Real devices used to design.

|  |  |
| --- | --- |
| Routers | Cisco 4431 Integrated Services Router (ISR 4431 Router) |
| Multilayer Switch | Cisco Catalyst 9300x copper |
| Switch | Cisco C9200L-24T-4G |
| Servers | Server and Backup Server |
| Wireless Access Point | Cisco Catalyst WIFI-6E |

**ISR 4431 Router (Routers)**

ISR 4431 Router is used for our university network diagram. Some of router features are here.

* High Performance
* Scalability
* Security
* Quality of Service
* WAN Connectivity
* Integrated Services
* Management and monitoring

The ISR 4431 router offers high performance capability with its multicore processors. It delivers 500Mbps updatable to 1 Gbps throughput and provides reliable and efficient routing. It can provide requirements of large number of users, devices, and applications not only that ISR 4431 has advance security features like firewall protection, VPN connectivity as well as it enabling administators to prioritize critical applications and allocate bandwidth accordingly, provides a better user experience. It has 3 gigabyte ethane ports and 2 network interface module ports. WAN interfaces, including gigabyte ethernet,T1/E1, and serial connections, enabling establish reliable and high speed connection. As well as it supports crntralized management tools,such as cisco DNA center, auto mate configuration tasks and troubleshooting processes. At least will be 8800 dollars. That’s why we chose the ISR 4431 router.

### **Cisco Catalyst 9300x copper (Multilayer Switch)**

The core layer is the back born of network, it provides high-speed connection between different distribution layer devices and the distribution layer connects the access layer to the core layer because of those layers wants to high-performance switch. cisco catalyst 9300x copper switch able to meet requirements. It has several features associated with these layers.

* Performance and scalability
* Network segmentation and security
* High availability and redundancy
* Network management and Automation

switch offers high-performance with advanced hardware capabilities. It provides 2000 Gbps Switching capacity, Switching capacity with stacking 3000 Gbps, Forwarding rate 1488 Mpps Forwarding rate with stacking 2232 Mpps as well as the catalyst switch support visual LANs(VLAN) and advance security features, secure network access, network administrators allows to increase network security and enforce to access policies and access control lists(ACLs). The catalyst switch provides high availability to confirm uninterrupted connectivity. features like that Visual router redundancy protocol (VRRP), Hot standby router protocol (HSRP) and link aggregation(LACP) to provide redundancy .This simplify network management . At least this router will be 7000 dollars or more. That’s why we chose the cisco catalyst 9300x copper switch.

**Cisco C9200L-24T-4G (Switch)**

The access layer, which is the lowest level of the three-tier network model, ensures that packets are delivered to end user devices. We place this router for access layer because this layer to not needed more high performance to work because of that we placed to compatible performance switch for access layer on other hand we localized care of money too. The advantages of using it and its features are as follows.

* Cost-Effective and Scalable
* Gigabyte ethane connectivity
* Power over Ethernet
* Security Features
* Network management and automation
* Reliability and redundancy

This cisco switch can buy at least dollar 2600. This switch supports gigabyte ethernet connectivity on its access ports. Its provide 1Gbps gigabyte ethernet connectivity as wel as Catalyst switch that offers high-speed switching with a capacity of 56Gbps. This switch supports PoE and PoE+ standards. This device has 24 data ports that can be used for either 10/100/1000Mbps Ethernet or PoE+. It also has 4 fixed uplinks that operate at 1Gbps. Access control list (ACLs), port security, and DHCP snooping to enforce network security policies, restrict unauthorized access, and mitigate security threads are this switch security features . network management and automation is the case of the cisco catalyst 9300x copper switch explained same as. Power redundancy and stacking functionality increase network reliability and availability. Redundant power supplies ensure continuous operation in the event of a power outage, while stacking allows for proper control of multiple switches, allowing for easy management and redundancy. This router at least dollar 2600 or more. That’s why we chose the Cisco C9200L-24T-4G switch.

**Servers**

**Cisco Catalyst WIFI-6E (Wireless Access point)**

We placed cisco catalyst wifi-6E wireless access point for our network diagram because it has high-performance, high-density. Their has many advance features and capabilities like

* Increased capacity and performance
* Higher throughput and Speed
* Reduced interface
* Support for high-density
* Enhanced security

WIFI-6E using 6 GHz frequency band, witch provides additional channels for Wi-Fi communications. This expanded range allows for higher capacity and reduce traffic.it support to more users and devices can connect without decreasing performance. it use Division Multiple Access(OFDMA) and Multi-User Multiple input Multiple Output (MU-MIMO) like advance features use for more efficiency and provide services for more devises at once and improving performance in whole network. Wi-Fi 6E access points using the 6 GHz band can operate in less congested spectrum. This provides users with greater reliability and a stronger wireless connection by minimizing interference from neighboring Wi-Fi networks and other devices operating in the 2.4 GHz and 5 GHz bands. It has least security standards and protocols including WPA3 encryption. That’s why we chose the Cisco Catalyst WIFI-6E wireless router.

**References**

* <https://www.router-switch.com>
* <https://www.cisco.com>

**Media Types**

* **Fiber Optic Cable**

We placed fiber cables for Core Layer, Distribution Layer and Server Room only because then can get high-performance be given without latency to the network. Due to fiber cable has most advantages including:

* High Bandwidth
* Security
* Scalability and Futureproofing
* Reliability and Low latency

Fiber optic cables offer significantly higher bandwidth compared to copper cables. Fiber optic cables can transmit data 10 Gbps or over 10 Gbps and higher data rates, allowing for the efficient transmission of large amount of data. Fiber optic cables provide greater security for data transmission. Data distortion is minimized. That’s why we chose the fiber optic cables.

* **copper straight through cable (cat 6)**

copper straight through cable used for connect access layer, end-devices and wireless access points. There are two category cat 5e and cat 6. Cat6 cables have stricter performance specifications and significantly higher data transfer speeds at greater distances. There are some reasons for chosen it.

* Cost-Effectiveness
* Compatibility
* Power Over Ethernet(POE) Support

**Technologies**

* LAN

In my opinion **Ethernet** is the appropriate LAN technology. Because it provide reliable and high speed wired connectivity. Fast ethernet provides 100 Mbps data transmit connectivity as well as Gigabit Ethernet provides 1 Gbps data transmit connectivity.

* WAN
* MPLS (Multiprotocol Label Switching)