

LABORATORY 3: DEFAULT GATEWAY

Objectives

By the end of the laboratory, students will be able to

- interconnect two LANs with a router.
- configure default gateway for the hosts.

Introduction:

LANs are meant for hosts within the same network to communicate and share resources. There is also need for hosts in a LAN to communicate with hosts on other LANs. Different LANs have different network address (network portion of the IP address), and in Lab 2 we have demonstrated that hosts with different network portion in their IP addresses are not able to communicate directly.

In order for two LANs to communicate, we need to link them up with a router. The router will route the IP packets from one LAN to another LAN. The router's interface that is connected to a LAN acts as the "gateway" for the traffic from that LAN to leave the network to reach another LAN. We need to inform each host in the LAN where this "gateway" is. This is done by configuring the "default gateway" for the hosts. In Windows computers, this can be done manually, as shown in Figure 3.1 below. The IP address of the router interface that is connected to the LAN is used as the default gateway setting.

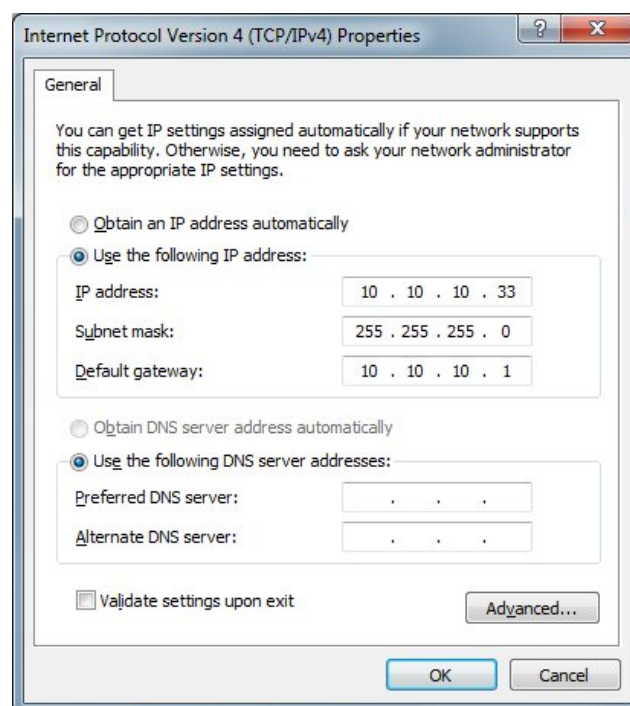


Figure 3.1 – Configure IP address, subnet mask and default gateway for a Windows host.

The choice of IP address for the router interface is arbitrary, although conventionally x.x.x.1 is chosen for convenience. The setting of default gateway is only required when there is intention of communicating with hosts outside the LAN. If all traffics are within the LAN, it is not necessary to configure the default gateway.

Equipment:

Windows OS laptops with Cisco Packet Tracer installed.

Procedures:

1. Construction and Configuration of a Computer Network for Testing Default Gateway

1.1 Construct the network shown in Figure 3.2.

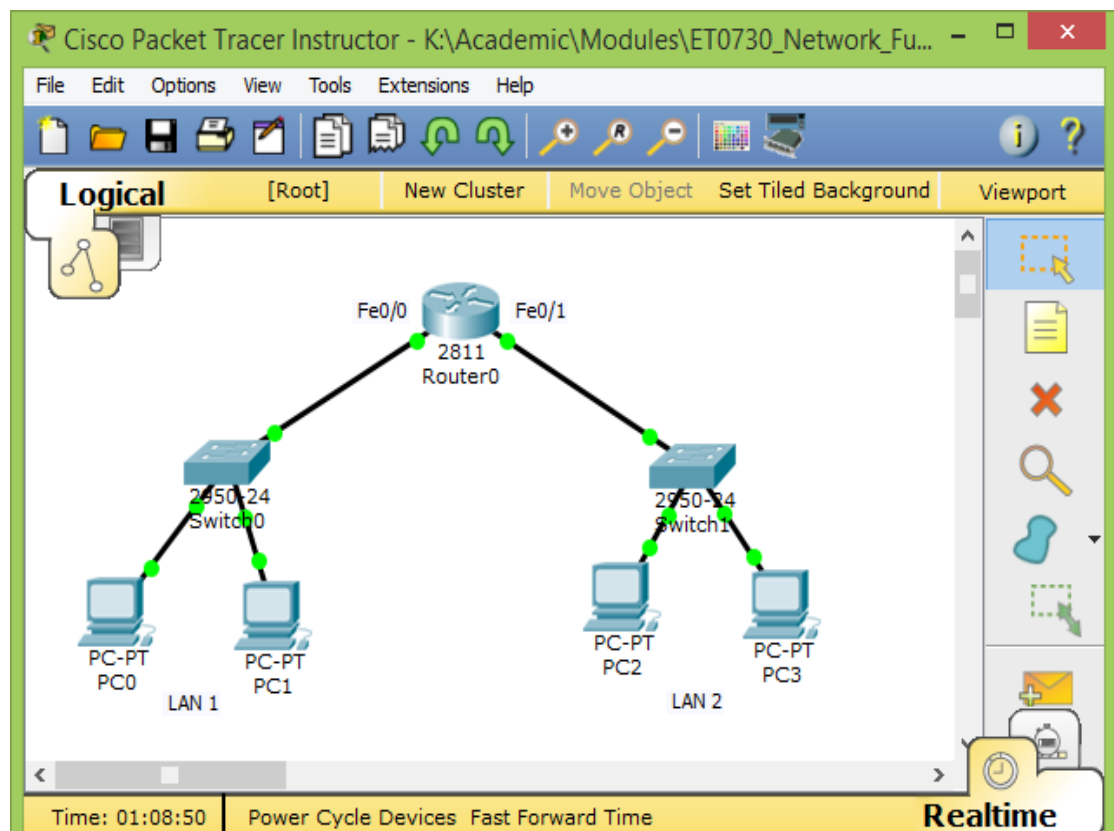


Figure 3.2 - A network for testing default gateway.

- 1.2 Configure the four hosts and the router's Fe0/0 and Fe0/1 interfaces with parameters as shown in Table 3.1 below. For the four hosts, the "Default Gateway" is configured under the "Config" tab's "Settings", and enter your setting in the "Gateway" textbox. When configuring Router0, remember to activate the router's FastEthernet interfaces by putting a tick in the box next to "On" for "Port Status", as shown in Figure 3.3 below, else the "LED"s on the router interfaces and the directly connected switch ports will remain "red" (i.e. status = down).

Device	IP Address	Subnet Mask	Default gateway
PC0	192.168.1.100	255.255.255.0	192.168.1.1
PC1	192.168.1.101	255.255.255.0	192.168.1.1
PC2	192.168.2.102	255.255.255.0	192.168.2.1
PC3	192.168.2.103	255.255.255.0	192.168.2.1
Router 0's Fe0/0	192.168.1.1	255.255.255.0	Not applicable
Router 0's Fe0/1	192.168.2.1	255.255.255.0	Not applicable

Table 3.1 – Network configuration parameters for Figure 3.2.

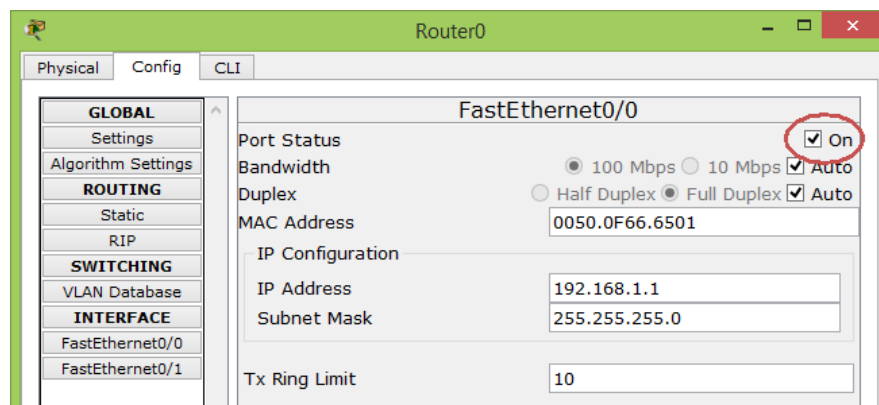


Figure 3.3 – Put a tick in the box next to "On" for "Port Status" to activate the FastEthernet port.

- 1.3 Configure the routing protocol for Router0 by carrying out the following steps. Routing protocols will not be covered in this module.
- 1.3.1 Click on Router0.
 - 1.3.2 Click "Config" → "RIP".
 - 1.3.3 In the textbox of "Network", enter 192.168.1.0, then click the "Add" button.
 - 1.3.4 Repeat Step 1.3.3 for 192.168.2.0.
 - 1.3.5 Check that you observe the same result as shown in Figure 3.4.

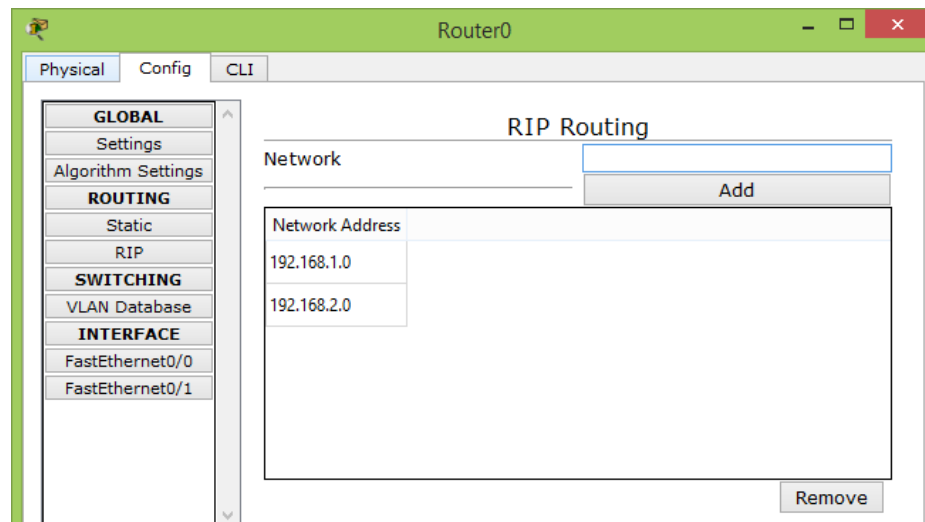
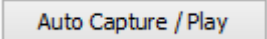


Figure 3.4 – Routing configuration for Router0.

- 1.4 Verify the connectivity among the four hosts. If any connectivity test fails, check your configuration to rectify the problem.
- 1.5 Switch Packet Tracer to “Simulation Mode”.
- 1.6 Click on PC0’s symbol, and select the “Desktop” tab. Click “Command Prompt”. Move the pop-up window away from the Logical Workspace in order not to block your network topology.
- 1.7 In the Command Prompt window, enter `ping 192.168.2.103` to test connectivity between PC0 and PC3. Click the  button so that the simulation proceeds automatically. Observe the movement of IP packets of type “ICMP” only. Ignore the rest.

Question:

For every ping command, there are four ICMP’s ECHO messages sent out to the destination host. The destination host correspondingly returns four messages if the connectivity is working. Google “ICMP echo” to find the type of ICMP message returned by the destination host. Which type of ICMP messages are those?

ICMP returned by the destination host are 'ICMP echo reply'.

2. Consequence of Removing Default Gateway setting

- 2.1 Switch Packet Tracer back to “Realtime Mode”.
- 2.2 Click on PC0’s symbol, and select the “Config” tab. Delete the entry for “Gateway” textbox. This effectively removes the default gateway setting for host PC0.

- 2.3 Try to ping from PC0 to PC3 again. Is it successful?

The pinging failed.

- 2.4 Switch Packet Tracer to “Simulation Mode”.

- 2.5 In the Command Prompt window of PC0, enter ping 192.168.2.103 again to test connectivity between PC0 and PC3. Observe the movement of IP packets of type “ICMP”.

Question:

Does PC0 send IP packets to Fe0/0 interface of Router0? Can you explain why it is so?

No packets were sent from PC0 to the router. The default gateway of PC0 was removed, hence the router cannot direct any messages from PC0 to PC3.

- 2.6 Switch Packet Tracer to “Realtime Mode”.

- 2.7 In the Command Prompt window of PC0, enter ping 192.168.1.101 to test connectivity between PC0 and PC1.

Question:

Does PC0 manage to ping PC1?

PC0 managed to ping PC1.

Question:

The default gateway setting of PC0 has been removed in Step 2.2. Can you explain why PC0 is still able to ping PC1?

PC0 and PC1 are in the same LAN, hence they are able to send message to each other with using the router, hence removing the default gateway has no effect.

- 2.8 Restore the default gateway setting for host PC0.

- 2.9 Delete the default gateway setting for PC3, using the same approach as in Step 2.2.

- 2.10 Switch Packet Tracer to “Simulation Mode”.

- 2.11 In the Command Prompt window of PC0, enter ping 192.168.2.103 to test connectivity between PC0 and PC3. Observe the movement of IP packets of type “ICMP”.

Question:

Does PC0 send IP packets to Fe0/0 interface of Router0 this time?

PC0 does send packets to Fe0/0.

Question:

Does PC3 send IP packets to Fe0/1 interface of Router0? Can you explain why it is so?

PC3 does not send packets to Fe0/1 as the default gateway was deleted,
hence, it is effectively not in the network.

Question:

Is the connectivity test successful? What conclusion can you draw?

The test failed. Hence I can conclude that without the proper default
gateway, devices in 2 separate LANs cannot communicate with each
other through a router.
