

Understanding and resolving backup and restore performance issues

Imaging and restoring is necessarily a time consuming process due to the significant volumes of data involved. During the development of Macrium Reflect, we have focused on performance. However, the data rate will always be limited by the slowest link in the chain. For a modern PC, this is typically the source or target storage media / hard disks or the communication link. However, it can also be faulty hardware, leads or flawed/out of date drivers.

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Typical data rates for a correctly functioning system

During the imaging process, the data transfer rate is specified in Mbits/sec. The transfer rate will always be lower than the link speed, sometimes significantly. This is due to communication overhead, contention (i.e. shared use of the link) and CPU bottlenecks.

For backups to a USB 2 and firewire connected external hard disk, you can expect ~ 200Mbits/sec (1GB per minute).

For backups to a USB 3, you can expect somewhat more than 200Mbits/sec. It will typically be limited by the performance of the hard disk or firmware.

It is difficult to estimate the expected rate for backups over 100Mbit/1Gbit as it will depend on how saturated the network is and the performance of the network attached storage.

Note that the data rate might vary considerably due to variable compression rates, link contention etc.

If you are getting very much less than these rates, then it is indicative of a issue.

Note that setting the 'intelligent sector copy' and differential and incremental imaging will greatly improve backup times.

Potential causes of poor performance

Vista Compatibility (Windows7 / Server2008)

This is never set on install, but some third party tools will set it. If set, it will have a significant impact on performance, progressively slowing down the imaging.

To check, you will find it in the compatibility tab of the properties page for the shortcut / start menu item for the reflect application. Ensure the compatibility option is unset.

You can download a utility to automatically remove application compatibility settings here: <http://updates.macrium.com/reflect/utilities/ReflectCompatFlags.exe>

This condition is tested for and automatically corrected from builds 5732.

Antivirus software

AV software typically will scan new or modified files for viruses. This can radically slow down the imaging process.

Unfortunately, it is not always possible to turn off AV software or disabling it has no effect on the scanning behavior. Some customers have reported that they had to uninstall their AV software completely, before they saw a performance improvement.

Resource contention

Is your machine busy during the imaging period, with other tasks? The CPU and hard disks are shared resources, so other processes will necessarily slow the imaging process. Furthermore, the snapshot process is dynamic; to efficiently maintain a point in time view of the file system, as sectors are modified, a copy is taken of the original data. Hence frequent write activities on the disk being imaged can have a very significant additional performance cost.

Networks and shared network attached storage devices can also form bottlenecks due to the effects of shared use.

Interface issues

- *Are you using eSATA? Our experience with eSATA has been poor and we have found USB 3 to be faster (not just with Macrium Reflect) in many cases so you might want to try changing the connection of your external drive*
- *Cable faults : sometimes a faulty or miss-connected cable will appear to work but with a hidden high error rate, resulting in a unexpected performance bottleneck. Many customers have reported that replacing cables has lead to a performance improvement.*
- *Check any USB hubs. If you are using a USB 1 hub, the whole link will run at that speed even if your interface and disk is USB 2 / 3.*

Drivers

Drivers, particularly for RAID devices and USB 3 have been found to cause performance issues. Typically, updating to the latest version will resolve the issue.

Virtual Machines

If your system is running as a virtual machine, it is worth checking that, if available, you have configured "para-virtual" hardware and are using the matching drivers. These are, by design, much more efficient by avoiding the emulation overhead.

RAID systems

It has been reported by several users that disabling file write caching in their RAID system improves performance.

Out of date Reflect install

Confirm that you are running the latest revision of Reflect. Recent revisions have included enhancements that will improve performance for some users. Also, backup performance reporting is now included (see below).

Techniques to isolate the source of the problem

To confirm that the issue is not with Macrium Reflect, time how long it takes to copy a large file (at least 1GB) from the source disk to the intended image file location. You may also want to try a different backup location to determine if the bottleneck is reading drive 'C' or writing to the backup drive.

If you have a Windows PE based rescue CD, try booting that and then doing a file copy test with PE explorer and take an image of the same disk to the same target disk.

If the transfer rate is still slow with the Windows PE test, then an issue with your hardware is indicated. If the transfer rate is good with Windows PE, then it points to either AV software, faulty drivers or a machine heavily loaded with background tasks.

Backup I/O performance monitoring

As of release v5.1.5732, the i/o performance is reported at the end of the log file for a backup. This will give you some further insight into what may be the bottleneck in the case of poor backup performance. As previously noted, these figures will always be less than the SATA/ethernet theoretical data rates.

1. *If the read performance is significantly less than the write speed, the bottleneck is the source disk, interface etc.*

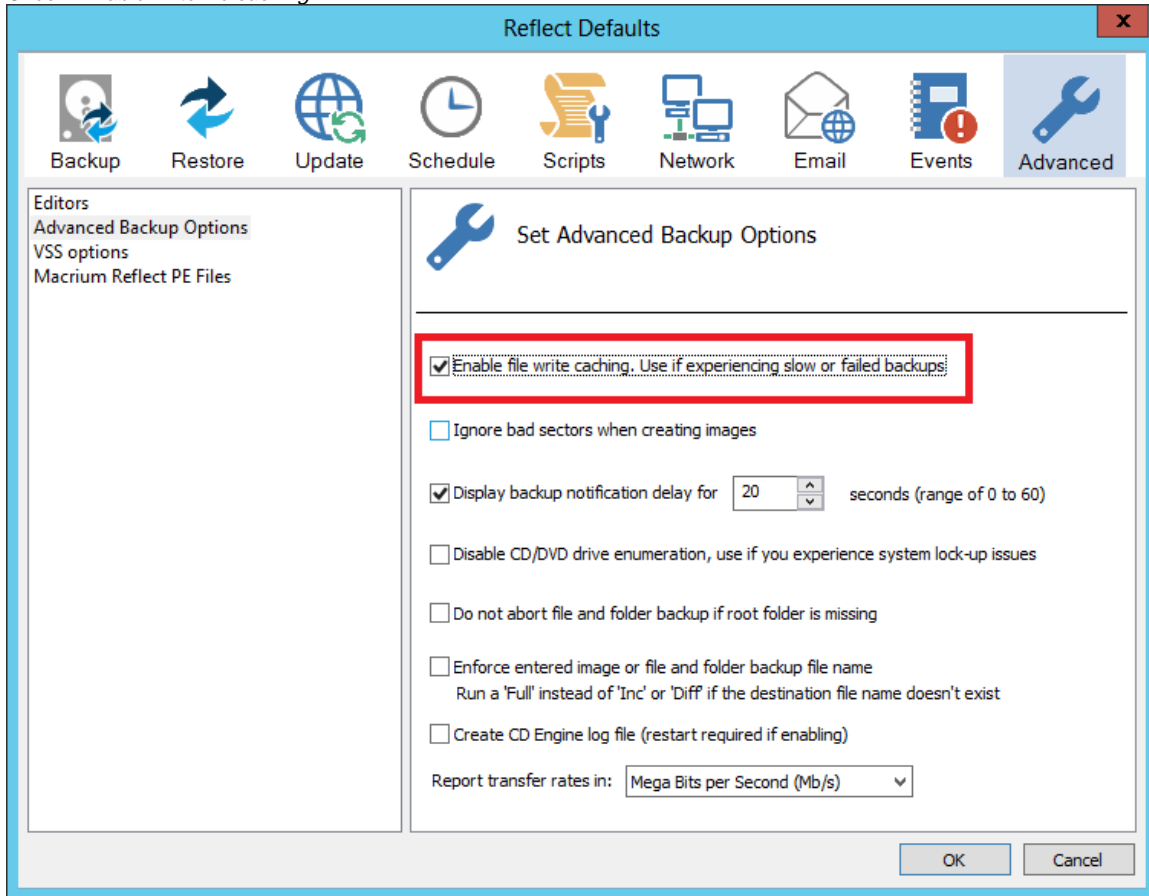
2. If the write performance is significantly less than the read performance, then the bottleneck is with storing the image files.

Tuning options

Direct disk writing

If you still haven't identified the source of your issue, then it might be due to a flawed driver that performs poorly with direct disk writing. You can disable it as follows.

From the other tasks menu, pick edit defaults, click on the Advanced icon and pick "Advanced Backup options" from the left. Check "Enable write file caching".



Write buffer size

In very rare cases it could be a problem with the write buffer size. This is basically the size of each 'chunk' of data that's written (or sent over the network). You should never normally need to alter this, and doing so will normally reduce your imaging performance. Proceed with great care.

The default size is 4MB but you can modify it by creating the following registry key:

```
Key: HKEY_CURRENT_USER\Software\Macrium\Reflect\VSS
Name: WriteBuffer
Type: DWORD
Value: 4096
```

The value is in KB so 4096 is 4MB. Try it to a lower value to see what impact that has on the network speed. If the impact is negligible or negative, restore the original value.

USB Cache Settings

Enable caching on the external USB drive which may improve backup performance.

Please note, if you use this option you must use the Safely Remove Hardware option in Windows before unplugging the external USB drive to avoid possible file system corruption.

1. *Open Device Manager.*
2. *Right click the external USB drive (the drive should be located under 'Disk Drives')*
3. *Select Properties.*
4. *Click the Policies tab.*
5. *Select 'Better Performance'*
6. *Click Ok.*

Drive Power Settings

Hard drives can possibly be put into sleep mode by system settings. To change power options for drives:

1. *Open Control Panel > Power Options (this can be found under System & Security for Windows Vista onward).*
 2. *Select 'Change plan settings' for whichever plan you currently have configured (a link on the right hand side of the selected power option).*
 3. *Click 'Change advanced power settings'.*
 4. *Select 'Hard Disk' > 'Turn off hard disk after'. Set a value of 1 hour or more. Having this value too low (less than a minute for example) could cause a hard disk to go into low power/suspend mode during a backup. This will adversely affect backup performance and the lifetime of the disk.*
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