IBM ioMemory VSL 3.2.8

# Release Notes

# Table of Contents

# IBM ioMemory VSL 3.2.8 Release Notes

## Legal Notices



**Part Number**: D0001594-006_1
**Published**: June 04, 2014

# Introduction

This document describes details about the 3.2.8 ioMemory VSL software release:

- System requirements, including supported operating systems and hardware requirements.
- 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 an IBM High IOPS Adapter, you may substitute your particular device(s), such as an Second Generation IBM High IOPS Adapter or each of the two IBM High IOPS Adapters of an IBM High IOPS Duo Adapter.

**Attention!**

**Products with Multiple Devices**

Some products, such as an IBM High IOPS Duo Adapter, are actually comprised of multiple IBM High IOPS Adapters. If your product consists of multiple IBM High IOPS Adapters, you will manage each IBM High IOPS Adapter as an independent device.

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

# System Requirements

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

## Hardware Requirements

**NOTE-**

For complete hardware requirements and installation instructions, please refer to the *IBM High IOPS Adapter Hardware Installation Guide*.

**NOTE-**

For the latest IBM System x server configuration information and requirements for IBM High IOPS Adapters, please see the URL below:

http://www.ibm.com/support/entry/portal/docdisplay?lndocid=SERV-IOPS

### 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 IBM High IOPS Adapter with a 4096 byte (4KiB) sector size and thereby force the average written block size to be 4KiB or greater. However, some operating systems do not allow 4KiB sector sizes.

All IBM High IOPS Adapter ship formatted with 512B sector sizes.

---

**Attention!**

**512B-only Support**

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

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

---

**Attention!**

**Windows 4KiB Support**

While Microsoft does not officially support 4KiB sector sizes with Windows Server 2008, 4KiB sector sizes do work with many applications. The performance benefit of 4KiB sectors is significant enough in Windows operating systems that we recommend testing 4KiB sectors for use with your application.

Microsoft does support 4KiB sector sizes on Windows Server 2012. However, some applications may require 512B sector sizes.

---

Even if you cannot use a device formatted to use 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 memory utilization.

### Calculating Maximum RAM Requirements

At various block sizes, the following table shows the upper limit of RAM that may be required of your system for every GB of IBM High IOPS Adapter storage space used.

| Average Written Block Size (bytes) | RAM Usage (MB) per GB of storage space |
|---|---|
| 8192 | 1.59 |
| 4096 (Most common) | 2.85 |
| 2048 | 5.38 |
| 1024 | 11 |
| 512 | 22 |

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:

(1200GB capacity) x (2.85MB of RAM per GB of storage) = *3,420MB (or around 3.4GB) of system RAM* may be used by the ioMemory VSL software in a worst-case scenario.

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

**Attention!**

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` on the command line to see how much RAM the ioMemory VSL software is using per IBM High IOPS Adapter.

## Supported Devices

This section lists the new and legacy IBM adapters that are supported with version 3.x of the ioMemory VSL software. To identify the model cards installed in a server, run the management application or use the `fio-status` command line tool. With the introduction of the second generation adapters, the first generation adapters are considered to be legacy devices when mixing the two generations of cards.

### Enterprise Value IBM Flash Adapters

- IBM Flash Adapter F825 Enterprise Value for System x
- IBM Flash Adapter F1650 Enterprise Value for System x
- IBM Flash Adapter F3200 Enterprise Value for System x

**Attention!**

You must use the SCSI version of the ioMemory VSL software for VMware hypervisors in order to use capacities greater than 2TB.

### First Generation IBM High IOPS Mono Adapters (Low Profile cards)

- IBM 160GB High IOPS SS Class SSD PCIe Adapter
- IBM 320GB High IOPS MS Class SSD PCIe Adapter
- 320GB High IOPS SLC Adapter for IBM System x
- 640GB High IOPS MLC Adapter for IBM System x

### First Generation IBM High IOPS Duo Adapters (Full Height cards)

- IBM 320GB High IOPS SD Class SSD PCIe Adapter
- 640GB High IOPS MLC Duo Adapter for IBM System x
- 640GB High IOPS SLC Duo Adapter for IBM System x
- 1.28TB High IOPS MLC Duo Adapter for IBM System x

### Second Generation IBM High IOPS Mono Adapters (Low Profile cards)

- IBM 365GB High IOPS MLC Mono Adapter
- IBM 785GB High IOPS MLC Mono Adapter
- IBM 1.2TB High IOPS MLC Mono Adapter

### Second Generation IBM High IOPS Duo Adapters (Full Height cards)

- IBM 2.4TB High IOPS MLC Duo Adapter

## 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 |
|---|---|---|---|
| IBM 785GB High IOPS MLC Mono Adapter | 2 | 367.5GB | 735GB |
| IBM 1.2TB High IOPS MLC Mono Adapter | 2 | 577.5GB | 1155GB |
| IBM 2.4TB High IOPS MLC Duo Adapter | 4 | 577.5GB | 2310GB |

**Attention!**

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 *IBM 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 IBM High IOPS Adapters. 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

**NOTE-**

IBM High IOPS Adapters cannot be used as hibernation devices.

**Attention!**

This version of the ioMemory VSL software supports Microsoft Windows Server 2008 R2 and later. If you are using Microsoft Windows Server 2008 SP2, you should use ioMemory VSL version 3.2.6.

### Hyper-V support

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

**Attention!**

With Hyper-V on Windows Server 2008 R2, only a 512B sector size is supported on IBM High IOPS Adapters. 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 5.10), 6 (up to 6.5)
- SUSE Linux Enterprise Server (SLES) 10, 10 SP4, 11, 11 SP3

## Supported VMware Operating Systems

- ESXi 5.0
- ESXi 5.1
- ESXi 5.5

**NOTE-**

All ESXi updates are supported unless otherwise specified.

IBM High IOPS Adapters are only compatible with operating systems that are 64-bit x86 architecture. This means the following scenarios are supported:

1. Using the IBM High IOPS Adapter 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 IBM High IOPS Adapter.
2. Using VMDirectPathIO, allow a virtual machine to directly use the IBM High IOPS Adapter. In this case, only supported operating systems can use the device.

---

**Attention!**

VMDirectPathIO is currently supported with Windows and Linux guest operating systems that are supported by IBM.

---

See either the *IBM ioMemory VSL User Guide for Linux* or the *IBM 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. However, if you do not plan on passing the device through to a guest operating system, you should install the ioMemory VSL software on the host stystem. For more information on using VMDirectPathIO, see the VMDirectPathIO appendix in the *IBM ioMemory VSL User Guide for VMware ESXi*.

# Upgrade Notes

## Firmware Version

Use the firmware archive file that is released with this version of the ioMemory VSL software. The `fio-firmware-highiops-<version>.<date>.fff` archive file contains the controller firmware version `7.1.17.116786` for all IBM High IOPS Adapters.

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: `7.1.255`

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

## Upgrading Devices for ioMemory VSL software 3.2.8

This version of the ioMemory VSL software supports new features. These features require a minimum version of the IBM High IOPS Adapter firmware as described above. Every IBM High IOPS Adapter in a system should be upgraded to the same version of the firmware.

For example, if you have a system running 2.2.3 with Legacy IBM High IOPS Adapters previously installed, and you want to install new Second Generation IBM High IOPS Adapters (that require the latest version of the firmware), then you will need to upgrade all of the existing devices to the latest firmware version.

**Attention!**

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 http://www.ibm.com/systems/support.

## 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:

**1.2.8 -> 2.2.3 -> 3.2.8**

For example, if your device is using the firmware for ioMemory VSL software version 2.1.0, upgrade to 2.2.3 (both the ioMemory VSL software **and compatible firmware**) and then continue on the path. Download the required software and firmware versions at

http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-65723 (follow that link and then select **IBM High IOPS software matrix**) .

---

**Attention!**

Note that when running multiple firmware upgrades in sequence (such as going from 2.1.0 to 2.2.3), 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

---

**Attention!**

Upgrading devices previously configured for ioMemory VSL 2.x or earlier to work with VSL 3.2.8 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 IBM High IOPS Adapter to the current firmware version from any firmware version that is released with ioMemory VSL software version 2.2.3 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 version **it will require a low-level format** (which will erase the user data on the device) after you upgrade the firmware: Software version 2.2.3, Firmware version **5.0.6.101583**

- 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**

---

**NOTE-**

In the firmware version shown above, the major version number is 5 (the first number). The firmware major version number for this 3.2.8 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 *IBM 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 *IBM ioMemory VSL Release Notes* , available at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-65723 (follow that link and then select **IBM High IOPS software matrix**), 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 {IBM High IOPS Adapters 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 (3.2.8), consult the user guide for this version for further upgrade instructions.

## Do Not Downgrade Device Firmware

**Attention!**

Do not downgrade the IBM High IOPS Adapter 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://www.ibm.com/systems/support for compatibility information and to discuss your use case.

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

# Change Log

## 3.2.8 Change Log

In addition to various improvements, the following are changes made to the ioMemory VSL software since version 3.2.6, including:

## General Changes

### General Improvements and Features

- Updated supported operating systems. See See Supported Operating Systems on page 10 for a full list of supported operating systems.
    - **Newly Supported Operating Systems**:

| | |
|---|---|
| **Linux** | ▪ RHEL 5.10<br>▪ RHEL 6.5 |

    - **Discontinued Operating System Support**:

| | |
|---|---|
| **Microsoft Windows** | ▪ Microsoft Windows Server 2003<br>▪ Microsoft Windows Server 2008 (R1) |
| **Linux** | |
| **VMware** | ▪ ESX 4.x<br>▪ ESXi 4.x |

- The ioMemory VSL software now prints in the kernel logs the formatted size of each device as it attaches.
- Documentation for the `preallocate_mb` parameter for controlling the amount of memory that the ioMemory VSL software preallocates for using devices as SWAP (also known as paging files in Windows). See the *IBM ioMemory VSL User Guide* for Windows or Linux for more information.

### Fixed General Issues

- Issue with the `fio-status` utility

| | |
|---|---|
| **Issue** | When an IBM High IOPS Adapter was no longer enumerated on the PCIe bus, the fio-status utility would return device information that was no longer valid. For example, the firmware version was reported as `v1023.1023.1023` |
| **Resolution** | The utility now returns valid information. |

- Issues when interrupting the `fio-format` utility

| | |
|---|---|
| **Issue** | If you interrupted the `fio-format` utility while it was formatting an IBM High IOPS Adapter, the device would become unusable, and you would need to use the `fio-sure-erase` utility to recover use of the device. |
| **Resolution** | You can now interrupt the `fio-format` utility and then recover the device by formatting it again using the `fio-format` utility. |

- Delayed startup with preallocated memory

| | |
|---|---|
| **Issue** | Preallocating memory to use IBM High IOPS Adapters for swap (page files) could result in startup times that were delayed by approximately 20 - 25 minutes. |
| **Resolution** | Preallocating memory no longer results in delayed startup times. |

- Certain devices not recognized by management software

| | |
|---|---|
| **Issue** | After certain first generation devices such as 1.28TB High IOPS MLC Duo Adapters for IBM System x were upgraded to ioMemory VSL software 3.2.x the devices were no longer recognized by management tools (such as SNMP). |
| **Resolution** | The IBM High IOPS Adapters now work with the management tools. |

## Windows Changes

### Windows Improvements and Features

- The ioMemory VSL software installer for Windows will cease installation if another version is previously installed. You must remove other versions before you install this version.

- The ioMemory VSL installer no longer presents tree-view options when installing the software. The ioMemory VSL utilities are now installed by default.

### Fixed Windows Issues

- Issues with multiple PCI domains

| | |
|---|---|
| **Issue** | Not all IBM High IOPS Adapters would attach in a system configured with multiple PCI domains and many IBM High IOPS Adapters installed (for example, more than 32 devices). This was due to PCI address collisions. |
| **Resolution** | The ioMemory VSL software now detects the domain number to avoid address collisions. |

- Utilities still installed

| | |
|---|---|
| **Issue** | When installing the VSL software the installer may not uninstall the utilities. |
| **Resolution** | When you uninstall the ioMemory VSL software, the installer will now also uninstall the ioMemory VSL utilities. |

- `fio-config` incorrectly reports values

| | |
|---|---|
| **Issue** | The `fio-config` utility would incorrectly show values for parameters that were not set. |
| **Resolution** | The utility now displays the correct values for all parameters. |

## Linux Changes

### Linux Improvements and Features

- IBM High IOPS Adapters are no longer limited to 15 partitions per device in Linux operating systems using kernel 2.6.28 or newer. Any limitations on the number of partitions are now due to system constraints.

### Fixed Linux Issues

- Issue with `init` scripts on SLES 10

| | |
|---|---|
| **Issue** | `init` scripts failed to load the ioMemory VSL software on SLES 10 with the following warning:<br>`Service udev has to be enabled to start service iomemory-vsl` |
| **Resolution** | The init script now loads the ioMemory VSL software on all supported Linux distributions. |

- Issue with unmounting similarly named volumes

| | |
|---|---|
| **Issue** | The `init` script for unmount would unmount all volumes with similar names. For example, it would unmount both `/volume1` and `/volume1-new`. |
| **Resolution** | The script now only unmounts the specified volume. |

- Flushed system signals

| | |
|---|---|
| **Issue** | The ioMemory VSL software would issue a system call that flushed pending signals. This prevented some applications from receiving the signals and the applications would hang. |
| **Resolution** | The ioMemory VSL software no longer issues this system call. |

- Filesystem barriers

| | |
|---|---|
| **Issue** | Previous versions of the 3.x ioMemory VSL software do not implement barriers on Linux. |
| **Resolution** | The ioMemory VSL software has been changed to implement barriers within Linux filesystems. |

# VMware Changes

## VMware Improvements and Features

- The SCSI unmap command is now supported with ESXi 5.5.
- vSAN is now supported with the ESXi 5.5 SCSI version of the ioMemory VSL software.
- In order to minimize issues while detaching, the `fio-detach` utility now issues the following warning:

```
WARNING: Please verify that the device is no longer in use, and
unmounted before continuing.  A device in use, on forced detach, can
cause system instability and kernel crashes.
Do you wish to continue [y/n]?
```

- In order to minimize issues while detaching, the `fio-detach` utility now makes additional attempts to unclaim devices while detaching.
- ioMemory VSL software utilities now support remote ESXCLI commands for remote management. See the *IBM ioMemory VSL User Guide for Vmware* for more info.

## Fixed VMware Issues

- System crash while attaching

| | |
|---|---|
| **Issue** | A PSOD (VMware system crash) would result when an IBM High IOPS Adapter failed to attach and the ioMemory VSL software would immediately attempt another attach (before verifying the failed attach). The software would go into an invalid state and cause the PSOD. |
| **Resolution** | The ioMemory VSL software now verifies the failed attach to prevent the invalid state and the PSOD. |

- Dead paths reported

| | |
|---|---|
| **Issue** | VMware kernel logs reported dead paths because the ioMemory VSL software recognized some invalid multipaths to IBM High IOPS Adapters as valid. This issue did not affect driver functionality. |
| **Resolution** | The ioMemory VSL software no longer recognizes these invalid paths nor does it print the errors in the kernel logs. |

- Read/write errors

| | |
|---|---|
| **Issue** | Infrequent read/writer errors would result from the ioMemory VSL software not responding quickly enough to read/write requests. The following is an example error in the `vmkernel.log` file:<br><br>`2014Y03Y03T20:10:39.353Z$cpu2:2050)NMP:$nmp_ThrottleLogForDevice:2318:$Cmd$0x2a$`<br><br>`$to$dev$"eui.a6e07c87573e4e-8a002471ccd0b2f712"$on$path$"fioiom0:C0:T0:L0"$`<br><br>`Failed:$H:0x7$D-:0x0$P:0x0$Possible$sense$data:$0x0$0x0$0x0.Act:EVAL` |
| **Resolution** | The ioMemory VSL software no longer has these errors. The software now has improved response to abort handling due to read/write timeouts. |

# Known Issues

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.

### Keep default Message Signaled Interrupts for better performance

With ioMemory VSL software 3.x and later, all IBM High IOPS Adapters 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 *IBM 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.

### Proper Time On Startup

If the IBM High IOPS Adapter 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

A Legacy IBM High IOPS Adapter 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 IBM High IOPS Duo Adapters, upgrade each IBM High IOPS Adapter (on the duo product) individually.

**Attention!**

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

### Device capacity may change after upgrade

If you upgrade a device that was previously formatted using a much earlier version of IBM High IOPS Adapter, 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
```

## Management Specific

### Make sure the utilities match the ioMemory VSL software version

When you install this version of the 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 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 IBM High IOPS Adapter fails, the device may no longer appear in `fio-status`. If your device has failed, contact Customer Support.

## Windows Specific

### SCSI ID conflict with other storage devices

If your Windows system uses a storage device in addition to an IBM High IOPS Adapter, the devices may have duplicate SCSI IDs which will cause conflicts. You can resolve the conflict by changing the IBM High IOPS Adapter fct index number. This will make it possible to give the IBM High IOPS Adapter a unique SCSI ID.

1. Determine the PCIe bus number of the device with conflicting ID using `fio-status`.

    a. The `fio-status` utility displays the bus number as a hexidecimal value. You must convert that value into a decimal value.

    b. For example, the utility may return a value of `0xb`. This stands for bus `011`.

    c. You should also verify the fct value (for example, `fct0`).

2. Open up the Windows registry editor `regedit.exe`, and navigate to the location of the key or path:

    ```
    HKEY_LOCAL_
    MACHINE\SYSTEM\CurrentControlSet\services\fiodrive\fctDevMap
    ```

3. You will see that there is one entry per drive. The registry entry visible in the right pane will be named with the PCIe bus number (for example, `000:011:00.0-0` would be for the device on bus `11` (reported as `0xb` in `fio-status`).

    The registry entry value is the fct index number. For example, a value of `0` results in `fct0`. You should verify that this value matches the current fct number of the device.

4. Edit the registry entry and change the fct index number.

    a. The fct index must be between `0` and `254`. The fct index number determines the SCSI Logical Unit of the SCSI ID.

    b. The value must not already be in use.

    **NOTE-**

    For example, you can run `msinfo32.exe` to verify the SCSI IDs of other devices.

5. After changing the number, restart your Windows system for it to take effect. This will be preserved across a system restart.

---

**Attention!**

Unused entries may be deleted, but only one device entry may have the same fct index, otherwise the results are undefined.

---

Be aware that if a new IBM High IOPS Adapter is added to the system, the numbering of the fct index will start at the lowest number again, or `fct0`. You may need to modify the registry again in this case.

## Read requests delayed for new data

Read IO requests to a sector location that was very recently written may have higher latency (up to around 200ms) than typical read IO requests. This is typically seen in applications that write data and immediately check (read) the data.

## ioMemory VSL software not loading or attaching devices after install

If the ioMemory VSL software is not loading or attaching IBM High IOPS Adapters 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 *IBM ioMemory VSL User Guide for Windows*. Repeat this procedure to install each device.

# Linux Specific

## 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.

## 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.

## 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-IBM drivers. The issue has been resolved in newer kernels.

Because this is an issue in the Linux kernel, IBM 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 the 2.6.34 or kernel 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 kernel 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 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.

## RHEL6 udevd warning

When using an IBM High IOPS Adapter 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.

## RHEL6 warn_slowpath during device attach

When attaching an IBM High IOPS Adapter 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.

## Do not use an IBM High IOPS Adapter as a `kdump` target

Do not direct `kdump` to dump the crash information to an IBM High IOPS Adapter. Due to the restricted memory environment in `kdump`, the ioMemory VSL software does not load in the `kdump` crashkernel and IBM High IOPS Adapters are not supported as `kdump` targets.

# VMware Specific

## Only 512B Sectors Supported

Only a 512B sector size is supported onVMware hypervisors. Consult the `fio-format` section of the *IBM 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.

## 16 block device limit with VMware hypervisors

VMware ESXi hypervisors will only recognize up to 16 IBM High IOPS Adapters 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 IBM High IOPS Duo Adapters (each with two IBM High IOPS Adapters).

This limit only applies to IBM High IOPS Adapters that are used directly by the hypervisor system as raw block devices.

If you pass devices through to a guest OS, those devices are not counted toward the 16 block device limit.

## Using VMDirectPathIO with multiple-device products

Some products contain multiple IBM High IOPS Adapters on one PCIe adapter, such as the IBM High IOPS Duo Adapter. The ioMemory VSL software does not support splitting the two IBM High IOPS Adapters between two functions or virtual machines. The following scenarios are supported:

- Both IBM High IOPS Adapters are used as a VMFS datastore in ESXi.
- Both IBM High IOPS Adapters are passed through (using VMDirectPathIO) to the same virtual machine.

## ESXi 5.x injected installer allows installation on an IBM High IOPS Adapter

IBM High IOPS Adapters are not designed to be bootable, therefore you should not install the host OS on an IBM High IOPS Adapter. The ESXi injected installer will permit you to install the OS on an IBM High IOPS Adapter, but the installation will fail on reboot.

## vCenter cannot manage extents on IBM High IOPS Adapters

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

# Download Location

Software, utilities, and related documentation for this version can be found at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-65723 (follow that link and then select **IBM High IOPS software matrix**)