Spring Data Introduction

Spring Data, Repositories, Services

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Questions

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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**

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 Projects (1)

- 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

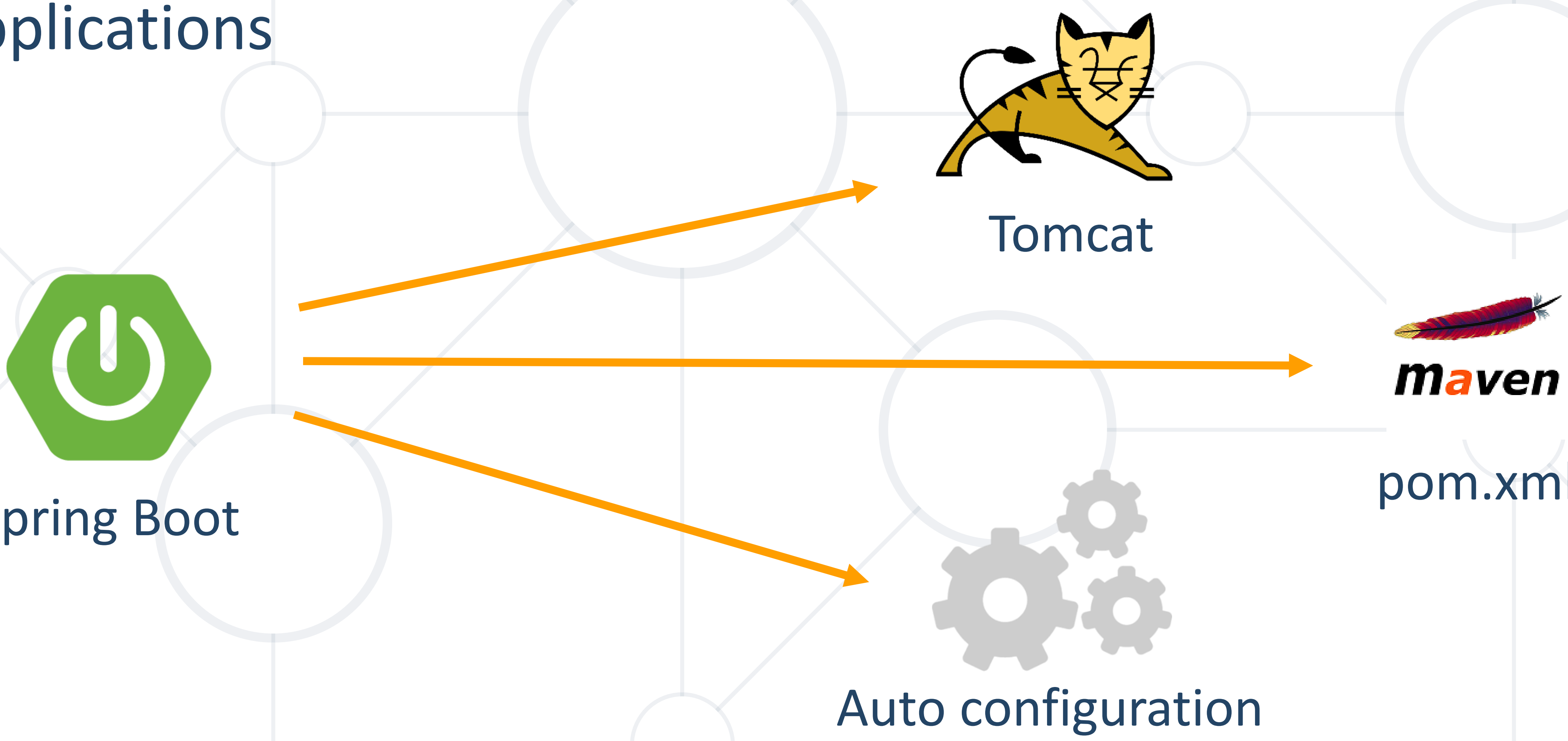
Spring Projects (2)

- 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

Spring Boot

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



Spring Framework

Spring Framework

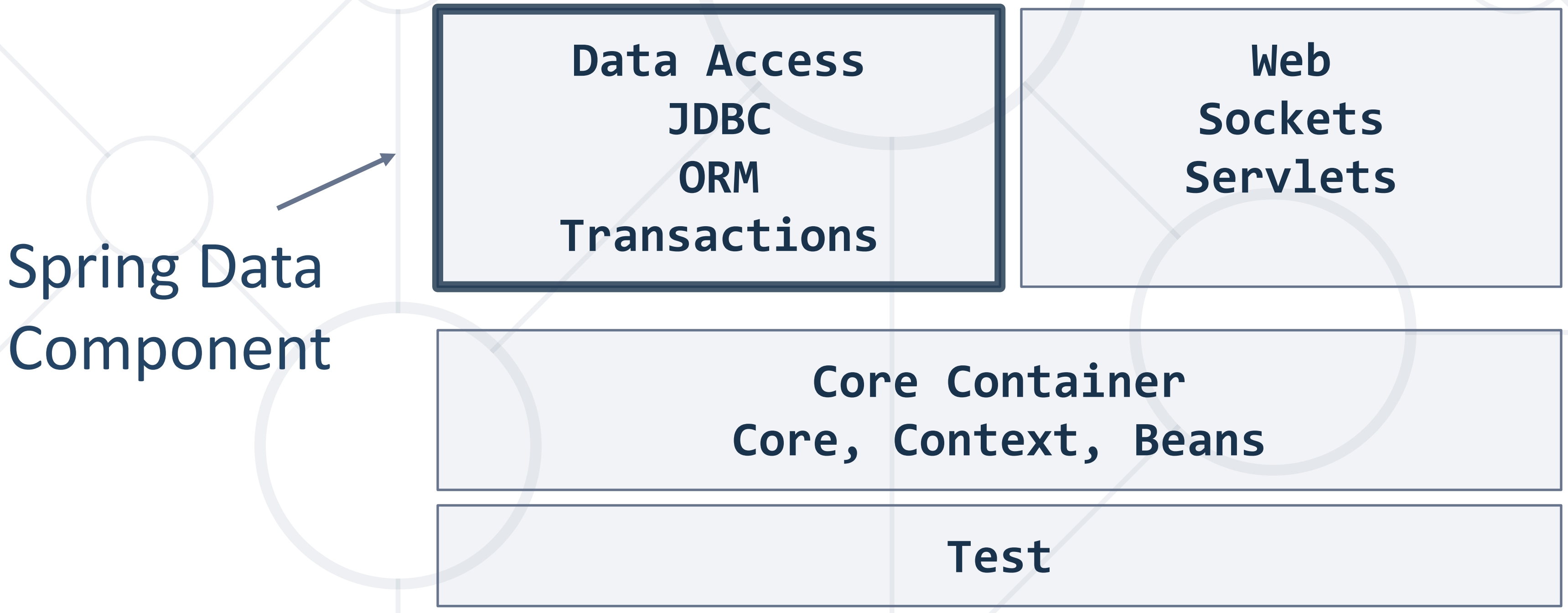
- **Open-Source Application framework** and **inversion of control container** for the Java platform
- Core features can be used by any Java application **extensions** for building web applications **on top of the Java EE**

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

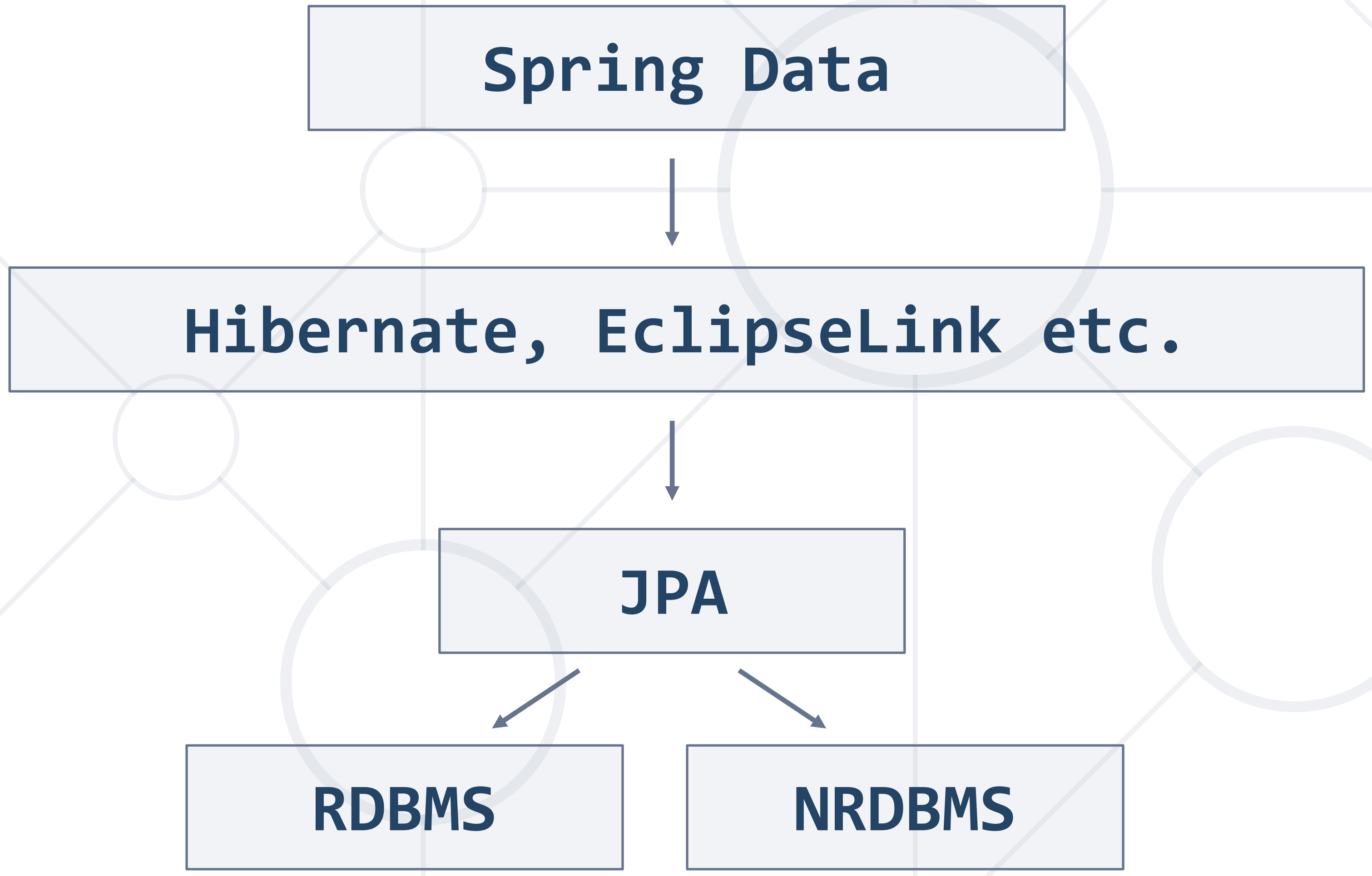


Spring Framework Overview

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**

Spring Data Role



Extra layer of abstraction over the used ORM

Spring Boot – Convention Over Configuration

- 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

Dependencies (1)

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

Build

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

#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
```

Database Connection

JPA properties

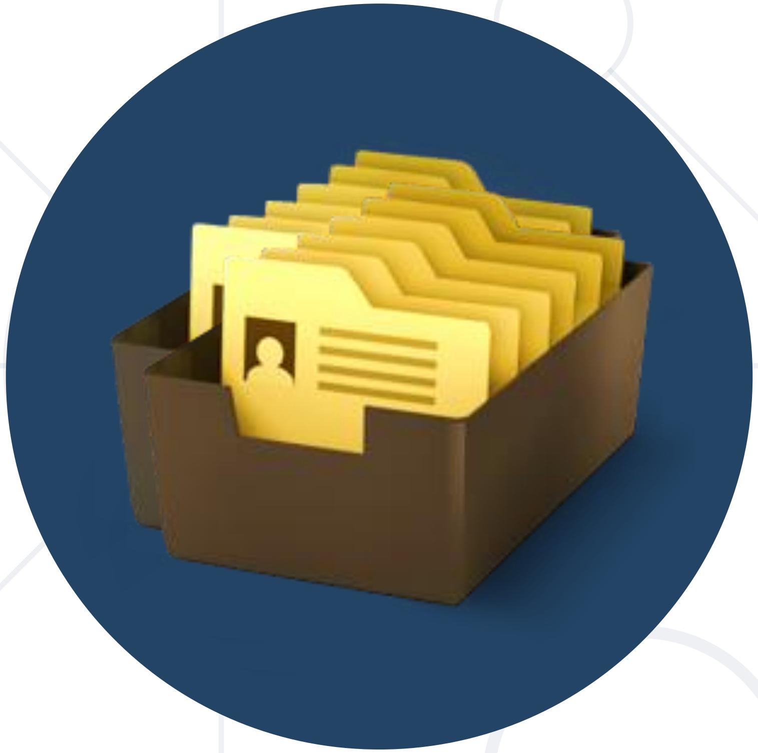
Configuration (2)

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
```

Loggin settings

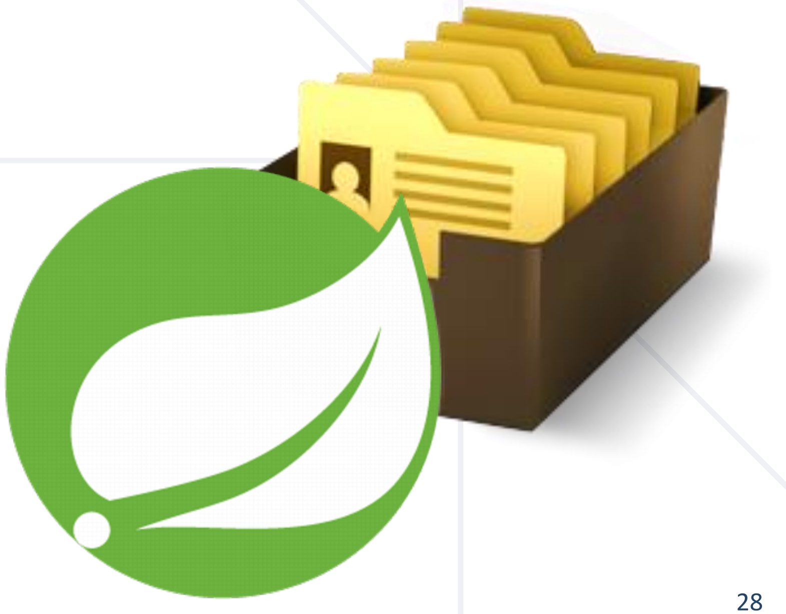


Spring Data Repositories

Spring Framework Ecosystem

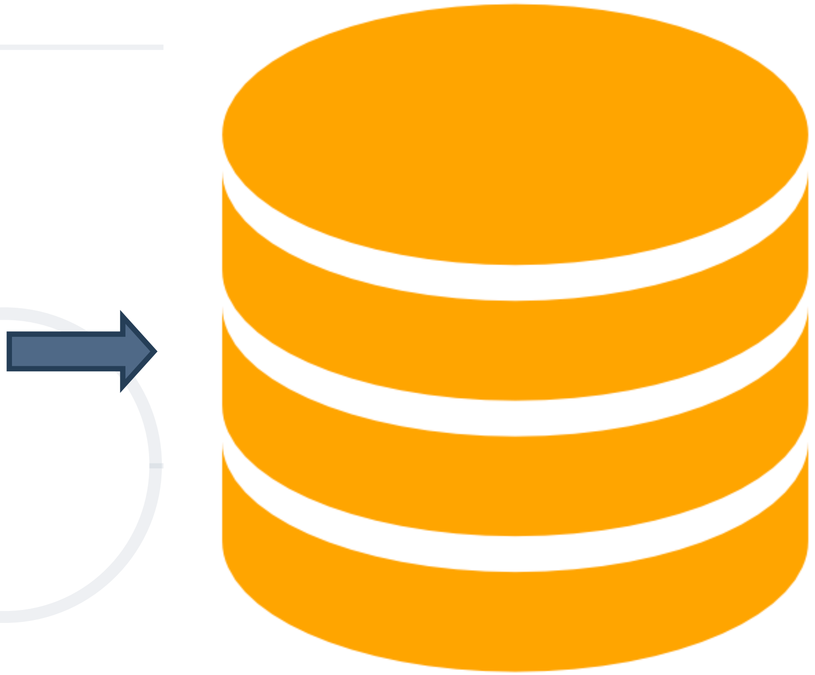
Spring Repository

- 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

Query Creation

- 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

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

Custom method

SQL

```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 (par ameter bound wrapped in %)
In	findByAgeIn(Collection<Age> ages)	… where x.age in ?1

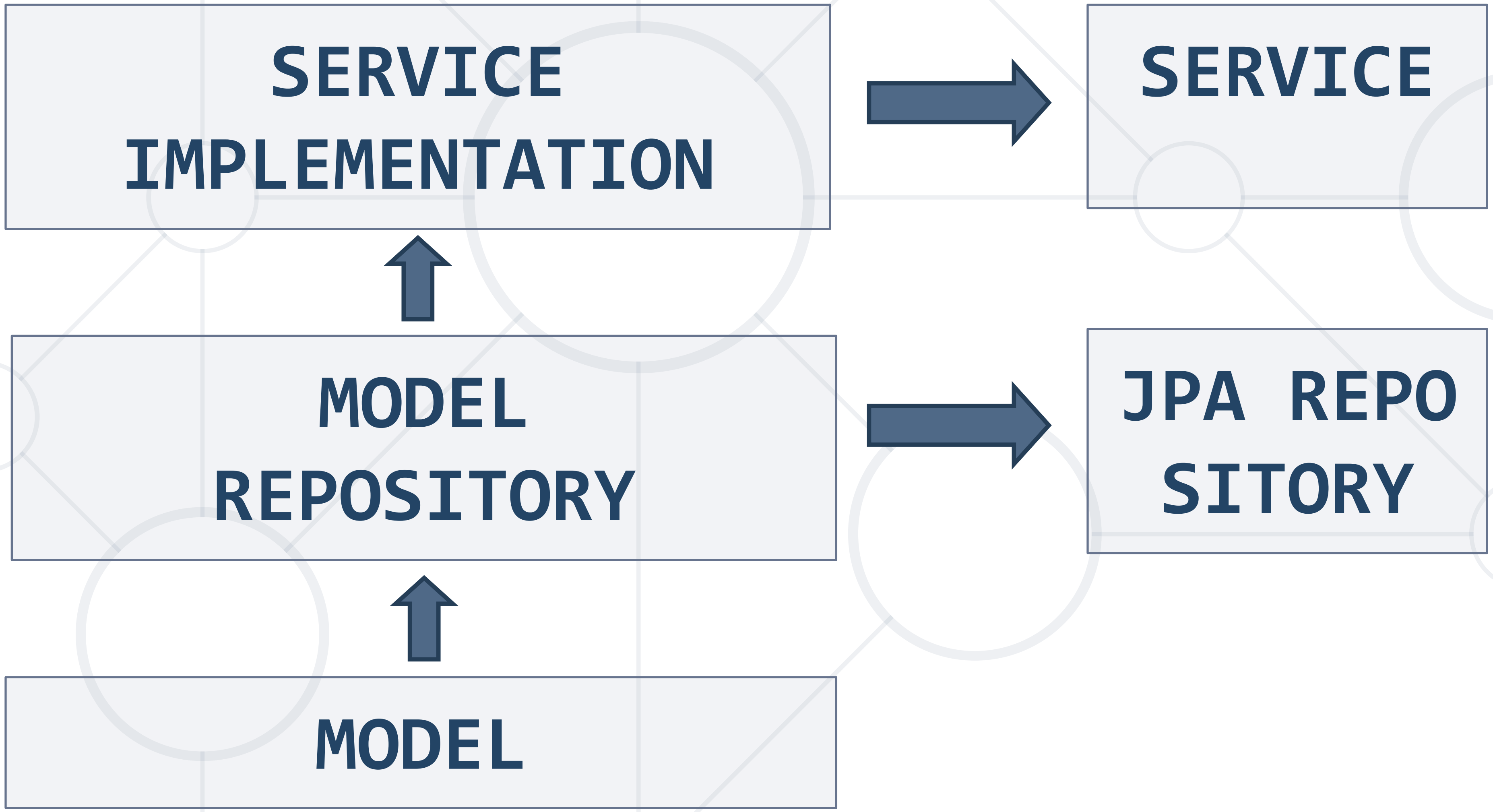
Spring Data Services

Encapsulating Business Logic

Service Pattern

- 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

Spring Data Architecture



Services (1)

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

Services (2)

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

Entry Point

MainApplication.java

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

Spring Boot Entry Point

Command Line Runner

CommandLineRunner.java

```java
@Component
public class ConsoleRunner implements CommandLineRunner {
    @Autowired
    private StudentService studentService;

    @Autowired
    private MajorService majorService;

    @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);
    }
}
```

Component

Student service

Major service

Persist data

Summary

- 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**

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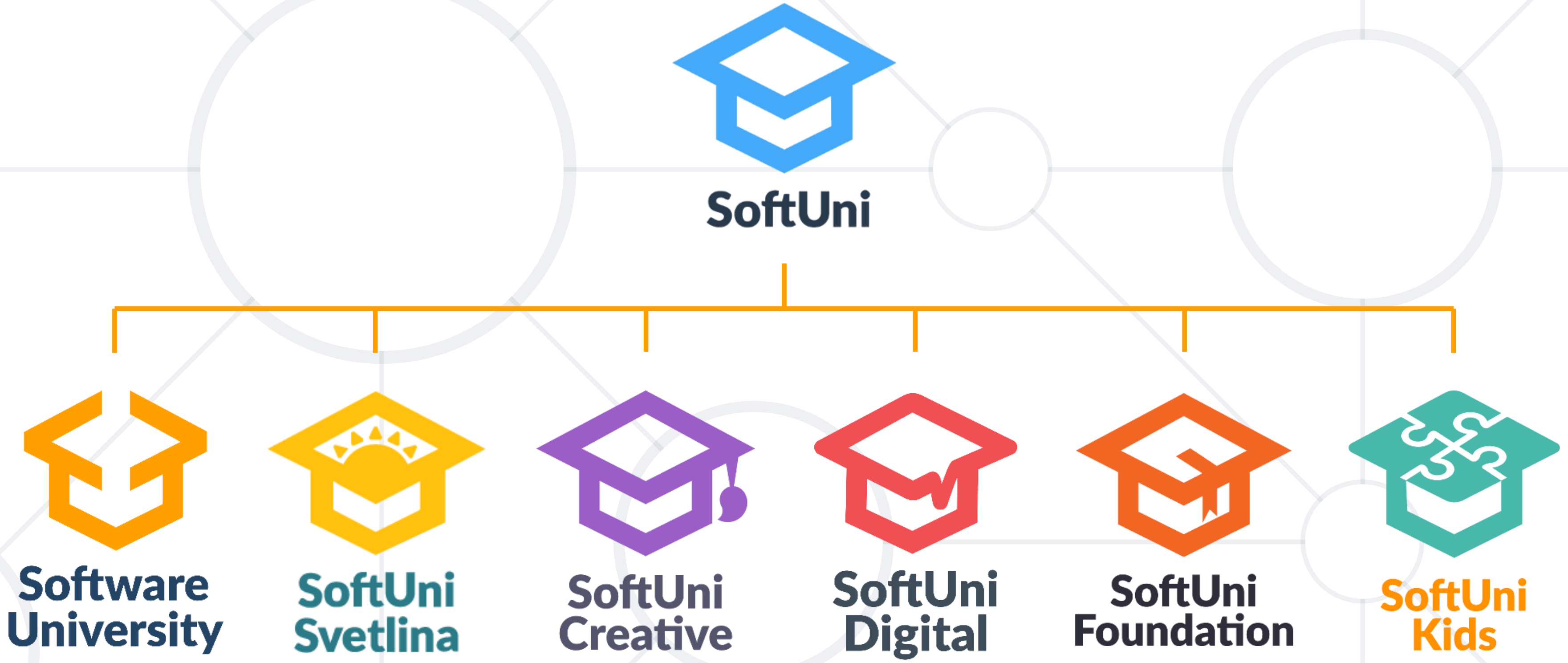
Questions?



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