🌐 Lecture 11 — Dynamic Routing,RIP

🧭 1. What is Dynamic Routing?

Dynamic routing is a routing technique in which **routers automatically learn routes** and **update their routing tables** by exchanging routing information with neighboring routers.

✔ How it works?

Routers use routing protocols (RIP, EIGRP, OSPF) to decide:

- Which path is best
- How far the destination is
- How fast a link is
- Network changes (failures)

✔ Why is it used?

- Automatic route updates
- No need to manually configure routes
- Good for medium–large networks
- Automatically adapts when links go down

✔ Real Life Example

Just like **Google Maps automatically finds the best route**, a router also finds the best path dynamically.

🔎 2. Types of Dynamic Routing Protocols

🔥 Interior Gateway Protocols (IGP)

Used **inside an organization**

- RIP
- EIGRP
- OSPF

🌍 Exterior Gateway Protocols (EGP)

Used **between different organizations**

- BGP

📌 3. Routing Protocols Explained

🟣 RIP (Routing Information Protocol)

👉 Type: Distance Vector Protocol

👉 Metric: Hop Count

👉 Max Hop: 15 (16 = unreachable)

👉 AD value: 120

✓ What RIP checks?

RIP checks **how many routers** (hops) must be crossed to reach destination.
Less hops = better route.

🔵 EIGRP (Enhanced Interior Gateway Routing Protocol)

👉 Type: Advanced Distance Vector (Hybrid)

👉 Metric: Bandwidth + Delay

👉 Only works on Cisco devices

👉 **Much faster and smarter than RIP**

✓ **What EIGRP checks?**

- Bandwidth
- Delay
- Reliability
- Load

🔴 **OSPF (Open Shortest Path First)**

👉 **Type: Link-State Protocol**

👉 **Metric: Cost = Bandwidth**

👉 **Very fast and scalable**

👉 **Creates a full Network Topology Map**

🧮 4. What is Administrative Distance (AD Value)?

AD value = trust level of routing protocol
Lower AD → More trusted route.

Protocol	AD Value
Connected	0
Static	1
EIGRP	90
OSPF	110
RIP	120
BGP	20 (external)

🛠 5. Important Commands

📌 do show ip route

Shows full routing table:

- Directly connected networks
- Static routes
- Dynamic routes (RIP, OSPF, EIGRP)

📌 do show ip rip database

Shows RIP-learned networks uniquely.

🟥 6. RIP

🧩 Versions of RIP

RIP v1

- Classful (NO subnet mask support)
- No authentication
- Broadcast updates

RIP v2

- Classless (supports VLSM)
- Supports subnet masks
- Supports Authentication
- Uses Multicast (224.0.0.9)

🔁 How RIP Works Step-by-Step (Full Flow)

1️⃣ Router discovers neighbors

Broadcasts routing table every 30 seconds.

2️⃣ Neighbor receives update

Neighbor adds new networks.

3️⃣ Router calculates hop count

More hops → Less preferred.

4️⃣ Routing table updates

Routers share routes continuously.

⏱️ RIP Timers (Important)

Timer	Value	Purpose
Update	30 sec	Sends routing updates
Invalid	180 sec	Route marked invalid
Hold-down	180 sec	Wait before accepting changes
Flush	240 sec	Delete route from table

🧪 7. RIP Lab Configuration — Full Lab (4 Routers + 4 PCs)

Your lab:

- 4 Routers: R1, R2, R3, R4
- 4 PCs
- All using RIP Version 2

Below is the **full detailed explanation + commands**.

🚀 ROUTER R1 Configuration

Interfaces

g0/0 → 10.0.12.1

g0/1 → 10.0.13.1

g0/2 → 171.16.1.1

Commands

en

conf t

int g0/0

ip add 10.0.12.1 255.255.255.0

no shut

int g0/1

ip add 10.0.13.1 255.255.255.0

no shut

int g0/2

ip add 171.16.1.1 255.255.255.0

no shut

hostname R1

router rip

version 2

network 10.0.12.0

network 10.0.13.0

network 171.16.1.0

do wr

🚀 **ROUTER R2 Configuration**

Interfaces

g0/0 → 10.0.12.2

g0/1 → 10.0.24.1

g0/2 → 192.168.2.1

Commands

hostname R2

router rip

version 2

network 192.168.2.0

network 10.0.24.0

network 10.0.12.0

do wr

🚀 ROUTER R3 Configuration

Interfaces

g0/0 → 10.0.34.1

g0/1 → 10.0.24.2

g0/2 → 192.168.4.1

Commands

hostname R3

router rip

version 2

network 10.0.34.0

network 192.168.4.0

network 10.0.24.0

do wr

🚀 ROUTER R4 Configuration

Interfaces

g0/0 → 10.0.13.2

g0/1 → 10.0.34.2

g0/2 → 192.168.3.1

Commands

hostname R4

router rip

version 2

network 10.0.13.0

network 10.0.34.0

network 192.168.3.0

do wr

🖥 8. PC IP Addressing (VERY IMPORTANT)

Each PC must be placed in the network connected to its router interface.

PC1 (Connected to R1 g0/2)

Network: **171.16.1.0/24**

IP: 171.16.1.10

Subnet: 255.255.255.0

Gateway: 171.16.1.1

PC2 (Connected to R2 g0/2)

Network: **192.168.2.0/24**

IP: 192.168.2.10

Subnet: 255.255.255.0

Gateway: 192.168.2.1

PC3 (Connected to R3 g0/2)

Network: **192.168.4.0/24**

IP: 192.168.4.10

Subnet: 255.255.255.0

Gateway: 192.168.4.1

PC4 (Connected to R4 g0/2)

Network: **192.168.3.0/24**

IP: 192.168.3.10

Subnet: 255.255.255.0

Gateway: 192.168.3.1

🟢 9. After Configuration — Verification Commands

✓ Check routing table

do show ip route

✓ Check RIP database

do show ip rip database

✓ Ping test

Ping from PC1 → PC4
Ping from PC2 → PC3

If RIP is correct → All PCs can communicate.