Spring Boot eCommerce Masterclass

Faisal Memon (EmbarkX)

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How Does the Web Work?

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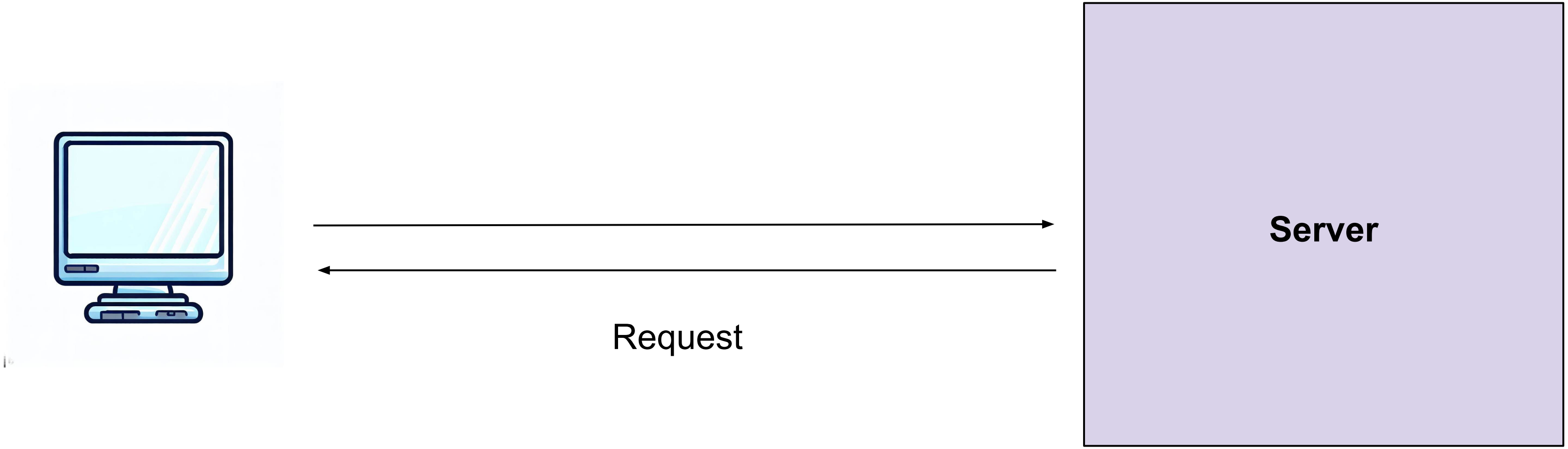
Internet	Web
Internet is a global network of computers connected	World Wide Web is a way of accessing information over the medium of the Internet

How Web Works



Server

Request

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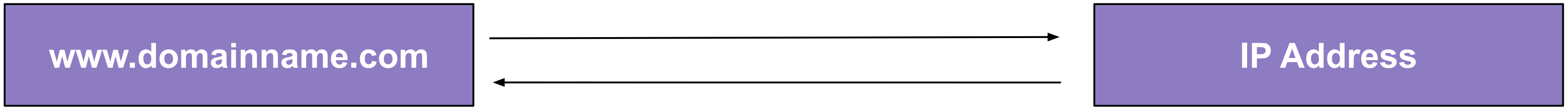
How Web Works



Thank you

What is Client & Server?

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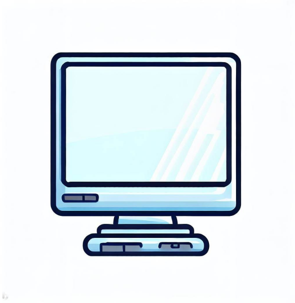
What is a Client?

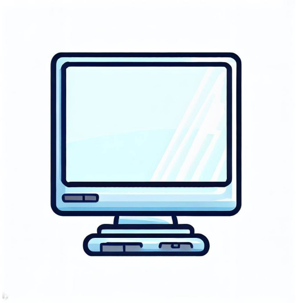


→ A device or application that requests services or resources from a server

→ A client is typically a web browser that users interact with to access web pages

→ A client can also be other types of software like an email client or a mobile app

Characteristics of a Client



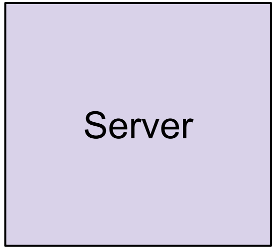
Client

→ *User Interface*

→ *Requests Services*

→ *Receives Data*

What is a Server?



Server

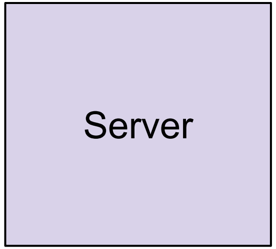
→ *A device or application that provides services or resources to clients*

→ *A Server is designed to handle requests from multiple clients*

→ *A Server hosts websites and respond to requests*

Characteristics of a Server

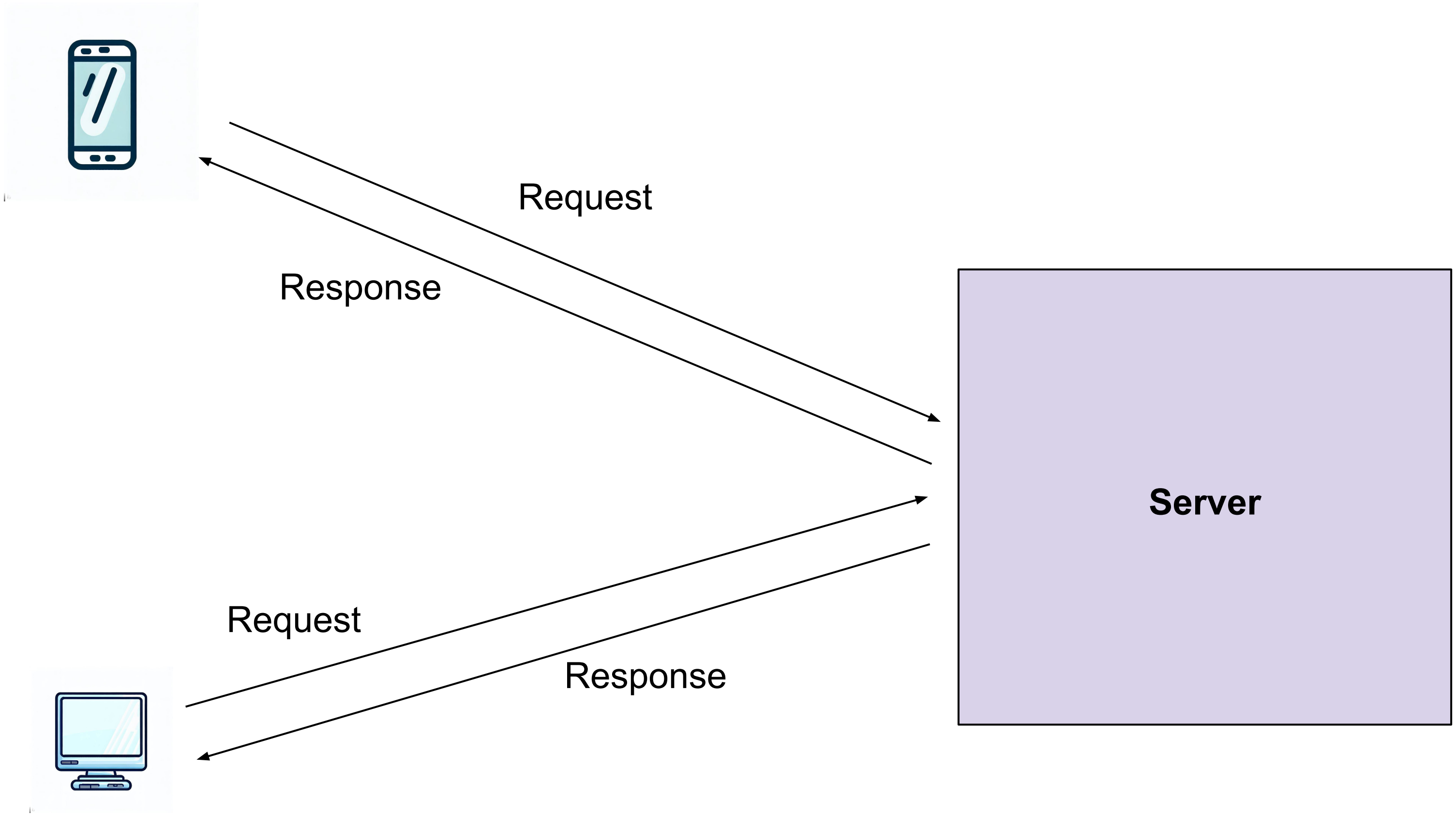
→ *Always On*



→ *Handles Multiple Requests*

→ *Sends Data*

How do they interact?



Request

Response

Server

Request

Response

Examples

→ *Web Browsing*

→ *Email*

Thank you

What Are APIs

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API stands for **Application Programming Interface**

Imagine you are at a **Restaurant**

Restaurant

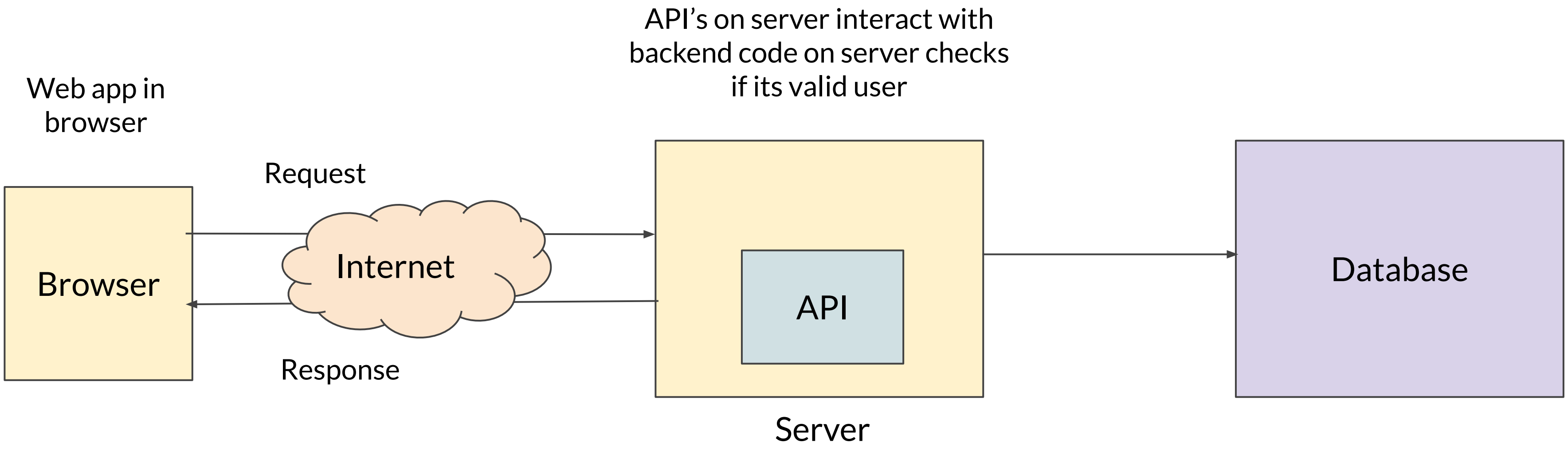
Customer → Application

Kitchen → Another System Service

Menu → API Specifications

Waiter → API

Food → Response



API's on server interact with backend code on server checks if its valid user

Web app in browser

Request

Browser

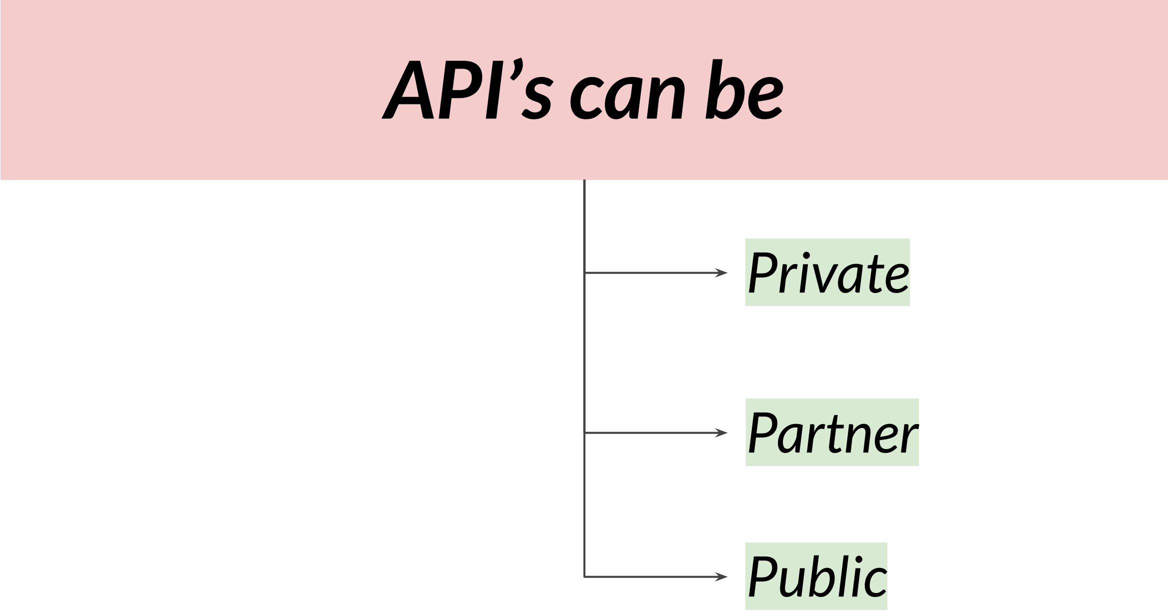
Internet

Response

API

Server

Database



API’s can be

- Private
- Partner
- Public

The Need

→ *Reduces manual effort*

→ *Automates everything*

Thank you

Types of API Requests

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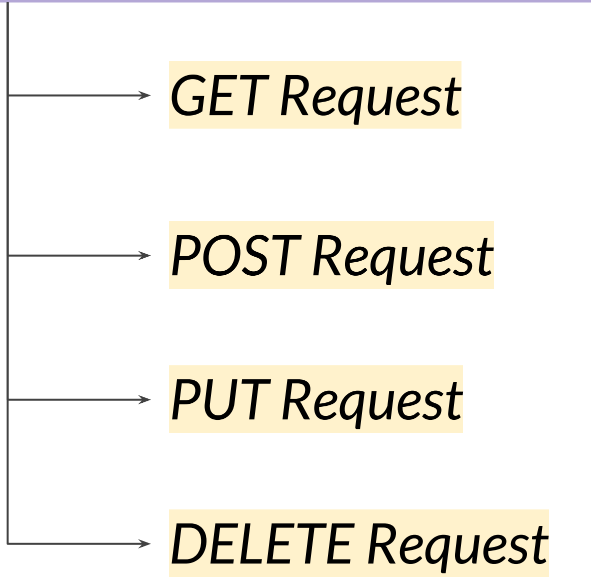
Types of API requests



GET Request

POST Request

PUT Request

DELETE Request

GET Request

→ *Retrieve or GET resources from server*

→ *Used only to read data*

POST Request

→ *Create resources from server*

on success: 201

PUT Request

→ *Update existing resources on Server*

on success : 200

DELETE Request

→ *Used to DELETE resources from Server*

Thank you

What is REST API and its Architecture?

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REST API, stands for **Representational State Transfer** Application Programming Interface

REST is **stateless**

Principles of REST API

→ Client-Server Architecture

→ Stateless

server must be told everything it needs to know in every r

→ Can be Cached

→ Opaque in terms of Layers

→ Uniform Interface

Web services built following the REST architectural style are known as **RESTful web services**

Common Methods

→ GET

→ POST

→ PUT

→ DELETE

Benefits

→ *Simplicity*

→ *Scalability*

no state hence scale

→ *Flexibility*

flexible or json

→ *Visibility*

responses using html, understood by everyone

Thank you

http vs https

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http stands for

HyperText Transfer Protocol

https stands for

HyperText Transfer Protocol Secure

HTTPS is essentially HTTP with security

Http and Https

→ *Both HTTP and HTTPS are protocols designed for transferring hypertext across the World Wide Web.*

→ *They operate based on a client-server model, where a client (web browser) sends a request to the server hosting a website*

→ *Both protocols use similar methods to perform actions on the web server as well as status codes*

→ *HTTP and HTTPS are both stateless protocols, meaning they do not inherently remember anything about the previous web session*

→ *Both HTTP and HTTPS can transfer data in various formats including HTML, XML, JSON, and plain text*

Thank You

Status Codes in API

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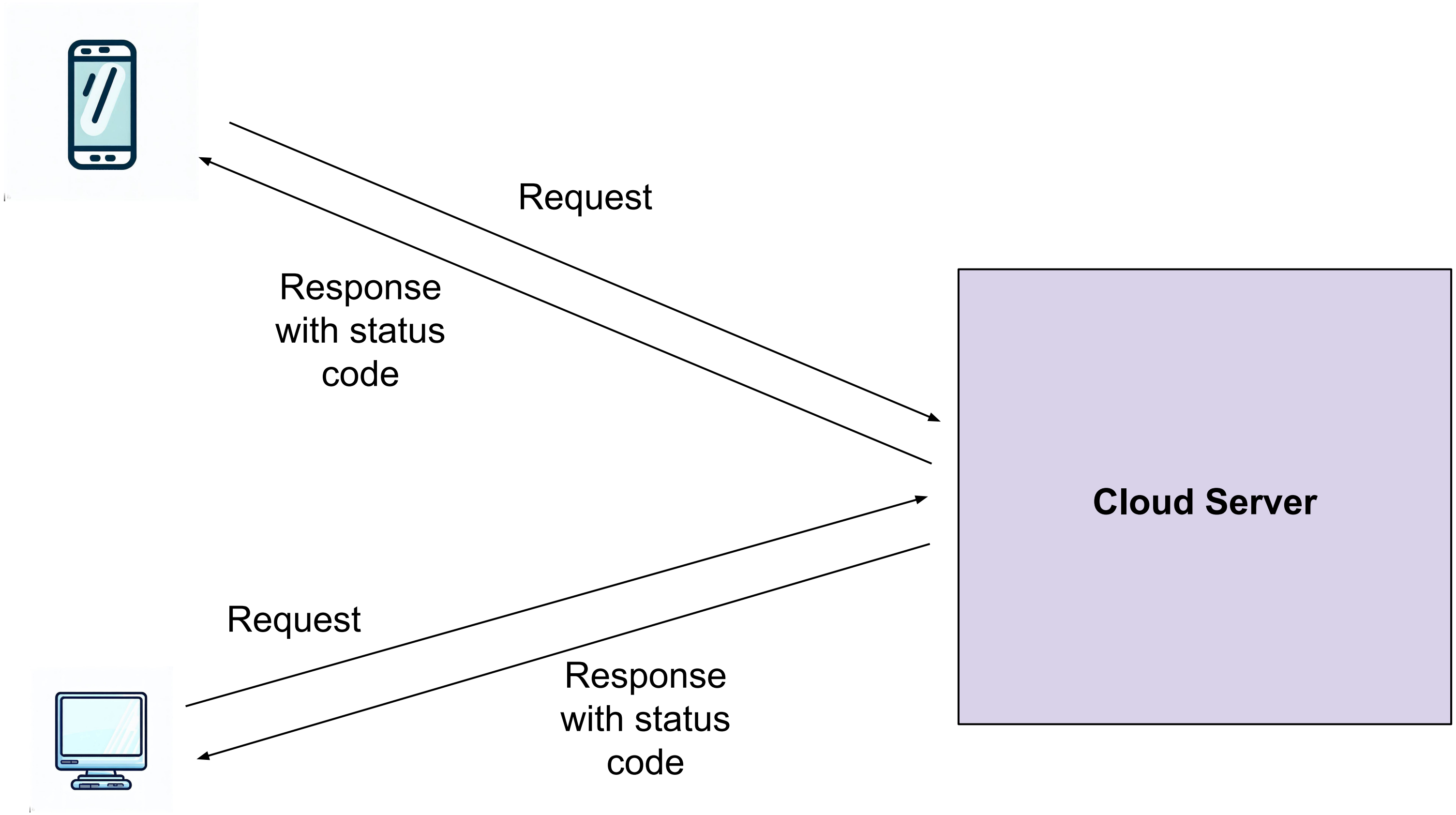
Need for Status Codes



Request

Response with status code

Cloud Server

Request

Response with status code

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Classification of Status Codes

→ *1xx (Informational)*

request is received -in proc

→ *2xx (Successful)*

→ *3xx (Redirection)*

→ *4xx (Client Error)*

→ *5xx (Server Error)*

Commonly used Status Codes

→ 200 OK

→ 201 Created

→ 204 No Content

→ 301 Moved Permanently

→ 400 Bad Request

Commonly used Status Codes

→ *401 Unauthorized*

→ *403 Forbidden*

→ *404 Not Found*

→ *500 Internal Server Error*

401The user is attempting to access a resource but doesn't have the required auth

Thank you

What is Resource, URI and Sub-Resource

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Resource

→ *A Resource is any piece of information that can be named or identified on the web.*

→ *Can represent any type of object, data, or service that can be accessed by clients*

→ *A resource is not just limited to documents or files; it can be anything from a text file, an image, a collection of other resources, a non-virtual object like a person, and even abstract concepts like a service*

→ *In a social media application, resources could include a user profile, a photo, a list of friends, or even a specific post or comment.*

URI (Uniform Resource Identifier)

→ A URI is a string of characters used to identify a resource on the internet either by location, name, or both

→ It provides a mechanism for accessing the representation of a resource over the network, typically through specific protocols such as HTTP or HTTPS.

→ URIs are a broad category that includes both URLs (Uniform Resource Locators) and URNs (Uniform Resource Names).

Sub-Resource

→ *A Sub-Resource is a resource that is hierarchically under another resource.*

→ *It's a part of a larger resource and can be accessed by extending the URI of the parent resource.*

→ *Sub-resources are often used in RESTful APIs to maintain a logical hierarchy of data and to facilitate easy access to related resources.*

→ *Example: In a blogging platform, you might have a users resource identified by a URI (/users). A specific user could be a resource accessible at /users/{userId}.*

→ *If each user can have blog posts, a post would be a sub-resource of that user, identified by something like /users/{userId}/posts/{postId}.*

Importance in Web Development

→ Organization

→ Accessibility

→ Scalability

Thank you

Spring Boot eCommerce Masterclass

What is a Web Framework?

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Why do you need Web Framework?

→ *Websites have a lot in common*

→ *Security, Databases, URLs, Authentication….more*

→ *Should you do this everytime from scratch?*

Think of building a House

→ *You would need Blueprint and Tools*

→ *That’s how web development works*

→ *Developers had to build from scratch*

What if…

→ *You could have prefabricated components?*

→ *Could you assemble faster?*

→ *Could you reduce errors?*

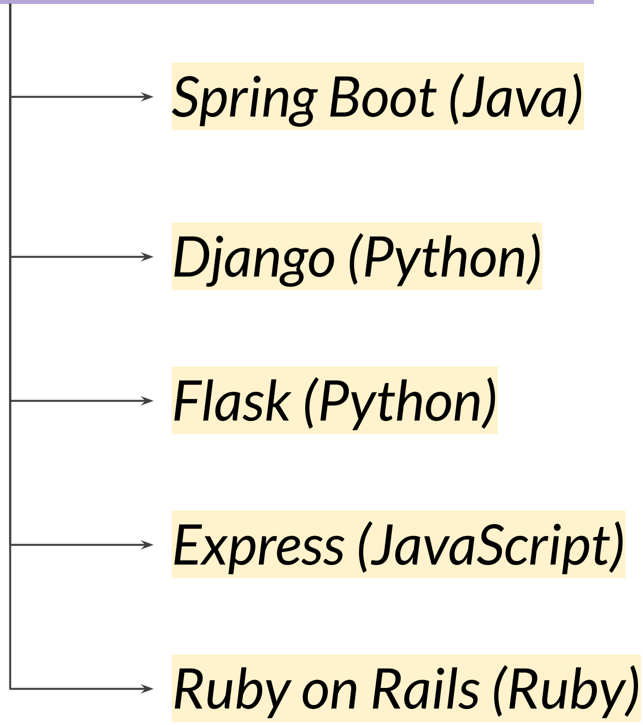
→ *Would that make you fast?*

This is what a **Web Framework** does!

What is Web Framework

Web Framework is nothing but collection of tools and modules that is needed to do standard tasks across every web application.

Popular Web Frameworks



- Spring Boot (Java)
- Django (Python)
- Flask (Python)
- Express (JavaScript)
- Ruby on Rails (Ruby)

Thank you

Introduction to Spring Framework

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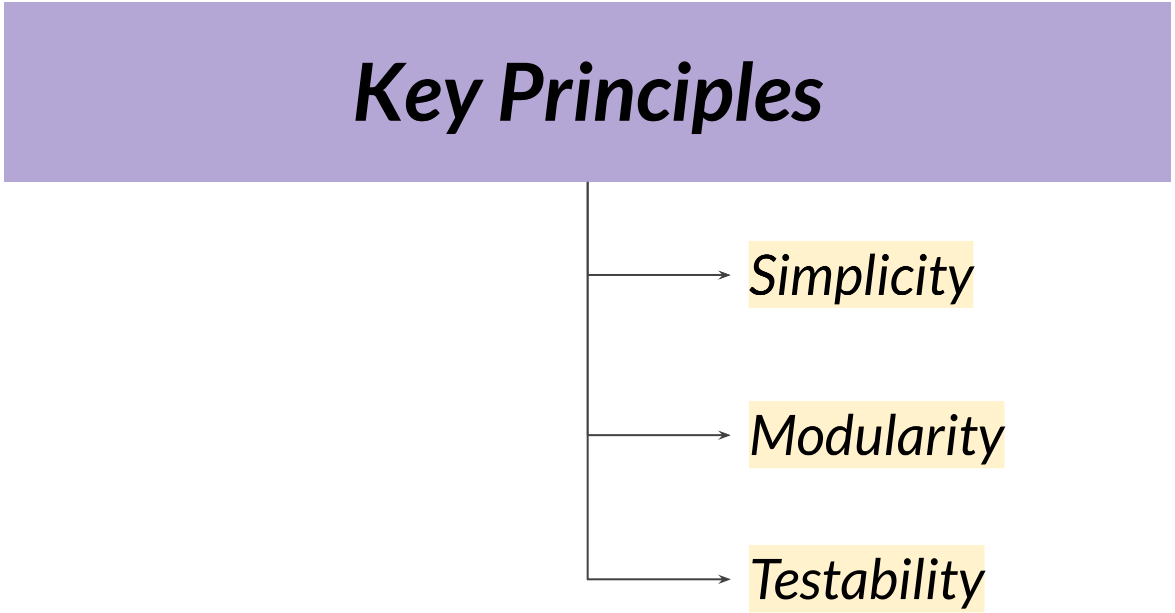
History

→ *Initially developed by Rod Johnson in 2002*

→ *First version released in March 2004*

→ *Since then, major developments and versions released*

Spring simplifies enterprise application development



Key Principles

- Simplicity
- Modularity
- Testability

Key Components of Spring

→ Core Spring Framework

→ Spring Boot

→ Spring Data

→ Spring Security

→ Spring Cloud

Use Cases

→ *Enterprise Applications*

→ *Microservices Architecture*

→ *Web Applications*

Thank you

Tight Coupling and Loose Coupling

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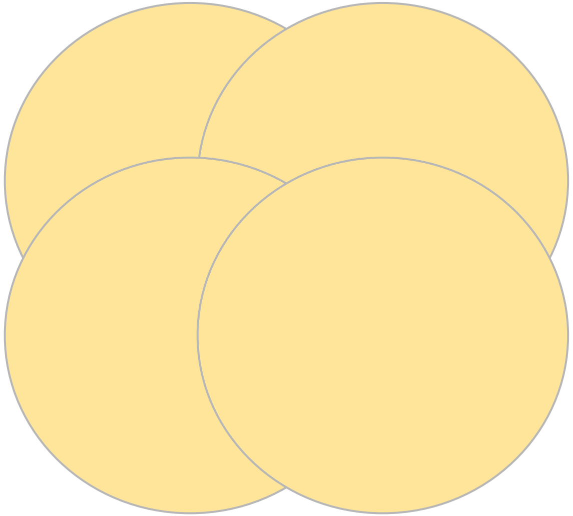
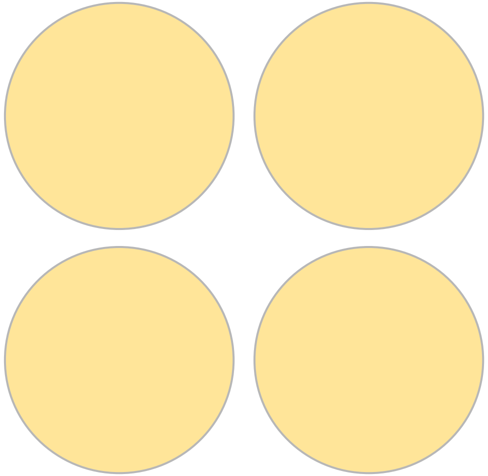
Coupling refers to how closely connected different components or systems are

Tight Coupling



Tight coupling describes a scenario where software components are **highly dependent** on each other

Loose Coupling



Loose coupling describes a scenario where software components are **less dependent** on each other

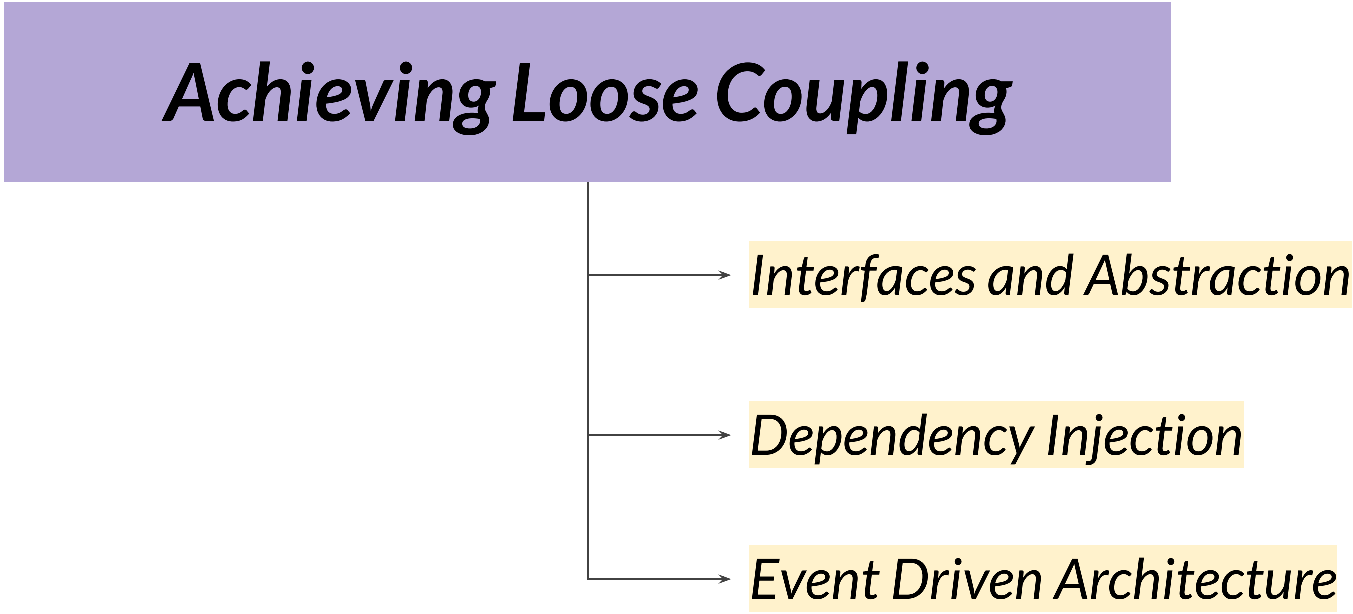
Importance in Software Design

→ *Flexibility and Maintainability*

→ *Scalability*

→ *Testing*

Achieving Loose Coupling



Interfaces and Abstraction

Dependency Injection

Event Driven Architecture

Thank you

Core Concepts of Spring

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Loose Coupling

Loose Coupling is a design principle that aims to reduce the dependencies between components within a system

with minimum knowledge about other modules and working reg

Inversion of Control (IoC)

Inversion of Control is a design principle where the control of object creation and lifecycle management is transferred from the application code to an external container or framework

basically in loose coupling, see that we are , in the main, creating object of each database and then passing it. we want it to be taken care by spring far

Dependency Injection [DI]

Dependency injection is a design pattern commonly used in object-oriented programming, where the dependencies of a class are provided externally rather than being created within the class itself

in loose coupling whenever we want to call user manager, we want user to pass object. this is di. we want di to be done

Beans

Objects that are managed by frameworks are known as Beans

Thank you

Spring Container and Configuration

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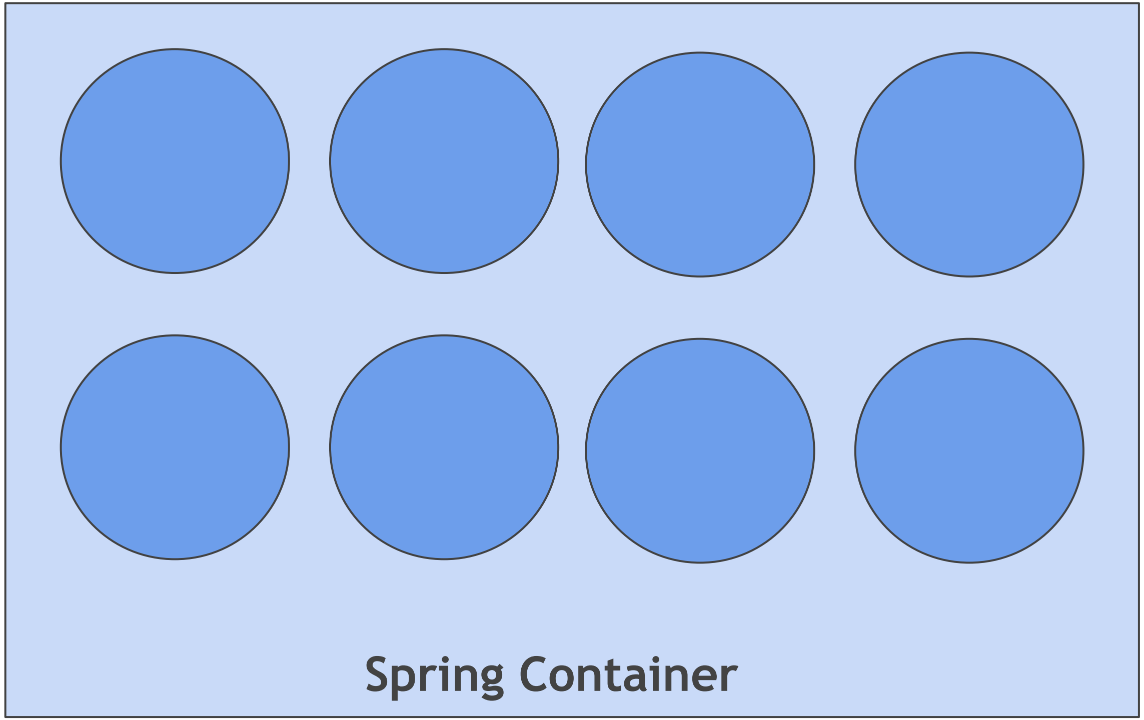
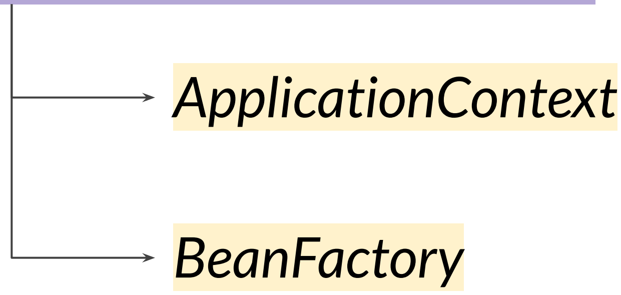


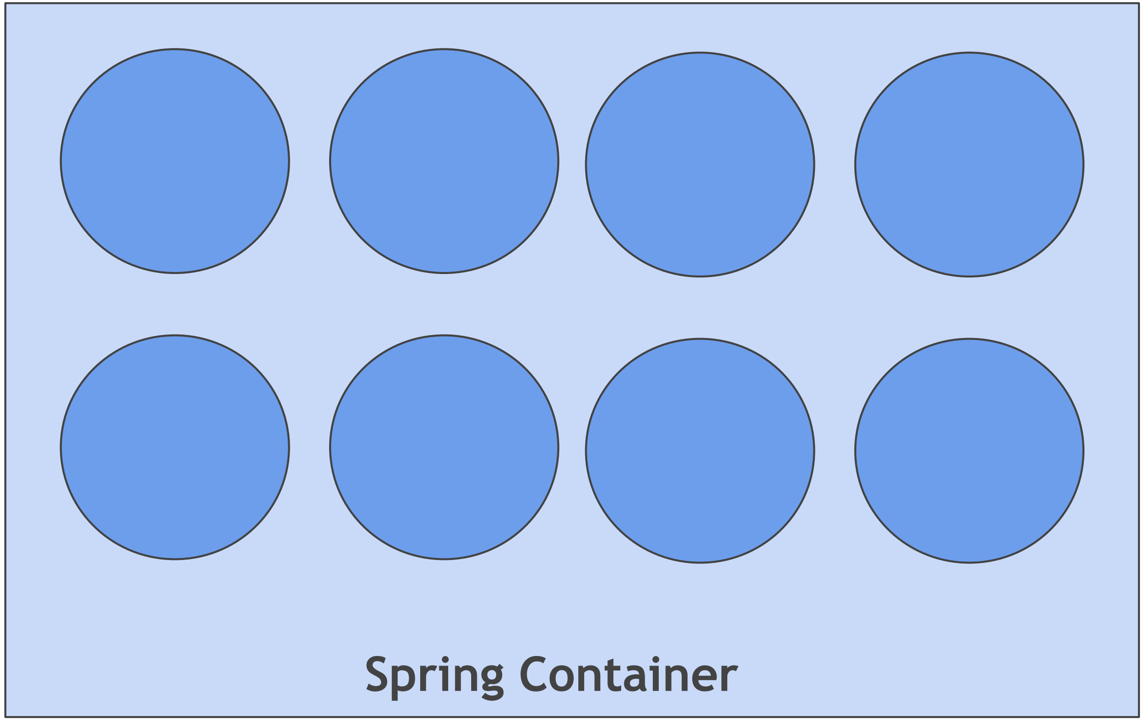
Spring Container

Types of Spring Containers

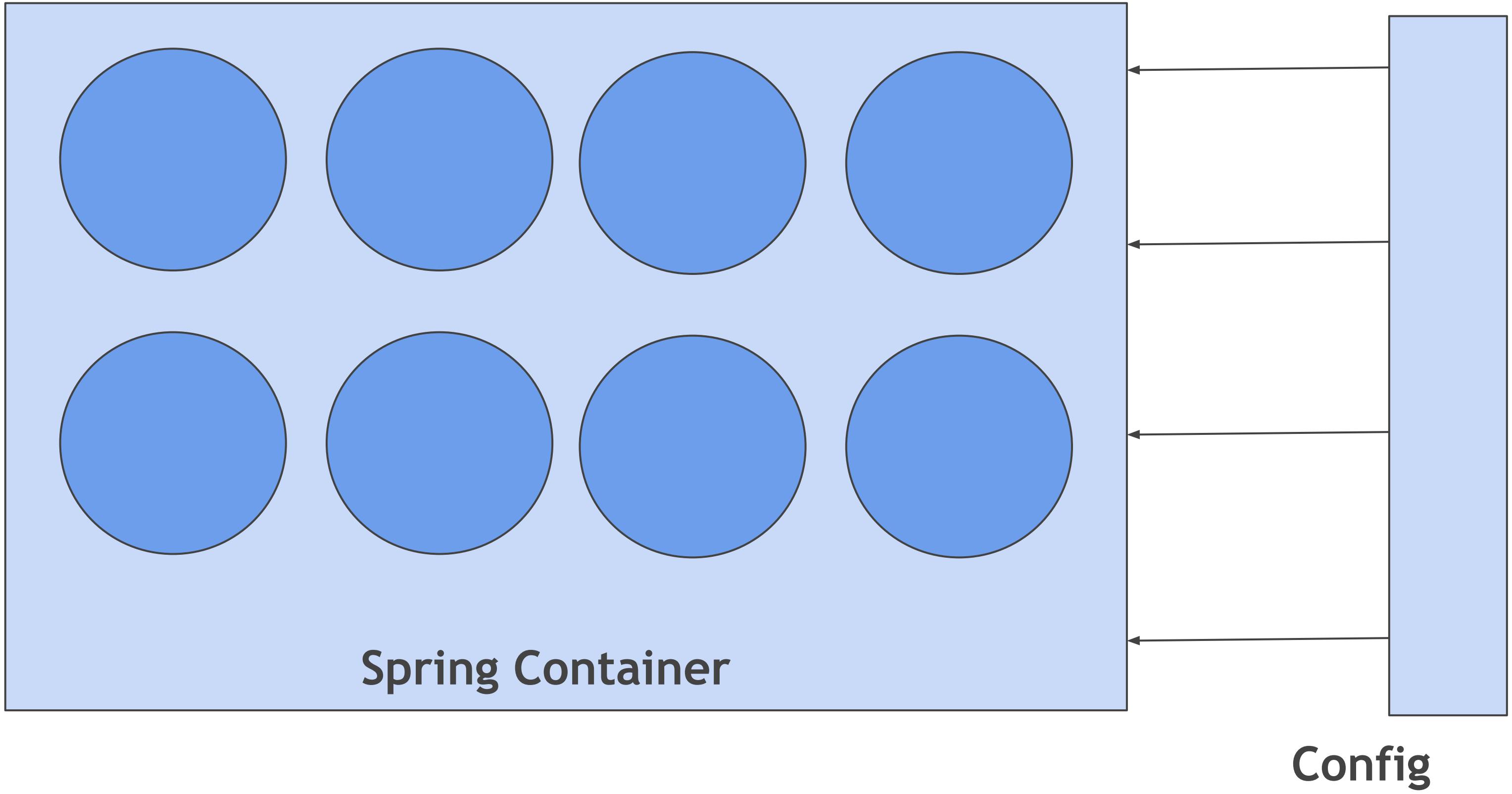


ApplicationContext

BeanFactory



Spring Container


Spring Container
Config

Configuration contains bean definition

Thank you

Lifecycle of Bean

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Beans

Objects that are managed by frameworks are known as Beans

Beans

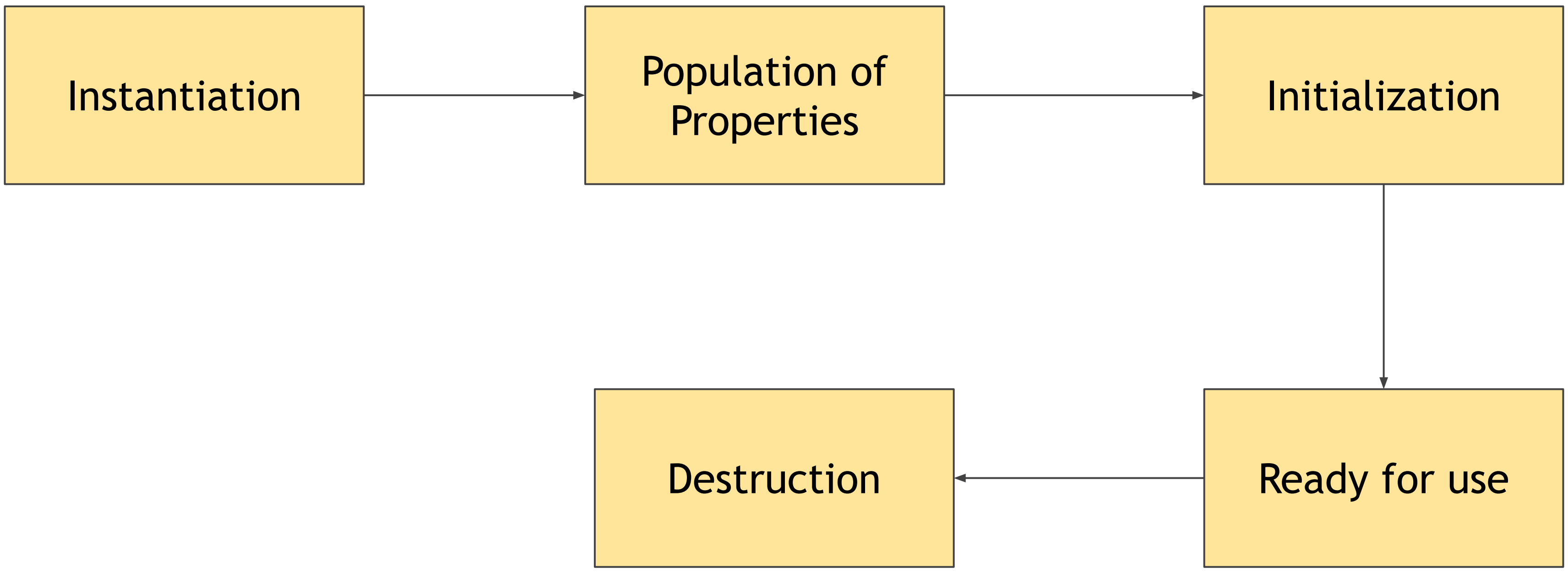
Bean Definition

- *A bean definition includes configuration metadata that the container needs to know to create and manage the bean*

Bean Configuration

- *Bean definitions can be provided in various ways, including XML configuration files, annotations, and Java-based configuration.*
- *Beans are configured using XML files, where each bean is defined within <bean> tags with attributes specifying class, properties, and dependencies.*
- *Beans can be configured using annotations like @Component, @Service, @Repository, etc., which are scanned by Spring and managed as beans.*

Lifecycle of Beans



Dependency Resolution

→ *Dependency Injection*

→ *Autowiring*

Thank you

Dependency Injection (DI)

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Dependency Injection (DI) is a design pattern used in software development to achieve loose coupling between classes by removing the direct dependency instantiation from the dependent class itself

Types

→ *Constructor Injection*

→ *Setter Injection*

Thank you

Constructor Injection

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Constructor Injection

→ Dependencies are provided to the dependent class through its constructor

→ Dependencies are passed as arguments to the constructor when the dependent class is instantiated

→ Constructor injection ensures that the dependencies are available when the object is created

Thank you

Setter Injection

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Setter Injection

→ Dependencies are provided to the dependent class through setter methods

→ Dependent class exposes setter methods for each dependency that needs to be injected

→ Setter injection allows for flexibility as dependencies can be changed or updated after the object is instantiated

Thank you

Introduction to Annotations

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Annotations in Java provide a way to add metadata to your code

first of all we need two classes for autowiring to work, like class specification and class. now in ioc, we use ref vkeyword in xml file to tell which reference to p

@Override

Commonly Used Spring Annotations

→ @Component

→ @Autowired

→ @Qualifier

→ @Value

→ @Repository

Commonly Used Spring Annotations

→ *@Service*

→ *@Controller*

→ *@RequestMapping*

→ *@SpringBootApplication*

Thank you

Understanding Components and ComponentScan

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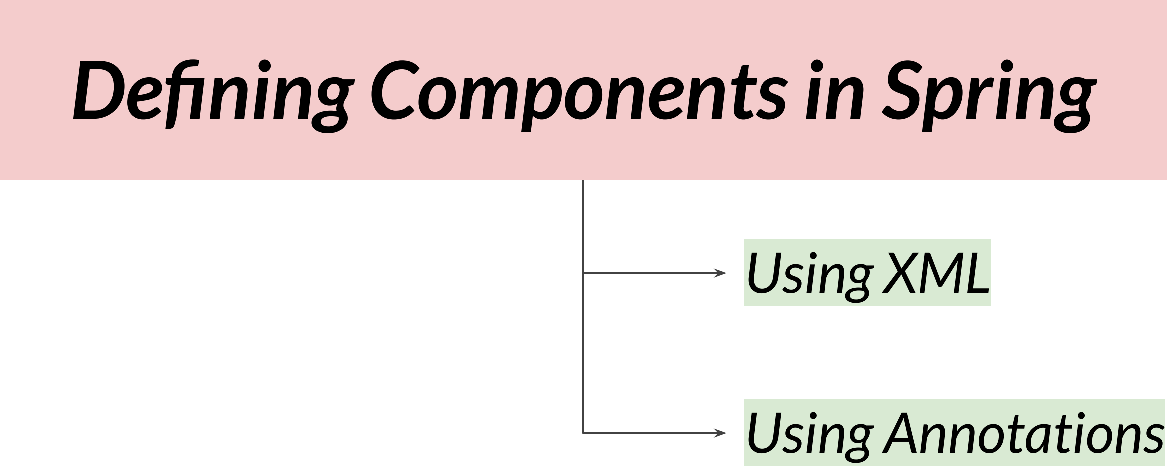
Component refers to a Java class that is managed by the Spring IoC container



Defining Components in Spring

- Using XML
- Using Annotations

Using XML

```
<bean id="myComponent" class="com.example.MyComponent" />
```

Using Annotations

```
import org.springframework.stereotype.Component;

@Component // Marks the class as a Spring component
public class MyComponent {
    // Class implementation
}
```

Component scanning is a feature helps to automatically detect and register beans from predefined package paths.

component is a bean that auto registers

Using XML

```
<!-- Enable component scanning -->
<context:component-scan base-package="car.example.componentscan"/>
```

Thank you

Progress and Review So Far

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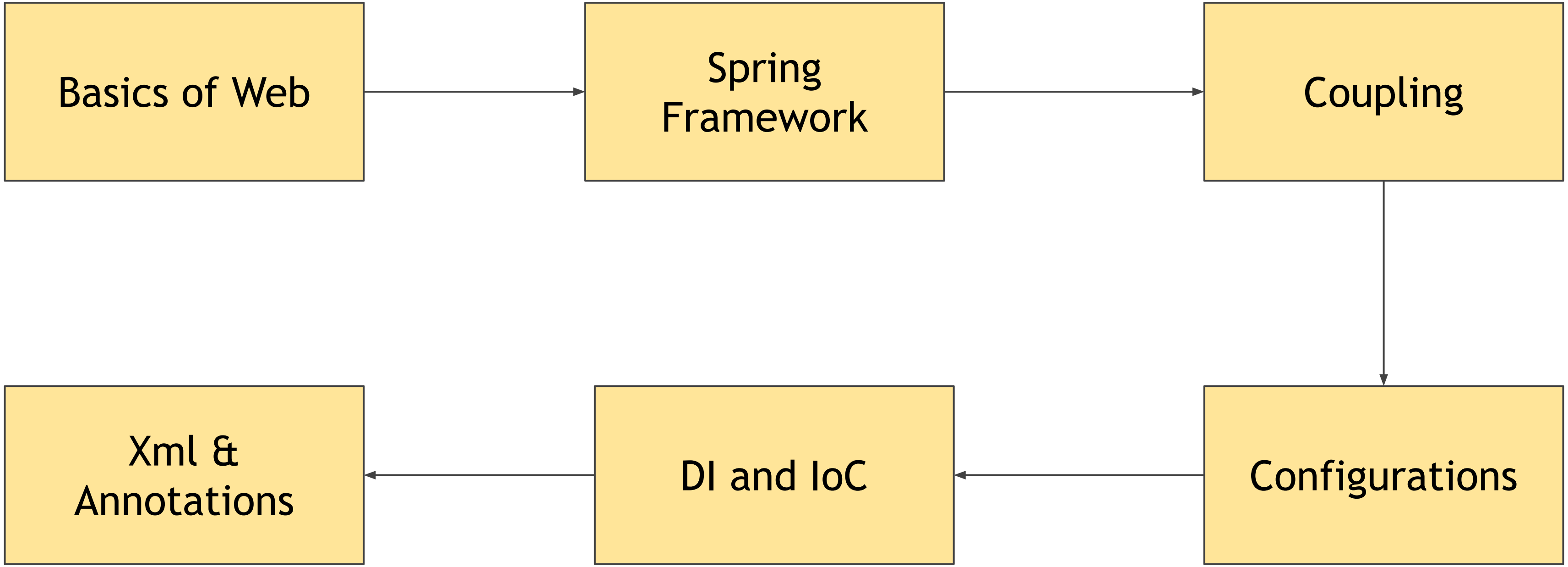
Review



Basics of Web

Spring Framework

Coupling

Configurations

DI and IoC

Xml & Annotations

Review

→ Explicit Bean Configuration

→ No Embedded Server

→ Component Scanning

→ Boilerplate code

Thank you

What is Spring Boot?

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What is Spring Boot?

Open-source, Java-based framework used to create stand-alone, production-grade Spring-based Applications

Spring	VS	Spring Boot
Lots of steps involved in setting up, configuration, writing boilerplate code, deployment of the app		Offers a set of pre-configured components or defaults, and eliminating the need for a lot of boilerplate code that was involved in setting up a Spring application

Spring boot =

Spring Framework

+

Prebuilt Configuration

+

Embedded Servers

Components of Spring Boot

→ *Spring Boot Starters*

→ *Auto Configuration*

→ *Spring Boot Actuator*

→ *Embedded Server*

→ *Spring Boot DevTools*

Advantages of Spring Boot

→ *Stand alone and Quick Start*

→ *Starter code*

→ *Less configuration*

→ *Reduced cost and application development time*

Why do developers love Spring Boot?

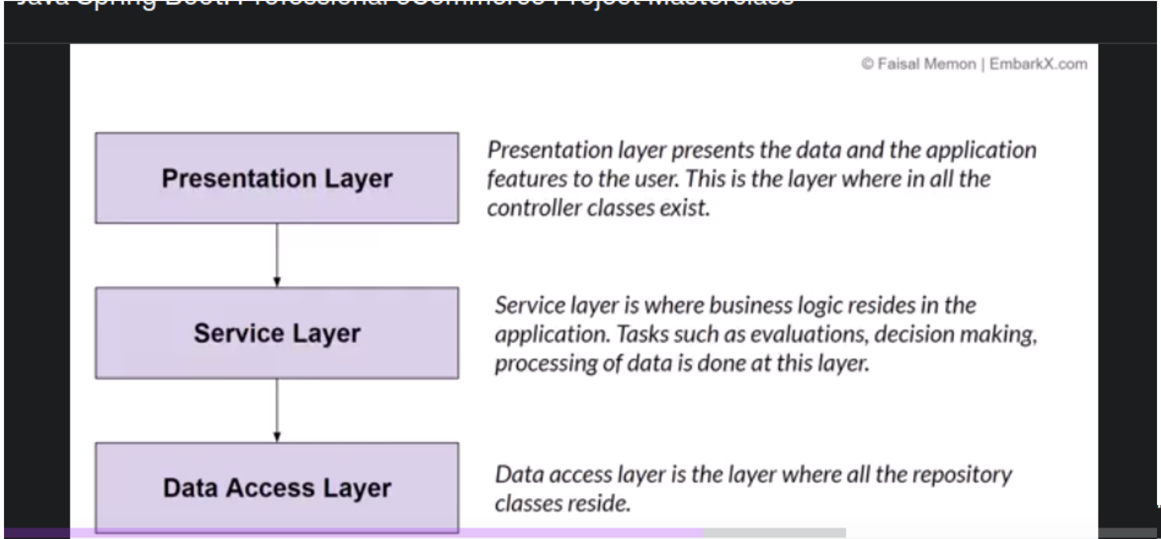
→ *Java based*

→ *Fast, easy*

→ *Comes with embedded server*

→ *Various plugins*

→ *Avoids boilerplate code and configurations*



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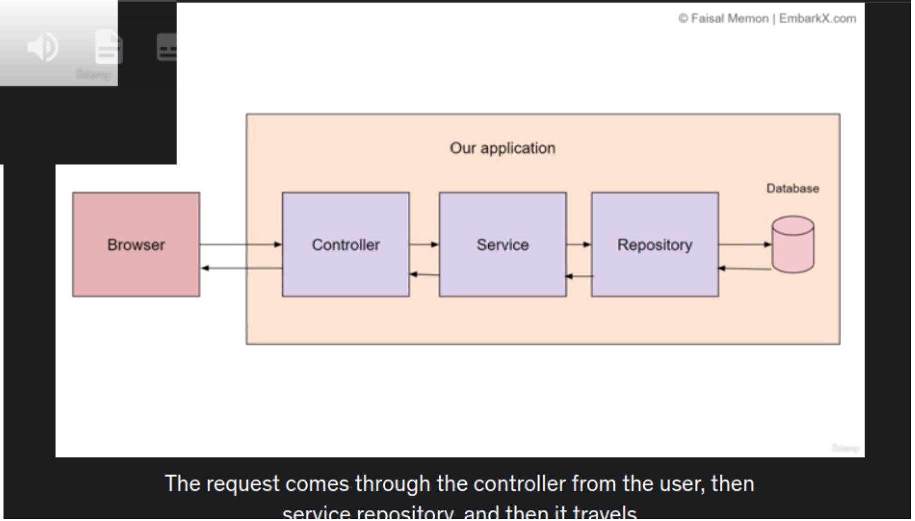
Presentation layer presents the data and the application features to the user. This is the layer where in all the controller classes exist.

Service layer is where business logic resides in the application. Tasks such as evaluations, decision making, processing of data is done at this layer.

Data access layer is the layer where all the repository classes reside.

2:25 / 4:12

A typical spring boot architecture looks like.



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The request comes through the controller from the user, then service repository, and then it travels

Thank you

Structuring Thoughts

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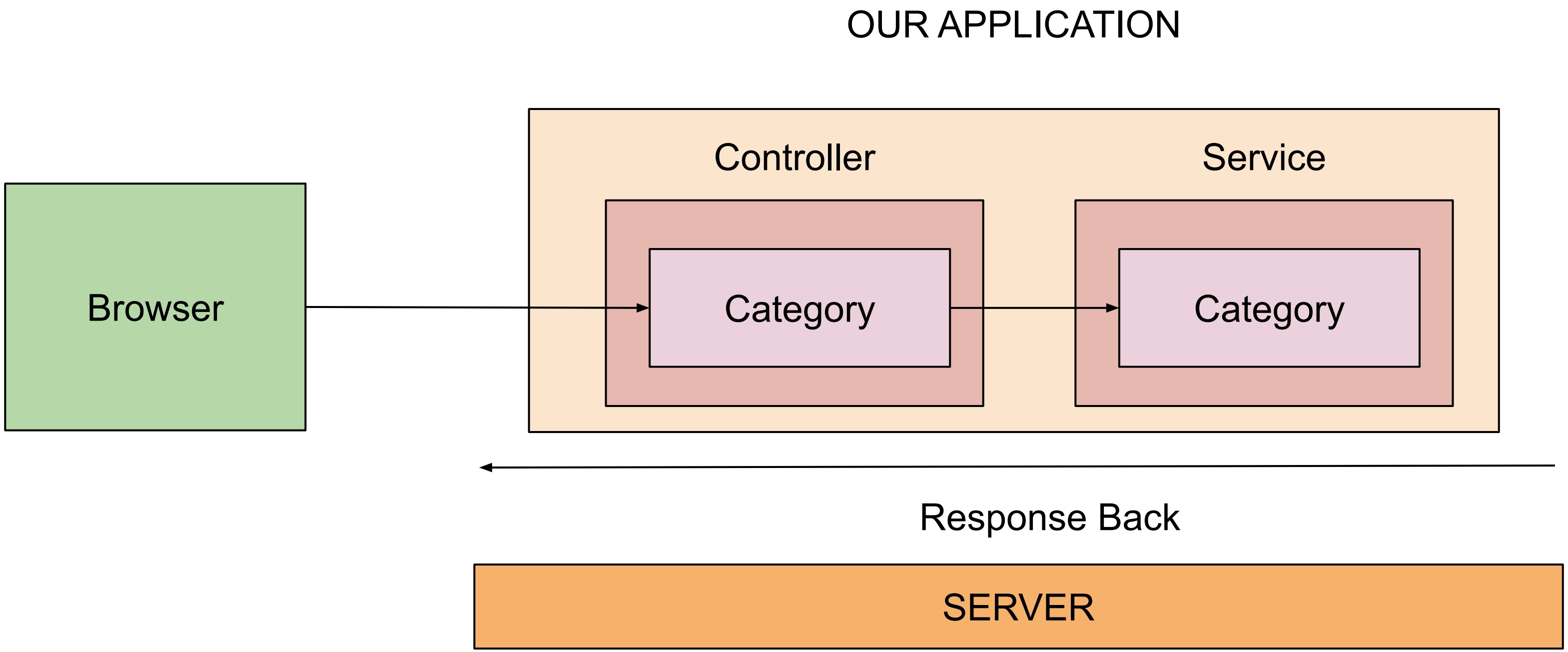


OUR APPLICATION

Browser

Controller

Category

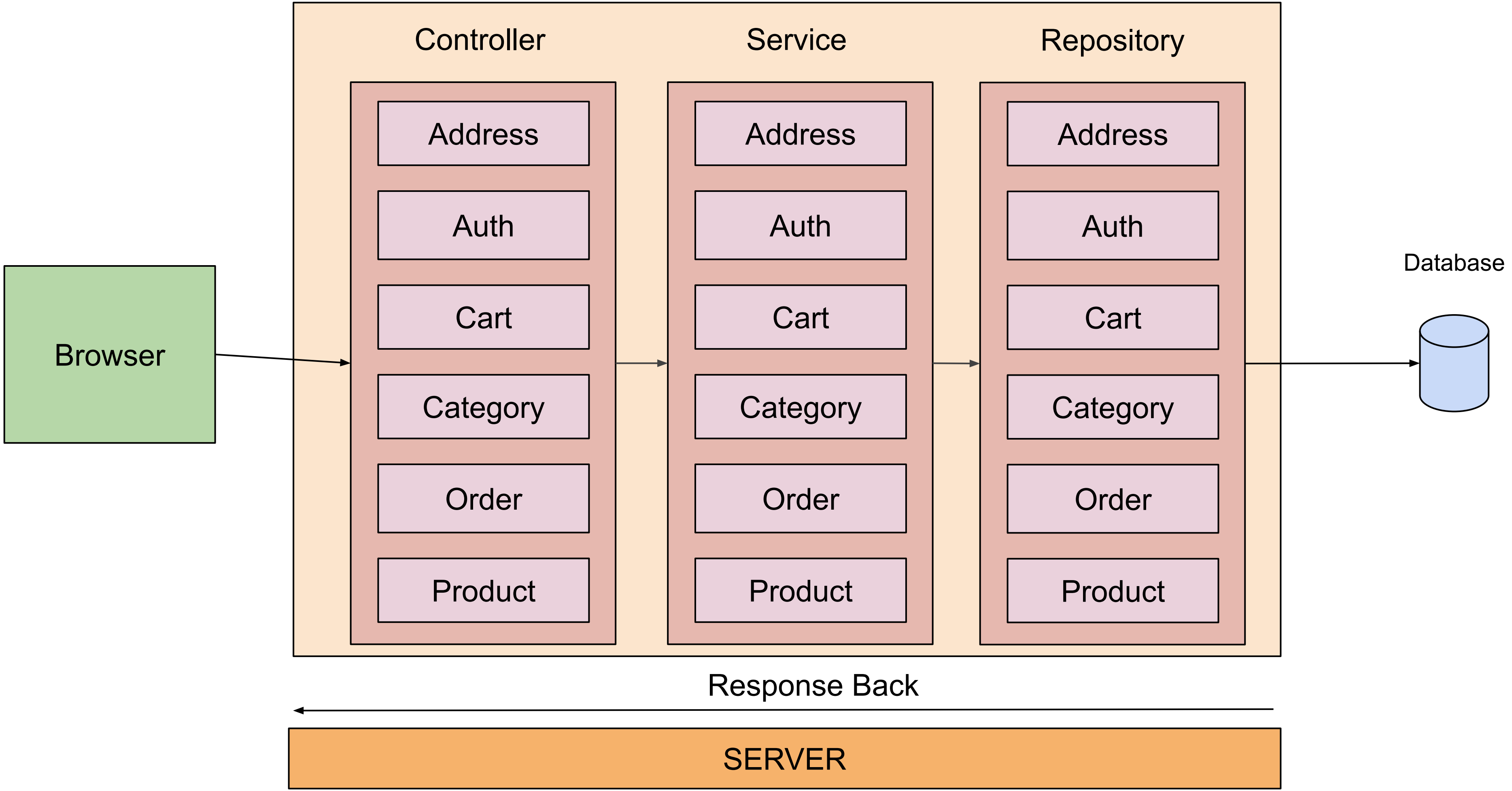
Service

Category

Response Back

SERVER

OUR APPLICATION



API Name	Endpoint	Method	Purpose	Request Body	Request Parameters	Response
Create Category	/api/admin/category	POST	Create a new category	Category	None	CategoryDTO
Get Categories	/api/public/categories	GET	Retrieve a list of categories	None	pageNumber, pageSize, sortBy, sortOrder	CategoryResponse
Update Category	/api/admin/categories/{categoryId}	PUT	Update an existing category	Category	categoryId	CategoryDTO
Delete Category	/api/admin/categories/{categoryId}	DELETE	Delete an existing category	None	categoryId	CategoryDTO

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Thank you

Understanding Data and Databases

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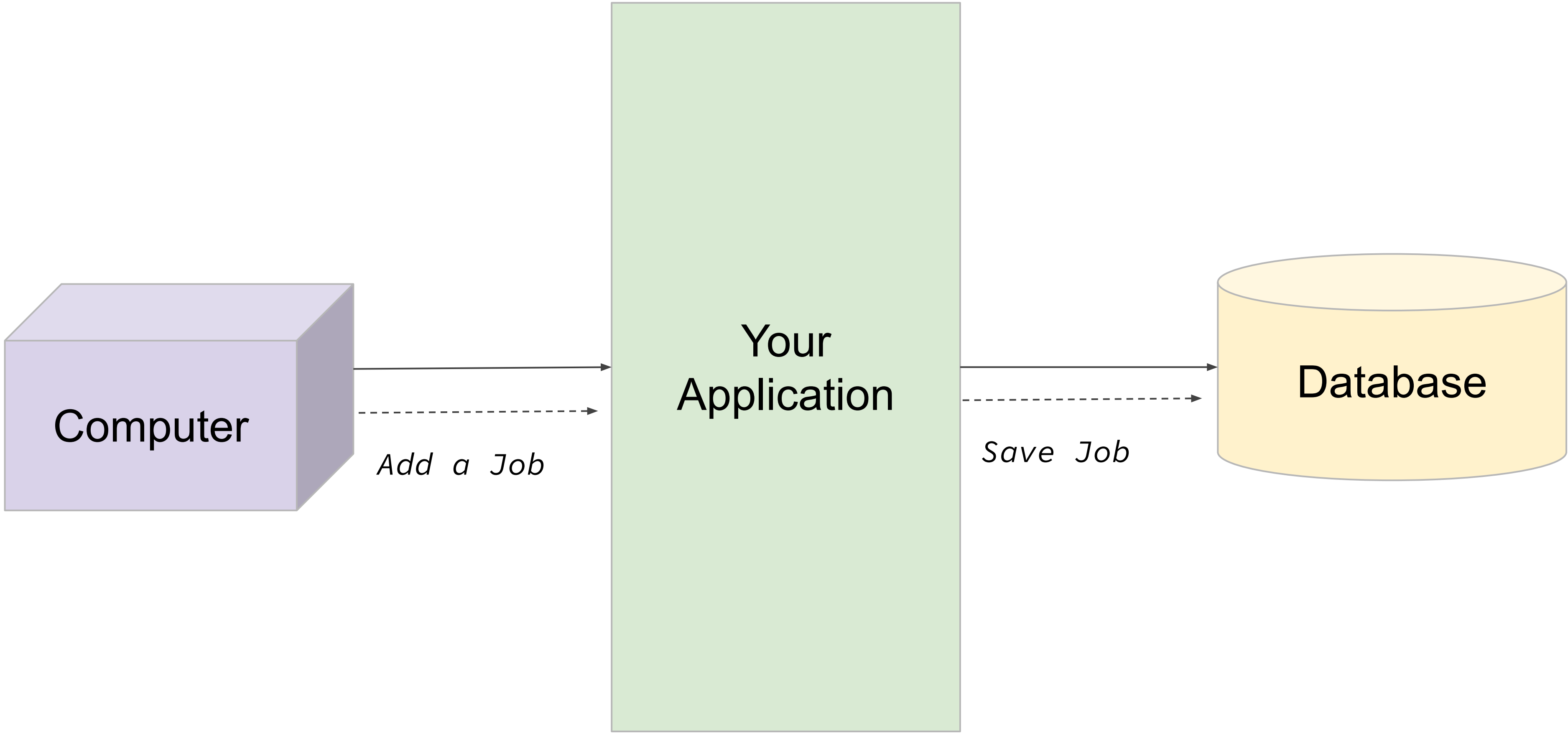
Computer
Add a Job
Your Application
Save Job
Database

What is a Database?

Database is a place where data related to your users and product is stored.

Databases Types

→ *Relational*

→ *Non-Relational*

Thank you

What is DBMS

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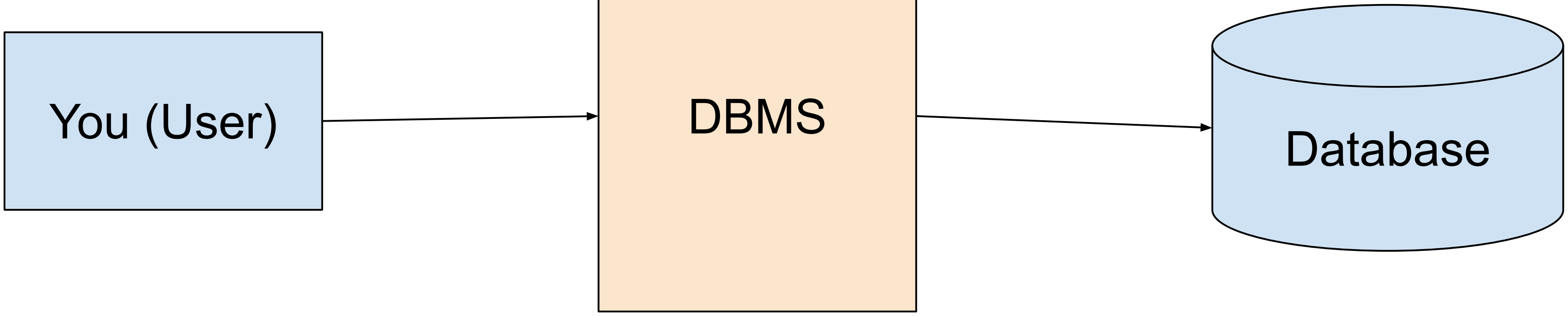


You (User)

DBMS

Database

Examples of DBMS

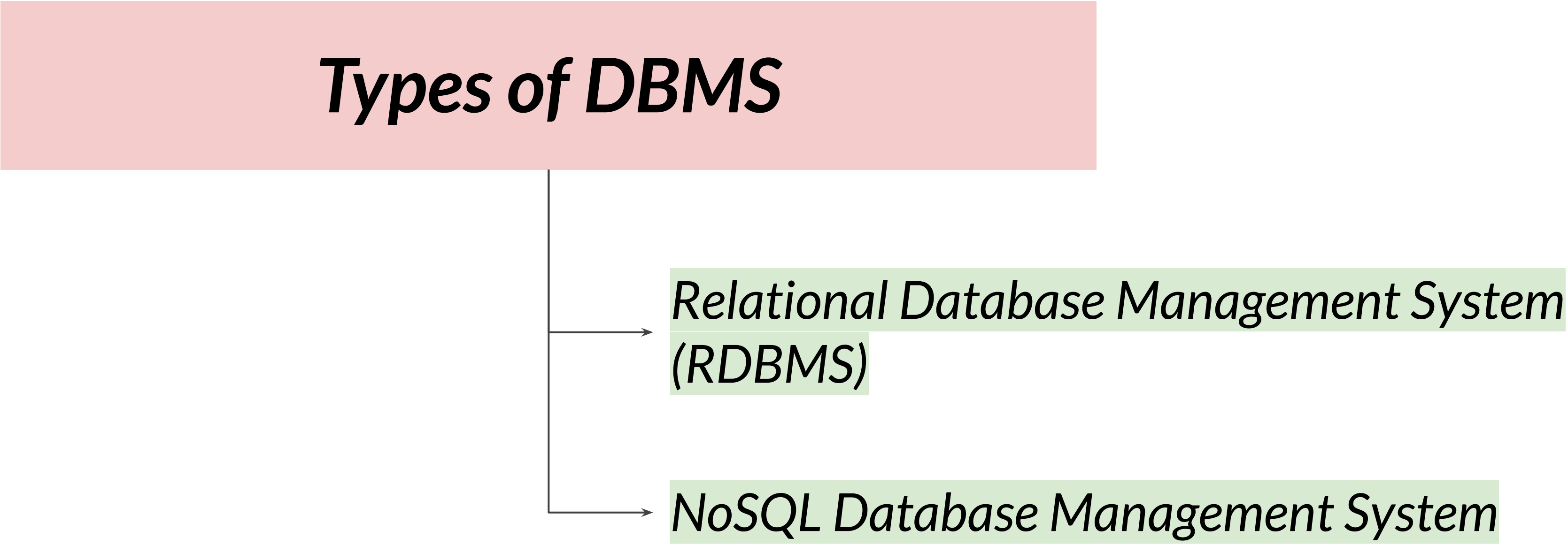
→ *MySQL*

→ *Oracle Database*

→ *SQL Server*

→ *MongoDB*

→ *Cassandra*



Types of DBMS

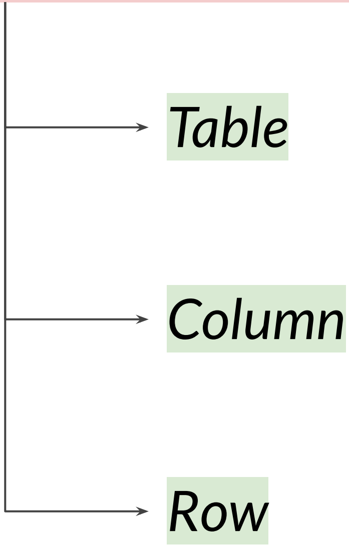
- *Relational Database Management System (RDBMS)*
- *NoSQL Database Management System*

Thank you

Introduction to Relational Databases Concepts

Faisal Memon (EmbarkX)

DBMS Terminologies

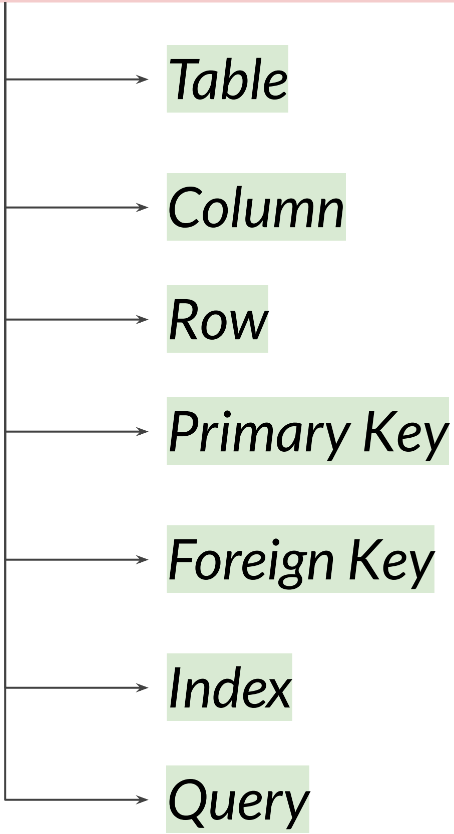


Table

Column

Row

DBMS Terminologies



Table

Column

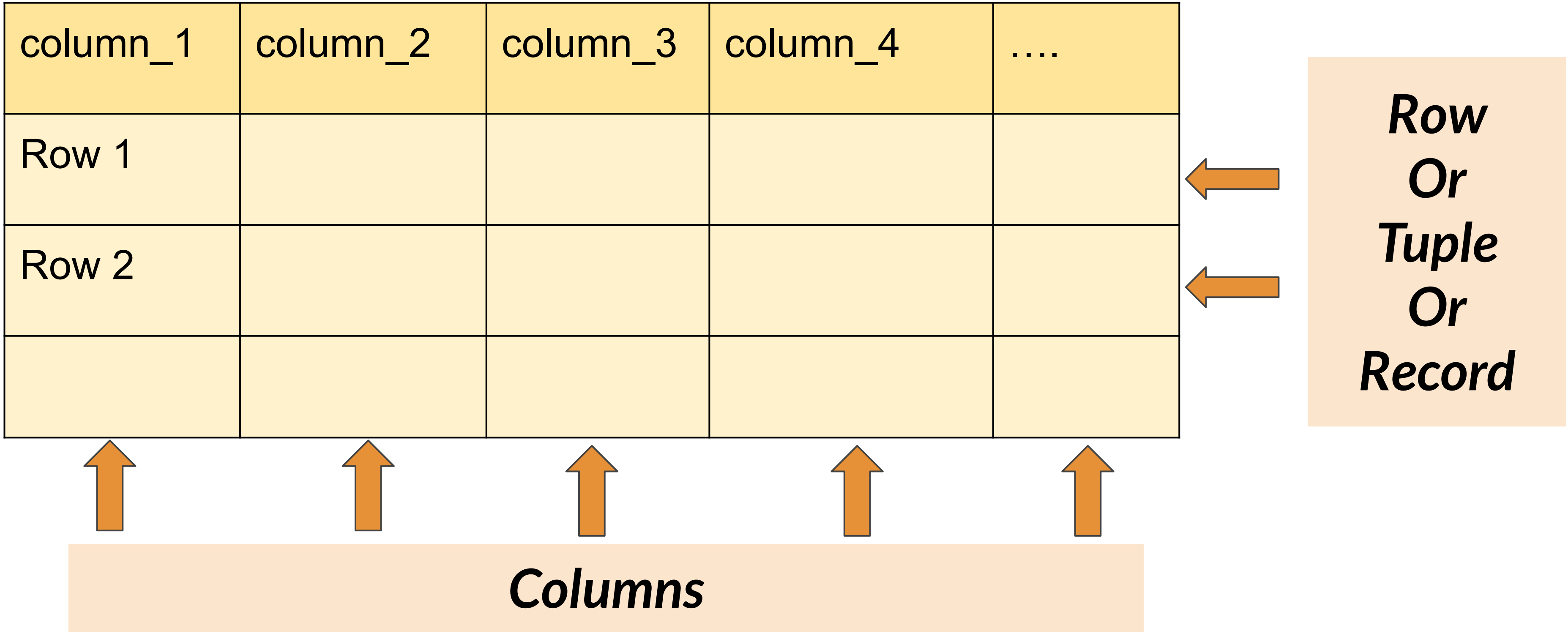
Row

Primary Key

Foreign Key

Index

Query



column_1	column_2	column_3	column_4	….
Row 1				
Row 2				

Rental ID	Car Make	Car Model	Rental Period	Rental Price
1	Maruti Suzuki	Vitara	3 days	$150
2	Jaguar	F7	2 days	$120
3	Renault	Duster	5 days	$400
4	Chevrolet	Impala	7 days	$700
5	TATA	Nexon	4 days	$200
6	Kia	Seltos	1 day	$50
7	Mahindra	XUV700	10 days	$1000

Row
Or
Tuple
Or
Record

These are columns- may have diff datatypes

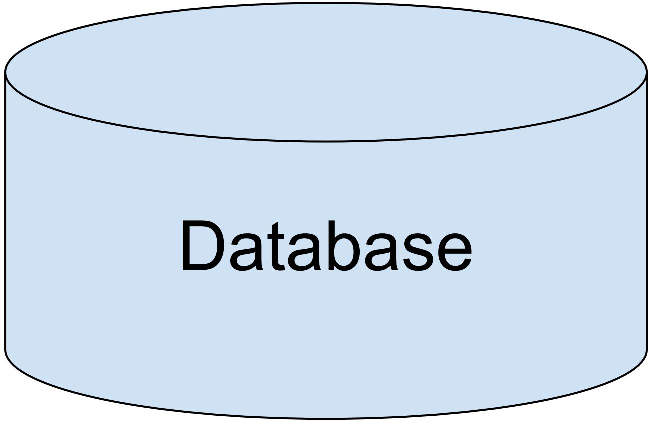
Rental ID	Car Make	Car Model	Rental Period	Rental Price
1	Maruti Suzuki	Vitara	3 days	$150
2	Jaguar	F7	2 days	$120
3	Renault	Duster	5 days	$400
4	Chevrolet	Impala	7 days	$700
5	TATA	Nexon	4 days	$200
6	Kia	Seltos	1 day	$50
7	Mahindra	XUV700	10 days	$1000

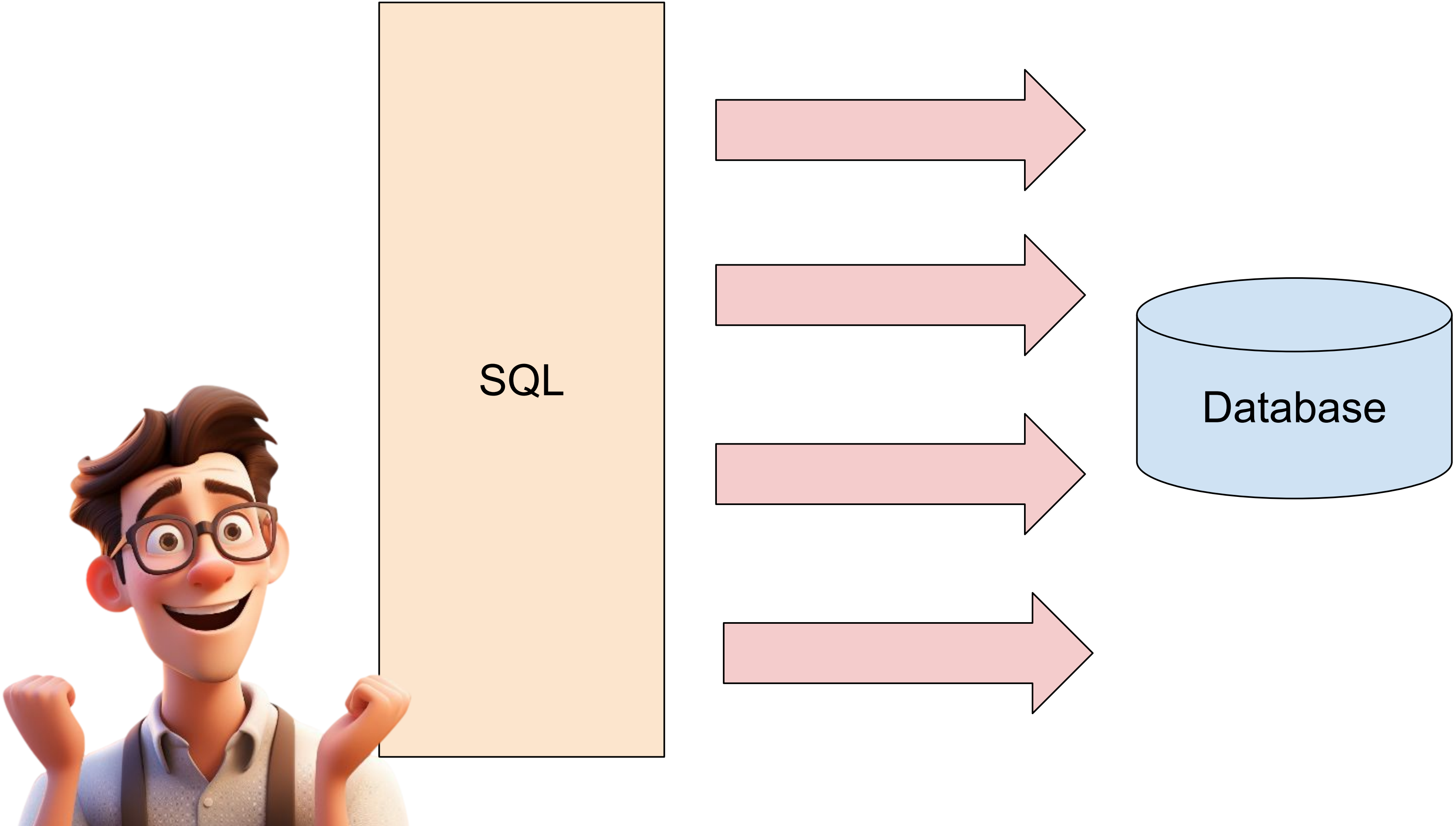
Thank you

Overview of SQL

Faisal Memon

How do I get the data?




SQL
Database

What is SQL

SQL stands for Structured Query Language. Used to retrieve, manage and update data in Database

SQL Queries

Data from Database is retrieved with the help of SQL queries.

Different Types of SQL Queries

→ *Data Query Language [DQL]*

→ *Data Manipulation Language [DML]*

→ *Data Definition Language [DDL]*

→ *Data Control Language [DCL]*

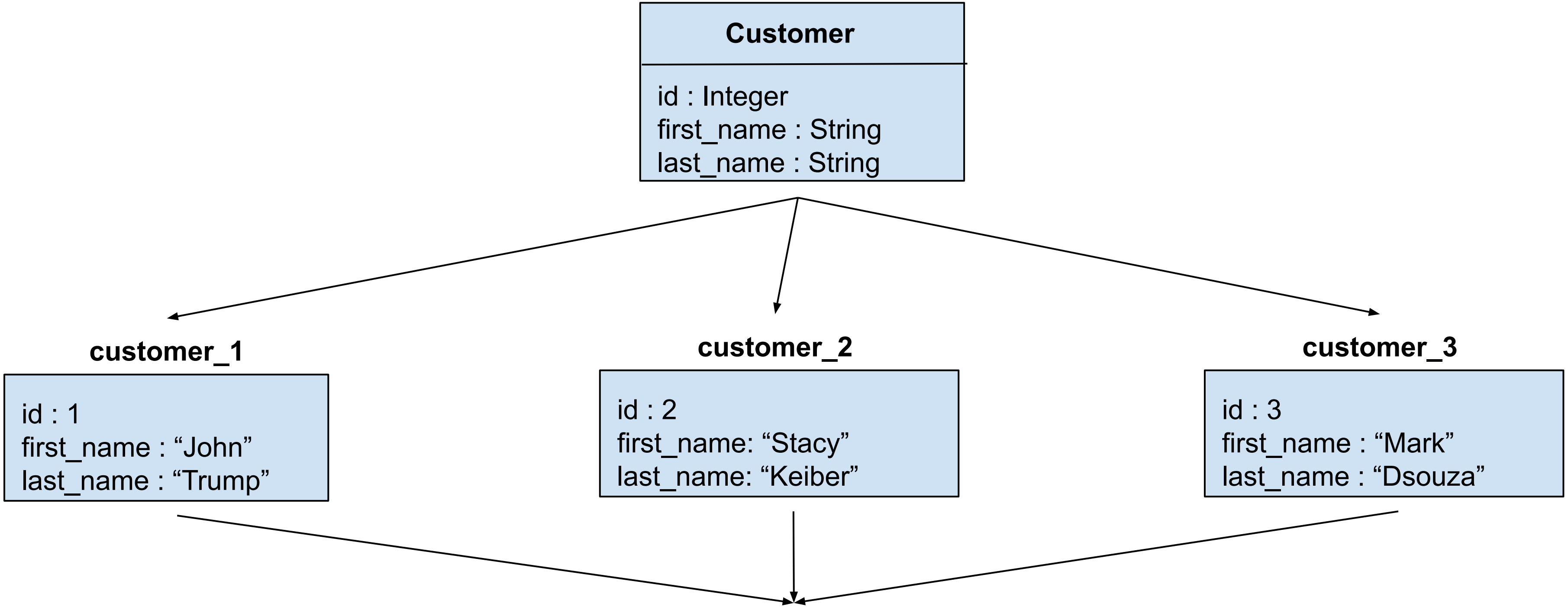
→ *Transaction Control Language(TCL)*

Thank you

What is ORM?

Faisal Memon (EmbarkX)

Customer class



Customer

id : Integer
first_name : String
last_name : String

customer_1

id : 1
first_name : “John”
last_name : “Trump”

customer_2

id : 2
first_name: “Stacy”
last_name: “Keiber”

customer_3

id : 3
first_name : “Mark”
last_name : “Dsouza”

Customer in database

id	first_name	last_name
1	John	Trump
2	Stacy	Keiber
3	Mark	Dsouza

ORM

object relational mapping - now querying becomes indpependent of database - mysql postgre anything- as you dont hardcore

→ Whenever there is a class, that class can be automatically converted to a table with its attributes being converted to columns

→ So now the developer does not have to write queries for table creation, it's created automatically

→ Whenever an object is created, its data can be saved in the database as row in table, this is automatically handled by ORM

ORM

→ ORM as a concept makes developers lives easier and lets developers focus on application logic rather than SQL queries

→ Because of ORM developers don't need to learn how to write SQL queries since the translation from application to SQL is handled by ORM itself

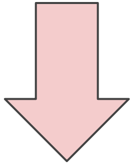
→ It's a powerful technique in programming which also minimizes mistakes since developers are not writing queries on their own

Thank you

What is JPA?

Faisal Memon (EmbarkX)

```
class Category {
    Long categoryId;
    String categoryName;
}
```



categoryId	categoryName
1	Senior Software Engineer

Advantages of using JPA

→ *Easy and Simple*

→ *Makes querying easier*

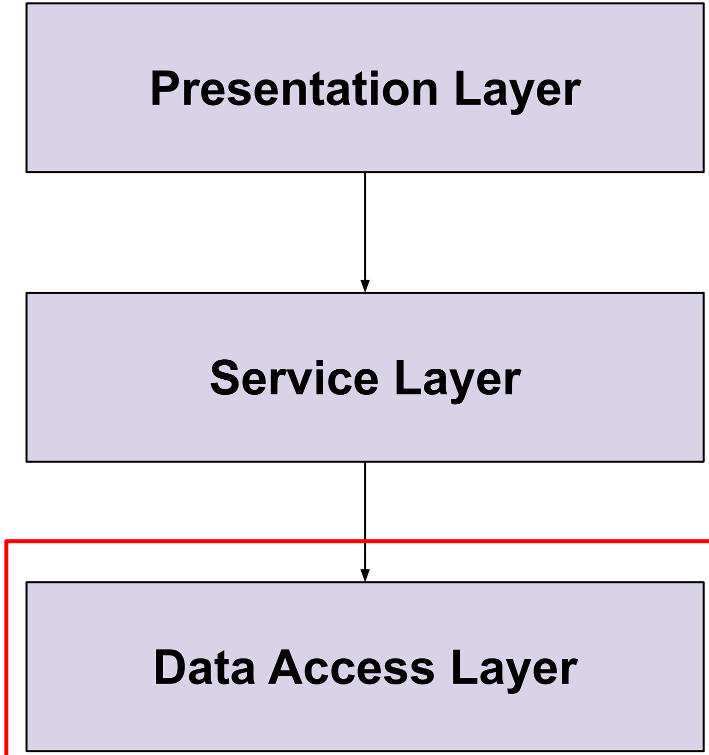
→ *Allows to save and update objects*

→ *Easy integration with Spring Boot*

Thank you

Let’s Understand Data Layer

Faisal Memon (EmbarkX)



Presentation Layer

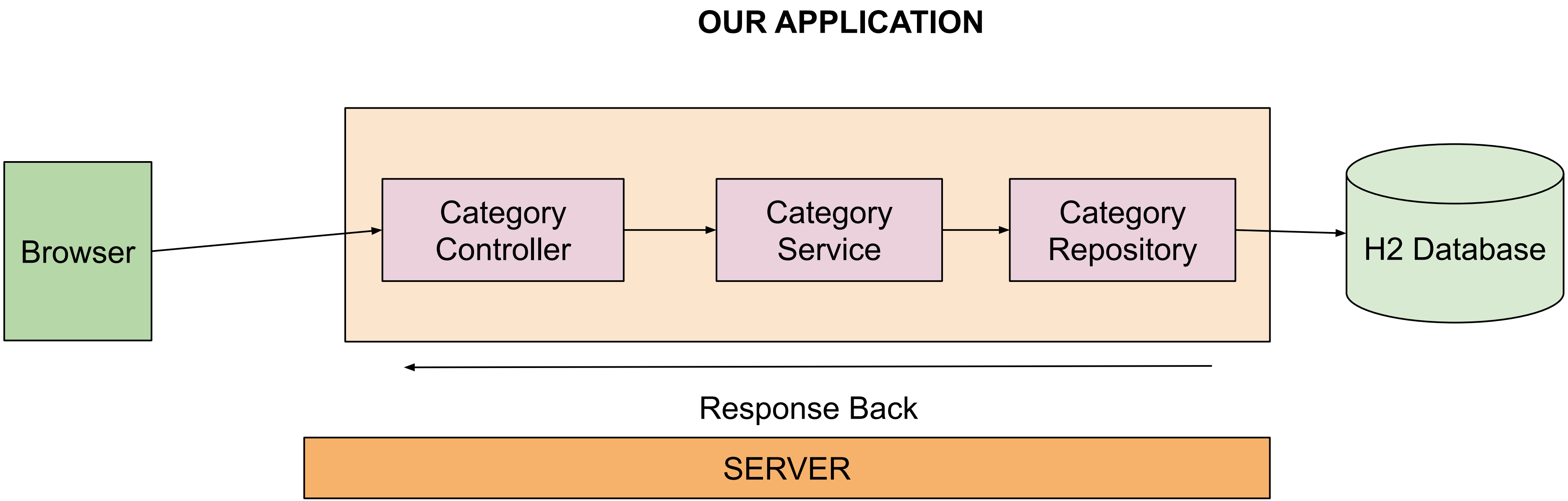
Presentation layer presents the data and the application features to the user. This is the layer where in all the controller classes exist.

Service Layer

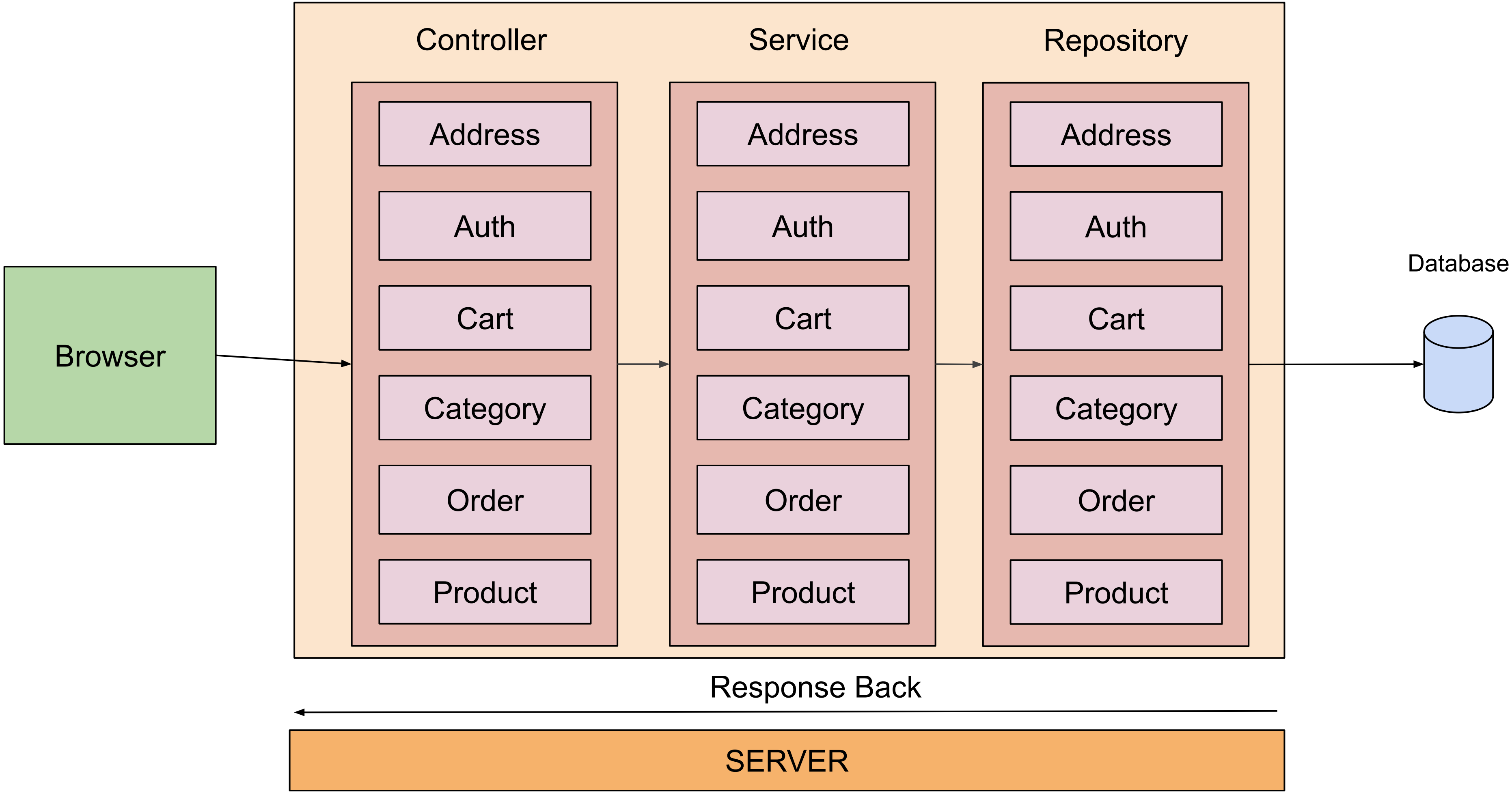
Service layer is where business logic resides in the application. Tasks such as evaluations, decision making, processing of data is done at this layer.

Data Access Layer

Data access layer is the layer where all the repository classes reside.


OUR APPLICATION
Browser
Category Controller
Category Service
Category Repository
H2 Database
Response Back
SERVER

OUR APPLICATION



Browser

Controller

Address

Auth

Cart

Category

Order

Product

Service

Address

Auth

Cart

Category

Order

Product

Repository

Address

Auth

Cart

Category

Order

Product

Database

Response Back

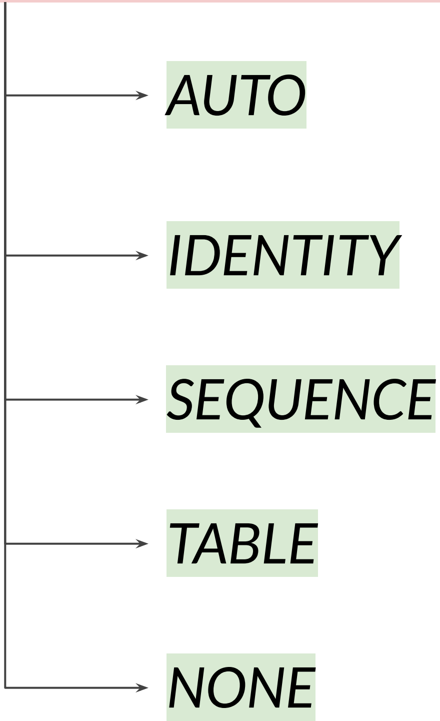
SERVER

Thank you

Generation Types For Identity

Faisal Memon (EmbarkX)

Different Generation Types



AUTO

IDENTITY

SEQUENCE

TABLE

NONE

GenerationType.AUTO

default, delegate it to jpga to select primary key. especially when you have different primary key in test and production, then you dont want to interfere

```
@Id
@GeneratedValue(strategy = GenerationType.AUTO)
private Long id;
```

GenerationType.IDENTITY

to generate identity key values in column- supported by mysql,postgre. altho not suppc

```
@Id
@GeneratedValue(strategy = GenerationType.IDENTITY)
private Long id;
```

GenerationType.SEQUENCE

uses database sequence to generate prima

```
@Id
@GeneratedValue(strategy = GenerationType.SEQUENCE)
private Long id;
```

generation of sequence on next pa

GenerationType.SEQUENCE

```
@Id

@GeneratedValue(strategy = GenerationType.SEQUENCE,
generator = "order_seq")

@SequenceGenerator(name = "order_seq", sequenceName =
"order_sequence", allocationSize = 1)

private Long id;
```

increments by 1 on every new o

GenerationType.SEQUENCE

```
@Id

@GeneratedValue(strategy = GenerationType.SEQUENCE,
generator = "order_seq")

@SequenceGenerator(name = "order_seq", sequenceName =
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private Long id;
```

GenerationType.SEQUENCE

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GenerationType.SEQUENCE

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@Id

@GeneratedValue(strategy = GenerationType.SEQUENCE,
generator = "order_seq")

@SequenceGenerator(name = "order_seq", sequenceName =
"order_sequence", allocationSize = 1)

private Long id;
```

GenerationType.TABLE

```
@Id
@GeneratedValue(strategy = GenerationType.TABLE)
private Long id;
```

GenerationType.TABLE

stores next value of a sequence in a table. not efficient, though good for databses where sequence is not g

```
@Id

@GeneratedValue(strategy = GenerationType.TABLE,
generator = "task_gen")

@TableGenerator(name = "task_gen", table = "id_gen",
pkColumnName = "gen_key", valueColumnName = "gen_value",
pkColumnValue = "task_id", allocationSize = 1)


private Long id;
```

GenerationType.TABLE

```
@Id

@GeneratedValue(strategy = GenerationType.TABLE,
generator = "task_gen")

@TableGenerator(name = "task_gen", table = "id_gen",
pkColumnName = "gen_key", valueColumnName = "gen_value",
pkColumnValue = "task_id", allocationSize = 1)


private Long id;
```

GenerationType.TABLE

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@Id

@GeneratedValue(strategy = GenerationType.TABLE,
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pkColumnName = "gen_key", valueColumnName = "gen_value",
pkColumnValue = "task_id", allocationSize = 1)


private Long id;
```

GenerationType.TABLE

```
@Id

@GeneratedValue(strategy = GenerationType.TABLE,
generator = "task_gen")

@TableGenerator(name = "task_gen", table = "id_gen",
pkColumnName = "gen_key", valueColumnName = "gen_value",
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private Long id;
```

GenerationType.TABLE

```
@Id

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generator = "task_gen")

@TableGenerator(name = "task_gen", table = "id_gen",
pkColumnName = "gen_key", valueColumnName = "gen_value",
pkColumnValue = "task_id", allocationSize = 1)


private Long id;
```

Lombok: boilerplate code for repititive stuff like getter/setter/constructor. done with the help of annotation. see the code ca

Thank you

Validations in Spring Boot

Faisal Memon (EmbarkX)

Validations in Spring Boot are all about ensuring the data your application receives meets certain criteria before it's processed

hibernate, - orm framework- used to map java objects too entity, to ensure validity or c

Validation in Spring Boot

→ @NotNull

→ @NotEmpty

→ @Size(min = x, max = y)

→ @Email

→ @Min(value) and @Max(value)

Example

```java
import jakarta.validation.constraints.Email;
import jakarta.validation.constraints.NotEmpty;
import jakarta.validation.constraints.Size;

public class User {
    @NotEmpty(message = "Email cannot be empty")
    @Email(message = "Email should be valid")
    private String email;

    @NotEmpty(message = "Name cannot be empty")
    @Size(min = 2, message = "Name should have at least 2 characters")
    private String name;

    // getters and setters
}
```

Thank you

Custom Exceptions in Spring Boot

Faisal Memon (EmbarkX)

Use of **ResponseStatusException**

Why Consider Custom Exceptions Anyway?

→ *Separation of Concerns*

→ *Consistency and Reusability*

→ *Detailed Error Information*

→ *Complex Error Handling Logic*

Using Custom Exceptions with ResponseStatusException

→ *ResponseStatusException for direct feedback*

→ *Define Custom Exceptions for Business Logic*

→ *Handle Custom Exceptions in Controller Advice*

→ *Custom Exceptions for consistency*

Pagination:pageNopageSizetotalElementsto

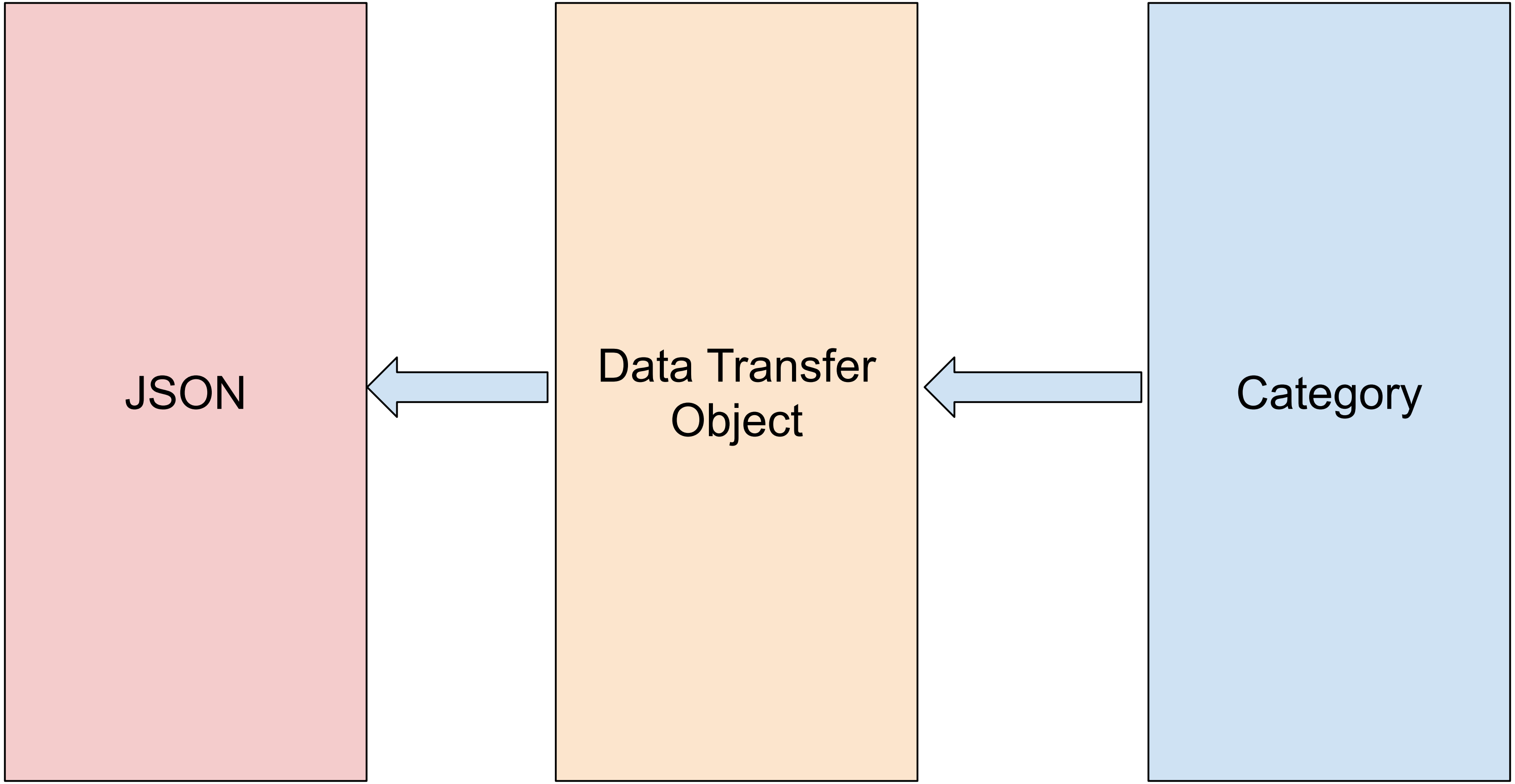
Thank you

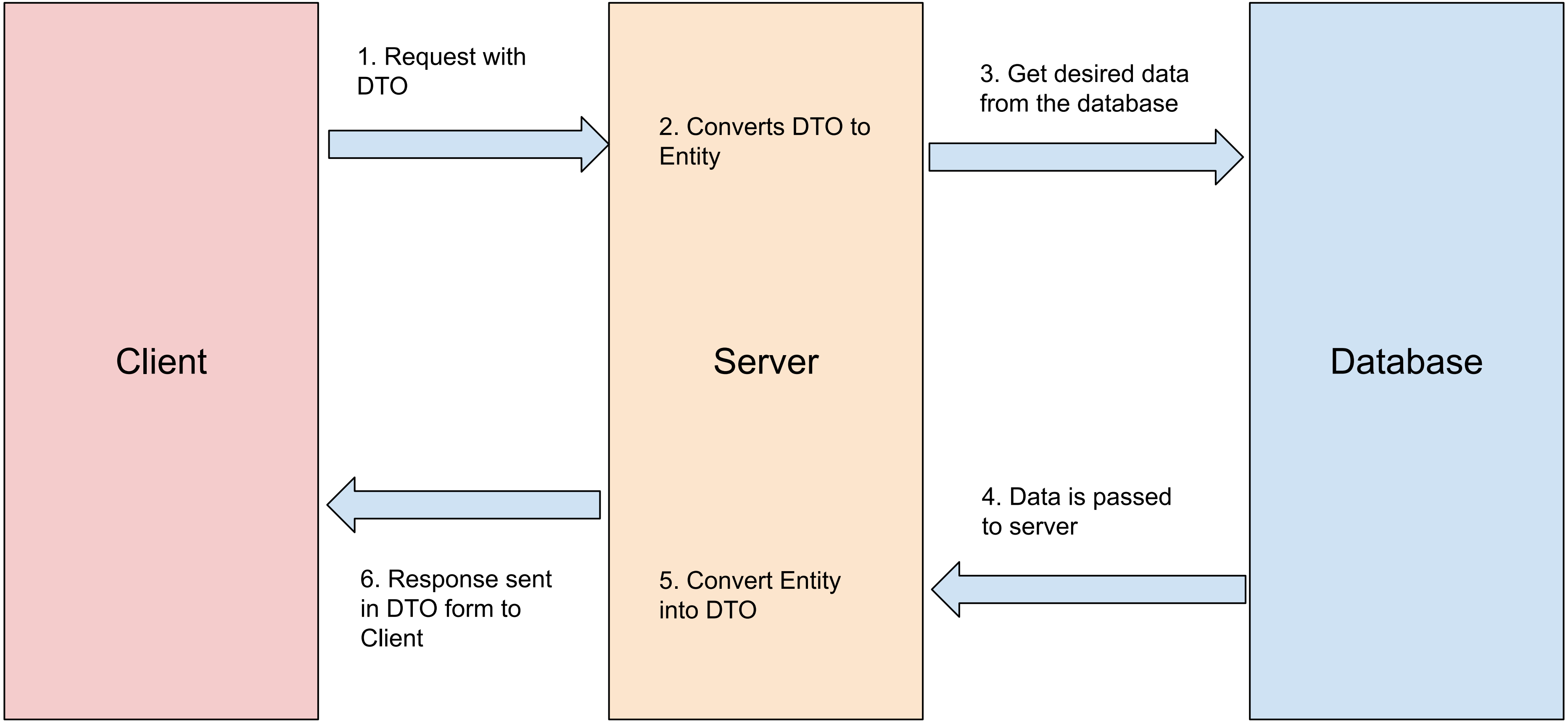
DTO Pattern

Faisal Memon (EmbarkX)

What is it?

Design pattern used to transfer data between software application subsystems


JSON
Data Transfer Object
Category



Client

1. Request with DTO

Server

2. Converts DTO to Entity

3. Get desired data from the database

Database

4. Data is passed to server

5. Convert Entity into DTO

6. Response sent in DTO form to Client

Thank you

Working with Multiple Entities / Relationships

Faisal Memon (EmbarkX)

Real world projects will have multiple models

Entity relationships are important

JPA and Relationships

→ *An entity represents a table in your database*

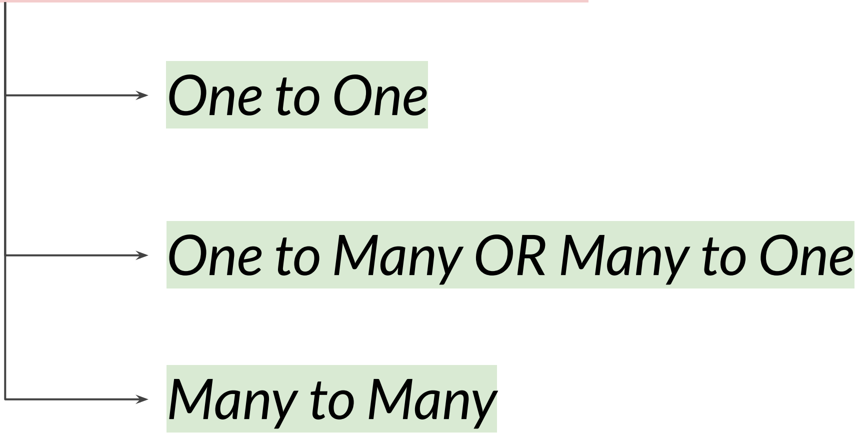
→ *Each instance of an entity corresponds to a row in that table*

→ *If you have a table for storing information about books, each book object would be a row*

→ *Relationships in JPA define how entities are related to each other*

→ *JPA allows you to map these relationships using annotations in your Java code*

Relationships



One to One

One to Many OR Many to One

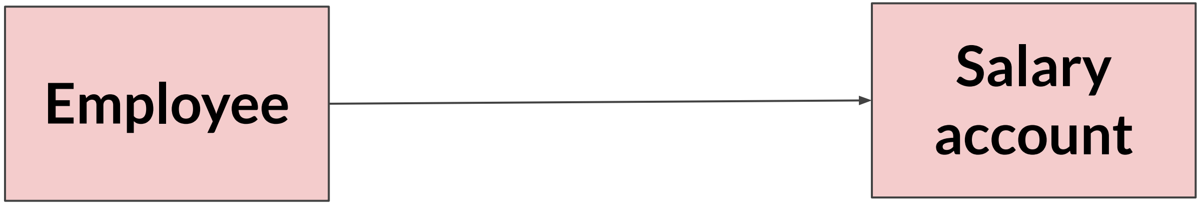
Many to Many

One to One Relationship

One to one relationship is a type of relationship where in one record in a table is related to exactly one more record in another table and vice versa

Example

Employee and salary account



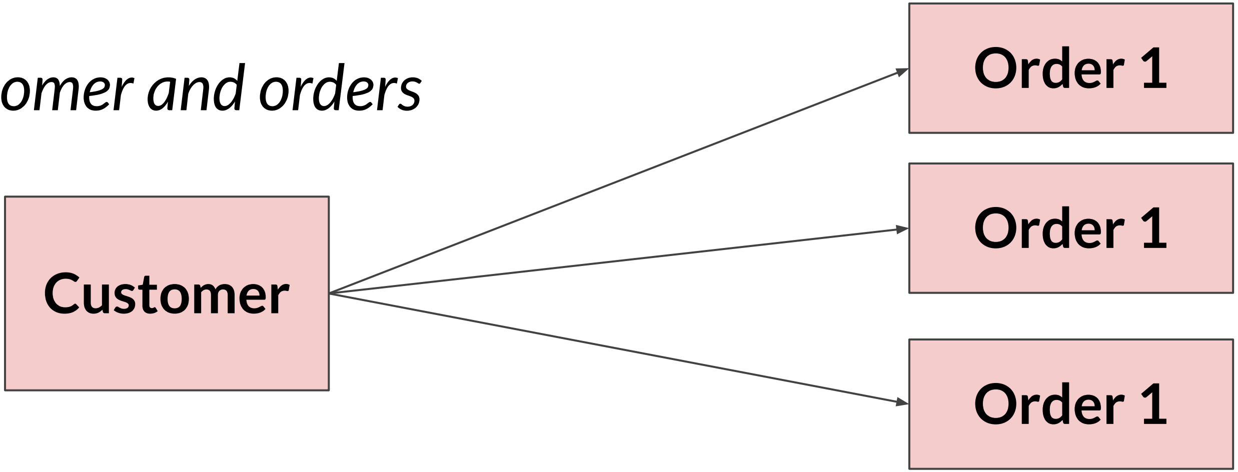
Example 2 → Person and passport

Many to One relationship

A many to one relationship is a type of relationship when one record in one table has one or many related record in another table

Example

Customer and orders



Customer

Order 1

Order 1

Order 1

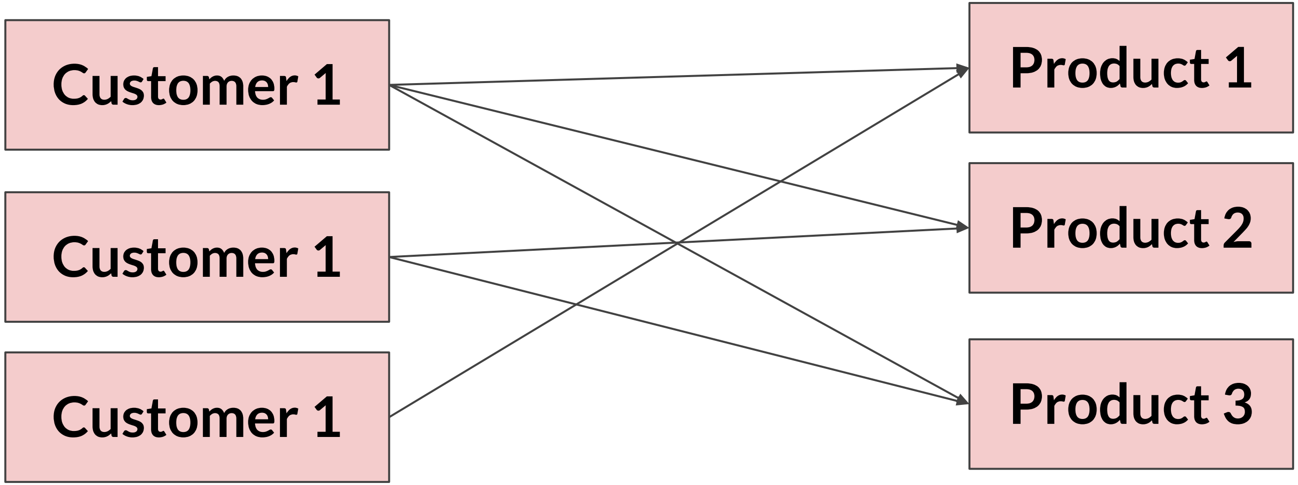
Users and Bank accounts

Many to Many relationship

A many to many relationship is a type of relationship when one record in one table has many related record in another table

Example

Customer and products



Courses and Students

Unidirectional Relationship

When only one entity knows about the relationship

Bidirectional Relationship

When both entities are aware of each other

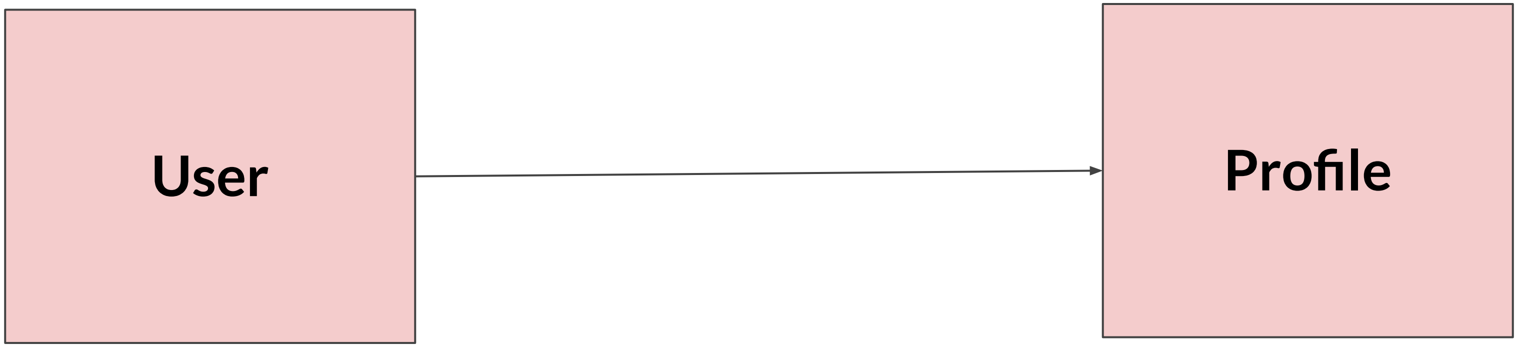
Thank you

One to One Relationship

Faisal Memon (EmbarkX)

Occurs when **one** record in a table is associated with **one and only one record** in another table

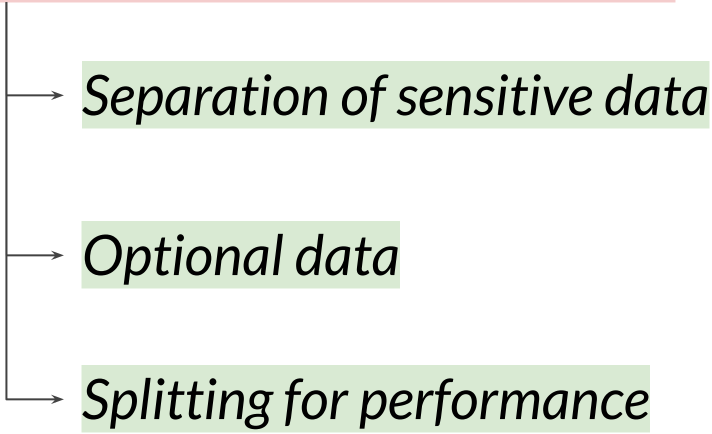
Example



User

Profile

Why Do We Need 1:1 Relationship

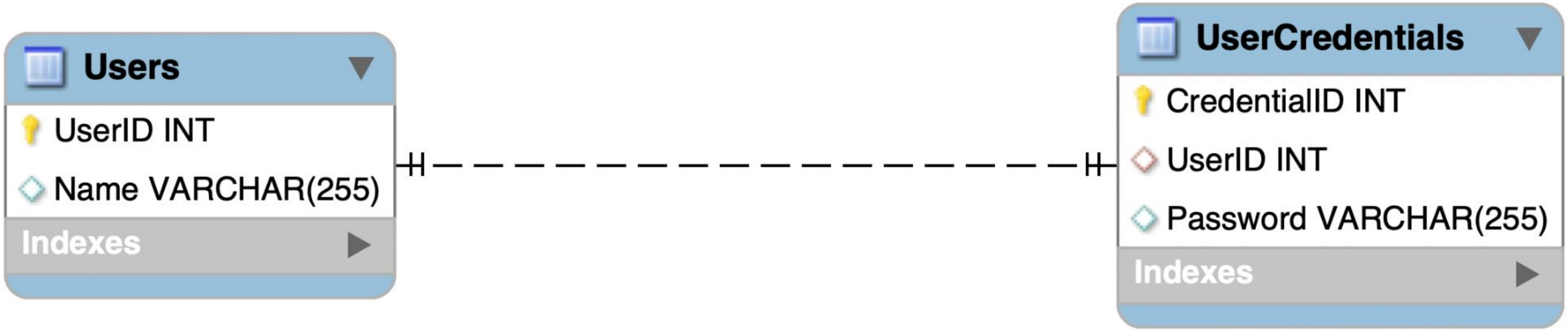


Separation of sensitive data

Optional data

Splitting for performance

Example



Users

UserID INT

Name VARCHAR(255)

Indexes

UserCredentials

CredentialID INT

UserID INT

Password VARCHAR(255)

Indexes

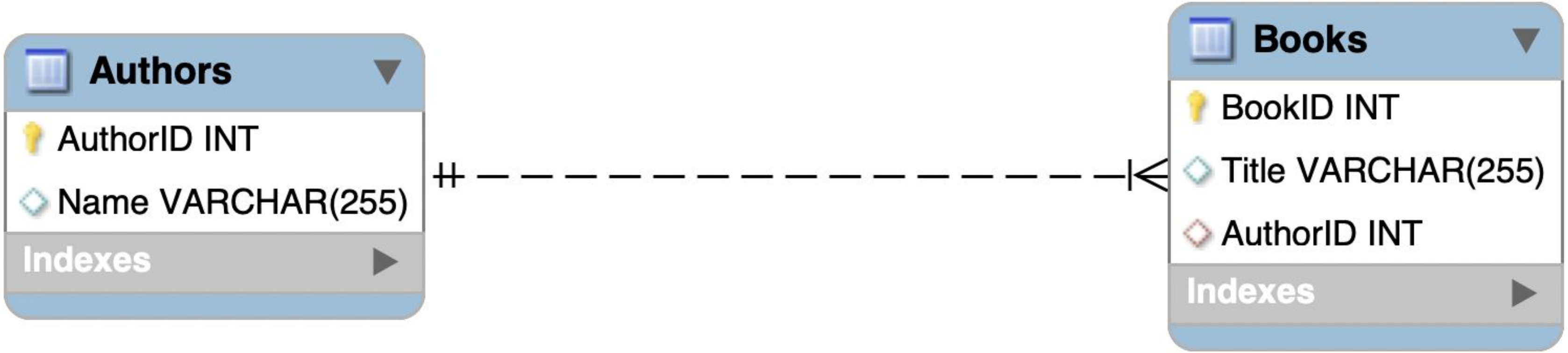
Thank you

One to Many AND Many to One

Faisal Memon (EmbarkX)

Occurs when **one** record in one table can be associated with multiple records in another table

Example



Authors

AuthorID INT

Name VARCHAR(255)

Indexes

Books

BookID INT

Title VARCHAR(255)

AuthorID INT

Indexes

Before

BookID	Title	AuthorName
1	Quantum Realm	Alice Smith
2	Particle Play	Bob Johnson
3	Atomic Actions	Alice Smith

After

AuthorID	Name
1	Alice Smith
2	Bob Johnson

BookID	Title	AuthorID
1	Quantum Realm	1
2	Particle Play	2
3	Atomic Actions	1

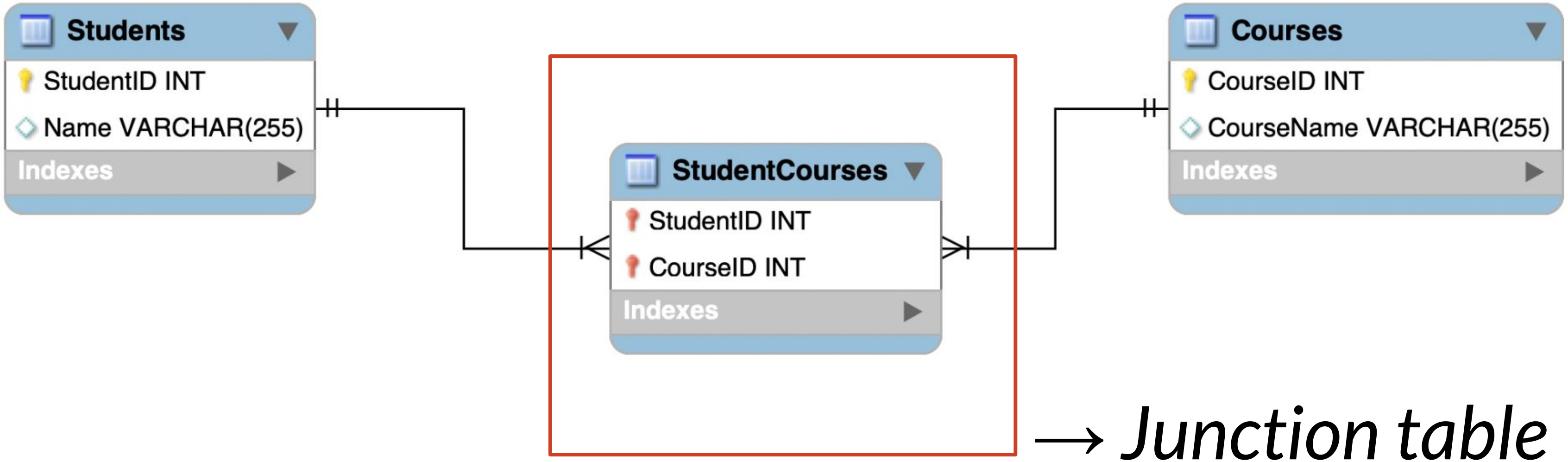
Thank you

Many to Many Relationship

Faisal Memon (EmbarkX)

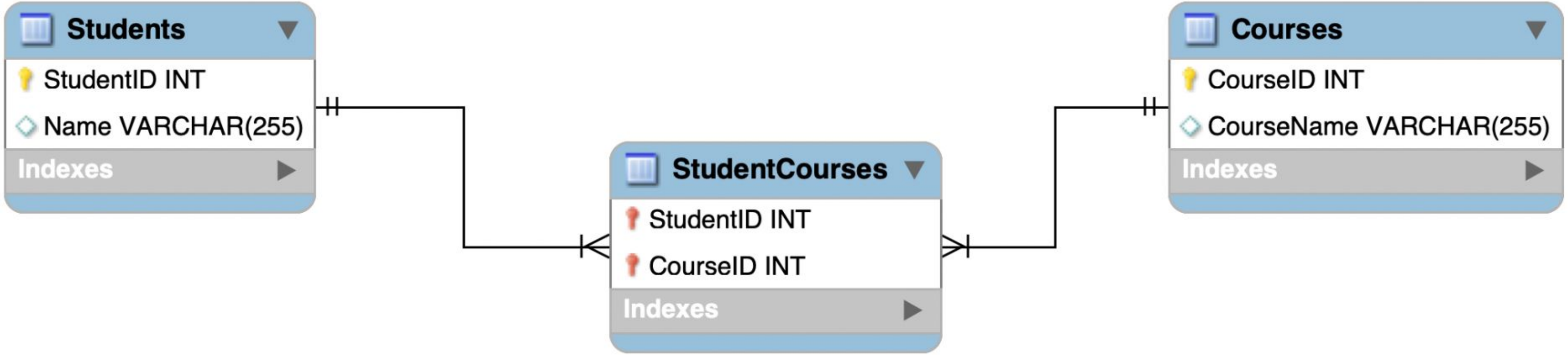
Occurs when **multiple records** in one table can be associated with **multiple records** in another table

Example



→ *Junction table*

Example


Students
StudentID INT
Name VARCHAR(255)
Indexes
StudentCourses
StudentID INT
CourseID INT
Indexes
Courses
CourseID INT
CourseName VARCHAR(255)
Indexes

Things to remember

→ Junction table may contain additional attributes

→ Junction table helps avoid redundancy

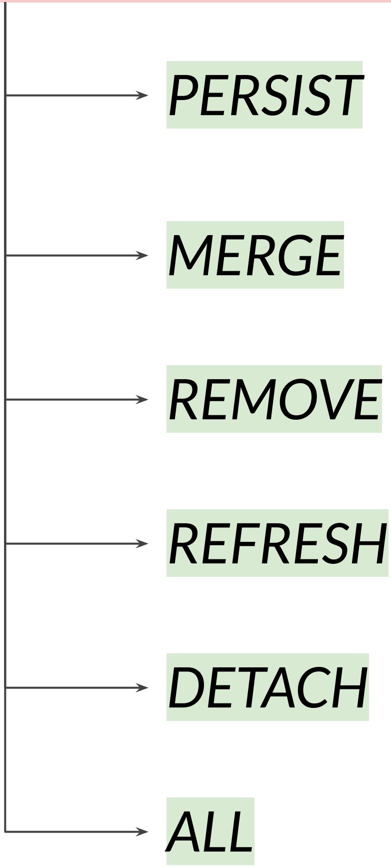
→ To retrieve data you have to write JOIN statements that include the junction table

Thank you

Cascading

Faisal Memon (EmbarkX)

Cascading Types



PERSIST

MERGE

REMOVE

REFRESH

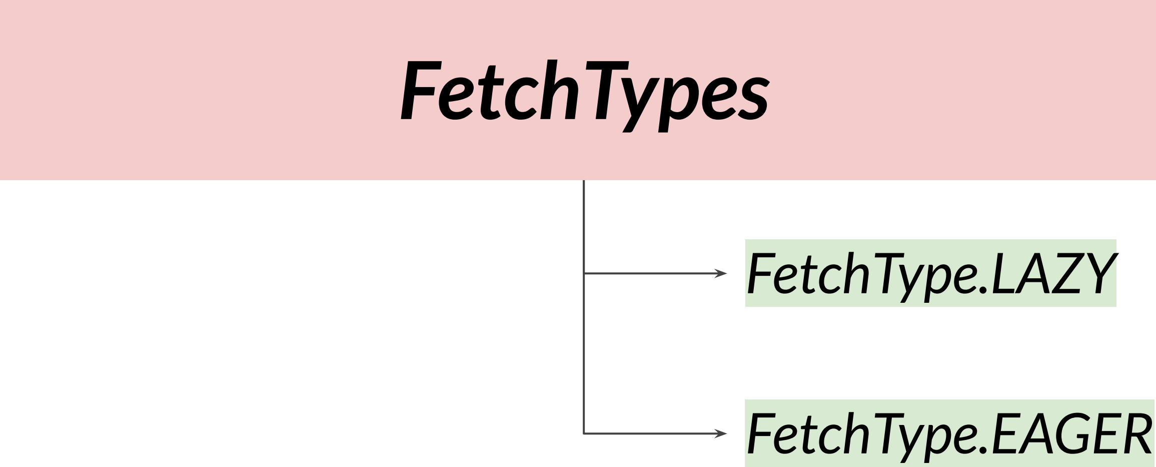
DETACH

ALL

FetchTypes

Faisal Memon (EmbarkX)

FetchType plays a crucial role in defining how and when related entities are loaded from the database in relation to the parent entity child type is fetched not with parent, but when it is demanded for the fi



FetchTypes

FetchType.LAZY

FetchType.EAGER

Default FetchTypes

→ OneToMany: Lazy

→ ManyToOne: Eager

→ ManyToMany: Lazy

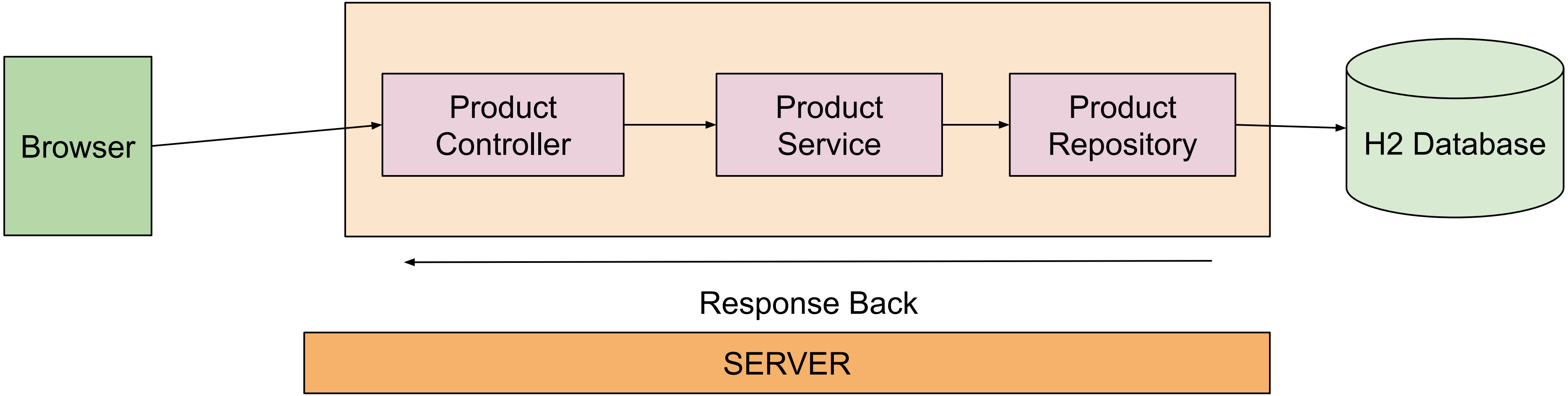
→ OneToOne: Eager

Thank you

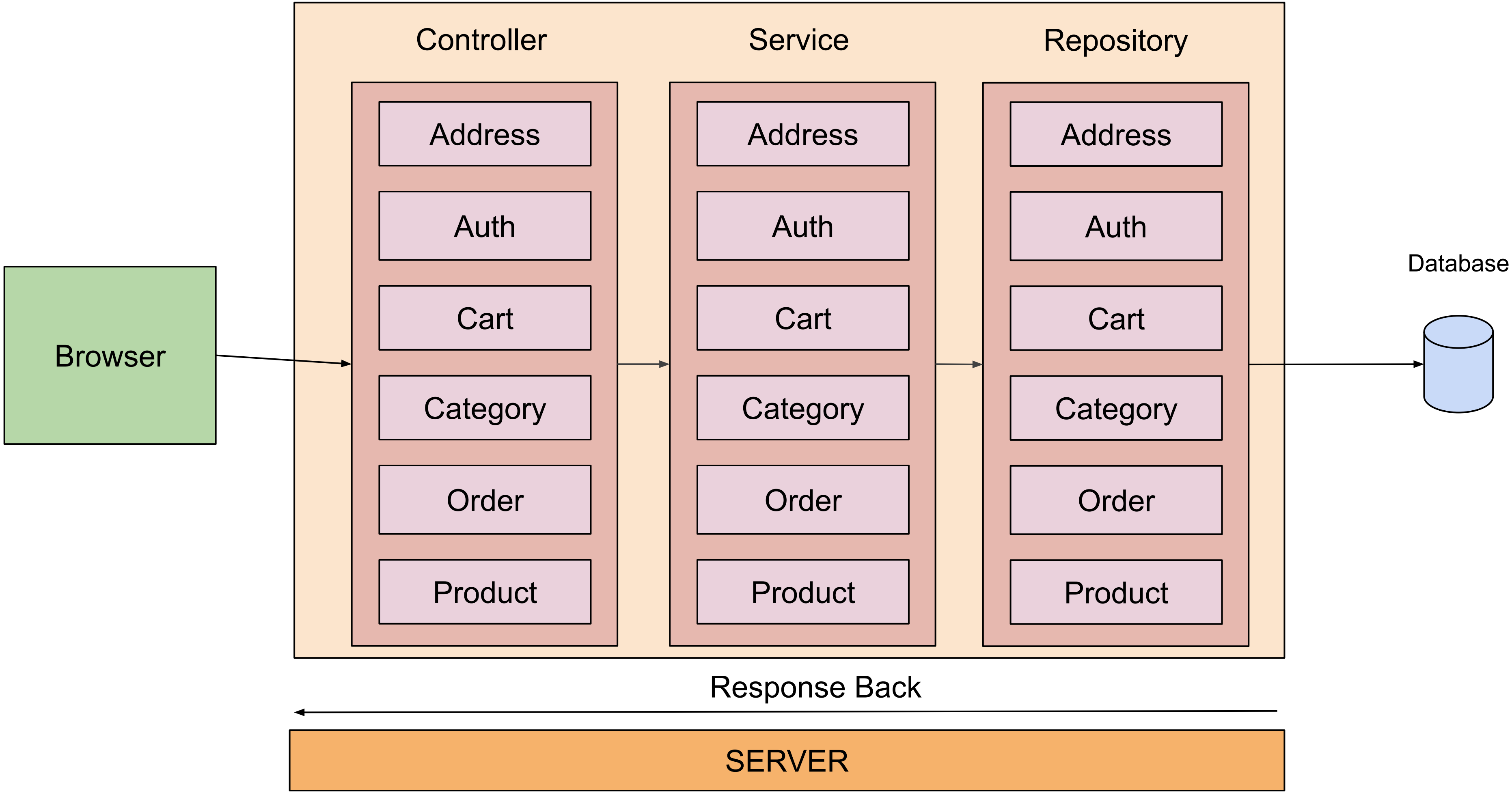
Understanding the Product Module

Faisal Memon (EmbarkX)

OUR APPLICATION



OUR APPLICATION



Browser

Controller

Address

Auth

Cart

Category

Order

Product

Service

Address

Auth

Cart

Category

Order

Product

Repository

Address

Auth

Cart

Category

Order

Product

Database

Response Back

SERVER

API Name	Endpoint	Method	Purpose	Request Body	Request Parameters	Response
Add Product	/api/admin/categories/{categoryId}/product	POST	Adds a new product to a category	Product (JSON)	categoryId (PathVariable)	ProductDTO (JSON), HttpStatus 201
Get All Products	/api/public/products	GET	Retrieves all products	-	pageNumber, pageSize, sortBy, sortOrder (RequestParams)	ProductResponse (JSON), HttpStatus 200
Get Products by Category	/api/public/categories/{categoryId}/products	GET	Retrieves products by category	-	categoryId (PathVariable), pageNumber, pageSize, sortBy, sortOrder (RequestParams)	ProductResponse (JSON), HttpStatus 200
Get Products by Keyword	/api/public/products/keyword/{keyword}	GET	Searches products by keyword	-	keyword (PathVariable), pageNumber, pageSize, sortBy, sortOrder (RequestParams)	ProductResponse (JSON), HttpStatus 302
Update Product	/api/products/{productId}	PUT	Updates an existing product	Product (JSON)	productId (PathVariable)	ProductDTO (JSON), HttpStatus 200

API Name	Endpoint	Method	Purpose	Request Body	Request Parameters	Response
Update Product Image	/api/products/{productId}/image	PUT	Updates the image of a product	Multipart File (Form Data)	productId (PathVariable)	ProductDTO (JSON), HttpStatus 200
Delete Product	/api/admin/products/{productId}	DELETE	Deletes a product	-	productId (PathVariable)	String (Status Message), HttpStatus 200
Get Products by Seller	/api/seller/products	GET	Retrieves products by seller	-	pageNumber, pageSize, sortBy, sortOrder (RequestParams)	ProductResponse (JSON), HttpStatus 200
Get Product Count	/api/admin/products/count	GET	Retrieves product count	-	-	Long, HttpStatus 200

Thank you

Introduction to Spring Security

Faisal Memon (EmbarkX)

Security is important

Importance of Security

→ *Privacy Protection*

→ *Trust*

→ *Integrity*

→ *Compliance*

Role of Spring Security within the Spring Ecosystem

→ *Spring Framework*

→ *Spring Boot*

→ *Spring Data*

→ *Spring Security*
  - *Authentication*
  - *Authorization*

Authentication and Authorization

Authentication

Authentication is proving who you are.

Authorization

Authorization is about what you're allowed to do after you've proven who you are.

Authentication and Authorization

Authentication

Scanning your ID badge to confirm your identity as an employee.

Authorization

After confirming your identity, determining if you're permitted to enter certain restricted areas based on your job role or clearance level.

Key Security Principles

→ *Least Privilege*

→ *Secure by Design*

→ *Fail-Safe Defaults*

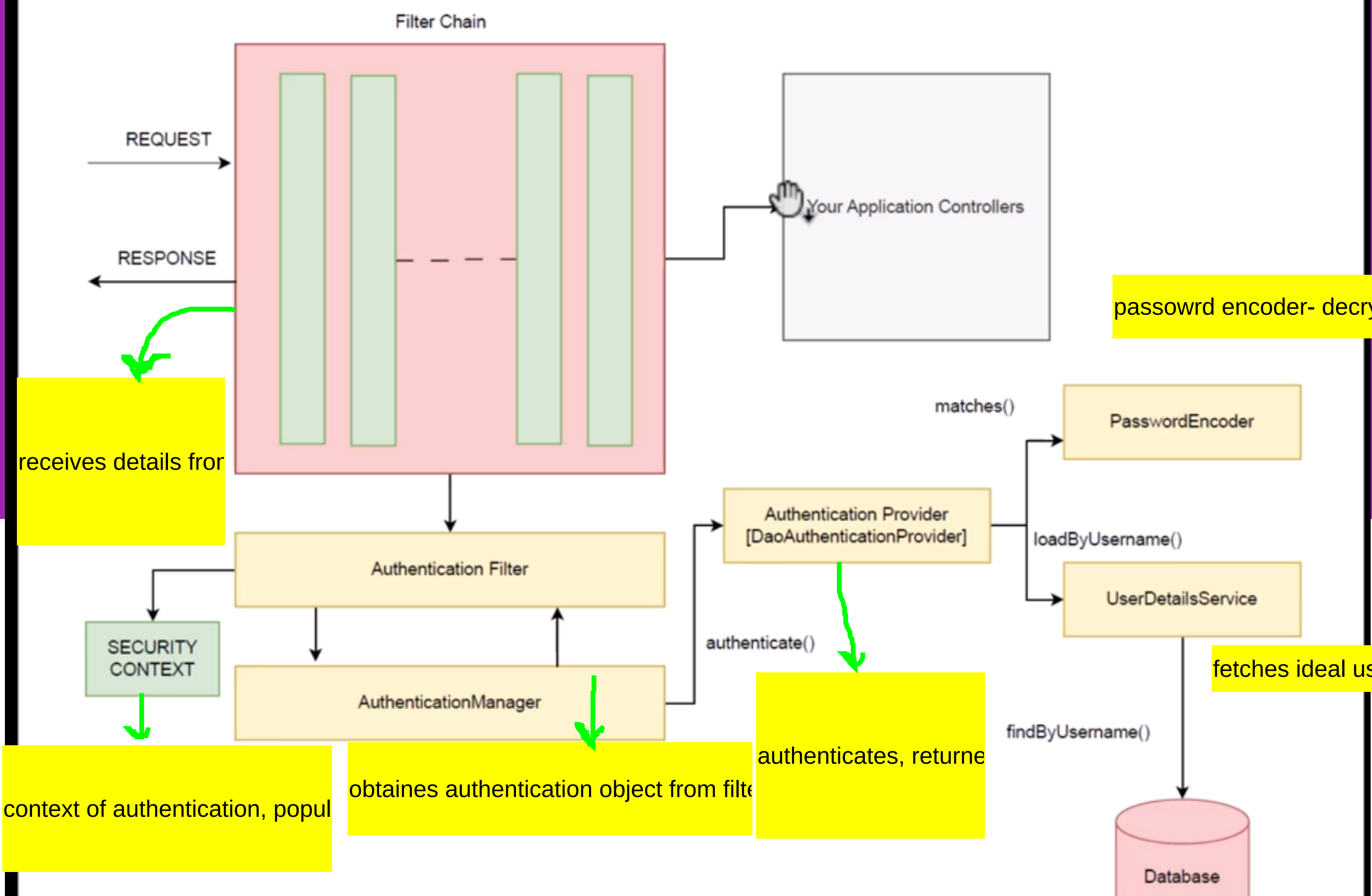
→ *Secure Communication*

Key Security Principles

→ *Input Validation*

→ *Auditing and Logging*

→ *Regular Updates and Patch Management*



passowrd encoder- decrypts the entered encrypted pa

receives details fror

fetches ideal username and password, give:

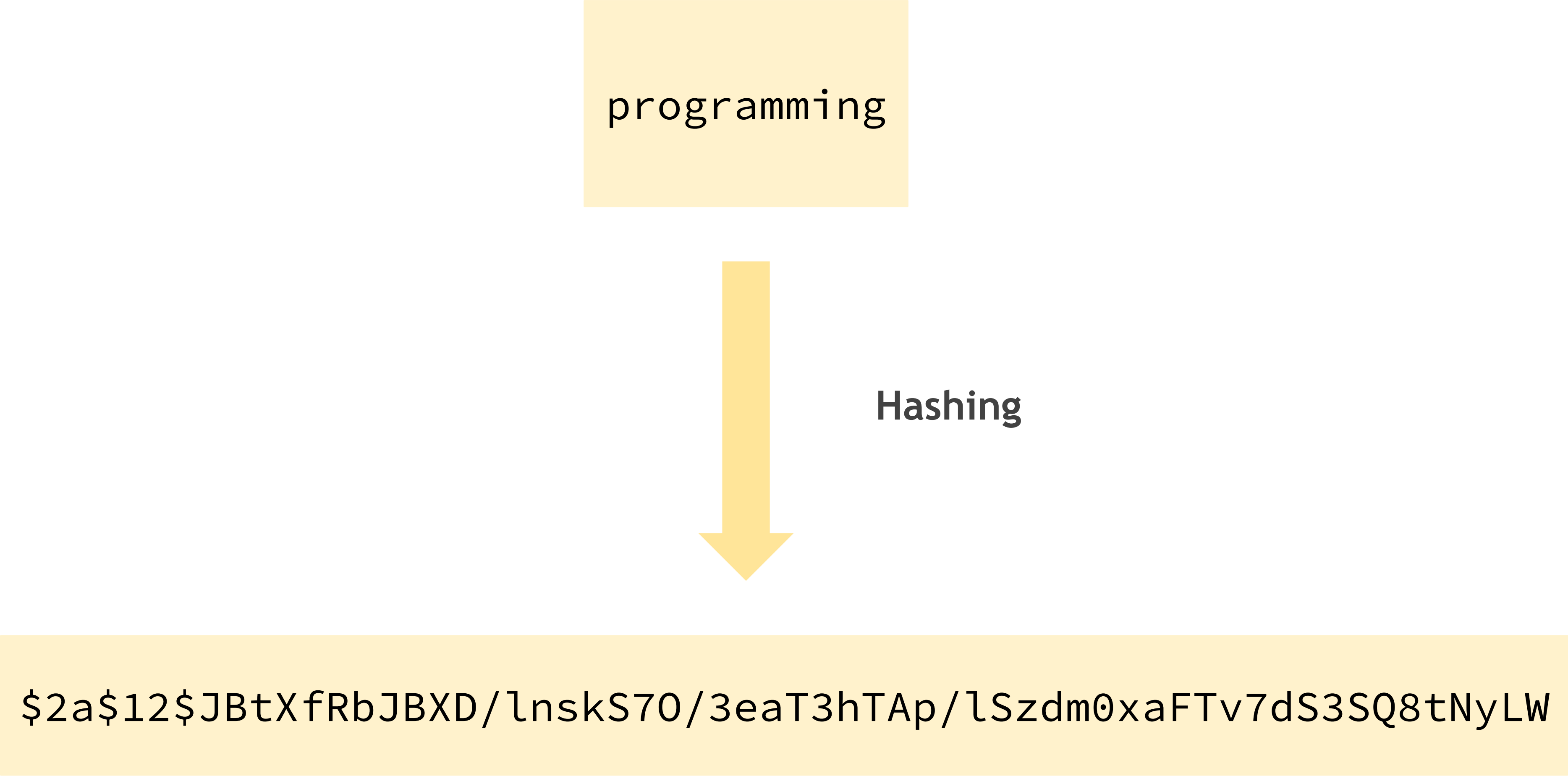
authenticates, returne

context of authentication, popul

obtaines authentication object from filte basic authentication => popup instead of form authenticationform authentication vi

What is **Hashing**?

in memory authentication: users created within memory which configure app-> they wont persist. a method that stores user credentials and roles in the applicatior



programming

Hashing

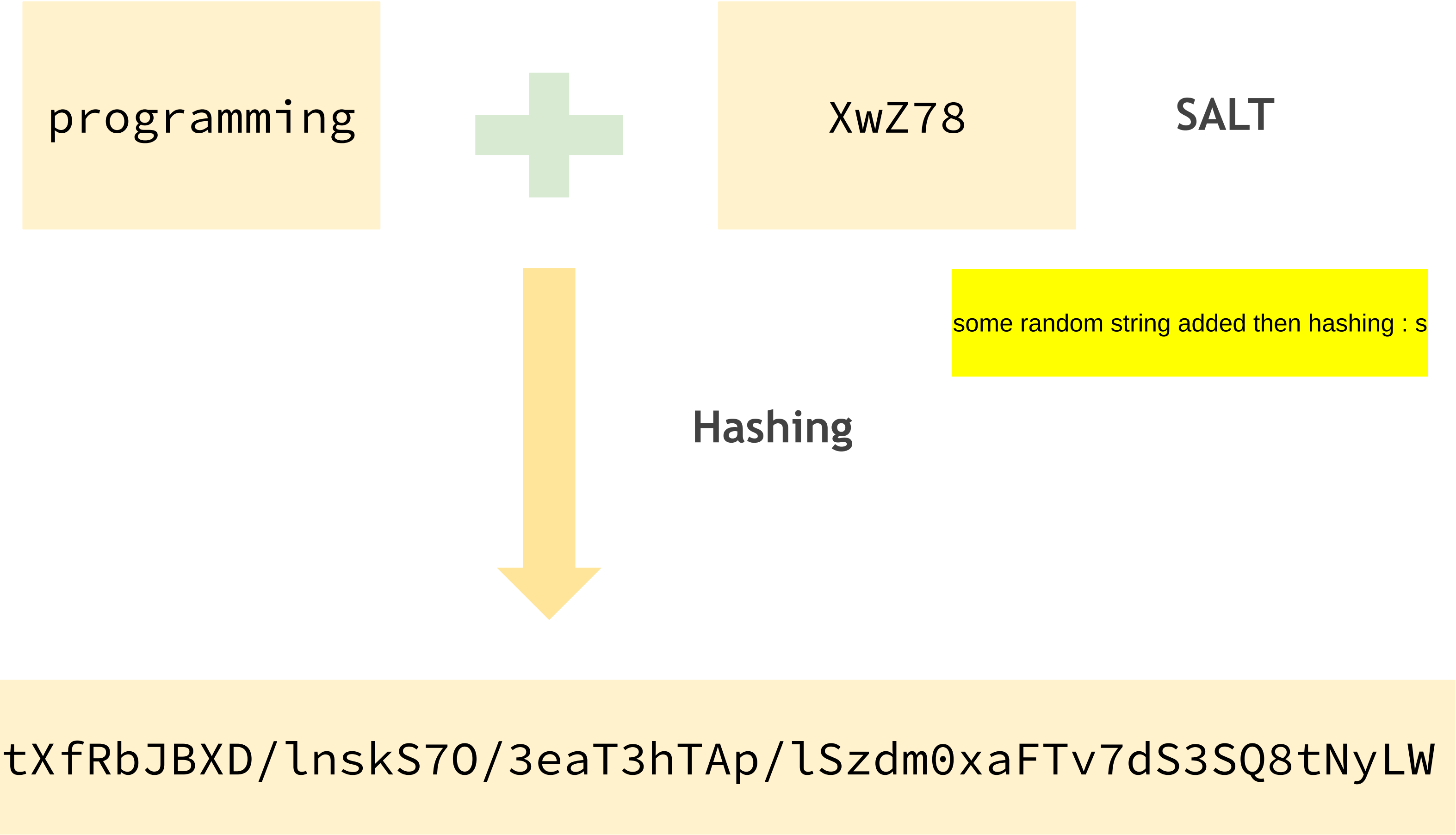
```
$2a$12$JBtXfRbJBXD/lnskS7O/3eaT3hTAp/lSzdm0xaFTv7dS3SQ8tNyLW
```

Hashing involves using

Algorithms

bcrypt involves using salting

Salting helps increase security



programming

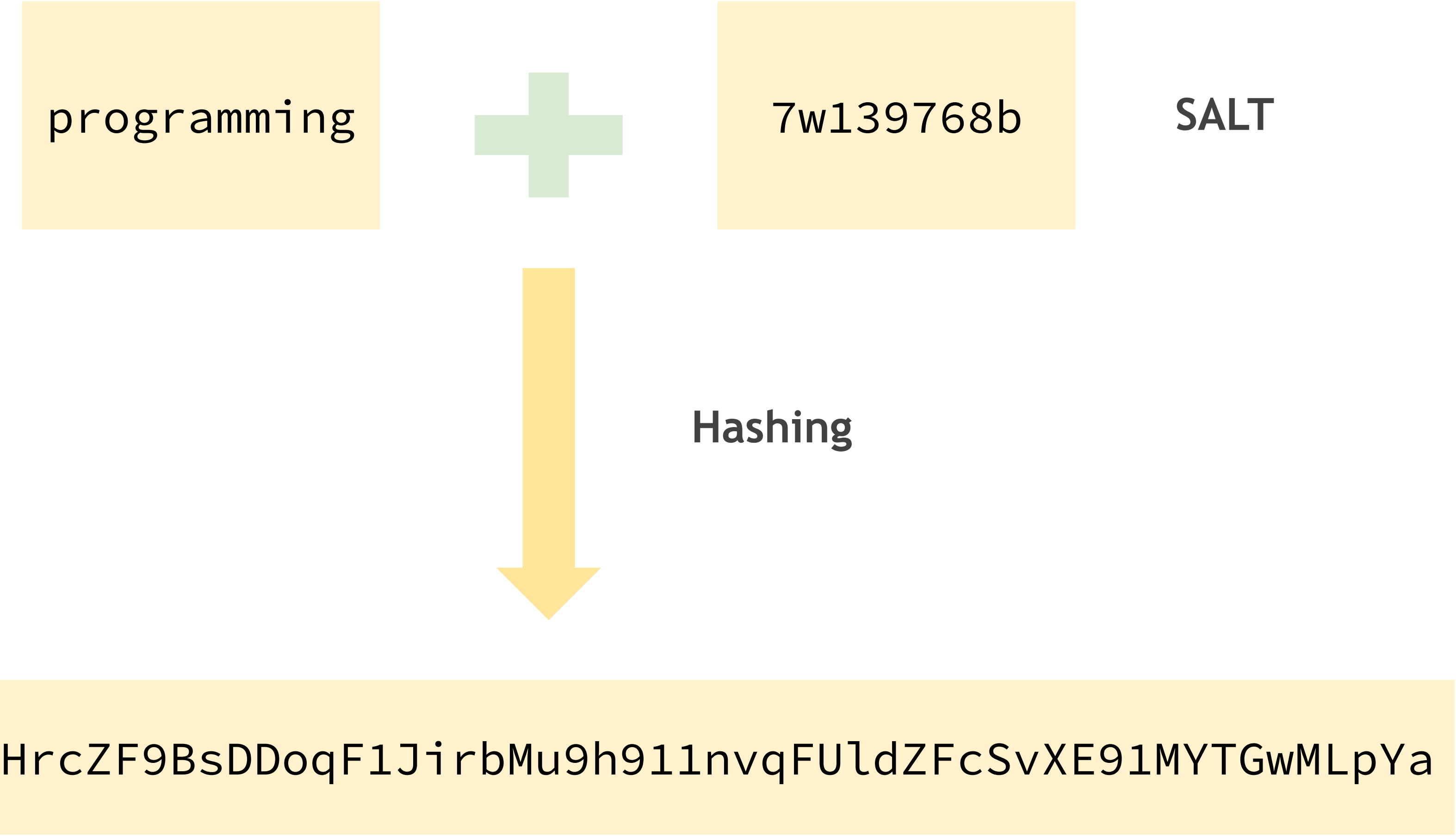
XwZ78

SALT

some random string added then hashing : s

Hashing

$2a$12$JBtXfRbJBXD/lnskS7O/3eaT3hTAp/lSzdm0xaFTv7dS3SQ8tNyLW



programming

7w139768b

SALT

Hashing

$2a$12$xwHrcZF9BsDDoqF1JirbMu9h911nvqFUldZFcSvXE91MYTGwMLpYa

JWT Authentication

Faisal Memon (EmbarkX)

Without JWT

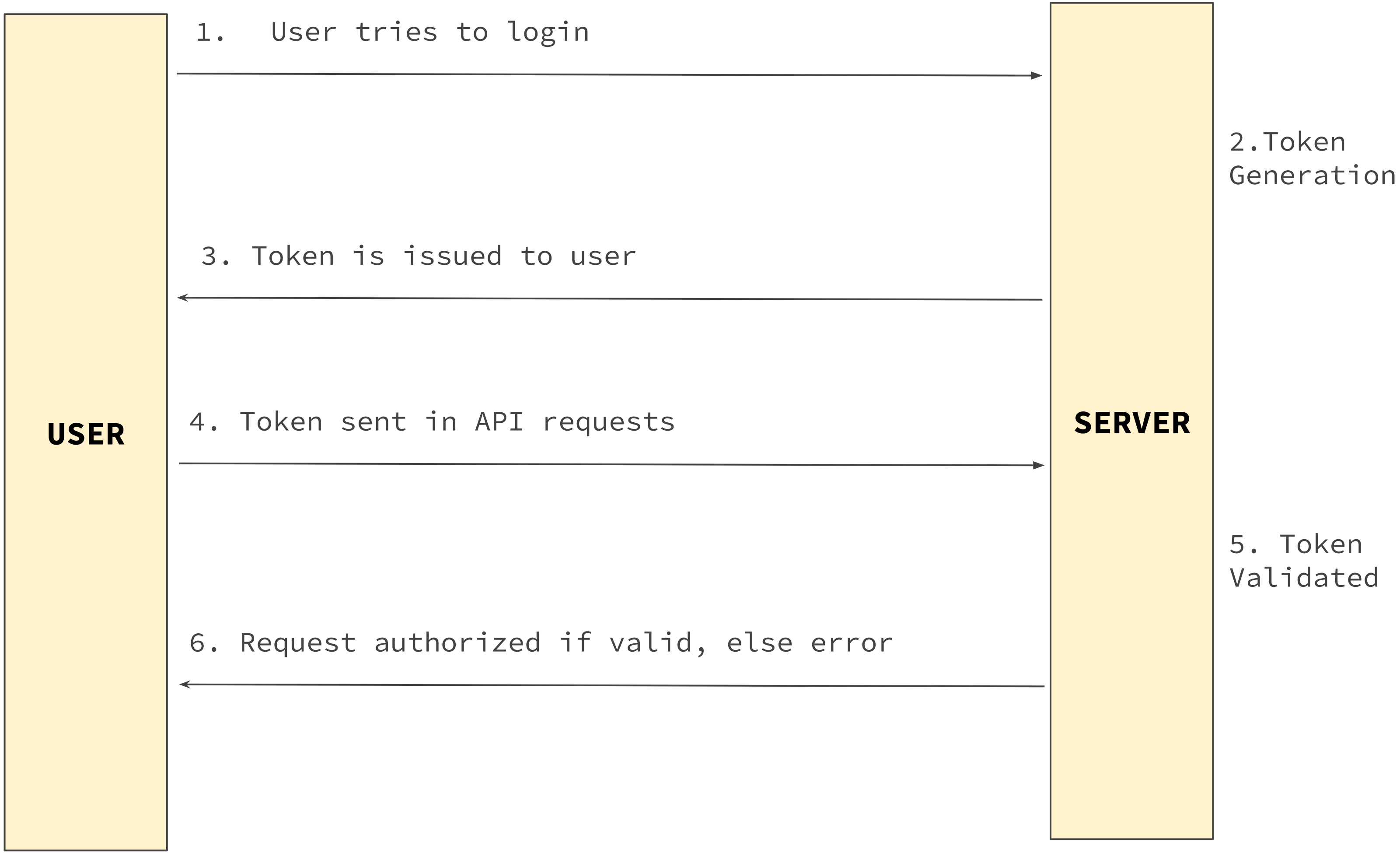
→ *No advanced features like expiration time*

→ *Can be decoded easily*

→ *Should we go for "Custom token system"*

JWT = **JSON Web Token**

JSON Web Tokens are an **open, industry standard**



USER
SERVER
1. User tries to login
2.Token Generation
3. Token is issued to user
4. Token sent in API requests
5. Token Validated
6. Request authorized if valid, else error

How is Token sent

Tokens are sent using HTTP Authorization header

Format

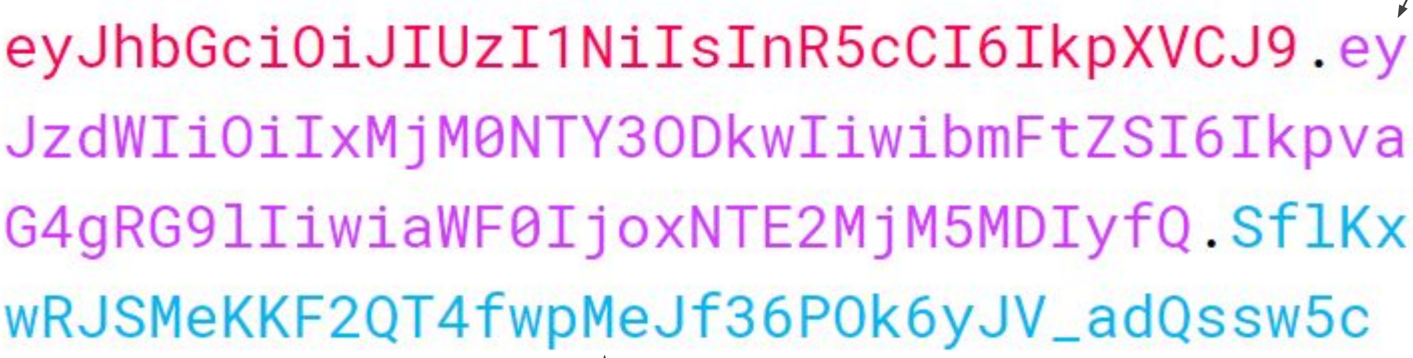
Authorization: Bearer <token>

Header

consists of signing what type, like jwt is u

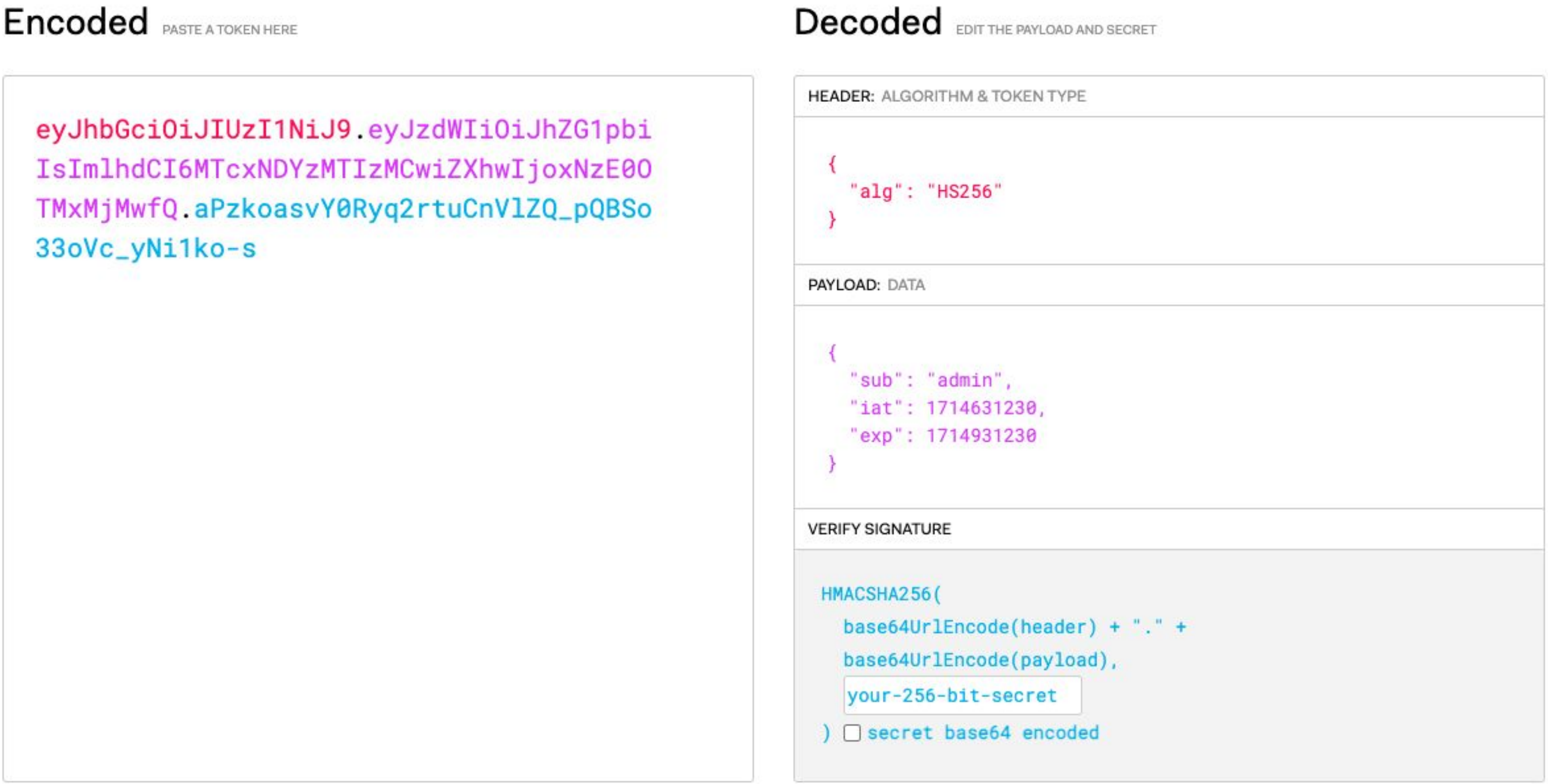
PAYLOAD

any metadat



```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.ey
JzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI6Ikpva
G4gRG9lIiwiaWF0IjoxNTE2MjM5MDIyfQ.SflKx
wRJSMeKKF2QT4fwpMeJf36POk6yJV_adQssw5c
```

VERIFY SIGNATURE



Encoded PASTE A TOKEN HERE

```
eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJhZG1pbi
IsImlhdCI6MTcxNDYzMTIzMCwiZXhwIjoxNzE0O
TMxMjMwfQ.aPzkoasvY0Ryq2rtuCnVlZQ_pQBSo
33oVc_yNi1ko-s
```

Decoded EDIT THE PAYLOAD AND SECRET

HEADER: ALGORITHM & TOKEN TYPE

```
{
  "alg": "HS256"
}
```

PAYLOAD: DATA

```
{
  "sub": "admin",
  "iat": 1714631230,
  "exp": 1714931230
}
```

VERIFY SIGNATURE

```
HMACSHA256(
  base64UrlEncode(header) + "." +
  base64UrlEncode(payload),
  your-256-bit-secret
) □ secret base64 encoded
```

Understanding Implementation of JWT

Faisal Memon (EmbarkX)

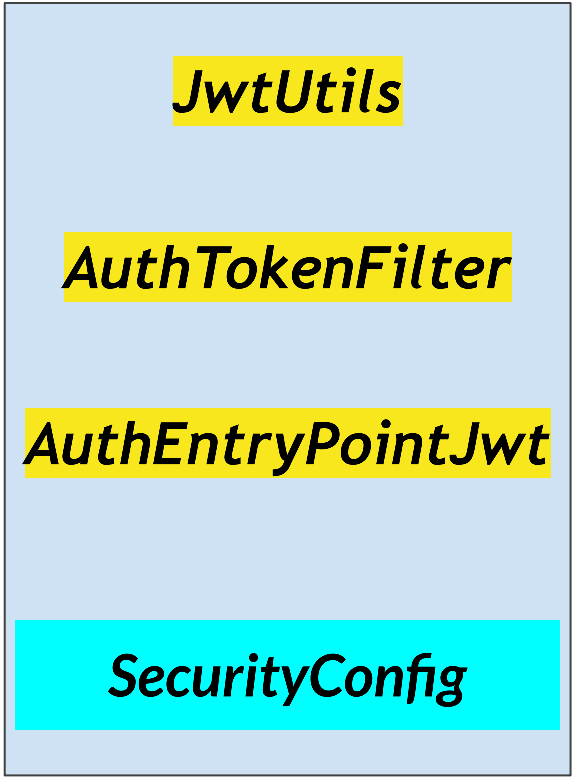
JwtUtils

AuthTokenFilter

AuthEntryPointJwt

SecurityConfig

Files we are going to need



JwtUtils

AuthTokenFilter

AuthEntryPointJwt

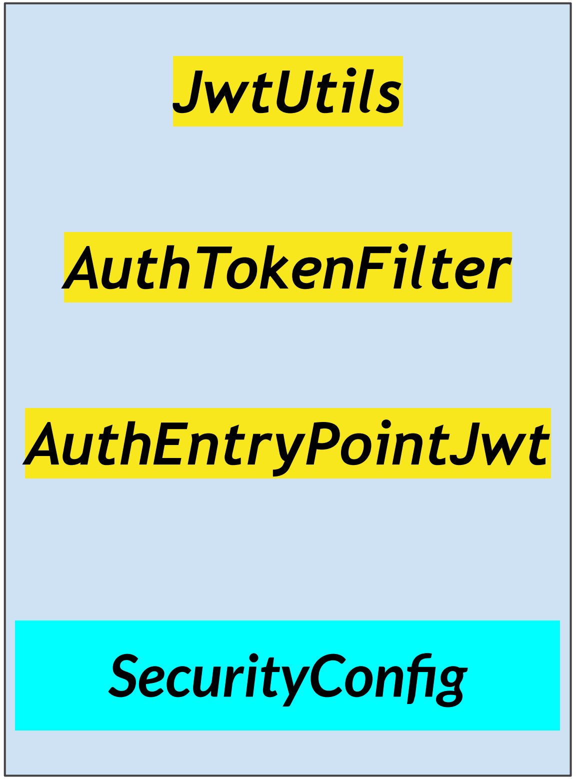
SecurityConfig

JwtUtils

→ Contains utility methods for generating, parsing, and validating JWTs.

our custom filter

→Include generating a token from a username, validating a JWT, and extracting the username from a token.



JwtUtils

AuthTokenFilter

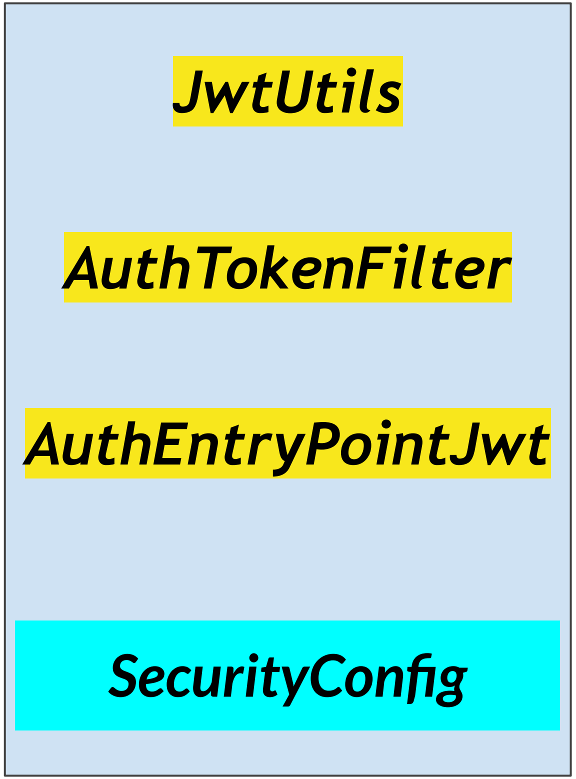
AuthEntryPointJwt

SecurityConfig

AuthTokenFilter

→ Filters incoming requests to check for a valid JWT in the header, setting the authentication context if the token is valid.

→Extracts JWT from request header, validates it, and configures the Spring Security context with user details if the token is valid.



JwtUtils

AuthTokenFilter

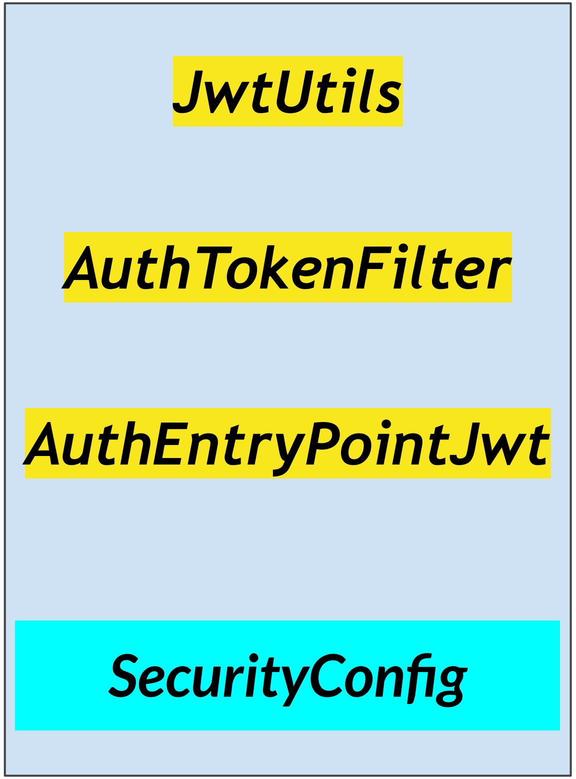
AuthEntryPointJwt

SecurityConfig

AuthEntryPointJwt

→ Provides custom handling for unauthorized requests, typically when authentication is required but not supplied or valid.

→When an unauthorized request is detected, it logs the error and returns a JSON response with an error message, status code, and the path attempted.



JwtUtils

AuthTokenFilter

AuthEntryPointJwt

SecurityConfig

SecurityConfig

→ Configures Spring Security filters and rules for the application

→Sets up the security filter chain, permitting or denying access based on paths and roles. It also configures session management to stateless, which is crucial for JWT usage.

Authentication Controller

Faisal Memon (EmbarkX)

API Name	Endpoint	Metho d	Purpose	Request Body	Request Parameters	Response
Sign In	`/signin`	`POST`	Authenticate a user	`LoginRequest` (JSON)	-	`UserInfoResponse` (JSON), `HttpStatus.OK`
Sign Up	`/signup`	`POST`	Register a new user	`SignupRequest` (JSON)	-	`MessageResponse` (JSON), `HttpStatus.OK`
Sign Out	`/signout`	`POST`	Sign out the user	-	-	`MessageResponse` (JSON), `HttpStatus.OK`
Current Username	`/username` first screen after logging	`GET`	Retrieve the username of the authenticated user	-	-	`String` (username), `HttpStatus.OK`
User Info	`/user`	`GET`	Retrieve user information	-	-	`UserInfoResponse` (JSON), `HttpStatus.OK`
All Sellers	`/sellers`	`GET`	Retrieve a paginated list of sellers	-	`pageNumber` (Query Parameter)	`UserResponse` (JSON), `HttpStatus.OK`

Jwt Cookie Based Auth

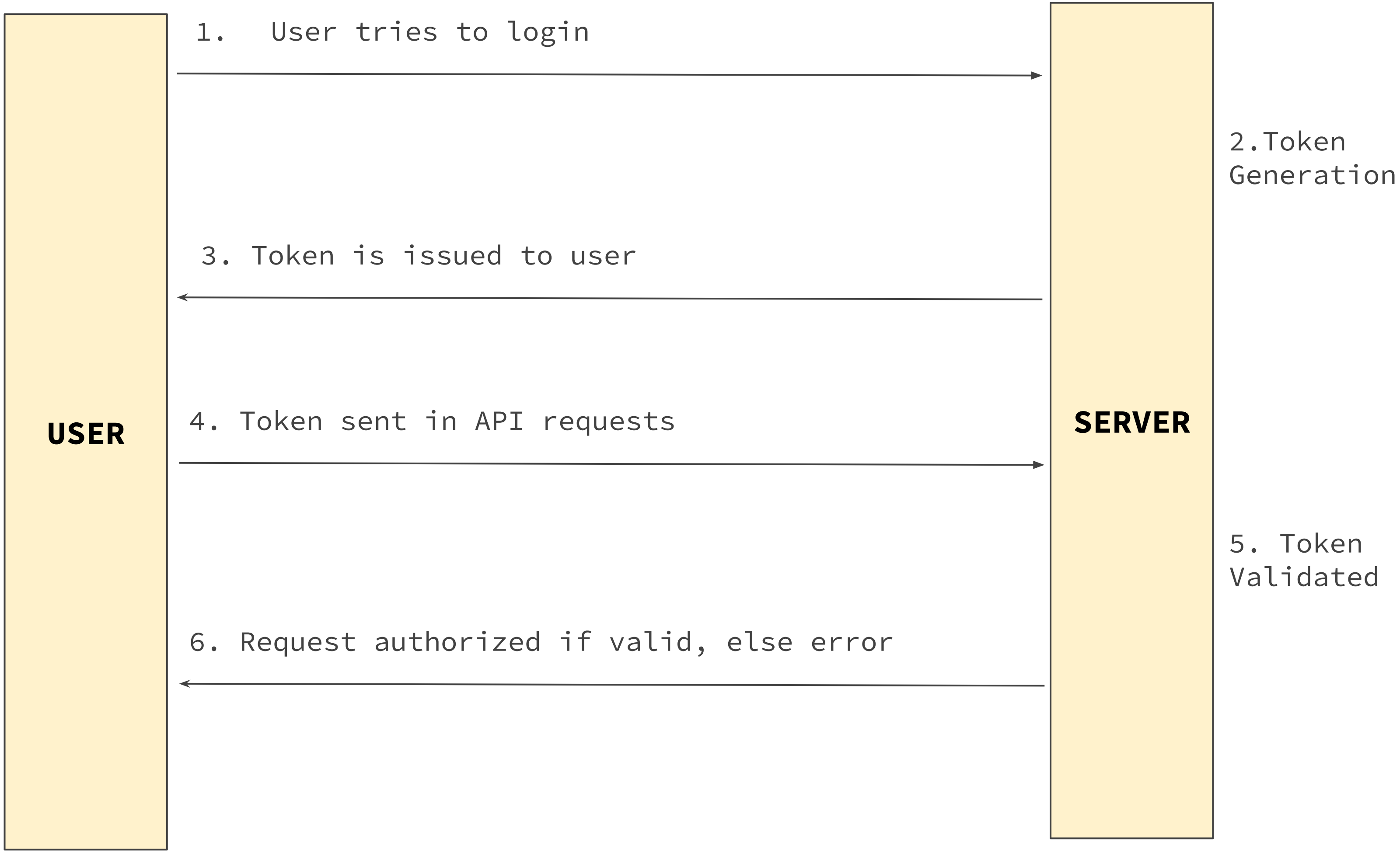
Faisal Memon (EmbarkX)

Bearer tokens need to be added **explicitly** to the HTTP request

Format

Authorization: Bearer <token>

Browser will **automatically** send cookies



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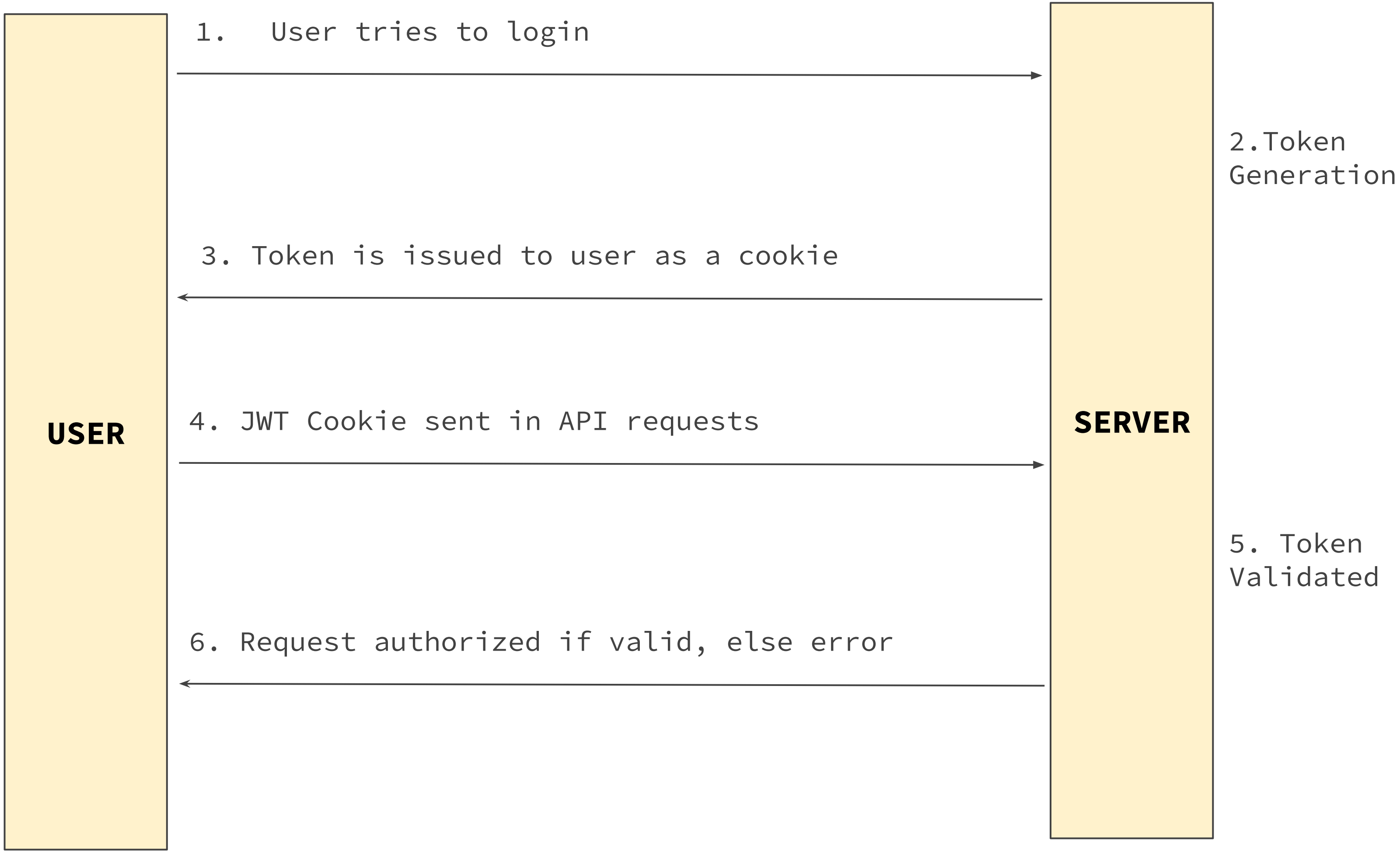


USER

SERVER

1. User tries to login

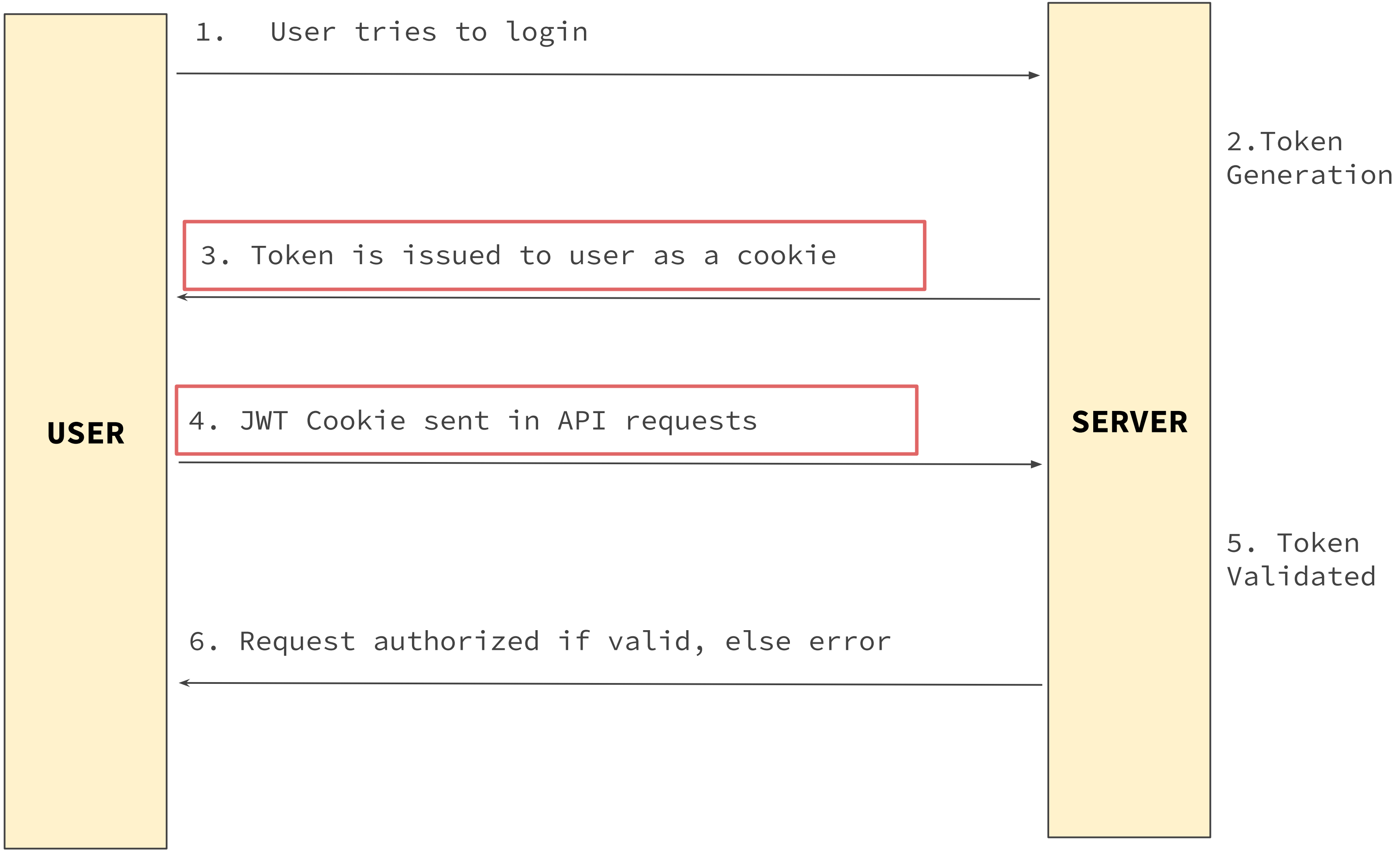
2.Token Generation

3. Token is issued to user as a cookie

4. JWT Cookie sent in API requests

5. Token Validated

6. Request authorized if valid, else error



USER

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1. User tries to login

2.Token Generation

3. Token is issued to user as a cookie

4. JWT Cookie sent in API requests

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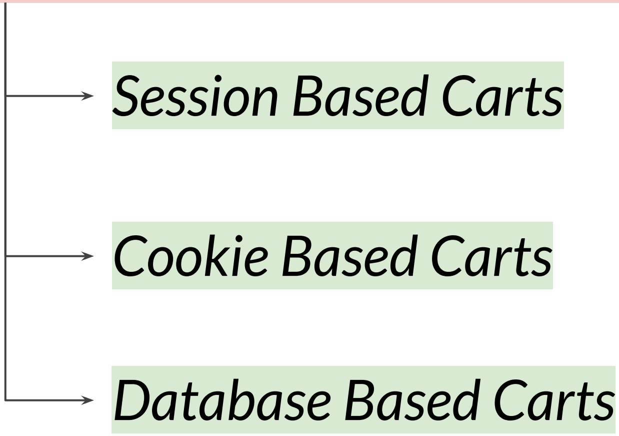
Thinking About Shopping Cart

Faisal Memon (EmbarkX)

Shopping Cart allows users to select and store items they wish to purchase

Ways to Implement Shopping Carts



- Session Based Carts
- Cookie Based Carts
- Database Based Carts

Shopping Carts

Session-Based Carts

Cart's contents are stored in the user's session. If session expires, data is lost.

Cookie-Based Carts

Cart data is stored in cookies on the user's browser.

Database-Based Carts

Cart data is stored on the server side, within a database. This approach is scalable, secure, and allows for advanced features like cart recovery, detailed analytics, and cross-device accessibility.

We Will Use **Database Based** Carts

Advantages of Database-Based Carts

→ *Persistence and Reliability*

→ *Scalability*

→ *Enhanced Features*

→ *Security*

→ *User Experience*

Thank you

Designing Cart Module

Faisal Memon (EmbarkX)

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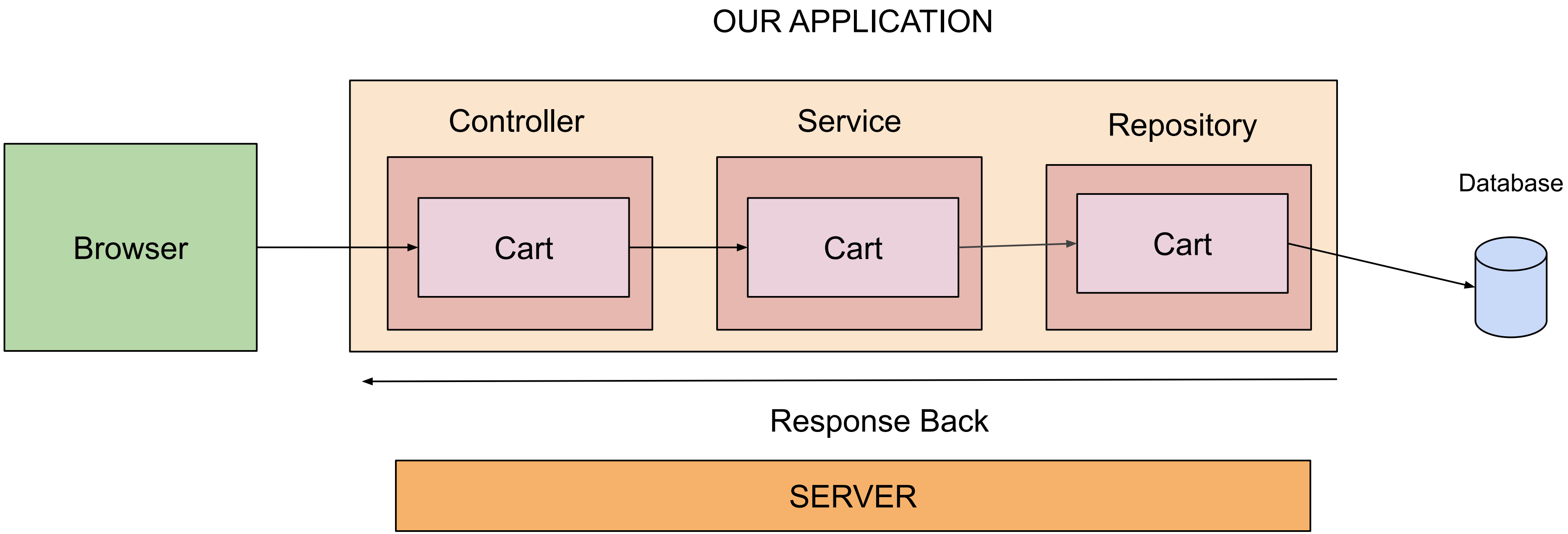

API Name	Endpoint	Method	Purpose	Request Body	Request Parameters	Response
Add Product to Cart	/api/carts/products/{productId}/quantity/{quantity}	POST	Adds a specified product and quantity to the user's cart.	None	productId: Long, quantity: Integer	CartDTO (JSON)
Get All Carts	/api/carts	GET	Retrieves a list of all carts.	None	None	List of CartDTO (JSON)
Get User's Cart	/api/carts/users/cart	GET	Retrieves the cart of the logged-in user.	None	None	CartDTO (JSON)
Update Product Quantity	/api/cart/products/{productId}/quantity/{operation}	PUT	Updates the quantity of a specific product in the cart.	None	productId: Long, operation: String	CartDTO (JSON)
Delete Product from Cart	/api/carts/{cartId}/product/{productId}	DELETE	Removes a specific product from the user's cart.	None	cartId: Long, productId: Long	String (Status message)

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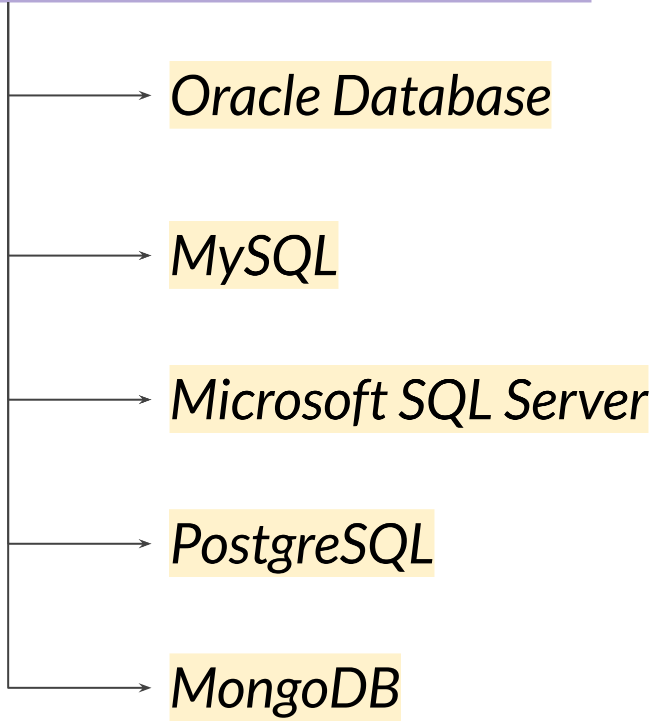
Different Databases and Magic of JPA

Faisal Memon (EmbarkX)

Database Vendor

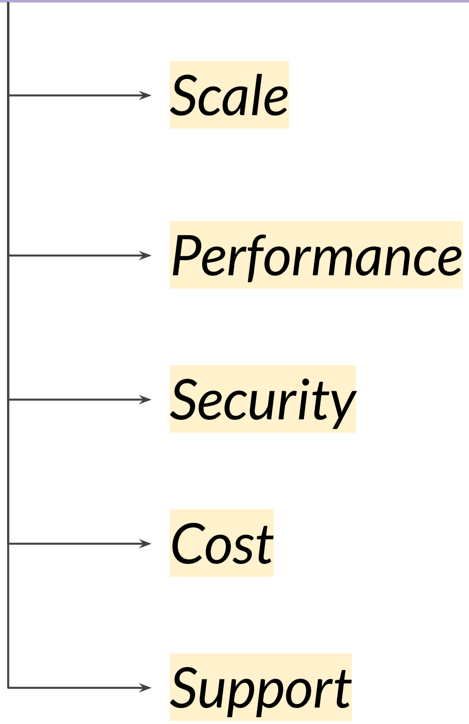
A database vendor is a company or organization that develops and maintains a database management system

Types of Vendors



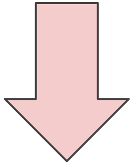
- Oracle Database
- MySQL
- Microsoft SQL Server
- PostgreSQL
- MongoDB

Choosing the right vendor



- *Scale*
- *Performance*
- *Security*
- *Cost*
- *Support*

```
class Category {
    Long categoryId;
    String categoryName;
}
```



categoryId	**categoryName**
1	Senior Software Engineer

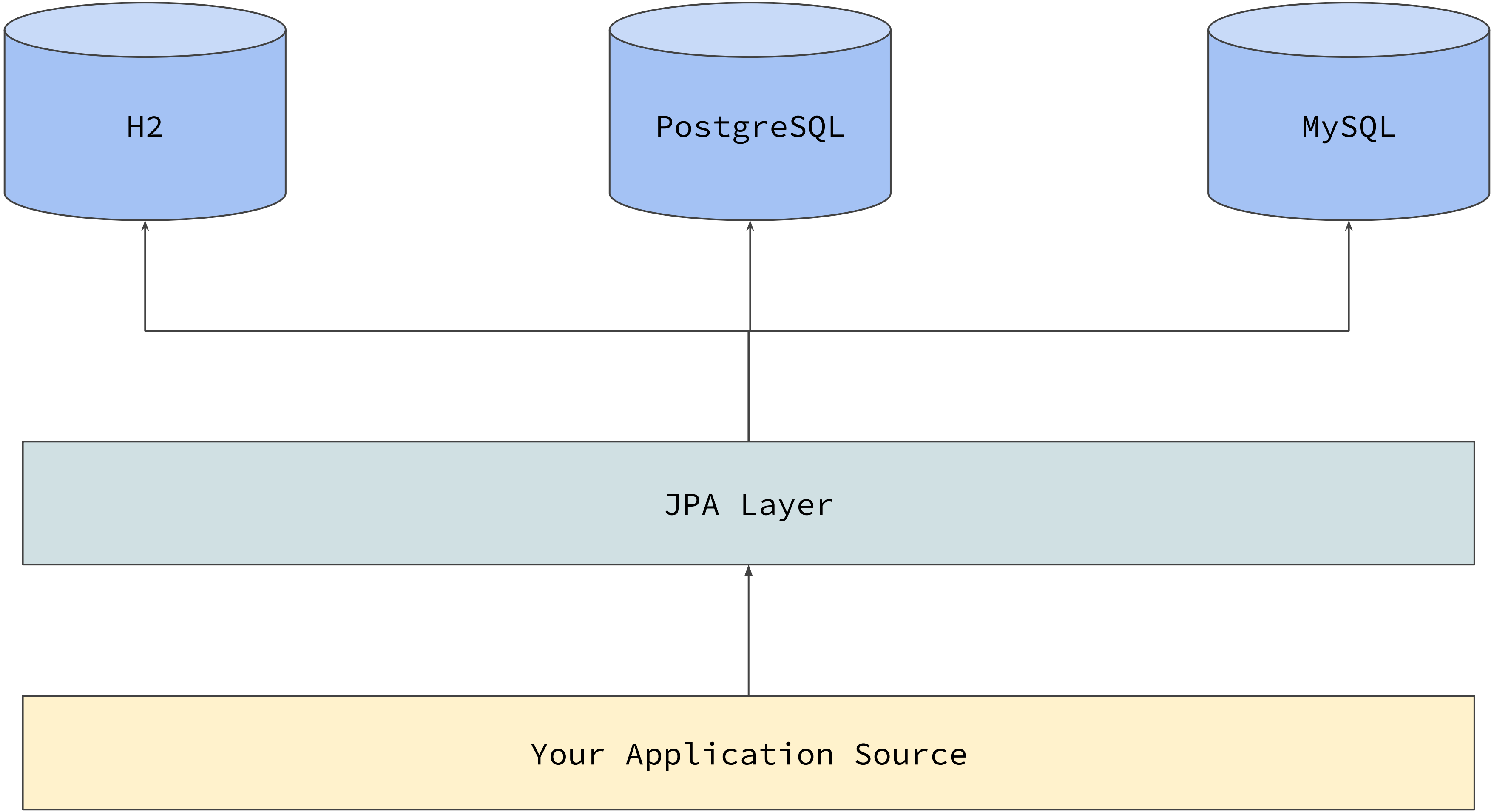
Advantages of using JPA

→ *Easy and Simple*

→ *Makes querying easier*

→ *Allows to save and update objects*

→ *Easy integration with Spring Boot*



H2

PostgreSQL

MySQL

JPA Layer

Your Application Source

Configuration for MySQL

```
spring.datasource.url=jdbc:mysql://localhost:3306/ecommerce
spring.datasource.username=root
spring.datasource.password=<your-password>

spring.jpa.hibernate.ddl-auto=update
spring.jpa.show-sql=true
spring.jpa.properties.hibernate.dialect=org.hibernate.dialect.MySQLDialect
```

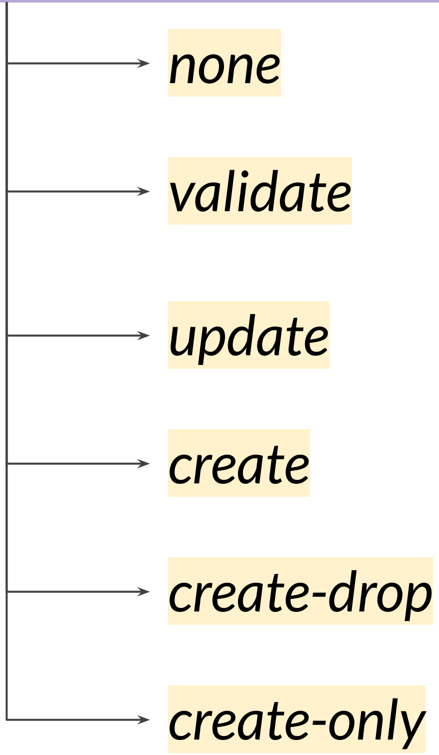
Thank you

Database Schema Management

Faisal Memon (EmbarkX)

```
spring.jpa.hibernate.ddl-auto=update
```

Possible Values



- none
- validate
- update
- create
- create-drop
- create-only

Value	**Description**	**When to Use**
none	Hibernate does not perform any schema generation or modification.	Use this in production environments where schema changes are managed manually or through migrations.
validate	Hibernate validates the schema against the entities. It checks if the tables and columns in the database schema match the entities. If there is a mismatch, an exception is thrown, and the application fails to start.	Use this in production environments to ensure the schema matches the entity mappings without making changes.
update	Hibernate updates the database schema to match the entities. It adds new columns and tables as necessary, but it does not remove or modify existing columns and tables.	Use this in development and testing environments where you want the schema to evolve with the entity mappings without losing data.

Value	Description	When to Use
create	Hibernate drops the existing schema (tables) and creates a new schema based on the entity mappings. This means that all data in the existing tables will be lost.	Use this in development and testing environments where you need to start with a fresh schema on every run.
create-drop	Similar to create, but in addition, Hibernate drops the schema when the SessionFactory is closed, typically when the application shuts down.	Use this in unit tests or short-lived applications where you need a fresh schema on every run and don't need to keep the data after the application ends.
create-only	Hibernate creates the schema, but does not drop it when the session factory is closed.	Use this when you need to create the schema initially but want to handle cleanup or further management manually.

Thinking About Managing Addresses

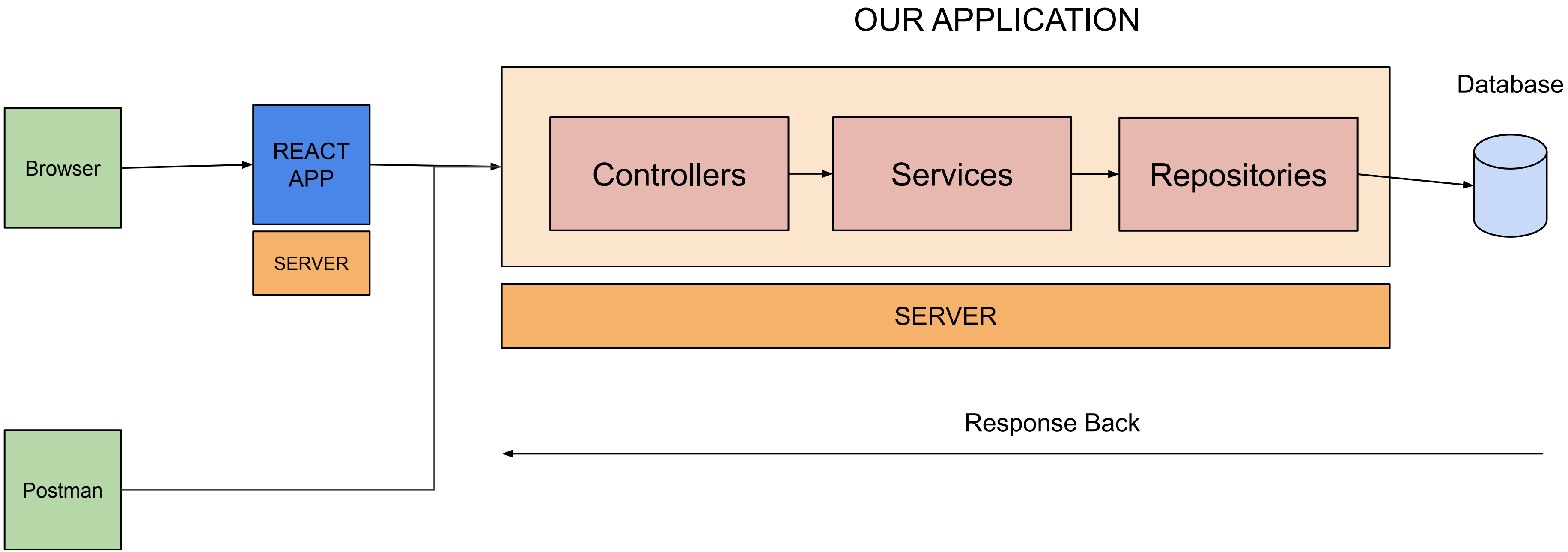
Faisal Memon (EmbarkX)

API Name	Endpoint	Method	Purpose	Request Body	Request Parameters	Response
Create Address	/addresses	POST	Create a new address	AddressDTO	None	AddressDTO with HttpStatus.CREATED
Get All Addresses	/addresses	GET	Retrieve all addresses	None	None	List of AddressDTO with HttpStatus.OK
Get Address by ID	/addresses/{addressId}	GET	Retrieve an address by its ID	None	Path: addressId (Long)	AddressDTO with HttpStatus.OK
Get Address by User	/users/addresses	GET	Retrieve the logged-in user's address	None	None	AddressDTO with HttpStatus.OK

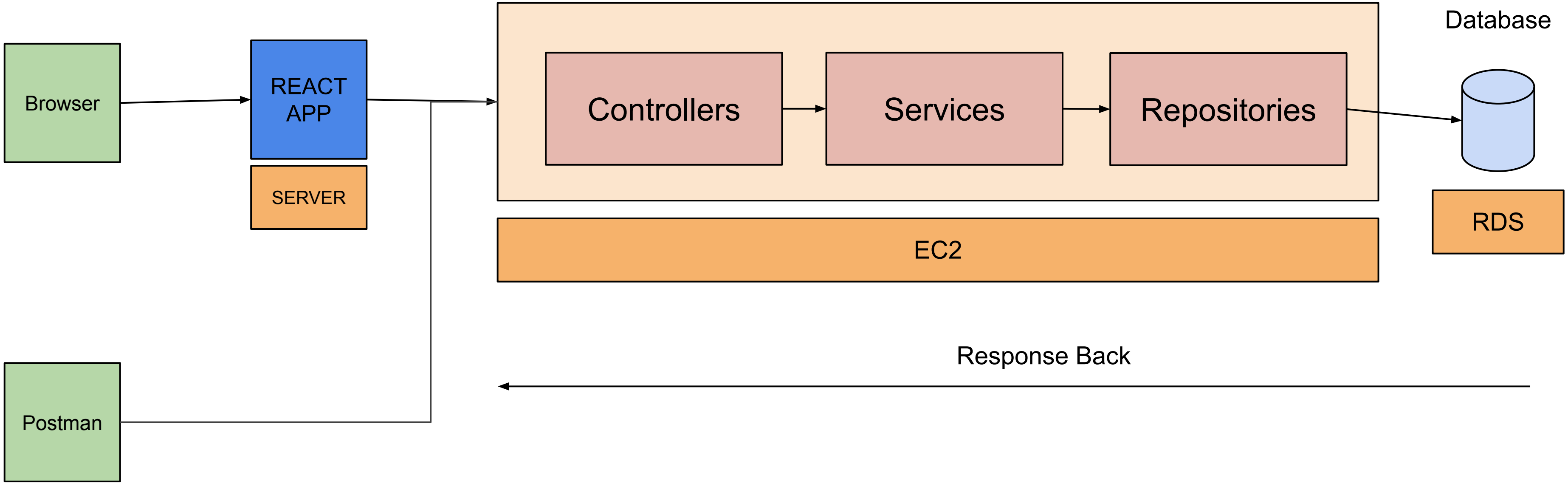
API Name	Endpoint	Method	Purpose	Request Body	Request Parameters	Response
Update Address	/addresses/{addressId}	PUT	Update an existing address by its ID	Address	Path: addressId (Long)	AddressDTO with HttpStatus.OK
Delete Address	/addresses/{addressId}	DELETE	Delete an address by its ID	None	Path: addressId (Long)	Status message with HttpStatus.OK

Understanding Deployments

Faisal Memon (EmbarkX)


OUR APPLICATION
Browser
REACT APP
SERVER
Controllers
Services
Repositories
Database
SERVER
Response Back
Postman

OUR APPLICATION



Browser

REACT APP

SERVER

Postman

Controllers

Services

Repositories

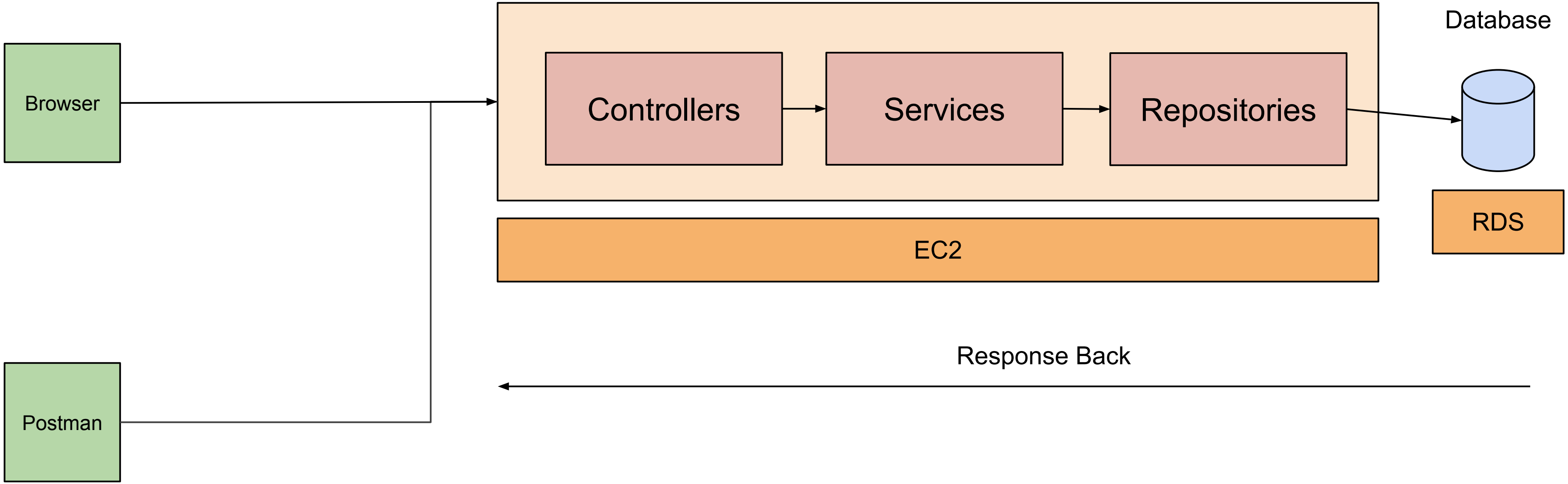
EC2

Database

RDS

Response Back

OUR APPLICATION



Browser

Postman

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EC2

Database

RDS

Response Back

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We appreciate your **support** and look forward to hearing your **thoughts**!