Oracle® 6.8 TB (max 7.68 TB) NVMe SSD v3 Product Notes

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Contents

Using This Documentation

- **Overview** – Provides late-breaking information about Oracle 6.8 TB NVMe SSD v3
- **Audience** – System administrators, network administrators, and service technicians
- **Required knowledge** – Advanced understanding of server systems

Product Documentation Library

Documentation and resources for this product and related products are available at: `https://www.oracle.com/goto/oracleflashf640/docs`

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Oracle 6.8 TB NVMe SSD v3 Product Notes

This section contains late-breaking information about Oracle 6.8 TB NVMe SSD v3 (solid state devices). Read this section before reading other Oracle 6.8 TB NVMe SSD v3 documentation. Always refer to the latest version of the product notes.

For specific installation instructions, late-breaking information about the installation and use of Oracle 6.8 TB NVMe SSD v3s with your server, supported firmware and operating systems, important operating notes, and known issues, refer to the latest platform product notes document. For detailed information about using this storage drive with your server, see the product notes for your server, available at `https://docs.oracle.com`.
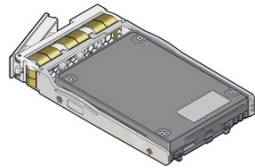
These topics are included in this section.

Description	Links
Review the software and firmware supported for Oracle 6.8 TB NVMe SSD v3s.	"Supported Hardware and Software" on page 10
Review important information for configuring Oracle 6.8 TB NVMe SSD v3s.	"Implementation Considerations" on page 13
Check known issues.	"Known Issues" on page 26

Supported Hardware and Software

The following sections describe the software and firmware supported for Oracle 6.8 TB NVMe SSD v3s:

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-
-
-

Supported Servers and Operating Systems

This section lists the servers that support Oracle 6.8 TB NVMe SSD v3s. For detailed information about using this storage drive with your server, see the product notes for your server, available at `https://docs.oracle.com`.

The following servers are supported for the Oracle 6.8 TB NVMe SSD v3.

SPARC Servers	Number of 6.4 TB NVMe SSDs	Slots Supported for Installing 6.4 TB NVMe SSDs	Minimum Supported Operating Systems
SPARC S7-2 Server	1 to 4	2, 3, 4, 5. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.4
SPARC S7-2L Server	8 drive: 1 to 4 12 drive: 1 to 12 24 drive: 1 to 4	8 drive: 2, 3, 4, 5. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3 12 drive: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3 NVMe4, NVMe5, NVMe6, NVMe7, NVMe8, NVMe9, NVMe10, NVMe11 24 drive: 3, 4, 19, 20. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.4 **Note -** SPARC S7-2L with 3.5-inch 12 drive configuration does not support Oracle 6.8 TB NVMe SSD v3 operation.
SPARC T7-1 Server	1 to 4	2, 3, 4, 5. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.4
SPARC T8-1 Server	1 to 4	2, 3, 4, 5. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.4
SPARC T8-2 Server	1 to 4	2, 3, 4, 5. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.4
SPARC T8-4 Server	1 to 8 2 Oracle PCIe Switch Cards	0, 1, 2, 3, 4, 5, 6, 7. Slots labeled NVMe0, NVMe1, NVMe2, NVMe3 NVMe4, NVMe5, NVMe6, NVMe7	Oracle Solaris 11.4

Other servers and processors might be added to this list in the future, if they qualify. Check your server product notes for confirmation that your server has subsequently been qualified for device support.

Caution - Any unsupported configuration causes the host to power off as soon as it is powered on. A fault is generated on the service processor when an unsupported configuration is detected. The fault clears after the unsupported configuration is fixed and the host is powered on.

Note - Slots that can contain either SAS HDD or NVMe storage drives have labels with both HDD and NVMe identification marks on the server panel.

Note - Refer to your server product notes for up-to date information on supported servers, operating systems, and required patchsets.

Minimum Supported Oracle 6.8 TB NVMe SSD v3 Firmware Version

Oracle 6.8 TB NVMe SSD v3s run with the minimum required firmware package listed in the following table.

Firmware	Minimum Required Drive Firmware Version	Recommended Drive Firmware Version
Oracle 6.8 TB NVMe SSD v3 Package	6.8TB v3 NVME PCIE SSD 2CV1RC30 FW	6.8TB v3 NVME PCIE SSD 2CV1RC30 FW

If you install Oracle 6.8 TB NVMe SSD v3s as an add-on option, you must update the firmware if the release number is lower than 2CV1RC30.

Note - For best practice, install the latest device firmware versions.

Summary of Changes in Firmware 2CV1RC30 Release

The following improvements or changes were included in firmware 2CV1RC30 release of Oracle 6.8 TB NVMe SSD v3s:

- Update to 6.8TB v3 NVME PCIE SSD 2CV1RC30 FW or a subsequent release if available.

Required Host Firmware

Oracle 6.8 TB NVMe SSD v3s run with the minimum required host firmware listed in the following table.

SPARC Driver	Minimum Required System Firmware Version (Patch No.)	Recommended System Firmware Version (Patch No.)
SPARC S7-2 Server	FIRMWARE: SPARC S7-2 SUN SYSTEM FIRMWARE 9.9.1.F With Hardware_Programmables-1.0.14-SPARC_T7-1+T7-2+T7-4+S7-2+S7-2L.pkg file also installed.	FIRMWARE: SPARC S7-2 SUN SYSTEM FIRMWARE 9.9.3 or later With Hardware_Programmables-1.0.14-SPARC_T7-1+T7-2+T7-4+S7-2+S7-2L.pkg file also installed.
SPARC S7-2L Server	FIRMWARE: SPARC S7-2L SUN SYSTEM FIRMWARE 9.9.1.F With Hardware_Programmables-1.0.14-SPARC_T7-1+T7-2+T7-4+S7-2+S7-2L.pkg file also installed.	FIRMWARE: SPARC S7-2 SUN SYSTEM FIRMWARE 9.9.3 or later With Hardware_Programmables-1.0.14-SPARC_T7-1+T7-2+T7-4+S7-2+S7-2L.pkg file also installed.
SPARC T7-1 Server	FIRMWARE: SPARC T7-1 SUN SYSTEM FIRMWARE 9.9.1.F With Hardware_Programmables-1.0.17-SPARC_T7-1.pkg file also installed.	FIRMWARE: SPARC T7-1 SUN SYSTEM FIRMWARE 9.9.3 or later With Hardware_Programmables-1.0.17-SPARC_T7-1.pkg file also installed.
SPARC T8-1 Server	FIRMWARE: SPARC T8-1 SUN SYSTEM FIRMWARE 9.9.1.F With Hardware_Programmables-1.0.17-SPARC_T8-1.pkg file also installed.	FIRMWARE: SPARC T8-1 SUN SYSTEM FIRMWARE 9.9.3 or later With Hardware_Programmables-1.0.17-SPARC_T8-1.pkg file also installed.
SPARC T8-2 Server	FIRMWARE: SPARC T8-2 SUN SYSTEM FIRMWARE 9.9.1.F	FIRMWARE: SPARC T8-2 SUN SYSTEM FIRMWARE 9.9.3 or later
SPARC T8-4 Server	FIRMWARE: SPARC T8-4 SUN SYSTEM FIRMWARE 9.9.1.F	FIRMWARE: SPARC T8-4 SUN SYSTEM FIRMWARE 9.9.3 or later

Keep Drivers and Firmware Up to Date

Refer to the server documentation to check for updates to the device firmware. For information on updating drivers and firmware for Oracle 6.8 TB NVMe SSD v3s, see "Accessing Software Updates and Firmware Downloads" on page 15.

Server Management Tools

The following single system management tools are available for the server:

- **Oracle Integrated Lights Out Management (ILOM)**. For information, refer to the product information page at: `https://www.oracle.com/servers/technologies/integrated-lights-out-manager.html`. For documentation, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at: `https://www.oracle.com/goto/ilom/docs`

  You can find descriptions of new Oracle ILOM 5.0 features in the *Oracle ILOM Feature Updates and Release Notes*.

- **Oracle Hardware Management Pack**, available with the Oracle Solaris OS or as a standalone product with other OS. For information, refer to the product information page at: `https://www.oracle.com/servers/technologies/hardware-management-pack.html`. For documentation and OS support matrix, refer to the Oracle Hardware Management Pack 2.4 Documentation Library at: `https://www.oracle.com/goto/ohmp/docs`

  Oracle Hardware Management Pack for Oracle Solaris 11.4 Documentation Library at `https://docs.oracle.com/cd/E79568_01/index.html`

In addition, the following software is available to manage multiple systems in a data center:

Oracle Enterprise Manager Ops Center, available software to manage multiple systems in a data center. For information, refer to the product information page at: `https://www.oracle.com/enterprise-manager/technologies/`. For documentation, refer to the Oracle Enterprise Manager Cloud Control Documentation Library at: `https://docs.oracle.com/en/enterprise-manager/related-products.html`.

Implementation Considerations

The following sections provide important information about configuring Oracle 6.8 TB NVMe SSD v3s in supported servers:

SPARC S7-2 Server Configuration

SPARC S7-2 servers support Oracle 6.8 TB NVMe SSD v3 as a boot device.

An Oracle PCIe Switch Card is not required in a four NVMe drive configuration. The switch function is included in the motherboard.

Refer to the server documentation at `https://www.oracle.com/goto/s7-2/docs`.

SPARC S7-2L Server Configuration

SPARC S7-2L servers support Oracle 6.8 TB NVMe SSD v3 as a boot device.

An Oracle PCIe Switch Card is not required in a four NVMe drive configuration. The switch function is included in the motherboard. The SPARC S7-2L Server can support three Oracle PCIe Switch Cards. Additional Oracle PCIe Switch Cards are required to support backplane configurations with more than four NVMe drives.

Refer to the server documentation at `https://www.oracle.com/goto/s7-2l/docs`.

SPARC T7-1 Server Configuration

SPARC T7 series servers support Oracle 6.8 TB NVMe SSD v3 as a boot device. The SPARC T7-1 Server supports only one Oracle PCIe Switch Card in PCIe slot 3.

Refer to the server documentation at `https://www.oracle.com/goto/t7-1/docs`.

SPARC T8-1 Server Configuration

SPARC T8 series servers support Oracle 6.8 TB NVMe SSD v3 as a boot device. The SPARC T8-1 Server supports only one Oracle PCIe Switch Card in PCIe slot 3.

Refer to the server documentation at `https://www.oracle.com/goto/t8-1/docs`.

SPARC T8-2 Server Configuration

SPARC T8 series servers support Oracle 6.8 TB NVMe SSD v3 as a boot device. The SPARC T8-2 Server supports two Oracle PCIe Switch Cards in PCIe slots 1 and 2.

Refer to the server documentation at `https://www.oracle.com/goto/t8-2/docs`.

SPARC T8-4 Server Configuration

SPARC T8 series servers support Oracle 6.8 TB NVMe SSD v3 as a boot device. The SPARC T8-4 Server can support zero or two Oracle PCIe Switch Cards.

Refer to the server documentation at `https://www.oracle.com/goto/t8-4/docs`.

SSD Volume Management

A volume manager can present multiple SSD devices as one larger volume. Use the Automatic Storage Management (ASM) volume manager or other volume manager to concatenate multiple flash memory domains. For example, a volume manager can be used to concatenate four 6.8 TB domains into a single 27.2 TB volume.

Refer to the Automatic Storage Management documentation at `https://docs.oracle.com/en/database/oracle/oracle-database/19/ostmg/index.html`.

Accessing Software Updates and Firmware Downloads

Product patches, updates and firmware are available on My Oracle Support at `https://support.oracle.com` from the Patches and Updates tab.

See:

- "Download the Device Software Package" on page 15
- "Update the NVMe Storage Drive Firmware" on page 16
- "Verify Oracle 6.8 TB NVMe SSD v3 Operation" on page 22

▼ Download the Device Software Package

To find the device software package, access My Oracle Support and download the latest software package for Oracle 6.8 TB NVMe SSD v3s.

1. **Go to the My Oracle Support web site: `https://support.oracle.com`.**

2. **Sign in to My Oracle Support.**

3. **At the top of the page, click the `Patches & Updates` tab.**
   The Patch Search pane appears at the right of the screen.

4. **Within the Search tab area, click `Number/Name` or `Bug Number (Simple)`.**
   The Search tab area appears with search fields.

5. **In the Product field, enter the patch number for `6.8TB NVME PCIE SSD`.**
   See "Minimum Supported Oracle 6.8 TB NVMe SSD v3 Firmware Version" on page 11.

6. **Click** `Search`.

The Patch Search Results screen appears, listing the patch for the software release.

7. **To review the ReadMe file for this patch, click** `ReadMe`.

8. **To download the patch for the software release, click** `Download`.

9. **In the File Download dialog box, click the patch zip file name.**

The patch for the software release downloads. The download is an archive zip file, which you must extract to find the directory containing the image.pkg file.

▼ Update the NVMe Storage Drive Firmware

This procedure provides instructions to update Oracle 6.8 TB NVMe SSD v3 NAND flash controller firmware for the host on supported Oracle Solaris and Oracle Linux operating systems. Oracle 6.8 TB NVMe SSD v3 firmware is updated as a single package using Oracle Hardware Management Pack utility command-line interface (CLI) tools.

Note - Refer to the server documentation product notes for detailed instructions on system software updates.

Before You Begin
- Update your system to the latest software release.
- Verify that the latest supported software release of Oracle Hardware Management Pack is installed on the host.

  For CLI command instructions, refer to Oracle Hardware Management Pack documentation at `https://www.oracle.com/goto/ohmp/docs`.

1. **Check Oracle 6.8 TB NVMe SSD v3 Product Notes for the latest firmware requirements.**

   See "Minimum Supported Oracle 6.8 TB NVMe SSD v3 Firmware Version" on page 11.

2. **Log in to the target system.**

   For detailed instructions, refer to the server installation guide. For example, to log in to the target system through SSH or through Oracle ILOM Remote System Console Plus, do one of the following:

   - **If you are using an SSH client connection.**

     a. **From a shell command line in a terminal window, establish an SSH connection to the server host.**

Type: `ssh root@`*hostname*, where *hostname* can be the DNS name or the IP address for the server host.

b. **Log in to the system using an account with root access.**

c. **Proceed to Step 3.**

■ **If you are using a remote system console, first refer to the server administration guide and then perform these steps.**

To launch an Oracle ILOM Remote System Console Plus session, refer to Launching Remote KVMS Redirection Sessions in the server administration guide.

a. **Access the host console. Establish a remote connection to the host console.**

Start an Oracle ILOM serial console session, type:

`-->start /HOST/console`

`Are you sure you want to start /HOST/console (y/n)? y`

b. **Ensure that the server is powered on and booted.**

c. **Access the operating system command-line interface.**

You issue Oracle Hardware Management Pack commands from the operating system command-line interface.

3. **Download and store any firmware image file updates on the server that are required to support Oracle 6.8 TB NVMe SSD v3s.**

a. **Download firmware image files from this location:**

https://support.oracle.com

See "Download the Device Software Package" on page 15.

b. **Copy the downloaded firmware image files to the target system root directory.**

4. **Identify all Oracle 6.8 TB NVMe SSD v3s and controller firmware versions in the server.**

a. **Type:** `# fwupdate list controller`

In the following examples, 6.8 TB NVMe SSD controllers `c1-11` are enumerated in the output returned by the above command.

```
# fwupdate list controller
==================================================
CONTROLLER
==================================================
ID    Type   Manufacturer   Model     Product Name            FW Version
--------------------------------------------------------------------------
c0    NVMe
c1    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c2                          -
c3    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c4    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c5    NVMe
c6    NVMe
c7    NVMe
c8    NVMe
c9    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c10   NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c11   NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
```

b. Verify that the firmware package files that are installed in Oracle 6.8 TB NVMe SSD v3s require updating.

To identify NVMe controllers that need updated firmware image files, view the `FW Version` column in the output from the `fwdupdate list controller` command.

In the following example, 6.8 TB NVMe SSD controller `c1` shows firmware version `2CV1RC29`, while all of the other NVMe controllers show firmware version `2CV1RC30`. All 6.8 TB NVMe SSD controllers `c0` through `c11` are enumerated in the output returned by the above command.

```
# fwupdate list controller
==================================================
CONTROLLER
==================================================
ID    Type   Manufacturer   Model     Product Name            FW Version
--------------------------------------------------------------------------
c0
c1    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC29
c2
c3    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c4    NVMe   Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c5    NVMe
c6    NVMe
c7    NVMe
```

```
c8    NVMe
c9    NVMe    Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c10   NVMe    Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c11   NVMe    Intel          0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
```

c. **View the Firmware Revision in the output from the `nvmeadm list -v` command.**

To identify NVMe controllers and current firmware versions type:

`# nvmeadm list -v`

In the following example, controller `SUNW-NVME-2` shows firmware version `2CV1RC30` in the output returned by the above command.

```
# nvmeadm list -v
SUNW-NVME-1
        PCI Vendor ID:
        Serial Number:
        Model Number:
        Firmware Revision:
        Number of Namespaces:
SUNW-NVME-2
        PCI Vendor ID:            0x8086
        Serial Number:            PHAB011200LV7P6GGN
        Model Number:             INTEL SSDPF2KX076T9S
        Firmware Revision:        2CV1RC30
        Number of Namespaces:     128
```

5. **Quiesce Oracle 6.8 TB NVMe SSD v3 devices.**

Before removing a drive, manually quiesce I/O and device usage.

> ⚠️ **Caution - System hang or data loss.** Before updating device firmware, ensure that the device is quiesced and the following events are not occurring:
>
> - The operating system is not accessing the disk (for example, the system boot disk).
> - An application is not accessing the disk (for example, a database application).

6. **Update the selected 6.8 TB NVMe SSDs with the specified firmware package.**

The `fwupdate` command can update firmware for all similar devices in the system utilizing an XML metadata file. This method is called Automatic Mode and is the recommended method for upgrades.

> **Note -** Alternately, if you determine that each device must be updated with a separate `fwupdate`
> command, perform the `fwupdate` Automatic Single Drive method, or the `fwupdate` Manual
> method (if an XML metadata file is not available). For CLI command instructions, refer to
> Oracle Hardware Management Pack documentation at: https://www.oracle.com/goto/ohmp/
> docs.

a. **Verify that an XML metadata file is available for the server.**

An XML metadata file must be included with the firmware update package to use
Automatic Mode. Refer to the update package Release Notes.

b. **To update device firmware on Oracle 6.8 TB NVMe SSD v3s, type `fwupdate`**
`update controller -x metadata.xml.`

```
# fwupdate update controller -x metadata.xml
 The following components will be upgraded as shown:
==========================================================
ID        Priority Action      Status     Old Firmware Ver.   Proposed Ver.
 New Firmware Ver.   System Reboot
----------------------------------------------------------------------------------------------
c7       1        Check FW    Success    2CV1RC29            2CV1RC30
 N/A                None
c8       1        Check FW    Success    2CV1RC29            2CV1RC30
 N/A                None
      System Reset
Do you wish to process all of the above component upgrades? [y/n]?
```

If the current firmware package version on the selected drive is higher than the specified
firmware package version, the command returns an error. For error codes, refer to Oracle
Hardware Management Pack documentation at https://www.oracle.com/goto/ohmp/
docs.

c. **To upgrade the firmware packages and process all of the above component**
upgrades, type `y`.

```
Updating c1:  Success
Updating c2:  Success
Verifying all priority 1 updates
Execution Summary
==========================================================
ID        Priority Action      Status     Old Firmware Ver.   Proposed Ver.
 New Firmware Ver.   System Reboot
------------------------------------------------------------------------------------------
```

```
c7        1        Check FW    Success    2CV1RC29        2CV1RC30
 N/A                  None
c8        1        Check FW    Success    2CV1RC29        2CV1RC30
 N/A                  None
System Reboot required for some applied firmware
Do you wish to automatically reboot now? [y/n]?
```

    d. Type y to reboot the host server to initialize the firmware update.

7. Re-access the console. See step 2.

For more instructions, refer to the server Installation Guide.

8. Verify that the updated firmware package is installed in Oracle 6.8 TB NVMe SSD v3s.

    a. Type the following from a terminal: `# fwupdate list controller`

In the following example, Oracle 6.8 TB NVMe SSD v3s are displayed.

```
# fwupdate list controller
===================================================
CONTROLLER
===================================================
ID    Type  Manufacturer   Model    Product Name              FW Version
---------------------------------------------------------------------------
c0    NVMe  Samsung        0xa824   SAMSUNG MZWLR7T6HALA-00AU3MPK94R5Q
c1    NVMe  Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
c2    HDC   Intel          0xa182   0x4873                    -
c3    NVMe  Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
c4    NVMe  Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
c5    NVMe  Intel          0x0b60   INTEL SSDPFCKE064T9S      2CV1R104
c6    NVMe  Intel          0x0b60   INTEL SSDPFCKE064T9S      2CV1R104
c7    NVMe  Intel          0x0b60   INTEL SSDPFCKE064T9S      2CV1R103
c8    NVMe  Intel          0x0b60   INTEL SSDPFCKE064T9S      2CV1R103
c9    NVMe  Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
c10   NVMe  Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
c11   NVMe  Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
```

    b. Verify host recognition of all 6.4 TB NVMe SSDs by checking ID enumeration.

In the above example, 6.8 TB NVMe SSD controller IDs c0 to c6 are enumerated in the output returned by the above command.

    c. Ensure that the 6.8 TB NVMe SSD firmware was updated in the output returned by the above command.

9. **Verify Oracle 6.8 TB NVMe SSD v3 operation.**
   See "Verify Oracle 6.8 TB NVMe SSD v3 Operation" on page 22.

10. **Repeat the firmware upgrade process until Oracle 6.8 TB NVMe SSD v3s have the most up to date firmware release.**
    See "Minimum Supported Oracle 6.8 TB NVMe SSD v3 Firmware Version" on page 11.
    For example, upgrade firmware revision to 2CV1RC30.

   Related Information

   - *Oracle Server CLI Tools User's Guide* at: `https://www.oracle.com/goto/ohmp/docs`
   - "Minimum Supported Oracle 6.8 TB NVMe SSD v3 Firmware Version" on page 11

▼ Verify Oracle 6.8 TB NVMe SSD v3 Operation

This procedure provides instructions to verify Oracle 6.8 TB NVMe SSD v3 operation on the host for supported Oracle Solaris and Oracle Linux operating systems. Verify Oracle 6.8 TB NVMe SSD v3 operation using Oracle Hardware Management Pack utility CLI tools.

Before You Begin
   - Verify that Oracle Hardware Management Pack is installed on the host.

     For CLI command instructions, refer to Oracle Hardware Management Pack documentation at `https://www.oracle.com/goto/ohmp/docs`.
   - Ensure that you have access to the server (either directly or over the network).

1. **Observe Oracle 6.8 TB NVMe SSD v3 status indicator LEDs.**
   Verify that the Fault-Service Required 6.8 TB NVMe SSD status indicator is not lit and that the green Power status indicator is lit on the 6.8 TB NVMe SSDs that you updated. LED status indicators are: Green (operational), Amber (faulty disk), Blue (SSD has been prepared for removal).
   Refer to *Oracle 6.8 Tbyte, 2.5-inch, NVMe Solid State Drive Specification*.

2. **Log in to the target system.**
   For detailed instructions, refer to the server installation guide. For example, to log in to the target system through SSH or through Oracle ILOM Remote System Console Plus, do one of the following:

   - **If you are using an SSH client connection.**

      a. **From a shell command line in a terminal window, establish an SSH connection to the server host.**

Type: `ssh root@`*hostname*, where *hostname* can be the DNS name or the IP address for the server host.

b.   **Log in to the system using an account with root access.**

c.   **Proceed to Step 3.**

■   **If you are using a remote system console, first refer to the server administration guide and then perform these steps.**

To launch an Oracle ILOM Remote System Console Plus session, refer to Launching Remote KVMS Redirection Sessions in the server administration guide.

a.   **Access the host console. Establish a remote connection to the host console.**

Start an Oracle ILOM serial console session, type:

`-->`**start /HOST/console**

`Are you sure you want to start /HOST/console (y/n)?` **y**

b.   **Ensure that the server is powered on and booted.**

c.   **Access the operating system command-line interface.**

You issue Oracle Hardware Management Pack commands from the operating system command-line interface.

3.   **Identify all 6.8 TB NVMe SSDs and verify that the latest firmware packages are installed.**

a.   **Type the following command:** `# fwupdate list controller`

In the following example, devices are enumerated in the output returned by the above command.

```
# fwupdate list controller
==================================================
CONTROLLER
==================================================
ID    Type   Manufacturer   Model    Product Name              FW Version
------------------------------------------------------------------------
c0    NVMe   Samsung        0xa824   SAMSUNG MZWLR7T6HALA-00AU3MPK94R5Q
c1    NVMe   Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
c2    HDC    Intel          0xa182   0x4873                    -
c3    NVMe   Intel          0x0b60   INTEL SSDPF2KX076T9S      2CV1RC30
```

```
c4    NVMe   Intel        0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c5    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T9S    2CV1R104
c6    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T9S    2CV1R104
c7    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T9S    2CV1R103
c8    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T9S    2CV1R103
c9    NVMe   Intel        0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c10   NVMe   Intel        0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
c11   NVMe   Intel        0x0b60    INTEL SSDPF2KX076T9S    2CV1RC30
```

b. Verify host recognition of all 6.8 TB NVMe SSDs by checking controller ID enumeration.

In the above example, 6.8 TB NVMe SSD controllers `c0` to `c6` are enumerated in the output returned by the above command.

c. Ensure that all 6.8 TB NVMe SSDs firmware revisions are current in the output returned by the above command.

See "Minimum Supported Oracle 6.8 TB NVMe SSD v3 Firmware Version" on page 11.

4. Check NVMe device status.

To identify NVMe controllers and current firmware versions, type: # nvmeadm list -v

To identify NVMe controllers that have updated firmware, view the **Firmware Revision** row in the output from the **nvmeadm list -v** command.

In the following example, controller `SUNW-NVME-2` shows firmware version `2CV1RC30` in the output returned by the above command.

```
# nvmeadm list -v
SUNW-NVME-1
        PCI Vendor ID:          0x144d
        Serial Number:          S64TNE0N800033
        Model Number:           SAMSUNG MZWLR7T6HALA-00AU3
        Firmware Revision:      MPK94R5Q
        Number of Namespaces:   32
SUNW-NVME-2
        PCI Vendor ID:          0x8086
        Serial Number:          PHAB011200LV7P6GGN
        Model Number:           INTEL SSDPF2KX076T9S
        Firmware Revision:      2CV1RC30
        Number of Namespaces:   128
```

5. Check the health of Oracle 6.8 TB NVMe SSD v3s.

To check the selected 6.8 TB NVMe SSD health and SMART (Self-Monitoring, Analysis, and Reporting Technology) information, type: # nvmeadm getlog -h

Ensure that the 6.8 TB NVMe SSDs have remaining drive life (`Percentage Used`) in the output returned by the above command.

```
# nvmeadm getlog -h
SUNW-NVME-1
SMART/Health Information:
        Critical Warning: 0
        Temperature: 315 Kelvin
        Available Spare: 100 percent
        Available Spare Threshold: 10 percent
        Percentage Used: 0 percent
        Data Unit Read: 0x2fa1c314 of 512k bytes.
        Data Unit Written: 0x23bd12c7 of 512k bytes.
        Number of Host Read Commands: 0x3f0bb9308
        Number of Host Write Commands: 0x1c2433434
        Controller Busy Time in Minutes: 0x525
        Number of Power Cycle: 0x56e
        Number of Power On Hours: 0x55f
        Number of Unsafe Shutdown: 0x307
        Number of Media Errors: 0x0
        Number of Error Info Log Entries: 0x0

SUNW-NVME-2
SMART/Health Information:
        Critical Warning: 0
        Temperature: 310 Kelvin
        Available Spare: 99 percent
        Available Spare Threshold: 10 percent
        Percentage Used: 1 percent
        Data Unit Read: 0x138a818a of 512k bytes.
        Data Unit Written: 0x2d71a25d of 512k bytes.
        Number of Host Read Commands: 0xe75e59ca
        Number of Host Write Commands: 0x7a604b45c
        Controller Busy Time in Minutes: 0xe0
        Number of Power Cycle: 0x89
        Number of Power On Hours: 0x1443
        Number of Unsafe Shutdown: 0x78
        Number of Media Errors: 0x0
        Number of Error Info Log Entries: 0x0
```

Related Information

-
- Oracle Hardware Management Pack documentation at: `https://www.oracle.com/goto/ohmp/docs`

Known Issues

This section describes important operating issues and known hardware and software issues for Oracle 6.8 TB NVMe SSD v3s.

Supplementary and workaround information for Oracle 6.8 TB NVMe SSD v3s. Specific Bug ID identification numbers are provided for service personnel.

SPARC Servers Report NVMe Device Error When Using `probe-nvme-all` Command

Bug ID: 30067668

Issue: Oracle 6.8 TB NVMe SSD v3 storage drives with 2CV1RC30 firmware that enables multiple namespaces generate a failure message when using the `probe-nvme-all` command at OBP to query NVMe drive information in SPARC Servers. This `probe-nvme-all` command issue does not cause any functional issues with the NVMe device.

The following screen shows a namespace error for Oracle 6.8 TB NVMe SSD v3. The list is formatted as ordered word sized entries of namespace ids, with a 0 termination.

```
{0} ok probe-nvme-all
/pci@303/pci@1/pci@0/pci@5/nvme@0
  NVME Controller VID: 8086 SSVID: 108e SN: BTLN830008066P4C
MN: 7361456_ICRPC2DD2ORA6.4T FR: VDV1RL04 NN: 80
  Namespace ID: 1 Size: 6.401 TB EUI: eui.0001cde8bde4d25c
  Namespace ID: 2 Size: 0.0 MB
  Namespace ID: 3 Size: 0.0 MB
  Namespace ID: 4 Size: 0.0 MB
....
  Namespace ID: 127 Size: 0.0 MB
  Namespace ID: 128 Size: 0.0 MB
ERROR: Last Trap: Fast Instruction Access MMU Miss
{0} ok
```

Affected Hardware and Software: Oracle 6.8 TB NVMe SSD v3 storage drives with 2CV1RC30 firmware on supported SPARC T7, S7, and T8 series servers. See "Supported Servers and Operating Systems" on page 10.

Workaround: Do not use `probe-nvme-all` at OBP to query drive information on SPARC servers with system firmware release 9.9.2 or earlier. Use `nvmeadm` commands in Solaris to query drive information.

Fix: Update SPARC servers to system firmware release 9.9.3 or later.

Oracle ILOM Incorrectly Faults the Device with Message `fault.io.scsi.cmd.disk.dev.rqs.baddrv`

Bug ID: 28244670

Issue: Oracle ILOM might report a `fault.io.scsi.cmd.disk.dev.rqs.baddrv` error for NVMe devices. Oracle ILOM incorrectly faults the device with message Fault `fault.io.scsi. cmd.disk.dev.rqs.baddrv` on *FRU /SYS*.

Affected Hardware and Software: NVMe storage devices on all supported operating systems

Workaround: None

Recovery:

If a system encounters this issue, do the following steps.

1. Look for the NVMe ILOM fault code: `fault.io.scsi.cmd.disk.dev.rqs.baddrv`

   The following screen shows a fault.io.scsi.cmd.disk.dev.rqs.baddrv error for Oracle 6.8 TB NVMe SSD v3.

   ```
   ereport.io.scsi.cmd.disk.dev.rqs.baddrv@/SYS/DBP/HDD10/NVME
                          status_flags  = 0xc3
                          smart_warning = 0xff
                          reason        = Drive is not functional
   ```

   You can also use the Oracle ILOM `show faulty` command at the Oracle ILOM command-line prompt (->) to identify a drive failure.

   To list all known faults in the server, log in to the Oracle ILOM service processor from the Oracle ILOM Fault Management Shell and issue the `fmadm faulty` command. For information about how to use the Oracle ILOM Fault Management Shell and supported commands, refer to the *Oracle ILOM User's Guide for System Monitoring and Diagnostics* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https: //www.oracle.com/goto/ilom/docs`.

2. Upgrade drive firmware if not current.

   See Oracle 6.8 TB NVMe SSD v3 "Supported Hardware and Software" on page 10.

3. Do one of the following:

   If SMbus `status_flags = 0xbb` displays, then clear the fault. No power cycling is required. To clear the fault code in Oracle ILOM, go to step 4.

If SMbus `status_flags = 0xc3` displays, complete a server power cycle, then clear the fault. Do the following to recover, then go to step 4.

a. To identify the drive slot, type:

```
# lspci -vv -s 1b:00.0
  1b:00.0 Non-Volatile memory controller: [NVM Express])
          Subsystem: Oracle/SUN Device
          Physical Slot: 900
          Control: I/O- The PCIe address of /dev/nvme10n1 is 0000:e7:00.0
```

b. Take the affected drive off-line.

Disconnect all users of the NVMe drive and back up the NVMe drive data as needed. Use the `umount` command to unmount any file systems that are mounted on the device. Remove the device from any multiple device (md) and Logical Volume Manager (LVM) volume using it.

If the device is a member of an LVM Volume group, then it might be necessary to move data off the device using the pvmove command, then use the `vgreduce` command to remove the physical volume, and (optionally) `pvremove` to remove the LVM metadata from the disk. If the device uses multipathing, run `multipath -l` and note all the paths to the device. Then, remove the multipathed device using the `multipath -f device` command. Run the `blockdev --flushbufs device` command to flush any outstanding I/O to all paths to the device.

c. To prepare the NVMe drive for removal, that is, to detach the NVMe device driver and power off the NVMe drive slot, type: `# echo 0 >/sys/bus/pci/slots/900/power`

d. To power on the drive, type: `# echo 1 >/sys/bus/pci/slots/900/power`

4. To clear the fault code in Oracle ILOM, type:

```
-> set /SYS/DBP/HDD0 clear_fault_action=true
   Are you sure you want to clear /SYS/DBP/HDD0 (y/n)? y
   Set 'clear_fault_action' to 'true'
->
```

5. Enable the drive.

Rescan the PCI bus to rediscover the NVMe drive.

`# echo 1 > /sys/bus/pci/rescan`.

If the same failure occurs again, use the same recovery process noted above. The drive has failed if the failure occurs again within minutes. If problem persists, then replace the faulty drive identified in the `fmadm faulty` output.

Refer to the following document for the latest procedures for displaying event content in preparation for submitting a service request and applying any post-repair actions that may be required. *PSH Procedural Article for ILOM-Based Diagnosis* (Doc ID 1155200.1)

Oracle ILOM Reports a Fault for NVMe Devices When Performing a Reboot, Firmware Update, or Hot-Plug Operation

Bug ID: 28654297

Issue Oracle ILOM might report a `fault.chassis.device.fail` error for NVMe devices when performing a reboot, a firmware update, or hot-plug operation.

Affected Hardware and Software NVMe storage devices on all supported operating systems

Workaround Disable the device_monitor feature in Oracle ILOM using the following command:

```
set /SP/services/device_monitor servicestate=disabled
```

Secure Erase Drives Before Use

Oracle 6.8 TB NVMe SSD v3s may report uncorrectable errors or assert after not being powered for three or more months. For best practice, secure erase Oracle 6.8 TB NVMe SSD v3s before use (especially if use is reading from the drive as a test) and especially if the drive has been unpowered for more than three months. If the NAND media is not refreshed for approximately three months, the drive may experience media errors.

Over time, the drive firmware policy refreshes the media in the background while it remains powered-on. If the drive has been powered on long enough for the background refresh policy to be applied to all bits, the drive is not at risk for this issue. The time required to refresh all the bits is approximately 14 days and varies by product.

If the number of bits experiencing this issue exceeds the error-correction code (ECC) capability, it may result in an uncorrectable read error. If the uncorrectable read errors occur during normal drive operation, the drive will report an increased number of SMART media errors to the host. If the uncorrectable read errors occur during drive power-on, the drive will report either an ASSERT or BAD_CONTEXT error code to the host.

The following screen shows an ASSERT or BAD_CONTEXT event at power-on after the media has not been refreshed for a time.

```
Firmware QDV1RD28: ASSERT_100452A0, BAD_CONTEXT_1042, or BAD_CONTEXT_1043
```

Workaround:

Select one of the following methods before use of the drive for operation or test. An off-line server can be used.

Choose one of the erase options:

- Secure erase the drive, using the `nvmeadmin` utility.
- Download and use third party utilities to secure erase the drive.
- Wait two weeks for a media refresh while the drive is powered-on before using the drive.

⚠️ **Caution -** All data will be destroyed after an erase.

Secure Erase Drive Using `nvmeadmin` **Utility**

To secure erase the drive, using the Oracle Hardware Management Pack NVMe admin utility:

1. Stop all IO to the NVMe device before attempting this action.
2. To securely erase all namespaces, type: `# nvmeadm erase -s -a` *controller_name*. For example:

   ```
   # nvmeadm erase -s -a SUNW-NVME-1
   ```
3. List all server devices.
4. Verify drive health.

Refer to *Oracle Hardware Management Pack 2.4 Server CLI Tools User's Guide*: `https://www.oracle.com/goto/ohmp/docs`. See "Server Management Tools" on page 12.

Secure Erase Drive Using Third-party Utilities

To secure erase the drive before use, using the Intel Solid-State Drive Configuration Manager utility, if available:

1. Install the Intel Solid-State Drive Configuration Manager.
2. Stop all IO to the NVMe device before attempting this action.
3. Use the `–secure_erase` option to erase all the data on the drive.

   ```
   issdcm –drive_index 1 –secure_erase
   ```
4. The user is prompted unless the `–force` option is used:

   ```
   WARNING: You have selected to secure erase the drive!
   Proceed with the secure erase? (Y/N)
   ```
5. If the drive contains a partition, the prompt contains a second warning message:

   ```
   WARNING: You have selected to secure erase the drive!
   ```

```
WARNING: Tool has detected as partition on the drive!
Proceed with the secure erase? (Y/N)
```

6. To bypass the warning prompts, use the **–force** option:

```
issdcm –drive_index 1 –secure_erase -force
```

7. List all server devices.
8. Verify drive health.