


Troubleshooting MPLS VPN's




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About the Speaker

- **Dr. Pete Welcher**
 - Cisco CCIE #1773, CCSI #94014, CCIP
 - Network design & management consulting
 - Stock quotation firm, 3000 routers, TCP/IP
 - Second stock quotation firm, 2000 routers, UDP broadcasts
 - Hotel chain, 1000 routers, SNA
 - Government agency, 1500 routers
 - Teach many of the Cisco courses
- **Enterprise Networking Magazine articles**
 - <http://www.netcraftsmen.net/welcher/papers>

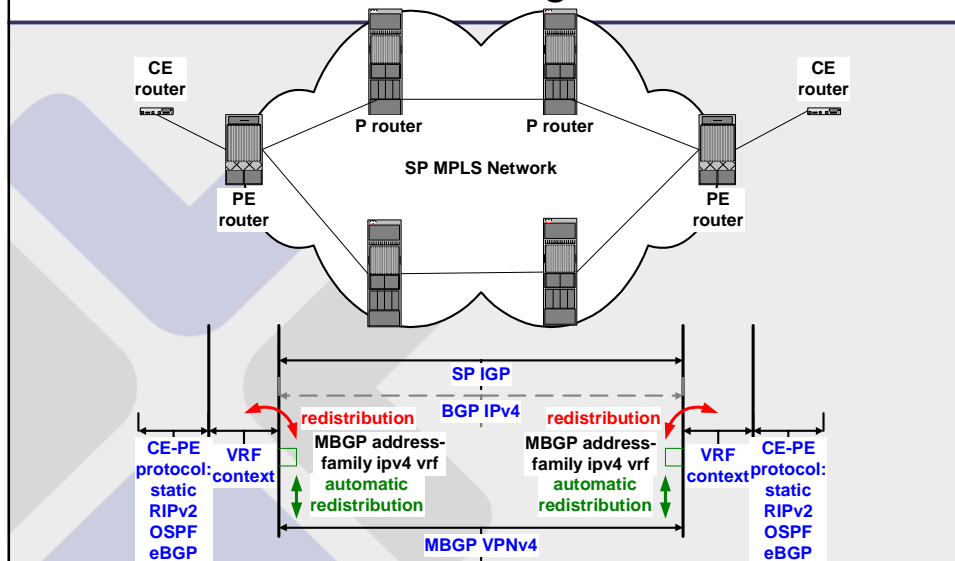


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Objectives

- Upon completion of this lesson, students will be able to:
- Understand MPLS VPN routing
- Troubleshoot simple MPLS VPN problems

MPLS VPN Big Picture



MPLS VPN Big Picture — 2

- **Routing for MPLS VPN requires the following major components:**

- MBGP between PE routers
- SP Core IGP providing routing between MBGP routers
- CE-PE routing on both sides, in a VRF context
- Static, RIPv2, OSPF require special redistribution to/from BGP



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MBPG Components

- **MBGP stores routes for 3 address families:**

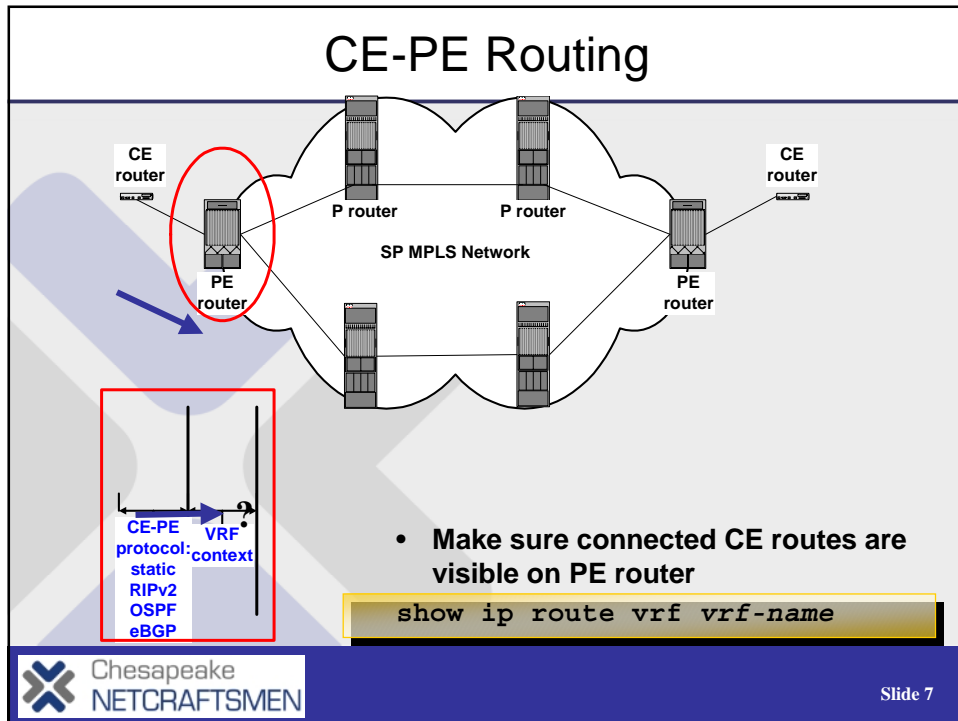
- IPv4
- IPv4 VRF contexts
 - Routes from eBGP into a VRF context, or redistributed from another protocol in a VRF context)
- VPNv4 “long addresses”
 - RD: IP prefix

- **IPv4 and VPNv4 routes advertised to PE peers**

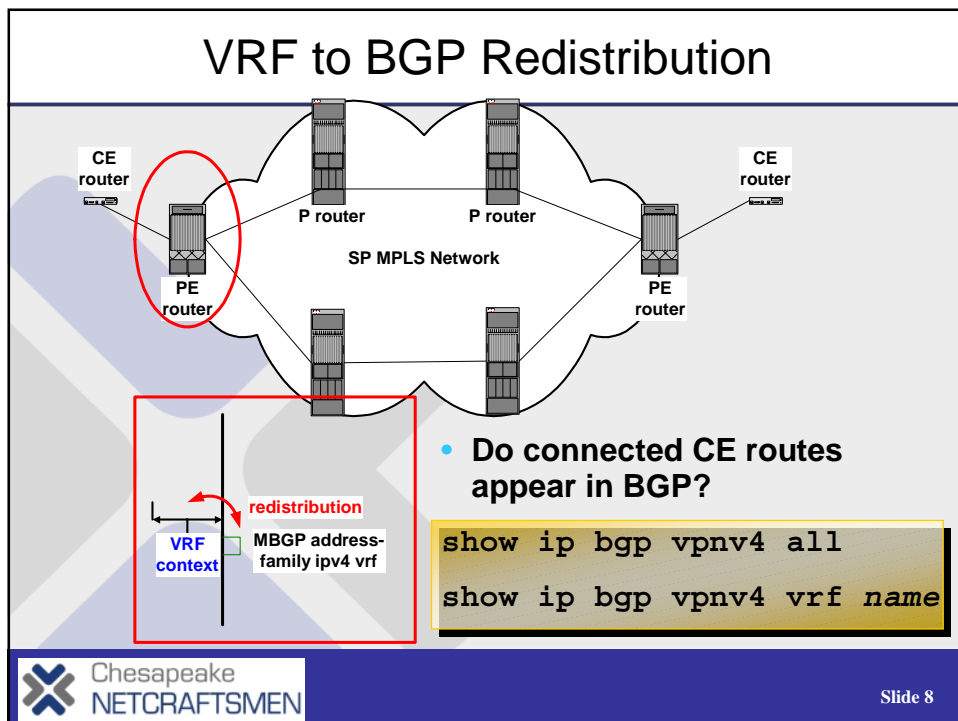


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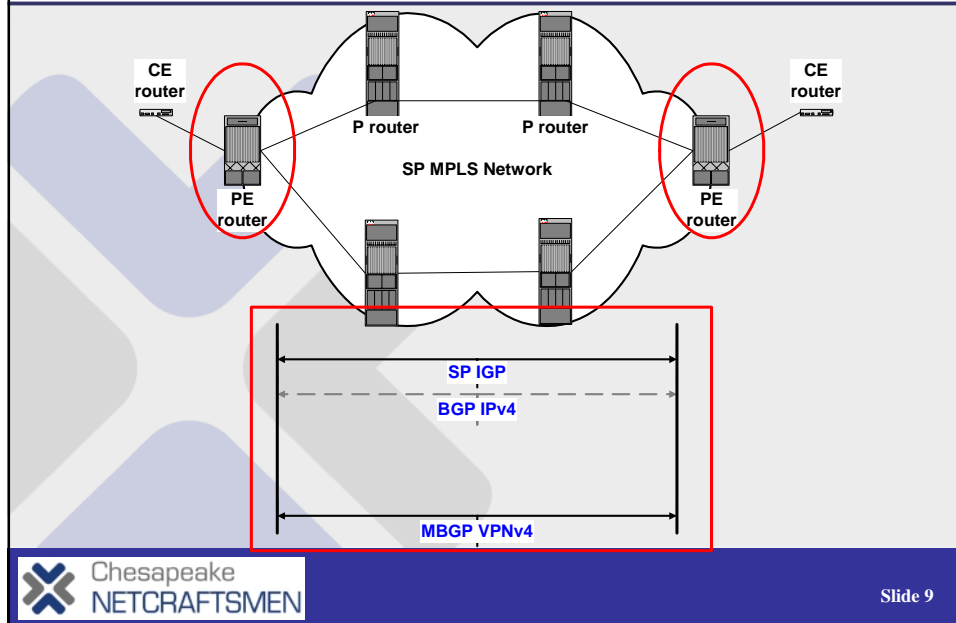
CE-PE Routing



VRF to BGP Redistribution



IGP Routes, BGP Neighbors



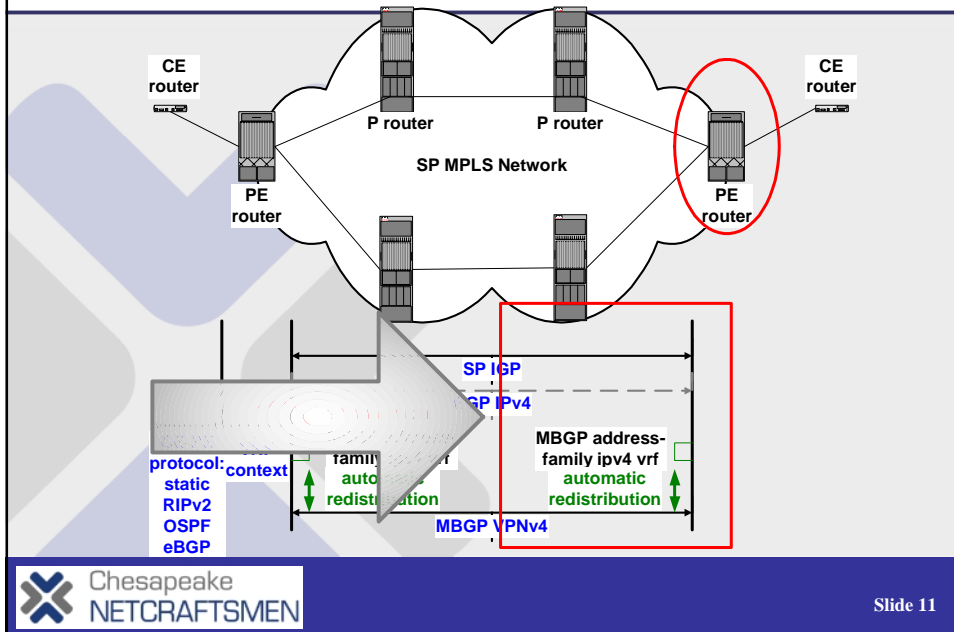
BGP Neighbors — 2

- PE routers must be BGP neighbors

```
show ip bgp vpnv4 all summary
```

- If not: check route to loopback or neighbor address of MBGP peer
 - Note: `show ip bgp summary` only shows IPv4 peers, not VPNv4 peers

Routes Arrive at Right? BGP, VRF?

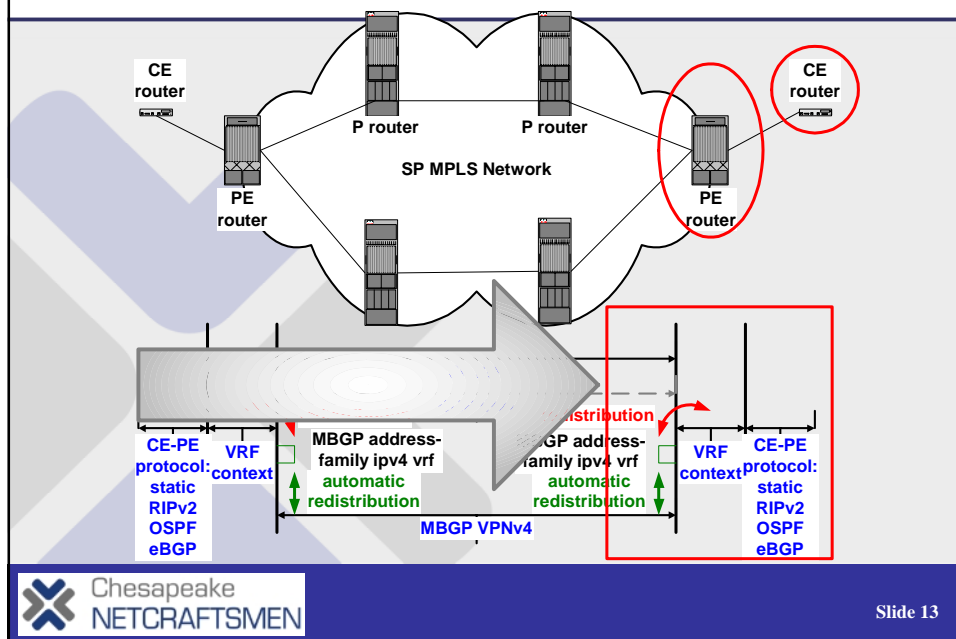


Routes Arrive at Right? BGP, VRF?

- Verify that routes from CE to left of picture arrive at PE on right via MBGP

```
show ip bgp vpnv4 all
```

Routes at Right CE? Redistribution, PE-CE?



Routes at Right CE? Redistribution, PE-CE?

- Check the redistribution of the left CE routers on the right PE router

```
show ip route vrf vrf-name
```

- Do these routes arrive at the right CE?

```
show ip route
```

Connectivity Problem?

If you see routes from the left CE and site in the right CE, but have connectivity problems:

- **Do a trace from the connected PE to PE**
 - Look for lines missing the MPLS label
- **MPLS VPN doesn't work with "MPLS dropouts"**
 - Need a complete **label** path from PE to the loopback or MBGP next-hop address of the other PE

Traceroute with MPLS VPN

- **If you have a VPN VRF route to the VPN (customer) destination, but trace fails to even show a first hop...**
 - When TTL reaches zero on a P router, the P router does not know how to route back to the source address, if the trace source is a VPN customer site
 - So with **all** VPN traffic, the ICMP TTL-exceeded is sent onwards using the label that would have been used if the TTL had not reached zero
 - Other end of VPN sends the ICMP TTL-exceeded back
- **That means you may not get replies unless the destination PE or even CE has a route back**
 - First thing to do: check other end for route back
 - Then trace may start working

Summary

After completing this lesson, you should be able to complete the following tasks:

- **Understand MPLS VPN routing**
- **Troubleshoot simple MPLS VPN problems**



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A Word About Us ...

- **We can provide**
 - Network design review: how to make what you have work better
 - Periodic strategic advice: what's the next step for your network or staff
 - Network management tools & procedures advice: what's right for you
 - Implementation guidance (your staff does the details) or full implementation
- **We do**
 - Small- and Large-Scale Routing and Switching (design, health check, etc.)
 - IPsec VPN and V3PN (design and implementation)
 - QoS (strategy, design and implementation)
 - IP Telephony (preparedness survey, design, and implementation)
 - Call Manager deployment
 - Security
 - Network Management (design, installation, tuning, tech transfer, services, etc.)



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A Word About Us ...



Certified by Cisco in:

- **IP Telephony**
- **Network Management**
- **Wireless**
- **Security**
- **(Routing and Switching)**



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