Spring Fundamentals

Spring Boot Introduction

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Questions

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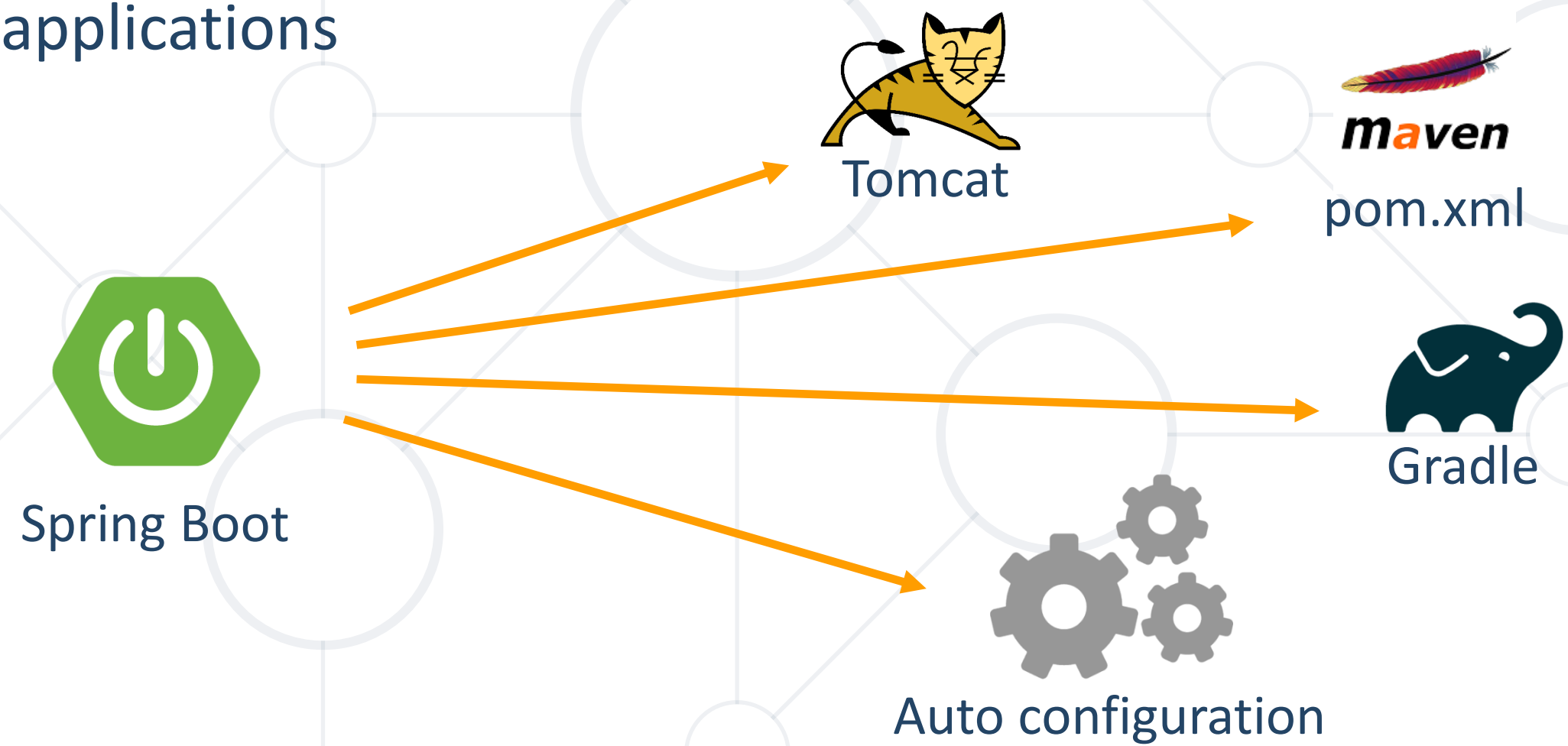
#java-web

What is Spring Boot?

Spring Boot

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



Creating Spring Boot Project

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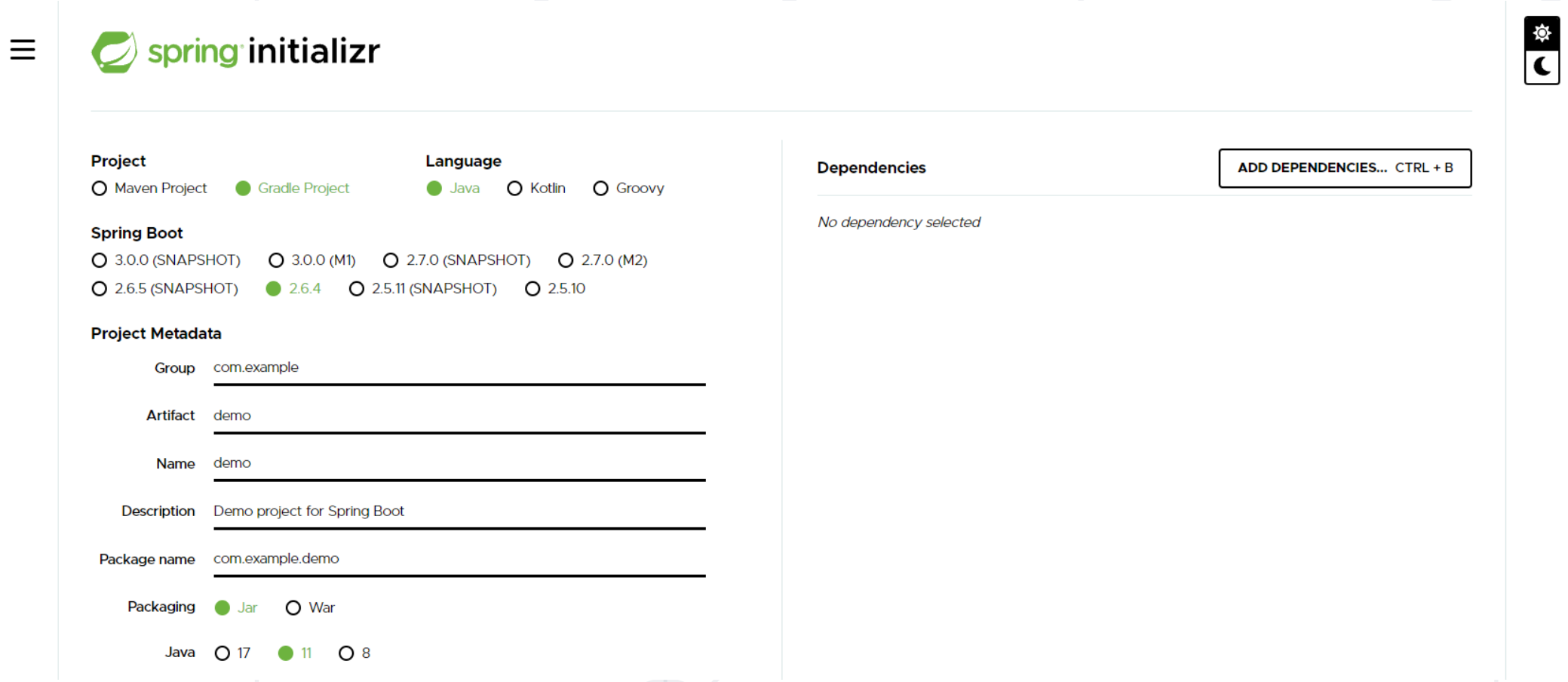
- Just go to https://start.spring.io/



Spring Dev Tools

- Additional set of **tools** that can make the application development **faster** and more **enjoyable**
- In **Maven**:

pom.xml

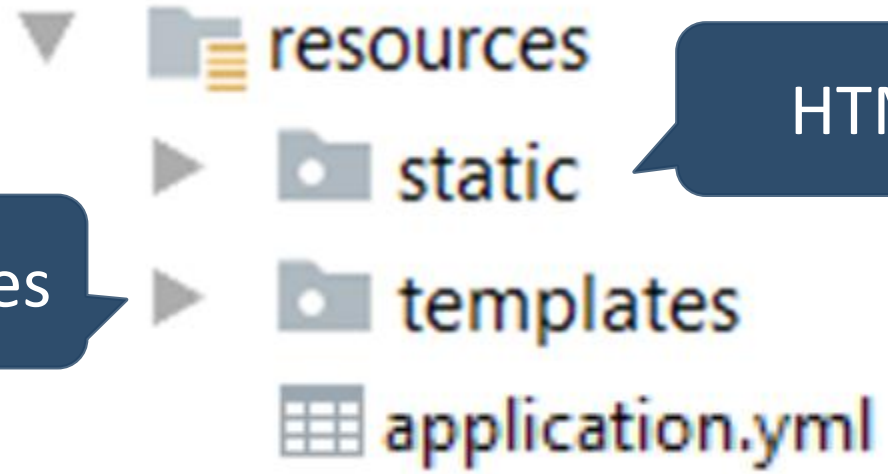
```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-devtools</artifactId>
    <scope>runtime</scope>
</dependency>
```

- In **Gradle**:

build.gradle

```
dependencies {
    compileOnly("org.springframework.boot:spring-boot-devtools")
}
```

Spring Resources



HTML, CSS, JS

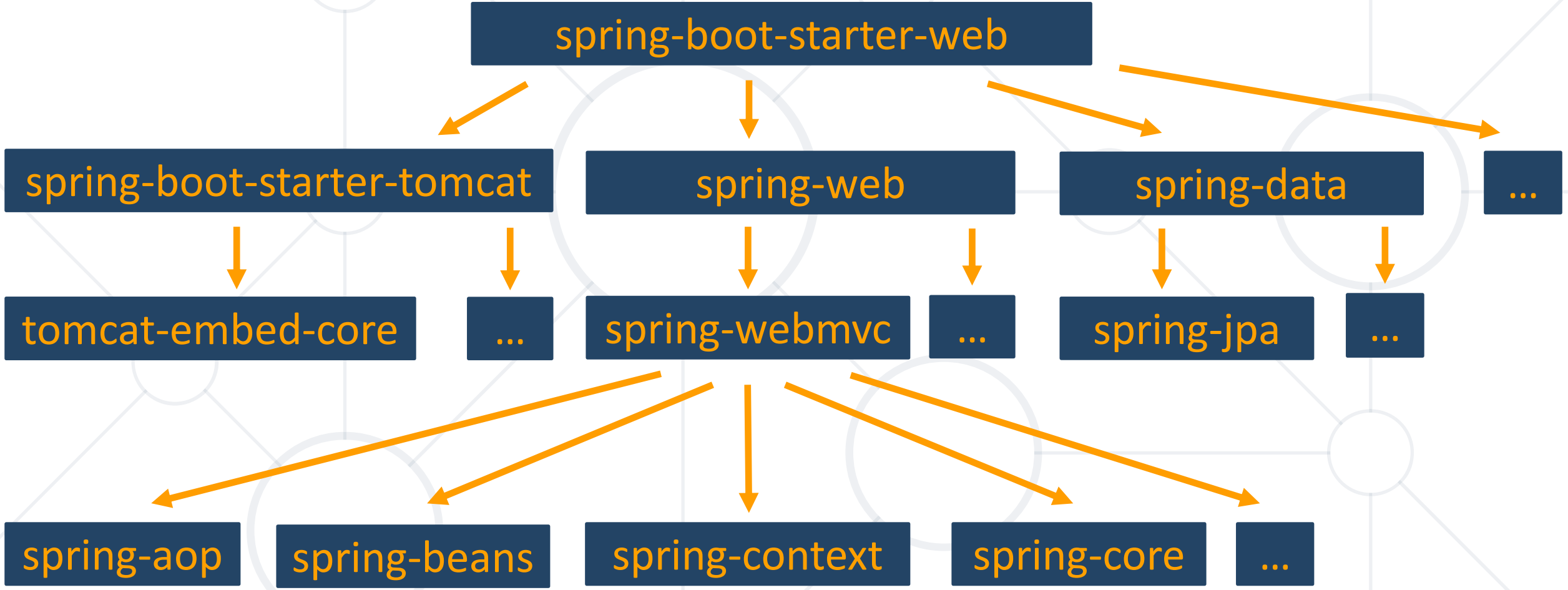
Thymeleaf templates

Yaml configuration

Spring Boot Main Components

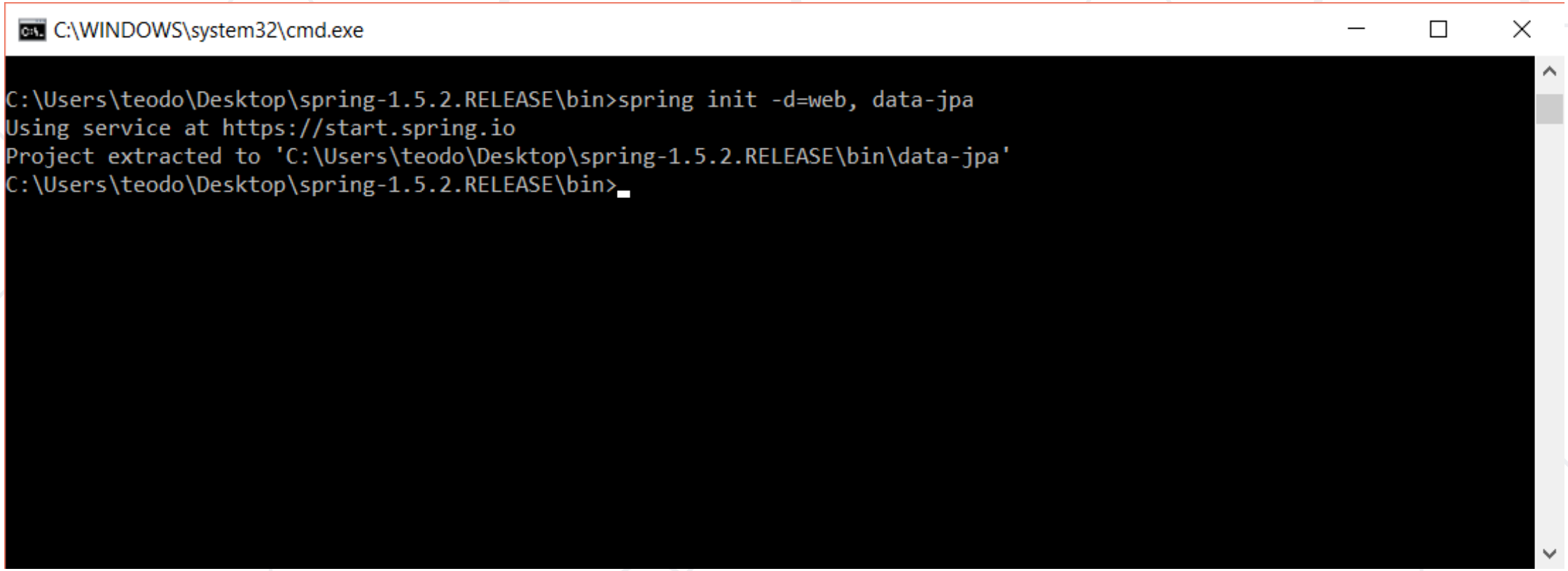
- Some main components:
  - **Spring Boot Starters** - combine a group of common or related dependencies into single dependency
  - **Spring Boot Auto-Configuration** - reduce the Spring Configuration
  - **Spring Boot Actuator** – provides EndPoints and Metrics
  - **Spring Data** – unify and ease the access to different kinds of database systems

Spring Boot Starters



Spring Boot CLI

- **Command Line Interface** - Spring Boot software to run and test Spring Boot applications

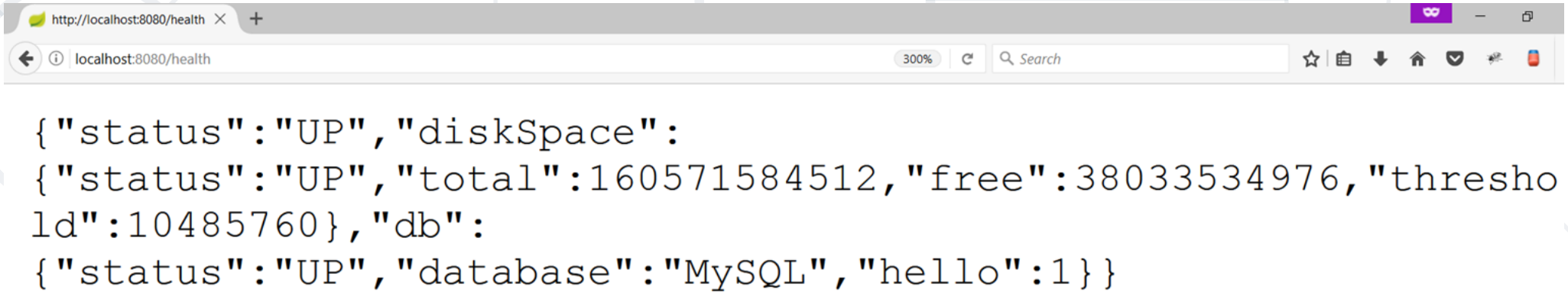


Spring Boot Actuator

- Expose different types of information about the **running application**

build.gradle

```
dependencies {
    compileOnly("org.springframework.boot:spring-boot-starter-actuator")
}
```



Inversion of Control

- Spring provides **Inversion of Control** and **Dependency Injection**

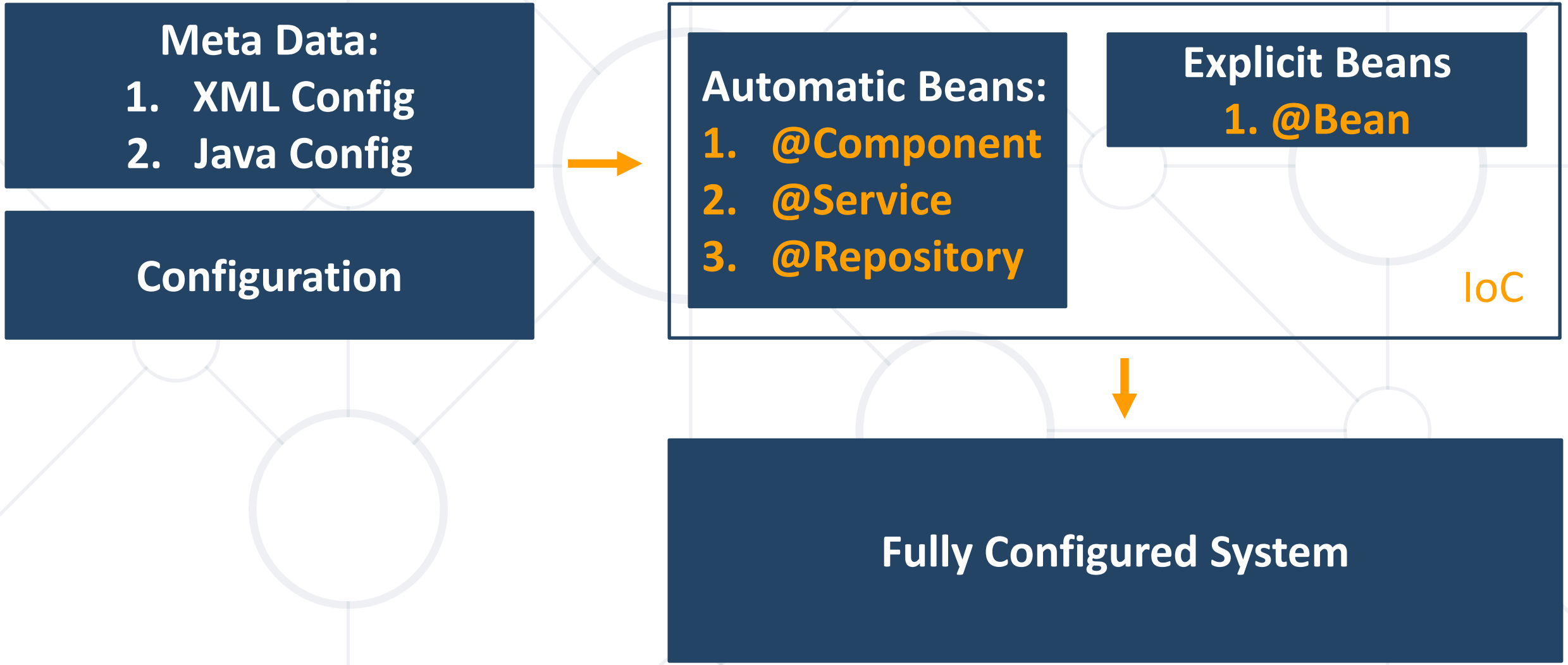
UserServiceImpl.java

```
//Traditional Way
public class UserServiceImpl implements
UserService {

private UserRepository userRepository = new
UserRepositoryImpl();

}
```

UserServiceImpl.java

```
//Dependency Injection
@Service
public class UserServiceImpl implements
UserService {

@Autowired
private UserRepository userRepository;
}
```

Spring IoC


Meta Data:
1. XML Config
2. Java Config
Configuration
Automatic Beans:
1. @Component
2. @Service
3. @Repository
Explicit Beans
1. @Bean
IoC
Fully Configured System

Beans

- Object that is **instantiated**, **assembled**, and otherwise managed by a **Spring IoC** container

Dog.java

```
public class Dog implements Animal {

    private String name;

    public Dog() {}

    //GETTERS AND SETTERS
}
```

Bean Declaration

MainApplication.java

```
@SpringBootApplication
public class MainApplication {

    …

    @Bean
    public Animal getDog(){
        return new Dog();
    }
}
```

Bean Declaration

Get Bean from Application Context

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MainApplication.java

```
@SpringBootApplication
public class MainApplication {
  public static void main(String[] args) {
    ApplicationContext context = SpringApplication.run(MainApplication.class, args);
    Animal dog = context.getBean(Dog.class);
    System.out.println("DOG: " + dog.getClass().getSimpleName());
    }
}
```

```
2017-03-05 12:59:19.389  INFO
2017-03-05 12:59:19.469  INFO
2017-03-05 12:59:19.473  INFO
DOG: Dog
```

Beans Scopes in Spring Framework

- There are part of Beans scopes:
  - Singleton
  - Prototype
  - Request
  - Session

Singletone Scope

- Container creates a **single instance** of that bean, and all requests for that bean name will return the **same object**, which is cached
- This is **default** scope

```
@Bean
@Scope("singleton") <- Can be omitted
public Student student() {
    return new Student();
}
```

Prototype Scope

- Will return a different instance every time it is requested from the container

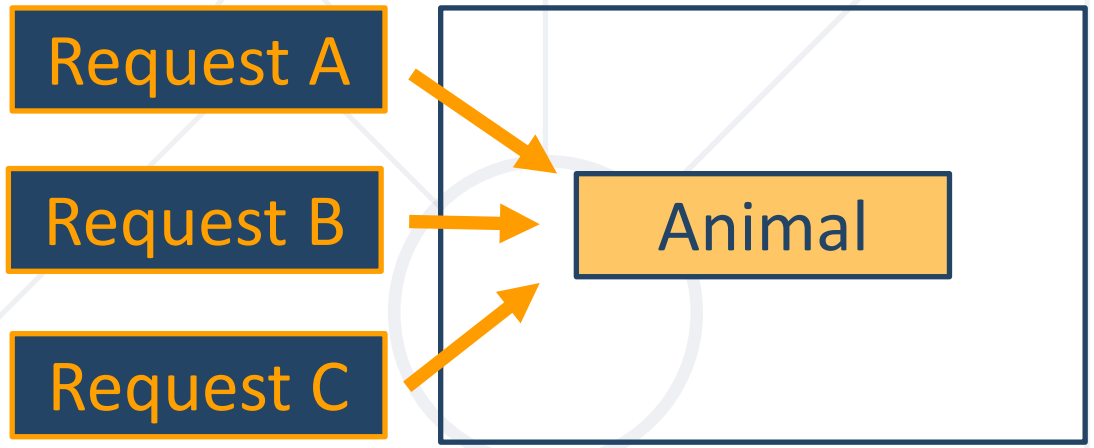
```
@Bean
@Scope("prototype")
public Student student() {
    return new Student();
}
```

Bean Scope

✦The default one is **Singleton**. It is easy to change to **Prototype**

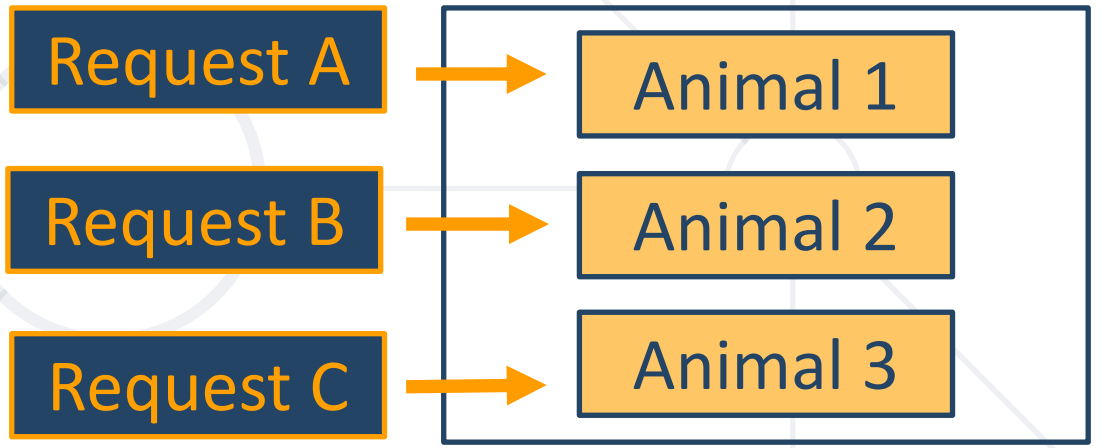
Mostly used as State-less

Singleton

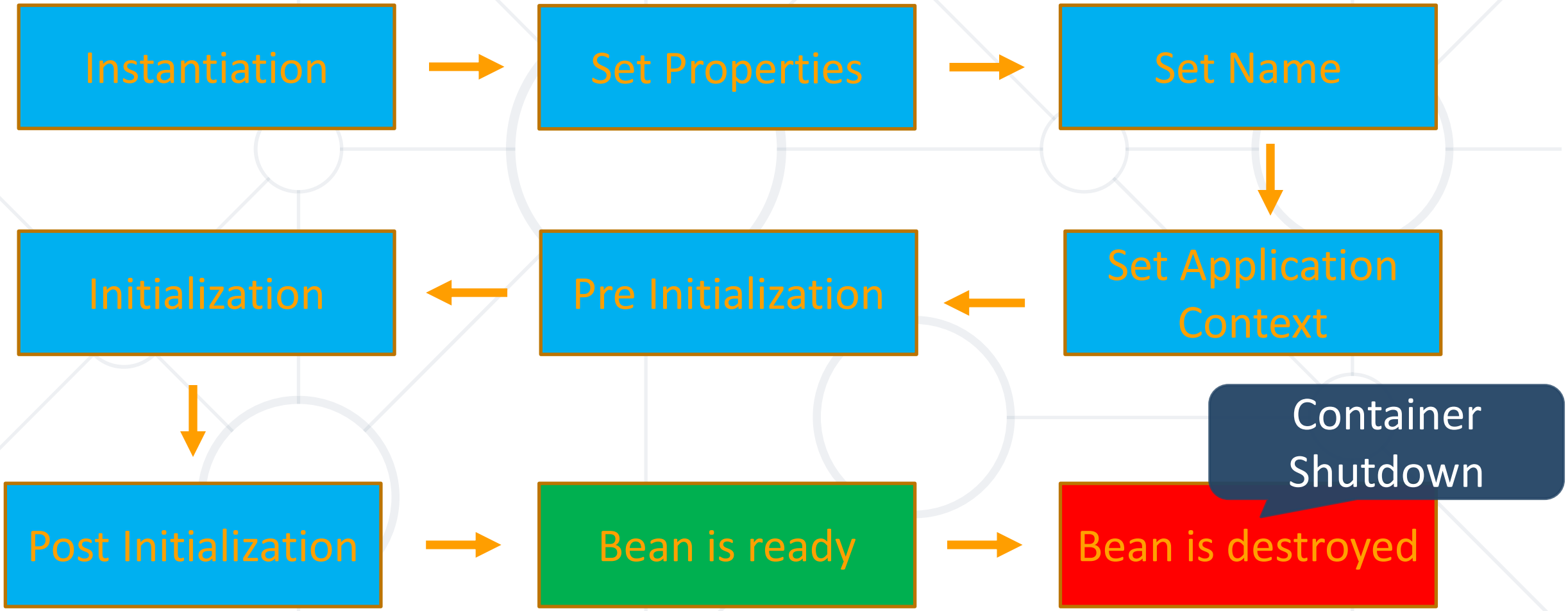


Mostly used as State-full

Prototype



Bean Lifecycle



Bean Lifecycle Demo (1)

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MainApplication.java

```
@SpringBootApplication
public class MainApplication {

 public static void main(String[] args) {
        ApplicationContext context =
       SpringApplication.run(MainApplication.class, args);
        ((AbstractApplicationContext)context).close();
 }
 @Bean(destroyMethod = "destroy", initMethod = "init")
 public Animal getDog(){
     return new Dog();
 }
}
```

Bean Lifecycle Demo (2)

MainApplication.java

```
public class Dog implements Animal {

    public Dog() {
        System.out.println("Instantiation");
    }

    public void init(){
        System.out.println("Initializing..");
    }

    public void destroy(){
        System.out.println("Destroying..");
    }
}
```

```
Instantiation
Initializing..
Destroying..
```

PostConstruct Annotation

- Spring calls methods annotated with *@PostConstruct* only once, just after the initialization of bean

```
@Component
public class DbInit {
    private final UserRepository userRepository;
    public DbUnit(UserRepository userRepository)
       { this. userRepository = userRepository;}

    @PostConstruct
    private void postConstruct() {
        User admin = new User("admin", "admin password");
        User normalUser = new User("user", "user password");
        userRepository.save(admin, normalUser);
    }
}
```

PreDestroy Annotation

- A method annotated with **@PreDestroy** runs only once, just before Spring removes our bean from the application context

```
@Component
public class UserRepository {

    private DbConnection dbConnection;
    @PreDestroy
    public void preDestroy() {
        dbConnection.close();
    }
}
```

BeanNameAware Interface

- BeanNameAware makes the object aware of the bean name defined in the container

```
public class MyBeanName implements BeanNameAware {
    @Override
    public void setBeanName(String beanName) {
        System.out.println(beanName);
    }
}
```

```
@Configuration
public class Config {
    @Bean (name = "myCustomBeanName")
    public MyBeanName getMyBeanName() {
        return new MyBeanName();
    }
}
```

BeanFactoryAware Interface

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- BeanFactoryAware is used to **inject** the **BeanFactory object**
- With the **setBeanFactory()** method, we assign the BeanFactory reference from the IoC container to the beanFactory property

```
public class MyBeanFactory implements BeanFactoryAware {
    private BeanFactory beanFactory;
    @Override
    public void setBeanFactory(BeanFactory beanFactory)throws BeansException {
        this.beanFactory = beanFactory;}
    public void getMyBeanName() {
        MyBeanName myBeanName = beanFactory.getBean(MyBeanName.class);
        System.out.println(beanFactory.isSingleton("myCustomBeanName"));
    }
}
```

InitializingBean Interface

- For bean implemented **InitializingBean**, it will run **afterPropertiesSet()** after all bean properties have been set

```
@Component
public class InitializingBeanExampleBean implements InitializingBean {
    private static final Logger LOG
      = Logger.getLogger(InitializingBeanExampleBean.class);

    @Autowired
    private Environment environment;

    @Override
    public void afterPropertiesSet() throws Exception {
        LOG.info(Arrays.asList(environment.getDefaultProfiles()));
    }
}
```

DisposableBean Interface

- For bean implemented **DisposableBean**, it will run **destroy()** after Spring container is released the bean

```
@Component
public class Bean2 implements DisposableBean {

    @Override
    public void destroy() throws Exception {
        System.out.println(
          "Callback triggered - DisposableBean.");
    }
}
```

Common Application Properties

- Various properties can be specified inside your **application.yaml** file
- Property contributions can come from **additional jar files**
- You can define your **own properties**
- **Link to documentation**

Application Properties Example

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application.properties

```
spring.datasource.driverClassName=com.mysql.cj.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/thymeleaf_adv_lab_exam_db?c
reateDatabaseIfNotExist=true
spring.datasource.username=root
spring.datasource.password=12345
spring.jpa.properties.hibernate.dialect = org.hibernate.dialect.MySQL8Dialect
spring.jpa.properties.hibernate.format_sql = TRUE
spring.jpa.hibernate.ddl-auto = update
spring.jpa.open-in-view=false
logging.level.org = WARN
logging.level.blog = WARN
logging.level.org.hibernate.SQL = DEBUG
logging.level.org.hibernate.type.descriptor = TRACE
server.port=8000
```

Application Yaml Example

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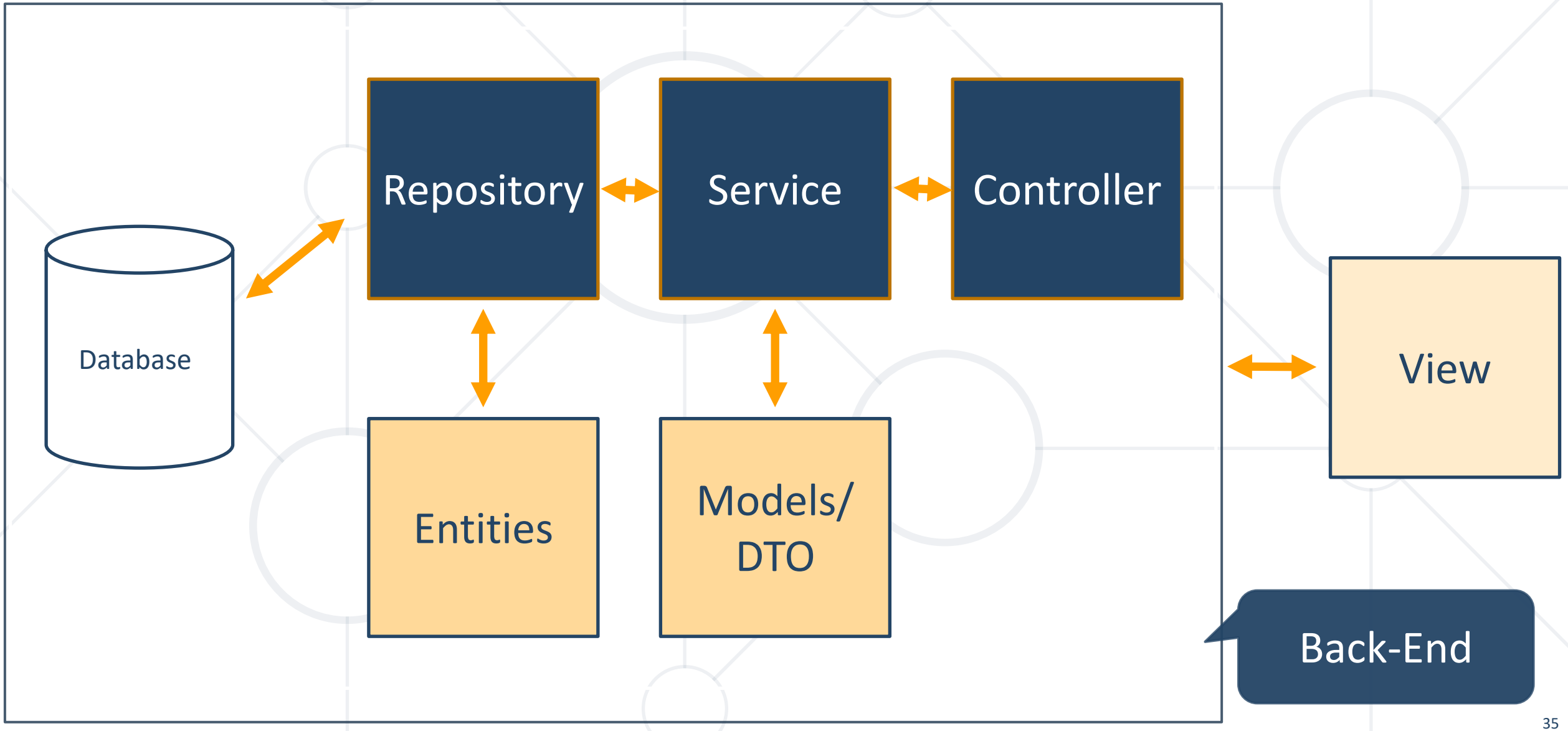
application.yaml

```
spring:
  datasource:
    driverClassName: com.mysql.cj.jdbc.Driver
    password: 12345
    url:
jdbc:mysql://localhost:3306/spring_data_lab_db?allowPublicKeyRetrieval=true&useSSL=fa
lse&createDatabaseIfNotExist=true
    username: root
  jpa:
  database-platform: org.hibernate.dialect.MySQL8Dialect
  hibernate:
      ddl-auto: create-drop
      open-in-view: false
      properties:
      hibernate:
        format_sql: true
```

Spring Data

Overall Architecture



Entities

- Entity is a lightweight persistence domain object

Cat.java

```
@Entity
@Table(name = "cats")
public class Cat {

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

    private String name;
    //GETTERS AND SETTERS
}
```

Repositories

- **Persistence** layer that works with **entities**

CatRepository.java

```
@Repository
public interface CatRepository extends JpaRepository<Cat, Long> {
}
```

Services

- **Business Layer** - All the business logic is here.

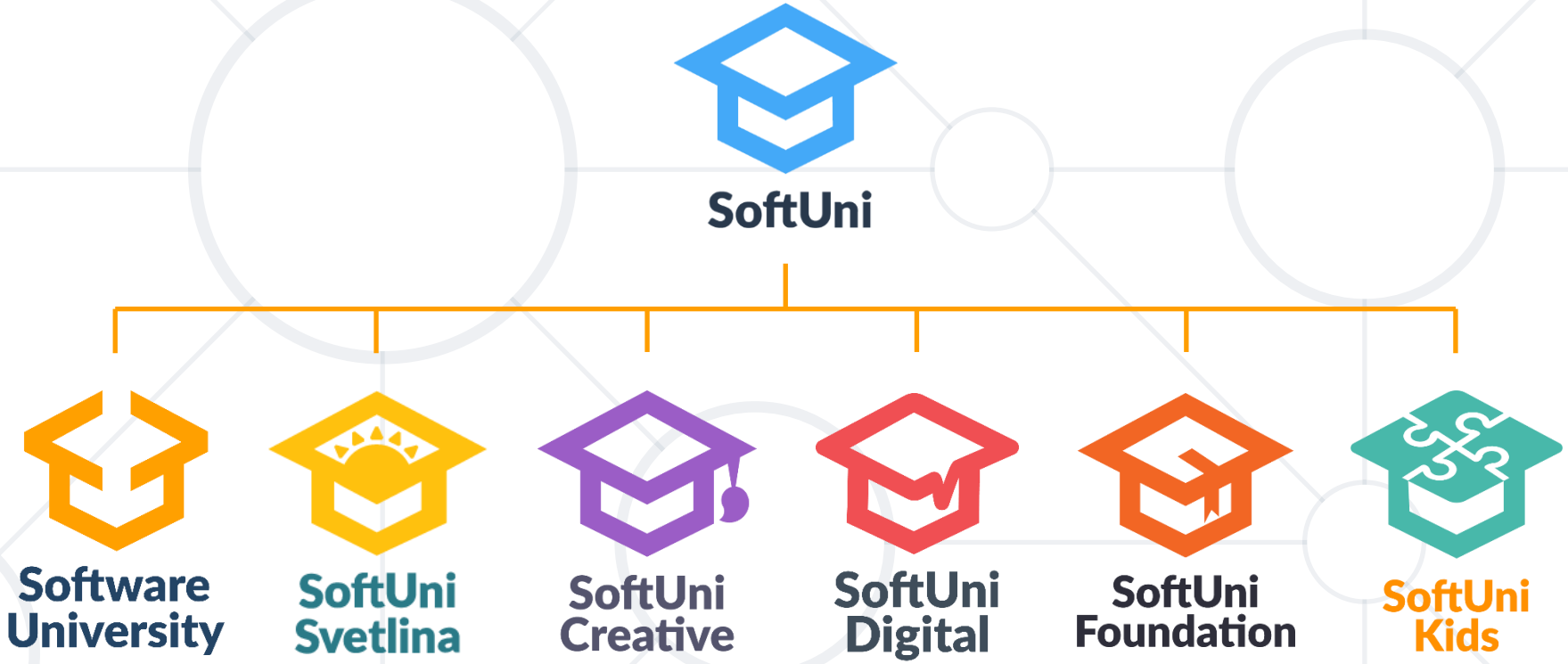
CatService.java

```
@Service
public class CatServiceImpl implements CatService {
    private final CatRepository catRepository;
    @Autowired
    public CatServiceImpl(CatRepository catRepository){
      this.catRepository = catRepository;
    }
    @Override
    public void buyCat(CatModel catModel) { //TODO Implement the method }
}
```

Summary

- **Spring Boot** - **Opinionated view** of building production-ready Spring applications
- **Spring Data** - Responsible for database related operations

Questions?



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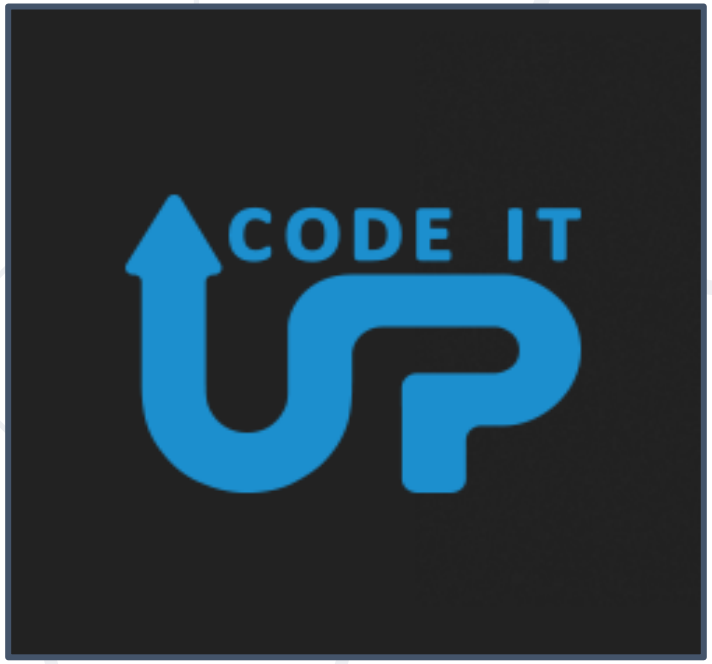

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