ZebOS-XP®
Network Platform

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Extended Performance

Ethernet Local Management Interface Configuration Guide

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Contents

Preface

This guide describes how to configure Ethernet Local Management Interface (ELMI) in ZebOS-XP.

Audience

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

Conventions

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

Table P-1: Conventions

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

Contents

This guide contains this chapter:

- Chapter 1, *ELMI Configuration*

Related Documents

Use this guide with the *Ethernet Local Management Interface 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 ELMI Configuration

Ethernet Local Management Interface (ELMI) is an Ethernet OAM management protocol used for communications between a UNI-C and UNI-N. ELMI enables auto configuration of the customer edge (CE) to support Metro Ethernet services. ELMI also provides UNI and EVC status information to the CE. The UNI and EVC information enables automatic configuration of CE operation based upon the Metro Ethernet Network configuration. ELMI relies on the CFM for end-to-end status of Ethernet virtual connections (EVCs) across CFM domains. ELMI enables customer equipment to receive information regarding the status and attributes of Ethernet services thus allowing automatic configuration and improved Subscriber network performance.

Topology

This chapter shows how to set up two customer edges (CEs) to communicate with each other using two provider Ethernet bridges (PEBs). Figure 1-1 displays the topology.

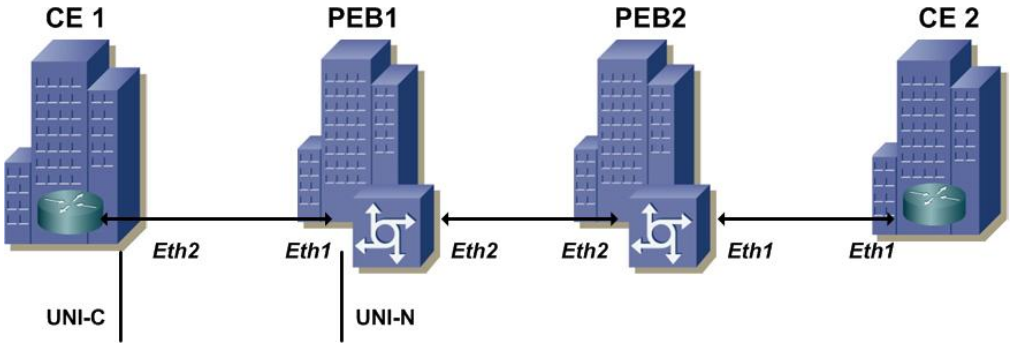

Figure 1-1: Provider Ethernet Bridge Configuration

Switch PEB1

The second sample configuration sets up the first provider Ethernet bridge switch.

`#configure terminal`	Enter the Configure mode.
`(config)#bridge 1 protocol provider-rstp edge`	Configures bridge 1 as provider edge RSTP bridge.
`(config)#ethernet lmi global bridge 1`	Configures bridge 1 as ELMI
`(config)#vlan database`	Enter the VLAN Configure mode.
`(config-vlan)#vlan 2 type customer bridge 1 state enable`	Configure VLAN 2 as a customer VLAN and associate it with bridge 1.
`(config-vlan)#vlan 3 type customer bridge 1 state enable`	Configure VLAN 3 as a customer VLAN and associate it with bridge 1
`(config-vlan)#vlan 20 type service point-point bridge 1 state enable`	Configure VLAN 20 as a service VLAN and associate it with bridge 1.
`(config-vlan)#ethernet svlan 20 evc-id EVC_20 bridge 1`	Configure EVC ID for SVLAN.
`(config-vlan)#exit`	Exit VLAN database mode

`(config)#cvlan registration table map1 bridge 1`	Goes to CVLAN registration table.
`(config-cvlan-registration)#cvlan 2 svlan 20`	Maps CVLAN 2 (default VLAN) to SVLAN 20.
`(config-cvlan-registration)#cvlan 3 svlan 20`	Maps CVLAN 3 (default VLAN) to SVLAN 20.
`(config-cvlan-registration)#exit`	Exits the CVLAN-registration mode.
`(config)#interface eth1`	Goes to the interface mode for Eth1.
`(config)#switchport`	Configures the Eth1 port as a layer2 port.
`(config-if)#bridge-group 1`	Associates the Eth1 interface with bridge 1.
`(config-if)#switchport mode customer-edge hybrid`	Sets the port type as a customer edge (CE).
`(config-if)#switchport customer-edge hybrid allowed vlan add 2 egress-tagged enable`	Allow VLAN 2 with egress-tag on the interface.
`(config-if)#switchport customer-edge hybrid allowed vlan add 3 egress-tagged enable`	Allow VLAN 2 with egress-tag on interface.
`(config-if)#switchport customer-edge vlan registration map1`	Associate CVLAN registration table on interface.
`(config-if)#ethernet uni id UNI_ETH1`	Configure a UNI ID.
`(config-if)#ethernet uni bundle`	Configure CE-VLAN ID/EVC Map Type as a bundle.
`(config-if)#ethernet lmi interface`	Configures ELMI.
`(config-if)#ethernet lmi T392 12`	Configures T393 value at UNI-N.
`(config-if)#exit`	Exits the Interface mode.

Configuration for CE1

The initial sample configuration sets up the first customer edge.

`#configure terminal`	Enter the Configure mode.
`(config)#bridge 1 protocol rstp vlan-bridge`	Configures bridge 1 as a VLAN-bridge RSTP bridge.
`(config)#ethernet lmi global bridge 1`	Configures bridge 1 as ELMI
`(config)#interface eth2`	Go to interface mode.
`(config-if)#switchport`	Configure Eth2 as a layer2 port.
`(config-if)#bridge-group 1`	Associate Eth2 interface with bridge 1.
`(config-if)#switchport mode hybrid`	Set the port mode to hybrid.
`(config-if)#switchport hybrid allowed vlan all`	Creates the VLAN database
`(config-if)#ethernet lmi interface`	Configures ELMI.
`(config-if)#ethernet lmi t391 12`	Configures the ELMI polling time to 12 seconds.
`(config-if)#exit`	Exits the Interface mode.

Switch PEB2

The last sample configuration sets up the second provider Ethernet bridge second.

`#configure terminal`	Enter the Configure mode.
`(config)#bridge 1 protocol provider-rstp edge`	Configures bridge 1 as provider edge RSTP bridge.
`(config)#ethernet lmi global bridge 1`	Configures bridge 1 as ELMI
`(config)#vlan database`	Enter the VLAN Configure mode.
`(config-vlan)#vlan 2 type customer bridge 1 state enable`	Configure VLAN 2 as a customer VLAN and associate it with bridge 1.
`(config-vlan)#vlan 3 type customer bridge 1 state enable`	Configure VLAN 3 as a customer VLAN and associate it with bridge 1
`(config-vlan)#vlan 20 type service point-point bridge 1 state enable`	Configure VLAN 20 as a service VLAN and associate it with bridge 1.
`(config-vlan)#ethernet svlan 20 evc-id EVC_20 bridge 1`	Configure EVC ID for SVLAN.
`(config-vlan)#exit`	Exit VLAN database mode
`(config)#cvlan registration table map1 bridge 1`	Goes to the CVLAN registration table.
`(config-cvlan-registration)#cvlan 2 svlan 20`	Maps CVLAN 2 (default VLAN) to SVLAN 20.
`(config-cvlan-registration)#cvlan 3 svlan 20`	Maps CVLAN 3 (default VLAN) to SVLAN 20.
`(config-cvlan-registration)#exit`	Exits the CVLAN-registration mode.
`(config)#interface eth1`	Goes to the interface mode.
`(config-if)#switchport`	Configures Eth1 as a layer2 port.
`(config-if)#bridge-group 1`	Associates the Eth1 interface with bridge 1.
`(config-if)#switchport mode customer-edge hybrid`	sets port type as a customer edge (CE).
`(config-if)#switchport customer-edge hybrid allowed vlan add 2 egress-tagged enable`	Configures VLAN membership and egress tag type.
`(config-if)#switchport customer-edge hybrid allowed vlan add 3 egress-tagged enable`	Allow VLAN 2 with egress-tag on interface.
`(config-if)#switchport customer-edge vlan registration map1`	Associate CVLAN registration table on interface.
`(config-if)#ethernet uni id UNI_Eth1`	Configures the UNI ID (Any string).
`(config-if)#ethernet uni bundle`	Configures the CEVLAN-EVC map type as a bundle.
`(config-if)#ethernet lmi interface`	Configures ELMI.
`(config-if)#ethernet lmi T392 12`	Configures T393 value at UNI-N.
`(config-if)#exit`	Exits the interface mode.

Configuration for CE2

The initial sample configuration sets up the second customer edge.

`#configure terminal`	Enter the Configure mode.
`(config)#bridge 1 protocol rstp vlan-bridge`	Configures bridge 1 as a VLAN-bridge RSTP bridge.
`(config)#ethernet lmi global bridge 1`	Configures bridge 1 as ELMI
`(config)#interface eth1`	Go to interface mode.
`(config-if)#switchport`	Configure Eth1 as a layer2 port.
`(config-if)#bridge-group 1`	Associate Eth1 interface with bridge 1.
`(config-if)#switchport mode hybrid`	Set the port mode to hybrid.
`(config-if)#switchport hybrid allowed vlan all`	Creates the VLAN database
`(config-if)#ethernet lmi interface`	Configures ELMI.
`(config-if)#ethernet lmi t391 12`	Configures the ELMI polling time to 12 seconds.
`(config-if)#exit`	Exits the Interface mode.

Validation for Ethernet CFM

```
#sh ethernet cfm maintenance-points remote domain test vlan 20 bridge 1
MPID     LEVEL     VLAN     ACTIVE    Remote Mac         RDI    FLAGS
------------------------------------------------------------------------------
---
555        3         20        Yes     0002.a54e.86e9     False   Configured
#sh ethernet cfm maintenance-points remote domain test vlan 20 bridge 1
MPID     LEVEL     VLAN     ACTIVE    Remote Mac         RDI    FLAGS
------------------------------------------------------------------------------
---
55         3         20        Yes     0090.27cc.145c     True   Configured
```

Validation for EVC Status at PEB

```
#show ethernet lmi evc bridge 1
St    EVC Id                                          Port
--- ----------------------------------------          ----
N_A   EVC_20                                         eth1
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active, ?=Link Down
#show ethernet lmi evc
bridge     detail     interface map

#show ethernet lmi evc bridge 1
St    EVC Id                                          Port
--- ----------------------------------------          ----
N_A   EVC_20                                         eth1
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active, ?=Link Down
```

Validation for EVC Status at CE

```
#show ethernet lmi evc bridge 1
St    EVC Id                                          Port
--- ---------------------------------------          ----
N_A   EVC_20                                         eth2
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active,?=Link Down
#show ethernet lmi evc bridge 1
St    EVC Id                                          Port
--- ---------------------------------------          ----
N_A   EVC_20                                         eth1
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active,?=Link Down
```

Validation for EVC Detail Status at Bridge

```
#show ethernet lmi evc detail EVC_20 bridge 1
EVC Id: EVC_20
Interface: eth2
Time since Last Full Report: 00:29:25
Ether LMI Link Status: UP
UNI Status: UP
UNI Id: UNI_ETH1
CE-VLAN/EVC Map Type: Bundling
EVC Reference Id(svid): 20
EVC Status: New and Active
EVC Type: point-point
Default EVC: FALSE
Untagged/Priority Tagged: FALSE
CE-VLAN to EVC membership:
    2    3
% Ingress Bandwidth Profile Set Per: EVC
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
#show ethernet lmi evc detail EVC_20 bridge 1
EVC Id: EVC_20
Interface: eth1
Time since Last Full Report: 01:11:19
Ether LMI Link Status: UP
UNI Status: UP
UNI Id: UNI_ETH1
CE-VLAN/EVC Map Type: Bundling
EVC Reference Id(svid): 20
EVC Status: New and Active
EVC Type: point-point
Default EVC: FALSE
Untagged/Priority Tagged: FALSE
CE-VLAN to EVC membership:
    2    3
% Ingress Bandwidth Profile Set Per: EVC
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
```

Validation for EVC Status at Interface

```
#show ethernet lmi evc interface eth2
EVC Id: EVC_20
Interface: eth2
Time since Last Full Report: 00:30:38
Ether LMI Link Status: UP
UNI Status: UP
UNI Id: UNI_ETH1
CE-VLAN/EVC Map Type: Bundling
EVC Reference Id(svid): 20
EVC Status: New and Active
EVC Type: point-point
Default EVC: FALSE
Untagged/Priority Tagged: FALSE
CE-VLAN to EVC membership:
    2    3
% Ingress Bandwidth Profile Set Per: EVC
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
#show ethernet lmi evc interface eth1
EVC Id: EVC_20
Interface: eth1
Time since Last Full Report: 00:02:14
Ether LMI Link Status: UP
UNI Status: UP
UNI Id: UNI_ETH1
CE-VLAN/EVC Map Type: Bundling
EVC Reference Id(svid): 20
EVC Status: New and Active
EVC Type: point-point
Default EVC: FALSE
Untagged/Priority Tagged: FALSE
CE-VLAN to EVC membership:
    2    3
% Ingress Bandwidth Profile Set Per: EVC
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
```

Validation for EVC Details on Interface

```
#show ethernet lmi evc detail EVC_20 interface eth2
EVC Id: EVC_20
Interface: eth2
Time since Last Full Report: 00:33:34
Ether LMI Link Status: UP
UNI Status: UP
UNI Id: UNI_ETH1
CE-VLAN/EVC Map Type: Bundling
EVC Reference Id(svid): 20
EVC Status: New and Active
EVC Type: point-point
Default EVC: FALSE
Untagged/Priority Tagged: FALSE
```

```
CE-VLAN to EVC membership:
    2    3
% Ingress Bandwidth Profile Set Per: EVC
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
#show ethernet lmi evc detail EVC_20 interface eth1
EVC Id: EVC_20
Interface: eth1
Time since Last Full Report: 00:04:51
Ether LMI Link Status: UP
UNI Status: UP
UNI Id: UNI_ETH1
CE-VLAN/EVC Map Type: Bundling
EVC Reference Id(svid): 20
EVC Status: New and Active
EVC Type: point-point
Default EVC: FALSE
Untagged/Priority Tagged: FALSE
CE-VLAN to EVC membership:
    2    3
% Ingress Bandwidth Profile Set Per: EVC
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
```

Validation for UNI Info on CE

```
#show ethernet lmi uni interface eth2
 UNI Id:      UNI_ETH1
 CE-VLAN/EVC Map Type:    Bundling
 Bandwidth Profile Per UNI
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
St    EVC Id                                        Port
--- ----------------------------------------        ----
N_A   EVC_20                                        eth2
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active,?=Link Down

#sh ethernet lmi uni interface eth1
 UNI Id:      UNI_ETH1
 CE-VLAN/EVC Map Type:    Bundling
 Bandwidth Profile Per UNI
 CIR     CBS     EIR     EBS     Coupling-flag   Color-mode
 ======= ======= ======= ======= =============== ============
 0       0       0       0       disable         color-blind
St    EVC Id                                        Port
--- ----------------------------------------        ----
N_A   EVC_20                                        eth1
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active,?=Link Down
```

Validation for LMI Parameters on Interface

```
#show ethernet lmi parameters interface eth2
E-LMI Parameters for interface eth2
Ether LMI Link Status: UP
 Mode: CE
 T391: 12
 N391: 360
 N393: 4

#show ethernet lmi parameters interface eth1
E-LMI Parameters for interface eth1
Ether LMI Link Status: UP
 Mode: CE
 T391: 12
 N391: 360
 N393: 4
```

Validation for LMI Map Parameters

```
#show ethernet lmi evc map interface eth2
UNI Id: UNI_ETH1
Ether LMI Link Status: UP
 St     Evc Id                                    CE-VLAN
 ---- ----------------------------------------   -------
 N_A       EVC_20                                  2   3
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active,?=Link Down

#show ethernet lmi evc map interface eth1
UNI Id: UNI_ETH1
Ether LMI Link Status: UP
 St     Evc Id                                    CE-VLAN
 ---- ----------------------------------------   -------
 N_A       EVC_20                                  2   3
 Key: St=Status, A=Active, P=Partially Active, I=Inactive, N_A=New and Active,
 N_P=New and Partially Active, N_I=New and Not Active,?=Link Down
```

Validation for LMI Interface statistics

```
#clear ethernet lmi statistics interface eth2
#show ethernet lmi statistics interface eth2
ELMI statistics for interface eth2
Ether LMI Link Status: UP
UNI Id: UNI_ETH1
Reliability Errors:
 Status Timeouts         0              Invalid Sequence Number    0
 Invalid Status Response 0              Unsolicit Status Rcvd      0
Protocol Errors:
 Invalid Protocol Version 0             Invalid EVC Reference Id   0
 Invalid Message Type     0             Out of Sequence IE         0
 Duplicated IE            0             Mandatory IE Missing       0
 Invalid Mandatory IE     0             Invalid non-Mandatory IE   0
 Unrecognized IE          0             Unexpected IE              0
 Short Message            0
 Last Full Status Enq Sent: 00:00:00    Last Full Status Rcvd: 00:00:00
```

```
 Last Status Check Sent: 00:00:04       Last Status Check Rcvd: 00:00:04

#clear ethernet lmi statistics interface eth1

#show ethernet lmi statistics interface eth1
ELMI statistics for interface eth1
Ether LMI Link Status: UP
UNI Id: UNI_ETH1
------
Reliability Errors:
 Status Timeouts         0              Invalid Sequence Number    0
 Invalid Status Response 0              Unsolicit Status Rcvd      0
Protocol Errors:
 Invalid Protocol Version 0             Invalid EVC Reference Id   0
 Invalid Message Type     0             Out of Sequence IE         0
 Duplicated IE            0             Mandatory IE Missing       0
 Invalid Mandatory IE     0             Invalid non-Mandatory IE   0
 Unrecognized IE          0             Unexpected IE              0
 Short Message            0
 Last Full Status Enq Sent: 00:00:00    Last Full Status Rcvd: 00:00:00
 Last Status Check Sent: 00:00:00       Last Status Check Rcvd : 00:00:09
 Last counters cleared : 00:00:06
```

Validation for LMI bridge statistics

```
#clear ethernet lmi statistics bridge 1


#show ethernet lmi statistics bridge 1
ELMI statistics for interface eth2
Ether LMI Link Status: UP
UNI Id: UNI_ETH1
------
Reliability Errors:
 Status Timeouts         0              Invalid Sequence Number    0
 Invalid Status Response 0              Unsolicit Status Rcvd      0
Protocol Errors:
 Invalid Protocol Version 0             Invalid EVC Reference Id   0
 Invalid Message Type     0             Out of Sequence IE         0
 Duplicated IE            0             Mandatory IE Missing       0
 Invalid Mandatory IE     0             Invalid non-Mandatory IE   0
 Unrecognized IE          0             Unexpected IE              0
 Short Message            0
 Last Full Status Enq Sent: 00:00:00    Last Full Status Rcvd: 00:00:00
 Last Status Check Sent: 00:00:08       Last Status Check Rcvd : 00:00:08
 Last counters cleared : 00:00:25

#clear ethernet lmi statistics bridge 1

#show ethernet lmi statistics bridge 1
ELMI statistics for interface eth1
Ether LMI Link Status: UP
UNI Id: UNI_ETH1
------
Reliability Errors:
 Status Timeouts         0              Invalid Sequence Number    0
```

```
 Invalid Status Response 0              Unsolicit Status Rcvd      0
Protocol Errors:
 Invalid Protocol Version 0             Invalid EVC Reference Id   0
 Invalid Message Type     0             Out of Sequence IE         0
 Duplicated IE            0             Mandatory IE Missing       0
 Invalid Mandatory IE     0             Invalid non-Mandatory IE   0
 Unrecognized IE          0             Unexpected IE              0
 Short Message            0
 Last Full Status Enq Sent: 00:00:00    Last Full Status Rcvd: 00:00:00
 Last Status Check Sent: 00:00:00       Last Status Check Rcvd : 00:00:11
 Last counters cleared : 00:00:06
```

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