**LAB 1**

**TASK 1.**

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

### **1. Cisco 819 H1G Router**

* **Purpose**: Compact IoT/M2M device with integrated 3G/4G support.
* **Key Features**: IOx support for edge computing, cellular connectivity (3G/4G LTE), rugged design.
* **Use Case**: Ideal for mobile, transportation, or remote industrial deployments.

### **2. PT-Router (Packet Tracer Router)**

* **Purpose**: Generic, customizable router model used within Packet Tracer for simulation purposes.
* **Key Features**: Allows you to add and configure modules/interfaces in simulation.
* **Use Case**: Primarily for learning and simulation in Cisco Packet Tracer.

### **3. PT-Empty 2901**

* **Purpose**: An empty router chassis used in Packet Tracer where modules (interfaces like Ethernet, Serial) can be manually inserted.
* **Key Features**: Provides flexibility to simulate different network configurations.
* **Use Case**: Teaching and simulation purposes where you customize the router’s hardware.

### **4. Cisco 1841 Router**

* **Purpose**: Entry-level branch office router.
* **Key Features**: Supports WAN and LAN connectivity, security features like VPN, firewall.
* **Use Case**: Small businesses or branch offices requiring basic routing and security.

### **5. Cisco 1941 Router**

* **Purpose**: Integrated Services Router (ISR) for small-to-medium business (SMB) networks.
* **Key Features**: Modular design, support for security features (VPN, firewall), better performance than the 1841.
* **Use Case**: Small branch deployments needing more versatility and security.

### **6. Cisco 2620XM & 2621XM Routers**

* **Purpose**: Multi-service routers for small and branch offices.
* **Key Features**: Modular slots for adding interfaces, limited support for security and voice services.
* **Differences**: The 2620XM supports one Ethernet port, while the 2621XM has two.
* **Use Case**: Small branch networks with basic connectivity needs.

### **7. Cisco 2811 Router**

* **Purpose**: Part of the Cisco 2800 series ISR, providing enhanced performance and versatility.
* **Key Features**: Modular, with support for voice, security, and wireless services.
* **Use Case**: Small-to-medium branch offices requiring more advanced services like VoIP or VPN.

### **8. Cisco 2911 Router**

* **Purpose**: Mid-range ISR for small-to-medium-sized offices.
* **Key Features**: Supports data, voice, video, security, and wireless services, higher throughput compared to 2811.
* **Use Case**: Organizations needing integrated voice, data, and security solutions in one platform.

### **9. Cisco 819 Router**

* **Purpose**: Same as the 819 H1G, focused on IoT and M2M solutions.
* **Key Features**: Integrated 3G/4G, designed for remote sites and machine-to-machine applications.
* **Use Case**: IoT and edge computing environments where cellular connectivity is key.

### **10. Cisco 4331 ISR Router**

* **Purpose**: High-performance ISR router for large branch offices.
* **Key Features**: Modular, supporting high-speed WAN connectivity, SD-WAN, and cloud services.
* **Use Case**: Large offices or branch deployments needing fast WAN services and cloud integration.

### **11. Cisco 4321 ISR Router**

* **Purpose**: Similar to 4331 but slightly lower performance and scalability.
* **Key Features**: Compact ISR for medium-to-large branch offices with modularity.
* **Use Case**: Branch networks needing solid performance with scalability for future needs.

### **12. Cisco 4221 ISR Router**

* **Purpose**: Entry-level model of the Cisco ISR 4000 series.
* **Key Features**: Compact size, supports advanced features like SD-WAN, cloud connectivity.
* **Use Case**: Small branch offices needing advanced services with moderate performance.

**TASK 2.**

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

### **1. Cisco 2960 Switch**

* **Type**: Layer 2 switch
* **Key Features**: Supports VLANs, STP (Spanning Tree Protocol), port security, and basic QoS.
* **Use Case**: Ideal for small to medium-sized networks requiring only Layer 2 switching without routing. Suitable for basic LAN segmentation and security.

### **2. Cisco 2950 Switch**

* **Type**: Layer 2 switch
* **Key Features**: Supports basic VLANs, STP, and basic port security but lacks advanced features.
* **Use Case**: Used in small networks or for learning purposes when advanced Layer 2 features are not needed.

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

* **Type**: Layer 3 switch (Multi-layer)
* **Key Features**: Provides both Layer 2 switching and Layer 3 routing capabilities. Supports routing protocols (OSPF, EIGRP), inter-VLAN routing, QoS, and advanced security features.
* **Use Case**: Suitable for medium to large networks where routing between VLANs or subnets is required. Typically used in enterprise networks or campus environments.

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

* **Type**: Layer 3 switch (Multi-layer)
* **Key Features**: Advanced Layer 3 capabilities, with support for routing protocols (OSPF, EIGRP, BGP), high-performance inter-VLAN routing, extensive QoS, and PoE (Power over Ethernet).
* **Use Case**: Used in larger networks where both high-performance switching and routing are needed. Ideal for enterprise environments requiring advanced routing, QoS, and PoE for IP phones or wireless access points.

### **5. PT-Switch**

* **Type**: Layer 2 switch (Generic in Packet Tracer)
* **Key Features**: Basic switch functionality with support for VLANs and basic Layer 2 operations. Limited in advanced features compared to the Cisco-specific models.
* **Use Case**: Used for simple network simulations or for beginners learning basic network concepts in Cisco Packet Tracer.

### **6. PT-Empty Switch**

* **Type**: Empty switch chassis (Customizable)
* **Key Features**: Allows users to add and configure their own modules and interfaces.
* **Use Case**: Used when simulating custom-built switches with specific interface needs. Ideal for simulations that require flexibility in terms of hardware configuration.

### **7. Cisco IE 2000 Switch**

* **Type**: Industrial Ethernet Switch (Layer 2)
* **Key Features**: Rugged design, designed for harsh environments, supports VLANs, STP, and advanced security features.
* **Use Case**: Best used in industrial networks, transportation, and energy sectors where rugged, reliable connectivity is required in challenging environments.

### **8. Cisco 2950T Switch**

* **Type**: Layer 2 switch (with gigabit uplink)
* **Key Features**: Similar to the 2950 but includes Gigabit Ethernet uplink ports for faster backbone connectivity.
* **Use Case**: Suitable for small networks needing basic VLANs and STP, with the added need for high-speed uplink to the core network or backbone.

### **9. PT Bridge**

* **Type**: Basic bridge device (Layer 2)
* **Key Features**: Simplistic device used to connect different network segments, no VLAN support or advanced switching capabilities.
* **Use Case**: Used in very basic network simulations for connecting small segments or devices. Rarely used in modern simulations as switches offer more functionality

**TASK 3.**

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

### **Console Cable**

* **Use**: Connects a computer (PC or laptop) to a router or switch for configuration via CLI.
* **Purpose**: Primarily used for device management and configuration via the console port.

### **2.Straight-Through Cable**

* **Use**: Connects different types of devices (e.g., PC to switch, switch to router).
* **Purpose**: Commonly used for connecting end devices (like computers) to networking devices like switches and routers.

### **3.Copper Crossover Cable**

* **Use**: Connects similar devices (e.g., PC to PC, switch to switch, router to router).
* **Purpose**: Used when connecting two devices of the same type without the need for a switch.

### **4.Fiber Cable**

* **Use**: Connects devices over long distances, typically in a WAN environment or backbone connections.
* **Purpose**: Used for high-speed, long-distance communication, often between switches or routers in large networks.

### **5.Phone Cable**

* **Use**: Connects VoIP phones to switches or voice-enabled routers.
* **Purpose**: Specifically for voice communication in VoIP setups.

### **6.Coaxial Cable**

* **Use**: Used in WAN emulation scenarios, particularly when simulating older broadband technologies.
* **Purpose**: Provides a physical medium for cable-based WAN connections or legacy network setups.

### **7.Serial DCE Cable**

* **Use**: Connects routers via serial interfaces in a WAN setup where one side provides the clocking signal (DCE).
* **Purpose**: Required for WAN links where the router needs to control the clock rate (commonly used in simulations for point-to-point WAN connections).

### **8.Serial DTE Cable**

* **Use**: Connects routers via serial interfaces in a WAN setup where no clock rate is required (DTE side).
* **Purpose**: Used in WAN links where the device receiving the data (DTE) does not control the clocking rate.