



## BGP-based VPWS Autodiscovery

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An important aspect of VPN technologies is the ability of network devices to automatically signal to other devices about an association with a particular VPN. Autodiscovery refers to the process of finding all the provider edge routers that participate in a given VPWS instance.

The two primary functions of the VPWS control plane are: auto-discovery and signaling. Both of these functions are accomplished with a single BGP Update advertisement.

When a VPWS cross-connect is configured with BGP auto-discovery and signaling enabled, BGP needs to distribute NLRI for the xconnect with the PE as the BGP next-hop and appropriate CE-ID. Additionally, the cross-connect is associated with one or more BGP export Route Targets (RTs) that are also distributed (along with NLRI).

- [Configuring VPWS with BGP Autodiscovery and Signaling, on page 1](#)
- [VPWS with BGP Autodiscovery and BGP Signaling, on page 3](#)

## Configuring VPWS with BGP Autodiscovery and Signaling

Perform this task to configure BGP-based autodiscovery and signaling.

### Procedure

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**Step 1**     **configure**

**Example:**

```
RP/0/RP0/CPU0:router# configure
```

Enters the global configuration mode.

**Step 2**     **l2vpn**

**Example:**

```
RP/0/RP0/CPU0:router(config)# l2vpn
```

Enters L2VPN configuration mode.

**Step 3**     **xconnect group *group name***

**Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn)# xconnect group gr1
```

Enters configuration mode for the named xconnect group.

**Step 4** **mp2mp** *vpws-domain name***Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc)# mp2mp mp1
```

Enters configuration mode for the named vpws domain.

**Step 5** **vpn-id** *vpn-id***Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-m2mp)# vpn-id 100
```

Specifies the identifier for the VPWS service.

**Step 6** **l2 encapsulation** *vlan***Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-mp2mp)#l2-encapsulation vlan
```

Configure the L2 encapsulation for this L2VPN MP2MP Instance.

**Step 7** **autodiscovery** *bgp***Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-mp2mp)#autodiscovery bgp
```

Enters BGP autodiscovery configuration mode where all BGP autodiscovery parameters are configured.

**Step 8** **rd** { *as-number:nn* | *ip-address:nn* | **auto** }**Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-mp2mp-ad)# rd auto
```

Specifies the route distinguisher (RD).

**Step 9** **route-target** { *as-number:nn* | *ip-address:nn* | **export** | **import** }**Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-mp2mp-ad)# route-target 500:99
```

Specifies the route target (RT).

**Step 10** **signaling-protocol bgp****Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-mp2mp-ad)# signaling-protocol bgp
```

Enables BGP signaling, and enters the BGP signaling configuration submode where BGP signaling parameters are configured.

**Step 11** **ce-id { number }****Example:**

```
RP/0/RP0/CPU0:router(config-l2vpn-xc-mp2mp-ad-sig)# ce-id 10
```

Specifies the local Customer Edge Identifier.

**Step 12** Use the **commit** or **end** command.

**commit** - Saves the configuration changes and remains within the configuration session.

**end** - Prompts user to take one of these actions:

- **Yes** - Saves configuration changes and exits the configuration session.
- **No** - Exits the configuration session without committing the configuration changes.
- **Cancel** - Remains in the configuration mode, without committing the configuration changes.

## VPWS with BGP Autodiscovery and BGP Signaling

The following figure illustrates an example of configuring and verifying VPWS with BGP autodiscovery (AD) and BGP Signaling.

**Figure 1: VPLS with BGP autodiscovery and BGP signaling**

**Configuration at PE1:**

```
l2vpn
  xconnect group gr1
  mp2mp mp1
  vpn-id 100
  l2 encapsulation vlan
  autodiscovery bgp
  rd auto
  route-target 2.2.2.2:100
  ! Signaling attributes
```

```

signaling-protocol bgp
ce-id 1
interface GigabitEthernet0/1/0/1.1 remote-ce-id 2

```

### Configuration at PE2:

```

l2vpn
xconnect group gr1
mp2mp mp1
vpn-id 100
l2 encapsulation vlan
autodiscovery bgp
rd auto
route-target 2.2.2.2:100
! Signaling attributes
signaling-protocol bgp
ce-id 2
interface GigabitEthernet0/1/0/2.1 remote-ce-id 1

```

### Verification:

#### PE1:

```
PE1# show l2vpn discovery xconnect
```

```
Service Type: VPWS, Connected
```

```
List of VPNs (1 VPNs):
```

```
XC Group: gr1, MP2MP mp1
```

```
List of Local Edges (1 Edges):
```

```
Local Edge ID: 1, Label Blocks (1 Blocks)
```

Label	base	Offset	Size	Time Created
-----	-----	-----	-----	-----
16030	1		10	01/24/2009 21:23:04

```
Status Vector: 9f ff
```

```
List of Remote Edges (1 Edges):
```

```
Remote Edge ID: 2, NLRIs (1 NLRIs)
```

Label	base	Offset	Size	Peer ID	Time Created
-----	-----	-----	-----	-----	-----
16045	1		10	1.1.1.1	01/24/2009 21:29:35

```
Status Vector: 7f ff
```

```
PE1# show l2vpn xconnect mp2mp detail
```

```
Group gr1, MP2MP mp1, state: up
```

```
VPN ID: 100
```

```
VPN MTU: 1500
```

```

L2 Encapsulation: VLAN
Auto Discovery: BGP, state is Advertised (Service Connected)
    Route Distinguisher: (auto) 3.3.3.3:32770
    Import Route Targets:
        2.2.2.2:100
    Export Route Targets:
        2.2.2.2:100
    Signaling protocol: BGP
    CE Range: 10
...
Group gr1, XC mpl.1:2, state is up; Interworking none
Local CE ID: 1, Remote CE ID: 2, Discovery State: Advertised
AC: GigabitEthernet0/1/0/1.1, state is up
    Type VLAN; Num Ranges: 1
    VLAN ranges: [1, 1]
    MTU 1500; XC ID 0x2000013; interworking none
PW: neighbor 1.1.1.1, PW ID 65538, state is up ( established )
    PW class not set, XC ID 0x2000013
    Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
        MPLS          Local                      Remote
        -----
        Label         16031                          16045
        MTU           1500                          1500
        Control word  enabled                          enabled
        PW type       Ethernet VLAN                      Ethernet VLAN
        CE-ID         1                                  2
        -----
...
PE1# show bgp l2vpn vpws

BGP router identifier 3.3.3.3, local AS number 100
BGP generic scan interval 60 secs

```

```

BGP table state: Active
Table ID: 0x0
BGP main routing table version 913
BGP NSR converge version 3
BGP NSR converged
BGP scan interval 60 secs
Status codes: s suppressed, d damped, h history, * valid, > best
                i - internal, S stale
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network          Next Hop      Rcvd Label    Local Label
Route Distinguisher: 1.1.1.1:32775
*>i2:1/32           1.1.1.1       16045         nolabel
*>i3:1/32           1.1.1.1       16060         nolabel
Route Distinguisher: 3.3.3.3:32770 (default for vrf gr1:mp1)
*> 1:1/32           0.0.0.0       nolabel       16030
*>i2:1/32           1.1.1.1       16045         nolabel
*>i3:1/32           1.1.1.1       16060         nolabel

```

Processed 5 prefixes, 5 paths

### **PE2:**

```
PE2# show l2vpn discovery xconnect
```

```
Service Type: VPWS, Connected
```

```
List of VPNs (1 VPNs):
```

```
XC Group: gr1, MP2MP mp1
```

```
List of Local Edges (2 Edges):
```

```
Local Edge ID: 2, Label Blocks (1 Blocks)
```

Label base	Offset	Size	Time Created
-----	-----	----	-----
16045	1	10	01/24/2009 21:09:14

```
Status Vector: 7f ff
```

```
Local Edge ID: 3, Label Blocks (1 Blocks)
```

Label base	Offset	Size	Time Created
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```

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16060      1      10      01/24/2009 21:09:14

```

Status Vector: 7f ff

List of Remote Edges (1 Edges):

Remote Edge ID: 1, NLRIs (1 NLRIs)

Label base	Offset	Size	Peer ID	Time Created
-----	-----	----	-----	-----
16030	1	10	3.3.3.3	01/24/2009 21:09:16

Status Vector: 9f ff

```
PE2# show l2vpn xconnect mp2mp detail
```

Group gr1, MP2MP mp1, state: up

VPN ID: 100

VPN MTU: 1500

L2 Encapsulation: VLAN

Auto Discovery: BGP, state is Advertised (Service Connected)

Route Distinguisher: (auto) 1.1.1.1:32775

Import Route Targets:

2.2.2.2:100

Export Route Targets:

2.2.2.2:100

Signaling protocol:BGP

CE Range:10

...

Group gr1, XC mp1.2:1, state is up; Interworking none

Local CE ID: 2, Remote CE ID: 1, Discovery State: Advertised

AC: GigabitEthernet0/1/0/2.1, state is up

Type VLAN; Num Ranges: 1

VLAN ranges: [1, 1]

MTU 1500; XC ID 0x2000008; interworking none

PW: neighbor 3.3.3.3, PW ID 131073, state is up ( established )

PW class not set, XC ID 0x2000008

Encapsulation MPLS, Auto-discovered (BGP), protocol BGP

MPLS	Local	Remote
Label	16045	16031
MTU	1500	1500
Control word enabled		enabled
PW type	Ethernet VLAN	Ethernet VLAN
CE-ID	2	1

...

PE2# show bgp l2vpn vpws

BGP router identifier 1.1.1.1, local AS number 100

BGP generic scan interval 60 secs

BGP table state: Active

Table ID: 0x0

BGP main routing table version 819

BGP NSR converge version 7

BGP NSR converged

BGP scan interval 60 secs

Status codes: s suppressed, d damped, h history, \* valid, > best

i - internal, S stale

Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Rcvd Label	Local Label
Route Distinguisher: 1.1.1.1:32775 (default for vrf gr1:mp1)			
*>i1:1/32	3.3.3.3	16030	nolabel
*> 2:1/32	0.0.0.0	nolabel	16045
*> 3:1/32	0.0.0.0	nolabel	16060
Route Distinguisher: 3.3.3.3:32770			
*>i1:1/32	3.3.3.3	16030	nolabel

Processed 4 prefixes, 4 paths