

# Inter-AS Model C for VLL

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## In This Chapter

This section describes advanced inter-AS model C for VLL configurations.

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## **Applicability**

This configuration note is applicable to all of the 7750 SR, 7710 SR and 7450 ESS series (including mixed mode). The information was tested with SROS 8.0 R4.

## Overview

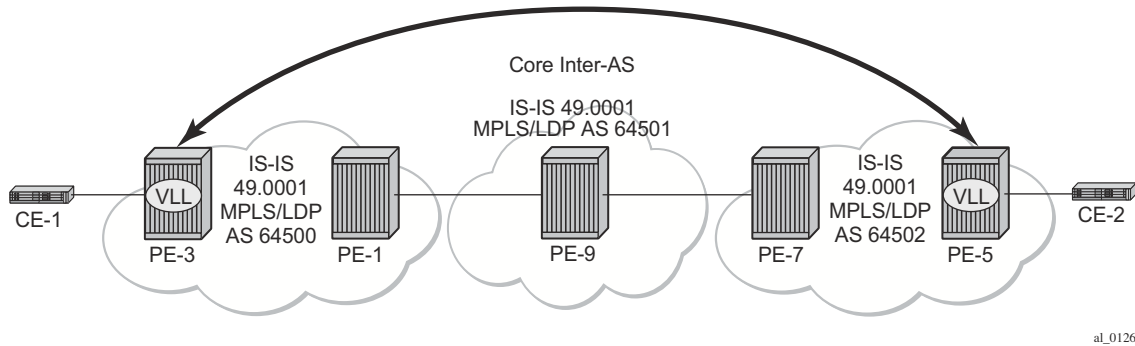
SR OS 8.0R1 adds the support for RFC 3107, *Carrying Label Information in BGP-4*, including VLL/VPLS. Starting with SR-OS 8.0R4, BGP SDPs have been extended and now can also be used with PBB-VPLS services.

ISPs are looking for mechanisms to implement the VLL/VPLS outside an autonomous system (AS). A service provider may have inter-AS operation as a consequence of delivering inter-provider VLL/VPLS or because they use multiple ASs as a result of acquisitions and merges.

The objective of this example is to describe the interconnection of VLL services across multiple ASs.

## Network Setup

Figure 54 shows the network setup used.

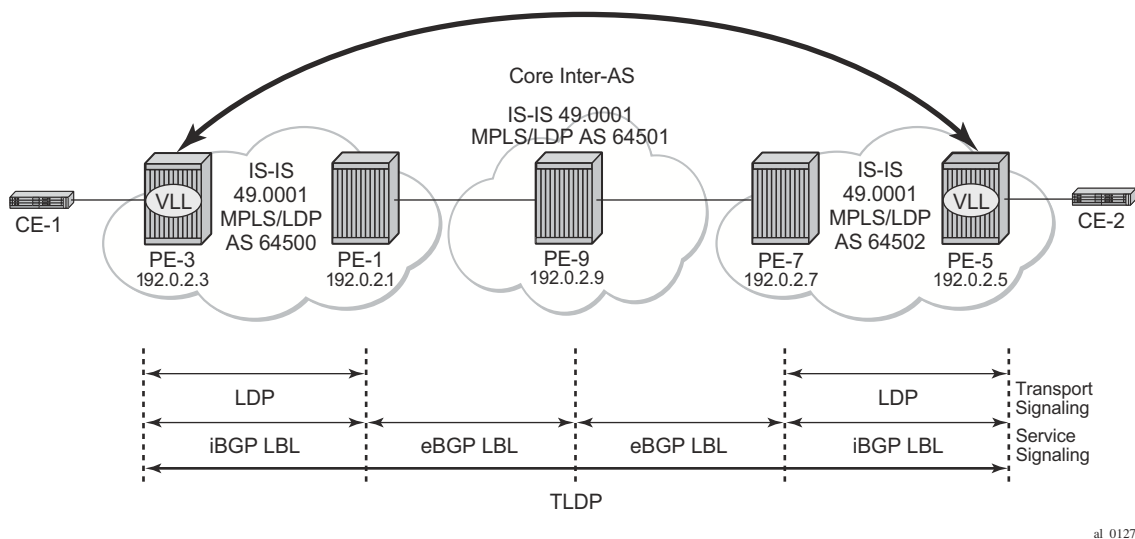


**Figure 54: Network Setup - Inter-AS Model C for VLL**

The network topology displayed in Figure 54 consists of three sites in different ASs with each site using 7750 SRs.

In AS 64500, there are PE-3 and PE-1, AS 64501 has PE-9 and AS 64502 has PE-7 and PE-5.

There is a business customer with two remote locations, Site A and Site B, with customer edge (CE) devices CE-1 connected to the AS 64500 via PE-3 and CE-2 connected to the AS 64502 via PE-5. A VLL service is configured between PE-3 and PE-5 to connect site A and site B together.

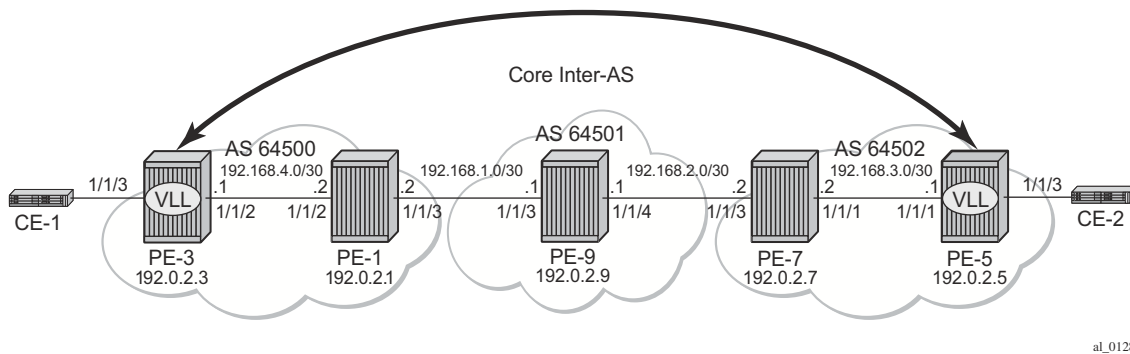


**Figure 55: Inter-AS Model C for VLL**

## Configuration

This section describes all of the relevant configuration tasks for the detailed setup shown in the [Figure 56](#). In this particular example the following protocols are assumed to be already configured.

- IS-IS as the IGP with all the nodes being level Layer1/Layer 2.
- LDP as the MPLS protocol to signal the transport tunnels.
- iBGP within each AS with family IPv4.



**Figure 56: Network Setup Configuration**

## BGP Configuration

The following CLI output shows the BGP configuration — iBGP and eBGP — required for the PE routers to implement VLL Inter-AS.

The configuration on PE-9 in AS 64501 is displayed below:

```
configure router
  bgp
    rapid-withdrawal
    min-route-advertisement 1
    group "ebgp"
      family ipv4
      type external
      local-as 64501
      neighbor 192.168.1.2
        peer-as 64500
        advertise-label ipv4
      exit
      neighbor 192.168.2.2
        peer-as 64502
        advertise-label ipv4
      exit
    exit
  exit
```

The **advertise-label ipv4** statement must be configured so that MPLS labels are carried with IPv4 NLRIs.

The configuration of PE-1 in AS 64500 is displayed below:

```
configure router
  bgp
    rapid-withdrawal
    min-route-advertisement 1
    group "ebgp"
      family ipv4
      type external
      export "export-systems"
      neighbor 192.168.1.1
        peer-as 64501
        advertise-label ipv4
      exit
    exit
    group "ibgp"
      family ipv4
      type internal
      local-as 64500
      neighbor 192.0.2.3
        next-hop-self
        advertise-label ipv4
      exit
    exit
  exit
```

The configuration of PE-7 in AS 64502 is displayed below:

```
configure router
  bgp
    rapid-withdrawal
    min-route-advertisement 1
    export "export-systems"
    group "ebgp"
      family ipv4
      type external
      local-as 64502
      neighbor 192.168.2.1
        peer-as 64501
        advertise-label ipv4
      exit
    exit
  group "ibgp"
    family ipv4
    type internal
    local-as 64502
    neighbor 192.0.2.5
      next-hop-self
      advertise-label ipv4
    exit
  exit
exit
```

To complement the BGP setup, the configurations of PE-3 and PE-5 (the PEs to which the CEs are connected in AS 64500 and AS 64502), respectively, are displayed below:

PE-3:

```
configure router
  bgp
    rapid-withdrawal
    min-route-advertisement 1
    group "ibgp"
      family ipv4
      type internal
      local-as 64500
      neighbor 192.0.2.1
        next-hop-self
        advertise-label ipv4
      exit
    exit
  exit
exit
```

PE-5:

```
configure router
  bgp
    rapid-withdrawal
    min-route-advertisement 1
    group "ibgp"
      family ipv4
```

## Configuration

```
        type internal
        local-as 64502
        neighbor 192.0.2.7
            next-hop-self
            advertise-label ipv4
        exit
    exit
exit
```



## Policy Configuration

The export policy on the PE-1 and PE-7 peering determines the system addresses leaked to the remote AS. It is worth noting here that it is important to modify the default origin attribute from incomplete to IGP in dual-homing scenarios otherwise the iBGP route will be always preferred over the eBGP route.

This is the configuration on PE-1:

```
configure router
  policy-options
    begin
    prefix-list "pe-systems-as64500"
      prefix 192.0.2.1/32 exact
      prefix 192.0.2.3/32 exact
    exit
    policy-statement "export-systems"
      entry 10
        from
          prefix-list "pe-systems-as64500"
        exit
        action accept
          origin igp
        exit
      exit
    exit
  commit
exit
```

This is the configuration on PE-7:

```
configure router
  policy-options
    begin
    prefix-list "pe-systems-as64502"
      prefix 192.0.2.5/32 exact
      prefix 192.0.2.7/32 exact
    exit
    policy-statement "export-systems"
      entry 10
        from
          prefix-list "pe-systems-as64502"
        exit
        action accept
          origin igp
        exit
      exit
    exit
  commit
exit
```

## Service Configuration

Once BGP is configured, the configuration requires the service to be defined (Epipe 1). The focus here is a VLL service (noting that it is also possible to have a similar configuration with VPLS services).

The following CLI shows the service level configuration on PE-3:

```
configure
  service
    customer 1 create
      description "Default customer"
    exit
    sdp 35 mpls create
      far-end 192.0.2.5
      bgp-tunnel
      keep-alive
      shutdown
    exit
    no shutdown
  exit
  epipe 1 customer 1 create
    description "Tunnel to PE-5"
    sap 1/1/3:1 create
    exit
    spoke-sdp 35:1 create
    exit
    no shutdown
  exit
exit
```

The following CLI shows the service level configuration on PE-5:

```
configure
  service
    customer 1 create
      description "Default customer"
    exit
    sdp 53 mpls create
      far-end 192.0.2.3
      bgp-tunnel
      keep-alive
      shutdown
    exit
    no shutdown
  exit
  epipe 1 customer 1 create
    description "Tunnel to PE-3"
    sap 1/1/3:1 create
    exit
    spoke-sdp 53:1 create
    exit
    no shutdown
  exit
exit
```

## Show Commands and Troubleshooting

On PE-3 we have BGP tunnels to the remote AS system addresses that are using LDP as a transport mechanism and the configuration of end-to-end SDPs over which TLDP service labels are exchanged.

The following output shows the SDP and LDP information:

```
*A:PE-3# show service sdp
=====
Services: Service Destination Points
=====
SdpId      Adm MTU  Opr MTU  IP address      Adm  Opr      Deliver  Signal
-----
35         0       1552    192.0.2.5      Up   Up       BGP      TLDP
-----
Number of SDPs : 1
=====

*A:PE-3# show service service-using
=====
Services
=====
ServiceId   Type      Adm  Opr  CustomerId  Service Name
-----
1           Epipe    Up   Up   1           2147483648
2147483648  IES      Up   Down 1           _tmnx_InternalIesService
-----
Matching Services : 2
=====

*A:PE-3# show router ldp session
=====
LDP Sessions
=====
Peer LDP Id      Adj Type  State      Msg Sent  Msg Recv  Up Time
-----
192.0.2.1:0     Link     Established 1351      1351     0d 01:02:08
192.0.2.5:0     Targeted Established 123       123     0d 00:10:42
-----
No. of Sessions: 2
=====
```

The route-table shows that the system IP address of PE-5 is reachable using a BGP tunnel:

```
*A:PE-3# show router route-table
=====
Route Table (Router: Base)
=====
Dest Prefix                                     Type  Proto  Age      Pref
```

## Configuration

Next Hop[Interface Name]				Metric
192.0.2.1/32	Remote	ISIS	01h03m07s	15
192.168.4.2			10	
192.0.2.3/32	Local	Local	01h12m03s	0
system			0	
192.0.2.5/32	Remote	BGP	00h21m22s	170
192.0.2.1 (tunneled)			0	
192.0.2.7/32	Remote	BGP	00h21m22s	170
192.0.2.1 (tunneled)			0	
192.168.4.0/30	Local	Local	01h10m50s	0
int-PE-3-PE-1			0	

No. of Routes: 5

The tunnel-table below shows the details of the LDP, SDP and BGP tunnels. This is followed by the service details, noting that Epipe 1 is using SDP 3. A ping is used to show that there is IP connectivity from PE-3 to the system IP address of PE-5:

```
*A:PE-3# show router tunnel-table
```

Destination	Owner	Encap	TunnelId	Pref	Nexthop	Metric
192.0.2.1/32	ldp	MPLS	-	9	192.168.4.2	10
192.0.2.5/32	sdp	MPLS	35	5	192.0.2.5	0
192.0.2.5/32	bgp	MPLS	-	10	192.0.2.1	1000
192.0.2.7/32	bgp	MPLS	-	10	192.0.2.1	1000

```
*A:PE-3# show service id 1 base
```

Service Basic Information	
Service Id	: 1
Service Type	: Epipe
Name	: (Not Specified)
Description	: Tunnel to PE-5
Customer Id	: 1
Last Status Change:	09/03/2011 17:23:17
Last Mgmt Change	: 09/03/2011 17:22:11
Admin State	: Up
Oper State	: Up
MTU	: 1514
Vc Switching	: False
SAP Count	: 1
SDP Bind Count	: 1
Per Svc Hashing	: Disabled
Force QTag Fwd	: Disabled

Service Access & Destination Points					
Identifier	Type	AdmMTU	OprMTU	Adm	Opr
sap:1/1/3:1	q-tag	1518	1518	Up	Up
sdp:35:1 S(192.0.2.5)	Spok	0	1552	Up	Up

```

=====
*A:PE-3# ping 192.0.2.5
PING 192.0.2.5 56 data bytes
64 bytes from 192.0.2.5: icmp_seq=1 ttl=64 time=3.20ms.
64 bytes from 192.0.2.5: icmp_seq=2 ttl=64 time=3.72ms.
64 bytes from 192.0.2.5: icmp_seq=3 ttl=64 time=3.92ms.
64 bytes from 192.0.2.5: icmp_seq=4 ttl=64 time=3.59ms.
64 bytes from 192.0.2.5: icmp_seq=5 ttl=64 time=3.54ms.

---- 192.0.2.5 PING Statistics ----
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min = 3.20ms, avg = 3.59ms, max = 3.92ms, stddev = 0.235ms

```

The same commands on PE-5 are shown below:

```

*A:PE-5# show service sdp
=====
Services: Service Destination Points
=====
SdpId      Adm MTU  Opr MTU  IP address      Adm  Opr          Deliver  Signal
-----
53         0       1552    192.0.2.3      Up   Up           BGP      TLDP
-----
Number of SDPs : 1
=====

```

```

*A:PE-5# show service service-using
=====
Services
=====
ServiceId  Type      Adm  Opr  CustomerId  Service Name
-----
1          Epipe    Up   Up   1
2147483648 IES      Up   Down 1          _tmnx_InternalIesService
-----
Matching Services : 2
=====

```

```

*A:PE-5# show router ldp session
=====
LDP Sessions
=====
Peer LDP Id      Adj Type  State      Msg Sent  Msg Recv  Up Time
-----
192.0.2.3:0     Targeted Established 331       332       0d 00:29:46
192.0.2.7:0     Link     Established 1253      1255      0d 00:57:44
-----
No. of Sessions: 2
=====

```

## Configuration

```
*A:PE-5# show router route-table
=====
Route Table (Router: Base)
=====
Dest Prefix                               Type   Proto   Age           Pref
  Next Hop[Interface Name]                Metric
-----
192.0.2.1/32                               Remote BGP     00h42m30s    170
    192.0.2.7 (tunneled)                   0
192.0.2.3/32                               Remote BGP     00h42m30s    170
    192.0.2.7 (tunneled)                   0
192.0.2.5/32                               Local  Local    00h58m27s    0
    system                                  0
192.0.2.7/32                               Remote ISIS    00h56m41s    15
    192.168.3.2                             10
192.168.3.0/30                             Local  Local    00h57m28s    0
    int-PE5-PE7                             0
-----
No. of Routes: 5
=====
```

```
*A:PE-5# show router tunnel-table
=====
Tunnel Table (Router: Base)
=====
Destination      Owner Encap TunnelId  Pref   Nexthop      Metric
-----
192.0.2.1/32     bgp   MPLS   -         10    192.0.2.7    1000
192.0.2.3/32     sdp   MPLS   53        5     192.0.2.3    0
192.0.2.3/32     bgp   MPLS   -         10    192.0.2.7    1000
192.0.2.7/32     ldp   MPLS   -         9     192.168.3.2  10
=====
```

```
*A:PE-5#
```

```
*A:PE-5# show service id 1 base
=====
Service Basic Information
=====
Service Id       : 1                               Vpn Id          : 0
Service Type     : Epipe
Name             : (Not Specified)
Description      : Tunnel to PE-3
Customer Id      : 1
Last Status Change: 09/03/2011 17:23:22
Last Mgmt Change : 09/03/2011 17:23:22
Admin State      : Up                               Oper State      : Up
MTU              : 1514
Vc Switching     : False
SAP Count        : 1                               SDP Bind Count  : 1
Per Svc Hashing  : Disabled
Force QTag Fwd   : Disabled
-----
Service Access & Destination Points
-----
Identifier                               Type           AdmMTU  OprMTU  Adm  Opr
-----
sap:1/1/3:1                               q-tag         1518    1518    Up   Up
-----
```

```

sdp:53:1 S(192.0.2.3)                Spok          0          1552      Up      Up
=====

*A:PE-5# ping 192.0.2.3
PING 192.0.2.3 56 data bytes
64 bytes from 192.0.2.3: icmp_seq=1 ttl=64 time=3.45ms.
64 bytes from 192.0.2.3: icmp_seq=2 ttl=64 time=3.74ms.
64 bytes from 192.0.2.3: icmp_seq=3 ttl=64 time=4.40ms.
64 bytes from 192.0.2.3: icmp_seq=4 ttl=64 time=3.85ms.
64 bytes from 192.0.2.3: icmp_seq=5 ttl=64 time=4.93ms.

---- 192.0.2.3 PING Statistics ----
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min = 3.45ms, avg = 4.07ms, max = 4.93ms, stddev = 0.530ms

```

On PE-5, the BGP route to the system IP address of PE-3 can be seen with a next hop of PE-7:

```

*A:PE-5# show router bgp routes
=====
BGP Router ID:192.0.2.5          AS:64502          Local AS:64502
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes  : i - IGP, e - EGP, ? - incomplete, > - best
=====
BGP IPv4 Routes
=====
Flag  Network                LocalPref  MED
      Nexthop                VPNIabel
      As-Path
-----
u*>i  192.0.2.1/32             100        None
      192.0.2.7
      64501 64500
u*>i  192.0.2.3/32            100        None
      192.0.2.7
      64501 64500
*i    192.0.2.5/32          100        10
      192.0.2.7
      No As-Path
*i    192.0.2.7/32         100        None
      192.0.2.7
      No As-Path
-----
Routes : 4
=====

```

Again on PE-5, the FIB on slot 1 shows that the system IP address of PE-3 is reachable using BGP over an LDP transport to PE-7:

```
*A:PE-5# show router fib 1
=====
FIB Display
=====
Prefix                                     Protocol
  NextHop
-----
192.0.2.1/32                               BGP
  192.0.2.7 (Transport:LDP)
192.0.2.3/32                               BGP
  192.0.2.7 (Transport:LDP)
192.0.2.5/32                               LOCAL
  192.0.2.5 (system)
192.0.2.7/32                               ISIS
  192.168.3.2 (int-PE5-PE7)
192.168.3.0/30                             LOCAL
  192.168.3.0 (int-PE5-PE7)
-----
Total Entries : 5
=====
```

The show commands on PE-9 router in AS 64501 are as follows:

```
*A:PE-9# show router bgp summary
=====
BGP Router ID:192.0.2.9      AS:64501      Local AS:64501
=====
BGP Admin State      : Up      BGP Oper State      : Up
Total Peer Groups    : 1        Total Peers          : 2
Total BGP Paths      : 6        Total Path Memory    : 752
Total IPv4 Remote Rts : 4        Total IPv4 Rem. Active Rts : 4
Total IPv6 Remote Rts : 0        Total IPv6 Rem. Active Rts : 0
Total Supressed Rts  : 0        Total Hist. Rts     : 0
Total Decay Rts      : 0

Total VPN Peer Groups : 0        Total VPN Peers      : 0
Total VPN Local Rts   : 0
Total VPN-IPv4 Rem. Rts : 0      Total VPN-IPv4 Rem. Act. Rts : 0
Total VPN-IPv6 Rem. Rts : 0      Total VPN-IPv6 Rem. Act. Rts : 0
Total L2-VPN Rem. Rts : 0        Total L2VPN Rem. Act. Rts   : 0
Total VPN Supp. Rts   : 0        Total VPN Hist. Rts       : 0
Total VPN Decay Rts   : 0
Total MVPN-IPv4 Rem Rts : 0      Total MVPN-IPv4 Rem Act Rts : 0
Total MDT-SAFI Rem Rts : 0      Total MDT-SAFI Rem Act Rts : 0
=====
BGP Summary
=====
Neighbor
      AS PktRcvd InQ Up/Down State|Rcv/Act/Sent (Addr Family)
      PktSent OutQ
-----
192.168.1.2
```



```

          64500    128    0 01h01m22s 2/2/2 (IPv4)
          132      0
192.168.2.2
          64502    113    0 00h53m31s 2/2/2 (IPv4)
          117      0
=====

```

\*A:PE-9# show router bgp routes

```

=====
BGP Router ID:192.0.2.9      AS:64501      Local AS:64501
=====
Legend -
Status codes  : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes  : i - IGP, e - EGP, ? - incomplete, > - best
=====
BGP IPv4 Routes
=====
Flag  Network                               LocalPref  MED
      Nexthop                               VPNLabel
      As-Path
-----
u*>i  192.0.2.1/32                             None        None
      192.168.1.2
      64500
u*>i  192.0.2.3/32                             None        10
      192.168.1.2
      64500
u*>i  192.0.2.5/32                             None        10
      192.168.2.2
      64502
u*>i  192.0.2.7/32                             None        None
      192.168.2.2
      64502
-----
Routes : 4
=====

```

\*A:PE-9# show router bgp inter-as-label

```

=====
BGP Inter-AS labels
=====
NextHop                               Received      Advertised    Label
                                      Label         Label         Origin
-----
192.168.1.2                           131068       131069        External
192.168.1.2                           131069       131070        External
192.168.2.2                           131066       131067        External
192.168.2.2                           131067       131068        External
=====

```

\*A:PE-9# show router route-table

```

=====
Route Table (Router: Base)
=====
Dest Prefix                               Type  Proto  Age  Pref
      Next Hop[Interface Name]                               Metric
-----

```

## Configuration

```

-----
192.0.2.1/32                               Remote BGP      00h35m46s  170
    192.168.1.2                             0
192.0.2.3/32                               Remote BGP      00h35m46s  170
    192.168.1.2                             0
192.0.2.5/32                               Remote BGP      00h31m56s  170
    192.168.2.2                             0
192.0.2.7/32                               Remote BGP      00h31m56s  170
    192.168.2.2                             0
192.0.2.9/32                               Local  Local      01h08m18s   0
    system                                    0
192.168.1.0/30                             Local  Local      01h07m10s   0
    int-PE-9-PE-1                            0
192.168.2.0/30                             Local  Local      01h06m27s   0
    int-PE-9-PE-7                            0
-----
No. of Routes: 7
=====

```

The commands on PE-1 are shown below:

```
*A:PE-1# show router bgp summary
```

```

=====
BGP Router ID:192.0.2.1      AS:64500      Local AS:64500
=====
BGP Admin State      : Up          BGP Oper State      : Up
Total Peer Groups    : 2          Total Peers         : 2
Total BGP Paths      : 5          Total Path Memory   : 612
Total IPv4 Remote Rts : 2          Total IPv4 Rem. Active Rts : 2
Total IPv6 Remote Rts : 0          Total IPv6 Rem. Active Rts : 0
Total Supressed Rts  : 0          Total Hist. Rts     : 0
Total Decay Rts      : 0

Total VPN Peer Groups : 0          Total VPN Peers     : 0
Total VPN Local Rts   : 0
Total VPN-IPv4 Rem. Rts : 0      Total VPN-IPv4 Rem. Act. Rts: 0
Total VPN-IPv6 Rem. Rts : 0      Total VPN-IPv6 Rem. Act. Rts: 0
Total L2-VPN Rem. Rts : 0          Total L2VPN Rem. Act. Rts : 0
Total VPN Supp. Rts   : 0          Total VPN Hist. Rts  : 0
Total VPN Decay Rts   : 0
Total MVPN-IPv4 Rem Rts : 0      Total MVPN-IPv4 Rem Act Rts : 0
Total MDT-SAFI Rem Rts : 0          Total MDT-SAFI Rem Act Rts : 0
=====
BGP Summary
=====
Neighbor
      AS PktRcvd InQ  Up/Down  State|Rcv/Act/Sent (Addr Family)
      PktSent OutQ
-----
192.0.2.3
      64500    137    0 01h06m58s 0/0/2 (IPv4)
      138      0
192.168.1.1
      64501    119    0 00h57m29s 2/2/2 (IPv4)
      121      0
=====

```

```
*A:PE-1# show router bgp inter-as-label
```

```
=====
BGP Inter-AS labels
=====
```

NextHop	Received Label	Advertised Label	Label Origin
192.168.1.1	131067	131067	External
192.168.1.1	131068	131066	External
192.0.2.1	0	131069	Edge
192.0.2.3	0	131068	Internal

```
*A:PE-1# show router route-table
```

```
=====
Route Table (Router: Base)
=====
```

Dest Prefix Next Hop[Interface Name]	Type	Proto	Age	Pref Metric
192.0.2.1/32 system	Local	Local	01h12m22s	0
192.0.2.3/32 192.168.4.1	Remote	ISIS	01h09m14s	15
192.0.2.5/32 192.168.1.1	Remote	BGP	00h27m29s	170
192.0.2.7/32 192.168.1.1	Remote	BGP	00h27m29s	170
192.168.1.0/30 int-PE-3-PE-9	Local	Local	01h10m05s	0
192.168.4.0/30 int-PE-1-PE-3	Local	Local	01h11m15s	0

```
-----
No. of Routes: 6
=====
```

### The show commands on PE-7:

```
*A:PE-7# show router bgp summary
```

```
=====
BGP Router ID:192.0.2.7      AS:64502      Local AS:64502
=====
```

BGP Admin State	: Up	BGP Oper State	: Up
Total Peer Groups	: 2	Total Peers	: 2
Total BGP Paths	: 5	Total Path Memory	: 612
Total IPv4 Remote Rts	: 2	Total IPv4 Rem. Active Rts	: 2
Total IPv6 Remote Rts	: 0	Total IPv6 Rem. Active Rts	: 0
Total Supressed Rts	: 0	Total Hist. Rts	: 0
Total Decay Rts	: 0		
Total VPN Peer Groups	: 0	Total VPN Peers	: 0
Total VPN Local Rts	: 0		
Total VPN-IPv4 Rem. Rts	: 0	Total VPN-IPv4 Rem. Act. Rts:	0
Total VPN-IPv6 Rem. Rts	: 0	Total VPN-IPv6 Rem. Act. Rts:	0
Total L2-VPN Rem. Rts	: 0	Total L2VPN Rem. Act. Rts	: 0
Total VPN Supp. Rts	: 0	Total VPN Hist. Rts	: 0
Total VPN Decay Rts	: 0		

## Configuration

```
Total MVPN-IPv4 Rem Rts : 0          Total MVPN-IPv4 Rem Act Rts : 0
Total MDT-SAFI Rem Rts  : 0          Total MDT-SAFI Rem Act Rts  : 0
```

```
=====
BGP Summary
=====
```

```
Neighbor
      AS PktRcvd InQ  Up/Down  State|Rcv/Act/Sent (Addr Family)
      PktSent OutQ
-----
192.0.2.5
      64502   104   0 00h49m52s 0/0/4 (IPv4)
              108   0
192.168.2.1
      64501   118   0 00h56m44s 2/2/2 (IPv4)
              120   0
=====
```

```
*A:PE-7# show router bgp routes
```

```
=====
BGP Router ID:192.0.2.7      AS:64502      Local AS:64502
=====
```

```
Legend -
```

```
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes  : i - IGP, e - EGP, ? - incomplete, > - best
```

```
=====
BGP IPv4 Routes
=====
```

```
Flag Network                      LocalPref MED
      Nexthop                      VPNLabel
      As-Path
-----
u*>i 192.0.2.1/32
      192.168.2.1
      64501 64500
u*>i 192.0.2.3/32
      192.168.2.1
      64501 64500
-----
```

```
Routes : 2
=====
```

```
*A:PE-7# show router bgp inter-as-label
```

```
=====
BGP Inter-AS labels
=====
```

```
NextHop                      Received Advertised Label
                              Label       Label       Origin
-----
192.168.2.1                   131069   131069     External
192.168.2.1                   131070   131068     External
192.0.2.5                     0        131066     Internal
192.0.2.7                     0        131067     Edge
=====
```

## Conclusion

The BGP tunnel based SDP binding is allowed for VLL and VPLS services, including PBB-VPLS in SROS 8.0R4. Using RFC 3107, it is possible to implement inter-AS Model C VLLs.

The examples used in this section illustrates the configuration of VLL Inter-AS for access CE sites. Troubleshooting commands also have been shown so an operator can verify all the procedures.

Conclusion