Full-Stack Development

Object-Oriented Programming

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2025-II

Outline

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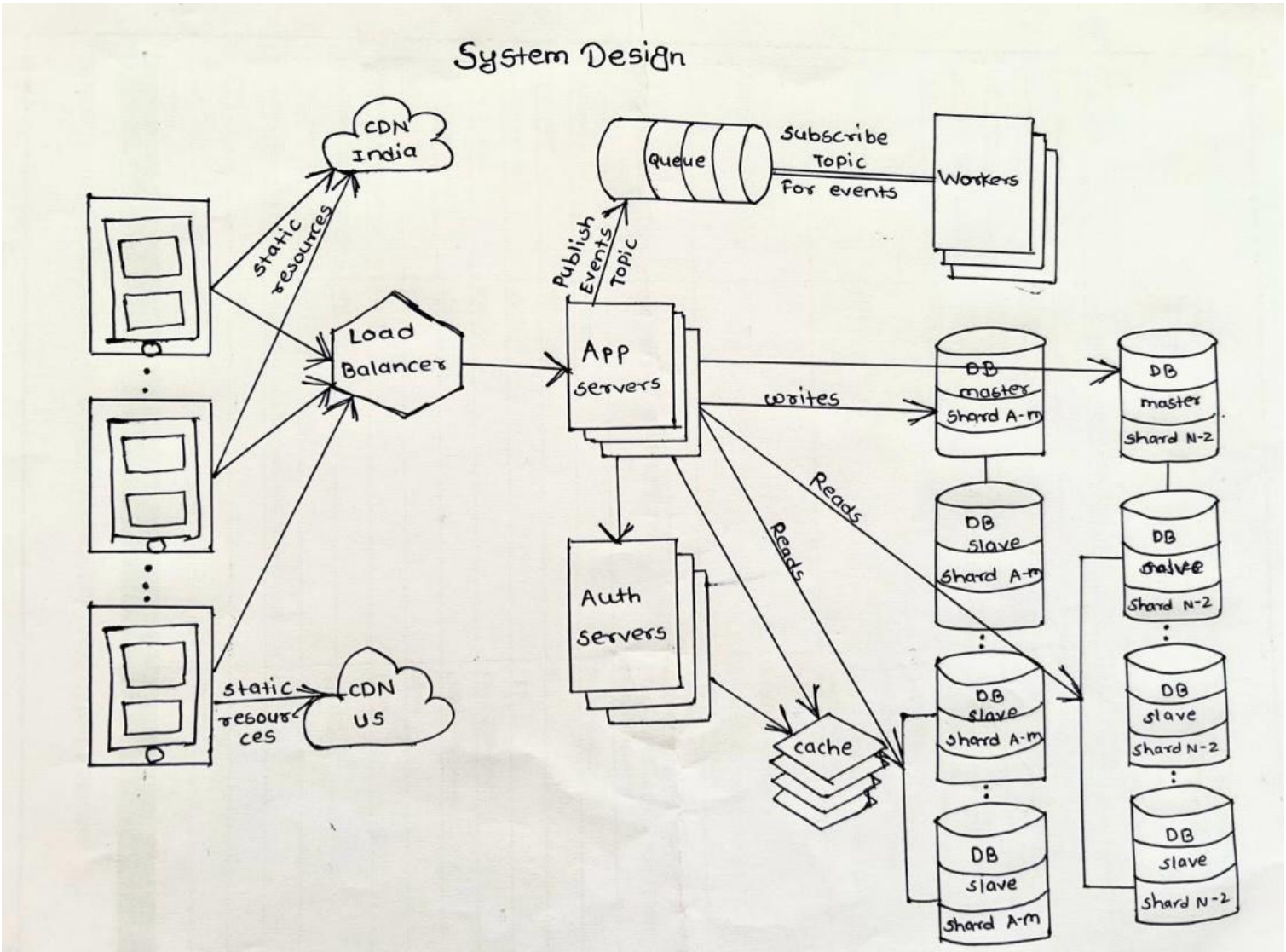
Systems Design applied to Software Architectures

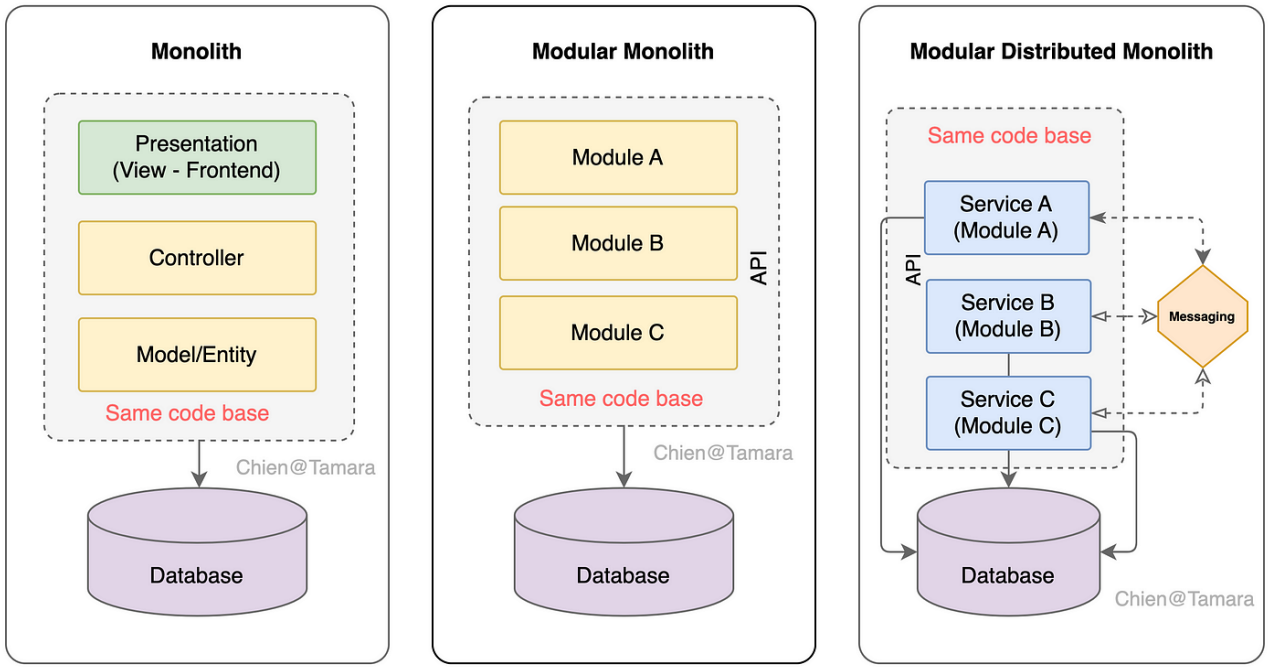


What is a System Architecture?

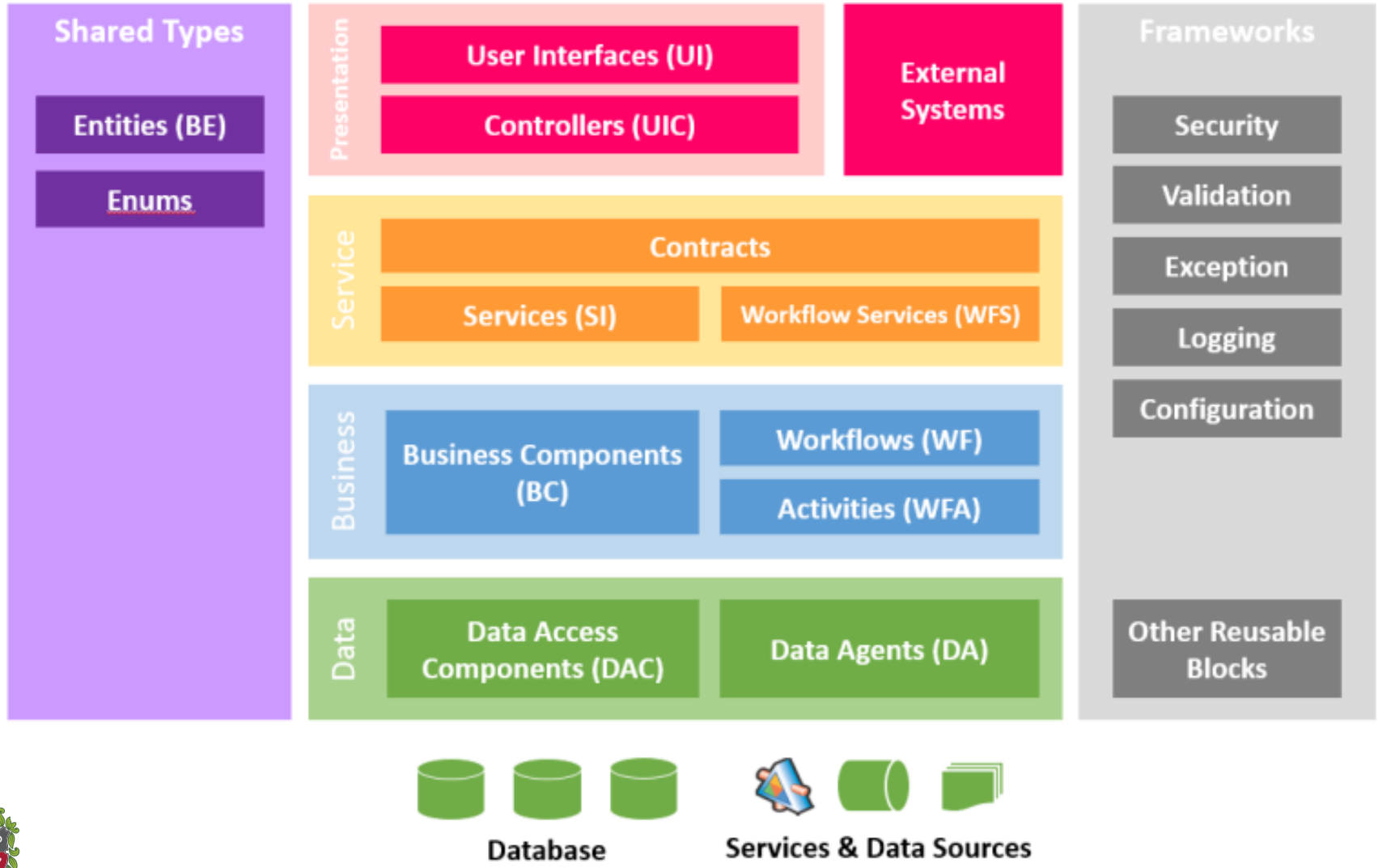
- A **system architecture** is the *structure* of a `system` that *defines* its components, interactions, and relationships.
- A **system architecture** is the *blueprint* of a `system` that *guides* its development and implementation.
- A **system architecture** is the `foundation` of a system that ensures that it meets the needs of its users.

Monolithic System Architecture

- A **monolithic system architecture** is a single-tier architecture that consists of a single unit that `performs` all the `functions` of the system.
- It is simple, easy to develop, and maintain, but it is **not** scalable and flexible. It is *typically used* for small systems that do not require high performance or reliability.



Layered Architecture Pattern



Packages in Java

Packages are a way of structuring the `Java namespace` using *dotted package names*.

- **Creating Packages**: To create a package, you just have to create a directory with a `package-info.java` file.
- **Importing Packages**: To import a package, you can use the `import` statement.
- **Third-party Packages**: Java has a set of third-party packages that you can use in your projects.
- **Maven**: Maven is a build automation tool used primarily for Java projects.

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Data System Concepts

Key Points of Data Systems:

- Data modeling is the process of designing the **structure** and organization of data.
- Data storage is the process of storing data in a structured or unstructured **format**.
- Data retrieval is the process of **accessing** and **retrieving** data from a storage system.
- Data manipulation is the process of modifying and **transforming** data.
- Data security is the process of protecting data from unauthorized access and ensuring its **integrity** and **confidentiality**.

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Data Access Objects and Data Transfer Objects

Data Access Objects (DAOs) and Data Transfer Objects (DTOs) are design patterns used to separate the data access logic from the business logic in an application.

- A Data Access Object (DAO) is an object that provides **an abstract interface** to some type of `database` or other persistence mechanism.
- The DAO pattern is used to **separate the** `data access logic` from the `business logic` in an application.
- A Data Transfer Object (DTO) is an object that **carries data** between processes in an application.
- The DTO pattern is used to **transfer data** between processes in an application.

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Objects Persistence

- **Serialization**: It is the process of converting an object into a stream of bytes.
- **Deserialization**: It is the process of converting a stream of bytes into an object.

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- **JSON**: It is a lightweight data-interchange format that is easy for *humans* to `read` and `write` and easy for *machines* to `parse` and `generate`.

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Backend Concepts

Key Points of Backend Systems:

- A **backend system** is a software system that provides the logic and functionality to support the front-end of an application.
- A **backend system** typically consists of a `server`, a `database`, and an `application server`.
- A **server** is a computer that provides services to other computers over a network.
- An **application server** is a software framework that provides an environment for running web applications.
- A **database** is a collection of data that is organized and stored in a defined format.

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Connection with Data Layer

- The **backend layer** is responsible for `managing` the data layer and `providing` the logic and functionality to *support the front-end* of an application.
- The connection between the `backend` and `data layers` is typically managed through an application programming interface (API).
- An **API** is a set of rules and protocols that allows different software applications to communicate with each other.
- The **API** provides a way for the `front-end` of an application to interact with the `backend` and `access the data` stored in the database.
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FrontEnd Layer

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- The front-end is the **presentation layer** of the application.
- The front-end is the **user interface** and the **user experience**.

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UI Vs. UX


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Model-View-Controller (MVC) Pattern

- The Model-View-Controller (MVC) is a software architectural pattern that separates the application into three main components: **model**, **controller**, and **view**.
- The **model** is responsible for managing the data and business logic of the application.
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Java Swing & Java FX

- **Java Desktop Applications** are applications that run on a user's computer and provide a graphical user interface (GUI) for the user to interact with.
- **Java Swing** is a set of GUI components that can be used to create desktop applications in Java.
- **JavaFX** is a set of GUI components that can be used to create desktop applications in Java.
- **JavaFX** is the successor to **Java Swing** and provides a more modern, flexible way to create desktop applications.
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