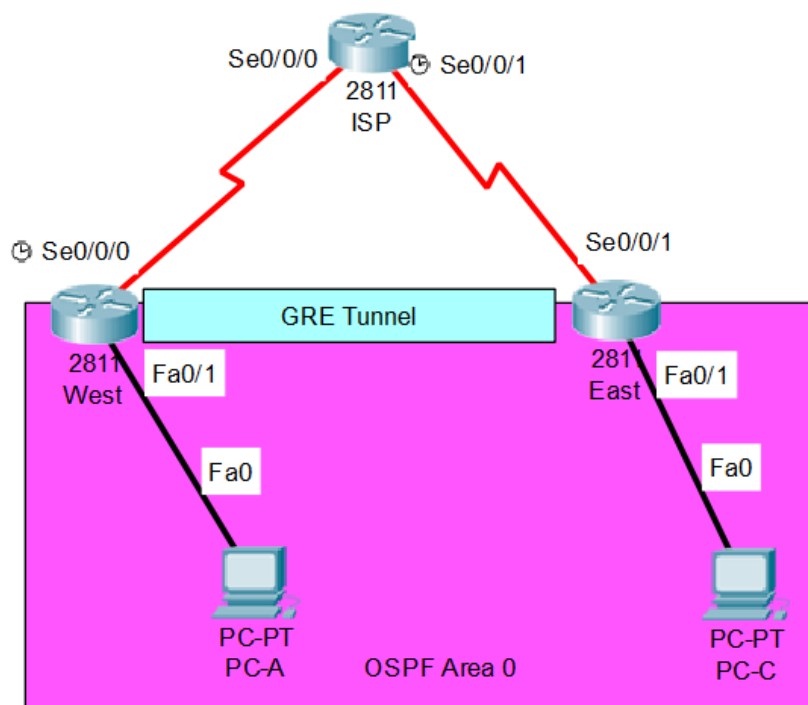


Point-to-Point GRE VPN Tunnel

Topology



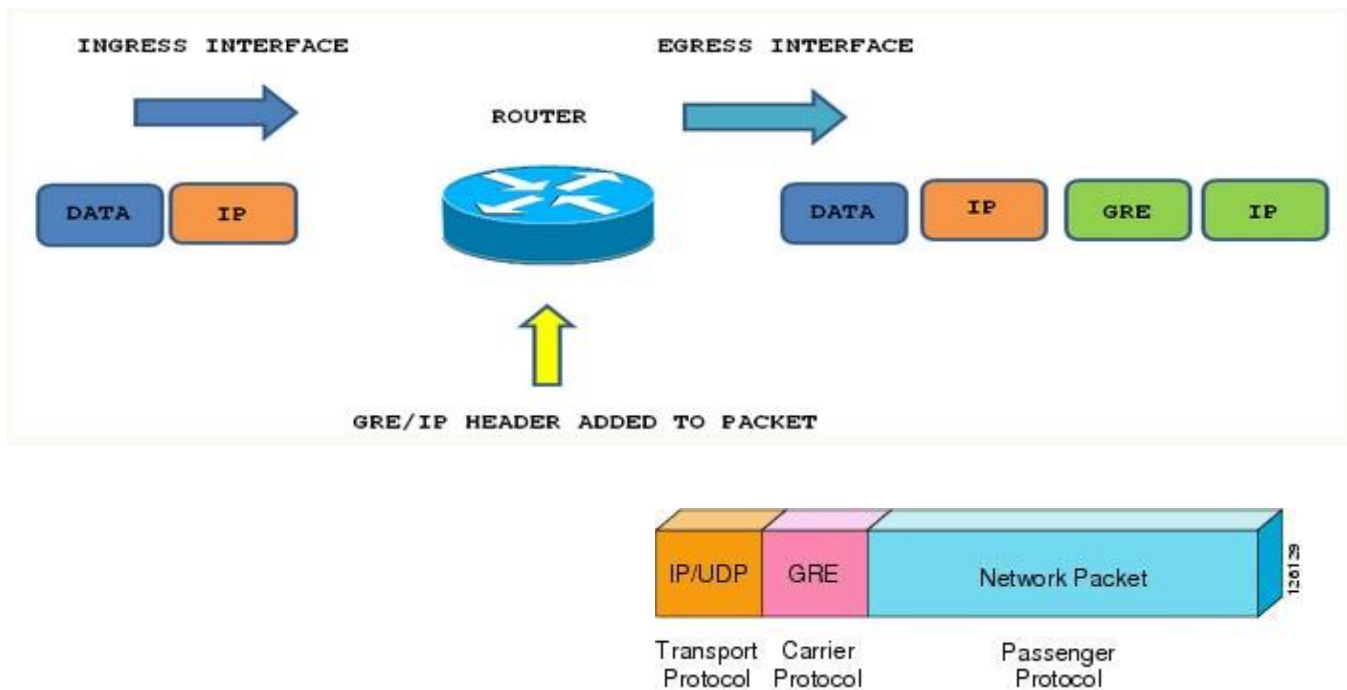
Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
WEST	F0/1	172.16.1.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A
	Tunnel0	172.16.12.1	255.255.255.252	N/A
ISP	S0/0/0	10.1.1.2	255.255.255.252	N/A
	S0/0/1 (DCE)	10.2.2.2	255.255.255.252	N/A
	Tunnel0	172.16.12.2	255.255.255.252	N/A
EAST	F0/1	172.16.2.1	255.255.255.0	N/A
	S0/0/1	10.2.2.1	255.255.255.252	N/A
	Tunnel0	172.16.12.2	255.255.255.252	N/A
PC-A	NIC	172.16.1.3	255.255.255.0	172.16.1.1
PC-C	NIC	172.16.2.3	255.255.255.0	172.16.2.1

Background / Scenario

Tunneling provides a mechanism to transport packets of one protocol within another protocol. The protocol that is carried is called as the passenger protocol, and the protocol that is used for carrying the passenger protocol is called as the transport protocol. Generic Routing Encapsulation (GRE) is one of the available tunneling mechanisms which uses IP as the transport protocol and can be used for carrying many different passenger protocols. The tunnels behave as virtual point-to-point links that have two endpoints identified by the tunnel source and tunnel destination addresses at each endpoint.

The below diagram shows encapsulation process of GRE packet as it traverses the router and enters the tunnel interface:



Note: Make sure that the routers and switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Required Resources

- 3 Routers
- 2 PCs
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet and serial cables as shown in the topology

Part 1: Configure Basic Device Settings

In Part 1, you will set up the network topology and configure basic router settings, such as the interface IP addresses, routing, device access, and passwords.

Step 1: Cable the network as shown in the topology.

Step 2: Initialize and reload the routers as necessary.

Step 3: Configure basic settings for each router.

- a. Disable DNS lookup.
- b. Configure the device names.
- c. Encrypt plain text passwords.
- d. Create a message of the day (MOTD) banner warning users that unauthorized access is prohibited.
- e. Assign **pass** as the encrypted privileged EXEC mode password.
- f. Assign **pass** as the console and vty password and enable login.
- g. Set console logging to synchronous mode.
- h. Apply IP addresses to Serial and Fast Ethernet interfaces according to the Addressing Table and activate the physical interfaces. Do NOT configure the Tunnel0 interfaces at this time.
- i. Set the clock rate to **128000** for DCE serial interfaces.

Step 4: Configure default routes to the ISP router.

```
WEST(config)# ip route 0.0.0.0 0.0.0.0 10.1.1.2
```

```
EAST(config)# ip route 0.0.0.0 0.0.0.0 10.2.2.2
```

Step 5: Configure the PCs.

Assign IP addresses and default gateways to the PCs according to the Addressing Table.

Step 6: Verify connectivity.

At this point, the PCs are unable to ping each other. Each PC should be able to ping its default gateway. The routers are able to ping the serial interfaces of the other routers in the topology. If not, troubleshoot until you can verify connectivity.

Step 7: Save your running configuration.

Part 2: Configure a GRE Tunnel

In Part 2, you will configure a GRE tunnel between the WEST and EAST routers.

Step 1: Configure the GRE tunnel interface.

- a. Configure the tunnel interface on the WEST router. Use S0/0/0 on WEST as the tunnel source interface and 10.2.2.1 as the tunnel destination on the EAST router.

```
WEST(config)# interface tunnel 0
```

```
WEST(config-if)# ip address 172.16.12.1 255.255.255.252
```

```
WEST(config-if)# tunnel source s0/0/0
```

```
WEST(config-if)# tunnel destination 10.2.2.1
```

- b. Configure the tunnel interface on the EAST router. Use S0/0/1 on EAST as the tunnel source interface and 10.1.1.1 as the tunnel destination on the WEST router.

```
EAST(config)# interface tunnel 0
EAST(config-if)# ip address 172.16.12.2 255.255.255.252
EAST(config-if)# tunnel source 10.2.2.1
EAST(config-if)# tunnel destination 10.1.1.1
```

Note: For the **tunnel source** command, either the interface name or the IP address can be used as the source.

Step 2: Verify that the GRE tunnel is functional.

- a. Verify the status of the tunnel interface on the WEST and EAST routers.

```
WEST# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
Embedded-Service-Engine0/0	unassigned	YES	unset	administratively down	down
FastEthernet0/0	unassigned	YES	unset	administratively down	down
FastEthernet0/1	172.16.1.1	YES	manual	up	up
Serial0/0/0	10.1.1.1	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Tunnel0	172.16.12.1	YES	manual	up	up

```
EAST# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
Embedded-Service-Engine0/0	unassigned	YES	unset	administratively down	down
FastEthernet0/0	unassigned	YES	unset	administratively down	down
FastEthernet0/1	172.16.2.1	YES	manual	up	up
Serial0/0/0	unassigned	YES	unset	administratively down	down
Serial0/0/1	10.2.2.1	YES	manual	up	up
Tunnel0	172.16.12.2	YES	manual	up	up

- b. Issue the **show interfaces tunnel 0** command to verify the tunneling protocol, tunnel source, and tunnel destination used in this tunnel.

What is the tunneling protocol used? What are the tunnel source and destination IP addresses associated with GRE tunnel on each router?

- c. Ping across the tunnel from the WEST router to the EAST router using the IP address of the tunnel interface.

```
WEST# ping 172.16.12.2
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.12.2, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/34/36 ms

- d. Use the **traceroute** command on the WEST to determine the path to the tunnel interface on the EAST router. What is the path to the EAST router?

- e. Ping and trace the route across the tunnel from the EAST router to the WEST router using the IP address of the tunnel interface.

What is the path to the WEST router from the EAST router? _____

With which interfaces are these IP addresses associated? Why?

- f. The **ping** and **tracert** commands should be successful. If not, troubleshoot before continuing to the next part.

Part 3: Enable Routing over the GRE Tunnel

In Part 3, you will configure OSPF routing so that the LANs on the WEST and EAST routers can communicate using the GRE tunnel.

After the GRE tunnel is set up, the routing protocol can be implemented. For GRE tunneling, a network statement will include the IP network of the tunnel, instead of the network associated with the serial interface. just like you would with other interfaces, such as Serial and Ethernet. Remember that the ISP router is not participating in this routing process.

Step 1: Configure OSPF routing for area 0 over the tunnel.

- a. Configure OSPF process ID 1 using area 0 on the WEST router for the 172.16.1.0/24 and 172.16.12.0/24 networks.

```
WEST(config)# router ospf 1
WEST(config-router)# network 172.16.1.0 0.0.0.255 area 0
WEST(config-router)# network 172.16.12.0 0.0.0.3 area 0
```

- b. Configure OSPF process ID 1 using area 0 on the EAST router for the 172.16.2.0/24 and 172.16.12.0/24 networks.

```
EAST(config)# router ospf 1
EAST(config-router)# network 172.16.2.0 0.0.0.255 area 0
EAST(config-router)# network 172.16.12.0 0.0.0.3 area 0
```

Step 2: Verify OSPF routing.

- a. From the WEST router, issue the **show ip route** command to verify the route to 172.16.2.0/24 LAN on the EAST router.

```
WEST# show ip route
```

```
Gateway of last resort is 10.1.1.2 to network 0.0.0.0
```

```
S*    0.0.0.0/0 [1/0] via 10.1.1.2
      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      10.1.1.0/30 is directly connected, Serial0/0/0
L      10.1.1.1/32 is directly connected, Serial0/0/0
      172.16.0.0/16 is variably subnetted, 5 subnets, 3 masks
C      172.16.1.0/24 is directly connected, FastEthernet0/1
L      172.16.1.1/32 is directly connected, FastEthernet0/1
O      172.16.2.0/24 [110/1001] via 172.16.12.2, 00:00:07, Tunnel0
C      172.16.12.0/30 is directly connected, Tunnel0
L      172.16.12.1/32 is directly connected, Tunnel0
```

What is the exit interface and IP address to reach the 172.16.2.0/24 network?

- b. From the EAST router issue the command to verify the route to 172.16.1.0/24 LAN on the WEST router.
What is the exit interface and IP address to reach the 172.16.1.0/24 network?
-

Step 3: Verify end-to-end connectivity.

- a. Ping from PC-A to PC-C. It should be successful. If not, troubleshoot until you have end-to-end connectivity.

Note: It may be necessary to disable the PC firewall to ping between PCs.

- b. Traceroute from PC-A to PC-C. What is the path from PC-A to PC-C?
-