VPNs

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Benefits of VPNs

- **Cost savings** - VPNs enable organizations to use cost-effective, high-bandwidth technologies, such as DSL to connect remote offices and remote users to the main site.

- **Scalability** - Organizations are able to add large amounts of capacity without adding significant infrastructure.

- **Compatibility with broadband technology** - Allow mobile workers and telecommuters to take advantage of high-speed, broadband connectivity.

- **Security** - VPNs can use advanced encryption and authentication protocols.

DMVPN

Dynamic Multipoint VPN (DMVPN) is a Cisco software solution for building multiple VPNs.
DMVPN is built using the following technologies:
Next Hop Resolution Protocol (NHRP) - NHRP creates a distributed mapping database of public IP addresses for all tunnel spokes.
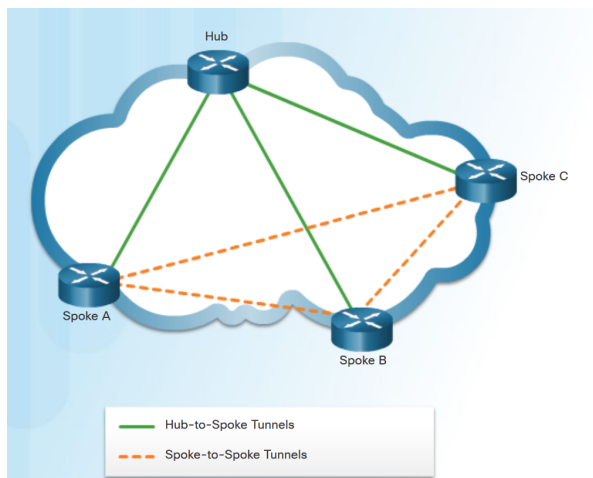
Multipoint Generic Routing Encapsulation (mGRE) tunnels - An mGRE tunnel interface allows a single GRE interface to support multiple IPsec tunnels.
IP Security (IPsec) encryption - provides secure transport of private information over public networks.
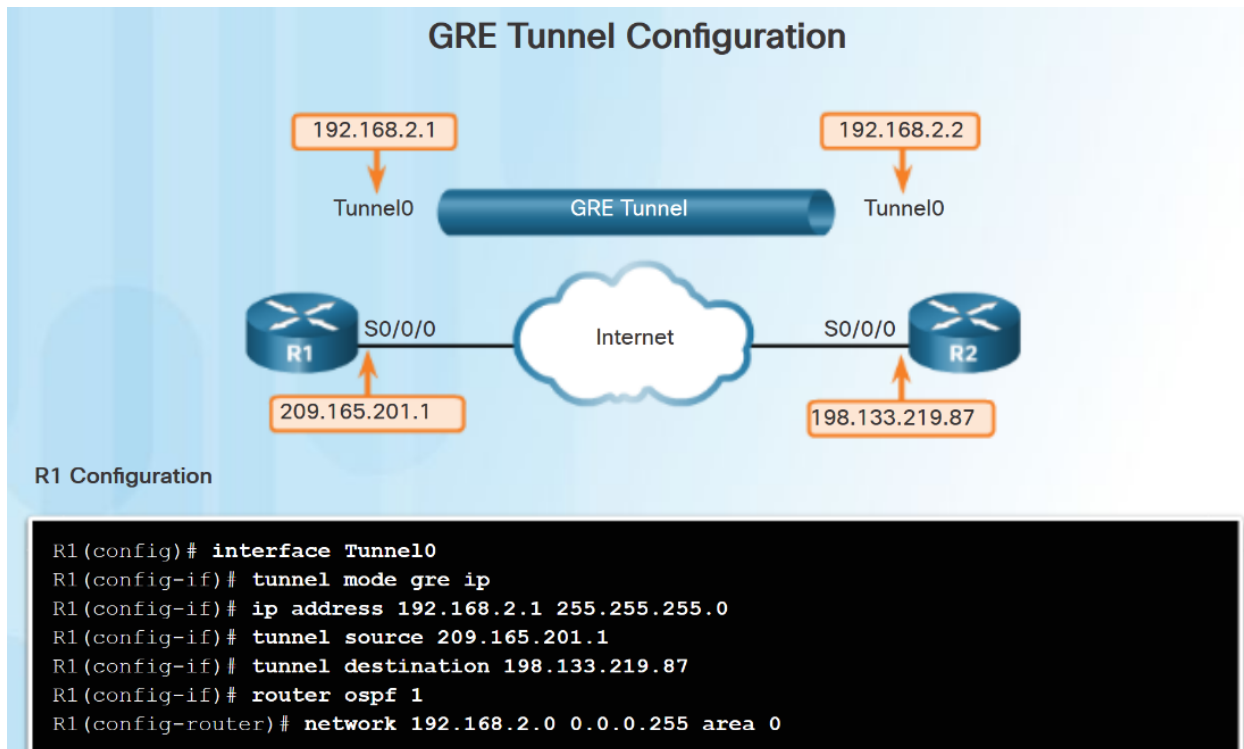
GRE

Generic Routing Encapsulation (GRE) is a non-secure, site-to-site VPN tunneling protocol.

In the outer IP header, 47 is used in the protocol field.
GRE encapsulation uses a protocol type field in the GRE header to support the encapsulation of any OSI Layer 3 protocol.

Configuration Example

Step 1. Create a tunnel interface using the interface tunnel number command.
Step 2. Configure an IP address for the tunnel interface. (Usually a private address)
Step3. Specify the tunnel source IP address.
Step 4. Specify the tunnel destination IP address.
Step 5. (Optional) Specify GRE tunnel mode as the tunnel interface mode.

GRE Tunnel Configuration

192.168.2.1   192.168.2.2

Tunnel0   GRE Tunnel   Tunnel0

S0/0/0   Internet   S0/0/0

R1   R2

209.165.201.1   198.133.219.87

R1 Configuration

```
R1(config)# interface Tunnel0
R1(config-if)# tunnel mode gre ip
R1(config-if)# ip address 192.168.2.1 255.255.255.0
R1(config-if)# tunnel source 209.165.201.1
R1(config-if)# tunnel destination 198.133.219.87
R1(config-if)# router ospf 1
R1(config-router)# network 192.168.2.0 0.0.0.255 area 0
```

Note: The tunnel source and tunnel destination commands reference the IP addresses of the preconfigured physical interfaces
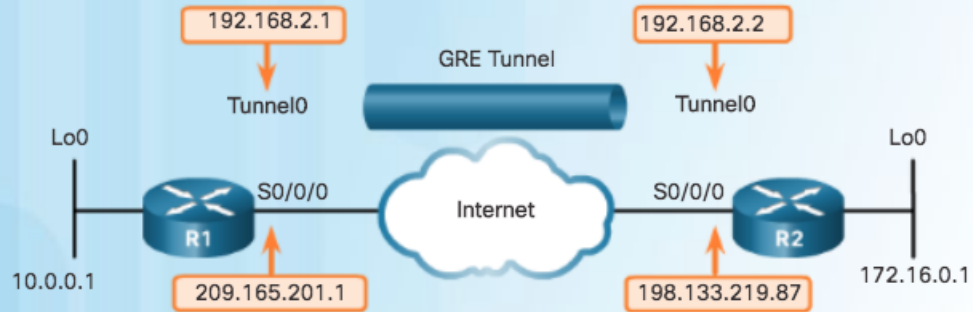
Verifying Configuration

Use the following commands to verify the GRE configuration

`show ip interface brief`

`show interface tunnel x`

`show ip ospf neighbour`

Verify that All Necessary Interfaces are Up


```
R1# show ip interface brief
<output omitted>

Interface              IP-Address        OK? Method Status         Protocol
Serial0/0/0            209.165.201.1     YES manual up             up
Loopback0              10.0.0.1          YES manual up             up
Tunnel0                192.168.2.1       YES manual up             up
R1#
```

```
R2# show ip interface brief
<output omitted>

Interface              IP-Address        OK? Method Status         Protocol
Serial0/0/0            198.133.219.87    YES manual up             up
Loopback0              172.16.0.1        YES manual up             up
Tunnel0                192.168.2.2       YES manual up             up
R2#
```