DMVPN FEATURES

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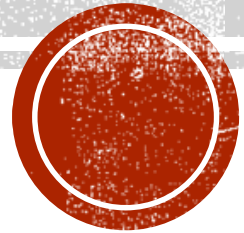
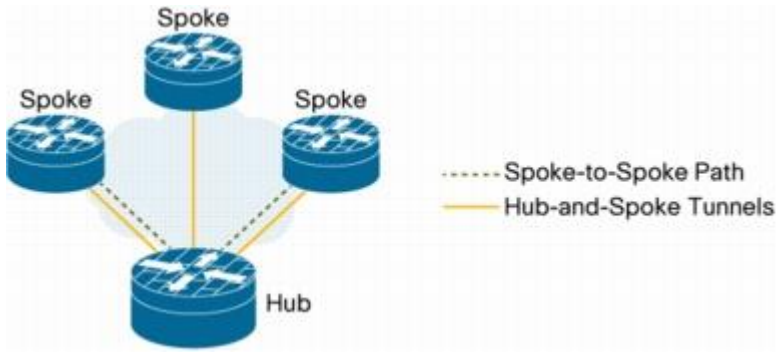


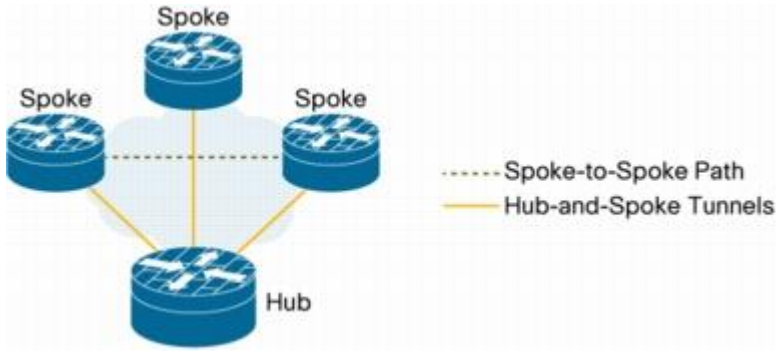
DMVPN PROTOCOL FEATURES

- GRE Tunnel Protocols (Generic Routing Encapsulation) or mGRE (Multipoint GRE)
- Next-Hop Resolution Protocols (NHRP)
- Dynamic Routing Protocols (IGP)
- IPSEC Encryption Protocols
- CEF (Cisco Express Forwarding)
- Hub and Spoke architectures



Cisco DMVPN Hub-and-Spoke Deployment Model

supports dynamic routing, QoS, and IP Multicast



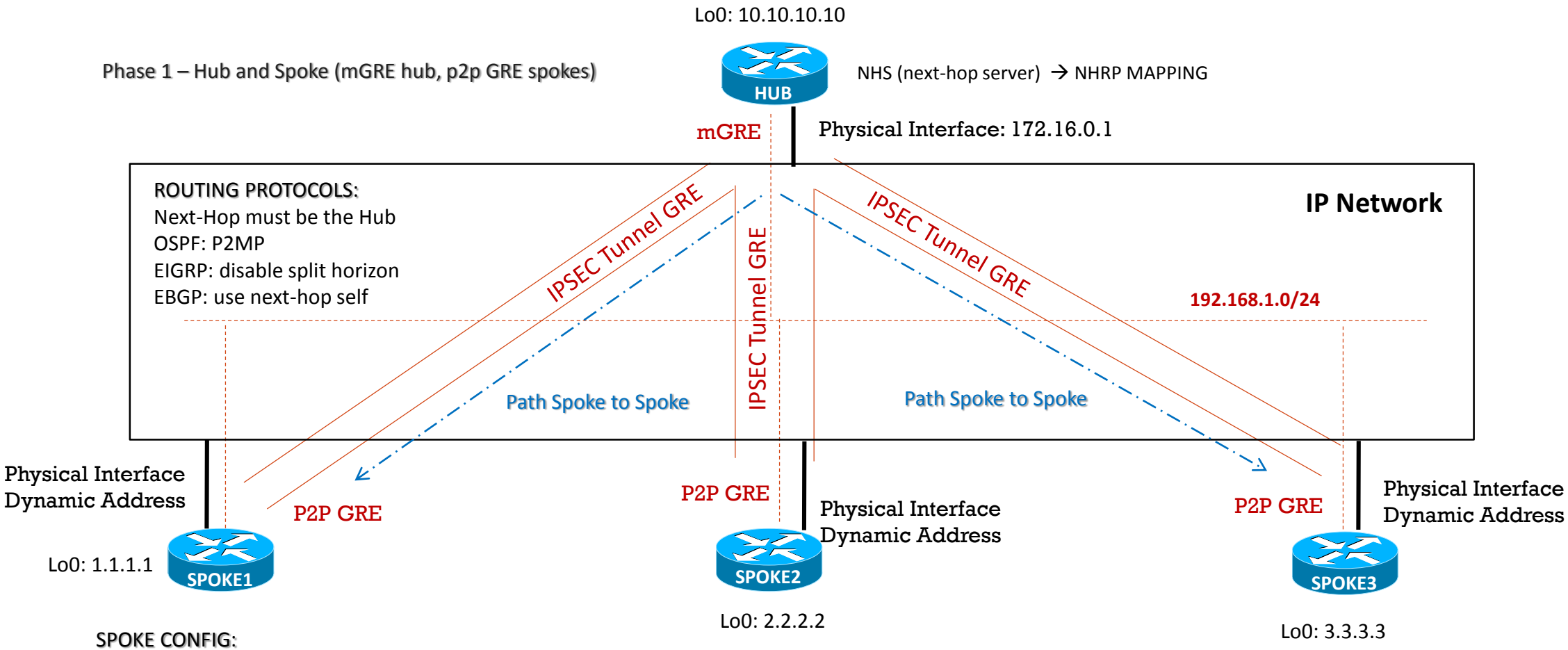
Cisco DMVPN Spoke-to-Spoke Deployment Model

dynamically created IPsec tunnels directly between the spokes. With direct spoke-to-spoke tunnels, traffic between remote sites does not need to traverse the hub; this eliminates additional delays and conserves WAN bandwidth. Spoke-to-spoke capability is supported in a single-hub or multihub environment.

DMVPN PROTOCOL FEATURES

Phase 1 - 12.2(13)T	Phase 2 – 12.3(4)T (Phase 1+)	Phase 3 – 12.4(6)T
• Hub and spoke functionality • p-pGRE interface on spokes, mGRE on hubs • Simplified and smaller configuration on hubs • Support dynamically addressed CPEs (NAT) • Support for routing protocols and multicast • Spokes don't need full routing table – can summarize on hubs	• Spoke to spoke functionality • mGRE interface on spokes • Direct spoke to spoke data traffic reduces load on hubs • Hubs must interconnect in daisy-chain • Spoke must have full routing table – no summarization • Spoke-spoke tunnel triggered by spoke itself • Routing protocol limitations	• More network designs and greater scaling • Same Spoke to Hub ratio • No hub daisy-chain • Spokes don't need full routing table – can summarize • Spoke-spoke tunnel triggered by hubs • Remove routing protocol limitations • NHRP routes/next-hops in RIB (15.2(1)T)

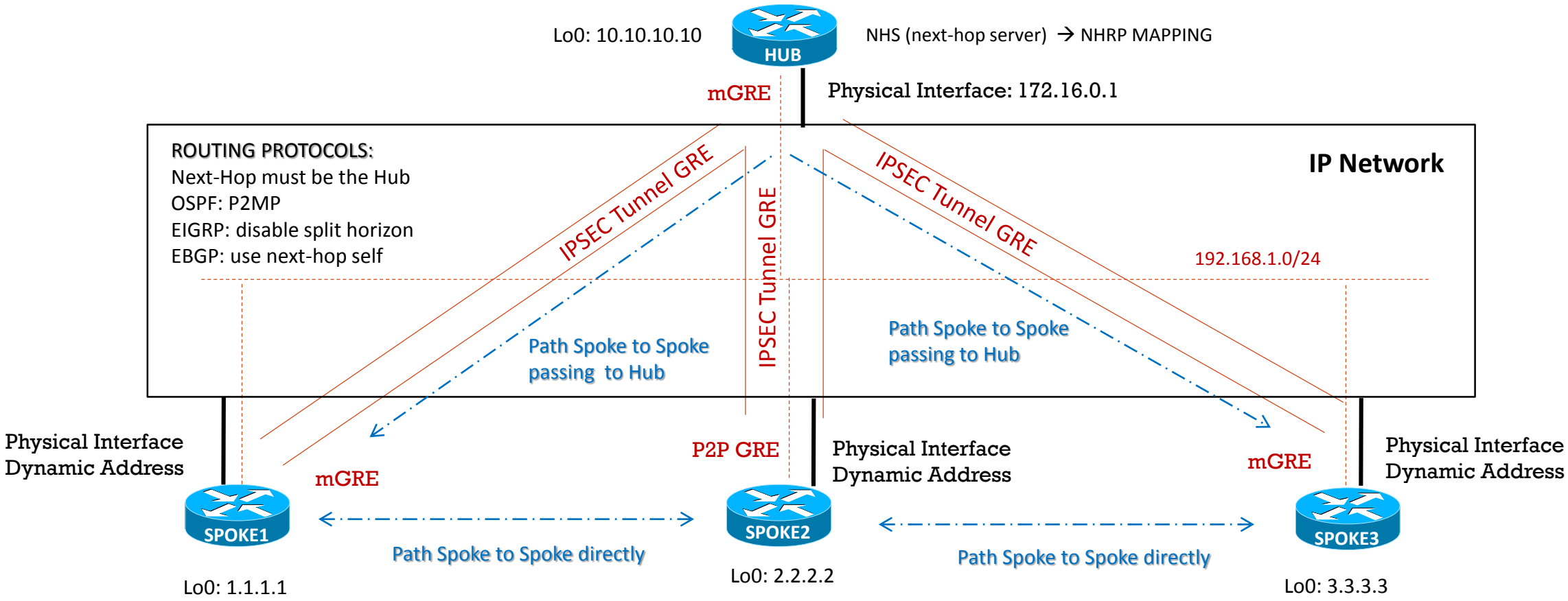
DMVPN HUB AND SPOKE WITH DYNAMIC IP ADDRESSES PHASE 1



SPOKE CONFIG:
Static route or default routing is required for tunnel destination
Set tunnel MTU and TCP MSS
Specify tunnel bandwidth
Tunnel key may be option on phase 1

TRAFFIC FLOW:
Multicast between Hub Spoke
Data Traffic (path) trhought the hub

DMVPN HUB AND SPOKE WITH DYNAMIC IP ADDRESSES PHASE 2



Phase 2 – Hub and Spoke with Spoke-to-Spoke tunnels (mGRE everywhere)

DMVPN CONFIGURATION EXAMPLE

Configurazione parametri IPSEC phase 1 e phase 2

```
crypto isakmp policy 1
encr  3des
authentication pre-share
group 2
crypto isakmp key <key> address 0.0.0.0 0.0.0.0
!
crypto ipsec transform-set IPSEC esp-3des  esp-sha-hmac
mode transport
!
crypto ipsec profile DMVPN
set tranform-set IPSEC
!
interface tunnel 0
tunnel protection ipsec profile DMVPN
```

segue ./.

Configurazione Tunnel mGRE + NHRP

HUB router#

```
interface loopback 0
ip address 10.10.10.10 255.255.255.255
!
interface tunnel 0
ip address 192.168.1.1 255.255.255.0
ip mtu 1400
no ip redirects
ip nhrp authentication <password>
ip nhrp map multicast dynamic
ip nhrp network-id  <network-id>
tunnel source  loopback 0  (oppure la IP interfaccia  fisica)
tunnel mode gre multipoint
tunnel key  <tunnel-key>
no ip split-horizon eigrp <as>  (con EIGRP) → only for phase 1
no ip next-hop-self eigrp <as> (con EIGRP) → both phase 1 and phase 2
ip summary-address eigrp  <as> 0.0.0.0 0.0.0.0

---

ip ospf network point-to-multipoint  (con OSPF)
```

DMVPN CONFIGURATION EXAMPLE

Configurazione Dynamic Routing

HUB router#

```
router eigrp  <as>
network 192.168.1.0  0.0.0.255
network 10.10.10.10  0.0.0.0
no auto-summary
!
```

SPOKE router#

```
router eigrp  <as>
netwok 192.168.1.0  0.0.0.255
network 1.1.1.1  0.0.0.0
eigrp stub connected
```

HUB router#

```
router ospf  <process-id>
router-id 192.168.1.0
network 192.168.1.0  0.0.0.255 area 0
network 10.10.10.10  0.0.0.0 area 0

!
```

SPOKE router#

```
router ospf  <process-id>
router-id 192.168.1.2
netwok 192.168.1.0  0.0.0.255 area 0
network 1.1.1.1  0.0.0.0 area 0
!
!
ip route 0.0.0.0 0.0.0.0 tunnel 0
```

Configurazione Tunnel P2P GRE + NHRP

SPOKE1 router#

```
interface loopback 0
ip address 1.1.1.1 255.255.255.255
!
interface tunnel 0
ip address 192.168.1.2 255.255.255.0
ip mtu 1400
no ip redirects
ip nhrp authentication <password>
ip nhrp map multcast 10.10.10.10 (loopback Hub or IP interfaccia fisica)
ip nhrp map 192.168.1.1  10.10.10.10
ip nhrp nhs 10.10.10.10
ip nhrp network-id  <network-id>
ip nhrp registration  timeout 30
ip nhrp holdtime 60
tunnel source  loopback 0  (oppure la interfaccia fisica)
tunnel destination  10.10.10.10
tunnel key  <tunnel-key>
```

segue ./.

DMVPN CONFIGURATION EXAMPLE

In DMVPN vi è anche una fase 3, che differisce dalla fase 1 e 2 per questi step:

- **NHRP Redirect:** un nuovo messaggio è trasmesso dal router HUB verso gli SPOKE in modo tale che ques'ultimi possano conoscere il percorso migliore tra SPOKE e SPOK, piuttosto che attraverso l'HUB

- **NHRP Shortcut:** un nuovo modo di cambiare o sovrascrivere informazioni su base CEF lato SPOKE

La configurazione, quindi, cambia lato tunnel

```
interface tunnel 0
ip address 192.168.1.1 255.255.255.0
ip mtu 1400
no ip redirects
ip nhrp authentication <password>
ip nhrp map multicast dynamic
ip nhrp network-id  <network-id>
ip nhrp redirect
tunnel source  loopback 0  (oppure la IP interfaccia  fisica)
tunnel mode gre multipoint
tunnel key  <tunnel-key>
no ip split-horizon eigrp <as>
```