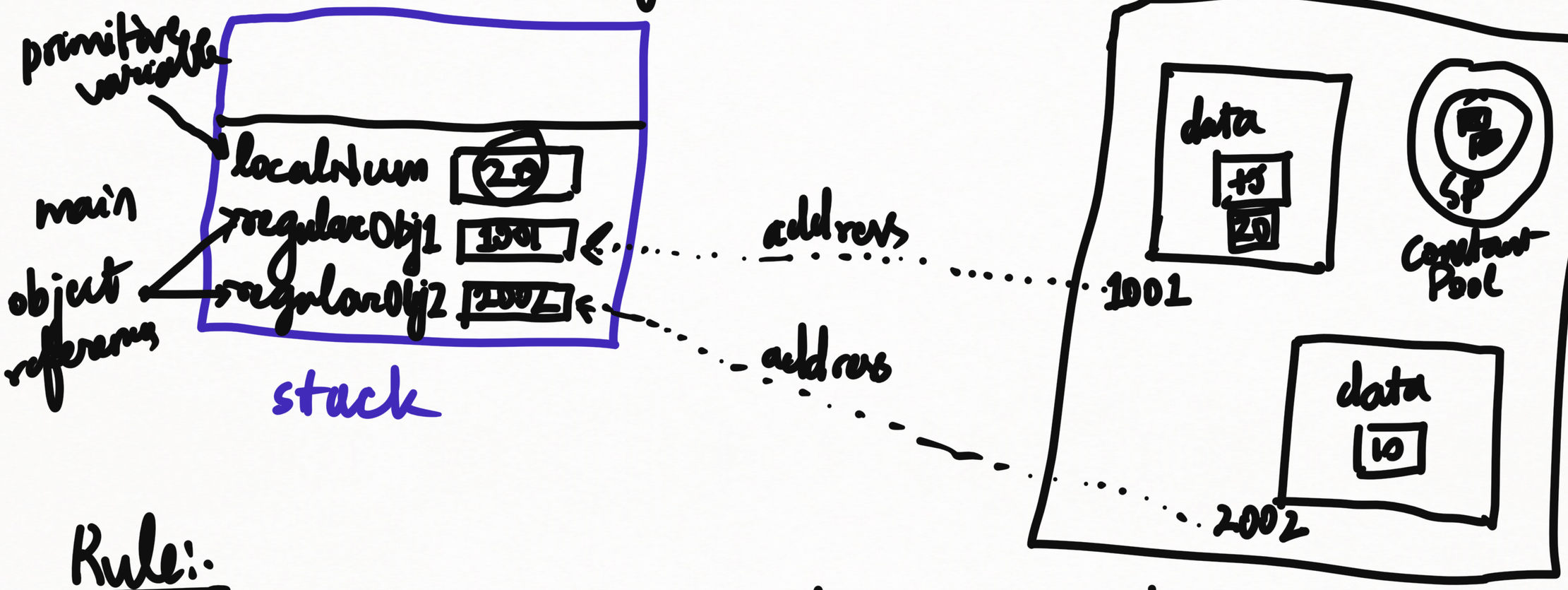
Regular class

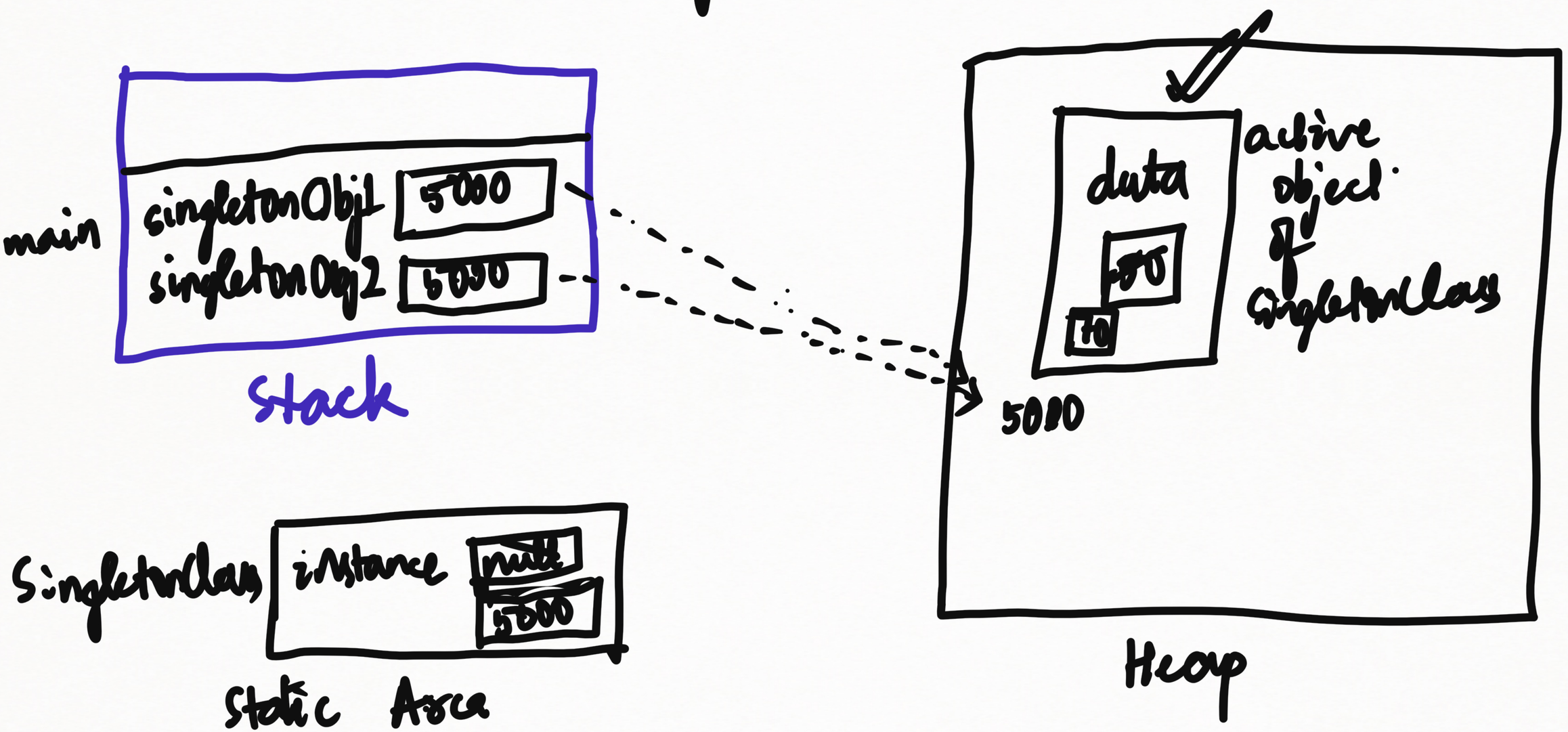


Rule:

Local variables are created in stack.

Instance variables reside in the heap memory(in objects)

Singleton Class



Use-cases of Singleton :-

i) Memory saving

ii) Data-sharing/synchronization

iii) can use an object repeatedly

Example

→ Database Connection

Limitations

i) can be unreliable in multi-threaded usage

ii) can be used unnecessarily to make things complex

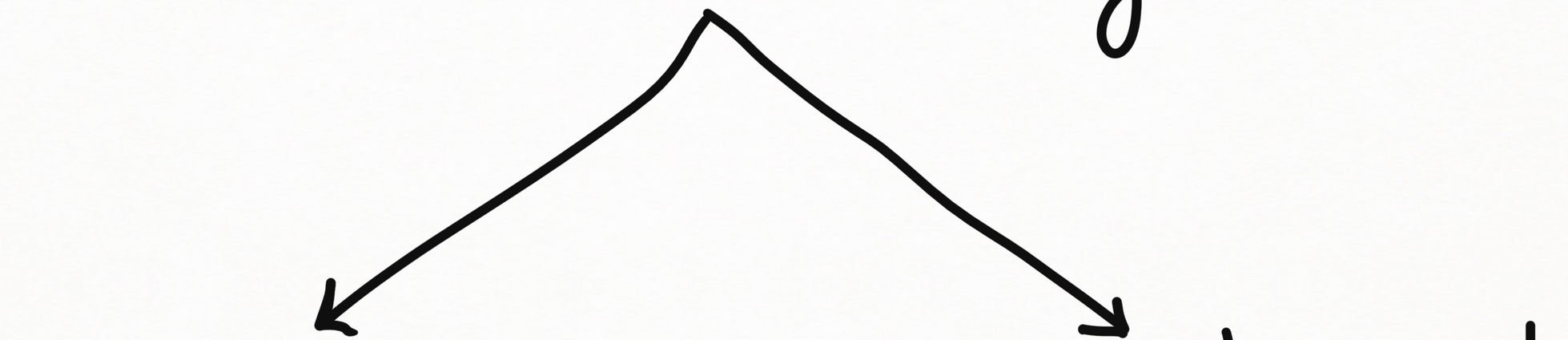
Framework

→ A set of tools to effectively and efficiently do a complex task with minimum effort.

Example :- i) Creating a set of objects using collection framework

ii) Creating a Java web application using spring framework.

Framework Learning

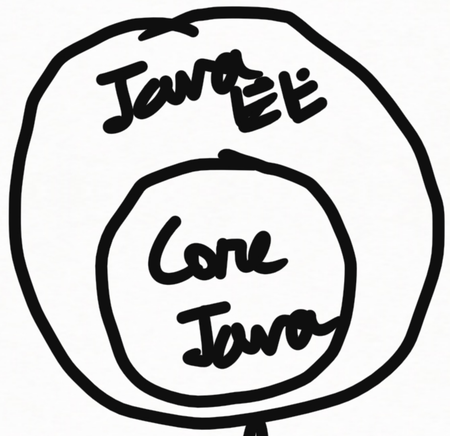


How to use the tools in the framework

How the framework works internally.

Spring Framework

→ Based Java EE (Java Enterprise Edition)



→ Modules, hence loose coupling

Inversion of Control (IoC)

→ Transfers the control of objects to the container/framework.

→ Works with object-oriented programming

→ One of the ways IoC can be achieved is dependency injection (DI).

Advantages are:-

i) Loose coupling
ii) Greater modularity
iii) easier to switch implementation
iv) easier to test

Dependency Injection (DI)

→ Implementation of IoC.

→ Allows for loose coupling

→ Moves the responsibility of managing components onto the container.

→ Fundamental aspect of Spring framework.

→ The framework will inject objects into other objects.

```
class Item{ }
```

Traditional Resolution

```
class Store{
    private Item item;
    public Store(){
        item= new Item();
    }
}
```

Dependency Injection

```
class Store{
    private Item item;
    public Store(Item item){
        this.item = item;
    }
}
```

Spring IoC container – Manages DI

Configurations Metadata

POJO = Plain Old Java Object.

↳ In Spring framework, "ApplicationContent" represents the Spring IoC container.

↳ ApplicationContent manages all the beans by using the configuration metadata.

↳ ApplicationContent is an interface.

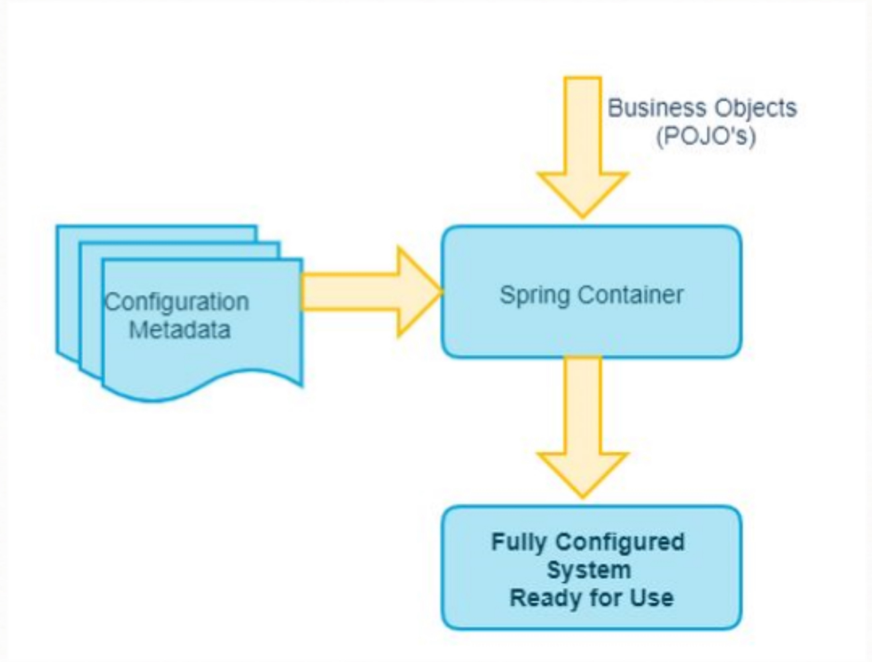
↳ Spring framework provides several implementations of the ApplicationContent interface.

↳ Some of the implementations are:-

↳ ClassPathXMLApplicationContext

↳ AnnotationConfigApplicationContext

etc.



Types of DI

i) Constructor Injection ✓

ii) Property (Field) Injection ✗

iii) Setter (Method Injection) ✓ (default)

✓ = supported by Spring

Spring ApplicationContext

→ ApplicationContext is an interface

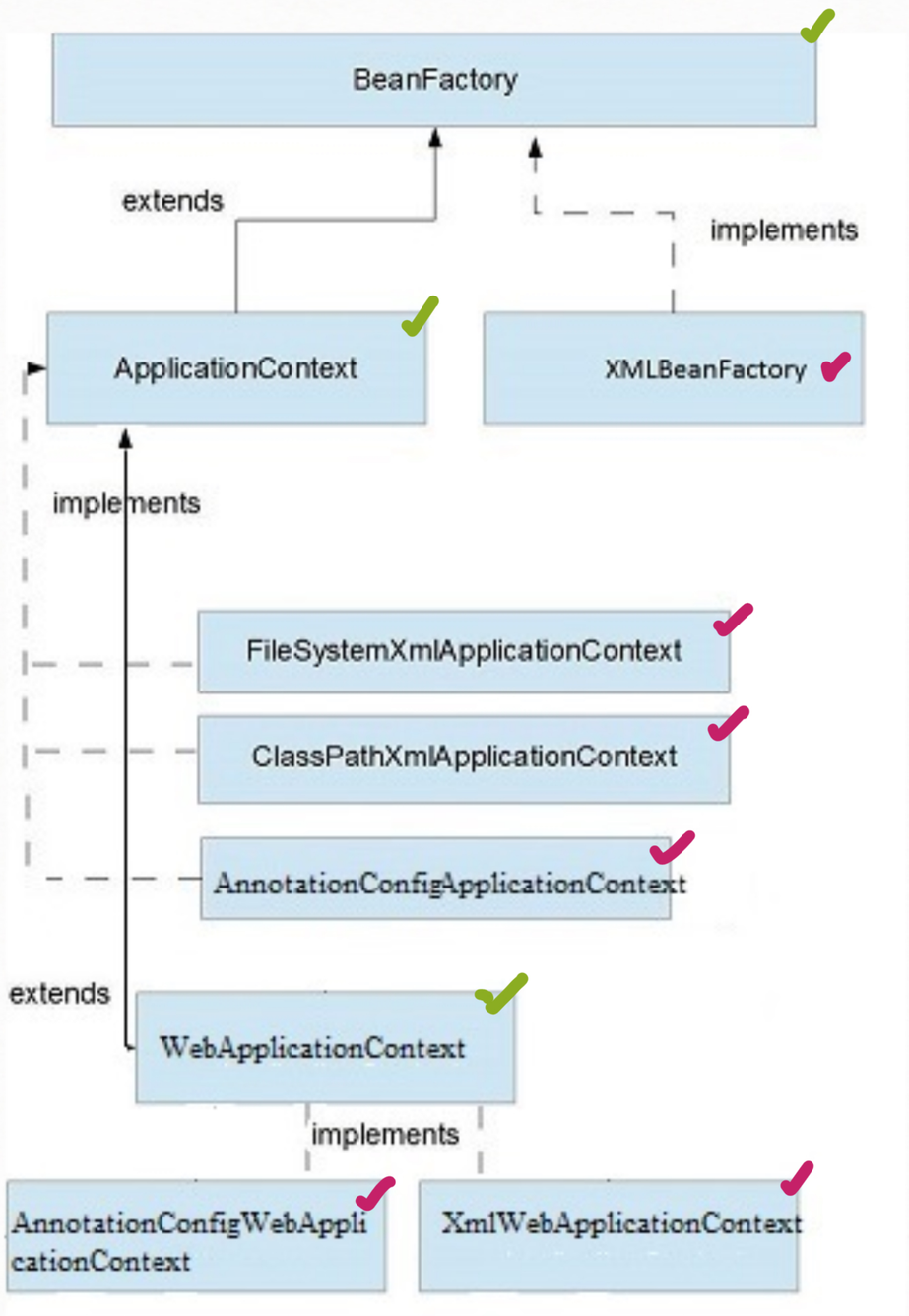
→ In Spring, ApplicationContext represents the container of the application.

→ In order to start a Spring application container, we need an instance of ApplicationContext

→ But ApplicationContext is an interface and it can't be instantiated.

→ So, we need an object of a concrete class that implements the ApplicationContext interface.

→ There are various concrete classes in Spring which implement the aforementioned interface, pertaining to different use-cases.



- interfaces
- concrete classes

→ There are 5 concrete implementations of AC :-

i) ClassPathXmlApplicationContext

ii) AnnotationConfigApplicationContext

iii) FileSystemXmlApplicationContext

iv) XmlWebApplicationContext

v) AnnotationConfigWebApplicationContext

→ The 5 concrete implementations can be broadly categorised into 2 types :-

a) Xml-Configured Application Contents

b) Annotation-Configured Application Contents

Events associated with ApplicationContext:-

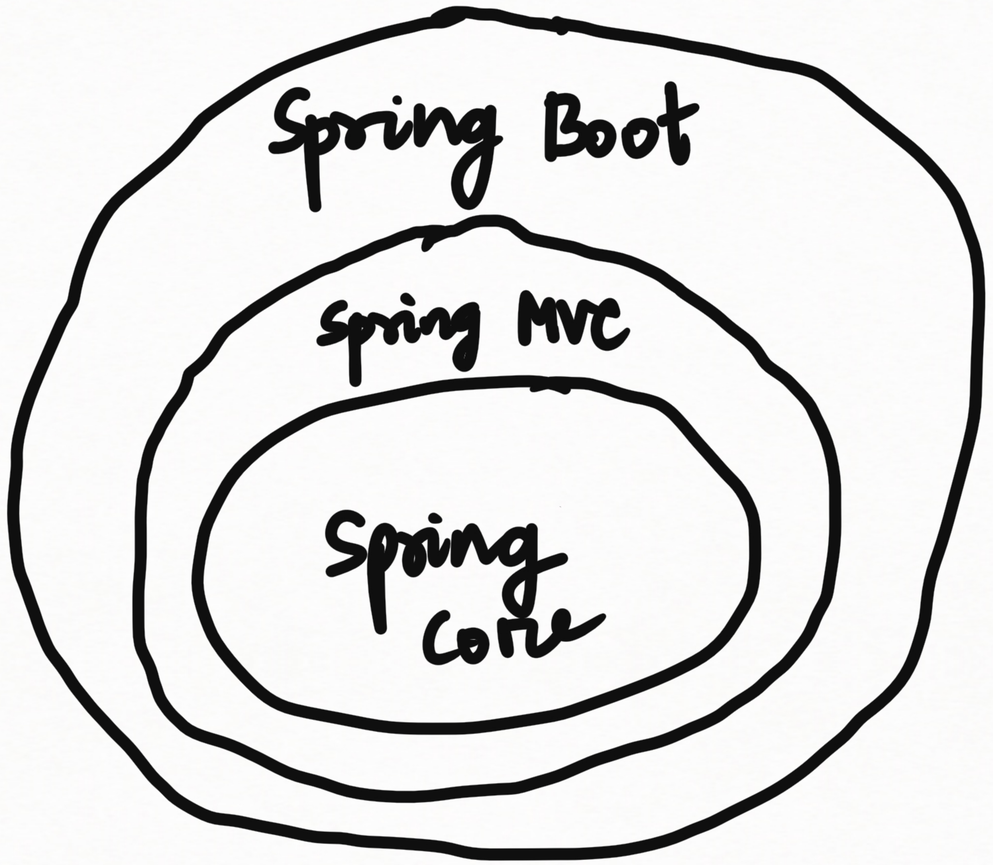
The following predefined/built-in container events are associated with the content object of every Spring application:-

i) ContextStartedEvent
ii) ContextRefreshedEvent
iii) ContextStoppedEvent
iv) ContentClosedEvent
v) RequestHandledEvent

→ Beans are managed objects (mostly POJOs). Their lifecycle is managed by the Spring IoC container. For instantiating a bean, the container may need some data, aka configuration metadata.

→ We can provide configuration metadata to the container(application context) in 3 ways:-

a) Xml-Based Configuration
b) Annotation-Based Configuration
c) Java-Based Configuration


Spring Boot
Spring MVC
Spring
Core

XML Schema-Based Configuration

Example

```java
package basicinjection;

public class Foo {
private String name;

public Foo() {  }

public Foo(String name) {
  this.name = name;
}

public void setName(String name) {
  this.name = name;
}

public String getName() {
  return name;
}

}
```

```java
package basicinjection;

public class Bar {
private String name;
private int age;
private Foo foo;

public Bar() {}

public Bar(String name,int age) {
  this.name = name;
  this.age = age;
}
public void setFoo(Foo foo) {
  this.foo = foo;
}

public void processFooName(){
  System.out.println("Name in Injected Foo is: "+foo.getName());
}

@Override
public String toString() {
  return "Bar has name = "+this.name+" and age = "+this.age;
}
}
```

To provide configuration metadata for the object reference "foo" in Bar class, we can use a XML file as follows:-

xml template →

```
<beans xmlns="http://www.springframework.org/schema/beans"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">
```

bean defn for Foo

```
    <bean id="foo" class="basicinjection.Foo" scope="prototype">
        <constructor-arg index="0" value="Cleopatra"></constructor-arg>
    </bean>
```

→ `Foo f = new Foo("Cleopatra");`

bean definition for Bar

```
    <bean id="bar" class="basicinjection.Bar">
        <constructor-arg type="int" value="26" />
        <constructor-arg type="java.lang.String" value="Arthur" />
        <property name="foo" ref="foo"></property>
    </bean>
</beans>
```

↳ constructor injection

↳ setter injection

→ `Bar b = new Bar("Arthur",26);`
`b.setFoo(f);`

beans.xml or applicationContext.xml

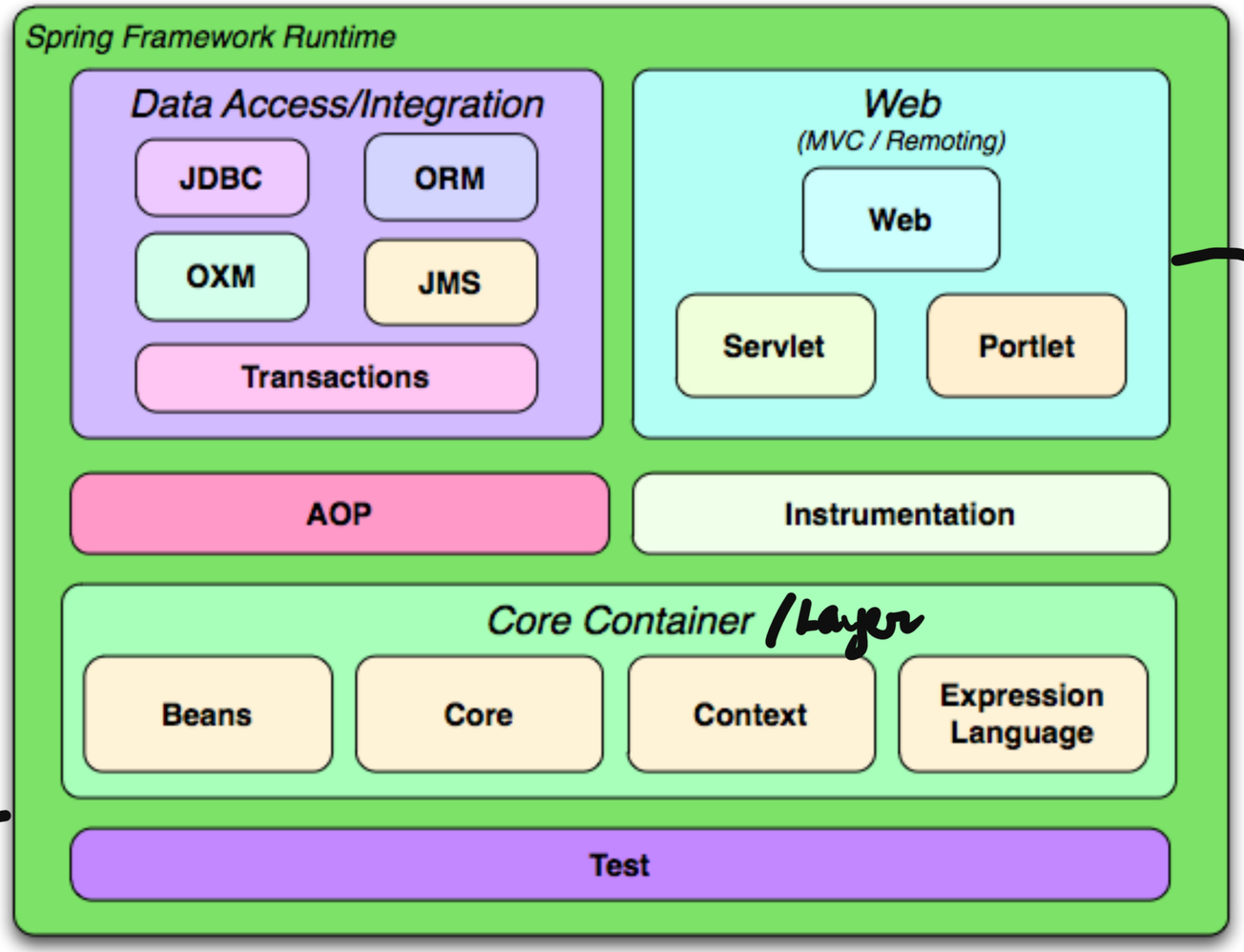
There are 2 ways of creating Spring application:-

i) Manually (by adding Spring dependencies to classpath)

ii) Using Maven (by defining Spring dependencies in pom.xml)

Spring Modules or Spring Architecture

Java Project
+
(spring-core
+
spring-beans
+
spring-context
+
spring-expression)
= Spring Project



20+ modules

web-enabled or web-aware Spring application

↳ Spring modules can be added as external dependencies to your Java project.

↳ External dependencies are added to the classpath.

↳ In eclipse:-

- Right-click on the project folder (in explorer)
- Hover on Build path & choose Configure build path.
- Select "Classpath" under the Libraries tab
- Click on Add External JARs button in the sidebar & add all the jar files.

→ When using Xml-Based configuration, the .xml file is kept directly under the "src" folder of your project.

→ XML = eXtensible Markup Language

→ In eclipse, after creating the beans.xml file or the applicationContext.xml file, right click on it and open with Generic Text Editor.