



ZebOS-XP®

Network Platform

Version 1.4

Extended Performance

**Data Center Bridging
Configuration Guide**

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IP Infusion Inc.
3965 Freedom Circle, Suite 200
Santa Clara, CA 95054
+1 408-400-1900
<http://www.ipinfusion.com/>

For support, questions, or comments via E-mail, contact:
support@ipinfusion.com

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Preface

This guide describes how to configure Data Center Bridging (DCB) in ZebOS-XP.

Audience

This guide is intended for network administrators and other engineering professionals who configure DCB.

Conventions

Table P-1 shows the conventions used in this guide.

Table P-1: Conventions

Convention	Description
<i>Italics</i>	Emphasized terms; titles of books
Note:	Special instructions, suggestions, or warnings
<code>monospaced type</code>	Code elements such as commands, functions, parameters, files, and directories

Contents

This guide contains these chapters:

- [Chapter 1, Enhanced Transmission Selection Configuration](#)
- [Chapter 2, Priority-based Flow Control Configuration](#)
- [Chapter 3, Quantized Congestion Notification Configuration](#)
- [Chapter 4, DCBx Configuration](#)

Related Documents

Use this guide with the *Data Center Bridging Command Reference* for details about the commands used in the configurations.

Note: All ZebOS-XP technical manuals are available to licensed customers at http://www.ipinfusion.com/support/document_list.

Chapter Organization

The chapters in this guide are organized into these major sections:

- An overview that explains a configuration in words
- Topology with a diagram that shows the devices and connections used in the configuration
- Configuration steps in a table for each device where the left-hand side shows the commands you enter and the right-hand side explains the actions that the commands perform
- Validation which shows commands and their output that verify the configuration

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CHAPTER 1 Enhanced Transmission Selection Configuration

This chapter shows how to:

- Enable ETS on a bridge and interface
- Configure priorities and bandwidth for ETS

Topology



Figure 1-1: ETS-Enabled Bridge

Configuring a Bridge and Interface for ETS

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enables DCB on the bridge
(config)#enhanced-transmission-selection enable bridge 1	Enables ETS on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV
(config-if)#enhanced-transmission-selection mode on	Start sending DCBX TLVs in LLDP messages

Configuring Priorities and Bandwidth for ETS

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enables DCB on the bridge
(config)#enhanced-transmission-selection enable bridge 1	Enables ETS on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set llpd enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV
(config-if)#enhanced-transmission-selection mode on	Configure the advertise flag and start sending DCBX TLVs in LLDP messages
(config-if)#traffic-class-group 1 add priority 2 3 6	Configure TCG 1 and add priorities 2, 3, and 6
(config-if)#traffic-class-group 4 add priority 1 5 7	Configure TCG 4 and add priorities 1, 5, and 7
(config-if)#bandwidth-percentage 1 50 4 50	Configure bandwidth percentages for TCG 1 and 4

Validation Commands

Verify the ETS parameters configuration on the port specified.

```
#show enhanced-transmission-selection interface eth1
Interface : eth1
Enhanced Transmission Selection : on
```

Admin Configuration

Mode	Advertise	Willing	Max-TCG	TCG-ID	BW%	Priorities
On	On	On	0	1	50	2 3 6
On	On	On	0	4	50	1 5 7
On	On	On	0	15	NA	0 4

Operational Configuration

Oper State	Max_TCG	TCG-ID	BW%	Priorities
On	0	1	50	2 3 6
On	0	4	50	1 5 7
On	0	15	NA	0 4

CHAPTER 2 Priority-based Flow Control Configuration

This chapter shows how to:

- Enable PFC on a bridge and interface
- Configure priorities and link delay allowance for PFC
- Configuring application priority for PFC

Topology



Figure 2-1: PFC Enabled Bridge

Configuring a Bridge and Interface for PFC

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enables DCB on the bridge
(config)#priority-flow-control enable bridge 1	Enables PFC on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#priority-flow-control mode on	Configure the advertise flag and start sending DCBX TLVs in LLDP messages

Configuring Priorities and Link Delay Allowance for PFC

#configure terminal	Enter Configure Mode.
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enables DCB on the bridge
(config)#priority-flow-control enable bridge 1	Enables PFC on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#priority-flow-control mode on	Configure the advertise flag and start sending DCBX TLVs in LLDP messages
(config-if)#priority-flow-control cap 4	Configure the maximum number of PFC priorities
(config-if)#priority-flow-control enable priority 2 4 5	Enable PFC on priorities 2, 4, and 5
(config-if)#priority-flow-control link-delay-allowance 34567	Configure the link delay allowance

Validation Commands

1. Verify the default data set.

```
#show priority-flow-control statistics bridge 1
bridge : 1
interface pause sent      pause received
=====
#show priority-flow-control statistics interface eth1
bridge : 2
interface : eth1
pause sent      pause received
=====
59680614996248372055834574861
```

2. Verify the current data set.

```
#show priority-flow-control details interface eth1
bridge : 1
priority flow control : on
interface : eth1
```

```
Admin Configuration
mode  advertise willing  cap  link      priorities
                                delay
                                allowance
=====
```

```
on      on      off      4      34567      2 4 5
```

```
Operational Configuration
state cap  link      priorities
          delay
          allowance
```

```
=====
on      4      34567      2 4 5
```

3. Verify the current data set.

```
#show priority-flow-control details bridge 1
```

```
Admin Configuration
interface mode  advertise willing  max  cap  link      priorities
          delay
          allowance
```

```
=====

Operational Configuration
interface state oper  cap  link      priorities
          delay
          allowance
```

Configuring Application Priority for PFC

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge.
(config)#data-center-bridging enable bridge 1	Enables DCB on the bridge
(config)#application-priority enable bridge 1	Enables application priority on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set llpd enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#application-priority enable	Configure the advertise flag and start sending DCBX TLVs in LLDP messages

Validation Commands

1. Verify the default data set.

```
#show application-priority interface eth1
bridge : 1
Application Priority : On
```

```
Admin Configuration
intf  Admin Config  Protocol  ProtoId  Priorities
```

	Mode	Advertise			
eth1	On	On	Ethertype	ip	6
eth1	On	On	Ethertype	arp	6
eth1	On	On	udp	telnet	6
eth1	On	On	tcp	telnet	6

2. Verify the current data set.

```
#show application-priority bridge 1
bridge : 1
```

Admin Configuration					
intf	Admin	Config	Protocol	ProtoId	Priorities
	Mode	Advertise			
eth1	On	On	Ethertype	ip	6
eth1	On	On	Ethertype	arp	6
eth1	On	On	udp	telnet	6
eth1	On	On	tcp	telnet	6

CHAPTER 3 Quantized Congestion Notification Configuration

This chapter shows how to:

- Enable QCN on a bridge and interface
- Enable a Congestion Notification Priority Value (CNPV) and create a Congestion Point (CP)

Topology



Figure 3-1: PFC-Enabled Bridge

Configuring a Bridge and Interface for QCN

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enable DCB on the bridge
(config)#qcn enable bridge 1	Enable QCN on the bridge
(config-qcn)#exit	Exit QCN mode
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV

Validation Commands

```
#show qcn configuration bridge 1
```

```
QCN:    Enable
CNM Transmit Priority: 6
Discarded Frames: 0
```

Errored Port List: NONE

Priority CNPV

=====

0	No
1	No
2	No
3	No
4	No
5	No
6	No
7	No

CNPV details:

CNPV	DefModeChoice	AltPriority	DefenseMode
=====	=====	=====	=====

CNPV details per interface:

Interface	CNPV	DefModeChoice	AltPriority	DefenseMode	XmitReady
=====	=====	=====	=====	=====	=====

Congestion Point Details:

Interface	CpId	W	SampleBase	MinHdrOctet	Qsp
=====	=====	=====	=====	=====	=====

Enable a CNPV and Create a CP

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an ieee vlan enabled bridge
(config)#data-center-bridging enable bridge 1	Enables DCB on the bridge
(config)#qcn enable bridge 1	Enables QCN on the bridge
(config-qcn)#cnpv 5	Set the CNPV value on the QCN enabled bridge
(config-qcn)#exit	Exit QCN mode
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 asa layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV
(config-if)#cp enable sample-base 10000 weight 10	Configure the congestion point

Validation Commands

1. Verify the QCN configuration on the bridge.

```
#show qcn configuration bridge 1
```

QCN: Enable
 CNM Transmit Priority: 6
 Discarded Frames: 0
 Errored Port List: NONE

Priority	CNPV
0	No
1	No
2	No
3	No
4	No
5	Yes
6	No
7	No

CNPV details:

CNPV	DefModeChoice	AltPriority	DefenseMode
5	AUTO	0	EDGE

CNPV details per interface:

Interface	CNPV	DefModeChoice	AltPriority	DefenseMode	XmitReady
eth1	5	COMP	0	EDGE	FALSE

Congestion Point Details:

Interface	CpId	W	SampleBase	MinHdrOctet	Qsp
eth1	*****	2.00	0	0	0

2. Verify the CNPV value on the QCN enabled bridge.

#show qcn cnpv bridge 1

Priority	CNPV
0	No
1	No
2	No
3	No
4	No
5	Yes
6	No
7	No

CNPV details:

CNPV	DefModeChoice	AltPriority	DefenseMode
5	AUTO	0	EDGE

CNPV details per interface:

Interface	CNPV	DefModeChoice	AltPriority	DefenseMode	XmitReady
eth1	5	COMP	0	EDGE	FALSE

3. Verify the CP on the QCN bridge.

```
#show qcn cp interface eth1
```

Congestion Point Details:

Interface	CpId	W	SampleBase	MinHdrOctet	Qsp
=====	=====	=====	=====	=====	=====
eth1	*****	2.00	0	0	0

CHAPTER 4 DCBx Configuration

This chapter show how to:

- Configure ETS parameter exchange
- Configure PFC parameter exchange

Topology



Figure 4-1: DCBx Configuration

Configuring ETS Parameter Exchange

Zebos1

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge.
(config)#data-center-bridging enable bridge 1	Enable DCB on the bridge
(config)#enhanced-transmission-selection enable bridge 1	Enable ETS on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#enhanced-transmission-selection mode on	Configure the advertise flag and start sending DCBx TLVs in LLDP messages
(config-if)#traffic-class-group 1 add priority 2 3 6	Configure TCG 1 and add priorities 2, 3, and 6

(config-if)#traffic-class-group 4 add priority 1 5 7	Configure TCG 4 and add priorities 1, 5, and 7
(config-if)#bandwidth-percentage 1 50 4 50	Configure the bandwidth percentage for TCG 1 and 4

Zebos2

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge.
(config)#data-center-bridging enable bridge 1	Enable DCB on the bridge
(config)#enhanced-transmission-selection enable bridge 1	Enable ETS on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#enhanced-transmission-selection mode on	Configure the advertise flag and start sending DCBx TLVs in LLDP messages
(config-if)#traffic-class-group 1 add priority 2 3 6	Configure TCG 1 and add priorities 2, 3, and 6
(config-if)# traffic-class-group 4 add priority 1 5 7	Configure TCG 4 and add priorities 1, 5, and 7
(config-if)# bandwidth-percentage 1 50 4 50	Configure the bandwidth percentage for TCG 1 and 4

Validation Commands

Zebos1

Verify the default data set on Zebos1

```
#show enhanced-transmission-selection interface eth1
Interface : eth1
Enhanced Transmission Selection : on
```

Admin Configuration

Mode	Advertise	Willing	Max-TCG	TCG-ID	BW%	Priorities
On	On	On	0	1	50	2 3 6
On	On	On	0	4	50	1 5 7
On	On	On	0	15	NA	0 4

Operational Configuration

Oper State	Max_TCG	TCG-ID	BW%	Priorities
------------	---------	--------	-----	------------

On	0	1	50	2 3 6
On	0	4	50	1 5 7

```
On      0      15      NA      0 4
```

Zebos2

Verify the default data set on Zebos2

```
#show enhanced-transmission-selection interface eth1
Interface : eth1
Enhanced Transmission Selection : on
```

Admin Configuration

Mode	Advertise	Willing	Max-TCG	TCG-ID	BW%	Priorities
On	On	On	0	1	50	2 3 6
On	On	On	0	4	50	1 5 7
On	On	On	0	15	NA	0 4

Operational Configuration

Oper State	Max_TCG	TCG-ID	BW%	Priorities
On	0	1	50	2 3 6
On	0	4	50	1 5 7
On	0	15	NA	0 4

Configuring PFC Parameter Exchange

Zebos2

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enable DCB on the bridge
(config)#priority-flow-control enable bridge 1	Enable PFC on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#priority-flow-control mode on	Configure the advertise flag and start sending DCBx TLVs in LLDP messages
(config-if)#priority-flow-control cap 4	Configure the maximum number of PFC priorities
(config-if)#priority-flow-control enable priority 2 4 5	Enables PFC on priorities 2,4, and 5
(config-if)#priority-flow-control link-delay-allowance 34567	Configure the link delay allowance

Zebos1

#configure terminal	Enter configure mode
(config)#bridge 1 protocol ieee vlan-bridge	Create bridge 1 as an IEEE VLAN-enabled bridge
(config)#data-center-bridging enable bridge 1	Enable DCB on the bridge
(config)#priority-flow-control enable bridge 1	Enable PFC on the bridge
(config)#interface eth1	Configure interface eth1
(config-if)#switchport	Configure eth1 as a layer 2 port
(config-if)#bridge-group 1	Configure eth1 in bridge group 1
(config-if)#set lldp enable txrx	Configure LLDP for transmit and receive mode on eth1
(config-if)#lldp tlv ieee-8021-org-specific	Configure LLDP to send an IEEE 802.1 organizationally specific TLV set in the packet
(config-if)#priority-flow-control mode on	Configure the advertise flag and start sending DCBx TLVs in LLDP messages
(config-if)#priority-flow-control cap 4	Configure the maximum number of PFC priorities
(config-if)#priority-flow-control enable priority 2 4 5	Enables PFC on priorities 2,4, and 5
(config-if)#priority-flow-control link-delay-allowance 34567	Configure the link delay allowance

Validation Commands

Zebos1

1. Verify the default data set.

```
show priority-flow-control statistics bridge 1
bridge : 1
interface pause sent      pause received
=====
```

2. Verify the current data set.

```
#show priority-flow-control details interface eth1
bridge : 2
priority flow control : on
interface : eth1
```

```
Admin Configuration
mode  advertise willing  cap  link      priorities
      delay
      allowance
```

```
=====
on    on          off    4      34567    2 3 4 5
```

```
Operational Configuration
state cap  link      priorities
          delay
          allowance
=====
```

```
on      4      34567      2 3 4 5
```

3. Verify the current data set.

```
#show priority-flow-control details bridge 1
```

Admin Configuration

```
interface mode  advertise willing  max    cap    link      priorities
                                     delay
                                     allowance
```

Operational Configuration

```
interface state oper  cap    link      priorities
                                     delay
                                     allowance
```

Zebos2

1. Verify the default data set.

```
show priority-flow-control statistics bridge 1
```

```
bridge : 1
```

```
interface pause sent      pause received
```

2. Verify the current data set.

```
#show priority-flow-control details interface eth1
```

```
bridge : 2
```

```
priority flow control : on
```

```
interface : eth1
```

Admin Configuration

```
mode  advertise willing  cap    link      priorities
                                     delay
                                     allowance
```

```
on      on      off      4      34567      2 3 4 5
```

Operational Configuration

```
state cap    link      priorities
                                     delay
                                     allowance
```

```
on      4      34567      2 3 4 5
```

3. Verify the current data set.

```
#show priority-flow-control details bridge 1
```

Admin Configuration

```
interface mode  advertise willing  max    cap    link      priorities
                                     delay
                                     allowance
```

Operational Configuration

```
interface state oper  cap    link      priorities
```

delay
allowance

=====

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