

Presentation on

Cisco Networking

(Routing and Switching)

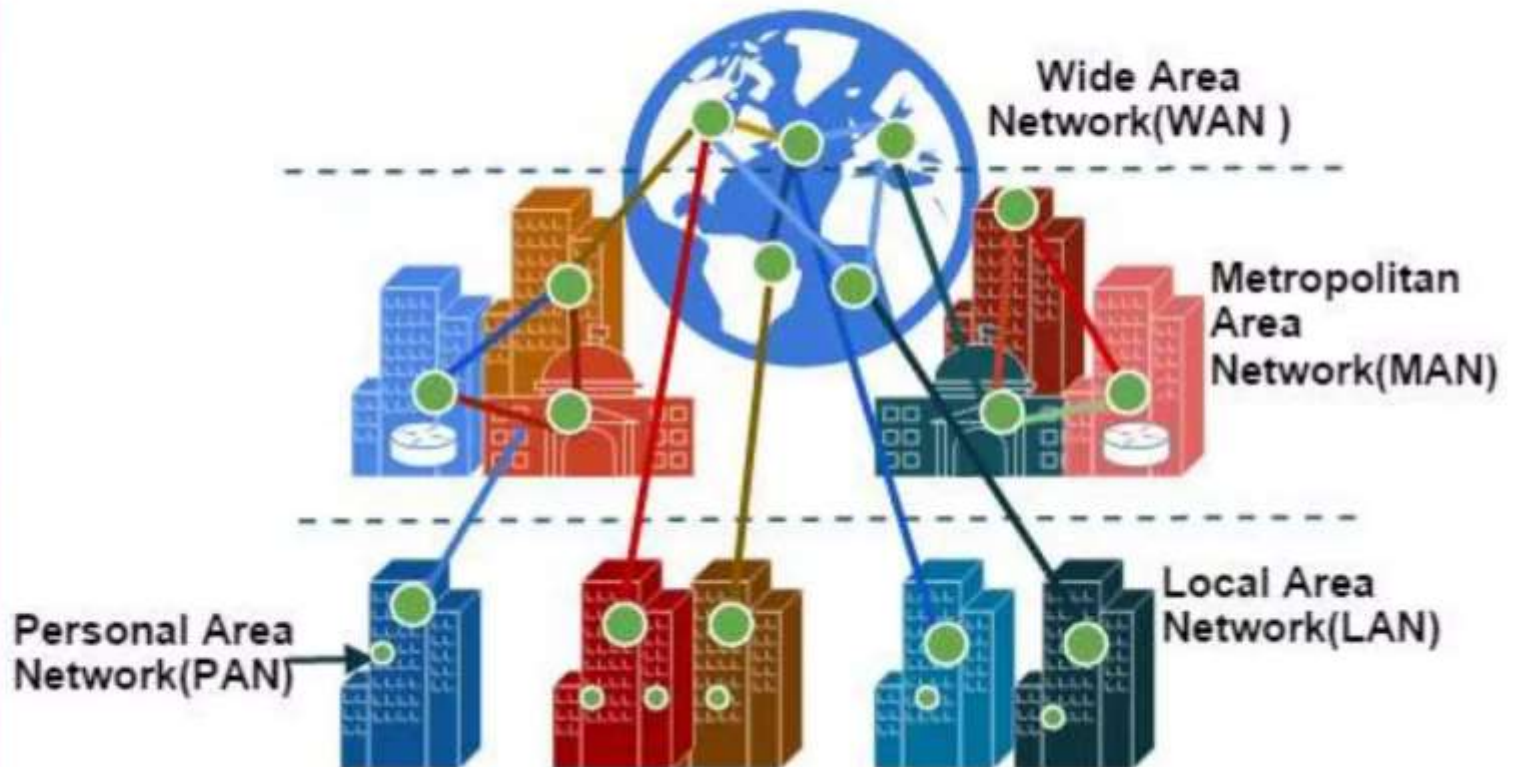
Computer Network



- A computer network or data network is a digital telecommunication network which allows nodes to share resources.
- In computer networks, networked computing devices exchange data with each other using a data link. The connections between nodes are established using either cable media or wireless media.

Network Types

- Usually networks are categorised on the basis of their area of operation.



Networking Devices

Equipment that connects directly to a network segment is referred to as a device.

These devices are broken up into two classifications.

- end-user devices
- network devices

End-user devices include computers, printers, scanners, and other devices that provide services directly to the user.

Network devices include all the devices that connect the end user devices together to allow them to communicate.

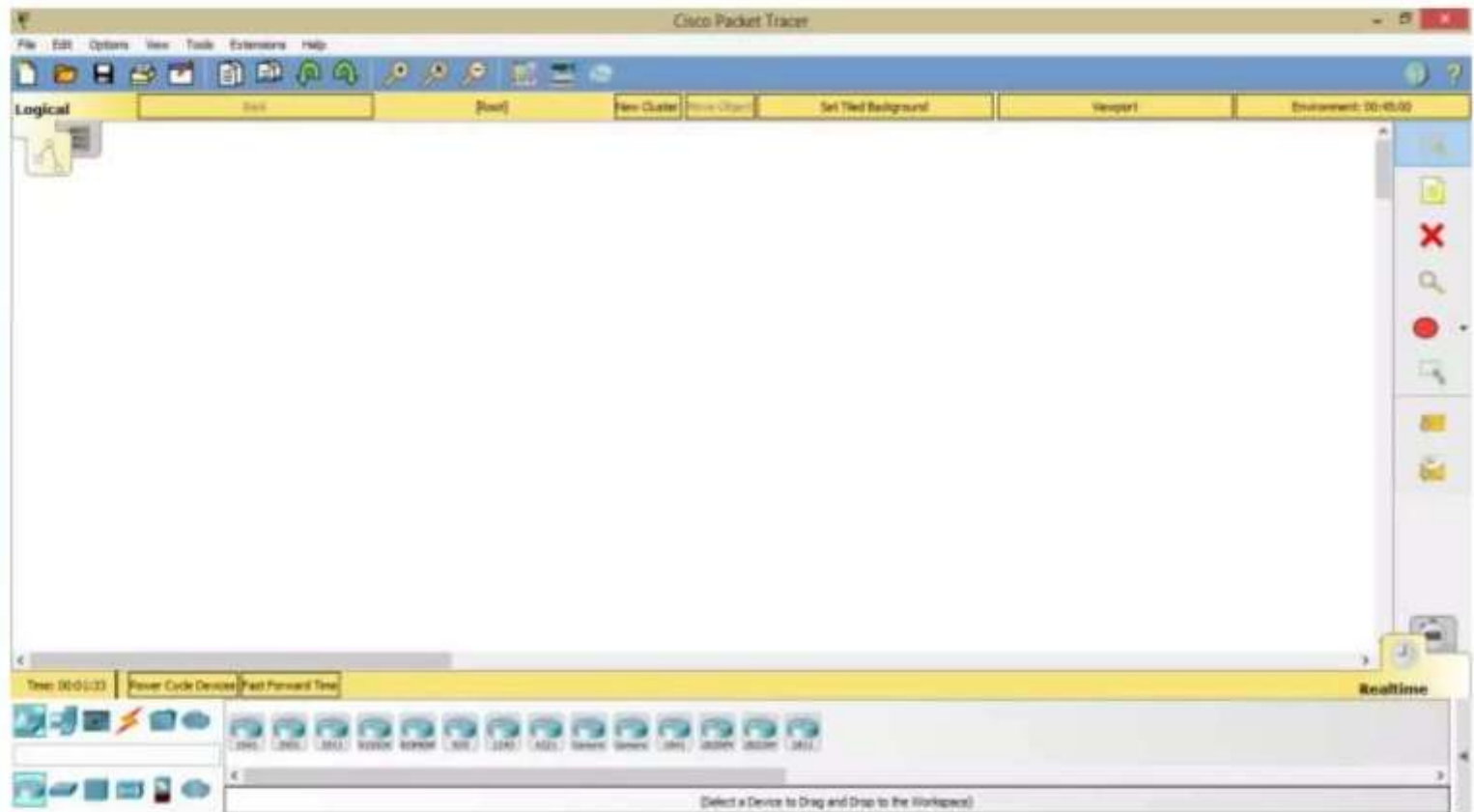
Network Interface Card

A network interface card (NIC) is a printed circuit board that provides network communication capabilities to and from a personal computer. Also called a LAN adapter.

Internal network interface card











Cisco Packet Tracer



Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface.

010100010
010100010
01010001010
1000101010
1000101010
01010
01010
101010001
1010001
010
1010100
10100
010
10
0101000
010100010
10100010
10100010101010
01000101010001
01000101010001
0101010001010
0101000101
01010001010

Network Devices	
Repeater 	Bridge 
10BASE-T Hub 	Workgroup Switch 
100BASE-T Hub 	Router 
Hub 	Network Cloud 

Subnetting and Supernetting

About Subnetting & Supernetting

In subnetting, a network is divided into several smaller subnetwork with each subnetwork(or subnet) having its own subnetwork address.

In supernetting, an organization can combine several class C addresses to create a larger range of addresses (supernetwork).

SUBNETTING

Class A, B, C in IP addressing are designed with two levels of hierarchy.

The organization has two-level hierarchical addressing, but it cannot have more than one physical network./ The host cannot be organized into groups, and all of The hosts are at the same level./ The organization has one network with many hosts.

One solution to this problem is subnetting, the further division of a network into smaller networks called **subnetworks**.

Example of Subnetting

(Example / Class A)

An organization with a class A address at least 1,000 subnetworks. Find the subnet mask and configuration of each subnetwork.

(Solution)

1. There is a need for at least 1,000 subnetworks.(we need at least 1,002 subnetworks to allow for the all-1s and all-0s subnets)
2. This means that the *minimum number of bits to be allocated for subnetting* should be 10, ($2^9 < 1,002 < 2^{10}$).
3. 14 bits are left to define the hostids. Subnet mask (11000000 = 192).

Mask

255.0.0.0

Netid

Hostid

11111111	00000000	00000000	00000000
----------	----------	----------	----------

a. Without subnetting

Mask

255.255.192.0

Netid

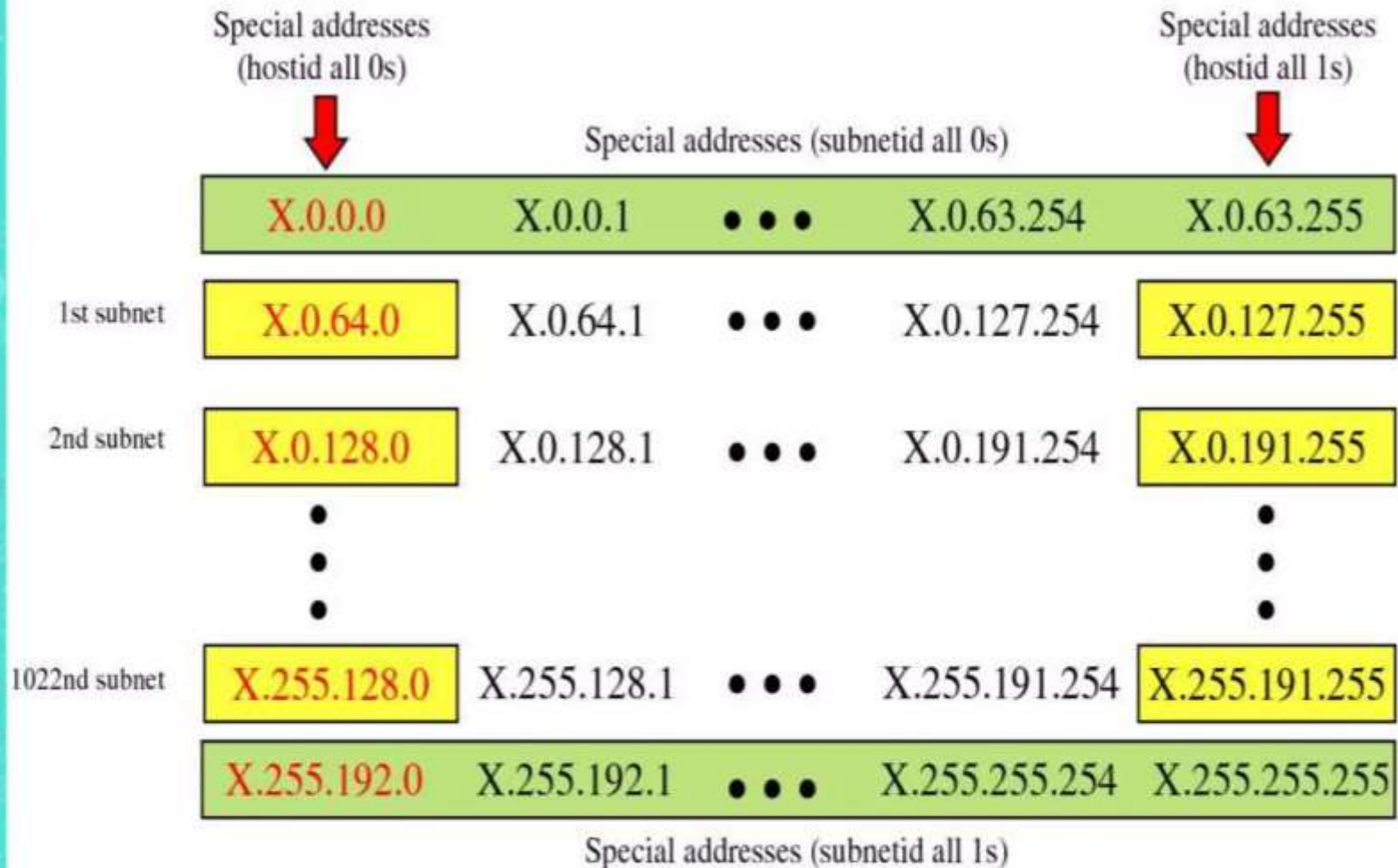
Subnetid

Hostid

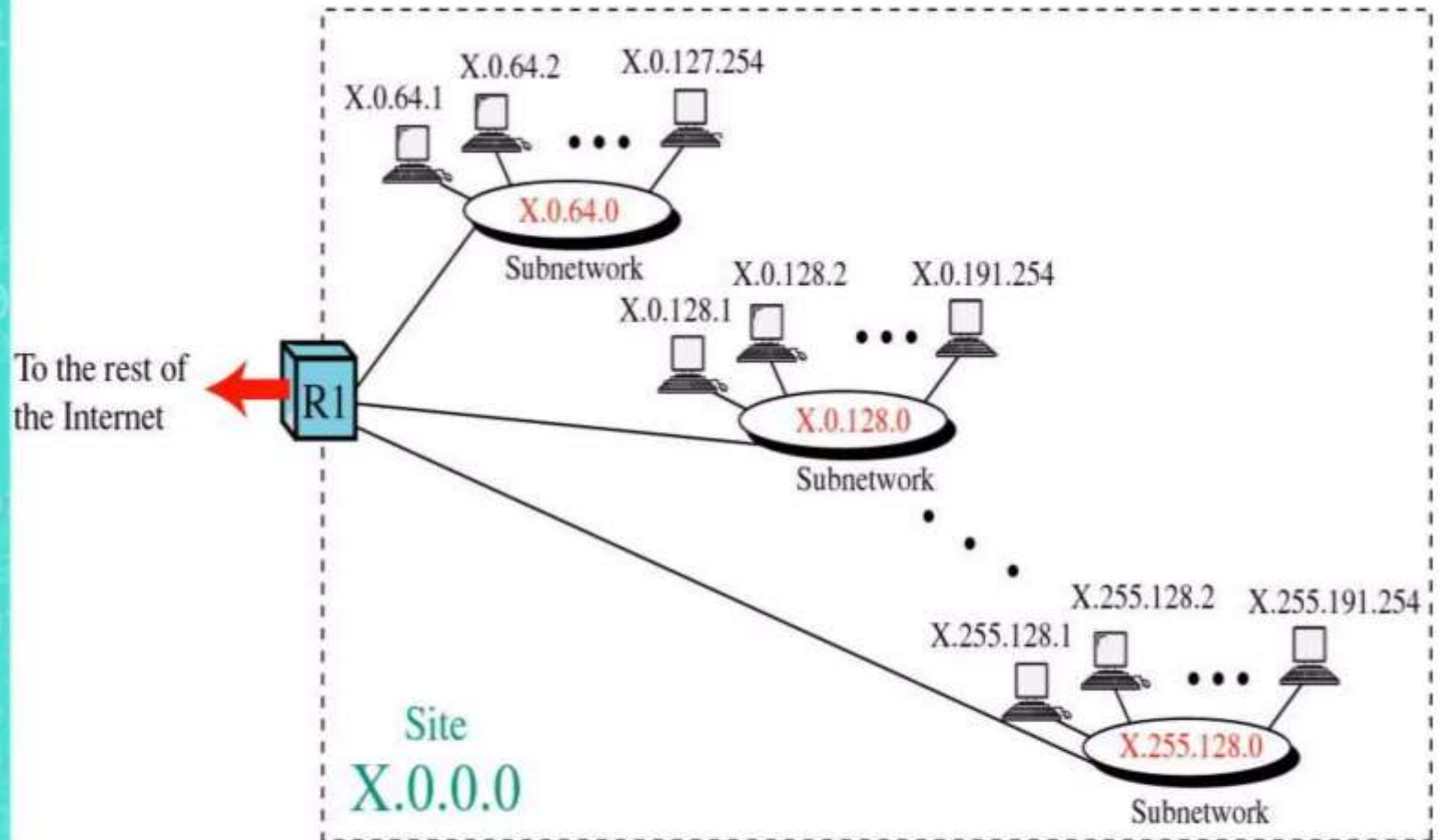
11111111	11111111 11	00000000	00000000
----------	-------------	----------	----------

b. With subnetting

Range of addresses



Subnetworks in example



Classless Interdomain Routing (CIDR)

Supernetting means assigning a set of class C addresses to an organization that needs more than 254 host addresses.

However, when these class C addresses are entered into the routing table, each occupies one entry in the routing table./ 256 entries in the routing table.

The classless interdomain routing(CIDR) technique is devised to reduce the number of routing table entries.

In this technique, instead of entering each single class C address with its corresponding default mask(255.255.255.0),**the router can use the supernet mask and the lowest network address in the group.**

CIDR

Default mask	Network address	Next hop address
255.255.255.0	X.Y.32.0
255.255.255.0	X.Y.33.0
255.255.255.0	X.Y.34.0
255.255.255.0	X.Y.35.0
⋮	⋮	⋮

a. Routing table without supernet mask

Default mask	Network address	Next hop address
255.255.252.0	X.Y.32.0
⋮	⋮	⋮

b. Routing table with supernet mask

Hubs vs. Switches

• **Hubs** – less expensive, used in a very small LAN where low throughput is OK

• **Switches** – segments collision domains, interconnects network segments, more expensive, but performance makes it cost effective.



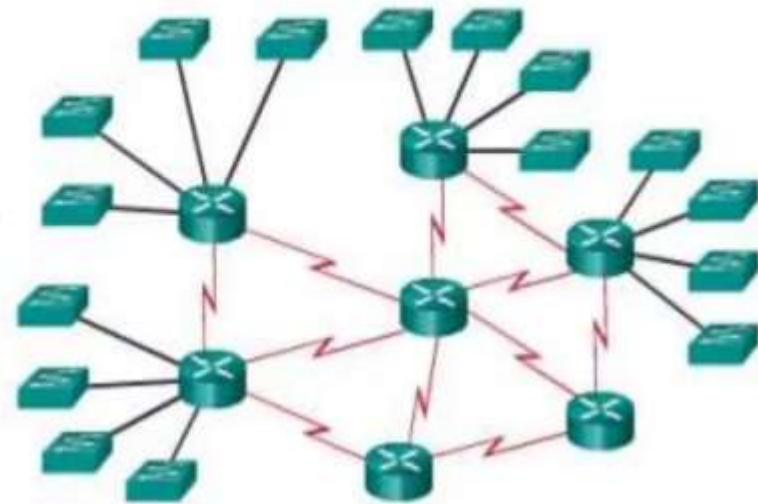
Routers

- It is a layer 3 or network layer device.
- In this there is no broadcast.
- It is WAN technology device.
- It is useful to connect different networks.
- Packet filtering & it finds the best path selection.



Routing

- Routing is the exchange of routes between different networks .
- There are three types of routing:
 1. Default routing
 2. Static routing
 3. Dynamic routing



Dynamic Routing

- A routing protocol is the communication used between routers.
- A routing protocol allows one router to share information with other routers.
- The information a router gets from another router, using a routing protocol, is used to build & maintain a routing table.

Examples of routing protocols:

1. RIP [ROUTING INFORMATION PROTOCOL]
2. OSPF [OPEN SHORTEST PATH FIRST]

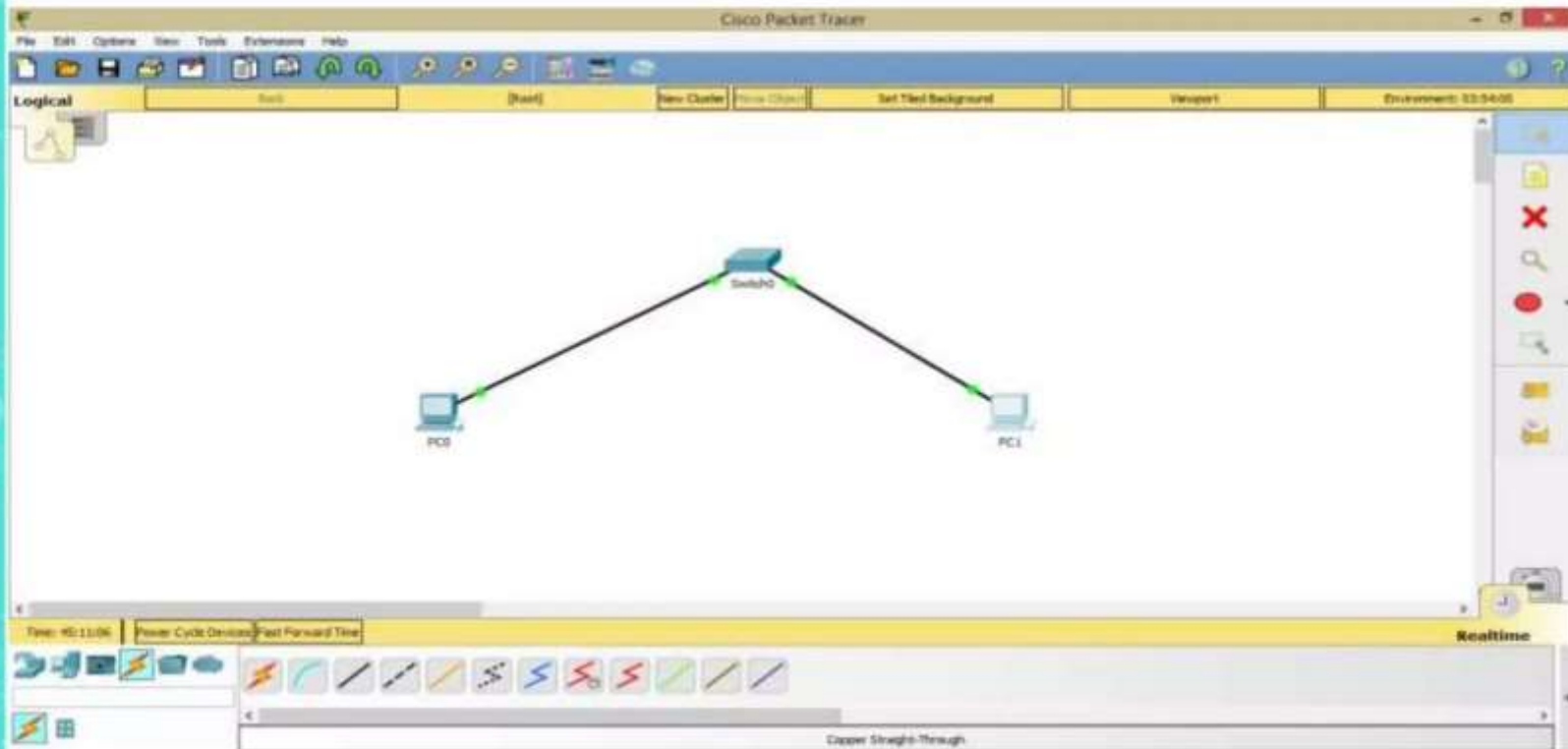
Routing Information Protocol (RIP)

- RIP is a distance vector routing protocol
- Hop count is used as the metric for path selection
- If the hop count is greater than 15, the packet will be discarded
- By default, routing updates are broadcast every 30 seconds
- RIP has evolved over the years from a Classful Routing Protocol, RIP Version 1 (RIP v1), to a Classless Routing Protocol, RIP Version 2 (RIP v2).

OSPF

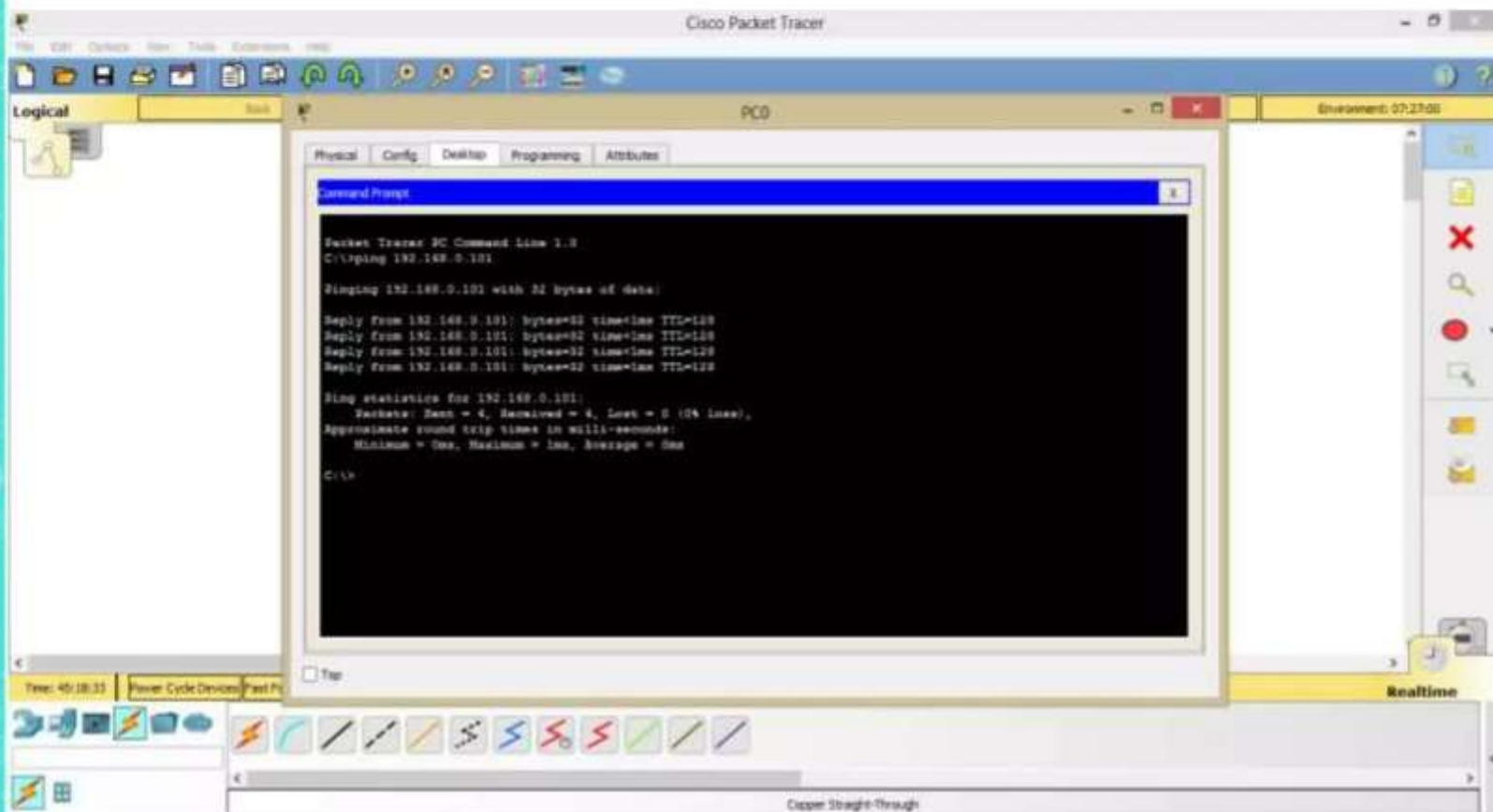
- Open Shortest Path First
- Dynamic IGP (Interior Gateway Protocol)
- Use within your own network
- Link state algorithm

Establishing a Connection



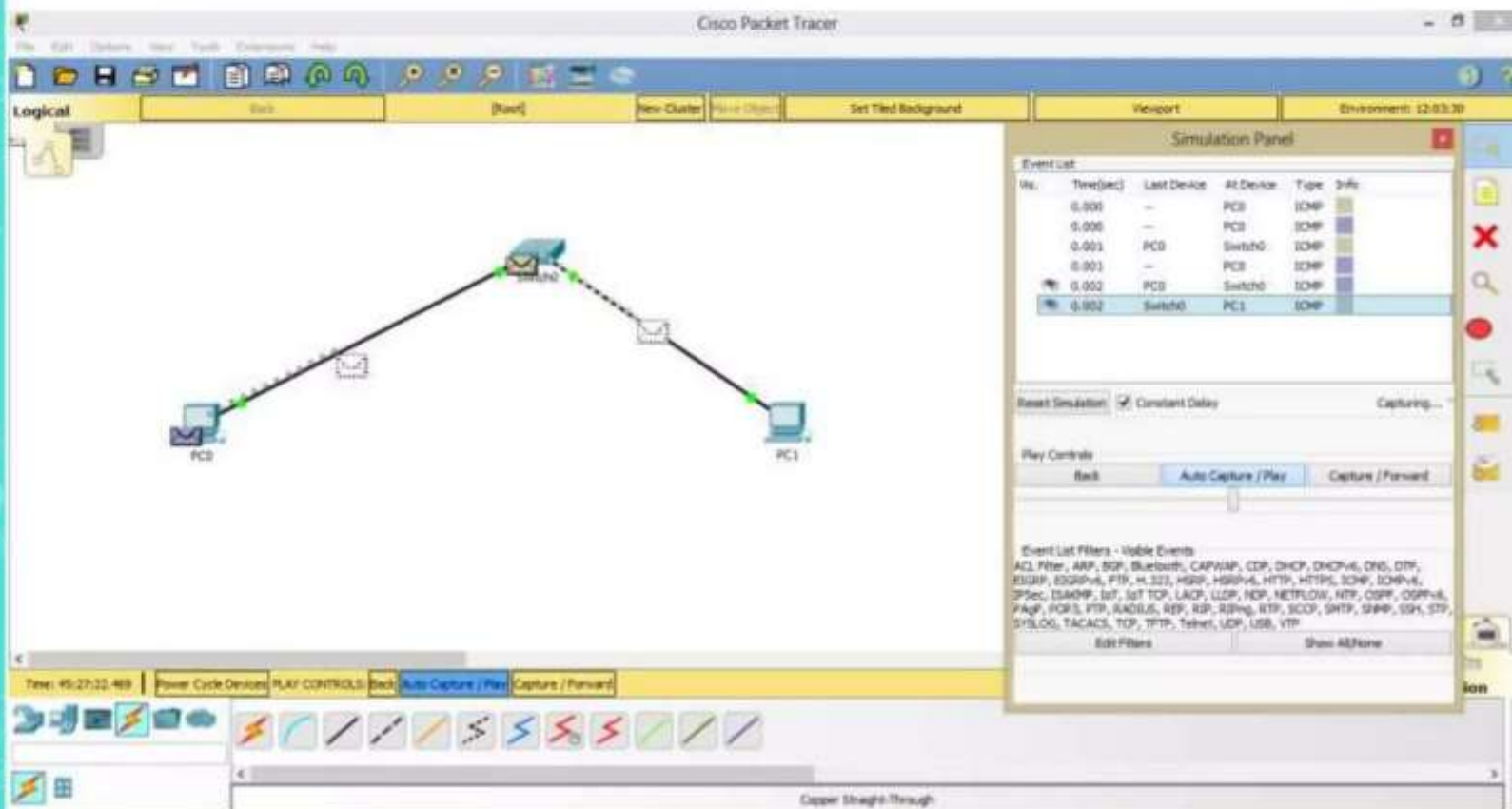
- 2 End devices
- 1 Network device (Switch)
- 2 Connections (Copper Straight Through)

Ping test



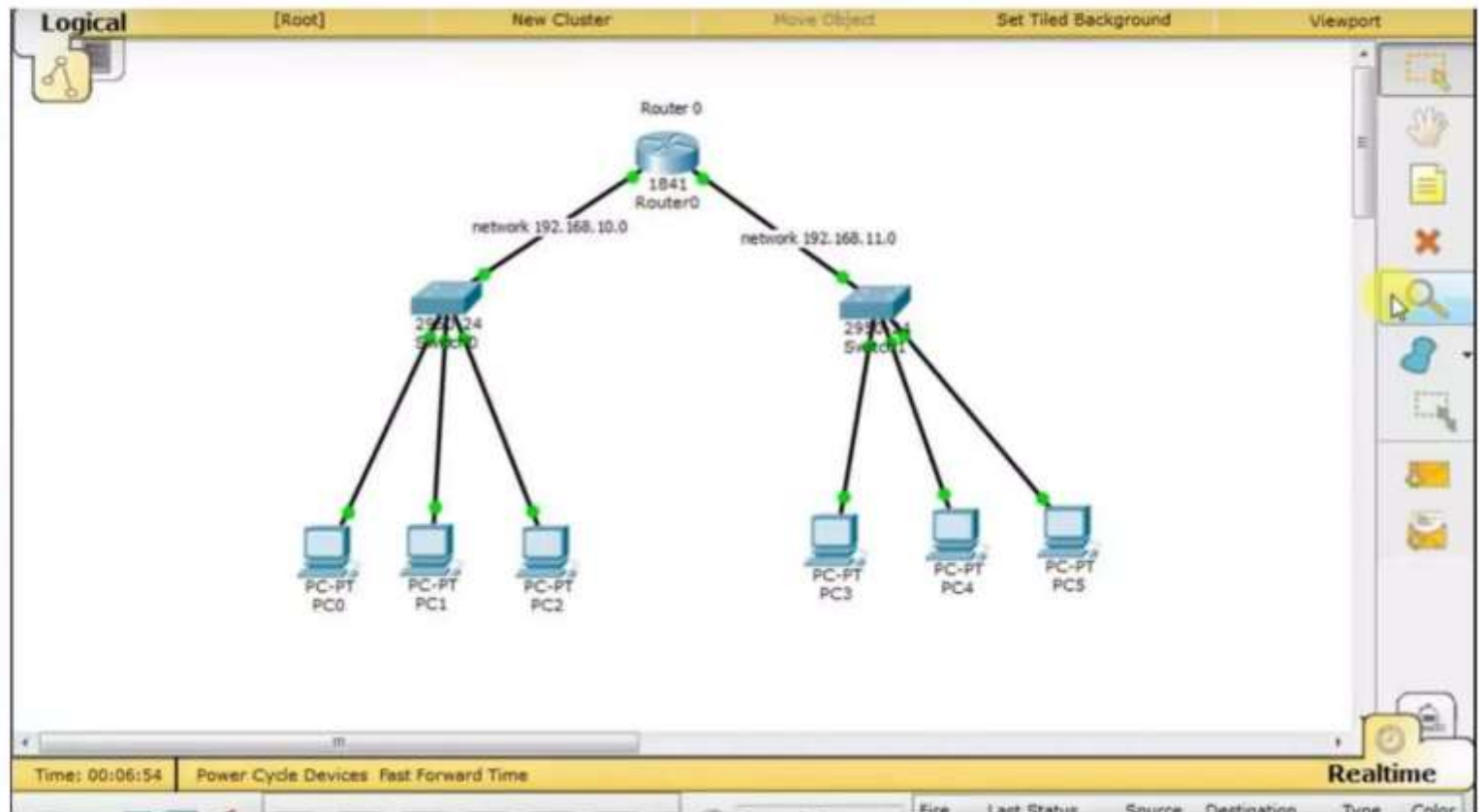
- Ping was sent from one end device(192.168.0.100) to another End device(192.168.0.101) .
- Ping test was successful.

Tracing a Packet



- PCo(source) sends packets to PC1(destination)
- The network device used was switch, which carried out the whole transfer of packet from PCo to PC1.

Creating a Network



Network Consists of -

- 1 Router
- 2 Switches
- 6 PCs

- PC0, PC1, PC2 are connected with Switch0.
- PC0(192.168.10.2), PC1(192.168.10.3), PC2(192.168.10.4)
- PC3, PC4, PC5 are connected with Switch1.
- PC0(192.168.11.2), PC1(192.168.11.3), PC2(192.168.11.4)
- Switch0 and 1 are connected with Router0.
- Router is assigned with different IP address for different networks
- PCs default gateway is set with respect to IP address of router.
- The network is established successfully.



Thank You