Lenovo Services Education

Servicing the Lenovo eXFlash DIMM Memory-Channel Storage

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Study guide

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Preface

Servicing the Lenovo eXFlash DIMM Memory-Channel Storage

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To provide feedback or receive more information about this course, send an e-mail to: ServicesEdu@lenovo.com

Objectives

After completing this course, you will be able to:

1. Describe the features of the Lenovo eXFlash DIMM Memory-Channel Storage.
2. Provide an overview of the Lenovo eXFlash DIMM Memory-Channel Storage.
3. Describe the product specifications and the new technology of the Lenovo eXFlash DIMM Memory-Channel Storage.
4. Describe the problem determination steps and explain how to troubleshoot the Lenovo eXFlash DIMM Memory-Channel Storage.

Servicing the Lenovo eXFlash DIMM Memory-Channel Storage

Overview

Lenovo eXFlash DIMM memory-channel storage

The Lenovo eXFlash memory-channel storage (Lenovo eXFlash DIMM) is flash memory technology that comes with X6 family servers. The eXFlash DIMM is a solid-state storage device in a standard DIMM form factor that plugs into existing memory DIMM slots and is directly connected to the DDR3 system memory bus.

Lenovo eXFlash DIMMs offer lower latency compared to traditional solid-state devices.

Product view

Figure 1 shows the Lenovo eXFlash DIMM.

Figure 1: Lenovo eXFlash DIMM

Product description

The Lenovo eXFlash DIMM modules are installed into DDR3 slots and use the processors' memory channels. Data transfer between processors and eXFlash DIMMs run directly without any extra controllers, including the PCIe controller and SAS/SATA controllers. This approach can reduce latency and improve performance.

Figure 2 shows the difference in data access between Lenovo eXFlash DIMMs and other solid-state storage products, including PCIe SSD adapters and SAS/SATA SSDs.

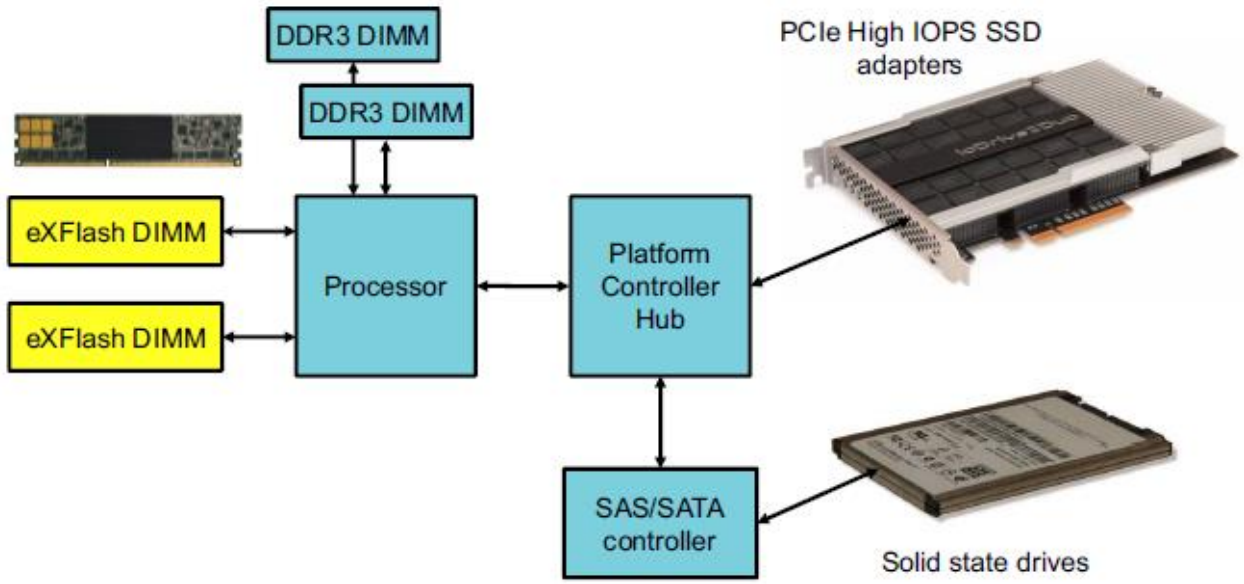

Figure 2: Lenovo eXFlash DIMMs placement

Features and specifications

Key features of the eXFlash DIMMs are as follows:

- 240-pin DDR3 RDIMM as per JEDEC® specification
- 200 GB and 400 GB capacity devices
- Interface Transfer Rate: PC3-6400, PC3-8500, PC3-10600, and PC3-12800
- Support for DDR3-800 to DDR3-1600 MHz
- Configured as single-rank x4 organization of 4 GB
- Supports 1.35 or 1.5 VDD, 3.0-3.6 V VDDSPD
- Support for ECC error detection and correction
- On-board I2 degrees Celsius temperature sensor
- Drive specific SMART attributes
- Guardian™ Technology to extend the native endurance of MLC Flash
- DataGuard™ Technology to protect against data corruption and loss
- Ultralow write latency with WriteNow technology
  - As low as 3.3 microseconds response time
  - Less wait time between transactions
  - Deterministic response time across varying workloads
  - Consistent performance for high throughput and speed
- RAID mirroring
  - Two eXFlash DIMMs in the system domain can be a mirrored pair
  - Business-critical data protection
- High scalability
  - Add multiple eXFlash DIMMs without experiencing performance degradation
  - High flash storage density within the server

- Maximized storage footprint with utilization of existing unused DDR3 slots
  - Increases storage capacity without increasing your servers
  - Features industry-standard DDR3 form factor
  - Plugs into existing DDR3 slot
- Up to 12.8 TB total flash storage capacity per server with Lenovo 200 GB and 400 GB eXFlash DIMMs

System configurations and diagrams

Configurations

Lenovo eXFlash DIMMs are recognized by the server as solid-state storage devices. A specialized kernel driver is required for the operating system to use eXFlash DIMMs.

Lenovo eXFlash DIMM installation requires the following:

- UEFI which supports eXFlash DIMM.
- A maximum of one eXFlash DIMM per DDR3 memory channel.
- At least one RDIMM must be installed in the same memory channel as eXFlash DIMM.
- eXFlash DIMMs only support RDIMMs; other memory types are not supported.
- eXFlash DIMMs with different capacities (that is, 200 GB and 400 GB) cannot be intermixed in the same server.

Note: eXFlash DIMMs are supported only in memory independent mode in the UEFI setting. Other memory modes of operations (including lockstep, memory mirroring, and memory sparing) are not supported.

Figure 3 shows one eXFlash DIMM installed with RDIMMs.

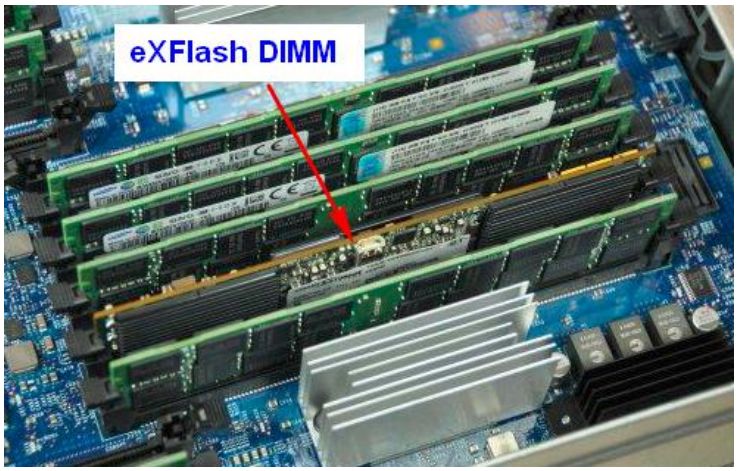

Figure 3: Lenovo eXFlash DIMM installed in the memory slot with RDIMMs

Lenovo eXFlash DIMMs are supported with the following servers:

- Lenovo System x3650 M4 (7915): Up to eight eXFlash DIMMs (one eXFlash DIMM per memory channel).
- Lenovo System x3850 X6 (3836): Up to 32 eXFlash DIMMs (one eXFlash DIMM per memory channel).

- Lenovo System x3950 X6 (3837): Up to 32 eXFlash DIMMs (one eXFlash DIMM per memory channel is only supported in the lower half of the x3950 X6).

The x3650 M4 has limited support for Lenovo eXFlash DIMMs. Only the components shown in **Table 1** are supported by Lenovo eXFlash DIMMs.

Table 1: Lenovo system x3650 m4 / eXFlash DIMM considerations

Item	Description
Quantity	Four or eight eXFlash DIMMs; other eXFlash DIMM quantities are not supported
Operating system	Red Hat Enterprise Linux 6 Server X64 Edition (Update 4)
Processor	Intel Xeon Processor E5-2667 v2 8C 3.3 GHz 25 MB Cache 1866 MHz 130 W Intel Xeon Processor E5-2643 v2 6C 3.5 GHz 25 MB Cache 1866 MHz 130 W Intel Xeon Processor E5-2697 v2 12C 2.7 GHz 30 MB Cache 1866 MHz 130 W Intel Xeon Processor E5-2690 v2 10C 3.0 GHz 25 MB Cache 1866 MHz 130 W
Memory	16 GB (1x16 GB, 2Rx4, 1.5 V) PC3-14900 CL13 ECC DDR3 1866 MHz LP RDIMM
Adapter	Intel X520 Dual Port 10 GbE SFP+ Embedded Adapter for Lenovo System x

Lenovo eXFlash DIMMs are supported with the following operating systems:

- Microsoft Windows Server 2012 R2.
- Microsoft Windows Server 2012.
- Microsoft Windows Server 2008 R2 (Service Pack 1)
- Red Hat™ Enterprise Linux® 5.8, 5.9, 5.10, 6.3, 6.4 6.5
- SUSE™ Linux Enterprise Server (SLES™ 11) for AMD64/EM64T(update 3).
- VMware® vSphere 5.1(update 1), 5.5 (ESXi).

Tools

Table 2 shows what tools can be used to manage the various operating systems.

Table 2: Operating systems and tools		
Command-line interface (CLI)	**Common information model (CIM)**	**Management console**
Linux		Linux
Windows		Windows
	VMware ESXi 5.X	

Device identifiers

A unique identifier for each operating system (Linux, Windows, and ESX) is assigned to each eXFlash DIMM module in a system.

The Linux naming convention is “tdx” where x is assigned a letter that starts with “a” and continues alphabetically. For example, tda or tdb. For CLI commands, use the tdx identifier to specify the device. Some commands, such as the upgrade command, specify the device using /dev/tda.

The Windows naming convention is “tdx” where x is a number. For example, td4.

The VMWare naming convention is “Tx” where x is assigned a number. For example, T2.

Block Size

The block size represents the size of data to be sent to the hardware. **Table 3** shows which block sizes are supported on the different platforms.

Table 3: Supported block sizes	
Platform	**Supported block sizes**
Windows 2008	512
Windows 2012	512, 4096
ESX	512
RHEL5	512
RHEL6	512, 4096
SLES 11	512, 4096

Linux considerations

This section describes how to prepare for the installation of the Linux device drive and tools.

Installing and managing IPMI on Linux:

An Intelligent Platform Management Interface (IPMI) proxy is provided with the eXFlash DIMM device to monitor platform status for temperature and throttling. Both the system IPMI driver and the proxy service need to be running for the IPMI proxy to perform the monitoring function.

Make sure that an appropriate IPMI driver, such as OpenIPMI, has been installed.

The IPMI proxy client is installed as a separate.rpm file, provided with the eXFlash DIMM installation package.

To start or stop the IPMI proxy service, or to check the status, use the `teradimm_ipmi_proxy` script, for example:

```
/etc/init.d/teradimm_rpm_proxy start
/etc/init.d/teradimm_rpm_proxy stop
/etc/init.d/teradimm_rpm_proxy status
```

To check the status, you can also view the logs, which are located here:

```
var/log/ipmiproxy.log
```

Installing the Linux device driver:

- Obtain the version of the device driver package that is compatible with the kernel.

Determine the revision of the Linux system kernel by typing:

```
# uname -r
2.6.32-279.1.1.el6.x86_64 (sample reply)
```

- The package consists of two RPM files: `cli` and `kmod` (device driver software).
- Change to the working directory that contains the RPM files.
- To install the eXFlash DIMM device driver, install the RPMs using the correct kernel revision information, and type:

```
# rpm -ihv [<file_name> <kernel _version].rpm
```

You must manually run `modprobe` or install the CLI tool (preferred) to create the device. When the CLI is installed, the CLI kicks off a driver start service that will automatically modprobe the teradimm driver and initialize the modules, which in turn creates the devices in Linux. The CLI controls the autostart of the teradimm drivers at boot time.

Note: You can control if the service autoload at boot time. Edit `/etc/teradimm/autoload.conf` and change the `AUTOLOAD=1` (enabled) to `AUTOLOAD=0` (disabled). When disabled the user will need to manually run modprobe teradimm to

initialize the driver after they log in to the system.

Installing the eXFlash DIMM Command Line Interface (CLI) on Linux:

- To install the CLI, download the package, and type:

```
# rpm -ihv <file_name>.rpm
```

Windows consideration

This section describes the installation process for Windows.

Installing and managing IPMI on Windows:

Make sure that an appropriate IPMI driver, such as Microsoft IPMI or Intel IPMI, has been installed. (The Microsoft IPMI driver may have been automatically installed with the operating system.)

To start or stop the IPMI proxy service, or to check the status, use the standard Windows console. For example, from the main screen click:

- **Control panel**
- **System**
- **Security**
- **Administrative Tools**
- **Services**

Or

- Click **Start**
- Type **services** in the **search** box
- Click the **IPMI** entry in the list as shown in **Figure 4.**

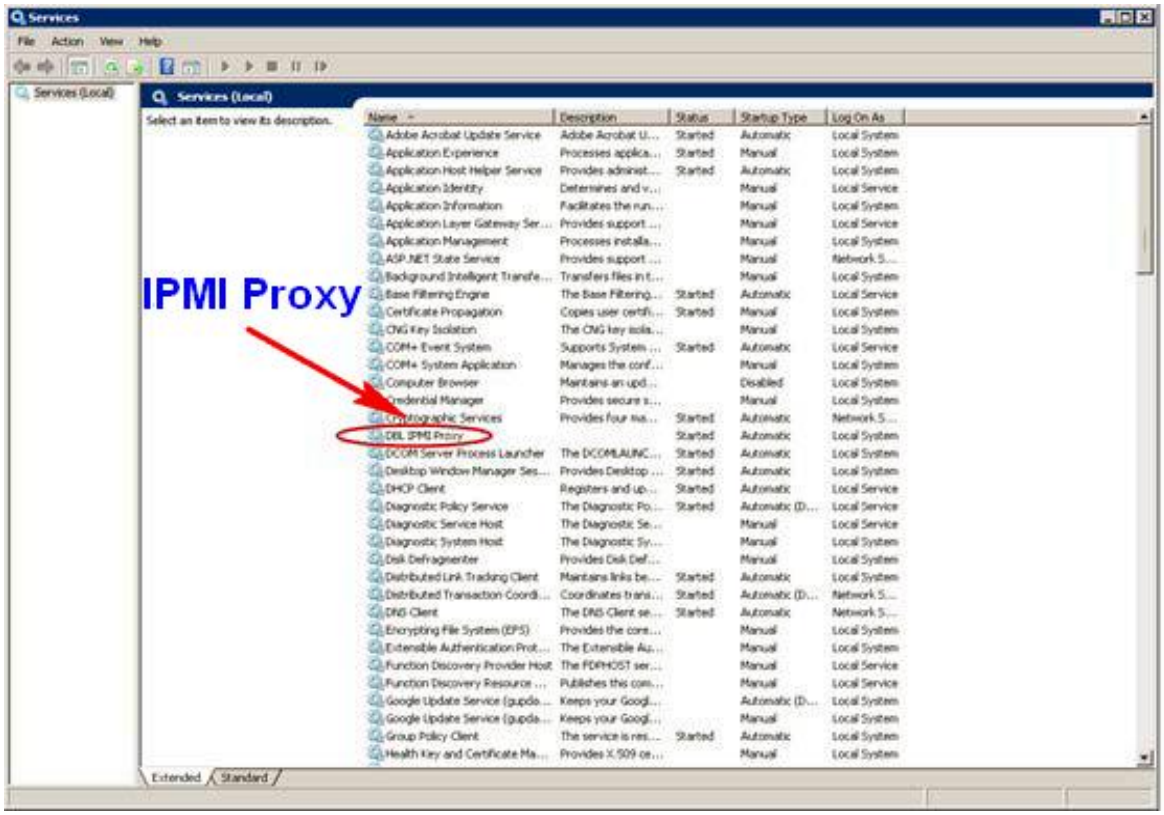

Figure 4: IPMI proxy service in the Windows Services list

Installing the eXFlash DIMM device driver and CLI on Windows:

You must be logged in as an administrator to perform the installation.

1. Download the Windows installer package (MSI files) and launch it.
2. If you agree, click **Accept** to accept the License Agreement.
3. Select **Typical install**.
4. Press **Finish** when the installation has completed successfully.
5. Open the Windows DISK Manager and initialize the drive.
6. Format the drive volume, if applicable to your requirements.

Installing the eXFlash DIMM Management Console on Windows:

1. Download the Windows installer package and launch it.
2. Follow the installation wizard to finish the installation process.
3. The Launch eXFlash DIMM Memory-Channel Storage Management Console icon shortcut will appear on your desktop.

Note: For the Windows 2012 operating system, a redistributable is required to operate the eXFlash DIMM Management Console.

VMware ESX consideration

The VMware ESX platform does not support onboard CLI management. Instead, ESX is managed using a CIM interface, which consists of a CIM client that runs on a host system which communicates over HTTP with a CIM server that runs on the ESX machine.

Installing and managing IPMI on ESX:

Make sure that an appropriate IPMI driver, such as OpenIPMI, has been installed.

(The OpenIPMI driver should have been automatically installed with the operating system.)

To start or stop the IPMI proxy service, or to check the status, use the standard CIM client interface.

Installing the eXFlash DIMM device driver on ESX:

Installing the eXFlash DIMM module requires a system reboot. Stop or vmotion all virtual machines that are running on the server before beginning this procedure.

1. Install the latest ESX device drivers according to your ESX management preferences. First, move the system into maintenance mode:

   ```
   esxcli system maintenanceMode set -e true
   ```

2. To Install the driver, type:

   ```
   esxcli software vib install -v /<URL or pathname>/<driver_filename>.vib
   ```

3. Reboot to complete the ESX VIB installation (normal for ESX driver VIB).

   ```
   esxcli system shutdown reboot
   ```

4. Determine the highest number in each node (for the purpose of CPU group assignment):

   ```
   vsish -e cat /hardware/cpuTopology/numa/nodes/<socket number>
   ```

5. Assign each device to a CPU group.

   ```
   esxcli system module parameters set -m teradimm -p socketmap=<highest
   number in socket 0, highest number in socket 1, ...>
   ```

6. Reboot the system after setting the parameter.
7. Place the device back in online mode:

```
esxcli system maintenanceMode set -e false
```

8. Make sure the eXFlash DIMM is formatted to block size = 512.
9. Make sure the eXFlash DIMM disks are seen:

```
~ # ls -l /dev/disks
```

An mpx.eXFlashDIMM should be listed for each device in your system. For example, if you have four devices, you should have four mpx. eXFlash DIMM entries. In the example below, the T0, T1, T2, and T3 refer to the devices.

```
lrwxrwxrwx 1 root 21 Dec 12 17:15
vml.0100000000613331343135392020005465726153 49 ->
mpx.exflash_dimm:C0:T0:L0
mpx.exflash_dimm:C0:T0:L0

lrwxrwxrwx 1 root 21 Dec 12 17:15
vml.0100000000613331343135392020005465726153 49 ->
mpx.exflash_dimm:C0:T1:L0

lrwxrwxrwx 1 root 21 Dec 12 17:15
vml.0100000000613331343135392020005465726153 49 ->
mpx.exflash_dimm:C0:T2:L0
lrwxrwxrwx 1 root 21 Dec 12 17:15
vml.0100000000613331343135392020005465726153 49 ->
mpx.exflash_dimm:C0:T3:L0
```

Installing the CIM Provider on ESX:

Ensure that the SFCB watchdog is disabled before installing the CIM provider. After installation, enable the watchdog.

- To stop the watchdog, type:

```
/etc/init.d/sfcbd-watchdog stop
```

- Install the ESX CIM provider according to your ESX management preferences.

```
esxcli software vib install -v /scratch/<device driver filename>.vib
```

- To restart the watchdog. Type:

```
/etc/init.d/sfcbd-watchdog start
```

Upgrading the eXFlash DIMM firmware

It is important to read the latest release notes when upgrading the eXFlash DIMM memory channel storage firmware.

Changes are made periodically to the Lenovo Web site. The procedure for locating firmware and documentation might change from what is described in this document.

Determining the eXFlash DIMM firmware level using the CLI:

- To determine the device ID, type:

```
% td-cli device --list
```

- To determine the firmware level, type the CLI command:

```
td-cli device <device_id> --status
```

- The sample output for this command contains the Flash Status information, including firmware version, DIMM slot, device group, lifetime, and so on.

```
td4:
        Product Number: TDIMMLite , SN: 0000015C
        Device Alias: devicefour
        UUID: ECF19445-90BF-BF16-7445-233069F69988
        Firmware Version: 1.4.0.29
        Backup Firmware: 1.3.2.10
        DIMM Slot: Bank 4
        DIMM Address: 0x280000000, DIMM Size: 0x100000000
        DDR Speed: 1333, IRQ: 19
        Device Group: LogProc_2
        Control Device: \\.\Global\TdCtrl
        Flash Status: N/A
        Percentage of Warranty Remaining: 98%
        Flash Temperature: 48.0 C, Max: 59.0 C
        Performance Status: Optimal (0)
        Lifetime: 164 hours, 0 GB read, 0 GB written
        Block Device: UNKNOWN <maintenance>
        Block Size: 512 bytes, Disk Size: 200049647616 bytes
        Stride: 4 kbytes
        Block Provisioning: 100%
        DRAM Protection Status: Unsupported
        TRIM : Disabled
        Predictive Failure Detected: FALSE
        Commit Mode: WriteNow
```

Determining the eXFlash DIMM firmware level using the Management Console:

From the Management Console, select:

1. The device in the left panel as shown in **Figure 5**.
2. Click **FIRMWARE** on the main menu. The application shows the current firmware version and the backup firmware version.

Upgrading the firmware using the CLI:

To upgrade the eXFlash DIMM memory- channel storage firmware, type the following CLI command: **`td-cli device-firmware --upgrade <image name> <device_id>`**

If a device ID is not specified, all devices are upgraded. The sample output as the following:

```
Parsed command - parsing upgrade package file
Parsed upgrade package file - initializing upgrade
Upgrade initialization complete - performing pre-upgrade version check
Version check complete - loading images
Loaded image 1 of 9 for device /dev/tda
Loaded image 2 of 9 for device /dev/tda
Loaded image 3 of 9 for device /dev/tda
Loaded image 4 of 9 for device /dev/tda
Loaded image 5 of 9 for device /dev/tda
Loaded image 6 of 9 for device /dev/tda
Loaded image 7 of 9 for device /dev/tda
Loaded image 8 of 9 for device /dev/tda
Loaded image 9 of 9 for device /dev/tda
Load phase complete. Invoking new load for device
Bankswitch complete. Resetting device
Reset complete. Confirming versions
Versions confirmed. Upgrade complete
FW upgrade succeeded.
Command handling complete
```

Upgrading the firmware using the Management Console:

Upgrades are typically performed in online mode. The system reminds you that you are upgrading in online mode.

1. Click **FIRMWARE** on the main menu as shown in **Figure 5**. The application shows the current firmware version and the backup firmware version.
2. From the Upgrade To option, click **Choose file**.
3. Select the file to use for upgrading the firmware.
4. Click **Upgrade.** The system displays a message to indicate that the upgrade may take a few minutes.

Note: Typically, a firmware upgrade can occur while the device is online and processing I/Os. However, occasionally, an upgrade will require that the device be placed into maintenance mode. The system will issue an alarm to indicate when this is required.

Figure 5 shows the eXFlash DIMM firmware upgrade using the management console.

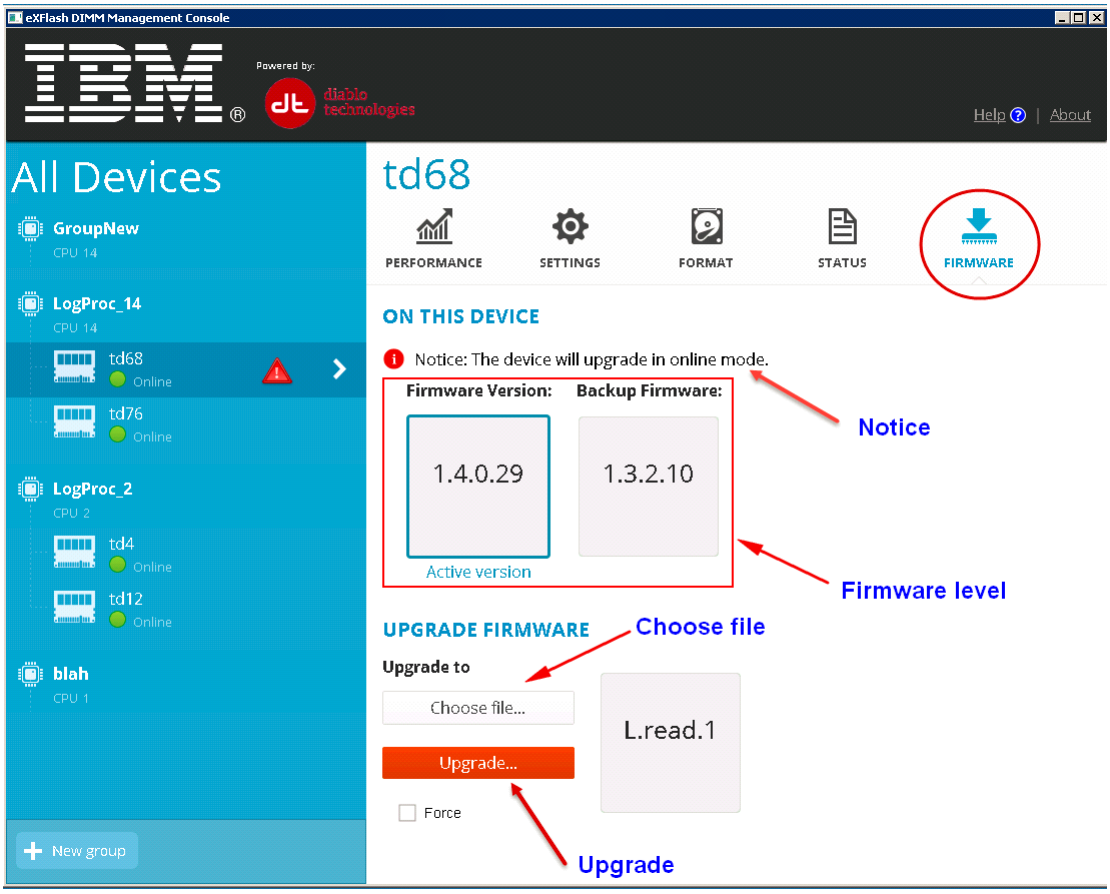

Figure 5: eXFlash DIMM firmware upgrade using the management console

Upgrading the firmware on ESX using CIM:

The VMware ESX platform does not support onboard CLI management. Instead, ESX is managed using a CIM interface, which consists of a CIM client that runs on a host system which communicates over HTTP with a CIM server that runs on the ESX machine.

To upgrade the eXFlash DIMM firmware on ESX using CIM, log in as root and navigate to the applicable directory. Then, type the upgrade command, which should include the following components:

CIM command, for example: `wbemcli cm`
CIM server and namespace, for example: `http://10.1.2.3:5988/root/cimv2`
CIM object, for example: `DBL_SoftwareInstallationService`

Method: **InstallFromEsxURI.**

- Parameter: URI

- Filename, including the path, for example: `EsxURI=<path_and_filename>`

- Parameter: Target
  - Name, for example: DBL_MCSController
  - SystemCreationClassName, for example: PG_ComputerSystem
  - SystemName, for example: localhost.localdomain
  - CreationClassName, for example: MCSController
  - DeviceID parameter, for example: DeviceID=</dev/tda>

Command-line interface (CLI)

eXFlash DIMM CLI structure

The structure of the eXFlash DIMM CLI command is:

```
td-cli <global_option> <command> <--parameter> <value>
```

Command parameters must be preceded by two dashes (--). For example, to set the provisioning level for a device to 100 percent, type:

```
td-cli device-format <device_id> --provision 100
```

Programs will exit with a value of 0 on success, and a non-zero code on any failure.

Global options

The eXFlash DIMM CLI supports two global options:

```
td-cli --verbose | -v   enables more output (stackable)
td-cli --help    | -h   shows the help
```

Overview of Commands

The main commands for the eXFlash DIMM CLI are shown in **Table 4**.

Table 4: CLI commands

Command	Description	Parameter / values

`device`	Manages or shows the eXFlash DIMM device.	`list`
		`<device_id>`
		`attach <group_name>`
		`commit <normal, WriteNow (default) >`
		`maintenance`
		`online`
		`status`
		`trim <on, off>`

`device-reset`	Performs a hardware reset of the device.	`<device_id>`
`device-stats`	Shows the block	`<device_id>`

	statistics.	delay <interval_in_seconds> repeat <number_of_iterations> reprint <number_of_entries_between_headers>
device-alias	Manages a device alias.	<device_id> get set <alias_name>
device-defaults	Resets the device configuration to the defaults.	<device_id>
device-diag	Executes diagnostic tests.	<device_id> list <device_id> run all (run all diagnostic tests) ecc_count (error correcting code test) fw_verify (firmware verification test) media_ro (media read only) media_wr (media write read compare) mem_wep (long WEP with multiple patterns) power_cap (power capacity test) wep (short WEP test)
device-erase	Erases the device.	<device_id> secure crypto yes
device-firmware	Manages the device firmware.	<device_id> upgrade <path_and_image_name> force query show
device-format	Manages the device format.	<device_id> provision <100 (default), 75, 50> bs <512 (default), 4096> stride <4 (default), 8, 16, 32, 64>
device-group	Manages the driver thread groups.	add <group_name> <cpu> list <group_name> delete

		status update name <new_group_name> <cpu> <cpu>
device-group	Manages the driver thread groups.	add <group_name> <cpu> list <group_name> delete status update name <new_group_name> <cpu> <cpu>
host-config	Saves the current group and device configuration settings and loads them on startup.	host- config -- save
device-smart	Displays the supported attributes for S.M.A.R.T. monitoring of the device.	<device_id> -attr
version	Reports the version of the CLI and device.	(n/a)
support-pkg	Sends a status report to the Support team.	(n/a)

Using the eXFlash DIMM Management Console

The section describes how to:

- Start the eXFlash DIMM management console.
- View performance data for the system.
- View device status and export data to a file.
- Manage devices.
- Format a device.
- Manage firmware.

Start the eXFlash DIMM management console:

The following is an example operated in Windows system. Log in as administrator and start the management console by clicking the **Launch** icon as shown in **Figure 6.**

Figure 6: Management console launch icon

Viewing performance data for the system:

Click **All Devices** in the left frame as shown in **Figure 7** to view the global read and write activity for all devices, or click any single device name to view the information for that specific device.

The PERFORMANCE tab shows the read and write activity for the device in megabytes, as well as the I/Os in KIOs (thousands of I/Os), and the temperature, throttling.

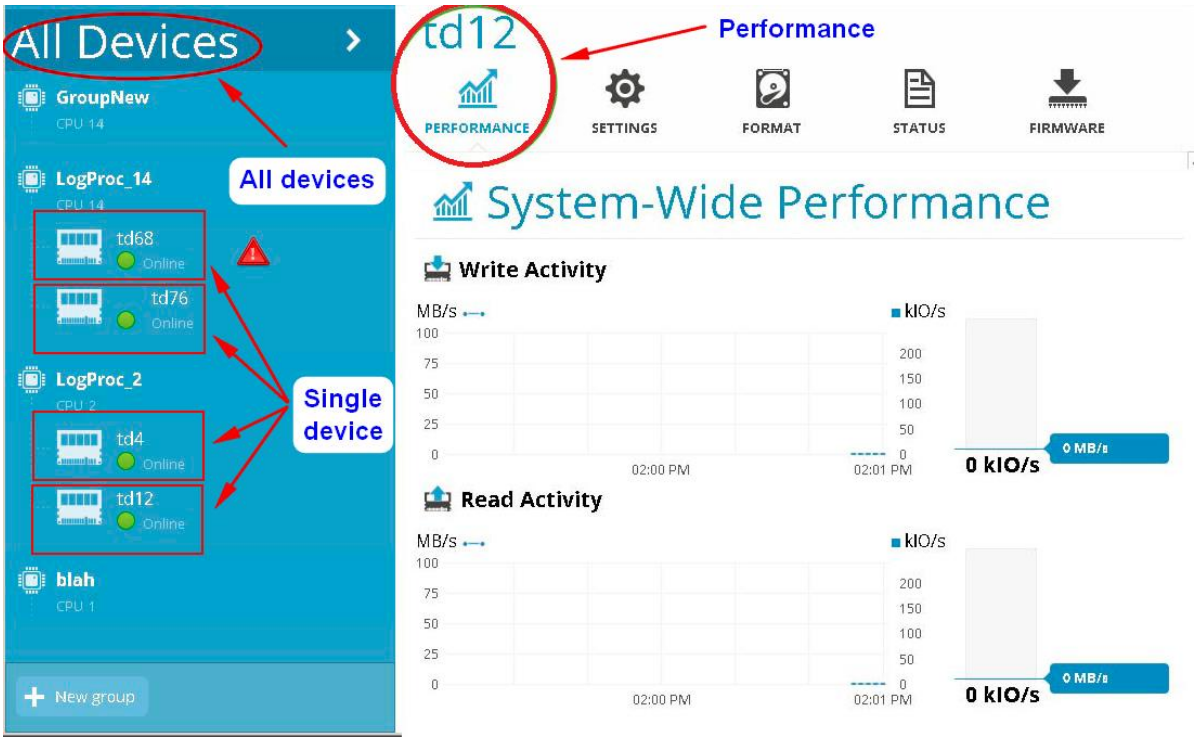

Figure 7: System wide performance (all devices in the system)

Viewing device status and exporting the data to a file:

To view the status of a device, click the **STATUS** tab. This tab shows all details available for the device as shown in **Figure 8**, including Firmware Version, DIMM Location, Operational mode, Warranty Write Life, Group name, CPU affinity, and so on. Warranty Write Life indicates the percentages of life remaining for the device based on total read and write activities used to date.

To export the status data for a device or for all devices to a file, click the box with the arrow at the top right of the STATUS tab as shown in **Figure 8**, and select either **This device only** or **All devices**. On the pop- up form, navigate to the desired directory, type a name for the file, and click **Save**.

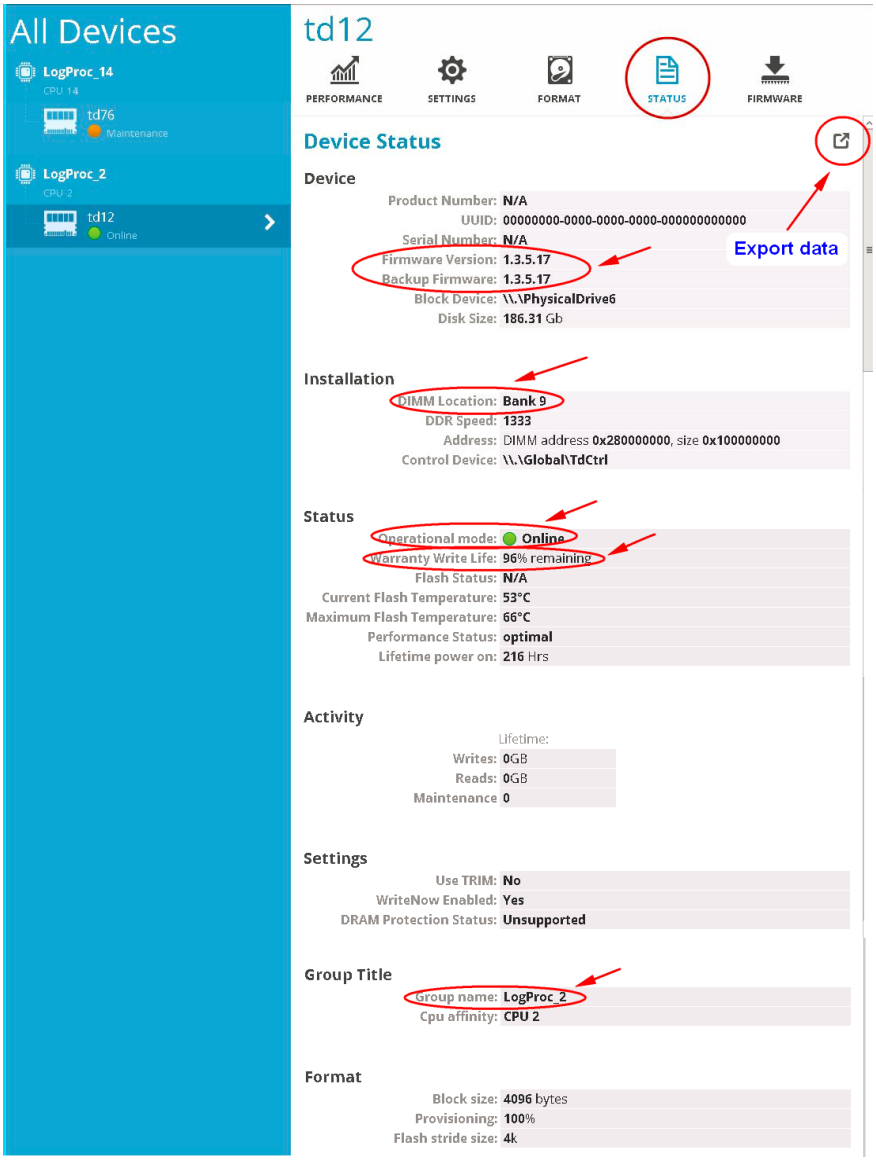

Figure 8: Device status

Managing devices:

Click the device that you want to manage and click the **SETTINGS** tab as shown in **Figure 9** to view or edit the following device details:

- Name (device ID)
- Alias
- Status
- Group attachment
- Trim setting
- Commit strategy

When the changes have made, click **Apply Changes**, or **Cancel** to return to the previous values.

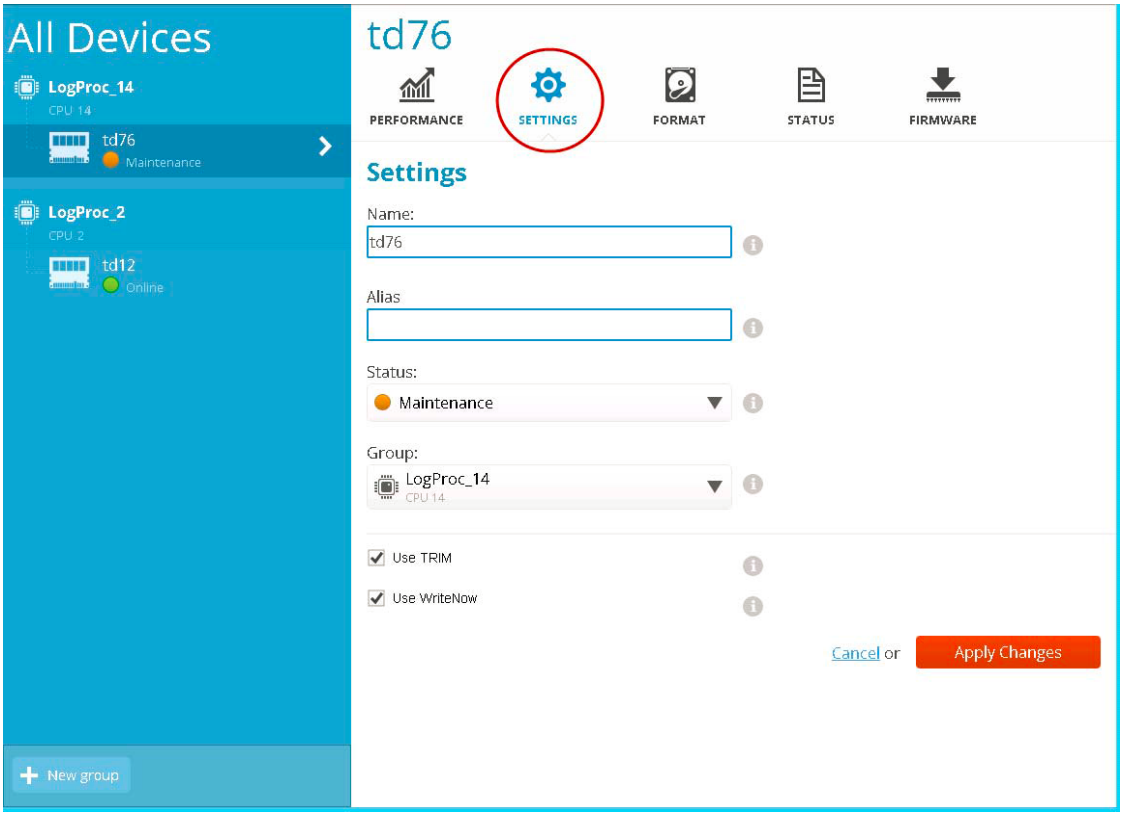

Figure 9: Settings tab

Formatting a device:

The **FORMAT** tab is used to view or edit the following device properties:

- Block size
- Provisioning level

- Flash stride size

The FORMAT tab is also used to erase a device, using either the crypto or secure method as shown in **Figure 10**.

Note: A device must be placed into Maintenance mode before it can be formatted. If a device is in Active mode, the FORMAT options are grayed out and cannot be changed.

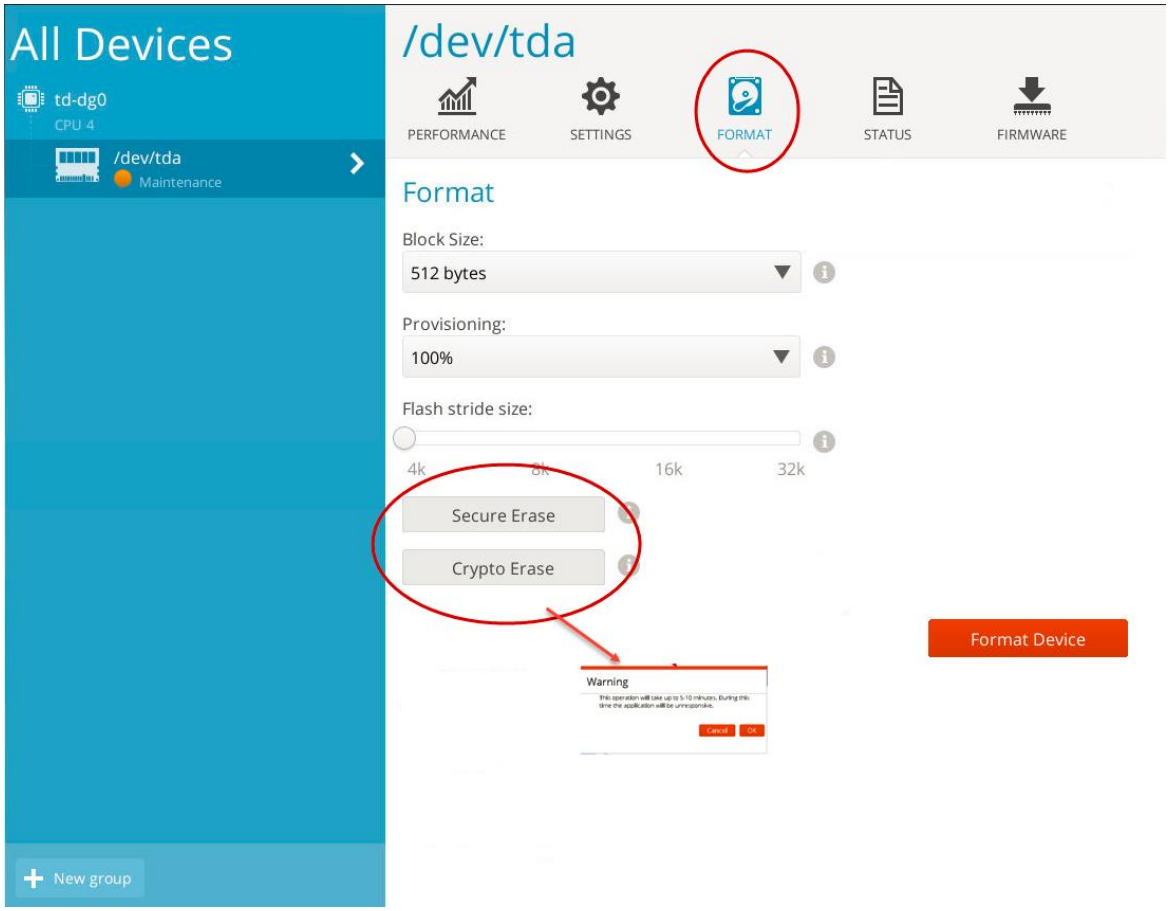

Figure 10: Format tab

Managing firmware:

The FIRMWARE tab shows the firmware version of the active firmware and the backup firmware, and enables you to upgrade the firmware. Upgrades are typically performed in online mode. The system reminds you that you are upgrading in online mode. Reference to page eighteen for firmware upgrade by using management console.

Diagrams

The eXFlash DIMM has the following onboard components as shown in **Figure 11.**

- 19 nm MLC NAND flash memory modules.

- Flash controllers which implement advanced flash management and protection techniques.
- Memory controller chipset, which provides an interface between physical DDR3 memory bus and solid-state storage.
- Power system, which protects memory write buffers from the unexpected power outage.

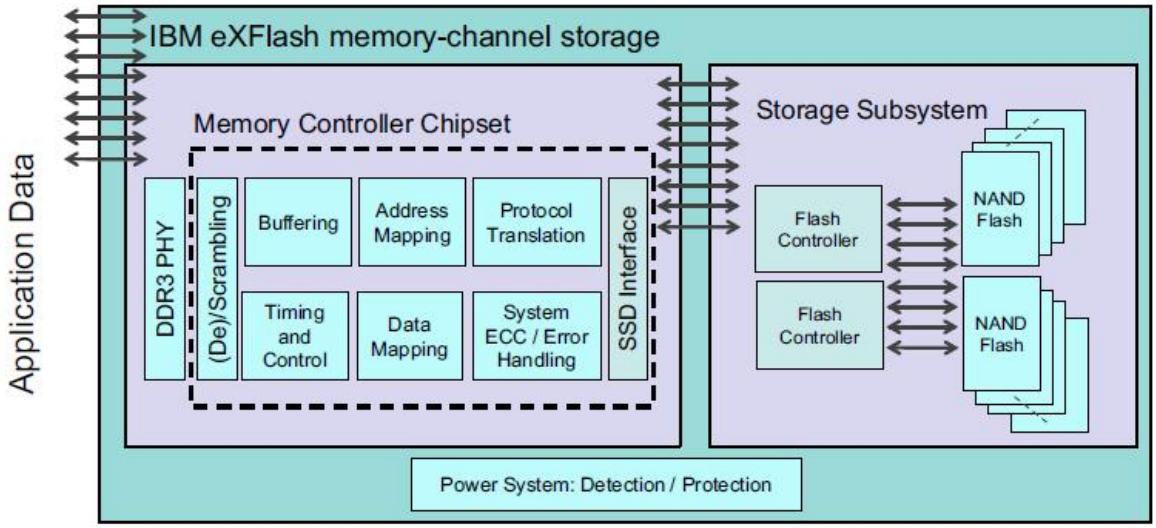

Figure 11: eXFlash DIMM block diagram

Note: For the current information about the specific versions and service packs that are supported, go to the Lenovo ServerProven Web site at: https://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp?topic=%2Fsgtk_sa_linux_lenovo%2Fserverproven.html

Problem determination and troubleshooting

Installation and startup problems

The following table shows the device problems, along with suggested solutions for each operating system where applicable.

Table 5: Problems and solutions

Symptom	Operating system	Solution
System resets before OS boots up	Linux, Windows, ESX	Remove the device and observe if the system resets. Perform a full AC power cycle on the system. If the system resets again, confirm that the UEFI settings correspond to the default settings recommended by the system manufacturer. If the system resets again: • Reseat device and reboot it. • Ensure that the device is not mapped out.
The eXFlash DIMM does not appear in the device listing or does not respond to driver commands	Linux, Windows, ESX	Inspect the system to ensure the device is physically installed correctly. Ensure that the driver is loaded. Reboot the system and verify that the device slot is enabled in the BIOS/UEFI. Ensure that the correct UEFI is installed according to the manufacturer's recommendations.
System resets during system initialization	Linux	Perform a full AC power cycle on the system.
	Windows	Confirm that the UEFI settings correspond to the default settings recommended by the system manufacturer. Make sure that the device is installed in the correct slot as recommended by

		the manufacturer.
ESX driver upgrade failed with the following error: Cannot be removed live.	ESX	Place the device in maintenance mode before upgrading.

Running POST

During power-up or a restart, the eXFlash DIMM performs a power-on self-test (POST). These tests take approximately one minute to complete. The management module reads the test results and displays them for you.

If these tests are completed without error, the green OK LED is lit. However, if the eXFlash DIMM fails POST, the switch-module error LED and the system-error LED on the chassis are lit. An event is stored in the event log in the system status panel of the management module. The specific failure is displayed on the system status I/O module panel of the management module.

LED behavior

The eXFlash DIMM has three LED indicators at the top edge of the module:

- Activity 0 (green).
- Activity 1 (green).
- POST Status (yellow).

The Activity LEDs flash briefly when the module is first powered up. The Activity LEDs are lit while the firmware is loaded and started. They will then flash until the firmware initialization is complete.

The Activity LEDs will remain off until there is activity on the host server.

The POST Status LED is a yellow LED used to indicate the operational status of the eXFlash DIMM. The POST Status LED lights during power up of the module. After the module powers up successfully, the POST Status LED turns off.

Event log

See event logs for information about notification events and diagnosis. That is Windows system event log and /var/log/messages of Linux. It will state what it needs in these logs if an eXFlash DIMM is having problems.

Helpful links

Table 6: Helpful links

Title	Link to materials
Benefits of the eXFlash Memory-Channel Storage in Enterprise Solutions	https://lenovopress.com/redp5089?cm_mc_uid=96593701455214557417429&cm_mc_sid_50200000=1466705682
Lenovo eXFlash DDR3 Storage DIMMs	https://lenovopress.com/tips1141-exflash-dimms?cm_mc_uid=96593701455214557417429&cm_mc_sid_50200000=1466705682
U.S. Announcement Letter	http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS114-031

Summary

This course enabled you to:

1. Describe the features of the Lenovo eXFlash DIMM Memory-Channel Storage Devices.
2. Describe the system configuration and diagrams of the Lenovo eXFlash DIMM Memory-Channel Storage Devices.
3. Describe the problem determination steps and explain how to troubleshoot the Lenovo eXFlash DIMM Memory-Channel Storage Devices.