

Fusion ioMemory™ VSL® 4.2.0

English



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Introduction

This document provides details about the 4.2.0 Fusion ioMemory™ VSL® software release:

- System requirements, including supported operating systems and hardware requirements.
- Supported SanDisk Fusion 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.

NOTE-

Throughout this document, when you see a reference to any Fusion ioMemory device, you may substitute your particular device(s) from the list of [Supported Devices on page 8](#).

System Requirements

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

Hardware Requirements

NOTE-

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

Sufficient System Memory (RAM)

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

Sector Sizes

If your applications and operating system fully support 4KiB sectors, you may want to use 4KiB sectors to reduce the worst-case memory consumption. However, it is rare to see IO write sizes smaller than 4KiB, even when using 512B sector sizes. When using 4KiB sectors, the actual memory consumption will only be reduced if writes smaller than 4KiB in size are being performed on a routine basis.

When the Fusion ioMemory device is formatted to 4KiB, the Fusion ioMemory VSL software does NOT emulate 512B sectors. This means that any attempts to perform IO that is not aligned to a sector boundary and a multiple of the 4KiB sector size will result in IO errors.

Fusion ioMemory SX300 devices, Fusion ioMemory SX350 devices and Fusion ioMemory PX600 devices ship with 4KiB sector sizes. Note that some operating systems are not compatible with 4KiB sector sizes.

ATTENTION!

512B-only Support

Some applications and operating systems will only work with 512B sector sizes. These operating systems include: VMware ESXi, and Solaris.

Consult the `fio-format` section for your operating system's *Fusion ioMemory VSL User Guide* for more information.

ATTENTION!

Windows 4KiB Support

While Microsoft does not officially support 4KiB sector sizes with Windows Server 2008 R2, 4KiB sector sizes do work with many applications.

Microsoft does support 4KiB sector sizes on Windows Server 2012, but not all applications support 4KiB sectors, even on Windows Server 2012.

Even if you cannot use a device formatted with native 4KiB sector sizes, the average write I/O size for most workloads is 4KiB or larger. For this reason, 4KiB average write size is typically the most accurate representation of the worst-case memory utilization.

Maximum RAM Requirements

The amount of RAM required by the Fusion ioMemory VSL software depends on the Fusion ioMemory device capacity, formatted sector size, 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.

Device Capacity	Worst case GB of RAM Required for Formatted Block Sizes (bytes)			
	4096-byte Blocks	2048-byte Blocks	1024-byte Blocks	512-byte Blocks
1.0TB	2.4GB	4.7GB	9.2GB	18.2GB
1.25TB	3.0GB	5.8GB	11.4GB	22.6GB
1.3TB	3.1GB	6.0GB	11.8GB	23.5GB
1.6TB	3.7GB	7.3GB	14.5GB	28.8GB
2.6TB	6.0GB	11.8GB	23.5GB	46.9GB
3.2TB	7.3GB	14.5GB	28.8GB	57.8GB
5.2TB	11.7GB	23.3GB	46.4GB	92.6GB
6.4TB	14.3GB	28.5GB	59.9GB	113.7GB

For example, if your system is equipped with a device that has a total capacity of 3200GB (3.2TB) **formatted to use 4096 byte sectors**, your system may require as much as **7.3GB of system RAM** in a worst-case scenario.

ATTENTION!

The amount of RAM used by the Fusion 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` on the command line to see how much RAM the Fusion ioMemory VSL software is using per Fusion ioMemory device.

Supported Devices

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

Fusion ioMemory SX300 devices

- Fusion ioMemory SX300-1300
- Fusion ioMemory SX300-1305
- Fusion ioMemory SX300-1600
- Fusion ioMemory SX300-1605
- Fusion ioMemory SX300-3200
- Fusion ioMemory SX300-3205

- Fusion ioMemory SX300-6400
- Fusion ioMemory SX300-6405

Fusion ioMemory SX350 devices

- Fusion ioMemory SX350-1300
- Fusion ioMemory SX350-1600
- Fusion ioMemory SX350-3200
- Fusion ioMemory SX350-6400

Fusion ioMemory PX600 devices

- Fusion ioMemory PX600-1000
- Fusion ioMemory PX600-1005
- Fusion ioMemory PX600-1300
- Fusion ioMemory PX600-1305
- Fusion ioMemory PX600-2600
- Fusion ioMemory PX600-2605
- Fusion ioMemory PX600-5200
- Fusion ioMemory PX600-5205

Supported Operating Systems

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

Supported Microsoft Windows Operating Systems

- Microsoft Windows Server 2008 R2 SP1 64-Bit
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Microsoft Hyper-V Server 2012
- Microsoft Hyper-V Server 2012 R2

NOTE-

Fusion 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, Windows Server 2012, or Windows Server 2012 R2, is supported.

ATTENTION!

With Hyper-V on Windows Server 2008 R2, only a 512B sector size is supported on Fusion 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

ATTENTION!

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 5.11), 6 (up to 6.6), 7.0
- SUSE Linux Enterprise Server (SLES) 11, 11 SP2, 11 SP3, 12
- Oracle Linux 5 (up to 5.11), 6 (up to 6.6), 7.0
- Oracle VM 3.2.7, 3.3.1
- Fedora 19, 20
- CentOS 5 (up to 5.11), 6 (up to 6.6), 7.0
- Debian Wheezy
- Ubuntu 12.04, 14.04

Supported VMware Operating Systems

- ESXi 5.0
 - ESXi 5.1
 - ESXi 5.5
-

NOTE-

All ESXi updates are supported unless otherwise specified.

NOTE-

Only SCSI versions of the Fusion ioMemory VSL software for ESXi are supported.

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

1. Using the Fusion ioMemory device as VMFS datastore or cache device (including VSAN) 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 Fusion ioMemory device.
 2. Using VMDirectPathIO, allow a virtual machine to directly use the Fusion ioMemory device. In this case, only supported operating systems can use the device.
-

ATTENTION!

VMDirectPathIO is currently supported on Windows and Linux operating systems that are supported by SanDisk.

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

If you are using VMDirectPathIO, you do not need to install the Fusion 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 *Fusion ioMemory VSL User Guide for ESXi*.

Supported Solaris Operating Systems

ATTENTION!

The Fusion ioMemory VSL software does not support SPARC processors.

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

Upgrade Notes

This version of the Fusion ioMemory VSL software only supports Fusion ioMemory SX300 devices, Fusion ioMemory SX350 devices and Fusion ioMemory PX600 devices, and it does not support devices that were compatible with Fusion ioMemory VSL software version 3.x.x or earlier (for example ioDrive®2, ioDrive®, ioScale®2, or ioScale® devices are not supported).

Firmware Version

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

Device	FW Archive
ioMemory SX300	4.2.0-20150501
ioMemory PX600	
ioMemory SX350	

If the current controller firmware version on any device is lower than the version number listed above, we recommend upgrading to the latest version. We recommend using this version or later.

Do Not Downgrade Device Firmware

WARNING!

Do not downgrade the Fusion ioMemory device to an earlier version of the firmware. Earlier versions of the firmware are not compatible with the device, and downgrading the firmware will result in data loss. If you have issues with your firmware upgrade, contact Customer Support <https://link.sandisk.com/commercialsupport> for compatibility information and to discuss your use case.

Change Log

4.2.0 Change Log

In addition to various improvements, the following are changes made to the Fusion ioMemory VSL software since version 4.1.2, including:

General Changes

General Improvements and Features

- Updated supported operating systems. See [Supported Operating Systems on page 9](#) for details.
 - **Newly Supported Operating Systems:**

Linux	<ul style="list-style-type: none"> ▪ Oracle Linux 5.11
--------------	---

- Added support for SanDisk 1y nm NAND.
- Users may experience slight performance variations between different units of the same product during write-intensive workloads when the PCIe slot power limit is set to the default value ($\leq 25W$). Note that performance will meet or exceed specifications despite these variations.

Fixed General Issues

- Uncorrectable read failure/failure to attach

Issue	An uncorrectable read failure occurred and/or a failure to attach after a power cut or format. Note that these failures were within committed analyzed failure rate (AFR).
Resolution	This failure no longer occurs.

Firmware Changes

- Improved power consumption of the device during peak and idle operations.

Windows Changes

Fixed Windows Issues

- Running multiple `fio-detach` instances caused the utility to hang.

Issue	Running the <code>fio-detach</code> utility on multiple devices at the same time in Windows would cause the utility to hang.
Resolution	You can now run multiple instances of this utility in parallel.

Linux Changes

Fixed Linux Issues

- Certain device failures combined with the user `work_queue=3` parameter caused improper shutdown.

Issue	Certain ioMemory device failures in combination with the parameter <code>use_work_queue=3</code> caused the ioMemory VSL software to fail to shut down properly.
Resolution	The ioMemory VSL software now shuts down properly under these conditions.

- Using `fio-sure-erase` with the `-p` option resulted in out-of-order command completions.

Issue	There was a known issue with handling out-of-order command completions from the card. The only known usage scenario which exposed the issue was when <code>fio-sure-erase</code> was used with the <code>-p</code> option. Affected VSL versions include VSL 4.1.x.
Resolution	The known issue has been fixed in VSL 4.2.0 and future VSL 4.2.x driver versions.

- Init scripts ignoring `FIO_DRIVER_MOD_OPTS`

Issue	Updating the system kernel or ioMemory VSL software would insert the ioMemory VSL software into the <code>initrd</code> and ignore the software configuration file (<code>/etc/modprobe.d/iomemory-vsl.conf</code>). This issue created software loading issues that required <code>dracut</code> to fix.
Resolution	Multiple solutions exist for this configuration issue: <ol style="list-style-type: none"> 1. If <code>DKMS</code> is installed and configured the ioMemory VSL software is configured for the new kernel. 2. If <code>dracut</code> is installed, the ioMemory VSL software uses that program to fix the configuration issue. 3. If both the <code>fio-sysvinit</code> and <code>fio-common</code> packages are installed, the ioMemory VSL software is excluded from the <code>initrd</code>.

Solaris Changes

Fixed Solaris Issues

- Issue when compiling the software

Issue	The Fusion ioMemory VSL software for Solaris would fail to load due to an installation script error.
Resolution	The Fusion ioMemory VSL software now loads properly.

Known Issues

This section describes issues you may encounter when using this Fusion 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 one of your systems, you may benefit from reviewing the associated knowledge base (KB) article for the most current information. 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.

NOTE-

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

VSL 4.2.0 and VSL 4.1.x are incompatible with IOMMU

With VSL 4.2.0 and 4.1.x driver versions, when performing a clean shutdown on a system using an IOMMU (input/output memory management unit), the IOMMU may trigger an internal error which disables the device.

For example, when a user detaches the ioMemory device by running the `fio-detach` command, the DMA buffers are unmapped prematurely by the VSL driver. If an IOMMU is used to map the DMA buffers, the DMA may not complete, causing an internal error (Watchdog event) that temporarily disables the device and forces it offline. The `fio-status` error reports:

```
fctx Failed: DEVICE IS OFFLINE. ALL READS AND WRITES WILL FAIL!
Reason: Watchdog fired.
```

The user must reboot the system in order for the ioMemory device to become usable again. As a workaround, you may disable the IOMMU until this issue is solved in a future VSL driver release. This issue poses no risk if an IOMMU is not used, as the memory buffer is not freed or reused until after the DMA completes.

VSL 4.2.0 improperly reports reduced-write mode when power-throttled

VSL 4.2.0 may improperly report reduced-write mode when the device is power-throttled. The following incorrect error message may display when the user runs the `fio-status` command:

```
WARNING: REDUCED WRITE MODE. PERFORMANCE SEVERELY DEGRADED.
ioMemory exceeds the PCIe power specification
```

The device is not in reduced-write mode and continues to work, although in a power-throttled state.

VSL does not support non-zero PCI domains

The VSL currently does not fully support non-zero PCI domains.

Command line utilities may hang during live firmware update

Command line utilities may hang or report errors when updating the firmware with the VSL loaded (live firmware update).

Don't disable or enable (decrease or increase) the number of active CPUs after loading the Fusion ioMemory VSL driver

If you plan to take any CPUs offline or online (including disabling or enabling Hyper-Threading Technology), you should do so before the Fusion ioMemory VSL driver loads and begins to use the available CPUs. If you disable or enable any CPUs that were being used by the Fusion ioMemory VSL software, then the software may hang. [KB788](#)

Keep default MSI-X for better performance

All Fusion ioMemory devices use MSI-X message signaled interrupts. This improves performance while decreasing CPU load. However, we have observed some compatibility issues with MSI-X in certain environments.

If you are experiencing performance issues, you may want to disable MSI-X. Doing so will then enable MSI interrupts by default. If you wish to use legacy interrupts instead, you may also disable MSI interrupts.

To disable either MSI-X or MSI, set the appropriate module parameter (`disable_msix` or `disable_msi`) value to 1. For examples on setting module parameters, please see the **Module Parameter** appendix in the *Fusion ioMemory VSL User Guide* for your platform (all platforms except Windows).

NOTE-

Disabling MSI in Windows

If you must disable MSI in Windows, edit the `MSISupported` registry entry. You cannot disable just MSI-X in Windows. If you need to disable MSI-X, you must disable both MSI and MSI-X by disabling MSI. See this Microsoft article for more information:

[http://msdn.microsoft.com/en-us/library/windows/hardware/ff544246\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff544246(v=vs.85).aspx)

Proper Time On Startup

If the Fusion ioMemory device does not boot up with proper time set on system, this may delay starting the software as the Fusion 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](#)

Management Specific

fio utilities may behave unpredictably during live firmware update

With this version of the Fusion ioMemory VSL software, during a live firmware update, `fio` utilities may not perform as expected (for example, `fio-status` may not return data or may return error messages); however, the firmware update still completes successfully.

Running `fio-sure-erase` on a clean formatted device may take longer

`fio-sure-erase` may take longer to run if the Fusion ioMemory device has recently been formatted with `fio-format`. For faster results, do not run `fio-format` before `fio-sure-erase`.

Make sure the utilities match the Fusion ioMemory VSL software version

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

If you use a set of utilities that does not match the Fusion 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](#)

`fio-status` may not display failed devices

On rare occasions, when a Fusion ioMemory device fails, the device may no longer appear in `fio-status`. If your device has failed, contact Customer Support. [KB875](#)

Windows Specific

Initial attach completes slowly

After upgrading the Fusion ioMemory VSL software and firmware to version 4.2.0, the first time you attach the device, the process will take longer than normal to complete.

After the 4.2.0 Fusion ioMemory VSL software and firmware are upgraded, the first device attach for Windows users will occur during the required reboot. This first boot may take up to twenty minutes on the highest capacity devices.

Specifically, during the upgrade process you will install the 4.2.0 driver and firmware, and then you will be prompted to reboot to complete the firmware upgrade process. When Windows is rebooting, the expected behavior is for Windows to appear to hang on the boot screen with the progress spinner going for up to 20 minutes for a 6.4TB device. The reboot and device attach will eventually complete successfully.

`fio-config` option `RSORT_MEMORY_LIMIT_MiB` may cause crash

The `fio-config` option `RSORT_MEMORY_LIMIT_MiB` (used to set the memory limit in MiBytes for `rsort rescan`) may dereference a NULL pointer and result in a system crash.

`fio-status` not returning some items

`fio-status -l` or `fio-status --list-fields` does not list all possible fields. `fio-status -fj` does list them all in JSON formatted output.

Windows Installer - Repair option is not restoring `fio` utilities

The workaround is to uninstall and re-install with the Windows driver. Engineering believes most customers wouldn't use the repair feature of the installer. The long term proposal from Engineering is to remove the option as most Windows driver installers don't actually include it.

`fio-bugreport` zip file missing directory

In VSL 4.2.0, `fio-bugreport` captures information in a .zip file with no directory structure. In previous versions, this information was captured in a .cab file with different directories for different information.

SCSI ID conflict with other storage devices

If your Windows system uses a storage device in addition to a Fusion ioMemory device, the devices may have duplicate SCSI IDs which will cause conflicts. You can resolve the conflict by changing the Fusion ioMemory device SCSI ID using the `WIN_SCSI_BUS_ID` module parameter.

This parameter sets the Windows SCSI ID number for all Fusion ioMemory devices in the system to avoid conflicts with other SCSI device IDs. The default value, 0, is off and no IDs are set. Any value between 1–254 will set the SCSI IDs for all Fusion ioMemory devices in the system to that number.

NOTE-

Fusion ioMemory devices do not directly use SCSI IDs, so any non-conflicting number will do.

For more information, see the `fio-config` documentation in the *Fusion ioMemory VSL User Guide for Windows*.

Specific partitions required for devices with capacities greater than 2TB

Devices with capacities greater than 2TB require the following partition types:

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

When you format these devices using `fio-format`, the default sector size is 4KiB. [KB916](#)

Fusion ioMemory VSL software not loading or attaching devices after install

If the Fusion ioMemory VSL software is not loading or attaching Fusion 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 *Fusion ioMemory VSL User Guide for Windows*. Repeat this procedure to install each device. [KB918](#)

Linux Specific**Driver crash may occur with kernel setting of `use_workqueue=3`**

This issue is correlated with the kernel setting of `use_workqueue=3`. If the option is set to 3, you may encounter this issue under CPU-intensive workloads. Customers use this configuration option on older kernels where CPU load balancing is less mature and they are relying on the VSL to balance the workload. We recommend against using the `use_workqueue=3` kernel configuration option.

fio-status not returning some items

`fio-status -l` or `fio-status --list-fields` does not list all possible fields. `fio-status -fj` does list them all in JSON formatted output.

VSL 4.2.0 may periodically experience stuck I/Os

The VSL may periodically experience stuck I/Os, where the `in_flight` counter increases slowly over time and the process hangs.

Warning message on console during OVM install

This is a warning message in the OVM (SCSI driver) environment. There is no observed impact to the functionality of the VSL due this warning.

DKMS is not fully functional

DKMS functionality is not fully integrated.

The VSL does not work properly with more than 32 Logical CPUs on Linux

Errors may occur when using more than 32 Logical CPUs on a Linux system.

Fio-bugreport prints to stderr erroneously on some linux distros

On late Redhat/Centos releases (6+) the Linux "which" command prints to stderr if it cannot find the command it is called with. This results in the following:

```
# hgtest02-vm02:/root> fio-bugreport
which: no vmware in (/usr/local/bin:/usr/sbin:/sbin:/usr/bin:/bin)
```

This does not occur on debian/ubuntu systems.

Initial attach completes slowly

After upgrading the VSL and firmware to version 4.2.0, the first time you attach the device, the process will take longer than normal to complete.

dracut: not found error during installation

When you install the Fusion ioMemory VSL software on a system that does not have `dracut` installed, you will see the following error:

```
# rpm -ivh iomemory-vsl4-<version>.rpm
Preparing...                               ##### [100%]
 1:iomemory-vsl4-<version>-39##### [100%]
/var/tmp/rpm-tmp.52200: line 12: hash: dracut: not found
```

You may safely ignore this message. The Fusion ioMemory VSL software does look for the `dracut` utility to assist in loading the Fusion ioMemory VSL software, but the utility is not required. See the Linux changes in the [Change Log on page 13](#) for more information on changes to how the software loads.

Error messages when installing Fusion ioMemory VSL software on RHEL 7.0

When you install the Fusion ioMemory VSL software on RHEL 7.0 you may see errors similar to the following:

```
dracut-install: ERROR: installing 'vi'
dracut-install: ERROR: installing '/etc/virc'
/usr/lib/dracut/dracut-install -D /var/tmp/initramfs.pcKkj9 -a vi /etc/virc ps
grep cat rm
rm: cannot remove '/var/tmp/dracut-log.LctCNA': Directory not empty
```

This is a known issue with RHEL 7.0, and despite the errors the software should install correctly. For more information on this issue, see https://bugzilla.redhat.com/show_bug.cgi?id=1118988

[KB1385](#)

The 3.7 kernel is incompatible with the Fusion ioMemory VSL software

The 3.7 Linux kernel has a known issue that makes it incompatible with the Fusion ioMemory VSL software. You may fix the kernel by applying the patch available here: <https://patchwork.kernel.org/patch/2031631/> [KB876](#).

fio-firmware may incorrectly report pending firmware

In the rare case when firmware version information gets corrupted, fio-firmware will start reporting that there is pending firmware, even when there isn't. Please use fio-status to confirm that there really is pending firmware.

SCSI Performance Limitations on OracleVM

The OracleVM requires the use of a SCSI interface for Fusion ioMemory devices. Due to SCSI performance limitations inherent in the Linux kernel, performance is limited compared other operating systems.

Upgrading the Kernel in Linux

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

1. Unload the Fusion ioMemory VSL driver.
2. Uninstall the Fusion ioMemory VSL software.
3. Upgrade the kernel.
4. Install the Fusion 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 Fusion ioMemory VSL software src.rpm rebuild failures on some distributions

If the ccache package is installed, rebuilding the Fusion 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-SanDisk drivers. The issue has been resolved in newer kernels.

Because this is an issue in the Linux kernel, SanDisk 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 the 2.6.34 Linux kernel 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 the 2.6.28 Linux kernel and was enabled by default. Discard was set by 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 Fusion 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-vsl4 disable_msi=1
```

2. Unload the driver

```
$ modprobe -r iomemory-vsl4
```

3. Load the driver, enabling MSI interrupts

```
$ modprobe iomemory-vsl4 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](#)

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. [KB884](#)

RHEL6 udevd warning

When using a Fusion ioMemory device under RHEL6 (or any Linux distro with udev version 147 or greater), udevd may report 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. [KB882](#)

RHEL6 warn_slowpath during device attach

When attaching a Fusion 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](#)

Do not use an Fusion ioMemory device as a kdump target

Do not direct `kdump` to dump the crash information to a Fusion ioMemory device. Due to the restricted memory environment in `kdump`, the Fusion ioMemory VSL software should not load in the `kdump` crashkernel and Fusion ioMemory devices are not supported as `kdump` targets. [KB886](#)

VMware Specific**Only 512 Byte Sectors Supported**

Only a 512 byte sector size is supported on VMware hypervisors. After you install the Fusion ioMemory VSL software, you must reformat the sectors to a 512 byte size on Fusion ioMemory SX300 devices and Fusion ioMemory PX600 devices before using the devices. Consult the `fio-format` section of the *Fusion ioMemory VSL User Guide* for more information.

ESXi 5.5 Rollup Driver Installer

The Rollup Driver installer for ESXi 5.5 includes version 3.2.6 of the Fusion ioMemory VSL software. If you use this version of the ESXi 5.5 installer, you will need to uninstall Fusion ioMemory VSL version 3.2.6 before you install any newer version, such as this version 4.2.0 of the Fusion ioMemory VSL software. See the *Fusion ioMemory VSL User Guide for VMware ESXi* for more information.

[KB927](#)

ESXi 5.x injected installer allows installation on an Fusion ioMemory device

Fusion ioMemory devices are not designed to be bootable, therefore you should not install the host OS on a Fusion ioMemory device. The ESXi injected installer will permit you to install the OS on a Fusion ioMemory device, but the installation will fail on reboot. [KB929](#)

vCenter cannot manage extents on Fusion ioMemory devices

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

[KB928](#)

Solaris Specific

Only 512B Sectors Supported

Only a 512B sector size is supported on Solaris. After you install the Fusion ioMemory VSL software, you must reformat the sectors to a 512B size on Fusion ioMemory SX300 devices before using the devices. Consult the `fio-format` section of the *Fusion ioMemory VSL User Guide* for more information.

No quiesce DDK interface

The Fusion ioMemory VSL software does not implement the quiesce DDK interface on Solaris. This means that the Fusion ioMemory device may continue to perform DMA operations after the Fusion ioMemory VSL driver has been instructed to shutdown, which can result in data corruption if the memory has been reused as well as kernel panics if the IOMMU is enabled. To reduce the chance of data corruption, disable "fastboot" to give the Fusion ioMemory VSL driver a better chance to shutdown cleanly before reboot.

Provide adequate RAM

The Fusion 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.

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
```

[KB922](#)

Solaris cannot use Fusion ioMemory devices with capacities greater than 2TB

Because the Fusion ioMemory VSL software for Solaris does not support devices with capacities greater than 2TB, you cannot use the full capacity of some devices. You will need to down-format these devices to 2TB using `fio-format`. For example:

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


Download Location

Software, utilities, and related documentation for this version can be found at <https://link.sandisk.com/commercialsupport>

Fujitsu Customer Support

E-Mail

Please use the contact form at:

<http://support.ts.fujitsu.com/contact/>

For the Japanese market, please use the following URL:

<http://jp.fujitsu.com/platform/server/primergy/support/>

Telephone Support

For customer support phone numbers, please refer to the Fujitsu Technology Solutions service desk at

<http://support.ts.fujitsu.com/contact/servicedesk/>

For the Japanese market, please use the following URL:

<http://jp.fujitsu.com/platform/server/primergy/support/supportdesk.html>

Web

It is recommended to use the latest firmware / driver / BIOS versions on servers and components.

Software packages are available for download at:

<http://support.ts.fujitsu.com> > Server > Drivers & Downloads

For the Japanese market, please use the following URL:

<http://jp.fujitsu.com/platform/server/primergy/downloads/>

Corresponding user documentation for servers and optional components can be found online at:

<http://manuals.ts.fujitsu.com> > Industry Standard Servers > Expansion Cards > PCIe SSD Devices

For the Japanese market, please use the following URL:

<http://jp.fujitsu.com/platform/server/primergy/manual/>

The complete PRIMERGY documentation can also be downloaded as a DVD ISO image at:

<ftp://ftp.ts.fujitsu.com/images/serverview>

<http://jp.fujitsu.com/platform/server/primergy/downloads/> (Japanese market).