3. Java Based Configuration

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2. Application Context
3. Handling Multiple Configuration
4. Bean Scopes
5. Property Values
6. Spring Profiles
7. Coding Section: *Java Based Configuration*

Java Based Configuration Concept

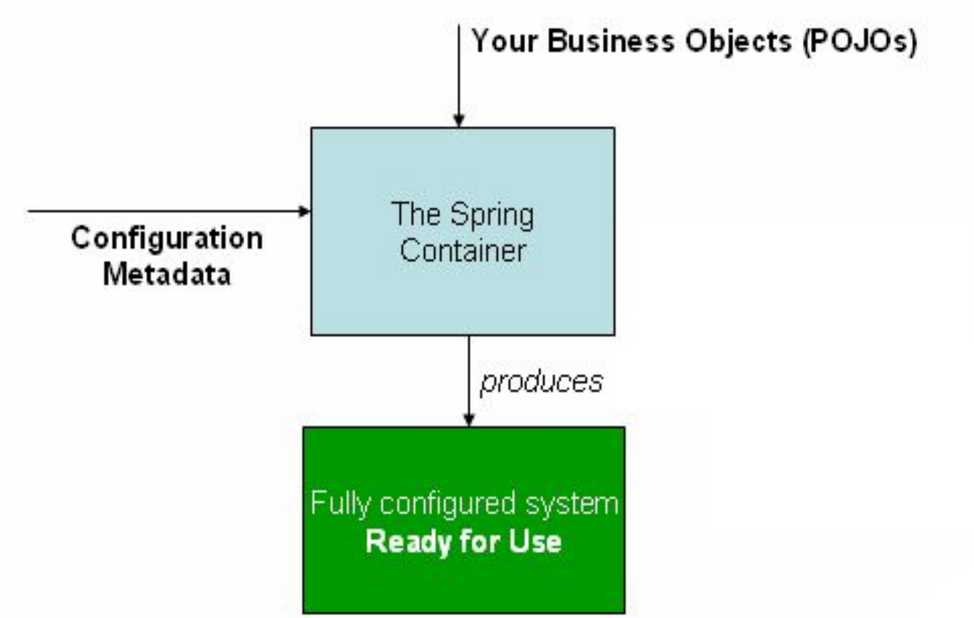

Figure 3.1: *The following diagram shows a high-level view of how Spring works. Application classes are combined with configuration metadata so that, after the ApplicationContext is created and initialized, you have a fully configured and executable system or application.*

- How can we initialize POJOs?
- How can we configure the dependencies they have?

Java Based Configuration Concept

No new operator
No service located
AccountRepository dependency

```
public class TransferServiceImpl implements TransferService {
    public TransferServiceImpl(AccountRepository ar) {
        this.accountRepository = ar;
    }
    ...
}
```

Dependency: Needed to perform money transfers between accounts

```
public class JdbcAccountRepository implements AccountRepository {
    public JdbcAccountRepository(DataSource ds) {
        this.dataSource = ds;
    }
    ...
}
```

Dependency: Needed to access account data in the database

No new operator
No service located
DataSource dependency

What we need?
Decoupling these components
Configuring our own components

Configuration Instructions with Dependencies

@Configuration: Tells the framework that we have definitions inside this class.
@Bean: Tells spring that defines a bean in ApplicationContext.

Method Invocation

```
@Configuration
public class ApplicationConfig {
  @Bean public TransferService transferService() {
    return new TransferServiceImpl( accountRepository() );
  }
  @Bean public AccountRepository accountRepository() {
    return new JdbcAccountRepository( dataSource() );
  }
  @Bean public DataSource dataSource() {
    BasicDataSource dataSource = new BasicDataSource();
    dataSource.setDriverClassName("org.postgresql.Driver");
    dataSource.setUrl("jdbc:postgresql://localhost/transfer" );
    dataSource.setUsername("transfer-app");
    dataSource.setPassword("secret45");
    return dataSource;
  }
}
```

Represents a dependency

Pass as Reference

```
@Configuration
public class ApplicationConfig {
  @Bean public TransferService transferService(AccountRepository repository) {
    return new TransferServiceImpl( repository );
  }
  @Bean public AccountRepository accountRepository(DataSource dataSource) {
    return new JdbcAccountRepository( dataSource );
  }
  @Bean public DataSource dataSource() {
    BasicDataSource dataSource = new BasicDataSource();
    ...
    return dataSource;
  }
}
```

Represents a dependency

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Application Context

```
// Create application context from the configuration
ApplicationContext context =
    SpringApplication.run( ApplicationConfig.class );

// Look up a bean from the application context
TransferService service =
        context.getBean("transferService", TransferService.class);

// Use the bean
service.transfer(new MonetaryAmount("300.00"), "1", "2");
```

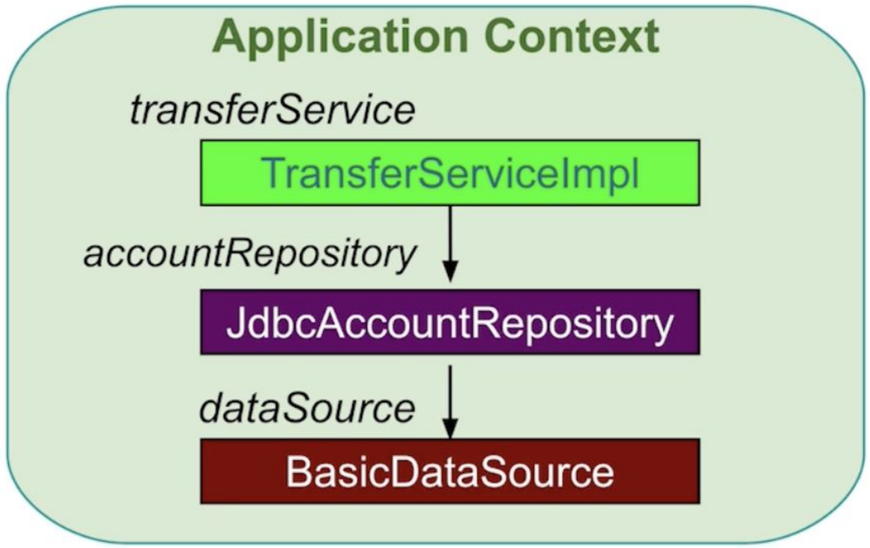
What configuration to use to define beans

Bean ID
Based in method name

use SpringApplication.run()

Inside the Spring ApplicationContext

```
// Create application context from the configuration
ApplicationContext context = SpringApplication.run( ApplicationConfig.class )
```



Application Context: Configuring with XML

```
// Create application context with ClassPathXmlApplicationContext
ApplicationContext context = new
ClassPathXmlApplicationContext("applicationContext.xml");
```

```
<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
           .xsd">

    <bean id="transferService" class="com.trendyol.bootcamp.service
        .TransferService"/>
</beans>
```

use ClassPathXmlApplicationContext with xml file

Accessing a Bean From Application Context

Multiple options

```
ApplicationContext context = SpringApplication.run(...);

// Use bean id, a cast is needed
TransferService ts1 = (TransferService)  context.getBean("transferService");

// Use typed method to avoid casting
TransferService ts2 =  context.getBean("transferService", TransferService.class);

// No need for bean id if type is unique - recommended (use type whenever possible)
TransferService ts3 =  context.getBean(TransferService.class );
```

cast because it is not type safe

a safe way with name and type

an ambiguity situation

Summary 

Spring manages your application objects

- ❑ Creating them in the correct dependency order
- ❑ Ensuring they are fully initialized before use

Ice Breaker 🥶

If you could travel anywhere in the world, where would you go?

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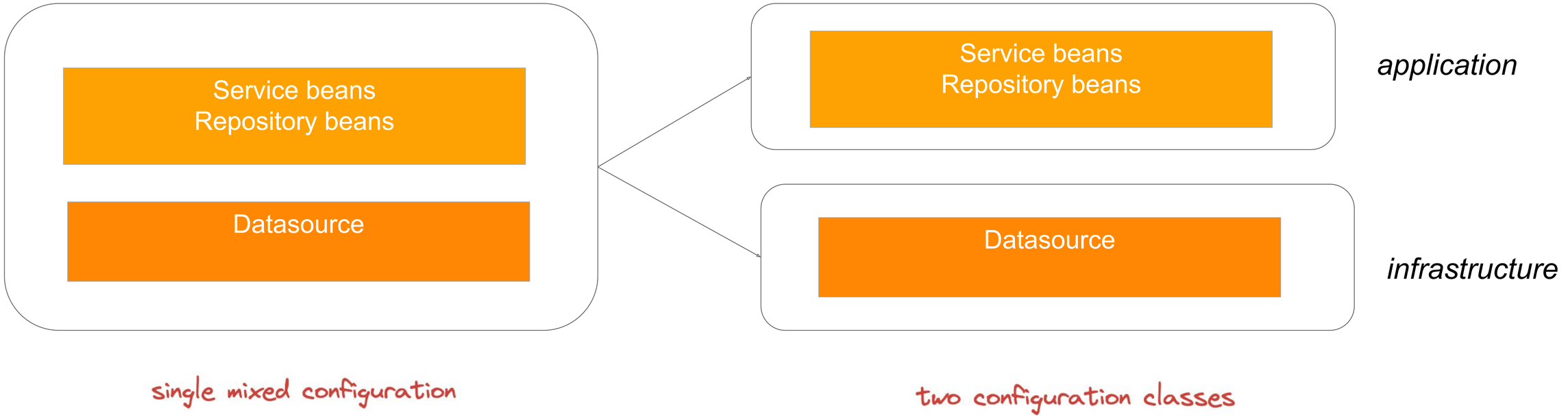
Creating an Application Context From Multiple Files



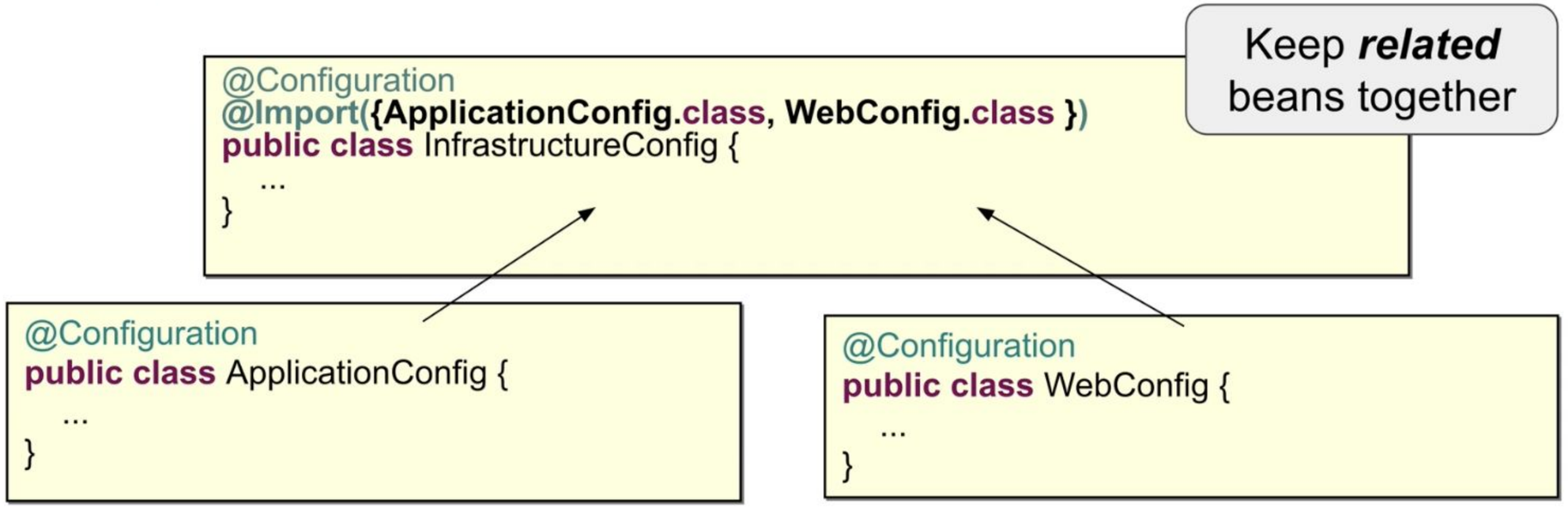
Separation of Concerns principle

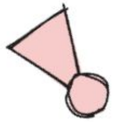
- ❏ Keep related beans in the same **@Configuration** file

Best Practice: separate “application” and “infrastructure”

- ❏ In real world, infrastructure often changes between environments

Handling Multiple Configurations





Files combined with @Import

Defines a single Application Context

Beans sourced from multiple files

Mixed Configuration

```
@Configuration
public class ApplicationConfig {

   @Bean public TransferService transferService(AccountRepository repository)
      { return new TransferServiceImpl( repository ); }

   @Bean public AccountRepository accountRepository(DataSource dataSource)
      { return new JdbcAccountRepository( dataSource );  }

   @Bean public DataSource dataSource() {
      BasicDataSource dataSource = new BasicDataSource();
      dataSource.setDriverClassName("org.postgresql.Driver");
      dataSource.setUrl("jdbc:postgresql://localhost/transfer" );
      dataSource.setUsername("transfer-app");
      dataSource.setPassword("secret45" );
      return dataSource;
   }
}
```

application beans

infrastructure bean

Coupled to a local Postgres environment

```
@Configuration
public class ApplicationConfig {
   @Bean public TransferService transferService(AccountRepository repository) {
      return new TransferServiceImpl ( repository );
   }

   @Bean public AccountRepository accountRepository(DataSource dataSource) {
      return new JdbcAccountRepository( dataSource );
   }
}
```

```
@Configuration
@Import(ApplicationConfig.class )
public class TestInfrastructureConfig {
   @Bean public DataSource dataSource() {
      ...
   }
}
```

```
ApplicationContext ctx = SpringApplication.run( TestInfrastructureConfig.class )
```

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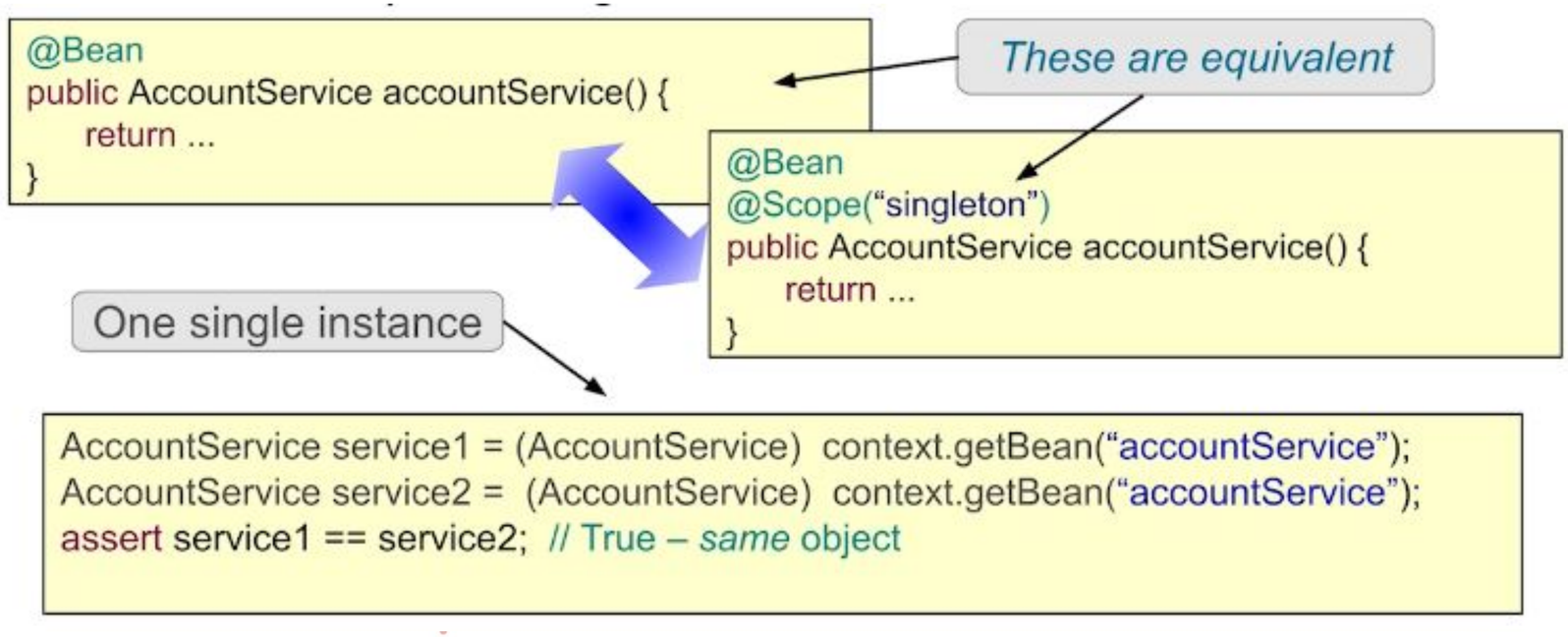
Bean Scope: *singleton*

The **scope** of a bean defines the life cycle and visibility of that bean in the contexts we use it.

- Default scope is *singleton.*
- **Singleton**: same instance used every time bean is referenced



Multiple requests problem:

Multiple threads accessing singleton beans at the same time

Bean Scope: *prototype*

- **Prototype**: new instance created every time bean is referenced

```
@Bean
@Scope("prototype")
public Action deviceAction() {
    return …
}
```

@Scope(scopeName="prototype")

```
Action action1 = (Action)  context.getBean("deviceAction");
Action action2 =  (Action)  context.getBean("deviceAction");
assert action1 != action2;  // True – different objects
```

TWO instances

Common Spring Scopes

Singleton

A single instance is used

Prototype

A new instance is created each time the bean is referenced

Session

A new instance is created per user session

Request

A new instance is created once per request

web environment only

Summary 

- In Java configuration there are two important annotation: **@Configuration** and **@Bean**
- You should define beans in configuration files.
- You can use single configuration file or multiple configuration file.
- You can use multiple configuration files with **@Import** annotation**.**

- Dependency injection aim is to decrease coupling
- Components don’t need to find their dependencies
- Container will inject those dependencies for them

- Application context manages the lifecycle of components
- The default scope is **Singleton**. It creates one instance and uses it
- In **Prototype** scope, a new instance is created every time

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Setting Property Values

Hard-coding these properties is a Bad practice

- ❏ Better practice is to “externalize” these properties.
- ❏ One way to “externalize” them is by using property files.

Environment bean represents loaded properties from runtime environment.
Properties derived from various sources:

- ❏ JVM System properties → **System.getProperty()**
- ❏ System Environment Variables → **System.getenv()**
- ❏ Java Properties Files


```
@Bean
public DataSource dataSource() {
  BasicDataSource ds = new BasicDataSource();
  ds.setDriverClassName("org.postgresql.Driver");
  ds.setUrl("jdbc:postgresql://localhost/transfer" );
  ds.setUser("transfer-app");
  ds.setPassword("secret45" );
  return ds;
}
```

Spring Environment Abstraction

Inject **Environment**

- ❏ package: *org.springframework.core.env*
- ❏ Call *getProperty()* method
- ❏ If you want to change any property value, change it from application.yml file

```
@Configuration
public class DbConfig {

    @Bean
    public DataSource dataSource(Environment env) {
        BasicDataSource ds = new BasicDataSource();
        ds.setDriverClassName(env.getProperty("spring.datasource.driver"));
        ds.setUrl(env.getProperty("spring.datasource.url"));
        ds.setUser(env.getProperty("spring.datasource.username"));
        ds.setPassword(env.getProperty("spring.datasource.password"));
        return ds;
    }

}
```

Inject Environment bean like any other Spring bean

```
spring:
  datasource:
    driver: org.postgresql.Driver
    url: jdbc:postgresql://localhost/transfer
    username: transfer-app
    password: secret45
```

application.yml file

Property Source

Environment bean obtains values from “property sources”

- ❏ *Environment variables* and *Java System Properties* always populated automatically.
- ❏ **@PropertySource** contributes additional properties.
- ❏ Available resource prefixes: **classpath: file: http:**

```
@Configuration
@PropertySource (“classpath:/com/trendyol/bootcamp/config/app.properties”)
@PropertySource (“file:config/local.properties”)
public class ApplicationConfig {

  ...
}
```

Add properties to these files in addition to environment variables and system properties

Accessing Properties Using @Value

use **@Value** annotation

- ❏ *package*: org.springframework.beans.factory.annotation
- ❏ No need to reference Environment
- ❏ 💥The *most* used way in Trendyol for accessing properties

```
@Configuration
   public class DbConfig {

      @Value("${spring.datasource.driver}")
       private String driver;

      @Value("${spring.datasource.url}")
       private String url;

      @Value("${spring.datasource.username}")
       private String username;

      @Value("${spring.datasource.password}")
       private String password;

      @Bean
      public DataSource dataSource() {
         BasicDataSource ds = new BasicDataSource();
         ds.setDriverClassName(driver);
         ds.setUrl(url);
         ds.setUser(username);
         ds.setPassword(password);
         return ds;
      }
}
```

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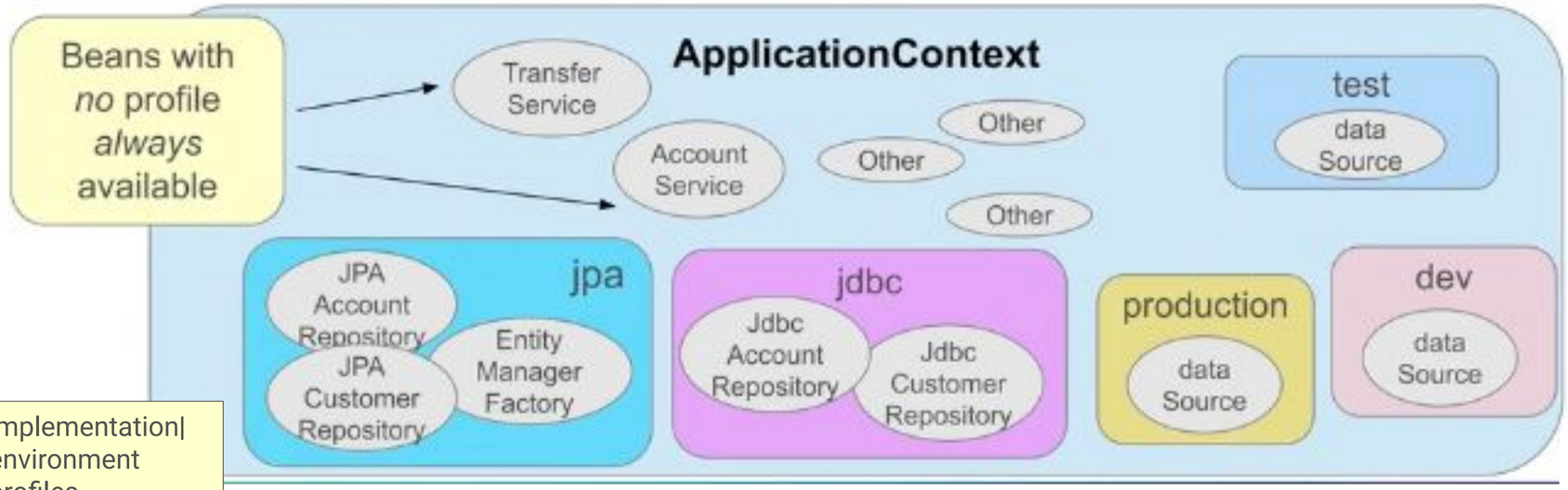
Spring Profiles

Profiles can represent

- ❏ Environment: *dev, test, production*
- ❏ Implementation: *jdbc, jpa*
- ❏ Deployment platform: *on-premise, cloud*
- ❏ Beans included / excluded based on profile membership



implementation| environment profiles

Defining Profiles

Using **@Profile** annotation on configuration class

- org.springframework.context.annotation
- Everything in Configuration belong to the profile
- If Profile is not activated, bean is not initialized

```
@Configuration
@Profile("embedded")
public class DevConfig {

   @Bean
   public DataSource dataSource() {
      EmbeddedDatabaseBuilder builder = new EmbeddedDatabaseBuilder();
      return builder.setName("testdb")
                  .setType(EmbeddedDatabaseType.HSQL)
                  .addScript("classpath:/testdb/schema.db")
                  .addScript("classpath:/testdb/test-data.db").build();
   }
   ...
```

Nothing in this configuration will be used *unless* "embedded" profile is chosen as one of the active profiles

H2, Derby are also supported

Defining Profiles

You can use **@Profile** annotation on **@Bean** methods
You can use exclamation **!** with **@Profile**

```
@Configuration
@Profile("cloud")
public class DevConfig {
    …
}
```

If *cloud* is **active** profile

```
@Configuration
@Profile("!cloud")
public class ProdConfig {
    …
}
```

If *cloud* is **inactive** profile

Not cloud – use exclamation !

```
@Configuration
public class DataSourceConfig {

    @Bean(name="dataSource")
    @Profile("embedded")
    public DataSource dataSourceForDev() {
        EmbeddedDatabaseBuilder builder = new EmbeddedDatabaseBuilder();
        return builder.setName("testdb") ...
    }

    @Bean(name="dataSource")
    @Profile("!embedded")
    public DataSource dataSourceForProd() {
        BasicDataSource dataSource = new BasicDataSource();
        ...
        return dataSource;
    }
}
```

Explicit bean-name overrides method name

Both profiles define *same* bean name, so only *one* profile should be activated at a time.

Ways to Activate Profiles

Profiles must be activated at run-time

- System property via command-line

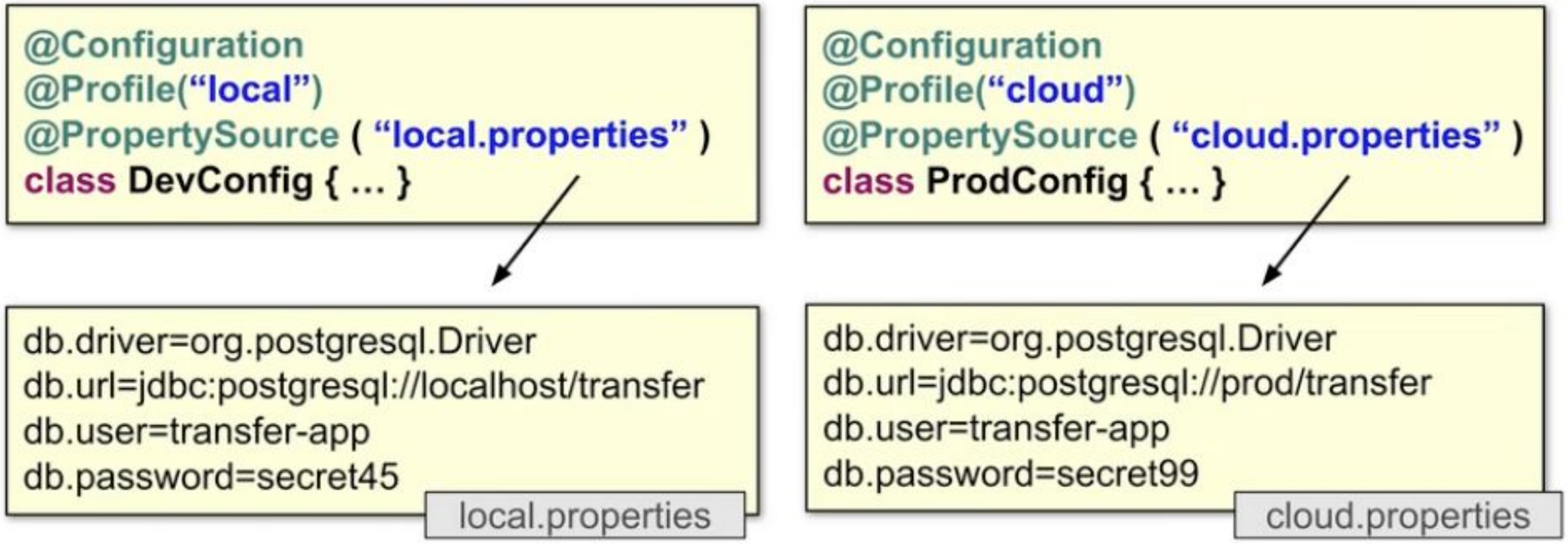
```
-Dspring.profiles.active=embedded,jpa
```

- System property programmatically

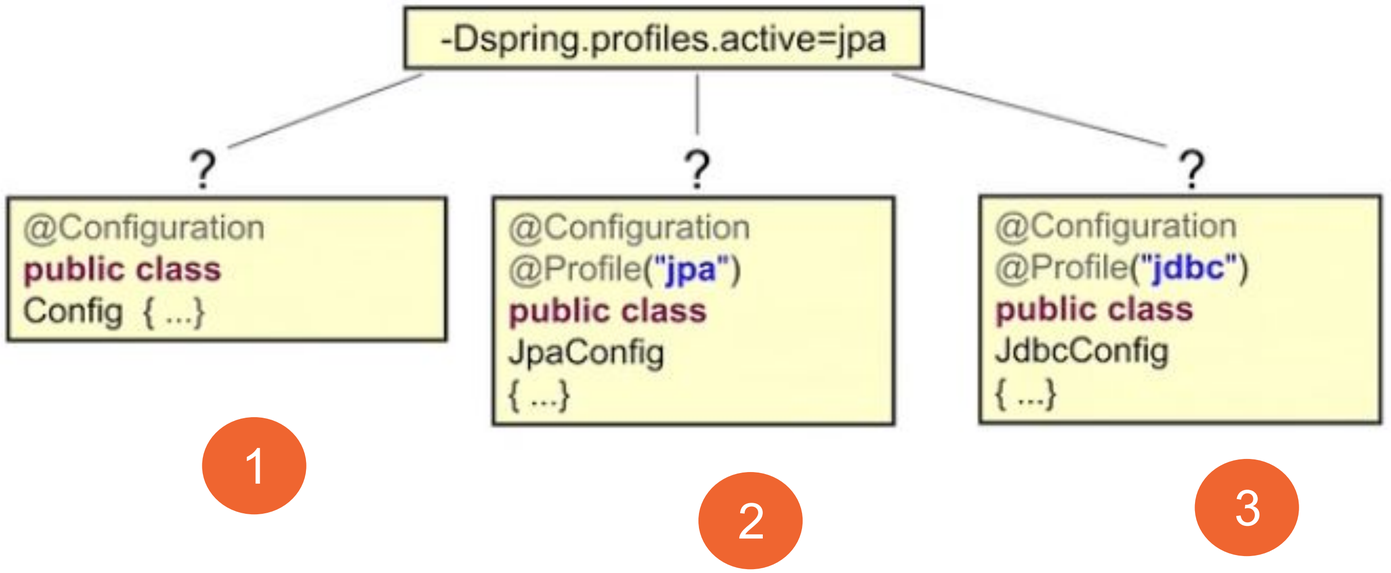
```
System.setProperty("spring.profiles.active", "embedded,jpa");
SpringApplication.run(AppConfig.class);
```

Property Source Selection

@Profile can control which **@PropertySource** are included in the Environment



Question



trendyol learning

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Lab Section

What we will learn:

1. How to create a Spring ApplicationContext and get a bean from it
2. Spring Java configuration syntax

Todos:

1. Please, Switch branch to `feature/java-based-configuration`
2. There are **12 TODOs** in the project files. Look at these TODOs
3. Lets try to do each TODO together