

Sun Ethernet Fabric Operating System

DCB Administration Guide



Part No.: E21715-02
July 2012

Copyright © 2010, 2012, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related software documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

Copyright © 2010, 2012, Oracle et/ou ses affiliés. Tous droits réservés.

Ce logiciel et la documentation qui l'accompagne sont protégés par les lois sur la propriété intellectuelle. Ils sont concédés sous licence et soumis à des restrictions d'utilisation et de divulgation. Sauf disposition de votre contrat de licence ou de la loi, vous ne pouvez pas copier, reproduire, traduire, diffuser, modifier, breveter, transmettre, distribuer, exposer, exécuter, publier ou afficher le logiciel, même partiellement, sous quelque forme et par quelque procédé que ce soit. Par ailleurs, il est interdit de procéder à toute ingénierie inverse du logiciel, de le désassembler ou de le décompiler, excepté à des fins d'interopérabilité avec des logiciels tiers ou tel que prescrit par la loi.

Les informations fournies dans ce document sont susceptibles de modification sans préavis. Par ailleurs, Oracle Corporation ne garantit pas qu'elles soient exemptes d'erreurs et vous invite, le cas échéant, à lui en faire part par écrit.

Si ce logiciel, ou la documentation qui l'accompagne, est concédé sous licence au Gouvernement des Etats-Unis, ou à toute entité qui délivre la licence de ce logiciel ou l'utilise pour le compte du Gouvernement des Etats-Unis, la notice suivante s'applique :

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

Ce logiciel ou matériel a été développé pour un usage général dans le cadre d'applications de gestion des informations. Ce logiciel ou matériel n'est pas conçu ni n'est destiné à être utilisé dans des applications à risque, notamment dans des applications pouvant causer des dommages corporels. Si vous utilisez ce logiciel ou matériel dans le cadre d'applications dangereuses, il est de votre responsabilité de prendre toutes les mesures de secours, de sauvegarde, de redondance et autres mesures nécessaires à son utilisation dans des conditions optimales de sécurité. Oracle Corporation et ses affiliés déclinent toute responsabilité quant aux dommages causés par l'utilisation de ce logiciel ou matériel pour ce type d'applications.

Oracle et Java sont des marques déposées d'Oracle Corporation et/ou de ses affiliés. Tout autre nom mentionné peut correspondre à des marques appartenant à d'autres propriétaires qu'Oracle.

Intel et Intel Xeon sont des marques ou des marques déposées d'Intel Corporation. Toutes les marques SPARC sont utilisées sous licence et sont des marques ou des marques déposées de SPARC International, Inc. AMD, Opteron, le logo AMD et le logo AMD Opteron sont des marques ou des marques déposées d'Advanced Micro Devices. UNIX est une marque déposée d'The Open Group.

Ce logiciel ou matériel et la documentation qui l'accompagne peuvent fournir des informations ou des liens donnant accès à des contenus, des produits et des services émanant de tiers. Oracle Corporation et ses affiliés déclinent toute responsabilité ou garantie expresse quant aux contenus, produits ou services émanant de tiers. En aucun cas, Oracle Corporation et ses affiliés ne sauraient être tenus pour responsables des pertes subies, des coûts occasionnés ou des dommages causés par l'accès à des contenus, produits ou services tiers, ou à leur utilisation.



Adobe PostScript

Contents

Using This Documentation	1
Purpose and Scope	1
Product Notes	1
Related Documentation	2
Acronyms and Abbreviations	2
CLI Command Modes	3
Feedback	4
Support and Accessibility	4
Protocol Description	5
DCB Protocol	5
Priority Group Feature	6
PFC Feature	6
Application Protocol Feature	7
Topology Setup	7
Configuring DCB	9
Configuration Specifications	9
Host Blade Configuration	9
Switch A	10
Switch B	10
Storage Array Server	10
Configuration Guidelines	10

Default Settings	11
▼ Configure DCB Features	12
Verifying DCB and LLDP Configurations	14
▼ Determine VLAN Assignment	14
▼ Determine Whether Interfaces Are Active	15
▼ Determine Whether LLDP is Running and Recognizing Peers	15
▼ Enable DCB	20
▼ Disable DCB	20
▼ Enable DCB for Each Interface	20
▼ Disable DCB for Each Interface	22
▼ Enable and Disable a Specific DCB Feature	23
▼ Configure the Mode for the DCB Feature	25
▼ Configure DCB Attributes	26
▼ Configure LLDP DCBX TLVs	30
▼ Display DCBX Feature Statistics and Control Information	32
▼ Display Output of Unstarted DCBX Protocol Exchange	33
▼ Display Output of DCBX TLV Exchange	34
▼ Display Output of No TLV Exchange	34
▼ Clear Feature Statistics	35
▼ Display Output Showing a Down Link	35

Using This Documentation

The DCBX protocol is used to exchange DCB configuration parameters with LLDP neighbors. The CEE DCBX standard specifies two major feature sets: priority group, which is also known as enhanced transmission selection, and priority-flow control.

- “Purpose and Scope” on page 1
- “Product Notes” on page 1
- “Related Documentation” on page 2
- “Acronyms and Abbreviations” on page 2
- “CLI Command Modes” on page 3
- “Feedback” on page 4
- “Support and Accessibility” on page 4

Purpose and Scope

This document describes the SEFOS DCB implementation, which is based on the CEE standard version 1.01 DCBX base specification revision 1.0.1.

Product Notes

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

Sun Blade 6000 Ethernet Switched NEM 24p 10GbE:

<http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE>

Sun Network 10GbE Switch 72p:

<http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p>

Related Documentation

Documentation	Links
All Oracle products	http://oracle.com/documentation
Sun Blade 6000 Ethernet Switched NEM 24p 10GbE	http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE
Sun Network 10GbE Switch 72p	http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p
Sun Blade 6000 modular system	http://www.oracle.com/pls/topic/lookup?ctx=sb6000
Oracle Integrated Lights Out Manager (Oracle ILOM) 3.0	http://www.oracle.com/pls/topic/lookup?ctx=ilom30

For detailed information about the commands and options described in this document, refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual*.

Acronyms and Abbreviations

Acronym or Abbreviation	Explanation
CEE	Converged enhanced Ethernet
CLI	Command-line interface
CNA	Converged network adapter
DCB	Data center bridging3
DCBX	DCB capability exchange protocol
ETS	Enhanced transmission selection
FC	Fibre Channel
FCoE	Fibre Channel over Ethernet
LLDP	Link Layer Discovery Protocol, IEEE 802.1AB

Acronym or Abbreviation	Explanation
OUI	Organizationally unique identifier
PFC	Priority-based flow control
PG	Priority group
PGID	Priority group to which the priority belongs
QoS	Quality of service
SEFOS	Sun Ethernet Fabric Operating System
TLV	Type length value

CLI Command Modes

The following table lists the configuration modes used in this document with their access and exit methods.

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Access SEFOS from Oracle ILOM with read-only rights (privilege level 1).	SEFOS>	Use the <code>logout</code> or <code>exit</code> command to return to the Oracle ILOM prompt.
Privileged EXEC	Access SEFOS from Oracle ILOM with full administrative rights (privilege level 15).	SEFOS#	Use the <code>logout</code> or <code>exit</code> command to return to the Oracle ILOM prompt.
Global Configuration	From User EXEC mode, use the <code>enable</code> command.	SEFOS(config)#	Use the <code>end</code> command to return to Privileged EXEC mode.
Interface Configuration	From Global Configuration mode, use the <code>interface interface-type interface-id</code> command.	SEFOS(config-if)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.
Router Configuration	From Global Configuration mode, use the <code>router rip</code> command.	SEFOS(config-router)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.

Feedback

Provide feedback on this documentation at:

<http://www.oracle.com/goto/docfeedback>

Support and Accessibility

Description	Links
Access electronic support through My Oracle Support	http://support.oracle.com For hearing impaired: http://www.oracle.com/accessibility/support.html
Learn about Oracle's commitment to accessibility	http://www.oracle.com/us/corporate/accessibility/index.html

Protocol Description

These sections describe DCB, the priority group feature, the PFC feature, the application protocol feature and an example topology.

- “DCB Protocol” on page 5
- “Priority Group Feature” on page 6
- “PFC Feature” on page 6
- “Application Protocol Feature” on page 7
- “Topology Setup” on page 7

DCB Protocol

DCB is a term commonly used to describe Ethernet enhancements to improve Ethernet networking and management in data center environments. DCB is a framework that defines the enhancements that are required for switches and endpoints and includes the following features:

- PG, also known as ETS, the priority grouping specification provides bandwidth management as well as a scheduling algorithm for various traffic classes on a converged link.
- PFC is an enhancement to the existing Ethernet pause protocol, this feature allows "no-drop" packet delivery for certain traffic classes.

This release of the SEFOS DCB feature supports DCB version 1.0.1, as specified by the DCB task group.

DCB features are discovered and exchanged using the DCBX protocol. DCBX uses LLDP to exchange parameters between two converged link peers. The parameters that are exchanged by DCB are packaged into organizationally specific TLVs and sent to the peer through LLDP messages.

The OUI used for the DCBX TLV is 0x001B21. IEEE-defined OUI and DCBX are used when the IEEE DCBX implementation is available. Because DCBX is an acknowledged protocol that uses LLDP, both transmit and receive directions from LLDP must be enabled on the interface that runs DCBX.

In addition to exchanging DCB parameters with the link partner, the local system DCBX entity works closely with the QoS module to configure the scheduling policy, manage bandwidth, and control the priority flow control in the hardware.

Priority Group Feature

PG (ETS) allocates link bandwidth based on the priority group setting on a link. Different traffic types might have different network bandwidth requirements. With a PGID group identifier, one or more priorities can be grouped together for the purpose of bandwidth allocation. The number of priority groups that can be supported cannot exceed the number of traffic classes supported.

Before you configure the PG, you must identify the priority to the priority group mapping based on the network traffic types and the bandwidth requirement for each PG. In some deployment environments, a priority group can be configured as an unrestricted group. This unrestricted group does not need its bandwidth allocation, and strict priority scheduling is applied to this group.

- PGIDs from 0 to 7 are available for bandwidth allocation.
- PGID 15 is for the unrestricted priority group.

The PG feature is an asymmetric parameter exchange feature. This means that the desired PG configuration for the peer does not have to match the local PG configuration.

PFC Feature

The PFC feature provides "no-drop" packet delivery for certain traffic classes while maintaining existing LAN behavior for other traffic classes on a converged link. Priority 3 is enabled by default for flow control. In order to efficiently utilize switch resources, the switch allows up to two priorities for Ethernet priority pause. The Ethernet per-priority pause is applied only to PFC packets.

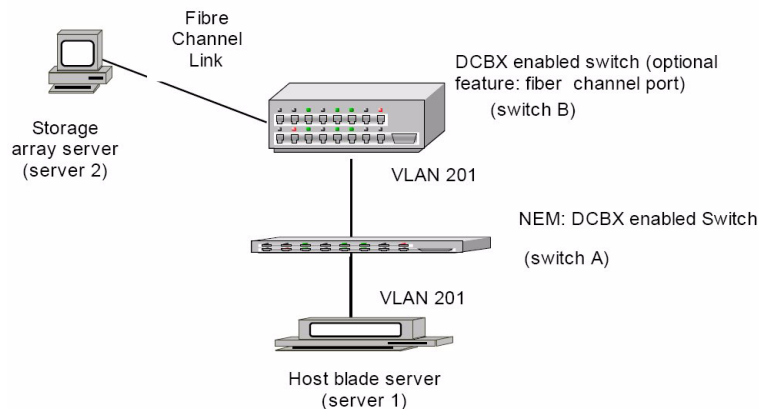
The PFC feature is a symmetric exchange feature. This means that the desired PFC configuration for the peer must match the local PFC configuration.

Application Protocol Feature

The application protocol feature allows the DCB node to advertise the upper-layer protocols and associated priority mapping over a DCB link. Because the SEFOS switch is only a DCB-capable switch and it is not FCoE-capable, EtherType for layer 2 protocols is the only protocol supported. The protocol's main purpose is to advertise its capability to the link partner, which is a CNA port, and the host runs FCoE over this CNA link. The priority mapping for this feature is taken from what the PFC feature has configured.

Topology Setup

All the configurations explained in this guide are based on the following topology.



Configuring DCB

These sections provide configuration requirements and sample configurations using DCB with SEFOS switches.

- [“Configuration Specifications” on page 9](#)
- [“Configuration Guidelines” on page 10](#)
- [“Default Settings” on page 11](#)
- [“Configure DCB Features” on page 12](#)
- [“Verifying DCB and LLDP Configurations” on page 14](#)

Configuration Specifications

The topology that is presented in this guide is configured with the following system specifications:

- [“Host Blade Configuration” on page 9](#)
- [“Switch A” on page 10](#)
- [“Switch B” on page 10](#)
- [“Storage Array Server” on page 10](#)

Host Blade Configuration

In a configuration using DCB with SEFOS switches, the host blade (server 1) has the following specifications:

- Sun Dual 10GbE PCIe 2.0 Fabric Expansion Module connected to the switch in slot 0:
 - Linux interface: FEM port 0
 - Switch port number: 18
 - Can also be used to connect to the switch’s external ports such as ports 1 or 2.

- Host blade running SUSE 11 2.6.32.12-0.7 or later.
SEFOS DCB only supports a server with a Sun Dual 10GbE SFP+ PCIe 2.0 ExpressModule Adapter installed.
- Server option: Server running SUSE 11 2.6.32.12-0.7 with Sun Dual 10GbE SFP+ PCIe 2.0 ExpressModule Adapter installed.

Switch A

Switch A has the following specifications:

- Port 2 is connected to port 33 of a third-party DCBX-capable switch.
- Port 18 is connected to the host blade server.
- VLAN 201 is assigned to port 2 and port 18.

Switch B

Switch B is a third-party DCB capable switch with the following specifications:

- Port 33 is connected to port 2 of switch A.
- VLAN is assigned to port 33.
- Optionally, if switch B supports a Fibre Channel port, that port can be connected to the FC port of a storage array server.

Storage Array Server

In a configuration using DCB with SEFOS switches, an optional storage array (server 2) can be configured. This additional server is only required if the host server will run FCoE. Refer to documentation provided with the storage array server for information about configuring the storage array.

Configuration Guidelines

The following configuration guidelines apply where DCB is used:

- Configure the PG based on the traffic types and bandwidth requirements.

- The PFC priority set must match the peer's configuration. VLAN priority 3 is normally used. SEFOS supports a maximum of two priorities.
- Evaluate the following default settings table to determine if the default settings are applicable.
- If SEFOS DCB is to be used as a pass-through for FCoE traffic, the port connected to the host CNA running FCoE, the port connected to a third-party FCoE switch must be configured to belong to the same VLAN as what is configured on the third-party switch.
 - You must start LLDP system control status before DCBX TLVs can be exchanged.
 - You must enable LLDP for both transmit and receive, which is the default behavior.
- To enable and configure SEFOS DCB, you must complete the following minimum tasks:
 - Enable LLDP.
 - Enable DCB globally.
 - Enable the interface DCB feature that will be involved in DCBX exchange.
 - Configure the VLAN to DCB-capable ports if needed.
- The SEFOS DCB will not accept its configurations from the peer.

Refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual* for the complete set of commands and the various options available for configuring DCB.

Default Settings

When DCB is enabled, SEFOS configures each of the DCB features with the following default values.

Priority	Priority Group ID (PGID)	PG Bandwidth Allocation (%)	Priority Flow Control	Application Priority Mapping
0	0	50 (share with same group)	disable	disable
1	0	50 (share with same group)	disable	disable
2	0	50 (share with same group)	disable	disable
3	1	30	enable	enable

Priority	Priority Group ID (PGID)	PG Bandwidth Allocation (%)	Priority Flow Control	Application Priority Mapping
4	2	20 (share with same group)	disable	disable
5	2	20 (share with same group)	disable	disable
6	2	20 (share with same group)	disable	disable
7	15	Unrestricted (not subject to bandwidth limitation)	disable	disable

▼ Configure DCB Features

The following example shows the default configuration values for all three DCB features. Perform the following task to apply the default DCB configuration, enabling all three of the DCB features.

See “[Default Settings](#)” on page 11 for detailed information about the specifications used in the following example. See other sections in this document for additional details on each command.

1. Start DCB globally.

```
SEFOS# configure terminal
SEFOS(config)# no shutdown dcb
```

2. Enable DCB features on interface 0/2 and start the interface.

```
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb enable
SEFOS(config-if)# set dcb priority-flow-control enable
SEFOS(config-if)# set dcb priority-flow-control vlan-priority 0 0 0 1 0 0 0 0
SEFOS(config-if)# set dcb priority-flow-control mode auto
SEFOS(config-if)# set dcb priority-group enable
SEFOS(config-if)# set dcb priority-group 0 0 0 1 2 2 2 15 bandwidth 50 30 20 0 0 0 0 0
SEFOS(config-if)# set dcb priority-group mode auto
SEFOS(config-if)# set dcb application-etype-fcoe enable
```



```
SEFOS(config-if)# lldp tlv-select dcb1tlv priority-group  
priority-flow-control applicationetype-fcoe  
SEFOS(config-if)# no shutdown  
SEFOS(config-if)# exit
```

3. Enable DCB features on interface 0/18 and start the interface.

```
SEFOS(config)# interface extreme-ethernet 0/18  
SEFOS(config-if)# set dcb enable  
SEFOS(config-if)# set dcb priority-flow-control enable  
SEFOS(config-if)# set dcb priority-flow-control vlan-priority 0 0  
0 1 0 0 0 0  
SEFOS(config-if)# set dcb priority-flow-control mode auto  
SEFOS(config-if)# set dcb priority-group enable  
SEFOS(config-if)# set dcb priority-group 0 0 0 1 2 2 2 15 bandwidth  
50 30 20 0 0 0 0 0  
SEFOS(config-if)# set dcb priority-group mode auto  
SEFOS(config-if)# set dcb application-etype-fcoe enable  
SEFOS(config-if)# lldp tlv-select dcb1tlv priority-group  
priority-flow-control applicationetype-fcoe  
SEFOS(config-if)# no shutdown  
SEFOS(config-if)# end
```

4. Assign VLAN 201 to ports 2 and 18 for traffic pass-through and isolation.

```
SEFOS# configure terminal  
SEFOS(config)# vlan 201  
SEFOS(config-vlan)# ports add extreme-ethernet 0/2,0/18  
SEFOS(config-vlan)# exit
```

5. Start LLDP globally.

LLDP must be started and enabled for DCBX protocol TLVs exchange.

```
SEFOS(config)# no shutdown lldp  
SEFOS(config)# set lldp enable  
SEFOS# end
```

Verifying DCB and LLDP Configurations

If both peers that are connected to port 2 and port 18 have been configured properly, you can use various `show` commands to verify the configurations. Use the following commands to display the configurations and verify that a DCB feature is configured correctly, and that DCBX TLVs are exchanged with a peer.

- “Determine VLAN Assignment” on page 14
- “Determine Whether Interfaces Are Active” on page 15
- “Determine Whether LLDP is Running and Recognizing Peers” on page 15
- “Enable DCB” on page 20
- “Disable DCB” on page 20
- “Enable DCB for Each Interface” on page 20
- “Disable DCB for Each Interface” on page 22
- “Enable and Disable a Specific DCB Feature” on page 23
- “Configure the Mode for the DCB Feature” on page 25
- “Configure DCB Attributes” on page 26
- “Configure LLDP DCBX TLVs” on page 30
- “Display DCBX Feature Statistics and Control Information” on page 32
- “Display Output of Unstarted DCBX Protocol Exchange” on page 33
- “Display Output of DCBX TLV Exchange” on page 34
- “Display Output of No TLV Exchange” on page 34
- “Clear Feature Statistics” on page 35
- “Display Output Showing a Down Link” on page 35

▼ Determine VLAN Assignment

- **Type the `show vlan id` command to determine VLAN assignment.**

In the sample configuration, port 2 and port 18 must have `VLAN 201` assigned to them.

▼ Determine Whether Interfaces Are Active

- Type.

```
show interfaces extreme-ethernet 0/2 description
show interfaces extreme-ethernet 0/18 description
```

If interfaces are not in the up state, DCBX TLVs will not be exchanged.

▼ Determine Whether LLDP is Running and Recognizing Peers

In a correct DCB configuration, LLDP must be running and recognizing peers. If LLDP does not show the neighbors for port 2 and port 18, perform the following steps to determine whether the peers are configured correctly and both links are up.

1. Display the DCB administrative, operational, and peer configurations.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb priority-group
detail
SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control detail
SEFOS# show interfaces extreme-ethernet 0/2 dcb
application-etype-fcoe detail
SEFOS# show interfaces extreme-ethernet 0/18 dcb priority-group
detail
SEFOS# show interfaces extreme-ethernet 0/18 dcb
priority-flow-control detail
SEFOS# show interfaces extreme-ethernet 0/18 dcb
application-etype-fcoe detailshow
SEFOS# show interfaces extreme-ethernet 0/2 dcb counters
SEFOS# show interfaces extreme-ethernet 0/18 dcb counters
```

2. Display the VLAN information for the database.

```
SEFOS# show vlan 201

Vlan database
-----
Vlan ID           : 201
Member Ports      : Ex0/2, Ex0/18
Untagged Ports    : None
Forbidden Ports   : None
Name              :
Status            : Permanent
```

In the following steps, DCB features are exchanged, and DCB is in operating mode with its peer.

3. Ensure that the interface is up on a specified port (port 0/2, in this example).

```
SEFOS# show interfaces extreme-ethernet 0/2 description

Interface      Status   Protocol
-----
Ex0/2          up      up
```

4. Ensure that the interface is up on a specified port (port 0/18, in this example).

```
SEFOS# show interfaces extreme-ethernet 0/18 description

Interface      Status   Protocol
-----
Ex0/18         up      up
```

5. Display the LLDP global configuration details.

```
SEFOS# show lldp

LLDP is enabled
Transmit Interval      : 30
Holdtime Multiplier    : 4
Reinitialization Delay : 2
Tx Delay               : 2
Notification Interval  : 5
Chassis Id SubType     : Mac Address
Chassis Id             : 00:14:4f:6c:5e:cf
```

6. Display information about the neighbors learned on the interfaces.

```
SEFOS# show lldp neighbors

Capability Codes :
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device,
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

Chassis ID          Local Intf      Hold-time    Capability    Port Id
-----
00:1b:21:4a:ab:2d   Ex0/18         120
00:1b:21:4a:ab:2d
00:0d:ec:a4:79:40   Ex0/2         120          B             Eth1/33
Total Entries Displayed : 2
```

7. Display the local configuration, operational status, and peer configuration of the PG.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb priority-group
detail

Port : Ex0/2
Show Type : Admin Config
Feature : Priority Group
Enable : true
Advertise : true
Willing : false
Group Bandwidth : 50% 30% 20% 0% 0% 0%
0% 0%
Priority Group ID: 0 0 0 1 2 2
2 15
Max Traffic Class: 8

Show Type : Oper Config
Feature : Priority Group
Oper Version : 0
Max Version : 0
Errors : 0x0 - none
Operational Mode : true
Syncd with Peer : true
Group Bandwidth : 50% 30% 20% 0% 0% 0%
0% 0%
Priority Group ID: 0 0 0 1 2 2
2 15
Max Traffic Class: 8

Show Type : Peer Config
```

```

Feature           : Priority Group
Local Interface  : Ex0/2
Status           : successful
Enable           : true
Willing          : false
Group Bandwidth : 50% 50% 0% 0% 0% 0%
0% 0%
Priority Group ID: 0 0 0 1 0 0
0 0
Max Traffic Class: 2
-----
Total Entries Displayed : 1

```

8. Display the local configuration, operational status, and peer configuration of the PFC feature.

```

SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control detail

Port           : Ex0/2
Show Type      : Admin Config
Feature        : Priority Flow Control
Enable         : true
Advertise      : true
Willing        : false
Priority Mask   : 0 0 0 1 0 0
0 0
Max Traffic Class: 8

Show Type      : Oper Config
Feature        : Priority Flow Control
Oper Version    : 0
Max Version    : 0
Errors         : 0x0 - none
Operational Mode : true
Syncd with Peer : true
Priority Mask   : 0 0 0 1 0 0
0 0
Max Traffic Class: 8

Show Type      : Peer Config
Feature        : Priority Flow Control
Local Interface : Ex0/2
Status         : successful
Enable         : true
Willing        : false
Priority Mask   : 0 0 0 1 0 0
0 0

```

```
Max Traffic Class:      8
```

```
-----  
Total Entries Displayed : 1
```

9. Display the local configuration, operational status, and peer configuration of the application feature.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb  
application-ettype-fcoe detail
```

```
Port          :      Ex0/2  
Show Type    :      Admin Config  
Feature      :      Application FCoE  
Enable       :      true  
Advertise    :      true  
Willing      :      false  
Priority Map  :      0      0      0      1      0      0      0      0  
  
Show Type    :      Oper Config  
Feature      :      Application FCoE  
Oper Version :      0  
Max Version  :      0  
Errors       :      0x0 - none  
Operational Mode :      true  
Syncd with Peer :      true  
Priority Map  :      0      0      0      1      0      0      0      0  
  
Show Type    :      Peer Config  
Feature      :      Application FCoE  
Local Interface :      Ex0/2  
Status       :      successful  
Enable       :      true  
Willing      :      false  
Priority Map  :      0      0      0      1      0      0      0      0
```

In addition to the commands shown in this section, you can also use the following commands to display information:

- show lldp
- show lldp interface
- show lldp neighbor
- show lldp traffic

▼ Enable DCB

After you have configured the desired DCB features, perform the following steps to start DCB in the switch. By default, DCB is disabled globally.

1. Enable DCB in the switch.

```
SEFOS# configure terminal
SEFOS(config)# no shutdown dcb
SEFOS(config)# end
```

2. View the DCB information.

```
SEFOS# show dcb global info

DCB Global Information
-----
System Control           : Start
```

▼ Disable DCB

By default, DCB is disabled globally.

1. Disable DCB.

```
SEFOS# configure terminal
SEFOS(config)# shutdown dcb
SEFOS(config)# end
```

2. View the DCB information.

```
SEFOS# show dcb global info

DCB Global Information
-----
System Control           : Shutdown
```

▼ Enable DCB for Each Interface

By default, all three features are enabled. However, to use the features, the global interface state must be turned on.

This example uses port 0/2.

1. Enable DCB on a specific interface.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb enable
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
```

2. View the interface configuration.

These examples show the default configurations.

```
SEFOS# show interfaces extreme-ethernet 0/2 description
Interface      Status      Protocol
-----
Ex0/2          up          up
```

3. Display the DCB state and feature mode on a specific interface.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb mode

Port                : Ex0/2
Show Type           : Admin State
DCB Capable State   : on
Priority Group       : auto
Priority Flow Control : auto
```

4. Display the local configuration of the priority group.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb priority-group

Port                : Ex0/2
Show Type           : Admin Config
Feature             : Priority Group
Enable              : true
Advertise           : true
Willing              : false
Group Bandwidth    : 50%   30%   20%   0%   0%   0%
0%   0%
Priority Group ID:  0     0     0     1     2     2
2     15
Max Traffic Class:  8
```

5. Display the local configuration of the priority flow control feature.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb  
priority-flow-control  
Port          :      Ex0/2  
Show Type     :      Admin Config  
Feature       :      Priority Flow Control  
Enable        :      true  
Advertise     :      true  
Willing       :      false  
Priority Mask  :      0      0      0      1      0      0  
0      0  
Max Traffic Class:      8
```

6. Display the local configuration of the application feature.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb  
application-etype-fcoe  
  
Port          :      Ex0/2  
Show Type     :      Admin Config  
Feature       :      Application FCoE  
Enable        :      true  
Advertise     :      true  
Willing       :      false  
Priority Map   :      0      0      0      1      0      0  
0      0
```

▼ Disable DCB for Each Interface

This example uses port 0/2.

1. Enter Global Configuration mode.

```
SEFOS# configure terminal  
SEFOS(config)# interface extreme-ethernet 0/2
```

2. Disable DCB.

```
SEFOS(config-if)# set dcb disable
```

3. Exit Global Configuration mode.

```
SEFOS(config-if)# end
```

4. View the interface DCB state after it was disabled.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb mode

Port                : Ex0/2
Show Type           : Admin State
DCB Capable State   : off
Priority Group       : auto
Priority Flow Control : auto
```

▼ Enable and Disable a Specific DCB Feature

You can enable and disable a specific DCB feature after DCB has been globally enabled. For example, when exchanging a DCBX protocol with its peer, you might want to inform its peer that a DCB-specific feature has been enabled or disabled.

The following example enables the PFC feature and disables PG and the application. This example uses port 0/2.

1. Enable DCB.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb enable
```

2. Enable PFC.

```
SEFOS(config-if)# set dcb priority-flow-control enable
```

3. Disable PG and the application.

```
SEFOS(config-if)# set dcb priority-group disable
SEFOS(config-if)# set dcb application-ettype-fcoe disable
SEFOS(config-if)# end
```

4. View the DCB state and feature mode.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb mode

Port                : Ex0/2
Show Type           : Admin State
DCB Capable State   : on
Priority Group       : auto
Priority Flow Control : auto
```

5. View the DCB PG parameters.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb priority-group

Port          :      Ex0/2
Show Type     :      Admin Config
Feature       :      Priority Group
Enable        :      false
Advertise     :      true
Willing       :      false
Group Bandwidth :    50%    30%    20%    0%    0%    0%
0%           0%
Priority Group ID:    0      0      0      1      2      2
2           15
Max Traffic Class:    8
```

6. View the PFC parameters.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control

Port          :      Ex0/2
Show Type     :      Admin Config
Feature       :      Priority Flow Control
Enable        :      true
Advertise     :      true
Willing       :      false
Priority Mask  :    0      0      0      1      0      0
0           0
Max Traffic Class:    8
```

7. View the application parameters.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb
application-ettype-fcoe

Port          :      Ex0/2
Show Type     :      Admin Config
Feature       :      Application FCoE
Enable        :      false
Advertise     :      true
Willing       :      false
Priority Map   :    0      0      0      1      0      0
0           0
```

▼ Configure the Mode for the DCB Feature

In normal operation, the DCB feature is in automatic mode. Whenever applicable, the hardware configuration will be set after a feature is exchanged with its peer and the feature attributes are compatible with its peer. In some cases, "force mode" might be needed to set the hardware configuration, regardless of its peer configuration, without waiting for DCBX TLV to be exchanged.

1. Set the PG feature to auto mode.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb priority-group mode auto
SEFOS(config-if)# set dcb priority-flow-control mode auto
SEFOS(config-if)# end
```

2. View the DCB mode.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb mode

Port                : Ex0/2
Show Type           : Admin State
DCB Capable State   : on
Priority Group       : auto
Priority Flow Control : auto
```

3. Set the PG feature to force mode.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb priority-group mode on
SEFOS(config-if)# set dcb priority-flow-control mode on
SEFOS(config-if)# end
```

4. View the interface mode after setting it to force mode.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb mode

Port                : Ex0/2
Show Type           : Admin State
DCB Capable State   : on
Priority Group       : force
Priority Flow Control : force
```

▼ Configure DCB Attributes

You can set PG and PFC feature attributes. This example configures a total of three groups with bandwidths of 40%, 20%, and 40%.

1. Configure PG with different priority grouping and bandwidth.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb priority-group 0 0 0 1 2 2 2 2 bandwidth
40 20 40 0 0 0 0 0
SEFOS(config-if)# end
```

2. View the configuration to verify that the PG feature is enabled and advertised.

If the feature is not enabled, it will not be in operating mode.

```
SEFOS# show int ex 0/2 dcb priority-group detail

Port          :      Ex0/2
Show Type     :      Admin Config
Feature       :      Priority Group
Enable        :      true
Advertise     :      true
Willing       :      false
Group Bandwidth : 40%    20%    40%    0%    0%    0%
0%           0%
Priority Group ID: 0      0      0      1      2      2
2           2
Max Traffic Class: 8

Show Type     :      Oper Config
Feature       :      Priority Group
Oper Version  :      0
Max Version   :      0
Errors       :      0x0 - none
Operational Mode : true
Syncd with Peer : true
Group Bandwidth : 40%    20%    40%    0%    0%    0%
0%           0%
Priority Group ID: 0      0      0      1      2      2
2           2
Max Traffic Class: 8

Show Type     :      Peer Config
Feature       :      Priority Group
Local Interface : Ex0/2
Status        :      successful
Enable        :      true
Willing       :      false
Group Bandwidth : 50%    50%    0%    0%    0%    0%
0%           0%
Priority Group ID: 0      0      0      1      0      0
0           0
Max Traffic Class: 2

-----
Total Entries Displayed : 1
```

This configuration has the following values:

- Group 0 - priority members (0, 1, 2), bandwidth 40% (share bandwidth among priority 0, 1, 2)
- Group 1 - priority member (3), bandwidth 20% (priority 3)
- Group 2 - priority members (4, 5, 6), bandwidth 40% (share bandwidth among priority 4, 5, 6)
- Group 3 to 7 - priority members (none)

The output shows the group bandwidth of each group. For groups that have no priorities assigned to them, the bandwidth shows 0%, as follows:

Group 0	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
40%	20%	40%	0%	0%	0%	0%	0%

The output also shows the priority group ID assigned to a priority (ID shown from 0 - 2 in this example).

3. Set the PFC priority with the following commands when the PFC priority set does not match what the peer has configured, then set the priority to match the peer's priority set.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb priority-flow-control vlan-priority 0 0
0 1 1 0 0 0
SEFOS(config-if)# end
SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control detail

Port                :      Ex0/2
Show Type           :      Admin Config
Feature             :      Priority Flow Control
Enable              :      true
Advertise           :      true
Willing             :      false
Priority Mask       :      0      0      0      1      1      0
0      0
Max Traffic Class:      8

Show Type           :      Oper Config
Feature             :      Priority Flow Control
Oper Version        :      0
Max Version         :      0
Errors              :      0x2 - config mismatch with peer
Operational Mode    :      false
Syncd with Peer     :      true
Priority Mask       :      0      0      0      1      1      0
0      0
Max Traffic Class:      8
```



```

Show Type      :      Peer Config
Feature        :      Priority Flow Control
Local Interface :      Ex0/2
Status         :      successful
Enable         :      true
Willing        :      false
Priority Mask   :      0      0      0      1      0      0
0      0
Max Traffic Class:      8
-----
Total Entries Displayed : 1

```

4. Set the PFC priority the same as the PFC priority of the peer.

```

SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# set dcb priority-flow-control vlan-priority 0 0
0 1 0 0 0 0
SEFOS(config-if)# end
SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control detail

Port          :      Ex0/2
Show Type     :      Admin Config
Feature       :      Priority Flow Control
Enable        :      true
Advertise     :      true
Willing       :      false
Priority Mask  :      0      0      0      1      0      0
0      0
Max Traffic Class:      8

Show Type     :      Oper Config
Feature       :      Priority Flow Control
Oper Version  :      0
Max Version   :      0
Errors        :      0x0 - none
Operational Mode :      true
Syncd with Peer :      true
Priority Mask  :      0      0      0      1      0      0
0      0
Max Traffic Class:      8

Show Type     :      Peer Config
Feature       :      Priority Flow Control
Local Interface :      Ex0/2
Status        :      successful

```

```

Enable           : true
Willing          : false
Priority Mask    : 0 0 0 1 0 0
0 0
Max Traffic Class: 8
-----
Total Entries Displayed : 1

```

▼ Configure LLDP DCBX TLVs

You can enable or disable the transmission of DCBX TLV types on a port. This example uses port 0/2.

1. Enable DCBX TLVs for PG, PFC, and the application.

```

SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# lldp tlv-select dcbtlv priority-group
priority-flow-control application-etype-fcoe
SEFOS(config)# end

```

2. View the TLV settings.

```

SEFOS# show interfaces extreme-ethernet 0/2 dcb priority-group

Port           : Ex0/2
Show Type      : Admin Config
Feature        : Priority Group
Enable         : true
Advertise      : true
Willing        : false
Group Bandwidth : 40% 20% 40% 0% 0% 0%
0% 0%
Priority Group ID: 0 0 0 1 2 2
2 2
Max Traffic Class: 8

```

3. View the PFC settings.

```

SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control

Port           : Ex0/2
Show Type      : Admin Config
Feature        : Priority Flow Control

```

```

Enable       : true
Advertise    : true
Willing      : false
Priority Mask : 0 0 0 1 0 0
0 0
Max Traffic Class: 8

```

4. View the application settings.

```

SEFOS# show interfaces extreme-ethernet 0/2 dcb
application-etype-fcoe

Port         : Ex0/2
Show Type    : Admin Config
Feature      : Application Fcoe
Enable       : false
Advertise    : true
Willing      : false
Priority Map  : 0 0 0 1 0 0
0 0

```

5. Disable DCBX TLVs for PG, PFC, and the application.

```

SEFOS# configure terminal
SEFOS(config-if)# no lldp tlv-select dcb1tlv priority-group
priority-flow-control application-etype-fcoe
SEFOS(config-if)# end

```

6. View the TLV settings after disabling them for the PG.

```

SEFOS# show interfaces extreme-ethernet 0/2 dcb priority-group

Port         : Ex0/2
Show Type    : Admin Config
Feature      : Priority Group
Enable       : true
Advertise    : false
Willing      : false
Group Bandwidth : 40% 20% 40% 0% 0% 0%
0% 0%
Priority Group ID: 0 0 0 1 2 2
2 2
Max Traffic Class: 8

```

7. View the TLV settings after disabling them for the PFC.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb
priority-flow-control

Port          :      Ex0/2
Show Type    :      Admin Config
Feature      :      Priority Flow Control
Enable       :      true
Advertise    :      false
Willing      :      false
Priority Mask :      0      0      0      1      0      0
0      0
Max Traffic Class:      8
```

8. View the TLV settings after disabling them for the PFC.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb
application-etype-fcoe

Port          :      Ex0/2
Show Type    :      Admin Config
Feature      :      Application FCoE
Enable       :      false
Advertise    :      false
Willing      :      false
Priority Map  :      0      0      0      1      0      0
0      0
```

▼ Display DCBX Feature Statistics and Control Information

- Type.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb counters

Port          :      Ex0/2
Show Type    :      Control and Feature Stats
Control Info Stats :
  SeqNo      :      9
  AckNo      :      4
  Frames Out :      27
  Frames In  :      19
```

```

Priority Group      :
  Frames Out       : 27
  Frames In        : 19

Priority Flow Control:
  Frames Out       : 27
  Frames In        : 19

Application Proto  :
  Frames Out       : 27
  Frames In        : 19

```

▼ Display Output of Unstarted DCBX Protocol Exchange

In the following output, all controls and features are zeroes, which indicates that the DCBX protocol exchange has not yet been started.

- **Type.**

```

SEFOS# show interfaces extreme-ethernet 0/2 dcb counters

Port                : Ex0/2
Show Type           : Control and Feature Stats
Control Info Stats  :
  SeqNo             : 0
  AckNo             : 0
  Frames Out        : 0
  Frames In         : 0
Priority Group      :
  Frames Out        : 0
  Frames In         : 0
Priority Flow Control:
  Frames Out        : 0
  Frames In         : 0

Application Proto   :
  Frames Out        : 0
  Frames In         : 0

```

▼ Display Output of DCBX TLV Exchange

- Type.

```
SEFOS# show interfaces extreme-ethernet 0/2 dcb counters

Port                : Ex0/2
Show Type           : Control and Feature Stats
Control Info Stats  :
  SeqNo             : 1
  AckNo             : 2
  Frames Out        : 3
  Frames In         : 2

Priority Group       :
  Frames Out        : 3
  Frames In         : 2

Priority Flow Control:
  Frames Out        : 3
  Frames In         : 2

Application Proto   :
  Frames Out        : 3
  Frames In         : 2
```

▼ Display Output of No TLV Exchange

In the following output, the switch has sent out packets, but has not received packets from the peer.

- Type.

```
SEFOS# show interfaces extreme-ethernet 0/19 dcb counters

Port                : Ex0/19
Show Type           : Control and Feature Stats

Control Info Stats  :
  SeqNo             : 1
  AckNo             : 0
  Frames Out        : 1
  Frames In         : 0

Priority Group       :
  Frames Out        : 0
```

```
Frames In          : 0

Priority Flow Control:
  Frames Out       : 0
  Frames In        : 0

Application Proto  :
  Frames Out       : 0
  Frames In        : 0
```

▼ Clear Feature Statistics

- Type.

```
SEFOS# clear interfaces extreme-ethernet 0/2 dcb counters
SEFOS# show interfaces extreme-ethernet 0/2 dcb counters

Port                : Ex0/2
Show Type           : Control and Feature Stats
Control Info Stats  :
  SeqNo             : 1
  AckNo             : 2
  Frames Out        : 0
  Frames In         : 0

Priority Group       :
  Frames Out        : 0
  Frames In         : 0

Priority Flow Control:
  Frames Out        : 0
  Frames In         : 0

Application Proto   :
  Frames Out        : 0
  Frames In         : 0
```

▼ Display Output Showing a Down Link

- Type.

```
SEFOS# show interfaces extreme-ethernet 0/3 dcb counters

Port                : Ex0/3
```

```
Show Type          : Control and Feature Stats
Status             : Link Down
```

```
SEFOS# show interfaces extreme-ethernet 0/3 description
```

Interface	Status	Protocol
-----	-----	-----
Ex0/3	down	down