ioMemory VSL 3.2.6

OCTOBER 23, 2013

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ioMemory VSL 3.2.6 Release Notes

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Introduction

This document describes details about the 3.2.6 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.

> ℹ️ 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

> ℹ️ References to "ESX(i)" refers to ESX or ESXi.

This section outlines the hardware requirements, supported devices, and supported operating systems for this release of the ioMemory VSL software.

Hardware Requirements

> For complete hardware requirements and installation instructions, please refer to the .

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: VMware ESX and ESXi, OS X, and Solaris. Consult the `fio-format` section for your operating system's *ioMemory VSL User Guide* 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. 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 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 ioMemory 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:

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

Devices with >2TB Capacity:

350MB RAM + (<MB RAM per GB \[see table]> * <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 MB + (2.67MB of RAM per GB) * (1200GB capacity) = **3,504MB (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	X	X	X*	X	X	X
ioDrive2 Duo Devices	X	X	X	X	X	X
ioCache Devices			X			
ioFX Devices	X	X			X	
ioDrive Devices	X	X	X	X		X
ioDrive Duo Devices	X	X	X	X		X
ioDrive Octal Device	X	X		X		
ioScale Devices	X	X	X*	X	X	X

* VMware operating systems only support device sizes up to 2TB with the raw block device version of the ioMemory VSL software. The 3.2TB ioScale Devices and 3.0TB ioDrive2 devices must be formatted down to 2TB on these platforms unless you use the SCSI device version of the ioMemory VSL software.

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 Devices

- 600GB MLC ioCache
- 825GB MLC ioCache

ioFX Devices

- 420GB MLC ioFX
- 1.6TB MLC ioFX

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 Devices

- 845GB MLC ioScale
- 1300GB MLC ioScale
- 3.2TB MLC ioScale

Second Generation ioScale Device

- 410GB MLC ioScale
- 825GB MLC ioScale
- 1650GB 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, (with SP2 or higher)
- Microsoft Windows Server 2008 R2 SP1 64-Bit
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Microsoft Windows 7 (only supported for ioFX devices)
- Microsoft Windows 8 (only supported for ioFX devices)

> ℹ 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 5.9), 6 (up to 6.4)
- SUSE Linux Enterprise Server (SLES) 10, 10 SP4, 11, 11 SP1, 11 SP2, 11 SP3
- Oracle Linux 5 (up to 5.9), 6 (up to 6.4)
- CentOS 5 (up to 5.9), 6 (up to 6.4)
- Debian Squeeze, Wheezy
- Fedora 18, 19
- OpenSUSE 12
- Ubuntu 10.04, 12.04, 12.10, 13.04

Supported VMware Operating Systems

- ESX 4.0 Update 4
- ESX 4.1 Update 3
- ESXi 4.0 Update 4
- ESXi 4.1 Update 3
- ESXi 5.0 Update 2*
- ESXi 5.1 Update 1*
- ESXi 5.1*
- ESXi 5.5**

* The `scsi` version of the ioMemory VSL software is only supported on these ESXi hypervisor versions.

** ESXi 5.5 is only supported with the `scsi` version of the ioMemory VSL software.

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 ESX(i) 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 9, Update 10, Update 11
- Solaris (x86, 64-bit) 11, 11.1

Supported OS X Operating Systems

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

> ℹ 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

Firmware Version

The following table shows the latest firmware archive file that accompanies this version of the ioMemory VSL software and the firmware controller version that it contains for each device type.

Products	FW Archive	Controller Firmware
ioDrive2	3.2.6-20131003	7.1.15.110356
ioDrive2 Duo	3.2.6-20131003	7.1.15.110356
ioDrive	3.2.6-20131003	7.1.15.110356
ioDrive Duo	3.2.6-20131003	7.1.15.110356
ioCache	3.2.6-20131003	7.1.15.110356
ioScale	3.2.6-20131003	7.1.15.110356
ioFX	3.2.6-20131003	7.1.15.110356
ioDrive Octal	3.2.6-20131003	7.1.15.110356

If the current controller firmware version on any device is lower than the version number listed above, we recommend upgrading to the latest version. However, this version of the ioMemory VSL software will work with any controller firmware versions within this range:

- Minimum firmware required with this release: `7.1.13`
- Maximum firmware version supported with this release: `7.1.19`

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. Virtual Controller Technology Support on page 10 for a list of compatible devices.

Upgrading Devices for ioMemory VSL software 3.2.6

This version of the ioMemory VSL software supports new features, including the latest generation of ioMemory architecture and improved features. These features require a minimum version of the ioMemory device firmware as described above. Every ioMemory device in a system should be upgraded to the same version of the firmware.

For example, if you have a system running 2.3.1 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 support@fusionio.com .

Device 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** -> **1.2.8** -> **2.1.0** -> **2.3.1** -> **3.2.6**

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

> ⛔ 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 shut down the system (including a complete power cycle of the system hardware), restart the system, load the ioMemory VSL software (if it doesn't automatically load with your OS), and attach each device.

Upgrading from ioMemory VSL software Version 2.x

> ⛔ Upgrading devices previously configured for ioMemory VSL 2.x or earlier to work with VSL 3.2.6 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 software version 2.3.1: Firmware version **5.0.7.101971**
- ioMemory VSL software version 2.3.10: Firmware version **5.0.7.107053**

> ℹ In the firmware versions shown above, the major version number is 5 (the first number). The firmware major version number for this 3.2.6 ioMemory VSL software release is 7.

It may take an extended period of time to format each device, depending on the wear on the device. You can consult the appendix of the *ioMemory VSL User Guide* for your 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 (3.2.6), 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 have issues with your firmware upgrade, contact Customer Support 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.

Upgrading to SCSI Version on VMware Hypervisors

If you are downloading the ioMemory VSL software for ESXi, then you may have the option to download a SCSI device version of the software or a Raw block device version of the software. Both of these versions present ioMemory devices as block devices, but the SCSI version attaches the device to the system *specifically* as a SCSI device, supporting SCSI commands, and the Raw block version attaches the device as a Raw block device.

Both versions will work with all ioMemory devices that are supported with this release and both are installed in the same way, **but you can only have one version installed at a time**.

The SCSI version includes the following features and capabilities:

- Ability to use devices that are greater than 2TB in capacity.
- Ability to use more than 16 ioMemory devices in a host system.
- SCSI commands that comply with SPC-3 and SBC-3

> ⓘ The ioMemory VSL software does not support Raw Device Mapping (RDM).

SCSI Upgrade Considerations

If you upgrade an existing installation of the ioMemory VSL software using VUM, the SCSI version will obsolete the Raw block version of the software. This means that you will not be able to use VUM to go back to the Raw block version of the software. If you need to go back, you will need to log into the host to manually uninstall the SCSI version install the Raw block version.

Depending on your applications and usage, your configuration may be affected when your previously installed devices are attached as SCSI devices. Consider the following:

- Any applications that relied on ioMemory VSL softwares appearing as "block" devices will be affected.
  - For example, you may have a PSA filter configured to use an ioMemory device as a block device.
- Device identification will change, including:
  - UID
  - Model
  - Path

SCSI Device Upgrade Steps

> 🚫 Please follow the steps provided, as inadvertent selections during the upgrade process may clear data from the device. We recommend you back up your data before performing any upgrade procedure.

Follow these steps after you have installed the SCSI version of the ioMemory VSL software and rebooted the machine:

1. Make sure all ioMemory devices are attached.

2. Directly connect to the hypervisor host using vSphere client.

> ⚠️ Do not use vCenter to reimport datastores when upgrading from a Raw-block-based ioMemory VSL to a SCSI version. Due to a known issue with vCenter Server, the datastores do not properly import.

3. You will notice that the VMs and datastores on the ioMemory device(s) are either missing or marked as unknown.

   You will need to re-import the data stores.

4. Re-import the datastores for each device:

   a. Select the **Configuration** tab.

   b. Under **Hardware** select **Storage** and then select **Add Storage**.

   c. In the window that pops up, select to add a **Disk/LUN** and then select **Next**.

   d. You are presented with three options. Choose one of the following options:

      i. **Keep the existing signature**: (Recommended) This will preserve the datastore and all the links to the VMs.

      ii. **Format the disk**: This will **erase the data** and create a new datastore.

      > 🚫 This is a data-destructive option.

⚠ If you accidentally choose **Assign new signature**, the data is still there, but you lose all the links to the VMs. In this case you will need to manually re-import every VM.

3.2.6 Change Log

In addition to various improvements, the following are changes made to the ioMemory VSL software since version 3.2.4, including:

General Changes

General Improvements and Features

- General performance improvements.

- Updated supported operating systems. See Supported Operating Systems on page 10 for details.

- Improved performance on systems with the Intel IOMMU (Input/Output Memory Management Unit) enabled. This enhancement improves how efficiently the VSL software handles DMA mappings, and it therefore helps minimize soft lockup warnings on systems with IOMMU enabled.

- The `fio-status` utility now reports the alert values that triggered an error. For example, if voltage spikes out of range, then the utility will report the peak voltage that caused the error.

- The `fio-sure-erase` utility will now stop and report an error if the device is attached during the erase process.

- Improved fio-status processing times.

Fixed General Issues

- Incorrect time value in log message

Issue	In a system log error message indicating a watchdog was fired, the time was erroneously given in ms.
Resolution	The time is now given in us (micro seconds).

- Invalid device information in system logs

Issue	When an ioMemory device was no longer enumerated on the PCIe bus, the ioMemory VSL software would log device information that was no longer valid.
Resolution	The VSL software no longer attempts to add invalid information to the system logs.

- Large misaligned IOs

Issue	Submitting maximum-sized IOs (1MB) on a non-page aligned boundary could cause IO

	failure and immediate channel failure.
Resolution	The ioMemory VSL now adequately handles large misaligned IOs.

Windows Changes

Due to a known issue with the Fusion-io TRIM service on Windows Server 2003 and Windows Server 2008 R1, this release of the ioMemory VSL installer does not install the Fusion-io TRIM service. For more information see KB950 in the http://support.fusionio.com Knowledge Base.

Fixed Windows Issues

- Potential Windows installation issue

Issue	The ioMemory VSL software installer may fail to install with this error message: ``` There is a problem with this Windows Installer package. A DLL required for this install to complete could not be run. Contact your support personnel or package vendor. ```
Resolution	The installer package no longer fails with this error.

- System crashes during format

Issue	Under certain circumstances formatting a device using the Disk Manager utility may crash the Windows system.
Resolution	The system will no longer crash while formatting ioMemory devices.

Linux Changes

Fixed Linux Issues

- Issue with Veritas Cluster Service and `fio-status`

Issue	The `fio-status` utility could hang when the Veritas Cluster Server configuration performed a check on the clusters.
Resolution	The utility will no longer hang when this check is performed.

- Continued issues with write performance that involve FLUSH functions.

Issue	Decreased write performance with file systems and other operations that use asynchronous IO or `libaio` and performed FLUSH functions on certain Linux kernels (for example, 2.6.32 and 2.6.38).
Resolution	The issue in these kernels no longer impacts write performance.

- FLUSH watchdog error

Issue	A watchdog error was erroneously reporting a stuck flush while the flush was still completing.
Resolution	The ioMemory VSL software now makes sure all current processes are completed before declaring a watchdog error.

- Incompatible kernel

Issue	The 3.10 Linux kernel is incompatible with previous versions of the ioMemory VSL software. This is a known issue with some newer kernel updates for Fedora 18.
Resolution	This release of the ioMemory VSL software is compatible with the 3.10 kernel.

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

Knowledge Base Articles

Every known issue in this release has a corresponding knowledge base article located at http://support.fusionio.com/knowledgebase. At the time of this release, most of the corresponding knowledge base articles contain the same information that is available in this document. However we will update the knowledge base articles as additional information, workarounds, and/or fixes become available for a particular issue.

If a particular issue affects you, you may benefit from reviewing the current information by visiting the associated article. If you are viewing this document in an electronic form, you may simply click on the KB link. If you are viewing a printed version, go to the knowledge base section of the support website (http://support.fusionio.com/knowledgebase) and search for the article using its KB number.

> 🛈 You will need to log into the support site (you must create a free account if you have not already done so).

Example article link: KB815

In this example, you can either click the link or search for "KB815" on the knowledge base section of the website.

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. KB788

Keep default Message Signaled 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. KB809

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. KB887

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. KB812

> ⚠ 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. KB813

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. KB870

Device capacity may change after upgrade

If you upgrade a device that was previously formatted using a much earlier version of ioMemory device, 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 a application or database that expects the exact same capacity.

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

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

KB815

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. KB871

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. KB872

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. KB873

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. KB874

`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. KB875

Windows Specific

Specific partitions required for devices with capacities greater than 2TB

Devices with capacities greater than 2TB, such as the 3.0TB MLC ioDrive or 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. KB916

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. KB918

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 user documentation for your ioSphere software 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).

KB919

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. KB920

Linux Specific

The 3.7 kernel is incompatible with the ioMemory VSL software

The 3.7 Linux kernel has a known issue that makes it incompatible with the ioMemory VSL software. This is a known issue with some kernel updates for Fedora 17. You may fix the kernel by applying the patch available here: https://patchwork.kernel.org/patch/2031631/ KB876.

Upgrading the Kernel in Linux

If you ever plan to upgrade the kernel when the ioMemory VSL software is installed, you **must**:

1. Unload the ioMemory VSL driver.
2. Uninstall the ioMemory VSL software.
3. Upgrade the kernel.
4. Install an ioMemory VSL software package that is compiled for the new kernel.

Failure to follow this procedure may result in driver load issues. KB902

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-vsl-<version>/root/usr/src/iomemory-vsl/driver_
init.o /root/fio/iomemory-vsl-<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. KB878

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. KB879

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. KB880

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 ioMemory VSL 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 the module parameter `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. KB881

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:

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

You can ignore this warning. KB882

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. KB883

Switching interrupt types with newer kernels can cause errors

With newer Linux kernels, switching interrupt types after initial driver load can cause do IRQ errors to be reported by the kernel. As a work around, reboot your system before loading the driver with the new interrupt type specified. KB884

Do not use an ioMemory device as a `kdump` target

Do not direct kdump to dump the crash information to an ioMemory device. Due to the restricted memory environment in kdump, the ioMemory VSL software does not load in the kdump crashkernel and ioMemory devices are not supported as kdump targets. KB886

VMware Specific

Only 512B Sectors Supported

Only a 512B sector size is supported onVMware hypervisors. Consult the fio-format section of the *ioMemory VSL User Guide* for more information.

No Device Names with Raw Block VSL Software for ESXi 5.x

The 3.2.4 release of the Raw block version of the ioMemory VSL software for ESXi 5.x does not support device names. The devices now appear as: "No name provided -" under **Storage Adapters** in the **Configuration** tab of the vSphere client. The SCSI version of the VSL software does support device names. KB979

16 block device limit with VMware hypervisors

VMware ESX(i) hypervisors will only recognize up to 16 ioMemory devices installed as raw block devices in the host system. This limit includes each device in a multi-device product. For example, VMware will recognize up to eight ioDrive Duo devices (each with two ioMemory devices).

This limit only applies to ioMemory devices that are used directly by the hypervisor system as raw block devices.

This does not apply to devices that are presented to the hypervisor as SCSI block devices via the SCSI version of the ioMemory VSL software. If you pass devices through to a guest OS, those devices are not counted toward the 16 block device limit. KB925

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 device 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 >2TB device if you pass the device through (using VMDirectPathIO/PCI Passthrough) to a guest OS that supports devices with capacities greater than 2TB.

The issue is resolved with the SCSI device version of the ioMemory VSL software. This issue is still seen in the raw block device version of the software. For more information on this issue, see knowledge base article KB926 on http://support.fusionio.com.

Using VMDirectPathIO with multiple-device products

Some products contain multiple ioMemory devices on one PCIe 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.

KB927

ESXi 5.x 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. KB929

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. KB928

Solaris Specific

Only 512B Sectors Supported

Only a 512B sector size is supported on Solaris. Consult the `fio-format` section of the *ioMemory VSL User Guide* for more information.

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/rdsk/c6d0p0 offset
212606976, length 0
```

KB922

Solaris cannot use devices with capacities greater than 2TB

Because Solaris does not support devices with capacities greater than 2TB, you cannot use the full capacity of a device such as the 3.0TB ioDrive2 device. You will need to down-format the device to 2TB using fio-format. For example:

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

OS X Specific

Only 512B Sectors Supported

Only a 512B sector size is supported on OS X. Consult the fio-format section of the *ioMemory VSL User Guide* for more information.

Encrypted partitions not supported

Encrypted partitions, new in OS X version 10.7 (Lion), are currently not supported on ioMemory devices. KB923

Provide adequate RAM

The ioMemory VSL software may use a large amount of system RAM. If enough RAM is not available, the system will crash. See Hardware Requirements for RAM requirements. KB922

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. KB924

Download Location

Software, utilities, and related documentation for this version can be found at http://support.fusionio.com