P06: Static and Dynamic Routing

Q1: Understand the Basics of Static and Dynamic Routing

Dynamic routing, also called adaptive routing, is a process where a router can forward data via a different route or given destination based on the current conditions of the communication circuits within a system. The term is most commonly associated with data networking to describe the capability of a network to 'route around' damage, such as loss of a node or a connection between nodes, so long as other path choices are available. Dynamic routing allows as many routes as possible to remain valid in response to the change.

Routers that use some adaptive protocols, such as the Spanning Tree Protocol, in order to "avoid bridge loops and routing loops", calculate a tree that indicates the one "best" link for a packet to get to its destination. Alternate "redundant" links not on the tree are temporarily disabled—until one of the links on the main tree fails, and the routers calculate a new tree using those links to route around the broken link.

Systems that do not implement dynamic routing are described as using static routing, where routes through a network are described by fixed paths. A change, such as the loss of a node, or loss of a connection between nodes, is not compensated for. This means that anything that wishes to take an affected path will either have to wait for the failure to be repaired before restarting its journey, or will have to fail to reach its destination and give up the journey.

Static Routing Use

- Static routing can be used to define an exit point from a router when no other routes are available or necessary. This is called a **default route.**
- Static routing can be used for small networks that require only one or two routes. This is often more efficient since a link is not being wasted by exchanging dynamic routing information.
- Static routing is often used as a complement to dynamic routing to provide a failsafe backup in the event that a dynamic route is unavailable.
- Static routing is often used to help transfer routing information from one routing protocol to another (routing redistribution).

+VE – Static Routing

- Static routing causes very little load on the CPU of the router, and produces no traffic to other routers.
- Static routing leaves the network administrator with full control over the routing behavior of the network.
- Static Routing Is very easy to configure on small networks.

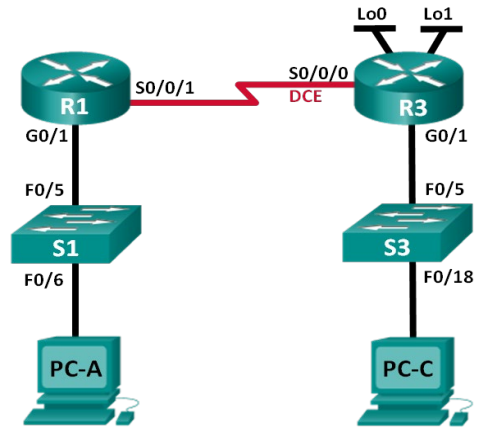
-VE – Static Routing

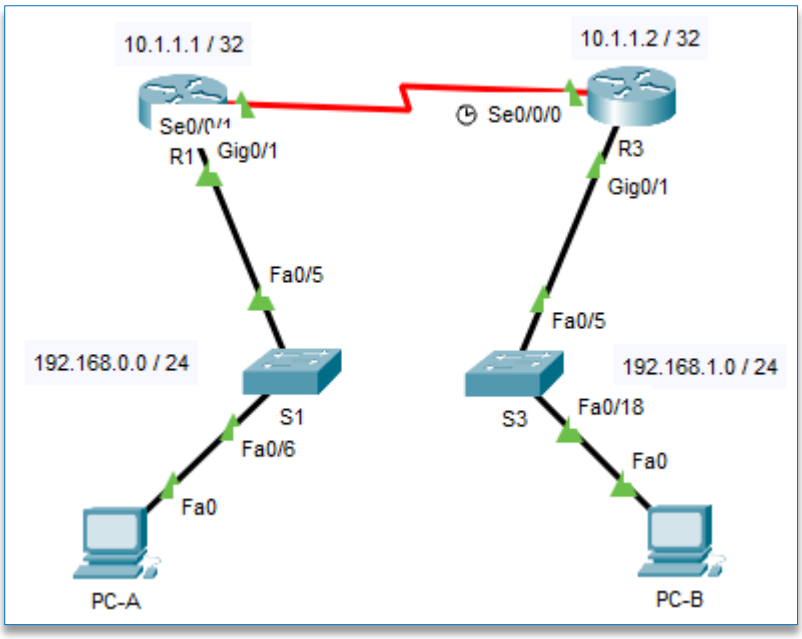
- **Human error:** In many cases, static routes are manually configured. This increases the potential for input mistakes. Administrators can make mistakes and mistype in network information, or configure incorrect routing paths by mistake.

- **Fault tolerance:** Static routing is not fault tolerant. This means that when there is a change in the network or a failure occurs between two statically defined devices, traffic will not be re-routed. As a result, the network is unusable until the failure is repaired or the static route is manually reconfigured by an administrator.
- **Administrative distance:** Static routes typically take precedence over routes configured with a dynamic routing protocol. This means that static routes may prevent routing protocols from working as intended. A solution is to manually modify the administrative distance.[4]
- **Administrative overhead:** Static routes must be configured on each router in the network(s). This configuration can take a long time if there are many routers. It also means that reconfiguration can be slow and inefficient. Dynamic routing on the other hand automatically propagates routing changes, reducing the need for manual reconfiguration.

Q2: Configuring Static Routes

- Open **PTLab 06.2.pka** and implement the network shown below:

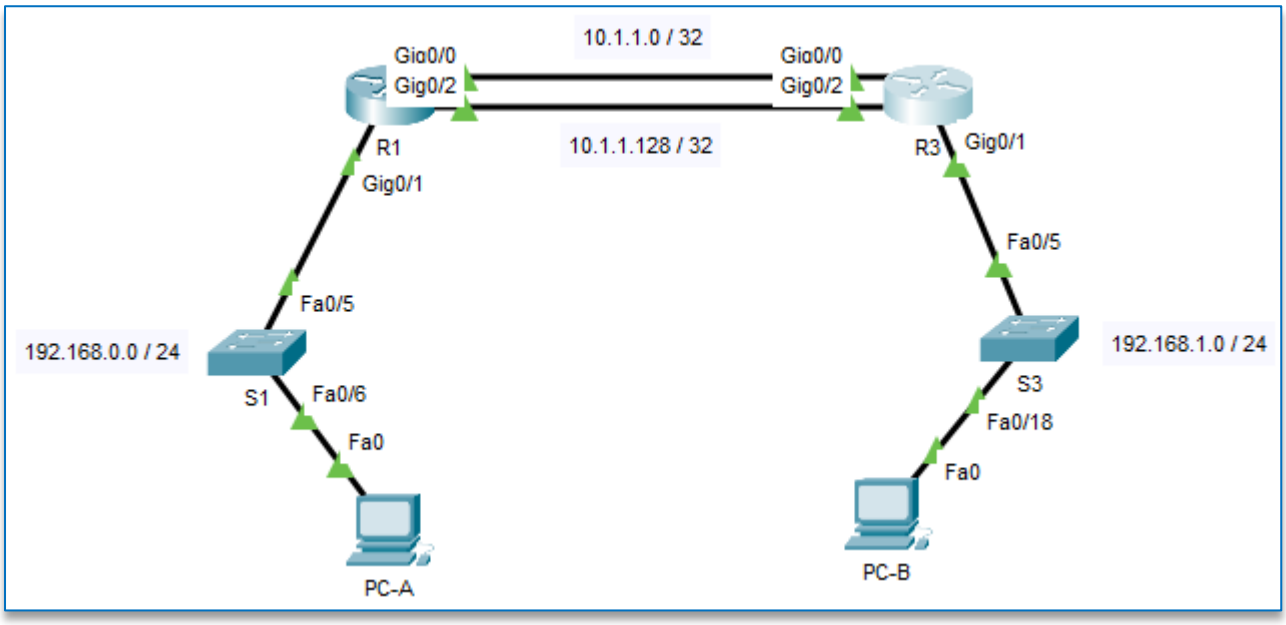




Note that the Loopback interfaces (Lo0, Lo1) interfaces are not shown on Packet Tracer visually. But you are required to configure them as per the instructions in **PTLab 06.2.pka**

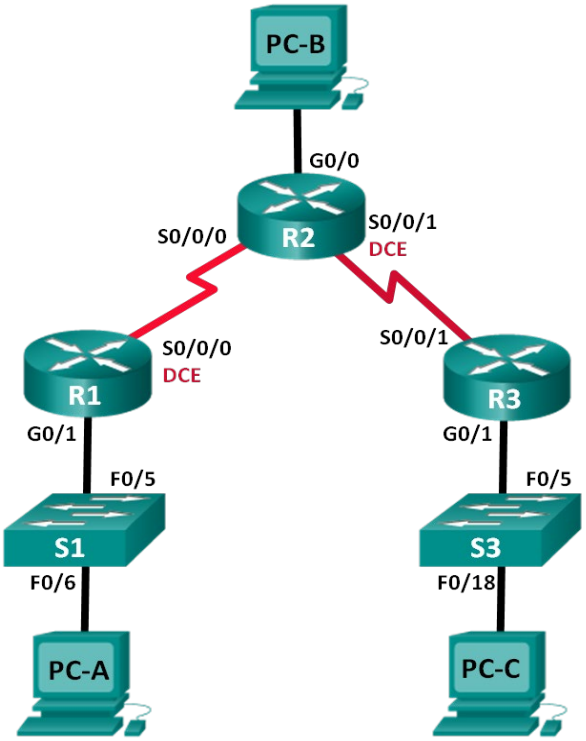
Q3: Fault tolerance with loopback interfaces

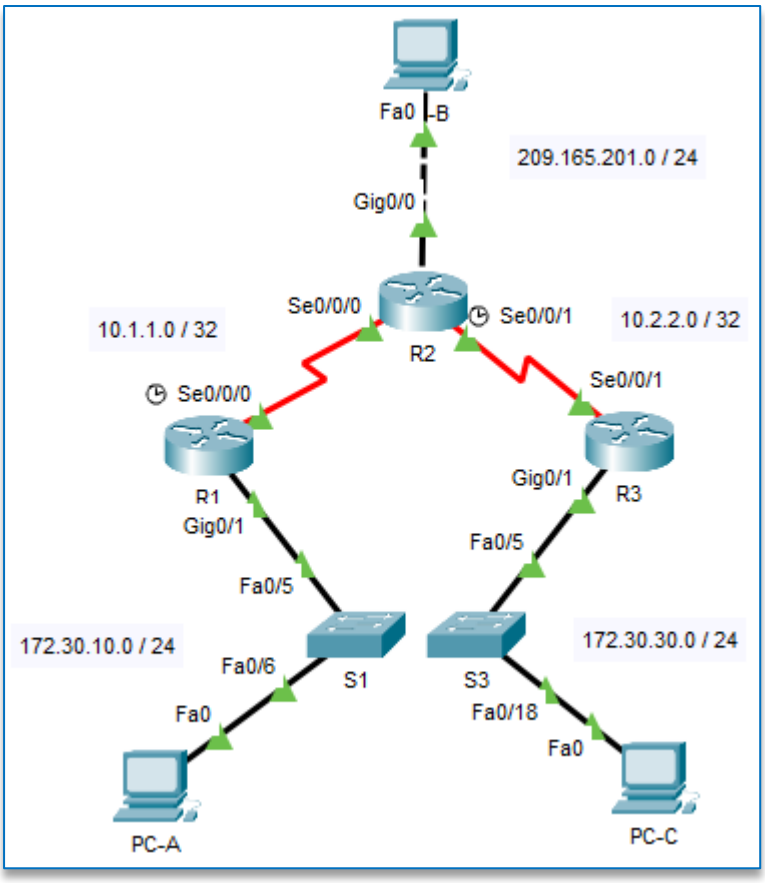
- Open **PTLab 06.3.pka** and implement the network shown below:



Q4: Dynamic Routing (RIPv2)

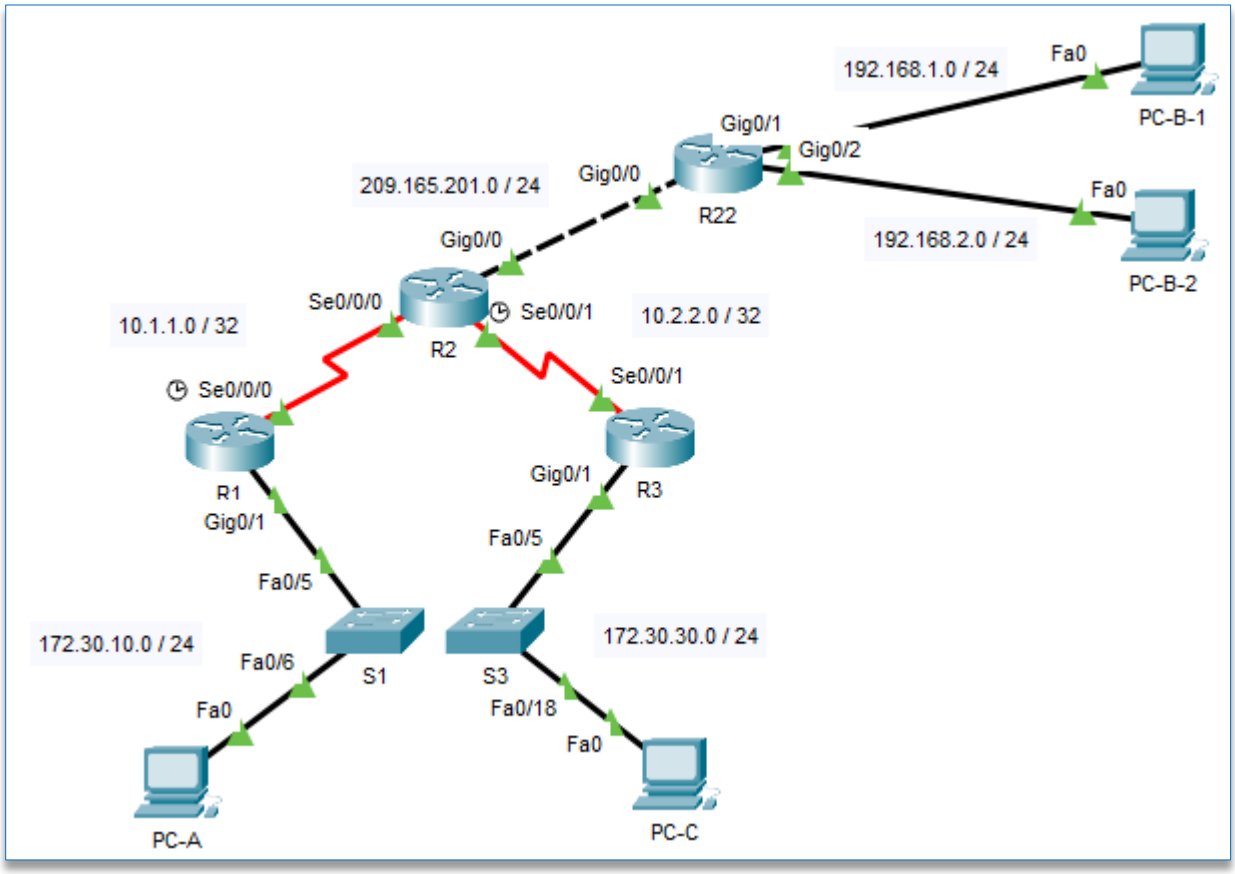
- Open **PTLab 06.4.pka** and implement the network shown below:





Q5: Dynamic Routing (RIPv2) and Static Routing (static routes)

- Open **PTLab 06.5.pka** and implement the network shown below:



Q6: Try me! Questions

1. Implement Q4 and Q5 by using OSPF routing protocol.
2. Implement Q4 and Q5 by using EIGRP routing protocol.

Summary

1. Understand the Basics of Static and Dynamic Routing
2. Configuring Static Routes
3. Fault tolerance with loopback interfaces
4. Dynamic Routing (RIPv2)
5. Dynamic Routing (RIPv2) and Static Routing (static routes)
6. **Try me! Questions**