BGP-based VPWS Autodiscovery

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 participates 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

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

SUMMARY STEPS

1. **configure**
2. **l2vpn**
3. **xconnect group** *group name*
4. **mp2mp** *vpws-domain name*
5. **vpn-id** *vpn-id*
6. **l2 encapsulation vlan**
7. **autodiscovery bgp**
8. **rd** { *as-number:nn* | *ip-address:nn* | **auto** }
9. **route-target** { *as-number:nn* | *ip-address:nn* | **export** | **import** }
10. **signaling-protocol bgp**
11. **ce-id** { *number*}
12. Use the **commit** or **end** command.

DETAILED STEPS

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 verifyingVPWS 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 mp1.1:2, 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

       ---------- ------   ----     -------------------

       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
```