Dell Networking S6000

Switch Configuration Guide for PS Series SANs

Dell Storage Engineering
February 2016
## Revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2013</td>
<td>Initial release</td>
</tr>
<tr>
<td>March 2014</td>
<td>Revised for firmware version 9.3.0.0</td>
</tr>
<tr>
<td>April 2014</td>
<td>Minor update</td>
</tr>
<tr>
<td>February 2016</td>
<td>Updated for FTOS v9.9.0.0</td>
</tr>
</tbody>
</table>

THIS WHITE PAPER IS FOR INFORMATIONAL PURPOSES ONLY, AND MAY CONTAIN TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND.

© 2013–2016 Dell Inc. All rights reserved. Dell, the DELL logo, and the DELL badge are trademarks of Dell Inc. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell disclaims any proprietary interest in the marks and names of others.
# Table of contents

1. **Introduction** ................................................................................................................................................................................ 5
   1.1 **Audience** ........................................................................................................................................................................... 5
   1.2 **Switch details** ................................................................................................................................................................... 5
   1.3 **Cabling diagram** .............................................................................................................................................................. 7

2. **Dell recommended switch configuration** ............................................................................................................................. 8
   2.1 **Hardware configuration** ................................................................................................................................................. 8
   2.1.1 Check firmware version ................................................................................................................................................. 8
   2.2 **Delete startup configuration** ......................................................................................................................................... 8
   2.3 **Configure out of band (OOB) management port** ..................................................................................................... 9
   2.4 **Configure route for OOB management port (optional)** ............................................................................................. 9
   2.5 **Configure login credentials** ........................................................................................................................................... 9
   2.6 **Configure 40GbE ports to 4x 10GbE ports** ................................................................................................................ 9
   2.7 **Enable Switchports** ....................................................................................................................................................... 10
   2.8 **Enable Jumbo Frames** ................................................................................................................................................... 11
   2.9 **Configure flow control** ................................................................................................................................................ 11
   2.10 **Configure spanning tree on edge ports** .................................................................................................................. 11
   2.11 **Configure port channel for LAG** ............................................................................................................................... 11
   2.12 **Configure 40GbE ports for LAG** ......................................................................................................................................... 12
   2.13 **Save configuration** ........................................................................................................................................................ 12
   2.14 **Configure additional switch** ........................................................................................................................................ 12

3. **Configure Data Center Bridging (DCB) (optional)** ................................................................................................................ 13
   3.1 **Disable 802.3x flowcontrol on SFP+ ports** ................................................................................................................ 13
   3.2 **Disable 802.3x flowcontrol on all QSFP ports** ............................................................................................................ 13
   3.3 **Enable DCB** ................................................................................................................................................................... 13
   3.4 **Create tagged VLAN for all ports and port-channels** ............................................................................................ 13
   3.5 **Configure DCB policies** ................................................................................................................................................ 14
   3.6 **Apply policies to switch ports** ....................................................................................................................................... 14
   3.7 **Save configuration** ....................................................................................................................................................... 14
   3.8 **Configure additional switches** ..................................................................................................................................... 14

4. **Reverting from DCB to non-DCB configuration (optional)** ............................................................................................... 15
   4.1 **Disable DCB** .............................................................................................................................................................. 15
4.2 Remove DCB policies and apply standard flow control

4.3 Revert to default VLAN ID on switch and arrays

4.4 Save configuration

4.5 Reload

4.6 Verify DCB status

4.7 Configure additional switch

Additional resources
1 Introduction

This document illustrates how to configure Dell™ Networking S6000 switches for use with PS Series storage using Dell best practices. The recommended configuration uses link aggregation groups (LAGs) for inter-switch connections.

The host and arrays are connected using 40GbE to 10GbE breakout cables and QSFP transceiver. The switches are connected to each other using 40GbE optical cables and QSFP transceiver.

Optional steps are provided in Section 3 to enable Data Center Bridging (DCB).

For more information on PS Series SAN design recommendations, see the Dell PS Series Configuration Guide.

1.1 Audience

This switch configuration guide describes an optimal configuration following Dell best practices for a PS Series iSCSI SAN and is intended for storage or network administrators and deployment personnel.

1.2 Switch details

The table below provides an overview of the switch configuration.

Table 1 Switch specifications

<table>
<thead>
<tr>
<th>Dell Networking S6000</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch vendor</td>
<td>Dell</td>
</tr>
<tr>
<td>Switch model</td>
<td>S6000</td>
</tr>
<tr>
<td>Switch firmware</td>
<td>9.9.0.0 or later</td>
</tr>
</tbody>
</table>

Note: For proper functionality, the switch must be at the switch firmware version shown in the table above before proceeding with this configuration. Using previous firmware versions may have unpredictable results.

The latest firmware updates and documentation can be found at: www.force10networks.com. This site requires a login.
**Note:** FTOS v9.3.0.0 incorporates new command line syntax for DCB configuration. To configure a new switch for DCB operation, follow the configuration steps in this Switch Configuration Guide as outlined below.

If you are upgrading from an FTOS version prior to v9.3.0.0, your DCB settings in the running configuration file will be preserved and you may continue to use the original DCB command line syntax. If you make changes using the previous DCB command line syntax, you will receive a warning message that the commands have been deprecated, however the commands will still continue to function as they did with the previous version.
1.3 Cabling diagram

The cabling diagram shown below represents the Dell recommend method for deploying your servers and PS Series arrays.

PowerEdge R620

Dell Networking S6000

To additional arrays (primary controller)

PS6110XV

Figure 1 Cabling diagram
Dell recommended switch configuration

These steps show you how to configure two Dell Networking S6000 switches with a Link Aggregation Group (LAG). The switches are interconnected using two of the 40 GbE Quad Small Form-factor Pluggable (QSFP) uplink ports, and the LAG is configured for Dynamic Link Aggregation Control Protocol (LACP).

2.1 Hardware configuration

1. Power on the two switches.
2. Connect a serial cable to the serial port of the first switch.
3. Using Putty or another terminal utility, open a serial connection session to the switch.
4. Open your terminal emulator and configure it to use the serial port (usually COM1 but this may vary depending on your system). Configure serial communications for 9600,N,8,1 and no flow control.
5. Connect the (QSFP) LAG cables between the switches, by connecting port 116 on switch 1 to port 116 on switch 2 and port 124 on switch 1 to port 124 on switch 2. See this configuration in Figure 1.

2.1 Check firmware version

FTOS>enable

FTOS#show version

Note: If the active version displayed here is not 9.3.0.0 or later, please visit support.dell.com and download the latest update for your switches.

2.2 Delete startup configuration

Note: The following commands will delete all configuration settings.

FTOS>enable

FTOS#delete startup-config

Proceed to delete startup-config [confirm yes/no]yes

FTOS#reload

System configuration has been modified. Save? [yes/no]no

Proceed with reload [confirm yes/no]yes

Note: The switch will reboot.
2.3 Configure out of band (OOB) management port

FTOS>enable

After the startup configuration is deleted, the factory default Enable mode password is **force10**.

FTOS#config

FTOS(conf)#interface Managementethernet 0/0

FTOS(conf-if-ma-0/0)#no shutdown

FTOS(conf-if-ma-0/0)#ip address ipaddress mask

FTOS(conf-if-ma-0/0)#exit

2.4 Configure route for OOB management port (optional)

FTOS(conf)#management route X.Y.Z.0 /24 A.B.C.1

*Note*: X.Y.Z.0 is the network your management system is connecting from and A.B.C.1 is the gateway for the switch. If your management system is on the same subnet as the switch, the previous step may be omitted. The example above assumes a class C subnet mask.

2.5 Configure login credentials

FTOS(conf)#username admin privilege 15 password 0 yourpassword

FTOS(conf)#enable password level 15 0 yourpassword

FTOS(conf)#exit

2.6 Configure 40GbE ports to 4x 10GbE ports

*Note*: There are eight fixed 40GbE ports on the switch – Ports 4, 12, 20, 28, 100, 108, 116, 124. These ports will only operate in 40GbE mode and cannot be configured as 4 x 10GbE ports.

Identify the 40GbE ports number that will be configured as 4x10GbE ports and use the following command to configure them:

FTOS(conf)#stack-unit 0 port port-number portmode quad

Please save and reset unit 0 for the changes to take effect.

FTOS(conf)#exit

FTOS#copy running-config startup-config
FTOS\#reload

Once the switch is up, use the following command to check port interface status:

FTOS>enable

FTOS\#show interface status

2.7 Enable switch ports

**Option 1:** You can enable ports individually by entering the port number.

FTOS\#configure

FTOS(conf)#interface tengigabitethernet 0/0

FTOS(conf-if-te-0/0)#switchport

FTOS(conf-if-te-0/0)#no shutdown

FTOS(conf-if-te-0/0)#exit

FTOS(conf)#interface fortyGigE 0/0

FTOS(conf-if-fo-0/0)#switchport

FTOS(conf-if-fo-0/0)#no shutdown

FTOS(conf-if-fo-0/0)#exit

FTOS(conf)#exit

**Option 2:** You can enable multiple ports at once using the “range” parameter.

FTOS\#configure

FTOS(conf)#interface range tengigabitethernet 0/0 – 124

% Warning: Non-existing ports(not configured) are ignored by interface-range

FTOS(conf-if-range-te-0/0-124)#switchport

FTOS(conf-if-range-te-0/0-124)#no shutdown

FTOS(conf-if-range-te-0/0-124)#exit

FTOS(conf)#interface range fortyGigE 0/0 – 124

% Warning: Non-existing ports(not configured) are ignored by interface-range

FTOS(conf-if-range-fo-0/0-124)#switchport
2.8 Enable Jumbo Frames
FTOS(conf) # interface range tengigabitethernet 0/0-124
FTOS(conf-if-range-te-0/0-124) # mtu 12000
FTOS(conf-if-range-te-0/0-124) # exit

2.9 Configure flow control
FTOS(conf) # interface range tengigabitethernet 0/0-124
FTOS(conf-if-range-te-0/0-124) # flowcontrol rx on tx off
FTOS(conf-if-range-te-0/0-124) # exit

2.10 Configure spanning tree on edge ports
FTOS(conf-if-range-te-0/0-47) # spanning-tree rstp edge-port
FTOS(conf-if-range-te-0/0-47) # exit
FTOS(conf) # protocol spanning-tree rstp
FTOS(conf-rstp) # no disable
FTOS(conf-rstp) # exit

2.11 Configure port channel for LAG
These commands create a port channel or LAG.
FTOS(conf) # interface Port-channel 1
FTOS(conf-if-po-1) # mtu 12000
FTOS(conf-if-po-1) # switchport
FTOS(conf-if-po-1) # no shutdown
FTOS(conf-if-po-1) # exit
2.12 Configure 40GbE ports for LAG
This step assigns the 40Gb QSFP ports to the Port Channel.

FTOS(conf)#interface range fortyGigE 0/116 , fortyGigE 0/124
FTOS(conf-if-range-fo-0/116,fo-0/124)#mtu 12000
FTOS(conf-if-range-fo-0/116,fo-0/124)#no shutdown
FTOS(conf-if-range-fo-0/116,fo-0/124)#flowcontrol rx on tx off
FTOS(conf-if-range-fo-0/116,fo-0/124)#port-channel-protocol lacp
FTOS(conf-if-range-fo-0/116,fo-0/124-lacp)#port-channel 1 mode active
FTOS(conf-if-range-fo-0/116,fo-0/124-lacp)#exit
FTOS(conf-if-range-fo-0/116,fo-0/124)#exit
FTOS(conf)#exit

2.13 Save configuration
FTOS#copy running-config startup-config

2.14 Configure additional switch
Repeat the commands from Section 2 to configure the second switch.

Note: The preceding procedure places all switch ports in the default VLAN. If you prefer to place ports in a non-default VLAN, refer to the documentation for your switch.
3 Configure Data Center Bridging (DCB) (optional)

To enable DCB mode on the switch, use the following commands.

**Note:** You must complete the Dell recommended switch configuration steps in Sections 2.1 to 2.14 before configuring the switch for DCB mode.

3.1 Disable 802.3x flowcontrol on SFP+ ports

```
FTOS#configure

FTOS(conf)#interface range tengigabitethernet 0/0 - 124
FTOS(conf-if-range-te-0/0-124)#no flowcontrol rx on tx off
FTOS(conf-if-range-te-0/0-124)#exit
```

3.2 Disable 802.3x flowcontrol on all QSFP ports

```
FTOS(conf)#interface range fortyGigE 0/116 , fortGigE 0/124
FTOS(conf-if-range-fo-0/116,fo-0/124)#no flowcontrol rx on tx off
FTOS(conf-if-range-fo-0/116,fo-0/124)#exit
```

3.3 Enable DCB

```
FTOS(conf)#dcb enable
```

3.4 Create tagged VLAN for all ports and port-channels

```
FTOS#configure

FTOS(conf)#interface vlan vlan-id

**Note:** You must supply a VLAN id. The valid range is 2-4093.

FTOS (conf-if-vl-vlan-id*)#no shutdown
FTOS (conf-if-vl-vlan-id*)#tagged tengigabitethernet 0/xx

xx represents the ports connected to the host and arrays. Repeat the command until all the host and array ports are tagged with a VLAN ID.

FTOS (conf-if-vl-vlan-id*)#tagged port-channel 1
FTOS (conf-if-vl-vlan-id*)#exit
```
3.5 Configure DCB policies

FTOS(conf)#dcb-map profile-name

FTOS(conf-dcbmap-profile-name*)#priority-group 0 bandwidth 50 pfc off
FTOS(conf-dcbmap-profile-name*)#priority-group 1 bandwidth 50 pfc on

**Note:** The sum of the bandwidth-percentages must be equal to 100. The bandwidth percentage used in this section is just an example. Monitor the LAN and SAN performance in your environment to determine optimal bandwidth settings.

FTOS(conf-dcbmap-profile-name*)#priority-pgid 0 0 0 1 0 0 0
FTOS(conf-dcb-profile-name*)#exit

3.6 Apply policies to switch ports

FTOS(conf)#interface range tengigabitethernet 0/0 – 124
FTOS(conf-if-range-te-0/0-124)# dcb-map profile-name
FTOS(conf-dcb-profile-name*)#exit
FTOS(conf)#interface range fortyGigE 0/116 , fortGigE 0/124
FTOS(conf-if-range-fo-0/116,fo-0/124)# dcb-map profile-name
FTOS(conf-if-range-fo-0/116,fo-0/124)#exit

3.7 Save configuration

FTOS#copy running-config startup-config

3.8 Configure additional switches

Repeat the commands from Section 3 to configure DCB on additional switches.
Reverting from DCB to non-DCB configuration (optional)

One method to revert from a DCB configured switch to a non-DCB configured switch is to delete the current configuration (startup-config) and follow the steps in Section 2. If deleting the current configuration is not an option, then use the following procedure to unconfigure DCB and enable standard flow control.

**Note:** This is a disruptive operation that requires down time. The arrays will temporarily lose communication with each other. Power off all arrays and hosts connected to the SAN before proceeding with these steps.

### 4.1 Disable DCB

FTOS#configure

FTOS(conf)#no dcb enable
FTOS(conf)#exit

### 4.2 Remove DCB policies and apply standard flow control

FTOS#configure

FTOS(conf)#interface range tengigabitethernet 0/0 - 124
FTOS(conf-if-range-te-0/0-124)# no dcb-map profile-name
FTOS(conf-if-range-te-0/0-124)#flowcontrol rx on tx off
FTOS(conf-if-range-te-0/0-124)#exit

FTOS(conf)# interface range fortyGigE 0/116, fortyGigE 0/124
FTOS(conf-if-range-fo-0/116,fo-0/124)# no dcb-map profile-name
FTOS(conf-if-range-fo-0/116,fo-0/124)#flowcontrol rx on tx off
FTOS(conf-if-range-fo-0/116,fo-0/124)#exit

### 4.3 Revert to default VLAN ID on switch and arrays

Once DCB is disabled on the switch, the PS Series arrays will no longer use the VLAN ID that was configured when DCB was enabled. The arrays will revert to the default or native VLAN. Therefore, a valid VLAN must be configured for all host servers, switches, and PS array members. A valid VLAN can use the default or native VLAN ID (typically 0 or 1) or a specific VLAN can be configured (for example, VLAN 100). If a non-default VLAN is configured, then any ports connected to the arrays must be configured as “untagged”.
Use the steps below to configure the native VLAN on the switch.

FTOS#configure

FTOS(conf)#no interface vlan vlan-id

4.4  Save configuration
FTOS#copy running-config startup-config

4.5  Reload
FTOS#reload

System configuration has been modified. Save? [yes/no] yes

Proceed with reload [confirm yes/no] yes

Note: The switch will reboot.

4.6  Verify DCB status
FTOS#show dcb

FTOS## show dcb
    DCB Status : Disabled
    FTOS#

4.7  Configure additional switch
Repeat the commands from Section 4 to disable DCB on any additional switches.
Additional resources

Dell.com/support is focused on meeting your needs with proven services and support.

DellTechCenter.com is an IT Community where you can connect with Dell Customers and Dell employees for the purpose of sharing knowledge, best practices, and information about Dell products and your installations.

Referenced or recommended Dell publications:

- Dell PS Series Configuration Guide:  
  http://en.community.dell.com/dell-groups/dtcmedia/m/mediagallery/19852516
- Dell Storage Compatibility Matrix:  

For PS Series best practices white papers, reference architectures, and sizing guidelines for enterprise applications and SANs, refer to PS Series Technical Documents.