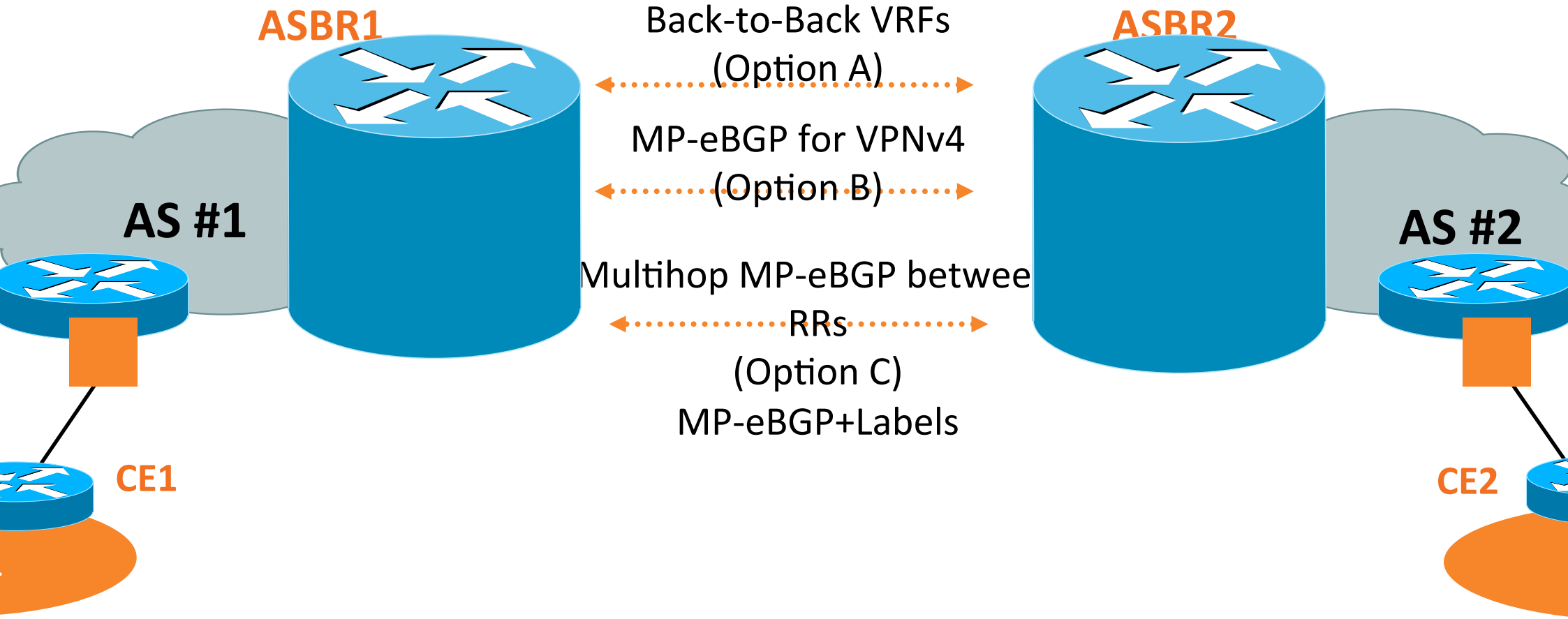
Introduction Inter-AS L3VPN

tending VPN services over Inter-AS tworks

- VPN Sites attached to different MPLS VPN Service Provi
- How do you distribute and share VPN routes between AS



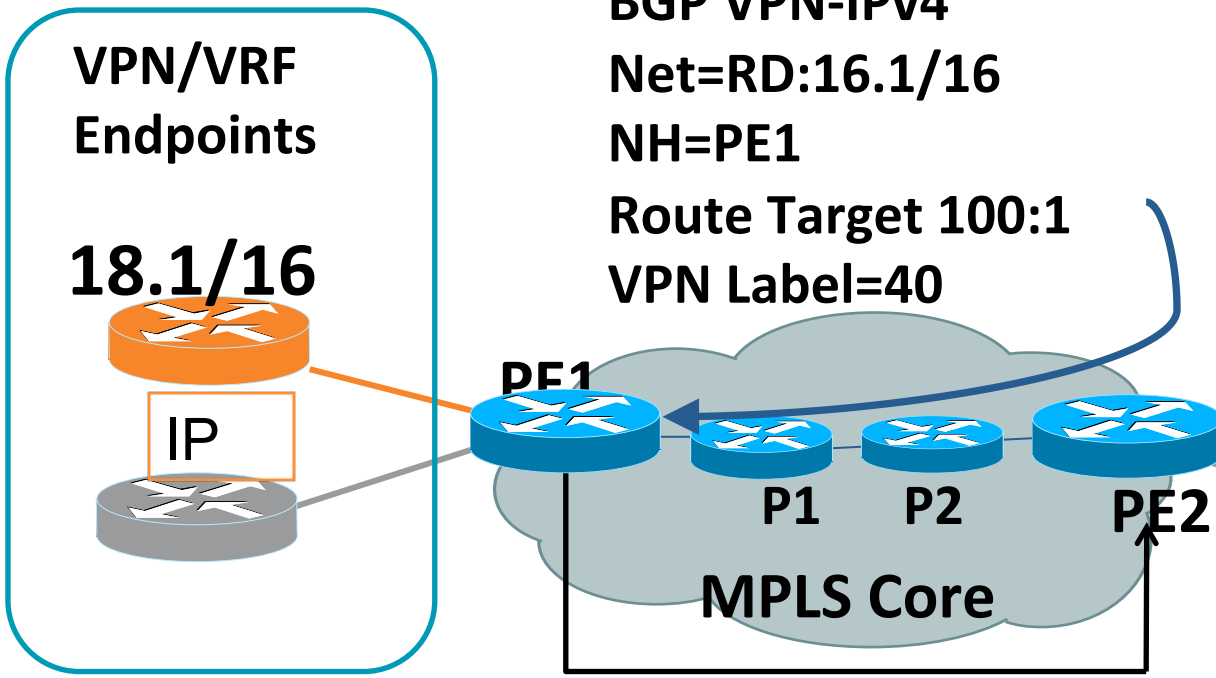
n-AS MPLS VPNs Review

Distinguisher (RD)
t IPv4 routes to VPNv4

Target allows VPN
to be imported/
ed to/from a VPN

E loopbacks are known

P protocol carries
routes and
unities using BGP
s-families



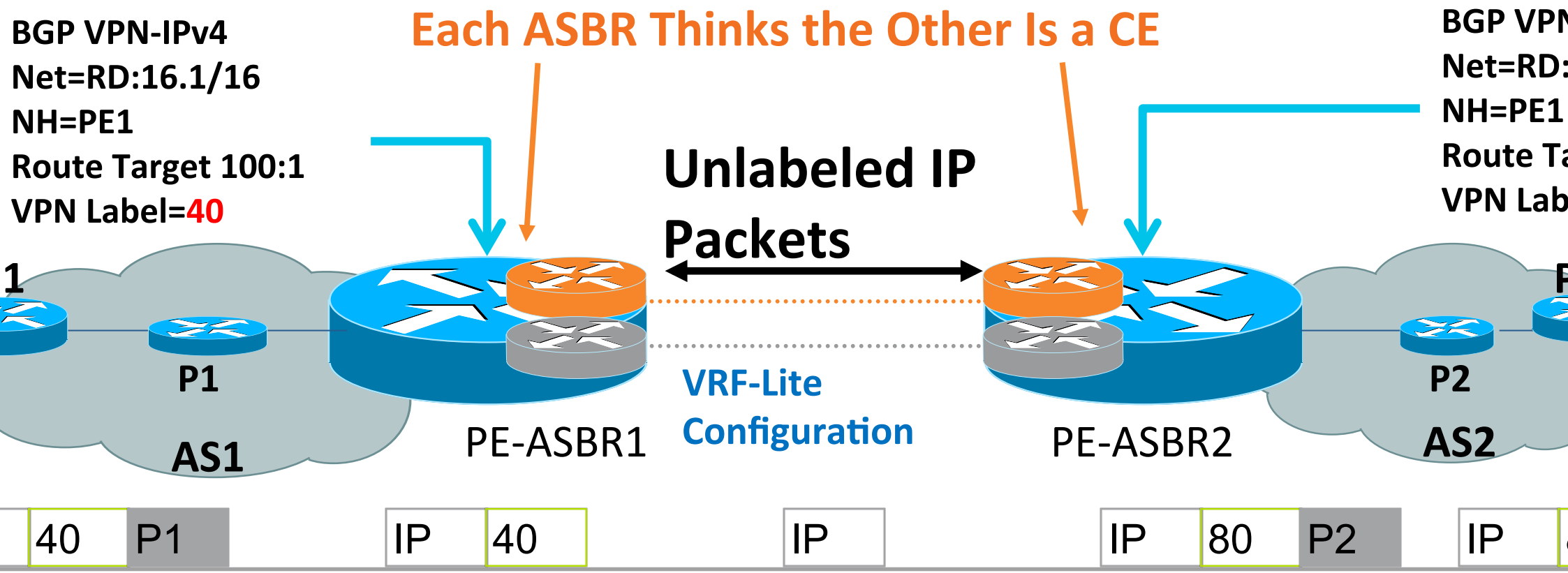
MP-iBGP Update:
BGP VPN-IPv4
Net=RD:18.1/16
NH=PE1
Route Target 100:1
VPN Label=41

IP	40	P1

IP

er-AS VPN—Option A

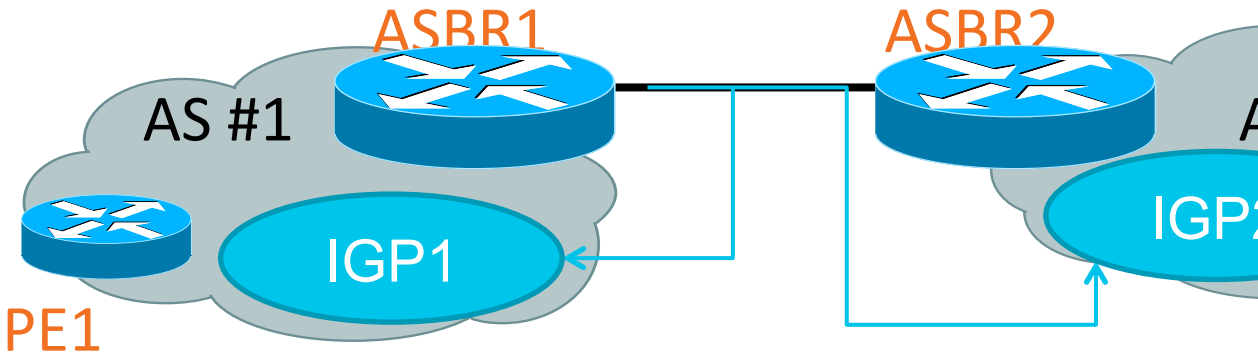
nnecting ASBRs using Back-to-Back VRFs



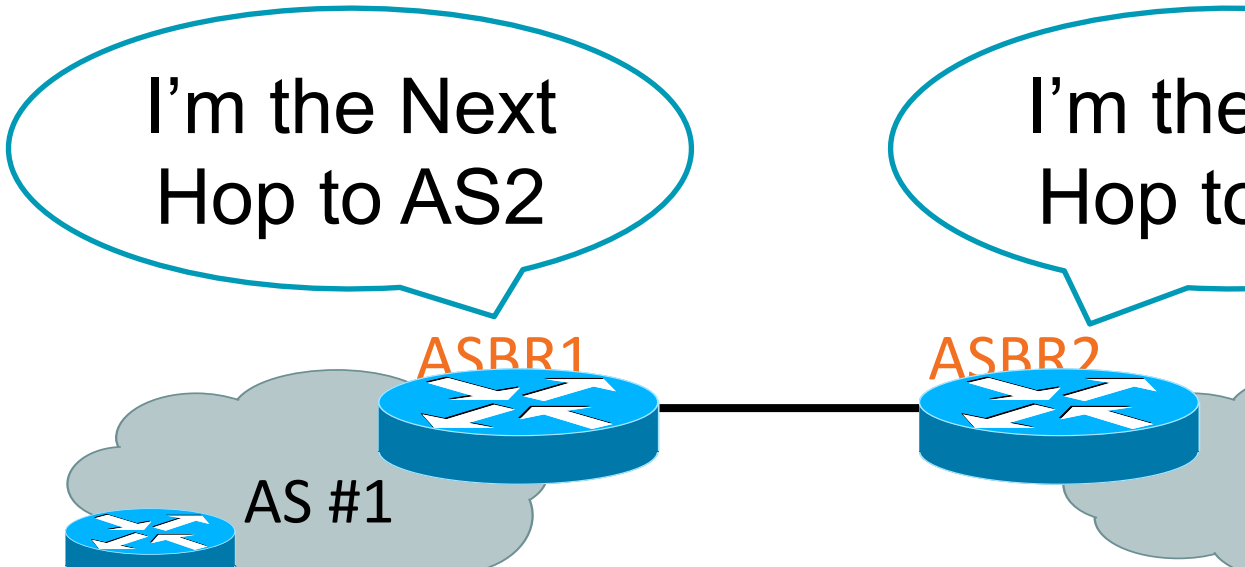
r-AS VPN—Option B

ecting two ASBRs – Two Methods

edistribute eBGP link into the IGP of both AS

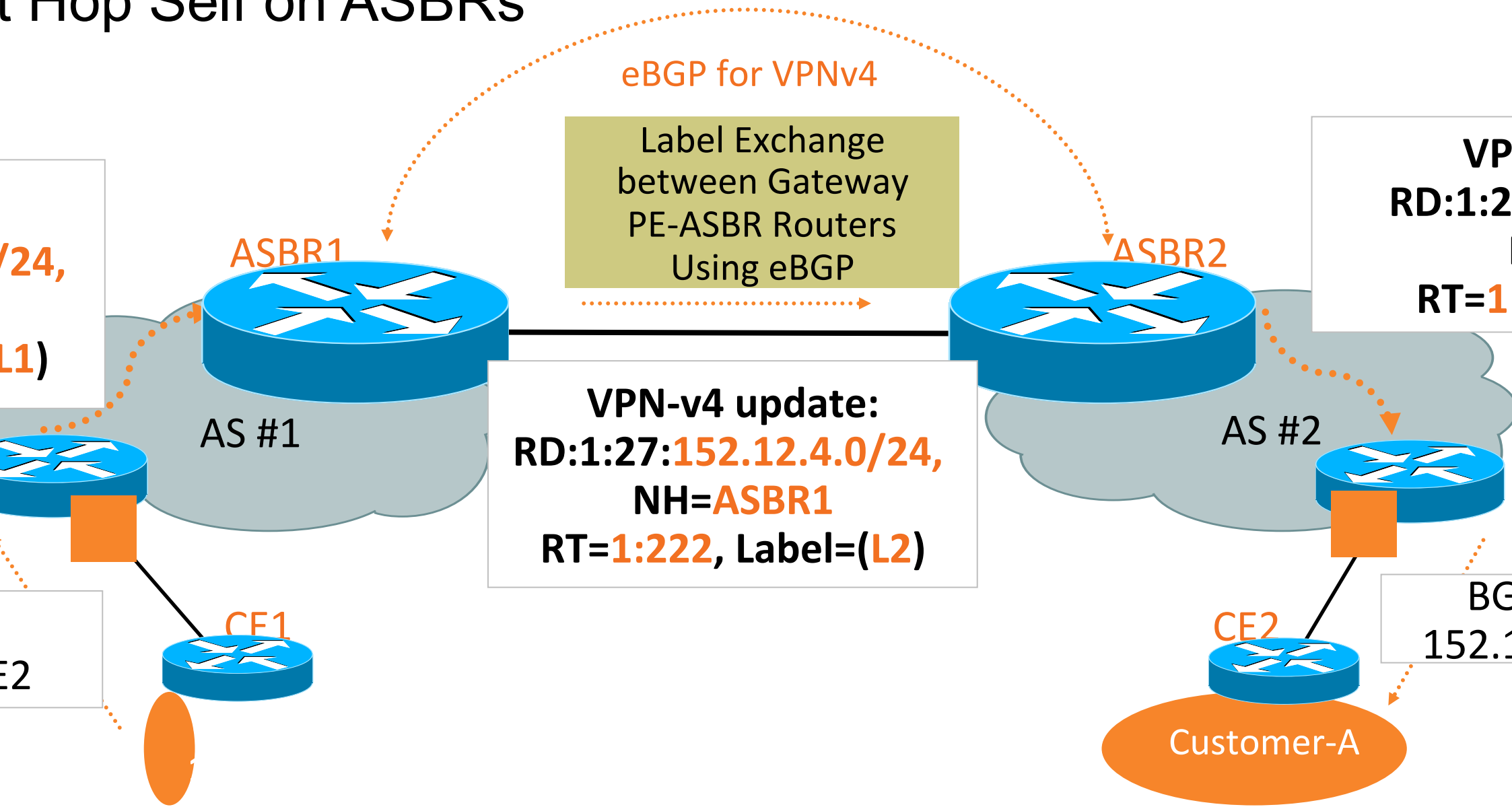


eceiving PE-ASBRs be the next hop



er-AS VPN—Option B

ablishing reachability between geographically dispersed VPN
t Hop Self on ASBRs



v4 Prefixes/Labels from PEs Distributed to ASBRs

er-AS VPN—Option B

blishing reachability between geographically dispersed VPNs u
Self on ASBRs

Virtual Routing Forwarding tables on ASBRs unless ASBR also supp
ctionality (has VRF interfaces)

OS, Receiving PE-ASBR automatically creates a /32 host route to a

ch must be advertised into receiving IGP if next-hop-self is not in operation to maintain the LSP

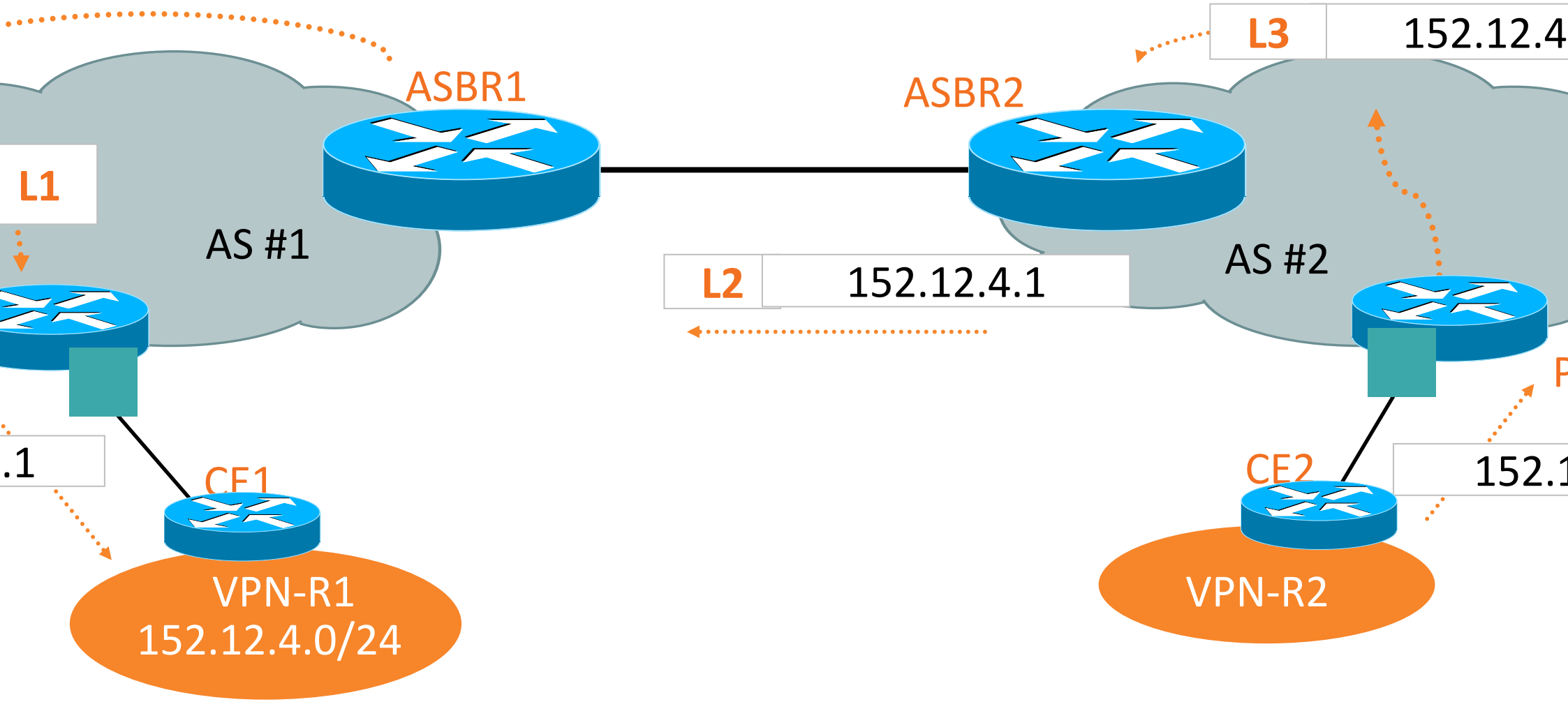
XR, **must** define a static route to the Next Hop of peer ASBR for Opti
l as **all address families (IPv4, IPv6, VPNv4, VPNv6)**. **The CLI is c**
tion B configuration example.

XR, **must** define route-policy to pass or filter selected VPNv4 routes
nd Option C as well as all address families (IPv4, IPv6, VPNv4, V
l is only shown in Option B configuration example.

BR-ASBR link must be directly connected!!!!!! Could use

-AS VPN—Option B

-end VPN packet forwarding - Next Hop Self on AS



_3 are BGP VPN label.

er-AS VPN—Option B

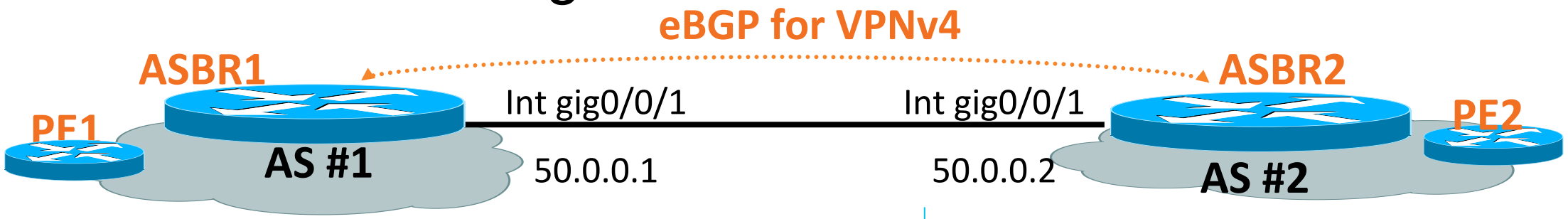
co IOS ASBR eBGP configuration


```
!
router bgp 1
neighbor <ASBR2> remote-as 2
neighbor <PE1> remote-as 1
neighbor <PE1> update-source loopback0
no bgp default route-target filter
!
address-family vpnv4
neighbor <PE1> remote-as 1 activate
neighbor <PE1> remote-as 1 next-hop-self
neighbor <ASBR2> remote-as 2 activate
neighbor <ASBR2> remote-as 2 send-community extended
```

re no bgp default route-target filter command to store VPNv4 routes as it does not have

r-AS VPN—Option B

OS XR ASBR1 Configuration




```
gp 1
tivate
 MPLS forwarding onASBR!)
e <type & #>
 ASBR-ASBR link!)
-family vpnv4 unicast

 <ASBR2>
-as 2
s-family vpnv4 unicast
e VPNv4 address family for ASBR)
olicy pass-all in
olicy pass-all out
orwarding of VPNv4 routes to other AS!)

licy pass-all
```

```
!
neighbor <PE1>
  remote-as 1
  update-source loopback0
  address-family vpnv4 unicast
  next-hop-self
(!Set ASBR1 as next-hop-self!)
!
router static
  50.0.0.2/32 interface gig0/0/1
!
(!Static Route for ASBR-ASBR link
configured. It is not installed auto
IOS!)
```

- **Note: Static route and route-policy required, for**

er-AS VPN—Option C

tihop eBGP VPNv4 Between RRs for better scale

Reflectors exchange VPNv4 routes

Exchange PE loopbacks (IPv4) with labels as these P NH addresses

tes LFIB duplication at ASBRs. ASBRs don't hold prefix/label info.

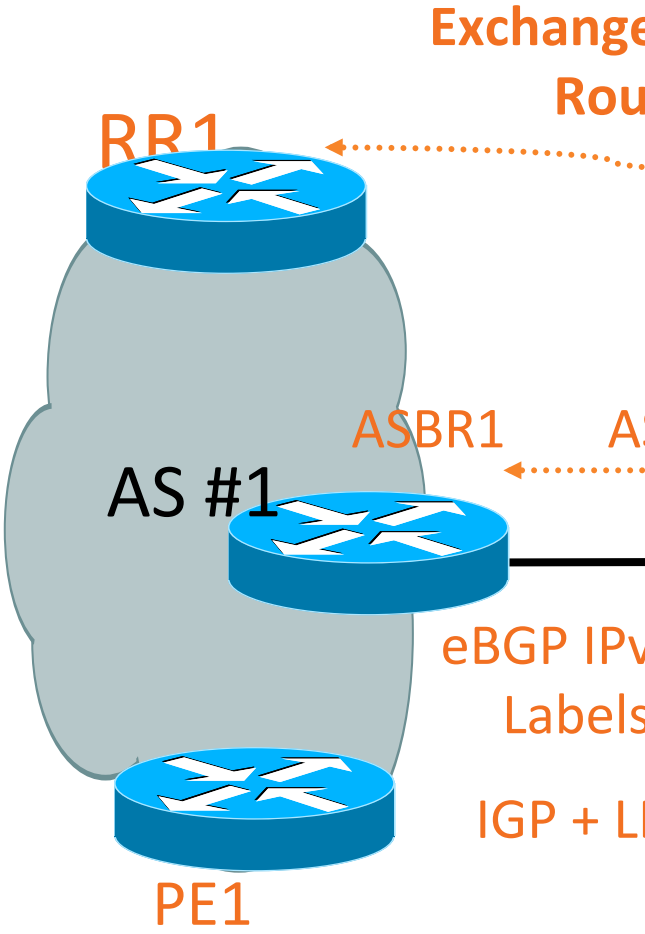
tions for Label Distribution for BGP NH Addresses for each domain:

BGP IPv4 + Labels (RFC3107) – most preferred & ecommended

GP + LDP

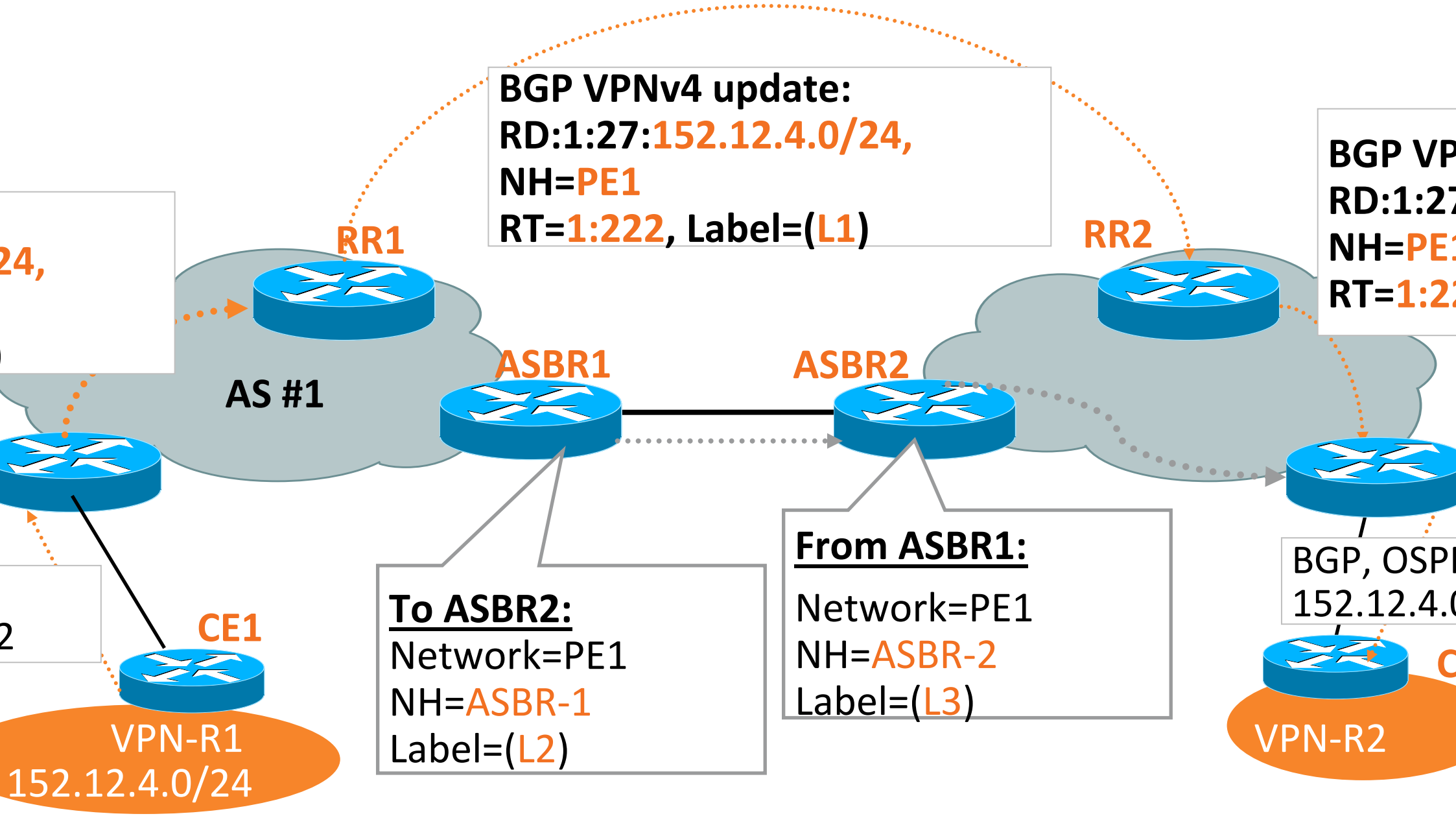
xchange Label Advertisement Capability - Enables d LSP Paths

quent Address Family Identifier (SAFI value 4) field is indicate that the NLRI contains a label



er-AS VPN—Option C

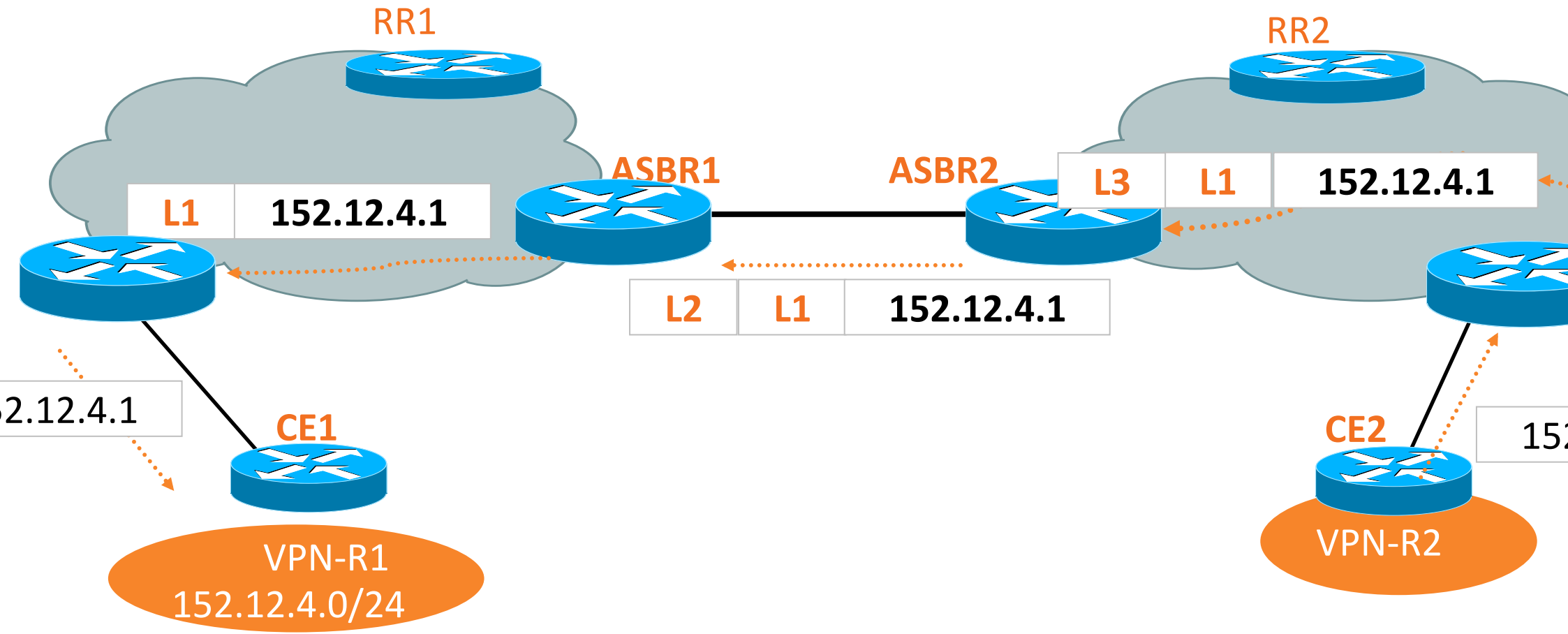
ablishing reachability between VPNs



tore PE loopbacks & exchange labels for PE Loopback addresses

er-AS VPN—Option C

N packet forwarding



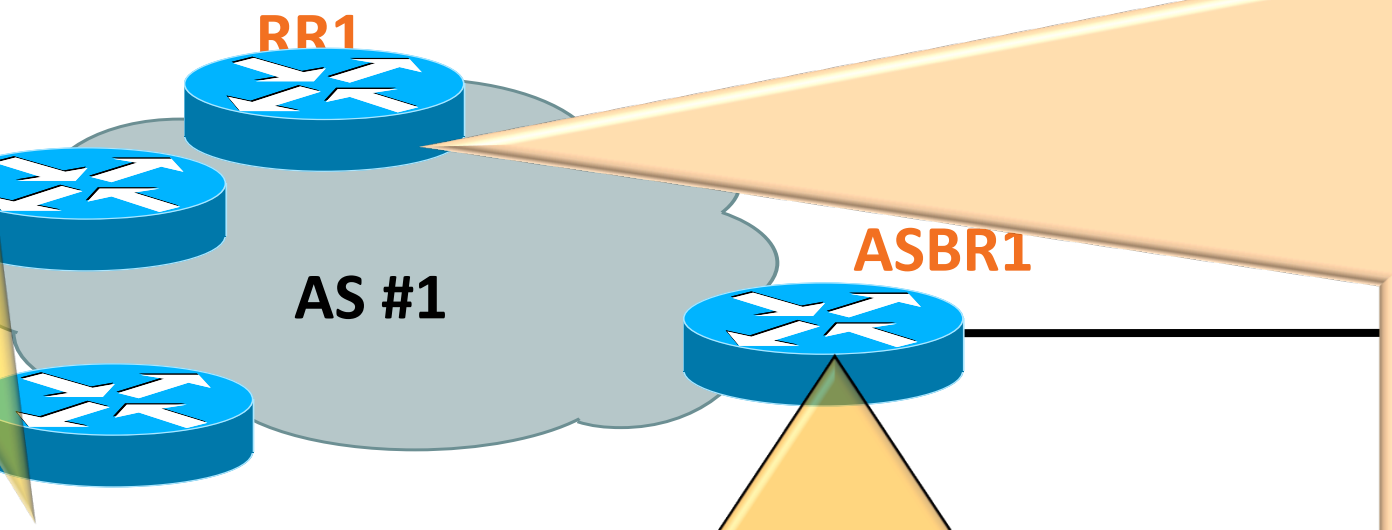
is a VPN label. L2 and L3 are IPv4 labels.

Outer Most Core (IGP Labels in an AS) Label Is not displayed in on this slide.

er-AS VPN—Option C

4+Label, Cisco IOS Configuration

```
pv4
activate
send-label
```




```
!
router bgp 1
neighbor <RR2> ebgp-multihop
!
address-family ipv4
neighbor <RR2> activate

neighbor <PE1> activate
neighbor <PE1> send-label

neighbor <ASBR1> activate
neighbor <ASBR1> send-label
!
address-family vpnv4
neighbor <RR2> next-hop-unch
exit-address-family
!
```

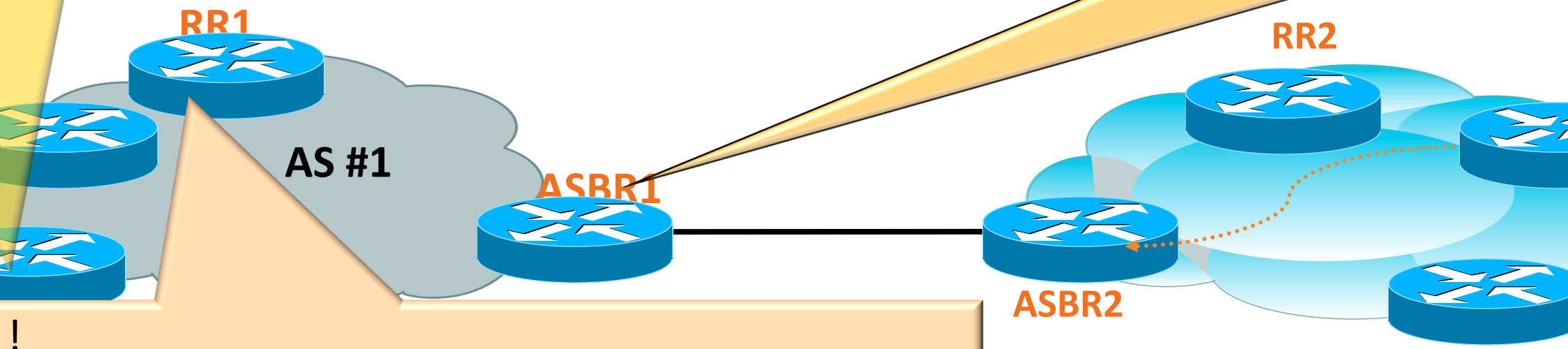
```
ddress-family ipv4
eighbor <ASBR2> activate
eighbor <ASBR2> send-label

eighbor <RR1> activate
eighbor <RR1> next-hop-self
```

er-AS VPN—Option C

4+Label, Cisco IOS XR Configuration

ards all peers!
pv4 labeled-unicast

! Command towards all peers!
address-family ipv4 labeled-uni
!




```
!
router bgp 1
address-family vpnv4 unicast
!
neighbor  <RR2>
   remote-as 2
   address-family vpnv4 unicast
   ebgp-multihop 255
```

er-AS L3VPN Summary

ree models: Option A, B, and C

tion A is the most secured, least invasive. Support granular QoS.

tion B, more scalable than Option-A for high numbers of VRFs. more adoptable
vider corporations

Less invasive than Option C, More invasive than Option A

More scalable than Option-A if have high numbers of VRFs

Use eBGP for ASBR peering

ASBRs store VPNv4 routes and allocate labels for VPN prefixes

tion C, most scalable, most invasive, mostly deployed in a single service provide
work

Use ASBRs to handle IPv4 PE loopbacks

Route Reflectors exchange VPNv4 routes

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THE HUMAN
NETWORK