



Pivotal®

More Configuration

Deeper Look into Spring's Java
Configuration Capability



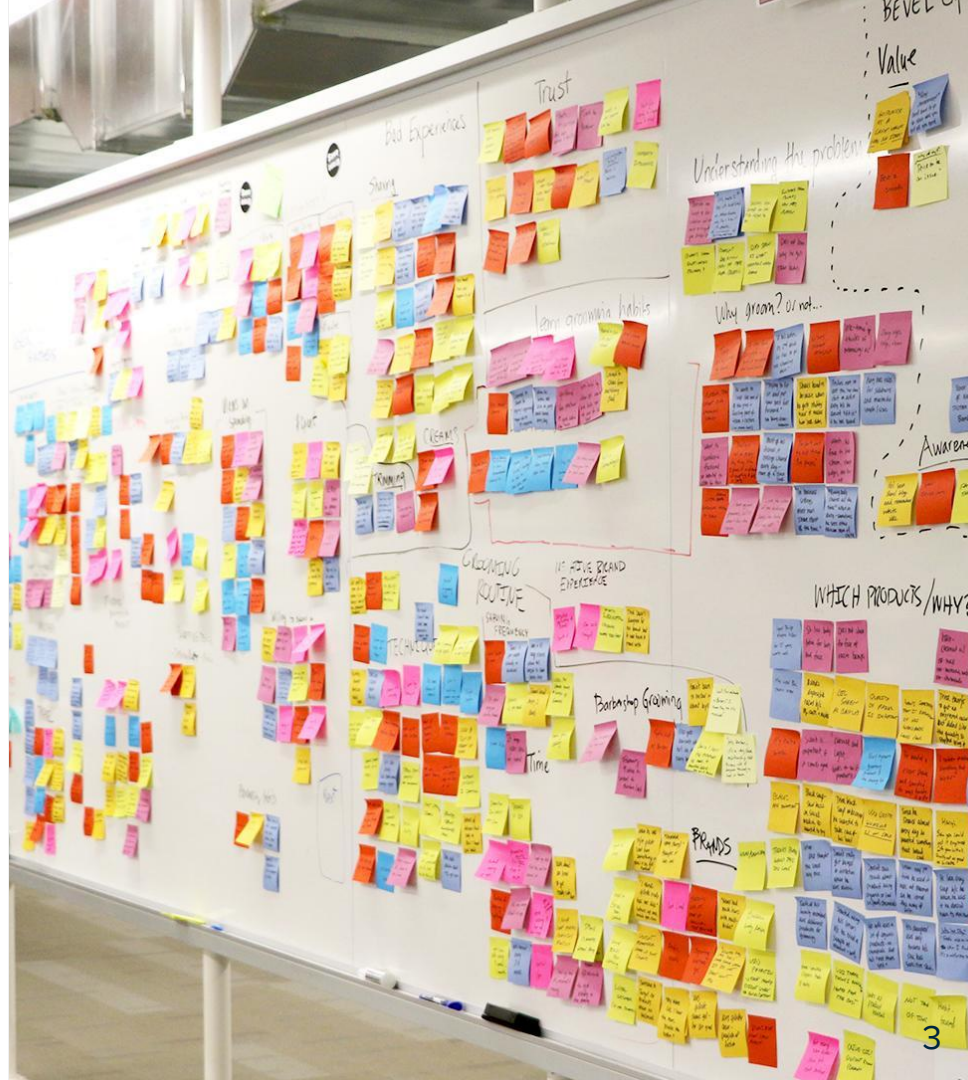
Objectives

After completing this lesson, you should be able to

- Use External Properties to control Configuration
- Demonstrate the purpose of Profiles
- Use the Spring Expression Language (SpEL)
- Explain How Configuration classes are Manipulated at Runtime

Agenda

- External Properties
- Profiles
- Spring Expression Language
- Singleton “Magic”



Setting property values

- Consider this bean definition from the last chapter:

```
@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;
}
```

- Bad practice to hard-code these parameter Strings
 - Better practice is to “externalize” these to a properties file

Spring's Environment Abstraction – 1

- **Environment** bean represents loaded properties from runtime environment
- Properties derived from various sources, in this order:
 - JVM System Properties - **`System.getProperty()`**
 - Servlet Context Parameters
 - JNDI
 - System Environment Variables - **`System.getenv()`**
 - Java Properties Files

Spring's Environment Abstraction – 2

@Configuration

```
public class DbConfig {
```

```
    @Bean public DataSource dataSource(Environment env) {
```

```
        BasicDataSource ds = new BasicDataSource();
```

```
        ds.setDriverClassName( env.getProperty( "db.driver" ));
```

```
        ds.setUrl( env.getProperty( "db.url" ));
```

```
        ds.setUser( env.getProperty( "db.user" ));
```

```
        ds.setPassword( env.getProperty( "db.password" ));
```

```
        return ds;
```

```
    }
```

```
}
```

Inject **Environment** bean
like any other Spring Bean

Fetch property
values from
environment

```
db.driver=org.postgresql.Driver  
db.url=jdbc:postgresql:localhost/transfer  
db.user=transfer-app  
db.password=secret45
```

app.properties

Property Sources

- 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/organization/config/app.properties” )
```

```
@PropertySource ( “file:config/local.properties” )
```

```
public class ApplicationConfig {
```

```
    ...
```

```
}
```

Adds properties from these files *in addition* to environment variables and system properties

Accessing Properties using @Value

@Configuration

public class DbConfig {

@Bean

public DataSource dataSource(

@Value("\${db.driver}") String driver,

@Value("\${db.url}") String url,

@Value("\${db.user}") String user,

@Value("\${db.password}") String pwd) {

BasicDataSource ds = **new** BasicDataSource();

ds.setDriverClassName(driver);

ds.setUrl(url);

ds.setUser(user);

ds.setPassword(pwd);

return ds;

}

}

Convenient
alternative to
explicitly using
Environment bean

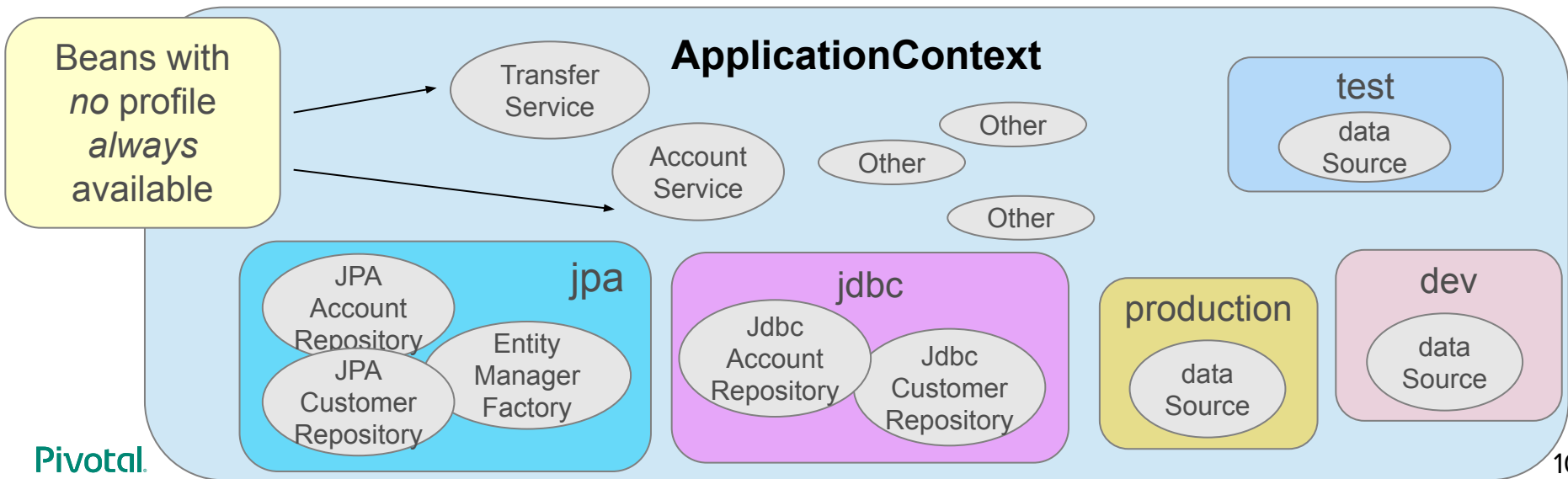
Agenda

- External Properties
- **Profiles**
- Spring Expression Language
- Singleton “Magic”



Profiles - Beans can be grouped into Profiles

- Profiles can represent environment: dev, test, production
- Or implementation: “jdbc”, “jpa”
- Or deployment platform: “on-premise”, “cloud”
- Beans included / excluded based on profile membership



Defining Profiles – 1

- Using **@Profile** annotation on configuration class
 - Everything in Configuration belong to the profile

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

Nothing in this configuration will be used unless “embedded” is activated

```
    @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();
    }
}
```

H2, Derby are also supported

Defining Profiles - 2

- Using **@Profile** annotation on **@Bean** methods

```
@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 id, so only
one profile should be
activated at a time.

Defining Profiles - 3

- Beans when a profile is *not* active

```
@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 !

Ways to Activate Profiles

- Profiles must be activated at run-time
 - System property via command-line

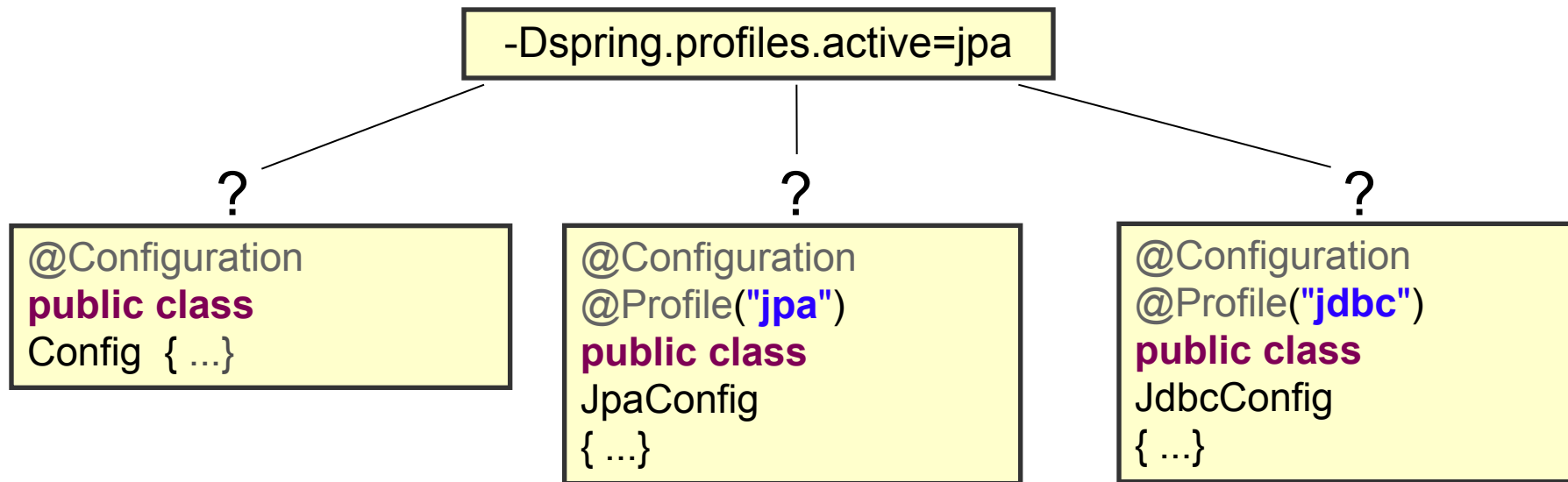
```
-Dspring.profiles.active=embedded,jpa
```

- System property programmatically

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

- Integration Test *only*: @ActiveProfiles (later section)

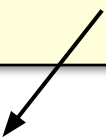
Quiz: Which of the Following is/are Selected?



Property Source selection

- `@Profile` can control which `@PropertySources` are included in the Environment

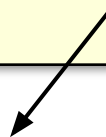
```
@Configuration  
@Profile("local")  
@PropertySource ( "local.properties" )  
class DevConfig { ... }
```



```
db.driver=org.postgresql.Driver  
db.url=jdbc:postgresql://localhost/transfer  
db.user=transfer-app  
db.password=secret45
```

local.properties

```
@Configuration  
@Profile("cloud")  
@PropertySource ( "cloud.properties" )  
class ProdConfig { ... }
```



```
db.driver=org.postgresql.Driver  
db.url=jdbc:postgresql://prod/transfer  
db.user=transfer-app  
db.password=secret99
```

cloud.properties

Agenda

- External Properties
- Profiles
- **Spring Expression Language**
- Singleton “Magic”



Spring Expression Language

- SpEL for short
 - Inspired by the Expression Language used in Spring WebFlow
 - Based on Unified Expression Language used by JSP and JSF
- Pluggable/extendable by other Spring-based frameworks



This is just a brief introduction, for full details see:

<http://docs.spring.io/spring/docs/current/spring-framework-reference/html/expressions.html>

SpEL examples – Using @Value

```
@Configuration
class TaxConfig {

    @Value("#{ systemProperties['user.region'] }") String region;

    @Bean
    public TaxCalculator taxCalculator1() {
        return new TaxCalculator( region );
    }

    @Bean
    public TaxCalculator taxCalculator2
        (@Value("#{ systemProperties['user.region'] }") String region, ...) {
        return new TaxCalculator( region );
    }
    ...
}
```

Option 1: Set an attribute then use it

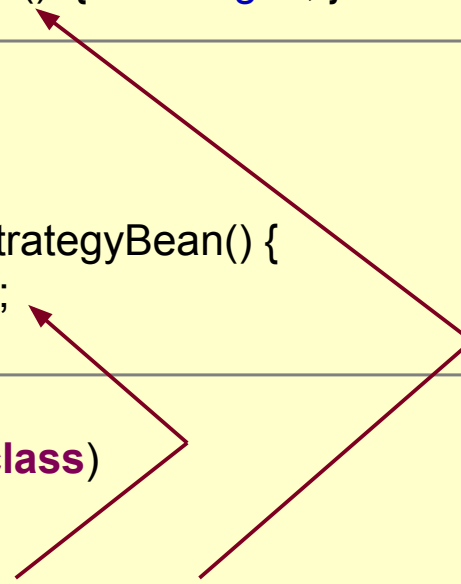
Option 2: Pass as a bean method argument

SpEL – Accessing Spring Beans

```
class StrategyBean {  
    private KeyGenerator gen = new KeyGenerator.getInstance("Blowfish");  
    public KeyGenerator getKeyGenerator() { return gen; }  
}
```

```
@Configuration  
class StrategyConfig  
{  
    @Bean public StrategyBean strategyBean() {  
        return new StrategyBean();  
    }  
}
```

```
@Configuration  
@Import(StrategyConfig.class)  
class AnotherConfig  
{  
    @Value("#{strategyBean.keyGenerator}") KeyGenerator kgen;  
    ...  
}
```



Accessing Properties

- Can access properties via the *environment*
 - These are equivalent

```
@Value("${daily.limit}")  
int maxTransfersPerDay;
```

```
@Value("#{environment['daily.limit']}")  
int maxTransfersPerDay;
```

- Properties are Strings
 - May need to cast in expressions

```
@Value("#{new Integer(environment['daily.limit']) * 2}")  
@Value("#{new java.net.URL(environment['home.page']).host}")
```

Cannot do this with properties

Fallback Values



Elvis lives!

- Providing a fall-back value
 - If `daily.limit` undefined, use colon `:`

```
@Autowired
public TransferServiceImpl(@Value("${daily.limit : 100000}") int max) {
    this.maxTransfersPerDay = max;
}
```

Equivalent operators

- For SpEL, use the “Elvis” operator `?:`

```
@Autowired
public setLimit(@Value("#{environment['daily.limit'] ?: 100000}") int max) {
    this.maxTransfersPerDay = max;
}
```

`x ?: y` is short for `x != null ? x : y`

SpEL

- EL Attributes can be:
 - Spring beans (like *strategyBean*)
 - Implicit references
 - Spring's *environment*, *systemProperties*, *systemEnvironment* available by default
 - Others depending on context
- SpEL allows to create custom functions and references
 - Widely used in Spring projects
 - Spring Security, Spring WebFlow
 - Spring Batch, Spring Integration
 - Each may add *their own* implicit references

Agenda

- External Properties
- Profiles
- Spring Expression Language
- **Singleton “Magic”**



Quiz

Which is the best implementation?

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

1. Method call



```
@Bean
public TransferService transferService1() {
    return new TransferServiceImpl(accountRepository());
}
```

2. New instance?

```
@Bean
public TransferService transferService2() {
    return new TransferServiceImpl( new JdbcAccountRepository() );
}
```

Prefer call to *dedicated* method. Let's discuss why ...

Working with Singletons

Recall: *Singleton* is default scope

```
@Bean
```

```
public AccountRepository accountRepository() {  
    return new JdbcAccountRepository();  
}
```

Singleton??

```
@Bean
```

```
public TransferService transferService() {  
    return new TransferServiceImpl(accountRepository());  
}
```

```
@Bean
```

```
public AccountService accountService() {  
    return new AccountServiceImpl( accountRepository() );  
}
```

Method
called *twice*
more

HOW IS IT POSSIBLE?

Singletons Require “Magic”

- At startup time, a *subclass* is created
 - Subclass performs *scope-control*
 - Only calls *super* on *first* invocation of singleton bean method
 - Singleton instance is cached by the *ApplicationContext*

```
@Configuration
public class AppConfig {
    @Bean public AccountRepository accountRepository() { ... }
    @Bean public TransferService transferService() { ... }
}
```

 inherits from

```
public class AppConfig$$EnhancerByCGLIB$ extends AppConfig {
    public AccountRepository accountRepository() { // ... }
    public TransferService transferService() { // ... }
}
```

Inheritance-based Subclasses

- Child class is the entry point

```
public class AppConfig$$EnhancerByCGLIB$ extends AppConfig {  
  
    public AccountRepository accountRepository() {  
        // if bean is in the applicationContext, then return bean  
        // else call super.accountRepository(), store bean in context, return bean  
    }  
  
    public TransferService transferService() {  
        // if bean is in the applicationContext, then return bean  
        // else call super.transferService(), store bean in context, return bean  
    }  
}
```



Java Configuration uses *cglib* for inheritance-based subclasses

Summary

- Property values are easily externalized using Spring's Environment abstraction
- Profiles are used to group sets of beans
- Spring Expression Language
- Spring proxies your **@Configuration** classes to allow for scope control