

CO1507 Introduction to Networking

Lab 11 - Routing

Task 1 - Build topology

Begin by constructing the following topology in CISCO packet tracer

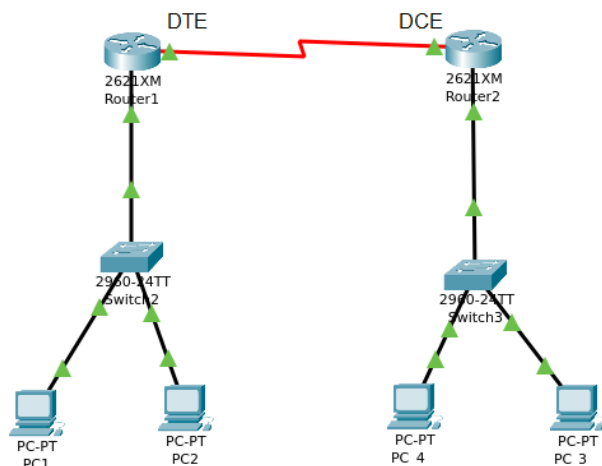


Figure 1 Topology with 3 subnets and two routers

IMPORTANT: 2621XM router by default does not have serial ports - you need to power off the router and add the WIC-2T eHWIC module to the router and then power back on.

DCE and DTE

One side of a serial link (DCE), has to transmit the clock signal, which controls the data rate, and the other side (DTE) receives the clock signal

DCE stands for data carrier equipment, DTE stands for data terminal equipment, generally a terminal or computer

With the DCE cable, (red zigzag with clock) the side you click first will be the DCE, the second will be DTE

With the DTE cable (red zigzag no clock) the side you click first will be DTE, the second will be DCE

Configure network

Configure and test the network using the following addressing requirements. **Note:** It will NOT yet be possible to ping from PCs 1 & 2 to 3 & 4.

Addressing table:

Device	Interface	IP Address	Subnet Mask	Default Gateway
Router 1	f0/0	192.168.0.1	255.255.255.0	N/A
Router 1	S0/0	10.1.1.1	255.255.255.252	N/A
Router 2	f0/0	192.168.1.1	255.255.255.0	N/A
Router 2	S0/0	10.1.1.2	255.255.255.252	N/A
PC 1	NIC	192.168.0.10	255.255.255.0	192.168.0.1
PC 2	NIC	192.168.0.11	255.255.255.0	192.168.0.1
PC 3	NIC	192.168.1.10	255.255.255.0	192.168.1.1
PC 4	NIC	192.168.1.11	255.255.255.0	192.168.1.1

Configure IP settings on the routers.

Configure the R1 and R2 interfaces with IP addresses according to the Addressing Table.

The S0/0 connection is the DCE connection and requires the clock rate command. The Router 2 S0/0 configuration is displayed below.

```
R3(config)# interface s0/0
R3(config-if)# ip address 10.1.1.2 255.255.255.252
R3(config-if)# clock rate 128000
R3(config-if)# no shutdown
```

Verify connectivity of the LANs.

- Test connectivity by pinging from each PC to the default gateway that has been configured for that host.
- Test by pinging from PC1 and PC2, is it possible to ping the default gateway?
- Test by pinging from PC3 and PC4, is it possible to ping the default gateway?
- Test connectivity by pinging between the directly connected routers.
- From Router 1, is it possible to ping the S0/0 interface of Router 2?

Task 2

A router uses a routing table to determine where to send packets. The routing table contains a set of routes that describe which gateway or interface the router uses to reach a specified network. Initially, the routing table contains only directly connected networks. To communicate with distant networks, routes must be specified and added to the routing table. In this lab, you will manually configure a static route to a specified distant network based on a next-hop IP address or exit interface. You will also configure a static default route. A default route is a type of static route that specifies a gateway to use when the routing table does not contain a path for the destination network.

You will employ multiple ways to implement static and default routes, you will confirm that the routes have been added to the routing tables of R1 and R3, and you will verify connectivity based on the introduced routes.

Configure a Recursive Static Route.

With a recursive static route, the next-hop IP address is specified. Because only the next-hop IP is specified, the router must perform multiple lookups in the routing table before forwarding packets. To configure recursive static routes, use the following syntax:

```
Router(config)# ip route [network-address] [subnet-mask] [ip-address]
```

On Router 1, configure a static route to the 192.168.1.0 network using the IP address of the Serial 0/0 interface of Router 2 as the next-hop address. Write down the command you used in your notes.

View the routing table to verify the new static route entry. How is this new route listed in the routing table?

From host PC-1, is it possible to ping the host PC-3?

```
show ip route
```

These pings should fail. If the recursive static route is correctly configured, the ping arrives at PC-3. PC-3 sends a ping reply back to PC-1. However, the ping reply is discarded at Router 2 because it does not have a return route to the 192.168.0.0 network in the routing table

Configure a Directly Connected Static Route.

With a directly connected static route, the exit-interface parameter is specified, which allows the router to resolve a forwarding decision in one lookup. A directly connected static route is typically used with a point-to-point serial interface. To configure directly connected static routes with an exit interface specified, use the following syntax:

```
Router(config)# ip route [network-address] [subnet-mask] [exit-intf]
```

On Router 2, configure a static route to the 192.168.0.0 network using S0/0 as the exit interface. Write down the command you used in your notes.

View the routing table to verify the new static route entry. How is this new route listed in the routing table?

From host PC-1 (or 2), is it possible to ping the host PC-3 (or 4)?

This ping should be successful. Troubleshoot if this is not the case and seek your tutors help if you cannot rectify the problems.

Configure and Verify a Default Route

You will now implement a default route, confirm that the route has been added to the routing table, and verify connectivity based on the introduced route. A default route identifies the gateway to which the router sends all IP packets for which it does not have a learned or static route. A default static route is a static route with 0.0.0.0 as the destination IP address and subnet mask. In a default route, either the next-hop IP address or exit interface can be specified. To configure a default static route, use the following syntax:

Configure Router 1 with a default route using the exit interface of S0/0 Write the command you used

```
Router(config)# ip route 0.0.0.0 0.0.0.0 [ip-address or exit-intf]
```

in your notes.

View the routing table to verify the new static route entry. How is this new route listed in the routing table?

Task 3 - Wide Area Network Schema

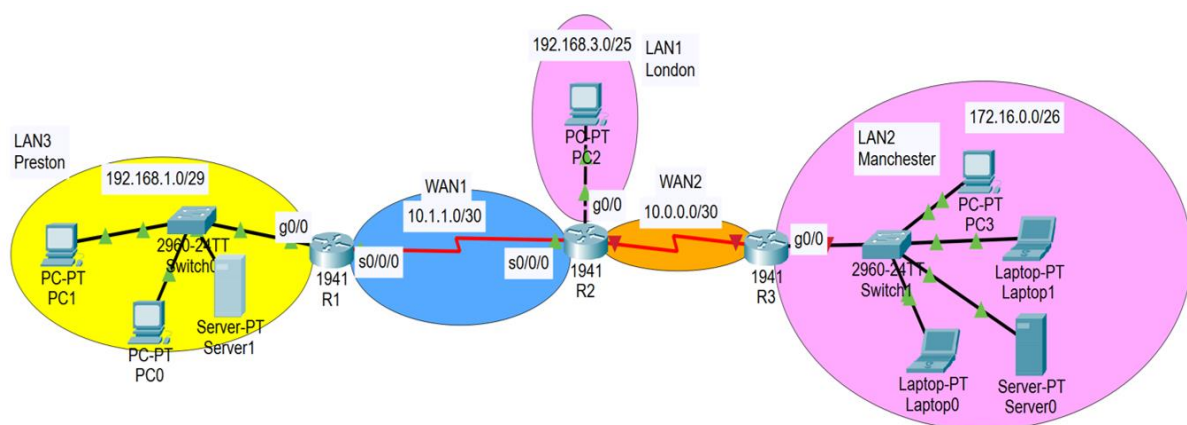


Figure 2 Complex topology with multiple subnets and routers

Answer the following Questions.

1. How many broadcast domains are in the topology?
2. In WAN 1: what are...
 - a) The subnet mask
 - b) The first valid host ID
 - c) The last valid host ID
 - d) The broadcast address
3. In LAN 2 (Manchester) what are...
 - a) The subnet mask
 - b) The first valid host ID
 - c) The last valid host ID
 - d) The broadcast address

- e) Assuming the server uses the last valid host id, and that the default gateway is the first, imagine DHCP is setup on the server and calculate the DHCP pool you would use on the server:
- The default gateway
 - The first address to be allocated in the pool
 - The maximum number of hosts that can be allocated
 - The last address to be allocated in the pool
4. In LAN 3 (Preston) what is...
- a) The subnet mask
 - b) The first valid host ID
 - c) The last valid host ID
 - d) The broadcast address

Task 4 - Network design

A company approached you to design a local area network (LAN) that consists of a number of PCs, laptops, and a printer to be housed on the ground floor of 2-story building. You are required to design the network using packet tracer. Configure all end devices for full communication. Test the final network for full operation. You need to configure a DHCP sever as shown in the network below.

The company purchased the first floor of the building and they wanted to add a separate network on the first floor with similar specifications to the LAN on the ground floor. They want to be able to communicate between the 2 networks but at the same time they want to isolate broadcast traffic from both LANs to improve security and performance.

Design the whole network on both floors as shown in the network diagram below (only 2 hosts are shown on each floor in reality it would be more) and use the network addresses supplied. Configure the whole network for full operation. You need to configure a DHCP server for each network.

You have been allocated two subnet addresses:

- LAN 1: 192.168.10.0 /26
- LAN 2: 192.168.10.64 /26

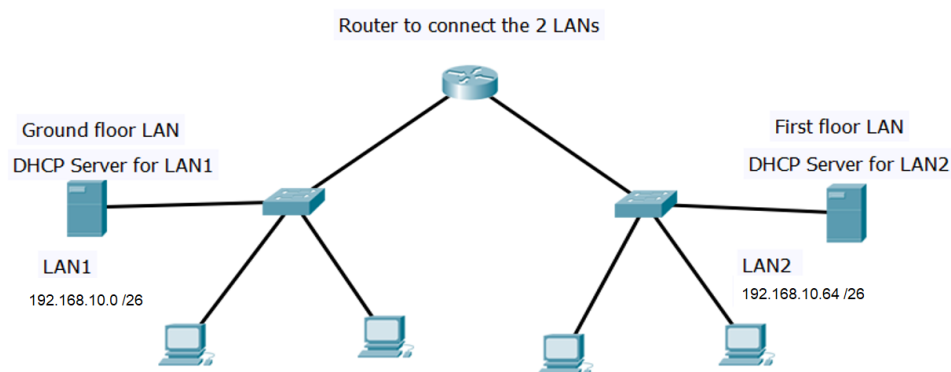


Figure 3 Company network design

You need to allocate a static IP address for each DHCP server and for the router interfaces. All other interfaces should be allocated using DHCP

Task 5 - questions

1. What is a router?
2. How does a router differ from a switch?
3. What is the difference between a static route and a dynamic route?
4. What is a routing protocol? Can you list any examples?
5. What is the default gateway?
6. You are working on a router and you are unsure what configurations are currently set on the available interfaces, what is the Cisco IOS command to view interfaces?
7. List some of the advantages and disadvantages of static routing