

# Oracle® Communications Diameter Signaling Router vSTP ADAX Card Installation Guide



Release 8.6

F55027-01

April 2022

The Oracle logo, consisting of a solid red square with the word "ORACLE" in white, uppercase, sans-serif font centered within it.

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# Acronyms

**Table Acronyms**

<b>Term</b>	<b>Definition</b>
HSL	High Speed Link
LSL	Low Speed Link
MEAL	Measurement Event Alarm Logging
MO	Managed Object
MSU	Message Signal Unit
MTP	Message Transfer Part
PC	Point Code
SCCP	Signaling Connection Control Part
TDM	Time Division Multiplexing
vSTP	Virtual Signaling Transfer Point

## Terminology

**Table Terminology**

<b>Term</b>	<b>Definition</b>
E1	E1 is a digital transmission link with a total baud rate of 2.048 Mbps (2048000 bits per second).
T1	T1 is a digital transmission link with a total baud rate of 1.544 Mbps (1544000 bits per second).

# What's New in This Guide

This section lists the documentation updates for Release 8.6.0 in Oracle Communications Diameter Signaling Router vSTP ADAX Card Installation Guide.

## **Release 8.6.0 - F55027-01, April 2022**

There are no updates in the document for this release.

# 1

## Introduction

This chapter describes how to obtain help, where to find related documentation, and provides other general information.

### Overview

The Time Division Multiplexing (TDM) over vSTP enables signal transmission over the ADAX HDC3 PCIe card and provide direct access using PCIe pass through.



# 2

## Installing vSTP with TDM Support

This section provides instructions for installing vSTP software and ADAX drivers to enable TDM support over vSTP:

### Prerequisites

Following are the pre-requisites you must have before proceeding with the installation of vSTP software with TDM support:

1. The Adax cards must be installed or attached in the host machine.
2. The firmware and bios must be up to date. - Refer appendix A for updating firmware on Host using the OSA(Oracle system assistant)
3. The Adax driver rpms compatible with Oracle Linux 6.10 must be available.
4. The vSTP-MP VM profile must be configured.

 **Note:**

The vSTP MP requires 8GB of RAM.

### Configuring PCI Pass Through over Cloud

Perform the following steps to configure PCI pass through over cloud:

1. Configure nova-scheduler (controller).  
Add **PciPassthroughFilter** filter to nova.conf with the following command:

```
[filter_scheduler]
enabled_filters = <your filters>, PciPassthroughFilter
available_filters = nova.scheduler.filters.all_filters
```

2. Locate vendor\_id and product\_id of the Adax card (compute).  
Execute the following **lspci** commnd to show vendor\_id and product\_id:

```
lspci -v |grep -i Adax -B 2 -A 8
```

**Sample Output:**

```
14:00.0 Power PC: Freescale Semiconductor Inc Device 0091 (rev 21)
  Subsystem: Adax, Inc. Device 0883
  Flags: bus master, 66MHz, fast devsel, latency 64, IRQ 26, NUMA node 0
  Memory at c7000000 (32-bit, non-prefetchable) [size=2M]
  Memory at c0000000 (32-bit, prefetchable) [size=32M]
  Memory at c7200000 (64-bit, non-prefetchable) [size=4K]
  Memory at c6000000 (64-bit, non-prefetchable) [size=16M]
  Capabilities: [48] CompactPCI hot-swap <?>
  Kernel driver in use: vfio-pci
```

In the above output, **14:00.0** is the PCI address of the Adax card, Using this address, the `vendor_id` and `product_id` can be listed with the following command:

```
lspci -nn -s 14:00.0
```

### Sample Output:

```
14:00.0 Power PC [0b20]: Freescale Semiconductor Inc Device [1957:0091] (rev 21)
```

In the above output, **14:00.0** is the PCI address of the Adax card, Using this address, the `vendor_id` and `product_id` can be listed as follows:

- `vendor_id=1957`
  - `product_id=0091`
3. Configure nova-api (controller).  
Add Adax card to nova.conf file on the controller:

The type of the card must be **type-PCI**. Name can be anything.

### Example:

```
[pci]
pci_passthrough_whitelist = [{"vendor_id":"1957","product_id":"0091"}]
alias = [{"vendor_id":"1957","product_id":"0091","device_type":"type-PCI","name":"adax1"}]
```

In this example the card name is Adax1:

**Note:** If multiple Adax cards are connected to a host, multiple alias needs to be created. In this example, one Adax card is connected to a host.

4. Update flavor with the card name (controller or cli box).  
Execute the following command:

```
openstack flavor set Adax --property
"pci_passthrough:alias"="Adax1:1"
```

**Note:** To connect multiple Adax cards to a VM, use Adax1:2 (connect 2 cards), Adax1:3 (connect 3 cards).

5. Configure nova-compute (compute)

Whitelist Adax1 card on the compute node in nova.conf with the following command:

```
[pci]
pci_passthrough_whitelist = '{"vendor_id":"1957","product_id":"0091"}'
```

6. Restart the controller and compute services.
  - a. Restart the controller services with the following command:

```
systemctl restart openstack-nova-api.service
openstack-nova-conductor.service
openstack-nova-consoleauth.service
openstack-nova-metadata-api.service
openstack-nova-scheduler.service
```

- b. Restart the compute services with the following command:

```
systemctl restart openstack-nova-compute.service
```

## Installing DSR

Install the DSR software. For information related to DSR software installation, refer to DSR Software Installation Guide for DSR Release 8.4.

## Installing Adax rpms on vSTP-MP

Perform the following steps on vSTP-MP. These steps are applicable to VMs to be enabled for TDM support:



### Note:

The IP/Sigtran only vSTP-MP must not execute these steps.

1. Login to vSTP-MP  
Switch the user to **root** and enter command:

```
sudo su
```

2. Set off the vSTP process.
3. Install Adax rpms  
Execute the following commands to install Adax rpms:

```
rpm -ivh Adax-LiS-2.21.8-1-RedHat-6.10-x86-64bit.rpm
rpm -ivh Adax-hdc-1.79-1-RedHat-6.10-x86-64bit-LiS2.21.8-MAJ234.rpm
rpm -ivh Adax-qcx-1.25-1-Linux-x86-64bit.rpm
```

Note: The Adax driver rpms compatible for Oracle Linux 6.10 must be available at path: /root/ folder.

4. Verify the Adax driver installation on the vSTP-MP.

Verify the Adax driver installation on vSTP-MP from `S05hdc.log` file. The log file must not report any error.

Execute the following command:

```
vim /tmp/S05hdc.log
```

**Note:**The **Failed to open /usr/net/Adax/hdc/hdc\_instances.conf, errno 2** error occurs during verification. This error can be ignored.

5. Turn off cloud-init services.  
Execute the following command to turn off the services:

```
sudo chkconfig cloud-init off
sudo chkconfig cloud-init-local off
```

6. Verify that all cloud-init services are off for each level. Execute the following command to verify:

```
sudo chkconfig cloud-init --list
```

Example Output:

```
cloud-init 0:off 1:off 2:off 3:off 4:off 5:off 6:off
chkconfig cloud-init-local --list
cloud-init-local 0:off 1:off 2:off 3:off 4:off 5:off
6:off
```

## Adax HDC3 Configuration using QCX

The Adax HDC3 PCIe card supports E1 mode and T1 Mode. Therefore, a single ADAX 4-port or 8-Port HDC3 PCIe card can only be configured for E1 mode or T1 mode, one at a time.

The static QCX configuration file is used for configuring E1 or T1 mode on trunc of Adax HDC3 PCIe card. This allows T1 or E1 operations to be selected on a particular trunc for the PCIe card.



### Note:

Adax HDC3 PCIe card does not allow a mix of T1 or E1 to be configured. Also, there can only be one entry per trunc or port in QCX configuration file.

The following table describes the modes allowed to be configure on HDC3 PCIe card:

Parameter	Trunk Type - E1	Trunk Type - T1
Framing	NA	D4,ESF(default)
Encoding	HDB3	AMI, B8ZS(default)
Trunk (Port)	0-7	0-7
Clock Source	ACS (default), MCS, ICS	ACS (default) , MCS ,ICS

Parameter	Trunk Type - E1	Trunk Type - T1
CRC	CRC4, NOCRC4	NA

The recommended values for T1 Trunc configuration are: *Framing - ESF, Encoding - B8ZS, Clock: ACS* or *Framing - D4, Encoding - AMI, Clock: ACS*

## Configuring E1/T1 parameters on vSTP MP

The Adax driver provides configuration file to update or enable the E1 or T1 connection parameters. QCX configuration file is located in `/usr/net/Adax/qcx/` folder and the filename is `qcx_conf.0`.

Perform the following steps to do the configuration:

1. Login to vSTP -MP.
2. Change user as root with the following command:

```
sudo su
```

3. Open the `qcx_conf.0` file.

```
vim/usr/net/Adax/qcx/qcx_conf.0
```

### Note:

If `qcx_conf.0` file is not available, use following command to create `qcx_conf.0` file from existing default configuration file.

```
cp /usr/net/Adax/qcx/qcx_conf.0.hdc /usr/net/Adax/qcx/qcx_conf.0
```

4. Update the E1 or T1 trunc type selection, Framing, Encoding scheme and Adax board clocking source selection as per deployment requirement.
  - a. Set Trunc type E1 or T1:

```
TRUNK_TYPE T1
```

- b. Trunk configuration:

```
trunk <n> [parameters]
trunk 0 ICLK
```

5. Apply updated parameters using following command:

```
/usr/net/Adax/qcx/qcx_conf -r -f /usr/net/Adax/qcx/qcx_conf.0
```

6. Verify trunc /port status:

```
cd /usr/net/Adax/qcx  
./qcctest -d hdcx
```

**Sample Output:**

```
qcctest> status 0
```

# 3

## vSTP TDM Support Feature Overview

The ADAX HDC3 PCIe card supports direct access using PCIe Pass Through. This means that a single ADAX 4-port or 8-Port HDC3 PCIe card can only be accessed from only one VM at a time.

The M3RL layer in vSTP MP VM communicates with the MTP2 layer running on the ADAX HDC3 card via the MTP2 Adapter layer.

The MTP2 Adapter layer uses the libraries and APIs provided by ADAX to communicate with ADAX HDC3 Card.

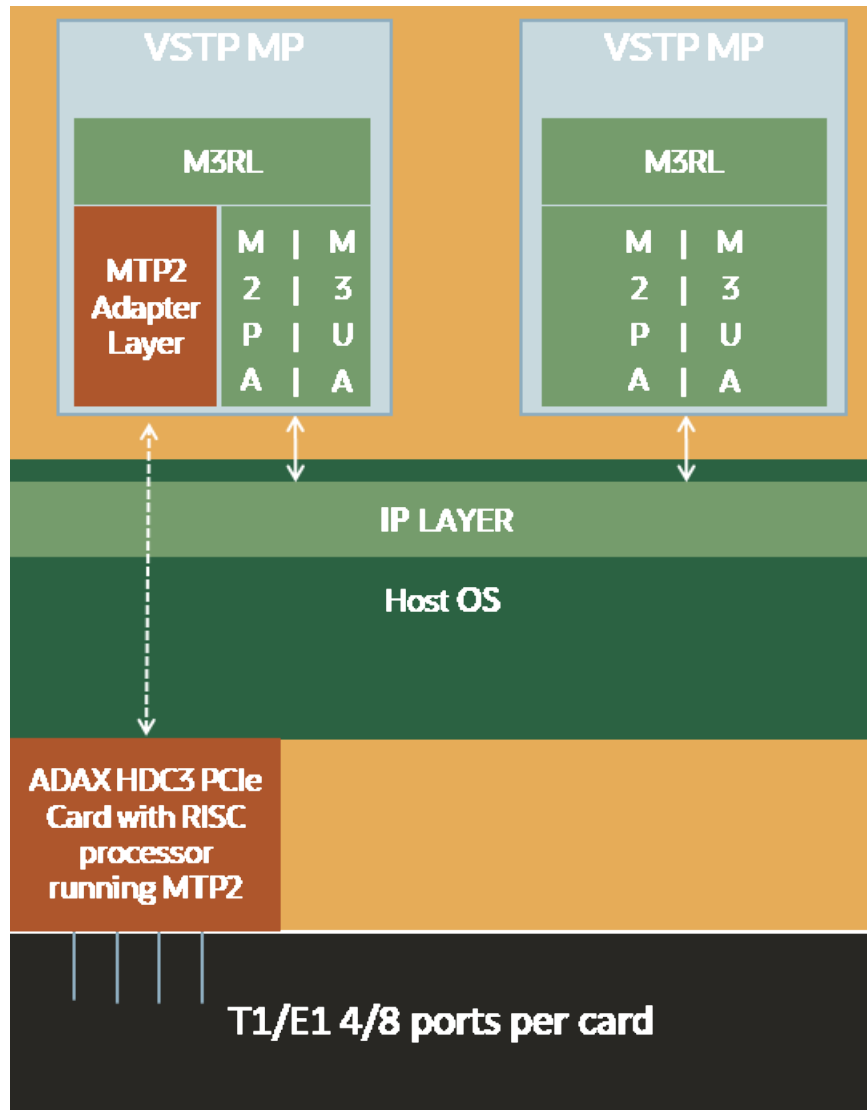
The TDM link implementation supports the following modes:

- E1 Low Speed Link (LSL) – 64 kbps and 56 kbps
- T1 Low Speed Link (LSL) – 64 kbps and 56 kbps
- E1 High Speed Link (HSL) – 2.048 mbps, 12-bit sequence numbers
- T1 High Speed Link (HSL) – 1.536 mbps , 12-bit sequence numbers

ADAX HDC3 card supports either E1 or T1 mode at a time, and needs to be defined during Driver configuration.

## Components for TDM Support on vSTP

The following figure describes components of the vSTP with TDM support:



**Components:**

- 3-Tier vSTP setup installed on the Virtualization environment running on underlying Host Servers.
- ADAX HDC3 PCIe Card installed on Host Server(s).
- vSTP MP(s) supporting TDM are co-located with TDM card(s) on same host.
- MTP2 Adapter layer on VSTP MP communicates with MTP2 Layer running on the ADAX HDC3 Card.
- M3RL Layer and MTP2 Adapter layer exchange data and link primitives.

## Feature Description

The vSTP TDM support feature comprises of the following protocol layers:



### MTP2 Adapter Layer (NIF) – Ingress & Egress

The MTP2 Adapter Layer runs as an independent thread. It acts as a mediation layer between the M3RL Layer running on vSTP application and the MTP2 layer running on TDM PCIe Card.

The MTP2 Adapter layer has following functions:

1. Sending MTP3 data & indications from M3RL Layer to MTP2 layer on TDM PCIe Card.
2. Reading MTP3 data from MTP2 layer on TDM PCIe Card & sending to M3RL layer.
3. Polling the MTP2 Layer on TDM PCIe Card for Link Status update indications & passing on these indications to the M3RL layer.
4. Fetching the FSN and BSN numbers from TDM PCIe Card during Link changeover.
5. Performing buffer retrieval from MTP2 link buffer on TDM PCIe Card & sending the retrieved buffers to M3RL layer.
6. Buffering any unsend messages to MTP2 Layer.

### M3RL Layer

The M3RL Layer performs the functionality specified in ITU-Q.703 and ITU-Q.704. For the Linksets with MTP2 Adapter type, the M3RL layer sends link indications and SS7 traffic to the MTP2 Adapter Layer. It processes the Link Status indications received from the MTP2 Adapter layer. Upon change of link availability status, the M3RL layer performs the following tasks:

1. Changeover or Changeback procedures.
2. Traffic buffering while the Linkset is On-Hold.
3. Traffic rerouting upon completion of change back or changeover procedure.
4. Congestion management for the links.

### TDM Interface Mapping

TDM interface is a logical name given to a specific timeslot within a trunk on a TDM PCIe card. The VSTP MP *Host Name*, *Port* and *timeslot* uniquely identifies a TDM Interface. The TDM Link Type (E1/T1) and Speed is specified for each TDM link interface.

The following table displays the supported TDM configuration combinations:

Mode	Type	Timeslot	Speed	Encoding	Framing	CRC4	Timing
E1	LSL	1 to 31	64 or 56 Kbps	Hdb3	N/A	On, Off	Acs, Mcs, lcs
E1	HSL	N/A	2.048 Mbps	Hdb3	N/A	On, Off	Acs, Mcs, lcs
T1	LSL	1 to 24	64 or 56 Kbps	B8zs, Ami	Sf, Esf	N/A	Acs, Mcs, lcs
T1	HSL	N/A	1.536 Mbps	B8zs, Ami	SF, Esf	N/A	Acs, Mcs, lcs

 **Note:**

Encoding, Framing, CRC and Timing parameters are configured through the Adax QCX utility. For more information, see [Adax HDC3 Configuration using QCX](#).

# 4

## Remote Inhibit

The Remote Inhibit functionality supports Inhibit/Uninhibit of Links from far end. The feature is mainly used for maintenance purpose. The following points describes the work flow:

- While this feature is enabled, traffic does not route through the inhibit link.
- When the inhibit message (LIN) is received on vSTP, the link becomes unavailable on MTP3 layer.
- There is no link state change on MTP2 layer.
- vSTP will send LIA as acknowledgement of LIN message confirming link is inhibit.
- When uninhibit message (LUN) is received on vSTP, the link becomes available on MTP3 layer.
- vSTP will send LUA as acknowledgement of LUN message confirming link is uninhibit and the traffic routes through the same link.
- 



### Note:

vSTP does not support Local Inhibit of Links. Only the handling of remote inhibit procedures is supported.

# 5

## Timer Set

Timer Set is a collection of time out values for SS7 timers. The Time latency for linksets can be different. Hence different timer sets are required. vSTP supports timer sets for the following layer on per-Linkset basis:

- M2PA
- M3UA
- MTP3
- MTP2

This feature allows users to configure SS7 timer sets for each layer for specific linkset. For more information, see MMI configuration options for inserting, updating and deleting the timer set.

# 6

## MTP2 Link Congestion

MTP2 Link congestion is derived from the utilization of link transmission buffers maintained at MTP2 adaption layer and un-acked messages buffered at Adax MTP2 connection queue. The Comcol system framework is used to track the usage and calculating thresholds. Congestion levels are derived as per below table:

Congestion Level	Threshold Level	Onset Threshold	Clear Threshold
3	Critical	95	90
2	Major	85	80
1	Minor	60	50

Based on the congestion level of Links, congestion level of Linkset is derived.

Congestion Level of Linkset = Max (Congestion level of all Links in the linkset)

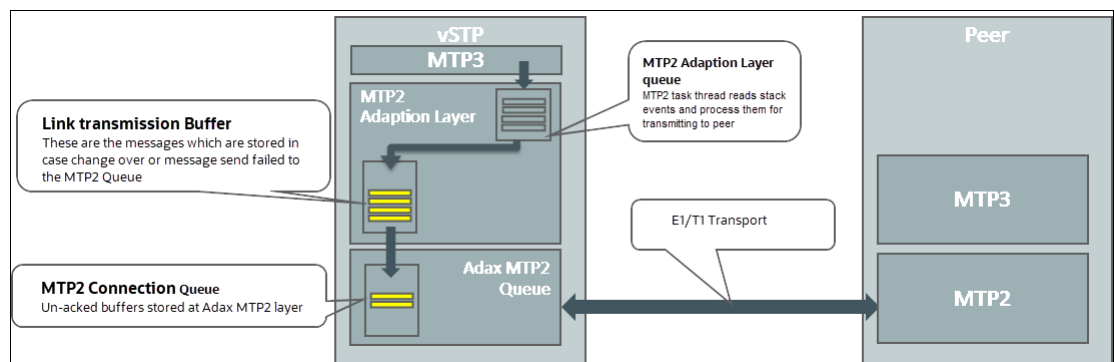
Based on congestion Level of linkset, congestion level of RSPs with route having the same linkset are derived.

## MTP2 Link Congestion Detection

To detect the congestion level, (Link TPS \* 2 ) base is used for the base calculation.

If the sum of Link transmission buffer and MTP2 connection buffer queue utilization percentage is above configured threshold level, then the link is treated as congested.

The following figure describes the MTP2 Link Congestion:



# 7

## vSTP MTP2 Remote Processor Outage

Remote processor outage is the procedure where remote signaling point communicate the processor outage status to the local signaling point. The outage message is initiated by the remote signaling point to notify that issue has occurred at the remote end. As soon as MTP2 layer receives the RPO message, it stops sending data messages to remote point . The MTP2 layer sends RPO indication to the MTP3 Layer to handle RPO.

The work flow for handling RPO is as follows:

1. When RPO message received at MTP2 Layer , it stop sending data messages to remote.
2. MTP2 Layer set the Link state to out of service and send the RPO notification to MTP3 Layer.
3. MTP3 layer receives the RPO notification and it starts the change over procedure.
4. If MTP2 received PO recovered message it send the indication to MTP3 Layer.
5. Once RPO recovered message received at MTP3 Layer , it mark the link available and initiate the change back procedure.
6. When the link status changes to **in-service** state , MTP2 starts data message transfer to remote end.

# 8

## Adax HDC3 Configuration using QCX

The Adax HDC3 PCIe card supports E1 mode and T1 Mode. Therefore, a single ADAX 4-port or 8-Port HDC3 PCIe card can only be configured for E1 mode or T1 mode, one at a time.

The static QCX configuration file is used for configuring E1 or T1 mode on trunc of Adax HDC3 PCIe card. This allows T1 or E1 operations to be selected on a particular trunc for the PCIe card.

### Note:

Adax HDC3 PCIe card does not allow a mix of T1 or E1 to be configured. Also, there can only be one entry per trunc or port in QCX configuration file.

The following table describes the modes allowed to be configure on HDC3 PCIe card:

Parameter	Trunk Type - E1	Trunk Type - T1
Framing	NA	D4,ESF(default)
Encoding	HDB3	AMI, B8ZS(default)
Trunk (Port)	0-7	0-7
Clock Source	ACS (default), MCS, ICS	ACS (default) , MCS ,ICS
CRC	CRC4, NOCRC4	NA

The recommended values for T1 Trunc configuration are: *Framing - ESF, Encoding - B8ZS, Clock: ACS or Framing - D4, Encoding - AMI, Clock: ACS*

## Configuring E1/T1 parameters on vSTP MP

The Adax driver provides configuration file to update or enable the E1 or T1 connection parameters. QCX configuration file is located in `/usr/net/Adax/qcx/` folder and the filename is `qcx_conf.0`.

Perform the following steps to do the configuration:

1. Login to vSTP -MP.
2. Change user as root with the following command:

```
sudo su
```

3. Open the `qcx_conf.0` file.

```
vim/usr/net/Adax/qcx/qcx_conf.0
```

 **Note:**

If `qcx_conf.0` file is not available, use following command to create `qcx_conf.0` file from existing default configuration file.

```
cp /usr/net/Adax/qcx/qcx_conf.0.hdc /usr/net/Adax/qcx/  
qcx_conf.0
```

4. Update the E1 or T1 trunc type selection, Framing, Encoding scheme and Adax board clocking source selection as per deployment requirement.

- a. Set Trunc type E1 or T1:

```
TRUNK_TYPE T1
```

- b. Trunk configuration:

```
trunk <n> [parameters]  
trunk 0 ICLK
```

5. Apply updated parameters using following command:

```
/usr/net/Adax/qcx/qcx_conf -r -f /usr/net/Adax/qcx/qcx_conf.0
```

6. Verify trunc /port status:

```
cd /usr/net/Adax/qcx  
./qcctest -d hdcx
```

**Sample Output:**

```
qcctest> status 0
```



# 9

## Uninstalling vSTP with TDM Support

### Uninstalling vSTP Software Patch

To uninstall the vSTP software patch, follow the uninstall steps from the downloaded patch.

### Uninstalling Adax Drivers

Perform the following steps to uninstall the Adax drivers:

1. Login to vSTP-MP.
2. Stop vSTP process with the following command:

```
pm.set off vstp
```

3. Change user to **root**.

```
sudo su-
```

4. Remove the qcx\_conf.0 file.

```
rm -f /usr/net/Adax/qcx/qcx_conf.0
```

5. Stop and remove the Adax QCX module.

```
chkconfig qcx stop
```

```
chkconfig --del qcx
```

6. Stop and remove the Adax HDC module.

```
chkconfig hdc stop
```

```
chkconfig --del hdc
```

7. Stop and remove the Adax LiS module.

```
chkconfig Adax-str stop
```

```
chkconfig --del Adax-str
```

**8. Remove Adax driver rpms.**

```
rpm -e Adax-qcx-1.25-1.x86_64 Adax-hdc-1.79-1.x86_64 Adax-  
Lis-2.21.8-1.x86_64
```

**9. Reboot vSTP-MP.**

```
init 6
```

# A

## Appendix A Upgrade Host Firmware using Oracle System Assistant

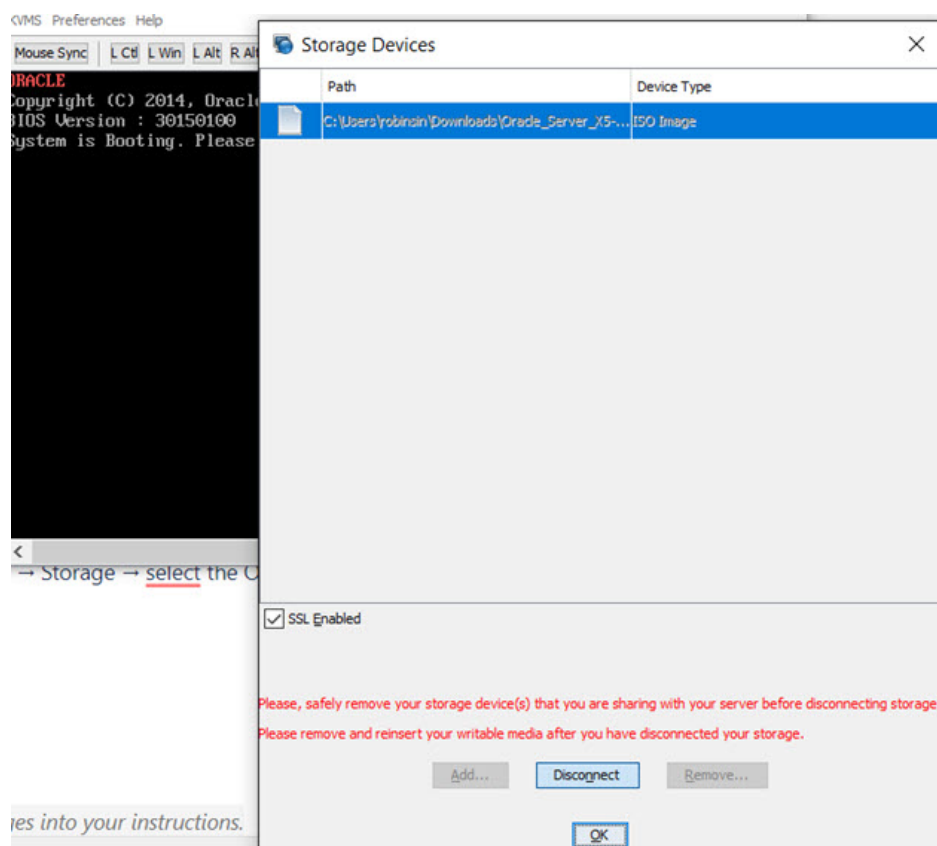
Execute the following steps to upgrade all the firmware using Oracle System Assistant (OSA):

1. Obtain the .iso file for OSA using the following steps:
  - a. Login to URL: <https://support.oracle.com>
  - b. In the **How Do I...?** header click **Download a Patch**. A new tab for **Patches and Updates** gets opened.
  - c. Select **Product or Family (Advanced)** tab under the **Patch Search** header.

**Figure A-1 Searching Patch**

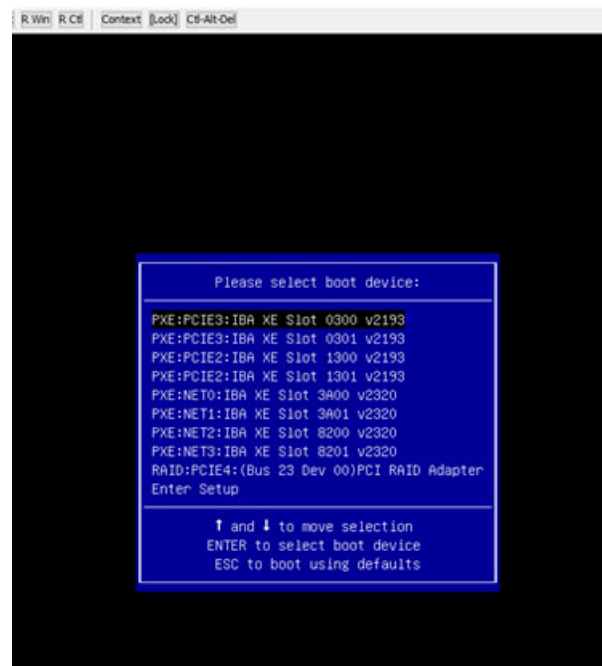
The screenshot shows the Oracle Patch Search interface. The search criteria are: Product is 'Start Typing...', Release is 'Platform', and Platform is 'Platform'. There are checkboxes for 'Include all products in a family', 'Show recommended patches only', and 'Exclude superseded patches'. The search button is visible at the bottom right.

- d. Enter the name of the server for which the OSA is required and select the required version. For example, Oracle server X7-2.
  - e. Click on **Search** button. The list of available patches appears on the screen.
  - f. Select and download the required Oracle System Assistant image from the list. Save on local machine.
2. Perform the following steps to mount and boot the ILOM using the downloaded OSA image file:
    - a. Log in to the ILOM for which the firmware needs to be updated.
    - b. Launch the Remote Console.
    - c. In the remote console window menu, select **KVMS > Storage**. The **Storage Devices** window gets opened. Select the OSA image from local machine, which is downloaded in the previous step. This creates a virtual Flash drive with the image on it.
    - d. Select the uploaded image and click **Connect**.

**Figure A-2 Upload Image**

- e. In the Boot menu, select press F8 from the keyboard and to select Boot popup menu.
- f. There will a virtual Flash drive. Select the drive by pressing **Enter**. The ILOM will boot with OSA image.

Figure A-3 ILOM Boot process



3. The boot process will continue for about 45 minutes. After this, the option for OSA starts appearing in the ILOM.
4. Click **Update Firmware > Install updates**. The server will switch ON/OFF several times during the process.
5. After the process is complete, reboot the server. The firmware will be upgraded to the latest version after the reboot.