FullStack Application Fundamentals

Object-Oriented Programming

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Outline

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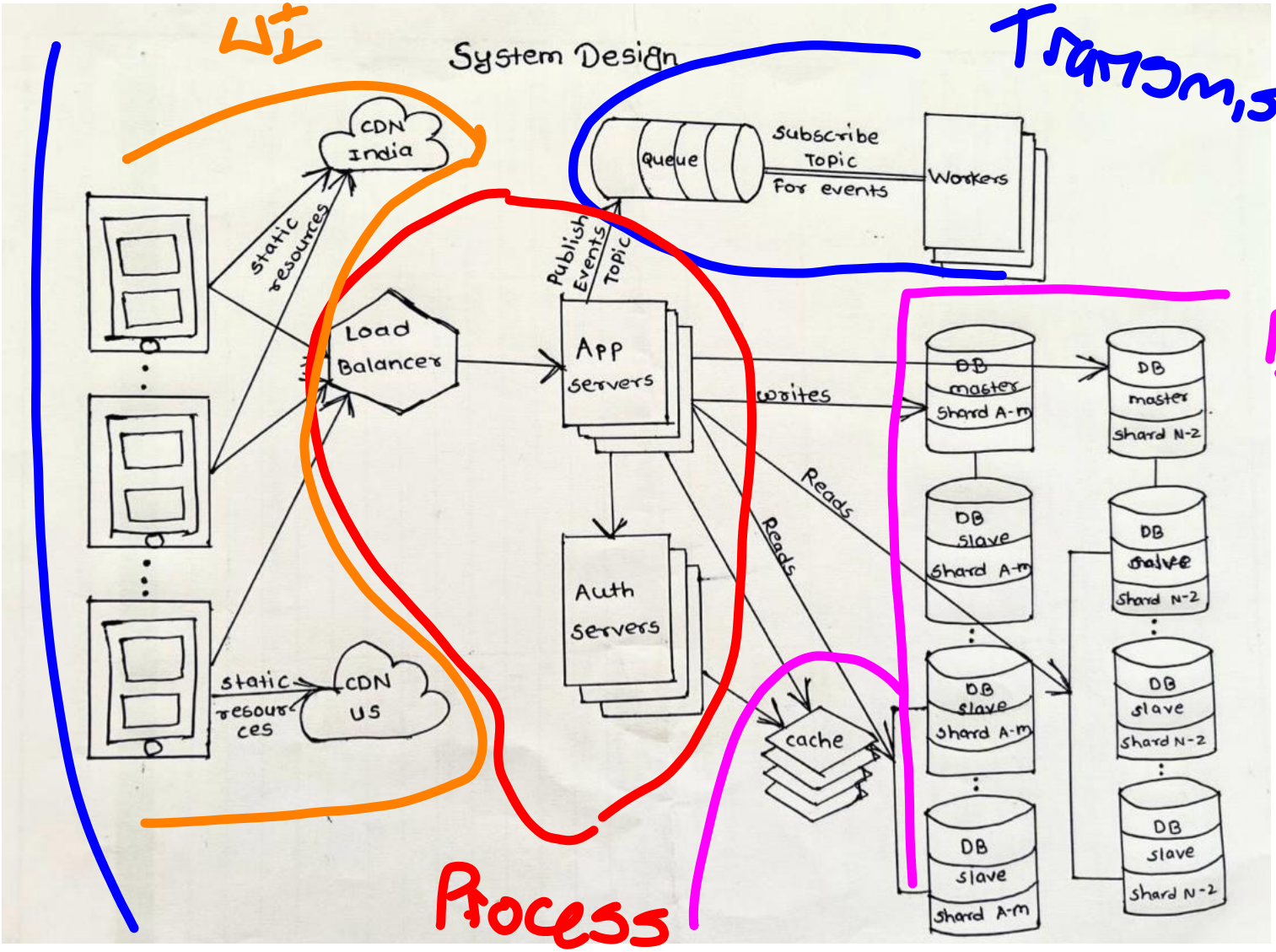
Systems Design applied to Software Architectures

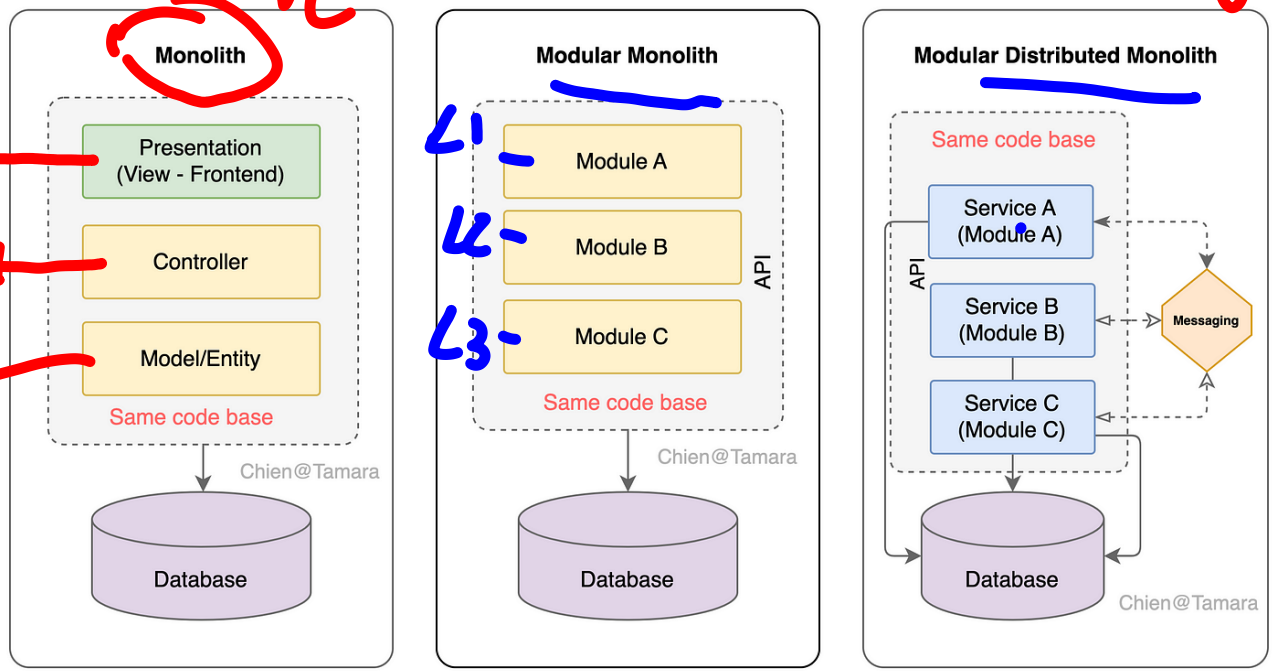


What is a System Architecture?

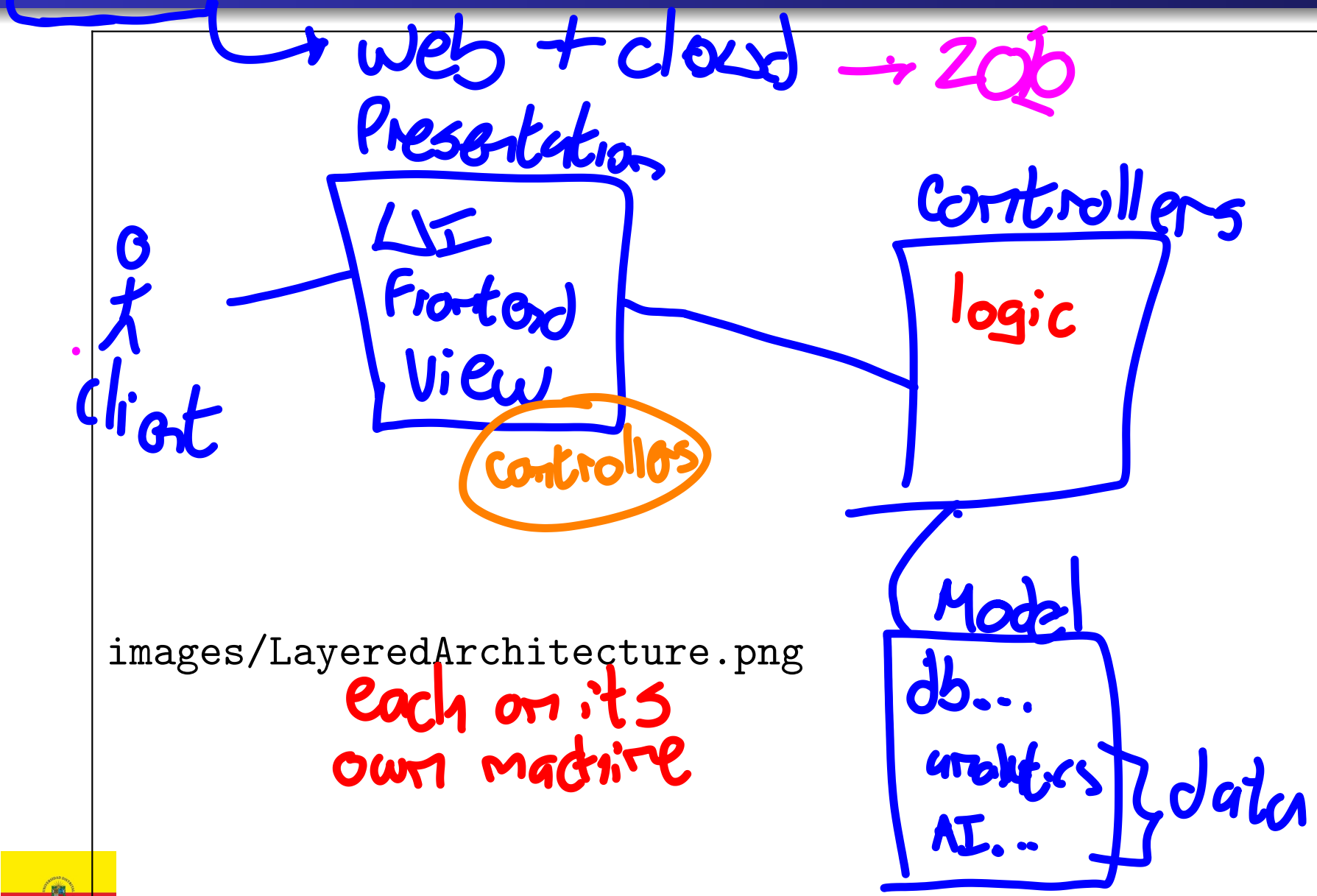
- A **system architecture** is the *structure* of a `system` that *defines* its components, interactions, and relationships.
- A **system architecture** is the *blueprint* of a `system` that *guides* its development and implementation.
- A **system architecture** is the `foundation` of a system that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



images/LayeredArchitecture.png

each on its own machine

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.

Demo time!

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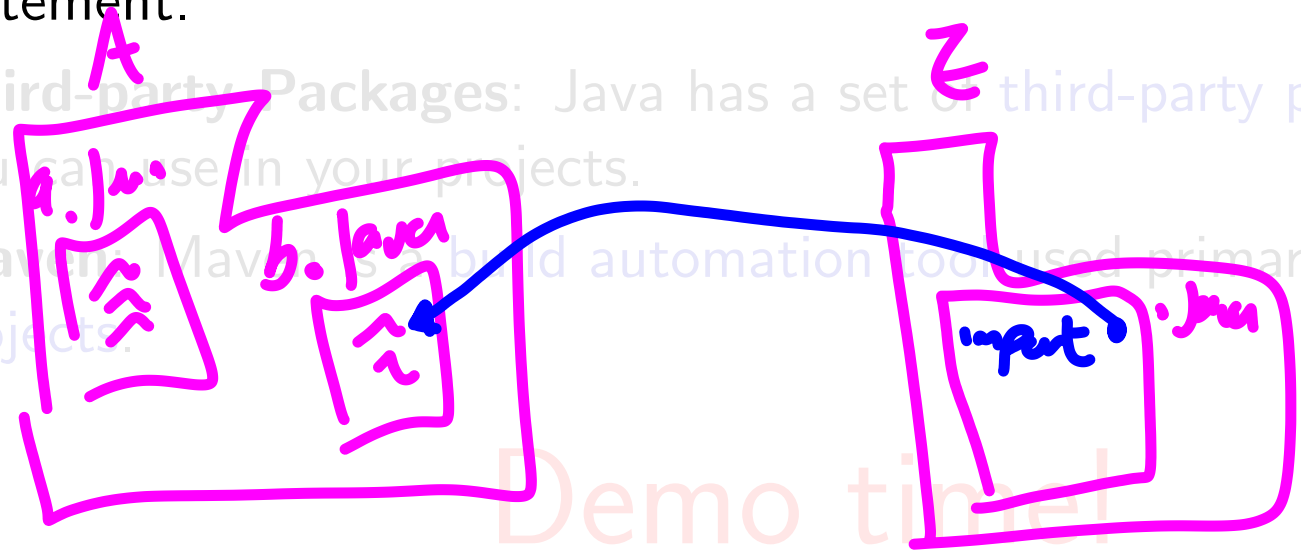

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util
Math
Spring Boot

Demo time!

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project packages | management

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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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no damage

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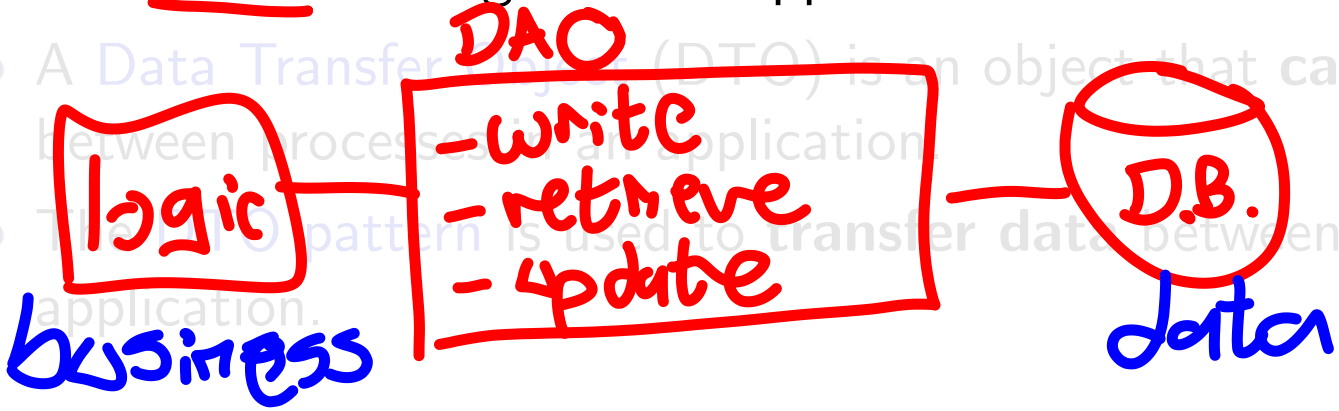
Data Access Objects and Data Transfer Objects

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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only attributes

→ database only

List of Objects

Demo time!

List of rows

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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.

Demo time!

- **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`.

Demo time!

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Key: value → all

Demo time!

JavaScript Object Notation

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web

attributes name

Demo time! X

```
{
  "key1": 123,
  "key2": Pepita,
  "key3": [0,1,2]
}
```

values

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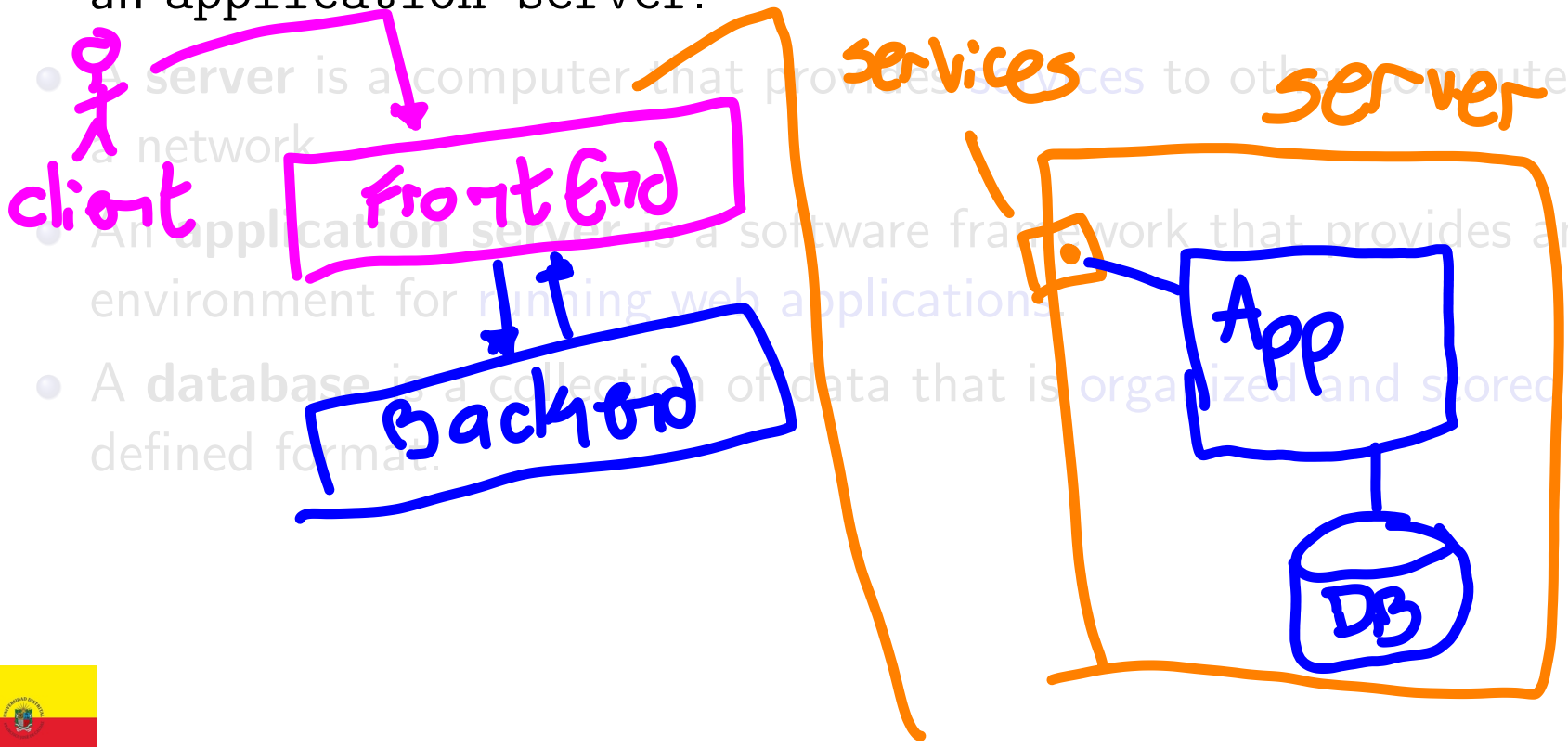
Backend Concepts

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.
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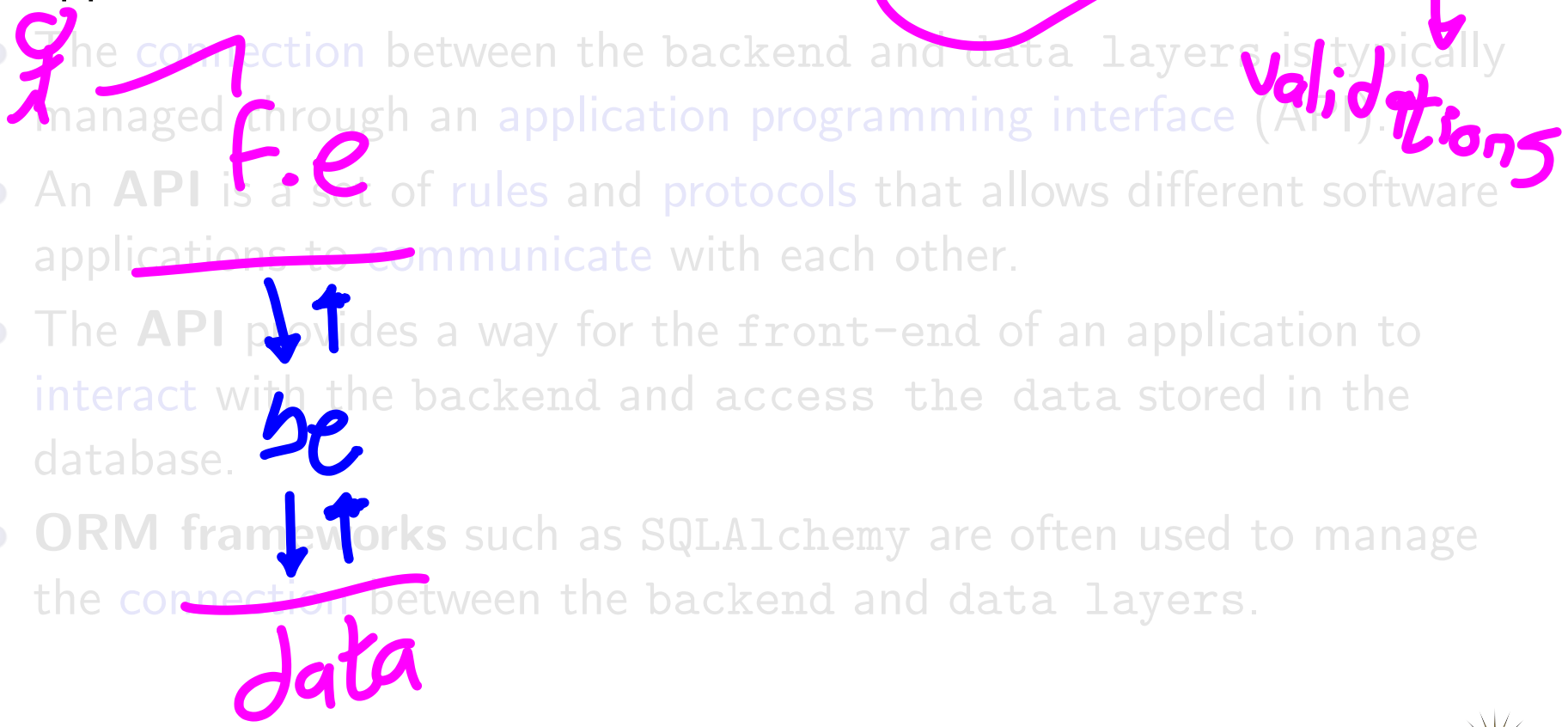
Connection with Data Layer

- 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.
- **ORM frameworks** such as SQLAlchemy are often used to manage the connection between the backend and data layers.



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Spring - Hibernate

Object-Relational Model

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FrontEnd Layer

- The front-end is the **client-side** of the application and everything that the user interacts with.
- 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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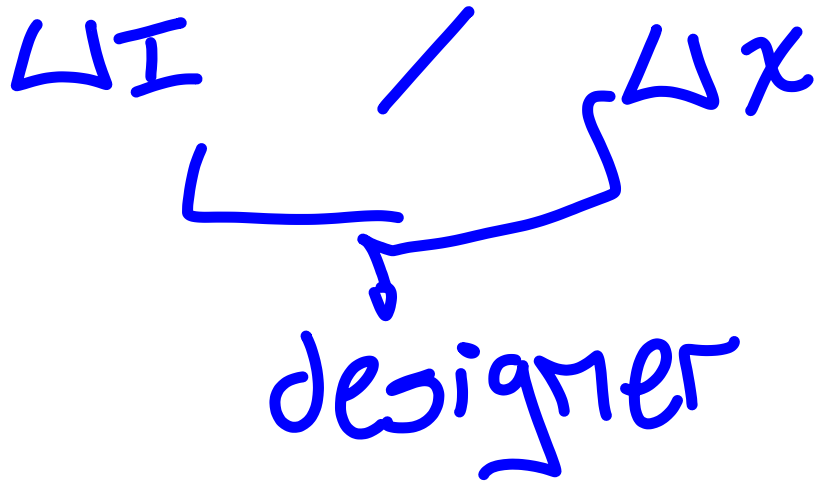

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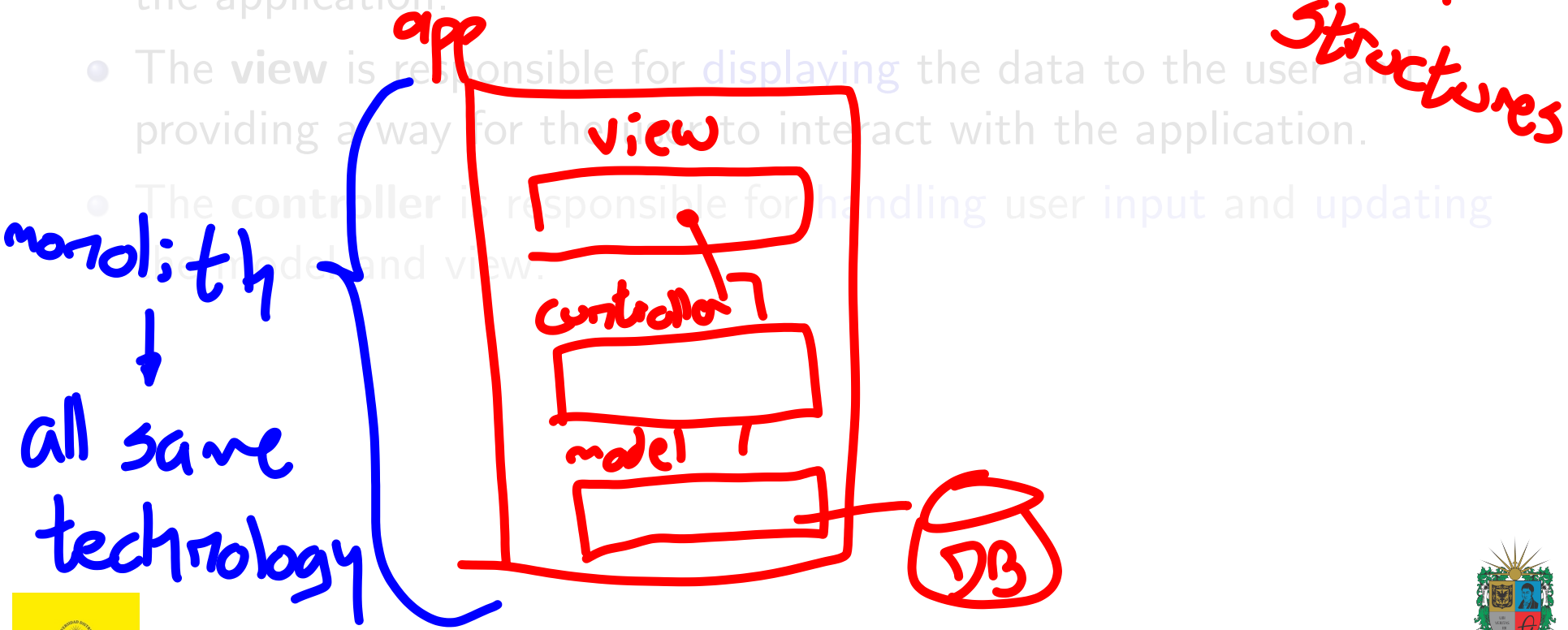
Model-View-Controller (MVC) Pattern

- 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.
- The **view** is responsible for displaying the data to the user and providing a way for them to interact with the application.
- The **controller** is responsible for handling user input and updating the model and view.



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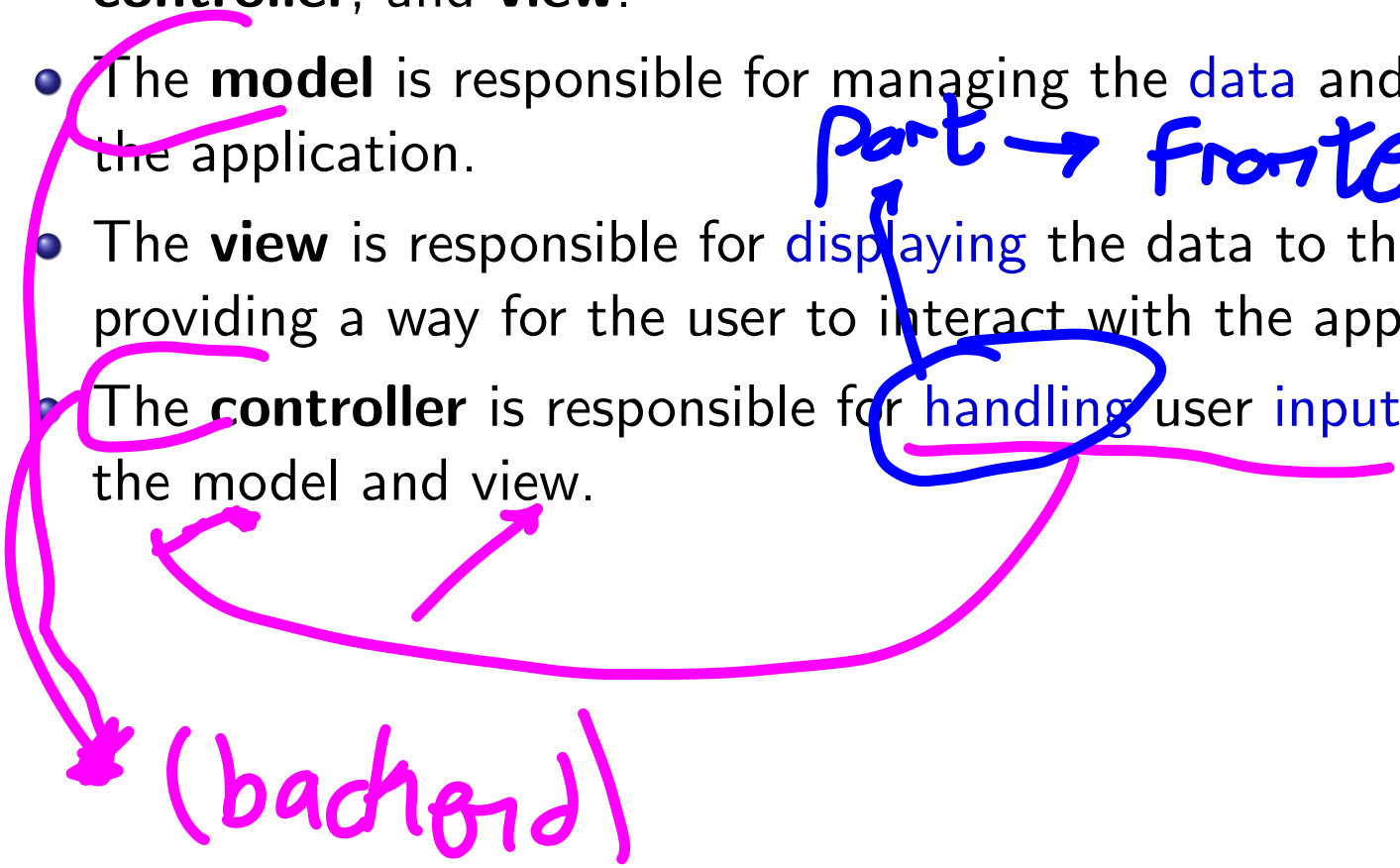

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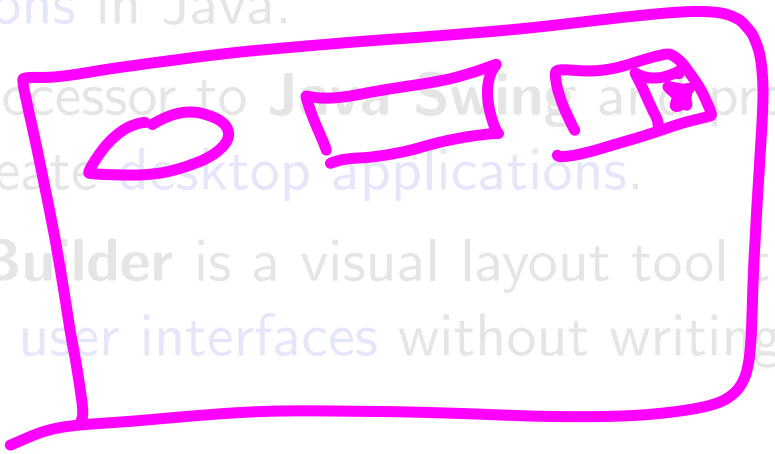
Java Swing & Java FX

- **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.
- **JavaFX Scene Builder** is a visual layout tool that allows developers to create JavaFX user interfaces without writing any code.



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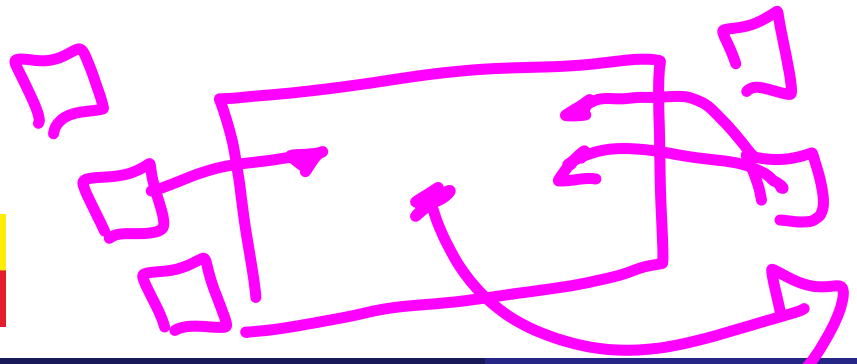

Java FX Components

- **JavaFX Components** are the building blocks of a JavaFX user interface.
- **JavaFX Components** are organized into a scene graph, which is a hierarchical structure that represents the layout and organization of the user interface.
- **JavaFX Components** can be customized and styled using CSS.
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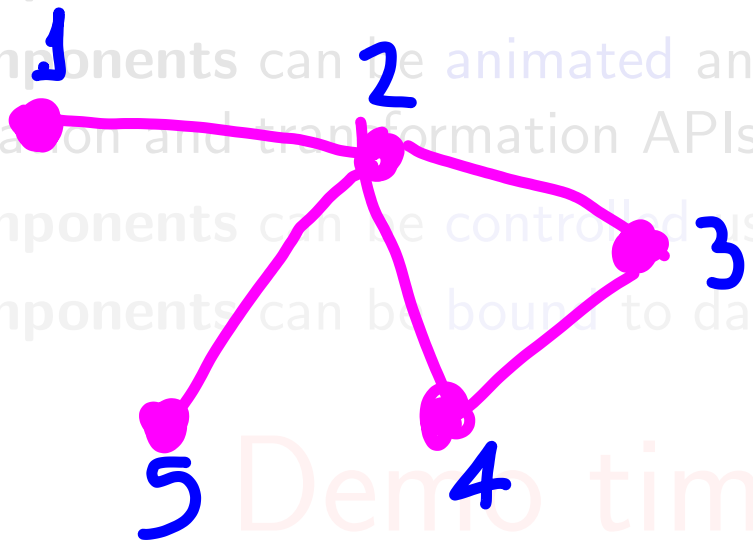

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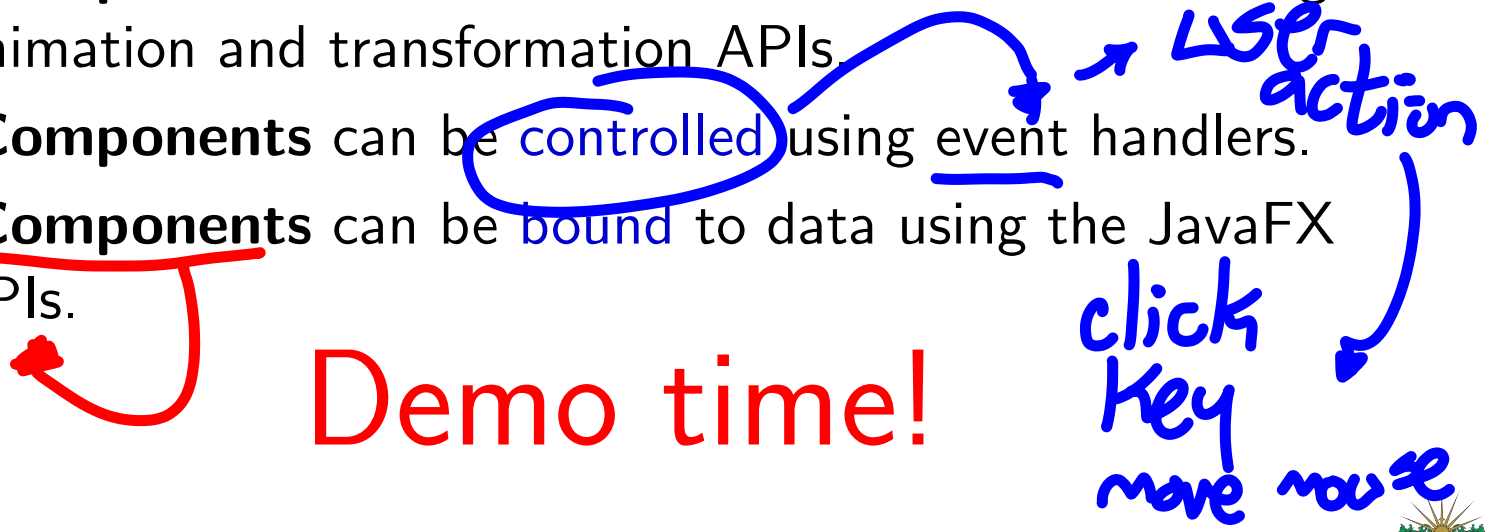

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Memory Management

- **Garbage Collection**: It is the process of automatically *reclaiming memory* that is no longer in use.
- **Memory Profiling**: It is the process of analyzing the memory usage of a program.
- **Memory Leaks**: A common problem in programming where memory is allocated but never deallocated.
- **Memory Management Tools**: There are several tools available for memory management in Java.

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Threads, Processes, and Concurrency

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Thanks!

Questions?

Repo: *https://github.com/EngAndres/ud-public/tree/main/courses/object-oriented-programming*

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