📘 Lecture 10- Basic IP Addressing & CLI Commands

🎯 Lecture Objective

This lecture focuses on **building a basic router lab**, **assigning IP addresses**, **understanding default gateway**, and **using Cisco router CLI commands**. This is a **very important CCNA hands-on topic** 🧠⚙️.

🧪 Lab Topology (What We Build)

🧩 Devices Used

- 🟢 Router 1 (R1)
- 🟢 Router 2 (R2)
- 🔵 Switch 1 (under R1)
- 🔵 Switch 2 (under R2)
- 💻 4 PCs under Router 1
- 💻 1 PC under Router 2

🔗 Physical Connections

- Router 1 → Router 2 (direct link)
- Router 1 → Switch → 4 PCs
- Router 2 → Switch → 1 PC

📍 Why this lab?

This simulates **two branch offices** connected together, each having its own local network.

🌐 IP Addressing Plan

🔸 Network Between Router 1 and Router 2

Network: **192.168.10.0/24**

Device	Interface	IP Address
Router 1	G0/1	192.168.10.1
Router 2	G0/0	192.168.10.2

🔸 Router 1 Local Network

Network: **192.168.20.0/24**

Device	IP Address
Router 1 (to switch)	192.168.20.1
PC 1	192.168.20.2
PC 2	192.168.20.3
PC 3	192.168.20.4
PC 4	192.168.20.5

🔸 Router 2 Local Network

Network: **192.168.30.0/24**

Device	IP Address
Router 2 (to switch)	192.168.30.1
PC	192.168.30.2

🚪 Default Gateway Concept (VERY IMPORTANT)

📌 What is Default Gateway?

The **default gateway is the router's IP address** in the same network.

📍 It allows a PC to **send data outside its own network**.

🧠 Example

- PC IP: 192.168.20.2
- Default Gateway: 192.168.20.1

🌍 Daily Life Example:

Your home PC sends internet traffic to your WiFi router (192.168.1.1). That router forwards traffic to the internet 🌐.

⚙️ Router 1 Configuration Commands

Router> enable

Router# configure terminal

Router(config)# interface g0/1

Router(config-if)# ip address 192.168.10.1 255.255.255.0

Router(config-if)# no shutdown

Router(config)# interface g0/0

Router(config-if)# ip address 192.168.20.1 255.255.255.0

Router(config-if)# no shutdown

Router(config)# hostname R1

⭐ Why no shutdown?

All router interfaces are **OFF by default** for safety.

🧠 **Daily Example:**
Like switching ON a power switch before using a device 🔌.

⚙️ Router 2 Configuration Commands

Router> enable

Router# configure terminal

Router(config)# interface g0/0

Router(config-if)# ip address 192.168.10.2 255.255.255.0

Router(config-if)# no shutdown

Router(config)# interface g0/1

Router(config-if)# ip address 192.168.30.1 255.255.255.0

Router(config-if)# no shutdown

Router(config)# hostname R2

🖥️ PC IP Configuration (Packet Tracer)

Steps:

1. Click PC
2. Go to **Desktop**
3. Open **IP Configuration**
4. Enter:
    - IP Address
    - Subnet Mask (auto-filled)
    - Default Gateway (router IP)

🧭 Cisco Router Modes

1️⃣ User EXEC Mode

- Prompt: Router>
- Basic commands only
- Cannot configure device
- Used for monitoring & basic troubleshooting
- Example: ping,traceroute,ssh,telnet

2️⃣ Privileged EXEC Mode

- Prompt: Router#
- Enter using: enable
- Used for show commands
- Can view the full router configuration
- Cannot make major configuration changes

3️⃣ Global Configuration Mode

- Prompt: Router(config)#
- Enter using: configure terminal
- Used for full configuration
    - Setting hostname
    - Setting passwords
    - Configuring interfaces
    - Assigning IP addresses
    - Enabling routing protocols

🧠 Daily Life Example:

- User Mode → Checking status

- Privileged Mode → Viewing settings
- Config Mode → Changing settings ⚙️

📋 Important Show Commands

Command	Purpose
show version	IOS version, uptime, model
show running-config	Current config (RAM)
show startup-config	Saved config (NVRAM)
show history	Previously used commands
show clock	Shows router time
show users	Active users
show arp	IP to MAC mapping
show mac-address-table	Switch MAC table

💾 Saving & Reloading

- Save configuration:

copy running-config startup-config

or

do write

- Restart router:

reload

- Delete startup config:

erase startup-config

🔐 Router Password Protection

🔸 Enable Password (Weak ❌)

enable password 1234

- **Uses MD7**
- Easily cracked
- Can be cracked easily
- Not recommended in real companies
- Shown as plain-text unless encryption is enabled

🔸 Enable Secret (Strong ✅)

enable secret mysecret123

- **Uses MD5**
- Industry standard
- Strong
- Cannot be reversed easily
- ALWAYS preferred over enable password

📜 Console Password

line console 0

password 123

login

📍 Prevents unauthorized **physical access**.

🌐 Telnet Password (Not Secure ❌)

Telnet is an **insecure** remote login method.

line vty 0 15

password telnet123

login

🚫 Telnet sends data in **plain text**.

Meaning:

- VTY 0–15 → allows 16 simultaneous Telnet users
- Everyone must enter this password

🔒 SSH Configuration (MOST IMPORTANT ✅)

SSH uses encryption and is the preferred remote access method.

Step 1: Set hostname

hostname Router1

Step 2: Set domain name

ip domain-name codingseekho.in

Step 3: Generate RSA key

crypto key generate rsa

It will ask:

How many bits in the modulus?

You can give:

- 1024
- 2048 (recommended)

More bits = more secure.

Step 4: Create a user account

username admin privilege 15 secret adminpass123

privilege 15 = full admin access

Step 5: Enable SSH-only access on VTY

line vty 0 4

transport input ssh

password 12345

login

Now only SSH is allowed.

⭐ **Daily Life Example of SSH:**

When engineers manage routers in:

- Banks
- Data centers
- Cloud networks
- IT companies

They ALWAYS use SSH (port 22).

Telnet is banned.

💾 **Final Step – Save Everything**

do write

or

do wr

📜 1️⃣ SUMMARY🧠⚙️

This lecture explains how to **build a basic router lab**, assign **IP addresses**, configure **default gateway**, and work with **Cisco Router CLI commands**.
It is a **core hands-on CCNA topic** because it combines **theory + practical configuration** 💻🌐.

In this lab:

- Two routers (**R1 & R2**) are connected together
- Each router has its **own LAN**
- PCs communicate using **IP addressing**
- Routers forward traffic between different networks

Key concepts covered:
✓ IP Addressing
✓ Default Gateway
✓ Router Interfaces (G0/0, G0/1)
✓ Router CLI modes
✓ Show commands
✓ Saving configuration
✓ Router security (Console, Telnet, SSH)

👉 This chapter builds **real networking skills**, not just exam theory 🔥

🎯 2️⃣ CONCLUSION 💡

Basic IP addressing and CLI configuration are the **foundation of networking**.
If IP addressing or default gateway is wrong, **communication will completely fail** ❌.

This lecture teaches:

- How routers and PCs communicate
- How traffic moves between networks
- How engineers configure and secure routers in real companies

A candidate who understands this chapter clearly:
✓ Can build real labs
✓ Can troubleshoot connectivity issues
✓ Can configure routers securely
✓ Is ready for **CCNA + real-world networking roles** 🚀

🧠 3️⃣ MIND MAP (Text-Based – Easy to Remember) 🌳

Basic IP Addressing & CLI

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├── Lab Topology

| ├── Router 1 & Router 2

| ├── Switches

| └── PCs

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├── IP Addressing

| ├── Inter-Router Network (192.168.10.0/24)

| ├── R1 LAN (192.168.20.0/24)

| └── R2 LAN (192.168.30.0/24)

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├── Default Gateway

| ├── Router IP

| └── Used for outside network traffic

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├── Router CLI Modes

| ├── User EXEC (>)

| ├── Privileged EXEC (#)

| └── Global Config (config#)

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├── Important Commands

| ├── show running-config

| ├── show version

| ├── show ip route

| └── show arp

|

├── Saving & Reloading

| ├── copy run start

| ├── reload

| └── erase startup-config

|

└── Security

├── Enable Password ❌

├── Enable Secret ✅

├── Console Password

├── Telnet ❌

└── SSH ✅

🎤 4️⃣ Q & A

🔹 **Q1. What is the purpose of IP addressing?** 🌐

Answer:
IP addressing uniquely identifies devices on a network so they can **communicate with each other**.

👉 Without IP address, no data transmission is possible.

🔹 **Q2. Why do we use different networks in a lab?** 🧪

Answer:
Different networks help:
✓ Reduce broadcast traffic
✓ Improve security
✓ Simulate real enterprise networks

🔹 **Q3. What is a default gateway?** 🚪

Answer:
A default gateway is the **router's IP address** used by a PC to send traffic **outside its local network**.

👉 Example:
PC → Router → Other Network / Internet

🔹 **Q4. What happens if default gateway is wrong?** ❌

Answer:
The PC can communicate **inside its network**, but **cannot access other networks or internet**.

🔹 Q5. Why do routers need IP addresses on interfaces? 🔌

Answer:
Router interfaces need IP addresses so they can:
✓ Identify networks
✓ Forward packets
✓ Act as default gateway

🔹 Q6. Why is no shutdown command required? ⚡

Answer:
Router interfaces are **administratively down by default**.
no shutdown activates the interface.

👉 Like switching ON a power button 🔌 .

🔹 Q7. What are Cisco router modes? 🧭

Answer:

Mode	Prompt	Purpose
User EXEC	Router>	Basic monitoring
Privileged EXEC	Router#	Show commands
Global Config	Router(config)#	Full configuration

🔹 Q8. Difference between User EXEC & Privileged EXEC? 🔁

Answer:
User EXEC:
✓ Limited access
✓ Cannot view full config

Privileged EXEC:
✓ Full monitoring access
✓ Can enter config mode

🔹 **Q9. What is show running-config used for?** 📄

Answer:
Shows the **current active configuration** stored in **RAM**.

🔹 **Q10. What is show startup-config used for?** 💾

Answer:
Shows the **saved configuration** stored in **NVRAM**.

🔹 **Q11. How do you save router configuration?** 💡

Answer:

copy running-config startup-config

or

write

🔹 **Q12. What happens if router reloads without saving?** 🔄

Answer:
All configuration changes are **lost** ❌.

🔹 **Q13. Difference between Enable Password and Enable Secret?** 🔐

Feature	Enable Password	Enable Secret
Security	Weak ❌	Strong ✅
Encryption	MD7	MD5
Industry Use	Not recommended	Always used

👉 **Enable secret is always preferred.**

🔹 **Q14. What is console password used for?** 🖥️

Answer:
Console password prevents **unauthorized physical access** to the router.

🔹 **Q15. Why is Telnet not secure?** 🚫

Answer:
Telnet sends:
❌ Username
❌ Password
❌ Data

…in **plain text**, which can be easily captured.

🔹 **Q16. What is SSH and why is it preferred?** 🔒

Answer:
SSH (Secure Shell):
✓ Uses encryption
✓ Protects credentials
✓ Industry standard

👉 Used in banks, data centers, cloud networks.

🔹 **Q17. What port does SSH use?** 🌐

Answer:
SSH uses **Port 22**.

🔹 **Q18. Why do we generate RSA keys for SSH?** 🔑

Answer:
RSA keys enable **encrypted communication** between client and router.

👉 More bits = more security.

🔹 **Q19. What does line vty 0 15 mean?** 📜

Answer:
Allows **16 simultaneous remote users** (VTY lines).

🔹 **Q20. Why Packet Tracer is important?** 🧪

Answer:
✓ Practice CCNA labs
✓ No physical devices needed
✓ Safe learning environment
