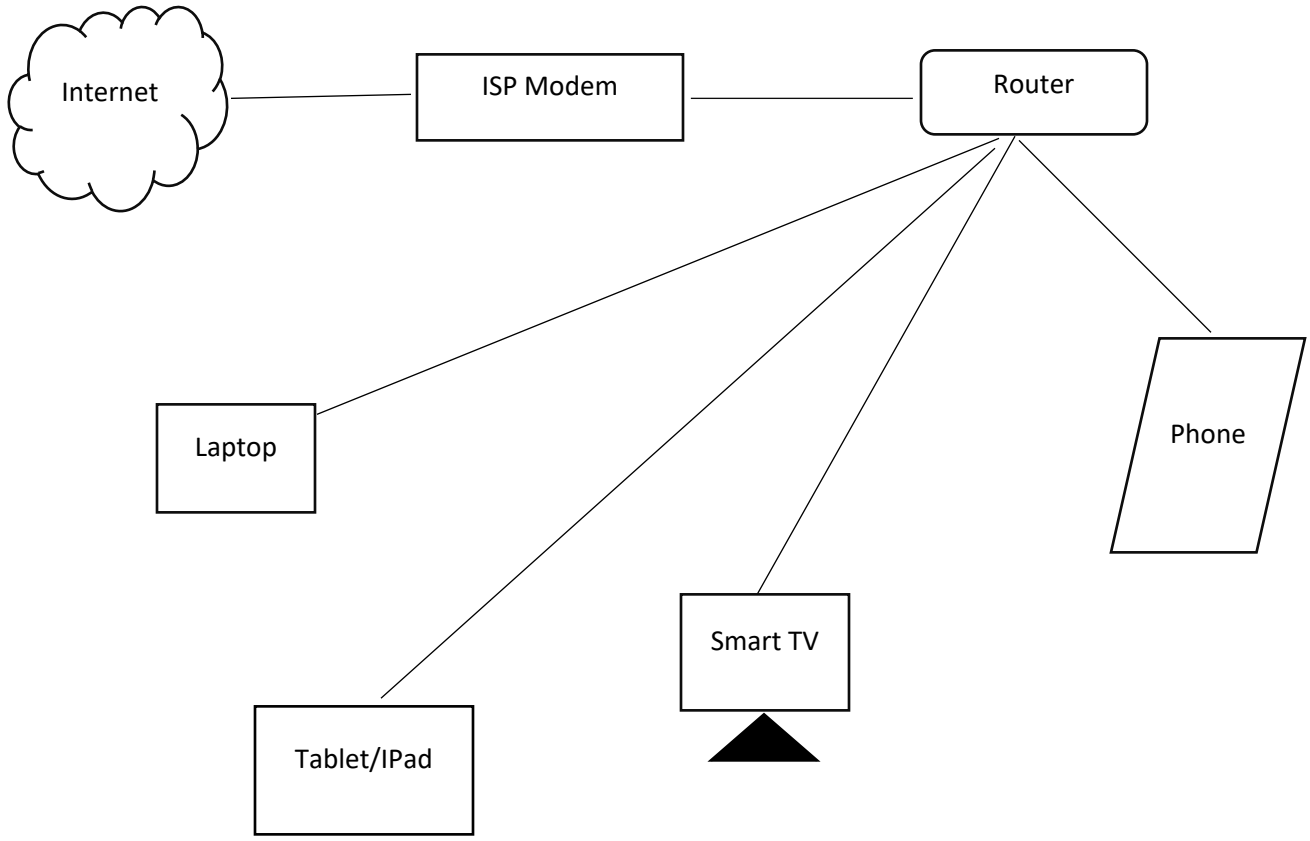
Assignment 1:

Draw your Home Network Topology and explain how you are accessing the RPS Lab environment.

Diagram:

HOME NETWORK TOPOLOGY



In this **Home network topology**, we might have several devices connected, such as computers, smartphones, smart TVs, and other smart devices. These devices are usually connected to a router, which acts as the central hub of your network.

The most common home network topology is a **star topology**, where all devices are connected directly to the router. Each device has its own unique IP address, which helps in identifying and communicating with them within the network.

ISP modem:

An ISP modem, also known as a broadband modem, is a device provided by your internet service provider (ISP) that connects your home network to the wider internet. It acts as a translator, converting the signal coming from your ISP (which can be cable, fiber optic, or DSL) into a digital format that your devices can understand.

Router:

A router is a networking device that connects two or more computer networks. It directs data packets between networks, using IP addresses to determine the correct destination. Routers are essential for creating large networks, such as the internet, and for allowing multiple devices on a home network to share a single internet connection.

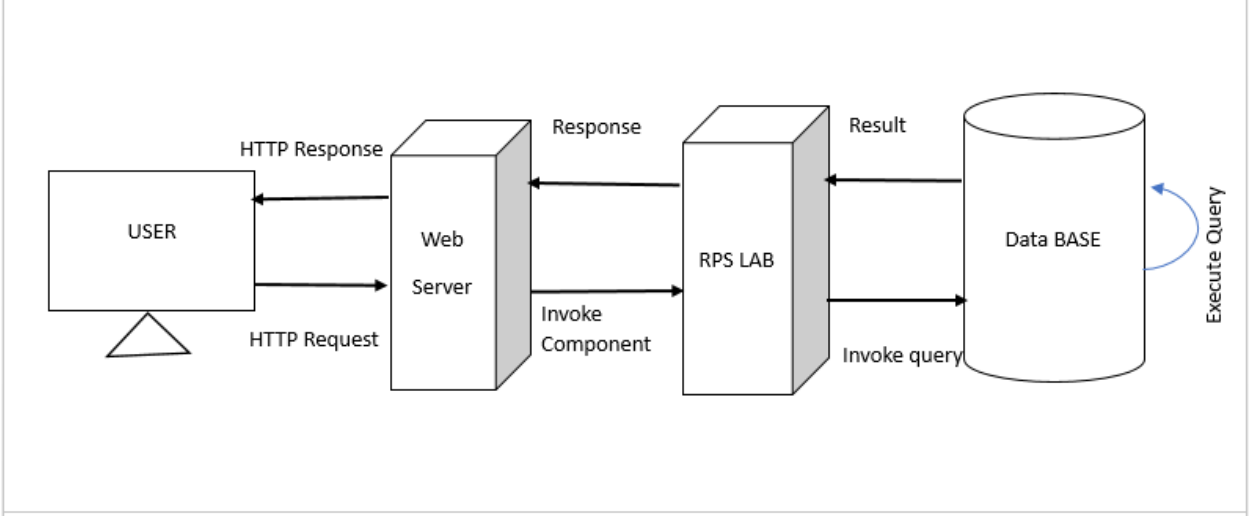
End Devices:

End Devices such as Desktops, mobiles, printers, tablets and all smart devices in the home are connected to the central device and each home device has its own network interface like Wi-Fi through which they can communicate with the central device.

Communication:

In star topology the communication between devices on the network goes through central devices. If one device need to send the information to the other device it sends through the central device and then forwards the information to the destination device. This network is simple and all the devices will be directly connected to the central device.

ACCESSING THE RPS LAB SERVICE ENVIRONMENT:



User (Client Server):

This represents the user devices to interact with lab environment it may be of laptop, mobile or devices that may sends the HTTP request and responses.

Webserver:

It serves as an entry point of User requests, initially it can handle initial authentications, requests, static content related to the lab environment e.g.: login page.

RPS Lab (Application Server):

It is an application server. Receives requests forwarded by the web server. It hosts the application's business logic, processes dynamic content, and interacts with other components such as databases.

Database:

It hosts the data where data can be modified and retrieved, the application server sends the query to database to fetch or modify data as needed.

Explanation:

- User sends the http request to the webserver.
- Webserver invokes the components or application to the application server based on the request.
- The application server processes the request and invokes the queries or related operations to interact with the database server.
- The Database server executes the query and sends to the application server, which responds to the user's request.

Assignment 2:

Identify a real-world application for both parallel computing and networked systems. Explain how these technologies are used and why they are important in that context.

Answer:

Parallel computing is a type of computing where multiple tasks or calculations are performed simultaneously. It involves breaking down a complex problem into smaller parts that can be solved independently and concurrently. These smaller tasks are then assigned to multiple processors or computing units, which work on them simultaneously.

- Parallel computing is used in various real-world applications, like weather forecasting, image and video processing, financial modeling. This helps speed up computations and solve problems more efficiently. It's like having a team of workers collaborating on different parts of a task to get it done faster and more efficiently.

Networked systems are built from a multitude of computing components, connected through the network. A prominent example of networked systems are data centers, which host tens of thousands to hundreds of thousands of computing nodes.

- Networked systems are used in many areas, such as online shopping and social media. They allow devices to communicate and share information over a network, like the internet. This enables people to connect, share data, and access resources from anywhere in the world.

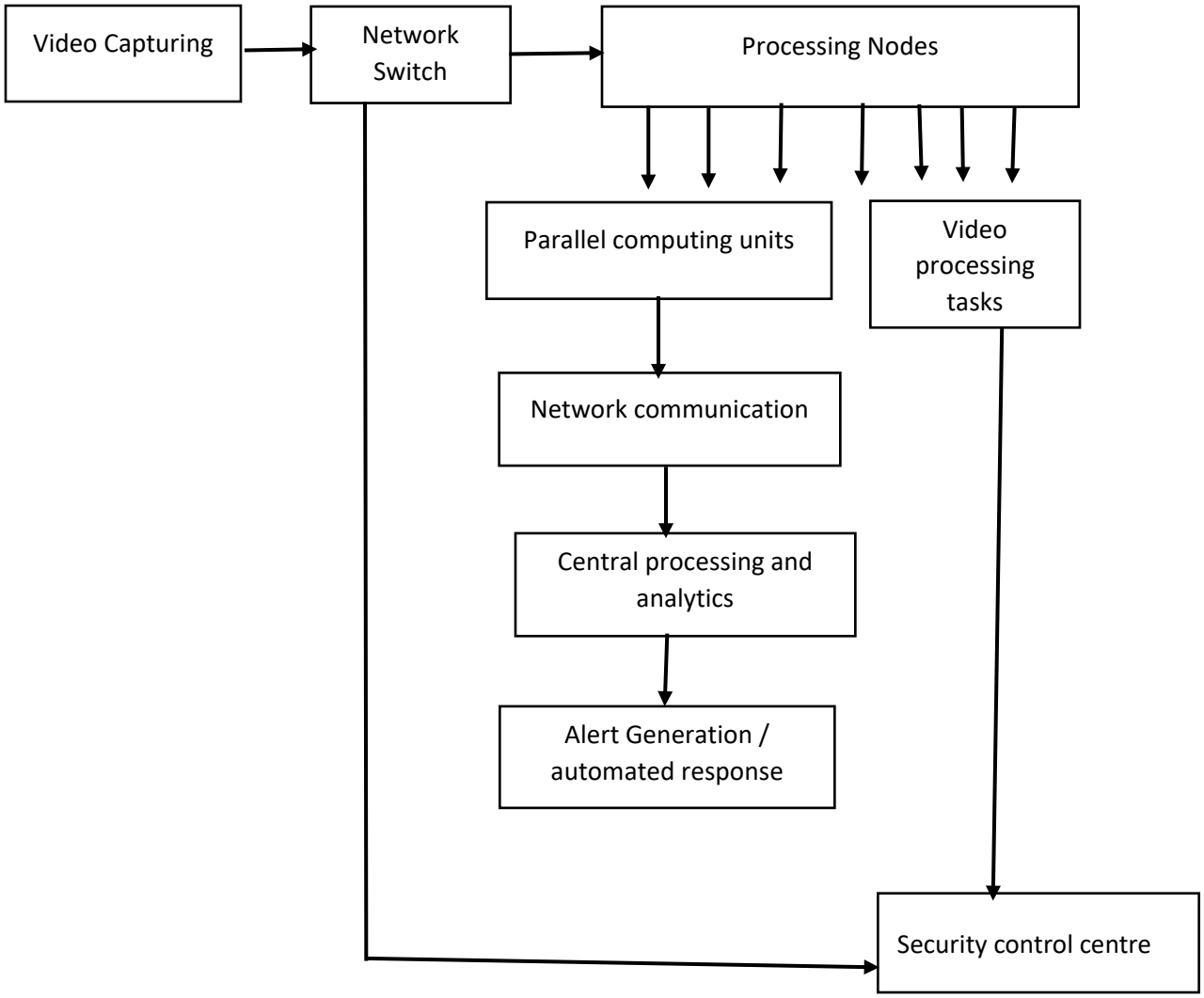
Real time application that uses both parallel computing and networked systems:

Video processing and analytics:

Explanation for this example:

- Video data from cameras is initially captured and sent to the network switch.
- The network switch routes the video data to the processing nodes.
- The processing nodes handle tasks such as initial preprocessing, segmentation, or feature extraction.
- The processed data is then forwarded to parallel computing units for more complex analysis, such as object detection or pattern recognition.
- Next, the data is sent to the central processing and analytics unit for higher-level analysis, such as behavior recognition or anomaly detection.
- Alerts may be generated based on the analysis results and passed to the alert generation component.
- Finally, the alerts are sent to the security control center for monitoring and potential action.

FIG: VIDEO PROCESSING AND ANALYTICS:



Both parallel computing and networked systems are important because they enhance performance, enable collaboration, and improve scalability in various domains. They help us tackle complex problems faster and connect people and resources globally.