

Spring Data Introduction

Spring Data, Repositories, Services



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Framework

Framework

- Platform for **developing software applications**
- Provides a **foundation** on which **software developers** can **build programs** for a **specific platform**
- Similar **to an API**
 - A Framework **includes an API**
- May include **code libraries**, a **compiler**, and other programs **used in the software development process**





Web Frameworks

Web Frameworks

- Software framework
- Designed to **support the development of web applications**
 - Web Services
 - Web Resources
 - Web APIs
- Provide **a standard way to build and deploy web applications**



Server-side Web Frameworks

- Software frameworks that make it **easier to write, maintain and scale web applications**
- Provides **tools and libraries** that simplify common web development tasks
- Example
 - **Spring MVC**
 - **ASP.NET**
 - **Symfony**



Client-side Web Frameworks

- **JavaScript library**
- Runs in a **Web browser**
- Provides developers with **tried and tested tools** for **building** scalable, interactive **web applications**
- Example
 - **Angular**
 - **ReactJS**
 - **VueJS**





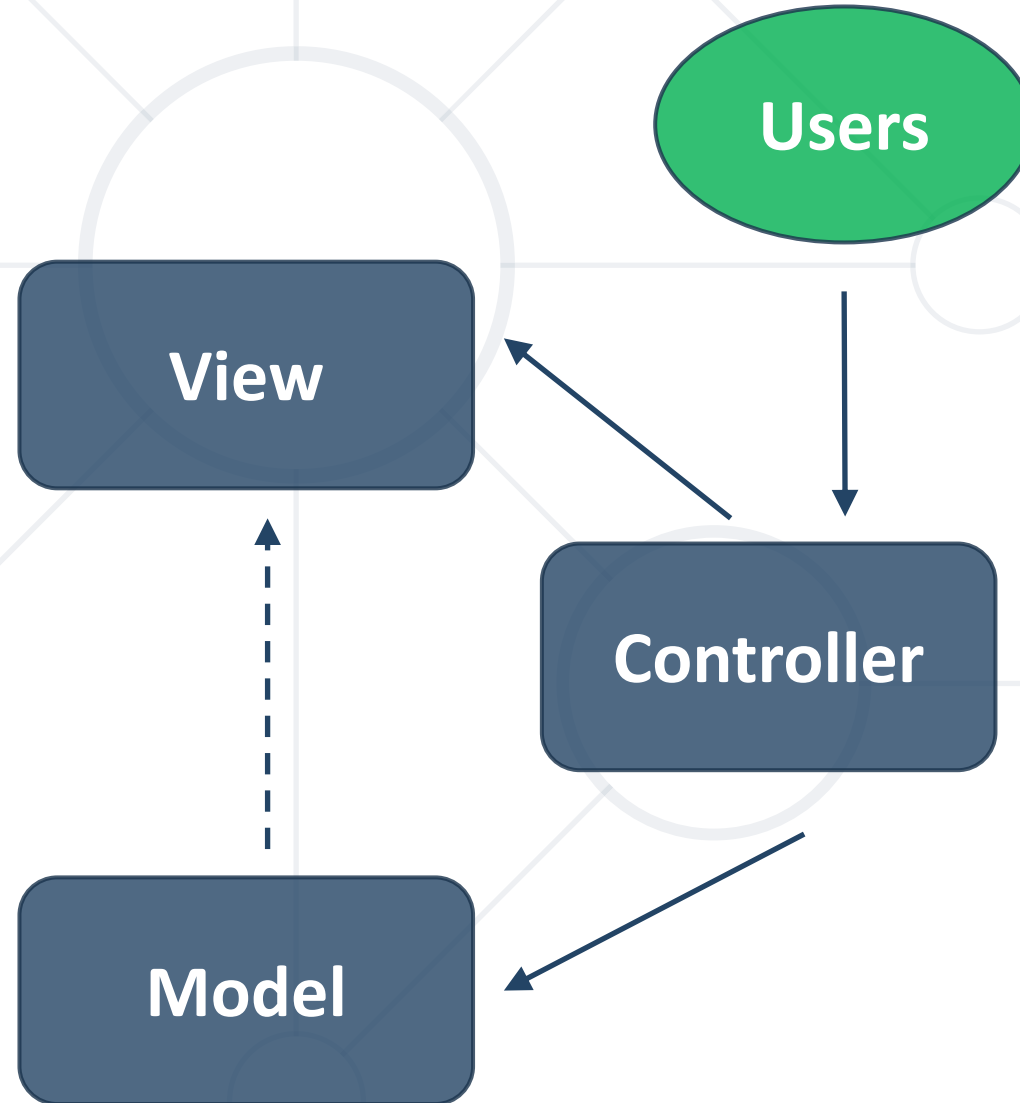
Framework Design Patterns

Design Patterns

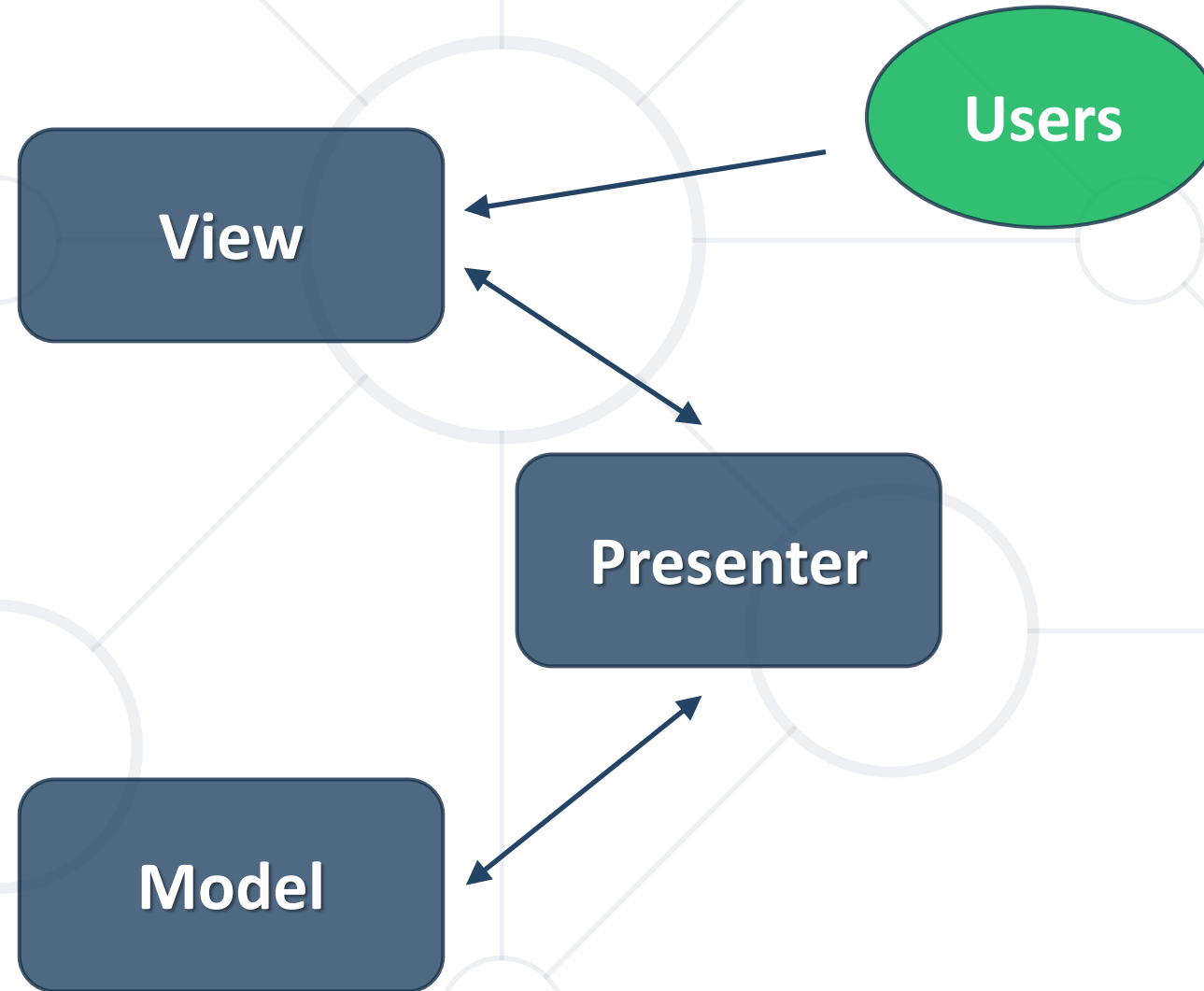
- Model–View–Controller (**MVC**)
 - **Divides** an application into **three major aspects**: Model, View, and Controller
- Model-View-Presenter (**MVP**)
 - It is **derived from MVC pattern**, wherein the controller is replaced by the presenter
- Model-View-ViewModel (**MVVM**)
 - **Two-way data binding** between View and View-Model



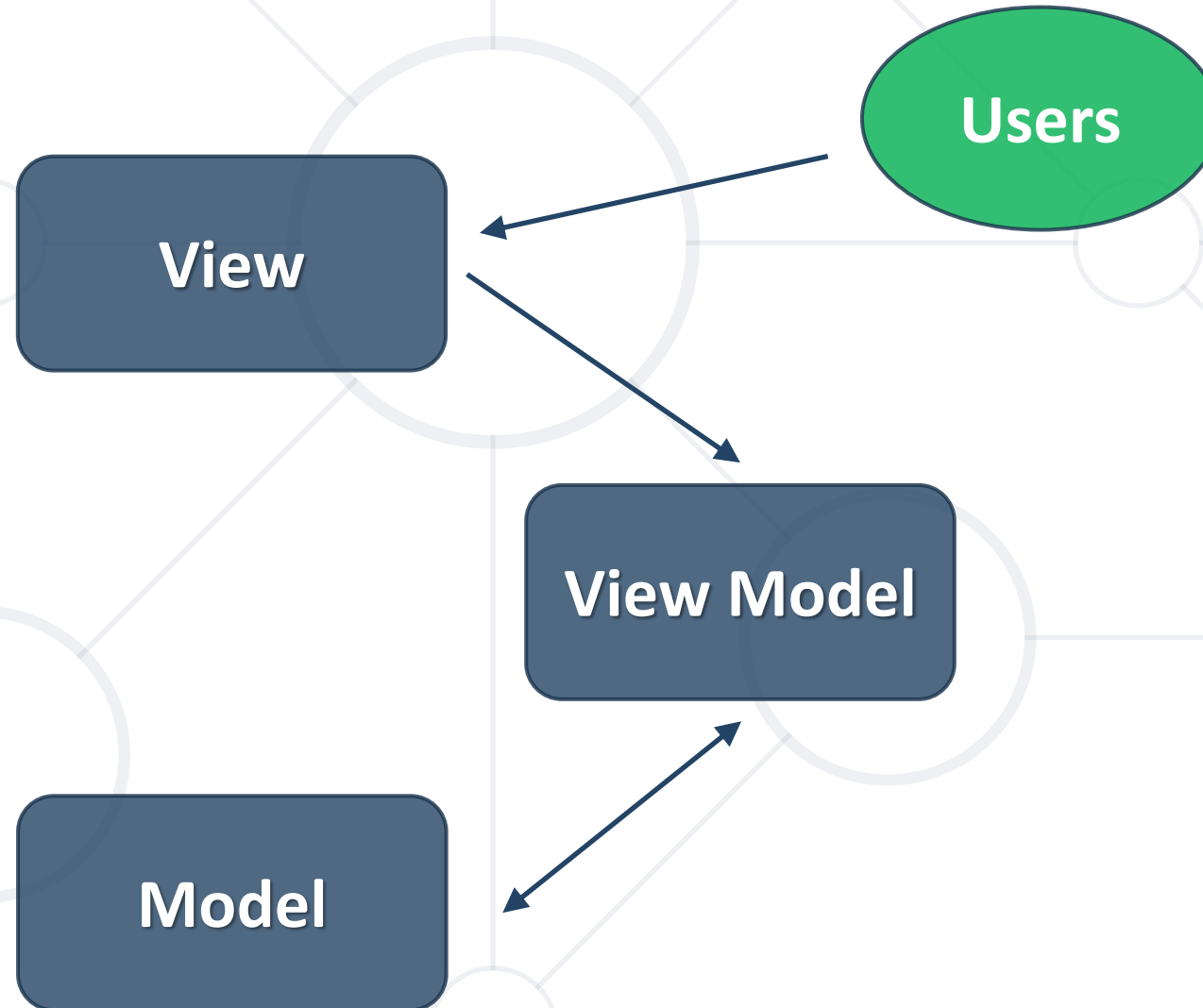
Design Pattern: MVC



Design Pattern: MVP



Design Pattern: MVVM





Spring Platform

Spring Platform

- Spring makes **programming Java quicker, easier, and safer for everybody**
- Spring's **focus is on speed, simplicity, and productivity** built by multiple Spring Projects
 - Spring **Boot**
 - Spring **Framework**
 - Spring **Data**



Spring Module (1)

- Spring **Core Container**
 - The base module of Spring and provides Spring containers
- **Aspect-Oriented Programming**
 - Enables implementing cross-cutting concerns
- **Authentication and Authorization**



Spring Module (2)

- **Data Access**
 - Working with **RDBMS** using **JDBC** and **ORM** tools
- **IoC Container**
 - Configuration of application **components and lifecycle management of Java objects**, done mainly via **dependency injection**
- **Testing**
 - Support classes for writing **unit tests and integration tests**





Spring Projects

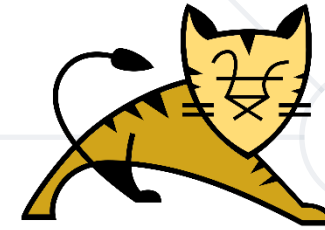
- Spring **Boot**
 - Makes it easy to **create stand-alone, production-grade Spring based Applications**
- Spring **Framework**
 - Provides a **comprehensive programming and configuration model** for modern Java-based enterprise applications - on any kind of deployment platform

- Spring **Data**
 - Spring Data's mission is to **provide a familiar and consistent, Spring-based programming model for data access** while still retaining the special traits of the underlying data store
- Spring **Cloud**
 - Spring Cloud **provides tools for developers to quickly build** some of the **common patterns in distributed systems**



Spring Boot

- **Opinionated view** of building production-ready Spring applications



Tomcat



maven

pom.xml



Auto configuration



Spring Framework

Spring Framework

- **Open-Source Application framework** and **inversion of control container** for the Java platform
- Core features can be used by any Java application **extensions** for building web applications **on top of the Java EE**



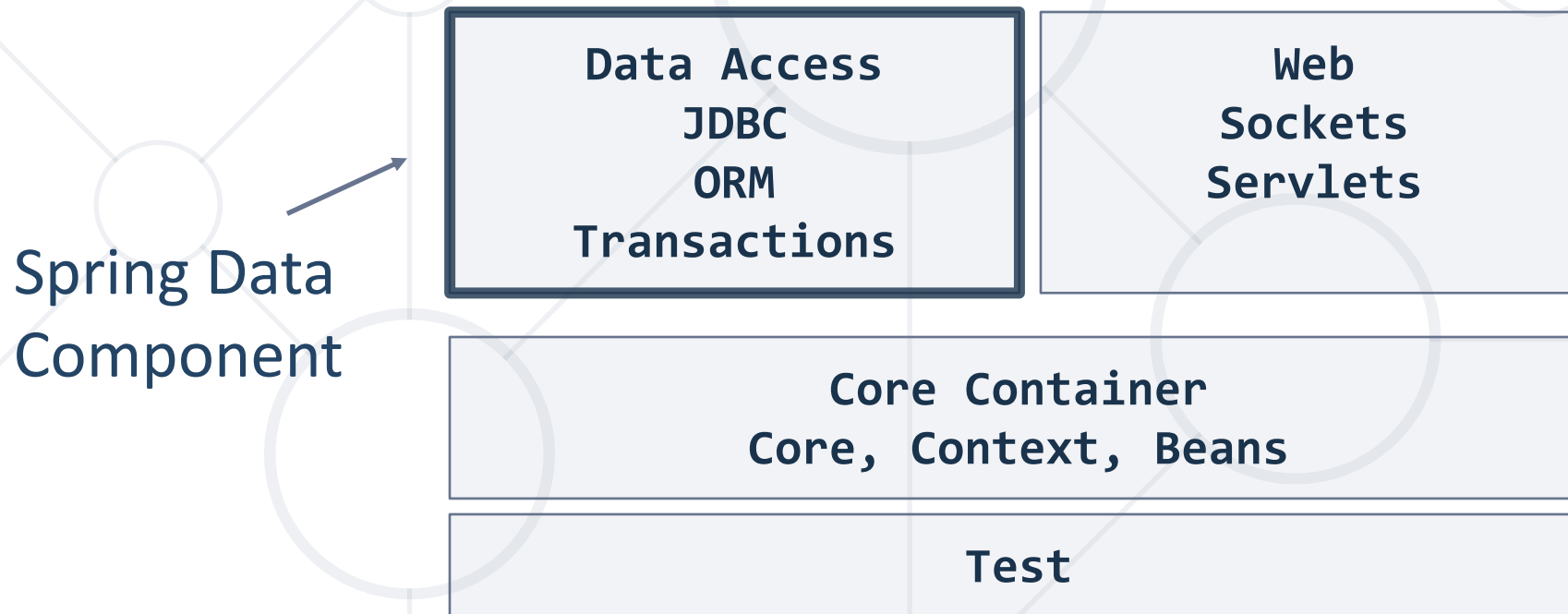


Spring Data Framework

Spring Framework Ecosystem

What is Spring Framework

- Application framework for the Java Platform
 - Technology stack - includes several modules that provide a range of services

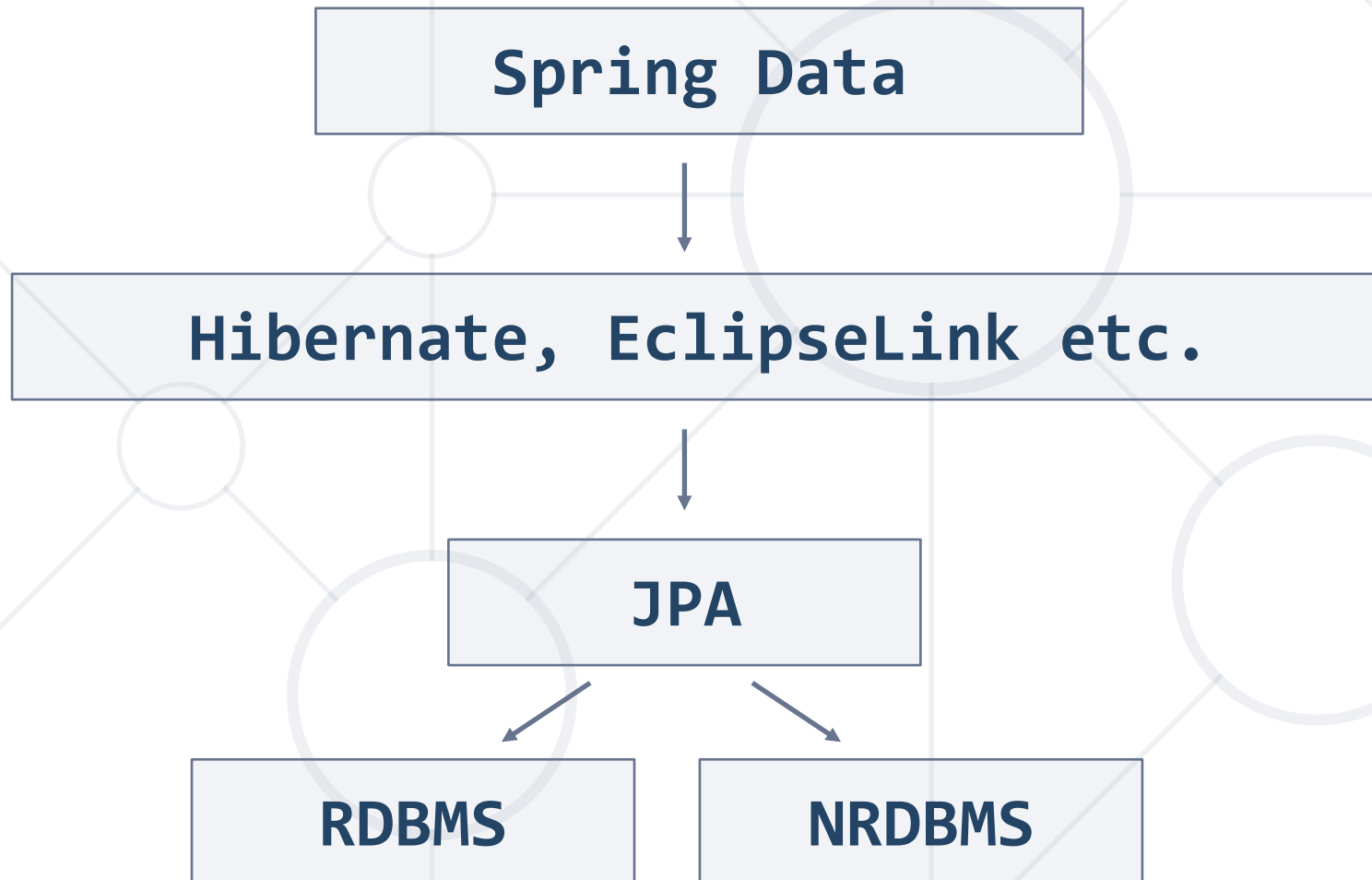


Spring Framework Overview

What is Spring Data

- Library that adds an **extra layer of abstraction** on the top of our JPA provider
- Provides:
 - Dynamic query derivation from repository method names
 - Possibility to integrate custom repositories and many more
- What Spring Data is not:
 - **Spring Data JPA is not a JPA provider**





Extra layer of abstraction
over the used ORM

- Creates stand-alone Spring applications
 - Provide opinionated 'starter' POMs to simplify your Maven configuration
- Automatically configure Spring whenever possible
- Absolutely no code generation and no requirement for XML configuration

pom.xml

```
<parent>  
  <groupId>org.springframework.boot</groupId>  
  <artifactId>spring-boot-starter-parent</artifactId>  
</parent>
```

Dependencies (2)

pom.xml

```
<dependencies>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-data-jpa</artifactId>
  </dependency>

  <dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
    <scope>runtime</scope>
  </dependency>
</dependencies>
```

Spring Data

MySQL Connector

pom.xml

```
<build>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-compiler-plugin</artifactId>
      <version>3.8.0</version>
      <configuration>
        <source>16</source>
        <target>16</target>
      </configuration>
    </plugin>
  </plugins>
</build>
```

Java compile
version

Configuration (1)

- Spring boot configurations are held in an **application.properties** file

application.properties

#Data Source Properties

```
spring.datasource.driverClassName =  
com.mysql.cj.jdbc.Driver  
spring.datasource.url =  
jdbc:mysql://localhost:3306/school?useSSL=false  
spring.datasource.username = root  
spring.datasource.password = 12345
```

Database Connection

#JPA Properties

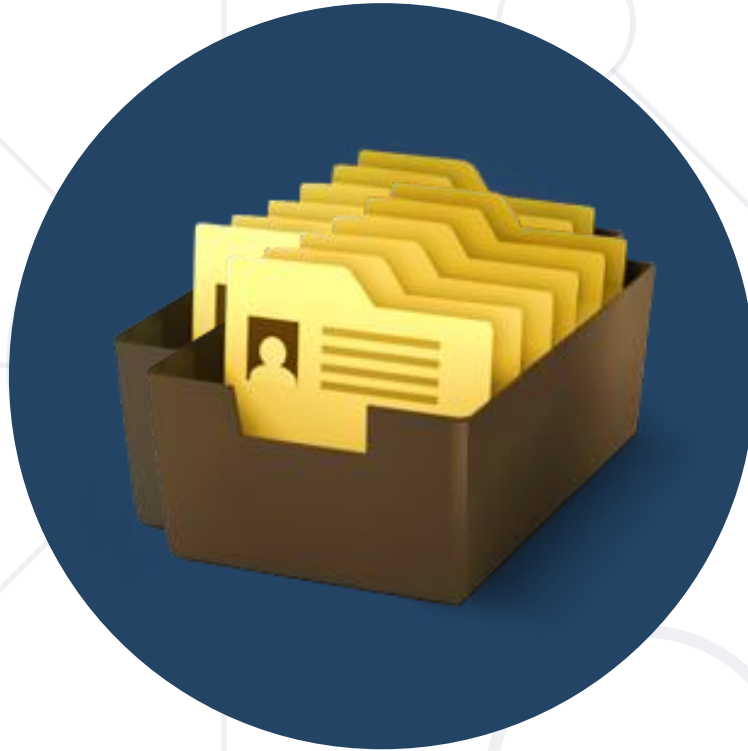
```
spring.jpa.properties.hibernate.dialect =  
org.hibernate.dialect.MySQL8Dialect  
spring.jpa.properties.hibernate.format_sql = TRUE  
spring.jpa.hibernate.ddl-auto = create-drop
```

JPA properties

application.properties

```
...  
###Logging Levels  
# Disable the default loggers  
logging.level.org = WARN  
logging.level.blog = WARN  
  
#Show SQL executed with parameter bindings  
logging.level.org.hibernate.SQL = DEBUG  
logging.level.org.hibernate.type.descriptor = TRACE
```

Login settings



Spring Data Repositories

Spring Framework Ecosystem

- Abstraction to significantly reduce the amount of boilerplate code required to implement data access layers
 - Perform CRUD Operations
 - Automatically generates JPQL/SQL code
 - Highly customizable



Built-in CRUD Operations

JPA REPOSITORY

- `<S extends T> S save(S var1);`
- `<S extends T> Iterable<S> save(Iterable<S> var1);`
- `T findOne(ID var1);`
- `boolean exists(ID var1);`
- `Iterable<T> findAll();`
- `long count();`
- `void delete(ID var1);`
- `void deleteAll();`
- ...





Spring Data Query Creation

Building Mechanism

- Queries are created via a query builder mechanism built into Spring Data
 - Strips the prefixes like **find...By**, **read...By**, **query...By** and starts parsing the rest of it
- Spring Data JPA will do a property check and traverse nested properties



Custom CRUD Operations

StudentRepository.java

```
@Repository
public interface StudentRepository extends
JpaRepository<Student, Long> {
    List<Student> findByMajor(Major major);
}
```

Custom method



SQL

```
SELECT s.*
FROM students AS s
INNER JOIN majors AS m
ON s.major_id = m.id
WHERE m.id = ?
```

Query Lookup Strategies

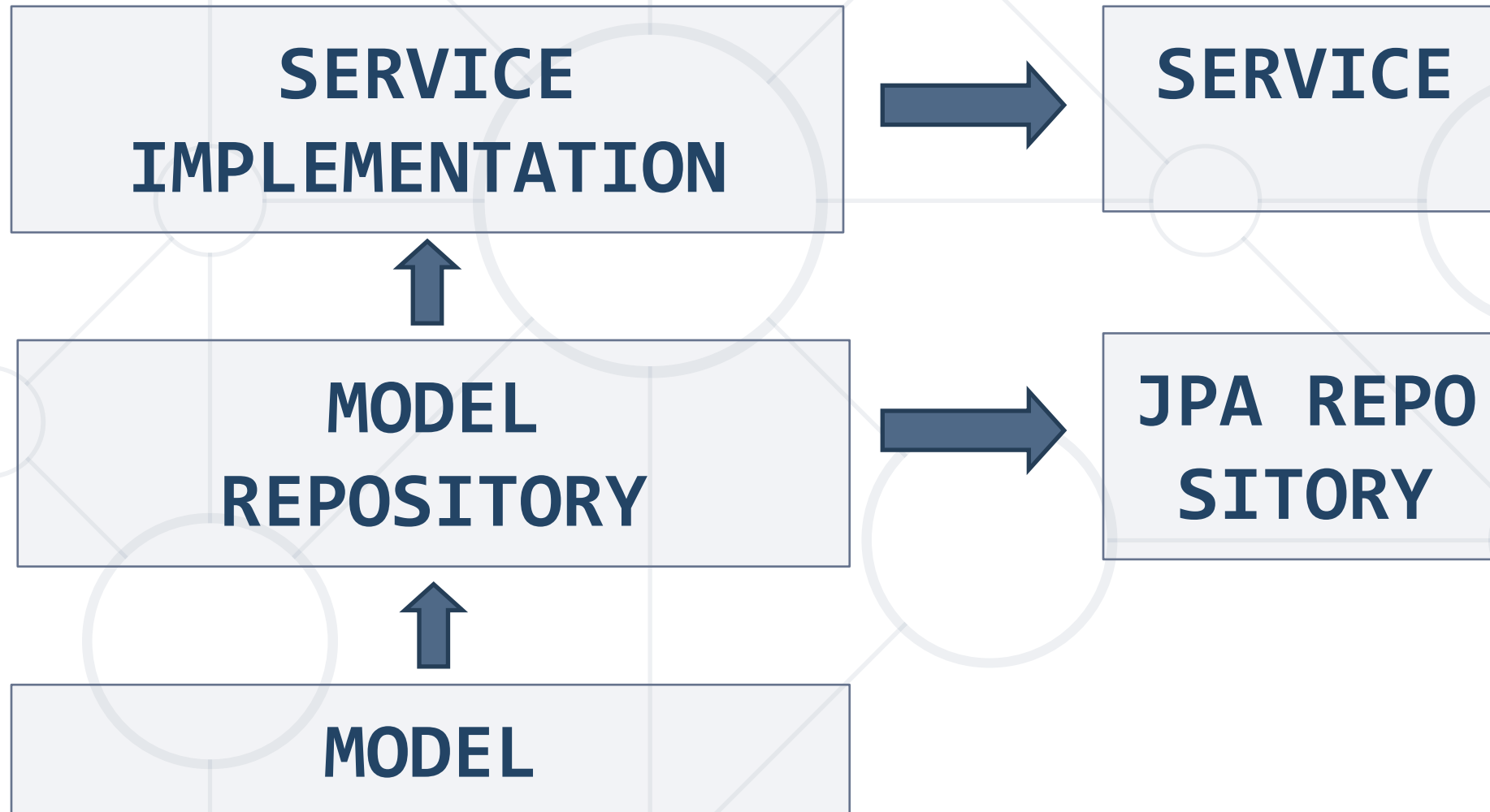
Keyword	Sample	JPQL
And	findByLastnameAndFirstName	... where x.last_name = ?1 and x.firstname = ?2
Or	findByLastnameOrFirstname	... where x.lastname = ?1 or x.firstname = ?2
Between	findByStartDateBetween	... where x.startDate between 1? and ?2
LessThan	findByAgeLessThan	... where x.age < ?1
Containing	findByFirstnameContaining	... where x.firstname like ?1 (parameter bound wrapped in %)
In	findByAgeIn(Collection<Age> ages)	... where x.age in ?1



Spring Data Services

Encapsulating Business Logic

- Service Layer is a design pattern of organizing business logic into layers
 - Service classes are categorized into a particular layer and share functionality
- Main concept is **not exposing details** of internal processes on entities
 - Services **interact closely** with Repositories



StudentService.java

```
public interface StudentService {  
    void register(Student student);  
    void expel(Student student);  
    void expel(long id);  
    Student findStudent(long id);  
    List<Student> findSampleByMajor(Major major);  
}
```

Business Logic

StudentServiceImpl.java

```
@Service
public class StudentServiceImpl implements StudentService {

    @Autowired
    private StudentRepository studentRepository;

    @Override
    public void register(Student student) {
        studentRepository.save(student);
    }

    @Override
    public void expel(Student student) {
        studentRepository.delete(student);
    }
}
```

Service Implementation

StudentRepository
injection

Method implementation

MainApplication.java

```
@SpringBootApplication
public class MainApplication {
    public static void main(String[] args) {
        SpringApplication.run(MainApplication.class, args);
    }
}
```

Spring Boot Entry Point

CommandLineRunner.java

@Component

Component

public class ConsoleRunner implements CommandLineRunner {

@Autowired

private StudentService studentService;

Student service

@Autowired

private MajorService majorService;

Major service

@Override

public void run(String... strings) throws Exception {

Major major = new Major("Java DB Fundamentals");

Student student = new Student("John", new Date(), major);

majorService.create(major);

studentService.register(student);

Persist data

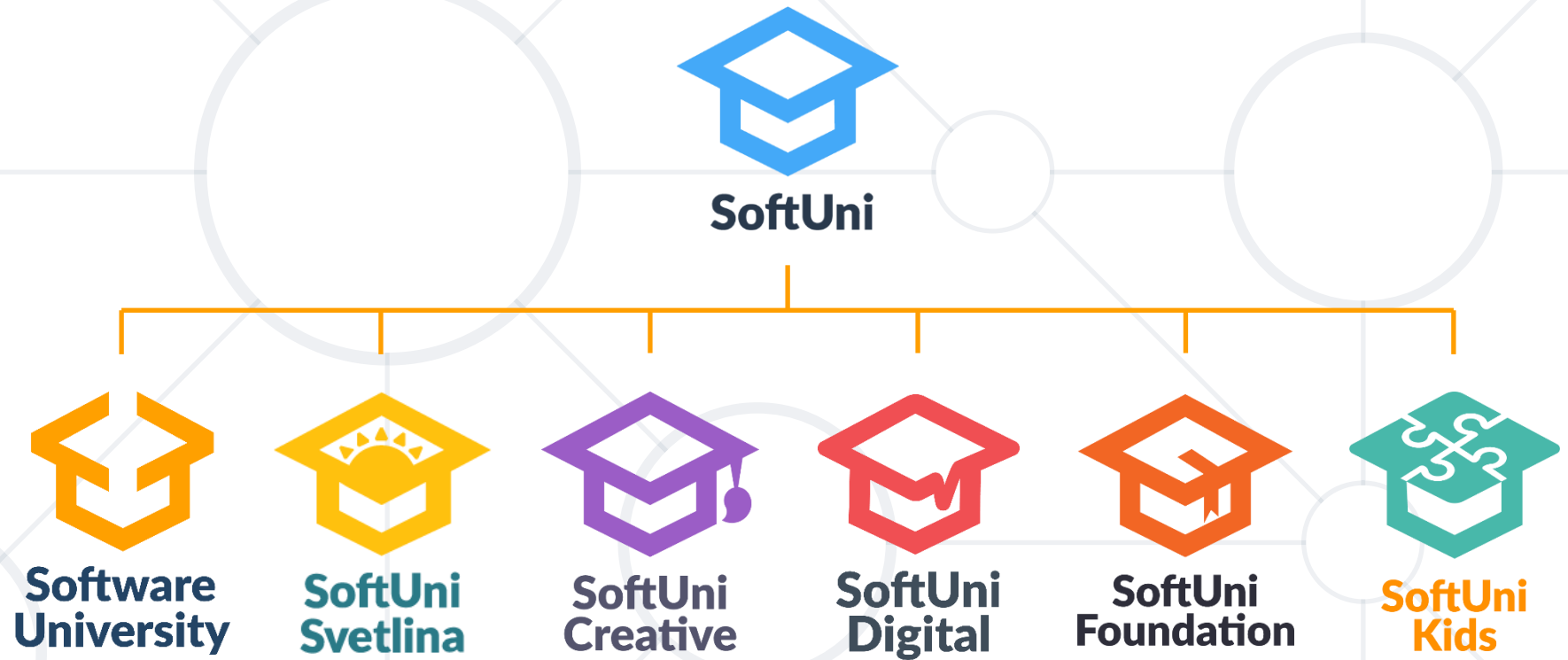
}

}

- Spring Data is **part of** the **Spring Framework**
 - It is not a JPA Provider, just an abstraction over it
- Spring Data builds **queries** over **conventions**
- Main **concept** of Spring Data are **Repositories** and **Services**



Questions?



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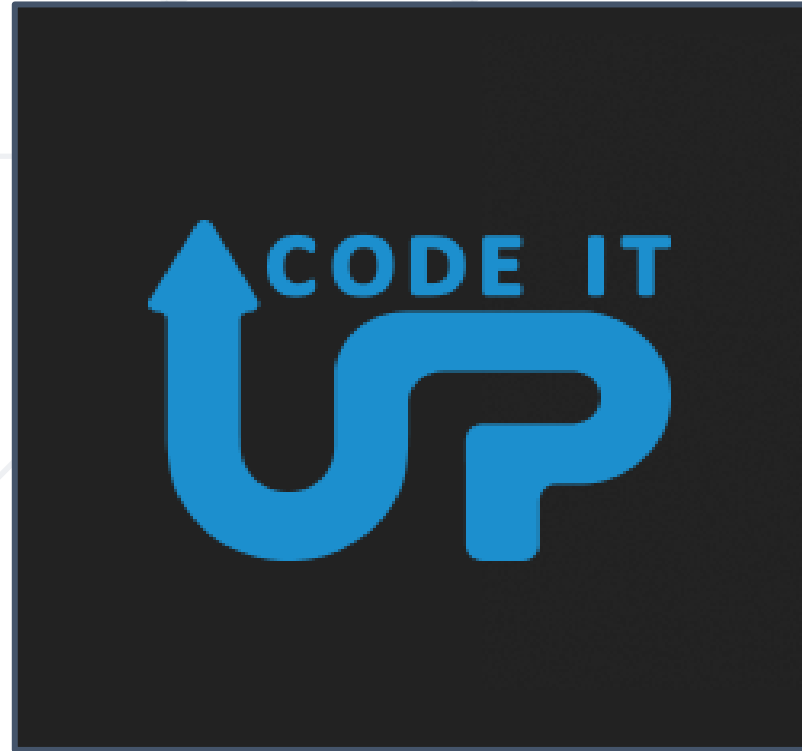
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