**Router & CLI Modes**

**Routers: An Overview**

A router is a network device that connects multiple networks and routes data packets between them. It operates primarily at the third layer (Network layer) of the OSI model, managing the paths that data packets take to reach their destinations. Routers are essential for directing traffic on the internet and ensuring that data reaches the correct endpoint efficiently.

**How Routers Work**

1. **Packet Transfer**: Routers transfer data packets from one device to another by establishing connections.
2. **Traffic Routing**: Routers manage the flow of traffic between networks, ensuring data packets are sent along the most efficient paths.

**Steps in Routing Process**

1. **Initiation**: Device 1 sends a data packet to Device 2.
2. **Router Connection**: Both devices are connected to routers (R1, R2).
3. **Data Transfer**: The data is sent from Device 1 to Router R1 using the device's IP address. Routers have ingress (FA0/1) and egress (FA0/0) interfaces.
4. **Path Determination**: Router R1 checks if R1 and R2 are directly connected and identifies the destination address (e.g., 192.168.4.20) via Router R2's IP (192.168.2.2). Router R2 acts as a hop and forwards the packet to its final destination.

**Types of Routers**

1. **Wired Router**: Connects directly to a modem using cables to distribute network data. Example: Cisco 1941.
2. **Wireless Router**: Similar to wired routers but uses antennas to distribute data packets wirelessly. Example: Cisco 880 ISR, EA7500.
3. **Edge Router**: Located at the boundary of the network, connecting to the Internet Service Provider (ISP) and managing traffic between customer networks and core routers. Example: ASR9000 Series.
4. **Core Router**: Designed to operate within the internet backbone, transmitting packets between core and edge routers with high efficiency and bandwidth. These routers handle data at very high speeds. Example: Cisco CRS Series.

**Router CLI Modes Explained**

Routers, especially those from Cisco, have various Command Line Interface (CLI) modes that network administrators use to configure, manage, and troubleshoot the network. Here’s an explanation of these modes:

**1. Setup Mode**

* Purpose: Setup mode is used for initial configuration of the router. It often appears when the router is first powered on or when no Start up configuration is present.
* How to Access: Automatically appears if no configuration file is found.

**2.Command Line Interface (CLI) Modes**

* **User EXEC Mode**:
  + Prompt: `Router>`
  + Purpose: Allows basic monitoring commands but does not permit any configuration changes.
* Access: First mode you enter upon accessing the router.
* **Privileged EXEC Mode:**
  + Prompt: `Router#`
  + Purpose: Allows all monitoring commands and also access to configuration modes. It is a higher-level mode than User EXEC.
* Access: From User EXEC mode, type `enable`.
* **Global Configuration Mode:**
  + Prompt: `Router(config)#`
  + Purpose: Used for making changes that affect the entire router, such as setting system-wide configurations.
  + Access: From Privileged EXEC mode, type `configure terminal`.
* **Interface Configuration Mode:**
  + Prompt: `Router(config-if)#`
  + Purpose: Used to configure specific interfaces like Ethernet, Serial, etc.
  + Access: From Global Configuration mode, type `interface <type> <number>`.

**3. ROM Monitor (ROMmon) Mode**

* + Purpose: This is a low-level operating mode used for troubleshooting and recovery. If the router fails to find a valid IOS image, it will automatically enter ROMmon mode.
  + How to Access: Automatically entered if there is an issue with the boot image or IOS file. You can also manually access it by interrupting the boot process.

**Summary of CLI Modes**

1. Setup Mode: Initial configuration, appears when no startup config is present.

2. User EXEC Mode: Basic monitoring, limited commands.

3. Privileged EXEC Mode: Full monitoring, access to all commands and configuration modes.

4. Global Configuration Mode: Configures system-wide settings.

5. Interface Configuration Mode: Configures specific interfaces.

6. ROMmon Mode: Troubleshooting and recovery, accessed if there’s a boot issue.

Understanding these modes is crucial for effective network management and troubleshooting. Each mode provides different levels of access and functionality, allowing administrators to perform a wide range of tasks from basic monitoring to complex configurations and troubleshooting.