



ioMemory VSL 3.2.3
RELEASE NOTES

FEBRUARY 5, 2013



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ioMemory VSL 3.2.3 Release Notes

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Part Number: D0001587-033_4

Published: February 5, 2013



Introduction

This document describes details about the 3.2.3 ioMemory VSL software release:

- System requirements, including supported operating systems and hardware requirements.
- Supported Fusion-io ioMemory devices.
- Upgrade Notes, including the firmware version required for this release.
- Changes since the last generally available release.
- Issues that may arise using this release.



Throughout this document, when you see a reference to an **ioMemory device**, you may substitute your particular device(s), such as an ioDrive2 device or each of the two ioMemory devices of an ioDrive Duo device.



Products with Multiple Devices

Some products, such as an ioDrive Duo device, are actually comprised of **multiple ioMemory devices**. If your product consists of multiple ioMemory devices, you will manage each ioMemory device as an independent device.

For example, if you have an ioDrive Duo device, you can independently attach, detach, and/or format each of the two ioMemory devices. Each of the two devices will be presented as an individual device to your system.



System Requirements

Hardware Requirements

 For complete hardware requirements and installation instructions, please refer to the *ioMemory Hardware Installation Guide*.

Sufficient System Memory (RAM)

The amount of RAM the ioMemory VSL software requires varies according to the average block size written to the device. Using the average block size table below, you can estimate the amount of system memory needed.

Sector Sizes
Depending on your operating system, you can reduce worst-case memory use by formatting your ioMemory device with a 4KB sector size and thereby force the average written block size to be 4KB or greater. However, some operating systems do not allow 4KB sector sizes. ioFX devices are pre-formatted with 4KB sector sizes. All other ioMemory devices are formatted to 512B sectors when shipped.  512B-only Support Some applications and operating systems will only work with 512B sector sizes. These operating systems include: ESX, ESXi, OS X, and Solaris. Consult the fio-format section for your operating system's <i>ioMemory VSL User Guide</i> for more information.  Windows 4KB Support While Microsoft does not officially support 4KB sector sizes with Windows Server 2003 or 2008, 4KB sector sizes do work with many applications on these operating systems. The performance benefit of 4KB sectors is significant enough in Windows operating systems that we recommend testing 4KB sectors for use with your application. Microsoft does fully support 4KB sector sizes on Windows Server 2012.

Even if you cannot force 4KB sector sizes, the average write I/O size for most workloads is 4KB or larger. For this



reason, 4KB average write size is typically the most accurate representation of memory utilization.

Calculating Maximum RAM Requirements

The amount of RAM required by the ioMemory VSL software depends on the ioScale device and how it is used. This section describes the upper limit of RAM that may be required of your system in a worst-case scenario. Depending on the use, devices that have a capacity greater than 2TB may require more RAM than devices with less than 2TB of capacity.

You will need to reference the following table to calculate the maximum RAM that may be required for your device size and average written block size:

Average Written Block Size (bytes)	Devices <2TB: MB RAM per GB Capacity	Devices >2TB: MB RAM per GB Capacity
8192	1.33	1.43
4096	2.67	2.87
2048	5.34	5.73
1024	10.68	11.47
512	21.35	22.93

Using the information above and the equations below, you can calculate the maximum RAM required for each device:

Devices with <2TB Capacity:

$300\text{MB RAM} + (<\text{MB RAM per GB [see table]}> * <\text{total GB of device capacity}>)$

Devices with >2TB Capacity:

$350\text{MB RAM} + (<\text{MB RAM per GB [see table]}> * <\text{total GB of device capacity}>)$

For example, if your system is equipped with a device that has a total capacity of 1200GB **formatted to use 4,096 byte sectors**, your system may require as much as:

$300\text{ MB} + (2.67\text{MB of RAM per GB}) * (1200\text{GB capacity}) = \mathbf{3,504\text{MB (or around 3.5GB) of system RAM}}$ may be used by the ioMemory VSL software in a worst-case scenario.

Note that some products, like ioDrive2 Duo devices, have more than one ioMemory device within the product. You must calculate the RAM usage for each of those ioMemory devices.



The amount of RAM used by the ioMemory VSL software will depend on your use case; the table entries above are worst-case numbers. Actual RAM usage will likely be less than the amount listed.

You may run `fio-status -a` in the command line to see how much RAM the ioMemory VSL software is using per ioMemory device.



Device Operating System Support

The following table shows which device types are supported for each operating system:

Device Type	Linux	Windows	ESX and ESXi	Solaris	OS X	FreeBSD
ioDrive2 Devices	•	•	•	•	•	•
ioDrive2 Duo Devices	•	•	•	•	•	•
ioCache Device			•			
ioFX Device	•	•			•	
ioDrive Devices	•	•	•	•		•
ioDrive Duo Devices	•	•	•	•		•
ioDrive Octal Device	•	•		•		
ioScale Device	•	•	•*			

* VMware operating systems only support device sizes up to 2TB. The 3.2TB ioScale Devices must be formatted down to 2TB on these devices.



Supported Devices

This section lists the Fusion-io devices that are supported with this version of the ioMemory VSL software.

ioDrive2 Devices

- 365GB MLC ioDrive2
- 785GB MLC ioDrive2
- 1205GB MLC ioDrive2
- 3.0TB MLC ioDrive2
- 400GB SLC ioDrive2
- 600GB SLC ioDrive2

ioDrive2 Duo Devices

- 1200GB SLC ioDrive2 Duo
- 2410GB MLC ioDrive2 Duo

ioCache Device

- 600GB MLC ioCache

ioFX Device

- 420GB MLC ioFX Device

ioDrive Devices

- 80GB SLC ioDrive
- 160GB SLC ioDrive
- 320GB SLC ioDrive
- 320GB MLC ioDrive
- 640GB MLC ioDrive



ioDrive Duo Devices

- 320GB SLC ioDrive Duo
- 640GB SLC ioDrive Duo
- 640GB MLC ioDrive Duo
- 1280GB MLC ioDrive Duo

ioDrive Octal Device

- 10TB MLC ioDrive Octal

First Generation ioScale Device

- 845GB MLC ioScale
- 1300GB MLC ioScale

Second Generation ioScale Device

- 410GB MLC ioScale
- 825GB MLC ioScale
- 1650GB MLC ioScale
- 3.2TB MLC ioScale

Virtual Controller Technology Support

Virtual Controller technology is supported on Windows and Linux operating systems. The following devices support Virtual Controller technology and will result in the following approximate capacities when the device has been configured for virtual devices:

Device	Number of Virtual Devices	Capacity per Virtual Device	Combined Capacities
785GB MLC ioDrive2	2	367.5GB	735GB
1205GB MLC ioDrive2	2	577.5GB	1155GB
400GB SLC ioDrive2	2	187.5GB	375GB
600GB SLC ioDrive2	2	287.5GB	575GB
1200GB SLC ioDrive2 Duo	4	287.5GB	1150GB
2410GB MLC ioDrive2 Duo	4	577.5GB	2310GB
845GB MLC ioScale	2	397.5GB	795GB
1300GB MLC ioScale	2	625GB	1250GB



Only relatively new devices (with few writes performed) may be configured to use Virtual Controller technology. Devices with too much wear are unsuitable for converting to or from a Virtual Controller configuration. Merging virtual devices may also result in additional wear (depending on the wear differences of the two virtual devices). See the *ioMemory VSL User Guide* for your platform for more information on considerations on using this feature.

Supported Operating Systems

All operating systems must be 64-bit and they must be x86 architecture to support ioMemory devices. Running the latest service pack / update of a release is strongly recommended.

Supported Microsoft Windows Operating Systems

- Microsoft Windows 2003 Server 64-Bit (with SP2 or higher)
- Microsoft Windows Server 2008 64-Bit, R1 (with SP2 or higher)
- Microsoft Windows Server 2008 64-Bit, R2 SP2
- Microsoft Windows Server 2012
- Microsoft Windows 7 (only supported for ioFX devices)

There are two installation programs available:

- `Fusion-io_3.2.3.950_x64_WS03.exe` – For installing on Windows Server 2003.
- `Fusion-io_3.2.3.950_x64.exe` – For all other supported Windows operating systems.



ioMemory devices cannot be used as hibernation devices.

Hyper-V support

Hyper-V, as a Type 2 hypervisor on top of Windows Server 2008 R2 or Windows Server 2012, is supported.



With Hyper-V on Windows Server 2008 R2, only a 512B sector size is supported on ioMemory devices. For more information on sector sizes in Windows, see the following Microsoft Knowledge Base article:
<http://support.microsoft.com/kb/2510009>.



Supported Linux Distributions



The following distributions are supported. Some distribution versions may have binary packages available for download. If your version does not have a binary package available, you can build the installation package from the available source package. Check the download folders for available packages.

- Red Hat Enterprise Linux 5 (up to 5.8), 6 (up to 6.3)
- SUSE Linux Enterprise Server (SLES) 10, 10 SP4, 11, 11 SP1, 11 SP2
- Oracle Linux 5 (up to 5.8), 6 (up to 6.3)
- CentOS 5 (up to 5.8), 6 (up to 6.3)
- Debian Squeeze
- Fedora 16, 17
- OpenSUSE 12
- Ubuntu 10.04, 11.10, 12.04

Supported VMware Operating Systems

- ESX 4.0 Update 4
- ESX 4.1 Update 3
- ESXi 4.0 Update 4
- ESXi 4.1 Update 2
- ESXi 4.1 Update 3
- ESXi 5.0 Update 1
- ESXi 5.1

ioMemory devices are only compatible with operating systems that are 64-bit x86 architecture. This means the following scenarios are supported:

1. Using the ioMemory device as VMFS datastore within the hypervisor, and then sharing that storage with guest operating systems. Guest operating systems can be 32-bit or 64-bit because they are not directly using the ioMemory device.



2. Using VMDirectPathIO, allow a virtual machine to directly use the ioMemory device. In this case, only supported operating systems can use the device.



VMDirectPathIO is currently supported on Windows and Linux operating systems that are supported by Fusion-io.

See either the *ioMemory VSL User Guide for Linux* or the *ioMemory VSL User Guide for Windows* for installation instructions.



If you are using VMDirectPathIO, you do not need to install the ioMemory VSL software on the ESXi system. Instead, install the driver on the guest system. Only install the driver if you plan on creating a VMFS on the device(s). For more information on using VMDirectPathIO, see the VMDirectPathIO appendix in the *ioMemory VSL User Guide for ESX and ESXi*.

Supported Solaris Operating Systems



The ioMemory VSL software does not support SPARC processors.

- Solaris (x86, 64-bit) 10 Update 8, 10 Update 9, 10 Update 10
- Solaris (x86, 64-bit) 11
- OpenSolaris 2009.06 (x86, 64-bit)

Supported OS X Operating Systems

- Snow Leopard (10.6.7 or later)
- Lion (10.7)
- Mountain Lion (10.8)



Snow Leopard does not always boot using the required 64-bit kernel. Older hardware may boot with the 32-bit kernel (to improve compatibility with drivers and software). You can check to see if the 64-bit kernel is loaded by clicking **About This Mac** under the **Apple** menu icon. While in **About This Mac**, click **More Info**, then click on **Software**. In 64-bit mode there will be a **yes** next to **64-bit Kernel and Extensions**.

If you are not in 64-bit mode, you can temporarily boot with the 64-bit kernels by holding down the **6** and **4** keys during boot (until the Apple logo appears). Consult Apple documentation or online guides for a permanent solution.



Supported FreeBSD Operation Systems

- FreeBSD 8
- FreeBSD 9



Upgrade Notes

Firmware Version

The following table shows the firmware archive file you should use for each device type and the controller firmware version number that will be installed on each type of device.

Product	FW archive	Controller Firmware
ioDrive2	3.2.3-20130122	7.1.13.109322
ioDrive	3.2.3-20130122	7.1.13.109322
ioCache	3.2.3-20130122	7.1.13.109322
ioScale	3.2.3-20130122	7.1.13.109322
ioFX	3.2.3-20130122	7.1.13.109322
ioDrive Octal	3.2.3-20130122	7.1.13.109322

The archive file that is released with this version of the ioMemory VSL software does support Virtual Controller technology on specific devices in Windows and Linux operating systems. See the [Virtual Controller Technology Support](#) section in this document for a list of compatible devices.

Upgrading Devices for ioMemory VSL software 3.2.3

This version of the ioMemory VSL software supports new features, including the latest generation of ioMemory architecture and improved Flashback Protection™. These features require the latest version of the ioMemory device firmware. Every ioDrive device in a system running 3.2.3 or later must be upgraded to the latest version of the firmware.

For example, if you have a system running 2.3.1 ioMemory VSL software with ioDrive devices previously installed, and you want to install new ioDrive2 devices (that require the latest version of the firmware), then you will need to upgrade all of the existing devices to the latest firmware version.



You cannot revert a device's firmware to an earlier version once you have upgraded the device. If you experience problems with your upgrade, please contact Customer Support at support@fusionio.com.



Upgrade Path

Depending on the current firmware version of your devices, you may need to upgrade your device's firmware multiple times in order to preserve internal structures. The following is the minimum upgrade path that must be followed. Upgrade the ioMemory VSL software on the system (and **upgrade the firmware** to the compatible version for each version of the software) in this order:

1.2.4 -> 1.2.7 -> 2.1.0 -> 2.3.1 -> 3.2.3

For example, if your device is using the firmware for ioMemory VSL software version 2.1.0, upgrade to 2.3.1 (both ioMemory VSL software **and compatible firmware**) and then continue on the path. Visit <http://support.fusionio.com> for all of the required software and firmware versions.



Note that when running multiple firmware upgrades in sequence (such as going from 2.1.0 to 2.3.1), after each subsequent firmware upgrade it is critical to reboot the system, load the ioMemory VSL software (if it doesn't automatically load with your OS), and attach each device

Upgrading from ioMemory VSL Version 2.x



Upgrading devices previously configured for ioMemory VSL 2.x or earlier to work with VSL 3.2.3 will require a firmware upgrade and a low-level media format of the device. User data will be destroyed during the format process. Be sure to backup all data as instructed.

As shown in the Upgrade Path section above, you may upgrade your ioMemory device to the current firmware version from any firmware version that is released with ioMemory VSL software version 2.3.1 or later. If the firmware version you are upgrading from has a different major version number than the current firmware for this release, then you will see a warning that the upgrade may require a format. If your device is configured with the following firmware versions it **will require a low-level format** (which will erase the user data on the device) after you upgrade the firmware:

- ioMemory VSL version 2.3.1: Firmware version **5.0.7.101971**
- ioMemory VSL version 2.3.10: Firmware version **5.0.7.107053**



In the firmware versions shown above, the major version number is **5** (the first number). The firmware major version number for this 3.2.3 ioMemory VSL release is **7**.

It may take an extended period of time to format each device, depending on the wear on the device. If 2.x versions of the ioMemory VSL software were supported on your operating system, then you can consult the appendix of the *ioMemory VSL User Guide* for that platform for more information on upgrading the previously configured devices.



Staged Upgrade Example

For more specific on upgrading from one version to the next, see the *ioMemory VSL Release Notes* (available at <http://support.fusionio.com>) for each incremental version you will upgrade the device to. Then follow the upgrade instructions in that version's user guide for your operating system (including the firmware update instructions).

However, these upgrade procedures will follow this basic outline:

1. Unload the driver of the ioMemory VSL software.
2. Uninstall the ioMemory VSL software.
3. Install the next version of the ioMemory VSL software in the upgrade path.
4. Load the driver module of the ioMemory VSL software.
5. Update the firmware on the device(s) to the firmware that came with the ioMemory VSL software.
6. Reboot
7. Ensure that the newly installed ioMemory VSL software loads correctly and that all ioMemory devices attach properly.
8. Repeat this procedure (if necessary) for all upgrades in the sequence.

Once you are ready to install this version of the ioMemory VSL software (3.2.3), consult the User Guide for this version for further upgrade instructions.

Do Not Downgrade Device Firmware



Do not downgrade the ioMemory device to an earlier version of the firmware. Earlier versions of the firmware may not be compatible with the device, and downgrading the firmware will result in data loss. If you need to downgrade your firmware, contact Customer Support at <http://support.fusionio.com> for compatibility information and to discuss your use case.

If you are installing new ioMemory devices in a system using older devices and firmware, upgrade the older devices to the latest firmware and driver as a best practice.



Change Log

3.2.3 Change Log

In addition to various improvements, the following are changes made to the ioMemory VSL Software from 3.2.2 to 3.2.3, including:

- HP-UX is not supported with this release.

Improvements and Features

- Added support for Windows Server 2003, see [Supported Operating Systems](#).
- Added support for ioScale devices in the following capacities: 845GB, 1300GB, 410GB, 825GB, 1650GB, 3.2TB. For more information, see [Supported Devices](#).
- Added support for 3.0TB ioDrive2 devices, see [Supported Devices](#).
- Change to **fio-sure-erase** so devices maintain current formatting parameters rather than reverting to the default parameters. Added an option (-t) that will reset the device format parameters to the default settings.

Fixed the Following Issues:

- Change to default setting of **use_workqueue** parameter

Issue	When the use_workqueue parameter was changed to a default value of 0 in VSL version 3.2.2, it exposed an issue with certain Linux kernels that resulted in decreased write performance with file systems and other operations that use Asynchronous IO or libaio and performed FLUSH functions.
Resolution	The issue in these kernels no longer impacts write performance.

- Incorrect load average

Issue	The reported Load average in Linux was incorrect due to a process (fct0-smp) in a constant state D (reporting a load of 1).
Resolution	Devices now only report a load of 1 while in use.



- Recommendation not to upgrade certain devices

Issue	Read error issue with 320GB ioDrive and 640GB ioDrive Duo devices on ioMemory VSL version 3.2.2. This may negatively affect read and write activity, and the products may enter reduced write mode.
Resolution	Restored the behavior of previous releases. We do recommend upgrading those devices to this ioMemory VSL release.

- Powercut issue with Virtual Controller devices

Issue	Powercut feature not working on Virtual Controller devices. Some in-flight data may have been lost in a power loss event.
Resolution	Powercut feature now works on all Virtual Controller devices. We recommend upgrading to this release if you are using Virtual Controller technology.

- Virtual Controller logs reversed

Issue	Virtual Controller operating system event log messages were reversed for splitting and merging. The devices were split or merged as expected, but the logs were incorrect.
Resolution	Logs indicate splits and merges correctly.

- Virtual Controller conversions failing if unsupported devices installed

Issue	Splitting and merging Virtual Controller configurations without specifying the device would fail if unsupported devices are installed.
Resolution	Devices that do not support Virtual Controller configuration are now ignored and the conversion is successful.

- Additional memory allocated

Issue	When attaching a freshly formatted device, ioMemory VSL version 3.2.2 allocated more initial memory than was required. This was more evident on a newly formatted device that wasn't in use.
Resolution	The VSL software now allocates the correct amount of memory.

- Power throttle warning on products with one device.

Issue	A power throttling warning appeared in fio-status every time there was a power throttling event.
Resolution	Power throttling is the correct behavior in these circumstances, but the messages they are now informational messages and not warning messages.

- Issues when interrupting **fio-format**

Issue	If the the fio-format utility is interrupted while it is formatting a device, then the device may become unusable. You may recover a device by using the fio-sure-erase utility.
Resolution	Added a notice to the utility stating that users should not interrupt the fio-format process and how to recover from a failed format by using fio-sure-erase . We still do not recommend interrupting the fio-format process.



- Utility interrupting firmware updates

Issue	Running fio-status while fio-update-iodrives was updating a device would cause the update to fail.
Resolution	The fio-update-iodrives utility now prevents other utilities from disrupting the update process.

- Failed firmware upgrade not reported

Issue	The fio-update-iodrives utility may a success message even though firmware update failed.
Resolution	The fio-update-iodrives utility now only returns success if the device is successfully upgraded.

- Problem updating multiple ioDrive duo devices

Issue	Upgrading multiple ioDrive Duo devices in a single fio-update-iodrives command would fail with error Device is missing midprom data .
Resolution	Updating multiple devices in a single command is now successful.

- Utilities and VSL software mismatch error

Issue	When you updated the ioMemory VSL software, but didn't update the utilities the utilities would not run and would return an error about an API mismatch .
Resolution	The installed VSL utilities should still match the ioMemory VSL version, but the error message is now more informative. For example: Error: This version of <utility> is not compatible with the running driver. Please install a <utility> that matches the driver's version.

- Reported memory grew on each attach

Issue	The reported memory in fio-status used by the ioMemory VSL version 3.2.2 for each device grew each time a device was reattached. Actual memory used was not affected.
Resolution	Reported memory usage now remains as expected every time a device is reattached.

- Interrupt affinity not working in Windows

Issue	The interrupt affinity did not work in Windows even when the operating system reports that the affinity was set.
Resolution	The ioMemory VSL software now uses the interrupt affinity settings and the affinity works as expected.

- Performance with large block sizes in VMware environments

Issue	ioMemory performance was negatively affected when using large device block sizes (>128K) in VMware hypervisors, especially in servers with multiple sockets.
Resolution	Performance is now improved in VMware environments when using large block sizes.



Fixed Issues Affecting Other Software:

- Caching devices becoming inaccessible

Issue	While running directCache with VSL software and Windows operating systems, a memory reporting error caused bound devices to become inaccessible.
Resolution	The VSL software no longer has a memory reporting error.

- Unable to bind to partitions

Issue	directCache is unable to bind to a partition on an ioMemory device and returns an invalid device error.
Resolution	directCache now binds to partitions on ioMemory devices.

- **fio-status** utility hanging on high throughput

Issue	When fio-status is run on multiple bound devices (using directCache) during high throughput, the fio-status utility hangs until the high I/Os stop.
Resolution	The utility no longer hangs during periods of high throughput.

- Benign but alarming error message

Issue	A failed assertion message appeared with the dc-disable utility output. You could safely ignore this message.
Resolution	The message no longer appears.

- **fio-agent** does not initialize in CentOS

Issue	The fio-agent service failed to load the shared VSL library (libvsl) on CentOS and therefore failed to initialize.
Resolution	The library now initializes on all supported platforms.

3.2.2 Change Log

In addition to various improvements, the following are changes made to the ioMemory VSL Software from 3.1.5 to 3.2.2, including:

- Expanded operating system support, see [Supported Operating Systems](#).
- Due to a known issue, Windows Server 2003 is not supported with this release of the ioMemory VSL.



- Changes to the firmware archive filename and distribution.
 - In Windows and Solaris, the firmware archive file is now distributed as a separate file, and no longer embedded within the ioMemory VSL installation package.
 - In Linux, the firmware is still distributed as a package, but is now also distributed as a separate firmware archive file.
 - The firmware archive filename convention is now **fusion_<version>-<date>.fff**.
- New Virtual Controller feature available for Windows and Linux.
 - See the Windows or Linux *ioMemory VSL User Guide* for complete information on using the feature.
 - With Virtual Controller technology each physical ioMemory device is split into two (virtual) logical devices. Splitting the ioMemory device into two virtual devices has the following implications:
 - **Latency:** There is no affect on latency.
 - **Throughput:** The total peak I/O bandwidth of the device is approximately the same.
 - **IOPS:** Depending on the use of the virtual devices (especially the average I/O size), the peak IOPS for each virtual device is about the same for a non-split device. In other words, the combined peak IOPS of the two virtual devices can be nearly double that of a non-split device. See the *ioMemory VSL User Guide* for your platform for more information.
 - **Capacity:** Due to virtualization overhead, the combined capacity of the two virtual devices is slightly less than that of a single-controller device. See the [Virtual Controller Technology Support](#) section in this document for a list of compatible devices and their Virtual Controller capacities.
- Added **WIN_LOG_VERBOSE** parameter to the Windows ioMemory VSL software. This parameter expands the extent of the ioMemory VSL error log messages in the event log and provides additional crucial information for troubleshooting any issues. For more information, see the *Troubleshooting Event Log Messages* appendix in the *ioMemory VSL User Guide for Windows*.
- Change to the device numbering in Windows. The **/dev/fctx** device number used in the command-line utilities is now assigned as the ioMemory VSL software initially loads.
- The NUMA affinity parameters in Windows and Linux now use the PCI bus number to set the affinity, and you will need to update any existing affinity configuration. See the user guide for your platform for more information.



- Separate Management Software Releases: Starting with this ioMemory VSL software release, the following management software will no longer be included as part of the ioMemory VSL release:
 - **Management SDK**, including:
 - libfio-dev
 - libfio-doc
 - libvsl-dev
 - libvsl-doc
 - **SMI-S**, including:
 - fio-remote-util
 - fio-SMIS
 - fusion-cimprovider
 - **SNMP**, including:
 - fio-SNMP-agent
 - fio-SNMP-mib
 - These management tools will be released as part of the ioSphere software releases. The Windows versions of these tools are part of the Windows ioSphere software installer. The versions for all other platforms will be distributed as individual packages along with the ioSphere software release.



If you have any issues finding these packages, please contact Customer Support.



Known Issues

Overview

This section describes issues you may encounter when using this ioMemory VSL release.

General

Don't disable CPUs after loading the ioMemory VSL driver

If you plan to take any CPUs offline (including disabling Hyper-Threading Technology), you should do so before the ioMemory VSL driver loads and begins to use the available CPUs. If you disable any CPUs that were being used by the ioMemory VSL software, then the software may hang.

Improved hardware failure detection

Due to refined capabilities in detecting issues, some devices that are upgraded to work with ioMemory VSL software version 3.2.3 may exhibit failures that were not detected previously. You may see the following error message in the system log:

```
<device-name> some pads are write protected
```

This failure prevents potential data loss that may occur with continued use of the device. If your ioMemory device fails with this error message, contact Customer Support to RMA the device.

Keep default MSI Interrupts for better performance

With ioMemory VSL software 3.x and later, all ioMemory devices have changed from using legacy-style interrupts to message signaled interrupts (MSI). This improves performance while decreasing CPU load.

If you wish to continue using legacy interrupts, set the **disable_msi** VSL module parameter value to **1**. For examples on setting module parameters, please see the **Module Parameter** appendix in the *ioMemory VSL User Guide* for your platform (Windows uses the **fio-config** utility and the parameter is in all caps: **DISABLE_MSI**).

In limited situations, using legacy interrupts with the 3.x.x series VSL may degrade performance as much as 10% compared to previous releases. With the 3.x.x series VSL, customers are strongly encouraged to use MSI (default setting) for optimal performance.



Improved thermal throttling

With improvements to thermal throttling on some devices, the ioMemory VSL software will now throttle or shutdown the device based on the device's NAND board temperature. The NAND board temperatures are currently not exposed in the management interfaces, but a throttling or shutdown event is visible in the operating system logs. See the *ioMemory Hardware Installation Guide* for more information on the NAND board temperature thresholds for specific devices.

Proper Time On Startup

If the ioMemory device does not boot up with proper time set on system, this may delay starting the software as the ioMemory VSL software self-tunes to the difference between the reflected age data and actual age of data.

If the time is set backwards on a running system, this may result in decreased card performance for the lesser of 1 day or the amount the time is set backwards.

"Proper time" is within a few minutes of actual time.

Firmware update may fail with a TDO mismatch error

An ioDrive device firmware upgrade may fail with the following error:

ERROR: TDO mismatch

This generally occurs when upgrading multiple devices at once.

To resolve this issue, update the devices again, but perform the update one device at a time. This includes ioDrive Duo devices, upgrade each ioMemory device (on the duo product) individually.



Do not reboot the system until the devices have been successfully updated.

ioDrive Octal devices in minimal mode

One or more of the ioMemory devices within an ioDrive Octal device may go into minimal mode. This state is visible in **fio-status**. To bring the device(s) out of minimal mode, reboot the system.

Reboot issues with ioDrive Octal devices

Certain servers may spontaneously reboot when multiple ioDrive Octal devices are installed. Updating the server BIOS may resolve this issue. Contact Customer Support for additional configuration adjustments if updating the BIOS does not resolve the issue.



Device capacity may change after upgrade

If you upgrade a device that was previously formatted using a much earlier version of ioMemory VSL software, the device capacity may change. The capacity difference may be minimal (for example 160.94GB becomes 160GB), but it may be an issue if the device was part of an application or database that expects the exact same capacity.

To solve this issue, use the **-o** (overformat) option with **fio-format**. For example:

```
fio-format -o 160940M /dev/fct1
```

Management-Specific

Do not run multiple **fio-format** commands in parallel

We do not recommend running multiple instances of **fio-format** commands at the same time. If you do run multiple commands in parallel, one or more of the commands may fail and it may cause the device to fail. To avoid this issue, either run multiple commands in sequence or (if you are formatting all devices to the same settings) specify multiple devices within one command.

Make sure the utilities match the ioMemory VSL software version

When you install this version of the ioMemory VSL software, make sure you install the utilities that go with this version. Each set of utilities is designed to work with a specific version of the ioMemory VSL software.

If you use a set of utilities that does not match the ioMemory VSL software, you may see an error in the command line or logs such as **unhandled ioctl** or **Error: This version of <utility> is not compatible with the running driver**. To solve this issue, reinstall the utilities using the package with the correct version number.

Utility failed while running **fio-bugreport**

The **fio-bugreport** utility uses other utilities to create the report. Depending on the operating system, some of these additional utilities may not be available and **fio-bugreport** will display an error that a **fio utility failed** or was not found.

The **fio-bugreport** utility is designed to continue even if a component fails and the report will still be created.

Do not run **fio-status** during driver load

Run **fio-status** after the driver has loaded and not during driver load. Running **fio-status** while the ioMemory VSL software driver is loading may yield the message:

```
Missing MIDS.  Coming up in minimal mode.
```



If this message is received while running **fio-status** while loading driver, unload and then reload the driver and run **fio-status** after the driver has loaded.

fio-status may not display failed devices

On rare occasions, when an ioMemory device fails, the device may no longer appear in **fio-status**. If your device has failed, contact Customer Support.

Windows-Specific

fio-trim-config returns Unknown status

The **fio-trim-config** utility returns **Unknown** status on Windows Server 2008 R2, Windows 7, and Windows Server 2012. Windows Server 2008 R2, Windows 7, and Windows Server 2012 have native TRIM support and therefore do not use this utility. While you should only use this utility with Windows Server 2003, you will not harm the system by running it on newer versions of Windows, and you can safely ignore the **Unknown** status if you do run it on a later version.

Specific partitions required for devices with capacities greater than 2TB

Devices with capacities greater than 2TB, such as the 3.2TB ioScale device, require the following partition types:

- Single device: GPT (GUID Partition Table)
- Multiple devices (for a RAID configuration): Dynamic Disk

These devices also require sector sizes greater than 512B (we recommend 4KB sectors). When you format these devices using **fio-format**, the default sector size is 4KB.

Forced detach sometimes required for Virtual Controller devices

You may need to use the force option (**-f**) to detach one or more Virtual Controller devices in the following circumstances:

- **Busy Device:** If you attempt to detach a device using **fio-detach** and it fails with a status of **device busy**, then you should first try to detach again. If detach fails again, you may need to use the force option.
- **Raid Configuration:** If an ioMemory device is in a Virtual Controller configuration and is part of RAID array, one of the virtual devices may not detach because the RAID management tool is using the device. Make sure the RAID volume is offline. If the device still does not detach, you must force the device to detach using the force option in **fio-detach**.



A forced detach will likely result in an unclean shutdown and reattach may take longer than usual.



ioMemory VSL software not loading or attaching devices after install

If the ioMemory VSL software is not loading or attaching ioMemory devices after installation (including an upgrade), make sure that you have rebooted the system after the installation.

If a reboot does not solve the problem, follow the manual installation procedure in the appendix of the *ioMemory VSL User Guide for Windows*. Repeat this procedure to install each device.

Conversion to GPT or Dynamic disk terminates Logical Disk Manager Admin Service

This issue appears in any of these cases:

- Converting a Basic partition to GPT
- Converting a Basic partition to Dynamic Volume
- Switching between GPT and Dynamic Volume, either way

The message is: "The Logical Disk Manager Administrative Service terminated unexpectedly. Restart the 'Virtual Disk' service." This problem occurs only with Windows Server 2003.

If the ioMemory devices are to be used in GPT or Dynamic mode, the following process should be done during the initial setup. This process will also recover devices that have had a failed conversion attempt.



This will destroy any existing data on your devices. If you already have data on a device, be sure to back it up before proceeding.

1. For each ioMemory device in the system that is to be converted, use the ioSphere software to a) detach the drive and b) do a low-level format (See the ioSphere software User Guide for details).
2. Restart the computer.
3. Go to Disk Management and select Initialize Disk.
4. Right-click and select Convert to GPT (or Convert to Dynamic Disk).

ioDrive Octal devices report incorrect temperature

One or more of the ioMemory devices of an ioDrive Octal device may report a temperature in the system log that is unlikely high, for example:

```
fct10-474370: Unlikely temperature from card: 429496714 C
```

This unlikely temperature log is inaccurate and can be safely ignored.



Linux-Specific

Software not installed post kernel update

When the ioMemory VSL software is installed for a specific kernel version and the kernel version is changed for any reason, the VSL must be reinstalled to work with the new kernel version. RHEL5 has some processes that minimize the need to reinstall the software after kernel upgrade.

Compiler Cache (ccache) causes ioMemory VSL software src.rpm rebuild failures on some distributions

If the ccache package is installed, rebuilding the ioMemory VSL software src.rpm may fail with an error similar to the following:

```
CC [M]
/root/fio/iomemory-vls-<version>/root/usr/src/iomemory-vsl/driver_init.o
/root/fio/iomemory-vls-<version>/root/usr/src/iomemory-vsl/driver_init.c:116:
error: initializer element is not constant
[...]
```

To allow the VSL to rebuild, remove the ccache package or disable ccache.

Rare error on driver unload using kernels older than 2.6.24

An issue in Linux kernels prior to 2.6.24 can cause a general protection fault or other kernel error when the driver is unloaded. This issue also affects non-Fusion-io drivers. The issue has been resolved in newer kernels. More information is available here:

<http://www.kernel.org/pub/linux/kernel/v2.6/ChangeLog-2.6.24>

(search for "commit 5a622f2d0f86b316b07b55a4866ecb5518dd1cf7")

Because this is an issue in the Linux kernel, Fusion-io cannot resolve this issue for older kernels.

ext4 in Kernel 2.6.33 or earlier may silently corrupt data when discard (TRIM) is enabled

The ext4 filesystem in Kernel.org kernel 2.6.33 and earlier has an issue where the data in a portion of a file may be improperly discarded (set to all 0x00) under some workloads. Use 2.6.34 or newer to avoid this issue. For more info see the patch 1 and bug report 2 below.

The fix is included in RHEL6 as of pre-release kernel **kernel-2.6.32-23.el6**. The production RHEL6 kernel is not affected by this issue.

Discard support was added to the kernel.org mainline ext4 in 2.6.28 and was enabled by default. For fear of damaging some devices, discard was set to default to disabled in v2.6.33-rc1 and was back ported to 2.6.31.8 and v2.6.32.1.



1. <http://git.kernel.org/?p=linux/kernel/git/torvalds/linux-2.6.git;a=commitdiff;h=b90f687018e6d6>
2. https://bugzilla.kernel.org/show_bug.cgi?id=15579
3. <http://git.kernel.org/?p=linux/kernel/git/torvalds/linux-2.6.git;a=commitdiff;h=5328e635315734d>

Kernels 2.6.34/35 don't handle switching interrupt types

Linux kernels around 2.6.34/35 may have problems processing interrupts if the driver is loaded using one interrupt type, unloaded, and then loaded again using a different interrupt type. The primary symptom is that the ioMemory device is unusable, and the kernel logs have errors with "doIRQ". For example, the following sequence on an affected system would likely result in errors.

1. load the driver with default of `disable_msi=1` which selects APIC interrupts

```
$ modprobe iomemory-vsl  
$ modprobe -r iomemory-vsl
```

2. load the driver, enabling MSI interrupts

```
$ modprobe iomemory-vsl disable_msi=0
```

To work around this issue, reboot if you see the error and always load with the same interrupt type selected. To change between interrupt types, reboot first.

RHEL6 udevd warning

When using an ioMemory device under RHEL6 (or any Linux distro with udev version 147 or greater), udevd may emit the following innocuous messages:

```
udev[154]: worker [19174] unexpectedly returned with status 0x0100  
udev[154]: worker [19174] failed while handling  
'/devices/virtual/block/fioa'
```

You can ignore this warning.

RHEL6 warn_slowpath during device attach

When attaching an ioMemory device under RHEL6, you may find log messages similar to the following:



```
kernel: -----[ cut here ]-----
kernel: WARNING: at fs/fs-writeback.c:967 __mark_inode_dirty+0x108/0x160()
(Tainted: P          ----- )
.
.
.
[<ffffffff8106b857>] warn_slowpath_common+0x87/0xc0
[<ffffffff8106b8aa>] warn_slowpath_null+0x1a/0x20
.
.
.
```

This is due to an issue in the 2.6.32 kernel, and the warning can safely be ignored.

Switching interrupt types with newer kernels can cause errors

With newer Linux kernels, switching interrupt types after initial driver load can cause **doIRQ** errors to be reported by the kernel. As a work around, reboot your system before loading the driver with the new interrupt type specified.

kdump crashkernel requires additional memory for the ioMemory VSL software

With the ioMemory VSL software installed, **kdump** may fail to generate a complete dump due to a lack of reserved memory. To ensure that there is enough memory, increase the memory allocated to the crashkernel.

The amount of memory required will vary depending on your kernel version and the formatted sector sizes (more RAM is required for 512B sector sizes than for 4K sectors). The device sector size can be formatted using **fio-format**. A good starting point would be to increase the crashkernel reserve by approximately 50-250MB of RAM (depending on your configuration).



Formatting the device will destroy the user data. Be sure to back up the data before running **fio-format**.

Do not use an ioMemory device as a kdump target

Do not direct **kdump** to dump the crash information to an ioMemory device. The ioMemory VSL software does not load in the **kdump** crashkernel, and ioMemory devices are not supported as **kdump** targets.



VMware-Specific

Hypervisors cannot directly use devices with capacities greater than 2TB

Because the VMFS in VMware hypervisors does not directly support devices with capacities greater than 2TB, you cannot use all of the capacity of a 3.0TB MLC ioDrive2 or a 3.2TB MLC ioScale device when using the device as a LUN. You will need to down-format the device to 2TB using `fio-format`. For example (using SSH):

```
fio-format -s 2T /dev/fct1
```

You may utilize the entire capacity of the 3.0TB MLC ioDrive2 device if you pass the device through (using VMDirectPathIO/PCI Passthrough) to a guest OS that supports devices with capacities greater than 2TB.

ESXi 5.0 Update 1 firmware upgrade

The `fio-update-iodrive.py` remote script is currently unsupported on ESXi 5.0 Update 1. To perform a firmware update on ESXi 5.0 Update 1, use the `fio-update-iodrive` utility as documented in the *ioMemory VSL User Guide for VMware ESX and ESXi*.

Using VMDirectPathIO with multiple-device products

Some products contain multiple ioMemory devices on one PCI adapter, such as the ioDrive Duo device. The ioMemory VSL software does not support splitting the two ioMemory devices between two functions or virtual machines. The following scenarios are supported:

- Both ioMemory devices are used as a VMFS datastore in ESX(i).
- Both ioMemory devices are passed through (using VMDirectPathIO) to the same virtual machine.

ESXi 5.0 injected installer allows installation on an ioMemory device

ioMemory devices are not designed to be bootable, therefore you should not install the host OS on an ioMemory device. The ESXi injected installer will permit you to install the OS on an ioMemory device, but the installation will fail on reboot.

The ioMemory VSL software cannot be installed as part of an ESXi 4.1 installation

The ioMemory VSL software must be installed on an existing ESXi host system (after the ESXi system is installed).

vCenter cannot manage extents on ioMemory devices

You cannot use vSphere vCenter to manage extents on ioMemory devices, including growing or spanning extents. However, you can connect directly to the host using the vSphere client and manage extents on ioMemory devices.



Solaris-Specific

Provide adequate RAM

The ioMemory VSL may use a large amount of system RAM. If enough RAM is not available, the system will crash. See [Hardware Requirements](#) for RAM requirements.

As the system runs out of RAM, it may generate the message:

```
verify: bad magic header 0, wanted acca at file /dev/rdisk/c6d0p0 offset
212606976, length 0
```

OS X-Specific

Encrypted partitions not supported

Encrypted partitions, new in OS X version 10.7 (Lion), are currently not supported on ioMemory devices.

Provide adequate RAM

The ioMemory VSL may use a large amount of system RAM. If enough RAM is not available, the system will crash. See [Hardware Requirements](#) for RAM requirements.

FreeBSD-Specific

Progress indicator for fio-attach returns incorrect percentage

When attaching a device in FreeBSD, the **fio-attach** utility may momentarily return a percentage that is more than 100%, for example:

```
pu05# fio-attach /dev/fct0
Attaching: [=====] (100%)=====] (208%)
fio0 - attached.
```

This is only an issue with the progress indicator; the device will still attach as expected.



Download Location

Software, utilities, and related documentation for this version can be found at:

<http://support.fusionio.com>