Agenda

- Route Reflection Platforms

- Internet RR Behaviour with iBGP Multipath

- Add Path and BGP Optimal Route Reflection.

- COLT Route Reflection Deployment
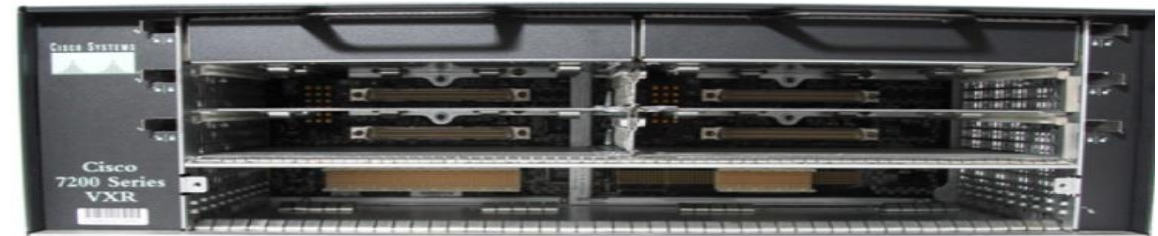
Route Reflection Models In Use

- Hardware Based

- Either deployed in existing core routers

- Or deployed as dedicated routers

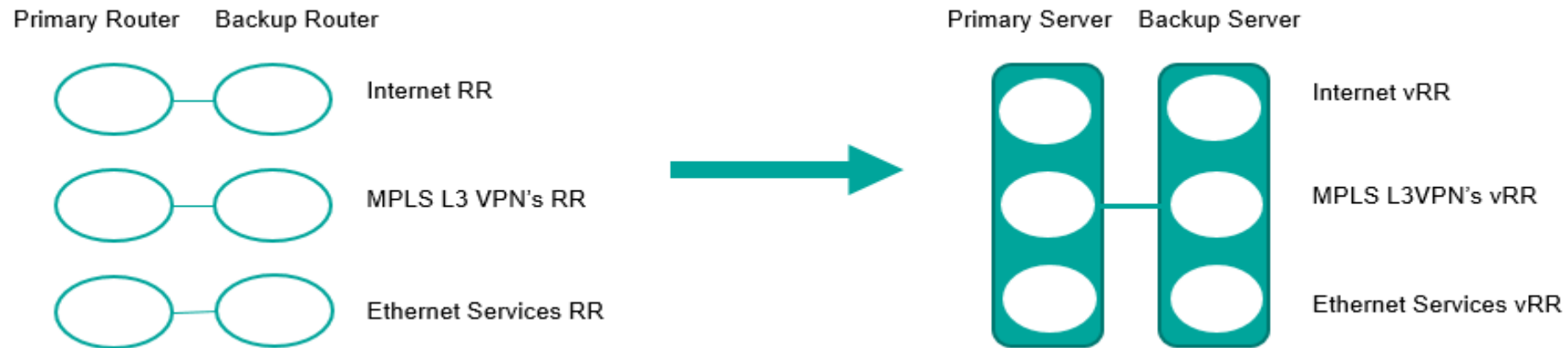Generally Used Platforms :-

Juniper JCS/SRX

Cisco ASR-1001

Cisco 7200

New Virtualized Route Reflector (vRR)

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Operators prefer to keep separate RR for each service to address following concerns:-

- Scalability
- Convergence
- Security
- Resiliency

Now we are moving from using dedicated RR hardware for each control plane to virtualized RR Platform
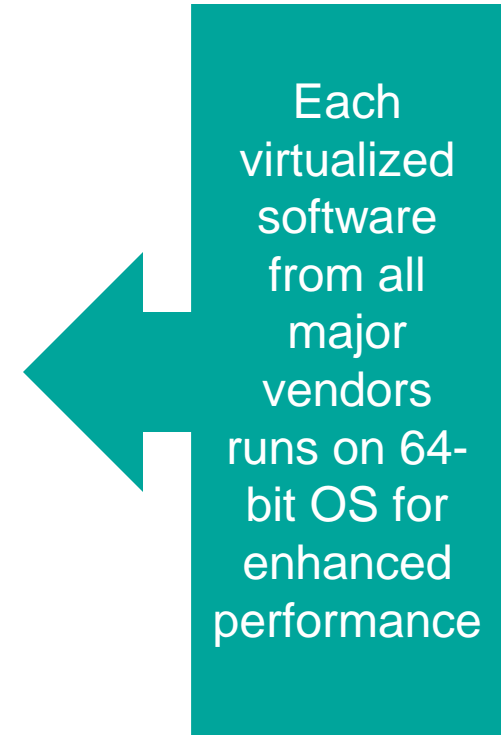
Need for vRR

- To eliminate the Hardware limitations.

- To address control plane memory requirements.

- To save Infrastructure Space.

- To deploy the Out of path topologies RR for better convergence.

- To Leverage the Commodity hardware.

- Innovating through software.

Benefits

- Scalability (64b OS), Performance (Multi-core support), Independence of Operations and BGP Software consistency are not compromised.

- New virtualized RR can run on commodity x86 Hardware using VM Image/VMware ESXI, KVM, Citrix XenServer, Microsoft Hyper-V etc.

vRR - Products

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- ## Cisco
    - CSR –1000v   - runs standard IOS-XE Software
    - IOS-XRv 9000   - runs standard IOS-XR Software

- ## Juniper
    - vRR and vMX   - runs standard Junos Software

- ## Nokia
   - vSR-RR   - runs standard SR-OS Software

Each virtualized software from all major vendors runs on 64-bit OS for enhanced performance

Current Route Reflector Behaviour

- RR picks route that is considered best from it's point of view.

- RR does best path algorithm and advertise only one update to the client PE, which results in suboptimal routing.

- RR's are deployed based on exit points in network, either on multiple Core Routers or multiple out of path.
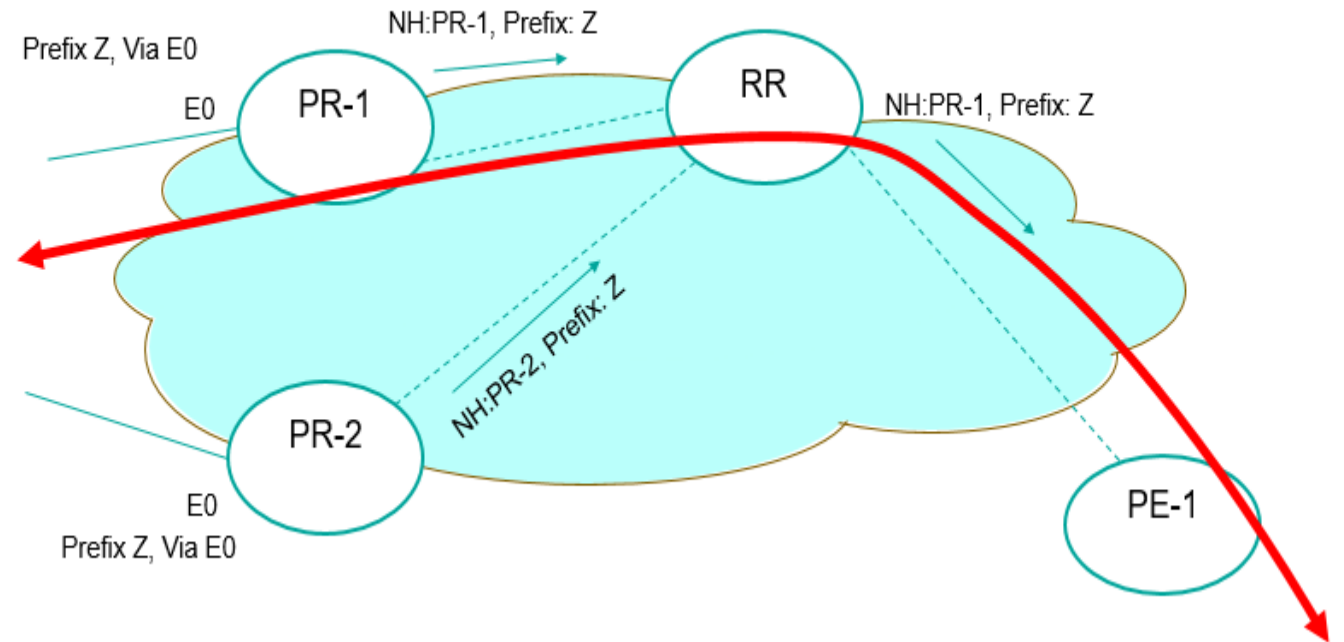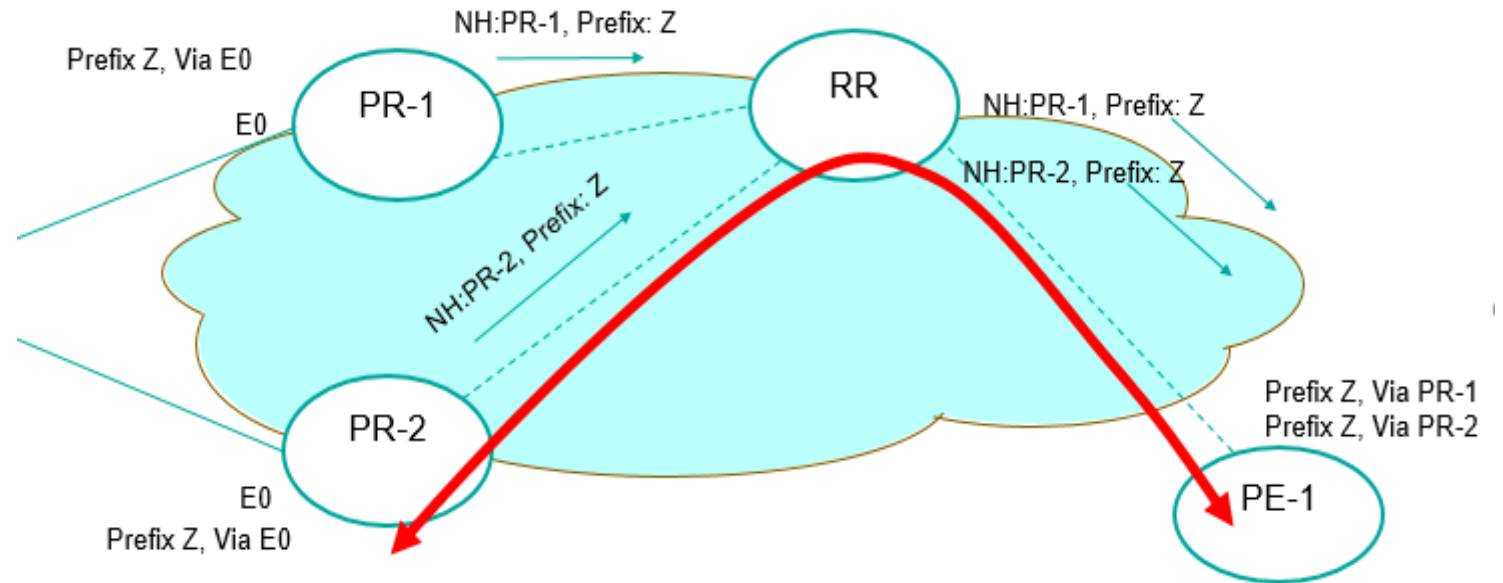
Solutions

Option 1: (BGP Add- Path)

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https://datatracker.ietf.org/doc/rfc7911/

- Add-Path will signal the diverse path.

- Require support from both the RR and the clients as this is additional capability to be negotiated between two devices.

Advantages

✓ Reduce Routing Churns

✓ Faster Convergence

✓ Better Load Sharing

✓ Support & Availability

Caveats

More Load on the Control Plane

Increase Memory Requirements on the end devices

BGP Add-Path Support

- Cisco
  - IOS-XE - supported from 3.7S onwards.
  - IOS-XR - supported in 12K/CRS/ASR-9K started from Rel 4.0 onwards.
  - NX-OS   - supported from 6.0(2) onwards.

- Juniper
  - MX/M/T/SRX Series-Platforms   - supported from Junos 11.4 or later

- Nokia
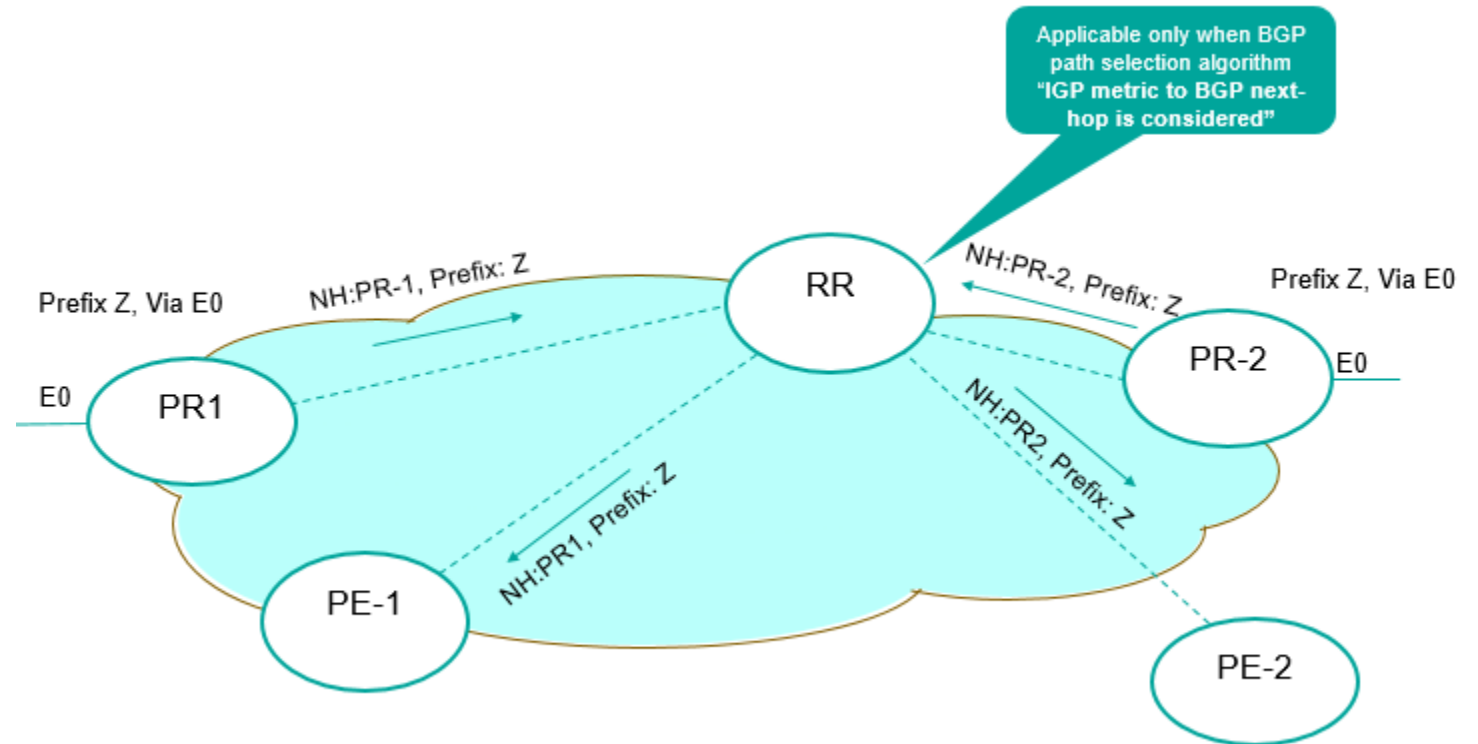 - 7750 SR-OS - supported from 10.0 R1 onwards

  Supported for all the address families
  - IPV4 unicast and IPV6 unicast (including labelled IPV4 and labelled IPV6 routes)
  - VPN-V4 and VPN-V6

Option 2: (BGP Optimal Route Reflection)

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https://datatracker.ietf.org/doc/draft-ietf-idr-bgp-optimal-route-reflection/

- Allow Client Specific best path.

- RR runs SPF multiple times, one per each RR client BGP Speaker.

- BGP best path mechanism modified to compute best path per RR Client.

- BGP Route advertisement modifies to announce best path to client.

Applicable only when BGP path selection algorithm "IGP metric to BGP next-hop is considered"

Prefix Z, Via E0   NH:PR-1, Prefix: Z

RR   NH:PR-2, Prefix: Z   Prefix Z, Via E0

E0   PR1   PR-2   E0

NH:PR2, Prefix: Z

NH:PR1, Prefix: Z

PE-1

PE-2

All control on RR no help is required from client routers

Topology free route reflectors

BGP ORR Support

- Cisco
  - Cisco -IOS-XR – 6.1.1 onwards (Supported in Hardware and Virtualized platforms)
  - Supported for both IGP's OSPF and ISIS
  - Not supported in any IOS-XE and NX-OS as of now.

- Juniper
  - Juniper JunOS 15.1F4.15 onwards
  - Supported for both IGP's OSPF and ISIS

- Nokia
  - Nokia SR-OS 15.0 onwards
  - Supported for both IGP's OSPF and ISIS

BGP ORR – Advantages & Caveats

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Advantages

✓ Gives flexibility to place RR any where in topology.

✓ Solves Hot potato Routing.

✓ Supports Resiliency for ORR Groups.

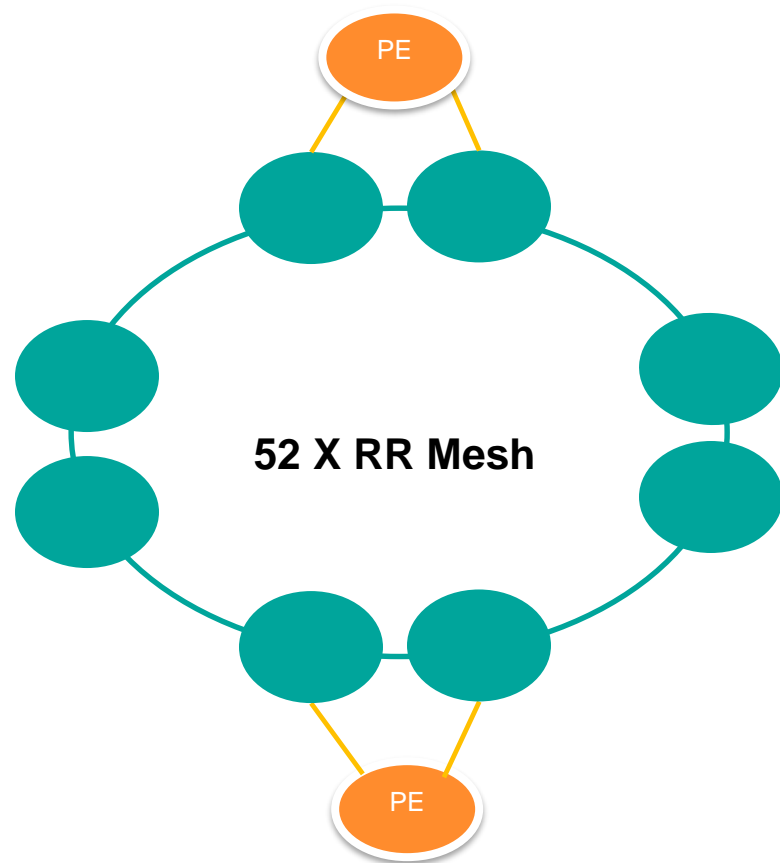✓ Require no support from clients.

✓ Even better with ADD-PATH.

Caveats

No Support for MPLS

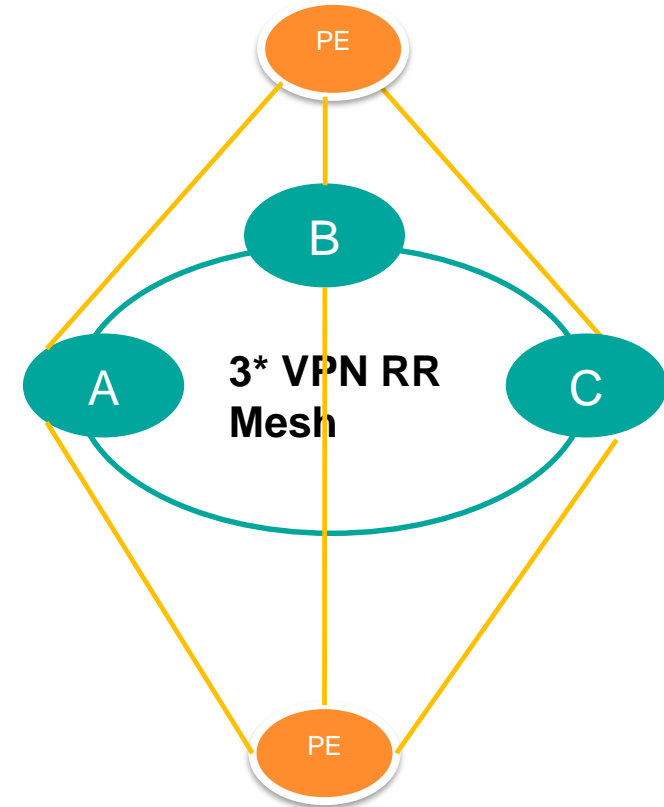**No Support for 6PE and 6VPE Technology**

COLT Route Reflector Deployment

Current COLT RR Design

Internet RR Design:
- 52 IRR, 26 Cities/ Region
- Hierarchal design.
- Core acts as IRR
- Full mesh between all the Cores
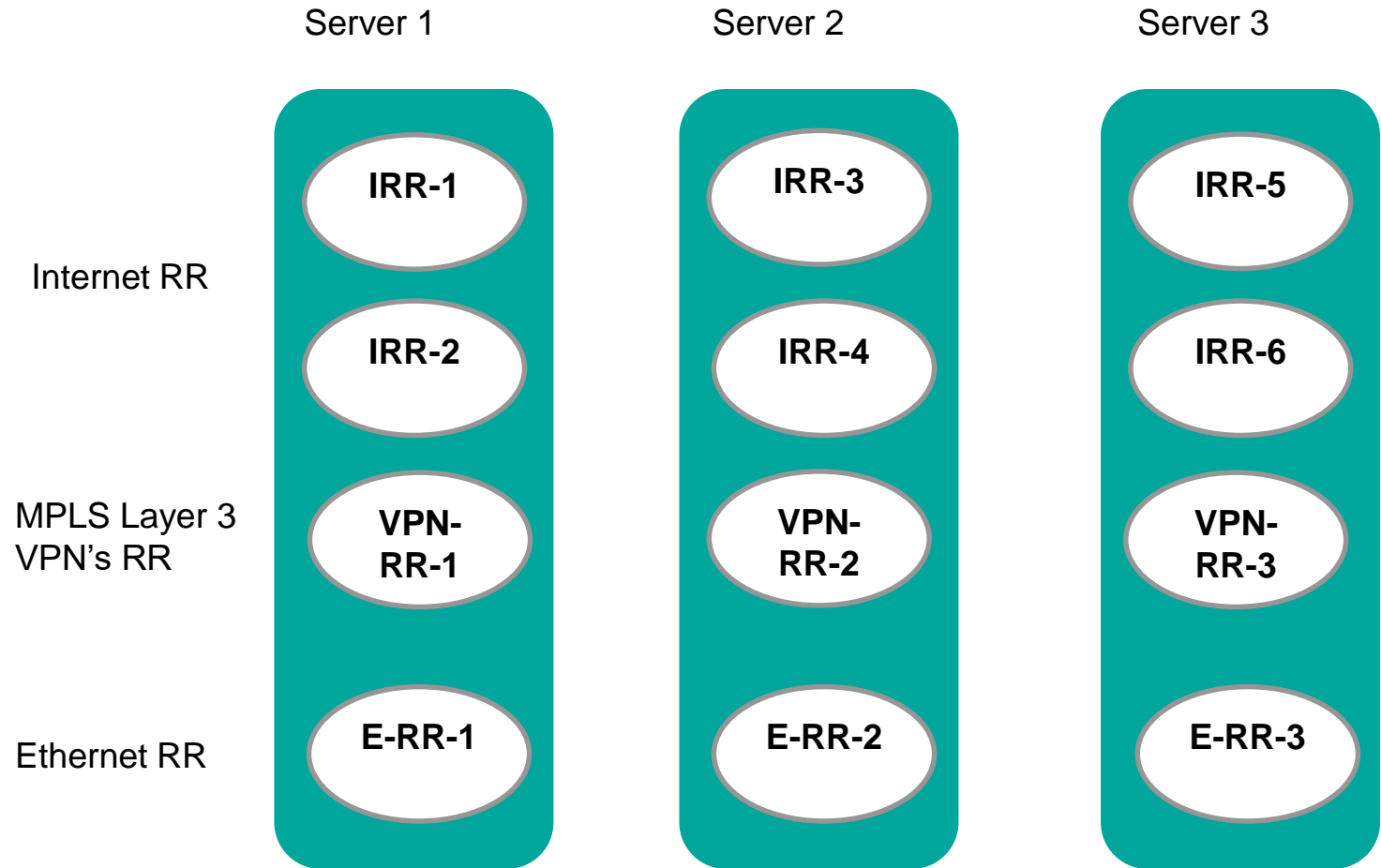- PE BGP to nearest RR region pair
- Bigger Scaling Issues

IP-VPN RR Design:
- Centralized with 3 dedicated H/W
- Full mesh between the 3 RR's.
- PE BGP to all three RR's.
- Eox, Scale and Feature Limitation

Colt New vRR Design

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- Virtualizing all the three RR's on KVM Hypervisor.

- Three Servers in tier 1 locations.

- Dedicated VM's for each RR per Server.

- BGP-ORR feature on Internet vRR for Optimal Routing.

Server 1   Server 2   Server 3

Internet RR

IRR-1   IRR-3   IRR-5

IRR-2   IRR-4   IRR-6

MPLS Layer 3 VPN's RR

VPN-RR-1   VPN-RR-2   VPN-RR-3

Ethernet RR

E-RR-1   E-RR-2   E-RR-3

Design Consideration for BGP-ORR

- Each ORR Client is associated with Single BGP Update Group.

- Ideal design is to have maximum 15-20 ORR Groups per RR.

- Choose the ORR points in network to achieve the "Hot Potato Routing".

- 6PE Hot potato routing can be achieved using the "BGP Add-Path feature".
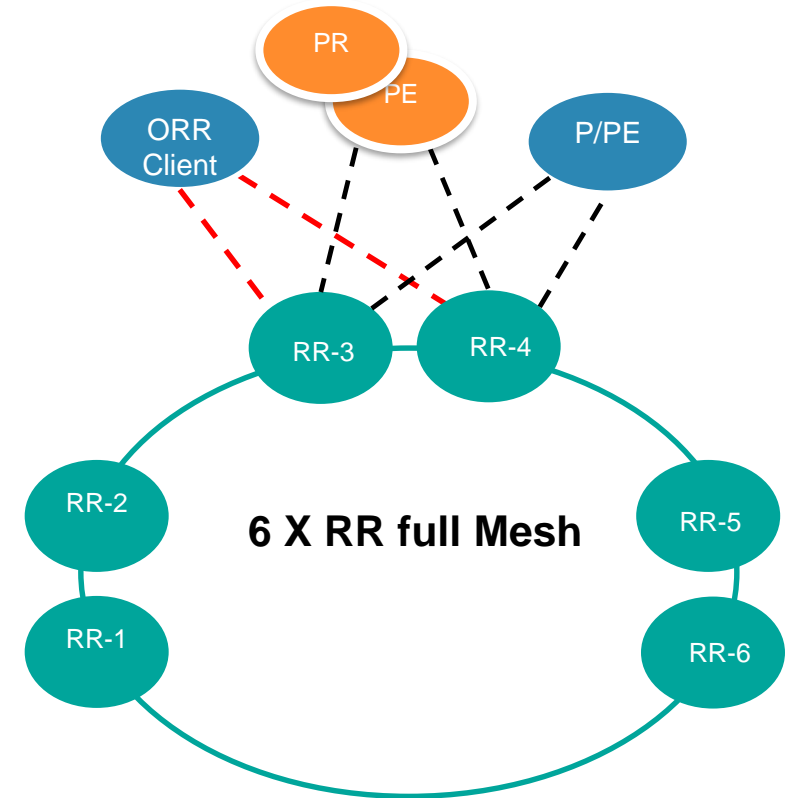
Thank you

amit.dhamija@colt.net

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