Developed by Rod Johnson in 2003

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Spring Framework

⇒ Spring is a Dependency Injection framework to make Java application loosely coupled.

⇒ Powerful Lightweight application development framework.

⇒ Makes easy development of JavaEE application.

⇒ Simplicity, Testability and loose coupling.

Feature of Spring :-

1. Open Source
2. Comprehensive tool
3. Light weight
4. Solves Problems
5. Framework of framework
6. Avails array of resources.

Simplicity

1. Spring is simple because it is non-invasive. It uses POJO and POJI

2. If a Java class is not coupled with any technology or any framework then that java class is called POJO (Plain old java object). If a java interface is not coupled with any technology or any framework then that java interface is called POJI (Plain Old Java Interface)

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Testability

1. For writing the spring application server [container] is not mandatory because it has its own container to run the application.

2. Spring framework already have testing layers available. ex. JUnit already integrated.

POM: Project Object Model

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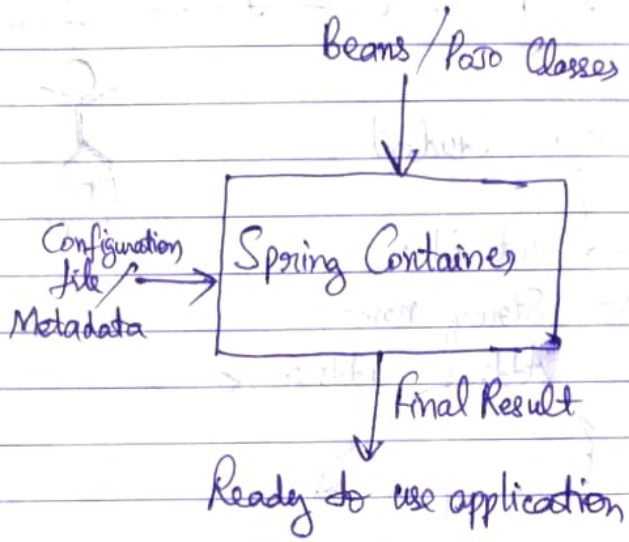
Spring IOC container

↳ Creating the object
↳ Holding the object in the memory
↳ Injecting one object into another (Dependency Injection)
↳ Maintain lifecycle of object.

Spring IOC containes by using Java POJO classes and configuration metadata produces a fully configured and executable system or application.



Spring containes will be responsible to construct the Java objects by parsing the XML files.

Types of IOC containers

Bean factory

* constructs the object when we request for it by calling getBean method
* simplest containes providing the basic support for dependency injection.

ApplicationContext

* Constructs the object even though we dont request for it.
* Built on top of bean factory interface. This containes adds more enterprise specific functional

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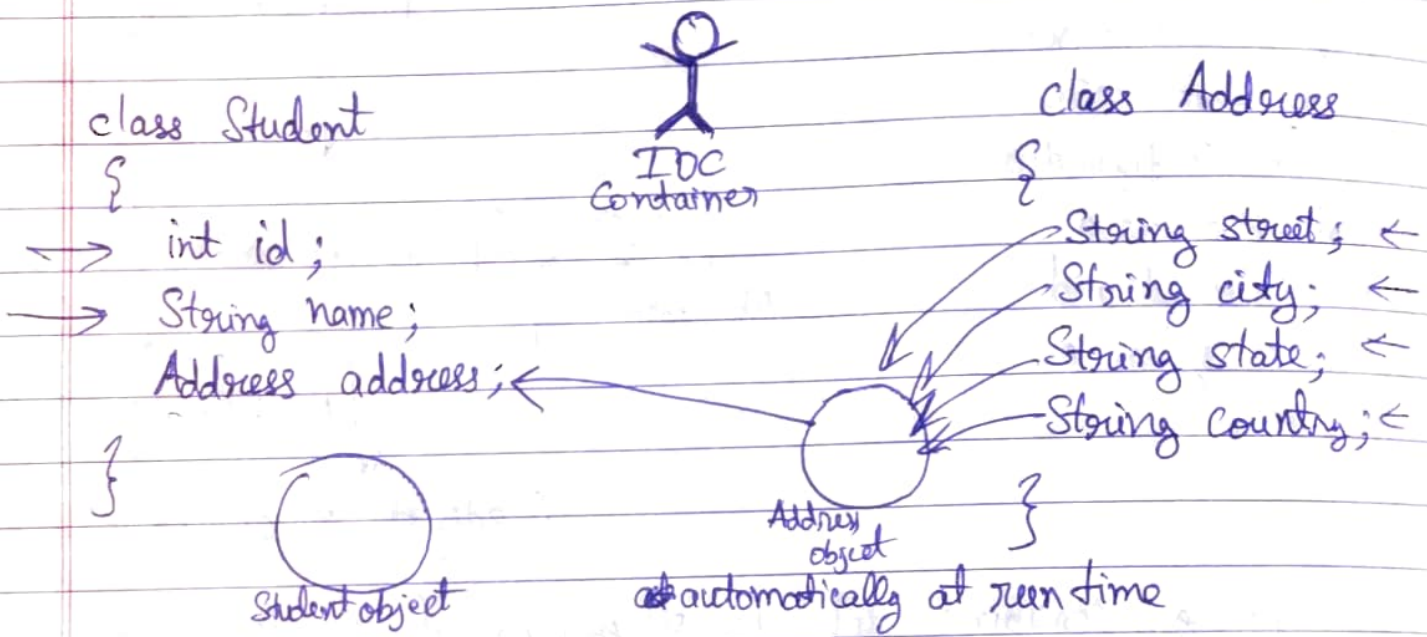
⇒ Application Context

- → ClasspathXMLApplicationContext
- → AnnotationConfigApplicationContext
- → FileSystemXMLApplicationContext

⇒ Dependency Injection (DI) is a design pattern



Student class depending on Address class.

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⇒ Dependency Injection can be done in 2 ways

Setter Injection

<property> subelement of <bean> is used for setter injection

Constructor Injection

<constructor-arg> subelement of <bean> is used for constructor injection.

⇒ Data types (Dependencies)

1. Primitive Data Types: byte, short, char, int, float, double, long, boolean
2. Collection Types: List, Set, Map and Properties
3. Reference Type (User defined): Other class object.

⇒ Ambiguity Problem and its solution with constructor injection.

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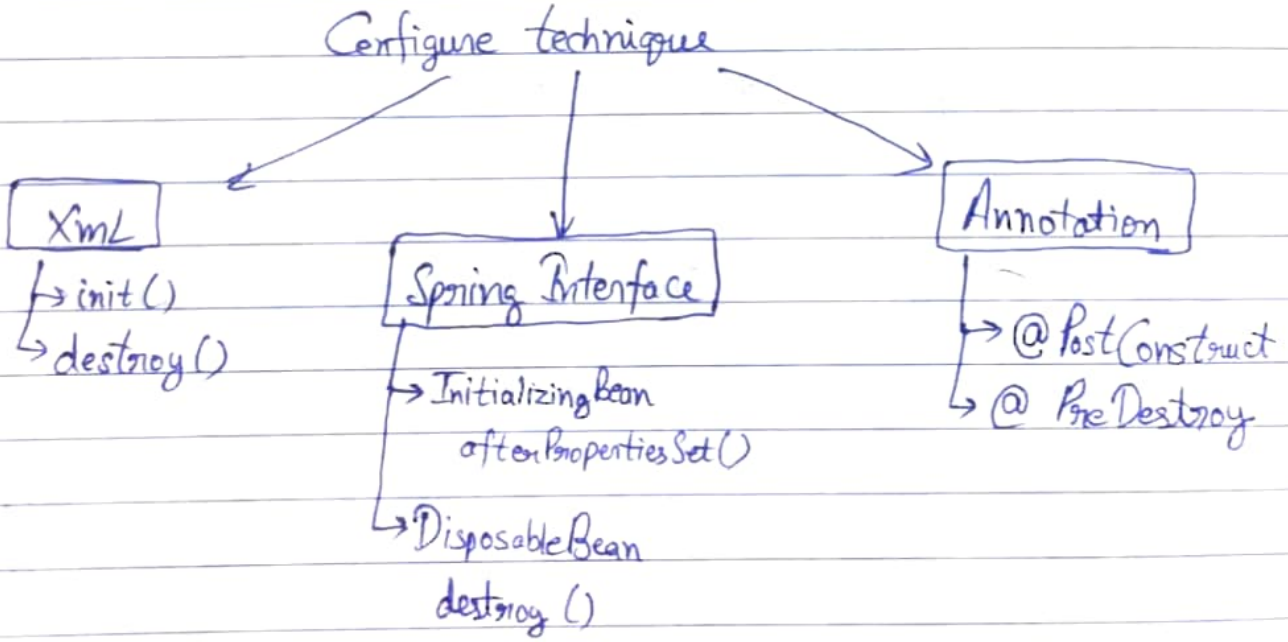
⇒ Life cycle Methods

object created
↓
Setting Value Properties
↓
init ()
↓
Then we read and use the bean
↓
destroy ()
↓
object destroyed



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⇒ Autowiring in Spring

* Feature of spring framework in which spring container inject the dependencies automatically.

* Autowiring can't be used to inject primitive and string values. It works with reference only.

Autowiring
- xml
  - Autowiring Modes
    - default: no
    - by Name
    - by Type
    - Constructor
    - auto detect — deprecated since Spring 3
- Annotation
  - @Autowired
    - on property
    - on setter
    - on constructor

uses byType

Advantages :-
→ Automatic
→ less code

Disadvantages :-
→ No control of programmer.
→ It can't be used for primitive and string values.

@Qualifier can be used above property and setter method and not above constructor

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⇒ @Qualifier annotation with Autowiring

```
@Autowired
@Qualifier(" ")
```

When we have multiple beans in configuration file, then we put name of the bean to be picked by using Qualifier annotation.

⇒ Spring Standalone Collections.

```
<util:list  list-class="java.util.LinkedList" id=" ... " />
<util:map  map-class="java.util.HashMap" id=" " />
<util:properties  id=" " />
```

⇒ Stereotype Annotations

```
@Component
class Student
{

}

Student student = new Student();
```

```
@Component("ob")
class Student
{

}

ob
```

```
<context:component-scan base-package=" " />

@Value(" ")
```

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⇒ Collection with @Value

```
@Value("#{temp}")
private List<String> address;
```

Standalone collection

```
<util:list list-class="java.util.ArrayList" id="temp" />
<value>Delhi</value>
<value>Noida</value>
<value>Dehradun</value>
```

⇒ Spring Bean Scope

singleton
prototype
request
session
globalsession — for portlet applications.

{ Web application }

(by default) singleton → Only single object created by spring container and provided to you everytime.

prototype → everytime we call, spring container will create new object of the bean

Configure bean scope

- XML: `<bean class="" name="" scope="" />`
- Annotation: `@Component` `@Scope("")`

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⇒ Spring Expression Language (SpEL)

Supports parsing & executing expressions with the help of @Value annotations.

```
@Value("#{Expression}")
```

expression → Classes, Variable, Methods, Constructors & Objects and symbols.
char, numerics, operators, keywords and special symbols which return a value.

eg. `@Value("#{11+22}")`

`@Value("#{8>6 ? 88 : 55}")`

* Invoking static method and variable

```
T(class).method(param)
T(class).Variable
```

```
@Value("#{T(java.lang.Math).sqrt(144)}")
@Value("#{T(java.lang.Math).E}")
```

* Boolean type with SpEL

`@Value("#{8>3}")`

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⇒ Removing Complete XML for Spring Configuration.

```
ApplicationContext context =
        new AnnotationConfigApplicationContext( .class);

@Configuration
@ComponentScan(basePackages = "")
@Bean
```

Airflow

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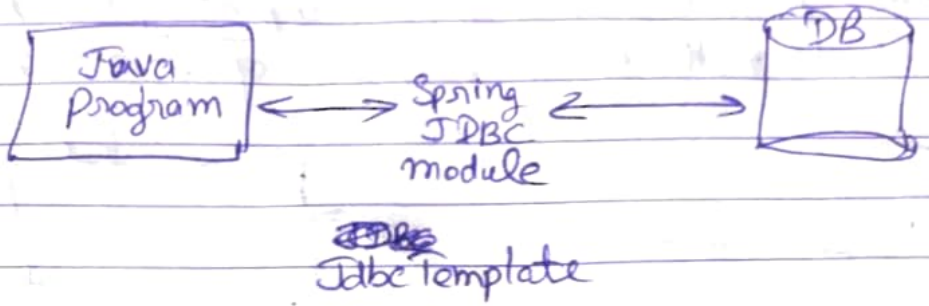
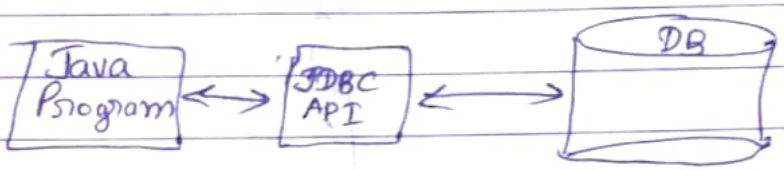
Spring JDBC

Spring JDBC is a powerful mechanism to connect to the database and execute SQL queries.



⇒ JDBC concept

JDBC is API to perform operation with database.



⇒ Problems of JDBC

* We need to write a lot of code
  ↳ Connection Open, statement, execute, connection close.
* Exception Handling Problem : checked Exception
  SQL Exception
* Repeating of all these codes from one to another database logic is a time consuming task.

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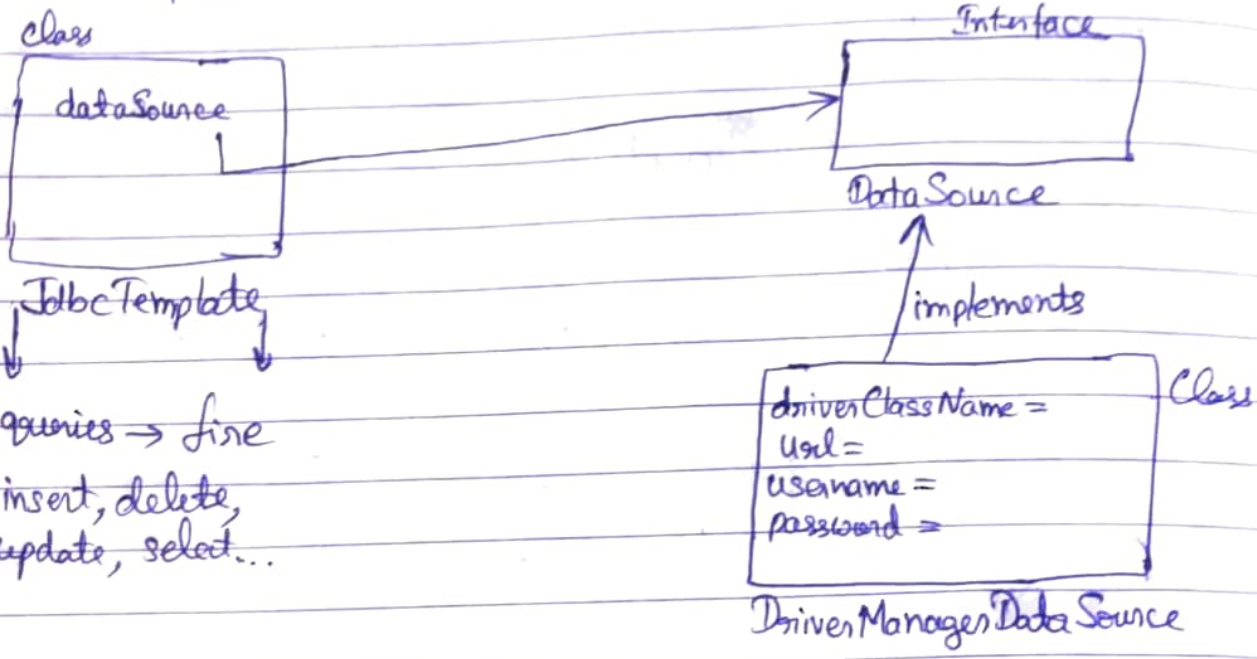
Advantage of Spring JDBC

* Solution of JDBC problems are provided by Spring JDBC

* Spring JDBC provide class **JdbcTemplate** which has all the important methods to perform operation with database.



JdbcTemplate methods :-

update () → insert, update, delete

execute () → select queries.