Real devices used to design.

|  |  |
| --- | --- |
| Routers | Cisco 4431 Integrated Services Router (ISR 4431 Router) |
| Multilayer Switch | Cisco Catalyst 9300X |
| Switch | Cisco C9200L (C9200L-24T-4G) |
| Servers | Dell PowerEdge R940 |
| Wireless Access Point | Cisco Catalyst WIFI-6E |

**Cisco 4431 Integrated Services Router (ISR 4431 Router)**

* This is a Cisco ISR 4431 Integrated Services router.
* The cisco 4000 series router is used because the high performance and this router performance enough for our network.
* This router has 500Mbps throughput that can be upgradable to 1Gbps aggregate throughput.
* The ISR 4431 offering

High performance

Security

Best Bandwidth

Quality of Service

Scalability

### **Cisco Catalyst 9300X (Multilayer Switch)**

* Cisco catalyst 9300 switch place for core layer and distribution layer. It has Up to 1 TBps of l stackable switching bandwidth.

**Cisco C9200L Switch**

Cisco 9200L switch use for access layer. it has1Gbps gigabyte ethernet connectivity and  high-speed switching with a capacity of 56Gbps as well as 4 fixed uplinks that operate at 1Gbps.

**Dell PowerEdge R940 server**

Dell PowerEdge R940 is high end rack server. It designs for high demanding workloads.

**Cisco Catalyst WIFI-6E**

We placed cisco catalyst wifi-6E wireless access point for our network diagram because it has high-performance as up to 5.4Gbps, high-density.

It has two frequency bands, 2.4 GHz and 5 GHz.

**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. Fiber optic cables can transmit data 10 Gbps or over 10 Gbps and higher data rates Due to fiber cable has most advantages including:

* High Bandwidth
* Security
* Scalability and Futureproofing
* Reliability and Low latency
* **copper straight through cable (cat 6)**

copper straight through cable used for connect access layer, end-devices and wireless access points. 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

Visual Private Network (VPN) is suitable for university network because . VPN enable secure remote access to the connecting from various kind of places. VPN use encryption and tunnelling protocols to protect data transmission over public networks as well as ensuring and security.

**ISO/OSI Reference Model**

7. Application Layer

6. Presentation Layer

5. Session Layer

4. Transport layer

3. Network Layer

2. Data Link Layer

1. Physical Layer

**7. Application Layer**

Application layer provides services to end user software to access the Network services.

* Web services: HTTP

Provide stateless connection.

* Email Services: ESMTP (Extended SMTP)

It is Extended version of SMTP. ESMTP follows the same protocols as SMTP. It adds more functionality, security, and authentication than SMTP.

* Ip Addressing Services: DHCP

The consuming process of manually configuring systems withing a network has been reduced, making everything faster and more automated.

* File Sharing Services: FTP

File transfer protocol supports authentication and remote users can upload and download files.

* Telnet

**6. Presentation Layer**

Transport layer security (TLS) is an improved version of SSL. It works in much the same way as the SSL.

It can compress and encrypt data.

**5. Session Layer**

* Session initiation protocol (SIP)

It is used for initiating, modifying, and terminating multimedia sessions over IP networks. It is commonly used for voice and video communication.

* NetBIOS protocol

It allows applications on computers to communicate with one another over a local area network.

* AppleTalk Session Protocol (ASP)

It provides session establishment and maintenance services for AppleTalk applications.

* Lightweight Presentation Protocol (LPP)

It provides session management services for iot devices, allowing them to establish and maintain communication sessions.

* Real-Time Transport Control protocol (RTCP)

It is responsible for providing control and monitoring of multimedia sessions, particularly in streaming applications.

**4. Transport layer**

* Transmission control Protocol (TCP)

It provides reliable, connection-oriented, and error checked delivery of data. It handles flow control to manage network traffic.

* User datagram protocol (UDP)

UPP is connectionless protocol. It does not provide reliable delivery or error checking like TCP, but it is commonly used for applications like real time streaming, VoIP and DNS.

**3. Network Layer**

* **Address resolution protocol (ARP)**

ARP is given Ip address to corresponding MAC Address on a local network.

* **Internet control massage protocol (ICMP)**

ICMP is response for reporting errors, testing network connectivity, providing diagnostic and control functions.

* **Internet Protocol Version4 (IPV4)**

IPV4 provides addressing and routing capabilities for data transmission across interconnected networks.

* **Internet Protocol Version6 (IPV6)**

IPV6 offer 128 bit address, enabling a visually unique addresses.

2. Data Link Layer

* Ethernet

Provide rules for transmitting data frames.

* Point to point protocol (PPP)

PPP use for Establishing a direct connection .

* High Level Data Link Control (HDLC)

HDLC provide reliable and error-free transmission of data frames.

* Asynchronous Transfer Mode (ATM)

ATM protocol use for reach high speed and low latency.

* Wireless LAN Protocols

This protocol provide wireless connection between devices.

* Frame Relay

Frame Relay used for transmit data with each branches low latency and high speed.