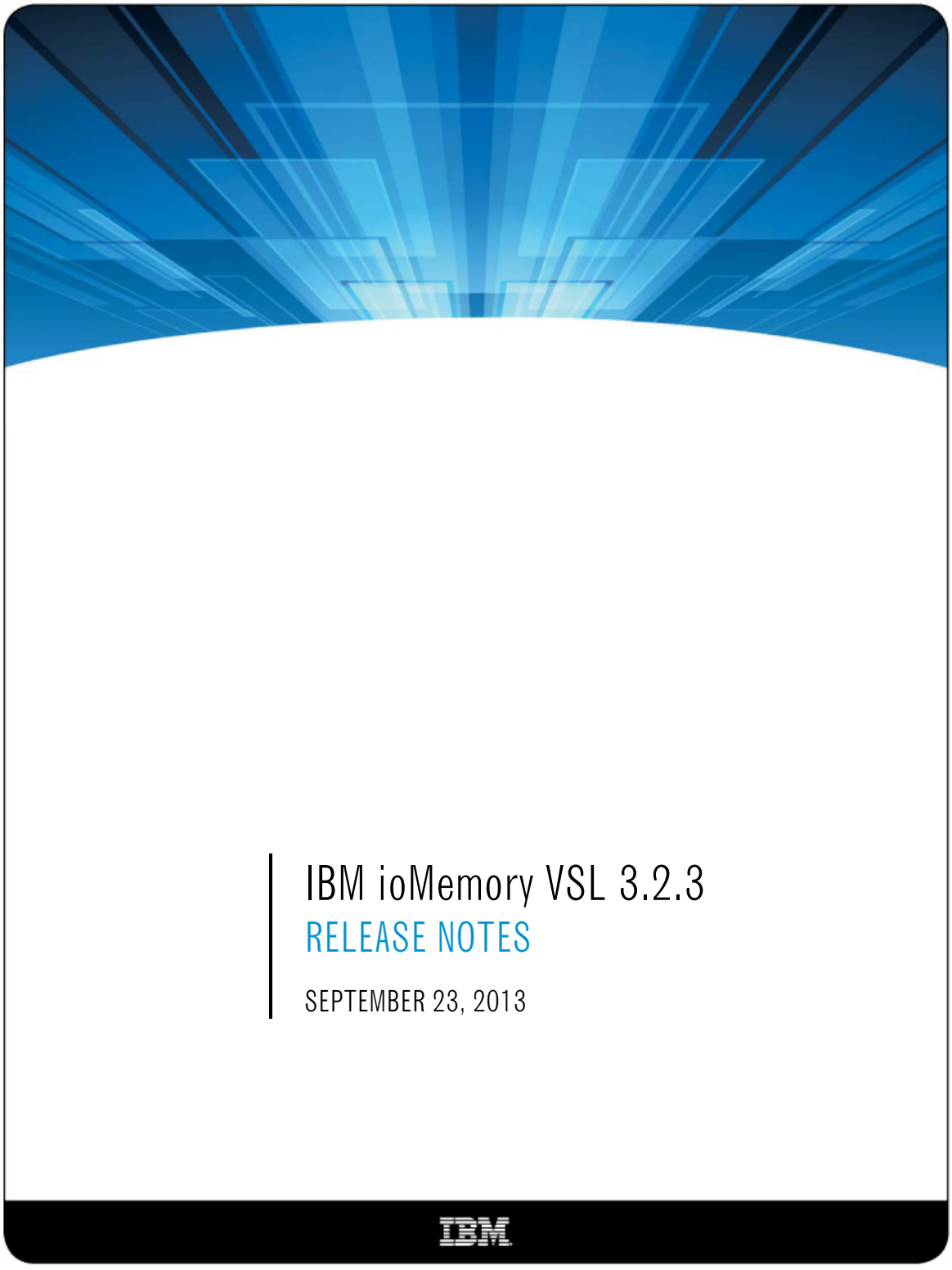

IBM ioMemory VSL 3.2.3

RELEASE NOTES

SEPTEMBER 23, 2013

[no notes on this page]

[no notes on this page]

Legal Notices

Part Number: D0001594-004_2
Published: September 23, 2013

[no notes on this page]

Introduction

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

- System requirements, including supported operating systems and hardware requirements.
- Supported IBM Adapters.
- 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 Adapter**, you may substitute your particular device(s), such as an IBM High IOPS Adapter or each of the two IBM 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 Adapters**. If your product consists of multiple IBM Adapters, you will manage each IBM 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 Adapters. Each of the two devices will be presented as an individual device to your system.

[no notes on this page]

System Requirements

Hardware Requirements

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

NOTE For the latest IBM System x server configuration information and requirements for IBM High IOPS Mono and Duo 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 Adapter 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.

Attention **512B-only Support**: Some applications and operating systems will only work with 512B sector sizes. These operating systems include: ESX and ESXi.

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

Attention **Windows 4KB Support**: While Microsoft does not officially support 4KB sector sizes with Windows Server 2003 or 2008, 4KB sector sizes do work with many applications on these operating systems. The performance benefit of 4KB sectors is significant enough in Windows operating systems that we recommend testing 4KB sectors for use with your application.

Microsoft does fully support 4KB sector sizes on Windows Server 2012.

Even if you cannot force 4KB sector sizes, the average write I/O size for most workloads is 4KB or larger. For this reason, 4KB average write size is typically the most accurate representation of memory utilization.

[no notes on this page]

Calculating Maximum RAM Requirements

The amount of RAM required by the ioMemory VSL software depends on the 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 IBM High IOPS Mono and Duo Adapters, have more than one device within the product. You must calculate the RAM usage for each of those 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` in the command line to see how much RAM the ioMemory VSL software is using per IBM Adapter.

[no notes on this page]

Supported Devices

This section lists the new and legacy IBM adapters that are supported with version 3.x of the The page Overview does not exist.. 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 and Enterprise Value 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 Enterprise Value adapters are only supported on VMware and Linux operating systems.

Attention Hypervisors cannot directly use devices with capacities greater than 2TB, see the *VMware-Specific* Known Issues for more information.

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

[no notes on this page]

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 Adapters. Running the latest service pack / update of a release is strongly recommended.

Supported Microsoft Windows Operating Systems

- Microsoft Windows 2003 Server 64-Bit (with SP2 or higher)
- Microsoft Windows Server 2008 64-Bit, R1 (with SP2 or higher)
- Microsoft Windows Server 2008 64-Bit, R2 SP1
- Microsoft Windows Server 2012

NOTE IBM Adapters 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.

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

[no notes on this page]

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 5.8), 6 (up to 6.3)
- SUSE Linux Enterprise Server (SLES) 10, 10 SP4, 11, 11 SP1, 11 SP2

Supported VMware Operating Systems

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

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

1. Using the IBM 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 Adapter.
2. Using VMDirectPathIO, allow a virtual machine to directly use the IBM Adapter. 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 IBM.

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

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

[no notes on this page]

Upgrade Notes

Firmware Version

Use the firmware archive file that is released with this version of ioMemory VSL software. The archive file fio-firmware-highiops_3.2.3.20130221-*.rpm contains the controller firmware version `7.1.13.109322` for all ioMemory VSL softwares.

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

Upgrading Devices for ioMemory VSL software 3.2.3

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

For example, if you have a system running 2.2.3 ioMemory VSL software with IBM High IOPS Adapters previously installed, and you want to install new 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.

> You cannot revert a device's firmware to an earlier version once you have upgraded the device. If you experience problems with your upgrade, please contact Customer Support at *http://www.ibm.com/systems/support*.

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** -> **3.2.3**

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

[no notes on this page]

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

> Note that when running multiple firmware upgrades in sequence (such as going from 2.1.0 to 2.2.3), after each subsequent firmware upgrade it is critical to reboot the system, load the ioMemory VSL software (if it doesn't automatically load with your OS), and attach each device

Upgrading from ioMemory VSL Version 2.x

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

As shown in the Upgrade Path section above, you may upgrade your ioMemory device to the current firmware version from any firmware version that is released with ioMemory VSL software version 2.2.3 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: $body

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

It may take an extended period of time to format each device, depending on the wear on the device. 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

[no notes on this page]

7. Ensure that the newly installed ioMemory VSL software loads correctly and that all IBM 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 (3.2.3), consult the User Guide for this version for further upgrade instructions.

Do Not Downgrade Device Firmware

Do not downgrade the IBM 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 need to downgrade your firmware, contact Customer Support at *http://www.ibm.com/systems/support* for compatibility information and to discuss your use case.

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

[no notes on this page]

Change Log

3.2.3.953 Change Log (Windows Only)

The Windows installer is now updated to version 3.2.3.953. This latest version of the ioMemory VSL software Windows installer no longer installs the IBM TRIM service as a Windows service on Windows Server 2003 and Windows Server 2008 R1.

> The installer does copy over the Fusion-io TRIM service file, but it does not install it as a Windows service.

If you have previously installed the ioMemory VSL software on Windows Server 2003 or 2008 R1, we recommend stopping the Fusion-io IBM TRIM service. See *Windows-Specific* Known Issues for more information.

3.2.3 Change Log

In addition to various improvements, the following are changes made to the ioMemory VSL Software since the last release, including:

Improvements, Features, and Changes:

- Change to `fio-sure-erase` so devices maintain current formatting parameters rather than reverting to the default parameters. Added an option (`-t`) that will reset the device format parameters to the default settings.
- Changes to the firmware archive filename and distribution.
  - In Windows the firmware archive file is now distributed as a separate file, and no longer embedded within the ioMemory VSL installation package.
  - In Linux, the firmware is still distributed as a package, but is now also distributed as a separate firmware archive file.
  - The firmware archive filename convention is now `highiops_<version>-<date>.fff`.

[no notes on this page]

- New Virtual Controller feature available for Windows and Linux.
  - See the Windows or Linux *IBM ioMemory VSL User Guide* for complete information on using the feature.
  - With Virtual Controller technology each physical IBM Adapter is split into two (virtual) logical devices. Splitting the IBM Adapter into two virtual devices has the following implications:
    - **Latency**: There is no affect on latency.
    - **Throughput**: The total peak I/O bandwidth of the device is approximately the same.
    - **IOPS**: Depending on the use of the virtual devices (especially the average I/O size), the peak IOPS for each virtual device is about the same for a non-split device. In other words, the combined peak IOPS of the two virtual devices can be nearly double that of a non-split device. See the *IBM ioMemory VSL User Guide* for your platform for more information.
    - **Capacity:** Due to virtualization overhead, the combined capacity of the two virtual devices is slightly less than that of a single-controller device. See the *Virtual Controller Technology Support* section in this document for a list of compatible devices and their Virtual Controller capacities.
- Added `WIN_LOG_VERBOSE` parameter to the Windows ioMemory VSL software. This parameter expands the extent of the ioMemory VSL error log messages in the event log and provides additional crucial information for troubleshooting any issues. For more information, see the *Troubleshooting Event Log Messages* appendix in the *IBM ioMemory VSL User Guide for Windows*.
- Change to the device numbering in Windows. The `/dev/fctx` device number used in the command-line utilities is now assigned as the ioMemory VSL software initially loads.
- The NUMA affinity parameter in Windows now uses the PCI bus number to set the affinity, and you will need to update any existing affinity configuration. See the user guide for Windows for more information.
- The Linux ioMemory VSL `use_workqueue` parameter was changed to a default value of `0`.

Fixed the Following Issues:

- Incorrect load average

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

- Power throttle warning message

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

[no notes on this page]

- Issues when interrupting `fio-format`

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

- Utility interrupting firmware updates

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

- Failed firmware upgrade not reported

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

- Problem updating multiple IBM High IOPS Duo Adapters

Issue	Upgrading multiple IBM High IOPS Duo Adapters in a single `fio-update-iodrive` command could fail with error `Device is missing midprom data`.
Resolution	Updating multiple devices in a single command is now successful.

- Utilities and VSL software mismatch error

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

- Interrupt affinity not working in Windows

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

- Performance with large block sizes in VMware environments

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

[no notes on this page]

Known Issues

Overview

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

General

Don't disable CPUs after loading the ioMemory VSL driver

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

Improved hardware failure detection

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

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

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

Keep default MSI Interrupts for better performance

With ioMemory VSL software 3.x and later, all IBM 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.

[no notes on this page]

Improved thermal throttling

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

Proper Time On Startup

If the IBM 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 lessor of 1 day or the amount the time is set backwards.

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

Firmware update may fail with a TDO mismatch error

An 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 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 ioMemory VSL software, the device capacity may change. The capacity difference may be minimal (for example 160.94GB becomes 160GB), but it may be an issue if the device was part of a application or database that expects the exact same capacity.

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

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


[no notes on this page]

Management-Specific

Make sure the utilities match the ioMemory VSL software version

When you install this version of the ioMemory VSL software, make sure the 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 `API mismatch` or `unhandled ioctl`. 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 Adapter fails, the device may no longer appear in `fio-status`. If your device has failed, contact Customer Support.

Windows-Specific

Disable IBM TRIM Service on Windows Server 2003 and 2008 R1

The IBM TRIM service, which runs on Windows Server 2003 and 2008 R1, may cause a file system corruption to occur. This corruption will most likely occur when the NTFS cluster size is NOT the same size as the IBM Adapter sector size.

[no notes on this page]

This latest release of the ioMemory VSL does not deploy the TRIM service. If you are running an earlier build of this VSL version (3.2.3.950) that includes the IBM TRIM service, we recommend that you disable the IBM TRIM service by using the `fio-trim-config` utility. For example, run this command from the command prompt (with Administrator rights):

```
fio-trim-config -d
```

You can verify that the service has stopped by running the command with no options, for example:

```
C:\> fio-trim-config

Current TRIM status:

--------------------

Stopped
```

Forced detach sometimes required for Virtual Controller devices

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

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

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

ioMemory VSL software not loading or attaching devices after install

If the ioMemory VSL software is not loading or attaching IBM 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.

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

[no notes on this page]

- 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 IBM Adapters 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.

Attention 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 IBM Adapter in the system that is to be converted, use the IBM High IOPS Management Application to a) detach the drive and b) do a low-level format (See the IBM High IOPS Management Application User Guide for details).
2. Restart the computer.
3. Go to Disk Management and select Initialize Disk.
4. Right-click and select Convert to GPT (or Convert to Dynamic Disk).

Linux-Specific

Software not installed post kernel update

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

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

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

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

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

[no notes on this page]

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. 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, 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 2.6.34 or newer to avoid this issue. For more info see the patch 1 and bug report 2 below.

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

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

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

Kernels 2.6.34/35 don't handle switching interrupt types

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

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

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

2. load the driver, enabling MSI interrupts

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


[no notes on this page]

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 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 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.

`kdump` crashkernel requires additional memory for the ioMemory VSL software

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

The amount of memory required will vary depending on your kernel version and the formatted sector sizes (more RAM is required for 512B sector sizes than for 4K sectors). The device sector size can be formatted using

[no notes on this page]

`fio-format`. A good starting point would be to increase the crashkernel reserve by approximately 50-250MB of RAM (depending on your configuration).

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

Do not use an IBM Adapter as a `kdump` target

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

VMware-Specific

Hypervisors cannot directly use devices with capacities greater than 2TB

Because the VMFS in VMware hypervisors does not directly support devices with capacities greater than 2TB, you cannot use all of the capacity of a IBM Flash Adapter F3200 Enterprise Value for System x 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 IBM Flash Adapter F3200 Enterprise Value for System x if you pass the device through (using VMDirectPathIO/PCI Passthrough) to a guest Linux OS that supports devices with capacities greater than 2TB.

ESXi 5.0 Update 1 firmware upgrade

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

Using VMDirectPathIO with multiple-device products

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

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

ESXi 5.0 injected installer allows installation on an IBM Adapter

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

[no notes on this page]

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

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

vCenter cannot manage extents on IBM Adapters

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

[no notes on this page]

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**)

IBM part number 00D2422

[no notes on this page]