Oracle® SDN Controller

User's Guide

Part No.: E49478-03
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Contents

Using This Documentation

This guide describes how to install, upgrade, and manage the controller.

These instructions are designed for enterprise network administrators with experience configuring network hardware and software.

Release Notes

For late-breaking information and known issues about this product, refer to the release notes at:

http://docs.oracle.com/cd/E38500_01/

Related Documentation

Documentation	Links
All Oracle products	http://oracle.com/documentation
Oracle Fabric Interconnect	http://docs.oracle.com/cd/E38500_01/

Feedback

Provide feedback on this documentation at:

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Understanding the Oracle SDN Controller

Oracle SDN Controller runs on an Oracle Linux 6.1 32-bit server with Linux kernel 2.6.39. Oracle SDN Controller does not require an Oracle Fabric Interconnect device.

Features Overview

Oracle SDN Controller brings high-speed Ethernet connectivity (Oracle PVI) to your current IB networks without additional hardware. Oracle SDN Controller extends from the software stacks of the Oracle Fabric Interconnect chassis. Oracle SDN Controller is configured and managed with Oracle Fabric Manager 4.2.0 and up, which provides a progressive UI for applying PVI clouds and vNICs.

Key features include:

- Physical server auto-discovery
- PVI cloud management
- PVI vNIC management
- I/O template management
- Multi-tenant support
- IB topology view
- Enhanced performance monitoring

Hardware and Software Requirements

Hardware	Software
Two Oracle SDN Controller servers with 4 GB RAM, 1.6 Ghz CPU, 40 GB disk space, and a standard HCA card.	Oracle Linux 6.1 32-bit, `postgresql`, `postgresql-devel`, `httpd`, `httpd-devel`, `mod_ssl`
Oracle Fabric Manager server. Oracle SDN Controller cannot run on the same server as Oracle Fabric Manager. This server does not require an HCA card.	Minimum version 4.2.0. Refer to the *Oracle Fabric Manager 4.2.0 User's Guide* at: `http://docs.oracle.com/cd/E38500_01/`
An IB switch. Any IB switch is supported. No cable restrictions.	Open SM must be turned off.
ConnectX DDR or QDR IB-HCA card per host server.	IB-HCA firmware (included in Oracle Linux 6.1)
Host servers.	Oracle Linux, Oracle VM, RHEL, or ESXi. For PVI vNIC support: ESX4, ESX5, RHEL 6.2, Oracle Linux 6, all Oracle VM versions. See "Minimum Host Driver Requirements" on page 2.

Minimum Host Driver Requirements

Host	Oracle Virtual Networking Driver Version	How to Install
Oracle Linux	Oracle Linux 6 Update 3 or 4 (32- or 64-bit). Oracle Virtual Networking host driver version 5.0.7-LX. This driver supports Oracle Linux and RHEL.	Refer to the release notes available at: `http://docs.oracle.com/cd/E38500_01/`

Host	Oracle Virtual Networking Driver Version	How to Install
Oracle VM	Oracle Virtual Networking host driver version 3.7.3-OVM3.	Refer to the release notes available at: `http://docs.oracle.com/cd/E38500_01/`
RHEL	InfiniBand host driver: `kernel-ib-1.5.1-2.6.18`. RHEL 6 Update 1. Oracle Virtual Networking host driver version 5.0.0-LX.	"Install RHEL 6 Update 1 Host Drivers" on page 14
ESXi	ESXi Server 5.x Update 0 (GA). Oracle Virtual Networking host driver version 5.1.0-ESX.	"Install VMware ESXi 5.0 Host Drivers Locally" on page 15 "Install VMware ESXi Host Drivers by Creating an ESXi 5.0.x Driver Disk" on page 16

HCA Port Requirements

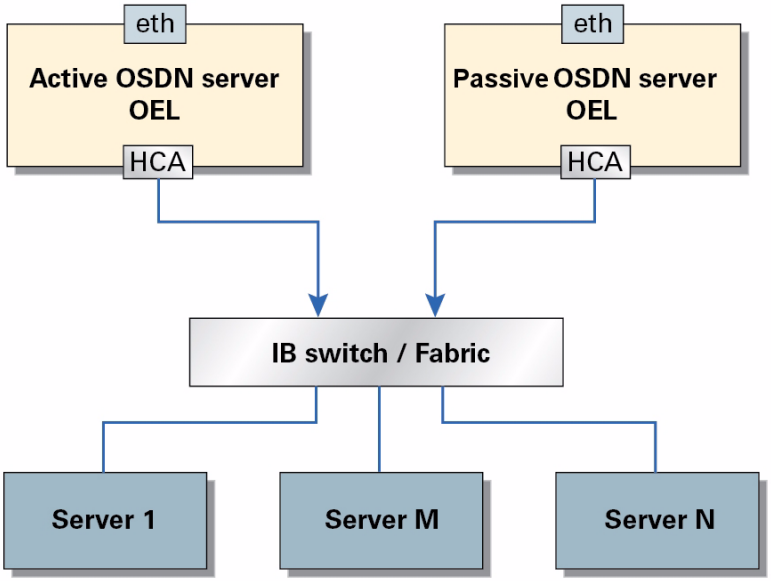
In this release, only a single HCA port configuration is supported.

- Dual port HCA cards must use Port 1.
- The HCA port must be connected during the installation.

  If the HCA port is not connected during installation, the controller service must be restarted after the HCA port is connected.
- If no HCA port is connected, or if the port is down, an alarm will be issued.

Oracle SDN Controller HA Active and Passive Server Configuration

Configure two Oracle SDN Controller servers for HA in the same IB fabric. Only two controllers are supported in the same subnet. One controller must be active and one controller must be passive.



At startup, both Oracle SDN Controller servers are in passive mode. You must set the active controller when adding the two controller servers to Oracle Fabric Manager. See "Add the Oracle SDN Controller Servers to Oracle Fabric Manager" on page 25. When a node is made active, Oracle Fabric Manager pushes the latest configurations to the controller server and periodically backs up the active controller configuration. The backups are available to send to the passive controller if the active controller goes down.

Failover Overview

Once a data channel is established between Oracle Fabric Manager and the active Oracle SDN Controller server, host servers are automatically discovered and Oracle Fabric Manager is able to push I/O Profiles and PVI vNICs out to the host servers. Oracle Fabric Manager monitors the health of both the active and passive Oracle SDN Controllers and reports any failures.

If an active controller failure occurs, you must use Oracle Fabric Manager to push the latest backup of the active controller to the passive controller and make the passive controller active. See "Managing Failovers and Backups" on page 38.

MAC Address Management

The controller manages its own address space. As part of installation, you are asked to enter address prefix information to enable up to 4K MAC addresses. You can use one of the MAC addresses block allocated by Oracle, or you can use your own. You must use the same block of allocated MAC addresses for both HA controllers.

Note – Changing MAC addresses on the controller is not supported.

Installing and Administering Oracle SDN Controller

Oracle SDN Controller software is available from the My Oracle Support web site: http://support.oracle.com.

▼ Install Oracle SDN Controller Software

Note – Before you begin, ensure that all of your servers, networking hardware, and cables are correctly installed.

Note – If not already installed, the install script installs the following prerequisite software on the server: `postgresql`, `postgresql-devel`, `httpd`, `httpd-devel`, `mod_ssl`.

1. **Download the Oracle SDN Controller software from the My Oracle Support web site:** http://support.oracle.com
2. **Copy the installation package to the server** `/tmp` **directory and uncompress it.**

```
# tar xvf osdn32-6.0.0-XGOS-RC1J.tar
```

3. **Execute the install script.**

   The script guides you through the installation process and verifies that all required software packages are installed.

```
# ./osdn_install.sh
...
Do you want to install semanage package ? y
Do you want to install Apache2 key and certificate files ? y
...
Do you want to update iptables ? y
Do you want use Oracle provided block of MAC addresses ? y
Resolving Dependencies
...
Running Transaction
 Installing : postgresql-8.4.9-1.el6_1.1.i686           1/4
 Installing : httpd-2.2.15-9.0.1.el6_1.3.i686           2/4
 Installing : 1:mod_ssl-2.2.15-9.0.1.el6_1.3.i686       3/4
 Installing : postgresql-server-8.4.9-1.el6_1.1.i686    4/4
...
 Installing : policycoreutils-python-2.0.83-19.8.el6_0.i686   1/1
...
Complete!
aikido3-master_32/
...
Installing aikido in /usr
Copying bin/aikido to /usr/bin
...
Installing OSDN Controller SW
...
Update IP tables
iptables: Saving firewall rules to /etc/sysconfig/iptables:[  OK  ]
...
Installatiion is completed. ...
...
Reboot server so all changes will take effect
```

4. **After all required software and security updates are installed and verified, reboot the server.**

```
# reboot
```

5. **Configure the controller settings during the first boot process.**

   See "Configure First Boot" on page 9.

6. **Repeat Step 1 through Step 5 for the second Oracle SDN Controller server.**

▼ Configure First Boot

The first boot process allows you to specify the: controller name, subnet manager, admin and user passwords, and the controller assigned MAC address.

Note – The controller names and MAC addresses must be the same for both controllers. See "MAC Address Management" on page 5.

- **Login as root and type:**

Note – This command could take up to five minutes to bring you to first boot setup.

```
# su admin
...
Would you like to use the XgOS Configuration Wizard? [Y/n] y
OSDN Controller Name [hostname]: OsdnControllerName
Is this Director to be designated as the IB subnet manager (leave
as Y unless using an external, non-Xsigo subnet manager) ? [Y/n] y
Supply the SNMP Read Community Name (leave blank if you want to
keep the default of 'public')
   Please input the 'admin' password: *******
   Please confirm the 'admin' password: *******
   OSDN MAC Address. Both HA OSDN Controllers should be assigned
  the same MAC Address. Both HA OSDN Controllers should be assigned
   the same MAC Address. Choose one frome the list:
        0013975DA000
        ...
        0013975E3000 [xxxxxxxxxxxx]: 0013975DF000
#
```

▼ Install Oracle Fabric Manager

Note – Oracle Fabric Manager must be installed on a separate server and cannot be installed on the same server as the Oracle SDN Controller.

Note – The Oracle Fabric Manager server does not require IB connectivity to the Oracle SDN Controllers.

1. **Install Oracle Fabric Manager 4.2.0 or later.**

   For installation instructions and server requirements, refer to the *Oracle Fabric Manager 4.2.0 User's Guide* (E39262).

2. **Add the Oracle SDN Controller servers to Oracle Fabric Manager.**

   See "Add the Oracle SDN Controller Servers to Oracle Fabric Manager" on page 25.

▼ Upgrade Oracle SDN Controller

Upgrading the Oracle SDN Controller is done through CLI on the Oracle SDN Controller server.

1. **Download the Oracle SDN Controller upgrade package file (`.xpf`) from the My Oracle Support web site:** `http://support.oracle.com`

2. **Make the upgrade package file accessible through a file transfer protocol.**

   This example uses `scp`.

3. **Login as root and type:**

```
# su admin
                    Welcome to OSDN Controller
...
admin@hostname[xsigo]
```

4. **Execute the system upgrade script.**

```
admin@hostname[xsigo] system upgrade -noconfirm
scp://username@hostname.country.company.com:/path_to_upgrade_script/
osdn32-6.0.0-XGOS-RC1J.xpf
...
Copying...          ##############################################
You have begun to upgrade the system software. Please be aware that
this will cause an I/O service interruption and the system may be
rebooted.
The following software will be installed:
   1. XgOS Operating System software including SCP Base OS
```

```
Running verify scripts...
Running preunpack scripts...
Installing...      ########################################## [100%]
Verifying...         ##########################################
Running preinstall scripts...
Installing package...
Running postinstall scripts...
Installation successful.  Please stand by for CLI restart.
admin@hostname[xsigo] system upgrade -noconfirm
Restarting OSDN Applications. Please log in again in a couple of
minutes...
```

▼ Remove Oracle SDN Controller

Removing the Oracle SDN Controller is done through CLI on the Oracle SDN Controller server.

1. Login as root and copy the uninstall script to the `/tmp` **directory.**

```
# cp /opt/xsigo/xsigos/current/osdn_uninstall.sh /tmp
```

2. Execute the uninstall script.

```
# /tmp/osdn_uninstall.sh
Stop all CLI Sessions
Stopping OSDN services:
...
Do you want to uninstall postgresql postgresql-server mod_ssl
policycoreutils-python ? y
Do you want to undo security changes in SELinux ? y
Do you want to reverse iptables ? y
userdel: group rcli is the primary group of another user and is not
removed.
groupdel: cannot remove the primary group of user 'ucli'
groupdel: group 'admin' does not exist
cp: cannot stat '/etcsysconfig/iptables.save': No such file or
directory
iptables: Saving firewall rules to /etc/sysconfig/iptables:[  OK  ]
Setting up Remove Process
Resolving Dependencies
...
Complete!
Reboot server so all changes will take effect
```

Installing Supported Host Software on the Servers

To support Oracle SDN Controller, a compatible version of Oracle Virtual Networking host drivers must be installed for Oracle Linux, Oracle VM, or VMware ESXi servers installed in the server fabric. See "Minimum Host Driver Requirements" on page 2 for the minimum supported versions of host drivers.

Note – Refer to the release notes for your host server driver software for the latest features and installation instructions: `http://docs.oracle.com/cd/E38500_01/` The Oracle SDN Controller-capable host drivers are not a separate set of host drivers. The SDN features are built into the standard host driver package.

▼ Install Oracle Linux 5.0.7 and Oracle VM 3.7.3 Host Drivers

- **For installation instructions, refer to the release notes available at:** `http://docs.oracle.com/cd/E38500_01/`

▼ Install RHEL 6 Update 1 Host Drivers

The Oracle SDN Controller host drivers for Red Hat Enterprise Linux 6 update 1 or later are available as a standard RPM file. Installing the host drivers occurs through the `rpm -ivh` command.

Note – Do not install 64-bit host drivers on a 32-bit server.

Note – There is a dependency that the appropriate `kernel-ib` RPM is installed before the corresponding host drivers. Install the Oracle Virtual Networking InfiniBand host drivers before installing the Linux host drivers. Each of these images (IB driver and Linux host driver) are contained in separate RPM packages.

---

1. **Make a note of the servers on which Oracle SDN Controller host drivers are installed.**

   You need to know which servers are running the Oracle SDN Controller host drivers when configuring the Oracle SDN Controller.

2. **Remove any existing IB or Linux host drivers completely before installing the Oracle SDN Controller-capable host drivers.**

3. **Download the supported version of IB and Linux host drivers from the My Oracle Support web site at:** `http://support.oracle.com`**.**

4. **Install the IB stack for your architecture, either:**

   - `kernel-ib-1.5.3-2.6.32-131.0.15.el6.i686.rpm`
   - `kernel-ib-1.5.3-2.6.32-131.0.15.el6.x86_64.rpm`

   For example:

```
# rpm -ivh kernel-ib-1.5.3.2-2.6.32-131.0.15.el6.i686.rpm
```

5. **Install the correct host driver for your architecture, either:**

   - `xsigo-hostdrivers-kmod-2.6.32-131.0.15.el6.5.0.0.LX3B.i686.rpm`

- `xsigo-hostdrivers-kmod-2.6.32-131.0.15.el6.5.0.0.LX3B.x86_64.rpm`

For example:

```
# rpm -ivh
xsigo-hostdrivers-kmod-2.6.32-131.0.15.el6.5.0.0.LX.i686.rpm
```

6. **Reboot the server to load the new drivers into memory.**
7. **Verify the installation.**

   See "Verify Linux Host Software" on page 19.

▼ Install VMware ESXi 5.0 Host Drivers Locally

ESXi host drivers can be installed locally or through PXE Boot methods, such as SAN Boot. To install ESXi host drivers through PXE or SAN Boot, see "Install VMware ESXi Host Drivers by Creating an ESXi 5.0.x Driver Disk" on page 16.

With ESXi 5.0 and later host drivers, RPM files are no longer supported. Instead, the host drivers are installed like standard VMware VIB file straight from the depot. To install the ESX host drivers directly onto an ESXi 5.0 host, use the `esxcli vib install` command.

1. **Make a note of the servers on which Oracle SDN Controller-capable host drivers are installed.**
2. **Remove any existing host drivers completely before installing the Oracle SDN Controller-capable host drivers.**
3. **Download the supported version of host drivers from the My Oracle Support web site at** `http://support.oracle.com`**.**
4. **When the ESXi 5.0 driver bundle is on the ESX server, use the** `esxcli software vib install -d` **command.**

   You must specify the full path for the bundle. For example:

```
#
esxcli software vib install -d /software/xsigo/xsigo_5.1.0.ESX.1-
1vmw.500.0.0.406165.zip
```

5. **Reboot the ESXi 5.0 server after installing the bundle.**

6. **Verify the installation.**

   See "Verify ESXi 5.0 Host Software" on page 19.

Note – If you are already running the required host drivers, you can update to newer versions of the supported host driver.

▼ Install VMware ESXi Host Drivers by Creating an ESXi 5.0.x Driver Disk

ESXi host drivers can be installed locally or through PXE Boot methods, such as SAN Boot. This task installs ESXi host drivers through PXE or SAN Boot. See "Install VMware ESXi 5.0 Host Drivers Locally" on page 15 to install ESXi host drivers locally.

To enable PVI vNICs with the ESXi 5.0 OS for PXE or SAN Booting, you must install the Oracle Virtual Networking host drivers into the native ESXi OS as described in this task.

The procedure for PXE Booting or SAN Booting an ESXi 5.0 host is the same as for an ESXi 4.0 host, with the exception of installing the Oracle Virtual Networking host drivers into the ESXi 5.0 bundle. Use this task instead of the instructions for the `remaster-iso` script in the *XgOS Remote Booting Guide*. After completing this task, use the SAN Boot procedure for ESXi 4.0 hosts in that document to configure the ESXi 5.0 host for SAN Booting.

Be aware of the following:

- Creating the custom ISO is accomplished through Microsoft Windows PowerShell and specifically the VMware vSphere PowerCLI plug-in for PowerShell. The Windows server needs this tool installed.
- Creating the custom ISO is supported on a Windows server only. The server requirements are determined by the PowerShell application.
- You use a pre-configured ESXi bundle as a baseline, then inject the Oracle Virtual Networking bits into it. The OS file is `VMware-ESXi-5.0.0-469512-depot.zip` and is available from VMware's website.
- You will need full administrative rights on the Windows server where you create the custom ISO.

1. **Remove any previous version of host driver before installing new Oracle Virtual Networking host drivers.**

```
# esxcli software vib remove -n net-xsvnic -n scsi-xsvhba -n
net-xscore -n net-ib-basic -n net-mlx4-en
```

2. **Install PowerShell on the Windows server if you have not done so already.**
3. **Install the PowerCLI plug-in if you have not done so already.**
4. **Download the** `VMware-ESXi-5.0.0-469512-depot.zip` **file to the Windows server.**
5. **Start PowerCLI.**
6. **Import the ESXi 5.0 bundle and the Oracle Virtual Networking host drivers into PowerCLI.**

```
> Add-EsxSoftwareDepot -DepotUrl C:\Users\adminA‡esktop\images\
New\VMware-ESXi-5.0.0-469512-depot.zip

> Add-EsxSoftwareDepot -DepotUrl C:\Users\adminA‡esktop\images\
New\xsigo_5.0.5.ESX.1-1vmw.500.0.0.406165.zip
```

7. **Specify the profile that you want to use when creating the output ISO.**

   The profile determines metadata about the output ISO, such as formatting, compression method, and so on.

```
> New-EsxImageProfile -CloneProfile ESXi-5.0.0-469512-standard
-name "ESXi-5.0.0-469512-standard-xsigo"
```

8. **Add the IB stack and other dependencies to the depot.**

```
> Add-EsxSoftwarePackage -ImageProfile
ESXi-5.0.0-469512-standard-xsigo -SoftwarePackage net-mlx4-en

> Add-EsxSoftwarePackage -ImageProfile
ESXi-5.0.0-469512-standard-xsigo -SoftwarePackage net-ib-basic

> Add-EsxSoftwarePackage -ImageProfile
ESXi-5.0.0-469512-standard-xsigo -SoftwarePackage net-xscore

> Add-EsxSoftwarePackage -ImageProfile
ESXi-5.0.0-469512-standard-xsigo -SoftwarePackage net-xsvnic
```

```
> Add-EsxSoftwarePackage -ImageProfile
ESXi-5.0.0-469512-standard-xsigo -SoftwarePackage scsi-xsvhba

> Add-EsxSoftwarePackage -ImageProfile
ESXi-5.0.0-469512-standard-xsigo -SoftwarePackage net-xve
```

Note – Ensure to add the `net-xve` line to the driver disk. If you do not, the supported host drivers will not be installed and Oracle SDN Controller will not be supported on the ESXi host.

9. **Create single output ISO containing all required files from the depot.**

   The following example assumes unsigned drivers to provide the most complete example.

```
> Export-EsxImageProfile -ImageProfile ESXi-5.0.0-469512-standard-xsigo
-ExportToIso -FilePath C:\Users\adminA‡esktop\images\New\
VMware-VMvisor-Installer-5.0.0-469512_Xsigo.x86_64.iso -NoSignatureCheck
```

Note – Oracle Virtual Networking makes every effort to release signed, certified host drivers. However, on some occasions, Oracle Virtual Networking might release unsigned drivers. If you receive unsigned Oracle Virtual Networking host drivers, the `Export -EsxImageProfile` command has the `-NoSignatureCheck` option which bypasses signature checking. Use the `-NoSignatureCheck` for unsigned drivers. Omit the `-NoSignatureCheck` option if the drivers are signed.

10. **When the ISO is created, put on the SAN LUN and create a SAN Boot server profile with a vHBA connected to it.**

    For details, refer to the *Remote Booting Guide*.

Verifying Installed Host Software

Verify that the correct software is installed on the host servers. The version of software installed should be at least the minimum version listed in "Minimum Host Driver Requirements" on page 2.

▼ Verify Linux Host Software

- **Verify the Oracle Virtual Networking software is installed and enabled.**

```
# rpm -q xsigo-hostdrivers-kmod
kernel-ib-1.5.3.2-2.6.32-131.0.15.el6.i386
xsigo-hostdrivers-kmod-2.6.32-131.0.15.el6.5.0.0-LX3B

# chkconfig --list | grep xsigo
xsigo     0:off     1:off     2:on     3:on     4:on     5:on     6:off
```

If the drivers were loaded correctly, you will see `xsigo` and `on(s)` in the display.

You can also use the `rpm -qV xsigo-hostdrivers-kmod` command to validate the package install. In addition, you can check the standard Linux logs for information about the installation of Oracle Virtual Networking host drivers.

▼ Verify ESXi 5.0 Host Software

- **Verify that the correct software is installed.**

```
esxcli software vib list | grep xs

net-xscore 5.1.0.ESX.1-1vmw.500.0.0.406165 VMware
PartnerSupported 2011-12-12
net-xsvnic 5.1.0.ESX.1-1vmw.500.0.0.406165 VMware
PartnerSupported 2011-12-12
scsi-xsvhba 5.1.0.ESX.1-1vmw.500.0.0.406165 VMware
PartnerSupported 2011-12-12
```

You can also check the standard ESX logs for information about the installation of Oracle Virtual Networking host drivers.

Topologies

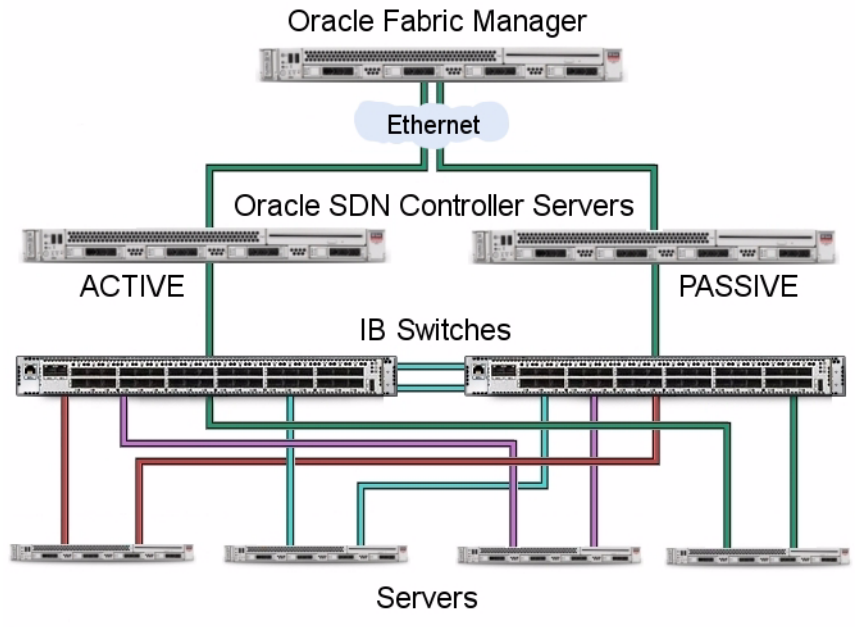
These topologies depict dual Oracle SDN controller server configurations for HA redundancy.

Device Requirements

For the minimum supported OSs and host driver software requirements for the servers, HCAs, and switches in these topologies, see:

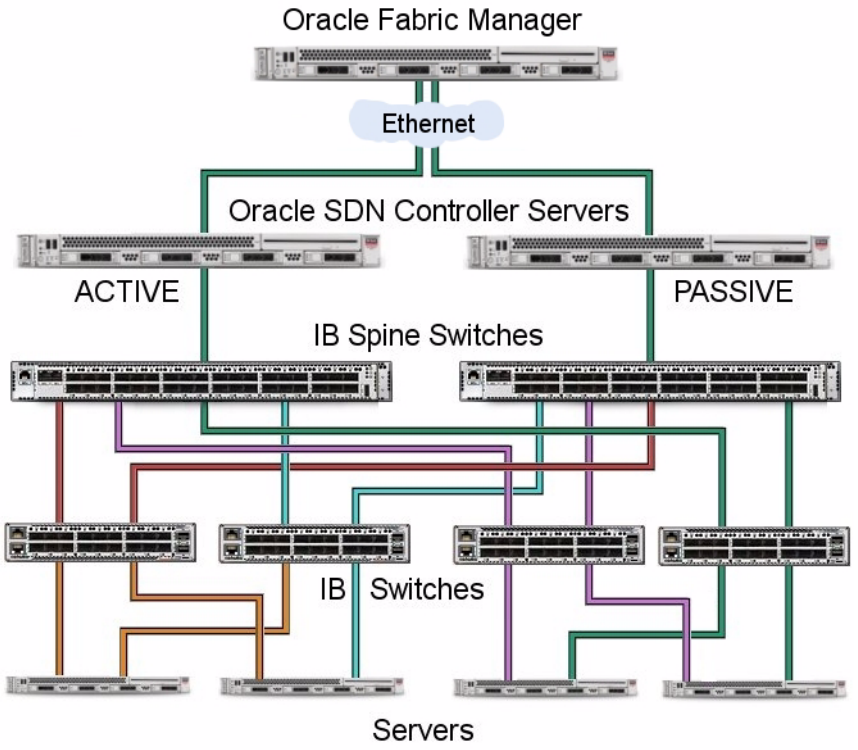
Small HA Network

At least four switch ports are required. Two ports are for Oracle SDN Controllers and one or more ports on each switch is used to connect the two subnets. If both switches are 36 port QDR, this configuration could support up to 34 servers in HA.



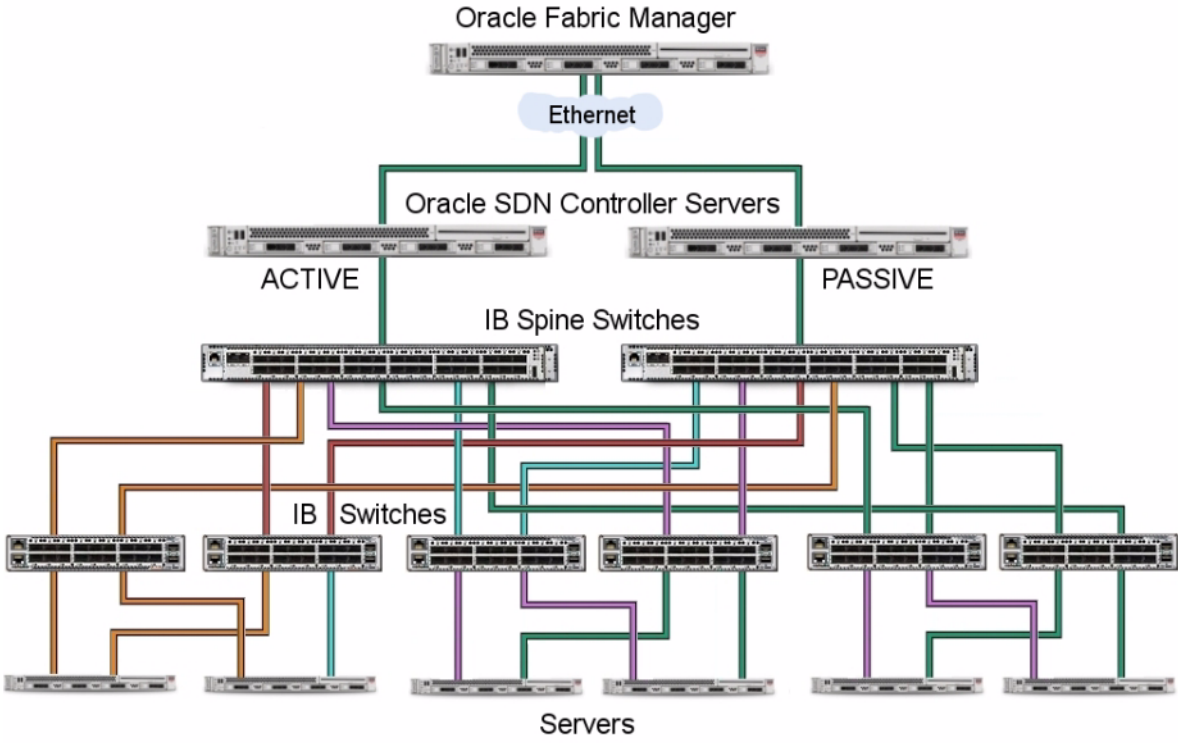
Expanded HA Network

In this topology, the first expansion must add two switches and two spine switches. There are no loops in the network. Each expansion needs four plus ports for overhead, however, these ports enable support for an additional 34 servers. With 36 port QDR switches, this topology can support 68 servers in HA.



Additional Expanded HA Network

In this configuration, all future expansions connect with the existing spine switches. Each expansion requires four plus ports for overhead, however, these ports enable support for an additional 34 servers. With 36 port QDR switches, this topology can support 102 servers in HA.



Configuring Oracle SDN Controller With Oracle Fabric Manager

These topics describe how to configure Oracle SDN Controller and its features with Oracle Fabric Manager 4.2.0. For additional details, refer to the *Oracle Fabric Manager 4.2.0 User's Guide*.

Note – Mousing over the icons displays a description of each icon's function.

▼ Add the Oracle SDN Controller Servers to Oracle Fabric Manager

Note – Both Oracle SDN Controller servers are not added the same way. You must add the second Oracle SDN Controller server as a *Backup Device*.

Note – The password used in this task is what you set during the first boot configuration. See "Configure First Boot" on page 9.

1. **Launch an Oracle Fabric Manager session in your web browser.**

   After Oracle Fabric Manager is installed, log in to the GUI by pointing your browser to: `http://`*server-name*`:8880/xms`.

   Refer to the *Oracle Fabric Manager 4.2.0 User's Guide* for details.

2. **Under *Managed Devices*, click on *SDN Controllers* in the left navigation bar.**

3. **Click on the *Add an SDN Controller* icon (+) on the top left of the page.**

4. **Enter the host name or IP address, admin name, and password of the first Oracle SDN Controller server.**

   Click Submit.

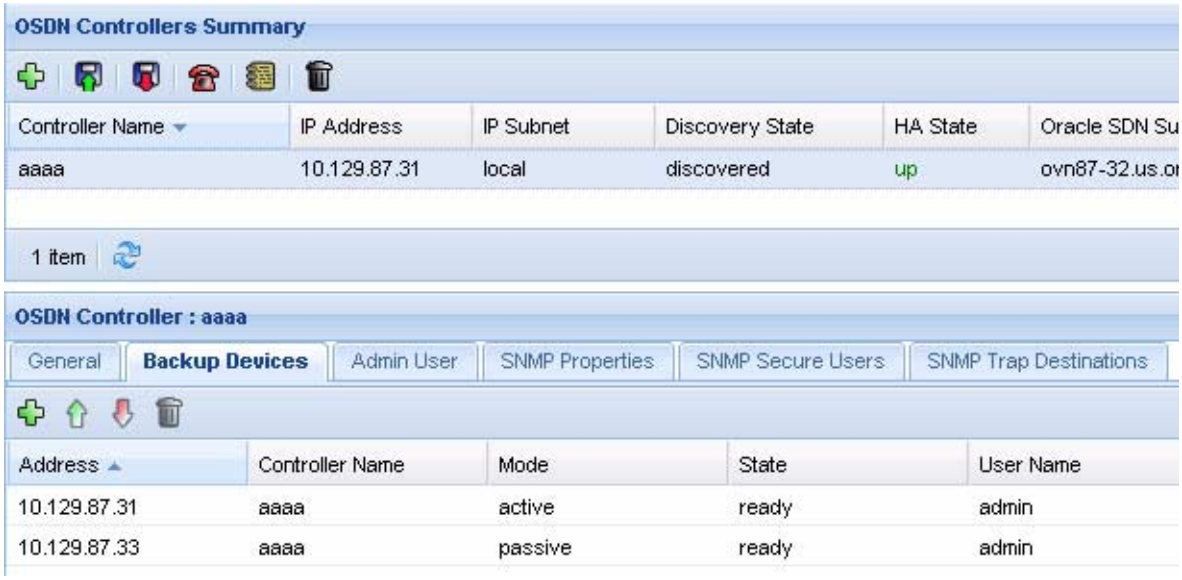
5. **Click on the *Backup Devices* tab in the *OSDN Controller: controller-name* section.**

6. **Click on the *Add a Backup Device* icon (+).**

7. **Enter the host name or IP address, admin name, and password of the passive Oracle SDN Controller server.**

8. **Verify the status of the Oracle SDN Controller servers.**

   HA state should be `up` with one active server and one passive server.



▼ Create PVI Clouds

A PVI cloud is a software entity that provides server-to-server communication between hosts. PVI clouds act as a termination point for PVI vNICs.

1. **On the navigation frame, select *Network Cloud Manager->PVI Clouds* to display the summary.**
2. **Click the plus sign (+) to display the *New PVI Network Cloud* dialog.**
3. **In the *Name* field, enter the name for the PVI Cloud that you are creating.**
4. **As an option, in the *Description* field, enter a string that describes the PVI cloud.**
5. **From the *MTU* dropdown menu, select the appropriate MTU for the PVI cloud.**

   The PVI cloud MTU should be set to one of the following, and the PVI vNICs that attach to the PVI cloud will inherit this MTU:

   - 1500
   - 9000

- 65504

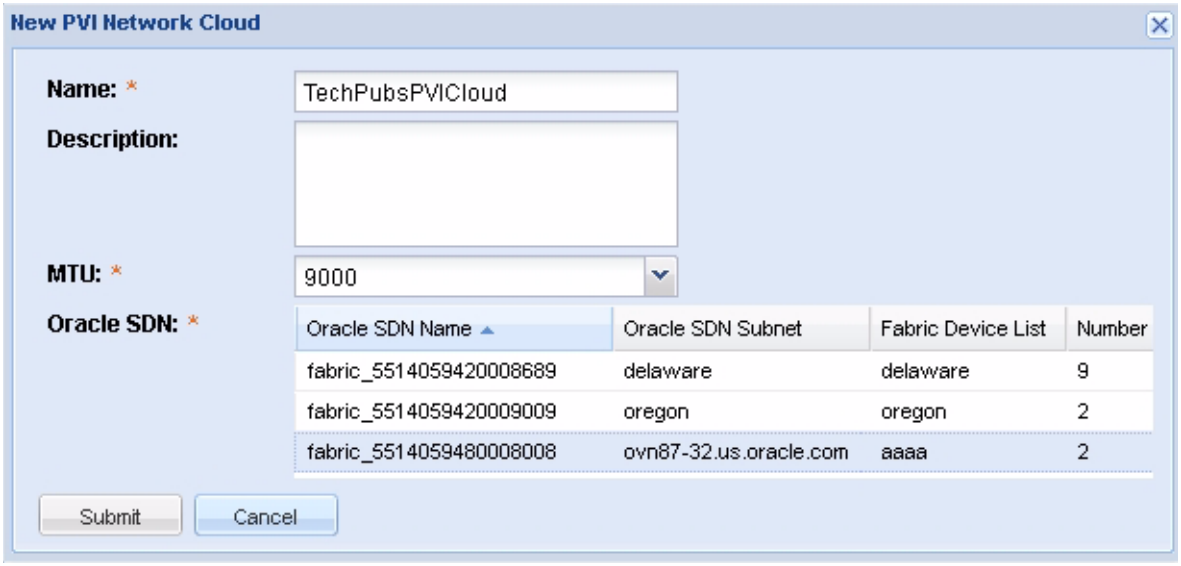
Note – The vNICs can operate at equal to or less than the MTU size that you set for the PVI cloud. For example, a PVI cloud with a 9000 MTU can only have a vNIC with an MTU of 9000 or 1500. Be aware of this behavior if you are setting the vNIC MTU on the host.

---

6. **From the *Oracle SDN* table, select the Fabric.**

   You must select a device to enable the *Submit* button.

7. **Click *Submit* to create the PVI cloud.**



8. **Check the *PVI Cloud Summary*, *State (Admin/Oper)* field to verify that the new PVI cloud state is `up/up`.**

   At this point, the PVI cloud exists. Now, you can use this PVI cloud to make standalone or HA PVI vNICs. See "Configuring Standalone or HA PVI vNICs" on page 30.

PVI vNICs Overview

Note – You must create a PVI cloud with the status of `up/up` before creating PVI vNICs. See "Create PVI Clouds" on page 27.

PVI vNICs are terminated on PVI clouds and can be either standalone (single) or HA (dual) connections into the PVI cloud. When PVI vNICs are pushed to servers, the servers are joined into the PVI network and can support Oracle SDN. PVI vNICs require an IP address and can participate in VLANs. You can use a DHCP server to assign IP addresses if that server is connected to a PVI vNIC.

To support PVI vNICs, the host server must run a supported OS with the minimum version of Oracle SDN Controller compatible host drivers installed. See "Hardware and Software Requirements" on page 2 and "Minimum Host Driver Requirements" on page 2.

When the PVI cloud is `up/up`, you can configure PVI vNICs. One vNIC can be created per PVI cloud per host HCA port. So, a two-port server can have two vNICs to the same cloud (which is the minimum required for HA). 16 vNICs are supported per server. This total includes all vNICs, HA vNICs (which count as two), and PVI vNICs.

HA PVI vNICs

HA PVI vNICs are a pair of vNICs that are hosted on the same server. The HA vNIC has a primary (active) path that supports traffic and a secondary (passive) path that supports traffic only if the primary path goes down.

Both the primary and secondary paths for each HA PVI vNIC must terminate on the same PVI cloud. In addition, both primary and secondary paths must terminate on different physical host HCA ports. Thus, two separate host server HCA ports are required to configure each HA PVI vNIC. As a result, redundant paths are available for the Oracle SDN Controller traffic on that server.

Note – The primary and secondary interfaces for HA PVI vNICs are shown to the host as two separate vNICs (for example `eth3/eth3B`). Once the two vNICs are configured and pushed to the host, you must configure your host driver software to bond the two interfaces together on the host to provide the failover feature. For RHEL and ESXi hosts, see "Bonding the HA PVI vNIC Dual Interfaces on RHEL or ESXi Hosts" on page 34.

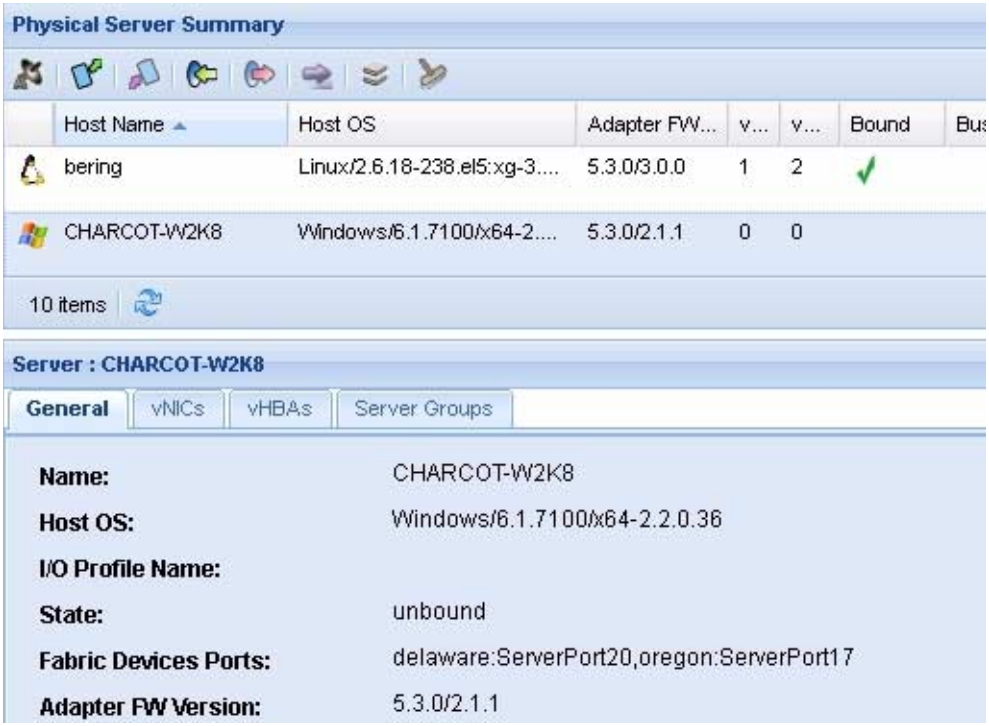
Configuring Standalone or HA PVI vNICs

There are two methods for configuring PVI vNICs.

- "Create PVI vNICs From a Host Server" on page 30
- "Create PVI vNICs From an I/O Template" on page 32

▼ Create PVI vNICs From a Host Server

1. **In the left nav bar, select *Physical Servers* under *Server Resource Manager*.**
2. **Select the server you want to configure.**
   Server information is populated in the Server Details frame.

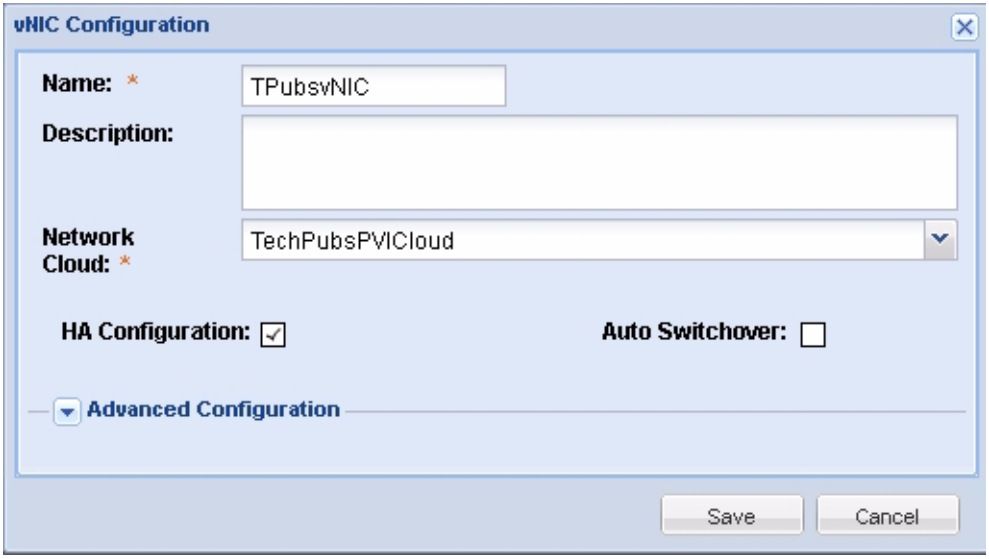


3. **Click the vNICs tab to display the vNICs on the server.**
   At this point, none will be displayed

4. **On the vNICs tab, click the plus sign (+) to display the *Add vNIC* dialog.**
5. **In the Name field, enter a name for the vNIC.**

   The name must be an alphanumeric character string between 1 and 10 characters.
6. **From the *Network Cloud* dropdown menu, select the PVI Network Cloud that you created.**

   If you are creating HA PVI vNICs, check the *HA Configuration* checkbox. If not, leave this checkbox blank.



Note – All configured Network Clouds are displayed. To support Oracle SDN, the vNIC you are creating must be terminated on a PVI cloud. If you terminate the vNIC on a non-PVI Network Cloud, the vNIC will not come up.

---

7. **Click *Submit* to create the PVI vNIC on the host server.**
8. **Check the *vNICs* tab to verify the following for the PVI vNIC:**
   - vNIC is attached to the PVI cloud.
   - vNIC state is `up/up`.
   - The Job was successful in the bottom panel.

▼ Create PVI vNICs From an I/O Template

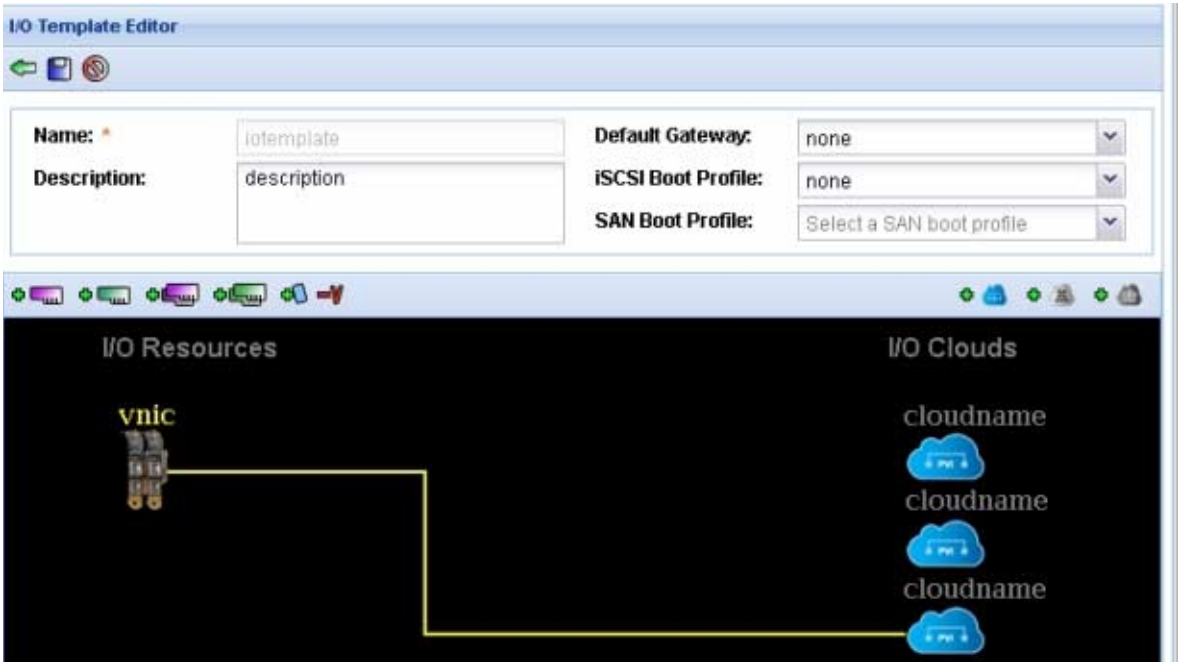
I/O templates are saved virtual I/O configurations that can be applied many times. I/O templates are not actually created on the server. For configurations in an I/O template to take effect, the template must be applied to a server.

1. **Click on *I/O Templates* under *Server Resource Manager*.**
2. **Click the plus sign (+) to display the I/O template editor page.**
3. **In the Name field, enter an alphanumeric character string for the I/O Template that you are creating.**
4. **Add a standalone or HA vNIC.**

   For a standalone vNIC, click the single, purple, *Add a vNIC to the Template* icon.

   For an HA vNIC, click the dual, purple, *Add an HA vNIC to the Template* icon.

   The examples in this task show an HA vNIC.
5. **Click the center of the vNIC icon and drag to the PVI cloud to draw a line connecting the vNIC to the correct PVI cloud.**



6. **On the top toolbar, click the disk icon to save the I/O Template.**

   The *I/O Template Summary* page is displayed. The *Status* column should contain a checkmark.

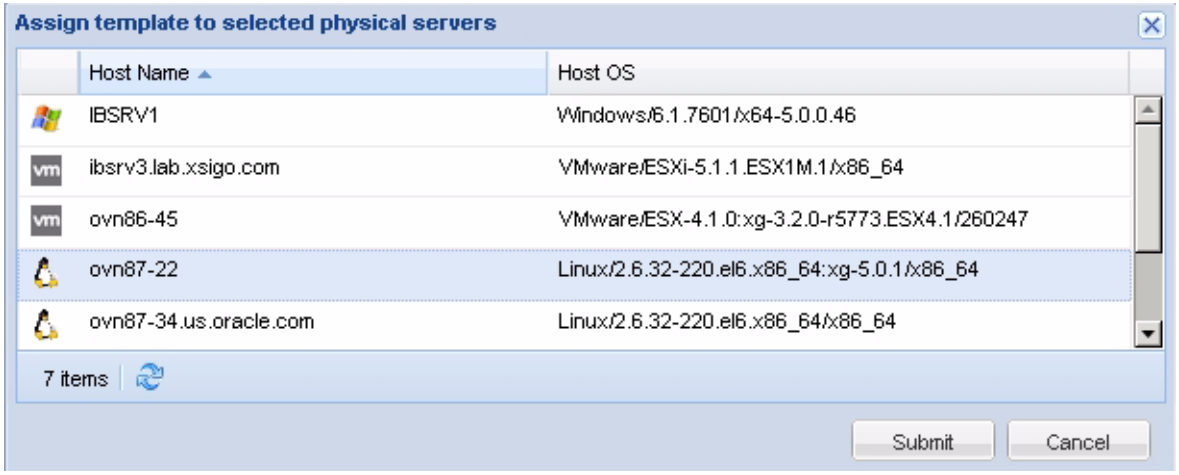
7. **Select the PVI vNIC Template that you just created, and click the *Assign to a Server or Set of Servers* button.**

   The I/O Template must be selected to activate the button. When you click the button, the *Assign Template to Selected Physical Servers* dialog is displayed.

Note – At this point, no template should be bound to the server. However, if the *Assign Template to Server* dialog does not show the server where you want to bind the template, make sure that the server is not already bound to a template. If the server is bound, it will not appear in the dialog.

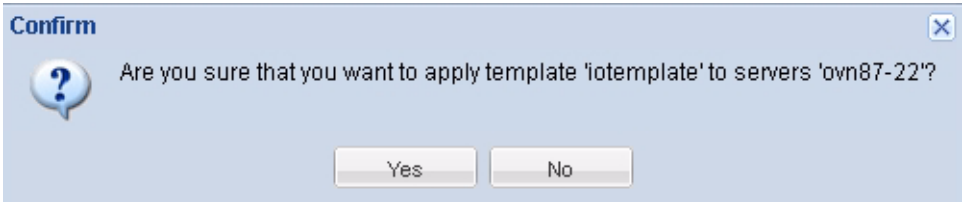
---

8. **Select the server you want and click *Submit* to display the confirmation dialog.**



9. **Click *Yes*.**

   When you answer the confirmation dialog, the I/O Template gets applied to the server.



10. **Verify the status of the configuration by clicking *Physical Servers* under *Server Resource Manager*.**

    The server should have a green checkmark (*Bound*). The State should be `up`. The I/O Template name should be listed (*I/O Profile Name*).

Bonding the HA PVI vNIC Dual Interfaces on RHEL or ESXi Hosts

To enable the redundancy offered by HA PVI vNICs on the host servers you must bond the active and standby interfaces on the host.

With Oracle Fabric Manager, each HA PVI vNIC offers two vNICs to the host OS. When an HA vNIC is pushed to the host, the host sees two separate data paths (vNICs) created for that server.

On RHEL and ESXi hosts, protection switching (failover policy) for the HA PVI vNICs is not controlled by Oracle Fabric Manager. Instead, for RHEL hosts you configure protection switching by bonding the vNICs in the RHEL OS. Additionally, for VMware ESXi hosts you configure protection switching with NIC Teaming in the VMware ESXi OS.

- "Bond HA PVI vNIC Interfaces on a RHEL Host" on page 35
- "Bond HA PVI vNIC Interfaces on an ESXi Host" on page 38

▼ Bond HA PVI vNIC Interfaces on a RHEL Host

This task describes how to create bonded interfaces on RHEL 6 Update 2 hosts to support HA PVI vNICs. This task assumes that you have already created the HA PVI vNICs (in "Configuring Standalone or HA PVI vNICs" on page 30).

For additional information about bonding in general, refer to:
`http://www.linuxhorizon.ro/bonding.html`

Before you begin, create the following files in the `/etc/sysconfig/network-scripts/` directory.

- `ifcfg-bond0` – Bonding file that controls the bonded vNICs in HA PVI.
- `ifcfg-pvi0` – Interface configuration file for one of the bonded vNICs in the HA PVI.
- `ifcfg-pvi0S` – Interface configuration file for one of the bonded vNICs in the HA PVI.

Also, create the following file in the `/etc/modprobe.d/` directory.

- `bonding.conf`

Note – Although many bonding modes exist for bonded interfaces, `mode=1` (active-backup) is the only bonding mode supported for Oracle SDN Controller.

---

1. **Verify that the server detects the interfaces supporting the HA PVI vNICs by issuing `ifconfig -a` on the server. You should see the interfaces listed in the resulting output.**
2. **Create the four required files, and copy them into the appropriate directory on your server.**
3. **Change the name of `ifcfg-pvi0` and `ifcfg-pvi0S` to correspond with the name of your PVI vNICs.**

   For the remainder of the task, the original file names are used for identification purposes (`ifcfg-pvi0` and `ifcfg-pvi0S`). Your file names will be different.

4. **Edit the** `ifcfg-pvi0` **file and change the device name (**`DEVICE=`**) to the device in your configuration.**

   Do not change the other interface options. For example:

```
DEVICE=pvi0
USERCTL=no
ONBOOT=yes
MASTER=bond0
SLAVE=yes
BOOTPROTO=none
```

5. **Edit** `ifcfg-pvi0S` **and change the device name (**`DEVICE=`**) to the one in your configuration.**

   Do not change the other interface options. For example:

```
DEVICE=pvi0S
USERCTL=no
ONBOOT=yes
MASTER=bond0
SLAVE=yes
BOOTPROTO=none
```

6. **Edit** `ifcfg-bond0` **and change the** `IPADDR`**,** `NETWORK`**, and** `NETMASK` **parameters to the address, network, and mask that you are using in your PVI vNIC configuration.**

   Do not change the other interface options. For example:

```
DEVICE=bond0
IPADDR=1.1.1.55
NETWORK=1.1.1.0
NETMASK=255.255.255.0
MTU=9000
USERCTL=no
BOOTPROTO=none
ONBOOT=yes
BONDING_OPTS="mode=1 miimon=100"
```

7. **Restart your network service.**

```
# service network restart
...
```

8. **When the server boots to runtime, verify the interface configuration settings.**

```
# ifconfig -a
bond0     Link encap:Ethernet HWaddr 00:13:97:02:40:8A
          inet addr:1.1.1.55 Bcast:1.1.1.255 Mask:255.255.255.0
          inet6 addr: fe80::213:97ff:fe02:408a/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST MTU:9000 Metric:1
          RX packets:1068 errors:0 dropped:0 overruns:0 frame:0
          TX packets:42 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:193960 (189.4 KiB) TX bytes:3116 (3.0 KiB)
pvi0 Link encap:Ethernet HWaddr 00:13:97:02:40:8A
          UP BROADCAST RUNNING SLAVE MULTICAST MTU:9000 Metric:1
          RX packets:568 errors:0 dropped:0 overruns:0 frame:0
          TX packets:42 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:256
          RX bytes:99699 (97.3 KiB) TX bytes:3116 (3.0 KiB)
pvi0S Link encap:Ethernet HWaddr 00:13:97:05:50:6A
          UP BROADCAST RUNNING SLAVE MULTICAST MTU:9000 Metric:1
          RX packets:500 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:256
          RX bytes:94261 (92.0 KiB) TX bytes:0 (0.0 b)
```

In this example, the two PVI vNICs (`pvi0` and `pvi0S`) are the HA PVI vNICs, and they are controlled by the bond file (`bond0`).

After the first bonded vNICs and their bond file are created, you can duplicate this process to add more bonded vNICs on the RHEL server.

Multiple bonded interfaces can exist on each server, but each bonded pair requires its own bond file. For each, the bond file must be incremented. So for example, another pair of bonded vNICs might be controlled by the bond file `bond1`.

9. **Determine which vNIC is active.**

```
# cat /proc/net/bonding/bond0
Bonding Mode: fault-tolerance (active-backup)
Primary Slave: None
Currently Active Slave: pvi0
MII Status: up
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0
Slave Interface: pvi0
MII Status: up
Link Failure Count: 0
Permanent HW addr: 00:13:97:02:40:8a
Slave queue ID: 0
```

```
Slave Interface: pvi0S
MII Status: up
Link Failure Count: 2
Permanent HW addr: 00:13:97:05:50:6a
Slave queue ID: 0
```

Note – After the initial vNIC bonding is created, you can configure additional bond files by duplicating the three `ifcfg` files in the same directory, and changing the names accordingly.

▼ Bond HA PVI vNIC Interfaces on an ESXi Host

This task involves creating the bonded interfaces on VMware ESXi 5.0 hosts that support HA PVI vNICs. This task assumes that you have already created the HA PVI vNICs (in "Configuring Standalone or HA PVI vNICs" on page 30).

After creating the HA vNICs through the Fabric Manager user interface, you must create the HA vNICs as a NIC-Teamed interface on the ESXi host.

On the ESXi host, configure NIC Teaming for the two vNICs created (active and standby interfaces) when you created the HA PVI vNIC. For NIC Teaming configuration instructions, refer to the VMware documentation that accompanied your ESX server.

- **For NIC Teaming configuration instructions, refer to the VMware documentation that accompanied your ESX server.**

Managing Failovers and Backups

Oracle Fabric Manager performs periodic configuration backups with date and time stamps. These tasks describe how to failover an active Oracle SDN Controller to a passive controller and how to manually backup and restore configurations.

Note – Avoid having both Oracle SDN Controllers in active mode. Before performing a failover, make sure the previously active Oracle SDN Controller is truly down and not just temporarily interrupted, for example, with a reboot or cabling issue.

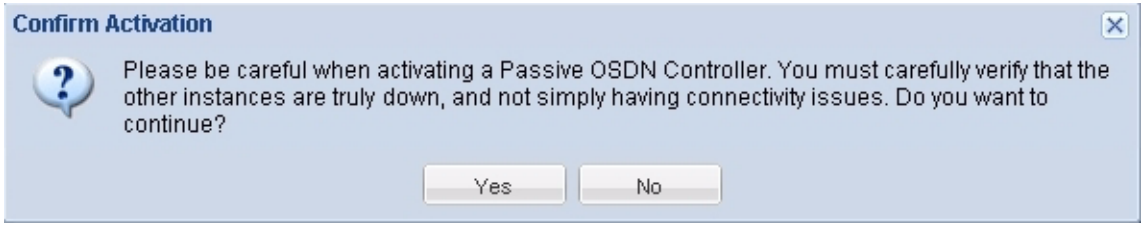
- "Backup and Restore a Configuration Manually" on page 40

▼ Perform a Failover

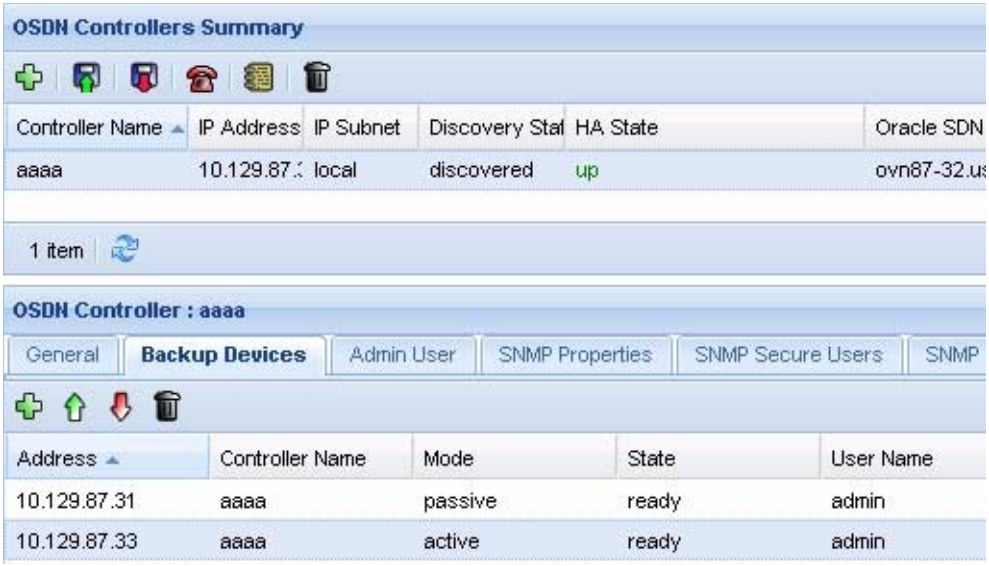
Perform this task only if the active Oracle SDN Controller is truly down and will not come back online after a temporary connectivity issue.

1. **Select the Oracle SDN Controller server to make active.**
2. **Click the green up arrow in the *Backup Devices* tab under *OSDN Controller: controller-name* to activate the passive controller.**

A confirmation dialog is displayed. Select Yes if the previously active controller is truly down. The *Mode* changes to `active` and the *State* changes to `hostsyncing`, then changes to `ready`.



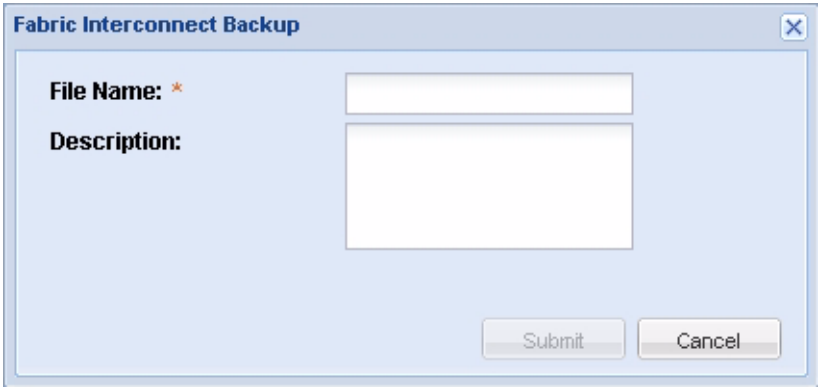
3. **Verify the HA State is up and one controller is active.**



▼ Backup and Restore a Configuration Manually

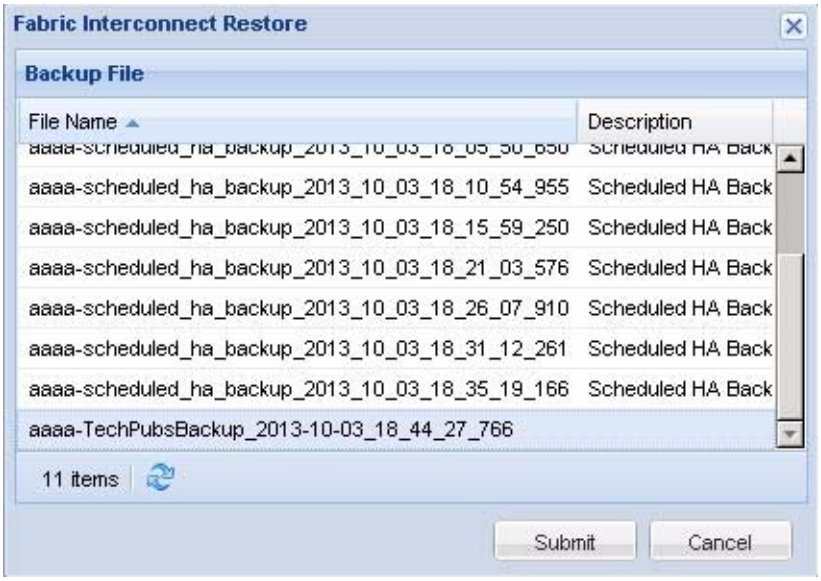
1. **Click the disk icon with the green up arrow under *OSDN Controllers Summary*.**

2. **Enter the backup file name and optional description in the dialog.**



3. **Click the disk icon with the red down arrow under *OSDN Controllers Summary*.**

4. **Select the backup file that you just created from the dialog.**



5. **Click Submit.**

   The backup file is exchanged with the active controller.

Configuring SNMP

For information on how to configure SNMP Properties, Secure Users, and Trap Destinations, refer to the *Oracle Fabric Manager 4.2.0 User's Guide*.

Glossary

E

ESXi VMware's Electric Sky X Integrated hypervisor software.

H

HA High Availability.

HCA Host Channel Adapter.

I

IB InfiniBand.

IB-HCA InfiniBand Host Channel Adapter.

IPoIB Internet Protocol over InfiniBand.

O

OL Oracle Linux.

OSDN Oracle Software Defined Networking.

OVN Oracle Virtual Networking.

OVM Oracle VM Server.

P

PVI Private Virtual Interconnect.

R

RHEL Redhat Enterprise Linux.

S

SDN Software Defined Network.

V

vNIC Virtual Network Interface Cards.

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