Assignment No: 13

Title: Configure RIP/OSPF/BGP using Packet Tracer

Learning Objectives:

- To learn Packet Tracer tool
- To configure RIP/OSPF/BGP on Packet Tracer

Problem Statement:

Configure RIP/OSPF/BGP using Packet Tracer

Learning Outcome: Students will able to

- To learn Packet Tracer tool
- To configure RIP/OSPF/BGP on Packet Tracer

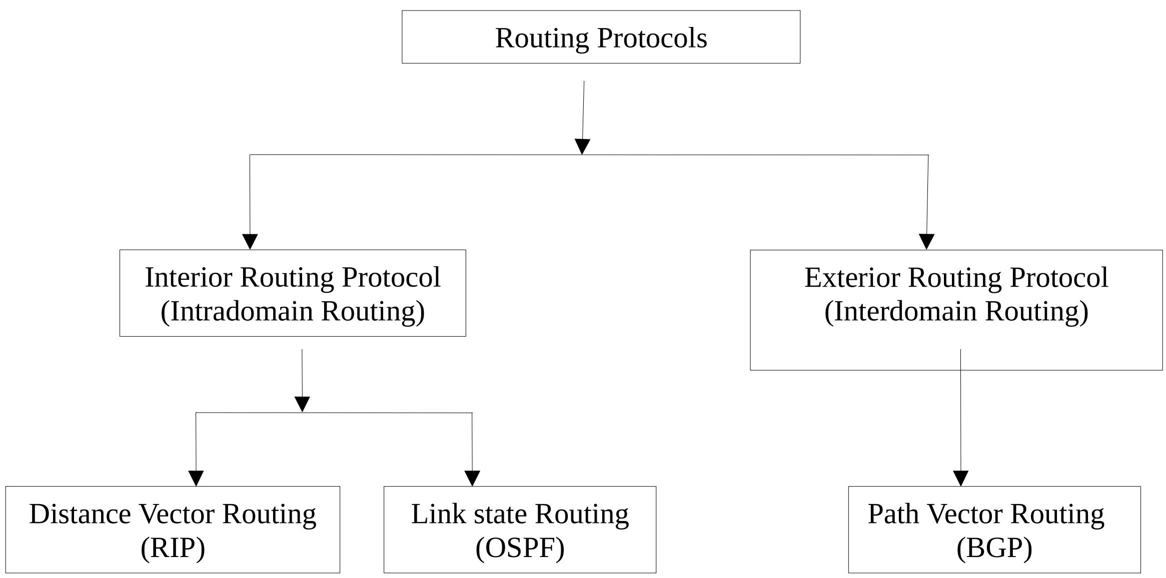
Software and Hardware Requirement:

- PC with network
- Linux Operating system
- Packet Tracer

Theory:

1. Routing Protocols:

A routing protocol specifies how routers communicate with each other, distributing information that enables them to select routes between any two nodes on a computer network. Routing algorithms determine the specific choice of route. Each router has a priori knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. This way, routers gain knowledge of the topology of the network.Following fig. shows the types of routing Protocols.



Distance vector protocols

As the name implies, distance vector routing protocols use distance to determine the best path to a remote network. The distance is usually the number of hops (routers) to the destination network.

Distance vector protocols send complete routing table to each neighbor (a neighbor is directly connected router that runs the same routing protocol). They usually use some version of Bellman-Ford algorithm to calculate the best routes. Compared with link state routing protocols, distance vector protocols are simpler to configure and require little management, but are susceptible to routing loops and converge slower than link state routing protocols. Distance vector protocols also use more bandwidth because they send complete routing table, while link state procotols sends specific updates only when topology changes occur.RIP and EIGRP are examples of distance vector routing protocols.

Link state protocols

Unlike distance vector protocols, link state protocols don’t advertise the entire routing table. Instead, they advertise information about a network toplogy (directly connected links, neighboring routers…), so that in the end all routers running a link state protocol have the same topology database. Link state routing protocols converge much faster than distance vector routing protocols, support classless routing, send updates using multicast addresses and use triggered routing updates. They also require more router CPU and memory usage than distance-vector routing protocols and can be harder to configure.

Each router running a link state routing protocol creates three different tables:

1. neighbor table – the table of neighboring routers running the same link state routing protocol
2. topology table – the table that stores the topology of the entire network
3. routing table – the table that stores the best routes

Shortest Path First algorithm is used to calculate the best route. OSPF and IS-IS are examples of link state routing protocols.

Path vector protocol

A path vector protocol is a network routing protocol which maintains the path information that gets updated dynamically. Updates which have looped through the network and returned to the same node are easily detected and discarded. This algorithm is sometimes used in Bellman–Ford routing algorithms to avoid "Count to Infinity" problems.

It is different from the distance vector routing and link state routing. Each entry in the routing table contains the destination network, the next router and the path to reach the destination.

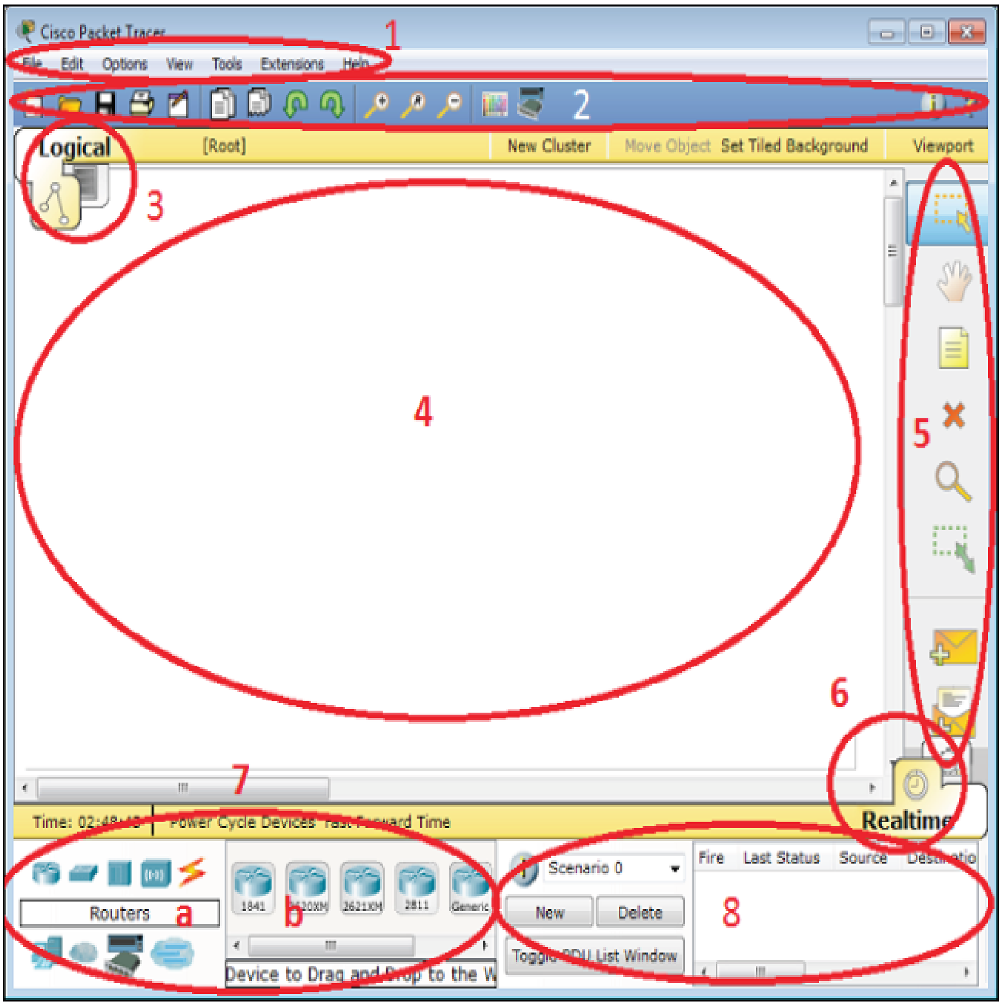
Path Vector Messages in Border Gateway Protocol (BGP): The autonomous system boundary routers (ASBR), which participate in path vector routing, advertise the reachability of networks. Each router that receives a path vector message must verify that the advertised path is according to its policy. If the messages comply with the policy, the ASBR modifies its routing table and the message before sending it to the next neighbor. In the modified message it sends its own AS number and replaces the next router entry with its own identification.

Border Gateway Protocol is an example of a path vector protocol. In BGP, the routing table maintains the autonomous systems that are traversed in order to reach the destination system.

2. Packet Tracer:

Packet Tracer is a protocol simulator developed by Dennis Frezzo and his team at Cisco Systems. Packet Tracer (PT) is a powerful and dynamic tool that displays the various protocols used in networking, in either Real Time or Simulation mode. This includes layer 2 protocols such as Ethernet and PPP, layer 3 protocols such as IP, ICMP, and ARP, and layer 4 protocols such as TCP and UDP. Routing protocols can also be traced

The layout of Packet Tracer is divided into several components similar to a photo editor. Match the numbering in the following screenshot with the explanations given after it:

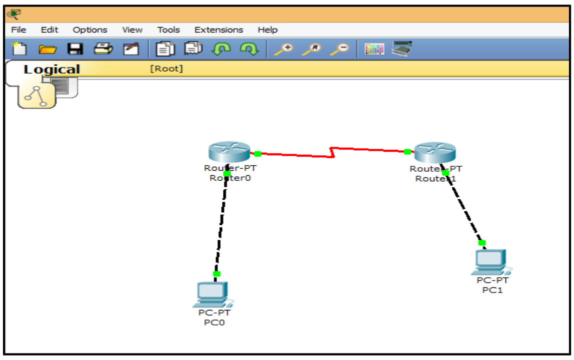


The components of the Packet Tracer interface are as follows:

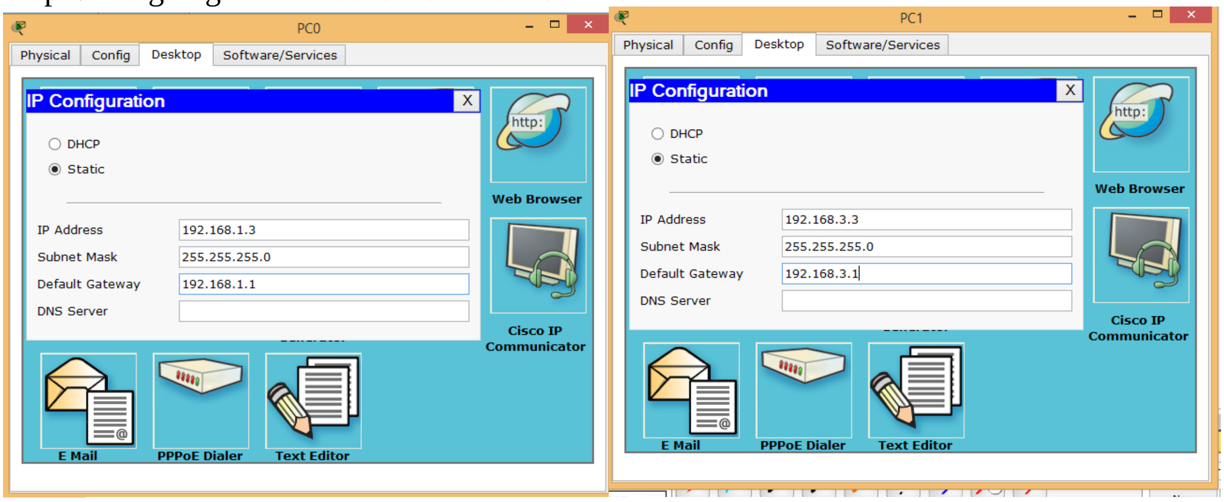
1. Menu bar – This is a common menu found in all software applications; it is used to open, save, print, change preferences, and so on.
2. Main toolbar – This bar provides shortcut icons to menu options that are commonly accessed, such as open, save, zoom, undo, and redo, and on the right-hand side is an icon for entering network information for the current network.
3. Logical/Physical workspace tabs – These tabs allow you to toggle between the Logical and Physical work areas.
4. Workspace – This is the area where topologies are created and simulations are displayed.
5. Common tools bar – This toolbar provides controls for manipulating topologies, such as select, move layout, place note, delete, inspect, resize shape, and add simple/complex PDU.
6. Realtime/Simulation tabs – These tabs are used to toggle between the real and simulation modes. Buttons are also provided to control the time, and to capture the packets.
7. Network component box – This component contains all of the network and end devices available with Packet Tracer, and is further divided into two areas:
   7a: Device-type selection box – This area contains device categories
   7b: Device-specific selection box – When a device category is selected, this selection box displays the different device models within that category
8. User-created packet box – Users can create highly-customized packets to test their topology from this area, and the results are displayed as a list.

3. Configure RIP

Step1: Create a topology as shown in fig 1. to apply RIP protocol .



Step2: Assigning IP address to PC0 and PC1



Step3: Assign IP addresses to all the fast Ethernet and serial interfaces and change the state of the interfaces from down to UP.

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#
```

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Fig.: Configuration of Router 0 i.e. configuring both serial and fast ethernet interfaces.

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 192.168.2.3 255.255.255.0
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
no shutdown
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
```

Fig.: Configuration of Router 1 i.e. configuring both serial and fast ethernet interfaces.

Step 4: We will apply RIP protocol commands on both routers

R1: In order to apply protocol RIP, we will write the following set of commands.
Router(config)# router rip
Router(config-router)# network 192.168.1.0
Router(config-router)# network 192.168.2.0
Router(config-router)# network 192.168.3.0
Router(config-router)#exit

R2: In order to apply protocol RIP, we will write the following set of commands on R2 as well.
Router(config)# router rip
Router(config-router)# network 192.168.1.0

```
Router(config-router)# network 192.168.2.0
Router(config-router)# network 192.168.3.0
Router(config-router)#exit
```

Step5: Now, you can check it. Traffic is enabled and you can easily send data from PC0 to PC1.

Algorithm:

1. Open Packet Tracer
2. Build the topology with help of devices and connections.
3. Configuring IP Addresses and Subnet Masks on the Hosts
4. Configure router with help of RIP/OSPF/BGP
5. Run the simulation and observer packet traversing

Application:
Packet tracer is useful to create network topologies using different network devices and connection and can simulate the packet traversing.

Conclusion
Hence we learn how to use packet tracer tool and simulate the network over it.