

# Dell EMC PowerEdge Systems Running SUSE Linux Enterprise Server 12

Release Notes

## Notes, cautions, and warnings

 | **NOTE:** A NOTE indicates important information that helps you make better use of your product.

 | **CAUTION:** A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

 | **WARNING:** A WARNING indicates a potential for property damage, personal injury, or death.

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# Overview

SUSE Linux Enterprise Server 12 is available on the 64-bit Intel architecture.

Topics:

- [System configuration requirements](#)
- [Memory](#)

## System configuration requirements

For detailed system configuration requirements of this version of SUSE Linux Enterprise Server, see the documentation at [suse.com/documentation](https://www.suse.com/documentation).

## Memory

The following table lists the system memory requirements for the x86\_64 architecture of SUSE Linux Enterprise Server 12.

**Table 1. Memory Requirements for x86\_64 Architecture**

<b>Memory</b>	<b>Size</b>
Minimum recommended system memory	512 MB per logical CPU
Maximum certified system memory	6 TB

## Issues and Resolutions

### SUSE Linux Enterprise Server 12 SP3 does not respond under web stress

- Description:** On Dell EMC 14<sup>th</sup> generation of PowerEdge servers with AMD EPYC processors, SLES12 SP3 does not respond under web stress. OS logs indicate kernel crash with many `page_faults` and `cpu-recovery` failures.
- Applies to:** SUSE Linux Enterprise Server 12 SP3 on R7425, R7415, and R6415
- Solution:** Update the kernel to version 4.4.103-6.33.1.x86\_64.rpm or later.

### Turbostat displays an input/output error with AMD processor

- Description:** On Dell EMC's 14<sup>th</sup> generation of PowerEdge servers with Advanced Micro Devices (AMD) processor, if you run the Turbostat utility with the **Debug** option, the system displays an input/output error.
- Cause:** Turbostat reads the Intel's model-specific registers (MSRs) on AMD platforms.
- Workaround:** Update the `cpupower` package to `cpupower -4.10-3.3.1` or later.

### SUSE Linux Enterprise Server 12 Service Pack 3 displays an error message in dmesg logs with AMD processor

- Description:** On Dell EMC's 14<sup>th</sup> generation of PowerEdge servers with Advanced Micro Devices (AMD) processor having PERC controller, after booting into SUSE Linux Enterprise Server 12 Service Pack 3, the following error message is displayed in the kernel logs:
- ```
"AMD-Vi: Event logged [IO_PAGE_FAULT device= domain= address= flags= "
```
- Cause:** Driver `megaraid_sas` allocates 256 byte of length for MFI frames but while sending MFI frames to firmware, the driver sets the length as 4k. This causes DMA read error messages during boot.
- Solution:** Update the kernel to version 4.4.103-6.33.1.x86\_64.rpm or later.

### Installer is unable to auto detect the FCoE LUN connected to QLogic FastLinQ cards

- Description:** When installing SUSE Linux Enterprise Server 12 Service Pack 3 on FCoE LUN connected using Qlogic FastLinQ cards, the installer does not detect the LUN and results in installation failure.

- Cause:** The *qedf* driver which is responsible for FCoE Offloading on Qlogic FastLinQ cards fails to start *fc* function because more command queues are requested than actually available.
- Solution:** You must first boot into the kISO (kernel ISO) image to start installation and when prompted, insert the SUSE Linux Enterprise Server 12 Service Pack 3 DVD to continue the installation.
- You can find the kISO Image at [https://drivers.suse.com/suse/installer-update/sle-12-sp3-x86\\_64/3.0/install-readme.html](https://drivers.suse.com/suse/installer-update/sle-12-sp3-x86_64/3.0/install-readme.html).

## An error message is displayed while disconnecting the NVMe over FC target and initiator using Emulex LPe32000 or LPe31000-series card

- Description:** Using Emulex LPe32000/LPe31000-series cards for NVMe over FC, connecting to target is successful from initiator, but while disconnecting target by entering command `nvme disconnect --device /dev/<device_name>` from initiator, `dmesg` displays an error message and subsequent connections to the target fail.
- Cause:** Few feature patches are missing in SUSE Linux Enterprise Server 12 Service Pack 3 GM kernel.
- Workaround:** Update the SUSE Linux Enterprise Server 12 Service Pack 3 kernel to at least `kernel-default-4.4.92-6.18.1` version and `multipath-tools` to latest available version.

## SRIOV VFs of Mellanox cards interfaces are named incorrectly

- Description:** On Dell EMC PowerEdge servers with Mellanox ConnectX Network cards, if SRIOV is enabled and VFs are created, the network interfaces are displayed incorrectly.
- Cause:** There is a race condition between the Virtual Function link creation in `sysfs` and calling the `mlx_5core` driver. The Virtual Function links should be created in `sysfs` before calling the driver to avoid the race condition.
- Workaround:** Disable `biosdevname` by entering boot parameter `biosdevname=0`. This leads to `systemd` naming of interfaces.

## SUSE Linux Enterprise Server 12 displays an error message in /var/log/messages

- Description:** After restarting SUSE Linux Enterprise Server 12, the PCIe devices display an error message in the `/var/log/messages` log file `kernel: pci 0000:01:00.0: can't claim BAR 6 [mem 0xffff80000-0xffffffff pref]: no compatible bridge window.`
- Cause:** The addresses of the expansion ROM BARs do not contain accurate values.
- Workaround:** This error message can be ignored because there is no functionality loss.

## During boot sfc driver reports debug messages

- Description:** `sfc` driver in SUSE Linux Enterprise Server 12 Service Pack 2 (SLES 12 SP2) reports few debug messages during boot with the SFN8522 card.

**Cause:** These messages indicate the non-existence of a feature and are not errors. The SFN8522 card does not include a PIO buffer support nor a PTP support in the firmware. The following messages are displayed:

```
sfc (unnamed net_device) (uninitialized): MC command 0x4a inlen 8 failed rc=-2
(raw=2) arg=0
sfc (unnamed net_device) (uninitialized): no PTP support
sfc (unnamed net_device) (uninitialized): MC command 0x8f inlen 0 failed rc=-1
(raw=1) arg=0
sfc (unnamed net_device) (uninitialized): failed to allocate PIO buffers (-1)
```

**Workaround:** These messages can be ignored because these are only cosmetic errors.

## Processor C-state failing

**Description:** After successful installation of SUSE Linux Enterprise Server 12 Service Pack 2 (SLES 12 SP2) on a server with the Kabylake processor, when you perform processor C-state test, it fails. When processor is in idle state, C6 and C7 must display highest value, whereas it displays zero value.

**Cause:** System fails during the processor C-state.

**Workaround:** The upstream KBL support commit (commit 3ce093d4de75: for adding KBL entries in intel\_idle driver) has fix for this issue. It is back ported the SP2 kernel. There is no workaround that is currently available for this issue.

## SUSE Linux Enterprise Server 12 Service Pack 3 tcspd service fails to start in Xen r kernel

**Description:** In Dell EMC PowerEdge servers the tcspd service fails to start. The tpm device node is not created when booted to SLES 12 SP3 Xen Tboot kernel and when Intel TXT is enabled on TPM 1.2 chip.

**Cause:** The 0xfed40000 (size 0x5000) address is not reserved by BIOS in E820 which is required by the TPM driver.

**Solution:** For 14<sup>th</sup> generation of Dell EMC PowerEdge servers, update the BIOS to the latest available version.

**NOTE:** For 13G and earlier generation servers, the issue in the BIOS is not yet fixed. You can do one of the following as a workaround:

- Boot with Kernel boot parameter "memmap=0x5000\\\$0xfed40000"
- Edit the grub (/etc/default/grub) by running the following commands. After editing the grub, recreate grub.cfg by running the command `grub2mkconfig -o /boot/grub2/grub.cfg`.

```
GRUB_CMDLINE_LINUX_DEFAULT=" memmap=0x5000\\$0xfed40000 "
```

```
GRUB_CMDLINE_LINUX_XEN_REPLACE_DEFAULT=" memmap=0x5000\\$0xfed40000 "
```

## Disabling SRIOV vfs of ConnectX-4 card displays error messages

**Description:** After configuring SRIOV on ConnectX-4LX card, when you delete a virtual function (VF) there are some errors in the dmesg.

**Cause:** There is no functionality loss, but error messages are displayed in `/var/log/messages` because of disabling SRIOV vfs of ConnectX-4 card.

**Workaround:** The upstream commit (`net/mlx5: Fix teardown errors that happen in pci error handler`) has fix for this issue. The patch has been merged into SUSE Linux Enterprise Server 12 Service Pack 2 (SLES 12 SP2), update branch.

# System monitor displays less processor cores when Hyperthreading is enabled

- Description:** After booting to SUSE Linux Enterprise Server 12 Service Pack 2 (SLES 12 SP2), the system monitor displays less number of processors than what is listed in `/cat/proc/cpuinfo`
- Cause:** Libgtop which is part of system monitor has a code that counts the number of processors by copying the content of `/proc/cpuinfo` into a 64 k buffer and then reads through it, which is inadequate for some hardware (platform with higher number of processor cores).
- Workaround:** This issue is fixed in the newer version of the `libgtop 2_0-10-2.34.0-11.1.x86_64` through the `patchCpu buffer .patch`. This patch uses a large buffer to read `/proc/cpuinfo` when required.

# Log file displays error message upon installing SUSE Linux Enterprise Server 12 Service Pack 1

- Description:** After successfully installing SUSE Linux Enterprise Server 12 Service Pack 1 (SLES 12 SP1), the following error message is displayed in the log file: `ioapic: probe of 0000:<pci-address> failed with error -22`
- Workaround:** This error message can be ignored because there is no functionality loss.

# The system does not run on Turbo mode with Intel E5-26xx v4 processor

- Description:** With some power profile options in BIOS, the system does not run on Turbo mode with Intel E5-26xx v4 processor by default in SUSE Linux Enterprise Server 12 Service Pack 1.
- Cause:** Not available.
- Workaround:** Run the `cpupower set -b 0` command after every boot.

# Network devices on SUSE Linux Enterprise Server 12 obtain IPv6 addresses when configured to DHCP version 4 only

- Description:** The network interfaces on SUSE Linux Enterprise Server 12 are obtaining IPv6 addresses even when configured to `DHCP version 4 only`.
- Cause:** By default the interface is set to DHCPv4 and DHCPv6.
- Workaround:** Remove IPv6 module and restart the network services.

# Unable to boot from iSCSI when static IPv6 address is assigned to the initiator

- Description:** The SUSE Linux Enterprise Server 12 does not boot from iSCSI over IPv6 address after successful installation, when static IPv6 address is assigned to the initiator.

**Cause:** Not available

**Workaround:** Use Dynamic Host Configuration Protocol (DHCP) address to the initiator.

## Network ports are displayed as unknown in YaST2 network configuration

**Description:** While configuring a bonding interface, the configured bond-slaves are listed as `Unknown Network Device`

**Cause:** YaST installer is unable to write the device name in to the `ifcfg` files.

**Workaround:** Delete the existing configuration of previously configured network interfaces.

## Unable to boot from iSCSI over IPV6 after successful installation

**Description:** After the successful installation of SUSE Linux Enterprise Server 12 from iSCSI over IPV6, the system does not boot and fails to provide a GUI login.

**Cause:** This issue occurs when firewall is enabled during installation.

**Workaround:** Disable firewall settings during install.

## Unable to expose some ports of Emulex cards with NPAR-EP enabled when system reboots

**Description:** The Emulex OneConnect OCm14104-N1-D and Emulex OneConnect OCe14102-N1-D cards have totally 32 interfaces, with NPAR-EP enabled, when the system reboots some ports of the cards are not exposed to the operating system.

**Cause:** The OS has only 30 seconds to linkup with interfaces after it reboots.

**Workaround:** Edit `/etc/wicked/common.xml` and set `use-nanny` to `true` and reboot.

## Invalid naming conventions for ports in Intel and NDC cards

**Description:** The naming conventions for Intel and NDC cards in SUSE Linux Enterprise Server 12 by `biosdevname` might not be accurate for all the networking devices.

**Cause:** Limitation in the `biosdevname`.

**Workaround:** Add kernel boot parameter `biosdevname=0` and the naming convention reverts to `eth` naming.

# Installing SUSE Linux Enterprise Server 12 by using the iDRAC Virtual Media does not resume if the iDRAC network is set to the shared LOM mode

- Description:** When installing SUSE Linux Enterprise Server 12 by using the iDRAC Virtual Media, where the iDRAC network is set to **Shared LOM** mode, SUSE Linux Enterprise Server 12 installer initiates a reset on the LAN on Motherboard (LOM) devices.
- Cause:** If **Spanning Tree** is enabled on the switch, there could be a delay in the switch port forwarding network traffic. This delay results in loss of connection to iDRAC or Virtual Media and the installation stops. After sometime the connectivity is restored but the installer but the installation does not resume. This is an expected behavior from the installer.
- Workaround:** Disable **Spanning Tree Protocol** (STP) or set **PortFast** on the uplink port to the iDRAC, during the Virtual Media installation.

# SUSE Linux Enterprise Server 12 might not boot in the UEFI mode

- Description:** After booting SUSE Linux Enterprise Server 12 from the hard drive in the UEFI mode, if you enter `c` to go to the grub command line, and then enter `exit`, the system automatically restarts and displays the Red Screen of Death (RSOD).
- Cause:** Grub2 bootloader exits before the system services complete running.
- Workaround:** Press Esc to exit from grub command line.

# On the YaST2 LAN window, the bonding interface name changes when switching from one tab to other

- Description:** On the **YaST2 LAN** window, the bonding interface name changes from `bond0` to `eth0` when switches from the **Address** tab to the **Hardware** tab or the **Bond Slaves** tab.
- Cause:** This is related to the **YaST2 LAN** configuration tool.
- Workaround:** You can continue configuring bond setup without switching to other tab or edit `eth0` to `bond0`.

# Network Time Protocol Daemon does not start service as expected

- Description:** NTPD does not start the service and does not synchronize with the time server.
- Cause:** `Application Armor` is a Linux kernel security module, and the module does not allow the NTPD service to synchronize.
- Workaround:** Delete the `apparmor` profile for NTPD.

## Unable to assign link local address via DHCP

- Description:** Unable to assign link local address (169.254.0.1/16) via "BOOTPROTO=autoip".
- Cause:** Unable to recognize the link local address by DHCP client(dhclient).
- Workaround:** Assign link local address via static using the command "ifconfig <interface-name> <ip-address>".

## Unable to move soft link .desktop file

- Description:** Unable to move soft link .desktop file with `type=link`.
- Cause:** Unable to deference the source of softlink.
- Workaround:** Use `type=application`.

## Unable to move the OpenManage Server Administrator icon anywhere on the desktop

- Description:** You are unable to move the OpenManage Server Administrator icon anywhere on the desktop. `Error while copying` message is displayed.
- Cause:** Hard linked `.desktop` files do not have source files information populated appropriately.
- Workaround:** This error can be ignored as there is no functionality loss.

## Invalid naming conventions for the ports of Emulex OneConnect OCe14102-UX-D card when NPAR-EP is enabled

- Description:** SUSE Linux Enterprise Server 12 with Emulex OneConnect OCe14102-UX-D card naming conventions by `biosdevname` may not be accurate for all the networking devices. As a result partitions 3 and 4 of all the four ports of Emulex are not named as expected.
- Cause:** `Biosdevname` cannot handle more than 7 PCI functions.
- Workaround:** Add kernel boot parameter "biosdevname=0" this return back to `ethN` naming.

## SUSE Linux Enterprise Server 12 Service Pack 3 kernel panics with QLogic FastLinQ cards

- Description:** When installing the operating system (OS) or booting OS on a server with QLogic FastLinQ cards enabled with NPAR-EP and configured with iSCSI, the kernel panics.
- Cause:** The `qedi` driver which is responsible for iSCSI offloading on QLogic FastLinQ cards fails to start iSCSI function because more command queues are requested than actually available.
- Workaround:** You must first boot the kISO (kernel ISO) image to start installation and when prompted, insert the SUSE Linux Enterprise Server 12 Service Pack 3 DVD to continue the installation. Download the kISO image at [https://drivers.suse.com/suse/installer-update/sle-12-sp3-x86\\_64/3.0/install-readme.html](https://drivers.suse.com/suse/installer-update/sle-12-sp3-x86_64/3.0/install-readme.html)

# SUSE Linux Enterprise Server 12 Service Pack 3 system soft lockup during I/O

- Description:** In Dell EMC 14<sup>th</sup> generation PowerEdge servers with AMD EPYC processors, if all NUMA nodes are not populated with memory, system soft lockup occurs during high intensity I/O operations on drives such as NVMe.
- Applies to:** SUSE Linux Enterprise Server 12 SP3 on R7425, R7415, and R6415
- Solution:** Update the kernel to version 4.4.82-6.3.1.x86\_64 or later.

# SUSE Linux Enterprise Server 12 Service Pack 3 tcspd service fails to start in Xen r kernel

- Description:** In Dell EMC PowerEdge servers the tcspd service fails to start. The tpm device node is not created when booted to SLES 12 SP3 Xen Tboot kernel and when Intel TXT is enabled on TPM 1.2 chip.
- Cause:** The 0xfed40000 (size 0x5000) address is not reserved by BIOS in E820 which is required by the TPM driver.
- Solution:** For 14<sup>th</sup> generation of Dell EMC PowerEdge servers, update the BIOS to the latest available version.

**NOTE:** For 13G and earlier generation servers, the issue in the BIOS is not yet fixed. You can do one of the following as a workaround:

- Boot with Kernel boot parameter "memmap=0x5000\\\$0xfed40000"
- Edit the grub (/etc/default/grub) by running the following commands. After editing the grub, recreate grub.cfg by running the command `grub2mkconfig -o /boot/grub2/grub.cfg`.

```
GRUB_CMDLINE_LINUX_DEFAULT=" memmap=0x5000\\$0xfed40000 "
```

```
GRUB_CMDLINE_LINUX_XEN_REPLACE_DEFAULT=" memmap=0x5000\\$0xfed40000 "
```

# Getting help

Topics:

- [Contacting Dell EMC](#)
- [Related documentation for Linux](#)
- [Documentation resources](#)
- [Downloading the drivers and firmware](#)
- [Documentation feedback](#)

## Contacting Dell EMC

Dell EMC provides several online and telephone based support and service options. If you do not have an active internet connection, you can find contact information about your purchase invoice, packing slip, bill, or Dell EMC product catalog. Availability varies by country and product, and some services may not be available in your area.

To contact Dell EMC for sales, technical assistance, or customer service issues:

- 1 Go to [Dell.com/support](https://Dell.com/support).
- 2 Select your country from the drop-down menu on the lower right corner of the page.
- 3 For customized support:
  - a Enter your system Service Tag in the **Enter your Service Tag** field.
  - b Click **Submit**.The support page that lists the various support categories is displayed.
- 4 For general support:
  - a Select your product category.
  - b Select your product segment.
  - c Select your product.The support page that lists the various support categories is displayed.
- 5 For contact details of Dell EMC Global Technical Support:
  - a Click [Global Technical Support](#).
  - b The **Contact Technical Support** page is displayed with details to call, chat, or email the Dell EMC Global Technical Support team.

## Related documentation for Linux

**NOTE:** For all PowerEdge and PowerVault documentation, go to [Dell.com/poweredgemanuals](https://Dell.com/poweredgemanuals) and [Dell.com/powervaultmanuals](https://Dell.com/powervaultmanuals). Enter the system Service Tag to get your system documentation.

**NOTE:** For information on deploying SUSE Linux Enterprise Server Virtualization, see the product documentation available at [suse.com](https://suse.com).

Product documentation from Dell EMC includes:

- Installation Guide
- Release Notes

**NOTE:** For more information about Dell EMC PowerEdge servers compatibility with supported operating systems, see [Dell.com/ossupport](https://Dell.com/ossupport).

**NOTE:** For more information about Dell EMC PowerEdge servers compatibility with supported operating systems on Dell EMC TechCenter, see [Linux OS Support on Dell EMC PowerEdge Servers](#).

## Documentation resources

This section provides information about the documentation resources for your server.

**Table 2. Additional documentation resources for your server**

| Task                    | Document                                                                                                                                                                                                       | Location                                                                             |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Setting up your server  | For information about installing the server into a rack, see the Rack documentation included with your rack solution Or the <i>Getting Started With Your System</i> document that is shipped with your server. | <a href="http://Dell.com/poweredgemanuals">Dell.com/poweredgemanuals</a>             |
|                         | For information about turning on the server and the technical specifications of your server, see the <i>Getting Started With Your System</i> document that is shipped with your server.                        | <a href="http://Dell.com/poweredgemanuals">Dell.com/poweredgemanuals</a>             |
| Configuring your server | For information about the iDRAC features, configuring and logging in to iDRAC, and managing your server remotely, see the Integrated Dell Remote Access Controller User's Guide.                               | <a href="http://Dell.com/idracmanuals">Dell.com/idracmanuals</a>                     |
|                         | For information about installing the operating system, see the operating system documentation.                                                                                                                 | <a href="http://Dell.com/operatingsystemmanuals">Dell.com/operatingsystemmanuals</a> |
|                         | For information about understanding Remote Access Controller Admin (RACADM) subcommands and supported RACADM interfaces, see the RACADM Command Line Reference Guide for iDRAC.                                | <a href="http://Dell.com/idracmanuals">Dell.com/idracmanuals</a>                     |
|                         | For information about updating drivers and firmware, see the Methods to download firmware and drivers section in this document.                                                                                | <a href="http://Dell.com/support/drivers">Dell.com/support/drivers</a>               |
| Managing your server    | For information about servers management software offered by Dell EMC, see the Dell EMC OpenManage Systems Management Overview Guide.                                                                          | <a href="http://Dell.com/openmanagemanuals">Dell.com/openmanagemanuals</a>           |
|                         | For information about setting up, using, and troubleshooting OpenManage, see the Dell EMC OpenManage Server Administrator User's Guide.                                                                        | <a href="http://Dell.com/openmanagemanuals">Dell.com/openmanagemanuals</a>           |

| <b>Task</b>                                                                   | <b>Document</b>                                                                                                                                                                                                                                                         | <b>Location</b>                                            |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|                                                                               | For information about installing, using, and troubleshooting Dell EMC OpenManage Essentials, see the Dell EMC OpenManage Essentials User's Guide.                                                                                                                       | <b>Dell.com/openmanagemanuals</b>                          |
|                                                                               | For information about installing and using Dell SupportAssist, see the Dell EMC SupportAssist Enterprise User's Guide.                                                                                                                                                  | <b>Dell.com/serviceabilitytools</b>                        |
|                                                                               | For understanding the features of Dell EMC Lifecycle Controller (LC), see the Lifecycle Controller User's Guide.                                                                                                                                                        | <b>Dell.com/idracmanuals</b>                               |
|                                                                               | For information about partner programs enterprise systems management, see the OpenManage Connections Enterprise Systems Management documents.                                                                                                                           | <b>Dell.com/omconnectionsenterprisesystemsmanagement</b>   |
|                                                                               | For information about viewing inventory, performing configuration, and monitoring tasks, remotely turning on or off servers, and enabling alerts for events on servers and components using the Dell EMC Chassis Management Controller (CMC), see the CMC User's Guide. | <b>Dell.com/esmanuals</b>                                  |
| Working with the Dell EMC PowerEdge RAID controllers                          | For information about understanding the features of the Dell EMC PowerEdge RAID controllers (PERC) and deploying the PERC cards, see the Storage controller documentation.                                                                                              | <b>Dell.com/storagecontrollermanuals</b>                   |
| Understanding event and error messages                                        | For information about checking the event and error messages generated by the system firmware and agents that monitor server components, see the Dell EMC Event and Error Messages Reference Guide.                                                                      | <b>Dell.com/openmanagemanuals &gt; OpenManage software</b> |
| Troubleshooting your system                                                   | For information about identifying and troubleshooting the PowerEdge server issues, see the Server Troubleshooting Guide.                                                                                                                                                | <b>Dell.com/poweredgemanuals</b>                           |
| Configuring Dell PowerEdge VRTX shared storage for VMware vSphere environment | For information on configuring Dell PowerEdge VRTX shared storage for VMware vSphere environment, see Dell EMC White papers.                                                                                                                                            | <a href="#">Dell EMC White papers</a>                      |

# Downloading the drivers and firmware

Dell EMC recommends that you download and install the latest BIOS, drivers, and systems management firmware on your system. Ensure that you clear the web browser cache before downloading the drivers and firmware.

- 1 Go to **Dell.com/support/drivers**.
- 2 Under the **Drivers & Downloads** section, type the Service Tag of your system in the **Service Tag or Express Service Code** box, and then click **Submit**.

 **NOTE:** If you do not have the Service Tag, select **Detect My Product** to allow the system to automatically detect your Service Tag, or under **General support**, navigate to your product.

- 3 Click **Drivers & Downloads**.  
The drivers that are applicable to your selection are displayed.
- 4 Download the drivers to a USB drive, CD, or DVD.

## Documentation feedback

You can rate the documentation or write your feedback on any of our Dell EMC documentation pages and click **Send Feedback** to send your feedback.