

ET0730

Chapter 3

Connecting LANs to WAN

Singapore Polytechnic
School of Electrical & Electronic Engineering

Objectives

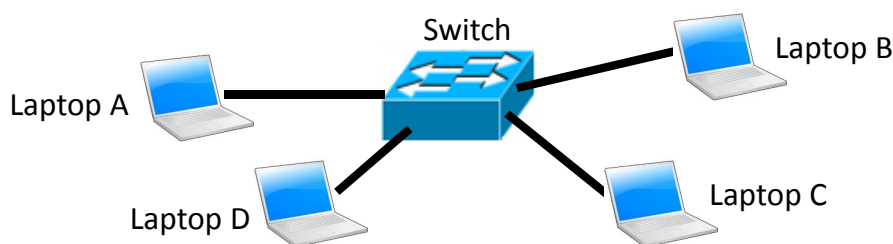
- Explain why routing is necessary for hosts on different networks to communicate.
- Explain what default gateway is, and its role.
- Identify the interface to be set as default gateway.
- Explain the choice of IP address for default gateway.
- Understand the situation under which a default gateway is needed.
- Describe the function of ports on routers.

Outline



- Interconnecting LANs
- Default gateway
- When do we need a default gateway?
- Connecting LANs to WAN with a router
 - Interface Ports of Routers

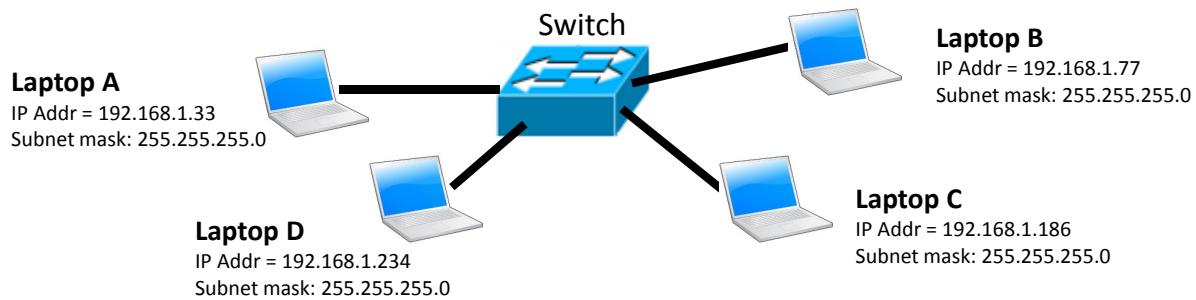
What is LAN?



Example: A LAN consisting of four laptops connected by a switch.

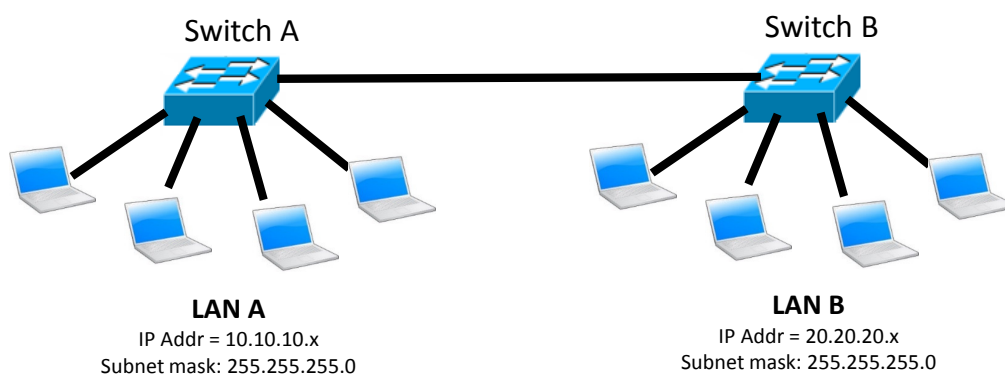
- Local Area Networks (LANs), as defined in Chapter 1,
 - are used within small areas (e.g. within an office, building).
 - provide services and applications to people within a common organizational structure, such as a single business, campus or region.

IP Address of End Devices in a LAN



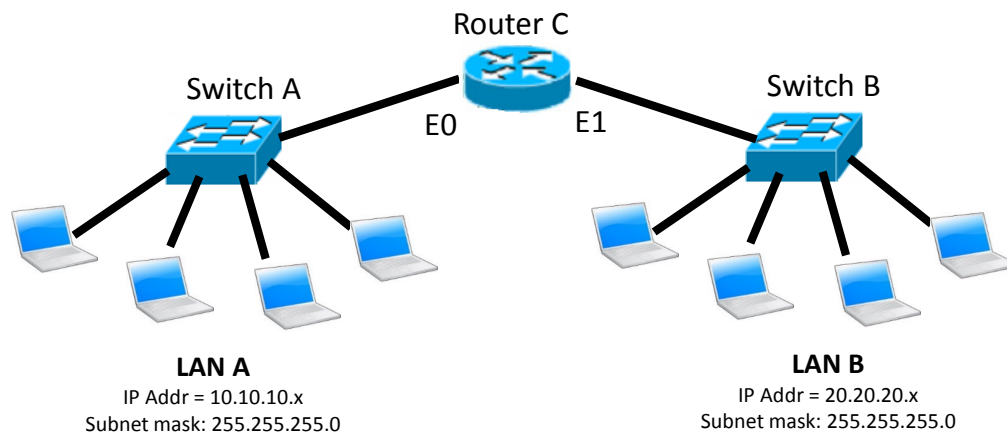
- IP addresses of end devices in a LAN have **common “Network Portion”**.
- In Lab 2, we have demonstrated that computers physically connected together **cannot** ping one another if they do not have common “Network portion” in their IP addresses.
- End devices not having same “network portion” in their IP addresses are considered to be belonged to **different networks**.

Interconnecting LANs (1)



- Hosts in LAN A will not be able to communicate with hosts in LAN B.
- IP packets from the 10.10.10.x network cannot reach the 20.20.20.x network.

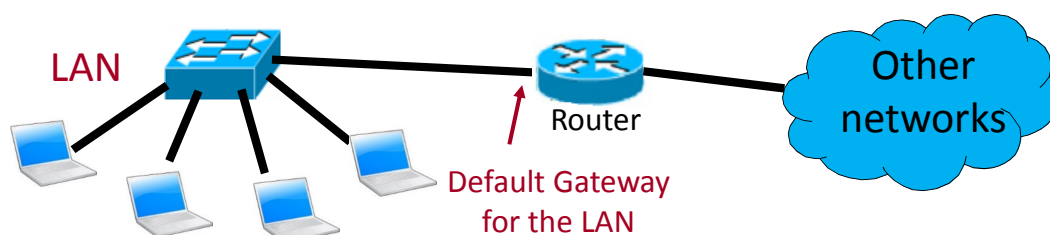
Interconnecting LANs (2)



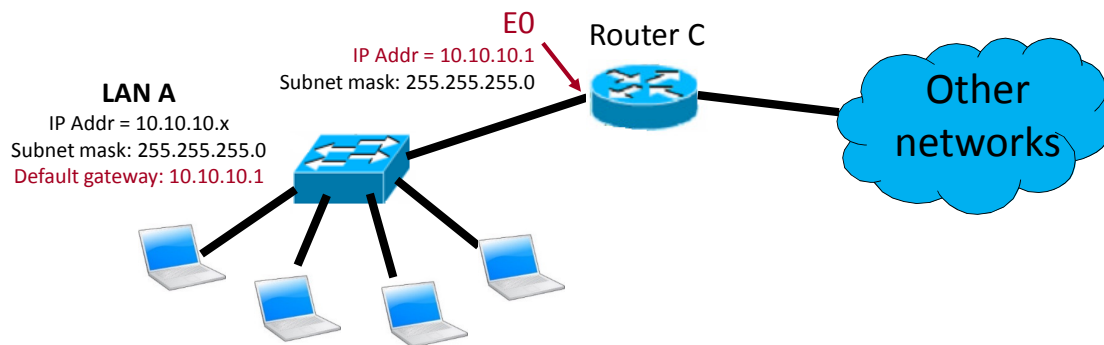
- We need a router (Router C) to **route the IP packets** between LAN A and LAN B.
- Router C serves as a “**gateway**” for the LANs.

Default Gateway (1)

- “**Default gateway**” is a router’s interface port for all data traffic to be **re-directed to** if the destination of the IP packet is **outside the network**.
 - This is analogue to the “main door” of a house, that the residents inside would have to use for access to areas beyond the house.
- The interface port of a router that is connected to a LAN acts as the default gateway for that LAN.

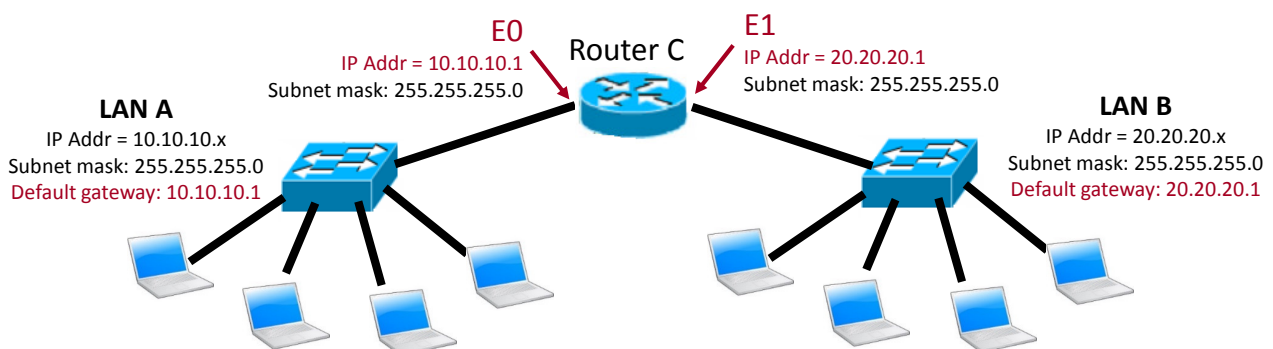


Default Gateway (2)



- The interface of the router that is connected to a LAN must be in same network as the hosts in that LAN, else the IP packet from the hosts cannot reach that interface.
 - Interface E0 of Router C must have IP address of 10.10.10.x, for example, 10.10.10.1.

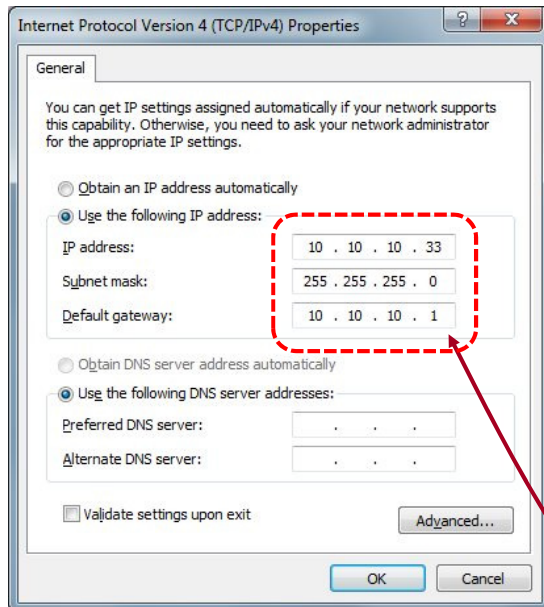
Default Gateway (3)



- Similarly, the interface of Router C that is connected to LAN B must be in same network as the hosts in LAN B.
 - Interface E1 of Router C must have IP address of 20.20.20.x, for example, 20.20.20.1.

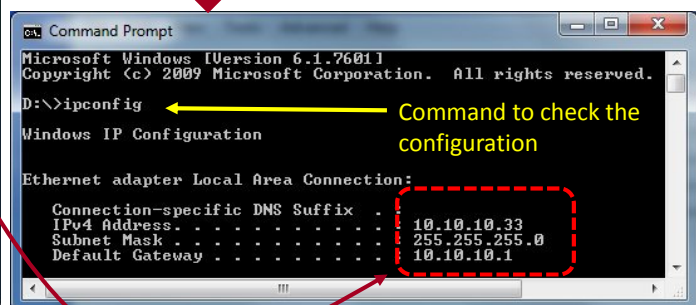
Default Gateway (4)

- All the hosts in LAN A must be configured to use E0 of Router C as the default gateway.



Configure the IP address, subnet mask, and default gateway for a host in LAN A.

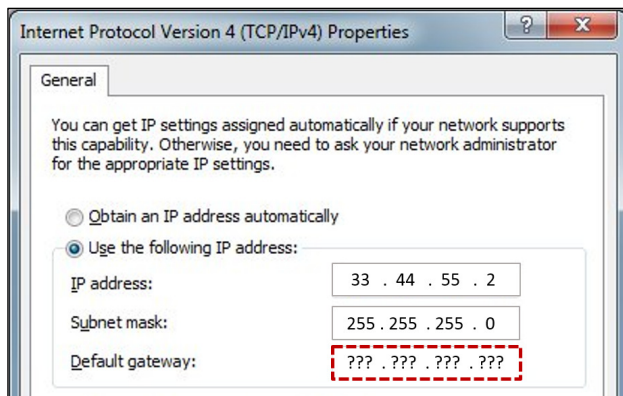
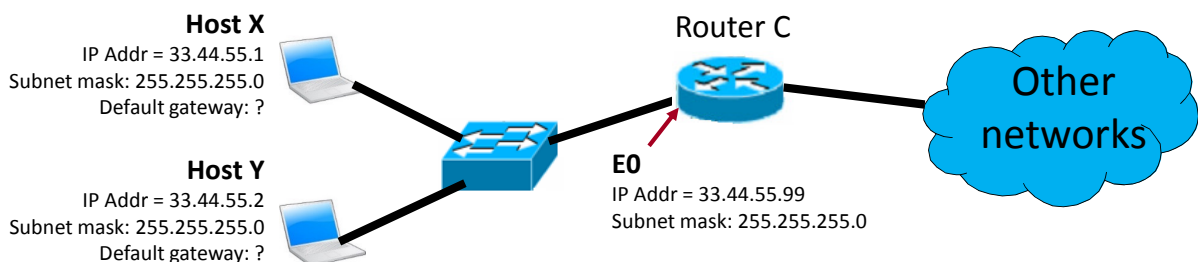
Confirm the configuration of the host.



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Exercise: Default Gateway



- What would you enter as the default gateway for Host Y?

Answer:

- Default Gateway = 33.44.55.99

Note:

- It is **not mandatory** to use x.x.x.1 as the IP address of the router interface.
- Always use the IP address of the router interface as the default gateway.

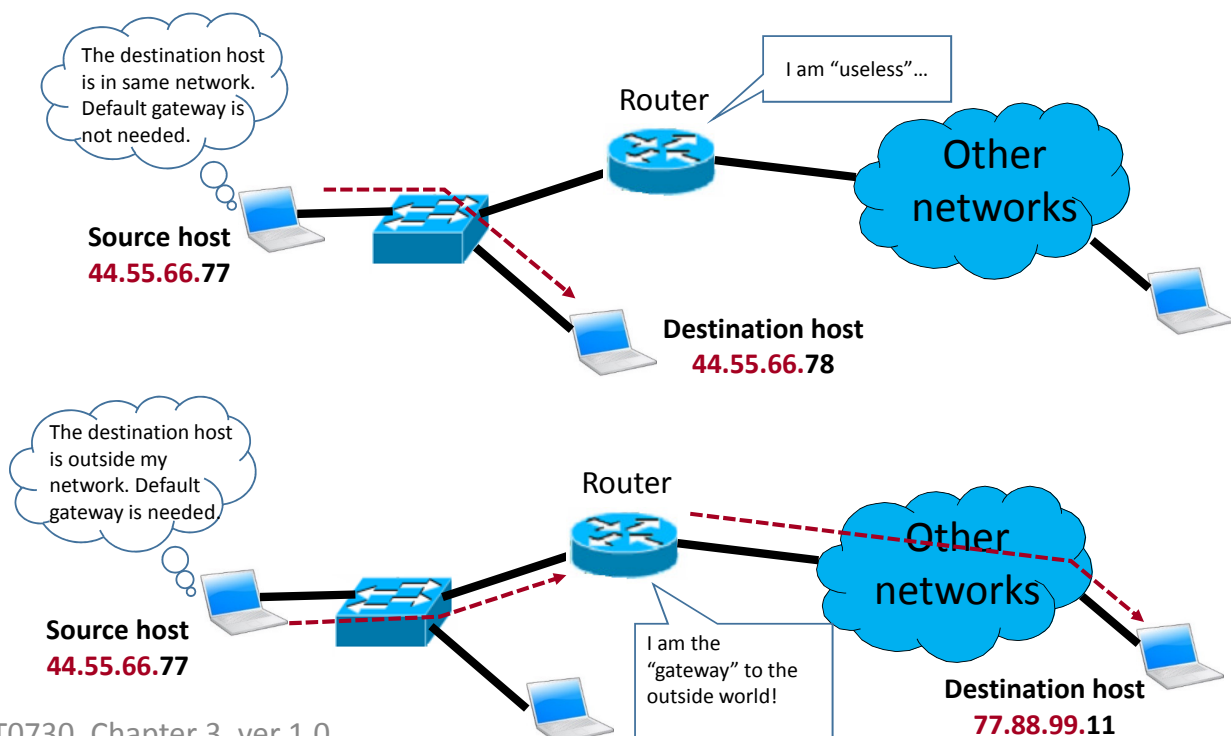
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When do we need a default gateway ?(1)

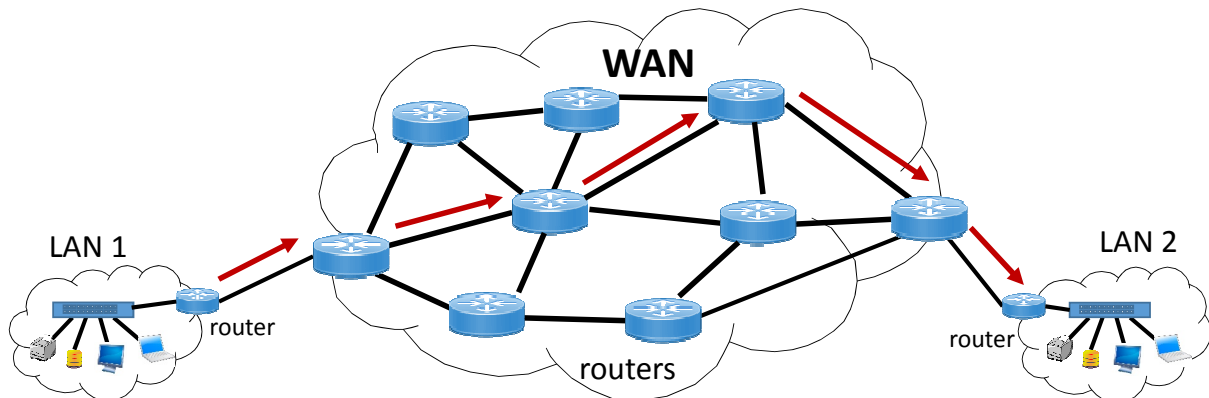
- It depends on the destination host's IP address (i.e. destination IP address, where the IP packet is to be sent to).
- If the destination IP address's "network portion" is **identical** to the host IP address's network portion, the destination host is in the **same network** as the source host.
 - Default Gateway is **NOT** needed.
- Else, the source and destination hosts are not in the same network.
 - Default Gateway is needed.

When do we need a default gateway ?(2)



Connecting LANs to WAN

- WANs span very large geographic area (e.g. country).
- A WAN connects 2 or more LANs/MANs together using relatively slow-speed connections .
- Routers in the WAN decide the best route to forward the IP packets from the source host to the destination host.

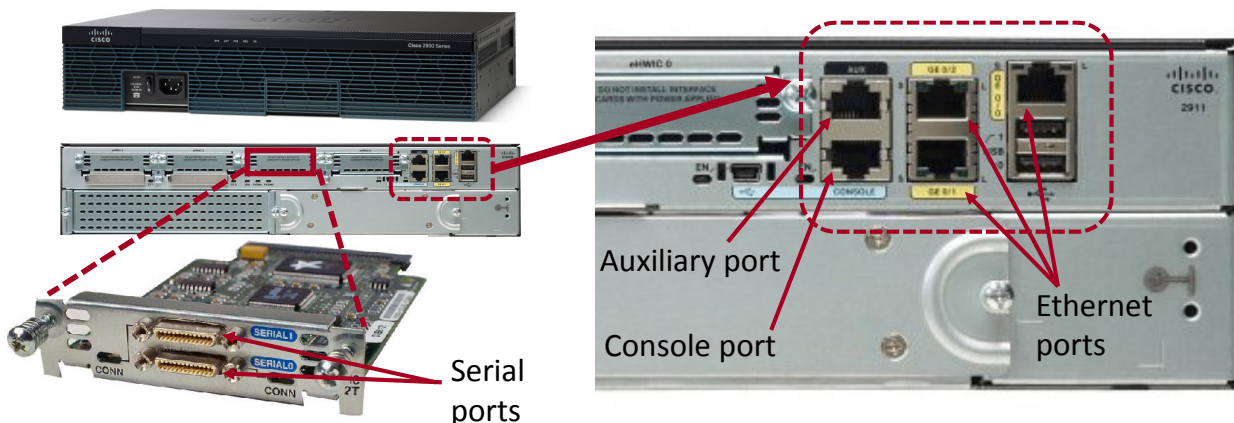


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Interface Ports of Routers

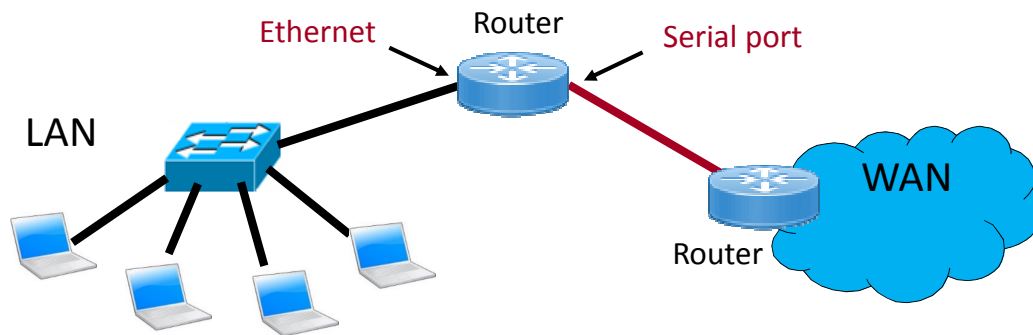
- Typically, a router will have:
 - a “**Console Port**” for router configuration,
 - an “**Auxiliary Port**” for remote router configuration,
 - a few “**Ethernet ports**” for connection to LANs, and
 - a few “**Serial ports**” for connection to routers.



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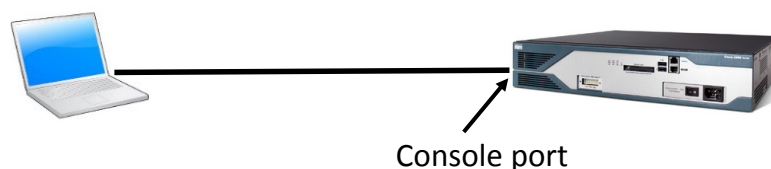
Ethernet Ports and Serial Ports



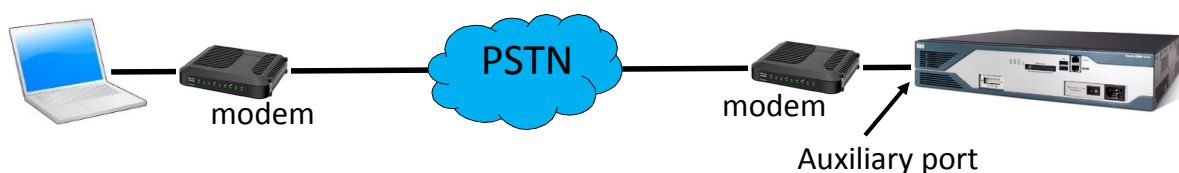
- The **LAN** is connected to **Ethernet port** of the router.
- The **WAN** is connected to **Serial port** of the router.

Console and Auxiliary Ports

- Console port is for connection to COM port of computer acting as terminal.

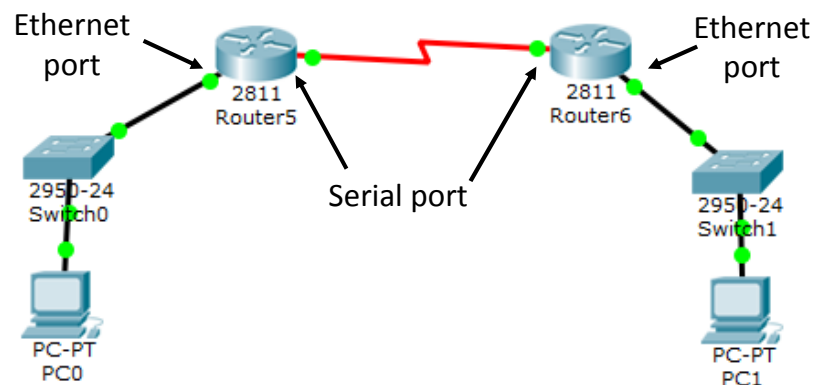


- Auxiliary port is for connection to modem.



Graphical Representation of Router Connections in Packet Tracer

- Black solid lines represent straight-through Ethernet cable.
- The red line represents a serial connection.



Questions & Answers

