windows operating system.

1. From the Backup task bar, select Create a File and Folder backup to start the backup wizard.



2. Select Add folder.

	File and folder backup	
📄 Add the F	Folders you want to Backup	
Source		
Backup Files ar	nd Folders	
	lete folders that you wish to backup. After adding a folder you can select sub folders ild-card filters for inclusions and exclusions.	s
Click the 'Add fo	older' link below.	
\sim		
Add folde	er 🔰 Edit folder 🗙 Delete folder	Backup NTFS permissions
~	er 🕐 Edit folder 🗙 Delete folder	Backup NTFS permissions
Destination	Edit folder X Delete folder	Backup NTFS permissions
Destination		Backup NTFS permissions
● Folder	(\wb\Public\Backups\FileAndFolder v)	Backup NTFS permissions
● Folder	\\wb\Public\Backups\FileAndFolder v Alternative locations @ (F:) - TSSTcorp, CDDVDW SH-224DB vSB01 (1:0:0) v	Backup NTFS permissions
● Folder	\\wb\Public\Backups\FileAndFolder v Alternative locations @ (F:) - TSSTcorp, CDDVDW SH-224DB vSB01 (1:0:0) v Image Up use the Image ID as the file name. (Recommended)	Backup NTFS permissions
Destination Folder	\\wb\Public\Backups\FileAndFolder v Alternative locations @ (F:) - TSSTcorp, CDDVDW SH-224DB vSB01 (1:0:0) v	Backup NTFS permissions
Destination Folder CD/DVD Burner	\\wb\Public\Backups\FileAndFolder v Alternative locations @ (F:) - TSSTcorp, CDDVDW SH-224DB vSB01 (1:0:0) v Image Up use the Image ID as the file name. (Recommended)	Backup NTFS permissions
Destination Folder CD/DVD Burner	\\wb\Public\Backups\FileAndFolder \vee Alternative locations \vee \vee (F:) - TSSTcorp, CDDVDW SH-224DB vSB01 (1:0:0) \vee \vee Use the Image ID as the file name. (Recommended) \vee \lambda Uase the Image ID as the file name. (Recommended) \vee	Backup NTFS permissions
Destination Folder CD/DVD Burner	\\wb\Public\Backups\FileAndFolder ✓ Alternative locations ✓	Cancel Finish

The Select Folder to backup dialog appears.

Select folder to backup	
File and folder inclusion and exclusion masks	
1. Folder to backup	
C:\Documents and Settings	
✓ Include subfolders	
Exclude hidden files and folders	
Exclude System files and folders	
Select files and folders to be included/excluded. Wildcards are supported. Separate multiple masks with semi-colon (*.xls; *.doc; *.mp3))
.	v
3. Add any files to exclude	_
*.temp; *.tmp; *.bak; *.~*	~
4. Add any folders to exclude	~
Enter full or partial folder path, wildcards are supported.	
"e.g. c:\temp; temp; *\temp; temp*"	
OK Cancel]

Select the folder you want to backup, or the folder containing the files you want to backup. Several different masks and wildcards can be specified to include specific files within the given directory or exclude other files.

Option	Description
Include subfolders	Recurse all folders below the backup folder using the specified filters
Exclude hidden files and folders	Do not backup files or folders that have the Hidden attribute
Exclude system files and folders	Do not backup files or folders that have the System attribute
Add files to include	Add a semi-colon separated list of file name filters to include in the backup. Use the asterisk * character as a wild card. For example; *.doc; *data*; *.xls

Option	Description
Add files to exclude	Add a semi-colon separated list of file name filters to exclude from the backup. Use the asterisk * character as a wild card. Note : Exclude filters take precedence over include filters
Add any folders to exclude	Add a semi-colon separated list of folder name filters to exclude from the backup. Use the asterisk * character as a wild card. Filter names can be full path and/or folder names.
	For example: *temp* will exclude all folders with the letters 'temp' anywhere in the folder name *\data\temp* will exclude all paths where the folder name begins with 'temp' that has a parent folder named 'data'

3. Click OK

- 4. Repeat to add further individual directories if necessary.
- 5. In the **Destination** section, specify where you want the backup to be made.

		File and t	folder back	kup			
Add the Folders	you want i	to Backup					
Source							
Folder	Include Files	Exclude Files	Sub Folders	Exclude Folde	rs		
C:\Documents and Settings\	*,*	*.temp; *.tmp; *.bak; *.~*	Y			001010013	
						45 1014615	
						— —	
🕒 Add folder 💉 E	dit folder	X Delete folder				Backup I	NTFS permissions
	dit folder	X Delete folder				Backup I	NTFS permissions
	<u>dit folder</u>	X Delete folder	_			🗹 Backup I	NTFS permissions
Pestination	_		_			Backup 1	NTFS permissions
Destination	<u>dit folder</u> ublic\Backups\		_	×	>	✓ Backup I	NTFS permissions
Sectination Folder	ublic \Backups \	FileAndFolder		×	>	Backup I	NTFS permissions
Pestination Folder	Public\Backups\ ative location	VFileAndFolder		· · · ·	>	Backup I	NTFS permissions
Destination Folder	Public\Backups\ ative location	FileAndFolder	:0:0)	>	>	🕑 Backup 1	NTFS permissions
Destination Folder	Public\Backups\ ative location	VFileAndFolder	:0:0)	>	>	☑ Backup I	NTFS permissions
Destination Folder ClybVD Burner C CD/DVD Burner	^u ublic\Backups\ ativ <u>e location</u>) - TSSTcorp, (FileAndFolder 15 CDDVDW SH-224DB VSB01 (1		>	>	☑ Backup I	NTFS permissions
Destination Folder CD/DVD Burner Use Use	Public \Backups \ ative location) - TSSTcorp, (the Image ID	VFileAndFolder		>	>	₽ Backup I	NTFS permissions
Destination Folder Chuble Could be the second seco	Public \Backups \ ative location) - TSSTcorp, (the Image ID	FileAndFolder 15 CDDVDW SH-224DB VSB01 (1		•	>	⊘ Backup I	NTFS permissions
Folder CD/DVD Burner Gacup filename: (IMAC	ublic\Backups\ ative location) - TSSTcorp, (the Image ID SEID}	FileAndFolder 15 CDDVDW SH-224DB vSB01 (1 as the file name. (Recommen	ded)	▼ ▼	>	I Badup 1	NTFS permissions
Folder CD/DVD Burner Gacup filename: (IMAC	ublic\Backups\ ative location) - TSSTcorp, (the Image ID SEID}	FileAndFolder 15 CDDVDW SH-224DB VSB01 (1	ded)	>	>	[d Badup 1	NTFS permissions
Destination Folder CD/DVD Burner Backup filename:	ublic\Backups\ ative location) - TSSTcorp, (the Image ID SEID}	FileAndFolder 15 CDDVDW SH-224DB vSB01 (1 as the file name. (Recommen	ded)	>	>	In Backup 1	NTFS permissions
Destination Folder CD/DVD Burner Backup filename:	ublic\Backups\ ative location) - TSSTcorp, (the Image ID SEID}	FileAndFolder 15 CDDVDW SH-224DB vSB01 (1 as the file name. (Recommen	ded)	>	>	I Backup 1	NTFS permissions
Pestination ● Folder ○ CD/DVD Burner ■ Get Backup filename: ● Use Backup filename:	ublic\Backups\ ative location) - TSSTcorp, (the Image ID SEID}	FileAndFolder LS CDDVDW SH-224DB vSB01 (1 as the file name. (Recommen Lups\FileAndFolder\{IMAGEID}	ded) 00-00.mrbak		>		·
estination) Folder) CD/DVD Burner) CD/DVD Burner) CD/DVD Burner) CD/DVD Burner) CD/DVD Burner) CD/DVD Burner) CD/DVD Burner	ublic\Backups\ ative location) - TSSTcorp, (the Image ID SEID}	FileAndFolder LS CDDVDW SH-224DB vSB01 (1 as the file name. (Recommen Lups\FileAndFolder\{IMAGEID}	ded)	✓ …	Next >	[Backup 1	NTFS permissions

Alternative Locations can be used to provide backup rotations or as a fail safe for temporary unavailability of the primary backup destination.

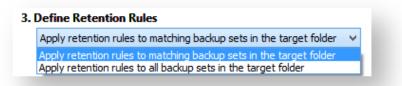
- 6. When you have finished adding folders and making all necessary changes, click Next.
- 7. The Backup Plan Page is shown:

	File and folder backup
	an for this Backup e for your Backup Plan
None	▼
2. Add/Edit Schedul	
Backup Type	Schedule
Add Schedu	ile ▼ 🗒 Edit Schedule Delete Schedule
3. Define Retention	Rules
•	es to matching backup sets in the target folder V
✓ Full	Keep 12 Backups V
 Differential 	Keep 4 A Backups V
✓ Incremental	Keep 10 A Backups V
	Create a Synthetic Full if possible 🗌
Run the purge b	vefore backup.
Delete the older	st backup set(s) if less than 5 GB on the target volume (minimum 1GB)
슈나 Advanced Options	Help <a>Red Next > Cancel Finish

The new Macrium Reflect retention rules provide a powerful and flexible way to manage the lifetime and storage space used by your backups.

Choose how backups are matched and retention rules are applied to the target folder

Retention rules are applied to the target folder of the backup by selecting one of two options:



a. Apply retention rules to matching backup sets in the target folder.

Disk Images are purged if they contain **exactly the same Partitions** as the current Image. Partitions are identified using the unique **Disk ID** stored in sector 0 of the disk and the **Partition sector offset**.

Note: For GPT disks the unique GPT disk GUID is used instead of the Disk ID

For **File and Folder** backups retention rules are applied according to the '**Backup Set Matching'** option select in the '**Advanced Properties'** for this backup.

b. Apply retention rules to all backup sets in the target folder. All backup sets in the target folder of the same type (Disk Image or File and Folder) are purged according the retention rules.

Note: This option uses the same logic as Macrium Reflect v5

Select the age or number of backup types that you wish to keep

✓ Full	Кеер	12 🛓 Backups 🗸
✓ Differential	Кеер	4 🛓 Backups 🗸
✓ Incremental	Кеер	10 📥 Backups 🗸
		Create a Synthetic Full if possible
Run the purge	pefore back	up.
 Delete the olde 	st backup se	et(s) if less than 5 GB on the target volume (minimum 1GB)

Option	Description
Full	When deleting Full backups all linked incremental and Differential backups in the same backup chain (set) are also deleted This operation will delete the entire backup set.
Differential	When deleting Differential backups all linked incremental backups in the same backup chain (set) are also deleted.
Incremental	When deleting Incremental backups the integrity of the backup set is maintained by ensuring that the chain is never broken. This is achieved by merging older Incremental backups when required.
	In the example below, before retention, there is 1 Full backup, 1 Differential backup and 6 Incremental backups. The retention rules are set to retain 4 incremental backups. After retention, the most recent 4 incremental backups are retained. Deleting the oldest 2 incrementals would cause the backup chain to be invalid as the oldest retained incremental requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backups are consolidated with it to create a new incremental backup.
	F = Full D = Differential I = Incremental

Option	Desc	riptic	on														
	м	т	W	т	F			м	т	W	т	F			м	т	W
	F							D	I	I	I	I			F	I	I
										->	I						
Create a Synthetic Full if possible	follo	wed k	by Inc	reme	ntal b	ackı	ups	, ther	this o	kup set (option ca his is als	auses	the Fu	ull b	ackı	up to	be 'ro	
Run the purge	Select this option to run the retention rules before the current backup.																
before the backup	0	cal IS	lculati includ	on wh led. Tl	en pu his me	rging eans	g be tha	efore t it if yo	he cu u set	it backup rrent bac the reter a new F	ckup. ntion (In v6 t	the o to 1	curre Full	ent ba	ackup	set
Delete oldest	Automatically remove the oldest backup set(s) in the target folder if the free space on the drive drops below the GB threshold.																
		No															

- 8. The summary screen gives the details of what is being backed up. Click Finish.
- 9. You are now given the opportunity to save the backup options.

The backup Save Options Dialog enables you to save your backup options as a re-usable XML definition file.

This is essential for many operations in Reflect including Scheduling and creating Incremental and Differential backups

Backup Save Options
What do you want to do now?
 Run this backup now Save backup and schedules as an XML Backup Definition File You can run this backup at any time by double clicking the saved XML file.
Enter a name for this backup definition. System Image C:\System Image.xml
Help OK Cancel

Option	Description
Run this backup now	Create a 'Full' backup now using the backup definition
Save to an XML file	 Saving your definition enables you to: Re-run the same backup without stepping through the wizard Run Incremental and Differential backups Schedule your backups Create a Desktop shortcut for running with one click
Name for this backup definition	Enter a meaningful name for this definition
	Choose a folder to save the XML definition to. Always save to a local folder. It isn't necessary to save the definition to the same folder as your backup target Note: Always save your definition to a local drive and never to a password protected network share.

See also: Manually running a job from a configured XML backup definition

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Best practises for saving Macrium Reflect backup definition files

Regardless of your PC environment, leaving your backup definition files in an insecure location is bad practice. The effort required to ensure your files are secure is minimal and doesn't impede day to day usage of Macrium Reflect.

What's the problem?

Backup definition (.xml) files are used to initiate backups either interactively by using Macrium Reflect directly, or as scheduled tasks using the Windows Tasks Scheduler. If you save your backup definitions to a publicly accessible folder then these can be edited by standard users and could potentially compromise your system. In addition, it's also possible to create batch files, either MS-DOS, PowerShell or VBScript, to automatically run during your backups as described here. A restricted user with bad intentions could easily create a batch file to run with elevated privileges when a scheduled or interactive backup runs.

The default, and recommended, location for your backup definitions is folder 'C:\users\<USER NAME>\documents\reflect'. When running Reflect for the first time this location is created and defaulted when saving. See Backup Save Options for more information on how to save your definitions.

This folder is automatically restricted for standard users and can only be accessed by Administrators and the local SYSTEM account.

To see assigned NTFS permissions right click on any folder, select 'Properties' and click the 'Security' tab:

Reflect Proper	ties			×
General Sharing	Security	Previous Versions	Customize	
Object name: 0	:\Users\D	ev\Documents\Ref	lect	
Group or user nam	nes:			_
SYSTEM .				
👗 Dev (WIN10				
Administrator	s (WIN10)	/M-5\Administrators)		
To change permis	sions, click	c Edit.	Edit	
Permissions for S	(STEM	Allo	w Der	ıy
Full control		~		^
Modify		\checkmark		
Read & execute	e	\checkmark		
List folder conte	ents	~		
Read		~		
Write		~		¥
For special permis click Advanced.	sions or ad	vanced settings,	Advanc	ed
	0	K Cance	el /	Apply

In the above example only SYSTEM, Dev (the Macrium Reflect user) and the Administrators group can access files contained in the folder. Standard users are denied access and cannot modify or create files.

We strongly recommend that, if not using the default location. you ensure that NTFS permissions are used to prevent unauthorised modification and creation of files in your backup definition folders.

For more information on setting NTFS permissions for folders and files please see Microsoft TechNet - How IT works NTFS Permissions

Note: A popular misconception is that backup definition files should be saved to the same folder as your backup files. **This is incorrect.** Backup definitions are only required to create backups and have no other purpose. They are not required for restore.

If you want to run the backup at this point, select 'Run this backup now' and click OK.

Cloning a disk

It is possible to clone an entire hard drive or specific partitions on a hard drive. This is useful if you are upgrading to a larger hard drive. With Macrium Reflect you can boot the target disk on the same system after cloning. Cloning your hard drive creates a bootable new hard drive with the state of your computer at the time you undertook the clone.You can clone to a hard drive installed in your computer or to a hard drive installed in a USB hard-drive Caddy.

Important

Windows cannot boot from a USB connected drive. This is a restriction imposed by Windows. If you clone your system disk to a USB connected external drive then, to boot your clone, the physical disk must be removed from the USB caddy and attached to your Motherboard SATA port.

Deleting and re-configuring existing partitions or configuring new partitions is possible with Macrium Reflect, so you don't need to do this prior to cloning.

Show important information about MS Dynamic Volumes...

0		mic volume is a logical abstraction of the underlying physical disk and may be striped or extended ultiple physical disks. Because of this, Dynamic volume file systems are copied not disk ns.
	•	source disk contains Dynamic Volume(s) then the background will be orange and the link will show Dynamic Volumes':
	R	Dynamic Disk 6 [374BB0D8-F5AE-458A-A9B1-D492B272507D]
	· ·	1 - Windows (K:) NTFS Dynamic
		4.63 GB 126.87 GB
	In the C	<u>Copy dynamic volumes</u> Clone Wizard:
	•	The partition selection check boxes and 'Copy selected partitions' link will not be available. Therefore, Dynamic Volumes must be dragged and dropped to the destination.
	•	To copy source Dynamic Volume(s) to destination Dynamic Volume(s) you must prepare the target as Dynamic and format the destination volume(s) in advance of the clone operation. This can be achieved using the Windows Disk Management Console to convert one or more physical disks to Dynamic.

- A destination Dynamic Volume cannot be resized so **the 'Cloned partition properties' link will not be available** if the destination is Dynamic.
- To convert Dynamic Volume(s) to standard partitions, select an unformatted or an MBR/GPT basic disk as the destination and use 'Drag and Drop' to copy the source volumes. After the clone operation you can leave the disk as a 'Basic' disk or convert to Dynamic using the Windows Disk Management Console.

See also: Bare metal restore of a Dynamic disk system

1. Select the disk you wish to clone in the main application window and Click 'Clone this disk'...



2	Macrium Reflect - Server Plus Edition [UEFI] - 🗖 🔼
File View Backup Restore Other Tasks	
Backup Restore Log	
▲ Backup Tasks	Create a Backup Backup Definition Files VBScript Files PowerShell Files MS-DOS Batch Files Scheduled Backups
Image selected disks on this computer.	(J Refresh
Create an image of the	GPT Disk 1 [4DE35055-08EB-46C3-8D02-E71FEB27680D] - Msft Virtual Disk 1.0 <40.00 GB>
partition(s) required to backup and restore Windows.	Image: 1 - Recovery (Nor Image: 2 - NO NAME (N Image: 3 - (None) Image: 4 - (C:) Image: 5 - (None) Image: NTFS Primary FAT32 (LBA) Primary Unformatted Primary NTFS Primary NTFS Primary
Create a File and Folder backup.	
Other Tasks	
Exchange Tasks	15.0 MB 25.5 MB □ 128.0 MB □ 17.96 GB 253.7 MB □ 300.0 MB 99.0 MB □ 128.0 MB □ 39.04 GB □ 450.0 MB □
Backup Microsoft Exchange	Actions 🗸
▲ SQL Server Tasks	Clone this disk
👼 Backup SQL Databases	
Continuous Backup	
Canage SQL Logins	
Details	
Recovery {62EA5380-70C2-4998-9A58-1095A	
File System: NTFS	
Free Space: 285.0 MB	
Total Size: 300.0 MB	

2. In the wizard that opens Click Select a disk to clone to...

	Select a disk to clone to
partition	Cloned Partition Properties Copy selected partitions when I dick 'Next'
	Help < Back Next > Cancel Finish

- 3. Select the hard disk you wish to clone to. In this case, there is only one disk available.
- 4. If you do not want to modify the order or size of partitions of the clone, **click Next**. This is the default behavior.

Alternatively, drag the partitions you want to clone, the red arrow below shows this.

		Clor	ne		
Drag	partitions to the destina	ition disk or click 'Coj	by selected partitions	5	
Source Local d	isk			Select a different source disk	
GPT Disk 1 [A8779CE9-FE0B-46C1-8BC7-73AAB0959B32] - Msft Virtual Disk 1.0 <50.00 GB>					
	1 - Recovery (None) NTFS Primary	2 - NO NAME (None) FAT32 (LBA) Primary	3 - (None) Unformatted Primary	4 - (C:) NTFS Primary	
	238.4 MB 300.0 MB	25.3 MB 99.0 MB	128.0 MB	15.50 GB 49.48 GB	
Destination Local disk Image: Copy selected partitions Select a different target disk Image: GPT Disk 2 [BFB25AE7-A51C-4CAB-BBFC-423CB22FB56B] - Msft Virtual Disk 1.0 <50.00 GB>					
	1 - (None) Unformatted Primary		ata (E:) S Primary		
	128.0 MB 128.0 MB		100.3 MB 49.87 GB		
	X Delete Existing partition	Cloned P	artition Properties	Copy selected partitions when I click 'Next'	
Image: Advanced Options < Back					

Becomes

		Clor	ne	
Drag p	partitions to the destina	tion disk or click 'Cop	by selected partitions	5
Local di	sk			Select a different source dis
	GPT Disk 1 [A8779CE9-FE0B-46C	1-8BC7-73AAB0959B32] - Msft	Virtual Disk 1.0 <50.00 (GB>
	1 - Recovery (None) NTFS Primary	2 - NO NAME (None) FAT32 (LBA) Primary	3 - (None) Unformatted Primary	4 - (C:) NTFS Primary
	238.4 MB	25.3 MB 99.0 MB	128.0 MB	15.50 GB 49.48 GB
on Loca	al disk 🛛 🖉 U GPT Disk 2 [8FB25AE7-A51C-4CA		cted partitions Virtual Disk 1.0 <50.00 0	
n Loca				Select a different target dis
on Loca	GPT Disk 2 [8FB25AE7-A51C-4CA 1 - (None)	B-BBFC-423CB22FB56B] - Msft		
R	GPT Disk 2 [8FB25AE7-A51C-4CA 1 - (None) Unformatted Primary 128.0 MB 128.0 MB	B-BBFC-423CB22FB56B] - Msft	Virtual Disk 1.0 <50.00 (58>
R	GPT Disk 2 [8FB25AE7-A51C-4CA 1 - (None) Unformatted Primary 128.0 MB	B-BBFC-423CB22FB56B] - Msft		58>

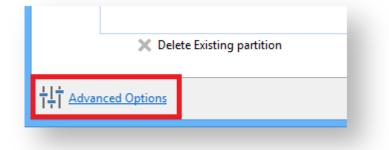
In this example, there is 400MB of free space after the copied partition. You can modify the size of each partition to fit the new disk if required.

U You can delete partitions on the target disk by selecting and clicking 'Delete existing partitions'...

- 5. To modify the partition sizes, click **Cloned Partition Properties** and adjust the size of the partition by:
 - a. Setting the partition size precisely using the Partition Size entry box.
 - b. Resize the partition automatically by clicking Maximum size, Minimum size or Original size.

		Parti	tion Properti	es)
Set the pro	perties for the I		Dartition	~	Partition Type:	Primary V
4 - (E:) NTFS Primary 15.50 GB 49.48 GB						
Partition Size: Free Space:	49.483 <u>^</u> 400 <u>^</u>	GB ❤ MB ❤	Ma	aximum Size 49.87 GB	Minimum Size 15.55 GB	Original Size 49.48 GB
Alignment:	Vista/7/SSD (1MB)	~			Start Sector: End Sector:	264,192 104,038,399

- 6. Click OK.
- 7. If required, click Advanced Options to change settings for this clone:



	Cloning Options ×
Backup	
Cloning Options	Set options for this cloned drive
	Set default options for disk doning. Please note that Intelligent Sector Copy will always be used if the target partition is smaller than the source partition Perform an Intelligent Sector Copy. This will only copy the sectors that are in use on the source file system.
	✓ Verify File System. Verify the source file system prior to the cloning operation
	Rapid delta clone. Only copy the differences between the source and target.
	Enable SSD TRIM. This increases lifetime and the performance by flagging unused blocks; avoiding slow erase operations and the read-modify-write cycle for these blocks.
	O Perform a Forensic Sector Copy. This option will copy all sectors from the source disk, whether they are in use or not. This operation will take longer than an Intelligent Sector Copy.
	OK Cancel
	OK Cancel

Option	Description
Intelligent sector copy	Copy only file system sectors/clusters that are in use. This reduces the time to create the clone as unused file system clusters are not copied.
Verify File System	Verifying the file system prior to cloning ensures that there are no file system errors transferred to the clone.
	Please note that this may take several minutes to complete
Rapid Delta Clone	Copy only file system differences between the clone source and target. This increases cloning speed dramatically. Show more information on RDC
	As with Rapid Delta Restore (RDR) the concept of RDR has been something that has been thought about for quite some time here at Macrium Software. We wanted to build a clone solution that would effectively and rapidly copy only the differences between the source and target file systems. The advantage of this is obvious, RDC offers similar a performance increase as an Incremental disk image offers over a Full image and enables regular clones to be a viable and fast DR solution.

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Option	Description
	How does it work? The NTFS file system resident on the clone source is compared with file system on the target disk. The two file systems are first verified that they originated from the same format command and then the target NTFS file system structures are analyzed for differences. All the NTFS file system structures are copied to the target disk and any that do not exist or have been modified on the target disk cause the data records for each NTFS file or object to be copied as well. The result is an 'Incremental' clone applying only file system changes detected between the source and the target.
	 Note: RDC is not available when shrinking partitions during a clone.
Enable SSD TRIM	Enable SSD TRIM on the clone target to optimize the disk. Show more information on SSD TRIM This features provides automated SSD optimization resulting enhanced SSD performance and longevity. Writing to an unused block is much quicker than an in-use block as it avoids both the slow erase operation and the read-modify-write cycle. This results an increase of both the lifetime and the performance of the device. It is effective for all windows operating systems, even those that support SSD trim natively as the file system driver can only TRIM blocks on de-allocation; it cannot TRIM blocks written by another process. It is also effective for USB attached SSDs.
Forensic Sector Copy	Copy every sector from the source to the target disk partition. Please note tat this option is only necessary if you want to copy unused file system space and will significantly increase the time to complete the clone.

8. Click Next.

The options to Add Schedule, Edit Schedule or Delete Schedule is displayed.

s Clone		
done again in future you can schedule it below (other	wise click 'Next' to skip this step):	
Schedule		
le Edit Schedule		
	Schedule	s done again in future you can schedule it below (otherwise dick 'Next' to skip this step): Schedule Jule

Click 'Add Schedule' to optionally schedule your clone

	Schedule	Properties - Clone
Clone Sche	edule Settings	
Frequency	Options	
 Monthly Weekly Daily One Time Only On Event 	 Every Day Weekdays Every Start Time Start Date 	1 days 09:00 • 07/05/2015
✓ If missed then run at	next start-up	OK Cancel

Make any required changes and click **Next**. For more information see Scheduling backups.

- 9. Review the settings and click **Finish**.
- 10. Verify the settings in Backup Save Options and if appropriate, click OK.

Backup Save Options ×
What do you want to do now?
✓ Run this backup now
✓ Save backup and schedules as an XML Backup Definition File
You can run this backup at any time by double clicking the saved XML file.
Enter a name for this backup definition.
My Clone
C: \Macrium \My Clone.xml
OK Cancel

Note: Saving a backup definition enables you to run your Clone at any time with a single click
 Note: You must save your backup definition if you have created Clone schedules. Your schedules cannot run if this step is missed.

If you want to run the Clone at this point, select 'Run this backup now' and click OK.

11. A Warning box appears, if appropriate click **Continue**.

	Confirm Overwrite
.9	WARNING: The following drives will be overwritten
Drive	Volume
E:\	\\?\Volume{75208f4e-70a7-11e4-8277-6002928a1000}\
	Continue Cancel

(i) Important

The target disk for the clone operation will be overwritten. This is unrecoverable, so please ensure that the target disk contains no valid data.

The clone operation now starts.

Incompatible Disk Selected

If you receive the error message 'Incompatible Disk Selected' when cloning then please see this article for more information: Incompatible Disk Selected

Creating a clone video

Backing up Microsoft Exchange databases

With Macrium Reflect Server Plus you can choose which databases to backup on the local Microsoft Exchange Server.

Note: Remote backups are not possible.

Before you begin: Macrium Reflect requires the Microsoft Exchange Information Store service to be installed and running in order for successful database backup to function.

1. On the main Backup interface, click **Backup Microsoft Exchange**.

 Backup Tasks
Image selected disks on this computer.
Create an image of the partition(s) required to backup and restore Windows.
Create a File and Folder backup.
Dother Tacks
Exchange Tasks
Backup Microsoft Exchange
SQL Server Tasks

The Microsoft Exchange Backup wizard appears. A Microsoft Exchange 2010 example is shown below:

vlicrosoft Exchange	•
🔀 Select Da	tabases to Backup and enter Destination
Databases	
	WIN-2K8R2
	Mailbox Database 0005262179
	Mailbox-database-2
	Public-folders
. 4. C. J 4 - 11 C 1	
✓ Select all for back	ackup The View selected component files (1) Selected for backup: 56 files (445.1 MB)
	ackup Tiew selected component files (445.1 MB)
	ackup View selected component files Image: Selected for backup: 56 files (445.1 MB) Image: Image
Destination	
Destination	\\wb\public\Stephen G\bk\exchange\
Destination	\\wb\public\Stephen G\bk\exchange\ Alternative locations
Destination Folder	\\wb\public\Stephen G\bk\exchange\ Alternative locations Image ID as the file name. (Recommended)
Destination Folder	\\wb\public\Stephen G\bk\exchange\ Alternative locations Image ID as the file name. (Recommended) {IMAGEID}
Destination Folder	\\wb\public\Stephen G\bk\exchange\ Alternative locations Image ID as the file name. (Recommended) {IMAGEID}
Destination Folder	\\wb\public\Stephen G\bk\exchange\ Alternative locations Is the file name. (Recommended) {IMAGEID} \\wb\public\Stephen G\bk\exchange\{IMAGEID}-00-00.mrex

- 2. Select the items you want to backup:
 - For Microsoft Exchange 2010 and later, select individual databases to backup.
 - For Microsoft Exchange 2007 and earlier, select storage groups to backup, this includes all the databases in the selected storage group.

① Caution

Unmounted Exchange databases are shown in the Microsoft Exchange Backup Wizard and can be selected for backup. However, VSS will not include unmounted databases in the snapshot and *the Exchange backup will fail.* To include these databases in the backup, either ensure the databases are mounted at point of backup, or use established recovery mechanisms to bring the affected databases into a clean, shutdown state.

Alternative Locations can be used to provide backup rotations or as a fail safe for temporary unavailability of the primary backup destination.

Optionally, click View selected component files to see the list of files that make up the currently selected items.

The **Exchange Component File List** appears. Files are grouped according to type and show last date modified along with file size. Each category of file shows total size. Groups of files can be expanded /collapsed by clicking the plus/minus button to the left of the file type name.

Exchange Component	: File List	
Exchange Component Files		
File	Date	Size ^
 Databases 		392.1 ≡
L Mailbox Database 0195109825.edb Streaming Files	12/01/2015 14:	392.1
 Transaction Logs 		1.44 GB
– E00.log	13/01/2015 13:	1024
– E000000011.log	28/11/2014 10:	1024
– E000000012.log	28/11/2014 10:	1024 🗸
		Close

4. Enter the **Destination Folder** for the backup.

Note: MS Exchange backups cannot be stored on optical media.

5. If the primary target location is not available, click Alternative Locations to add the relevant folder.

Bac	kup Locations			X
Edit the list of alternative backup locations When a backup is running, each location in this list will be tried in sequence until a valid location is found. This enables, for example, backup rotations to use multiple external drives that are assigned different drive letters by Windows. Note: During the backup, missing sub-folders will be created automatically.				
Type in a folder here to add as an alternative location				
Add to list	Reorder priority:	🕇 Up	🕹 Down	X <u>Remove</u>
Folder				
C:\Users\administrator.MACRIUMNET\Desktop\	exchange2013			
			ОК	Cancel

- 6. Click Next to proceed.
- 7. If desired, edit the plan for the backup. For more information see Scheduling backups.

	▼
Add/Edit Schedule	IS IN THE REPORT OF THE REPORT
Backup Type	Schedule
₽	
Add Schedul	le 🔻 📑 Edit Schedule 🔂 Delete Schedule
Define Retention	Rules
🔽 Full	Keep 12 📕 Backups 🔻
Differential	Keen 4 A Padaina -
✓ Differential	Keep 4 Backups V
 Differential Incremental 	Keep 10 Backups V

Select the age or number of backup types that you wish to keep

✓ Full	Кеер	12 🚔 Backups 🗸		
✓ Differential	Кеер	4 📮 Backups 🗸		
✓ Incremental	Кеер	10 📮 Backups 🗸		
		Create a Synthetic Full if possible		
Run the purge before backup.				
✓ Delete the oldest backup set(s) if less than 5 GB on the target volume (minimum 1GB)				

Option	Description
Full	When deleting Full backups all linked incremental and Differential backups in the same backup chain (set) are also deleted This operation will delete the entire backup set.

Option	Desc	Description															
Differential		When deleting Differential backups all linked incremental backups in the same backup chain (set) are also deleted.															
Incremental	ensu backt In the 6 Inc reten increa backt new i $\mathbf{F} = \mathbf{F}$ $\mathbf{D} = \mathbf{D}$	ring th ups w e exar reme tion, t ement menta up inte incren full Differe	nat the hen re ntal b he mo al requ egrity nental	e chair equire elow, ackup ost rec ould ires th the 2 back	n is ne d. befor os. Th cent 4 cause he pre older	ever b re rete e rete incre e the l evious	enti enti me bao	ken. T on, th on ru ental b c kup incre	This is nere is les ar backu chaii menta	ty of the achieve a 1 Full I e set to r ps are re n to be i al backup xups are	ed by backu retaine etaine nvalie os to	mergii up, 1 I a 4 inc d. De d as th compl	ng old Differ creme leting ne old ete th	der In rentia ental g the dest re ne cha	creme I bac backu oldes etaine ain. To	kup ups. t 2 d	and After
	M F	т	w	т	F			M D	т I	w	т	F		M			w I
										->	I						
Create a Synthetic Full if possible	follo	wed b	by Inc	reme	ntal b	acku	ps,	, then	this o	kup set c option ca his is als	uses	the F	ull ba	ckup	to be	'roll	
Run the purge before the backup	 Select this option to run the retention rules before the current backup. Note: in Macrium Reflect v5 the current backup set wasn't included in the p calculation when purging before the current backup. In v6 the current backup all of your backups will be deleted and a new Full backup created. 						up	set									
			ally rer s belov					-	set(s)	in the ta	rget f	olderi	if the	free s	space	on	the

Option	Description
Delete oldest backup set (s) if less than n GB	

- 8. Review the summary of the backup.
- 9. Click Finish.

Backup Save Options is shown.

Backup Save Options
What do you want to do now?
 Run this backup now Save backup and schedules as an XML Backup Definition File You can run this backup at any time by double clicking the saved XML file.
Enter a name for this backup
My Backup(5)
C:\Users\administrator.MACRIUMNE\My Backup(5).xml
OK Cancel

Note: Saving a backup definition enables you to run your backup Image at any time with a single click

Note: You must save your backup definition if you have created backup schedules. Your schedules cannot run if this step is missed.

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If you want to run the backup at this point, select 'Run this backup now' and click OK.

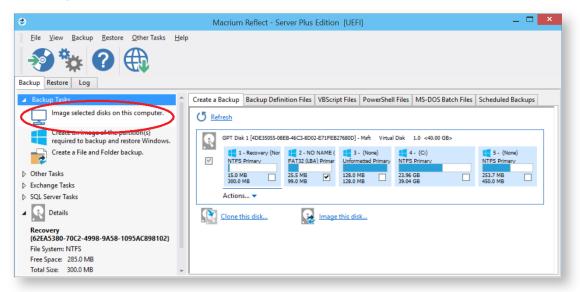
Backing up MS SQL Databases

Error: RuntimeException occurred while performing an XHTML storage transformation (null)

Creating a disk image of a single drive or partition

Using Microsoft Volume Shadow Copy Service (VSS) Macrium Reflect creates persistent images of your system.

1. Select Image selected disks on this computer.



2. The wizard starts. All partitions are displayed, select the required drives or partitions.

				Disk	Image			
	t Source Drive(s)	and Image D	estinatio	n				
GPT Dis	1 [4DE35055-08EB-46C3-	8D02-E71FEB27680D)] - Msft Vi	irtual Disk 1.0 <40.	00 GB>			
		2 - NO NAM FAT32 (LBA) Prim		3 - (None) Unformatted Primary 128.0 MB 128.0 MB	/	4 - (C:) NTFS Primary 23.96 GB 39.04 GB	5 - (None) NTFS Primary 253.7 MB 450.0 MB	
Total Selected:	25.5 MB							
	Alternative loca	d\Desktop\Backup\ ations			¥			
CD/DVD Burn		ID as the file nam	ie. (Recom	mended)	\rightarrow			
Backup filename	{IMAGEID}							
	C:\Users\Rid	hard\Desktop\Back	up\{IMAGE	ID}-00-00.mrimg				

3. In the **Destination** section, select where to write the resultant image.

In this example, 'E drive' is used.

4. Click Next.

5. If desired, edit the plan for the backup by making necessary selections.

	Disk Image		
Edit the plan for this bac	kup, Click 'Next' to conti	nue	
Backup Plan Template Do not schedule this backup			¥
Schedules for this backup plan			
Backup Type Schedule			
Add Schedule 👻 📑	Edit Schedule Delete Sch	edule	
Policy	How To Retain	Retention Count	t/Period
Retain full backups	number of backups	12	
Retain differential backups	number of backups	10	
Retain incremental backups	number of backups	30	
Synthetic Full	\fbox Delete the oldest backup set(s)	if less than 0 0	SB on the target
		Back Next >	Cancel Finish

For more information on editing the backup plan and advanced options see Scheduling backups.

6. Click Next.

7. A summary screen displays detailing the settings used for this image.

	Disk Image	
Imaging Summary		^
Backup Type: Destination: Auto Verfy: Maximum File Size: Compression: Password: Intelligent Copy: Power Saving: Total Selected:	Auto E:\{IMAGEID}-00-00.mrimg N Automatic Medium N Y Y Y 17.24 GB	
Retention Rules Free space threshold:	Delete backup sets when free space is less than 0 B	
Operation 1 of 5 Hard Disk: Drive Letter: File System: Label: Size: Free: Used:	1 N/A NTFS Recovery 300.0 MB 285.0 MB 15.0 MB	
Operation 2 of 5 Hard Disk: Drive Letter: File System: Label: Size: Free: Used:	1 N/A FAT32 (LBA) NO NAME 95.0 MB 69.5 MB 25.5 MB	
Operation 3 of 5 Hard Disk: Drive Letter: File System: Label:	1 N/A Unformatted	~
Advanced Options	< Back Next > Cancel	Finish

8. Click Finish.

You are now given the opportunity to save the backup options.

Backup Save Options
What do you want to do now?
✓ Run this backup now
✔ Save backup and schedules as an XML Backup Definition File
You can run this backup at any time by double clicking the saved XML file.
Enter a name for this backup
My Backup(2)
C:\Users\Richard\Documents\Reflect\My Backup(2).xml
OK Cancel

9. If you want to run the backup at this point, click **OK**.

maging Summary		^
Backup Definition File: Backup Type: Destination: Auto Verfy: Maximum File Size: Compression: Password: Intelligent Copy: Power Swing: Total Selected:	C:\Users\Richard\Documents\Reflect\My Backup(2).xml Full FDC907BBEB9CE3962-00-00.mmg Automatic Medium V N N 24 GB	
Deeration 1 of 5 Hard Disk: Drive Letter: File System: Label: Size: Free: Used:	1 N/A NTFS Recovery 000.0 MB 285.0 MB 15.0 MB	
Derration 2 of 5 Hard Disk: Drive Letter: File System: Label: Size: Free: Used:	1 N/A TAT32 (LBA) NO NAME 55 0 MB 59 5 MB 25 5 MB	~
verall Progress: 100%		Time remaining: 0 Seconds
urrent Progress: 100%		Time remaining: 0 Seconds

Your system partitions are backed up to the chosen location.

- 10. When the image has completed, click **Close** to shut down the message box.
- 11. Click **Close** to close the backup window.

Macrium Reflect creates the backup.

See also: Windows Partitions

Differential and incremental disk images

The entire contents of the imaged file system are stored in a full image file. This is a reliable way of backing up your PC, however, repeating the process is slow and subsequent images can fill your backup media very quickly.

After you have created an initial full image, you can create differential and incremental images. These are both quicker to execute than full images and create much smaller image files.

Note: With the Free Edition of Macrium Reflect you can only make full and differential images of your disks and partitions.

- Differential Images
- Incremental Images
- Maintaining backup sets
- Selecting an incremental or differential backup
- Alternative method using an existing backup

Differential Images

A differential image stores the changes that have been made to the imaged file system since the last full image. Subsequent differentials can be taken, but only one differential and the full are required in order to fully restore the system.

This is quicker than creating a full image, however the longer the time between the full and the differential, the larger the differential image file is and the longer it takes to create.

Advantages of differential images:

- Differential images created after the initial full Image are very quick because only file system changes since the full backup are saved.
- The amount of disk space used by differential images is significantly less than that of full images.
- Only two image files are required to restore the system.

Disadvantages of differential images:

- As the time since the last full image was taken increases, the size of the differential grows as does the time it takes to create the differential image.
- In order to reduce this time, it is necessary to perform a full image occasionally to reduce the size of the subsequent differential images.

Incremental Images

The main difference with incremental images is that they only store file system changes since the last image, either full, differential or incremental. The resultant backup set therefore consists of a full image and a number of incremental images which must all be present in order to restore the system correctly.

Advantage of incremental images:

 Incremental images have the same advantages as differential images, but since they only store the changes that were made since the last full or incremental. They are always small and very quick to make, especially if done frequently.

Disadvantage of incremental images:

• All files must be present in the image set. If any intermediate incremental images are missing, it is not possible to restore the system to the latest backup.

Maintaining backup sets

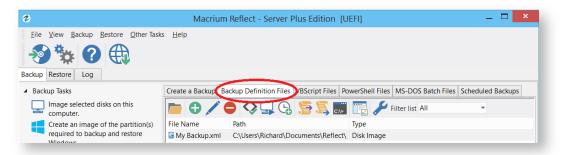
Maintaining backup sets can seem an onerous task, however, Macrium Reflect takes care of all the hard work for you. With Macrium Reflect you can schedule incremental or differential backups automatically. It is as simple as selecting the image you wish to restore and Macrium Reflect automatically selects the required files in the image set as part of the restore process. The same is true for exploring an image. If you choose to explore an incremental image in an explorer window, Macrium Reflect reconstructs all the files that have been backed up to that time.

Macrium Reflect also includes functionality to automatically delete expired image sets. For example, if you take a full image every month and then incremental images every day, you can configure Reflect to keep two full image sets (the equivalent of two months of backups) and delete any older files. As a result, your backup media does not become full of obsolete image files.

Selecting an incremental or differential backup

The process for creating a differential or incremental backup is the same. Both save changes since the full backup if this is the only backup made so far.

1. Initiate an incremental or differential backup, select **Backup DefinitionsFiles**.



In this instance, there is one saved XML definitions file *MyBackup.xm*/which contains the configuration required to back up the C drive.

2. Right click MyBackup.xml and select Run Now.

You are presented with a number of options.

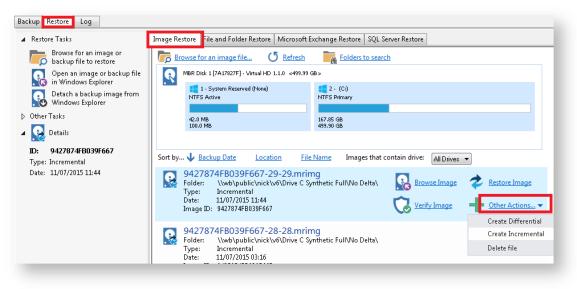
3. Select Full, Incremental or Differential to automatically execute that particular backup. If unsure which you want to run, click Prompt.

\$	Macrium Reflect - Server Plus Edition [UEFI] – 🗖	×
File View Backup Restore Other Tasks		
 Backup Tasks Image selected disks on this computer. Create an image of the partition(s) required to backup and restore Windows. Create a File and Folder backup. Other Tasks Exchange Tasks SQL Server Tasks Metails 	Create a Backup Backup Definition Files VBScript Files PowerShell Files MS-DOS Batch Files Scheduled Back	

- 4. Click Finish.
- 5. When the Image is complete close the dialog.

Alternative method using an existing backup

- 1. Click the 'Restore' tab
- 2. Select either **Image Restore** or **File and Folder Restore**. This presents a list of image or file and folder backup files
- 3. Select the file that you want to create an incremental or differential from.
- 4. Select Other Actions... link, and choose 'Differential' or 'Incremental'

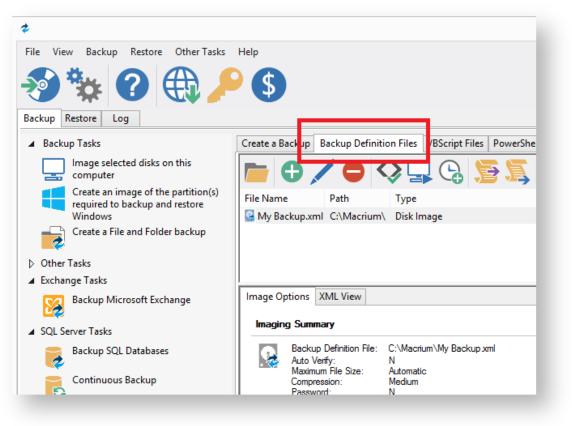


Creating desktop shortcuts for full, incremental and differential backups

Creating Desktop Shortcuts for your backups enables quick and easy execution without the need to start Macrium Reflect or choose the backup type (Full, Diff or Inc).

Pre-requisite: To create a desktop shortcut for your definitions files you must already have a backup definitions file. If required, follow the instructions in Creating a backup image of your computer, drive or partitions.

1. Select Backup Definitions Files tab.



2. Select the backup definition file and Click the Create Desktop Shortcut button on the Backup Definition File View toolbar.

Create a Backuj	Backup Definition	n Files VBScript Files PowerShell File r INS DOC Batch Fi
		🔉 🖵 😪 🌅 🦉 🖓 🕫
File Name	Path	Туре
🔛 My Backup	xml C:\Macrium\	Disk Image
		Create Desktop Shortcut
Image Option:	s XML View	You can run the selected XML, VBS or BAT file by double clicking the shortcut file on your desktop.
Imaging Su	mmary	Backup type: Full
Auto Max	kup Definition File: (Verify: 1 imum File Size: / ipression: 1	Target Name: My Backup
Pas Intel Pow	sword: I lligent Copy: Y ver Saving: I al Selected: 2	OK Cancel

3. Select the Backup Type and enter the shortcut name that appears on the Desktop.

For easy reference to the backup type you could add a Full, Diff or Inc suffix to the shortcut name.

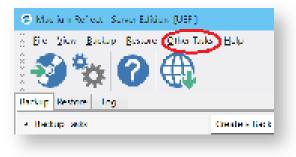
4. Click OK.

Checking VSS events when backups fail

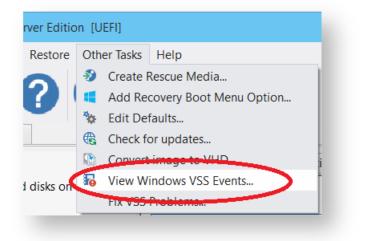
Macrium uses Volume Shadow Copy Service (VSS) to create its images and backups and windows keeps a log of VSS events. These events can give you information, useful if you are experiencing problems, such as backup failures.

View events to check what has occurred as follows.

1. From the toolbar click Other Tasks.



2. Click View Windows VSS Events.



- 3. Select the parameters for your event search.
- 4. The viewer updates automatically displaying relevant information.

0	Show event:	s Last 30 Days	•	VSS Events	All Events	[Refresh
rom:	16/01/2015	i 👻 00:00:00 👗	To:	15/02/2015 👻	23:59:59 🛔		Search Internet
	📝 Error Ev	ents 👿 Warni	ng Event	s 📃 Infor	mation Events	(Clipboard Copy
Source	Event ID	Date					Save to File
× VSS	8193	03/02/2015 22:14:41				1 p	Close
😵 VSS	13	03/02/2015 22:14:41					
😣 VSS	8193	03/02/2015 22:11:35					Help
😣 VSS	13	03/02/2015 22:11:35					
😵 VSS	8193	03/02/2015 22:11:12					
😵 VSS	13	03/02/2015 22:11:12					
75 Even	its	<u> </u>					
ate		5 22:14:41					
ype vent	Error 8193						
ource	VSS						
olume 9	Shadow Con	y Service error: Unexp	ected err	or calling routine			
oCreat	eInstance.	hr = 0x80070422, The	service o	annot be started,			
ecause	it is disabled	d or because it has no e	nabled d	levices associated	with it.		
peratio							

- 5. If required, select an event and choose to:
 - a. Search Internet. This will open your default browser with search terms setup for the selected Windows error event.
 - b. Clipboard Copy. Useful for pasting into an email if you are contacting support.
 - c. Save to File.

/iewer	
rents 🛛 Last 30 Days 🔹 💿 VSS Events 💿 All Events	Refresh
2015 👻 00:00:00 🚔 To: 15/02/2015 👻 23:59:59 🚔	Search Internet
r Events 🛛 Warning Events 📄 Information Events	Clipboard Copy
ID Date	Save to File
03/02/2015 22:14:41	Close
03/02/2015 22:14:41 03/02/2015 22:11:35 03/02/2015 22:11:35	Help

6. When you have finished reviewing events, click **Close**.

Alternative Locations For Backups

All backup wizards in Macrium Reflect allow you to select **Alternative Locations** to use for the backup destination. Should the primary backup location not be available, each location will be checked in sequence until an available one is found.

Alternative locations can also be used to provide backup rotations, for example, keeping an offsite backup, or as a fail safe for temporary unavailability of the primary backup destination.

1. Click Alternative Locations

			Disk Image					
Source	Select Source Drive(s) and Image Des	tination					
Ν	1BR Disk 1 [C40210C3] - 5T200	0DM001-1CH164 CC29 <	1.82 TB>					
•	1 - System Reserved (Nor NTFS Active 260.9 MB 350.0 MB	ve)	2 - Work (2TB) (E:) NTFS Primary 386.73 GB 1.82 TB				v	
	5500 115		102 10					
Total Sele	en E:\Backups			v				_
		age ID as the file name.		\checkmark				
Backup f	ilename: {IMAGEID}	c/Chris/{IMAGEID}-00-0						
†Ļ† <u>Adv</u>	anced Options		Help	< Back	Next >	Cancel	Finish]

2. The Backup Locations dialog is shown.

	Backup Locations			x
This enables, for example, backup ro	e backup locations ation in this list will be tried in sequence tations to use multiple external drives th ne backup, missing sub-folders will be cr	at are assig	ned differen	
Type in a folder here to add as an alter	native location			
Add to list	Reorder priority:	🛧 Up	🔶 Down	🗙 Remove
Folder				
	There are no items to show.			
			ОК	Cancel

- 3. Select a folder and click Add to list
- 4. Repeat for each folder to be used as an alternative location
- 5. Change the order of locations by selecting a folder in the list and click **Up** or **Down**

Backup Locations
Edit the list of alternative backup locations
When a backup is running, each location in this list will be tried in sequence until a valid location is found. This enables, for example, backup rotations to use multiple external drives that are assigned different drive letters by Windows. Note: During the backup, missing sub-folders will be created automatically.
Type in a folder been to add us an elternative location
Add to list Reorder priority: 1 Up V Down Remove
Folder
E:\Backups
\\wb\public\Backups\
\10.0.1\Staff\Backups\
OK Cancel

- 6. Remove a folder by selecting it and clicking Remove
- 7. Click OK when done

Advanced Options

Advanced Options

All forms of backup in Macrium Reflect have advanced options, accessed by clicking the Advanced Options link, All backup wizards have this link which can always be located in the lower left hand corner of each wizard. Cloning, too, is a form or backup and this also has advanced options, accessed in the same way.

lmagin	ng Summary		
<u>8</u>	Auto Verify: Maximum File Size: Compression: Password: Intelligent Copy: Power Saving: Total Selected:	N Automatic Medium N Y N 397.71 G8	
Sched	lules	None	
Reten	tion Rules	Rules will be applied to all matching backup sets in the destination folder	
	Full:	Retain 12 full images Linked incremental and differential images will also be deleted	
	Differential:	Retain 4 differential images Linked incremental images will also be deleted	ľ
	Incremental:	Retain 10 incremental images The oldest incremental images may be consolidated	
		Purge will be run after the image.	
	Free space threshold:	Delete oldest backup sets when free space is less than 5.00 GB	
Destin	ation: File Name:	\\wb\public\Chris\{IMAGEID}-00-00.mrimg	-
	dvanced Options	Help Help <a <="" a="" href="help"> <a <="" a="" href="help"> <a <="" a="" href="help"> Help <a <="" href="help" td=""><td></td>	

Below is the Image backup advanced options as an example:

	Advanced Settings
Backup Email	
Compression File Size Password Auto Verify Image Comments Shutdown	Set the compression level for this image or backup Compression reduces the file size but may increase the total backup time. Medium (Recommended) Compression level Intelligent sector copy (Recommended) Copies only disk sectors used by the file system. Windows pagefile and suspend to disk (hibernation) files are not copied. This reduces the image size and backup time. Make an exact copy of the partition(s). Partitions include unused sectors therefore forensic examination of the partition(s) remain unchanged. Deleted files may be recovered for example.
	Help OK Cancel

Common Advanced Options - Available to all backup types except Cloning

Option	Description
Compression	Set the desired compression on the resulting backup file. Choose between None, Medium or High.
Intelligent sector copy	Copy only file system sectors/clusters that are in use. This reduces the size of the disk image file as unused file system clusters are not copied.
Make an exact copy	Copy every sector/cluster used by the partition. This will also copy unused space and will make the image file significantly larger than 'Intelligent sector copy' .
File Size	Set maximum file size that will be created for the backup file, these are also known as file splits. Choose between Automatic or fixed size in either Megabytes or Gigabytes.
Password	Add password protection to the resulting backup files. Choose between standard, medium and high encryption. Each increasing level of encryption will require a stronger password.
Auto Verify	Automatically verify the resulting backup file. This will add more time to the backup process but confirms if the resulting backup can be restored from.

Option	Description
Comments	Add a free form text comment to the backup.
Shutdown	Once the backup has complete you can choose to shutdown the computer, choose between Shutdown, Hibernate or Suspend.
Email Success	Set recipient, subject, body and attachments should this backup succeed.
Email Failure	Set recipient, subject, body and attachments should this backup fail.

Cloning Advanced Options

Option	Description
Intelligent Copy	 Clone only sectors in use from the source disk. Further to this option: Verify File System. Ensure the source file system is valid before cloning. Rapid Delta Clone. Only clone differences in the source and target disks since the previous clone was made. Enable SSD Trim. Ensure target SSD partitions are trimmed prior to a clone.
Forensic Copy	Clone all sectors from the source disk.

File & Folder Backup Advanced Options

Option	Description
Reparse Points	For both system and user reparse points, select to either follow or do not follow. An example reparse point is the folder "Documents and Settings" which when followed points (or expands) to a number of other folders. If followed then all folders the reparse point "contains" will be included in the backup.
Backup Set Matching	Choose between Similar, Strict or All.

Verifying image and backup files

Backup verification checks the entire contents of backup files against MD5 message digests (Hashes) created from the source data when the backup was created. For more information on the verification process see: Understanding Image Verification Failures

To verify Image and File and Folder backup files using the command line see: Verifying image and backup files from the command line

To verify using the Macrium Reflect user interface follow the steps below:

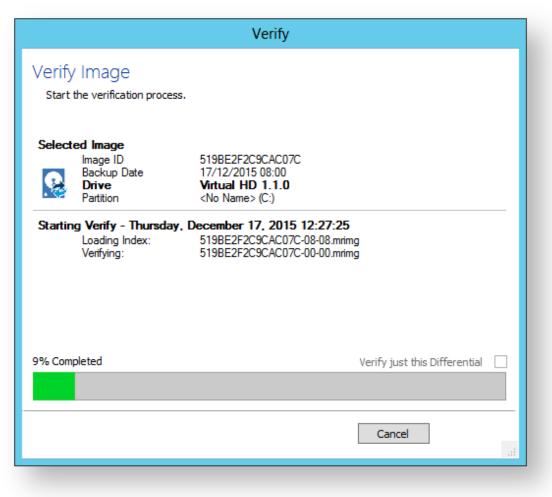
1. Click the 'Restore'tab, choose Image or File and Folder and select the backup that you want to verify:

Backup Restore Log	
▲ Restore Tasks	Image Restore File and Folder Restore Microsoft Exchange Restore SQL Server Restore
Browse for an image or backup file to restore Open an image or backup file in Windows Explorer Detach a backup Detach a backup	Browse for an image file Befresh Folders to search MBR Disk 1 [EE5CEE6C] - Virtual HD 1.1.0 <39.99 GB> If 1 - (C) NTFS Active 4.58 GB
Windows Explorer Other Tasks	4.56 GB 39.99 GB
D Other Tasks	
Details	Sort by
ID: 519BE2F2C9CAC07C Type: Differential Date: 17/12/2015 08:00	519BE2F2C9CAC07C-08-08.mrimg Image ID: 519BE2F2C9CAC07C Image ID: 519BE2F2C9CAC07C Image ID: 519BE2F2C9CAC07C Image ID: 519BE2F2C9CAC07C Image ID: 519BE2F2C9CAC07C
	5198E2F2C9CAC07C-07-07.mrimg

2. Click 'Verify':



3. Click the 'Verify' button in the dialog that opens:



The entire backup set required to restore the selected backup file will be verified. To just verify the integrity of the selected Differential or Incremental select the option 'Verify just this Differential/Incremental'.

How to backup Hyper-V Cluster Shared Volumes

Please ensure that you are running Macrium Reflect v6.1.1309 or later.

Disk images cannot be used to backup Hyper-V Cluster Shared Volumes.

Server 2012R2 Hyper-V Cluster Shared Volumes (CSV) can be backed up using the File and Folder backup functionality in Macrium Reflect. Earlier versions of Windows are not supported.

You must use the File and Folder restore functionality to restore VHD and VHDX files. You cannot mount /browse backup files and use Copy and Paste to restore files larger than 4GB

To ensure that you have correctly backed up the CSV folders please check the backup log.

Successful CSV snapshot Example.

Note the lines 'CSV - Volume n' and the snapshot line:

Folder:	C:\ClusterStorage\Volume1\VHD\
Include File Filter:	*.vhdx
Exclude File Filter:	*.temp; *.tmp; *.bak; *.~*
Include Sub Folders:	Y
Exclude Folder Filter:	
Exclude Hidden Files:	N
Exclude System Files:	N
Folder:	C:\ClusterStorage\Volume2\
Include File Filter:	* *
Exclude File Filter:	*.temp; *.tmp; *.bak; *.~*
Include Sub Folders:	Y
Exclude Folder Filter:	
Exclude Hidden Files:	Ν
Exclude System Files:	N
Email On Success:	N
Email On Failure:	Ν
Creating Cluster Shared	Volume Snapshot - Please Wait
o Snanchote Croated	'
CSV - Volume1	\/?\GLOBALROOT\Device\CSV{46542b53-ba80-4231-b971-5a0e6bd517cd}
CSV - Volume2	\\?\GLOBALROOT\Device\CSV{1b3332c3-b1ba-4198-8142-53c48e59e8e7}
ng backap Tharsday,	
	Packup Location (Dr) - Eron Space 97 50 CP
Destination Drive:	Backup Location (D:) - Free Space 87.50 GB
Free space threshold:	Delete oldest backup sets when free space is less than 5.00 GB
Free space threshold: Determining files to copy	Delete oldest backup sets when free space is less than 5.00 GB
Free space threshold:	Delete oldest backup sets when free space is less than 5.00 GB
Free space threshold: Determining files to copy	Delete oldest backup sets when free space is less than 5.00 GB
Free space threshold: Determining files to copy Total Number of Files:	Delete oldest backup sets when free space is less than 5.00 GB

The successful VSS log will also indicate 'C:\ClusterStorage\Volume*' added to the snapshot:

Discover explicitly included components
Verifying explicitly specified writers/components
Select explicitly included components
* Writer 'Microsoft Hyper-V VSS Writer':
- Add component \6FA1E0B1-72D8-4687-BAD8-C7BBC29E8338
Creating shadow set {e72a35c8-eefc-4fe9-bd50-35e95a123fe5}
- Adding volume \\?\Volume{12f7f3d3-b552-4a05-b948-da5ba054f7fd}\ [C:
\ClusterStorage\Volume1\] to the shadow set
- Adding volume \\?\Volume{2cd57d04-80b0-4d12-ac10-406e9f121b09}\ [C:
\ClusterStorage\Volume2\] to the shadow set

Failed Snapshot Example.

Note the Error message: VSS failed for Cluster Shared Storage. Ensure that no folders outside of CSV mount points are included in this backup

Folder: Include File Filter: Exclude File Filter: Include Sub Folders: Exclude Folder Filter: Exclude Hidden Files: Exclude System Files:	C:\ClusterStorage\Volume1\VHD\ *.vhdx *.temp; *.tmp; *.bak; *.~* Y N N
Folder: Include File Filter: Exclude File Filter: Include Sub Folders: Exclude Folder Filter: Exclude Hidden Files: Exclude System Files:	C:\boot\ *.* *.temp; *.tmp; *.bak; *.~* Y N N
Folder: Include File Filter: Exclude File Filter: Include Sub Folders: Exclude Folder Filter: Exclude Hidden Files: Exclude System Files:	C:\ClusterStorage\Volume2\ *.* *.temp; *.tmp; *.bak; *.~* Y N N
Email On Success: Email On Failure:	N N
To Create Volume Sna	i Volume Snapshot - Please Wait ipshot. Result Code: 0x80042313 hared Storage. Ensure that no folders outside of CSV mount points are included in this backup

How to backup Cluster Shared Volumes

1. From the **Backup** task bar, select 'Create a File and Folder backup' to start the backup wizard.

e	Macrium Reflect - Server Plus Edition [UEFI] — 🗖	×
File View Backup Restore Other Tasks Help	p Create a Backup Backup Definition Files VBScript Files PowerShell Files MS-DOS Batch Files Scheduled Backup	
 Backup Tasks Image selected disks on this computer. Create an image of the partition(s) required to be legisland restore Windryss. Create a File and Folder backup. Other Tasks SQL Server Tasks SQL Server Tasks Details 	Create a backup i backup Definition Files VBScript Files PowerShell Files MS-DUS backnike Scheduled backup Image Image Image Image Image Image Image Imaging Summary Imaging Summary Image Image Image Image Image Image Options XML View Image Image Image Image Image Options XML View Image Image Image Image Options XML View Image Image Image Options Im	s × ×

2. Select 'Add folder'.

File and folder backup			
Add the F	olders you want to Backup		
Source			
Backup Files an	d Folders		
Add, edit and delete folders that you wish to backup. After adding a folder you can select sub folders and files using wild-card filters for inclusions and exclusions.			
Click the 'Add fo	lder' link below.		
Add folde	Edit folder X Delete folder Backup NTFS permissions		
Destination			
 Folder 	E:\FileAndFolder\		
	Alternative locations		
O CD/DVD Burner	✓		
	✓ Use the Image ID as the file name. (Recommended)		
Backup filename:	{IMAGEID}		
	E:\FileAndFolder\{IMAGEID}-00-00.mrbak		
Help < Back Next > Cancel Finish			
	di .		

The 'Select Folder to backup' dialog appears.

Select folder to backup		
File and folder inclusion and exclusion masks		
1. Folder to backup		
C:\ClusterStorage\Volume1		
✓ Include subfolders		
Exclude hidden files and folders		
Exclude System files and folders		
Select files and folders to be included/excluded.		
Wildcards are supported. Separate multiple masks with semi-colon (*.xls; *.doc; *.mp3)		
2. Add files to include		
. v		
3. Add any files to exclude		
*.temp; *.tmp; *.bak; *.~* 🗸		
4. Add any folders to exclude ∨		
Enter full or partial folder path, wildcards are supported.		
"e.g. c:\temp; temp; *\temp; temp*"		
OK Cancel		

Select/Add o nly folder(s) beneath the C:\ClusterStorage\ in order for the Clustered Shared Volume contents to be included in your backup.
 Do not include folders outside of the 'C:\ClusterStorage\' mount point otherwise VSS will fail.

Several different masks and wildcards can be specified to include specific files within the given directory or exclude other files.

Option	Description
Include sub-folders	Recourse all folders below the backup folder using the specified filters
Exclude hidden files and folders	Do not backup files or folders that have the Hidden attribute

Description
Do not backup files or folders that have the System attribute
Add a semi-colon separated list of file name filters to include in the backup. Use the asterisk * character as a wild card. For example; *.doc; *data*; *.xls
Add a semi-colon separated list of file name filters to exclude from the backup. Use the asterisk * character as a wild card. Note : Exclude filters take precedence over include filters
Add a semi-colon separated list of folder name filters to exclude from the backup. Use the asterisk * character as a wild card. Filter names can be full path and/or folder names. For example: *temp* will exclude all folders with the letters 'temp' anywhere in the folder name *\data\temp* will exclude all paths where the folder name begins with 'temp' that

- 3. Click OK
- 4. Repeat to add further **CSV** directories if necessary.
- 5. In the **Destination** section, specify where you want the backup to be created.

Folder	Include Files	Exclude Files		Exclude Folders
-older C:\ClusterStorage\Volume1		*.temp; *.tmp; *.bak; *.~*		Exclude Folders
Add folder	Edit folder	X Delete folder		✓ Backup NTFS permissions
estination	Edit folder eAndFolder	X Delete folder		Backup NTFS permissions
) Folder				
 Folder E: \Filder <	eAndFolder\		led)	

Alternative Locations can be used to provide backup rotations or as a fail safe for temporary unavailability of the primary backup destination.

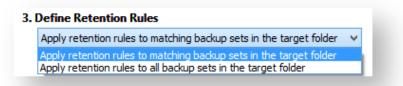
- 6. When you have finished adding folders and making all necessary changes, click Next.
- 7. The Backup Plan is shown:

None	
	▼
2. Add/Edit Schedules	
Backup Type	Schedule
Add Schedule	Edit Schedule
3. Define Retention R	lules
Apply retention rules	to matching backup sets in the target folder 🛛 🗸
✓ Full	Keep 12 A Backups V
✓ Full	
 ✓ Full ✓ Differential 	Keep 12 A Keep 4 A Backups V
 ✓ Full ✓ Differential 	Keep 12 n Badkups v Keep 4 n Badkups v Keep 10 n Badkups v
 ✓ Full ✓ Differential 	Keep 12 Backups 4 V Backups V Keep 10 Backups Create a Synthetic Full if possible

The new Macrium Reflect retention rules provide a powerful and flexible way to manage the lifetime and storage space used by your backups.

Choose how backups are matched and retention rules are applied to the target folder

Retention rules are applied to the target folder of the backup by selecting one of two options:



a. Apply retention rules to matching backup sets in the target folder.

Disk Images are purged if they contain **exactly the same Partitions** as the current Image. Partitions are identified using the unique **Disk ID** stored in sector 0 of the disk and the **Partition sector offset**.

Note: For GPT disks the unique GPT disk GUID is used instead of the Disk ID

For **File and Folder** backups retention rules are applied according to the '**Backup Set Matching'** option select in the '**Advanced Properties'** for this backup.

b. Apply retention rules to all backup sets in the target folder. All backup sets in the target folder of the same type (Disk Image or File and Folder) are purged according the retention rules.

Note: This option uses the same logic as Macrium Reflect v5

Select the age or number of backup types that you wish to keep

✓ Full	Кеер	12 Backups V
✓ Differential	Кеер	4 ▲ Backups ✓
✓ Incremental	Кеер	10 Backups V
		Create a Synthetic Full if possible
Run the purge	before back	up.
✓ Delete the olde	st backup se	et(s) if less than 5 GB on the target volume (minimum 1GB)

Option	Description
Full	When deleting Full backups all linked incremental and Differential backups in the same backup chain (set) are also deleted This operation will delete the entire backup set.
Differential	When deleting Differential backups all linked incremental backups in the same backup chain (set) are also deleted.
Incremental	When deleting Incremental backups the integrity of the backup set is maintained by ensuring that the chain is never broken. This is achieved by merging older Incremental backups when required.
	In the example below, before retention, there is 1 Full backup, 1 Differential backup and 6 Incremental backups. The retention rules are set to retain 4 incremental backups. After retention, the most recent 4 incremental backups are retained. Deleting the oldest 2 incrementals would cause the backup chain to be invalid as the oldest retained incremental requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backups are consolidated with it to create a new incremental backup.
	F = Full D = Differential I = Incremental

Option	Desc	riptic	on														
	м	т	W	т	F			м	т	w	т	F			м	т	w
	F							D	I	I	I	I			F	I	I
										->	I						
Create a Synthetic Full if possible	follo	wed b	by Inc	reme	ntal b	ackı	ups	, then	this o	kup set c option ca his is als	auses	the Fu	ull ba	ackı	up to	be 'ro	
Run the purge	Seleo	ct this	optio	n to ru	in the	rete	ntio	n rule	s befo	ore the c	urren	t back	up.				
before the backup	0	cal IS	lculati incluc	on wh led. Tl	en pu nis me	rging eans	g be tha	fore t t if yo	he cu u set	t backup rrent bac the reter a new F	ckup. ntion (In v6 f	the c to 1	curre Full	ent ba	ackup	set
Delete oldest backup set			•	move w the				•	set(s)	in the ta	irget f	older i	f the	e fre	e spa	ice on	the
(s) if less than n GB	0	ava		e drop	s belc	w th	e th	reshc	old the	oned dyn en the ru		-			-		

8. The next screen, **Summary**, gives the details of what is being backed up. Click**Finish**.

Restoring and browsing

Macrium Reflect can restore disk partitions exactly as they were when the backup was taken. With File and Folder backups you can restore all or selected files and folders to their original or new location.

You can also explore any backup or image file in Windows Explorer. This powerful feature enables you to restore individual files or folders by simply using copy and paste.

To restore whole computers, including boot partitions, Macrium Reflect uses Windows PE, a cut down version of Windows. On a working system, when you restore to an earlier time, Macrium Reflect reboots into the Windows PE operating system, carries out the requested restore, then boots back into the restored operating system. On a system that is not working, to restore to an earlier time, you need to boot from your Windows PE rescue media, whether that is a CD, DVD or USB-stick. The rescue media contains Macrium Reflect so that you can carry out the restore, then boot back into the restored operating system.

Although this all sounds complex, it really is very simple to perform with Macrium Reflect leading you through each step.

Finally, if you have *Macrium Reflect Server Plus*, it has a rich feature set for restoring backups of SQL databases and Microsoft Exchange Servers while giving you the power to restore to any time and granularity right down to an individual email.

Further reading:

- Restoring an image from within Windows
- Understanding partition alignment
- Browsing Macrium Reflect images and backups in Windows Explorer
- Restoring a file and folder backup
- Restoring MS SQL
- Restoring MS Exchange databases
- Restoring an MBR System image to UEFI/GPT
- Restoring a UEFI/GPT System image to MBR
- Bare metal restore of a Dynamic disk system
- Drive letters assigned to restored or cloned partitions
- Restore to VHD

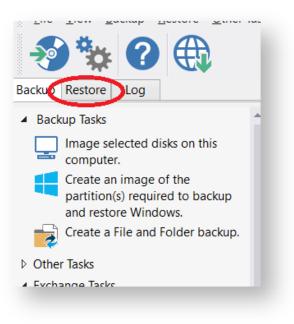
Restoring an image from within Windows

This topic is for restoring a data image. For restoring a system image see Restoring a system image.

If the image contains only data, restoring it is very simple using Macrium Reflect. You can restore it back to its original location without interrupting the operating system.

Before you begin: You must have a backup image of the disk ready to restore.

1. On the main screen, select Restore.



Backup images available to be restored are shown in the main pane.

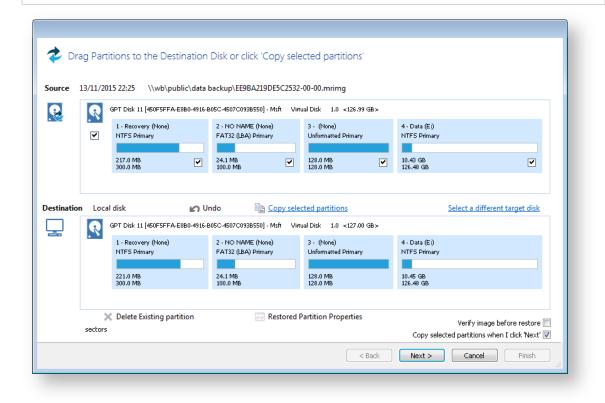
2. Select the image you wish to restore and click **Restore Image**.

Image Re	store File and Folder Restore Micros	oft Exchange Restore SQL Server R	lestore	
Dig Br	owse for an image file 0 Refre	sh Folders to search		
<u>.</u>	GPT Disk 11 [450F5FFA-E880-4916-805C-4507 1 - Recovery (None) NTFS Primary 217.0 MB	C0938550] - Msft Virtual Disk 1.0 <12 2 - NO NAME (None) FAT32 (IBA) Primary 24.1 MB	6.99 GB> 3 - (None) Unformatted Primary 128.0 MB	4 - Data (Ei) NTFS Pirmary
Sorthy	300.0 MB	100.0 MB File Name Images that contain	128.0 MB	126.48 GB
Soft by.	Backup Date Location Ecenton Folder: \\wb\public\data backup\ Type: Full Date: 13/11/2015 22:25 Image ID: EE9BA219DE5C2532		adrive: E: ▼	Browse Image Restore Image Verify Image Other Actions •

3. The next dialog gives you the opportunity to modify the destination properties.

(i) Moving and Resizing the restored partition

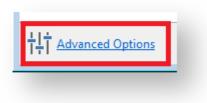
By default, partitions restore to their original locations. However, it's also possible to select a different target disk and to drag partitions to different locations and resize them to use the available space. Simply drag the source partition to any available partition or free space on the target disk. You can also delete partitions on the target disk to make space. For more destination options and further information, see Modifying restored partition properties.



4. Click Next.to restore back to the original location.

lestore Summary		*
Image File: Image ID: Date: Time: Image Type:	\\wb\public\data backup\EE9BA219DE5C2532-00-00.mrimg EE9BA219DE5C2532 13 November 2015 22:25 Full	
Source Disk: Geometry: Destination Disk:	GPT Disk 11 [450F5FFA-E880-4916-805C-4507C0938550] - Msft Virtual Disk 1.0 <126.99 GB> 16578\63\512 GPT Disk 11 [450F5FFA-E880-4916-805C-4507C0938550] - Msft Virtual Disk 1.0 <127.00 GB>	=
Verify: Delta: SSD Trim:	N Y Y	
chedules	None	
Iperation 1 of 4 Restore Partition: Drive Letter Start Sector: End Sector: Partition Type:	1 - Recovery NTFS 217.0 MB / 300.0 MB None 2,048 616,447 Primary	
peration 2 of 4 Restore Partition: Drive Letter Start Sector: End Sector:	2 - NO NAME FAT32 (LBA) 24.1 MB / 100.0 MB None 616,449 821.247	
Advanced Options	<pre>< Back Next > Cancel Finish</pre>	ר

5. If required, set Advanced Options as follows:



Option	Description
Rapid Delta Restore:	Copy only changed data blocks to complete the restore process more quickly See: Rapid Delta Restore - RDR
SSD Trim:	Enable TRIM on restore to increase of both the lifetime and the performance of the SSD. See: SSD Trim Support
Verify Image:	To verify the image integrity before restoring.

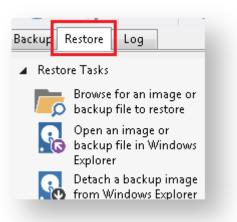
Option	Description
Master Boot Record:	To replace the Master Boot Record (MBR) with the MBR from the backup. The MBR is a small program that executes when the computer starts up. If this program becomes corrupt then you can have problems starting the computer operating system.
	Note: On modern GPT/UEFI systems this option has no effect.

6. A summary screen is displayed confirming the choices that have been made, click finish.

Restoring a System image from Windows

System images of, for example, the C drive, contain operating system files so it is not possible to restore files in real time because they will be in use by the operating system. To resolve this Macrium Reflect boots Windows PE, a cut down version of Windows. It then restores the file system before rebooting again and loading the restored Windows OS. Although this sounds complex, it really is very simple to perform.

1. In the main application window, select Restore.



2. Select the required image and click **Restore Image**.

Image Re	store File and Folder Restore Microsoft Exchange Restore S	QL Server Restore	
D Br	owse for an image file 🕐 Refresh 🛛 📷 Folders to	search	
R	MBR Disk 1 [7A17827F] - Virtual HD 1.1.0 <126.99 GB>		
	1 - System Reserved (None) NTFS Active	1 2 - (C;) NTFS Primary	
	42.0 MB 100.0 MB	122.83 GB 126.90 GB	
Sort by.	<u> <u> Backup Date</u> <u> Location</u> <u> File Name</u> Images t </u>	hat contain drive:	
	CBABC794FF847A5D-00-00.mrimg Folder: \\wb\public\nick\v6\Drive C Synthetic Full\ Type: Full Date: 10/02/2015 15:13 Image ID: CBABC794FF847A5D		Browse Image
Q	26CFF29CE6937957-15-15.mrimg Folder: \\wh\nublic\nick\v6\Drive C &mthetic Full\		

3. The next dialog gives you the opportunity to restore the image, click Next and select all defaults.

		-	ull\CBABC794FF847A5D-00-00.m	lining
?	MBR Disk 1 [7A17827F] - Virtual HD 1.1.0 1 - System Reserved (None) NTFS Active		2 - (Ci) NTFS Primary	
	42.0 MB 100.0 MB		122.83 GB 126.90 GB	 ✓
<u></u>	MBR Disk 1 [7A17827F] - Virtual HD 1.1.0		2 - (Ci) NTFS Primary	
	46.0 MB 100.0 MB		124.31 GB 126.90 GB	

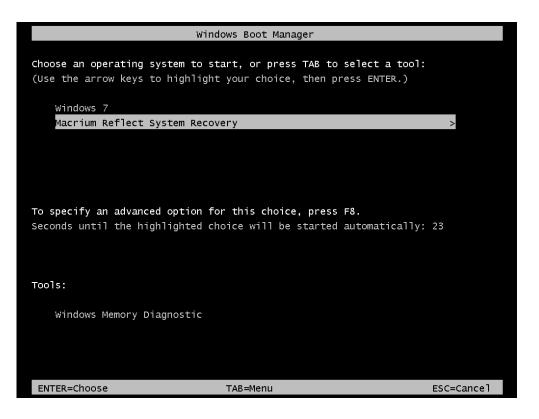
Note: By default, partition(s) restore to their original locations. However, it is possible to restore to a different partition by using Drag and Drop. Simply drag the source partition to any available partition on the target disk. See Modifying restored partition properties

- 4. Review the summary and click Finish.
- 5. Macrium Reflect, recognizing that it is not possible to restore the image to the C drive, displays a dialog informing you that Windows PE must be used. Click **Run from Windows PE**.

) lock drive
	The following drive is in use and the restore cannot continue:
. 🗡	[Volume{bb3f99ac-9f56-11e4-9209-806e6f6e6963}\]
- Wi	ndows PE
[V Automatic boot
	Automatically boot into Windows PE. This option is
	only available if you have enabled the Windows boot menu option in Macrium Reflect.
9	Select 'Run from Windows PE' to automatically run this
r	estore the next time Windows PE starts.
	Run from Windows PE Cancel

ONOTE: If the option for 'Automatic boot' is unavailable the please follow the steps Adding a Boot Menu option for system Image recovery and retry the restore.

6. You are prompted to restart your PC. Close any saved work and click Restart Now.



- 7. The system reboots, Macrium adds a boot menu option and automatically selects the recovery environment.
- 8. Windows PE boots and automatically runs Macrium Reflect. Macrium Reflect detects which image is to be restored and starts restoring automatically. When restore is complete, Macrium automatically reboots the PC again and the restored Windows OS boots as normal.

Restoring a system image video

Modifying restore destination partition properties

Hard disks are organized into partitions, similar to a filing cabinet, to optimize the use of space on the device. Each partition contains a small amount of error correction data, in case of a fault. Partitions are aligned to further optimize the amount of error correction data they require, maximizing the available space on the device.

There are two alignment possibilities used by Windows:

- 1. 1MB alignment. Beginning with Windows Vista/Server 2008 partitions are aligned on 1MB boundaries. For a disk with 512 bytes per sector this equates to 2048 sector alignment.
- Cylinder, Head, Sector (CHS) alignment. This is the alignment used by all Windows versions, up to and including Windows XP/Server 2003. Disks are described as having sectors, heads and cylinders, typically 512 bytes per sector, 63 sectors per head and 255 heads per cylinder. A head is often referred to as a track. Partitions start on a head (or track) boundary and end on a cylinder boundary http://en.wikipedia.org/wiki /Cylinder-head-sector.

Solid State Disks (SSD) require partition alignment to 4KB boundaries for optimum performance and life. 1MB aligned partitions are aligned on 4KB boundaries so present no problem, however, CHS aligned partition are often aligned on 63 sectors (31.5KB) degrading SSD performance and life time considerably. This can be improved by modifying restore destination partition properties when you restore an image.

When you ask to restore images Macrium Reflect initially sets out to restore the partitions back to their original position on the disk. From here you can modify their destinations.

The example below restores a 122GB partition to a 16TB disk.

To modify the restore destination:

1. Click Restore image.

Image Re	estore File and Folder Restore Microsoft Exchange Restore SQL Server	Restore	
7 🗖	rowse for an image file 🕐 Refresh 🛛 🦷 Folders to search		
R	MBR Disk 1 [7A17827F] - Virtual HD 1.1.0 <126.99 GB>		
	1 - System Reserved (None) NTFS Active	2 - (C;) NTFS Primary	
	42.0 MB 100.0 MB	122,83 GB 126,90 GB	
Sort by		in drive: D: -	Restore Image
	Type: Full Date: 10/02/2015 15:13 Image ID: CBABC794FF847A5D		Verify Image + Other Actions
	26CFF29CE6937957-15-15.mring Folder: \\web\public\nick\\x6\Drive C 3ynthetic Full\ Type: Incremental Date: 30/01/2015 01:59 Image ID: 26CFF29CE6937957		

2. The following dialog shows. **Source** shows the location of the image file we are restoring from. The **Target** is the original location.

	MBR Disk 1 [7A17827F] - Virtual HD 1.1.0		Full\CBABC794FF847A5D-00-00.mr	
<u>₹</u>	1 - System Reserved (None) NTFS Active	«126.55 GB»	2 - (C;) NTFS Primary	
	42.0 MB 100.0 MB	✓	122.83 GB 126.90 GB	✓
<u>.</u> *	1 - System Reserved (None)		2 - (C:)	
			 2 - (Ci) NTFS Primary 124.30 GB 126.90 GB 	

- 3. Click Select a different target disk and select the required target disk.
- 4. If you have partitions on the target disk which you are sure can be deleted, select each one in turn and click **Delete Existing partition** to create empty space.
- 5. Drag the source partition onto the destination partition.

The partition locates to the first available free area of the new disk. In this case, partition 2.

R	MBR Disk 1 [7A17827F] - Virtua	HD 1.1.0 <126.99 GB>	
	1 - System Reserved (None) NTFS Active	2 - (C:) NTFS Primary	
	42.0 MB 100.0 MB	122,83 GB 12 0 GB	■ 1
tion Loo		Undo Image: Copy selected partitions BB-3DF7-BF580DDE6677] - Msft Virtual Disk 1.0 <10.1	<u>Select a different target dis</u>
	1 - System Reserved (None)	2 - (Auto) NTFS Primary	
	NTFS Primary		

6. Click Restored Partition Properties.

The Partition Properties dialog appears for you to modify the size of the target partition.

artition Propertie	s						- ×-
Set the prop	erties for t	he rest	ored pa	rtition			
				Drive Letter:	Auto 🔻	Partition Type:	Primary 🔹
		\sum					
2 - (Auto) NTFS Primary 122.83 GB 2.52 TB		7.48 TB					
Partition Size:	2.517						
Free Space:	7.483	×	TB 🔻		Maximum Size 10.00 TB	Minimum Size 122.88 GB	Original Size 126.90 GB
Alignment:	Vista/7/SSD		TD •			Start Sector: End Sector:	206,848 5,405,634,559
						ОК	Cancel

- 7. There are a number of things you can do here:
 - Modify the drive letter by selecting another from the list.

- Click between the arrows < > above the disk view and drag the partition to a new size.
- Fine-tune the Partition Size, Free Space and Alignment.
- Click Maximum Size to configure the partition to the maximum available unallocated space on the disk, in this case about 10 TB (the size of the disk)
- Click **Minimum Size** to configure the partition to the minimum size, The minimum size is equivalent to the used space on the restored partition plus 50MB.
- Click **Original Size** sets the partition to the same size as it was when backed up.

Note: If the source disk is an MBR disk and the target is greater than 2TB in size then the restore process will automatically convert the disk to GPT style format.

8. Click **OK**.

()

See also: Drive letters assigned to restored or cloned partitions

Understanding partition alignment

Partition alignment refers to the physical sector offset of partitions. There are two alignment possibilities used by Windows:

- 1. **1MB alignment.** Beginning with Windows Vista/Server 2008 partitions are aligned on 1MB boundaries. For a disk with 512 bytes per sector this equates to 2048 sector alignment.
- 2. Cylinder, Head, Sector (CHS) alignment. This is the alignment used by all Windows versions, up to and including Windows XP/Server 2003. Disks are described as having sectors, heads and cylinders, typically 512 bytes per sector, 63 sectors per head and 255 heads per cylinder. A head is often referred to as a track. Partitions start on a head (or track) boundary and end on a cylinder boundary. http://en.wikipedia.org/wiki /Cylinder-head-sector

Partition alignment and Solid State Disks (SSD)

Solid State Disks require partition alignment to 4KB boundaries for optimum performance and life. 1MB aligned partitions are aligned on 4KB boundaries so present no problem, however, CHS aligned partition are often aligned on 63 sectors (31.5KB) degrading SSD performance and life time considerably.

Partition alignment and the Macrium Reflect cloning and restore function

To preserve the source partition alignment either...

- 1. Select the source partition check box(es) and click the 'Copy selected partitions' link.
- 2. Drag and drop the source partition(s) to free space on the target disk

To use the target partition alignment.

Note: This could be used to 'convert' and XP aligned partition for SSD alignment

1. Drag and drop the source partition to an existing partition on the target disk

These defaulted alignment possibilities can be overridden in the Partition Properties dialog by selecting the 'Alignment' drop down control.

iet the prop	erties for the restored	partition			
		Drive Letter:	None 🗸 🗸	Partition Type:	Primary 🗸 🗸
	•				
1 - System Reser NTFS Primary	ved (None)				
42.0 MB 100.0 MB	260.0 MB				
Partition Size:	100 MB	v	Maximum Size	Minimum Size	Original Size
Free Space:	260 MB	v	360.0 MB	92.0 MB	100.0 MB
Alignment:	Vista/7/SSD (1MB)	~		Start Sector: End Sector:	2,048 206,847
				OK	Cancel

Browsing Macrium Reflect images and backups in Windows Explorer

Introduction

By mounting image files in Windows Explorer you can browse or explore an image and access all the files in a backup. The backed up data appears as a temporary drive in Windows Explorer that you can access, just like any other drive, mounted with its own drive letter. Individual Files and Folders can easily be recovered by using Copy and Paste.

If you mount an incremental or differential backup, the chosen folder must contain *all* the files required to load the image. Meaning an incremental backup requires all the previous files in the backup set to be present, and a differential backup requires the full backup to be present. For example, If your backup is split across multiple DVD's then it isn't possible to mount the backup.

If you restart Windows, all temporary mounted Images are detached.

Note: If you have a File and Folder backup (not image backup) Macrium Reflect also has a wizard to restore selected files and/or folders. You must use the File and Folder restore wizard to restore files greater than 4 GB in size. These files cannot be restored by mounting your backup as described in this article. Please see Restoring a file and folder backup

There are several ways to mount / unmount an image:

- Mounting an image in Windows Explorer
- Using Macrium to mount an image
- Using Macrium Reflect Command Line Interface (CLI) to mount an image
- Unmounting a temporary mounted drive

See also: Browsing Linux Ext File System Images

Mounting an image in Windows Explorer

- 1. Navigate to the location of the image you wish to mount.
- 2. Right click the image file and select **Explore image**.

	📜 =		Documents	
le	Home Share	View		
$\overline{}$	👻 🛧 🚺 🕨 Th	is PC → Documents		
🕂 н	ome	Name	Date modified	Туре
🛨 Fa	vorites	Reflect	29/12/2014 19:59	File folder
	Explore image	F372357D-00-00	29/12/2014 19:59	Disk Partition image
	Restore Open with Share with Restore previous Send to Cut	s versions		
	Copy Create shortcut Delete Rename			
	Rename			

3. Select the partition you wish to mount and Click **OK**.

In this example, the image only contains one partition.

You can also select which Drive Letter you would like to be assigned.

Backup Se Select the Backu	election up or Image that you	u wish to brow	se and as	ssociate a dri	ve letter in	explorer.	
Original location	Backup Date	Drive Letter	Backup 1	D	Capacity	Used Space	Free
Recovery	29/12/2014 19:59	E: 🗸 🗸	7AFE0F9	FF372357D	300.0 MB	11.0 MB	28
<							>
	to restricted folders . Note: Changes are		d will be	discardec	ОК	Cance	

The option **Enable access to restricted folders** mounts the image with full NTFS access rights to all folders in the image. This means you can browse images created on another PC without having to grant NTFS permissions.

The option **Make writable** makes the mounted file system temporarily writable. This is useful when accessing files in the image where the opening application is required to write to the file. For example, Microsoft Virtual Hard Disk (.vhdx) files can be mounted and files in the mounted backup can be recovered without having to restore the .vhdx file first.

Note: Changes made to the mounted file system are temporary and are discarded when the image is unmounted.

4. You can now navigate through the image in Windows Explorer.

	Drive Tools	· · · ·	covery (E:)		
ile Home Share	e View Manage				\checkmark
) 🏵 🕆 🏠 🕅	'his PC → Recovery (E:)			✓ C Search Recovery	y (E:)
🚰 Home	Name	Date modified	Туре	Size	
★ Favorites	boot	16/12/2014 16:06	File folder		
Desktop	PerfLogs	04/11/2014 13:23	File folder		
Downloads	Program Files	16/12/2014 16:05	File folder		
Downloads	Program Files (x86)	04/11/2014 13:50	File folder		
💻 This PC	RecoveryImage	15/12/2014 03:08	File folder		
🐑 Network	Users	15/12/2014 03:00	File folder		
Metwork	Windows	16/12/2014 16:15	File folder		
🔩 Homegroup	Windows.old	15/12/2014 10:53	File folder		
	\$UPG\$PBR.MARKER	15/12/2014 10:45	MARKER File	1 KB	
	PSMounterLog	29/12/2014 20:24	Text Document	1 KB	
	Reflect_Install	16/12/2014 16:06	Text Document	300 KB	
items					

Using Macrium to mount an image

1. In the main window of Macrium Reflect, select Restore.

nage Restore File and Folder Restore Micro	soft Exchange Restore SQL Server R	lestore	
browse for an image file 🕚 Refr	esh Folders to search		
GPT Disk 11 [450F5FFA-E880-4916-805C-450	7C093B550] - Msft 🛛 Virtual Disk 1.0 <12	6.99 GB>	
1 - Recovery (None) NTFS Primary	2 - NO NAME (None) FAT32 (LBA) Primary	3 - (None) Unformatted Primary	4 - Data (E:) NTFS Primary
217.0 MB 300.0 MB	24.1 MB 100.0 MB	128.0 MB 128.0 MB	10.43 GB 126.48 GB
Fort by Backup Date Location	File Name Images that contain	drive: E: •	
EE9BA219DE5C2532-00-00. Folder: \\wb\public\data backup' Type: Full			Browse Image < Restore Image
Date: 13/11/2015 22:25 Image ID: EE9BA219DE5C2532			Verify Image + Other Actions

2. Select the image you wish to mount then click the Browse Image link.

Using Macrium Reflect Command Line Interface (CLI) to mount an image

1. Open a command prompt and change the directories as necessary so the path to reflect.exe is shown. See Running an elevated command prompt.

Complete the command line as follows:

reflect.exe ["Path to Image file"] [Add one or more switches]

Note: Instead of inserting Path to Image file you can also replace it with LAST_FILE_CREATED if you want the last Image created in the current Windows session to be mounted.

Available CLI switches:

-b	Browse Image, always needed to mount Image.
-auto	Do not show the Backup Selection dialog and automatically mount all partitions in the image file.
- drives	A comma separated list of drive letters to use for the mounted image eg; -drives m,n If no drive letters are specified then the next available letters are used.
	Note: To 'skip' mounting a partition use the Asterisk character instead of a drive letter
-pass	Use for password protected Image files, add password in inverted commas. e.gpass "password"

Note: If you do not use -auto you will be prompted with the **Backup Selection** dialog to assign the drive letters.

Some examples of using the CLI to mount images:

To mount an image and prompt for a drive letter:

C:\Program Files\Macrium\Reflect>reflect.exe "J:\76FF71EBBB032A35-00-00.mrimg" -b

To mount all partitions of an image using the next available drive letter(s):

```
C:\Program Files\Macrium\Reflect>reflect.exe "J:\76FF71EBBB032A35-00-00.mrimg" - b -auto
```

To mount all partitions for the last image created in the current Windows session:

C:\Program Files\Macrium\Reflect>reflect.exe "LAST_FILE_CREATED" -b -auto

To mount all partitions in an image using drive letters p,q,r

v9

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C:\Program Files\Macrium\Reflect>reflect.exe "J:\76FF71EBBB032A35-00-00.mrimg" -b -auto -drives p,q,r

To mount the third partition only using drive letter 'R'

```
C:\Program Files\Macrium\Reflect>reflect.exe "J:\76FF71EBBB032A35-00-00.mrimg" -b -auto -drives *,*,r
```

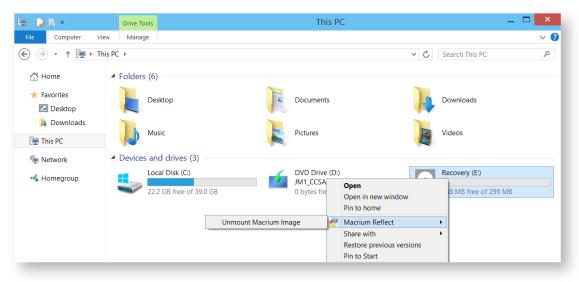
To mount all partitions in a password protected image using drive letters p,q,r where *pwd* is the password,(the password is case sensitive):

```
C:\Program Files\Macrium\Reflect>reflect.exe "J:\76FF71EBBB032A35-00-00.mrimg" -b
-auto -drives p,q,r -pass "pwd"
```

Unmounting a temporary mounted drive

Using Windows Explorer:

- 1. To detach a temporary mounted drive using Windows Explorer, right click the drive you wish to unmount.
- 2. Scroll to Macrium Reflect, click Unmount Macrium Image.



Using Macrium Reflect:

- 1. In the Macrium Reflect application, select **Restore** in the top menu.
- 2. Take the 'Restore' > 'Detach Image' menu option.

Restore	Other Tasks	Help	
brov	wse for an ima	ge or backup file to restore	
🔝 Expl	ore Image		
🔂 Deta	ich Image		
3			

3. Select the drive letter you wish to unmount.

Detach Image	X
Drive	Detach Cancel

Using the CLI:

- 1. Open a **command prompt** and change the directory as necessary so the path to reflect.exe is shown. See Running an elevated command prompt.
- 2. Complete the command line as follows:

reflect.exe [drive letter to detach] [-u]

(if no drive letter is included the switch -u will detach all temporary mounted drives).

3. Press Enter.

Examples of using CLI to unmount an image:

To Detach all temporary drives:

C:\Program Files\Macrium\Reflect>reflect.exe -u

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To Detach Drive J only:

```
C:\Program Files\Macrium\Reflect>reflect.exe J -u
```

(i) Problems mounting images

If you have a problem mounting your images, it is possible that the image mounting system driver has failed to load correctly. To resolve this issue it is recommended you reinstall Macrium Reflect. This problem can be caused by anti-virus software disabling features as a security precaution.

Browsing Linux Ext File System Images

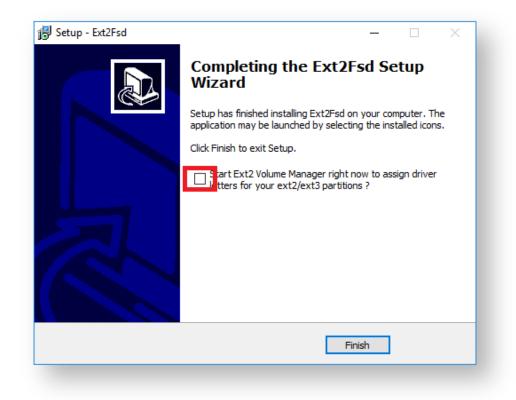
By default Windows doesn't recognise file systems formatted using Linux ext, however, Images containing Linux ext file systems can be browsed by using a free Windows driver.

Download Ext2Fsd from here: https://sourceforge.net/projects/ext2fsd/

Once downloaded, run the installer accepting any defaults.

Setup - Ext2Fsd		_		×
Select Additional Tasks				
Which additional tasks should be per	formed?		Q	
Select the additional tasks you would then click Next.	d like Setup to perform wh	ile installing Ex	t2Fsd,	
Make Ext2Fsd automatically sta	rted when system boots			
Enable write support for Ext2 page	artitions			
Enable force writing suppor	t on Ext3 partitions			
	< Back	Next >	Can	cel

De-select launching the volume manage as this isn't required.



Linux ext partitions in Macrium Reflect image files can now be mounted and explored.

iginal location	Backup Date	Drive Letter	Backup ID	Capacity	Used Space	Free Space	File System	Compression
Recovery	09/12/2017 13:30	N/A	ABA7C77C44ADA670	450.0 MB	372.9 MB	77.1 MB	NTES	Medium
S NO NAME	09/12/2017 13:30	N/A	ABA7C77C44ADA670	95.0 MB	28.4 MB	66.6 MB	FAT32 (LBA)	Medium
No Name >	09/12/2017 13:30	N/A	ABA7C77C44ADA670	16.0 MB	16.0 MB	0 B	Unformatted	Medium
🧇 <no name=""> (C:)</no>	09/12/2017 13:30	N/A	ABA7C77C44ADA670	1.02 TB	24.86 GB	1022.59 GB	NTFS	Medium
🧇 <no name=""></no>	09/12/2017 13:30	N/A	ABA7C77C44ADA670	977.0 MB	977.0 MB	0 B	Unformatted	Medium
🧼 <no name=""></no>	09/12/2017 13:30	N/A	ABA7C77C44ADA670	18.63 GB	5.76 GB	12.86 GB	ext	Medium
🧇 <no name=""></no>	09/12/2017 13:30	E: ~	ABA7C77C44ADA670	980.42 GB	15.55 GB	964.87 GB	ext	Medium
			-					>

		Name	Date modified	Туре
55		dev	09/12/2017 12:11	File folder
	A	lost+found	09/12/2017 12:04	File folder
s	A			
ts	1			

See also: Linux ext file systems can show a larger used and total space in Macrium Reflect

Restoring a file and folder backup

When you restore a file and folder backup, you can restore files to their original folder or restore the folder structure and selected files to a place of your choosing. If you want to restore individual files without their folder structure, browse them instead and use Windows Explorer to copy and paste them.

- This tutorial is only for File and Folder backups and not image backups. For information on restoring image backups see Restoring a system image.
 - 1. Open Macrium Reflect and select the **Restore**.

٢	Macrium Reflect - Server Plus Edition [UEFI]	_ — ×
<u>F</u> ile <u>V</u> iew <u>B</u> ackup <u>R</u> estore <u>O</u> ther Ta	Help	
🤧 🐄 🕜 🤀		
Backue Restore Log		
 Backup Tasks 	Create a Backup Definition Files VBScript Files PowerSI	hell Files MS-DOS Batch Files Scheduled Backups
Image selected disks on this computer.	O <u>Refresh</u>	
Create an image of the	GPT Disk 1 [4DE35055-08EB-46C3-8D02-E71FEB27680D] - Msft V	rtual Disk 1.0 <40.00 GB>
partition(s) required to backup and restore Windows.	📒 1 - Recovery (Non 🗧 2 - NO NAME (N 📒 3 - (None)	4 - (C:)
Create a File and Folder backup.	NTFS Primary FAT32 (LBA) Primar Unformatted Primary	NTFS Primary NTFS Primary
▷ Other Tasks		
 Exchange Tasks 	15.0 MB 300.0 MB ☑ 25.5 MB □ 128.0 MB □ 99.0 MB □ 128.0 MB □	17.36 GB 253.7 MB 39.04 GB 450.0 MB
Backup Microsoft Exchange	Actions 🗸	
 SQL Server Tasks 	Clone this disk	
👼 Backup SQL Databases		
Continuous Backup		
Manage SQL Logins		
Details		
Recovery		
{62EA5380-70C2-4998-9A58-1095A		
File System: NTFS		
Free Space: 285.0 MB		
Total Size: 300.0 MB		

2. Select File and Folder Restore.

٢	Macrium Reflect - Server Plus Edition [UEFI]	_ 🗆 🗙
 File View Backup Restore Other Task Backup Restore Log Restore Tasks Browse for an image or backup file to restore Open an image or backup file in Windows Explorer Detach a backup image from Windows explorer Other Tasks Other Tasks Details ID: 7AFE0F9FF372357D Type: Incremental Date: 01/01/2015 18:00 		All files in view Selected file Search
	Folders to search	

3. Select your backup, if none show select **Browse for a backup file...** and locate the file you want, it is added to the list of backups in the bottom half of the window.

\$	Macrium Reflect - Server Plus Edition [UEFI]	- 🗆 X
Eile View Backup Restore Other Tasks J		
 Restore Tasks Browse for an image or backup file to restore Open an image or backup file in Windows Explorer Detach a backup image from Windows explorer Other Tasks Details D: 92E18D851AC753B5 Type: Full Date: 12/01/2015 18:46 C:\USERS\ADMINISTRATOR\DOCUMENTS* Inc: *.* Exc: *.temp; *.tmp; *.bak; *.~* 	Type: Full	e Backup

4. Click Restore Backup.

Select the Folders and Files that you was File Name: C:\Users\Administrator\Desktop\Backups\ Backup Date: 13/01/2015 09:00		
□-♥ ↓ Drive (C) □-♥ ↓ Users		Drive (C)
i → ♥ ▶ Administrator i → ♥ ▶ Documents	Type of file:	Virtual Backup Drive
···· ✓ g, My Music ···· ✓ g, My Pictures ···· ✓ g, My Videos	Created:	12/01/2015 18:46
Reflect SQL Server Management Studio Visual Studio 2010 SQL desktop.ini	Attributes:	Read only Hidden
< B	ack N	ext > Cancel Finish

5. Select the files that to be restore. You may restore all the files as shown in this tutorial, or select individual directories and files you wish to restore.

Where do you want to restore to?
i
Original location. Restore to the same directory as the backed up files.
New location. Choose a new location for the restored files.
P Browse for folder 🗸
File replace Replace all files
✓ Restore folder create and modified dates
Restore NTFS permissions.
Note: NTFS permissions can only be restored to NTFS formatted drives.
< Back Next > Cancel Finish

- 6. Click Next.
- 7. Select where you would like the files restored to. By default they are placed in the original location, but it is possible to restore them to a new location.
- 8. Click Next.
- 9. A summary window displays showing the details of the restore.
- 10. Click Finish.

	Macrium Reflect	
i	Restore completed successfully See history log for more details	
		OK

Restoring MS SQL

Macrium Reflect Server Plus offers a rich feature set for restoring backups taken of SQL databases.

- Restoring MS SQL to time of backup
- Restoring MS SQL to a point-in-time
- Restoring MS SQL to a different instance, folder or database name

Restoring MS SQL to time of backup

1. Select SQL Server Restore.

You should see your backups. If no backups show click **Folders to search**, to direct Macrium Reflect to the location of the SQL backup files.

Image Restore File and Folder Restore Micro	soft Exchange Restore SQL Server Restore		
	esh Folders to search		
WIN-V6Q5GT1GS00	🕏 Set the restore	e options for SQL database 'master'	
	Destination	Restore summary	
master	Instance: WIN-V6Q5GT10	SS00 V Database to restore	Restore Type
	Target database master name:	WIN-V6Q5GT1G5	600\master Restore to previous I
	Restore to directory:	\MSSQL\DATA\ ✓	
	Restore to time: Restore most n	ec Select time	
	C:\Users\Administrator\Deskt	op\WIN-V6Q5GT1GS00_n	
	Restore plan		
	Type Date and ti		
	Full 12/01/2015	10:55:11	
	< 111	> < III	>
		Verify	Restore

The left hand tree shows databases that can be restored.

2. Select the databases you wish to restore.

The middle of the screen shows controls for choosing the destination instance, database name and directory that contains the MDF and LDF files. The controls automatically default to the instance, database name and directory of the original backup. The latest backup is selected.

- 3. If you wish to restore to a different backup click Select time... and select the backup you wish to restore to.
- 4. When you are happy with the selection, click **Restore**.

5. Review the summary and click **Restore**.

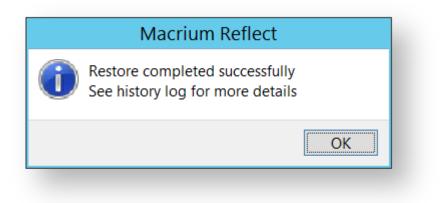
Restore Plan	
Restoring database: Backup File: Restoring to instance: Restore action: Restore time: Target directory:	master C:\Users\Administrator\Desktop\WIN-V6Q5GT1GS00_master_2015-01-12-10-55-10.mrsql WIN-V6Q5GT1GS00 Restore to previous backup 2015-01-12 10:55:11 C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQLSERVER\MSSQL\DATA\
Overall Progress:	
	Cancel Restore

6. A warning box appears, if appropriate click **Yes** to continue with the restore.

Restoring a backup may lead to data being lost that has been added since the last backup. Do you wish to continue?		Macrium Reflect
-	<u>^</u>	lost that has been added since the last
Yes <u>N</u> o		Do you wish to continue?
		<u>Y</u> es <u>N</u> o

The restore completes and a dialog box advising completion appears.

7. Click OK.



Restoring MS SQL to a point-in-time

In some circumstances, it is possible to restore a database to a specific point-in-time. This is especially useful if you have accidentally deleted a table or other specific piece of data and need to roll back to the point just before the delete was done. The following situations must be considered when trying to restore to a point-in-time:

- The database must be running the FULL recovery model.
- It is not possible to restore to a point-in-time prior to the last full or differential backup.
- It is not possible to restore to a point-in-time between full or differential images. You can restore to a point-intime from the last full or differential to the present.

In order to restore to a point-in-time:

- 1. On the Restore task pane, select SQL Server Restore and select a database.
- 2. Click **Select Time...** you see the following dialog showing the history of backups made for the selected database.

Sele	ect restore time	X
Select the time you wish to resto	re to	
• Restore to time of backup		
◯ Restore to Current Time		
Restore to a specific date and time Time: 12 Jan 2015 15:58:06 Backup file: C:\Users\Administrator\Desktop\W	Now Now /IN-V6Q5GT1GS00_master_1	2015-01-12-15-58-05.mrsql
Backup date	Backup type	
Mon 12/01/2015 15:58:06 Mon 12/01/2015 10:55:11	Full	
		OK Cancel

3. Select Restore to a specific date and time.

- 4. Select the time you wish to restore to, either setting the time and date manually, or selecting the backup you wish to restore and then tweaking the date/time as required. It is not possible to set the controls to a date /time that can not be restored. Click **OK**.
- 5. Continue as above.

Restoring MS SQL to a different instance, folder or database name

It is possible to restore a backup to a different instance by selecting the target instance in the **Instance** drop down combo box. Be aware that there can be compatibility issues when restoring databases to Microsoft SQL instances of differing versions.

By default, the folder selected in **Restore to directory** is the default folder where the instance places MDF and LDF files associated with the databases. If you change the folder, upon restoration, the MDF and LDF files move to the target directory, wherever they were to start with.

By default, Macrium Reflect restores the database back to the original database name. However, if you change the name of the database in **Target database name**, a new database of that name is created. The MDF and LDF files that restore also rename. This ensures the original database does not change but can be deleted manually when it is no longer required.

Restoring MS Exchange databases

Macrium Reflect Server Plus can restore select databases back to your Microsoft Exchange Server providing the following restore scenarios:

- Restoring MS Exchange databases to time of backup
- Restoring MS Exchange databases to point in time
- Restoring MS Exchange databases to a different name or location

Restoring MS Exchange databases to time of backup

1. Select Microsoft Exchange Restore.

Available databases display. If no databases are showing, click **Folders to search** to search for Microsoft Exchange backup files.

Image Restore File and Folder Restored Microsoft Exchan	nge Restore DL Server Restore	
() Refresh	Folders to search	
MINEXH13 Millox Database 0195109825 -	Select databases to restore from Restore Options	Restore Summary
Win2k8R2Ex2k13	Create rollback for files being restored	Database Type Date
	Creater folloads for files to being restored Creater folloads for files not being restored Deleter rollback on completion Mount database after restore Restore to Mailbox Database 1095109825 Restore from backup 08/01/2015 11:10 Restore Plan Type Date	Malbox Database I type Date Malbox Database Full 08/01/2015 11:10
	Ful 08/01/2015 11:10	

2. Select each database to restore. By default the most recent backup is selected.

Restore Plan shows the backup files selected.

Restore Summary lists all databases restoring and the date/time of the backup file to restore from.

Image Restore File and Folder Restore Microsoft Exc	hange Restore SQL Server Restore			
() <u>Refresh</u>	Folders to search			
		Restore Summary Database Instruction Database 09509035 Instruction Database 0926457378	Type Full Full	Date 08/01/2015 11:10 13/11/2014 14:11
				Restore

- 3. Click **Restore** to restore selected databases back to their original volume locations and database names.
- 4. Review the information and click **Restore**.

Restoring MS Exchange databases to point in time

When you restore to a different point in time, only the log files up to that point in time are restored which are then replayed into the restored database. you restore to a different point in time Macrium Reflect replays the log files up until the selected point.

- 1. Select the databases to restore.
- 2. For each database restoring, select **Restore from backup**.

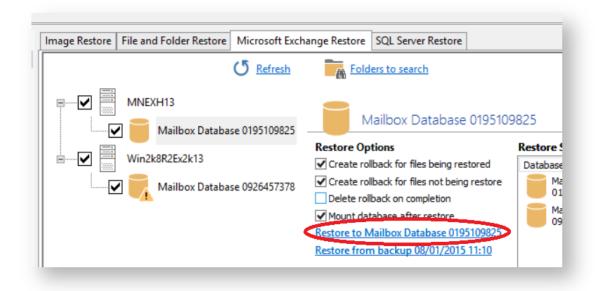
Select Exchange Backup				
Select Exch	nange Backup To Restore	From		
Date	Time	Туре	Size	
 ∠ 2014 → October → November 				
L 13/11/20	014 14:11:45	Full	102.7 MB	
View files in Ex	<u>change Backup file</u>	OK	Cancel	

- 3. Select a file in the list.
- 4. Click OK.
- 5. Optionally, click View files in Exchange Backup file to show files contained in the backup.
- 6. Click **OK** to keep the current selection.
 - Note: When restoring databases to point in time for the same storage group (under Microsoft Exchange 2003/2007) Macrium Reflect forces you to use the same backup file in a single restore operation to maintain log file consistency during the mount process. If you need to restore databases in the same storage group to different points in time, do so in separate restore operations.
- 7. Review the information and click **Restore**.

Restoring MS Exchange databases to a different name or location

Macrium Reflect Server Plus allows you to restore databases to different names and locations with support for storage group and database creation.

- 1. Select the databases to restore.
- 2. Click Restore to (in this example) Mailbox Database.



Select Restore Destination wizard begins:

Select Restore Destination
Select type of restore for Database
 Restore to original location Restore database back to original name and volume location When restoring to a different domain, use 'Restore to Recovery Management' Restore to alternate location Databases can be restored to either a different location or database When restoring to a different domain, use 'Restore to Recovery Management'
 Restore to Recovery Management Restore to Microsoft Exchange Recovery mechanisms Required when restoring from a different domain Note: Microsoft Exchange 2003 does not support online Recovery Management
< Back Next > Cancel Finish .:i

- 3. Select Restore to alternate location.
- 4. Click Next.
- 5. Specify the database to restore to:

	Select Restore Destination
Select where to R New database settings	Restore
Name	Exchange_restore
Path	C:\Users\administrator.MACRIUMNET\Desktop\exchange2013
Log file path	C:\Users\administrator.MACRIUMNET\Desktop\exchange2013
	<back next=""> Cancel Finish</back>

Name:	Specify the name for the database
Path:	Specify the folder where you want the database restored.
Log file path:	Specify the folder where transaction log files are stored.

6. Click Next.

7. Review the information and click **Finish**.

Restoring emails with Mailbox Restore

In Macrium Reflect Server Plus you can use Mailbox Restore to restore individual emails from a backup of Microsoft Exchange. This is useful if your backup contains some vital emails or attachments, but you don't want to have to restore the whole MS Exchange server in order to access them .

Mailbox Restore can restore emails, appointments, contacts, journal entries, notes and tasks in the same way.

Before you begin:

For Mailbox Restore to function, Microsoft Exchange MAPI and CDO must be installed on the server. These are present by default on Microsoft Exchange Server 2003. For Exchange 2007 or later, they can be downloaded from the following link:

http://www.microsoft.com/en-us/download/details.aspx?id=42040

To restore an email using Mailbox Restore, the edition of Microsoft Exchange running on the target server must be the same as the original server. An email backed up on a server running Exchange Server 2007, for example, can be restored onto other servers running Exchange 2007, but not to a server running Exchange 2010.

Note: A mailbox needs to exist on the target server, with the same name as the original mailbox.

The user running Macrium Reflect must have full access permissions for the mailbox being restored to.

- 1. In Restore, select Microsoft Exchange Restore.
- 2. Select Restore Exchange Mailboxes.

Macrium Reflect - Server Plus Edition			- • •
<u>Eile V</u> iew <u>B</u> ackup <u>R</u> estore <u>O</u> ther Tasks <u>H</u> elp			
≫ 🍫 🕜 🤀			
Backup Restore Log			
Restore Tasks	Image Restore File and Folder Restore Microsoft Exch	nange Restore SQL Server Restore	
Browse for an image or backup file to restore	(J Refresh	Folders to search	
Open an image or backup file in Windows Explorer	WIN-2K8R2		co170
Detach a backup image from Windows Explorer	Mailbox Database 0005262179	Mailbox Database 00052	
> Other Task	Mailbox-database-2	Restore Options Create rollback for files being restored	Restore Summary Database Type
Exchange Tasks	Public-folders	Create rollback for files not being reston	Database Type
Restore Exchange Mailboxes		Delete rollback on completion Mount database after restore	
We meant an Evchange Backing		Restore to Mailbox Database 0005262179	
Verify an Exchange Backup		Restore from backup 04/02/2015 12:55	
		Type Date	
		1,000 0000	
			Restore
	<u> </u>		

The Exchange Mailbox Restore Wizard appears.

3. Select the required message store / database to restore from and click Next.

Exchange Mailbox Restore Wizard Select the Exchange Backup to Restore				
WIN-2K8R2 Mailbox Database 0005262179 Mailbox-database-2 Public-folders	Date	Time 10:22:27 11:18:44 12:24:26 12:54:22 12:55:59	Type Full Full Full Incremental	Size 133.3 MB 146.5 MB 146.2 MB 146.4 MB 103.4 MB
	< Back	Next >	Close	estore

4. Select required folder, or click appropriate folder to select required individual email to restore.

	Filter	by mes	sage class (IPM.Note)				Y
		0	From	Subject	Date	Time	Size 🖌
🖻 🔲 🧧 Marian Houston			Justin.Meyer@absorbres	earch.com <justin.meye< td=""><td>r@absorbresear</td><td>ch.com></td><td>3 KB</td></justin.meye<>	r@absorbresear	ch.com>	3 KB
Inbox (850 items)		\square	Michele.Cox@absorbr	re: about_ActiveDirec	24 Septemb	14:12:40	6 KB
Outbox (0 items) 🔂 Sent Items (0 items)		\square	Edwin.Singleton@abso	re: about_ActiveDirec	24 Septemb	14:16:23	7 KB
Deleted Items (0 ite		\square	Edwin.Singleton@abso	re: about_ActiveDirec	24 Septemb	14:18:04	6 KB
Calendar (0 items)		\square	Neil.Newman@absorb	re: about_ActiveDirec	24 Septemb	14:20:12	6 KB
Contacts (0 items)		\square	Justin.Meyer@absorbr	re: about_ActiveDirec	24 Septemb	14:20:40	5 KB
Drafts (0 items)		\square	Marian.Houston@abso	re: about_ActiveDirec	24 Septemb	14:23:33	6 KB
🔚 Journal (0 items)		\bowtie	Michele.Cox@absorbr	re: about_ActiveDirec	24 Septemb	14:23:57	3 KB
		\bowtie	Eric.Wade@absorbrese	. re: about_ActiveDirec	24 Septemb	14:24:25	4 KB
Tasks (0 items)		\bowtie	Todd.Summers@absor	re: about_ActiveDirec	24 Septemb	14:24:38	5 KB
Deletions (0 items)		\bowtie	Franklin.Phelps@absor	re: about_ActiveDirec	24 Septemb	14:25:05	6 KB
····· Versions (0 items)		\bowtie	Jerome.Manning@abs	re: about_ActiveDirec	24 Septemb	14:26:16	6 KB
		\bowtie	Lois.Hall@absorbresea	re: about_ActiveDirec	24 Septemb	14:26:30	6 KB
		\square	Winifred.Mann@absor	re: about_ActiveDirec	24 Septemb	14:26:39	5 KB 👻

5. Click the filter button to filer the email list by Sender, Recipient, Subject, Between dates, or whether there are attachments.

E	schange Mailbox Restore Wizard Select items to restore □-□ ■ WIN-2K0R2	*	Filte	r by mes	sage class (IPM.Note)		
	Avia Resolution A	ш			From Marian.Houston@absor Michele.Cox@absorbre Edwin.Singleton@absor Reil.New man@absorbre Justin.Meyer@absorbre Marian.Houston@absor Michele.Cox@absorbre Eric.Wade@absorbreses Todd.Sum mers@absort	 Sender Contains Recipient Contains Subject Contains Between dates Where items have IPM.Note 	Mike Active 16/02/2015 • To 16/02/2015 • one or more attachments •
-	Curcions (0 items)	Ŧ			Franklin.Phelps@absorb Jerome.Manning@abso Lois.Hall@absorbresear Winifred.Mann@absorb	Match Case	Reset OK Cancel ck Next > Close Restore

- 6. When you have made all the required selections / deselections, click OK.
- 7. Click Restore.

Setting up permissions for Mailbox Restore

MS Exchange 2007 or more recent

- 1. Open the Microsoft Exchange Management Shell as an administrator.
- 2. Run the following commands:

```
Add-MailboxPermission -user USERNAME -AccessRights FullAccess -
InheritanceType All MAILBOX
Add-ADPermission -user USERNAME -ExtendedRights Send-As MAILBOX
Add-ADPermission -user USERNAME -ExtendedRights Receive-As MAILBOX
```

substituting USERNAME and MAILBOX with your own username and the name of the user of the target mailbox.

MS Exchange 2003

- 1. Click Start > Administrative Tools > Active Directory Users and Computers.
- 2. Under Users, right click on the user whose mailbox you wish to restore to, and click Properties.

🍜 Active Directory Users and Comp 🎻 File Action View Window <u>H</u>	alp			
		2 🖮 🖓 🍕 🙍		
		4 100 Y ≪ 🕼		
Active Directory Users and Computer E- Computer Saved Queries	Users 23 objects			
E 2k3test.local	Name	Туре	Description	
🗄 📲 Builtin	Administrator	User	Built-in account for admini	
🗄 🖳 Computers	Cert Publishers	Security Group	Members of this group are	
🗄 🧭 Domain Controllers		Security Group	DNS Administrators Group	
🖅 💼 ForeignSecurityPrincipals	2 DnsUpdateProxy	Security Group	DNS clients who are permi	
Users	Domain Admins	Security Group		
	Domain Computers	Security Group	All workstations and serve	
	Domain Controllers Domain Guests	Security Group	All domain controllers in th	
	Domain Users	Security Group	-	
		Security Group Security Group		
	Exchange Domain Servers		Microsoft Exchange Domai	
	Exchange Enterprise Serv		Microsoft Exchange Enter	
	Group Policy Creator Own		Members in this group can	
	Guest	User	Built-in account for quest	
	HelpServicesGroup	Security Group		
	RIIS_WPG	Security Group		
	IUSR_TSTSVR01	User	Built-in account for anony	
	1WAM_TSTSVR01	User	Built-in account for Intern	
	RAS and IAS Servers	Security Group	Servers in this group can	
	🕵 Schema Admins	Security Group	Designated administrators	
	5UPPORT_388945a0	User	This is a vendor's account	
	🕵 Target Mailbox Name	licer		
	T T CILICOLICIICS	oy	Members of this group ha	
		d to a group		
		able Account		
		set Password		
		<u>v</u> e :hange Tasks		
	_	en Home Page		
		nd Mail		
	All	Tas <u>k</u> s 🕨		
۲	Cu			
Opens the properties dialog box for the cu		ete		
opens are properties dialog box for the to	Trenc Selection. –	na <u>m</u> e	,)
	Pr	operties		
	He	D		

3. In Exchange Advanced, click Mailbox Rights.

Target Mailbox Name Properties	? 🗙
Member Of Dial-in Environment Terminal Services Profile COM+ General Address Account Profile E-mail Addresses Exchange Features	
Sim <u>p</u> le display name:	
🔲 Hide from Exchange address lists	
Downgrade high priority mail bound for X.	400
View and modify custom attributes	Custo <u>m</u> Attributes
Configure server and account information for Internet locator service	ILS Settings
View and modify permissions to access this mailbox	Mailbox <u>R</u> ights
Administrative Group: First Administrative Gro	up
OK Cancel	Apply Help

4. In the Permissions dialog, click Advanced, select your user name in the list, and click Edit.

If your user name does not appear on the list, then click **Add**, use the dialog to select your user name, then click **OK**.

	Advanced Security Settings for Target Mailboy Name
Permissions for Target Mailbox Name Mailbox Rights Group or user names: Administrator (2K3TEST\Administrator) Administrator (2K3TEST\Administrator) ADNYMOUS LOGON Domain Admins (2K3TEST\Domain Admins) Enterprise Admins (2K3TEST\Domain Admins)	Advanced Security Settings for Target Mailbox Name Image: Constraint of the second secon
click Advanced.	Learn more about access control.
OK Cancel Apply	OK Cancel Apply

5. Check Full mailbox access - Allow , and click OK.

Permission Entry for Target Mailbo	x Name	? ×
Object		
This permission is inherited from the p	arent object.	
Name: Administrator (2K3TEST\Ad	dministrator)	Change
Apply onto: This object and subcor	itainers	
Permissions:	Allow	Deny
Delete mailbox storage Read permissions Change permissions Take ownership Full mailbox access Associated external account		
C Apply these permissions to object containers within this container of	is and/or nly	Cjear Ali
	ОК	Cancel

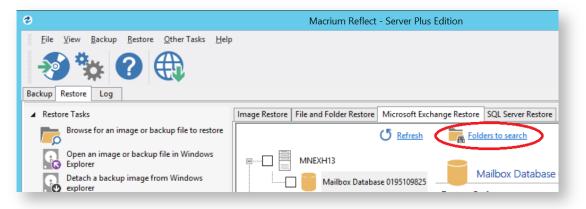
Adding MS Exchange search folders

(II)

Macrium Reflect Server Plus maintains a list of all Microsoft Exchange backup folders, these folders are queried in the Microsoft Exchange Restore view for storage groups/databases that can be restored.

Note: Macrium Reflect Server Plus can discover backups of Microsoft Exchange made on different servers by using the following steps but only detects backups made from the same version of Microsoft Exchange. When restoring databases from a different server you must restore databases to Microsoft Exchange recovery mechanisms before migrating mailboxes using Microsoft Exchange.

1. Select Folders To Search at the top of the Microsoft Exchange Restore tab.



The Rebuild Exchange Backup Cache wizard displays.

	Rebuild Exchange Backup Cache
Select	Exchange Backup Folders
Add a folder to	the list
Type in a folder	r here to add to the search list
Add to list	
Recent backup	destinations
Search	Folder
¥	C:\Users\administrator.MACRIUMNET\Desktop\exchange2013\
	Remove
	< Badk Next > Cancel Finish

- - a. Typing a folder name into the edit box.
 - b. Clicking the browse button.
 - c. Selecting Add to list and browsing available folders.
- 3. Select required folders and click Next.

	Reb	uild Exchange Ba	ackup Cache		
Review Fo	olders to scan				
Action Process folder C:\U	lsers\administrator.MACF	RIUMNET\Desktop\ex	change2013\		
		< Back	Next >	Cancel	Finish

- 4. Review the folders to scan.
- 5. Click Finish.

Macrium Reflect scans the specified folders for Microsoft Exchange backups and lists those available for restore in **Microsoft Exchange Restore**.

Restoring an MBR System image to UEFI/GPT

The Unified Extensible Firmware Interface (UEFI) is an interface between a computer's firmware and operating system. It is designed as a replacement for Basic Input/Output System (BIOS). UEFI supports hard disks with either master boot record (MBR) or the newer GUID Partition Table (GPT) system. GPT is a newer standard that supports disks larger than 2TiB and allows for more than four primary partitions per disk.

As UEFI and GPT are increasingly widespread, older images of MBR disks often need restoring to replacement UEFI / GPT systems.

Rescue media created on Windows 7 and later is dual boot, meaning it boots in both MBR and UEFI mode. Boot your rescue media in UEFI mode. Consult your Motherboard user manual for information on how to do this.

Caution: We assume there are no other hardware differences between the system being imaged and the system being restored to. For dissimilar hardware, use ReDeploy.

1. Boot into Windows PE.

2. Open a Windows command window. To open a command window click the icon on the taskbar.

3. Type:

0

diskpart

4. Type:

v9

list disk

5. Select the disk number that you want to restore to. For example:

select disk 0

6. Clean the selected disk:

e.	-						 	 	 	 	 -	 -	 				-				-		-		 		-	-	 -		 	 	 -		 	 	 	 	 	 -	 -	 	 	 -		 	-	 	 	 -	 -	- 1
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7. By default, "clean" creates an empty MBR disk. Convert it to GPT:

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convert gpt

8. Create the EFI partition:

create partition efi size=200

9. Format the EFI partition:

format fs=fat32

10. Create the MSR partition:

create partition msr size=128

11. Exit Diskpart:

e	хi	t.																								
0.		Ŭ																								
			 	 	 	10.000	 	 10.000	 																	

	: X:\Windows\Syster]
Microsoft Wir	ndows [Version	6.1.7601]				
X:\windows\sy	ystem32>diskpaı	۰t					
Copyright (C)	skPart version > 1999-2008 Mic MININT-50GLG55	crosoft C		n.			
ON COMPUTER: DISKPART> li:)					
Disk ### 9		Size	Free	D	Gpt		
				Dуп 			
	Online Online	149 GB 7702 MB	0 B 0 B		×		
DISKPART> sel	l disk Ø						
Disk Ø is nov	w the selected	disk.					
DISKPART> cle	ean						
DiskPart succ	ceeded in clear	ning the	disk.				
DISKPART> cor	nvert gpt						
DiskPart succ	cessfully conve	erted the	selected	disk	to GPT	format.	
DISKPART> cre	eate partition	efi size	=200				
DiskPart succ	ceeded in creat	ting the	specified	part	ition.		
DISKPART> for	rmat fs=fat32						
100 percent	t completed						
DiskPart succ	cessfully forma	atted the	volume.				
DISKPART> cre	eate partition	msr size	=128				
	- ceeded in creat			part	ition.		
DISKPART>							

- 12. In Macrium Reflect, click Backup tab.
- 13. Click **Refresh** to read the newly initialized disk.



- 14. Click Restore tab.
- 15. Select the image file, *drag and drop the imaged partitions* but *DO NOT restore the MSR partition* from the image file. In this example, only the C partition is restored to the target disk.

-	MBR Disk 1 [90725E63] - SAMS	5UNG HE161HJ 1AC0 <149	01 GB>	
	1 - System Reserved (No NTFS Active	ne) 🛃 2 - (Ci) NTES Primary		
-	-			
	24.1 MB 100.0 MB	17.32 GB 148.91 GB	×	
	🔦 Undo 📖 Co	opy selected partitions		Select a different target
Ŷ		428-871D-833ADFF4F24C] - SAMS		
<i>~</i>	GPT Disk 1 [959A413C-5988-44 1 - NO NAME (None) FAT32 (LBA) Primary	28-871D-B33ADFF4F24C] - SAMS 2 - (None) Unformatted Primary	UNG HE161HJ 1AC0 <149.01 GB>	
\$	1 - NO NAME (None)	2 - (None)	🛃 2 - (Auto)	

16. When the restore is complete, configure the UEFI boot files in the EFI system partition.

Follow the steps in the section **Fix Boot problems for GPT/UEFI Boot Systems** in the following KB article: Fixing Windows boot problems

You may need to edit the UEFI configuration to tell it to boot into the new GPT hard disk.

0

Restoring a UEFI/GPT System image to MBR

The Unified Extensible Firmware Interface (UEFI) is an interface between a computer's firmware and operating system. It is designed as a replacement for Basic Input/Output System (BIOS). UEFI supports hard disks with either master boot record (MBR) or the newer GUID Partition Table (GPT) system. GPT is a newer standard that supports disks larger than 2TiB and allows for more than four primary partitions per disk.

This article covers restoring a disk image of a UEFI/GPT system and enable the restored image to boot using legacy MBR booting.

0	Caution: We assume there are no other hardware differences between the system being imaged and the system being restored to. For dissimilar hardware, use ReDeploy.
1.	Boot into Windows PE.
2.	Open a Windows command window. To open a command window click the icon 🔤 on the taskbar.
3.	Туре:
	diskpart
4.	Туре:
	list disk
5.	Select the disk number that you want to restore to. For example:
	select disk 3
	Please ensure that you use the correct disk number in the above command.
6.	Clean the selected disk:
	clean
7.	Ensure that the target disk is MBR formatted
	convert mbr

8. Create the Microsoft System Reserved partition

create par pri size=300

9. Format the MSR partition:

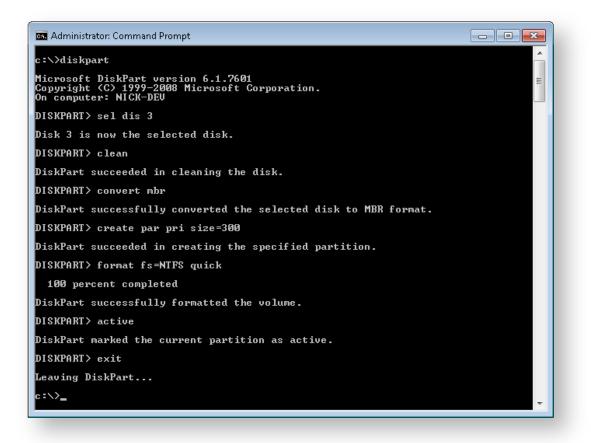
format fs=NTFS quick

10. Set the partition 'Active'

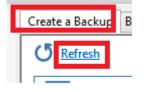
r								 	 -	 	1																																		
	ł	a	С	t	i	v	e																																						i i i
								 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	 	j												

11. Exit Diskpart:

exit



- 12. In Macrium Reflect, click Backup tab.
- 13. Click **Refresh** to read the newly initialized disk.



- 14. Click Restore tab.
- 15. Select the image file, drag and drop just the Windows System partition to the free space on the target disk. In this example, only the 'C:' partition is restored to the target disk.

	/2014 10:14 \\hv3\public\Im	ages\win81_efi-00-00.mrimg			
	GPT Disk 1 [AC38AC5B-5B97-43F/ 1 - Recovery (None) NTFS Primary	2 - NO NAME (None) FAT32 (LBA) Primary	3 - (None) Unformatted Primary	4 - (C;) NTFS Primary	
	264.8 MB 300.0 MB	25.2 MB 99.0 MB	128.0 MB 128.0 MB	12.16 GB 126.48 GB	
nation Lo	ocal disk 🛛	Undo Copy sel	ected partitions	Select a differe	ent target disk
nation Lo	ocal disk 💋 MBR Disk 4 (EC791DB3) - Msft 🕔		ected partitions	Select a differe	ent target disk
nation Lo	MBR Disk 4 [EC791DB3] - Msft 4	Virtual Disk 1.0 <2.00 TB>	ected partitions	Select a differe	ent target disk
nation Lo	MBR Disk 4 [EC791DB3] - Msft V	Virtual Disk 1.0 <2.00 TB>	ected partitions	Select a differe	ent target disk
nation La	MBR Disk 4 [EC791DB3] - Msft 4	Virtual Disk 1.0 <2.00 TB>	ected partitions		ent target disk
ination Lo	MBR Disk 4 [EC791DB3] - Msft 4 1 - (None) NTFS Active 24.7 MB	Virtual Disk 1.0 <2.00 TB>			ent target disk

Note: You can click 'Restored Partition Properties' to resize the restored partition to fill the new disk if you wish.

16. Follow the steps in the section **Fix boot problems on MBR/BIOS systems** in the following KB article: Fixing Windows boot problems

Note: You should select the newly created 300MB partition as the 'Active' partition when running 'Fix Boot Problems'

Bare metal restore of a Dynamic disk system

Introduction

Dynamic disks are Microsoft's LVM implementation. It is analogous to RAID enabling volumes to be extended over more than one disk, be mirrored over multiple disks etc. Unlike RAID, it does not need any specific hardware.

As dynamic volumes support many more than the 4 primary partitions of an MBR partitioning scheme but can still be booted (in mirrored or simple configurations), they are occasionally used for single disk configurations.

Non-Dynamic disks are known as Basic disks by Microsoft.

How Reflect images a Dynamic disk

Dynamic disk systems can be imaged by Macrium Reflect Home, Workstation and Server editions. The physical structure of the source dynamic volume is not stored in the image and so dynamic volumes restructures to the physical layout of the target disk when restored.

Dynamic volumes are differentiated from standard partitions by use of a contrasting color and the disk title.

Create a Backu	Backup Definition Files	VBScript Files	PowerShell Files	MS-DOS Batch Files	Scheduled Backups	
O Refresh						
Dynar	nic Disk 2 [72501200] - SAMSUNG	HD501LJ CR100-1	1 <465.76 GB>			
1- V NTF	(K:) °5 Dynamic					
	52 GB					
_	52 GB					
Copy	dynamic volumes	Image the sele	ected volumes			

How to restore a Dynamic disk

Typically, the target will be same the dynamic disk from which the backup was taken; in which case the restore is automatically configured when the image is selected for restore. It is just as straightforward as the restore of a Basic disk.

There are some limitations if you wish to restore to an already configured dynamic volume:

 Before the backup is started, the Dynamic disk initialization and Volume configuration must be have been completed by an external tool such as Disk Management or diskpart (both included with all versions of Windows).

- Operation of Windows PE (read more here and here) as a result of not being able to persist the Dynamic disk state in the (possibly absent) host OS. If your target disk is not initialized, and you need to restore from the rescue environment, then you must restore to a Basic disk, and convert back to dynamic once you have booted your (restored) Windows system. See the next section for more details.
- The restore is by volume. As part of the restore configuration, volumes to be restored must be "dragged" to already configured Dynamic volumes on your target disk. It is not possible to reconfigure the target volume size, so the "Restored partition properties" option is not available.

You can also drag and drop dynamic volumes to Basic MBR or GPT partitioned or an uninitialized target disk. This enables you to convert a Dynamic disk back to Basic. This is not possible with Microsoft tools.

How to restore a bootable Dynamic volume to an uninitialized disk

If your computer is not bootable, the restore must be run from the Reflect PE based rescue environment.

The process is complicated as it it not possible to create a Dynamic disk from the rescue environment.

Therefore, the recommend method is to restore up to the first 4 partitions from within the rescue environment ensuring the C: partition and your system reserved (if used) are included. Follow the restore steps, here, noting that you **must drag each partition** from the backup layout to the target disk.

Note that if there is no target disk then start the PE command window (icon lower left). Then type

diskpart list disks

Note: If you don't see your target disk, then a driver is missing for your target mass storage interface. Please read about adding additional drivers here.

Identify the target disk and note the disk number. Then type

```
sel disk <disk number>
clean
```

(1)

(i)

Note: The clean command will reinitialize your disk. Any data will be lost. Please ensure that you select the correct disk!

To update windows PE with the new disk configuration, type



Example diskpart session ...

Microsoft Windows [Version 6.3.9600] X:\windows\system32>diskpart Microsoft DiskPart version 6.3.9600 Copyright (C) 1999-2013 Microsoft Corporation. On computer: MININT-8R5C5BL DISKPART> list disk <u>Disk #### Status</u> Size Free Dyn Gpt <u>Disk 0</u> Online 127 GB 126 GB DISKPART> sel disk 0 Disk 0 is now the selected disk.
Microsoft DiskPart version 6.3.9600 Copyright (C) 1999-2013 Microsoft Corporation. On computer: MININT-BRSC5BL DISKPART> list disk <u>Disk ### Status</u> <u>Size</u> <u>Free</u> <u>Dyn Gpt</u> Disk Ø Online <u>127 GB 126 GB</u> DISKPART> sel disk Ø DISKPART> sel disk Ø
Copyright (C) 1999-2013 Microsoft Corporation. On computer: MININT-8R5C5BL DISKPART> list disk <u>Disk ### Status Size Free Dyn Gyt</u> Disk Ø Online 127 GB 126 GB DISKPART> sel disk Ø Disk Ø is now the selected disk.
On computer: MININT-8R5C5BL DISKPART> list disk <u>Disk ### Status</u> <u>Size</u> <u>Free</u> <u>Dyn Gpt</u> Disk Ø Online 127 GB 126 GB DISKPART> sel disk Ø Disk Ø is now the selected disk.
Disk ### Status Size Free Dyn Gpt Disk Ø Online 127 GB 126 GB DISKPART> sel disk Ø Disk Ø is now the selected disk.
Disk Ø Online 127 GB 126 GB DISKPART> sel disk Ø Disk Ø is now the selected disk.
DISKPART> sel disk Ø Disk Ø is now the selected disk.
Disk Ø is now the selected disk.
DISKPART> clean
· · · · · · · · · · · · · · · · · · ·

Then use the refresh link in the backup tab. You should now be able to see the disk.



You should now be able to drag / drop up to 4 partitions from your image to your target disk.

If your Dynamic disk is UEFI / GPT configured, you will be able to restore all your partitions to a Basic GPT disk.

		-
	Oynamic Disk 1 [00018D47] - Virtual HD 1.1.0 <126.99	GB>
	1 - System Reserved (None) NTFS Dynamic	2 - (C;) NTF5 Dynamic
	26.4 MB 100.0 MB	12.60 GB 126.90 GB
	<u>با لم</u>	¿ [,
٦Ē	Local disk <u>Undo</u> Disk 2 [E98E6317] - Virtual HD 1.1.0 <127.00 GB>	Select a different target disk
tination		Select a different target disk
٦Ē	Disk 2 [E9BE6317] - Virtual HD 1.1.0 <127.00 GB>	2 - (Auto)

Once the restore has completed you should be able to reboot your computer, this time booting into your restored Windows system.

▲ If your system doesn't reboot, you can use the fix boot problems feature.

You now have the choice of leaving your system as it is or converting back to Dynamic configuration. To do this, use Disk Management, right clicking on the disk and selecting "Convert to Dynamic Disk ...".

•	•	🖸 🗳 🛛						
Volume		Layout	Туре	File System	Status	Capacity	Free Spa	% Free
🗎 (C:)		Simple	Basic	NTFS	Healthy (B	126.90 GB	114.19 GB	90 %
🔮 Rescue		Simple	Basic	UDF	Healthy (P	203 MB	0 MB	0 %
System	Reserved	Simple	Basic	NTFS	Healthy (S	100 MB	70 MB	70 %
_					(())			
127.0	New Spa <u>n</u>	ned Volume.			(C:) 126.90 GB N	TFS		
Basic 127.0	New Spa <u>n</u> New S <u>t</u> rip	ed Volume		ary Partition)	126.90 GB N	TFS ot, Page File, Cra	sh Dump, Prim	ary Partition)
Basic 127.0	New Spa <u>n</u> New S <u>t</u> rip New Mi <u>r</u> ro	ed Volume pred Volume.		ary Partition)	126.90 GB N		sh Dump, Prim	ary Partition)
Basic 127.0 Onlin	New Spa <u>n</u> New S <u>t</u> rip New Mi <u>r</u> ro	ed Volume		ary Partition)	126.90 GB N		sh Dump, Prim	ary Partition)
Basic 127.0	New Spa <u>n</u> New S <u>t</u> rip New Mi <u>r</u> ro Ne <u>w</u> RAID	ed Volume pred Volume.		ary Partition)	126.90 GB N		sh Dump, Prim	ary Partition)
Basic 127.0 Onlin Elect DVD 204 N	New Spa <u>n</u> New S <u>t</u> rip New Mi <u>r</u> ro Ne <u>w</u> RAID	ed Volume ored Volume. -5 Volume o Dynamic Di		ary Partition)	126.90 GB N		sh Dump, Prim	ary Partition)
Basic 127.0 Onlin	New Spa <u>n</u> New S <u>t</u> rip New Mirro Ne <u>w</u> RAID	ed Volume ored Volume. -5 Volume o Dynamic Di		ary Partition)	126.90 GB N		sh Dump, Prim	aary Partition)
Basic 127.0 Onlin Elect DVD 204 N	New Spa <u>n</u> New S <u>t</u> rip New Mi <u>r</u> ro Ne <u>w</u> RAID <u>Convert to</u>	ed Volume ored Volume. -5 Volume Dynamic Di COT Disk		ary Partition)	126.90 GB N		sh Dump, Prim	ary Partition)

Once you have taken this step, if you have already restored all your volumes from the rescue environment, the restore task is complete.

If you have further volumes to restore, you should use Disk Management (or diskpart) to create the new volumes of a large enough size to contain the partitions to be restored. You can then restore any additional partitions that could not be restored from the rescue environment.

Drive letters assigned to restored or cloned partitions

This article explains how to change the drive letters of restored or cloned partitions during and after the restore or clone process.

/*<![CDATA[*/ div.rbtoc1566554612120 {padding: 0px;} div. rbtoc1566554612120 ul {list-style: disc;margin-left: 0px;} div. rbtoc1566554612120 li {margin-left: 0px;padding-left: 0px;} /*]]>*/

- How Windows assigns drive letters to mounted volumes (drives) on your system
- Changing drive letters in the 'Restore Wizard' or 'Clone Wizard' when running Reflect in Windows
- Changing drive letters using the Windows Disk Management Console after restoring or cloning

How Windows assigns drive letters to mounted volumes (drives) on your system

Windows maintains driver letter persistence by storing a reference to each mounted volume and drive letter in the system registry using the following registry key

HKEY_LOCAL_MACHINE\SYSTEM\MountedDevices

https://technet.microsoft.com/en-us/library/cc978525.aspx

Note: When restoring using the Windows PE rescue media, the letters assigned to restored partitions are temporary for that Windows PE session only. When you boot into the restored system, drive letter assignments will be exactly the same as they were when the image was created.

Changing drive letters in the 'Restore Wizard' or 'Clone Wizard' when running Reflect in Windows

 In the Restore Wizard Click the 'Restored Partition Properties' link after copying or dragging the partition to it's destination on the target disk: Note: In the Clone Wizard Click 'Cloned Partition Properties'.

	01/08/20	15 10:00 \\wb\puł	blic\nick\v6\case54080\D12	2405A08A497067-00-00.mrimg	
	R	GPT Disk 5 [6EE60696-30	31-41BC-AC97-D22618DDB010]	- Msft Virtual Disk 1.0 <4.00 TB>	
K		1 - (None) Unformatted Primary 128.0 MB	2 - New Volume ();) NTFS Primary 131.3 MB 106.03 GB	200.00 GB	3.60 TB
tinatio	n Loca	l disk GPT Disk 5 [6EE60696-30	S1-41BC-AC97-D22618DDB010]	Copy selected partitions - Msft Virtual Disk 1.0 <4.00 TB>	Select a different target disk
		1 - (None) Unformatted Primary 128.0 MB 128.0 MB	2 - New Volume ();) NTFS Primary 131.3 MB 106.03 GB	3 - Windows (Mi) NTFS Primary 4.73 GB 300.00 GB	3.60 TB
			1		

2. In the 'Partition Properties' dialog click the 'Drive Letter' combo box:

					Drive Letter:	J:	Parti	ion Type:	Primary 🔻
						None J:			•
2 - New Volume I NTFS Primary	())					L: O: Q:			
131.3 MB 106.03 GB						Ř: S: T:			
Partition Size:	106.031	* *	GB	•		U: V: W:	Minir	um Size	Original Size
Free Space:	0	×	МВ	•		X: Y: Z:		81.0 MB	106.03 GB
Alignment:	Vista/7/SSD	(1MB)		•				t Sector:	264,192 222,627,839

Property	Description
Auto	Let Windows automatically assign the next available drive letter
None	No drive letter will be assigned to the restored partition
Letter	Select a drive letter to use from thie list of free letters. The original drive letter will be selected by default.

Changing drive letters using the Windows Disk Management Console after restoring or cloning

Windows ships with a utility to maintain local drives and partitions called the **Windows Disk Management Console** (DMC). Using the DMC you can easily change the drive letters assigned to any partition on your system, (except for your system drive C:),

1. To start the Windows Disk Management Console

Click 'Start' or press the Windows Key, Type the following and press enter:

diskmgmt.msc

2. The DMC starts as shown below:

/olume	Layout	Туре	File System	Status	Capacity	Free Spa	% Free	Fault Tolerance	
∋ (G;)	Simple	Basic	NTES	Healthy (P.		126.89 GB	100 %	No	
■ (I:)	Simple	Dynamic	NTFS	Healthy	126.48 GB	116.68 GB		No	r.
= (4.) ■ FAT32TEST (H:)		Basic	FAT32		. 126.87 GB	76.48 GB	60 %	No	
New Volume	Simple	Basic	NTFS	Healthy (P.		130 MB	65 %	No	
NEW VOLUME	Simple	Basic	NTFS	Healthy (A.		307 MB	88 %	No	ŀ
💷 Disk 1									
Disk 1 Basic 500.00 GB Online	FAT32TEST (H:) 126.99 GB FAT32 Healthy (Active,	^p rimary Parti	tion)	373.00	/olume (P:) GB NTFS iy (Primary Partit	tion)			
Basic 500.00 GB	126.99 GB FAT32	Primary Parti Windo		373.00	GB NTFS	tion)			

3. Right click on the partition that you want to change in the lower pane and select 'Change drive letters and paths':

File Action	View Help								
•	🛛 🗔 🖾 🗶 🖆	i 🖻 🞑	10 10						
olume	Layout	Туре	File System S	Status	Capacity	Free Spa	% Free	Fault Tolerance	. /
(G:)	Simple	Basic	NTFS H	Healthy (P	127.00 GB	126.89 GB	100 %	No	
∍ (I:)	Simple	Dynamic	NTFS H	Healthy	126.48 GB	116.68 GB	92 %	No	1
FAT32TEST (H	H:) Simple	Basic	FAT32 H	Healthy (A	126.87 GB	76.48 GB	60 %	No	
New Volume	Simple	Basic	NTFS H	Healthy (P	200 MB	130 MB	65 %	No	
NEW VOLUM	E Simple	Basic	NTFS H	Healthy (A	350 MB	307 MB	88 %	No	
	A G G A A D A UTTE O		AGO OG OD LITTO						1.1
Dnline	100 MB NTFS Healthy (System		499.90 GB NTFS Healthy (Boot, Page	-		irtition)			
Dnline Disk 1 Basic 600.00 GB)		New Vo	Jump, Primary Pa		////////		
Dnline Disk 1 Basic 600.00 GB	Healthy (System)	Healthy (Boot, Page	New Vo	lume (P:)	Open			
Dnline Disk 1 Basic 00.00 GB	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32)	Healthy (Boot, Page	New Vo	lume (P:)				
Dnline D lisk 1 Basic 00.00 GB Dnline	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32)	Healthy (Boot, Page	New Vo	lume (P:)	Open Explore	tition as Activ	/e	
Donline Disk 1 Basic 00.00 GB Donline Disk 2	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32)	Healthy (Boot, Page	New Vo	lume (P:)	Open Explore Mark Par	tition as Activ		
Disk 1 Jasic 00.00 GB Disk 2 Disk 2 Jasic 047.88 GB	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32 Healthy (Active, New Yolume 200 MB NTFS) Primary Par Wind 9.45 (Healthy (Boot, Page tition) SB NTFS	New Vo	Jume (P:) (Primary Partit 2038.23 GB	Open Explore Mark Par	Drive Letter ar		
Disk 1 Jasic 00.00 GB Disk 2 Disk 2 Jasic 047.88 GB	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32 Healthy (Active, New Volume) Primary Par Wind 9.45 (Healthy (Boot, Page tition)	New Vo	Jume (P:)	Open Explore Mark Par Change I Format	Drive Letter ar		
Disk 1 asic 00.00 GB Disk 2 asic Disk 2 asic 047.88 GB	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32 Healthy (Active, New Yolume 200 MB NTFS) Primary Par Wind 9.45 (Healthy (Boot, Page tition) SB NTFS	New Vo	Jume (P:) (Primary Partit 2038.23 GB	Open Explore Mark Par Change I Format Extend Vi	Drive Letter ar olume		
Driline Disk 1 Jasic 00.00 GB Driline Disk 2 Jasic 047.88 GB Driline	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32 Healthy (Active, New Yolume 200 MB NTFS Healthy (Primar)	Primary Par y Pε Wind 9.45 (Healt	Healthy (Boot, Page tition) SB NTFS hy (Primary Partition)	New Vo	Jume (P:) (Primary Partit 2038.23 GB	Open Explore Mark Par Change I Format Extend Vi Shrink Vo	Drive Letter ar plume plume		
Disk 1 Disk 1 Dasic 500.00 GB Doline Disk 2 Basic 2047.88 GB Doline	Healthy (System) FAT32TEST (H:) 126.99 GB FAT32 Healthy (Active, New Yolume 200 MB NTFS	Primary Par y Pε Wind 9.45 (Healt	Healthy (Boot, Page tition) SB NTFS hy (Primary Partition)	New Vo	Jume (P:) (Primary Partit 2038.23 GB	Open Explore Mark Par Change I Format Extend Vi	Drive Letter ar plume plume		

4. In the dialog that opens, **select** the original drive letter, **Click 'Change'**, **Choose** a new drive letter and finally **Click 'OK**'

Dynamic	NIFS	Healthy	126.48 GB	116.68 GB	92 %	No
Basic	FAT3	Change Drive Letter	or Path			
Change Di	rive Let	Enter a new drive lett	er or path for P: (N	ew Volume).		lo
Allow acc	ess to th	Assign the following	ng drive letter:		F	
👄 P:		Mount in the follow	ving empty NTFS fo	older:	В	
					Тв	
				OK		
					Ť	
Add.		Change Rem	ove		7777 V	
					X	
			ОК	Cancel	Ž	
Window						
- winnov	~~					

See also:

Restoring and browsing Restoring an image from within Windows Restoring a System image from Windows Modifying restore destination partition properties

How to create a VHD and restore a backup to the VHD using Macrium Reflect.

- This article applies to Windows 7 and higher versions on Windows.
 - 1. This section will take you through the creation of a VHD using the Windows Disk Management console and the mounting process.

a.	Open	Windows	Disk	Management	console.
----	------	---------	------	------------	----------

📅 Disk Managem						_	×
File Action Vi	-	🔒 📙 🖾					
			. [10 ×	15 0	N 5	
Volume (C:)	Layout	Type File Sy Basic NTFS (Capacity 111.45 GB	2.43 GB	% Free 2 %	
System Reserved	Simple d Simple	Basic NTFS	BitLo Healthy (B Healthy (S		2.43 GB 317 MB	2 % 91 %	
Disk 0							
Basic 111.79 GB	System Reserved 350 MB NTFS	1	(C:) 111.45 GB NTFS (Bitl	Locker Encrypted			
Online	Healthy (System, J	Active, Primary Parti	Healthy (Boot, Page	File, Crash Dump	o, Primary Part	ition)	
	1		<u>y</u>				

b. Click onAction followed by Create VHD.

File		anagem ion Vie									_	×
(= e	Acti	Refresh		ŀ	2 🔒 🍃	E						
Volur		Rescan	Disks		Туре	File Syst	em	Status	Capacity	Free Spa	% Free	
— (C — Sy:		Create			Basic Basic	NTFS (B NTFS	itLo	Healthy (B Healthy (S	111.45 GB 350 MB	2.43 GB 317 MB	2 % 91 %	
		Attach		_	Dasic	NIIS		rieatiny (S	330 1010	317 100	51 /6	
		All Task	(S	<u> </u>								
	_	Help										
		i										
Basic			System Re	serv	ved		(C:)	///////////////////////////////////////				
	9 GB		350 MB NT	FS		nary Parti	111.45	GB NTFS (BitL	ocker Encrypte File, Crash Dur	d)	ition)	
Basic 111.7	9 GB		350 MB NT	FS	red n, Active, Prin	nary Parti	111.45	GB NTFS (BitL ny (Boot, Page	.ocker Encrypte File, Crash Dum	d) np, Primary Part	ition)	
Basic 111.7	9 GB		350 MB NT	FS		nary Parti	111.45	i GB NTFS (BitL ny (Boot, Page	.ocker Encrypte File, Crash Durr	d) p, Primary Part	ition)	
Basic 111.7	9 GB		350 MB NT	FS		nary Parti	111.45	g GB NTFS (Bitl Ny (Boot, Page	ocker Encrypte File, Crash Dun	d) p. Primary Part	ition)	
Basic 111.7	9 GB		350 MB NT	FS		nary Parti	111.45	i GB NTFS (BitL ny (Boot, Page	ocker Encrypte File, Crash Dun	d) p. Primary Part	ition)	
Basic 111.7	9 GB		350 MB NT	FS		nary Parti	111.45	GB NTFS (Bitl ny (Boot, Page	ocker Encrypte File, Crash Dum	d) 19, Primary Part	ition)	
Basic 111.7 Onlir	9 GB ie		350 MB NT	FS stem	n, Active, Prin	nary Parti	111.45	g GB NTFS (Bitl ny (Boot, Page	ocker Encrypte File, Crash Dum	d) 	iition)	

c. Set your desired options and $\ensuremath{\text{clickOK}}$ to generate the VHD at the set location.

Specify the virtual hard disk locati	on on the machine.
Location:	
C:\Users*Usemame*\Desktop\f	Reflect Restore.vhd Browse
Virtual hard disk <u>s</u> ize:	100 GB ~
Virtual hard disk format	
Supports virtual disks up to 2 \bigcirc VHDX	040 GB in size.
maximum of 64 TB) and is res	nan 2040 GB in size (Supported ilient to power failure events. This format systems earlier than Windows 8 or
Virtual hard disk type	
<u>Fixed size (Recommended)</u>	ocated to its maximum size when the
Exed size (Recommended) The virtual hard disk file is allo	ocated to its maximum size when the
 Exed size (Recommended) The virtual hard disk file is allowittual hard disk is created. Dynamically expanding 	ocated to its maximum size when the s to its maximum size as data is written

d. Locate the VHD in Windows Explorer and mount it by right clicking the icon and **selecting the Mount** option.

🔜 🛃 📙 🖵 Desktop			
File Home Share	View		
\leftarrow \rightarrow \checkmark \uparrow \square $>$ This	PC → Desktop		
📌 Quick access			
📃 Desktop 🛛 🖈			
👆 Downloads 🛛 🖈	Reflect	Mount	
🔮 Documents 🛛 🖈	Restore.vl	Scan with Windows Defender Open with	
📰 Pictures 🛛 🖈		Restore previous versions	
aneDrive 🍊		Send to	>
This PC		Cut	
💣 Network		Сору	
		Create shortcut	
		Delete	
		Rename	
		Properties	

e. Once Mounted, **Macrium Reflect Backup** tab and **Disk Management console** will now show the mounted VHD.

📅 Disk Manage	ement						—	\times
<u>F</u> ile <u>A</u> ction	<u>V</u> iew <u>H</u> elp							
🔶 🏟 🔤 🛛	? 🖬 🗩 🗹 🗉]						
Volume	Layout	Туре	File System	Status	Capacity	Free Spa		
- (C:)	Simple	Basic	NTFS (BitLo		111.45 GB	2.39 GB	2 %	
- System Resen	ved Simple	Basic	NTFS	Healthy (S	350 MB	317 MB	91 %	
	1							
Disk 0								
- Disk 0 Basic 111.79 GB	System Reserve	:d	(C:)		l ocker Encrypte	ed)		
Basic	System Reserve 350 MB NTFS Healthy (System,		111.4	5 GB NTFS (Bit	Locker Encrypte File, Crash Dur	ed) np, Primary Par	tition)	
Basic 111.79 GB	350 MB NTFS		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online	350 MB NTFS		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online Disk 2 Basic	350 MB NTFS		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online Disk 2 Basic 100.00 GB	350 MB NTFS Healthy (System, 100.00 GB		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online Disk 2 Basic	350 MB NTFS Healthy (System,		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online Disk 2 Basic 100.00 GB	350 MB NTFS Healthy (System, 100.00 GB		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online Disk 2 Basic 100.00 GB Online	350 MB NTFS Healthy (System, 100.00 GB Unallocated		111.4	5 GB NTFS (Bit			tition)	
Basic 111.79 GB Online Disk 2 Basic 100.00 GB Online	350 MB NTFS Healthy (System, 100.00 GB		111.4	5 GB NTFS (Bit			tition)	

Macrium Reflect - Server Edition - v6.1.1081 Technician's Licer	nse - Expires on 26/02/16	- 0]
<u>File View Backup Restore Other Tasks H</u> elp Backup Restore			
Backup Tasks Image selected disks on this computer Image selected disks on this computer Create a File and Folder backup Create a File and Folder backup Other Tasks Add drivers to technician's rescue media Details System Reserved File System: NIT5 Free Space: 317.3 MB Total Size: 350.0 MB Start Sector: 2,048 Sector: 2,048	a a backup Refresh Refresh		
If the VHD is not visible button.	e in Reflect after it has been mounted, please click the OREFR	<u>esh</u>	

2. This section will take you through the restore process of your image to the VHD.

Before you begin: You must have a backup image of the disk ready to restore.

a. On the main screen, select Restore.

Restore Lasis
The second term image or backup file to restore
Open an image or backup file in Windows Explorer
Detach a backup image from Windows Explore:

Backup images available to be restored are shown in the main pane.

b. Select the image you wish to restore and clickRestore Image.

lmage R	store File and Folder Restore		
🛛 🗖 🛛	owse for an image file 🕐 Refresh 🛛 🎆 Folders to search		
R	MBR Diak 1 [86E9FAE3] - KINGSTON 5V300537A120G 600ABBF0 <111.79 GB>		
	1 - System Reserved (None) NTFS Active	2 - (Ci) NTFS Primary	
	27.5 MB	98.54 GB	
	350.0 MB	111.45 GB	
Sort by	🕹 <u>Backup Date</u> <u>Location</u> <u>File Name</u> Images that contain drive: All Driver	s ~	🔥 View Load Erro
	69D67613EA69D68D-00-00.mrimq Folder: C:\Users\Desktop\69D67613EA69D68D-00-00.mrimg Twee: Full		Browse Image 📌 Restore Image
	Type: Full Date: 20/01/2016 12:22 Image ID: 69D67613EA69D68D		Verify Image

c. The next dialog gives you the opportunity to modify the destination properties.

Moving and Resizing the restored partition

By default, partitions restore to their original locations if you **click 'Copy selected partitions'**. However, to drag partitions to different locations and resize them to use the available space. Simply drag the source partition to any available partition or free space on the target disk. You can also delete partitions on the target disk to make space. For more destination options and further information, see Modifying restored partition properties.

Drag and drop the disk partitions from the Source image to the Destination VHD.

Source	20/01/20	16 12:22 C:\Users\Desktop\69D6	7613EA69D68D-0	0-00.mrimg			
8	R	MBR Disk 1 [86E9FAE3] - KINGSTON SV3	300537A120G 600ABB	F0 <111.79 GB>			
• <		1 - System Reserved (None) NTFS Active		2 - (C:) NTFS Primary			
		27.5 MB 350.0 MB	M	98.54 GB 111.45 GB			
)estinatio	n Loca	I disk 💋 <u>Undo</u>	En Con	y selected partitions	<u>ــــــــــــــــــــــــــــــــــــ</u>	Select a different ta	raat diek
		Disk 3 [F7D597D7] - Msft Virtual Disk		y selected partitions		<u>Select a different ta</u>	iget disk
	2	1 - System Reserved (None) NTFS Active	1.0 <100.00 GB>		`		
		27.5 MB 350.0 MB		99.66 GB			

d. Click Next to restore the image onto the VHD.

Γ

2	Image File: Image ID: Date: Time: Image Type:	\\psnas\Public\Gosha\pcBU\69D67613EA69D68D-00-00.mrimg 69D67613EA69D68D 20 January 2016 12:22 Full
	Source Disk: Geometry: BPB: Destination Disk:	MBR Disk 1 [86E9FAE3] - KINGSTON SV300S37A120G 600ABBF0 <111.79 GB> 14593\63\512 0\0\0 Disk 3 [F7D597D7] - Msft Virtual Disk 1.0 <100.00 GB>
	Verify: Delta: SSD Trim:	N Y Y
Sched	lules	None
Opera	tion 1 of 1 Restore Partition: Drive Letter Start Sector: End Sector: Partition Type:	1 - System Reserved NTFS 27.5 MB / 350.0 MB None 2,048 718,847 Active
·L† A	dvanced Options	Help < Back Next > Cancel Finish

e. A summary screen is displayed confirming the choices that have been made, click Finish.

ONOTE: You may need to run Macrium ReDeploy to enable a restored system image to boot into the Hyper-V VM. Please see Re-deploying to new hardware for more information.

Scheduling and Retention rules

Macrium Reflect provides multiple **Backup Plan** options to create backup cycles in days, weeks or months that allow you to pick when you want your backup definitions to run and whether they should be Full, Differential or Incremental backups. Scheduled backups can run independently of whether anyone is logged into the computer.

Macrium Reflect provides an easy 3 step approach to editing backup plans for a backup definition:

- 1. First, optionally select a **Template** from a set that includes implementations of industry best practice like Grandfather, Father, Son (GFS) or Incremental Forever
- 2. Add, remove or change the schedules as needed for full, differential and incremental backups
- 3. Finally, define **Retention Rules** for each type of backup. Using the **Retention Rules**, you can retain a specific number of each type of backup or keep them for a number of days or weeks before cleaning up.

Options define whether to apply the retention rules to all the backups in the folder, whether to run the purge before backing up, and let you define a minimum amount of disk space to retain in gigabytes (GB) before automatically deleting the oldest *backup sets* in the destination folder to make space available for new backups.

Note: A backup set consists of a full backup and any Incrementals or Differentials with the same image ID. The image ID is the part underlined in the following example backup file name: <u>69B5FC3F39E0F9F5</u> -00-00.mrimg

Further reading:

- Scheduling backups
- Configuring e-mail notifications
- Running continuous backup of SQL databases
- Which user name and password is used when scheduling a backup?
- Retention and consolidation

Scheduling backups

Creating and Editing a Backup Plan

· · ·	te for your	r Backup Plan
None		▼
. Add/Edit Schedu		
Backup Type	Sch	hedule
Add Scher	dule 🔻	Edit Schedule
Add Schee	dule 🔻	Edit Schedule
Add Schee		Edit Schedule
. Define Retentio	on Rules	Edit Schedule Delete Schedule
. Define Retentio	on Rules	
. Define Retention	on Rules ules to match	hing backup sets in the target folder v 12 Backups v
Define Retention Apply retention m Full Differential	on Rules ules to match Keep Keep	hing backup sets in the target folder v 12 Backups v 4 Backups v
Define Retention	on Rules ules to match Keep	hing backup sets in the target folder v 12 Backups v 4 Backups v 10 Backups v
Define Retention Apply retention m Full Differential	on Rules ules to match Keep Keep	hing backup sets in the target folder v 12 Backups v 4 Backups v
Define Retention Apply retention m Full Differential	on Rules ules to match Keep Keep Keep	hing backup sets in the target folder v 12 Backups v 4 Backups v 10 Backups v Create a Synthetic Full if possible

The wizard splits the task of scheduling backups and setting retention rules into 3 steps as follows:

Select a Template for your Backup Plan

1. Click the drop down box and chose an applicable template.

A summary is given for each template to help you select the template you require.

Grandfather, Father, Son. Daily Incremental ("Son"), weekly Differential ("Father"), and monthly Full ("Grandfather") backups.
Differential Backup Set
A Full backup is created periodically followed by daily Differential backups.
Incremental Backup Set
A Full backup is created periodically followed by daily Incremental backups.
Incrementals Forever
Incrementals forever optimizes backup space and time by only ever creating a single Full backup.
After this Incremental backups are created ad infinitum. The Full backup is consolidated with subsequent Incremental backups once the specified number of Incremental backups is reached.
This is also known as a Synthetic Full backup.

Add/Edit Schedules

When you have selected the template you want to use you can view the planned schedule.

Edit the Plan for th		run Plan		
Grandfather, Fat			•	
2. Add/Edit Sched				
Backup Type	Schedu			
Full	At 09:0	on the first Mon of every month, si	tarting 02/03/2015	
Differential		every Mon of every week, starting		
Incremental		every Mon, Tue, Wed, Thu, Fri of		
Add Sche	dule 🔻	Edit Schedule	lete Schedule	
3. Define Retention	on Rules	Edit Schedule De	lete Schedule	
3. Define Retention	on Rules	ackup sets in the target folder v	lete Schedule	
3. Define Retention Apply retention r	on Rules ules to matching	ackup sets in the target folder 🗸 🗸	lete Schedule	
 3. Define Retention Apply retention r Full 	on Rules ules to matching Keep 2	ackup sets in the target folder v	lete Schedule	
 3. Define Retention Apply retention r Full Differential 	n Rules ules to matching Keep 2 Keep 4 Keep 1	ackup sets in the target folder v Weeks v Weeks v	lete Schedule	

① Resolving Scheduling Conflicts

If multiple backup types are scheduled run at the same time on the same day then only one backup will run.. For example, when scheduling a **Full backup on the first Monday** of each month and scheduling a **Differential for every Monda**y, on the first Monday a Full and Differential are both scheduled to run at the same time. In this scenario **only the Full backup will run.**

- Full backups take precedence over Differentials and Incrementals
- Differential Backups take precedence over Incrementals.

To add to this schedule:

- 1. Click Add Schedule and select either Full, Differential or Incremental.
- 2. Set the frequency for the backup schedule.

	Full Bac	kup So	chedu	le				
Full Backu	up Schedule Settir	ngs						
Frequency	Settings							
Monthly	Every	First		~	Monda	ау		×
○ Weekly ○ Daily	◯ Selected Day	1	2	3	4	5	6	7
One Time Only		8	9	10	11	12	13	14
On Event		15	16	17	18	19	20	21
		22	23	24	25	26	27	28
	-	29	30	31				
	Start Time	09:00)		•			
	Start Date	02	March	2015				
If missed then run a	at next start-up				OK		Car	ncel

3. Click OK.

To Edit the schedule:

- 1. Select the schedule you want to edit and click Edit Schedule.
- 2. Change the schedule to meet your needs and click **OK**.

Full Back	Full Bac		neut					
Frequency	Settings							
Monthly	Every	First		~	Monda	ау		~
○ Weekly ○ Daily	O Selected Day	1	2	3	4	5	6	7
One Time Only		8	9	10	11	12	13	14
On Event		15	16	17	18	19	20	21
		22	23	24	25	26	27	28
		29	30	31				
	Start Time	09:00			•			
	Start Date	02 M	larch	2015				
☑ If missed then run	at next start-up				OK		Ca	ncel

To delete a schedule:

- 1. Select the schedule you want to delete and click **Delete Schedule**.
- 2. A confirmation box appears, click **Yes**.

Confirm delete Confirm deletion of the backup schedule(s): At 09:00 on the first Mon of every month, starting 02/03/2015 Yes No	Macrium Reflect
	Confirm deletion of the backup schedule(s): At 09:00 on the first Mon of every month, starting
Q Click Yes to delete or No to cancel	Yes No
	Click Yes to delete or No to cancel

Define Retention Rules

1. Establish how long each type of backup in the schedule should be kept. It is advisable to keep backups for the recommended period, however you can de-select the backup type if you do not want to retain it.

		Disk Image						
Edit th	he Plan for this Ba	ckup						
1.5	elect a Template for	your Backup Plan						
[Grandfather, Father, Sor	ı. 🔻						
2. A	dd/Edit Schedules							
	Backup Type	Schedule						
	Full	At 09:00 on the first Mon of every month, starting 02/03/2015						
	Differential Incremental	At 09:00 every Mon of every week, starting 02/03/2015 At 09:00 every Mon, Tue, Wed, Thu, Fri of every week, starting 02/03/2015						
	Incremental	At 09:00 every Mon, rue, wed, mu, Phot every week, starting 02/03/2015						
	Add Schedule	🖌 Edit Schedule 📄 Delete Schedule						
	Define Retention Rule	s matching backup sets in the target folder ∨						
	✓ Full Kee							
	✓ Differential Kee	ap 4 🖕 Weeks 🗸						
	✓ Incremental Kee	ep 10 💌 Days 🗸						
	✓ Run the purge before backup.							
	 Delete the oldest back 	sup set(s) if less than 5 GB on the target volume (minimum 1GB)						
법	Options	Help < Back Next > Cancel Finish						

The new Macrium Reflect retention rules provide a powerful and flexible way to manage the lifetime and storage space used by your backups.

Choose how backups are matched and retention rules are applied to the target folder

Retention rules are applied to the target folder of the backup by selecting one of two options:

3. I	Define Retention Rules	
	Apply retention rules to matching backup sets in the target folder	¥
	Apply retention rules to matching backup sets in the target folder	
	Apply retention rules to all backup sets in the target folder	-

a. Apply retention rules to matching backup sets in the target folder.

Disk Images are purged if they contain **exactly the same Partitions** as the current Image. Partitions are identified using the unique **Disk ID** stored in sector 0 of the disk and the **Partition sector offset**.

 \frown

W Note: For GPT disks the unique GPT disk GUID is used instead of the Disk ID

For **File and Folder** backups retention rules are applied according to the '**Backup Set Matching'** option select in the '**Advanced Properties'** for this backup.

b. Apply retention rules to all backup sets in the target folder. All backup sets in the target folder of the same type (Disk Image or File and Folder) are purged according the retention rules.

Note: This option uses the same logic as Macrium Reflect v5

Select the age or number of backup types that you wish to keep

0

✓ Full	Keep	12 🛓 Backups 🗸
✓ Differential	Кеер	4 ▲ Backups ∨
✓ Incremental	Keep	10 🛓 Backups 🗸
		Create a Synthetic Full if possible
Run the purge l	pefore back	ир.
 Delete the older 	st backup se	et(s) if less than 5 🚔 GB on the target volume (minimum 1GB)

Option	Description
Full	When deleting Full backups all linked incremental and Differential backups in the same backup chain (set) are also deleted This operation will delete the entire backup set.
Differential	When deleting Differential backups all linked incremental backups in the same backup chain (set) are also deleted.
Incremental	When deleting Incremental backups the integrity of the backup set is maintained by ensuring that the chain is never broken. This is achieved by merging older Incremental backups when required.
	In the example below, before retention, there is 1 Full backup , 1 Differential backup and 6 Incremental backups. The retention rules are set to retain 4 incremental backups. After retention, the most recent 4 incremental backups are retained. Deleting the oldest 2 incrementals would cause the backup chain to be invalid as the oldest retained incremental requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backups are consolidated with it to create a new incremental backup.

Option	Description F = Full D = Differential I = Incremental															
	м	т	W	т	F		м	т	W	т	F			м	т	w
	F						D	I	I	I	I			F	I	I
									->	I						
Full if	followed by Incremental backups, then this option causes the Full backup to be 'rolled forward' to create a Synthetic Full backup. This is also known as Incremental Forever. Select this option to run the retention rules before the current backup. Image: Note: in Macrium Reflect v5 the current backup set wasn't included in the purge															
Run the purge before the	Selec	ct this No	optior te: in	n to ru Macri	n the um R	etic Fo	ntion rule	up. Ti	his is als ore the c	so kno curren	wn as t back vasn't	s Inc cup.	uded	d in t	ll For	ever.
Run the purge before the	Selec	ct this No cald IS i	optior te: in culatio	n to ru Macri on who ed. Th	n the um R en pu nis me	eflect rging eans t	ull back	up. T es befo curren he cu u set	his is als ore the o It backup rrent ba the rete	curren	wn as t back vasn't In v6 count	inclu the c	uded curre Full	d in the	he pu ackup	ever.
possible Run the purge before the backup Delete oldest backup set	Selec	no No cald IS i all d	optior te: in culatic nclud of you	n to ru Macri on who ed. Th ir back	um R en pu his me kups v	eflect reten rging eans t will be	ull back	up. T es befo curren he cu u set d and	his is als ore the o t backup rrent ba the rete a new F	so kno curren o set v ckup. ntion o full ba	wn as t back vasn't In v6 count ckup o	s Inclusion inclusion inclusion inclusion inclusion inclusion inclusion inclusion in the constant inclusion in the constant inclusion in the constant inclusion in the constant in the constan	udec curre Full ted.	d in the second se	he pu ackup kup th	ever. Irge o set hen

Advanced options

If required, set Advanced Options as follows:

• **Compression** to reduce the file size. Select level of compression and whether to make an intelligent sector copy, that copies only disk sectors used by the file system or make an exact copy of the partitions, that includes unused sectors.

Note: reducing the file size may increase the total backup time.

- File Size to enter a fixed file size for the image, this is useful for manually copying the image file to CD/DVD.
- **Password** to select whether to password protect the image.
- Auto Verify Image to select to verify image or backup file directly after creation. Note: This can add a significant amount of time to the backup process.
- **Comments** to set comments for the image or backup.
- **Shutdown** to set whether the computer should be shutdown after a backup task has completed.

Configuring e-mail notifications

For many users, email notification of success or failure of a backup helps them keep on top of the status of their backups, particularly with scheduled backups which take place in the background.

- Program Defaults and SMTP Server settings
- Email notification for existing individual backups

Program Defaults and SMTP Server settings

The default settings are used when creating new backup definitions

• From Other Tasks select Edit Defaults.

Backup	Bistore Log
V Uge	kup Lasks
Cur Cur	a Tuska
	Create bootable rescue media with portable application support
6	Add a boot meno option to start the Reflect <u>recovery</u> environment
	Edit Defaults
€	Check for product updates on the internet

• Select 'Email' > 'Email Server'.

		-	-		_	~	_	
8	2	₩	Ŀ	Ţ				
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure				Email Serv	er Settings for	Macrium Re	flect	
			Senders	Email	Enter the sender	email address		
			Authent	ication	Auto Detect			~
			SMTP Us	ername	Enter server user	name		
			SMTP Pa	assword	Enter server pass	word		
			SMTP Se	erver	Enter host name			
			Connect	ion Type	Plain Text (No Sec	urity)		~
			SMTP Po	ort	25			
			Test Red	cipients	Enter test recipie	nts and click Test,	, separate recip	vients with ;
								Test
						Help	ОК	Cancel

Email Server options description:

Option	Description
Senders Email	Your e-mail address associated with your ISP or Gmail account etc.
	Note: If you use e-mail software such as MS Outlook, you can find the settings under Account Settings for e-mail address, user-name and Server.
Authentication	Authentication options are set by your email provider/server.
	Form Form Auto Detect Challenge/Kerpanze Authenhostion (CRAM-M12) Source Username/Recover degm (AUTH ECCER) Username/Recover degm (AUTH ECCER) Username/Recover degm (AUTH ECCER) Username/Recover degm (AUTH ECCER) Microsoft NTL an Manager (NTLM) Microsoft NTL an Manager (NTLM)

(j)

Option	Description
	Note: If you do not know your authentication settings, try Auto Detect.
SMTP Username	The user name associated with your e-mail account. This is essentially your email address.
SMTP Password	This is the password for your e-mail Server.
SMTP Server	This is the outgoing / SMTP Server setting or IP address.
Connection Type	This is the setting for the way Macrium Reflect will contact the Server. Plain Text (No Security) Plain Text (No Security) Secure Sockets (SSL/TLS) Transport Layer Security (STARTTLS)
SMTP Port	This is associated with Connection Type and is the port number that the SMTP server is listening on.
Test Recipients	This option is used to test the configured settings; enter your e-mail address in that field and click Test to send a test message to your email.

The following examples show completed Server settings for a typical ISP.

eflect Defaults								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure			Senders Authent SMTP Us SMTP Pa SMTP Se Connect	Email ication sername assword erver ion Type	ver Settings for username@gmail Auto Detect username@gmail ••••••• smtp.gmail.com Plain Text (No Sec 25	.com .com	effect	
			SMTP Pc		username @gmail	.com Help	ОК	Test

• Click **OK** to finish.

ONOTE: If you are using your Gmail account then please see here: Using Gmail SMTP Server for sending backup notification emails

Email success settings define who receives emails regarding the success of a backup and what message they receive.

Select Email Success

								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
mail Server mail Success mail Failure				otifications of g file SS log file t Enter Macriu	on successful bac a list of recipients m Reflect - Backs	s, separate each	email address v	

• Select Send Email Notifications on successful backups.

Image: Sector Image: Sector<	Reflect Defaults	;							×
Email Success Email Failure Default email settings for successful images or backups Send Email Notifications on successful backups Attach log file Recipient List Enter a list of recipients, separate each email address with ; Subject Macrium Reflect - Backup Success	Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Success			Send Ema Attac Attac Recipient Subject	il Notifications Tog file n VSS log file List Enter Macriu	on successful bac a list of recipient um Reflect - Back	kups s, separate each up Success	email address v	vith ;

Option	Description
Attach log file	Will attach the log file from the creation of the backup.
Attach VSS log file	Will attach the VSS log with the events made during the backup.

• Enter the email addresses of all recipients in **Recipient List**, separating each email address with a semicolon.

Image: Sector Image: Sector<	Reflect Defaults	5							×
Email Success Email Failure Default email settings for successful images or backups Send Email Notifications on successful backups Attach log file Attach VSS log file Recipient List Username@gmail.com; username1@gmail.com Subject Macrium Reflect - Backup Success	Backup	Restore	Update Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Success			Subject	ail Notifications ch log file ch VSS log file it List Macri	on successful bac name@gmail.com; um Reflect - Back	kups username 1@gma up Success	ail.com	

- Enter the subject for the email in **Subject**.
- Enter a message to be sent regarding the email in **Content**, include the PC that generated the success is identified.

Image: Server Image: Server<	5
Email Success Email Failure Default email settings for successful images or b	Advanced
Send Email Notifications on successful backups Attach log file Attach VSS log file Recipient List Username@gmail.com; username1@gmail.com Subject Macrium Reflect - Backup Success Content Desktop PC 13 Image backup of drives C, D and E.	

• Click OK.

Email failure settings define who receives emails regarding the failure of a backup and what message they receive.

• Select Email Failure.

								×
Backup	e store	Update Update	Schedule S	cripts	Network	Email	Events	Advanced
mail Server mail Success mail Failure			Defa	tification on F file S log file Enter a lit Macrium I	ailed Backups st of recipients Reflect - Backu	r failed image	email address w	

• Select Send Email Notification on Failed Backups.

Image: Sector Image: Sector<	Reflect Defaults								×
Email Success Email Failure Default email settings for failed images or backups Send Email Notification on Failed Backups Attach log file Attach VSS log file Recipient List Enter a list of recipients, separate each email address with ; Subject Macrium Reflect - Backup Failed	Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Success			Send Ema Attad Attad Recipient Subject	il Notification o h log file h VSS log file List Enter Macriu	n Failed Backups a list of recipient um Reflect - Back	s, separate each up Failed	email address v	

Option	Description
Attach log file	Will attach the log file from the creation of the backup.
Attach VSS log file	Will attach the VSS log with the events made during the backup.

• Enter the email addresses of all recipients in **Recipient List**, separating each email address with a semicolon.

Reflect Defaults	;							×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure			Send Email	l Notification o log file VSS log file List usern Macriu	ail settings fo n Failed Backups ame@gmail.com; um Reflect - Back your email messa	username 1@gma up Failed	ail.com	ps
						Help	OK	Cancel

- Enter the subject for the email in **Subject**.
- Enter a message to be sent regarding the email in **Content**, include the PC that generated the success is identified.

v9

Reflect Defaults								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure			Send Em	ail Notification o ch log file ch VSS log file t List usern Macrii	ail settings fo on Failed Backups ame@gmail.com; um Reflect - Back op PC 13 Image b	username 1@gma up Failed	ail.com	ps
				_		Help	ОК	Cancel

• Click OK.

Email notification for existing individual backups

• Click 'Backup Definition Files', right click on the backup definition and select 'Advanced Properties'.

				Files VBScript Files PowerShell Fil	
	Ð 🖊		\checkmark	L C 5 5 5	
File Name	2	Path		Туре	
🔛 My Ba	ckup.xml	C:\Users	\Geo	rgy\Documents\Reflect\ Disk Imag	e
	ckup(1).xml ckup(2).xml			Open Containing <u>F</u> older	
My Clo		C:\Users		Add to list	
· · · · · · · · · · · · · · · · · · ·			1	<u>E</u> dit	
				<u>R</u> ename	
	VA	L View	•	<u>D</u> elete	
Image Op	tions XIVI	L VIEW		D <u>u</u> plicate	
Imagin	g Summary		\diamond	<u>V</u> alidate	
	Backup De	finition File		<u>R</u> un Now	Þ
. 🍲	Auto Verify: Maximum F		B	Schedule	
	Compressio		5	Generate a <u>V</u> BScript File	
	Password: Intelligent C	ODV:	0.15	Generate an MS-DOS Batch File	
	Power Savi Email On Si	ng:	5	Generate a PowerShell Script File	
	Email On Fa	ailure:		Create a Desktop Shortcut	
	Total Selec	ted:	Ŷ	Advanced Properties	
Sched	les		-		_

• Click the Email icon.

Advanced Settings		×
Backup Email		
Email Success Email Failure	Email settings if this image or backup succeeds Send Email Notifications on successful backups Attach log file Attach VSS log file Recipient List Subject Content	
	Нер ОК	Cancel

• Set your e-mails for **success** and **failure** of a backup as described above.

• Click OK.

Running continuous backup of SQL databases

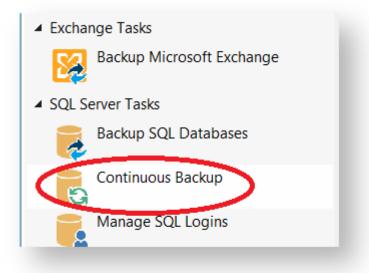
Running continuous backups of SQL databases ensures that frequent backups of your databases are taken at required time intervals. It is always possible, therefore, to restore your data to a point as close as possible to the failure point.

Continuous backups run separately to normal backups and imaging functions. A new Macrium Reflect SQL backup file is made each day and has its own email notification, disk space management, compression and password settings.

If an additional backup of a database under continuous backup is made, Macrium Reflect automatically creates a new full backup to ensure consistency of backed up logs.

You can not run continuous backup on databases that are not running the Full Recovery Model.

1. Select Continuous Backup from SQL Server Tasks.



- 2. The first time a reminder box displays, check Don't ask me again, if appropriate and click OK.
- 3. A dialog showing databases running the *Full* recovery model appears, select **Enable SQL continuous backup**.

Schedule Continuous SQL Enable SQL continuous backup	Backup
Schedule as Windows user	Password
WIN-V6Q5GT1GS00\Administrator	•••••
 Image: Clocal (local) Image: Clocal (local (local)) Image: Clocal (local (l	
	Add new instance 🕚 Refresh
Destination \\bb\public\Backups	✓ …
Advanced Settings	
	< Back Next > Cancel Finish

- 4. Select the databases you wish to add to continuous backup. You can select databases from multiple SQL instances.
- 5. If required, click Advanced Settings to change the compression, password and email option.
- 6. Click Next.

The dialog Select how you would like to run continuous backup appears.

Select how you would like to run continuous backup
● Run all day
Run from Start 08:00:00 T End 17:00:00 T
Create log backup every 15 ninutes
Create a new full backup 1 Adays, at 08:00:00
Select days that continuous backup will be running
Monday Thursday Sunday
✓ Tuesday ✓ Friday
✓ Wednesday ✓ Saturday
< Back Next > Cancel Finish
444

By default, Run all day is selected.

- 7. Select run from and specify a time range when you want to have the continuous backup running.
- 8. If required, select frequency for log backups.
- 9. Specify; how many days between full backups and what time of day you want them start.
- 10. When you are happy with your selection, click **Finish**.

Continuous backup runs in the background. You can run and create backups of the system or of SQL databases without interfering with continuous backup. Only logs files for failed continuous backups are stored.

Which user name and password is used when scheduling a backup?

Macrium Reflect uses the standard Windows task scheduler to schedule backup jobs. To ensure that tasks can run when no users are logged on to the computer it is necessary to supply a Windows user account and login password. These are the same details that are used when you login to Windows:

modified using the 'Defaults' menu option.				
This user name will be used to execute all scheduled tasks and can be modified using the 'Defaults' menu option.				
modified using the 'Defaults' menu option.				
This user name will be used to execute all scheduled tasks and can be modified using the 'Defaults' menu option. Note: The user must be a member of the Administrators group.				
OK Cancel				

How do I see what my actual user account name is?

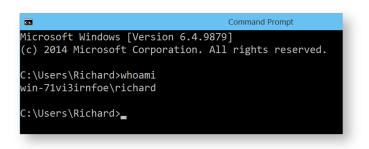
The actual account name can be different to the name used at the Windows login screen. If you are having difficulty finding your user account name then:

1. Click the Windows start button and type:

C	emd		
For	more information on starting a command prompt please see Running an elevated command pron	npt	

2. In the command prompt window, type:

1			1
whoami			
wiioallii			
i.			i



The screen-shot shows that the user account currently logged on is Richard.

Note: for Windows XP, the command is:

Windows XP	
echo %username%.	

I don't use a password but the scheduler is prompting for one

If you don't use a password when logging into Windows your system might have been set to automatically log you in with a saved password. To reset your password:

- 1. Click Windows key
- 2. Type netplwiz and press Enter.
- 3. Check Users must enter a user name and password to use this computer and click Apply.

	User Accounts	×				
Users Advanced						
Use the list below to grant or deny users access to your computer, and to change passwords and other settings.						
Users for this computer:						
User Name	Group					
💐 Richard	Administrators					
	Add Remove Properti	es				
Password for Richard		_				
To change your password, press Ctrl-Alt-Del and select Change Password.						
	Reset <u>P</u> assword					
	OK Cancel A	pply				

3. To manage/change your user account password press Ctrl+Alt+Del.

Retention and consolidation

Scheduling full, incremental and differential images as part of a regular backup cycle is essential for optimising the use of available storage space, protecting your computer from sudden failure and giving you the ability to recover historical data.

Retention types

Retention and consolidation of full, differential and incremental backups combined with deletion logic maintains backup set integrity by ensuring the backup chain is never broken.

The following are examples to show how retention rules operate on your backup sets....

Full backup retention

In Full backup retention, a specified number, or age, of full backups are retained. When full backups are purged, the entire backup set is also deleted.

- F = Full
- D = Differential
- I = Incremental

Μ	Т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W
F	I	I	I	I	D	I	I	I	I	D	I	I	I	I	D	I	I	I	I	D	I	I	I	I	F	I	I

e.g, Retain 1 Full backup.

After retention, the entire previous backup set is deleted

MTWTF	MTWTF	MTWTF	MTWTF	MTWTF	мтw
FIIII	DIIII	DIIII	DIIII	DIIII	FII

Differential retention

Specify a number of differential backups to retain by age or number,

М	т	W	т	F	M	I	N	Т	F	N	1	т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W
F	I	I	I	I	D	I	I	I	I	I)	I	I	I	I	D	I	I	I	I	D	I	I	I	I	F	I	I

For example, Retain 2 differential backups.

After retention, the most recent 2 differential backups are retained. Incremental backups that are linked to previous differential backups are deleted along with the deleted differentials.

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М	т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W	т	F	М	т	W	
ਸ	т	т	т	т	р	т	т	т	т	р	т	т	т	т	П	т	т	т	т	р	т	т	т	т	ਸ	т	т	

Incremental retention

Specify the number of incremental backups to retain. If by deleting an incremental the backup chain is broken this causes consolidation of the oldest retained Incremental.

For example, Retain 4 incremental backups.

After retention, the most recent 4 incremental backups are retained. The oldest retained incremental is not be valid on its own as it requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backups are consolidated with it to create a new incremental backup.

мтwтғ	MTWTF	MTWTF	MTWTF	MTWTF	мтw
FIIII	DIIII	DIIII	DIIII	DIIII	FII
				>I I	FII

Synthetic Full / Incrementals forever

Incrementals forever optimises backup space and time by only ever creating a single full backup. After this, incremental backups are created forever and, once the specified number of incremental backups is reached, Macrium Reflect consolidates the incremental backup into a new 'synthetic' full backup. This is also known as a Synthetic Full backup.

For example, Incrementals forever with retain 4 incrementals. For the first week,

MTWTF

The next Monday, to retain 4 Incrementals, the Full is consolidated with the first incremental to create a new Synthetic Full.

М	Т	W	Т	F	М
F	I	I	I	I	I
->	>F	I	I	I	I

On Tuesday the consolidation step is repeated again on the next incremental image.

Μ	Т	W	Т	F	МТ
	F	I	I	I	II
-	>	>F	I	I	II

This process is repeated forever. After the first Full only Incremental backups are required.

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Consolidation is performed non destructively and 'In Place'. Therefore, very little additional disk space is required during consolidation and failed consolidations will automatically revert to the pre-consolidation state. For example, a consolidation could fail mid process due to a hardware malfunction such as a dropped network connection. In this circumstance the consolidation would automatically begin again the next time the backup is run without any loss of backup integrity.

Backup Plans

Backups schedules and retention rules are saved in a **Backup Plan** with each backup definition. You can even define your own **Backup Pan Templates** for easy reuse. The following are default templates:

Grandfather, Father, Son.

Daily Incremental (**"Son"**), weekly Differential (**"Father"**), and monthly Full (**"Grandfather"**) backups. Retention for each backup type can be set based on data history and space requirements. e.g,

Backup Type	Schedule	Retention
Monthly Full Backup	Run on the 1st Monday of every month	26 Weeks
Weekly Diff Backup	Run on every Monday (except 1st Monday)	4 Weeks
Daily Inc	Run Tues, Wed, Thu, Fri	14 Days

Differential Backup Set

A Full backup is created periodically followed by daily Differential backups.

Backup Type	Schedule	Retention
Monthly Full Backup	Run on the 1st Monday of every month	26 Weeks
Daily Diff Backup	Run on Mon, Tues, Wed, Thu, Fri (except 1st Monday)	30 Days

Incremental Backup Set

A Full backup is created periodically followed by daily Incremental backups.

Backup Type	Schedule	Retention
Monthly Full Backup	Run on the 1st Monday of every month	26 Weeks
Daily Inc Backup	Run on Mon, Tues, Wed, Thu, Fri (except 1st Monday)	30 Days

Incrementals Forever

Backup Type	Schedule	Retention
Initial Full Backup	Initially created when the first Incremental is scheduled to be created	A Synthetic Full is created after the first 30 Incrementals
Daily Inc Backup	Run Every Mon, Tues, Wed, Thu Fri	30

An initial Full backup is created followed by daily Incremental backups.

The Macrium Rescue Environment

Caution

The first thing you need to do after installing Macrium Reflect is create Rescue Media

If you lose your Windows operating system, you can start your PC using Macrium Reflect rescue media on CD, DVD, or USB stick. This makes creating rescue media the first thing you need to do with Macrium Reflect. It contains a bootable, lightweight version of Windows and a full version of Macrium Reflect.

This lightweight version of Windows is called the Windows Recovery Environment (also known as Windows RE or WinRE) and is supplied with Windows 7 and later operating systems. For Windows XP, Vista and systems without WinRE, Reflect will download the Windows Pre-installation Environment (also known as Windows PE or WinPE) directly from Microsoft.

You have the option of restoring to a new system or virtual machine using **Macrium ReDeploy** to reconfigure your Windows installation for the new hardware.

Windows PE hardware support

The Macrium Rescue Environment needs to include support for your hardware such as USB ports, network interfaces, and in particular for your storage device if for example you use RAID disks. The default Windows PE environment supports a good selection of hardware and you can add support for further devices. When Macrium Reflect creates a rescue CD or USB, it analyses your system hardware and tries to locate drivers for unsupported devices by looking on your system. If it can't find appropriate drivers, Macrium Reflect prompts you to provide drivers. You can provide drivers by finding driver packages on the local hard drive, looking for driver CDs supplied with the system, or downloading drivers from the web. After you provide these additional drivers, Macrium Reflect adds them to the Windows PE environment.

Note: You cannot add support for booting media because booting takes place before drivers are loaded. For example, if your CD drive is connected via an unsupported SCSI interface card or your boot menu lies on an unsupported RAID array, then the Windows PE cannot boot. Booting using a USB stick is a good workaround in this case as all USB 2/3 interfaces are supported by default.

CD, DVD and USB rescue media

You can boot your computer into Windows PE from a CD, DVD, USB stick or USB attached external hard disk. For convenience or for automated restores to your system disk, you can add Windows PE to a boot menu that's displayed when your system first starts. Although, do not rely upon this local copy as a rescue mechanism because it could be lost if you suffered hard disk failure or corruption leaving you without a method for rescuing your system.

Macrium Reflect creates custom Windows PE systems for each installation type by downloading the required components from Microsoft.

Further reading:

- Rescue Media Builder How It Works
- Creating rescue media

- Adding a Boot Menu option for system Image recovery
- Preparing a USB stick for Windows PE
- Creating a bootable Windows PE USB stick
- Accessing network shares in Windows PE
- Technicians portable application support
- Adding device drivers to Windows PE
- About Adding Drivers to WinPE Rescue Media
- Fixing Windows boot problems
- Updating rescue media to include additional hardware drivers
- Adding iSCSI support to Windows PE
- Adding BitLocker support to Windows PE
- Restoring an image from within the Rescue Media

Rescue Media Builder - How It Works

RMBuilder.exe

v7.2 of Macrium Reflect includes a new Rescue media builder user interface that offers:

- Simplified user interface with one click build for most scenarios
- Windows RE support. Windows RE is usually available as a no download option on the majority Windows installations from Windows 7 and later.

For the majority of PCs, Windows 10 WinRE adds WiFi support when booted in the rescue media.

Note: A few WiFi adapters are unsupported. The vast majority of adapters will be automatically supported and will automatically connect using a WiFi profile copied from Windows during the build process.

- Windows PE 10 1709
- New network TaskBar icon and management UI in PE/RE. Right click on the Network icon to open the UI.

The Rescue Media Builder executable **'RMBuilder.exe'** is located in the Macrium Reflect installation folder, usually 'C:\Program Files\Macrium\Reflect'. **RMBuilder.exe** can be launched independently or by taking the Rescue Media build menu option in **Macrium Reflect**.

Description	Architecture	File name
DVD/CD Support	32 Bit	PrimoBurner.dll
	64 Bit	PrimoBurnerx64.dll
Free Edition	32 Bit	WaikFiles00x86.exe
	64 Bit	WaikFiles00x64.exe
Home/Workstation Edition	32 Bit	WaikFiles15x86.exe
	64 Bit	WaikFiles15x64.exe
Server Edition	32 Bit	WaikFiles20x86.exe

Description	Architecture	File name
	64 Bit	WaikFiles20x64.exe
Server Plus Edition	32 Bit	WaikFiles25x86.exe
	64 Bit	WaikFiles25x64.exe

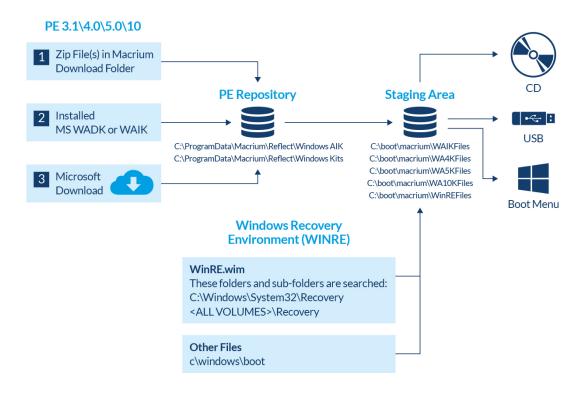
Note: RMBuilder.exe requires Macrium Reflect to be installed.

Windows Image File (WIM) and toolset files location

For Windows PE 3.1/4.0/5.0/10 the files required to build the Macrium Rescue media are copied from the Input Iocation to the Repository. The Repository is then used to populate the Staging Area when rescue media is built from scratch or stale.

For the **Windows Recovery Environment (WinRE)** the required files are located on the current system and copied to the **Staging Area** when rescue media is built from scratch or stale.

The Staging Area provides the files for the Boot Menu and for creating ISO/DVD/CD and USB boot media.



Macrium Rescue Environment

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Windows PE 3.1/4.0/5.0/10

Required files to populate the **PE Repository** are searched for in the following sequence...

1. **PE Zip files**: - PE zip files(s) containing the Windows Image (WIM) file and toolset files are saved to the Macrium download folder by the Reflect download manager ReflectDL.exe.

The default location is 'C:\users\<USER>\Downloads\Macrium'

Windows PE	File Name
PE 3.1	pe3x64.zip pe3x86.zip
PE 4.0	pe4x64.zip pe4x86.zip
PE 5.0	pe5x64.zip pe5x86.zip
PE 10	pe10_1709x64.zip pe10_1709x86.zip

 WAIK/WADK - Windows is searched for installations of the Windows® Automated Installation Kit (AIK) for PE 3.1 or the Windows® Assessment and Deployment Kit (Windows ADK). These products contain the Windows Image File (WIM) and tools to create the rescue media.

https://docs.microsoft.com/en-us/windows-hardware/get-started/adk-install https://www.microsoft.com/en-us/download/details.aspx?id=5753

Note: The WADK and WAIK download is several GB. It isn't necessary to manually install these products unless you are having problems with the automated download.

3. Automated Download - Finally, any missing files are automatically downloaded directly from Microsoft and copied to the PE Repository.

Note: If there is no Internet connection at this stage then the build process will fail.

PE Repository

Files located in 1. above are copied to the PE repository in the following folders.

PE Version	Location
3.1	C:\ProgramData\Macrium\Reflect\Windows AIK
4.0	C:\ProgramData\Macrium\Reflect\Windows Kits\8.0
5.0	C:\ProgramData\Macrium\Reflect\Windows Kits\8.1
10	C:\ProgramData\Macrium\Reflect\Windows Kits\10

Windows Recovery Environment (WinRE)

Files for the Windows Recovery rescue environment are pre-existing and located on the local file system.

The folowinng folders, and sub-folders are searched for file WinRE.wim

C:\Windows\System32\Recovery

<ALL VOLUMES>\Recovery

If multiple copies of **WinRE.wim** are found then each WIM is examined and the WIM that contains the most recent Windows OS is copied to the **Staging Area**.

Additional toolset files are copied from folder 'C:\Windows\Boot'

Staging Area

The Staging Area is re-populated each time the rescue media is re-built. Immediately after the Windows Image (WIM) file is copied to the Staging Area, it is mounted and the current version of Macrium Reflect is copied to the WIM file system along with required components and additional files extracted from **WaikFilesxNNnnn.exe**.

PE Version	Location
3.1	C:\boot\macrium\WAIKFiles
4.0	C:\boot\macrium\WA4KFiles
5.0	C:\boot\macrium\WA5KFiles
10	C:\boot\macrium\WA10KFiles

PE Version	Location
WinRE	C:\boot\macrium\WinREFiles

Output

When the 'Build' button is clicked files are copied from the Staging Area to the rescue media target. For the Boot menu, the Windows Boot Configuration Data (BCD) is updated to add a 'Macrium Reflect System Recovery' menu option which loads the Windows Image File (WIM) directly from the Staging Area.

For more information on the Windows BCD please see here: https://en.wikipedia.org/wiki /Windows_Vista_startup_process

Creating rescue media

- Main User Interface
- Boot Menu Options
- USB Rescue Media Options
- ISO/CD/DVD Rescue Media Options
- Advanced Options
- USB Flash Drive Formatting

Main User Interface

Macrium Rescue Media Builder provides a simple interface to allow for quick rescue media generation by selecting where the rescue media will be generated and then clicking a **'Build'** button.

All options for the rescue media will be suitably defaulted based on existing rescue media builds and a scan of the operating system environment.

- 1. Choose a rescue media target under 'Select Device'
- 2. Click 'Build'

	Windows RE:	Microsoft Windows Recovery Environment (x64) (10.0.16299)	liore
	Macrium Reflect: Status:	Macrium Reflect v7.1.3099 will be added to the rescue media. WIM file not found Click 'Build' to update.	
ect [Device		
1	Windows Boot Me	enu	^
	Add/change the b	oot menu for the selected Windows PE version	
	Removable USB F	Flash Drive	
	SanDisk SanDisk U	ltra - E: - 57.66 GB	
6	CD/DVD Burner		
Y	(G:) - MATSHITA, E	DVD-RAM UJ8D1 v8.10 (0:0:0)	
P	ISO File		
	Create new ISO File	e	~
	scue Media options		
Check	c for devices missing drive Multi Boot (MBR (UEEI)	vers on boot) Recommended for your system.	
Enabl		recommended for your system	
Enabl			

The **'Header'** area shows the currently selected Windows PE/RE version and settings. **'Show more'** expands the view to show the selected Advanced options.

Rebuilding the Windows Image File (WIM)

If the Rescue media needs rebuilding then this will be indicated in the header area. Reasons for rebuilding:

- A later version of Macrium Reflect is available and needs to be added to the build.
- A later version of Windows RE is available. A Windows update can cause the installed version of Windows RE to be updated.
- Any 'Advanced' settings that have changed since the rescue media was last built. If you click 'Show more' these settings will be highlighted in blue text.
- A 'Custom WIM' file has changed since the last build.
- The 'Boot\Macrium\Drivers' sub folder contains new or changed driver files.

Pressing 'Build' will re-populate the Staging Area, mount the WIM and copy the relevant files before dismounting the WIM and continuing with the build target operation.

WIM Rebuild Override

Overriding the default WIM rebuild behaviour may be useful to create rescue media without updating to a later release of Macrium Reflect, or, to force a rebuild to troubleshoot corrupt or non-booting rescue media or boot menu option.

The default WIM rebuild action can be overridden by **pressing the 'Ctrl' key**. Once pressed, and if appropriate, the 'Build' button becomes a 'Split' button showing either a **'Skip WIM Rebuild...'** or a **'Force WIM Rebuild...'** menu option, the opposite of the default 'Build' button behaviour. .

Build 🔽 Cla	ose	Build	 -	Close	
Skip WIM Rebuild		For	rce W	/IM Rebuild	

The override menu is not displayed in the following scenarios:

- 1. The 'Remove boot menu' option is selected. WIM operations are not relevant in this case.
- 2. The **WIM needs rebuilding** and the **'Current boot menu'** option is selected. In this case, the default operation of rebuilding the WIM is the only operation relevant and available.

The 'Select Device' area shows a list of possible ways the rescue media can be created.

Target	Description
Windows Boot Menu	Will either add, update or remove an entry from the Windows Boot Menu, select from the 'Boot Menu Options' for the desired action.
USB Flash Drive	Creates the rescue environment on an external USB flash drive. At least one partition is required on the drive with enough space for the rescue media files or the disk should be empty of partitions but be large enough for a new partition to accommodate the rescue media files.
USB HDD	Creates the rescue environment on an external USB HDD. As with the USB Flash Drive option a partition must be available with enough space or there should be enough space to create a new partition.
ISO File	Creates an ISO file suitable for either burning with third party software or booting a virtual machine from.

Note: In the case of external USB Flash/HDD the creation process is non destructive. No existing partition will be removed from the disk, only files added to an existing partition or a new partition created.

0

Boot Menu Options

Selecting the 'Windows Boot Menu' device will offer the following options

Option	Description
No boot menu	Do not add a boot menu option to the Windows boot menu.
mena	Note: This option is not visible if a Macrium Reflect rescue environment exists in the Windows boot menu
Add boot menu	Add the currently selected WinPE/WinRE environment as a Windows boot menu item. A description of the current enviroment can be seen to right of this option. Also, review the 'Header' area further up in this document.
Remove boot menu	Remove the currently configured Macrium Reflect rescue environment Windows boot menu item.
Current boot menu	Retain the currently configured Macrium Reflect rescue environment Windows boot menu item.

USB Rescue Media Options

Selecting either 'Removable USB Flash Drive' or 'Removable USB Hard Drive' device will offer the following options

Option	Description
Check for devices missing drivers on boot	Scans for Mass storage or network controllers that do not have driver support and show a dialog to assist with adding and loading drivers.
Enable Multi Boot (MBR /UEFI)	Enables USB media to boot on both MBR and UEFI systems.
Create Portable Technicians Rescue Media	Adds support for running the 'Technicians Portable' form of Macrium Reflect rescue environment.

ISO/CD/DVD Rescue Media Options

Selecting 'ISO File' or 'CD/DVD Burner' device will offer the following options

Option	Description
Check for devices missing drivers on boot	Scans for Mass storage or network controllers that do not have driver support and show a dialog to assist with adding and loading drivers.
Prompt for key press to continue boot sequence	Shows a simple prompt during boot, pressing any key will boot from the ISO media and not pressing any key will boot from the normal volume.

Advanced Options

The **'Advanced'** button opens options to change PE version and choose additional features for the rescue media build.

	Base WIM Options Devices & Drivers Rescue Media Volume	
	Windows RE This is the default choice for Windows 7 and above. Windows RE is pre installed with Windows. This option is best suited for your computer, includes WiFi support if built from Windows 10, and requires no further component downloads.	^
	Windows PE 10 (WADK) A downloadable option that supports UEFI / secure boot, USB 3.0, HyperV Gen 2 VMs and Windows overlay filesystems. This is a good choice for Win 10, 8, 8.1, 10, Server 2012, 2012R2 systems if Windows RE is unavailable. It is a requirement for Win 8.1 WIMBoot and Win 10 compact installs. Cannot be built on Vista / Windows Server 2008 or earlier.	
4	Windows PE 5 (WADK) A downloadable option that supports UEFI / secure boot, USB 3.0 and HyperV Generation 2 virtual machines. This is a good choice for Windows 8 or Windows Server 2012 systems. You may also consider this for older systems requiring default USB3 support. Cannot be built on Windows XP or Windows Server 2003.	

What version of Windows PE should I choose?

The default Windows PE version selected on a fresh installation:

os	Default Rescue Environment
Windows XP/Server 2003	Windows PE 3.1
Windows 7/Server 2008	Windows RE if available otherwise Windows PE 3.1
Windows 8.0/8.1/Server 2012/R2	Windows RE if available otherwise Windows PE 5
Windows 10/Server 2016./17	Windows RE if available otherwise Windows PE 10

You should ensure that your rescue media can access your System drive and also your backup location. The default option selects **Windows RE** if available. If Windows RE is not supported or cannot be located then the Windows PE version is selected that is the best match for your Windows operating system (s*ee table above*). This enables the rescue media wizard to automatically copy any required drivers for Network, USB or SATA controllers. However, versions of Windows PE that are more recent than your Windows OS may already contain compatible drivers and also offer additional support for USB 3.0.

0	Note: For Windows 7 systems with USB 3.0 ports it may be necessary to use PE 5.0 or PE 10.0 to enable USB 3.0 in the rescue media					
PE versi	on	Description				

Windows RE	This is the default choice for Windows 7 and above. Windows RE is pre installed with Windows. If available, this option is best suited for your computer, includes WiFi support if built with Windows 10 and requires no further component downloads.
	Note: Not available for Windows XP/Vista or for later Operating Systems if Windows RE cannot be located.
Windows PE 10.0	Based on Windows 10. Supports UEFI / secure boot, USB 3.0, HyperV Gen 2 VMs and Windows overlay file systems.
	This is a good choice for Win 8, 8.1, 10, Server 2012, 2012R2 systems if Windows RE is unavailable. Windows PE 10 supports Windows 8.1 WIMBoot technology and Windows 10 'Compact Install'. Both of these installation types are rare but may be used on Windows Tablet PCs with limited disk space.
	Note: The Windows PE 10.0 download option is not available if you are running Windows XP, Vista or Server 2003/2008

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version	
Windows PE 5.0	 Based on Windows 8.1. Supports UEFI / secure boot, USB 3.0 and HyperV Generation 2 virtual machines. This is a good choice for Windows 8/8.1 or Windows Server 2012 systems if Windows RE is unavailable. You may also consider this for older systems requiring default USB3.0 support.
	Note: The Windows PE 5.0 download option is not available if you are running Windows XP or Server 2003.
Windows PE 4.0	Based on Windows 8. Similar to Windows PE 5.0, but based on the Windows 8.0 kernel. This is a legacy option that is provided if you have used previous versions of Macrium Reflect before PE 5.0 was included. Includes support for USB 3.0. We recommend that you use PE 5.0/10 unless your require PE 5.0 features on Windows XP or Server 2003.
Windows PE 3.1	Based on Windows 7. This is the best option for Windows XP, Vista, Windows 7, Server 2003, Server 2008, 2008R2 operating systems if Windows RE is unavailable.
	Note: USB 3.0 support is not included.
	In the second

Note: If you have already built rescue media with an earlier version of Macrium Reflect then that PE version will be defaulted

oose Base WIM	Options	Devices & Drivers	Rescue Media Volume			
Architecture						
🔾 32 bit) 64 bit					
Options						
Add BitLocker Support						
	Automatically unlock BitLocker Volumes					
			es			
	tomatically u CSI Support		es			
Add isc	CSI Support	:	es port. Select if experiencing low resolution i	in PE.		
☐ Add iSC ☐ Enable	CSI Support	:	port. Select if experiencing low resolution i	in PE.		
☐ Add iSC ☐ Enable	CSI Support	: screen resolution supp	port. Select if experiencing low resolution i	in PE.		
Advanced	CSI Support legacy EFI profiles to au	: screen resolution supp utomatically connect to	port. Select if experiencing low resolution i			
Advanced	CSI Support legacy EFI profiles to au	screen resolution supp utomatically connect to . Advanced users can	port. Select if experiencing low resolution ii o WiFi			
Advanced	CSI Support legacy EFI profiles to au	screen resolution supp utomatically connect to . Advanced users can	port. Select if experiencing low resolution ii o WiFi			

Option	Description				
Architecture	Choose from 32 or 64 bit. WinRE is only available for the same architecture as the current Windows OS.				
		only necessary to choose an alternative architecture when creating rescue media to t a different PC.			
iSCSI Support	Enables restoration and clones to iSCSI connected disks. Please note that adding these components may several minutes to the creation process. See Adding iSCSI support to Windows PE for more information on using iSCSI in Windows PE				
BitLocker	Add Support	Add the components required to run 'managebde.exe' and unlock BitLockered drives to Windows PE.			
		Automatically unlocked BitLockered drives when the rescue media starts.			

Option	Description
	Auto Unlock
	Also see: Adding BitLocker support to Windows PE and BitLocker Restore/Clone Outcomes
Legacy EFI Screen Resolution	Select this option if you are experiencing very low, less than 1024 x 768, screen resolution in PE 10 or WinRE. Some early UEFI BIOS chipsets are incompatible with Windows 10 Pre-Installation Environment graphics output. Selecting this option will cause the PE 5.0 EFI microcode to be used instead of PE 10 when starting the rescue environment.
Copy WiFi Profiles	Select this option to copy WiFi profiles, including passwords, to the rescue media. If possible a WiFi connection will be automatically established when Windows RE starts.
	Note: This option, and WiFi support, is only available in Windows RE 10. WiFi profiles are encrypted to prevent unauthorised access.
Custom base WIM	Use your own customized WIM for the rescue media. This is an advanced topic not covered in this help.

Advanced Options					×
🤹 Update Driv	vers for I	Mass Storage ar	nd Network		
Choose Base WIM	Options	Devices & Drivers	Rescue Media Volum	ne	
Device		Status			
✓ Realtek PCIe GBE F					
 Standard NVM Expr Intel(R) Dual Band Standard SATA AHO 	Wireless-AC	3165 Driver already	present in Drivers folder present in Drivers folder vice support in WinPE		
			present in Drivers folder		
					Update
			Help	ОК	Cancel

Mass Storage and Network devices will be listed showing the current state of driver support. Drivers can be added for devices missing driver support as well as updating drivers previously added to the rescue media.

Device Status	Meaning
Device Detected	The device has no drivers and will not function in WinPE/WinRE. If you require this device then drivers should be added.
Device support in WinPE	The device has a supporting driver in WinPE/WinRE. Generally you do not need to update this form of driver.
Compatible device support in WinPE	The device has a compatible driver in WinPE/WinRE. Again, this driver generally does not require updating.
	A driver has been previously added to the Macrium Reflect rescue media for this device.

The status of a device can be one of the following

Device Status	Meaning
Driver already present in Drivers folder	
Copy host driver	For Vista based and later operating systems if a device is found without driver support then the operating system will be scanned for a compatible driver. If discovered the host OS driver will be added to the rescue media.
	Note: If no compatible device is found then the status will remain at Device Detected

(i) How To Update Drivers

Note: Click Update or double click a device to add or update a driver for a device.

(i) WiFI Device Support

Note: WiFi device support will only be available in WinRE based rescue environments, even if drivers are added for the device.

Update	e Device Driver			
ß	Standard NVM	1 Express Controlle	r	
	Driver Provider Driver Version Driver Date	Microsoft 10.0.16299.192 06/21/2006		
	n for an updated dri ewDrivers	ver in folder		Browse
⊠Sc	an subfolders			<u>S</u> can
			Apply	Cancel

This dialog will show the current driver information for a device. To update the driver, click Browse, select a folder and click the Scan button (optionally select to scan subfolders before starting the scan). The folder willk be checked for an updated driver based on either version number or date and if discovered, a prompt will be shown for update confirmation.

Driver So	Driver Scan Results					
?	Update To This Device Driver ?					
	An updated device driver was found:					
	Manufacturer: Microsoft Version: 11.0.18299.639 Date: 06/21/2016 Path: D:\NewDrivers\nvme\ Filename: stornvme.inf					
	Yes <u>N</u> o					
<u>View discovered INF file</u>						

Once an updated driver has been found and selected, click Apply to save the updated driver or Cancel to retain the current driver.

Advanced Options Select Volume for I	Rescue Media Fil	e storage		×
Choose Base WIM Options Drive Available Space File S	System	Rescue Media Volum	ne	
✓ C:\ 229.08 GB NTF3 D:\ 871.26 GB NTF5				
		Help	ОК	Cancel

Macrium Reflect Rescue Media files can be stored on a different volume, this tab allows for selection of the preferred volume. Select a volume by clicking the check box and then Click OK. Rescue media files will now be stored on that volume, any existing Macrium Reflect rescue media files from previous builds will be moved to a newly selected volume.

O Note: This option is not available in Windows XP

USB Flash Drive Formatting

•	The following partition is required on the USB flash drive for booting the Macrium Reflect rescue media:							
	Boot	Туре	Min Partition Size					
	Multi-Boot MBR / UEFI	FAT32	1.2 x Size of Rescue Media PE files					
	MBR Only	FAT32 or NTFS	1.2 x Size of Rescue Media PE files					

The Rescue Media PE files vary in size dependant on PE/RE version. 1GB will be sufficient for all PE and RE versions as of May 2018. If there is insufficient free space then the build may fail.

Rescue Media Builder will first attempt to non-destructively copy the PE/RE files to an existing partition, then nondestructively create a new partition if necessary. If this is not possible then you will be prompt to destructively format the drive.

The Flash drive is prepared and files copied according to the following steps...

1. The flash media is first searched for a partition of sufficient size and the required file system type as defined in the above table. If found then the **PE/RE files are copied to the Flash drive**.

Note:
For Multi-Boot (MBR/UEFI) rescue media the suitable partition is determined in the following sequence:
The current 'Active' partition is checked for suitability. If not found, the first suitable FAT32 partition is used. This partition is then marked 'Active'
For non Multi-Boot (MBR) rescue media the suitable partition is determined in the following sequence:
The current 'Active' partition is checked for suitability. If not found, the first suitable FAT32 partition is used. This partition is then marked 'Active' If not found, the first suitable NTFS partition is used. This partition is then marked 'Active'

2. If no suitable partition/file system is found and the rescue media creation is **Multi-Partition Aware** then the flash drive is searched to locate unallocated space to create a **1GB FAT32 partition**.

USB flash Rescue media is considered Multi-Partition Aware if the host OS is Windows 10 Release 1709 or later and the target Win PE/REWIM is also Windows 10 Release 1709 or later . In all other cases only a single partition will be allowed on flash media.

There can be a maximum of 4 primary partitions on the drive.

If a partition is successfully created and formatted then it is marked 'Active' and the PE/RE files are copied.

3. If the rescue media creation is **not** Multi-Partition Aware or if the partition in step 2 cannot be created then **Rescue Media Builder** will prompt to format the Flash Drive. This is destructive and **all existing data will be lost on the drive**:

Create USB Rescue Media						
?	The USB flash drive requires reformatting. Existing data will be lost on the drive. Click confirm and OK to proceed					
🗆 c	onfirm format	ОК	Cancel			

Partition and File System Created

Multi-Partition Aware	Туре	Size
Y	FAT32	1GB
N	FAT32	32GB or the maximum size of the flash drive

If a partition is successfully created and formatted then it is marked 'Active' and the PE/RE files are copied.

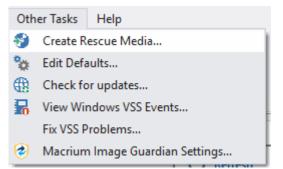
Adding a Boot Menu option for system Image recovery

Adding a Macrium Reflect Windows boot menu enables direct access to the Macrium Windows PE recovery environment without the need to burn a DVD or USB Flash drive.

Note: You are advised to create physical boot media, USB or DVD, that can be used if your OS system disk fails.

You can add a **Macrium Reflect System Recovery** menu option to your PC boot menu. By doing this you can restore a system image (the C drive) without a recovery CD.

1. Take the 'Other Tasks' > 'Create Rescue Media...' menu option

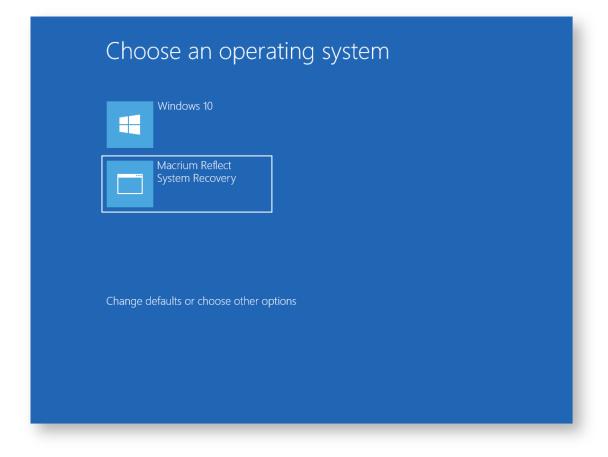


2. Select 'Windows Boot Menu' in the device list and click 'Build'

0

Rescu	e Media Settings		✓ Show more
	Windows RE: Macrium Reflect: Status:	Windows RE 10 Release 1803 (64-bit) Home Edition (64-bit) v7.2.3749 (Trial) A later version of Macrium Reflect is available - Click 'Build' to update.	v7.2.3787
Select	Device		
1	Windows Boot Me Add/change the bo	e nu oot menu for the selected Windows PE version	^
¢	• Removable USB F SanDisk SanDisk UI		
		Unsupported Disk - E: - 931.51 GB - GPT format is not supported	
Ø	CD/DVD Burner (G:) - VXDV , BD-	HD-DVDRAM S15 v10.0 (1:1:0)	¥
	enu options ove boot menu	s RE 10 Release 1803 (64-bit)	
Cum	ene boot mena - window	S KE 10 KEIEBSE 1005 (07-010)	

The Macrium recovery boot menu option - Windows 10



Preparing a USB stick for Windows PE

To use a USB stick as a boot device, Windows requires a Master Boot Record (MBR) however some USB sticks are shipped without one and with just a single partition. The USB stick, therefore, needs formatting but the standard Windows format option does not prepare the disk correctly as it does not create a master boot record. You therefore need to prepare the USB stick using other tools, for example, Windows diskpart.

- 1. Start an elevated command prompt. See Running an elevated command prompt for more information.
- 2. Type:

		- 1
diskpart		
arbitpare		- 1

3. Type:

list dis	k								
•		C:\WIND	OWS\system32	?\diskpar	t.exe		- 🗆 🗾	<	
Microsoft D)iskPart version	6.4.9879							
	C) 1999-2013 Mi : WIN-71VI3IRNF		orporatio	on.					
DISKPART> 1	ist disk.								
Disk ###	Status	Size	Free	Dyn	Gpt				
Disk 0	Online	40 GB	0 B						
DISKPART>									
								~	

4. Identify the disk number of your USB stick.

Please ensure that you correctly identify your USB stick.

5. Type:

e				 	 	
		-1-11				
	select	aisk	<n></n>			
1.00				 	 	

Where <n> is the number of the disk previously identified as being the USB stick. Confirm that the current disk selection is correct by typing in detail disk, this will show information relating to the currently selected disk.

Note: Please be certain you have the disk selection correct before proceeding to the next step.

6. Type:

clean

This erases all data on the USB stick.

7. Type:

create par primary

This creates a primary partition on the USB stick using the maximum size available.

8. Type:

active

To make the primary partition active.

9. Type:

format FS=ntfs LABEL="Macrium WinPE" QUICK

This formats the newly created partition on the USB stick for legacy MBR booting.

If your system has **GPT disks** and uses the newer **UEFI booting** standard then please type the line below instead:.

format FS=FAT32 LABEL="Macrium" QUICK

Note: UEFI booting requires a FAT32 formatted partition and will not recognize NTFS.

10. Type:

exit

once the format command has completed to exit diskpart.

11. Type:

exit	
Again to close the command prompt.	

See also: Troubleshooting USB rescue media

Creating a bootable Windows PE USB stick

Introduction

In this article we will explain how it is possible to create a USB flash drive to boot Windows PE.

- 1. Follow the steps on Creating Rescue Media
- 2. When you get to the final screen as show below:

	Rescue Media Wizard						
	SCUE Med our optical/USB	dia device and dick finish.					
?	Version: Date: Type:	6.0.467 11/02/2015 Auto-built Windows PE 5.0 (WADK) - 64 Bit					
Rel	build the rescu	e environment by copying the required files Rebuild					
		upported devices each time the Rescue media loads. y press to continue booting from the Rescue media.					
0	CD/DVD burne	er 📀 Create ISO image file 🗸 🗸					
۲	USB Device	🚈 (D: Backup) - Seagate FreeAgent Go (298.09 GB) 🛛 🗸 🗸					
~	Enable multiboot MBR/UEFI USB support. Recommended for your system.						
	Please press the Finish button to continue.						
		< Back Next > Cancel Finish					

Select 'USB Device' as indicated in Red and click Finish



	Troubleshooting USB rescue media	

Accessing network shares in Windows PE

The Macrium Reflect Windows PE rescue media includes the Windows networking stack and allows connection to authenticated network shares when booted into Windows PE. Network shares can be entered by UNC path using the \\Server\Share or by IP address and shared folder.

If you have problems accessing shared servers then please see Resolving network issues in Windows PE

Please note: Wireless Networking is not supported in Windows PE. Please connect to your network using an Ethernet cable.

Please Note: When accessing network shares in Windows PE 10 it's necessary to prepend the user name with '.\' if the network resource is on the local network/domain. For example enter '.\Administrator'

This is not required for earlier versions of Windows PE.

- Accessing the network when creating an image in PE
- Accessing the network when restoring an image in PE

Accessing the network when creating an image in PE

1. In the image wizard **enter the \\server\share\folder path** in the backup destination page. You will be prompted for login credentials if the share is password protected:

(II)

Disk Image		
R	, Select Sc	purce Drive(s) and Image Destination
Source		Windows Security
1 - 5 NTF 43.8	MBR Disk 1 [7 1 - System I	Enter the network logon credentials to enable Windows PE to access the Network share.
	NTFS Activ 43.8 MB 100.0 MB	User Name Password
		Access is denied.
Total Sel		OK Cancel
Folde	er	\/build_hg\public\backup 🗸
⊖ cD/D	OVD Burner	<u>Alternative locations</u>
Backup	o filename:	Use the Image ID as the file name. (Recommended) {IMAGEID} {IMAGEID} //wb/public/nick\case51985\{IMAGEID}-00-00.mrimg
국내 Advanced Options < Back Next > Cance		ions < Back Next > Cancel Finish

2. Alternatively, click the '...' browse button to browse the network for the shared folder:

Drive(s) and Image De Browse for Fol ct location for image file		4.00 GB>
Browse for Fol		4.00 GB>
		4.00 GB>
ct location for image file		
		4 - (C:) ry NTF5 Pi
		-,
	^	✓ 16.12 GI 63.48 GI
		03,40 01
Bocktop		
Network		
· 1.6		
	~	
- 1.A		
	OK Cancel	Ť
GEID}		-
	Hictoreo Network CUDIEDE CHRISWIN7X86 E DEV-PC E DEVDE	Music Documents Desktop Network CHRISWIN7X86 CHRISWIN7X86 CHRISWIN7X86 DEV-PC DEVDE

Expanding a network node that requires authentication will display the Network Credentials dialog:

Connect to \\OFFICE2
Connecting to \\OFFICE2
Jser name:
Password:
Authentication failed when enumerating shares on this server. Enter a share name here and use these credentials for access:
Share name:
OK Cancel

Leave the 'Share Name' field empty for root level authentication of the server.

Accessing the network when restoring an image in PE

_

1. If the image that you are restoring isn't visible in the Macrium Reflect Restore pane then **click the 'Browse** for an image file..' link

	Restore				
;t	ore Tasks	Image Restore	File and Folder Re	store	
	ReDeploy restored image to new hardware	Browse f	for an image file	(Refre	esh 🐂 E
	Fix Windows boot problems				
2	Browse for an image or backup file to restore				
	Open an image or backup file in Windows Explorer				
	Detach a backup image from Windows Explorer				
	Details	Sort by \downarrow 🛽	Backup Date	Location	<u>File Name</u>

*		Select an image file	-x
Look in:	E Desktop	v 🎯 🏂 📂 🎞 🗸	
Recent places		STEM This PC	
This PC			
	File name: Files of type:	\\Server\share\folder ✓ Macrium Reflect Image File (*.mrimg) ✓	Open Cancel

2. In the browse dialog that opens type the UNC path of the network share that you want to access:

3. Alternatively, click 'This PC':

٢		Select an image	e file			x
Look in:	E Desktop		¥	G 🔊	► 🔝 📚	
Recent places Libraries	SYSTE			This PC		
	File name: Files of type:	Macrium Reflect Image	e File (*.mrimg))	*	Open Cancel

4. Scroll down and double click 'Network':

\$		Select an image	e file						×
Look in:	J툦 This P	:	~	6	ø	Þ			
Ca.		IVIUSIC							^
Recent places		Pictures							
Libraries	1	Videos							i.
	Devices	(E)	_						•
This PC		Network							
	Ŷ	47.3 GB free of 63.4 GB							
		CD Drive (E:) Rescue							~
	File name:					¥]	Oper	ı
	Files of type	Macrium Reflect Image	e File (*.mrimg)		~]	Cano	el

5. Expand the network server that contains the share you want to access:

\$	Select an image file	×
Look in:	Network 🗸 🎯 🎓 🖽 🗸	
Recent places	CHRISDEVLOCAL	î
Libraries	CHRISWIN7X86	
	DEV-PC	
This PC	DEVDE	
	DEVPC	
		× 1
	File name: V Op	ben
	Files of type: Macrium Reflect Image File (*.mrimg) V	ncel

Expanding a network node that requires authentication will display the Network Credentials dialog:

C	onnect to \\OFFICE2	
	G P	
Connecting to \\O	FICE2	
User name:		
Password:		
shares o	ation failed when enumerating In this server. Enter a share name use these credentials for access:	
	OK Cancel	

Û

Leave the 'Share Name' field empty for root level authentication of the server.

See also: Resolving network issues in Windows PE

Technicians portable application support

O Applies to Server Edition Technician's License only.

Note: Technician's Portable Application USB sticks, Optical media and ISO image files expire when your license for Technician's product expires. You need to recreate your USB stick / ISO image file after this time.

The Macrium Reflect Technician's License allows a single user to image multiple PCs (as specified in the license). Macrium Reflect runs as a portable application from USB Rescue Media, mounted ISO image file or optical media. The media also acts as a bootable rescue environment, which you can use to back up and restore licensed PCs. Portable Mode Reflect is very similar to the Macrium Reflect environment you are familiar with.

Creating a technician's USB stick

1. Take the 'Other Tasks' > 'Create Rescue Media...' menu option.

 Other Tasks
 Help

 Image: Solution of the state of th

- 2. Select USB Device, CD/DVD Burner or ISO File as your target media.
- 3. Check Create a Technician's Rescue Media.

Rescu	e Media Settings		✓ Show more	
	Windows RE: Macrium Reflect:	Windows RE 10 Release 1803 (64-bit) Server Edition (64-bit) <u>Technician's License</u> Macrium Reflect edition has changed Click 'Build' to update.	v7.2.3749 (Trial)	
Select I	Device			
	Windows Boot M Add/change the b	enu 1000t menu for the selected Windows PE vers	ion	^
A	Removable USB SanDisk SanDisk U	Flash Drive Iltra - H: - 57.66 GB		
Ĵ,		• Unsupported Disk) - E: - 931.51 GB - GPT format is not suppor	ted	
Ø	CD/DVD Burner (G:) - VXDV , BD-	-HD-DVDRAM S15 v10.0 (1:1:0)		~
Ched	escue Media options k for devices missing dri le Multi Boot (MBR/UEFI te Portable Technician's) - Recommended for your system.		

4. Click Build.

Launching Macrium Reflect from the USB or ISO image

- 1. Insert the USB or Optical media file and you will be asked to choose what happens with it.
- 2. Select Open folders to view files.
- 3. In the root of the USB stick, select folder Win32 or Win64.

The media contains both 32-bit and 64-bit versions of Macrium Reflect. To launch the right one, a launcher is provided called portable.exe.

4. Double click reflect.exe to launch Macrium Reflect.

Pictures ^ Name	*	Date modified	Туре	Size	
Public					
aesdl		26/01/2015 14:20	Application extens	87 KB	
Homegroup		26/01/2015 14:23	TMP File	0 KB	
Delet	e.bmp	26/01/2015 14:23	BMP File	5 KB	
This PC	e16.bmp	26/01/2015 14:23	BMP File	2 KB	
Desktop	I	26/01/2015 14:20	Application extens	315 KB	
Documents	e.rtf	26/01/2015 14:20	Rich Text Document	24 KB	
Downloads	mp	26/01/2015 14:23	BMP File	5 KB	
ioe (vaio)	bmp	26/01/2015 14:23	BMP File	2 KB	
Music	Burner64.dll	26/01/2015 14:20	Application extens	1,850 KB	
Pictures	ounterex.sys	26/01/2015 14:20	System file	166 KB	
richard (vaio)	t.exe	26/01/2015 11:28	Application	38,677 KB	
Refle	ct.usb	26/01/2015 14:20	USB File	1 KB	
Videos	r.dll	26/01/2015 14:20	Application extens	561 KB	
Windows8_OS (C:					
IENOVO (D:)					
NEW VOLUME (G:					

Adding drivers to the portable PE environment

You can add drivers directly to the Windows PE rescue environment by booting into Windows PE and taking Restore > View Unsupported Devices. For more information see Adding device driver software

Adding drivers in Windows

Please note that this option is not accessible when booted in the PE environment and is only available in Windows.

The portable edition of Reflect offers the ability to copy any missing drivers from the current system. To do this:

1. Select the Add Drivers to technician's rescue media option from the other tasks group on either the **backup** or **restore** tabs.

0

Eile View Backup Restore Other Task Backup Restore Restore </th <th>s <u>H</u>elp</th>	s <u>H</u> elp
Restore Tasks	Image Restore
Browse for an image or backup file to restore	Browse
Open an image or backup file in Windows Explorer	
Detach a backup image from Windows explorer	
✓ Other Tools	
Add drivers to technician's rescue media	
▷ Details	Sort by J
	Jorr Dy 🖤

		Devices & Drivers	Rescue Media Volume		
Device			Status		
 Marvell AVASTAR Intel(R) 8 Series USB xHCI Compli 	SATA AHCI	Controller - 9C03	Driver already present in Driver already present in Driver already present in	Drivers folder	
			briver direddy present in	Differs folder	

Adding device drivers to Windows PE

Windows PE (WinPE) is packaged with a large collection of drivers but there are many devices that are not part of the WinPE list of drivers. If your device is not listed you must add its driver so WinPE recognizes it and communicates with your device.

You can run the Create bootable rescue media wizard at any time to check, add or change drivers, if for instance, you have added hardware since creating rescue media.

When you run the Macrium Reflect task, **Create bootable Rescue Media** the wizard checks whether your device requires drivers adding to WinPE. It builds a list of devices in your computer that are either hard drive/RAID controllers, network interface cards, USB controllers or USB hubs. For each of these devices it checks if:

- The device is supported by default in WinPE
- There is a compatible driver in the host operating system
- There is a compatible driver already present in the collection of drivers on previously created rescue media

Vizard
s
Compatible device support in WinP
Device Detected
Update Driver
Please press Next button to continue.
Next > Cancel Finish

Unsupported devices show in the list of devices with a warning icon and a status text of Device Detected.

Note: You do not need to install missing drivers for devices that you do not intend using from WinPE.

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Supported devices have a status of either:

- Device Support in WinPE
- Compatible Device Support in WinPE
- Copy Host Driver
- Driver already present in Drivers folder

Even if a device is supported you can choose to update it and use a different driver, you do not need to use the driver provided by WinPE. Being able to update drivers in this way is useful if you experiencing issues with performing backups or restores in WinPE, for example, if restoring runs slowly from a USB device.

A device driver is a collection of files (also referred to as a driver package) and generally comprises of:

- The driver software, these files have a .SYS extension.
- The driver information, or INF, file which contains the installation instructions for the drivers, these files have a .INF extension.
- An optional security catalog that signs those drivers for operating systems that require signed drivers, commonly used on x64 operating systems, these files have a .CAT extension.
- One or more optional supporting software library files (Dynamic Link Library) that contain further code to support the driver software, these files have a .DLL extension.

You can find driver install packages in several places. Most manufacturers create a driver folder on the hard drive of a new PC, often named after the manufacturer. If this is not present, you can download drivers from the device or PC vendor's website. For older PCs, manufacturers of devices and motherboards included driver CDs in the packaging, however, these may not be the latest.

Updating drivers

- 1. Select the driver you want to update, left click it in the list of devices.
- 2. Click Update Driver.

This presents a wizard. This wizard is straightforward to use, the first page prompts you for a folder to scan for drivers and whether you want to include all sub-folders.

	Updat	te Device Driver	r Software	e			
64		AVASTAR Wireles					
	Select a	a folder to scan for	device driv	er software			
	Folder						
		Include all subfo	lders				
				< Back	Next >	Cancel	Finish

- 3. Select a folder.
- 4. Click Next.

The wizard scans for drivers, automatically including the host operating system drivers if you do not choose to scan that folder.

- 5. When complete a list of results is displayed, select the driver from the list you want to use.
- 6. Click Finish.

64	Upda USB x	ate Device Driver So HCI Compliant Host Con	oftware troller				
	Select	a driver to use in the Re	scue Media				
	Selec	t Location	Date	Version	Comment		
		D:\Drivers\Chipset\All\	07/25/2013	9.4.0.1023			
		D:\Drivers\Chipset\WI	. 07/25/2013	9.4.0.1023			
			< Ba	ck	Next >	Cancel	Finish

The rescue environment driver is copied.

About Adding Drivers to WinPE Rescue Media

WinPE is packaged with a large collection of drivers, however, there are many devices that are not part of the WinPE list of drivers. For WinPE to recognize your device, you need to add a driver. Your device then communicates with WinPE and loads at boot time of WinPE.

The main devices to be concerned with are hard drive/RAID controllers, network interface cards (NIC) or USB controllers and USB hubs.

If you intend to use a network device then you need to ensure that your NIC is supported in WInPE. If your hard drives are attached to a RAID controller then you need to ensure that your RAID Controller is supported in WinPE, either by a WinPE driver or by adding a driver.

A device driver is a collection of files (also referred to as a driver package) and generally comprises of:

- 1. The driver software. These files have a .SYS extension.
- 2. The driver information, or INF, file which contains the installation instructions for the drivers. These files have a .INF extension.
- 3. An optional security catalog which signs the drivers for operating systems which require signed drivers, commonly used on x64 operating systems. These files have a .CAT extension.
- 4. One or more optional supporting software library files (Dynamic Link Library) which contain further code to support the driver software. These files have a .DLL extension.

Your best sources for driver packages are the CD that comes with your device (or motherboard) or downloads from the vendor website as a ZIP file. When downloading a package from the vendor website, it is best to source a ZIP package for easy extraction.

Fixing Windows boot problems

This article explains how to use the 'Fix Boot Problems' option to resolve common boot problems when restoring an image.

- Fix boot problems on MBR/BIOS systems
- Fix Boot problems for GPT/UEFI Boot Systems

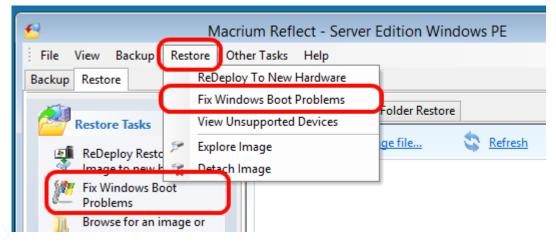
When restoring an image or cloning a HD there can be situations where Windows is unable to boot due to incorrect boot configuration. This article explains how Reflect enables you to resolve these situations.

Depending on whether the disk you have restored uses GPT or MBR partitioning schemes, the action you need to take may vary. This article covers both cases.

Fix boot problems on MBR/BIOS systems

Fix Windows boot problems is available in the Windows PE Rescue media environment. To fix Windows boot problems, start your computer with your rescue media inserted. Then, after a restore or clone, to use fix boot problems:

1. **Select** the restore menu, then **select** fix boot problems. Alternatively, **choose** the restore tab then under restore tasks **select** Fix Windows Boot Problems.



2. The Fix boot problems wizard will then open.

3. You will be presented with a list of Windows Installs, which the wizard detects. **Verify** these are correct. If the wizard has not automatically detected your Windows install, **add it** using the buttons on the right. You can also **correct any details** using the edit functionality.

	Fix Boo	ot Problems	
Installed Window	s Operating Systems		
Locate installed	Windows operating system	ns on your PC.	
Description	Version Drive	Path	Add
Disk 1 - VBOX H	IARDDISK 1.0 <125.00 G	GB>	Edit
🌌 Microsoft Wind	ows XP 5.1 C:	\WINDOWS	
			Ignore
			Search
-			
	Nindows should be listed l		
		that will appear in the Wind I clicking the 'Edit' button.	lows boot loader menu.
	Please pres	s the Next button to conti	nue.
	< Back	Next > Canc	el Finish

4. **Select the active partition**. The wizard automatically selects the boot disk for the relevant Windows install, but you can change this if you are using an alternative setup:

		Fix Boot Prol	blems
Active Partition			
Select which pa	artition your PC sl	hould boot from.	
Primary Partition	Drive Letter	File System	Disk ID
Disk 1 - VBOX	HARDDISK 1.0	<125.00 GB>	
√ 🧇 1	Preload (C:)	NTES	2BD2C32A
2 🖘 2	SERVICEV001	FAT32 (LBA)	2BD2C32A
The 'Active' partitio on the boot disk on		the Master Boot F	Record. This can be any 'Primary' partition
			ext button to continue.
	<	Back Ne	xt > Cancel Finish

5. **Choose** the boot options to be fixed. We recommend leaving all options checked, however, power users may wish to alter the behaviour of the wizard.

Fix Boot Problems
Boot Code Options
Select options to repair your PC boot code.
✓ Reset the boot disk ID. This is the unique identifier of your hard disk and is a common cause of boot problems.
Replace the Master Boot Record. Your computer will not be able to start if the Master Boot Record is missing or corrupt.
Replace partition sector boot code. The partition sector boot code is called from the Master Boot Record. If this is corrupt then your computer cannot start.
Rebuild the Boot Configuration Database (BCD) and BOOT.INI files The BCD and BOOT.INI files are essential for the active partition to locate any operating systems on your disk(s). The BOOT.INI file is only required if you have a Windows version earlier than Vista on your PC.
Please press the Finist button to continue.
< Back Next > Cancel Finish

6. Click finish. The wizard will then offer you the choice to reboot. If you need to perform additional tasks in the PE environment such as ReDeploy, select no. Otherwise, select yes.

7. Your system will now boot.

Fix Boot problems for GPT/UEFI Boot Systems

Fix boot problems is available in the same location as for MBR systems. Boot your UEFI capable rescue media. Then:

1. **Select** the restore menu, then **select** fix boot problems. Alternatively, **choose** the restore tab then under restore tasks **select** Fix Windows Boot Problems.

5	Macrium Reflect - Server Edition Windows PE
File View Backup	Restore Other Tasks Help
Backup Restore	ReDeploy To New Hardware
1	Fix Windows Boot Problems
Restore Tasks	View Unsupported Devices
🗐 ReDeploy Resto	
Image to new P	😪 Detach Image
Fix Windows Bo Problems	bot
Browse for an i	mage or

2. The Fix boot problems wizard will then open.

3. You will be presented with a list of Windows Installs, which the wizard detects. **Verify** these are correct. If the wizard has not automatically detected your Windows install, **add it** using the buttons on the left. You can also **correct any details** using the edit functionality.

	F	ix B	oot Problems	
Installed Windows C	perating Sy	/stem	15	
Locate installed Wir	ndows operatir	ng sys	stems on your PC.	
Description	Version D	Drive	Path	Add
Disk 1 - VMware, V Mindows 8 Pro				Edit
Disk 2 - VMware, V	/Mware Virtu	ial S 1	1.0 <200.00 GB>	Ignore
鸄 Windows 7 Ultimat	e 6.1	D:	\Windows	Search
	represents t	he na	ed here. me that will appear in the Windows and clicking the 'Edit' button.	boot loader menu.
2 .	-		ress the Next button to continue.	
	< B	ack	Next > Cancel	Finish

4. (Optional Step) if you have multiple disks, you may be asked to select which you should boot from. Choose the disk you wish to boot from, then press next.

	Fix Bo	oot Problems
Boot Driv		
Select	which drive your PC should boot f	rom.
Number	Name	Size
√ ⊛1	VMware, VMware Virtual S 1.0	200.00 GB
	Please or	ess the Next button to continue.
	Flease pro	
	< Back	Next > Cancel Finish

5. The wizard will then display a summary screen. $\ensuremath{\textbf{Press Next.}}$

6. You will then see a report showing you a choice of actions and allowing you to restart your PC. **Select Yes** if you wish to restart now and **select No** if you wish to perform additional tasks in the PE environment.

	Fix Boot Problems
Summary	
Review opti	ions to repair your PC boot code.
	Running Tasks 🖾
Click Finish t Boot Drive: Disk 1 - V Windows In Windows	 ✓ EFI partition found on disk 1 ➢ Removing old BCD ✓ Creating BCD for C:\Windows ✓ Creating BCD for D:\Windows
Windows	Reflect 🛛 🕅
	Restart your PC?
	Yes No I Finish

Updating rescue media to include additional hardware drivers

While you have valid rescue media, it is possible that further down the line you add hardware to your computer without updating the rescue media. Macrium Reflect provides a way of loading drivers for these pieces of hardware when in Windows PE.

Select the Restore > View Unsupported Devices menu option, the following dialog will be shown:

Drivers may need to be	e loaded for the follo	wing devices in ord	der to backup	/restore	2	
Description .		Vendor	Device	Туре	Last Load Resu	lt '
Realtek PCIe GBE Fa	mily Controller	VEN_10EC	DEV_8168	NIC	No driver loade	d
Export device list to 3	XML for support					
			Scan Folde		oad Driver	Close

a list of devices which are currently unsupported will be shown. Drivers can be loaded using two methods:

- Select a device from the list and click Load Driver. Browse and select a driver INF file in the dialog that is displayed. Macrium Reflect will try and load the driver and report the result back.
- Select 'Scan Folder'. The selected folder structure will be searched for driver INF files for all devices in the list. After the scan, a dialog will be displayed showing which devices had drivers loaded.

Notes on Driver Packages

After downloading a driver package, unzip to a folder that Macrium Reflect has access to. All files within the driver package should be extracted including .CAT and .DLL files.

When loading drivers Macrium Reflect will check for device support in INF files and if found will attempt to load the driver. It is important that all the files that the driver package consist of should be present in the same folder as the INF file. There will definitely need to be the .SYS file for the driver. The driver package may also consist of .CAT and . DLL files, these need to be present in the same folder as well in order to load successfully.

Drivers must ideally match the architecture of your Windows PE installation. It should be noted that Windows 7 drivers may appear to have been added to Windows PE 4.0/5.0 successfully but will only sometimes work.

Adding iSCSI support to Windows PE

Macrium Reflect can include the components necessary to connect Windows PE to iSCSI. This enables restoration and clones to iSCSI connected disks.

1. Ensure that your Windows PE rescue media has been created with the 'Add iSCSI Support' option selected.

/	Advanced Options X
Macrium Rescue Media I ile Logs Help	Set WIM Build Options
Rescue Media Settings	Choose Base WIM Options Devices & Drivers Rescue Media Volume
Windows RE: Macrium Reflect: Status:	Architecture
elect Device	Options
Windows Boot I Add/change the	Add BitLocker Support Automatically unlock BitLocker Volumes Add iSCSI Support
Removable USE SanDisk SanDisk	Enable legacy EFI screen resolution support. Select if experiencing low resolution in PE. Add WiFi Support
G-DRIVE ev (Gen	Copy profiles to automatically connect to WiFi Advanced
CD/DVD Burner (G:) - VXDV , BI	Custom base WIM. Advanced users can supply a pre-prepared Windows Image file. Custom WIM File Location
Boot menu options	
Remove boot menu	
Ourrent boot menu - Winde	Help OK Cancel
	Help Advanced Build Close

2. Boot into Windows PE and start a command prompt.



The command line can be accessed by clicking the black icon on the bottom left corner of your screen.

3. You will need to change the IP address of your Windows Pre-installation Environment to the same IP address that is configured on your Windows Host in order to be authenticated by the iSCSI target since unknown IP addresses will result in a timeout when trying to login to the target.

\$			Macrium F
File View Backup	Restore	Other Tasks	Help
Backup Restore		Network	c Config
▲ Restore Tasks		Keyboar	d Layout

Take 'Other Tasks' > 'Network Config'

4. Select the connected network adapter and click 'Properties'.

Name	Status	^
Ethernet Connections		
Surface Ethernet Adapter	Connected	
WiFi Connections		
att BTOpenzone	Disconnected	
all dlink_office	Disconnected	

5. In Network Adapter Properties input the same IP address that is configured to connect to the iSCSI target.

Note: In this case the Windows host IP address is '10.17.0.15'. Please replace with the correct IP address for your Windows host.

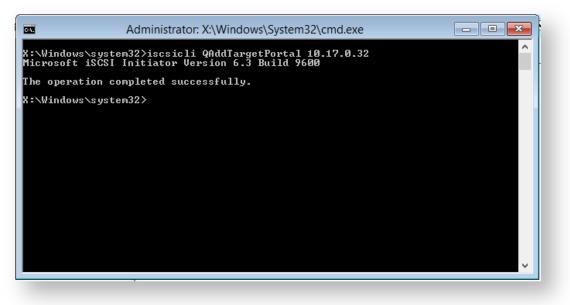
Surface Ethernet Adapter							
Address Settings							
🔿 Obtain an IP address au	Itomatic	ally	y		Re	ene	w
Use the following IP add	ress						
75 A LL	10		17		0		15
IP Address	10		1/				15
Subnet Mask	255	•	255	÷	0	÷	0
Gateway	10	•	0	•	0	•	1
DNS Settings							
Obtain a DNS server aut	tomaical	ly					
Use the following DNS set	erver ad	ldr	ess				
Preferred DNS Server	10	•	0	•	0	•	1
Alternate DNS	255	•	255	•	255	•	255
	_	_	Apply	_			Cancel

6. In the command window type "net start msiscsi" to enable the Microsoft iSCSI server:



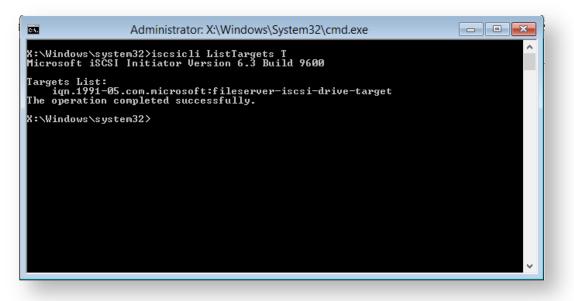
 After the service has started connect the iSCSI target to Windows PE by typing "iscsicli QAddTargetPortal 10.17.0.32".

Note: In this case the target is '10.17.0.32' please replace with the correct IP address for your own iSCSII target.



Note: Replace 10.17.0.32 with your IP address

8. Connect to the target in order to find out its Internet Qualified Name that is used to logon to the iSCSI target. Type: "iscsicli ListTargets T"

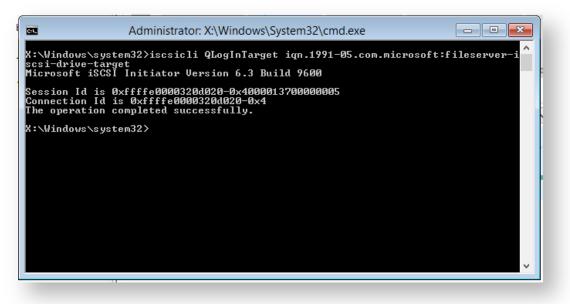


The above command gave output to a target name: iqn.1991-05.com.microsoft:fileserver-iscsidrive-target

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This target name is used to logon and access the iSCSI Virtual Disk.

9. Using the **"iscsicli QLogInTarget iqn.1991-05.com.microsoft:fileserver-iscsi-drive-target"** you will add the iSCSI Virtual Disk to Reflects interface and it will appear as a local disk available for restore and clone.



10. If the iSCSI disk is not visible at first in the restore tab, select the 'Backup' tab in Reflect and click Refresh .



R	MBR Disk 2 [10FA89D0] - MSFT	Virtual HD	6.3 <50.00 GB>
	1 - iscsi (E:) NTFS Primary		
	100.3 MB 50.00 GB		⊻

Your iSCSII disk is now connected and can be used as a target for your image restores and clones.

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Adding BitLocker support to Windows PE

Note: It isn't absolutely necessary to unlock a BitLocker encrypted drive when restoring an image of the encrypted partition. The partition will restore without problems but will require re-encrypting on reboot.

Unlocking the drive in Windows PE enables intelligent sector copy imaging and cloning, RapidDelta Restore (RDR) and also free access to the drives contents using PE Explorer. In addition, restoring to an unlocked drive will retain the encryption status of the drive when rebooting.

Automatically unlocking BitLocker encrypted drives

Macrium Reflect can include the components and decryption keys necessary to automatically unlock Microsoft BitLocker encrypted drives in Windows PE.

In the	Rescue	Media	Builder	select '	Add E	BitLocker	Support	' and	'Automatically	unlock E	BitLocker	Volumes'.
in un	, 1000000	moula	Dunaci	301001			ouppoit	ana	Automatically			Volumes.

	Advanced Options
🔊 Macrium Rescue Media I	Set WIM Build Options
File Logs Help	Set wild options
Rescue Media Settings	Choose Base WIM Options Devices & Drivers Rescue Media Volume
Windows RE:	Architecture
Macrium Reflect: Status:	
	○ 32-bit ● 64-bit
Select Device	Options
Windows Boot	Add BitLocker Support
Add/change the	Automatically unlock BitLocker Volumes
	Add iSCSI Support
Removable USE	Enable legacy EFI screen resolution support. Select if experiencing low resolution in PE.
SanDisk SanDisk	Add WiFi Support
USB Hard Drive	Copy profiles to automatically connect to WiFi
- G-DRIVE ev (Gen	Advanced
	Custom base WIM. Advanced users can supply a pre-prepared Windows Image file.
CD/DVD Burner	Custom WIM File Location
🗢 (G:) - VXDV , BI	
Boot menu options	
O Remove boot menu	
Current boot menu - Winde	Help OK Cancel
L	
	Help Advanced Build Close

When Windows PE starts any BitLocker locked drives that were attached when the recovery media was created it will automatically unlocked them.

Unlocking BitLocker encrypted drives using a USB stick

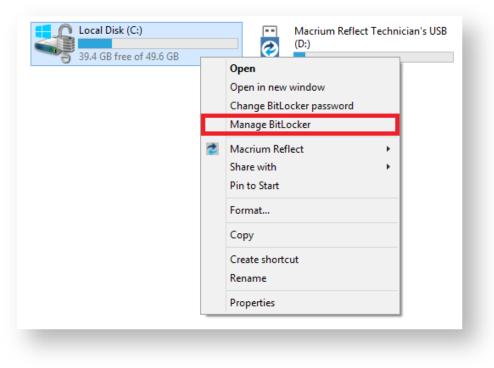
Automatically unlocking encrypted drives when PE starts may present an unacceptable security risk for some users.

Automatic unlocking requires no user intervention and the Macrium Reflect boot menu is able to access encrypted drives without password entry.

An alternative method is to **de-select** the **'Automatically unlock BitLocker encrypted drives'** option in the Rescue Media Builder:

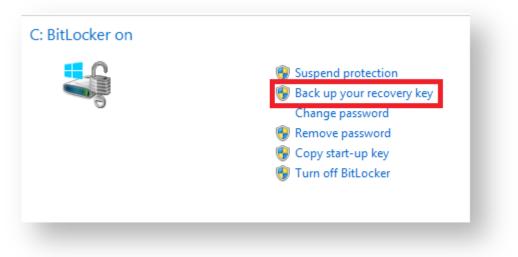
	Advanced Options
nacrium Rescue Media I File Logs Help	Set WIM Build Options
Rescue Media Settings	Choose Base WIM Options Devices & Drivers Rescue Media Volume
Windows RE: Macrium Reflect: Status:	Architecture
Select Device	Ontions
Windows Boot I Add/change the	Add BitLocker Support Automatically unlock BitLocker Volumes Add iSCSI Support
Removable USE SanDisk SanDisk	☐ Enable legacy EFI screen resolution support. Select if experiencing low resolution in PE. ☑ Add WiFi Support
USB Hard Drive	Copy profiles to automatically connect to WiFi
G-DRIVE ev (Gen CD/DVD Burner (G:) - VXDV , BI	Custom base WIM, Advanced users can supply a pre-prepared Windows Image file.
Boot menu options	
 Remove boot menu Current boot menu - Winde 	Help OK Cancel
	Help Advanced Build Close

You can then save BitLocker Encryption Key files (.BEK) and/or BitLocker password TXT files to the root of any USB stick. This could also be a Windows PE rescue media USB stick.



1. In Windows Explorer, right click on any BitLocker encrypted drive and click on 'Manage BitLocker'.

2. In the newly opened window click 'Back up your recovery key'



3. In the BitLocker Drive Encryption wizard select 'Save to a USB flash drive' and chose the USB device you want to save to.

How do you want to back up yo	ur recovery key?
Some settings are managed by your s	system administrator.
	r files and folders if you're having problems unlocking your PC. nd keep each in a safe place other than your PC.
Save to your Microsoft according to the second s	ount
➔ Save to a USB flash drive	
→ Save to a file	
 Print the recovery key 	
What is a recovery key?	

S	Save a recovery key to a USB flash drive
5	Insert the USB device, select it in the list, and click Save.
	Macrium Reflect Technician's USB (D:)
	Save Cancel

After choosing the USB device you want to save the Recovery Key file to, **click** '**Save**' and then '**Finish**' in the BitLocker Drive encryption wizard. This action will save a .BEK file and/or a recovery password text file to the chosen USB device.

Note: The .BEK file is a protected operating system file, it is hidden by default and won't be visible within Windows Explorer. it can be made visible by changing Folder Options and de-selecting the option to 'Hide Protected operating system files'.

You can add as many keys as you have encrypted drives.

When Windows PE starts ensure that your USB flash drive is attached to your PC. Your encrypted drives will then be automatically unlocked when Macrium Reflect initializes.

Restoring an image from within the Rescue Media

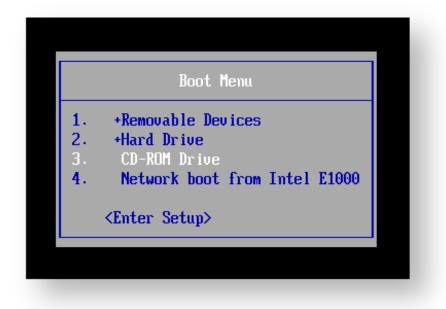
This article is for Restoring an image from within Windows PE Rescue Media. For restoring an image in Windows see Restoring an image within Windows.

If the image contains only data, restoring it is very simple using Macrium Reflect. You can restore it back to its original location without interrupting the operating system.

Before you begin: You must have a backup image of the disk ready to restore.

1. During start up of your PC on the first image you see press a button that will start a **Boot selection** menu.

Boot selection button differs from one PC manufacturer to another, best way to find out the Boot selection menu on your PC is to consult the motherboard manual provided by the manufacturer.



Chose CD-ROM drive or a Removable USB device based on the choice of Rescue Media you've built and press Enter to load the Rescue Media.

2. When You have loaded into windows PE, selectRestore

🕏 М	acrium I	Reflect - Ho	ome Edition	n - v6.1.1023 -	Windows PE	10
			Restore	Other Tasks	Help	
Backu	p Re	store				

Backup images will be available to choose from and be restored in the main pane.

3. Select the image you wish to restore and click Restore Image.

Image Res	store File and Folder Restor	re		
	owse for an image file	🕑 <u>Refresh</u>	Folders to search 📀 Back t	o search list
R	MBR Disk 1 [49C18BDC] - KINGS	TON SV300537A120G 60	ABBF0 <111.79 GB>	
	1 - System Reserved (None) NTFS Active		! - (Ci) ITFS Primary	
	343.1 MB 500.0 MB		4.57 GB 111.30 GB	
Sort by	↓ <u>Backup Date</u> Loc	ation File Name	Images that contain drive:	All Drives $$
	AED9067C19B3DB5L Folder: \\psnas\Public\ Type: Incremental Date: 01/02/2016 6:06	Daniel\Images\		
	Image ID: AED9067C19B3L		Verify Imag	<u>e</u> <u>Other Actions</u> •

If you cannot find the backup image you would like to use in the provided list, select "**Browse for an image** file..." on the menu at the top and look through the windows explorer to find it.

4. This next windows give you the ability to edit partitions prior to the restore.

Moving and Resizing the restored partition

By default, partitions restore to their original locations. However, it's also possible to select a different target disk and to drag partitions to different locations and resize them to use the available space. Simply drag the source partition to any available partition or free space on the target disk. You can also delete partitions on the target disk to make space. For more destination options and further information, see Modifying restored partition properties.

		l\Images\AED9067C19B3DB5E-31-31.mrimg	
2	MBR Disk 1 [49C188DC] - KINGSTON SV30	0537A120G 603A88F0 <111.79 G8>	
· · ·	1 - System Reserved (None) NTFS Active	2 - (C:) NTFS Primary	
	343.1 MB 500.0 MB	54.57 GB 1111.30 GB	V
nation Lo	cal disk 🔊 Undo	Copy selected partitions	<u>Select a different target disk</u>
nation Lo	MBR Disk 1 [8DF08941] - Virtual HD 1.1.0 < 1 - System Reserved (D:)	:127.00 GB> 2 - (C:)	<u>Select a different target disk</u>
	MBR Disk 1 [8DF08941] - Virtual HD 1.1.0 <	:127.00 GB>	<u>Select a different target disk</u>
	MBR Disk 1 [8DF08941] - Virtual HD 1.1.0 < 1 - System Reserved (D:)	:127.00 GB> 2 - (C:)	Select a different target disk

5. This is the restore summary page, here you can finalise your Restore and if required access the "Advanced Options."

	e Summary		- 11
2	Image File: Image ID:	\\psnas\Public\Daniel\Images\AED9067C1983DB5E-31-31.mrimg AED9067C1983DB5E	
~	Date:	01 February 2016	
	Time:	18:06	
	Image Type:	Incremental	
	Source Disk:	MBR Disk 1 [49C18BDC] - KINGSTON SV300S37A120G 603ABBF0 <111.79 GB>	
	Geometry:	14593\0\63	
	BPB: Destination Disk:	0\0\0 MBR Disk 1 [8DF0B941] - Virtual HD 1.1.0 <127.00 GB>	
	Deschapon Disk.	MBN DBK 1 (00P05341) - MICAI ND 1.1.0 < 127.00 GBS	
	Verify:	N	
	Delta:	Y	
	SSD Trim:	Y	
iched	ules		
		None	
perat	ion 1 of 2		
	Restore Partition:	1 - System Reserved NTFS 343.1 MB / 500.0 MB	
	Drive Letter	None	
	Start Sector:	2,048	
	End Sector: Partition Type:	1.026.047 Active	
	Partition Type:	ndive	- 11
perat	ion 2 of 2		
	Restore Partition:	2 - <no name=""> (C:)</no>	
	Drive Letter	NTFS 54.57 GB / 111.30 GB	~
	Drive Letter	A.0	*
	Ivanced Options	< Back Next > Cancel Finish	_

The Advanced Options include:

Option	Description	
Rapid Delta Restore:	Copy only changed data blocks to complete the restore process more quickly See: Rapid Delta Restore - RDR	
SSD Trim:	Enable TRIM on restore to increase of both the lifetime and the performance of the SSD. See: SSD Trim Support	
Verify Image:	To verify the image integrity before restoring.	
Master Boot Record:	To replace the Master Boot Record (MBR) with the MBR from the backup. The MBR is a small program that eexecutes when the computer starts up. If this program becomes corrupt then you can have problems starting the computer operating system. Note: On modern GPT/UEFI systems this option has no effect.	

6. Once you have looked over the summary and you are happy with your restore settings you can click "Finish" and begin the operation.

Macrium Image Guardian

- Macrium Image Guardian Overview
- Protected File Access
- Installing Macrium Image Guardian
- Activating Macrium Image Guardian
- Macrium Image Guardian Events
- Enabling and Disabling MIG on NTFS Volumes

Macrium Image Guardian Overview

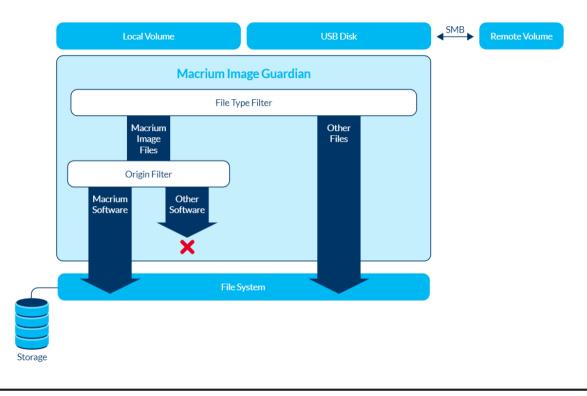


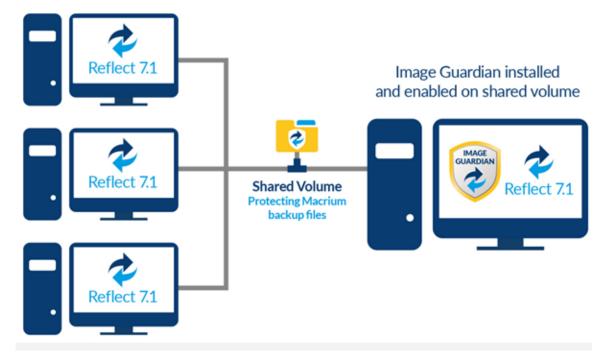
Macrium Image Guardian protects your backup files from unauthorised modification.

MIG grants write access to existing backups file for Macrium Reflect 7.1, any image tools created by us, and optionally, MS RoboCopy. All other process attempting to update existing backup files will be denied access.

MIG protects local **NTFS** volumes and allows Macrium Reflect 7.1 and later to use the protected volume as a shared network resource.

Macrium Image Guardian protection architecture





Macrium Image Guardian protecting backups in a networked environment

In the above illustration, the PC sharing the backup repository (Shared Volume) has a full install of Macrium Reflect, including **MIG**. A local drive is shared over the network and **MIG** has been enabled on that drive in the Macrium Reflect user interface.

The other PC's on the network can backup to this shared drive and **do not** require MIG to be installed. Backup file write access is automatically granted to Macrium Reflect 7.1, and later, write access for earlier versions of Macrium Reflect and other processes will fail.

The PC hosting the share with **MIG** installed can be used as a standalone Macrium Reflect installation. The protected drive will prevent unauthorised access to backup files on that drive if the local PC creates backups to the protected volume.

Protected File Access

Macrium Image Guardian will protect all existing local backup files from unauthorised modification or deletion. All such activity will be blocked with error 0x80070510 - Storage policy block.

👒 1 Interrupte	d Action	_		×
	ted error is keeping you from deleting iis error, you can use the error code to			
	0510: The requested file operation fail is that type of file. For more information or.			
?	6E970BD383C40F11-00-00 - Copy.mr Macrium Reflect Image Backup Backup Method: Full Compression: Medium Password protected: No	rimg	Cancel	
0.5	letails			

Protected File Types

The following file extensions are protected by Macrium Image Guardian.

Extension	Backup Type
.mrimg	Macrium Reflect image files
.mrbak	Macrium Reflect File and Folder backup files
.mrex	Macrium Reflect Exchange backup files
.mrsql	*Macrium reflect SQL backup files

*Note: SQL backup files can only be created to a protect volume by Macrium Reflect running on the local PC. Network write access will be blocked for all processes, including Macrium Reflect. This limitation will be removed in a future update.

Windows File operations on Macrium Backup files

Macrium Image Guardian will block opening of backup files for modification or delete, The following lists some of the operations and special considerations if you are maintaining the location and life of Macrium backup files outside of Macrium Reflect.

1. Windows Explorer Copy. New backup files can be created on a protected volume as the result of a Windows Explorer copy operation.

Copying a file to the same folder as the original will be blocked on local file systems. Duplicate files in the same folder is undesirable and should be avoided. The identity of the backup file will be duplicated and this can lead to unpredictable results in Macrium Reflect.

- 2. DOS Commands. COPY, MOVE, and XCOPY. These commands will succeed where the result of the operation is a new file. Overwriting or deleting existing backup files files will fail.
- 3. **RoboCopy.** RoboCopy.exe can copy, move and synchronise folders. For more information on RoboCopy parameters please see here: https://technet.microsoft.com/en-us/library/cc733145(v=ws.11).aspx

Some RoboCopy parameters may perform delete file and overwrite operatons on your backup files and have special functionality in MIG if the 'Allow RoboCopy to sync and move backup files on protected volumes' option is enabled:

Image Guardian Settings -



Turn on Image Guardian

Automatically protect local backup drives

Allow RoboCopy to sync and move backup files on protected volumes

Parameter	Rule
/MOVE /MOV	If the source folder is on a protected volume then the /MOVE /MOV parameters will only delete backup files in the source folder if the destination folder is also on a protected volume .
	This ensures that existing files cannot be moved to an unprotected volume and compromised.
/MIR /PURGE	If the target folder is on a protected volume then the the /MIR /PURGE parameters will only delete backup files in the target folder if both of the following conditions are true: a. The source folder is a backup destination in any saved backup definition xml file. b. The target folder is not a backup destination in any saved backup definition xml file
	This ensures that the synchronisation operation cannot inadvertently, or otherwise, delete files in a folder that is used as a backup destination in Macrium Reflect.

Parameter	Rule
All overwrite operations	If the result of any parameter is to overwrite an existing backup file on a protected volume then this will only be allowed if the target folder is not a backup destination in any saved backup definition xml file.

O RoboCopy and Network Shares

If the source of a /MOVE /MOV or target of a /MIR /PURGE operation is a MIG protected volume on a network share then all delete operations are blocked. This is because RoboCopy 'Rules' can only be applied if the Windows session that's opening the files is the same Windows session that's running RoboCopy. In the case of a network share, the remote computer is opening the files and will block all delete operations.

Installing Macrium Image Guardian

MIG is an optional component in the Macrium Reflect installer, It is selected by default and is available for Windows 7 and above in all editions of Macrium Reflect except for the Free Edition.

Macrium Reflect Server Plus Ed	dition v7.1.2557 64 bit Se	etup	×
Custom Setup	n	Refl	ect 7
Use the following options to cus Install CBT Changed block tracking for h			
☑ Install Image Guardian Ransomware protection for	Macrium backups		
Install ViBoot Instant VM booting of Macri	um backups		
🗹 Install Desktop Shortcut			
Install location:	C:\Program Files\Macriur	n\Reflect\	Browse
☑ Install for all users.		Language:	English 🗸 🗸
	< Back	Next >	Cancel

After installation, if **MIG has automatically protected any local back drives for existing backup definitions** then the following message box is displayed the first time Macrium Reflect is started:

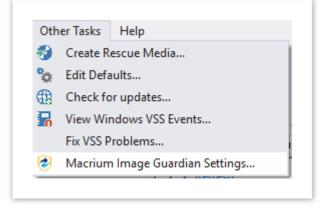
Copyright © 2019. Paramount Software UK Ltd. All Rights Reserved.

Macrium Reflect				
1	Macrium Image Guardian			
	Macrium Image Guardian has protected your local backup destination drives			
	ОК			
For more information on Macrium Image Guardian please click <u>here</u>				

Activating Macrium Image Guardian

MIG is active directly after installation and will automatically protect backup destination drives.

To turn MIG on, off or temporarily disable take the 'Other Tasks' > 'Macrium Image Guardian Settings..' menu option.



You can also activate the MIG Settings dialog by clicking 'Settings' in the MIG blocked activity popup.



The MIG Settings dialog

_	
	unauthorised modification of Macrium Reflect backup files
Settings	Events
Image	Guardian Settings
	Turn on Image Guardian
•	Automatically protect local backup drives
	✓ Allow RoboCopy to sync and move backup files on protected volumes
- V	Turn off Image Guardian (not recommended)
	More Options V
	um Image Guardian protects your backup files on local disks from unauthorised
	ication.
	Macrium Reflect v7.1 and later products and tools are granted access to write to g, .mrbak, .mrsgl and .mrex files.
Prote Refle	ction can be turned on or off for individual drives using the 'Actions' menu in the Macrium ct disk view.

Turn on Image Guardian	Starts the Image Guardian Service
Automatically protect local backup drives	 When turned on, all saved backup definitions are searched and Image Guardian is enabled for local backup drives When creating a new backups, unprotected target drives will be automatically protected by enabling Image Guardian on the drive. When the PC is restarted, Image Guardian will be re-enabled on all backup drives. This prevents accidentally leaving your drives unprotected by manually turning protection off.
Allow RoboCopy to sync and move backup files on protected volumes	Enables the MS utility RoboCopy to delete and overwrite backup files on protected volumes with the /MOV , /MOVE , /PURGE and /MIR parameters.

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	Parameter	Rule	
	/MOVE /MOV	If the source folder is on a protected volume then the /MOVE /MOV parameters will only delete backup files in the source folder if the destination folder is also on a protected volume .	
		This ensures that existing files cannot be moved to an unprotected volume and compromised.	
	/MIR /PURGE	If the target folder is on a protected volume then the the /MIR /PURGE parameters will only delete backup files in the target folder if both of the following conditions are true:	
		 The source folder is a backup destination in any saved backup definition xml file. 	
		2. The target folder is not a backup destination in any saved backup definition xml file	
		This ensures that the synchronisation operation cannot inadvertently, or otherwise, delete files in a folder that is used as a backup destination in Macrium Reflect.	
	All overwrite operations	If the result of any parameter is to overwrite an existing backup file on a protected volume then this will only be allowed if the target folder is not a backup destination in any saved backup definition xml file.	
	If the s protec is beca openin	CODENTIFY and Network Shares source of a /MOVE /MOV or target of a /MIR /PURGE operation is a MIG sted volume on a network share then all delete operations are blocked. This ause RoboCopy 'Rules' can only be applied if the Windows session that's of the files is the same Windows session that's running RoboCopy. In the case stwork share, the remote computer is opening the files and will block all delete ions.	
Irn off	Turns off the li	mage Guardian service. Optionally select from the list of further options:	
nage uardian	1 Minute to 2 Hours	Select to temporarily disable MIG for the selected time	

Restart service on reboot	
Permanently Off	When 'Turn off Image Guardian' is selected, 'Permanently Off' is the defaulted option if MIG is currently enabled and nothing is selected in th 'More Options' list. Otherwise, selecting this option will cancel any temporary disable settings and turn off MIG.

Note: Clicking 'Apply' will immediately change MIG and update the status text:.

The status area above the buttons shows the current status of MIG.

Current Status: Enabled		
Current Status: Disabled		
Current Status: Disabled Until Reboot		
Current Status: Temporarily Disabled	MIG is disabled for: 04:28	Re-Enable

Clicking 'Re-Enable' will immediately cancel the outstanding temporary disable and turn MIG 'On'.

Macrium Image Guardian Events

To view Image Guardian windows events, **take the 'Other Tasks' > 'Macrium Image Guardian Settings..'** menu option and **select the 'Events' tab**:

Macrium Image Guardian
Macrium Image Guardian Prevent unauthorised modification of Macrium Reflect backup files
Settings Events
Errors Warnings Information
Last 30 Days \checkmark Refresh Clipboard Copy Save to File
Source Event ID Date
ImacriumImageGuardian 300 09/08/2017 16:01:39 ImacriumImageGuardian 300 09/08/2017 16:01:39
Date 09/08/2017 16:01:39 Type Information Event 300 Source MacriumImageGuardian Volume (\\?\Volume{c2e8f9f0-015b-47c8-b56a-6285fc9fff30}) is protected.
OK Cancel

Number	Event Name	Severity	Description
100	EVT_MIG_SERVICE_STARTED	Informational	Image Guardian service started
110	EVT_MIG_DRIVER_STARTED_BY_SERVICE	Informational	Image Guardian driver started by service
200	EVT_MIG_SERVICE_STOPPED	Informational	Image Guardian service stopped
300	EVT_MIG_VOLUME_PROTECTED	Informational	Volume (\\?6a2d53fe- c79a-11e1-b189- 806e6f6e6963}\) is protected
310	EVT_MIG_BLOCK_VERIFICATION_FILE_ACCESS	Informational	Blocking process (processname.exe) creating verification file as process is not Macrium certified
320	EVT_MIG_BLOCKED_FILE_ACCESS	Warning	

Number	Event Name	Severity	Description
			Blocked unauthorised process (processname.exe) accessing file (\\?\Volume {6a2d53fe-c79a-11e1-b189- 806e6f6e6963} \Folder\filename.mrimg)
330	EVT_MIG_USER_PROTECTED_VOLUME	Informational	User has enabled Image Guardian on volume (\\? 6a2d53fe-c79a-11e1- b189-806e6f6e6963}\)
340	EVT_MIG_USER_DISABLED_VOLUME	Informational	User has disabled Image Guardian on volume (\\? 6a2d53fe-c79a-11e1- b189-806e6f6e6963}\)
500	EVT_MIG_ERROR_BAD_EVENT	Error	Error could not open Image Guardian verification event. Error code = 123
510	EVT_MIG_ERROR_PROTECTING_VOLUME	Error	Error protecting volume (\\? 6a2d53fe-c79a-11e1- b189-806e6f6e6963}\). Error code = 123
520	EVT_MIG_ERROR_UNPROTECTING_VOLUME	Error	Error unprotecting volume (\\? 6a2d53fe-c79a-11e1- b189-806e6f6e6963}\). Error code = 123

When an unauthorised process attempts to write to, delete or rename a Macrium backup file the action will be blocked and Windows Event 320 will be generated

Enabling and Disabling MIG on NTFS Volumes

MIG can be enabled or disabled on any **NTFS volume** by using the **'Actions' menu** in the Macrium Reflect main window.

R	GPT Disk 3 [D6DC3AB3-CC9E-4926-98C5-1F2D6D8EB08B] -	ORIVE ev (Gen2) 000A <931.51 GB>	
	1 - EFI (None) FAT32 (LBA) Primary	2 - Macrium Drive (E:) NTFS Primary	3
	5 KB 200.0 MB	✓ 686.52 GB 931.32 GB	V
		Actions 🔻	
<u> </u>	Clone this disk Image this disk.	Image this partition only Image this partition only File System Properties Analyze File System Enable Changed Block Tracker Disable Image Guardian	

A **MIG** shield indicates that a volume is protected:

1 - EFI (None) FAT32 (LBA) Primary		2 - Macrium Drive (E:) NTFS Primary	
			Image Guardian - Volume Protected
5 KB 200.0 MB	✓	686.52 GB 931.32 GB	v
		Actions 🔻	

(i) Automatic Protection

Please note that if the option to 'Automatically protect local backup drives' is selected in the MIG settings dialog, then **unprotected volumes** will be **automatically protected** when the next backup runs to the volume, or on reboot, if the volume contains the path of a backup destination saved in a backup definition.

Why MIG isn't available for 3rd party NAS devices

A frequent question asked about Macrium Image Guardian is why popular NAS devices aren't supported. This is an obvious question but misses a fundamental understanding of how network storage works.

Unlike Windows shares, NAS devices have their own proprietary operating systems. Each NAS device is effectively a computer with it's own file system and sharing control software. It isn't possible to control the way files are stored on NAS devices without installing a low level device driver specialised for each different NAS OS, usually Linux based. This also assumes that the NAS manufacturer has allowed 3rd party suppliers access to install file system drivers. It's a similar scenario to installing popular Anti-Virus software directly on a NAS, it isn't possible.

With that said, we are open to working with NAS manufacturers, and should a method of complementing a NAS file system be possible, we will certainly be involved.

Macrium Changed Block Tracker

Macrium Reflect Changed Block Tracker (MRCBT) reduces the amount of time it takes to perform incremental and differential images by monitoring the changes to an NTFS formatted volume in real-time. This is especially relevant when a file system contains very large files, such as virtual hard disk (VHD) files, where speed improvements are significant and can reduce the Incremental image time from hours to minutes or even seconds.

Implemented as a kernel mode filter driver, sitting below the NTFS file system driver, MRCBT is able to intercept all I /O requests to the logical volume and maintain a record of which blocks have changed.

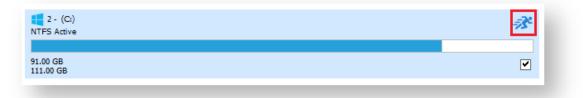
Traditionally, Macrium Reflect has detected changes to the file system by comparing the NTFS Master File Table (MFT) on the source volume, with the MFT of the most recent image in the backup set. While this is method is one of the quickest solutions available, we do not consider it an optimal solution when used in a continuous incremental scenario, especially if multi-GB files are present in the file system.

In additional to numerous performance improvements, starting with version 7.2, MRCBT tracks TRIM events. This events are generated by NTFS when a file is deleted or moved and are used by MRCBT to optimize the image by excluding the relevant blocks from the backup.

When MRCBT is first enabled, it captures an internal NTFS attribute that represents the number of times that the filesystem has been restarted. By tracking changes to this value, MRCBT can detect if a volume has been modified in any environment where MRCBT is not operating (e.g. on another computer or operating system).

When MRCBT is enabled and Reflect detects that the Restart attribute correctly sequenced, the subsequent incremental and differential image can be generated by comparing the changed block database (created by MRCBT) on the logical volume with that stored in the previous image in the chain. This is indicated by a blue running-man icon displayed in the Reflect UI (see image below).

If Reflect detects that the Restart attribute is not correctly sequenced, the subsequent incremental or differential image will be generated using the traditional method. This is indicated by a grey running-man icon displayed in the Reflect UI.



A reboot is required after installing Macrium Reflect to enable CBT. You can create images without rebooting but CBT will only be enabled after a restart.

The NTFS Restart attribute is a fundamental component of the NTFS file-system and has been supported by all Linux and Apple operating systems dating back several years.

Due to technical limitations with Windows XP, Macrium Reflect Changed Block Tracker will only work on Windows Vista and higher operating systems.

When MRCBT is being used to generate an Incremental or Differential image of the volume, you will see the following line in the Image log:

Operation 1 of 1 Hard Disk:	1	
Drive Letter:	r C	
File System:	NTES	
Label:		
Size:	475.91 GB	
Free:	163.94 GB	
Used:	311.98 GB	
	ny, February 18, 2017 13:58:34	
Initializing		
Destination Drive:	Macrium Drive (G:) - Free Space 250.54 GB	
Creating Volume Sn		
	apshot - Please Wait	
	apshot - Please Wait	
/olume Snapshots Creat	apshot - Please Wait	
Volume Snapshots Creat Saving Partition - (C:)	apshot - Please Wait ed	
Volume Snapshots Creat	apshot - Please Wait ed	
Volume Snapshots Creat Saving Partition - (C:) Reading File System CBT Init Success	apshot - Please Wait ed Bitmap	
Volume Snapshots Creat Saving Partition - (C:) Reading File System CBT Init Success Searching for NTFS meta	apshot - Please Wait ed Bitmap data	
Volume Snapshots Creat Saving Partition - (C:) Reading File System CBT Init Success	apshot - Please Wait ed Bitmap data	
Volume Snapshots Creat Saving Partition - (C:) Reading File System CBT Init Success Searching for NTFS meta Looking for changes	apshot - Please Wait ed Bitmap data	
Volume Snapshots Creat Saving Partition - (C:) Reading File System CBT Init Success Searching for NIFS meta Looking for changes Saving Partition	apshot - Please Wait ed Bitmap data	
Volume Snapshots Creat Saving Partition - (C:) Reading File System CBT Init Success Searching for NIFS meta Looking for changes Saving Partition Saving Index New File: 2 GB	apshot - Please Wait and Andrease Wait ed Bitmap data	

CBT Init Success indicates that the Incremental is using the CBT driver. Note that the **'Looking For Changes'** operation will be nearly instantaneous with no progress shown.

Macrium CBT Driver Tools

Macrium CBT Driver Tools is a small Windows utility to install and monitor the Macrium CBT driver. Macrium CBT Driver Tools provides the user with a visual representation of the changed blocks and of the various performance metrics reported by the kernel mode driver. **Macrium Driver Tools** can be found here: C:\Program Files\Macrium\Reflect\MrCBTTools.exe

v <u>H</u> elp			
Local Disk (C:\)	Description	Value	
Local Disk (C:\)	MRCBT Driver Version	7.2.3654	
84.7 GB free of 231 GB (NTFS)	Session Start Time	23/10/2018 - 14:26:22	
	Number of Writes	2196073	
Local Disk (D:\)	Number of Paged Writes	0	
56.9 GB free of 447 GB (NTFS)	Number of Tracked Writes	2196073	
50.5 GD HEE OF 447 GD (1411 5)	Number of Excluded Writes	0	
Removable Disk (E:\)	Number of Failed Writes	0	
	Total Time Tracking	83 Miliseconds	
1.81 TB free of 1.81 TB (NTFS)	Average Time Per Tracked Write	37ns	
	Number of Changed Blocks	3634286	
	Number of Changed Bytes	189 GB	
	\$CBT Starting LCN	16464270	
	\$CBT Ending LCN	16467740	
	Bytes Per Logical Cluster	4096	
	Bytes Per Block	135168	
	\$LogFile Restart Count	1595265065	
	Number of TRIM/UNMAP Bytes	54.0 GB	
	Displaying 5828 virtual blocks. One virtual block spans 610 physical		
	·····		
	·····	and and profilences	untiger model
	the second second second	accord professions	unitation unitation
		accord professions	unitation unitation
	the second second second	accord professions	unitation unitation
	the second second second		

Selecting a drive shows performance metrics and tracked block information for the chosen drive. The darker shades indicate a higher percentage of changed blocks.

Note: The red blocks indicate the physical location of the MRCBT tracking file on the volume. This view will be reset when a Macrium Reflect backup of the volume is started.

Clicking on one of the shaded blocks will cause Macrium Driver Tools to display a list of files that are currently using the clusters within the block.

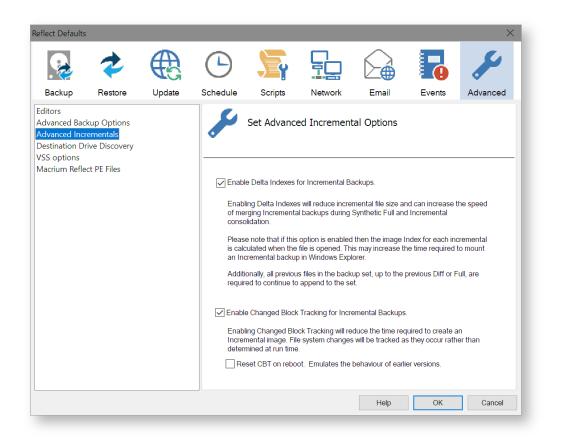
Performance Metrics

Metric Name	Description
Session Start Time	The date and time that MRCBT started monitoring the volume. This value will be reset when the volume is mounted, normally when Windows is restarted.
Number of Writes	The total number of write operations on the volume that MRCBT has monitored since the session started.
Number of Paged Writes	The total number of write operations on the volume, flagged as PAGING_IO, that MRCBT has monitored since the session started.
Number of Tracked Writes	The total number of write operations on the volume that MRCBT has tracked since the session started.

Number of Excluded Writes	The total number of write operations on the volume that MRCBT has excluded, due to already having a record of a change to that disk area, since the session started.
Number of Failed Writes	The total number of write operations on the volume that MRCBT has failed to track since the session started. NOTE: If this value is anything other than zero. Macrium Reflect will fall back to the normal method of generating an incremental backup.
Time Tracking	The total length of time that MRCBT has taken to track writes on the volume since the session started.
Average Time Per Tracked Write	The average length of time that MRCBT is taking to track each write operation on the volume since the session started.
Number of Changed Blocks	The total number of changed blocks on the volume since the session started.
Number of Changed Bytes	The total number of changed bytes on the volume since the session started.
\$CBT Starting LCN	The first Logical Cluster Number (LCN) of the MRCBT tracking file.
\$CBT Ending LCN	The last Logical Cluster Number (LCN) of the MRCBT tracking file.
Bytes Per Logical Cluster	The number of bytes per logical cluster for the volume, as reported by NTFS.
Bytes Per Block	The number of bytes per block, as reported by Macrium Reflect.
\$LogFile Restart Count	The current value of the NTFS \$LogFile Restart Count.
Number of TRIM /UNMAP Bytes	The number of bytes that have been affected by a TRIM or UNMAP event.

Enabling and disabling CBT

CBT is enabled by default. You can change whether CBT is enabled or disabled by selecting "Enable Changed Block Tracking for Incremental Backups" check-box in the "Advanced Incrementals" page of the "Reflect Defaults" dialog box.



Note: You can enable or disable CBT at any time without affecting your Image sets.

We recommend enabling the Delta Indexes for Incremental Backups option as this will produce the smallest incremental image files in the shortest amount of time. Please see Delta Indexes for Incremental Backups

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Macrium viBoot

Macrium viBoot

Macrium viBoot enables you, to instantly create, start and manage Microsoft Hyper-V virtual machines using one or more Macrium Reflect image files as the basis of the virtual machine storage sub-system.

At a minimum, viBoot enables you to boot into the images you have made using Macrium Reflect, for validation purposes, or to retrieve data from old applications stored on a bootable image. At an enterprise level, you could recover an entire network environment in minutes.

Macrium viBoot is now built upon new technology that allows it to instantly present a Macrium Reflect image file as a Microsoft Virtual Disk (.VHDX) file.

When creating a new virtual machine Macrium viBoot will create two Microsoft Virtual Hard Disk (.VHDX) files for each of the disks described within the selected Macrium Image file. The first VHDX file is incomplete and only contains enough information to describe the disk layout and a signature to mark it as a Macrium viBoot VHDX. The data for the disk is retrieved from the Macrium Image File by the Macrium Virtual Disk Provider filter driver as required. Because the data is not stored with the VHDX, it size will never exceed a few megabytes. The second VHDX file is a standard differencing disk that will receive any modifications made to during the lifetime of the virtual machine.

As with any differencing VHDX, this file can grow dramatically in size, depending on the usage of the virtual machine.

These VHDX files are stored in the designated Macrium viBoot repository and remain open until the Macrium viBoot virtual machine is deleted from within viBoot.

Note: The default location for the viBoot VHDX files is **C:\ProgramData\Macrium\viBoot**. This is configurable from within the Macrium viBoot UI.

Note: viBoot only supports Microsoft's Hyper-V running on a minimum of Windows 8.0 or Windows Server 2012.

Booting an image directly from Macrium Reflect

An image that contains the Windows System and Boot partition(s) can be directly booted from the 'Restore' view in Macrium Reflect.

Boot architecture	Partitions
MBR - Master Boot Record	

(i)

Boot architecture	Partitions
	Boot partition: This may be the same partition as drive 'C:' but is likely to be a separate small (100 to 300 MB) partition named the Microsoft System Reserved partition or MSR.
	Windows partition: This is the partition that contains the Windows OS and will be drive C:
UEFI - Unified Extensible Firmware	UEFI System Partition: A small FAT32 formatted partition that doesn;'t have a drive letter.
Interface	Windows partition: This is the partition that contains the Windows OS and will be drive C:

If an image contains the partitions required for booting then the image will show an active 'Boot Image' Link:



Otherwise the link will be disabled:

B83563D1AA88A3A9-00-00.mrimg Folder: c:\test_image\ Type: Full	Browse Image 🛷 Restore Image
Date: 22/02/2017 03:11 Image ID: B83563D1AA88A3A9	Boot Image Other Actions •

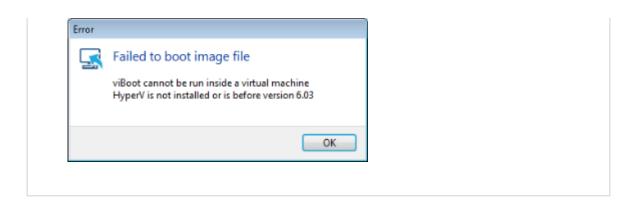
To boot an image directly with viBoot.

- 1. Click the 'Restore tab.
- 2. Select the bootable image.
- 3. Click the 'Boot Image' link.

<u>Boot Image</u>

Note: If viBoot cannot run on your Windows installation then you will receive an error message indicating the reason(s):

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4. If viBoot can launch, the viBoot Hyper-V settings dialog will start.

🛃 Macrium viBoot Wizard	- 0	×
Hyper-V VM Setti	ings	
Welcome Select Image Files Hyper-V VM Settings	Specify the name of the new virtual machine Name: Win XP Specify the amount of memory that this virtual machine will be started with Startup RAM: 2,048 Specify the number of virtual processors based on the processors on the host computer Processors: Automatic Virtual Switch:	
	< Previous Next > Einish Cancel Help	

5. Make any changes to the VM properties and click 'Finish'

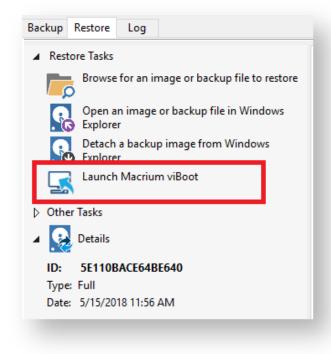
The VM will now start and boot directly into Windows.

Starting the viBoot create Virtual Machine Wizard from Macrium Reflect.

Take the 'Restore' > 'Launch Macrium viBoot' menu option

Rest	ore	Other Tasks Help
ō	Brow	wse for an image or backup file to restore
2	Expl	ore Image
	Deta	ach Image
5	Lau	nch Macrium viBoot

Or, click the 'Launch Macrium viBoot' task link on the Restore tab.



This will start the the viBoot Virtual Machine User Interface.

Launching viBoot as a standalone application

viBoot is installed by default during the standard Macrium Reflect installation and can be started using the installed shortcut:

Macrium viBoot Desktop app Documents		Best match	
© 2			
±	~	Documents	>
		,∽ viBoot	

Main Window

The Macrium viBoot main window allows you to see at a glance, which Macrium Reflect image files you have mounted (2), and which virtual machines are connected to those drives (1).

tual Machine								
New	Backup 📮 Delete	🕚 Refresh	Options 🕜 H	Help				
'irtual Machine	s							
lame		State	CPU Usage	Assigned Memory	Uptime	Status		
New Virtual N	lachine	Off	0%	2048 MB		ОК		
ounted Image	s							
age Path			Drive No	Туре	Capacity			
-								
	(2)							
g								
pe	Date and Time	Description						
Information	05/07/2016 14:13:58:0367		Checking device HKLM\SYSTEM\CurrentControlSet\Services\MrScsi\Mount\E00CC530-C561-4868-8C18245661253100					
Information	05/07/2016 14:13:58:0368		Checking device HKLM(SYSTEM)CurrentControlSet(Services(MrScsi(Mount(E00CC30-C30-44608-6C16243601235100 Checking device HKLM(SYSTEM)CurrentControlSet(Services(MrScsi(Mount(E1265382-C9D3-4440-A9B9267870ACF309					
Information	05/07/2016 14:12:58:0369		Checking device HKLM\SYSTEM\CurrentControlSet\Services\WrScsi\Mount\E3226ED8-A792-404F-921D86DACA2C67B3					
Information	05/07/2016 14 3 870			rentControlSet\Services				
Information	05/07/2016 14: 0371	-		rentControlSet\Services				
	05/07/2016 14:13:58:0372			rentControlSet\Services				_
Information	05/07/2016 14:13:58:0373			rentControlSet\Services				
Information	03/07/2010 14:13:30:0373							

The "Virtual Machines" **view (1)**, displays the name of the viBoot created virtual machine, the current state of the virtual machine (Off, Running, etc) and the current CPU usage of the virtual machine. Selecting a Hyper-V virtual machine in the "Virtual Machines" view (1) will update the "Mounted Images" view (2) to list the Macrium Reflect images that are being referenced by the virtual machine.

The "Mounted Images" **view (2)**, displays the path of the image file(s) used to create the virtual drive(s), the physical drive number assigned to the drive by Windows, the partition type of the drive (MBR or GPT) and the drive capacity.

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The "Log" view (3), shows a record of the actions taken by viBoot.

Macrium viBoot can only monitor the state of virtual machines and drives while it is running. Clicking the Windows close button will minimize viBoot.

Main Window Commands

Macrium viBoot menu:

Menu Item	Sub Menu Item	Description
<u>V</u> irtual Machine	<u>C</u> onnect	Connect to a virtual machine.
	<u>N</u> ew	Displays the viBoot Wizard which allows you to create a new virtual machine.
	<u>D</u> elete	Deletes the currently selected virtual machine.
	<u>S</u> tart	Starts the currently selected virtual machine.
	Sh <u>u</u> t down	Shuts down the currently selected virtual machine.
	Turn off	Turns off the currently selected virtual machine.
	Paus <u>e</u>	Pauses the currently selected virtual machine.
	<u>R</u> eset	Resets the currently selected virtual machine.
	Exit	Exit the Macrium viBoot application.
Tools	Log	Toggles the display of the Log window.
	<u>O</u> ptions	Configure the virtual machine repository folder, and logging options.
	<u>R</u> efresh	Instructs viBoot to refresh it's view of the virtual machines and mounted images.
Help	<u>C</u> ontents	Displays this help content.
	<u>A</u> bout Macrium viBoot	Displays the viBoot version and copyright notice.

Тір

You can right-click on the virtual machine pane to display the "Virtual Machine" menu as a context menu.

Macrium viBoot toolbar:

-	New - Displays the viBoot Wizard which allows you to create a new virtual machine.
	Deletes the currently selected virtual machine.
G	Refresh the list virtual machines and states.
**	Options - Configure the virtual machine repository folder, and logging options.
?	Help - Displays this help content.

Macrium viBoot Wizard

The Macrium viBoot Wizard will configure and start a Microsoft Hyper-V virtual machine from one or more Macrium Reflect image files.

The "Welcome" page provides a brief introduction and explains some of the limitations of virtualization.

Macrium viBoot Wizard	— 🗆 X
Welcome	
Welcome Select Image Files Hyper-V VM Settings	Welcome to the Macrium viBoot Wizard This wizard will guide you through the process of creating, configuring and starting a Microsoft Hyper-V Virtual Machine, from one or more Macrium Reflect image files. What is Macrium viBoot? Macrium viBoot is a technology that provides a mechanism to use Macrium Reflect Image files to very quickly test your backups or to perform a temporary virtualisation of a failed server as part of a Business Continuity Plan (BCP). Operational Considerations Before proceeding you should note the following operational considerations. There are some servers that you will not be able to virtualise. These include Microsoft Hyper-V Server, Citrix Xen Server etc. These servers must be physical. System Configuration Macrium viBoot will modify the virtual environment to include device drivers for the virtual machine disk sub-system, however; upon starting, Windows will automatically assign drive letters and these may or may not correspond to the drive letters assigned at the time of backup.
	< <u>Previous</u> <u>Next</u> > <u>Finish</u> Cancel <u>H</u> elp

Welcome Select Image Files	The virtual machine will be configured to boot from "D:\TestBackups\8disks_1ide_7scsi-00-00.mring"		isk 1.0" in	image file	
Hyper-V VM Settings	Name	Туре	Size	File System	Bootable
,,,	⊡ 📄 D:\TestBackups\8disks_1ide_7scsi-00-00.m	rimg			
		MBR	39.8 GB		Yes (Active)
	System Reserved (None)	Active		NTFS	
	🕒 🕒 Local Disk (None)	Primary		NTFS	
	🖃 🔚 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		
	🕒 🕒 New Volume (None)	Primary		NTFS	
	🖃 🦲 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		
	🕒 🕒 New Volume (None)	Primary		NTFS	
	🖃 🦲 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		
	🕒 🕒 New Volume (None)	Primary		NTFS	
	🖃 🦲 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		
	🕒 🕒 New Volume (None)	Primary		NTFS	
	🕂 🦲 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		
	🕀 🦲 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		
	庄 🦲 Msft 🛛 Virtual Disk 1.0	MBR	0.99 GB		

Select Image Files allows you to add one or more Macrium Reflect image files to be used for the virtual machine.

The first boot-able disk will be marked as the boot disk. If there are multiple disks that are boot-able, these can be set to be the boot disk by selecting the disk and clicking the "Set as Boot" button.

Hyper-V VM Settings allows you to configure the virtual machine. The RAM and CPU are limited to match the host computer. If the number of processors is set to "Automatic", viBoot will interrogate the Windows settings from the image files to set the correct number of processors. A Virtual Switch of "<None>" ensures that the new virtual machine is not connected to the network.

😞 Macrium viBoot Wizard	– 🗆 X
Hyper-V VM Setti	ngs
Welcome	Specifiy the name of the new virtual machine
Select Image Files Hyper-V VM Settings	Name: Win XP Specify the amount of memory that this virtual machine will be started with Startup RAM: 2,048 MB
	Startup RAM: 2,048 MB Specify the number of virtual processors based on the processors on the host computer Processors: Automatic
	Specifiy the configuration of the network adapter or remove the network adapter Virtual Switch: <pre></pre>
	< Previous Next > Finish Cancel Help

Image of the second second

Options

The "Options" button on the Macrium viBoot main toolbar, will display the "Options" dialog box. From here you can modify some of the behavior of Macrium viBoot.

The "Virtual Machine Repository" specifies the folder that Macrium viBoot will use to store Virtual Machine configurations and the virtual machine drive cache.

Options X
Virtual Machine Repository
Defines the base folder that Macrium viBoot will use to store Virtual Machine configurations and the virtual drive cache. The performance of the drive(s) where this folder resides, will directly affect the performance of the Virtual Machines.
C:\ProgramData\Macrium\viBoot
NOTE: Some Virtual Machines may require large amounts of storage. It is recommended that you have enough free space to accomodate the total capacity of the drives you intend to mount.
The log file is written to "C:\Users\mappleby\AppData\Local\Temp\Macrium\".
Log level: Critical V Days to keep: 16
Maximum number of files: 100 A Maximum log file size (MB): 100 A
OK Cancel <u>H</u> elp

Macrium viBoot writes a log of actions taken by the application. This file is saved to "%LOCALAPPDATA% \Temp\Macrium". The log file is configured by the following options:

Log level - Controls type of information written to the log file:

- Critical
- Error
- Warning
- Information
- Debug

Maximum number of files - Number of log files to keep before purging. A value of zero will disable this check.

Days to keep - Log files older than the specified number will be purged. A value of zero will disable this check.

Maximum log file size(MB) - Maximum file size for the log file, before a new log file is created. A value of zero will disable this check.

Macrium viBoot demonstration video

Re-deploying to new hardware

From the rescue environment you can launch Macrium **ReDeploy** to adapt the recovered Windows system to its new environment whether that is a virtual machine or a different computer. With Macrium Reflect **ReDeploy**, you can restore an image to a replacement computer or even create virtual hard drives to virtualize the machine, a technique sometimes called Physical to Virtual or P2V.

Macrium **ReDeploy** is now included in all paid editions of Macrium Reflect. This excludes the Free Edition and 30 day trials.

Further reading:

- Re-deploying Windows to new hardware using Macrium ReDeploy
- Using Windows sysprep and deploying using Macrium Reflect

Re-deploying Windows to new hardware using Macrium ReDeploy

Introduction

Macrium ReDeploy overcomes issues with Windows boot processes to run a Windows installation on new hardware. There are a variety of scenarios where you move a windows installation to a new machine, for example:

- Due to hardware failure or planned upgrade.
- Moving between a physical and a virtual machine (P2V / V2P).
- Changing a non-raid to a raid installation or legacy SATA to AHCI SATA.

Aspects of the Windows boot process can cause a boot failure after significant changes to the hardware, ReDeploy can overcome these.

Discovering hardware and association with matching device drivers is time consuming and must be undertaken while windows is being installed. It is skipped during a normal Windows boot making the boot delay acceptable.

Early in the boot process, the boot loader loads the Windows kernel (the core of the operating system) and the critical drivers required to get Windows up and running. If the new hardware configuration requires a new driver to read the disk containing the operating system then Windows will fail to boot.

When the kernel and critical drivers are loaded, the kernel starts. The kernel and its associated hardware abstraction layer (HAL) need to match the motherboard for best enabling. Drivers are optionally loaded to handle specific central processing unit (CPU) features. For a stable system, the driver needs to match the hardware, in this example, the CPU model.

ReDeploy detects changes to critical system features, locates relevant drivers and injects them into your Windows operating system so it boots.

ReDeploy makes the complex process of getting an off-line Windows operating system running, as easy and intuitive as possible. It does not, however, install the complete driver set for the new hardware. You can complete the driver installation for devices such as network and graphics adapters when your windows installation boots on your new hardware.

You need to run ReDeploy from the Windows PE Reflect rescue CD. This allows the new hardware to be detected and the configuration of the Windows system modified to enable it to boot.

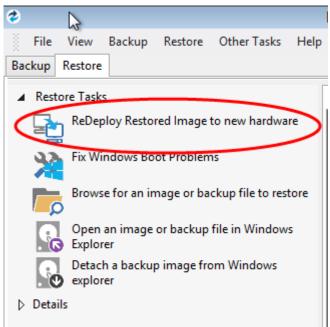
Note: To transfer to a Windows Server install to new hardware use Macrium Reflect Server edition for ReDeploy.

For non-server (workstation) installs use ReDeploy included with Home, Workstation or the Server Edition. Please note that ReDeploy is not included in 30 trial versions of Macrium Reflect

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Note:ReDeploy modifies an existing offline operating system to work with new hardware. Restore your system image to the PC being deployed before running ReDeploy. There is no need to reboot your PC after restoring an Image and before you run ReDeploy.

- 1. Boot the target PC with the Windows PE rescue CD or USB equivalent. (There is a link to a video on creating a Windows PE rescue CD at the bottom of this page).
- 2. Click ReDeploy Restored Image to new hardware.



3. If you have a multi-boot system, then you will be presented with a list of operating systems, select the operating system to be redeployed. Click **Next**.

Aacrium ReDeploy	
Select Operating System	
Select which operating system you wish to run ReDeploy on	
Operating System	Search
Microsoft Windows XP	5
Microsoft Windows Server 2003	
💐 Windows 7 Ultimate	
🐉 Windows Vista (TM) Home Premium	
Select an operating system to redeploy to new hardware and click Next to c	ontinue
· · · · · · · · · · · · · · · · · · ·	
< Back Next > Cancel	Finish

- 4. Specify driver locations for your mass storage devices (such as RAID card).
 - a. If you haven't already, insert a driver disk for the hardware you are going to boot from. This will typically be the motherboard or RAID card driver CD.
 - b. Click Add to add driver locations.You can also specify additional paths such as network folders.
 - c. Click Map Drive to add a network share.
 - d. Click Next.
- ReDeploy searches through user specified driver locations. If none are specified or no matching drivers are found then it searches removable devices such as CD's and disk drives. ReDeploy also searches through Windows' database of drivers.

4acrium ReDeploy	
Driver File Locations	
Optionally specify folders where driver files can be located	
Microsoft Windows XP in E:\WINDOWS\	
User Locations	Add
Y:\Drivers\	Romovo
	Remove
	Map Drive
Automatically check removable media if no drivers are found	
Ignore all floppy disk drives	
Specify the locations of your driver files and click 'Next' to continue	
[] []	1
<pre></pre>	Finish
	11.

6. ReDeploy seeks drivers for all discovered mass storage devices and displays a list with details, Click Next.

Macrium ReDeploy		
Detected Devices		
Set drivers for devices to be installed i	nto the operating system	
Microsoft Windows XP located in E	:\WINDOWS\	
GIGABYTE GBB36X Controller	RAID Controller from Intel Corporation	
IDE Controller	A driver has been located for this device but is not yet installed. ReDeploy will install the following driver:	
	Date: 26-Jun-2008 Version: 11.02.0626.2008 File: MegaSR.INF Path: Y:\ Drivers\ DriverPack\ MassStorage\ Xp\ x86\ L6\	
Set drivers for any unknown hardware and < Back	I click 'Next' to continue	

For each mass storage device, there are three possibilities:

- a. The driver is already installed. It might still need to be enabled at boot, this is done automatically.
- b. The driver is located, either from a CD, user specified path or from the Windows database. This driver is installed on completion of ReDeploy.
- c. No matching driver is located.
- 7. If no driver is located, or you choose to override the displayed driver, then use **locate driver** to manually specify an .inf file.

If you have multiple mass storage interfaces in your system, you only need to locate drivers for hardware that contains the Windows system and active partitions.

Review displayed options, leaving them as default if possible. Click Next.
 If you are having trouble booting these options can help to resolve issues. For more information about them options see below:

Macrium ReDeploy
Additional Options
Set diagnostic and other system hardware options.
Hover your mouse over the option text for pop-up help.
✓ Disable reboot on system stop
Display boot drivers as they load
Enable boot logging
🔲 Disable CPU Power Management
Set Hardware Abstraction Layer
Allow Windows to detect Hardware Abstraction Layer (Vista and later only)
🥅 Enable SATA AHCI (Vista and later only)
Select options and click 'Next' to continue.
< Back Next > Cancel Finish

Option	Description
Disable reboot on system stop	Set this option to stop automatic rebooting if a blue screen of death (BSOD) occurs while Windows is loading or running. If this option is not set and Windows generates a BSOD, there will be no time to note the BSOD error codes.
Display boot drivers as they load	Set this option to show which drivers are being loaded as Windows loads. Once Windows is loading and running without issue this option can be reverted using the Windows MSCONFIG utility. You can use the Pause/Break key to freeze the list as it scrolls past, use space to un-pause.
Enable boot logging	Set this option to log drivers being loaded by Windows as it loads. The resulting log file 'ntblog.txt' can be found in the windows folder. Once Windows is loading and running without issue this option can be reverted using the Windows MSCONFIG utility.
Disable CPU Driver	Set this option to disable CPU drivers. This may be useful if you see BSOD's in the selected HAL drivers or system lockup on entering standby or shutdown.

Option	Description
Set Hardware Abstraction Layer	Set this option to choose which Hardware Abstraction Layer is to be used in the selected Windows operating system. The recommended HAL for this machine is the one initially selected. If you have the incorrect HAL configured, your Windows installation is unstable and can cause random BSOD's or lock ups after Windows boots. In particular, if you are redeploying from or to Virtual Box with an advanced programmable interrupt controller (APIC) unchecked (the default) or very old physical hardware, set a new HAL.
Allow Windows to detect Hardware Abstraction Layer	Set this option to allow Windows to determine the best Hardware Abstraction Layer to use at boot time. This is a Vista and later only option.
Enable SATA AHCI	Set this option to enable support for generic SATA AHCI hardware. You will typically also need to enable an option in your BIOS for your mass storage hardware to operate in this mode. This is a Vista and later only option.

9. Review the actions to be be performed and click **Finish** to apply them to the target operating system.

A log file **ReDeploy.log** saves to the drive containing the redeployed operating system.

Macrium ReDeploy
Confirmation
Please review the actions ReDeploy will perform.
Actions to perform
Install drivers for device Standard Dual Channel PCI IDE Controller from offline operating
Install drivers for device LSI Embedded MegaRAID from Y:\Drivers\DriverPack\MassStora
Disable automatic reboot on BSOD
Click 'Finish' to redeploy the operating system.
< Back Next > Cancel Finish

After clicking **Finish** to inject drivers and apply your settings you see a confirmation dialog, and you can reboot your OS which should now be compatible with your new hardware.

Note: Check there is a tick in the checkbox against Check for unsupported devices each time the rescue media loads before burning the Windows PE rescue CD, so that you can add additional drivers when you boot on new hardware.

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Using Windows sysprep and deploying using Macrium Reflect

Using the Windows sysprep utility you can prepare a machine to be deployed across multiple other machines.

Windows provides a handy utility called **sysprep** which allows you to prepare a master PC image that is configured and set up to be deployed across multiple workstations. By running sysprep, Windows prepares the machine so that when installed on a workstation, the System Admin is prompted for Windows Activation and environment configuration, as if the PC has been installed from scratch.

To prepare a PC to be syspreped, ensure that it contains all the applications and configuration you want the deployed systems to have installed.

Note: Unless you have sufficient licenses for the machines you are deploying to, Reflect should be uninstalled from the PC that will be used for the base image. However, it is essential to have made a Windows PE based Macrium Reflect rescue CD on that PC first.

- 1. Run sysprep:
 - a. Open Windows Explorer and navigate to C:\Windows\System32\sysprep.
 - b. Run sysprep.exe.
 - c. Ensure that **System Cleanup Action** is set to **Out-of-Box Experience**, and that **Generalize** is checked as below.

System Cleanup Action Enter System Out-of-Box Experience (OOBE) V Generalize	· · ·	paration Tool 3.14 /sprep) prepares the machine for d cleanup.
Shutdown Options	ystem Cleanup <u>A</u> ction	
		Experience (OOBE) V
Deheat	hutdown Options	
Reboot	Reboot	~

- d. Shutdown options are your choice, selecting **Quit** ensures the system does not reboot or shutdown automatically.
- e. Click OK.

This prepares the machine so that it can be deployed to other PCs.

- 2. Shutdown the PC and boot it to the Macrium Reflect rescue environment.
- 3. Take an image of the PC using Macrium Reflect and store it to a USB device or a network location.
- 4. When this is complete, you can deploy the image to the workstations you require.
- 5. When the restore is complete, boot the new PC.

Windows asks for a new license key and some environment settings.

Macrium Reflect Server Plus for Exchange and SQL

This article is an introduction to Macrium Reflect v7 Server Plus for Exchange and SQL

Macrium Reflect v7 Server Plus has all the functionality of Macrium Reflect v7 Server and additional features for Microsoft Exchange servers and SQL servers.

To get you started the following are some useful tutorials:

Introduction to Macrium Reflect

Microsoft Exchange guides:

- Backing up Microsoft Exchange databases
- Restoring MS Exchange databases
- Restoring emails with Mailbox Restore
- Setting up permissions for Mailbox Restore
- Adding MS Exchange search folders

Microsoft SQL guides:

- Backing up MS SQL Databases
- Running continuous backup of SQL databases
- Restoring MS SQL

Command line operations with Macrium Reflect

- Installing Macrium Reflect from the command line
- Using Macrium Reflect from the command line
- Verifying image and backup files from the command line

Installing Macrium Reflect from the command line

Introduction

This article explains how to install and uninstall on the command line

Applies to:

Macrium Reflect version 5.x, 6.x and 7.x.

About the Macrium installation process

The macrium installer is msi based with an executable wrapper to ensure it is launched in the correct mode

Command line installation

In most cases, just invoking the installer interactively will be the most effective way to install Reflect. However, in some cases, particularly if the installation is to be automated across many PCs, it may be more desirable to enable the installation to complete without user intervention. To do this, first download the installer using ReflectDL. Then invoke using the following options.

```
v7.X.XXX_reflect_server_setup_x64.exe /passive /l log.txt LICKEY=XX-XXXX-XXXX-XXXX-XXXX-XXXX-XXXX
```

Or, if you have ordered multiple licenses, you can install them on multiple computers with the same command. If you run out of licenses, the install will fail.

v7.X.XXX_reflect_server_setup_x64.exe /passive /l log.txt ORDERREF=NNNNNNNNN ORDEREMAIL=sample_email@macrium.com

If the installation fails, consult the log file, specified by the /l parameter to discover why.

The above examples will display a progress bar. If you wish the install to be completely invisible, replace /passive with /qn.

1. The installer name will vary dependent on edition and platform.

- 2. This will only work with full (not upgrade) licenses.
- 3. An Internet connection is required.

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4. If you have made multiple orders, you can specify a colon separated list, eg ...

ORDERREF=NNNNNNNN:00000000:PPPPPPP etc

They will be searched in the same order as specified.

To make sure that the installation won't restart your computer on completion, a no restart parameter can be added.

```
v7.X.XXX_reflect_server_setup_x64.exe /passive /l log.txt LICKEY=XX-XXXX-XXXX-
XXXX-XXXX-XXXX-XXXXXX /norestart
```

Adding any parameters mentioned below to your install script will omit the feature from being installed. The example below shows a version of the install script that will omit MIG from installing with Reflect:

Using Macrium Reflect from the command line

You can retrieve a prompt for all the command line arguments by simply typing reflect -h from the command line.

Running a Backup

The command line form is as follows:reflect.exe [-v | -e [-w] [-full | -inc | -diff] [xml filename]]Explanations for the switches are as follows:

-h	This help text
-е	Execute the XML file. If no full / diff / inc qualifier is used, a full backup is performed by default.
-v	Validate the XML file and exit
-w	If Reflect is busy then wait until available otherwise exit immediately
-full	Run a full backup
-diff	Run a differential backup
-inc	Run an incremental backup
-pass	Password. Overrides the password saved in the xml file.

Please note that the XML file name is the fully qualified path.

ExamplesTo validate an XML file

reflect.exe -v "c:\backup.xml"

To execute an XML file

reflect.exe -e "c:\backup.xml"

To execute an XML file with wait if busy

reflect.exe -e -w "c:\backup.xml"

To execute an XML file and create an incremental image

```
reflect.exe -e -inc "c:\backup.xml"
```

Mounting an image

reflect.exe [Path To Image File] -b [-auto -drives [Drives[s]] -pass [PASSWORD]]Explanations for the switches are as follows:

-b	Browse image
-auto	Automatically assign drive letters. If not specified then you will be prompted
- drives	A comma separated list of drive letters to use. If not specified then the next available letters are used
-pass	The password for protected image files

The image file name is the fully qualified path. If "LAST_FILE_CREATED" is specified then the last image created in the current Windows session is mounted.

Examples

To mount an image and prompt for a drive letter to use

```
reflect.exe "D:\901DBF91346B9A81-00-00.mrimg" -b
```

To mount all partitions in an image using the next available drive letter(s)

reflect.exe "D:\901DBF91346B9A81-00-00.mrimg" -b -auto

To mount all partitions for the last image created

reflect.exe "LAST_FILE_CREATED" -b -auto

To mount all partitions in an image using drive letters j,k,l

reflect.exe "D:\901DBF91346B9A81-00-00.mrimg" -b -auto -drives j,k,l

To mount all partitions in a password protected image using drive letters j,k,l

```
reflect.exe "D:\901DBF91346B9A81-00-00.mrimg" -b -auto -drives j,k,l -pass "PWD"
```

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Unmounting an image

```
reflect.exe [Drive Letter] -u
```

Explanations for the switches are as follows:

-u Unmount image

If a drive letter isn't specified then all mounted images are unmmounted **Examples** To unmount an image from drive letter 'j'

reflect.exe J -u

To umnount all mounted drives

reflect.exe -u

Verifying image and backup files from the command line

Introduction

 \odot

This article explains how to verify Macrium Reflect image and backup files using the standalone command line verification tool **'mrverify.exe'. mrverify.exe** supports individual file verification as well as folder and sub-folder file search and verification.

To verify backups using the Macrium Reflect user interface see: Verifying image and backup files

Please use the link below to download: http://updates.macrium.com/reflect/utilities/mrverify.exe

Please note that mrverify.exe must be run from an Administrator command prompt. For instructions on how to do this please see here.

The following command line switches are supported:

```
mrverify.exe "full path to image file or folder" -p[--password] "password" -r[--
recurse] -l[--logfile] "logfile name"
```

File name or path with wild card can be used. e,g;

d:\backups*

or

d:\backups\1FF33614674A6438-00-00.mrimg

Switch	Description
-p OR password	The optional password that was used to protect and/or encrypt the backup
	Scan all sub-folders if a folder is specified. The default is not to recurse.

Switch	Description
-r OR recurse	
-I OR logfile	Full path to output log file. This file will be created for each run and contains the file name and verification status 'success' or ' fail' .
-s ORset	Verify all files in the set. Use if verifying individual files to ensure they can be restored. When verifying all files in a folder thisisn't necessary. The default is not to verify the entire set.
-h OR help	This help output

Examples:

```
mrverify.exe "d:\backups\1FF33614674A6438-00-00.mrimg"
```

```
mrverify.exe "d:\backups\1FF33614674A6438-00-00.mrimg" --set --password
"mypassword" -l "c:\verifylog.txt"
```

```
mrverify.exe "d:\backups\*" --password "mypassword" -r -l "c:\verifylog.txt"
```

On success mrverify.exe will return '0'. If any file fails verification then the return code will be '1'.

The following success/failure text will be displayed in the command window and log:

Verify Success	The file contained no errors.
Verify Failure	The file could not be verified successfully. Try the verification process again using the Macrium Reflect user interface. This may give more information on the problem.
Backup set is not complete. At least one file may be missing	At least one backup file required to restore this file cannot be opened and/or located in the same folder. This message is displayed as a Warning or an Error failure condition if the set command line switch is used.

Password Error	The backup file is password protected and/or encrypted and the supplied password is not correct.	

Generating scripts and batch files

Introduction

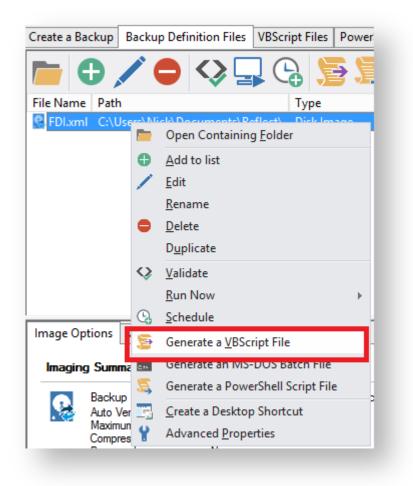
Macrium Reflect includes the ability to automatically create VBScript, PowerShell and MS-DOS source files to add pre and post backup functionality to your backup jobs. This enables system administrators to manage complex backup scenarios.

- Generating a VBScript source file
 - Using VBScript to run sequential backups
- Generating an MS-DOS batch file
- Generating a PowerShell source file

Generating a VBScript source file

For an example of a generated VBScript source file please see Example VBScript Source

To generate a VBScript file select the 'XML Definition Files' tab on the main window then right click on a file and select 'Generate a VBScript file'.



This open the VBScript Generation Options dialog:

Output

	VBScript Generation Options	
VB Script		
Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation	Enter output directory and file name	-
Run Once A Day Run Programs	Directory C:/Users/Wick/Documents/Reflect/	
	OK Cancel	

Property	Value
Directory	The folder where the source file is saved
File name	The name of the VBscript source file. This defaults to the XML file name with a .vbs extension

Shutdown

VBScript Generation Options		
VB Script		
Shutdown Application Event Logs Run Once A Day Shutdown or Log Off after running this script Wista Elevation Duplicate Backup File If enabled, your PC will shut down or log off at the end of the script. This could be used to create an image or backup as the last job of the day. If enables Shut Down Image: Shut Down		
OK Canc	el	

Generated code...

' Issue shutdow objShell.Ru	m command n "shutdown -s"	
Property	Value	
Enable Shut Down	Select to enable this property	
Shut down	The PC will shut own at the end of the backup	
Log Off	The user will be logged out at the end of the backup	

Application Event logs

Please note that Macrium Reflect Server and Server Plus Edition includes Windows Event logging built-in.

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	VBScript Generation Options
VB Script Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation Duplicate Backup File	Write messages to the Reflect log in this script Write a message on success Macrium Reflect - Successful Backup
	✓ ✓ Write a message on failure Macrium Reflect - Backup Failed ✓
	OK Cancel

Generated code...

```
if iReturnCode = 2 then
' Handle XML validation error
   elseif iReturnCode = 1 then
' Handle backup error
        objShell.LogEvent 1, "Macrium Reflect - VBScript Backup Failed"
   elseif iReturnCode = 0 then
' Everything OK
        objShell.LogEvent 0, "Macrium Reflect - Successful VBScript Backup"
   end if
```

Property	Value
Write a message on success	Enable a Windows Event on successful backup
	Enter the message text in the edit box below
Write a message on failure	Enable a Windows Event for failed backups
	Enter the message text in the edit box below

()

Note: The Windows Event logs generated by this script will have WHS (Windows Scripting host) as the message source

Level	Date and Time	Source	Task Category
(i) Information	07/04/2015 14:15:35	WSH	None

Event 0, WSH

General Details			
Macrium Refle	ct - Successful VBScript B	ackup	
Log Na <u>m</u> e:	Application		
Source:	WSH	Logge <u>d</u> :	07/04/2015 14:15:35
Event ID:	0	Task Category:	None
Level:	Information	Keywords:	Classic
User:	N/A	Compute <u>r</u> :	Office2

Run Once a Day

	VBScript Generation Options
VB Script	
Output Shutdown Application Event Logs <u>Run Once A Day</u> Run Programs Vista Elevation Duplicate Backup File	Only run this script once a day It can be useful to execute a script the first time you logon, logoff or shut down. Using this component you can be sure that an event triggered task only runs this script once a day. Run Once a Day.
	OK Cancel

Generated code...

```
' The following function call ensures that this script only runs once a day
  If HasRunToday Then
      WScript.Quit
  End If
. . . . . . . . . . .
'* Function: HasRunToday
۰*
'* Purpose: determines if this script has run today
۰*
۰*
'* Input:
        None
'* Output: true if has run today false otherwise
۰*
Function HasRunToday
  Dim RegScriptKey
  Dim LastRunDate
  Dim objShell
  Set objShell = WScript.CreateObject("WScript.Shell")
   RegScriptKey = "HKCU\SOFTWARE\Macrium\Reflect\Scripts\" & WScript.
ScriptFullName & "\LastRun"
```

```
'Check if script has run today
ON ERROR RESUME NEXT
LastRunDate = objShell.RegRead(RegScriptKey)
If LastRunDate = cstr(Date) Then
HasRunToday = true
Else
objShell.RegWrite RegScriptKey, Date,"REG_SZ"
HasRunToday = false
End If
Set objShell = nothing
End Function
```

Property	Value
Run Once a Day	If selected, will only enable this script to run once per day. This is useful for example if you want a backup to happen at first login or shutdown.

Run Programs

	VBScript Generation	Options	x
VB Script			
Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation	Run program	is or scripts from within this script	
Duplicate Backup File	Run a program or script at	t the start.	
	File name: C: \Users	Public\Admin\Before backup.bat	
	Parameters:		
	Run a program or script at	t the end.	
	File name: C: \users	public\Admin\After backup.exe	
	Parameters:		
		ОК	Cancel

Generated code...

```
' Run program before backup
   objShell.Run """C:\Users\Public\Admin\Before backup.bat""", 1, true
' Do the backup
   ExitCode = Backup ("""C:\Program Files\Macrium\Reflect\reflect.exe"" -e -w
<BACKUP_TYPE> ""C:\Users\Dev\Documents\Reflect\example.xml""")
' Run program after backup
   objShell.Run """C:\users\public\Admin\After backup.exe""", 1, true
```

Property	Value
Run a program or script at the start	Select to enable a program or script to run before the backup starts
File name	The path and executable file name
Parameters	Optional command line parameters for the program
Run a program or script at the start	Select to enable a program or script to run when the backup ends
File name	The path and executable file name
Parameters	Optional command line parameters for the program

Vista Elevation

VBScript Generation Options X		
VB Script Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation Duplicate Backup File	VBScript Generation Options Image: Second	
	○ Enable elevation. (vista/windows / Only) OK Cancel	

Generated code...

	Sub VBMain(Dim obj Dim Exi ' Elevate t Elevate	Shell tCode his script for Admin privileges in Vista

		Elevate
	'* Purpose: '* '*	Elevates this script for Vista UAC. This means that only one UAC Elevation prompt is displayed and functions/programs will not fail if they require admin privileges
	'* Input: '* Output: '*	None None
	llApp Shell WshProcessEnv elevate if run from Windows Task Scheduler	

```
If WScript.Arguments.Count > 0 Then
       If WScript.Arguments.Item(0) = "-s" then
             Exit Sub
       End If
    End If
    Set objShell = WScript.CreateObject("WScript.Shell")
    Set objWshProcessEnv = objShell.Environment("PROCESS")
    If objWshProcessEnv("ELEVATED_APP") <> "True" Then
       objWshProcessEnv("ELEVATED_APP") = "True"
        Set ShellApp = CreateObject("Shell.Application")
       Call ShellApp.ShellExecute("""" & WScript.FullName & """", """" &
WScript.ScriptFullName & """" & " " & GetBackupTypeParameter, , "runas")
       set ShellApp = nothing
       Set objWshProcessEnv = nothing
       wscript.quit
   End If
   Set objWshProcessEnv = nothing
   Set objShell = nothing
End Sub
```

Property	Value		
Enable Elevation	If selected will enable UAC elevation for the entire script. This enables functions and programs to run outside the context of Macrium Reflect without requesting further elevation.		

Directory Synchronization

VBScript Generation Options			
VB Script			
Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation	Synchronise destination directory		
Directory Synchronization	When enabled backup/image file(s) will be synchronised in the chosen directory after the backup completes.		
	Directory: E:\BackupSync		
	Please note that synchronization will delete files in the target directory that do not exist in the backup directory.		
	Help OK Cancel		

Generated code...

SynchroniseDirectories ExitCode, "C:\C++"
······ · ******************************
'* Function: RobocopyExists '*
<pre>'* Purpose: determines whether the program Robocopy can be called from the '* command line. '*</pre>
'* Input: None '* Output: boolean - true if Robocopy exists
· · · · · · · · · · · · · · · · · · ·
Function RobocopyExists() On Error Resume Next Dim objShell Dim objExec
<pre>Set objShell = WScript.CreateObject("WScript.Shell") Set objExec = objShell.Exec ("robocopy.exe", 0) If Err.Number = 0 Then RobocopyExists = True</pre>
Else RobocopyExists = False

```
End If
End Function
'* Function: SynchroniseDirectories
1 *
'* Purpose: Copies all files created by the previous backup / image
1 *
           to a supplied directory. Uses Macrium environment variables to
۰*
           determine which files to copy.
۱ *
'* Input:
          ExitCode - The exit code of the last backup
1 *
           strBackupDirectory - Directory to copy to
1 *
Function SynchroniseDirectories(Byval ExitCode, Byval strSyncDirectory)
   Dim objShell
   Dim objWshProcessEnv
   Dim strEnvPrefix
   Dim strBackupDirectory
   Dim strCmdLine
   Dim iReturnCode
   Dim fs
   Dim objSyncFiles
   Dim objBackupDirectory
   Dim objSyncDirectory
   Dim objBackupFile
   Dim objSyncFile
   Dim strExtension
   Dim dateBackupFile
   Dim dateSyncFile
' Only copy files if backup was successful
   if ExitCode <> 0 Then
       Exit Function
   End If
   Set objShell = WScript.CreateObject("WScript.Shell")
   Set objWshProcessEnv = objShell.Environment("VOLATILE")
' Get the prefix for the last backup set
   strEnvPrefix = objWshProcessEnv("MACRIUM_PREFIX")
' Get the directory where we just created a backup
   strBackupDirectory = objWshProcessEnv(strEnvPrefix + "_DIRECTORY")
   If right(strBackupDirectory, 1) = "\" Then strBackupDirectory = left
(strBackupDirectory, len(strBackupDirectory)-1)
   If right(strSyncDirectory, 1) = "\" Then strSyncDirectory = left
(strSyncDirectory, len(strSyncDirectory)-1)
   If RobocopyExists Then
       strCmdLine = "robocopy ""<SOURCE>"" ""<DESTINATION>"" *.mr* /copy:DAT
/lev:0 /purge /r:0"
   Else
    ' Robocopy does not exist - using xcopy
       Set fs = CreateObject("Scripting.FilesystemObject")
       Set objBackupDirectory = fs.GetFolder(strBackupDirectory)
       Set objSyncDirectory = fs.GetFolder(strSyncDirectory)
       For Each objSyncFile in objSyncDirectory.Files
           strExtension = fs.GetExtensionName(objSyncFile)
           dateSyncFile = objSyncFile.DateLastModified
           If Left(strExtension,2) = "mr" Then
           ' Check if file has been deleted
              If Not(fs.FileExists(strBackupDirectory+"\"+objSyncFile.name)) The
n
                  fs.DeleteFile(objSyncFile)
              Else
               ' Check if file has been modified
```

```
Set objBackupFile = fs.GetFile(strBackupDirectory+"\"
+objSyncFile.name)
                    dateBackupFile = objBackupFile.DateLastModified
                    If DateDiff("m", dateBackupFile, dateSyncFile) <> 0 Then
                       fs.DeleteFile(objSyncFile)
                    End If
               End If
           End If
       Next
        strCmdLine = "xcopy ""<SOURCE>\*.mr*"" ""<DESTINATION>"" /c /d /h /i /v
/y"
    End If
   strCmdLine = Replace(strCmdLine,"<SOURCE>", strBackupDirectory)
   strCmdLine = Replace(strCmdLine,"<DESTINATION>", strSyncDirectory)
   iReturnCode = objShell.Run(strCmdLine,0,true)
   if iReturnCode <> 0 then
' Handle synchronisation error
   else
' Everything OK
   end if
' Clean up
   set objShell = nothing
   Set objWshProcessEnv = nothing
End Function
```

Property	Value
Enable directory synchronization	If enabled will use the MS utility RoboCopy to synchronize the backup target directory with the supplied directory.
Directory	Enter the folder that you want to copy/archive your backup files to

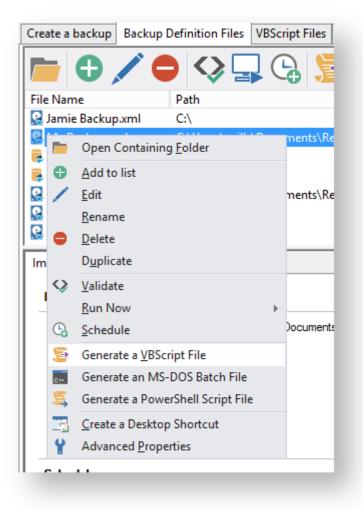
Click 'OK' to generate the VBScript source file

Using VBScript to run sequential backups

Using VBScript you can schedule multiple backups or images and run them one after the other. This enables guaranteed execution sequence and additional functionality can be coded between backups and/or at the end of the sequence.

To create a VBScript to run backups sequentially

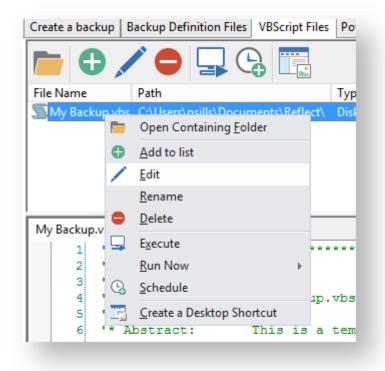
- 1. Step through the backup or image wizard and create the required XML backup definitions files.
- 2. In the Backup Definition Files tab, right-click a backup definition file and choose **Generate a VB Script File** from the short-cut menu.



The VBScript generation dialog box appears.

	VBScript Generation Options
VB Script	
Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation	Enter output directory and file name
Directory Synchronization	Directory C: \Users\Dev \Documents\Reflect \
	Help OK Cancel

- 3. Leave the options as defaults but change the file name for clarity.
- 4. Select the VBScript Files tab, right-click the new file and select Edit from the short-cut menu.



The VBScript file opens in the system default text editor, generally this is Notepad.

5. For clarity, switch off word wrap. In notepad, choose Edit > Word Wrap.

File	Edit	Format	View	Help
1 * *	* * * *	Word	Wrap	Ť
1 *		Font.		

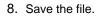
6. Find the line of code that starts the backup and copy and paste it once for each backup or image you want to run.

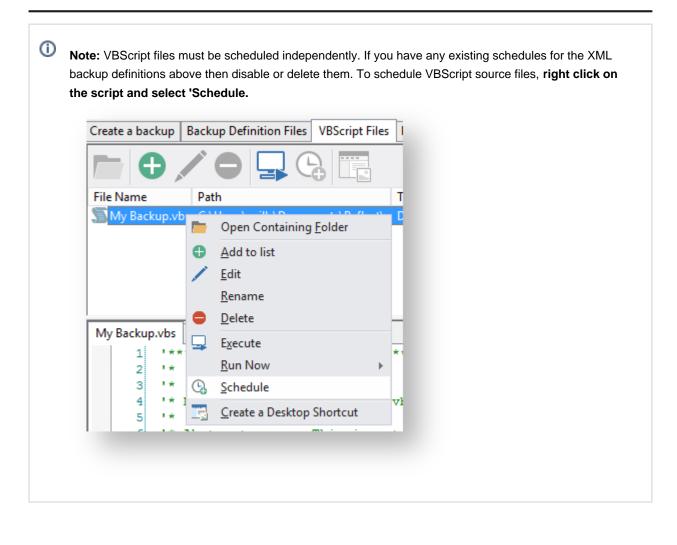
The line looks like this:

```
ExitCode = Backup ("""C:\Program Files\Macrium\Reflect\reflect.exe"" -e -w
<BACKUP_TYPE> ""C:\Backups\backup1.xml"" -g")
```

7. For each copy of the line change the xml file name to represent the backup you want to run. For example:

```
ExitCode = Backup ("""C:\Program Files\Macrium\Reflect\reflect.exe"" -e -w
<BACKUP_TYPE> ""C:\Backups\backup1.xml"" -g")
ExitCode = Backup ("""C:\Program Files\Macrium\Reflect\reflect.exe"" -e -w
<BACKUP_TYPE> ""C:\Backups\backup2.xml"" -g")
ExitCode = Backup ("""C:\Program Files\Macrium\Reflect\reflect.exe"" -e -w
<BACKUP_TYPE> ""C:\Backups\backup3.xml"" -g")
```

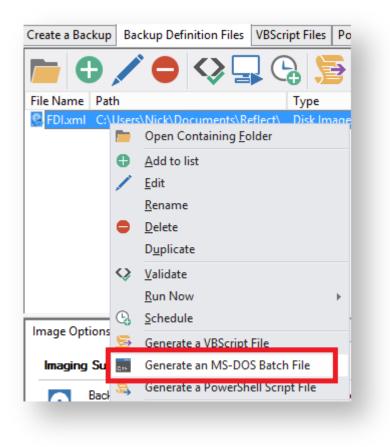




Generating an MS-DOS batch file

For an example of a generated MS_DOS batch file please see: Example MS-DOS Batch File

To generate a MS-DOS batch file select the 'XML Definition Files' tab on the main window then right click on a file and select 'Generate an MS-DOS Batch File'.



This open the MS-DOS Batch Generation Options dialog:

Batch File Output

MS-DO	OS Batch File G	eneration Options	×
Batch File Output	C:\> Note: For more	C:\Users\Dev\Documents\Reflect\	le iow
		OK Can	:el

Generated code...

@echo off				
REM ************************************				
REM *				
REM *				
REM * Module Name: FDI.bat				
REM *				
REM * Abstract: This is a template MSDOS batch file generated by Reflect v5.0				
REM * Modify to add your own functionality if required				
REM *				
REM *				
REM ************************************				
:again				
"C:\Program Files\Macrium\Reflect\reflect.exe" -e -w -full "C:				
\Users\Documents\Reflect\FDI.xml"				
if ERRORLEVEL 3 goto busy				
if ERRORLEVEL 2 goto validation_error				
if ERRORLEVEL 1 goto backup_error				
if ERRORLEVEL 0 goto ok				
:busy				
REM Will never get here if '-w' switch is used				
echo A backup or restore operation is in progress				

goto again :backup error
REM User cancelling a backup or any other error
echo A Backup error has occured
goto end
:validation_error
REM Command line or XML syntax errors
echo A validation error has occured
goto end
:ok
echo ok!
goto end
iend

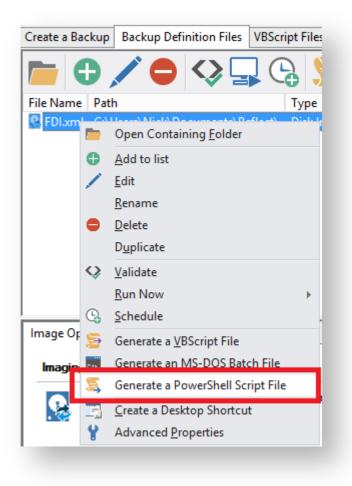
Property	Value
Directory	The folder where the batch source file is saved
File name	The name of the batch source file. This defaults to the XML file name with a .bat extension
Backup type	Choose from Full, Differential or Incremental.

Click ${}^{\mbox{\scriptsize OK'}}$ to generate an MS-DOS batch file

Generating a PowerShell source file

For an example of a generated PowerShell source file please see: Example PowerShell Source File

To generate a PowerShell file select the 'XML Definition Files' tab on the main window then right click on a file and select 'Generate a PowerShell Script File'.



This opens the PowerShell Script Generation Options dialog:

Output

	PowerShell Script Generation Options	x
PowerShell		
Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation	Enter output directory and file name	_
Directory Synchronisation	Directory C:\Users\Dev\Documents\Reflect\	
	File Name FDI.ps1	
	ОК Са	ncel

Property	Value
Directory	The folder where the source file is saved
File name	The name of the PowerShell source file. This defaults to the XML file name with aps1 extension

Shutdown

PowerShell Script Generation Options		
PowerShell Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation Directory Synchronisation	Shutdown or Log Off after running this script If enabled, your PC will shut down or log off at the end of the script. This could be used to create an image or backup as the last job of the day.	
	Enable Shut Down Shut Down Log Off	
	OK Cancel	

Generated code...

```
Write-Host ' * Initiating shutdown... ' -NoNewLine;
(Get-WMIObject Win32_OperatingSystem -ComputerName '.' -EnableAllPrivileges).
Win32Shutdown(8);
```

Property	Value
Enable Shut Down	Select to enable this property
Shut down	The PC will shut own at the end of the backup
Log Off	The user will be logged out at the end of the backup

Application Event logs

Please note that Macrium Reflect Server and Server Plus Edition includes Windows Event logging built-in.

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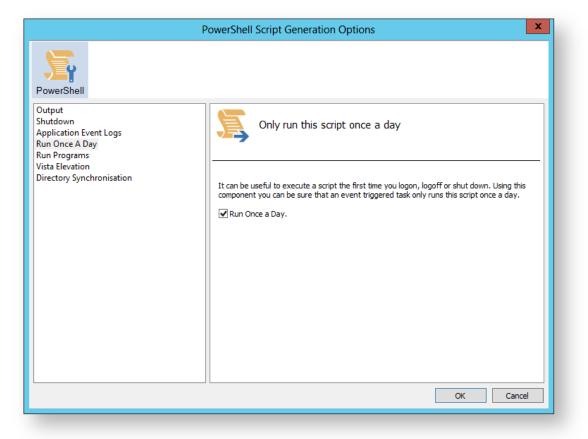
PowerShell Script Generation Options		
PowerShell Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation Directory Synchronisation	Write messages to the Reflect log in this script Write a message on success Macrium Reflect - Successful Backup Write a message on failure Macrium Reflect - Backup Failed	
	OK Cancel	

Generated code...

```
if ($iExitCode -eq 0) # if backup completed successfully...
{
    Write-EventLog -EntryType Information -EventId 0 -LogName Application -Message
    "Macrium Reflect - Successful Backup" -Source "Macrium Reflect"
    }
    if ($iExitCode -ne 0) # if backup failed...
    {
        Write-EventLog -EntryType Error -EventId 1 -LogName Application -Message "Macr
        ium Reflect - Backup Failed" -Source "Macrium Reflect"
    }
}
```

Property	Value
Write a message on success	Enable a Windows Event on successful backup
	Enter the message text in the edit box below
Write a message on failure	Enable a Windows Event for failed backups
	Enter the message text in the edit box below

Run Once a Day



Generated code...

```
if (HasRunToday)
 {
   Write-Host ' * Script already executed today. Exiting...';
   Write-Host 'Script finished with exit code 0.';
   Exit 0;
 }
. . . . . . . . . . . . . . . . . . .
#****
                  #* Func: HasRunToday
#*
#* Desc: determines if this script has run today
#*
function HasRunToday()
{
   Write-Host ' * Checking last run time... ' -NoNewLine;
   $strRegPath = 'HKCU:\Software\Macrium\Reflect\Scripts';
$boolRanToday = $false;
   $strDateToday = Get-Date -UFormat %Y%m%d;
   if (Test-Path $strRegPath)
   {
```

```
try
        {
            $strLastRunDate = (Get-ItemProperty -Path $strRegPath -Name $strScript
Path -ErrorAction Stop).$strScriptPath
           if ($strLastRunDate -eq $strDateToday)
            {
                $boolRanToday = $true;
            }
        } catch { };
    }
   if (!$boolRanToday)
    {
        Set-ItemProperty -Path $strRegPath -Name $strScriptPath -Value $strDateTod
ay;
    }
   Write-Host 'Done.';
   return $boolRanToday;
}
```

Property	Value
Run Once a Day	If selected, will only enable this script to run once per day. This is useful for example if you want a backup to happen at first login or shutdown.

Run Programs

PowerShell Script Generation Options	x
PowerShell	
Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation Directory Synchronisation	_
File name: C:\Users\Public\Admin\Before backup.bat .	
✓ Run a program or script at the end. File name: C:\Users\Public\Admin\After backup.exe	
Parameters:	
OK Cancel	

Generated code...

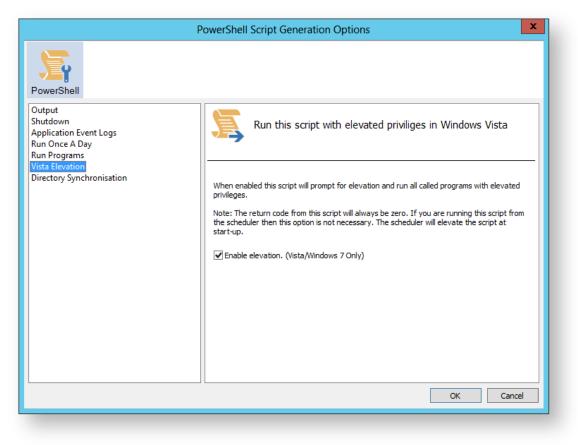
```
Write-Host ' * Executing "at start" program... ' -NoNewLine;
 $strRunAtStartApp = 'C:\Users\Public\Admin\Before backup.bat';
 $strRunAtStartArgs = '';
 if ([string]::IsNullOrEmpty($strRunAtStartArgs))
 {
   Start-Process -FilePath $strRunAtStartApp;
 }
 else
 {
   Start-Process -FilePath $strRunAtStartApp -ArgumentList $strRunAtStartArgs;
 }
. . . . . .
 Write-Host ' * Executing "at end" program... ' -NoNewLine;
 $strRunAtEndApp = 'C:\Users\Public\Admin\After backup.exe';
 $strRunAtEndArgs = '';
 if ([string]::IsNullOrEmpty($strRunAtEndArgs))
 {
   Start-Process -FilePath $strRunAtEndApp;
 }
 else
 {
   Start-Process -FilePath $strRunAtEndApp -ArgumentList $strRunAtEndArgs;
```

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}

Property	Value
Run a program or script at the start	Select to enable a program or script to run before the backup starts
File name	The path and executable file name
Parameters	Optional command line parameters for the program
Run a program or script at the start	Select to enable a program or script to run when the backup ends
File name	The path and executable file name
Parameters	Optional command line parameters for the program

Vista Elevation



Generated code...

```
function Main()
{
 Write-Host 'PowerShell script for Macrium Reflect Backup Definition File';
 Write-Host "BDF: $strXmlFilePath";
 Elevate;
. . . . . . . . . . . . . . . . .
#* Func: Elevate
#*
#* Desc: Elevates this script for UAC.
#*
       This means that only one UAC Elevation prompt is displayed and
#*
       functions/programs will not fail if they require admin privileges.
#*
function Elevate()
{
 # Only elevate if not ran from the task scheduler.
 Write-Host ' * Checking elevated access rights... ' -NoNewLine;
 if (-Not $s)
  {
   # Check to see if we are currently running "as Administrator"
   if (!([Security.Principal.WindowsPrincipal][Security.Principal.
WindowsIdentity]::GetCurrent()).IsInRole([Security.Principal.WindowsBuiltInRole]"A
dministrator"))
   {
     $ElevatedProcess = new-object System.Diagnostics.ProcessStartInfo "PowerShel
1";
     # Specify the current script path and name as a parameter
     $strType = GetBackupTypeParameter;
     $ElevatedProcess.Arguments = "-ExecutionPolicy Bypass & '" + $script:
MyInvocation.MyCommand.Path + "' $strType";
     # Indicate that the process should be elevated
     $ElevatedProcess.Verb = "runas";
     # Start the new process
     [System.Diagnostics.Process]::Start($ElevatedProcess);
     # Exit this unelevated script with exit code for "Error: Not elevated"
     Exit 3;
   }
 }
 Write-Host 'Done.';
}
```

Property	Value
Enable Elevation	If selected will enable UAC elevation for the entire script. This enables functions and programs to run outside the context of Macrium Reflect without requesting further elevation.

Directory Synchronization

PowerShell Script Generation Options		K
PowerShell Output Shutdown Application Event Logs Run Once A Day Run Programs Vista Elevation Directory Synchronisation	Synchronise destination directory When enabled backup/image file(s) will be synchronised in the chosen directory after the backup completes. Enable directory synchronisation	-
	Directory: D:\Archive	

Generated code...

```
if ($iExitCode -eq 0) # if backup completed successfully...
 {
   $strBackupDir = GetLastBackupPath;
   if (![string]::IsNullOrEmpty($strBackupDir))
   {
    SynchroniseDirectories $strBackupDir 'D:\Archive';
   }
 }
. . . . . . . . . . . . . . . .
#* Func: SynchroniseDirectories
#*
#* Desc: Copies all Macrium Reflect files to a supplied directory.
#*
function SynchroniseDirectories($strSrcDir, $strDstDir)
ł
 Write-Host ' * Synchronising directories... ' -NoNewLine;
 if (Get-Command robocopy -ErrorAction SilentlyContinue)
 {
   # robocopy is available...
   # /copy:DAT - D:Data
```

```
#
                 A:Attributes
    #
                  T:Time stamps
    # /purge - deletes destination files and directories that no longer
                   exist in the source
    #
    # /lev:0 - Does not copy subdirectories
    &robocopy $strSrcDir $strDstDir *.mr* /copy:DAT /lev:0 /purge /r:0 | Out-Null
  }
  else
  {
    # Fall back to xcopy...
    # Delete files from the target directory not present in the source directory
    $strDstDirChildren = $strDstDir+"\*";
    Get-ChildItem $strDstDirChildren -include "*.mr*" | Foreach-Object {
      $strMaybeDeletedSrcFile = $strSrcDir + '\' + $_.Name;
      if (-not (Test-Path $strMaybeDeletedSrcFile))
      {
        Remove-Item $_
      }
      else
      {
        $SrcFileTime = [datetime](Get-ItemProperty -Path $strMaybeDeletedSrcFile -
Name LastWriteTime).lastwritetime;
       $DstFileTime = [datetime](Get-ItemProperty -Path $_.FullName
Name LastWriteTime).lastwritetime;
        $SrcFileTimeString = $SrcFileTime.ToString("yyyMMddHHmmss")
        $DstFileTimeString = $DstFileTime.ToString("yyyMMddHHmmss")
        if ($SrcFileTimeString -ne $DstFileTimeString)
        {
         Remove-Item $_
        }
      }
    }
    # /c - Continues copying even if errors occur.
    # /d - Date check; only copies if file does not exist or is older.
    # /h - Copies hidden and system files.
    # /i - If the destination does not exist, and you are copying more than one
            file, this switch assumes that the destination is a folder.
    #
    # /v - Verifies each new file.
    # /y - Overwrites existing files without prompting.
    &xcopy $strSrcDir\*.mr* $strDstDir /c /d /h /i /v /y | Out-Null
  }
  Write-Host 'Done.';
}
```

Property	Value
Enable directory synchronization	If enabled will use the MS utility RoboCopy to synchronize the backup target directory with the supplied directory.
Directory	Enter the folder that you want to synchronize your backup files to

Click 'OK' to generate the PowerShell source file

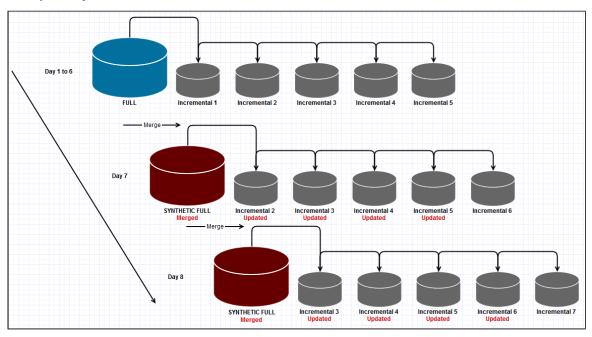
Backup Folder Synchronization

Note: This article refers to backup sets that are not using Delta Incremental indexes. Please see Delta Indexes for Incremental Backups

All backups apart from **MS Exchange** and **SQL** can use Delta Incremental indexes

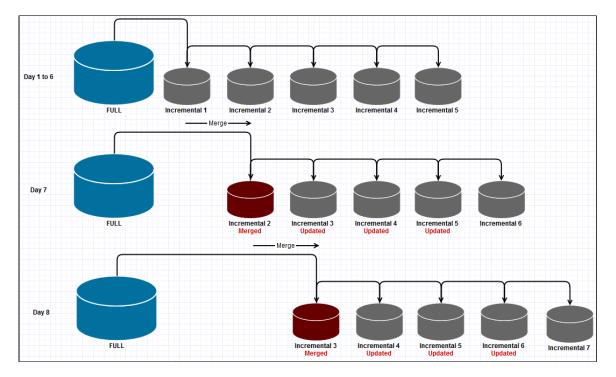
When backup sets are consolidated by either creating Synthetic Full images or merging Incremental images, subsequent Incremental images in the chain are updated to reflect the consolidation. This can be observed by looking at the file modification time stamps in Windows Explorer.

Example 1: Synthetic Full - Retain 5 Incrementals



In this example, when the 6th Incremental is created the Full image is merged with the first Incremental and existing Incremental images 2 to 5 are updated to indicated that Incremental 1 is no-longer in the backup chain by modifying the file index. This process is repeated for each subsequent Incremental that is run.

Example 2: Incremental Merge - Retain 5 Incrementals



In this example, when the 6th Incremental is created, the first Incremental is merged with the second and existing Incremental images 3 - 5 are updated to indicated that Incremental 1 is no-longer in the backup chain by modifying the file index. This process is repeated for each subsequent Incremental that is run.

When creating duplicate copies of Image files it is essential to **synchronize all files in the backup set** rather than just copy the most recently created file.

Using RoboCopy to synchronize folders

Windows ships with a file copy utility called **'Robust File Copy'** or **RoboCopy**. Robocopy can easily synchronize two folders and ensure that copies are kept up to date.

The following command line will synchronize all Macrium Reflect files in "D:\BackupFolder" with "E: \BackupSyncFolder"

Robocopy "D:\BackupFolder" "E:\BackupSyncFolder" *.mr* /copy:DAT /lev:0 /purge					
Switch	Description				
.mr	Only copy Macrium Reflect .mrimg and .mrbak files				
/copy:DAT	Copy Data, Attributes, and Time stamps				
/lev:0	Copy only this folder. Do not copy lower level folders				

0

Switch	Description
/purge	Delete destination files and directories that no longer exist in the source.

Macrium Reflect can generate VBScript and PowerShell scripts to automatically synchronize your backup sets directly after each run.

VBScript	Generating a VBScript source file				
PowerShell	Generating a PowerShell source file				

Macrium Reflect Default settings

The Macrium Reflect default settings allow you to set the default values used when creating a new backup definition.

1. To edit default settings from the main toolbar click the 'Cog' icon as shown below.



2. Select the area you want to amend.



3. When you are happy with your selections click **OK**.

To change existing definition, right click on the definition and select 'Advanced Properties'.

- Default Backup settings
- Default Restore settings
- Update Settings
- Scripts
- Email Settings
- Events
- Advanced

Default Backup settings

Compression is used to reduce the file size of the completed backup.

These options set the defau	
flect Defaults	×
Backup Restore	Scripts Network Email Advanced
Compression File Size Password Auto Verify Image /erify File System /85 Event Logs	Default compression level settings
PowerShell Event Logs Priority	Compression reduces the file size but may increase the total backup time.
Log file purge	Medium (Recommended) V Compression level
Retention Rules Cloning	Intelligent sector copy (Recommended)
Reparse Points Backup Set Matching Shutdown	Copies only disk sectors used by the file system. Windows pagefile and suspend to disk (hibernation) files are not copied. This reduces the image size and backup time.
	Make an exact copy of the partition(s). Partitions include unused sectors therefore forensic examination of the partition(s) remain
	unchanged. Deleted files may be recovered for example.
	Help OK Cancel

• Three levels of compression can be chosen, the higher the compression level the smaller the backup file will be:

Medium (Recommended)	$^{<}$
None	
Medium (Recommended)	
High	

Reducing the file size may increase the total backup time.

Compression allows you to chose an Intelligent sector copy or a Forensic copy of the partitions.

Option	Description
Intelligent Sector Copy	Only backup the sectors that are being used by data on the disk. Pagefile (pagefile.sys) and hibernation (hiberfil.sys) will also be excluded.
	This reduces the time it takes for the backup to complete.
Forensic Copy	Backup every sector.

File size options are used to select between automatic or fixed file size for an image.

npression Size sword o Verify Image fy File System Event Logs verShell Event Logs rify file purge ention Rules ning arse Points kup Set Matching Default file size settings Default file size settings Default file size settings (lect Defaults		×
	😣 🍫 🌐	Default file size settings Default file size settings Orbit file size settings Orbit file size settings Orbit file size will be determined by the file system written to. e.g. FAT32 files are limited to 4GB therefore images will be split into 4GB or less files. Orbit file size for the image. Source file size for the image. This is useful for manually copying the image file(s) to CD/DVD. Note: Incremental retention rules will not be run if backup files are split.	



Incremental Retention Rules will not be run if backup files are split. This can be caused by setting a fixed size or if the destination file system is FAT32.

Option	Description
Automatic (Recommended)	Let the system decide on how large the images are going to be created dependent on file system (NTFS, FAT32, DVD, CD)
	 e.g FAT32 files are limited to 4GB therefore images are going to be split into 4GB or less files.
Fixed file size	Create Images that will be split into many fixed size files. This is useful when copying Image files to CD/DVDs.

Password option is used to enable password protection.

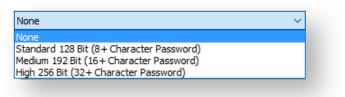
0 These options set the defaults for a new backup.

Reflect Defaults	5							×
Backup	Restore	Update	Scripts	Network	Email	Advanced		
Compression File Size Password Auto Verify In Verify File Syst VBS Event Log PowerShell Ev Priority Log file purge Retention Rul Cloning Reparse Point Backup Set M Shutdown	em js ent Logs es s		Enable pa Enter Pa Re-Enter Note: En	assword protect ssword Password ter password te	on xt \$PROMPT\$ 1	kup file passw		e.
						Help	ОК	Cancel

• With the **Password** option turned on all the images created will require a password before they can be browsed or restored.

Enter password text \$PROMPT\$ to specify a password at backup time.

• AES Encryption levels can be chosen when adding a password:



AES 256 bit encryption is the highest level of encryption available.

Option	Description	
Enable password protection	Enables protection of your image files.	
Encrypt stored passwords	Passwords saved in your backup definition will be encrypted.	

Auto Verify Image allows automatic verification of images after they are created.

These options set the defaults for a new backup.

Reflect Defaults							×
Backup Backup Compression File Size Password Auto Verify Imar Verify File Syster		Update	Scripts	Network	Email	Advanced backup file creation	settings
VBS Event Logs PowerShell Ever Priority Log file purge Retention Rules Cloning Reparse Points Backup Set Mat Shutdown	nt Logs		created. If fil Note: This ma	es are split then	each file is inc	of your image or backup file lependantly verified. time to the backup process. creation	
						Help C	OK Cancel

This can a	A This can add a significant amount of time to the backup process.					
Option	Description					
Verify image	Images will be verified automatically when the backup completes.					

Image verification please see Understanding Image Verification Failures

Verify File System is used to check the integrity of the file system before a backup.

flect Defaults								×
Backup	Restore	Update	Scripts	Network	Email	Advanced		
Compression File Size Password Auto Verify Im Verify File Syst	em			Verify file sy	stems befo	re backup		
/BS Event Log owerShell Ev								
riority	-						being backed up.	
.og file purge Retention Rule				and NTFS this me napped to the file			ers have their data ap (NTFS).	entries
Cloning Reparse Points							itialisation it is poss	
Backup Set Ma							system and abort	the backup.
Shutdown			You can d	isable file system	verification here			
			O Verify 1	file system before	backup			
			Backup	without verifying	the file system			
			0					

Reflect will automatically verify the integrity of the file system being backed up.
 For FAT32 and NTFS this means checking that all files and folders have their data entries correctly mapped to the file allocation table (FAT) or MFT Bitmap (NTFS).

Option	Description
Verify file system before backup	Verify the file system on your disk prior to the backup; this will increase the time taken to complete your backup.
	Backup without verifying, thus making your backup a little quicker.

Option	Description
Backup without verifying the file system	

Priority is used to change the CPU priority for images and backups.

Reflect Defaults	5							×
Backup Compression File Size Password	Restore	Update	Scripts	Network	Email	Advance ating image	d s and backups	
Auto Verify Im Verify File Syst VBS Event Log PowerShell Ev Log file purge Retention Rul Cloning Reparse Point Backup Set M Shutdown	tem js ent Logs es s		are running The lowest] .	other applicatio are running. P		II slow down other a er but will create the Highest	
						Help	ОК	Cancel

Option	Description
Highest	Your backup will take less time to complete and may slow down other applications.
Lowest	Your backup may take longer to complete but it will have less effect on other running applications.

Log file purge option enables you to manage the retention of your backup logs.

Reflect Defaults	×
Backup Restore	Scripts Network Email Advanced
Compression File Size Password Auto Verify Image Verify File System VBS Event Logs	Purge log file settings
PowerShell Event Logs Priority Log file purge Retention Rules Cloning Reparse Points Backup Set Matching Shutdown	Remove log files older than 52 Weeks Move to the recycle bin Perform at startup Remove Now Enable the 'Perform at startup' option to remove log files when Macrium Reflect starts. Alternatively you may use the 'Remove Now' button to action this manually.
	Help OK Cancel

Option	Description
Remove log files	Choose number of days of weeks
Move to Recycle Bin	Deleted logs will be moved to the Recycle Bin.
Perform at startup	Logs will be deleted when Reflect starts up.

You can press the **Remove Now** button to remove the logs manually at any time.

Retention Rules are used to define how long you want to keep different backup types (Incremental, Differential and Full).

These options set the defaults for a new backup.

Reflect Defaults		×
Backup Restore Update	Scripts Network Email Advanced	
Compression File Size Password Auto Verify Image Verify File System VPS Sevent Lance	Default retention rules settings	
VBS Event Logs PowerShell Event Logs	Retention Rules Apply To	
Priority Log file purge	Similar backup sets in the target folder $\qquad \lor$	
Retention Rules Cloning Reparse Points Backup Set Matching Shutdown	 ✓ Full Keep ✓ Differential Keep ✓ Incremental Keep ✓ Incremental Keep ✓ Backups ✓ Backups ✓ Create a Synthetic Full if possible 	
	Purge before a backup Purge oldest backup set(s) if less than 5 GB on the target volume	
	Reset Dackup templates to shipped defaults	
	Help OK Can	icel

The new Macrium Reflect retention rules provide a powerful and flexible way to manage the lifetime and storage space used by your backups.

Choose how backups are matched and retention rules are applied to the target folder

Retention rules are applied to the target folder of the backup by selecting one of two options:

3.1	Define Retention Rules	
	Apply retention rules to matching backup sets in the target folder	~
	Apply retention rules to matching backup sets in the target folder Apply retention rules to all backup sets in the target folder	
	Apply retention rules to all backup sets in the target folder	-

1. Apply retention rules to matching backup sets in the target folder.

Disk Images are purged if they contain **exactly the same Partitions** as the current Image. Partitions are identified using the unique **Disk ID** stored in sector 0 of the disk and the **Partition sector offset**.

Note: For GPT disks the unique GPT disk GUID is used instead of the Disk ID

For **File and Folder** backups retention rules are applied according to the '**Backup Set Matching'** option select in the '**Advanced Properties'** for this backup.

2. Apply retention rules to all backup sets in the target folder. All backup sets in the target folder of the same type (Disk Image or File and Folder) are purged according the retention rules.

Note: This option uses the same logic as Macrium Reflect v5

Select the age or number of backup types that you wish to keep

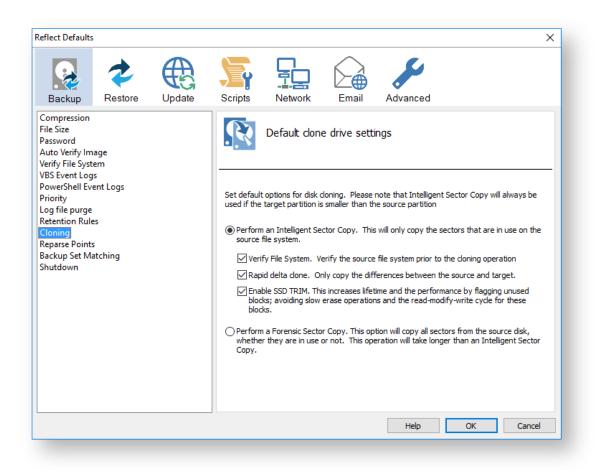
✓ Full	Кеер	12 📮 Backups 🗸
✓ Differential	Кеер	4 ➡ Backups ✓
✓ Incremental	Кеер	10 📮 Backups 🗸
		Create a Synthetic Full if possible
Run the purge		

Option	Description
Full	When deleting Full backups all linked incremental and Differential backups in the same backup chain (set) are also deleted This operation will delete the entire backup set.
Differential	When deleting Differential backups all linked incremental backups in the same backup chain (set) are also deleted.
Incremental	When deleting Incremental backups the integrity of the backup set is maintained by ensuring that the chain is never broken. This is achieved by merging older Incremental backups when required. In the example below, before retention, there is 1 Full backup, 1 Differential backup and 6 Incremental backups. The retention rules are set to retain 4 incremental backups. After retention, the most recent 4 incremental backups are retained. Deleting the oldest 2 incrementals would cause the backup chain to be invalid as the oldest retained incremental requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backup. F = Full D = Differential 1

Option	Desc	Description														
	м	т	w	т	F		м	т	W	т	F		м	т	W	
	F						D	I	I	I	I		F	I	I	
									->	I						
Create a Synthetic Full if possible	When purging Incremental backups, if the backup set only contains a Full backup followed Incremental backups, then this option causes the Full backup to be 'rolled forward' to create Synthetic Full backup. This is also known as Incremental Forever.															
Run the purge	Selec	Select this option to run the retention rules before the current backup.														
before the backup	Note: in Macrium Reflect v5 the current backup set wasn't included in the purge calculation when purging before the current backup. In v6 the current backup set IS included. This means that if you set the retention count to 1 Full backup then all of your backups will be deleted and a new Full backup created.															
Delete oldest backup set (s) if less than n GB	Automatically remove the oldest backup set(s) in the target folder if the free space on the drive drops below the GB threshold.															
	0	NU	low th	e thre	eshold				oned dyr ackup is		•					•

Cloning

① These options set the defaults for a new clone.



Option	Descriptio	Description			
Perform an	-	Only backup the sectors that are being used by data on the disk. Pagefile (pagefile.sys) and hibernation (hiberfil.sys) will also be excluded.			
Intelligent Sector Copy	This reduces the time it takes for the clone to complete.				
	Option	Description			
	Verify File System	Reflect will verify the integrity of your file system; Verification check that all files and folders data entries are correctly mapped to the file allocation table (FAT) or MFT Bitmap (NTFS)			
	Rapid Delta Clone				

Option	Description					
	Option	Description				
		As with Rapid Delta Restore (RDR) the concept of RDR has been something that has been thought about for quite some time here at Macrium Software. We wanted to build a clone solution that would effectively and rapidly copy only the differences between the source and target file systems. The advantage of this is obvious, RDC offers similar a performance increase as an Incremental disk image offers over a Full image and enables regular clones to be a viable and fast DR solution.				
		How does it work?				
	The NTFS file system resident on the clone source is compared with target disk. The two file systems are first verified that they originated format command and then the target NTFS file system structures are differences. All the NTFS file system structures are copied to the target that do not exist or have been modified on the target disk cause the each NTFS file or object to be copied as well. The result is an 'Increm applying only file system changes detected between the source and					
		Note: RDC works with NTFS file systems only. All other file systems will perform a full clone				
		(i) Note: RDC is not available when shrinking partitions during a clone.				
	Enable SSD TRIM	This features provides automated SSD optimization resulting enhanced SSD performance and longevity. Writing to an unused block is much quicker than an in-use block as it avoids both the slow erase operation and the read-modify-write cycle. This results an increase of both the lifetime and the performance of the device. It is effective for all windows operating systems, even those that support SSD trim natively as the file system driver can only TRIM blocks on de-allocation; it cannot TRIM blocks written by another process. It is also effective for USB attached SSDs.				
Perform a	Backup ev	very sector.				
Forensic Sector Copy	Δ Tr	nis can add a significant amount of time to the backup process.				

Reparse Points options are used to include or exclude Reparse Points from a backup.

These options set the defaults for a new backup.

eflect Defaults	×			
Backup Restore	Scripts Network Email Advanced			
Compression File Size Password Auto Verify Image Verify File System VBS Event Logs PowerShell Event Logs Priority Log file purge Retention Rules Cloning Reparse Points Backup Set Matching Shutdown	File and Folder default options for folder reparse points Reparse points are a feature of the NTFS file system that provides the ability to create a link to a directory which then functions as an alias of that directory. The options below define whether reparse points are followed or whether reparse point definitions are backed up. System Reparse Points ① Do not follow - Backup reparse definitions (Recommended) ① Follow - Backup sub-folders and files			
	User Reparse Ponts O Do not follow - Backup reparse definitions Follow - Backup sub-folders and files (Recommended)			
	Help OK Cancel			

• Reparse points are a feature of the NTFS file system that provides the ability to create a link to a directories which then fictions as an alias of that directory.

e.g. Reparse point is the folder "Documents and Settings" which when followed points (or expands) to a number of other folders. If followed then all folders the reparse point "contents" will be included in the backup.

The options below define whether reparse points are followed or whether reparse point definitions are backed up:

Option	Description		
System Reparse Points	Do not follow	Only backup the Reparse Definitions (Recommended)	
	Follow	Backup all the Reparse Points	

User Reparse Points	Do not follow	Backup the Reparse Definitions
	Follow	Backup all the Reparse Points (Recommended)

Backup Set Matching options sets rules for retention that is going to be applied to your backup sets.

Backup	Restore	Update	Scripts	Network	Email	Advanced	
Compression File Size Password Auto Verify Imag /erify File System				Select how t	he File and	Folder target backup set is ch	nosen.
VBS Event Logs PowerShell Event Priority Log file purge Retention Rules	t Logs		retention ru		hen selecting "A	appending to an existing backup set and apply retention rules to matching backup	
Cloning Reparse Points Backup Set Matching Shutdown			Similar - Match on backups with at least one matching folder Select this option to match if a backup set is found with at least one folder that is selected in the current backup. This option allows you to add and remove folders to your backup definition and still maintain a single backup set.				
			Selec	t this option to ma r and Include/Exc orked. Retention	atch only existin lude Filters. Thi	e folders and filters (As Macrium reflect g backups that have exactly the same s is similar to the way Macrium Reflect e applied to exact matched backup	v5)
			Selec targe regar	t folder. When se	atch on any exis lected, the mos	ting File and Folder backup set in the t recent backup set will be appended to tention rules will be applied to all File	
						Help OK	Cancel

• The options below define the logic used for appending to an existing backup set and how retention rules are applied when selecting 'Apply retention rules to matching backup sets in the target folder' in the backup wizard.

Option	Description
Similar - Match on backups with at least one matching folder	Add and remove folders in your backup definition and still maintain a single backup set.
Strict - Match on backups with the same folders and filters	Retention rules will only be applied to exact matched backup sets.

Option	Description
(As Macrium Reflect v5)	
All - Matching on any backup	Retention rules will be applied to all File and Folder backups.

Shutdown sets whether the computer should be shutdown after a backup task has completed.

flect Defaults	×
Backup Restore Update	Scripts Network Email Advanced
Compression ile Size Jassword Auto Verify Image (erify File System (RS Event Logs PowerShell Event Logs Priority .og file purge Retention Rules Cloning Reparse Points Backup Set Matching Shutdown	Default shutdown settings Set whether the computer should be shutdown after a backup task has completed Enable Power Saving Image: Shutdown the computer when a backup task has completed Image: Force the shutdown process. Checking this option will force all programs to close without them being queried if they can be closed. Image: Hibernate the computer when a backup task has completed Image: Suspend the computer when a backup task has completed
	Help OK Cancel

Option	Description		
Shutdown	This will Shutdown your computer after the backup is complete.		
	A sub-option can be enabled to Force the shutdown process - All programs will be forced to close without being queried.		

Option	Description	
Hibernate	This will Hibernate your computer after the backup is complete	
Suspend	This will put your computer to Sleep after the backup is complete.	

Default Restore settings

Rapid Delta Restore will only restore the changed data blocks and not the whole backup file.

These	options se	et the defau	ults for a new backup.
Reflect Defaults	;		X
R	*	æ	🔄 🔂 🕞 🖌
Backup Rapid Delta Ro SSD Trim Verify Image Master Boot R		Update	Scripts Network Email Advanced Use Rapid Delta Restore
			Rapid Delta Restoring will only copy changed data blocks and will complete the restore process much faster. Please note that only NTFS file systems that are not shrunk can be restored in this way
			☑ Enable Rapid Delta Restore
			Help OK Cancel

A Enabling Rapid Delta Restore decreases the time it will take to restore a backup. Only NTFS file systems that are not shrunk can be restored this way.

1 To find out more about RDR please click here.

SSD Trim option enables SSD TRIM on restore.

flect Defaults	5						×
Backup	Restore	Update	Scripts	Network	Email	Advanced	
apid Delta Re SD Trim erify Image 1aster Boot R			*	Use SSD Tr	im		
			Writing to erase ope	an unused block i	s much quicker t ad-modify-write	ag all unused blocks using the TF than an in-use block as it avoids cycle. This results an increase o	both the slow
			file syster		RIM blocks on d	tems, even those that support (je-allocation; it cannot TRIM blo 8 attached SSDs.	
				Enable TRIM on re	store		

When a partition is restored, Reflect can flag all unused blocks using the TRIM operation.
 Writing to an unused block is much quicker than an in-use block as it avoids both the slow erase operation and the read-modify-write cycle. This results an increase of both the lifetime and the performance of the device.

It is effective for all Windows operating systems, even those that support SSD trim as the file system driver can only TRIM blocks on de-allocation; it cannot TRIM blocks written by another process. It is also effective for USB attached SSDs.

Verify Image option verifies images before restoring.

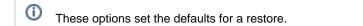
These options set the defaults for a restore.

Reflect Defaults	5						×
Backup	Restore	Update	Scripts	Network	Email	Advanced	
Rapid Delta Re SSD Trim Verify Image Master Boot R			*	Verify image	es before re	storing	
				nk You		g. t / locate any missing media	a when required.
						Help	OK Cancel

Option	Description
No Thank You	Reflect will not verify your images before the Restore process.
Yes Please	Reflect will verify your images before the Restore process.

The verification process will ask you to insert / locate any missing media when required.

Master Boot Record options select whether to recover and replace the Master boot record from the backup.



Reflect Defaults	;						×
Backup	Restore	Update Update	Scripts	Network	Email	Advanced	
Rapid Delta Re SSD Trim Verify Image Master Boot R			*	Restore Mas	ster Boot Re	cord settings	
			this progra starting th Each back the second	im has become coi e computer opera up contains a copy I option below. replace	rrupt, perhaps d ting system. v of the Master E	hat executes when the computer start ue to a virus, then you may have prol 30ot Record this can be recovered by : m the backup (Recomended)	blems
						HelpOK	Cancel

 Master Boot Record is a small program that executes when the computer starts up. If this program has become corrupt, perhaps due to a virus, then you may have problems starting the computers operating system.

Each backup contains a copy of the Master Boot Record that can be recovered by selecting the second option below:

Option	Description
Do not replace	Original MBR will be kept without replacing it with the MBR contained in the backup image.
Replace	MBR is replaced with the MBR from the the backup image.

Update Settings

Update options establish rules for updating Reflect.

Reflect Default	5			×
Backup	Restore	Update	Scripts Network Email Advanced	
Update Prope	rties		Enable automatic check for updates Check once a day	
			 Disable automatic update check Use the menu option to manually check for updates. Automatically restart Macrium Reflect after patching. 	
			Help OK	Cancel

Option	Description
Enable automatic check for updates	Chose when Reflect checks for updates. Image: The second seco
Disable automatic update check	Reflect will not check for updates automatically; updates will need to be manually checked for by using the update button.
Automatically restart Reflect will automatically restart once the update has been downloaded installed.	

Scripts

VBScript Logging options enable file logging in the same directory as your script file.

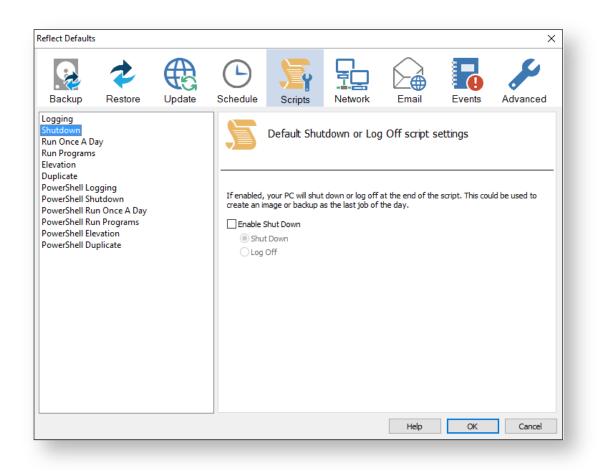
terlect Defaults X Image: Sector Imag						
Orgging Shutdown Shutdown Sun Once A Day Run Programs Elevation Duplicate PowerShell Logging PowerShell Shutdown PowerShell Shutdown PowerShell Run Once A Day PowerShell Run Programs PowerShell Elevation	flect Defaults					×
Logging Shutdown Run Once A Day Run Programs Elevation Duplicate PowerShell Logging PowerShell Shutdown PowerShell Run Once A Day PowerShell Run Once A Day PowerShell Run Programs PowerShell Elevation	Backup Restore Update	Schedule	Network	Email	Events	Advanced
	Shutdown Run Once A Day Run Programs Elevation Duplicate PowerShell Logging PowerShell Shutdown PowerShell Run Once A Day PowerShell Run Programs PowerShell Run Programs	If enabled, a log file wil contain the same outpu The log file name will be	be created in the san t as the Backup Wizar	d when your ima	ige or backup is	running.

• If enabled, the log file created will contain the same output as the Backup Wizard when your image or backup is running.

The log file name will be left unique and based on the date and time of your image or backup.

VBScript Shutdown option sets whether the PC should shutdown or log off at the end of the script.

These options set the defaults for a script.



This could be used when creating a backup as the last job of the day.

```
' Issue shutdown command
objShell.Run "shutdown -s"
```

Option	Description
Shut Down	 Enable Shut Down Shut Down Log Off Your PC will shutdown after the script has been ran.
Log Off	

Option	Description
	 Enable Shut Down Shut Down Log Off
	Your PC will Log Off after the script has been ran.

VBScript Run Once A Day option executes a script the first time you logon, logoff or shutdown.

These options set the defaults for a script.

Reflect Defaults							×
Backup Resto	ore Update	Schedule	Scripts	Network	Email	Events	Advanced
Logging Shutdown Run Once A Day Run Programs Elevation Duplicate PowerShell Logging PowerShell Shutdown PowerShell Run Once A PowerShell Run Program PowerShell Elevation PowerShell Elevation PowerShell Duplicate		It can be us	eful to execute you can be sure		tings time you logon, lo iggered task only		
					Help	OK	Cancel

Generated code...

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```
'* Function: HasRunToday
۰ *
'* Purpose: determines if this script has run today
1 *
1 *
'* Input:
           None
'* Output: true if has run today false otherwise
1 *
Function HasRunToday
   Dim RegScriptKey
   Dim LastRunDate
   Dim objShell
   Set objShell = WScript.CreateObject("WScript.Shell")
   RegScriptKey = "HKCU\SOFTWARE\Macrium\Reflect\Scripts\" & WScript.
ScriptFullName & "\LastRun"
   'Check if script has run today
   ON ERROR RESUME NEXT
   LastRunDate = objShell.RegRead(RegScriptKey)
   If LastRunDate = cstr(Date) Then
        HasRunToday = true
   Else
        objShell.RegWrite RegScriptKey, Date, "REG_SZ"
        HasRunToday = false
   End If
   Set objShell = nothing
End Function
```

Option	Description
Run once a day	Run Once a Day.
	The script will run only once a day.

① This is useful if you want a backup to happen at first login or shutdown.

VBScript Run Programs selects programs or scripts to run at the start or end of the script.

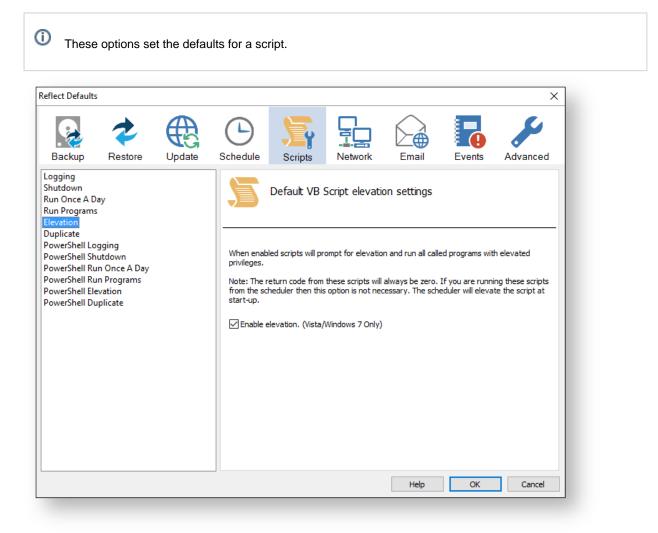
These options set the defaults for a script.

Image: Sector bit is a start of the start. Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Shell Shutdown Image: Sector bit is a start of the start. Image: Sector bit is a start of the start of the start of the start. Image: Sector bit is a start of the start. Image: Sector bit is a start of the start of the start of the start of the start. Image: Sector bit is a start of the start of the start. Image: Sector bit is a start of the start. Image: Sector bit is a start of the start of	×
Shutdown Default run programs and scripts settings Run Programs Default run programs and scripts settings Elevation Duplicate PowerShell Logging PowerShell Shutdown PowerShell Run Once A Day Run a program or script at the start. PowerShell Run Programs File name: PowerShell Elevation Parameters:	vanced
File name: Parameters:	

' Run program before backup	
objShell.Run """C:\Users\Public\Admin\Before backup.bat""", 1, true	
' Do the backup	
<pre>ExitCode = Backup ("""C:\Program Files\Macrium\Reflect\reflect.exe"" -e -w</pre>	
<backup_type> ""C:\Users\Dev\Documents\Reflect\example.xml""")</backup_type>	
' Run program after backup	
objShell.Run """C:\users\public\Admin\After backup.exe""", 1, true	

Option	Description
File name	Write the path and executable file name that you wish to run at the start of the script.
Parameters	Include optional command line parameters for the program.
File name	Write the path and executable file name that you wish to run at the end of the script.
Parameters	Include optional command line parameters for the program.

VBScript Elevation is used for Vista and later, to run all programs with elevated privileges.



```
Sub VBMain()
   Dim objShell
   Dim ExitCode
' Elevate this script for Admin privileges in Vista
   Elevate
. . . . . . . . . . . . . . . . .
'* Sub:
          Elevate
۰*
'* Purpose: Elevates this script for Vista UAC.
۰*
          This means that only one UAC Elevation prompt is displayed and
۰*
          functions/programs will not fail if they require admin privileges
۰*
'* Input:
          None
'* Output: None
1 *
```

```
Sub Elevate
   Dim ShellApp
   Dim objShell
   Dim objWshProcessEnv
   ' Don't elevate if run from Windows Task Scheduler
   If WScript.Arguments.Count > 0 Then
       If WScript.Arguments.Item(0) = "-s" then
            Exit Sub
       End If
   End If
   Set objShell = WScript.CreateObject("WScript.Shell")
   Set objWshProcessEnv = objShell.Environment("PROCESS")
   If objWshProcessEnv("ELEVATED_APP") <> "True" Then
       objWshProcessEnv("ELEVATED_APP") = "True"
       Set ShellApp = CreateObject("Shell.Application")
       Call ShellApp.ShellExecute("""" & WScript.FullName & """", """" &
WScript.ScriptFullName & """" & " " & GetBackupTypeParameter, , "runas")
       set ShellApp = nothing
       Set objWshProcessEnv = nothing
       wscript.quit
   End If
   Set objWshProcessEnv = nothing
   Set objShell = nothing
End Sub
```

The return code from these scripts will always be zero. If you are running these scripts from the scheduler then this option is not necessary. The scheduler will elevate the script at startup.

Option	Description
Enable Elevation	Enables UAC elevation for the entire script. This enables functions and programs to run outside the context of Macrium Reflect without requesting further elevation.

VBScript Duplicate option creates a copy of the backup to a chosen directory when the backup completes

These options set the defaults for a script.

Œ

Reflect Defaults								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Logging Shutdown Run Once A D Run Programs Elevation Duplicate PowerShell Sh PowerShell Sh PowerShell Ru PowerShell Ru PowerShell Ele PowerShell Du	gging utdown n Once A Day n Programs wation		When enabl backup com	ed backup/image oletes. irectory synchro	duplication se e file(s) will be syn nization	_	: chosen directo	ry after the
			Ple no	ase note that sy t exist in the bac	/nchronization wil	l delete files in the second sec	ne target directo	Cancel

```
SynchroniseDirectories ExitCode, "C:\C++"
. . . . . . . . . . . . . . . .
'* Function: RobocopyExists
۰*
'* Purpose: determines whether the program Robocopy can be called from the
۰*
         command line.
۰*
'* Input:
        None
'* Output: boolean - true if Robocopy exists
۰*
Function RobocopyExists()
  On Error Resume Next
  Dim objShell
  Dim objExec
   Set objShell = WScript.CreateObject("WScript.Shell")
   Set objExec = objShell.Exec ("robocopy.exe", 0)
   If Err.Number = 0 Then
     RobocopyExists = True
   Else
     RobocopyExists = False
   End If
End Function
```

```
'* Function: SynchroniseDirectories
1 *
'* Purpose: Copies all files created by the previous backup / image
1 *
           to a supplied directory. Uses Macrium environment variables to
۰ *
           determine which files to copy.
۱ *
'* Input:
          ExitCode - The exit code of the last backup
1 *
           strBackupDirectory - Directory to copy to
1 *
Function SynchroniseDirectories(Byval ExitCode, Byval strSyncDirectory)
   Dim objShell
   Dim objWshProcessEnv
   Dim strEnvPrefix
   Dim strBackupDirectory
   Dim strCmdLine
   Dim iReturnCode
   Dim fs
   Dim objSyncFiles
   Dim objBackupDirectory
   Dim objSyncDirectory
   Dim objBackupFile
   Dim objSyncFile
   Dim strExtension
   Dim dateBackupFile
   Dim dateSyncFile
' Only copy files if backup was successful
   if ExitCode <> 0 Then
       Exit Function
   End If
   set objShell = WScript.CreateObject("WScript.Shell")
   Set objWshProcessEnv = objShell.Environment("VOLATILE")
' Get the prefix for the last backup set
   strEnvPrefix = objWshProcessEnv("MACRIUM_PREFIX")
' Get the directory where we just created a backup
   strBackupDirectory = objWshProcessEnv(strEnvPrefix + "_DIRECTORY")
   If right(strBackupDirectory, 1) = "\" Then strBackupDirectory = left
(strBackupDirectory, len(strBackupDirectory)-1)
   If right(strSyncDirectory, 1) = "\" Then strSyncDirectory = left
(strSyncDirectory, len(strSyncDirectory)-1)
   If RobocopyExists Then
       strCmdLine = "robocopy ""<SOURCE>"" ""<DESTINATION>"" *.mr* /copy:DAT
/lev:0 /purge /r:0"
   Else
    ' Robocopy does not exist - using xcopy
       Set fs = CreateObject("Scripting.FilesystemObject")
       Set objBackupDirectory = fs.GetFolder(strBackupDirectory)
       Set objSyncDirectory = fs.GetFolder(strSyncDirectory)
       For Each objSyncFile in objSyncDirectory.Files
           strExtension = fs.GetExtensionName(objSyncFile)
           dateSyncFile = objSyncFile.DateLastModified
           If Left(strExtension,2) = "mr" Then
           ' Check if file has been deleted
               If Not(fs.FileExists(strBackupDirectory+"\"+objSyncFile.name)) The
n
                  fs.DeleteFile(objSyncFile)
              Else
               ' Check if file has been modified
                  Set objBackupFile = fs.GetFile(strBackupDirectory+"\"
+objSyncFile.name)
```

```
dateBackupFile = objBackupFile.DateLastModified
                    If DateDiff("m", dateBackupFile, dateSyncFile) <> 0 Then
                       fs.DeleteFile(objSyncFile)
                    End If
                End If
           End If
        Next
        strCmdLine = "xcopy ""<SOURCE>\*.mr*"" ""<DESTINATION>"" /c /d /h /i /v
/y"
    End If
   strCmdLine = Replace(strCmdLine,"<SOURCE>", strBackupDirectory)
   strCmdLine = Replace(strCmdLine,"<DESTINATION>", strSyncDirectory)
   iReturnCode = objShell.Run(strCmdLine,0,true)
   if iReturnCode <> 0 then
' Handle synchronisation error
   else
' Everything OK
   end if
' Clean up
   set objShell = nothing
   Set objWshProcessEnv = nothing
End Function
```

Option	Description
Enable file copy	If enabled the backup will create a copy of the files from the backup to the supplied destination.
Directory	Here you will need to enter the folder that you want to copy/archive your backup files to.

Please note that the synchronization will delete files in the target directory that do not exist in the backup directory.

Powershell Logging options enable file logging in the same directory as your script file.

These options set the defaults for a script.

Reflect Default	5							×
Backup	Restore	Update Update	C Schedule	Scripts	Network	Email	Events	Advanced
Logging Shutdown Run Once A D Run Programs Elevation Duplicate PowerShell Lo PowerShell Sh	ay s utdown in Once A Day in Programs evation		If enabled, contain the	Default log t a log file will be e same output as name will be unic		ne directory as y rd when your ima	our script file. T ge or backup is	his log file will running.
						Help	OK	Cancel

• If enabled, the log file created will contain the same output as the Backup Wizard when your image or backup is running.

The log file name will be left unique and based on the date and time of your image or backup.

Powershell Shutdown option sets whether the PC should shutdown or log off at the end of the script.

These options set the defaults for a script.

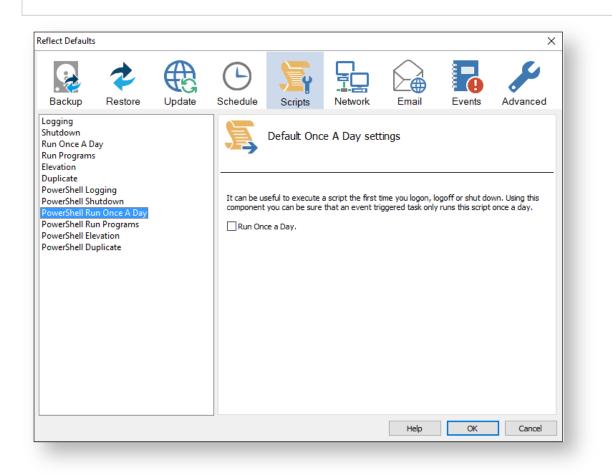
Reflect Defaults								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Logging Shutdown Run Once A Da Run Programs Elevation Duplicate PowerShell Log PowerShell Ru PowerShell Ru PowerShell Ru PowerShell Ele PowerShell Du	gging utdown n Once A Day n Programs vation		If enabled,	your PC will shut hage or backup a hut Down Down	tdown or Log	at the end of the		ild be used to
						Help	OK	Cancel

```
Write-Host ' * Initiating shutdown... ' -NoNewLine;
(Get-WMIObject Win32_OperatingSystem -ComputerName '.' -EnableAllPrivileges).
Win32Shutdown(8);
```

Option	Description
Shut Down	 Enable Shut Down Shut Down Log Off Your PC will shutdown after the script has been ran.
Log Off	 Enable Shut Down Shut Down Log Off Your PC will Log Off after the script has been ran.

Powershell Run Once A Day option executes a script the first time you logon, logoff or shutdown.

These options set the defaults for a script.



```
if (HasRunToday)
 {
  Write-Host ' * Script already executed today. Exiting...';
  Write-Host 'Script finished with exit code 0.';
  Exit 0;
 }
. . . . . . . . . . . . . . . . . . .
#* Func: HasRunToday
#*
#* Desc: determines if this script has run today
#*
function HasRunToday()
{
  Write-Host ' * Checking last run time... ' -NoNewLine;
             = 'HKCU:\Software\Macrium\Reflect\Scripts';
  $strRegPath
```

```
$boolRanToday = $false;
    $strDateToday = Get-Date -UFormat %Y%m%d;
    if (Test-Path $strRegPath)
    {
        try
        {
            $strLastRunDate = (Get-ItemProperty -Path $strRegPath -Name $strScript
Path -ErrorAction Stop).$strScriptPath
            if ($strLastRunDate -eq $strDateToday)
            {
                $boolRanToday = $true;
            }
        } catch { };
    }
    if (!$boolRanToday)
    {
        Set-ItemProperty -Path $strRegPath -Name $strScriptPath -Value $strDateTod
ay;
    }
    Write-Host 'Done.';
   return $boolRanToday;
}
```

Option	Description
Run once a day	Run Once a Day.
	The script will run only once a day.

This is useful if you want a backup to happen at first login or shutdown.

Powershell Run Programs selects programs or scripts to run at the start or end of the script.

These options set the defaults for a script.

Reflect Defaults	5							×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Logging Shutdown Run Once A D Run Programs Elevation Duplicate PowerShell Lo PowerShell Ru PowerShell Ru PowerShell Ru PowerShell Du	s iutdown in Once A Day in Programs evation		Run a pr File nam Paramet	ogram or script ; e: ers: ogram or script ; e:	at the start.	nd scripts set	tings	
						Help	OK	Cancel

```
Write-Host ' * Executing "at start" program... ' -NoNewLine;
 $strRunAtStartApp = 'C:\Users\Public\Admin\Before backup.bat';
 $strRunAtStartArgs = '';
 if ([string]::IsNullOrEmpty($strRunAtStartArgs))
 {
   Start-Process -FilePath $strRunAtStartApp;
 }
 else
 {
   Start-Process -FilePath $strRunAtStartApp -ArgumentList $strRunAtStartArgs;
 }
. . . . . .
 Write-Host ' * Executing "at end" program... ' -NoNewLine;
 $strRunAtEndApp = 'C:\Users\Public\Admin\After backup.exe';
 $strRunAtEndArgs = '';
 if ([string]::IsNullOrEmpty($strRunAtEndArgs))
 {
  Start-Process -FilePath $strRunAtEndApp;
 }
 else
 {
   Start-Process -FilePath $strRunAtEndApp -ArgumentList $strRunAtEndArgs;
 }
```

Option	Description
File name	Write the path and executable file name that you wish to run at the start of the script.
Parameters	Include optional command line parameters for the program.
File name	Write the path and executable file name that you wish to run at the end of the script.
Parameters	Include optional command line parameters for the program.

Powershell Elevation is used for Vista and later, to run all programs with elevated privileges.

flect Defaults		×
Backup Restore Update	Schedule Scripts	Events Advanced
Logging Shutdown Run Once A Day Run Programs Elevation Duplicate PowerShell Logging PowerShell Shutdown PowerShell Run Once A Day PowerShell Run Programs PowerShell Elevation PowerShell Duplicate	Default PowerShell elevation settings When enabled scripts will prompt for elevation and run all call privileges. Note: The return code from these scripts will always be zero. from the scheduler then this option is not necessary. The sch start-up. Enable elevation. (Vista/Windows 7 Only) Help	led programs with elevated

```
function Main()
{
 Write-Host 'PowerShell script for Macrium Reflect Backup Definition File';
 Write-Host "BDF: $strXmlFilePath";
 Elevate;
. . . . . . . . . . . . . . . . .
#* Func: Elevate
#*
#* Desc: Elevates this script for UAC.
       This means that only one UAC Elevation prompt is displayed and
#*
#*
       functions/programs will not fail if they require admin privileges.
#*
function Elevate()
{
  # Only elevate if not ran from the task scheduler.
 Write-Host ' * Checking elevated access rights... ' -NoNewLine;
 if (-Not $s)
  {
   # Check to see if we are currently running "as Administrator"
   if (!([Security.Principal.WindowsPrincipal][Security.Principal.
WindowsIdentity]::GetCurrent()).IsInRole([Security.Principal.WindowsBuiltInRole]"A
dministrator"))
   {
     $ElevatedProcess = new-object System.Diagnostics.ProcessStartInfo "PowerShel
1";
     # Specify the current script path and name as a parameter
     $strType = GetBackupTypeParameter;
     $ElevatedProcess.Arguments = "-ExecutionPolicy Bypass & '" + $script:
MyInvocation.MyCommand.Path + "' $strType";
     # Indicate that the process should be elevated
     $ElevatedProcess.Verb = "runas";
     # Start the new process
     [System.Diagnostics.Process]::Start($ElevatedProcess);
     # Exit this unelevated script with exit code for "Error: Not elevated"
     Exit 3;
   }
  }
 Write-Host 'Done.';
}
```

The return code from these scripts will always be zero. If you are running these scripts from the scheduler then this option is not necessary. The scheduler will elevate the script at startup.

Option	Description
Enable Elevation	Enables UAC elevation for the entire script.
Elevation	This enables functions and programs to run outside the context of Macrium Reflect without requesting further elevation.

Powershell Duplicate option creates a copy of the backup to a chosen directory when the backup completes.

ect Defaults	
Backup Restore Update	Schedule Scripts Retwork Email
gging utdown n Once A Day n Programs vation plicate werShell Logging werShell Shutdown werShell Run Once A Day werShell Run Programs werShell Elevation werShell Duplicate	Default file duplication settings When enabled backup/mage file(s) will be synchronised in the chosen directory after the backup completes. Enable directory synchronization Directory: Image with the synchronization will delete files in the target directory that do not exist in the backup directory.

```
function SynchroniseDirectories($strSrcDir, $strDstDir)
{
 Write-Host ' * Synchronising directories... ' -NoNewLine;
  if (Get-Command robocopy -ErrorAction SilentlyContinue)
  ł
   # robocopy is available...
   # /copy:DAT - D:Data
   #
                 A:Attributes
                T:Time stamps
   #
   # /purge - deletes destination files and directories that no longer
   #
                  exist in the source
   # /lev:0 - Does not copy subdirectories
   &robocopy $strSrcDir $strDstDir *.mr* /copy:DAT /lev:0 /purge /r:0 | Out-Null
  }
  else
  {
   # Fall back to xcopy...
   # Delete files from the target directory not present in the source directory
   $strDstDirChildren = $strDstDir+"\*";
   Get-ChildItem $strDstDirChildren -include "*.mr*" | Foreach-Object {
     $strMaybeDeletedSrcFile = $strSrcDir + '\' + $_.Name;
     if (-not (Test-Path $strMaybeDeletedSrcFile))
     {
       Remove-Item $_
     }
     else
      {
       $SrcFileTime = [datetime](Get-ItemProperty -Path $strMaybeDeletedSrcFile -
Name LastWriteTime).lastwritetime;
       $DstFileTime = [datetime](Get-ItemProperty -Path $_.FullName
Name LastWriteTime).lastwritetime;
       $SrcFileTimeString = $SrcFileTime.ToString("yyyMMddHHmmss")
       $DstFileTimeString = $DstFileTime.ToString("yyyMMddHHmmss")
       if ($SrcFileTimeString -ne $DstFileTimeString)
       {
         Remove-Item $
       }
     }
    }
    # /c - Continues copying even if errors occur.
    # /d - Date check; only copies if file does not exist or is older.
    # /h - Copies hidden and system files.
    \# /i - If the destination does not exist, and you are copying more than one
    #
           file, this switch assumes that the destination is a folder.
   # /v - Verifies each new file.
   # /y - Overwrites existing files without prompting.
   &xcopy $strSrcDir\*.mr* $strDstDir /c /d /h /i /v /y | Out-Null
  }
 Write-Host 'Done.';
}
```

Option	Description
Enable file copy	If enabled the backup will create a copy of the files from the backup to the supplied destination.

Option	Description
Directory	Here you will need to enter the folder that you want to copy/archive your backup files to.

Please note that the synchronization will delete files in the target directory that do not exist in the backup directory.

Network Settings

Windows contains a Network Credentials cache that enables network authentication details (User name and password) to be saved and re-used to logon automatically. However, scheduled tasks are run in Windows 'batch mode' and do not have access to saved credentials. Because of this you must enter network login details in the Macrium Reflect defaults to enable scheduled tasks to access and write to password protected network shares.

eflect Defaults	5							×
Backup	Restore		Schedule	Scripts	Network	Email	Events	Advanced
Backup Restore Update Schedule Scripts Network Email Events Advanced Network Logon Image: Schedule Network logon Retwork logon								
				efault blank to o	use the system/u:	er default value:	5.	Add Edit Delete
						Help	ОК	Cancel

Option	Description
Add	Add network logon details for a new network location

Option	Description
Edit	Edit an existing location. Note: The 'Default' location logon details will be used for all shares that aren't explicitly added.
Delete	Remove logon credentials

Add / Edit

Network Location	Details
Specify credentials	for a specific network path using the fields below
\\server\share	\\NAS\public
Username	Network\User
Password	•••••••
	OK Cancel

Option	Description
\\Server\share	Enter the UNC path to the root of the network share. Do not enter any sub-folders in the path
Username	Enter the authenticated user that has access to the share
Password	Enter the users password.

You can also select 'Default' and click 'Edit' to provide default credentials to be used for all network shares:

Vetwork Location	Details
Specify credentials	s for a specific network path using the fields below
\\server\share	
Username	Network\User
Password	••••••
	OK Cancel

Email Settings

- For many users, email notification of success or failure of a backup helps them keep on top of the status of their backups, particularly with scheduled backups which take place in the background.
- Select 'Email' > 'Email Server'.

flect Defaults						<u>^</u>		×			
Backup	Restore		Schedule	Scripts	Network	Email	Events	Advanced			
mail Server mail Success mail Failure	TRESIDIE		\sim		er Settings for			Auvanceu			
			Senders	Senders Email		Enter the sender email address					
			Authentication		Auto Detect 🗸 🗸						
			SMTP Username		Enter server username						
			SMTP Pa	assword	Enter server pass	sword					
			SMTP Se	erver	Enter host name						
			Connect	ion Type	Plain Text (No Sec	curity)		~			
			SMTP Po	ort	25						
			Test Red	Test Recipients		Enter test recipients and dick Test, separate recipients with ;					
								Test			
						Help	OK	Cancel			

Email Server options description:

Option	Description
Senders Email	Your e-mail address associated with your ISP or Gmail account etc.
	Note: If you use e-mail software such as MS Outlook, you can find the settings under Account Settings for e-mail address, user-name and Server.
Authentication	Authentication options are set by your email provider/server.
	None Auto Detect Challenge/Kerponce Authentication (CRAN-RESS) Source Username/Fusional login (AUTH ECCER) Username/Pansword login (AUTH ELATIK) Microsoft NELsa Manager (ATTH)

(j)

Option	Description
	Note: If you do not know your authentication settings, try Auto Detect .
SMTP Username	The user name associated with your e-mail account. This is essentially your email address.
SMTP Password	This is the password for your e-mail Server.
SMTP Server	This is the outgoing / SMTP Server setting or IP address.
Connection Type	This is the setting for the way Macrium Reflect will contact the Server. Plain Text (No Security) Plain Text (No Security) Secure Sockets (SSL/TLS) Transport Layer Security (STARTTLS) Image: These settings can be found from your email provider.
SMTP Port	This is associated with Connection Type and is the port number that the SMTP server is listening on. Image: These settings can be found from your email provider.
Test Recipients	This option is used to test the configured settings; enter your e-mail address in that field and click Test to send a test message to your email.

The following examples show completed Server settings for a typical ISP.

eflect Defaults								×		
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced		
Email Server Email Success Email Failure			Senders Authent SMTP Us SMTP Pa SMTP Se Connect	Email Serv		username@gmail.com Auto Detect username@gmail.com smtp.gmail.com Plain Text (No Security)				
			SMTP Pc		Username@gmail.com Test Help OK Canc					

• Click **OK** to finish.

ONOTE: If you are using your Gmail account then please see here: Using Gmail SMTP Server for sending backup notification emails

Email success settings define who receives emails regarding the success of a backup and what message they receive.

Select Email Success

								×
Backup	e store	Update	Schedule	Scripts	Network	Email	Events	Advanced
mail Server mail Success mail Failure				otifications of g file SS log file t Enter Macriu	on successful bac a list of recipients m Reflect - Backs	s, separate each	email address v	

• Select Send Email Notifications on successful backups.

Reflect Defaults								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure			Send Ema	il Notifications Tog file n VSS log file List Enter Macri	ail settings fo on successful bac a list of recipients um Reflect - Backu your email messa	kups s, separate each up Success	email address v	
						Help	OK	Help

Option	Description
Attach log file	Will attach the log file from the creation of the backup.
Attach VSS log file	Will attach the VSS log with the events made during the backup.

• Enter the email addresses of all recipients in **Recipient List**, separating each email address with a semicolon.

Email Success	Reflect Defaults	;							×
Email Success Email Failure Default email settings for successful images or backups Send Email Notifications on successful backups Attach log file Attach VSS log file Recipient List Subject Macrium Reflect - Backup Success	Backup	Restore	Update Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Server Email Success Email Failure			Send Em	ail Notifications ch log file ch VSS log file t List Macri	on successful bac name@gmail.com; um Reflect - Back	kups username 1@gma up Success	ail.com	

- Enter the subject for the email in **Subject**.
- Enter a message to be sent regarding the email in **Content**, include the PC that generated the success is identified.

Email Success	leflect Defaults	;							×
Email Success Email Failure Default email settings for successful images or backups Send Email Notifications on successful backups Attach log file Attach VSS log file Recipient List username@gmail.com; username1@gmail.com Subject Macrium Reflect - Backup Success	Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Server Email Success Email Failure			Send Em Attac Attac Recipien Subject	ail Notifications th log file th VSS log file t List Macri	on successful bac ame@gmail.com; um Reflect - Back	kups username 1@gma up Success	ail.com	packups

• Click OK.

Email failure settings define who receives emails regarding the failure of a backup and what message they receive.

• Select Email Failure.

								×
Backup	v Restore	Update Update	Schedule S	cripts	Network	Email	Events	Advanced
mail Server mail Success mail Failure			Defa	tification on F file S log file Enter a lit Macrium I	ailed Backups st of recipients Reflect - Backu	r failed image	email address w	

• Select Send Email Notification on Failed Backups.

Image: Sector Image: Sector<	Reflect Defaults								×
Email Success Email Failure Default email settings for failed images or backups Send Email Notification on Failed Backups Attach log file Attach VSS log file Recipient List Enter a list of recipients, separate each email address with ; Subject Macrium Reflect - Backup Failed	Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
	Email Success			Send Ema Attac Recipient Subject	il Notification o h log file h VSS log file List Enter Macriu	n Failed Backups a list of recipient um Reflect - Back	s, separate each up Failed	email address v	

Option	Description
Attach log file	Will attach the log file from the creation of the backup.
Attach VSS log file	Will attach the VSS log with the events made during the backup.

• Enter the email addresses of all recipients in **Recipient List**, separating each email address with a semicolon.

Reflect Defaults	;							×
Backup	Restore	Update Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure			Send Email	l Notification o log file VSS log file List usern Macriu	ail settings fo n Failed Backups ame@gmail.com; um Reflect - Back your email messa	username 1@gma up Failed	ail.com	ps
						Help	OK	Cancel

- Enter the subject for the email in **Subject**.
- Enter a message to be sent regarding the email in **Content**, include the PC that generated the success is identified.

Reflect Defaults								×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Email Server Email Success Email Failure				Notification o og file ISS log file st usern Macriu	ail settings fo n Failed Backups ame@gmail.com; Im Reflect - Backu op PC 13 Image b	username 1@gma up Failed	ail.com	ps
						Help	ОК	Cancel

• Click OK.

Events

Enable or disable Windows Events generated by Macrium Reflect.

	*	€€	Ŀ		y <u>1</u>			F	
Backup	Restore	Update	Schedule	S	cripts Netwo	ork Email	Events	Advanc	ed
vents				nable o	r disable events belov	erated by Macriun		. Use	
						Macrium Reflect data			
			Log	ID	Туре	Text		LECEN.	
				256	Reflect start	Macrium Reflect sta	2	LECT%>	
				257 258	Reflect stop SSL error	Macrium Reflect en An SSL error was en	-		
			✓	258	Socket error	A Windows socket			
				260	Backup start	Backup started - <9		untereu - <	,
				261	Backup finish	Backup finished	ONEF LECT /0×		
				262	Backup 4GB limit	· · · · · · · · · · · · · · · · · · ·	n image file size	e to 4 GB du	
				263	Backup read file	2	-		
				264	Memory error	A memory error wa			c
			2	265		A VSS error was end	countered creat	2	F.,
						Def	ault Current	Default All	

Advanced

Editor settings are used to amend the default editor settings for; VBScript files, Powershell script files, MS-DOS batch and XML.

eflect Defaults	;							×		
Backup	Restore	Update Update	Schedule	Scripts	Network	Email	Events	Advanced		
iditors Advanced Bac Advanced Inco Destination Dr /SS options Macrium Refle	rementals rive Discovery		Default Editor for VBScript files: C:\WINDOWS\system32\notepad.exe Parameters (%f = filename): "%f"							
			Default Editor for PowerShell script files: powershell_ise.exe Parameters (%f = filename): "%f" Default Editor for MS-DOS batch C:\WINDOWS\system32\notepad.exe Parameters (%f = filename): "%f"							
			C:\WINDO	or for XML files: OWS\system32 (%f = filename)	\notepad.exe					
						Help	ОК	Cancel		

Advanced Backup Options are used to modify your backup options.

Reflect Defaults	5							×
Backup	Restore	Update	C Schedule	Scripts	Network	Email	Events	Advanced
Editors Advanced Bao Advanced Inc Destination Dr VSS options Macrium Refle	rementals rive Discovery		 Enable fi ✓ Ignore b □ Log e □ Display b □ Disable C □ Do not a ✓ Enforce e Run a 'F □ Create C 	le write caching ad sectors when each bad cluster backup notificati CD/DVD drive en bort file and fol entered image o ull' instead of 'Ir CD Engine log file	ed Backup O . Use if experience n creating images r detail. Note: This on delay for 20 numeration, use if der backup if root or file and folder b nc' or 'Diff' if the d e (restart required Mega Bits per Sec	ing slow or failed s may slow down in the second you experience and folder is missing wackup file name lestination file na d if enabling)	the backup con inds (range of 0 system lock-up i	ssues
						Help	OK	Cancel

Option	Description
Enable file write caching	Is useful if experiencing slow or failed backups.
Ignore bad sectors when creating images.	Damaged disks may still be imaged if this option is selected.
Display backup notification delay for set number of seconds.	Changes the time delay windows is displayed before a scheduled backup starts.
Disable CD/DVD drive enumeration	This option is useful if experiencing system lockup issues.
	Enabling this option will allow your File and Folder backup to continue even if a root folder of the backup is missing.

Option	Description				
Do not abort a file and folder backup if a root folder is missing.					
Enforce an entered image or File and Folder backup file name.	Normally, if you run an Incremental or Differential image of say drive 'C', the target folder is searched for a recent backup set for the same source (Drive 'C'). The backup set is then appended to. The file name you have chosen for the backup will not be used in this matching process. If you enter your own file name and select " Enforce entered image or file and folder backup file name" then only backup sets using the same file name and for the same source will be appended to, if none is found then a new full will be created.				
Create a CD Engine log file	Turning this option on allows reflect to create additional logs that can be used for troubleshooting created CD/DVD Rescue Media.				
Report transfer rates.	Will allow you to change the way transfer rates are reported in. Mega Bits per Second (Mb/s) Mega Bits per Second (Mb/s) Mega Bytes per Second (MB/s)				

Advanced Incremental options are used for enabling Delta Indexes for Incremental backups

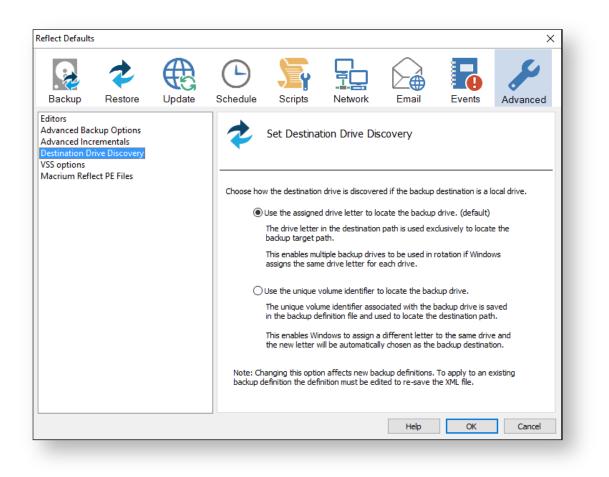
Reflect Default	s						×
Backup	Restore	Update	Scripts	Network	Email	Advanced	
Editors Advanced Ba Advanced Inc Destination D VSS options Macrium Refl	rementals rive Discovery		Enabli of me conso Please incren requir Additi requir Enabli Enabli	rging Incrementa lidation. e note that if this nental is calculate red to mount an I ionally, all previou red to continue to e Changed Block	or Incremental f will reduce incre l backups during option is enable d when the file incremental back us files in the back append to the incremental back stracking for Incre k Tracking for Incre system change	Backups. I Synthetic Full and Increase the spe Synthetic Full and Incremental I then the image Index for each is opened. This may increase the time up in Windows Explorer. ckup set, up to the previous Diff or Full, a	are
						Help OK	Cancel

Enabling **Delta indexes** will reduce incremental file size and can increase the speed of merging Incremental backups during Synthetic Full and Incremental consolidation.
 Additionally, all previous files in the backup set, up to the previous Diff or Full, are required to continue to append to the set.

If this option enabled then the image Index for each incremental is calculated when the file is opened. This may increase the time required to mount an Incremental backup in Windows Explorer.

For information on Changed Block Tracker please see here

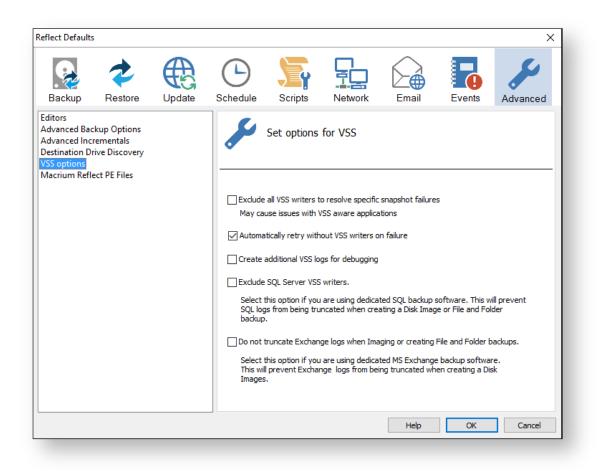
Destination Drive Discovery options change the way your destination drive is being discovered if the destination is a local drive.



Changing the option affects new backup definitions. To apply to an existing backup definition, the definition XML file needs to be opened and re-saved by clicking 'Finish'.

Option	Description
Use the assigned drive letter to locate the backup drive (default)	The drive letter in the destination path is used exclusively to locate the backup target path. Multiple backup drives can be be used in rotation if Windows assigns the same drive letter for each drive.
Use the unique volume identifier to locate the backup drive	The unique volume identifier is associated with the backup drive is saved in the backup definition file and used to locate the destination path. Windows will assign a different letter to the same dive and the new letter will be automatically chosen as the backup destination.

VSS Options are used to set options for VSS



Option	Description
Exclude all VSS writers to resolve specific snapshot failures.	This option will disable VSS writers. Due to Windows system configuration issues, VSS writers are the cause of some backup failures.
	M This may cause issues with other VSS aware applications.
Automatically retry without VSS writers on failure	Reflect will try to create a backup of your system without using VSS; this option is useful when experiencing VSS related errors.
Create additional VSS logs for debugging.	Each backup will create additional VSS logs that can be used in order to troubleshoot VSS related issues when creating backups.
Exclude SQL Server writers.	Select this option if you are using dedicated SQL backup software. This will prevent SQL logs from being truncated when creating a Disk Image or File and folder backup.

Option	Description
Do not truncate Exchange logs	Select this option if you are using dedicated MS Exchange backup
when imaging or creating file and	software. This will prevent Exchange logs from being truncated when
folder backups.	creating a Disk Images.

Macrium Reflect PE Files options are used to select the drive where Macrium Reflect PE files will be stored.

Reflect Default	s							×
Backup	Restore	Update	Schedule	Scripts	Network	Email	Events	Advanced
Advanced Inc Destination D VSS options	rive Discovery			Set Option	s For Macriun	n Reflect PE	Files	
Macrium Ref	lect PE Files		Select drive	where Macriur	n Reflect PE files w	vill be stored		
			Drive A	vailable Space	File System			
				9.78 GB 22.01 GB				
			Please note	. Only valid loc	ations are listed at	pove		
						Help	OK	Cancel

• If your system contains multiple drives you can choose on what Drive Macrium Reflect PE files are saved.

PXE Deployment

This article will take you through PXE deployment of the Rescue Media.

In order to use this technology you will need to have purchased the Macrium Reflect Technicians Deployment License.

If you wish to obtain this license please click here for further details.

Before you begin: You will need to have set up a Windows Deployment Services Server and created a rescue media ISO image file. See Creating rescue media.

- 1 Mount Rescue Open with... Share with ۲ Restore previous versions Send to ۲ Cut Сору Create shortcut Delete Rename Properties
- 1. Mount the Rescue Media Image that was created earlier.

2. Open Windows Deployment Services and select 'Servers > Boot Images'

é		Windows D	eployment Se	rvices				_ □	x
File Action View Help									
Þ 🏟 🙍 🖬 🗟 📝 🖬									
 Windows Deployment Services DeploymentSRV.macrium.local Install Images Boot Images Pending Devices Multicast Transmissions Drivers Active Directory Prestaged Devices 	Boot Images Image Name		Architecture	Status	Expanded Size	Date	OS Version	Priority	

3. Right click the right pane and click 'Add Boot Image...'

\$	Window	s Depl	loyment Sei	rvices					x
File Action View Help									
🗢 🔿 🙋 📰 🗟 🗊									
Windows Deployment Services	Boot Images								
⊿ III Servers ⊿ DeploymentSRV.macrium.local	Image Name	A	rchitecture	Status	Expanded Size	Date	OS Version	Priority	
Install Images									
 Boot Images Bending Devices 	Add Boot Image								
 Multicast Transmissions 	Export List								
Drivers	View	•							
🙀 Active Directory Prestaged Devices	Arrange Icons	•							
	Line up Icons								
	Help								
][
						_			

4. In the Wizard you can browse for a location of the bootable WIM.

<u>\$</u>	Add Image Wizard
lm	age File
	Enter the location of the Windows image file that contains the images to add.
	File location: Browse Browse Note: The default boot and install images (Boot.wim and Install.wim) are located on the installation DVD in the \Sources folder. More information about images and image types
	< Back Next > Cancel

- х Select Windows Image File 4 Ϯ This PC > DVD Drive (E:) Rescue > sources Ç Search sources Q v. = - 🔟 Organize 👻 ? Name Date modified Size \wedge Туре 쑦 Favorites 📃 Desktop boot.wim 29/02/2016 12:48 WIM File 240,079 KB 鷆 Downloads 🖳 Recent places 👰 This PC 膭 Desktop Documents \rm Downloads 🚺 Music 肁 Pictures 📑 Videos 📥 Local Disk (C:) DVD Drive (E:) Re Windows image files (*.wim) File name: boot.wim \mathbf{v} v Open Cancel
- 5. Locate 'boot.wim' in the 'sources' folder of the mounted Rescue Media Image and click 'Open' then 'Next'.

6. Name your boot image and click 'Next' twice.

₩	Add Image Wizard
lmage Metadata	<u></u>
Enter a name and description 'Microsoft Windows PE (x64 Image name: MR Rescue Media PE (x64) Image description:	
MR Rescue Media PE (x64) Image architecture: x64	
	< Back Next > Cancel

7. Once finished you will see the the bootable image in the '**Boot Images**' section of Windows Deployment Services console.

\$	Windows D	eployment Se	rvices				_ 🗆 X
File Action View Help							
🗢 🔿 🙍 📰 🗙 🗟 🚺 🖬							
windows Deployment Services	Boot Images 1 Boot Image(s)						
⊿ III Servers ⊿ B DeploymentSRV.macrium.local	Image Name	Architecture	Status	Expanded Size		OS Version	Priority
Deploymentsky.macrium.iocal Install Images	👮 MR Rescue Media PE (x64)	хб4	Online	1294 MB	09/0	10.0.10240	500000
🔉 🖾 Boot Images 🛛							
Pending Devices							
 Multicast Transmissions Minimized Drivers 							
Active Directory Prestaged Devices							

You will now be able to boot PCs on your network with the Macrium Reflect Rescue Media.

Standalone backup set consolidation

It can be useful to independently consolidate multiple files in a backup set into a single Full or to consolidate a group of Incremental backups. This helps to conserve disk space and can be used when archiving your backups to optimize the number of backups being copied.

Independent consolidations can be run without creating a backup or launching Macrium Reflect by running a small utility **Macrium Image Consolidation** located in the Macrium Reflect v7.2 install folder.

This is usually 'C:\Program Files\Macrium\Reflect\consolidate.exe'.

Users of earlier version of Macrium Reflect can download the consolidation tool from here:

Download:	http://updates.macrium.com/reflect/utilities/consolidate.exe
Version:	v7.1.2917
Date:	27th February 2018

Using Macrium Image Consolidation

To Launch Macrium Image Consolidation double click 'consolidate.exe' in Windows Explorer.

'consolidate.exe' is a standalone executable that does not require installing.

0

0:\988714260AB110B4-00-00.mrimg	1	
0	—	
D:\988714260AB110B4-03-03.mrimg	2	
rom File Details	To File Details	
Image ID: 988714260AB110B4	Image ID: 988714260AB110B4	
Backup Type: Full	Backup Type: Incremental	
Backup Date: 21/07/2016 12:47	(3)Backup Date: 13/08/2016 14:11	
Compression: Medium	Compression: Medium	
Password: Yes	Password: Yes	
- 13/08/2016 14:12:12 File '988714260AB1:	10B4-00-00.mrimg' loaded OK	
- 13/08/2016 14:12:12 File '988714260AB1:	10B4-00-00.mrimg' loaded OK	
- 13/08/2016 14:12:12 File '988714260AB1:	10B4-00-00.mrimg' loaded OK	
ile '988714260AB110B4-03-03.mrimg' loada 13/08/2016 14:12:12 File '988714260AB1: 13/08/2016 14:12:15 File '988714260AB1: 4	10B4-00-00.mrimg' loaded OK	
- 13/08/2016 14:12:12 File '988714260AB1:	10B4-00-00.mrimg' loaded OK	
- 13/08/2016 14:12:12 File '988714260AB1:	10B4-00-00.mrimg' loaded OK	
- 13/08/2016 14:12:12 File '988714260AB1:	10B4-00-00.mrimg' loaded OK	

Area	Description		
1	Enter the 'From' backup file for the consolidation process, or click '' to browse. This is usually the Full backup, ending in '00-00.mrimg', but can be an Incremental file. Valid Macrium backup file types are:		
	Image files:	.mrimg	

Description		
File and Folder backup files:	.mrbak	
Exchange backup files:	.mrex	
set as 1. and must have been crea	ated after	
Basic information about the backup files.		
Basic information about the backup files. The output Window. This is populated after clicking 'Consolidate' and contains detailed information about the consolidation process.		
	File and Folder backup files: Exchange backup files: Enter the 'To' file for the consolida set as 1. and must have been creat Click 'Consolidate' to begin the c	

0 Note: Selecting a 'Full' image for the 'From' backup file will create a consolidated 'Synthetic Full' image.

Restrictions when choosing the 'From' and 'To' backup files.

• Each file must be from the same backup set. See How backup sets are created and maintained for more information on sets.

Error output:

From and To files are from a different backup set.

The 'To' file must have been created after the from file.

Error output:

From file is more recent than the To file

• The backup set cannot contain any Differential backups.

Error output:

The backup set contains Differential backups

Converting a Physical machine to Virtual Machine

Links have been added to each applicable step to explain the step in greater detail.

- 1. Using Macrium Reflect take an image of your physical machine.
- 2. Once you have an image, create a Rescue Media ISO image.
- 3. Create a Virtual Machine using your preferred hypervisor (Hyper-V, VMware, Virtual box...), assigning to it a vCPU, Memory and a Virtual Hard Disk.
- 4. Boot the VM using the created Rescue Media ISO image.
- 5. From the booted Rescue Media restore your image on to the Virtual Hard Disk attached to your VM.
- 6. Without exiting the Rescue Media, run the ReDeploy option.
- 7. Detach the ISO from your VM and reboot it.

Automatic System Restore

This article describes the steps involved to setup a 'one-click' system restore. Using Macrium Reflect you can automatically and easily return a Windows PC to a previously imaged system recovery point.

- System restore is completed without any user interaction during the restore process.
- Using Rapid Delta Restore (RDR) recovery is fast!
- BitLocker encrypted drives can be restored without requiring re-encryption after restore.
- The restore can be password protected to prevent accidental or unauthorised recovery.

Add the Macrium recovery boot menu

The first step is to add the Macrium boot menu. Take 'Other Tasks' > 'Add Recovery Boot Menu' in Macrium reflect and follow the instructions here: Adding a Boot Menu option for system Image recovery.

Adding a boot menu is optional but will enable simple one-click restore when the PC starts. Without a boot menu you can still automatically restore by booting into optical rescue media or an external USB drive.

Create an image of drive C:

1. Start Macrium Reflect, select 'Image this partition only...' for drive C.

reate a backup Backup Definition File	s VBScript Files PowerShell File	s MS-DOS Batch Files	Scheduled Bac	cups			
(5 Refresh							
GPT Disk 1 [3A177438-02D6-4D86-9F	CC-184F81DEE52A] - KINGSTON SV30	0537A240G 600ABBF0 <223	.57 GB>				
1 - Recovery (None) NTFS Primary		O NAME (None) BA) Primary		3 - (Ci) NTFS Primary			
220.9 MB 300.0 MB	42.1 MB 100.0 ME		~	215.97 GB 223.18 GB	~		
Actions Action							

 Choose a location that will be accessible when the recovery media boots, this could be a spare partition on an internal drive or an external USB disk or flash drive. In this example we'll choose drive 'F:\', an internal partition.

			Disk Ir	nage			
Source	Select S	ource Drive(s) and Ir	nage Destination				
	GPT Disk 1 [3	A177438-02D6-4DB6-9FCC-18	F81DEE52A] - KINGSTON SV3	00537A24	OG 600ABBF0 <223.57 GB>		
V	1 - Rec NTFS Prim 220.9 MB 300.0 MB	overy (None) ary	2 - NO NAME (None) FAT32 (LBA) Primary 42.1 MB 100.0 MB		3 - (C:) NTFS Primary 215.97 GB 223.18 GB		
Total Sele Destinati		215.97 GB					
Folder	r I	F:\ Alternative locations			✓		
	VD Burner				~		
Backup	filename:	Use the Image ID as to {IMAGEID} F:\{IMAGEID}-00-00.	ne file name. (Recommended)			
┼┼┼ <u>ѧ</u> ѧ	vanced Opt	ions	Help		< Back Next >	Cancel	Finish

Backup Save Options	×
What do you want to do now?	
Run this backup now	
Save backup and schedules as an XML B You can run this backup at any time by clicking the saved XML file. Enter a name for this backup definition.	
system	
C:\system.xml	
Help OK	Cancel

	'C:\System.xml'		
Total Selected:	215.97 GB		~
estination:			
Backup Type:	Full		
File Name:	F:\E6D6E598B1B49634-00-00.mrimg		
peration 1 of 1			
Hard Disk:	1		
Drive Letter:	С		
File System: Label:	NTFS		
Size:	223.18 GB		
Free:	7.21 GB		
Used:	215.97 GB		
Initializing	December 13, 2016 13:00:32		=
Destination Drive: Free space threshold:	New Volume (F:) - Free Space 235.82 GB Delete oldest backup sets when free space is less than 5.00 GB		
Creating Volume Snap	shot - Please Wait		
aving Partition - <no nan<="" td=""><td>ne> (C:)</td><td></td><td></td></no>	ne> (C:)		
Reading File System B	itmap		
Saving Partition			
			\checkmark
erall Progress: 80%	Transfer Rate: 486.6 Mb/s	Time remaining: 11 Minu	ites
rrent Progress: 80%		Time remaining: 11 Minu	ites
rity	High On completion No Shutdown 🗸	Hide Cancel Paus	e

Prepare the auto restore XML file

Once the image completes we can prepare the xml file to automatically restore the image. To do this we need to step through the restore wizard but we aren't going to start the restore.

Start Macrium Reflect, click the 'Restore' tab, select the image created above and click the 'Restore Image' link

Image R	estore File and Folder Restore					
7 🕫 🖪	rowse for an image file (5 <u>Refresh</u>	Folders to search 💽 Back 1	to search list		
R	GPT Disk 1 [3A177438-02D6-4DB6-9	FCC-184F81DEE52A] - K	INGSTON SV300S37A240G 600ABBF) <223.57 GB>		
				3 - (Ci) NTFS Primary		
	300.0 MB		100.0 MB	216.14 GB 223.18 GB		
Sort by	🕹 Backup Date Locat	ion <u>File Name</u>	Images that contain drive:	All Drives 🗸		
	E6D6E598B1B49634-0 Folder: F:\ Type: Full Date: 13/12/201613:00	J			Browse Image	<u>Restore Image</u> Other Actions
	Image ID: E6D6E598B1B49634	4				

Launch the 'Auto Restore' Dialog.

To launch this dialog **press the 'Ctrl + Shift + S'** together in the **last** page of the restore Wizard.

Restore Summary Auto Restore Image File: \\vault\archive\p Password protect this restore: OK
Image rile: \\vault \archive \p OK
Date: 12 October 2017 Time: 16:07 Image Type: Full Leave blank for no password Hele
Source Disk: GPT Disk 1 [630] Source Image File Geometry: 13054/63/512 Destination Disk: GPT Disk 3 [CBA, Verify: N Detra: Y SSD Trim: Y
Schedules O Match target disk on unique disk identifier. (Default) Image: None Image: Match target disk on disk number if unique id not found WARNING: Matching on disk number could lead to Image: Matching on disk number could lead to
Operation 1 of 4 overwriting the wrong disk if the rescue media loads disks Restore Partition: 1 - Recovery NTFS 311.4 MB /
Drive Letter None Start Sector: 2,048 Restore xml file location End Sector: 923,647 File 'macrium_restore.xml' wil be saved to the root of a local Partition Type: Primary drive.
Operation 2 of 4 Restore Partition: 2 - NO NAME FAT32 (LBA) 19.5 Choose drive: C: Drive Letter Start Sector: None 923,648 Choose a file name and location after clicking 'OK' Note: Automatic restore will only be active if the restore xml file is named 'macrium_restore.xml' and is located in a root folder:
Advanced Options Set the restore xml file as 'Read Only'.

This dialog will prompt for options to automatically restore the selected image file at a later time using the Windows PE rescue media. When **'OK'** is clicked a restore definition xml file will be saved.

Password protect this restore:	ОК
	UK
	Cancel
Leave blank for no password	Help
Source Image File	пер
Restore this image file. (Default)	
O Restore the latest matching image in the same folder	
Target Disk Selection	
Match target disk on unique disk identifier. (Default)	
O Match target disk on disk number if unique id not found	
Disk Number: 1 V (Note: Disks start at no. 1)	
WARNING: Matching on disk number could lead to overwriting the wrong disk if the rescue media loads disks in a different sequence.	
Restore xml file location	
File 'macrium_restore.xml' wil be saved to the root of a local drive.	
Choose drive: C: \checkmark	
Choose a file name and location after clicking 'OK'	
Note: Automatic restore will ony be active if the restore xml file is named 'macrium_restore.xml' and is located in a root folder.	

Option	Description
Password:	Enter a password to protect against accidental or unauthorised running of this restore.
Source Image File:	Restore this image file: This is the default operation. The image file selected will be used as the restore source. Restore the latest matching image in the same folder: The image folder will be searched for any image files that contain the partitions being restored. The latest backup date is chosen as the restore source.

Option	Description
Target Disk Selection:	 Match target disk on unique identifier: This is the default operation. The unique disk id is used to ensure that the correct disk is restored to. Match target disk on disk number if unique id is not found: This option will not fail the restore if the target unique disk id cannot be found.
	The default number is the current number of the target disk but you can choose an alternative disk number if it's known that the number of the disk is different in the restore environment.
	Use with caution as Windows PE can enumerate disks in a different sequence and cause the wrong disk to be restored to, however, this won't be an issue if your system has only one local disk.
Restore xml file location	Choose drive: Select from a list of local drives to save the restore definition file. The file will be saved in the root folder of the chosen drive and will be named 'macrium_restore.xml' Choose a file name and location: If selected, a file 'save As' dialog will be shown when the 'OK' button on this dialog is clicked. This enables saving the restore definition file to any file name and to any folder.
	Note: For auto restore to operate the restore definition must be named 'macrium_restore. xml' and be located on a root folder on a local drive. Saving to a different name and/or location enables you to prepare several restore definitions for later use.
	Set the restore xml file as 'Read Only': At the end of an auto restore the restore definition is automatically deleted. Setting the definition as 'Read Only' prevents deletion and enables re-running of the same restore each time Windows PE starts.

If the image file is located on a network share then you'll be prompted to enter the authentication details:

,	×
clogon credentials to enable Windows PE to rk share.	
server\username	
••••••	
OK Cancel	
	s logon credentials to enable Windows PE to rk share. server\username

How auto restore works

Local drives are scanned (from A to Z) for a restore definition **'macrium_restore.xml'** file in each drive root folder. Macrium Reflect will use the first restore definition found. This can be any local drive, including USB flash drives or optical media.

The restore definition contains instructions to locate the image file to restore from and the target disk to restore to.

It is imperative that the correct image file is restored to the intended disk. To ensure that there are no nasty surprises after restoring, Macrium Reflect will uses unique disk identifiers and sector offsets to match the source and target of the restore.

Locating the source image file folder

The default behaviour is to read the image file specified in the **<file_name>** xml node. However, It's possible that Windows PE has assigned different drive letters to local drives, in this case the following procedure is followed.

All local drives are scanned for a 'Marker' file that is created when the restore definition is saved. This
Marker file has the following file name format: 'Macrium_restore_{GUID}.txt', where the GUID (Globally
Unique Identifier) is retrieved from the '<search node>' in the restore xml.

```
<search guid="{0D6B46C4-A5ED-4578-A9C0-5539B0AB94A0}">Y</search>
<file_name>D:\backups\auto_restore\4E855CB463979BC9-01-01.mrimg</file_name>
```

If the marker file isn't found in the **path** specified in the **<file_name>** xml node then all local drives are searched for the marker file in the same sub folder. If the marker file is found then that folder will be searched for the image file to restore.

 If no Marker file is found or is not specified in the xml then all local drive are scanned (from A to Z) to locate any images in the folder specified by the '<file_name>' xml node that contain images to restore.

Note: If the image file is located on a network path then no searching is required. Network paths are unambiguous and absolute.

Locating the correct source image file

The default behaviour is to read the specified image file in the folder in the '**<image_file>**' xml node. However, if **'Restore the latest matching image in the same folder'** is selected in the Auto Restore dialog then the following procedure is followed:

Source Image File

- Restore this image file. (Default)
- Restore the latest matching image in the same folder

xml attribute find_recent="Y" is added to the <file_name> xml node.

```
<file_name find_recent="Y">D:\backups\auto_restore\4E855CB463979BC9-01-01.mrimg<
/file_name>
```

All **matching** backup sets are loaded in the image file folder and the most recent backup date is selected and used for the restore. A **matching** backup set has the same disk and partitions specified in the restore definition file.

```
<restore_definition>
    <properties>
        <source_disk id="3A177438-02D6-4DB6-9FCC-184F81DEE52A">1</source_disk>
        </properties>
        <operation id="1">
        <type>copy</type>
        <copy>
            <source>
                <partition start_sector="2048" end_sector="616447">1</partition>
               </source>
               </source>
               </operation>
</restore_definition>
```

A matching image file contains the same disk identifier and partition start and end sectors as well as partition number.

e.g, In this case **Disk identifier 3A177438-02D6-4DB6-9FCC-184F81DEE52A** and **partition number 1** with **start sector 2048** and **end sector 616447**

Locating the restore target disk

The default behaviour is to select the target disk by matching the unique disk identifier specified in the **<target_disk>** xml node. However, if **'Match target disk number if unique id not found**' is selected in the Auto Restore dialog then the following procedure is followed:

Target Disk Selection
 Match target disk on unique disk identifier. (Default)
 Match target disk on disk number if unique id not found
 WARNING: Matching on disk number could lead to overwriting the wrong disk if the rescue media loads disks

in a different sequence.

xml attribute number_fallback="Y" is added to the <target_disk> xml node.

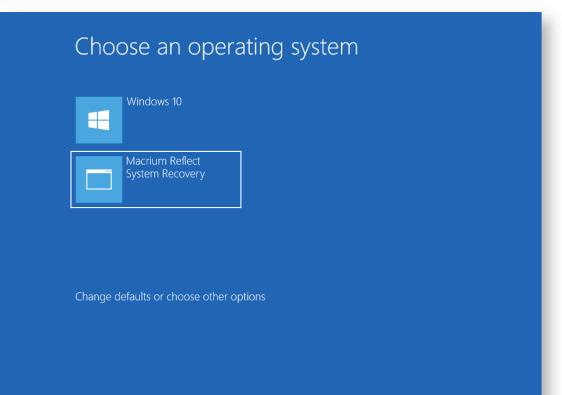
<target_disk id="3A177438-02D6-4DB6-9FCC-184F81DEE52A" number_fallback="Y">1< /target_disk>

The restore target disk is matched on disk number if a disk cannot be matched using the unique identifier.

Please use this option with caution as Windows PE may load disks in a different sequence to regular Windows. This may cause the wrong disk to be restored to.

That's it! Now whenever you take the Macrium System Recovery boot menu option your system will be automatically restored using the image created above.

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Logging file changes for Incremental and Differential Images

Your Windows operating system and installed applications can create many changes 'under the hood' without you knowing about it. This can cause Incremental or Differential images to be substantially larger than expected. This article describes a feature in Macrium Reflect to log files that have been changed in each Incremental or Differential image.

Note: In Macrium Reflect v7, this functionality is only available if Changed Block tracker (CBT) s disabled. Take 'Other Tasks' > 'Edit Defaults' > 'Advanced' > 'Advanced Incrementals' and un-check 'Enable Changed Block Tracker'

What are Incremental and Differential Images?

Incremental images will only backup data blocks that have changed since the last Image or, in the case of Differential, Full image in the backup set. Images are created at File System cluster level and each block is MD5 hashed and compared. Blocks with the same hash signature aren't included in the Differential or Incremental image file. A data block is usually 16 clusters in length.

See also: How backup sets are created and maintained

How to show changed files

If the following registry entry is set, Reflect will perform a reverse 'look-up' to identify the file for each cluster that is backed up.

О т	his may increase the time taken to backup and should only be used	for diagnosis.
Key:	HKEY_LOCAL_MACHINE\SOFTWARE\Macrium\Reflect\Settings	
Name:	LogIncrementalChanges	
Type:	DWORD	
Value:	1	

Once the registry entry is set, perform another Differential or Incremental Image and, once complete, delete the registry entry created above. Then use Windows Explorer to navigate to: 'C:\ProgramData\Macrium\Reflect' in Windows Explorer and sort by Modified Date:

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Burn New folder			
Name	Date modified	Туре	Size
6A68E296D85FDA2F-01-01.html	06/11/2016 13:10	Chrome HTML Do	25 KE
6A68E296D85FDA2F-01-013.inc.log	06/11/2016 13:10	Text Document	2 KI
6A68E296D85FDA2F-01-012.inc.log	06/11/2016 13:10	Text Document	1 KI
6A68E296D85FDA2F-01-011.inc.log	06/11/2016 13:10	Text Document	2 KI
6A68E296D85FDA2F-01-01.inc.log	06/11/2016 13:10	Text Document	1 KI
6A68E296D85FDA2F-01-01.vsslog	06/11/2016 13:10	VSSLOG File	9 KI
XMLFiles.dat	06/11/2016 13:09	DAT File	12 KI
15ABAE3CC06E5911-00-00.html	05/11/2016 16:53	Chrome HTML Do	15 KI
15ABAE3CC06E5911-00-00.vsslog	05/11/2016 14:51	VSSLOG File	5 KI
EA9CF14400168C6F-00-00.html	05/11/2016 14:49	Chrome HTML Do	13 KI
EA9CF14400168C6F-00-00.vsslog	05/11/2016 14:47	VSSLOG File	5 KI
09F7173C77E5BFC5-00-00.html	05/11/2016 14:29	Chrome HTML Do	13 KI
09F7173C77E5BFC5-00-00.vsslog	05/11/2016 14:29	VSSLOG File	5 KE

In addition to the normal '.html' and '.vsslog' files you will also see files with '.inc.log' at the end. There will be one for each NTFS partition in the Differential or Incremental.

The first file, **{IMAGEID}-XX-YY.inc.log**, is the log for the first NTFS partition, the next file is , **{IMAGEID}-XX-YY1. inc.log** and,

in the above example, {IMAGEID}-XX-YY3.inc.log is the last last NTFS partition in the image.

Example log output

```
MFT Record - 32 - .\$Extend\$RmMetadata\$TxfLog\$TxfLog.blf
MFT Record - 34 - .
MFT Record - 38 - .\Windows\Prefetch\AgGlGlobalHistory.db
MFT Record - 39 - .\Windows\Prefetch\AgGlFaultHistory.db
MFT Record - 43 - .\Windows\Prefetch\AgRobust.db
MFT Record - 45 - .\Windows\Prefetch\AgGlFgAppHistory.db
MFT Record - 1236 - .\Windows\SoftwareDistribution\SelfUpdate\WuPackages.xml
MFT Record - 1333 - .\Program Files (x86)\TeamViewer\Version8\TeamViewer8_Logfile.
loq
MFT Record - 1353 - .\ProgramData\Microsoft\RAC\PublishedData\RacWmiDatabase.sdf
MFT Record - 1592 - .\Users\Dev\AppData\Local\Google\Chrome\User
Data\Default\Current Session
MFT Record - 1783 - .\Program Files\Microsoft SQL Server\MSSQL10.
SQLEXPRESS\MSSQL\Log\ERRORLOG
MFT Record - 13900 - .\Windows\System32\winevt\Logs\Microsoft-Windows-
PrintService%4Admin.evtx
MFT Record - 15637 - .\Windows\WindowsUpdate.log
MFT Record - 15741 - ./Windows/System32/winevt/Logs/Microsoft-Windows-Windows
Defender%40perational.evtx
```

```
MFT Record - 15743 - .\Windows\System32\winevt\Logs\Microsoft-Windows-Windows
Defender%4WHC.evtx
MFT Record - 15755 - .\Users\Dev\AppData\Local\Google\Chrome\User
Data\Default\IndexedDB\http_localhost_2904.indexeddb.leveldb\LOG
MFT Record - 15868 - .\Windows\bootstat.dat
MFT Record - 21541 - .\Windows\security\database\secedit.sdb
MFT Record - 21544 - .\Windows\ServiceProfiles\LocalService\NTUSER.DAT
MFT Record - 21565 - .\Windows\ServiceProfiles\NetworkService\NTUSER.DAT
MFT Record - 22562 - .
\Windows\ServiceProfiles\NetworkService\AppData\Local\Temp\MpCmdRun.log
MFT Record - 22649 - .\Windows\System32\7B296FB0-376B-497e-B012-9C450E1B7327-5P-1.
C7483456-A289-439d-8115-601632D005A0
MFT Record - 22650 - .\Windows\System32\7B296FB0-376B-497e-B012-9C450E1B7327-5P-0.
C7483456-A289-439d-8115-601632D005A0
And so on.....
```

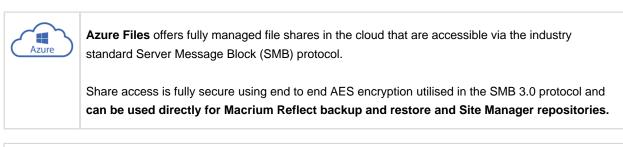
Each log file lists the MFT record and full path name to the file(s) that have changed.

There will be many MFT metadata files (prefixed by '\$') that are not visible to Windows Explorer or any other windows utilities, but these are always included (if changed) in Diff/Inc image files.

Please note that this doesn't mean that all clusters in the listed files have changed it means that the file clusters are scanned and differences have been detected.

(ī)

Backup to the cloud with Azure File Shares



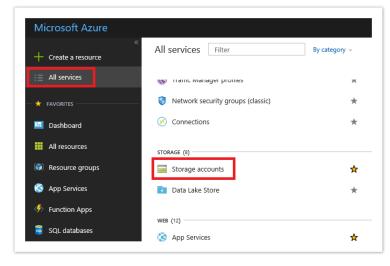
Note: SMB 3.0 is available with Windows 8.1 or later and Windows Server 2012or later operating systems. Earlier versions of Windows cannot mount Azure shares.

Port 445 (TCP outbound) must be open to allow communication with Azure file shares. If you have problems **please check that your ISP isn't blocking this port**.

How to setup an Azure File Share

It's easy and takes just 5 minutes! If you don't currently have an Azure account then it's easy to set one up. There's a Free tier and currently a free credit for full access when you first enrol. Please see here for more information: https://azure.microsoft.com

In the Azure Dashboard select 'All Services' then scroll to and select 'Storage Accounts' in the 'Storage' group:



Click the 'Add' button to reveal the share creation options.

Storage accounts	« 🖈 🗙	Create storage account
Add EE Edit columns	••• More	The cost of your storage account depends on the usage and the options you choose below. Learn more
Filter by name		* Name
NAME 🔍		macriumofficebackups 🗸
		.core.windows.ne
ab4956		Deployment model 🕈 Resource manager Classic
		Account kind 0
		Storage (classic)
		* Location
		West Europe 🗸
		Replication 0
		Read-access geo-redundant storage (RA 🗸
		Performance 0
		Standard Premium
		* Subscription
		Visual Studio Professional 🗸
		* Resource group
		Create new Use existing
		backups 🗸
		✓ Pin to dashboard
		Create Automation options

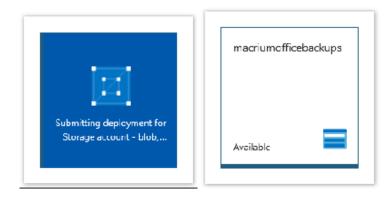
You must provide a **unique name**, across all Azure shares, for your share URL. I've used 'macriumofficebackups' for this example.

Select the 'Classic' deployment model to keep things simple.

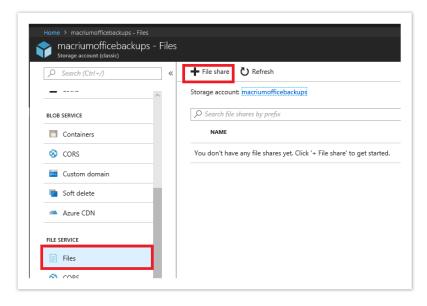
Create a new and appropriately named 'Resource Group'. I've used 'backups'.

Select 'Pin to dashboard' for easy access.

Finally, **click 'Create'** and you'll see the following activity widget on the dashboard followed by a new storage tile after a few seconds:



Click the new storage tile, select 'Files' in the storage account selections pane that opens, then click 'Add File Share'



Give your share a meaningful name and set the size. The max is 5TB / 5120 GB:

New file sha	re	
* Name		
share1		
Quota		
5120		•
		G
	Cancel	

Click the '...' menu on the new share and select 'Connect'

NAME	MODIFIED	QUOTA
✓ share1	Properties	:: ···
	Connect	-0-
	Quota	1
	Edit metadata	0
	Access policy	P
	View snapshots	Ð
	Delete share	Ξ.

You'll be presented with several scripts and command line options to connect to your new share from anywhere in the world

Connect X
Connecting from Windows
Drive letter Z
To connect to this file share from a Windows computer, run these PowerShell commands:
\$acctKey = ConvertTo-SecureString - Image: String "4FkHLDrmoaos2lYkwnLlR8Ls+6nVVATPlaMoCEWa1j6 GfvnHMDfAaVmFDA4lQkCzxtn4YPObl2Lc+IfXWZPjQw==" - AsPlainText -Force \$credential = New-Object
Alternatively, run this command if the key doesn't begin with a forward slash:
net use Z: \\macriumofficebackups.file.core.windows.net\share1 /u: <u>AZURE\</u> macriumofficebackups 4FkHLDrmoaos2IYkwnLIR8Ls+6nVVATPIaMoCEWa1j6GfvnHMDf AaVmFDA4IQkCzxtn4YPOb12Lc+IfXWZPiQw==
When connecting from a computer from outside Azure, remember to open outbound TCP port 445 in your local network. Some Internet service providers may block port 445. Check with your service provider for details.
Learn more about Azure File Storage with Windows
Connecting from Linux
To connect to this file share from a Linux computer, run this command:
sudo mount -t cifs //macriumofficebackups.file.core.windows.net/share1 [mount point] -o vers=3.0,username=macriumofficebackups,password=4FkHLDr moaos2lYkwnLIR8Ls+6nVVATPIaMoCEWa1j6GfvnHMDfAaVmFD A4IQkCzxtn4YPObI2Lc+IfXWZPjQw==,dir_mode=0777,file_mod e=0777,sec=ntImssp
The Linux SMB3 client doesn't support share level encryption yet, so mounting a file share in Linux only works from virtual machines running in the same Azure region as the file share. Learn more about Azure File Storage with Linux

We just need to select and copy the share path, username and password text from 'net use' command:

Your details will obviously be different, but for this example:

Share path:	\\macriumofficebackups.file.core.windows.net\share1
User:	AZURE\macriumofficebackups
Password:	4FkHLDrmoaos2IYkwnLIR8Ls+6nVVATPIaMoCEWa1j6GfvnHMDfAaVmFDA4IQkCzxtn4YPObl2Lc+IfX

-

U Creating the share is now complete and you have enough information to connect to Azure for backup and restore from Macrium Reflect and for creating Site Manager repositories.

More details on other setup methods and options can be found here: https://docs.microsoft.com/en-us/azure/storage /files/storage-how-to-create-file-share

How to connect to the Azure Share in Macrium Reflect

Connecting is simple! Once you have the share details copied from the steps above you can begin backing up to the cloud in exactly the same way as you would any local network share.

Take the 'Other Tasks' > 'Edit Defaults' > 'Network' menu option in Reflect. Click 'Add' and enter the Azure share user name and password then click OK.

etwork Location	Details	
pecify credentials	for a specific network path using the fields below	Add
\\server\share	\macriumofficebackups.file.core.windows.net\sha	Edit
		Delete
Username	AZURE\macriumofficebackups	
Password	•••••	•••
	OK Cancel	

You can now **backup directly to the cloud by entering the Azure share path** plus any sub folder if you want to:

In this example we're imaging directly to: \\macriumofficebackups.file.core.windows. net\share1\july_backups

	ige							
ource	, Select S	ource Drive(s)) and Ir	nage Destinatior	r			
	MBR Disk 1 [12A23975] - Samsung	g SSD 850	PRO 512GB EXM04B6Q	<476.94 GB>			
\checkmark	1 - Sy NTFS Acti	stem Reserved (H:) ve		2 - (C:) NTF5 Primary 429.56 GB		<i>3</i> °	3 - (None) NTFS Primary 382.6 MB	
	500.0 MB		✓	475,99 GB			465.0 MB	
	30010 MD			4/5.77 GB			10510 110	
	lected:	95.1 MB		4/3/3/00		_		
Destinat	lected: tion	\\macriumoffice			share1\jj.jhy_backups v]		
Destinat Folde	lected: tion				share1\Jµy_backups ∨]		
· ·	lected: tion er DVD Burner	\macriumoffice Alternative loc	<u>cations</u>		~]		
Destinat Folde	lected: tion er	\\macriumoffice Alternative loc Use the Imag {IMAGEID}	<u>cations</u> ge ID as ti	file.core.windows.net	~]		

Sucess!

Destin	nation: Backup Type: File Name:	Full \\macriumofficebackups file.core.windows.net\share1\july_backups\7E78D60A552280C9-00-00.mrimg Attempting to connect to: "\\macriumofficebackups file.core.windows.net\share1\july_backups"	
Opera	tion 1 of 1		
	Hard Disk:	1	
	Drive Letter:	H	
	File System:	NTFS Sector Descent	- 1
	Label: Size:	System Reserved 500.0 MB	
	Free:	404.9 MB	
	Used:	95.1 MB	
	Initializing Destination Drive: Free space threshold: Creating Volume Snap		
Saving	Destination Drive: Free space threshold:	Delete oldest backup sets when free space is less than 5.00 GB shot - Please Wait Reserved (H:)	
Saving	Destination Drive: Free space threshold: Creating Volume Snap g Partition - System F	Delete oldest backup sets when free space is less than 5.00 GB shot - Please Wait Reserved (H:)	
Saving	Destination Drive: Free space threshold: Creating Volume Snap g Partition - System F Reading File System B	Delete oldest backup sets when free space is less than 5.00 GB shot - Please Wait Reserved (H:)	
	Destination Drive: Free space threshold: Creating Volume Snap g Partition - System F Reading File System B Saving Partition Saving Index	Delete oldest backup sets when free space is less than 5.00 GB shot - Please Wait Reserved (H:)	,
Overall I	Destination Drive: Free space threshold: Creating Volume Snap g Partition - System F Reading File System B Saving Partition Saving Index	Delete oldest backup sets when free space is less than 5.00 GB shot - Please Wait Reserved (H:) itmap	conds
Overall I	Destination Drive: Free space threshold: Creating Volume Snap g Partition - System F Reading File System B Saving Partition Saving Index Progress: 91%	Delete oldest backup sets when free space is less than 5.00 GB shot - Please Wait Reserved (H:) itmap Transfer Rate: 55.9 Mb/s Time remaining: N/A	conds

Note: When your login credentials are saved in the Reflect defaults you can even perform an unattended system restore and the rescue media will automatically connect to Azure for you.

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How to add an auto restore xml file to the rescue media

If you've purchased a Macrium Reflect Deployment Kit License then to assist with deploying images it may be desirable to automate the restore of a 'Golden' Image by adding the Macrium Reflect auto restore xml file directly to the Windows Image (WIM) file used by the rescue media or by a PXE deployment server.

Create your auto restore XML using your 'Golden' image by **simulating a restore and pressing 'Ctrl' + 'Shift' + 'S'** on the **final restore wizard page** as describe below:

Note: The steps below to create the 'Golden' Image and 'macrium_restore.xml' can be run in Windows PE if required.

Ensure that the Image file is located on an accessible network share if you intend to deploy using PXE

Click here to show the Auto Restore dialog ...

To launch this dialog press the 'Ctrl + Shift + S' together in the last page of the restore Wizard.

Ctrl + S	hift + S			
Restore Summary		Auto Restore	×	^
Image File: Image ID: Date: Time: Image Type:	\\vault\archive\p 4149F3EAE3F3C: 12 October 2017 16:07 Full	Password protect this restore:	OK Cancel Helo	
Source Disk: Geometry: Destination Disk: Verify: Delta:	GPT Disk 1 [63D6 13054\63\512 GPT Disk 3 [CBA N Y	Source Image File O Restore this image file. (Default) Restore the latest matching image in the same folder Target Disk Selection	>	
SSD Trim: Schedules	Y None	Match target disk on unique disk identifier. (Default) Match target disk on disk number if unique id not found		
Operation 1 of 4 Restore Partition:	1 - Recovery NTFS 311.4 MB /	WARNING: Matching on disk number could lead to overwriting the wrong disk if the rescue media loads disks in a different sequence.		
Drive Letter Start Sector: End Sector: Partition Type:	None 2,048 923,647 Primary	Restore xml file location File 'macrium_restore.xml' wil be saved to the root of a local drive.		
Operation 2 of 4 Restore Partition: Drive Letter Start Sector:	2 - NO NAME FAT32 (LBA) 19.5 None 923,648	Choose drive: C: Choose a file name and location after clicking 'OK' Note: Automatic restore will only be active if the restore xml file is named 'macrium_restore.xml' and is located in a root folder.		Ŷ
Advanced Options		Set the restore xml file as 'Read Only'.	Finisl	h

This dialog will prompt for options to automatically restore the selected image file at a later time using the Windows PE rescue media. When **'OK'** is clicked a restore definition xml file will be saved.

Password protect this restore:	ОК
	UK
	Cancel
Leave blank for no password	Help
Source Image File	nep
Restore this image file. (Default)	
Restore the latest matching image in the same folder	
Target Disk Selection	
Match target disk on unique disk identifier. (Default)	
\bigcirc Match target disk on disk number if unique id not found	
Disk Number: 1 V (Note: Disks start at no. 1)	
WARNING: Matching on disk number could lead to	
overwriting the wrong disk if the rescue media loads disks in a different sequence.	
Restore xml file location	
File 'macrium_restore.xml' wil be saved to the root of a local drive.	
Choose drive: C: \checkmark	
Choose a file name and location after clicking 'OK'	
Note: Automatic restore will ony be active if the restore xml file is named 'macrium_restore.xml' and is located in a root folder.	

Option	Description
Password:	Enter a password to protect against accidental or unauthorised running of this restore.
Source Image File:	Restore this image file: This is the default operation. The image file selected will be used as the restore source. Restore the latest matching image in the same folder: The image folder will be searched for any image files that contain the partitions being restored. The latest backup date is chosen as the restore source.

Option	Description		
Target Disk Selection:	 Match target disk on unique identifier: This is the default operation. The unique disk id is used to ensure that the correct disk is restored to. Match target disk on disk number if unique id is not found: This option will not fail the restore if the target unique disk id cannot be found. The default number is the current number of the target disk but you can choose an alternative disk number if it's known that the number of the disk is different in the restore environment. Use with caution as Windows PE can enumerate disks in a different sequence and cause the wrong disk to be restored to, however, this won't be an issue if your system has only one local disk. 		
Restore xml file location	Choose drive: Select from a list of local drives to save the restore definition file. The file will be saved in the root folder of the chosen drive and will be named 'macrium_restore.xml' Choose a file name and location: If selected, a file 'save As' dialog will be shown when the 'OK' button on this dialog is clicked. This enables saving the restore definition file to any file name and to any folder.		
	Note: For auto restore to operate the restore definition must be named 'macrium_restore. xml' and be located on a root folder on a local drive. Saving to a different name and/or location enables you to prepare several restore definitions for later use.		
	Set the restore xml file as 'Read Only': At the end of an auto restore the restore definition is automatically deleted. Setting the definition as 'Read Only' prevents deletion and enables re-running of the same restore each time Windows PE starts.		

If the image file is located on a network share then you'll be prompted to enter the authentication details:

Windows Security	×		
Enter the network access the Netwo	logon credentials to enable Windows PE to rk share.		
User Name	server\username		
Password	••••••		
	OK Cancel		

How auto restore works

Local drives are scanned (from A to Z) for a restore definition **'macrium_restore.xml'** file in each drive root folder. Macrium Reflect will use the first restore definition found. This can be any local drive, including USB flash drives or optical media.

The restore definition contains instructions to locate the image file to restore from and the target disk to restore to.

It is imperative that the correct image file is restored to the intended disk. To ensure that there are no nasty surprises after restoring, Macrium Reflect will uses unique disk identifiers and sector offsets to match the source and target of the restore.

Locating the source image file folder

The default behaviour is to read the image file specified in the **<file_name>** xml node. However, It's possible that Windows PE has assigned different drive letters to local drives, in this case the following procedure is followed.

All local drives are scanned for a 'Marker' file that is created when the restore definition is saved. This
Marker file has the following file name format: 'Macrium_restore_{GUID}.txt', where the GUID (Globally
Unique Identifier) is retrieved from the '<search node>' in the restore xml.

```
<search guid="{0D6B46C4-A5ED-4578-A9C0-5539B0AB94A0}">Y</search>
<file_name>D:\backups\auto_restore\4E855CB463979BC9-01-01.mrimg</file_name>
```

If the marker file isn't found in the **path** specified in the **<file_name>** xml node then all local drives are searched for the marker file in the same sub folder. If the marker file is found then that folder will be searched for the image file to restore.

 If no Marker file is found or is not specified in the xml then all local drive are scanned (from A to Z) to locate any images in the folder specified by the '<file_name>' xml node that contain images to restore.

Note: If the image file is located on a network path then no searching is required. Network paths are unambiguous and absolute.

Locating the correct source image file

The default behaviour is to read the specified image file in the folder in the '**<image_file>**' xml node. However, if **'Restore the latest matching image in the same folder'** is selected in the Auto Restore dialog then the following procedure is followed:

-Source Image File

0

Restore this image file. (Default)
 Restore the latest matching image in the same folder

xml attribute find_recent="Y" is added to the <file_name> xml node.

```
<file_name find_recent="Y">D:\backups\auto_restore\4E855CB463979BC9-01-01.mrimg<
/file_name>
```

All **matching** backup sets are loaded in the image file folder and the most recent backup date is selected and used for the restore. A **matching** backup set has the same disk and partitions specified in the restore definition file.

```
<restore_definition>

<properties>

<source_disk id="3A177438-02D6-4DB6-9FCC-184F81DEE52A">1</source_disk>

</properties>

<operation id="1">

<type>copy</type>

<copy>

<source>

<partition start_sector="2048" end_sector="616447">1</partition>

</source>

</copy>

</operation>

</restore_definition>
```

A matching image file contains the same disk identifier and partition start and end sectors as well as partition number.

e.g, In this case Disk identifier 3A177438-02D6-4DB6-9FCC-184F81DEE52A and partition number 1 with start sector 2048 and end sector 616447

Locating the restore target disk

The default behaviour is to select the target disk by matching the unique disk identifier specified in the **<target_disk>** xml node. However, if **'Match target disk number if unique id not found**' is selected in the Auto Restore dialog then the following procedure is followed:

Target Disk Selection
 Match target disk on unique disk identifier. (Default)
 Match target disk on disk number if unique id not found
 WARNING: Matching on disk number could lead to overwriting the wrong disk if the rescue media loads disks in a different sequence.

xml attribute number_fallback="Y" is added to the <target_disk> xml node.

```
<target_disk id="3A177438-02D6-4DB6-9FCC-184F81DEE52A" number_fallback="Y">1<
/target_disk>
```

The restore target disk is matched on disk number if a disk cannot be matched using the unique identifier.

Please use this option with caution as Windows PE may load disks in a different sequence to regular Windows. This may cause the wrong disk to be restored to.

Next we need to mount the Windows Image (WIM) file and copy the 'macrium_restore.xml' file to the root of the image.

- 1. From within Windows (not PE), **create an empty folder** anywhere on your C: drive that will be used to mount the WIM file. In this example we'll use 'C:\Boot\Mount'.
- 2. Open a command prompt with elevated privileges and type the following command:

DISM /Mount-image /imagefile:C:\boot\macrium\WA10KFiles\media\sources\boot. wim /index:1 /MountDir:"c:\boot\mount"

Note: The location of the WIM in this case is the default location for the Windows PE 10 WIM file. Please update as necessary in your own command.

3. Open the mounted folder in Windows Explorer and copy the 'macrium_restore.xml' file to the root.

	Name	Date modified	Туре	Size
s	Name	Date modified	туре	SIZE
*	📙 boot	14/06/2018 12:02	File folder	
	Drivers	14/06/2018 12:02	File folder	
s 🖈		14/06/2018 12:02	File folder	
s ≯*	Program Files (x86)	29/09/2017 14:38	File folder	
*	ProgramData	29/09/2017 14:38	File folder	
(C:)	Users	29/09/2017 14:38	File folder	
	Windows	29/09/2017 14:39	File folder	

Note: After copying the file close Windows Explorer so that there are no locks on the open folder.

4. Type the following commands in the command prompt:

```
Dism /Unmount-image /MountDir:"c:\boot\mount" /Commit
Dism /Cleanup-Wim
```

5. Once complete **the WIM file can be copied** to a deployment server or USB stick and used to initiate an automatic restore.