Dynamic Routing

IT54 – Routing and Switching

Things we’ll cover today

- Introduction to Dynamic Routing
- Dynamic Routing Protocols

Dynamic Routing

- Dynamic routing is prevalently used on networks consisting of more than just a few routers.
- Dynamic routing protocols scale easily and automatically determine better routes based on the ever-changing network topology.
- It will make routers smart in making ***routing decisions***, not needing us to manually configure every single path.
  - However, this doesn't mean that you will not configure the IP address of a router's interfaces!
- Two types:
  - Interior Gateway Protocol (IGP)
  - Exterior Gateway Protocol (EGP)

Types of Dynamic Routing Protocols

IGP

- Distance Vector
  - Routing Information Protocol (RIP)
  - Enhanced Interior Gateway Routing Protocol (EIGRP)
- Link-State
  - Open Shortest Path First (OSPF)
  - Intermediate System to Intermediate System (IS-IS)

EGP

- Path Vector
  - Border Gateway Protocol

Best Path

- Each dynamic routing protocol has different ***algorithms*** on how they determine the best path when establishing routes on a router.
- First, they use the value, **metric**, to determine how far a destination IP is should they choose a particular route that leads to that destination.
- When we were dealing with static routes, all the metrics are **0**, shown in the **[1/0]** metric.

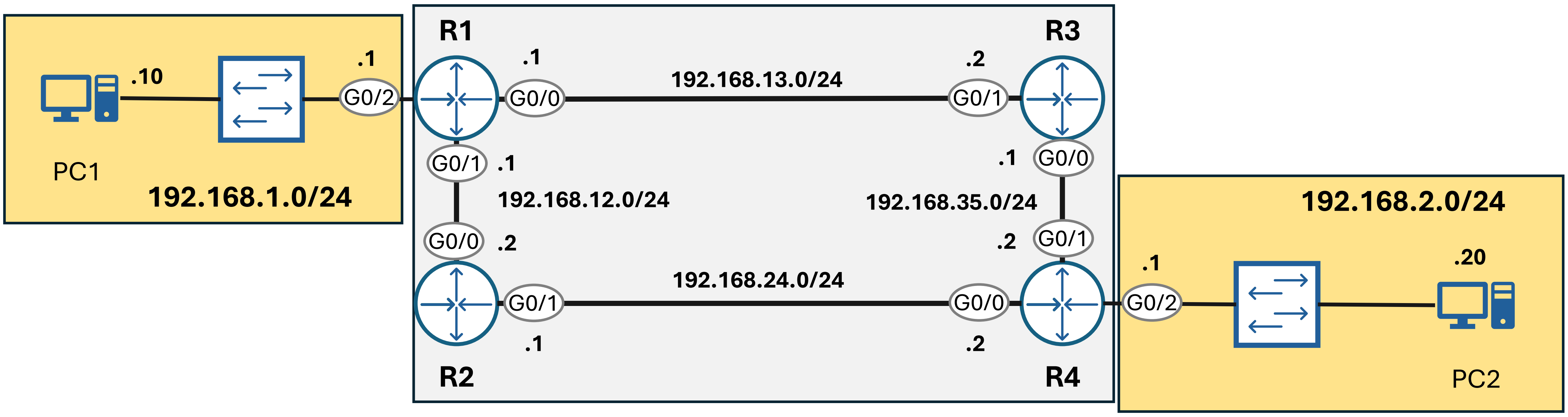
```
S       192.168.1.0/24 [1/0] via 192.168.13.1
S       192.168.2.0/24 [1/0] via 192.168.35.2
```

Dynamic Routing Metrics

Protocol	Metric Type	Simple Description
RIP	Hop Count	Fewer routers = better
EIGRP	Composite Metric	Bandwidth + Delay
OSPF	Cost	Lower bandwidth = higher cost

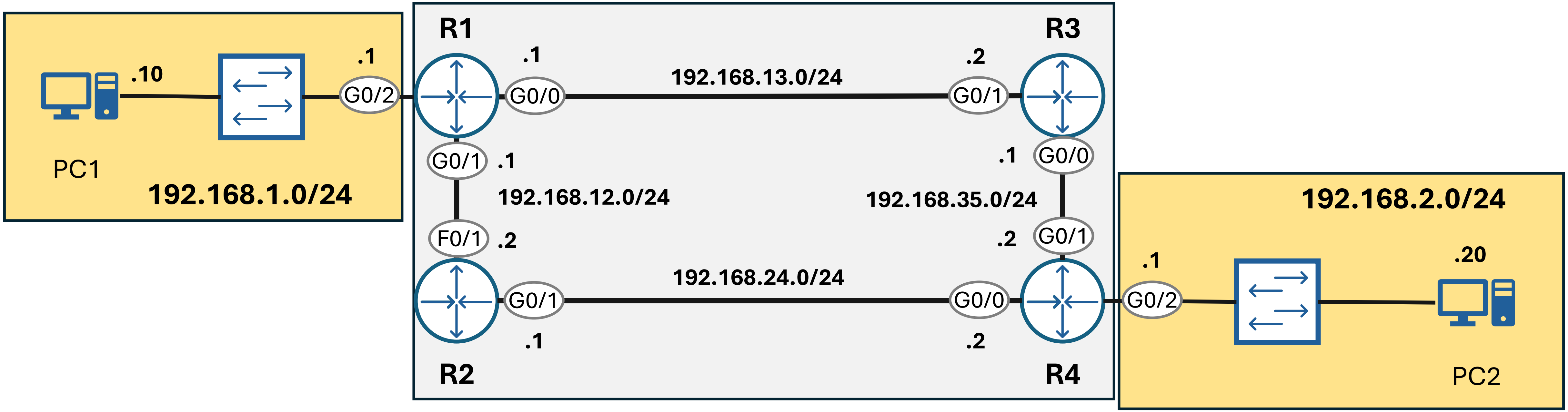
Routing Information Protocol (RIP)

- If RIP were to be implemented on all routers:
  - R1 would think that the route of either R2 or R3 to reach **192.168.2.0/24** would be the same.
  - R4 would think that the route of either R2 or R3 to reach **192.168.1.0/24** would be the same.



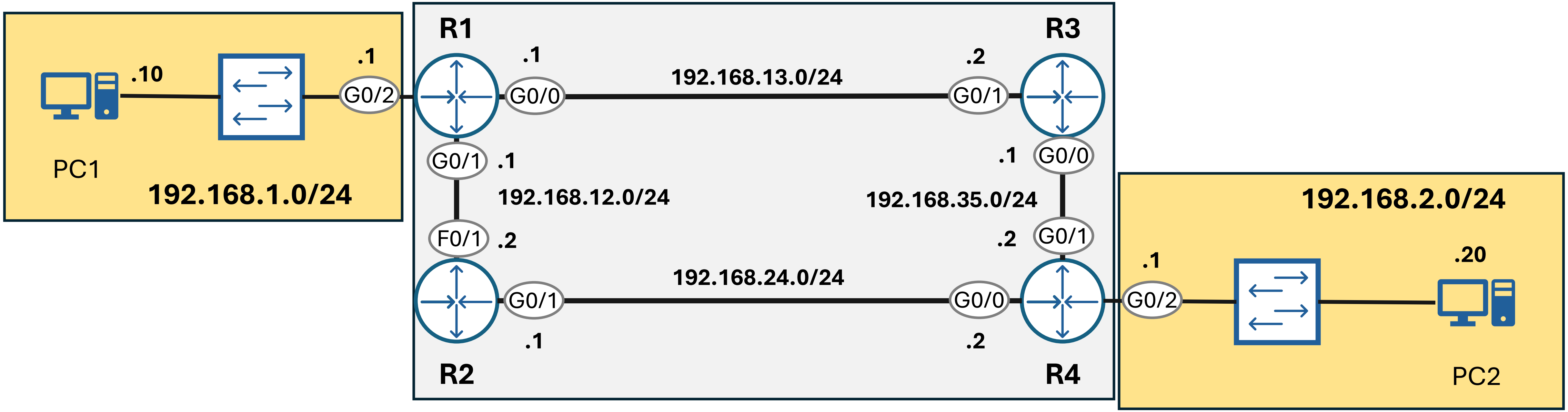
Routing Information Protocol

- If **R2** would use a FastEthernet connection over **R1** with **RIP**:
  - The situation is the same.
  - **RIP** doesn't care about bandwidth.
  - **RIP** chooses the route with the fewest hops, even if the connection is slower
- **RIP** only cares about how many routers does it take to reach the destination IP address.



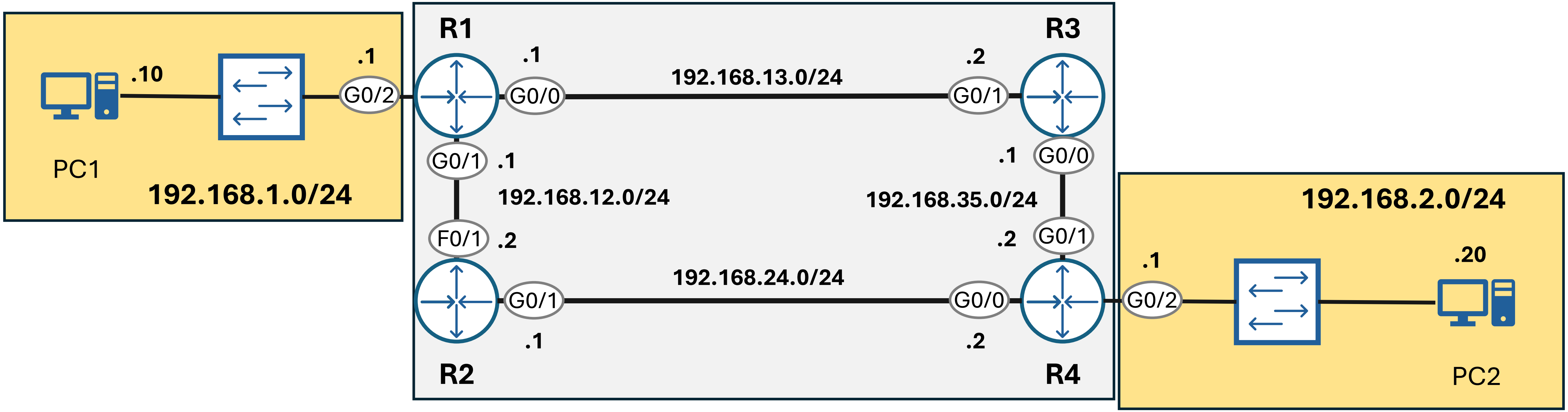
Open Shortest Path First

- If **R2** would use a FastEthernet connection over **R1** with **OSPF-enabled:**
  - R1 prefers R3 since OSPF considers bandwidth: Gigabit has lower cost than FastEthernet.
  - The route R1-R2-R4-192.168.2.0/24 will be a ***backup route*** since the connection of **R1-R2** is through a FastEthernet, which is slower.
- OSPF will prioritize routes with better bandwidth.
  - Higher bandwidth = lesser cost.



EIGRP

- If **R2** would use a FastEthernet connection over **R1** with **EIGRP-enabled:**
  - EIGRP also prefers the R3 path due to its better bandwidth and delay.



EIGRP

- If **R2** will revert back to Gigabit Ethernet connection for **R1**:
    - R1 will check if there is less delay between **R1-R2** or **R1-R3**.
    - For example, R3 might be the ***gateway*** to the Internet, so there is greater traffic in **R3** compared to **R2**.
- In this scenario, R1 will prioritize the connection to **R2** since there is less delay through that connection.