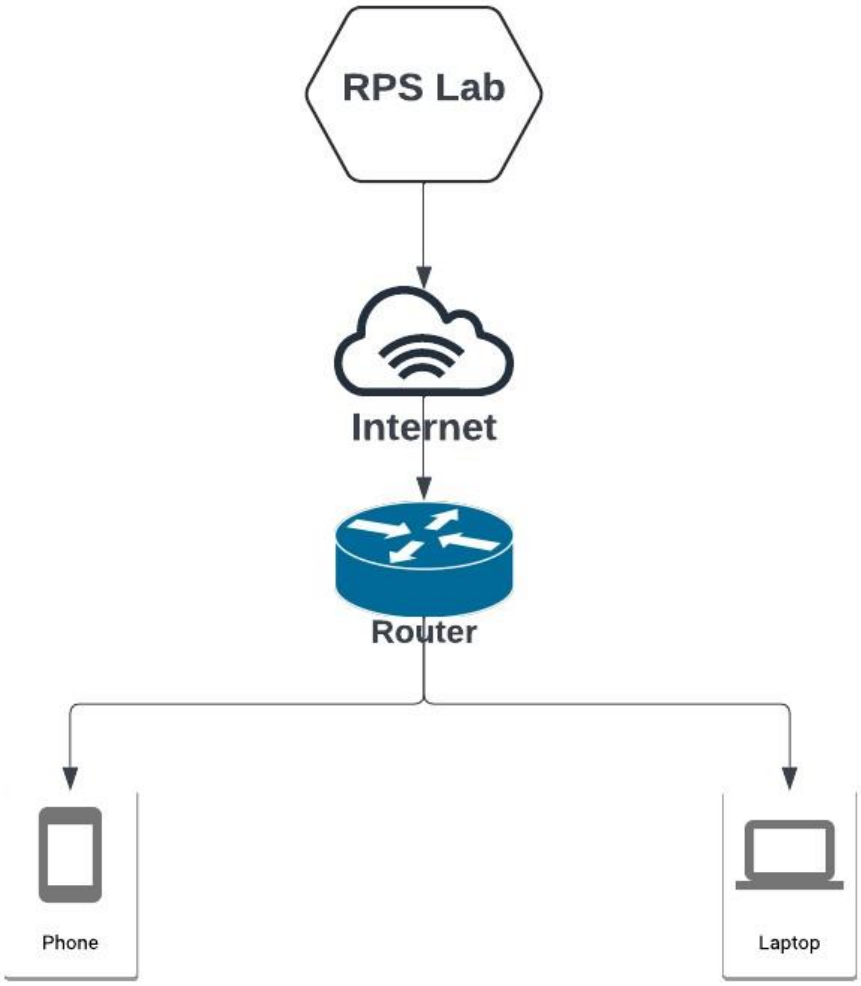
Day-1

Assignment 1:

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

Home Topology diagram



Accessing the RPS LAB environment

- RPS is present outside the home network.
- The Internet is available worldwide.
- The RPS can be accessed using the internet.
- By using router we can connect our phone, laptop and any other devices to internet.
- Through internet we can access RPS lab on our device.

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.

Parallel computing

In real-world applications, parallel computing is used in the educational sector, particularly in grading and assessment systems for large-scale tests.

Educational institutions collect large amounts of data from tests including student's performance. Parallel computing facilitates the analysis of this data by distributing data processing tasks across multiple processors, allowing educators to gain valuable insights into students' learning outcomes, identify areas of improvement, and inform instructional decision-making.

Why is parallel computing important in this context

- Parallel computing splits up the grading job among many computers, making it faster to grade tests for thousands or even millions of students.
- Parallel computing lets computers grade many tests all at once. This means students get their results back quickly.
- It helps educators assess student learning effectively, and provide timely feedback.
- Data analysis helps to find students good in which concepts and where they need improvement.

Networked systems

In real-world applications, a networked system is used in online banking.

In the last few years most peoples are using online banking, in this time networked systems enable individuals to access and manage their bank accounts, and interact with banking services through the Internet.

Why are networked systems important in this context

- Networked systems allow customers to access their bank accounts any time as long as they have an internet connection, it helps those who may not be able to visit the bank during regular business hours.
- It helps various financial transactions, including bill payments and online purchases these transactions are executed in real time.
- Networked systems play a vital role in online banking by providing convenient access to banking services.
- Making financial transactions more accessible, convenient and secure for customers in today’s digital age.

Day-2

Assignment 1:

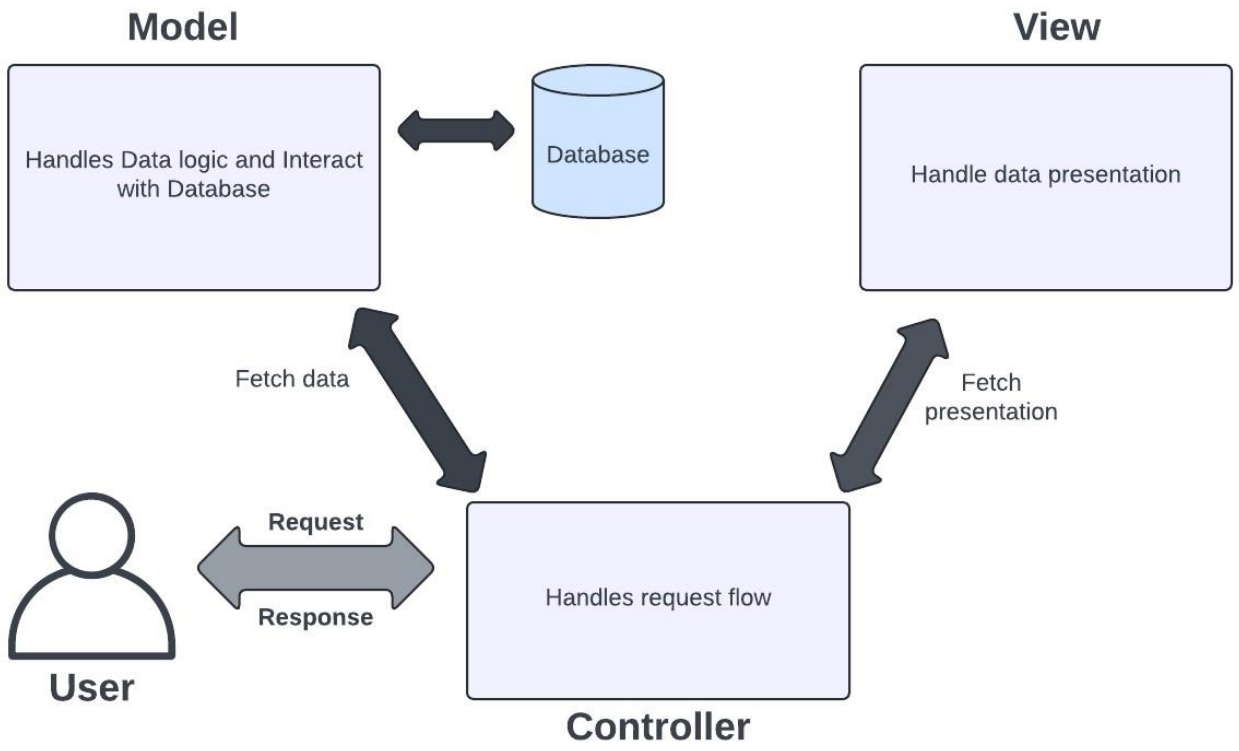
Design Pattern Explanation - Prepare a one-page summary explaining the MVC (Model-View-Controller) design pattern and its two variants. Use diagrams to illustrate their structures and briefly discuss when each variant might be more appropriate to use than the others.

MVC (Model-View-Controller):

MVC is an architectural design pattern that is separated into three logical components Model, View and Controller. It was traditionally used for desktop graphical user interfaces (GUI) and it is also used for mobile apps.

It supports large teams of web designers and developers and this will help for easy to maintain and can be extended easily.

MVC Architecture:



Controller:

- A controller is interconnected between the view and model.

- It tells the model what to do. It processes all the business logic and incoming requests.
- Manipulates data using model component and interacts with view to render the final output.

Model:

- Model represents the data and business logic of the application.
- It adds or retrieves data from the database.
- The model interacts with the database and gives the required data back to the controller.

View:

- The view component is used for all the UI logic of the application. It generates a user interface for the user.
- View which is created by the data which is collected by the model component but this data collected through a collector.

Variants:

Classic MVC

- When the model state changes, it notifies the view, which updates itself accordingly.
- The controller handles user input and updates the model based on the input received. It also updates the view if necessary.

Usage:

- Uses in small to medium-sized applications.
- Provides simplicity and implementation for simpler projects.

MVC with observer

- The controller remains responsible for handling user input and updating the model. It does not directly update the view.
- Update itself when notified of changes.

Usage:

- Recommended for large-scale applications with complex user interfaces.
- Beneficial when there's a need for multiple views to observe the same model.

Assignment 2:

Principles in Practice - Draft a one-page scenario where you apply Microservices Architecture and EventDriven Architecture to a hypothetical e-commerce platform. Outline how SOLID principles could enhance the design. Use bullet points to indicate how DRY and KISS principles can be observed in this context.

Microservice Architecture:

A microservice architecture is a type of application architecture where the application is developed as a collection of services.

Where do you apply Microservices Architecture to a hypothetical e-commerce platform

- Managing product information, including products, categories and attributes.
- Handles order processing, including order creation and status updates.
- Manages user authentication, authorisation and profile information.
- Provides personalized product recommendations based on user behaviour and preferences.

Event-Drive Architecture:

Event-Drive architecture is a software design pattern that enables an organization to detect “events” or important business moments and act on them in real-time or near real time.

Where do you apply Event-Drive Architecture to a hypothetical e-commerce platform

- Generated when a user successfully places an order. This event triggers downstream processes like inventory deduction, order confirmation mail, and payment processing.
- Indicates the outcome of a payment transaction. On successful payment, it triggers the fulfilment process on failure, it initiates a retry mechanism.
- Notifies the order management system and users about shipping status changes, such as shipped, out for delivery, or delivered.

Solid principles:

Single Responsibility Principle:

Each microservice has a single responsibility, ensuring it is focused and easy to maintain.

Open/Closed Principle:

Services are open for extension (adding new features) but closed for modification (existing functionalities remain intact).

Interface Segregation Principle:

Service interfaces are customized to the needs of their clients, avoiding unnecessary dependencies.

How DRY and KISS principles can be observed in this context

DRY (Don’t repeat yourself**):**

Shared components like authentication and database connections are centralized to avoid duplication and inconsistences across service.

KISS(Keep it simple stupid**):**

Service is designed to be simple and focused on there core functionalities, avoiding unnecessary complexities that could delay development and maintenance

Assignment 3:

Trends and Cloud Services Overview - Write a three-paragraph report covering: 1) the benefits of serverless architecture, 2) the concept of Progressive Web Apps (PWAs), and 3) the role of AI and Machine Learning in software architecture. Then, in one paragraph, describe the cloud computing service models (SaaS, PaaS, IaaS) and their use cases

Serverless architecture:

Serverless architecture is a type of cloud computing that enables development teams to get applications to market faster. Serverless means the server infrastructure is fully managed by a provider, so there's no need to manually track and manage application scale or cloud server configurations and provides benefits including reduced operating costs and always-on servers that support web and mobile applications. Servers are created on the fly only when required by the application. Instant availability creates additional scalability when compared to a cloud system.

Concept of Progressive Web Apps:

Progressive Web Apps are the advantages of web and mobile apps, utilizing web technologies like HTML, CSS, and JavaScript. They offer native app-like experiences across devices and platforms, including offline functionality and push notifications. These are responsive and installable directly from the browser, ensuring easy access and engagement for users. providing basic functionality on all browsers and enhanced features on modern ones, leading to faster, more reliable, and more engaging web experiences.

The role of AI and Machine Learning in software architecture

AI and machine learning are revolutionizing software architecture by enabling intelligent, data-driven decision-making and automation. These technologies are increasing integrated into various aspects of software development, including predictions, natural language processing, and recommendation systems. AI and machine learning algorithms can optimize performance, enhance security, and personalize user experiences. From automating tasks to identifying patterns in data, AI and machine learning play a crucial role in shaping the future of software architecture, empowering developers to create smarter and more efficient systems.

Cloud computing service models (SaaS, PaaS, IaaS) and their use cases

Software as a Service (SaaS) delivers applications over the internet on a subscription basis, ideal for enduser applications like email and collaboration tools.

Platform as a Service (PaaS) provides a platform for developers to build, deploy, and manage applications without worrying about the underlying infrastructure, suitable for application development and deployment.

Infrastructure as a Service (IaaS) offers virtualized computing resources over the internet, enabling users to provision and manage servers, storage, and networking infrastructure on-demand, suitable for businesses requiring more control over infrastructure and applications.