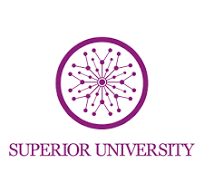
**Lab Manual**

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**SUPERIOR UNIVERSITY LAHORE PAKISTAN**

**LAB -01**

Task 1

What is the difference between all the routers, and when to use them (mentioned in cisco packet tracer)

In Cisco Packet Tracer, you typically encounter a few different types of routers, each with its specific use cases. Here's a brief overview of the common routers:

 **ISR (Integrated Services Router)**:

* **Use Case**: Suitable for small to medium-sized businesses. They support a range of services like voice, video, and security in addition to routing.
* **Features**: Modular design, supports various WAN interfaces, and has built-in security features.

 **RIP (Routing Information Protocol) Router**:

* **Use Case**: Best for simpler networks where ease of configuration is prioritized over performance. It’s suitable for small networks.
* **Features**: Uses distance-vector routing with a maximum hop count of 15.

 **EIGRP (Enhanced Interior Gateway Routing Protocol) Router**:

* **Use Case**: Ideal for larger networks requiring efficient and fast convergence.
* **Features**: Uses a hybrid routing approach, supporting multiple network layer protocols.

 **OSPF (Open Shortest Path First) Router**:

* **Use Case**: Good for medium to large enterprise networks that require more complex routing.
* **Features**: A link-state protocol that scales well and provides faster convergence.

1. **Frame Relay Router**:
   * **Use Case**: Used for WAN connections, particularly in scenarios where a leased line is not viable.
   * **Features**: Supports Frame Relay encapsulation for point-to-point or multipoint connections.
2. **WAN Emulation Routers**:
   * **Use Case**: Used to simulate various WAN technologies for training and testing.
   * **Features**: Helps in learning and experimenting with different WAN protocols.

**When to Use Each Type:**

* **ISR**: When you need an all-in-one solution for various services in a small to medium business.
* **RIP**: For very simple networks or when learning about routing fundamentals.
* **EIGRP**: When you have a larger network that needs fast, efficient routing.
* **OSPF**: For medium to large networks requiring robust routing capabilities.
* **Frame Relay**: When simulating or learning about WAN connectivity.
* **WAN Emulation**: When testing various network scenarios without the need for physical hardware.

Choosing the right router depends on your network's size, complexity, and specific needs!

Task 2

What is the difference between all the switches, and when to use them (mentioned in cisco packet tracer)

### 1. ****2950 Switch****

* **Type**: Layer 2 Switch (Managed)
* **Use Case**: Ideal for small to medium-sized networks where basic switching functionality is required.
* **Features**: Supports VLANs, basic management functions like port security, and Spanning Tree Protocol (STP) for loop prevention.
* **When to Use**: If you need simple switching without advanced features, such as in a small LAN environment.

### 2. ****2960 Switch****

* **Type**: Layer 2 Switch (Managed)
* **Use Case**: Suitable for small to medium-sized enterprise networks, where slightly advanced Layer 2 features are required.
* **Features**: Improved over 2950 with support for features like Quality of Service (QoS), Enhanced Security, and Energy Efficiency.
* **When to Use**: When you need Layer 2 switching with better performance, energy-saving features, and some security enhancements in a medium-sized network.

### 3. ****3560 Switch****

* **Type**: Layer 3 Switch
* **Use Case**: Ideal for medium to large enterprises where both switching and basic routing between VLANs is needed.
* **Features**: Layer 2 and Layer 3 features (routing capabilities), supports VLANs, Inter-VLAN routing, advanced security, QoS, and Power over Ethernet (PoE).
* **When to Use**: When you need both Layer 2 switching and Layer 3 routing functionality in a network, typically in larger campus environments or smaller data centers.

### 4. ****3650 Switch****

* **Type**: Layer 3 Switch
* **Use Case**: Advanced enterprise or data center networks that require high-speed Layer 3 switching and more scalability.
* **Features**: Offers Layer 2 and Layer 3 switching with enhanced performance, better routing capabilities, and higher bandwidth ports (Gigabit Ethernet), with advanced security and QoS features.
* **When to Use**: For larger networks requiring robust Layer 3 switching, high bandwidth, scalability, and integrated security and QoS.

### 5. ****Multilayer Switch****

* **Type**: Layer 3 Switch
* **Use Case**: Used for advanced Layer 2 and Layer 3 switching, where routing and switching are required in the same device.
* **Features**: Supports both Layer 2 switching (VLANs, STP) and Layer 3 routing (static routes, OSPF, EIGRP). It can handle more complex tasks in larger networks.
* **When to Use**: In larger enterprise networks or core layers where high throughput and advanced routing functionality are required. Suitable for both distribution and core layers in the network hierarchy.

### 6. ****Unmanaged Switches****

* **Type**: Layer 2 Switch (Unmanaged)
* **Use Case**: Designed for small networks or home networks with very basic connectivity needs.
* **Features**: Plug-and-play, with no configuration options. They do not support VLANs, security features, or any form of management.
* **When to Use**: For very small environments where you don’t need advanced switching features or network segmentation.

### Key Differences:

* **Layer 2 vs. Layer 3 Switching**:
  + **Layer 2 Switches** (like 2950, 2960): Only switch traffic within the same VLAN.
  + **Layer 3 Switches** (like 3560, 3650, Multilayer): Can perform both switching and routing, allowing them to route traffic between VLANs and support dynamic routing protocols like OSPF and EIGRP.
* **Managed vs. Unmanaged**:
  + **Managed Switches** (e.g., 2950, 2960, 3560): Offer configuration options, VLANs, security features, and better traffic management.
  + **Unmanaged Switches**: No management capabilities, plug-and-play, and limited to basic Layer 2 functionality.

### When to Use Each:

* **2950/2960**: Best for smaller networks or access layers in larger networks where basic Layer 2 switching is required.
* **3560/3650**: Ideal for medium to large networks needing both switching and routing, especially when you want to perform Inter-VLAN routing or use advanced features like PoE, QoS, or higher throughput.
* **Multilayer Switch**: Suitable for large enterprises, data centers, or core/distribution layers where both Layer 2 and Layer 3 traffic must be managed efficiently.

Your choice of switch depends on factors like network size, required functionality, and traffic management needs.

Task 3

What is the difference between all the connection wires, and when to use them (mentioned in cisco packet tracer)

In **Cisco Packet Tracer**, various connection wires (cables) are used to connect different network devices. Each type of cable serves a specific purpose, and understanding when to use them is essential for building network topologies. Here’s a breakdown of the common connection wires and when to use them:

### 1. ****Copper Straight-Through Cable**** (Solid Black Line)

* **Type**: Ethernet cable (Unshielded Twisted Pair - UTP)
* **Use Case**: Used for connecting devices that operate at **different layers** of the OSI model (e.g., a PC to a switch or a switch to a router).
* **Typical Connections**:
  + PC → Switch
  + Router → Switch
  + Access Point → Switch
* **When to Use**: Whenever you need to connect devices that function at different OSI layers. This is the most commonly used cable in networking.

### 2. ****Copper Cross-Over Cable**** (Solid Red Line)

* **Type**: Ethernet crossover cable (UTP)
* **Use Case**: Used for connecting devices that operate at **the same layer** of the OSI model (e.g., a PC to another PC or a switch to another switch).
* **Typical Connections**:
  + PC → PC
  + Switch → Switch
  + Router → Router
* **When to Use**: When connecting similar devices (e.g., two switches or two computers). In modern devices, auto-MDIX often negates the need for crossover cables since devices can automatically detect the cable type.

### 3. ****Fiber Optic Cable**** (Solid Light Blue Line)

* **Type**: Fiber optic cable (single-mode or multi-mode)
* **Use Case**: Used for long-distance connections and high-bandwidth links, typically between routers, switches, or for connecting to ISPs.
* **Typical Connections**:
  + Switch → Switch (long-distance)
  + Router → Switch (backbone connections)
* **When to Use**: In scenarios where high-speed data transfer over long distances is required, such as in the backbone of the network or between data centers.

### 4. ****Coaxial Cable**** (Solid Blue Line)

* **Type**: Coaxial cable (for traditional networks or specific broadband services)
* **Use Case**: Used for connecting cable modems or for legacy networks (rarely used in modern Ethernet networks).
* **Typical Connections**:
  + Cable Modem → ISP
* **When to Use**: For specific networking devices such as cable modems in home broadband setups or in legacy systems that use coaxial connections.

### 5. ****Serial DCE (Data Communications Equipment) Cable**** (Black Dotted Line)

* **Type**: Serial cable (DCE)
* **Use Case**: Used for WAN connections, particularly in **point-to-point connections** between routers (one router acts as DCE, and the other as DTE).
* **Typical Connections**:
  + Router (DCE) → Router (DTE)
* **When to Use**: In WAN simulations, typically to connect two routers in a point-to-point configuration. The DCE side provides the clock rate for the connection.

### 6. ****Serial DTE (Data Terminal Equipment) Cable**** (Blue Dotted Line)

* **Type**: Serial cable (DTE)
* **Use Case**: Works in conjunction with the DCE cable. This is the other end of a serial WAN link.
* **Typical Connections**:
  + Router (DTE) → Router (DCE)
* **When to Use**: When creating a point-to-point WAN connection between routers. One end (DTE) connects to the router, and the other connects to the DCE router.

### 7. ****Console Cable (Rollover Cable)**** (Solid Light Blue Line with Curve)

* **Type**: Rollover cable (Console cable)
* **Use Case**: Used for direct **management access** to network devices (e.g., configuring a router or switch).
* **Typical Connections**:
  + PC (terminal) → Router (console port)
  + PC → Switch (console port)
* **When to Use**: When you need to manage a device locally (e.g., initial configuration of a router or switch via the console port).

### 8. ****Copper Fibber-to-Copper Ethernet (FTCE) Cable**** (Green Line)

* **Type**: Media converter cable
* **Use Case**: Used for connecting devices that operate on **different media** (e.g., fibber optic to copper Ethernet).
* **Typical Connections**:
  + Fibber port → Ethernet port
* **When to Use**: When connecting a device with a fibber interface to a device with an Ethernet interface, usually through a media converter.

### 9. ****Phone Cable (RJ-11)**** (Solid Dark Blue Line)

* **Type**: RJ-11 Cable (Phone cable)
* **Use Case**: Used for **telephony connections**, such as connecting analog phones to a phone network or a router.
* **Typical Connections**:
  + Analog Phone → Modem
  + Phone → Router (with voice module)
* **When to Use**: In a voice network to connect phones or other analog devices to networking equipment.