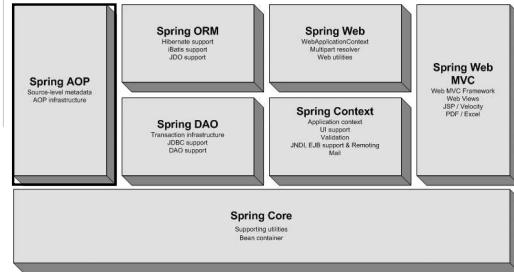


CS520 Web Programming

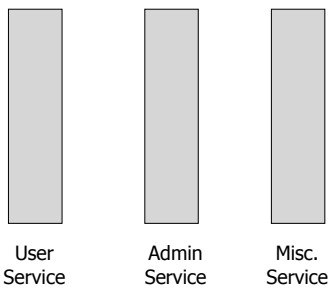
Spring – Aspect Oriented Programming

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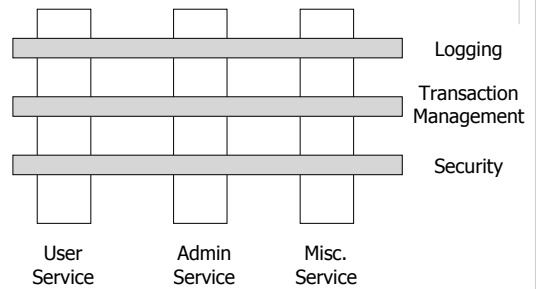
Spring Framework



Concerns



Cross-Cutting Concerns



An Example of Transaction Rollback

```
catch( SQLException e ) {  
    System.err.println( e.getMessage() );  
    if( c != null ) {  
        try {  
            c.rollback();  
        } catch( SQLException ex ) {  
            System.err.println( ex.getMessage() );  
        }  
    }  
}
```

Aspect Oriented Programming

- ◆ Separate out cross-cutting concern code into their own classes or modules, called aspects.

Example: Logging

- ◆ LoggedTask1 and LoggedTask2
 - Both implement LoggedTask interface
 - LoggedTask1 – mixes application code and logging code
 - LoggedTask2 – only has application code

How Does it Work?

```
class Foo {  
    Object bar() {...}  
}
```

run some code before bar() is called

run some code after bar() is called

Proxy – Subclass

```
class Foo1 extends Foo {  
    void bar()  
    {  
        // some code before super.bar()  
        ...  
        O o = super.bar();  
        // some code after super.bar();  
        ...  
        return o;  
    }  
}
```

Proxy – Wrapper Class

```
class Foo2 {  
    private Foo foo;  
    void bar()  
    {  
        // some code before super.bar()  
        ...  
        Object o = foo.bar();  
        // some code after super.bar();  
        ...  
        return o;  
    }  
}
```

Some AOP Terminology

- ◆ Target
- ◆ Proxy
- ◆ Proxy Interface
- ◆ Aspect
- ◆ Advice

Create Proxies Automatically - ProxyFactoryBean

```
<bean id="loggedTask2" class="cs520.spring.aop.LoggedTask2" />  
<bean id="loggedTask2WithAdvice"  
    class="org.springframework.aop.framework.ProxyFactoryBean">  
    <property name="proxyInterfaces">  
        <list>  
            <value>cs520.spring.log.LoggedTask</value>  
        </list>  
    </property>  
    <property name="target" ref="loggedTask2" />  
    <property name="interceptorNames">  
        <list>  
            <value>loggingAdvice</value>  
        </list>  
    </property>  
</bean>
```

More AOP Terminology

- ◆ Join point: a point in the execution of the application where the aspect can be plugged in
- ◆ Pointcut: A predicate that determines join points
- ◆ Introduction: adding new methods and/or fields to existing classes
- ◆ Weaving
 - *Compile time, class load time, or runtime*

Spring AOP

- ◆ Advices are written in Java
- ◆ Pointcuts are defined in XML configuration file
- ◆ Supports only method join points
- ◆ Aspects are woven in at runtime
- ◆ Advisor = Aspects + Pointcuts

Advice Types

Type	Interface
Around	org.aopalliance.intercept.MethodInterceptor
Before	org.springframework.aop.BeforeAdvice
After	org.springframework.aop.AfterReturningAdvice
Throws	org.springframework.aop.ThrowsAdvice

Use Interceptor

```
public class LoggingInterceptor implements MethodInterceptor {  
    public Object invoke( MethodInvocation invocation ) throws Throwable  
    {  
        // do something before method invocation  
        ...  
  
        Object result = invocation.proceed();  
  
        // do something after method invocation  
        ...  
  
        return result;  
    }  
}
```

Configure Pointcuts

- ◆ NameMatchMethodPointcutAdvisor
- ◆ RegExpPointcutAdvisor

AutoProxying

- ◆ BeanNameAutoProxyCreator
- ◆ DefaultAdvisorAutoProxyCreator

About AOP

- ◆ Good??
- ◆ Bad??