A P P E N D I X A

Sample Configlets

This appendix provides sample configlets for L2VPN and Metro Ethernet service provisioning in ISC. It contains the following sections:

Overview

The configlets provided in this appendix show the CLIs generated by ISC for particular services and features. Each configlet example provides the following information:

- Service
- Feature
- Devices configuration (network role, hardware platform, relationship of the devices and other relevant information)
- Sample configlets for each device in the configuration
- Comments

Overview

> **Note**   The configlets generated by ISC are only the delta between what needs to be provisioned and what currently exists on the device. This means that if a relevant CLI is already on the device, it does not show up in the associated configlet.

> **Note**   The CLIs shown in bold are the most relevant commands.

> **Note**   All examples in this appendix assume an MPLS core.

ERS (Point-to-Point)

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: ERS (point-to-point)
- Device configuration:
  - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL
  - The U-PE is a CISCO3750ME with 12.2(25)EY1, no port security
  - L2VPN point-to-point.
  - C3750ME (FA1/0/4 – FA1/0/23) <–> C7600 (FA8/17)

Configlets

UP-E	N-PE
vlan 772 exit ! interface FastEthernet1/0/23 switchport trunk allowed vlan 500,772 ! interface FastEthernet1/0/4 no cdp enable no keepalive no ip address **switchport trunk allowed vlan 500,772** **spanning-tree bpdufilter enable** **mac access-group ISC-FastEthernet1/0/4 in** **!** **mac access-list extended** **ISC-FastEthernet1/0/4** **deny any host 0100.0ccc.cccc** **deny any host 0100.0ccc.cccd** **deny any host 0100.0ccd.cdd0** **deny any host 0180.c200.0000** **permit any any**	vlan 772 exit ! interface FastEthernet8/17 switchport trunk allowed vlan 1,451,653,659,766-768,772,878 ! **interface Vlan772** **no ip address** **description L2VPN ERS** **xconnect 99.99.8.99 89027 encapsulation** **mpls** **no shutdown**

Comments

- The N-PE is a 7600 with an OSM or SIP-600 module.
- The U-PE is a generic Metro Ethernet (ME) switch. Customer BPDUs are blocked by the PACL.

ERS (Point-to-Point) with UNI Port Security

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: ERS (point-to-point) with UNI port security
- Device configuration:
  - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, OSM
  - The U-PE is a CISCO3550 with IOS 12.2(25)SEC2. Port security is enabled.
  - L2VPN point-to-point
  - C3550ME (FA3/31– FA3/23) <–> C7600 (FA2/18)

Configlets

UP-E	N-PE
vlan 788 exit ! interface FastEthernet3/23 no ip address switchport trunk allowed vlan 783,787-788 ! interface FastEthernet3/31 no cdp enable no keepalive no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan none switchport trunk allowed vlan 788 **switchport port-security** **switchport nonegotiate** **switchport port-security maximum 45** **switchport port-security aging time 34** **switchport port-security violation shutdown** **switchport port-security mac-address** **3456.3456.5678** spanning-tree bpdufilter enable mac access-group ISC-FastEthernet3/31 in ! mac access-list extended ISC-FastEthernet3/31 deny any host 0100.0ccc.cccc deny any host 0100.0ccc.cccd deny any host 0100.0ccd.cdd0 deny any host 0180.c200.0000 **deny any host 1234.3234.3432** permit any any	vlan 788 exit ! interface FastEthernet2/18 switchport trunk allowed vlan 350,351,430,630,777,780,783,785-788 ! interface Vlan788 no ip address description L2VPN ERS with UNI port security xconnect 99.99.5.99 89028 encapsulation mpls no shutdown

Comments

- The N-PE is a 7600 with an OSM or SIP-600 module.
- The U-PE is a generic Metro Ethernet (ME) switch. The customer BPDUs are blocked by the PACL.
- Various UNI port security commands are provisioned.

- A user-defined PACL entry is added to the default PACL.

EWS (Point-to-Point)

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: EWS (point-to-point)
- Device configuration:
    - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL
    - The U-PE is a CISCO3750ME with IOS 12.2(25)EY1. No port security, no tunneling.
    - L2VPN point-to-point
    - QinQ UNI
    - C3750ME (FA1/0/20 – FA1/0/23) <–> C7600 (FA8/17)

Configlets

UP-E	N-PE

`system mtu 1522`
`!`
`vlan 774`
`exit`
`!`
`interface FastEthernet1/0/20`
`no cdp enable`
`no keepalive`
`switchport`
`switchport access vlan 774`
`switchport mode dot1q-tunnel`
`switchport nonegotiate`
`spanning-tree portfast`
`spanning-tree bpdufilter enable`
`!`
`interface FastEthernet1/0/23`
`no ip address`
`switchport trunk allowed vlan 774,787-788`
	`vlan 774`
	`exit`
	`!`
	`interface FastEthernet8/17`
	`switchport trunk allowed vlan`
	`1,451,653,659,766-768,772,773-774,878`
	`!`
	`interface Vlan774`
	`no ip address`
	`description L2VPN EWS`
	`xconnect 99.99.8.99 89029 encapsulation`
	`mpls`
	`no shutdown`

Comments

- The N-PE is a 7600 with a OSM or SIP-600 module. Provisioning is the same as the ERS example.
- The U-PE is a generic Metro Ethernet (ME) switch.
- No PACL provisioned by default. BPDU can be tunneled if desired.
- The system MTU needs to set to 1522 to handle the extra 4 bytes of QinQ frames.

EWS (Point-to-Point) with UNI Port Security, BPDU Tunneling

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: EWS (point-to-point) with Port security, BPDU tunneling
- Device configuration:
  - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL
  - The U-PE is a CISCO3750ME with IOS 12.2(25)EY1. No port security, with tunneling.
  - L2VPN point-to-point
  - QinQ UNI

Configlets

UP-E	N-PE
| ```
system mtu 1522
!
vlan 775
exit
!
system mtu 1522
!
vlan 775
exit
!
interface FastEthernet1/0/19
no cdp enable
no keepalive
switchport
switchport access vlan 775
switchport mode dot1q-tunnel
switchport nonegotiate
switchport port-security maximum 34
switchport port-security aging time 32
switchport port-security violation shutdown
switchport port-security
l2protocol-tunnel cdp
l2protocol-tunnel stp
l2protocol-tunnel vtp
l2protocol-tunnel shutdown-threshold cdp 88
l2protocol-tunnel shutdown-threshold stp 99
l2protocol-tunnel shutdown-threshold vtp 56
l2protocol-tunnel drop-threshold cdp 56
l2protocol-tunnel drop-threshold stp 64
l2protocol-tunnel drop-threshold vtp 34
storm-control unicast level 34.0
storm-control broadcast level 23.0
storm-control multicast level 12.0
spanning-tree portfast
spanning-tree bpdufilter enable
mac access-group ISC-FastEthernet1/0/19 in

interface FastEthernet1/0/23
no ip address
switchport trunk allowed vlan
774-775,787-788

!
mac access-list extended
ISC-FastEthernet1/0/19
no permit any any
deny any host 3456.3456.1234
permit any any
``` | ```
vlan 775
exit
!
interface FastEthernet8/17
switchport trunk allowed vlan
1,451,653,659,766-768,772,773-775,878
!
interface Vlan775
no ip address
description L2VPN EWS
xconnect 99.99.8.99 89029 encapsulation
mpls
no shutdown
``` |

Comments

- The N-PE is a 7600 with an OSM or SIP-600 module. Provisioning is the same as the ERS example.

- The U-PE is a generic Metro Ethernet (ME) switch.

- PACL with one user-defined entry.

- BPDUs (CDP, STP and VTP) are tunneled through the MPLS core.

- Storm control is enabled for unicast, multicast, and broadcast.

EWS Hybrid

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: EWS hybrid. One side is EWS UNI; the other side is ERS NNI
- Device configuration:
  - The N-PE is a CISCO7600 with 12.2(18)SXF, Sup720-3BXL
  - The U-PE is a CISCO3750ME with 12.2(25)EY1. No port security, with tunneling.
  - L2VPN point-to-point
  - QinQ UNI
  - C3750ME (FA1/0/20 – FA1/0/23) <–> C7600 (FA8/17)

> **Note**   The first configlet example is the EWS side (UNI). The second configlet is the ERS side (NNI).

Configlets (EWS)

UP-E	N-PE
| ```
system mtu 1522
!
vlan 775
exit
!
system mtu 1522
!
vlan 775
exit
!
interface FastEthernet1/0/19
no cdp enable
no keepalive
switchport
switchport access vlan 775
switchport mode dot1q-tunnel
switchport nonegotiate
switchport port-security maximum 34
switchport port-security aging time 32
switchport port-security violation shutdown
switchport port-security
l2protocol-tunnel cdp
l2protocol-tunnel stp
l2protocol-tunnel vtp
l2protocol-tunnel shutdown-threshold cdp 88
l2protocol-tunnel shutdown-threshold stp 99
l2protocol-tunnel shutdown-threshold vtp 56
l2protocol-tunnel drop-threshold cdp 56
l2protocol-tunnel drop-threshold stp 64
l2protocol-tunnel drop-threshold vtp 34
storm-control unicast level 34.0
storm-control broadcast level 23.0
storm-control multicast level 12.0
spanning-tree portfast
spanning-tree bpdufilter enable
mac access-group ISC-FastEthernet1/0/19 in

interface FastEthernet1/0/23
no ip address
switchport trunk allowed vlan
774-775,787-788

!
mac access-list extended
ISC-FastEthernet1/0/19
no permit any any
deny any host 3456.3456.1234
permit any any
``` | ```
vlan 775
exit
!
interface FastEthernet8/17
switchport trunk allowed vlan
1,451,653,659,766-768,772,773-775,878
!
interface Vlan775
no ip address
description L2VPN EWS
xconnect 99.99.8.99 89029 encapsulation
mpls
no shutdown
``` |

Comments

- This is the EWS side (UNI).

- N-PE is 7600 with an OSM or a SIP-600 module. Provisioning is the same as the ERS.

- The U-PE is a generic Metro Ethernet (ME) switch.

- PACL with one user-defined entry.

- BPDUs (cdp, stp and vtp) are tunneled through the MPLS core.

- Storm control is enabled for unicast, multicast, and broadcast.

Configlets (ERS)

UP-E	N-PE
system mtu 1522 vlan 775 exit interface FastEthernet1/17 switchport trunk allowed vlan 1,451,653,659,766-768,772,773-775,878 interface FastEthernet1/10 switchport trunk allowed vlan 1,451,653,659,766-768,772,773-775,878	vlan 775 exit ! interface FastEthernet8/17 switchport trunk allowed vlan 1,451,653,659,766-768,772,773-775,878 ! interface Vlan775 no ip address description L2VPN EWS xconnect 99.99.8.99 89029 encapsulation mpls no shutdown

Comments

- This is the ERS side (NNI).

- The N-PE is a 7600 with an OSM or a SIP-600 module. Provisioning is the same as the ERS.

- The U-PE is really a PE-AGG. It connects to the wholesale customer as an NNI. Both ports are regular NNI ports.

VPLS (Multipoint) ERS

Configuration
- Service: L2VPN/Metro Ethernet
- Feature: VPLS (multipoint) ERS
- Device configuration:
  - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL
  - The U-PE is a CISCO3750ME with IOS 12.2(25)EY1. No port security, no tunneling.
  - VPLS Multipoint VPN with VLAN 767
  - C3750ME (FA1/0/21 – FA1/0/23) <–> C7600 (FA2/18)

Configlets

UP-E	N-PE
vlan 767 exit ! interface FastEthernet1/0/21 no cdp enable no keepalive no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan none switchport trunk allowed vlan 767 switchport nonegotiate spanning-tree bpdufilter enable mac access-group ISC-FastEthernet1/0/21 in ! interface FastEthernet1/0/23 no ip address mac access-list extended ISC-FastEthernet1/0/21 deny any host 0100.0ccc.cccc deny any host 0100.0ccc.cccd deny any host 0100.0ccd.cdd0 deny any host 0180.c200.0000 permit any any	**l2 vfi vpls_ers_1-0 manual** **vpn id 89017** **neighbor 99.99.10.9 encapsulation mpls** **neighbor 99.99.5.99 encapsulation mpls** ! vlan 767 exit ! interface FastEthernet2/18 switchport trunk allowed vlan 350,351,430,630,767,780,783,785-791 ! **interface Vlan767** **no ip address** **description VPLS ERS** **xconnect vfi vpls_ers_1-0** **no shutdown**

Comments
- The N-PE is a 7600 with OSM or SIP-600 module.
- The VFI contains all the N-PEs (neighbors) that this N-PE talks to.
- The U-PE is a generic Metro Ethernet (ME) switch. The customer BPDUs are blocked by the PACL. The VPLS ERS UNI is the same as the L2VPN (point-to-point) ERS UNI.
- The SVI (interface 767) refers to the global VFI, which contains multiple peering N-PEs.

VPLS (Multipoint) EWS with BPDU Tunneling

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: VPLS (multipoint) EWS with BPDU tunneling
- Device configuration:
  - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL
  - The U-PE is a CISCO3750ME with IOS 12.2(25)EY1. No port security, no tunneling.
  - VPLS Multipoint VPN, with VLAN 767
  - QinQ UNI
  - C3750ME (FA1/0/12 – FA1/0/23) <–> C7600 (FA2/18)

Configlets

UP-E	N-PE

<pre>system mtu 1522
!
errdisable recovery interval 33
!
vlan 776
exit
!
interface FastEthernet1/0/12
no cdp enable
no keepalive
switchport
switchport access vlan 776
switchport mode dot1q-tunnel
switchport nonegotiate
l2protocol-tunnel cdp
l2protocol-tunnel stp
l2protocol-tunnel vtp
l2protocol-tunnel shutdown-threshold cdp 88
l2protocol-tunnel shutdown-threshold stp 64
l2protocol-tunnel shutdown-threshold vtp 77
l2protocol-tunnel drop-threshold cdp 34
l2protocol-tunnel drop-threshold stp 23
l2protocol-tunnel drop-threshold vtp 45
no shutdown
spanning-tree portfast
spanning-tree bpdufilter enable</pre>
	<pre>**l2 vfi vpls_ews-89019 manual**
	vpn id 89019
	neighbor 99.99.8.99 encapsulation mpls
	!
	vlan 776
	exit
	!
	interface FastEthernet8/17
	switchport trunk allowed vlan
	1,451,653,659,766-768,772-776,878
	!
	interface Vlan776
	no ip address
	description VPLS EWS
	xconnect vfi vpls_ews-89019
	no shutdown</pre>

Comments

- The N-PE is a 7600 with an OSM or SIP-600 module
- The VFI contains all the N-PEs (neighbors) that this N-PE talks to.
- The VPLS EWS UNI is the same as L2VPN (point-to-point) EWS UNI.
- The SVI is the same as VPLS ERS SVI.

ERS with 1:1 VLAN Translation

Configuration

- Service: L2VPN/Metro Ethernet
- Feature: ERS with 1:1 VLAN translation
- Device configuration:
    - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL
    - The U-PE is a CISCO3750ME with IOS 12.2(25)EY1. VLAN translation on the NNI port (uplink).
    - L2VPN point-to-point.
    - C3750ME (FA1/0/8 – GI1/1/1) <–> C7600 (FA8/34)

Configlets

UP-E	N-PE
! **vlan 123** exit ! interface FastEthernet1/0/8 no cdp enable no keepalive no ip address **switchport trunk allowed vlan 123** switchport nonegotiate switchport port-security maximum 34 switchport port-security aging time 23 switchport port-security violation protect switchport port-security spanning-tree bpdufilter enable mac access-group ISC-FastEthernet1/0/8 in ! interface GigabitEthernet1/1/1 no ip address switchport mode trunk **switchport trunk allowed vlan 1,123** **switchport vlan mapping 123 778**	vlan 778 exit ! interface FastEthernet8/34 switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 1,778 ! interface Vlan778 no ip address description L2VPN ERS 1 to 1 vlan translation xconnect 99.99.8.99 89032 encapsulation mpls no shutdown

Comments

- VLAN translation is only for L2VPN (point-to-point) ERS.
- In this case, the 1:1 VLAN translation occurs on the U-PE, a 3750. It is provisioned on the NNI (uplink) port.
- The customer VLAN 123 is translated to the provider VLAN 778.

ERS with 2:1 VLAN Translation

Configuration

- Service: L2VPN/Metro Ethernet

- Feature: ERS with VLAN 2:1 translation

- Device configuration:

    - The N-PE is a CISCO7600 with IOS 12.2(18)SXF, Sup720-3BXL

    - The U-PE is a CISCO3750ME with IOS 12.2(25)EY1. VLAN translation on the NNI port (uplink).

    - L2VPN point-to-point.

    - C3750ME (FA1/0/5 – GI1/1/1) <–> C7600 (FA8/34)

Configlets

UP-E	N-PE
vlan 567 exit ! interface FastEthernet1/0/5 no cdp enable no keepalive no ip address switchport **switchport access vlan 567** **switchport mode dot1q-tunnel** switchport trunk allowed vlan none switchport nonegotiate spanning-tree bpdufilter enable mac access-group ISC-FastEthernet1/0/5 in ! interface GigabitEthernet1/1/1 no ip address switchport trunk allowed vlan 1,123,567 **switchport vlan mapping dot1q-tunnel 567** **234 779** ! mac access-list extended ISC-FastEthernet1/0/5 deny any host 0100.0ccc.cccc deny any host 0100.0ccc.cccd deny any host 0100.0ccd.cdd0 deny any host 0180.c200.0000 permit any any	vlan 779 exit ! interface FastEthernet8/34 switchport trunk allowed vlan 1,778-779 ! interface Vlan779 no ip address description L2VPN ERS 2 to 1 vlan translation xconnect 99.99.8.99 89033 encapsulation mpls no shutdown

Comments

- VLAN translation is only for L2VPN (point-to-point) ERS.

- In this case, the 2:1 VLAN translation occurs on the U-PE, a 3750. It is provisioned on the NNI (uplink) port.

- The customer VLAN 123 and the provider VLAN 234 (as part of Q inQ) are translated to a new provider VLAN 779.

ATM over MPLS (VC Mode)

Configuration

- Service: L2VPN
- Feature: ATM over MPLS (ATMoMPLS, a type of AToM) in VC mode
- Device configuration:
    - The N-PE is a CISCO7200 with IOS 12.0(28)S
    - No CE
    - No U-PE
    - L2VPN point-to-point (ATMoMPLS)
    - C7200 (ATM2/0)

Configlets

UP-E	N-PE

(None)	`interface ATM2/0.34234 point-to-point`
	`pvc 213/423 l2transport`
	`encapsulation aa5`
	`xconnect 99.99.4.99 89025 encapsulation`
	`mpls`

Comments

- The N-PE is any MPLS-enabled router.
- L2VPN provisioning is on the ATM VC connection.

ATM over MPLS (VP Mode)

Configuration

- Service: L2VPN
- Feature: ATM over MPLS (ATMoMPLS, a type of AToM) in VP mode
- Device configuration:
  - The N-PE is a CISCO7200 with IOS 12.0(28)S
  - No CE
  - No U-PE
  - L2VPN point-to-point (ATMoMPLS)
  - C7200 (ATM2/0)

Configlets

UP-E	N-PE
(None)	pseudowire-class ISC-pw-tunnel-123 encapsulation mpls preferred-path interface tunnel123 disable-fallback ! interface ATM2/0 atm pvp 131 l2transport xconnect 99.99.4.99 89024 pw-class ISC-pw-tunnel-123

Comments

- The N-PE is any MPLS-enabled router.
- L2VPN provisioning is on the ATM VP connection.
- The L2VPN pseudo-wire is mapped to a TE tunnel.

Frame Relay over MPLS

Configuration

- Service: L2VPN
- Feature: Frame Relay over MPLS (FRoMPLS, a type of AToM)
- Device configuration:
  - The N-PE is a CISCO7200 with IOS 12.0(28)S
  - No CE
  - No U-PE
  - L2VPN point-to-point (ATMoMPLS)
  - C7200 (ATM2/0)

Configlets

UP-E	N-PE

(None)	```interface Serial1/1```
	```exit```
	```!```
	```connect C1_89001 Serial1/1 135 l2transport```
	```xconnect 99.99.4.99 89001 encapsulation```
	```mpls```

Comments

- The N-PE is any MPLS-enabled router.
- L2VPN provisioning is on the serial port for the Frame Relay connection.

Frame Relay (DLCI Mode)

Configuration
- Service: L2VPN over a L2TPv3 core
- Feature: FR in DLCI mode
- Device configuration:
  - The N-PE is a CISCO7200 with IOS 12.0(28)S
  - No CE
  - No U-PE
  - L2VPN point-to-point (ATMoMPLS)
  - C7200 (ATM2/0)

Configlets

UP-E	N-PE

(None)	```pseudowire-class ISC-pw-dynamic-default```
	```encapsulation l2tpv3```
	```ip local interface Loopback10```
	```ip dfbit set```
	```!```
	```interface Serial3/2```
	```encapsulation frame-relay```
	```exit```
	```!```
	```connect ISC_1054 Serial3/2 86 l2transport```
	```xconnect 10.9.1.1 1054 encapsulation l2tpv3```
	```pw-class ISC-pw-dynamic-default```

Comments
- The N-PE is any L2TPv3 enabled router.
- L2VPN provisioning is on the serial port for the Frame Relay connection.

Frame Relay (DLCI Mode)