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JavaOne

Building JavaServer Faces Applications with Spring and Hibernate

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TS-7082

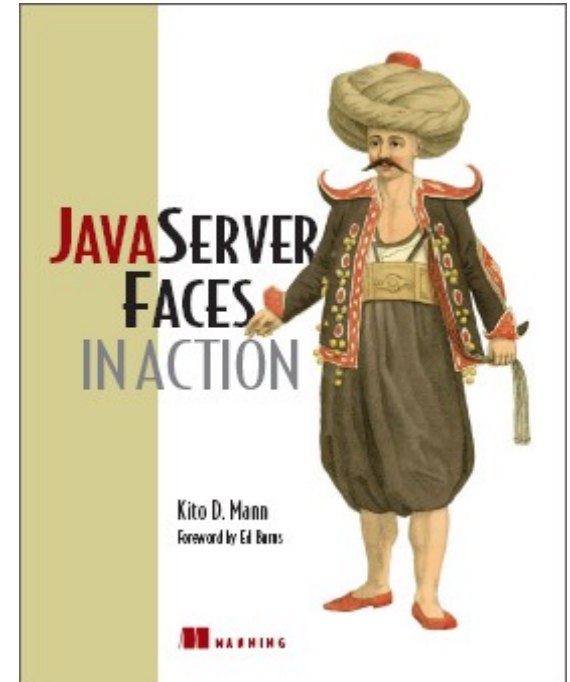


What You Will Learn...

**Why you should
use JavaServer Faces technology,
Spring, and Hibernate together and
how to do it**

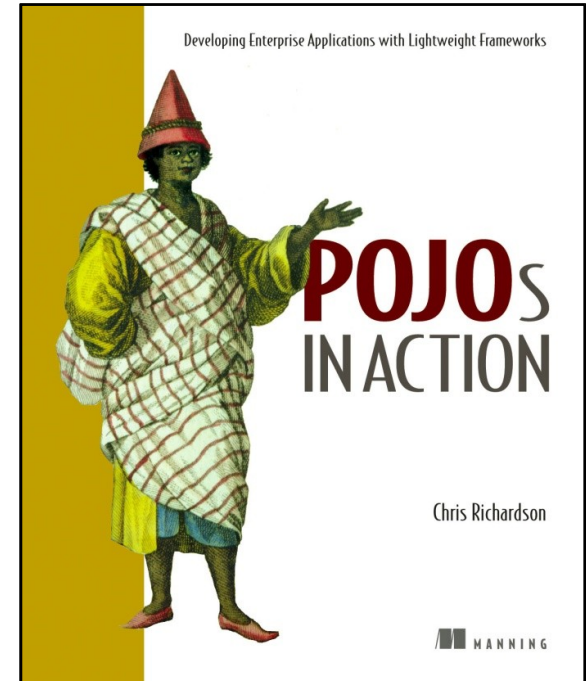
About Kito Mann

- Author, [JavaServer Faces in Action](#)
- Trainer, consultant, architect, mentor
- Internationally recognized speaker
 - JavaOneSM Conference, JavaZone, TSS Symposium, Javapolis, NFJS, etc.
- Founder, JSF Central
 - <http://www.jsfcentral.com>
- Java Community ProcessSM (JCPSM) Member
 - JavaServerTM Faces 1.2 platform, JavaServer Pages 2.1 (JSPTM) software, Design-Time API for JavaBeansTM architecture, Design-Time Metadata for JavaServer Faces Components, WebBeans, etc.
- Experience with JavaTM platform since its release in 1995
- Web development since 1993



About Chris Richardson

- Grew up in England
- Live in Oakland, CA
- Developing software for 21 years
 - OO development since 1986
 - Java platform since 1996
 - Java Platform, Enterprise Edition (Java EE) since 1999
- Author of POJOs in Action
- Speaker at JavaOne Conference, JavaPolis, NFJS, JUGs,
- Chair of the eBIG Java SIG in Oakland (www.ebig.org)
- Run a consulting and training company that helps organizations build better software faster



Agenda

Using JavaServer Faces technology
for the UI

Building a POJO backend

Using Spring in the business tier

Using Hibernate for persistence

Integrating Spring and JavaServer Faces
technology

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JavaServer Faces Technology Overview

- Standard web user interface (UI) framework for Java platform
 - JavaServer Faces 1.0 platform: Standardized through Java Community Process (JCP) in 2004 (JSR 127)
 - JavaServer Faces 1.2 platform: Standardized through JCP in 2006 (Java Specification Request (JSR) 252)
 - Part of Java EE 5.0 platform
- Specification consists of:
 - Server side UI component and event model
 - Set of basic UI components
 - Basic MVC-style application infrastructure



JavaServer Faces Technology Overview

- Can automatically synchronize UI components with application objects
- Includes basic Dependency Injection container
- Extensive tool support
 - Sun, Oracle, IBM, BEA, Exadel, Borland, JetBrains, Genuitec, others
- Enables RAD-style approach to Java platform web development
- Built on top of Servlet API
- Works with JSP framework, but does not require it

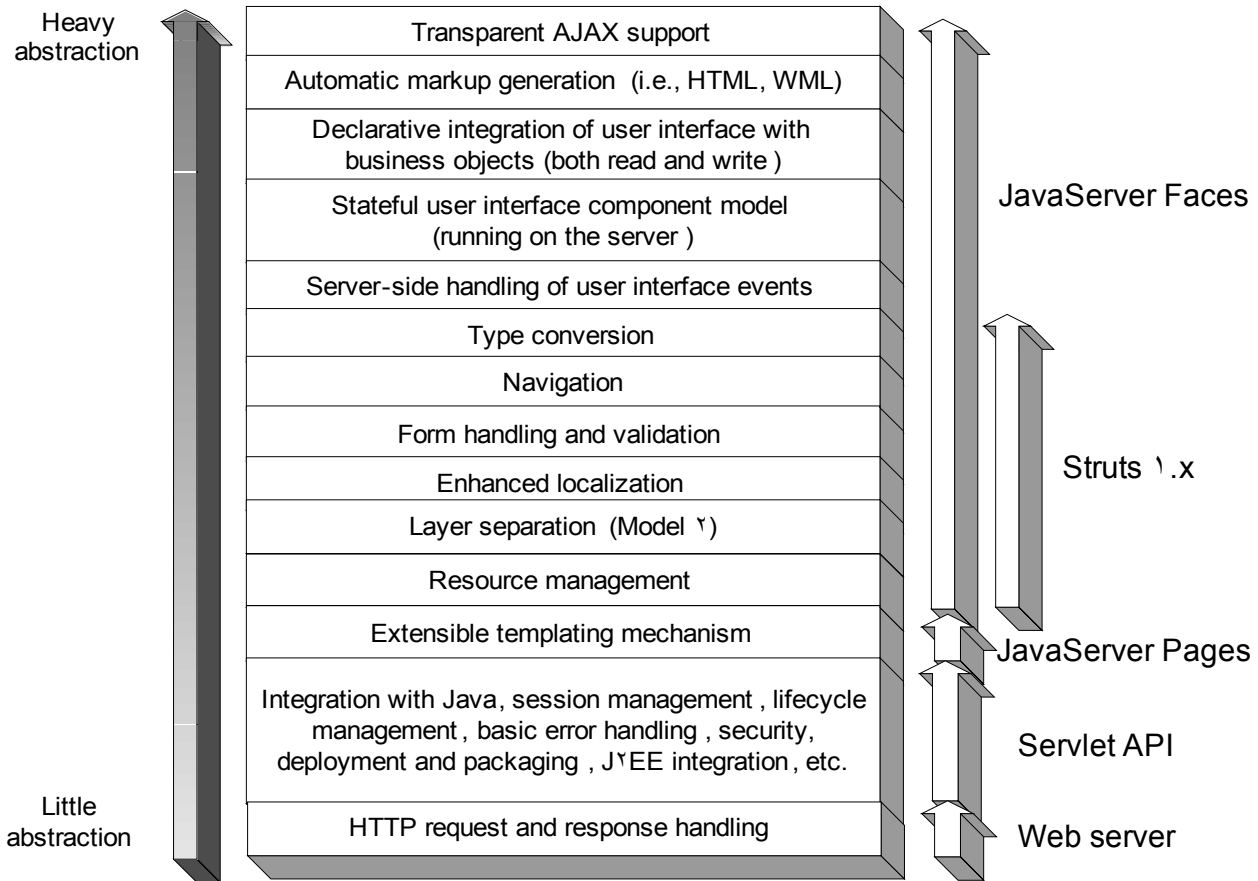


JavaServer Faces Technology Overview

- Standard UI component model enables a third-party component marketplace
 - Grids, Trees, Menus, Sliders, Panels, Charts, Popup Windows, Calendars, etc.
 - Open source and commercial vendors
 - Often have integrated AJAX support



JavaServer Faces Technology vs. Struts



View
(JSP, Facelets, Clay)

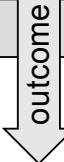
```
<h:commandButton value="Save"
  action="#{createProjectBean.add}" />
```



Managed Beans

Backing bean
(POJO)

```
public String add()
{
  Project project = getVisit().getCurrentProject();
  getProjectCoordinator().add(project);
  return "success";
}
```



Navigation rules
(faces-config.xml)

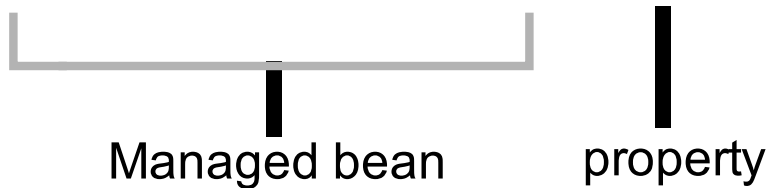
```
<navigation-rule>
  <from-view-id>create.jsp</from-view-id>
  <navigation-case>
    <from-outcome>failure</from-outcome>
    <to-view-id>create.jsp</to-view-id>
  </navigation-case>
  <navigation-case>
    <from-outcome>success</from-outcome>
    <to-view-id>show_all.jsp</to-view-id>
  </navigation-case>
</navigation-rule>
```

JavaServer Faces Platform Programming Model

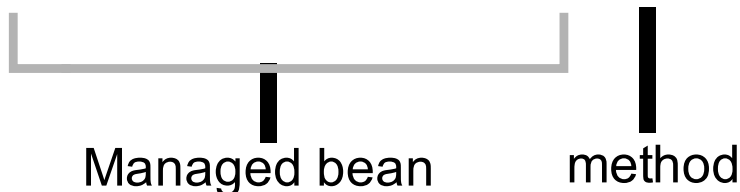
The JavaServer Faces Technology Expression Language

- Can reference managed bean properties and methods

`#{updateProjectBean.comments}`



`#{createProjectBean.add}`



The JavaServer Faces Technology Expression Language

- Expression evaluation is pluggable

```
# {updateProjectBean comments}
```



- Can either replace or decorate the default functionality
- Key integration point



DEMO

JavaServer Faces Platform UI Layer



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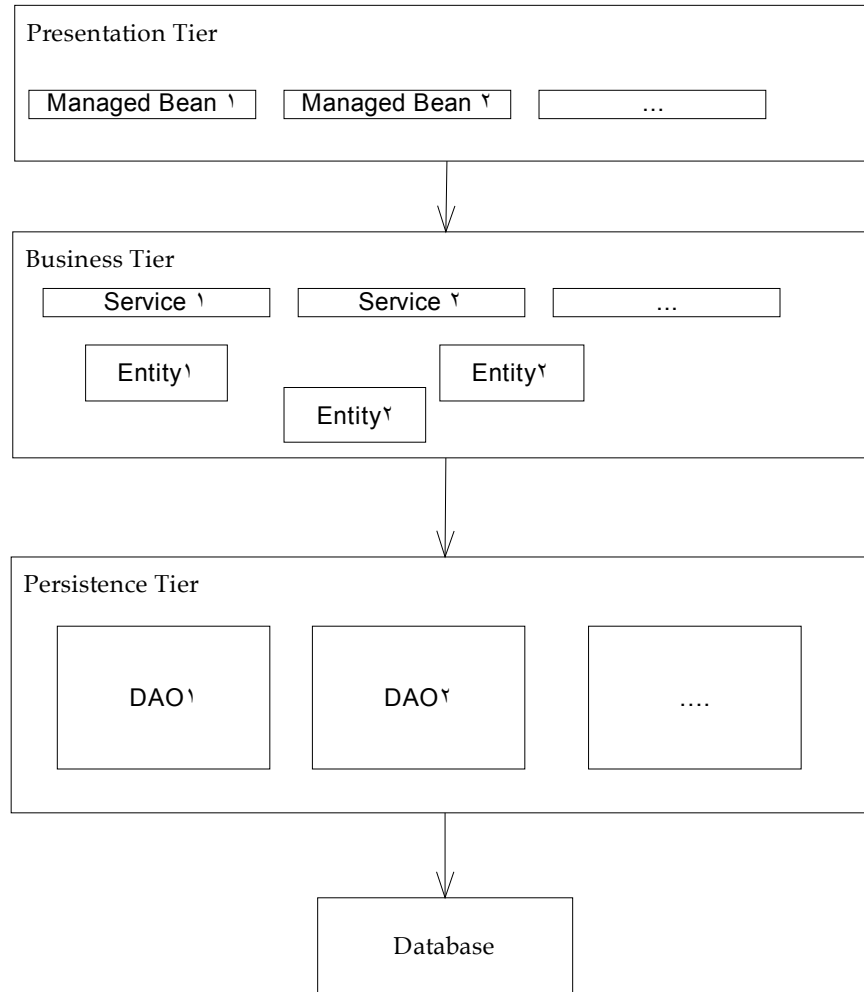
Using Hibernate for persistence

Integrating Spring and JavaServer Faces
technology

Avoid the Smart UI Anti-pattern

- Managed beans could do it all:
 - Implement the presentation logic
 - Implement the business rules
 - Access the database
- This might work for tiny application
- For real world applications you need to have a layered architecture
 - Improved modularity and reuse
 - Simplifies development
 - Simplifies testing

Use a Layered Architecture



Transaction management
Security
Application assembly

Spring or EJB

Database Access

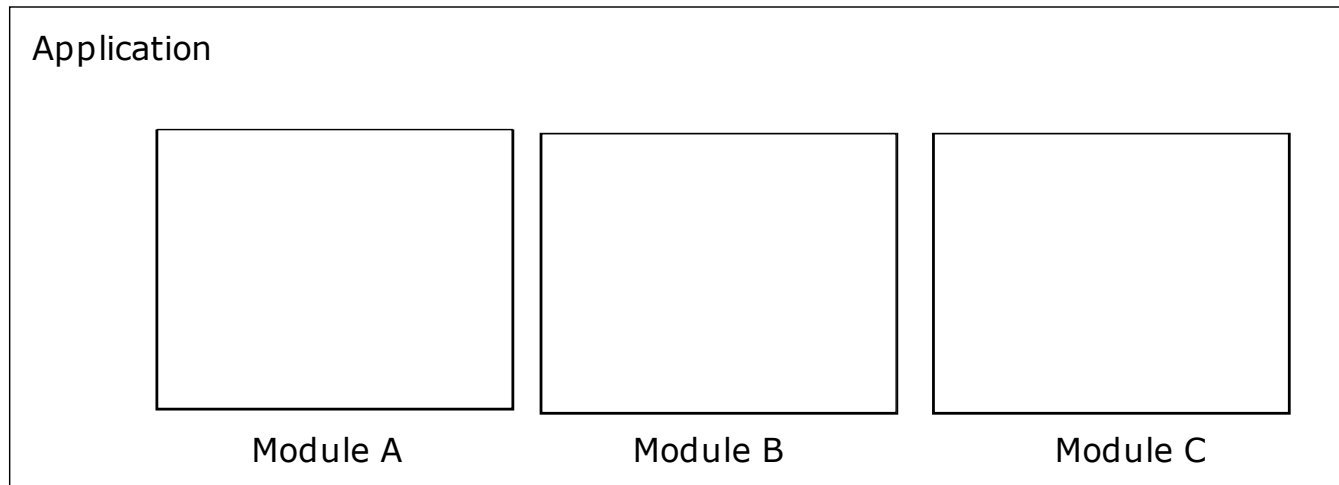
SQL: JDBC, iBATIS
or
OR/M: Hibernate, JPA



Separating Concerns in the Backend

- Layers are essential because they separate some concerns, e.g. presentation and business logic
- But within the business tier there are concerns that are not easily separated
 - Transactions
 - Security
 - Persistence
 - Other: logging, auditing, etc.
- These are cross cutting concerns
 - Span multiple application components
 - Can't be solved by traditional modularization mechanisms such as layers or base classes
 - You must implement them by sprinkling code throughout the application

Traditional Architecture = Tangled Concerns



Business logic

Persistence

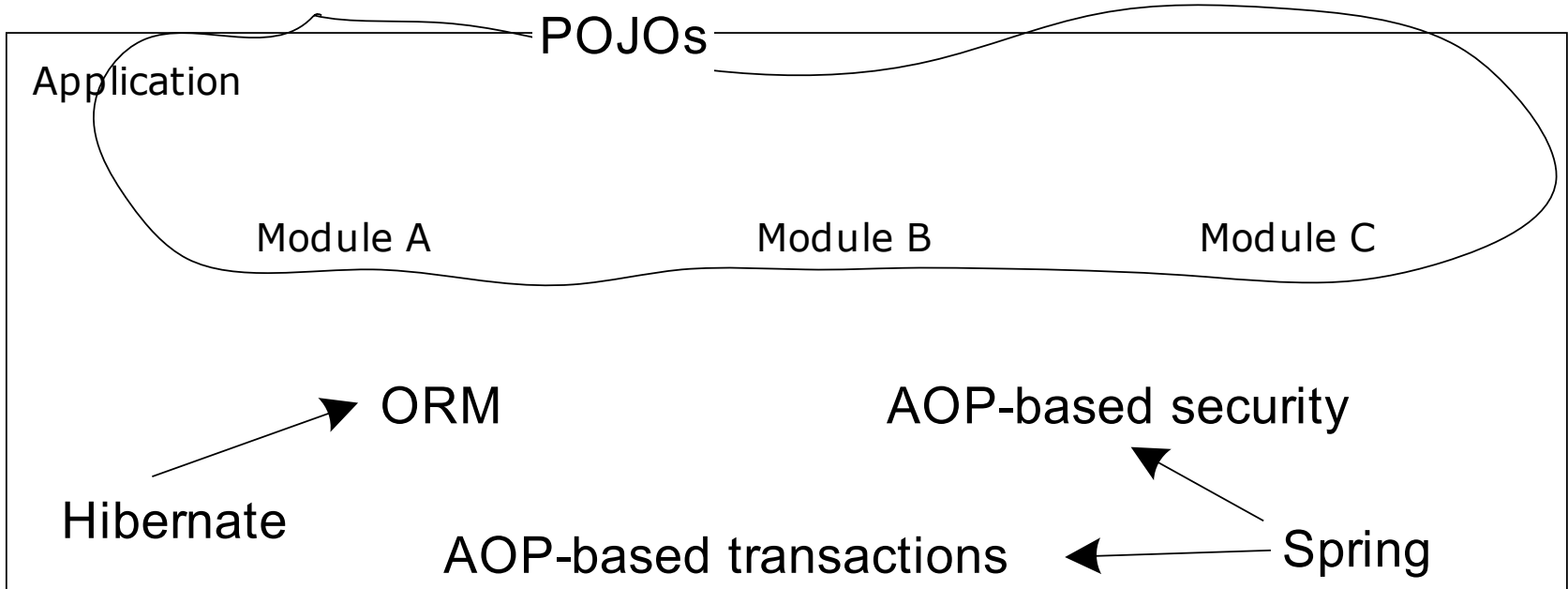
Transactions

Security

POJO = Plain Old Java Object

- Java objects that don't implement any special interfaces or (perhaps) call infrastructure APIs
- Coined by Martin Fowler, Rebecca Parsons, and Josh MacKenzie to make them sound just as exciting as JavaBeans, Enterprise JavaBeans™ technology
- Simple idea with surprising benefits

POJO Application Architecture



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Overview of Spring

- What is Spring?
 - Framework for simplifying Java EE platform application development
 - Rich feature set including dependency injection, AOP, ORM support, a web framework, ...
- Key Spring features:
 - Dependency injection
 - AOP for transaction management, security and application-specific cross cutting concerns
 - Classes for simplifying data access

Spring Lightweight Container

- Lightweight container = sophisticated factory for creating objects
- Spring bean = object created and managed by Spring
- You write metadata (e.g. XML) or code that specifies how to:
 - Instantiate Spring beans
 - Initialize them using dependency injection
- Separates component instantiation and assembly from the components themselves

Spring Code Example

```
public class ProjectCoordinatorImpl ...
public ProjectCoordinatorImpl(
    ProjectRepository
    projectRepository, ...)
{
    this.projectRepository =
        projectRepository;
    ...
}
```

```
<bean id="projectCoordinator"
      class="ProjectCoordinatorImpl">
  <constructor-arg ref="projectRepository"/>
  ...
</bean>
```

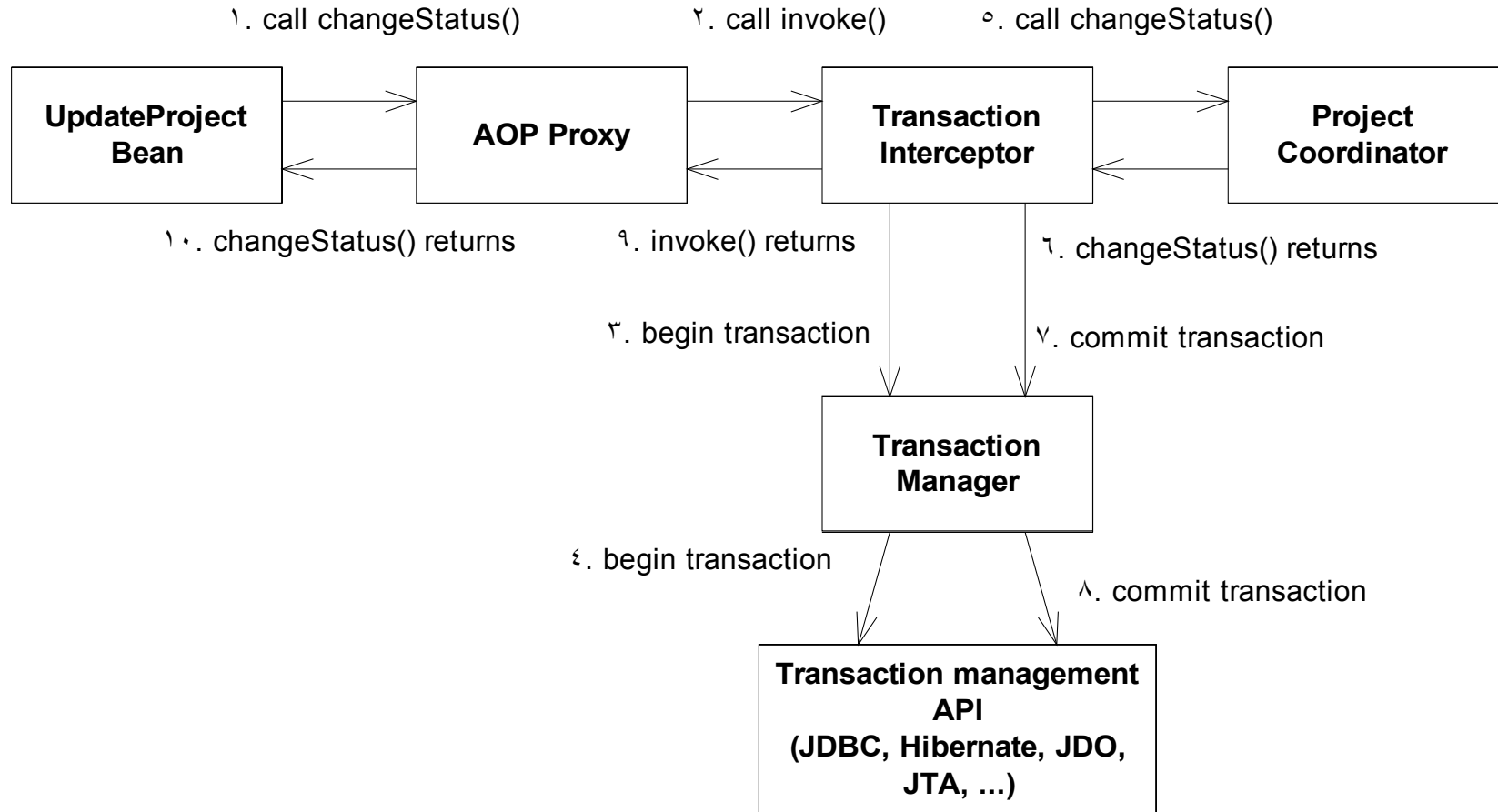
```
public class HibernateProjectRepository
  implements ProjectRepository {
  ...
}
```

```
<bean id="projectRepository"
      class="HibernateProjectRepository">
  ...
</bean>
```

Spring AOP

- AOP enables the modular implementation of crosscutting concerns
- Spring AOP = simple, effective AOP implementation
- Lightweight container can wrap objects with proxies
- Proxy executes extra code before/after/instead-of original method
- Spring uses proxies for:
 - transaction management
 - security
 - tracing
 - ...

Spring Transaction Management



Spring 2 Transaction Management

```
<bean id="projectCoordinator"
  class="ProjectCoordinatorImpl">
...
</bean>
```

```
<beans>
<aop:config>
  <aop:advisor
    pointcut="
      execution(* *.*Coordinator.*(..))"
    advice-ref="txAdvice"/>
</aop:config>
```

```
<bean id="transactionManager"
  class="HibernateTransactionManager">
...
</bean>
```

```
<tx:advice id="txAdvice">
  <tx:attributes>
    <tx:method name="*" />
  </tx:attributes>
</tx:advice>
</beans>
```

Handling Custom Crosscutting Concerns

- Examples of application-specific crosscutting concerns
 - Auditing—recording user actions in a database
 - Automatically retrying failed transactions
- The traditional approach = sprinkle code throughout the application
 - Auditing—logic in every business method
 - Transaction retry—loop/try/catch around every call
- It simple but there are important drawbacks
 - Duplication of code
 - Business logic does several things \Rightarrow more complex
 - Easy to forget \Rightarrow insecure/fragile application

Example Transaction Retry Aspect

```
public class TransactionRetryAspect {
    protected int maxRetries = 3;

    public Object retryTransaction(ProceedingJoinPoint jp)
        throws Throwable {
        int retries = 0;
        while (true)
            try {
                return jp.proceed();
            } catch (ConcurrencyFailureException e) {
                if (retries++ > maxRetries)
                    throw e;
                else continue;
            }
    }
}
```

Bean and Aspect Definitions

```
<bean id="transactionRetryPOJOAspect"  
    class="net.chrisrichardson.aspects.retry.TransactionRetryPOJOAspect">  
    <property name="maxRetries" value="4" />  
</bean>  
  
<aop:config>  
  
    <aop:pointcut id="serviceMethod"  
        expression="execution(public *  
net.chrisrichardson..*Coordinator.*(..))" />  
  
    <aop:aspect id="txnRetryAspect" ref="transactionRetryAspect" >  
        <aop:around method="retryTransaction" pointcut-ref="serviceMethod"  
/>  
    </aop:aspect>  
  
</aop:config>
```



DEMO

Spring Service Layer



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POJO Persistence

- Using an object/relational framework:
 - Metadata maps domain model to the database schema
 - Application code written in terms of objects
 - ORM framework generates SQL statements
- Java Persistence API (JPA)
 - Standardized OR/M
- Hibernate
 - Very popular open-source project
 - It's a superset of Java Persistence API

O/RM Example

```
class Project {  
  
    private int id;  
    private String name;  
  
    ...  
}
```

```
<class name="Project" table="PROJECT">  
  
    <id name="id" column="PROJECT_ID">  
        <generator class="native" />  
    </id>  
  
    <property name="name" column="NAME"/>  
  
</class>
```

```
public class HibernateProjectRepository ... {  
  
    public void add(Project project) {  
        getHibernateTemplate().save(project);  
    }  
  
    public Project get(int projectId) {  
        return (Project) getHibernateTemplate().get(Project.class, projectId);  
    }  
}
```

Cool OR/M Framework Features

- Provides (mostly) transparent persistence
 - Objects are unaware that they are persistent
 - Minimal constraints on classes
 - They are POJOs
- Supports navigation between objects
 - Application navigates relationships
 - ORM framework loads objects behind the scenes
- Tracks changes to objects
 - Detects which objects have changed
 - Automatically updates the database
- Manages object identity
 - Only one copy of an object per PK
 - Maintains consistency

O/R Mapping Framework Benefits

- Improved productivity:
 - High-level object-oriented API
 - Less Java code to write
 - No SQL to write
- Improved performance
 - Sophisticated caching
 - Lazy loading
 - Eager loading
- Improved maintainability
 - A lot less code to write
- Improved portability
 - ORM framework generates database-specific SQL for you

**But Use O/R
Mapping Wisely:
It's not a
Silver Bullet**



DEMO

Hibernate Data Access Layer



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Division of Labor: Managed Beans vs. Spring Beans

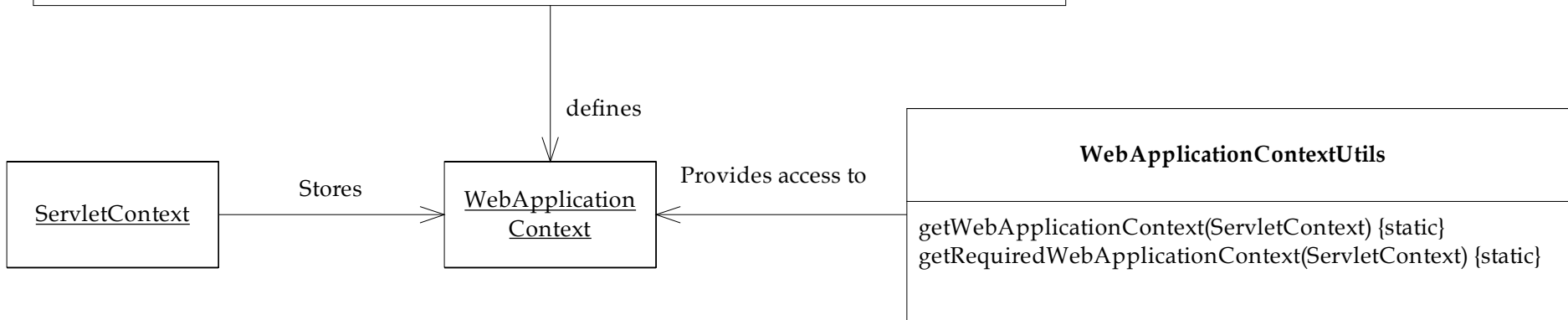
- Inject service-layer Spring beans into JavaServer Faces technology managed beans
 - Logical separation of UI from Service Layer
 - Integrated support with Spring DelegatingVariableResolver

Spring in a Web Application

```

<web>
  <context-param>
    <param-name>contextConfigLocation</param-name>
    <param-value>
      classpath:/appCtx/services.xml
      classpath:/appCtx/transactions.xml
    ...
  </param-value>
</context-param>
<listener>
  <listener-class>
    org.springframework.web.context.ContextLoaderListener
  </listener-class>
</listener>
...
</web>

```



JavaServer Faces Technology and Spring

- Managed beans = simple dependency injection
- Extend to resolve bean references using Spring
- DelegatingVariableResolver
 - Included with Spring 1.1 and higher
 - First, looks for a JavaServer Faces technology managed bean
 - Then, looks for a Spring bean

JavaServer Faces Technology Example

```

<faces-config>
  <application>
    <variable-resolver>
      org.springframework.web.jsf.DelegatingVariableResolver
    </variable-resolver>
  </application>

```

```

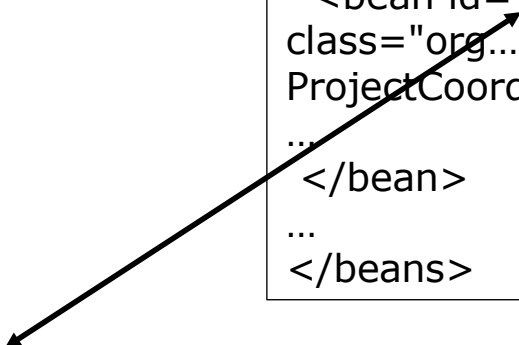
...
<managed-bean>
  <managed-bean-name>
    inboxBean
  </managed-bean-name>
  <managed-property>
    <property-name>
      projectCoordinator
    </property-name>
    <value> #{projectCoordinator} </value>
  </managed-property>
</managed-bean>
...
</faces-config>

```

```

<beans>
  ...
  <bean id="projectCoordinator"
    class="org...
    ProjectCoordinatorImpl">
  ...
</bean>
...
</beans>

```



Accessing the `WebApplicationContext`

- Use the `WebApplicationContextVariableResolver`
 - Available in Spring 1.25 or later
- Exposes Spring `WebApplicationContext` under the “`webApplicationContext`” variable
- Allows you to access the Spring `BeanFactory` and other services directly from managed beans
- This feature is included in Apache Shale

JavaServer Faces Technology-Spring

- Alternative to DelegatingVariableResolver
- Full bidirectional integration between Spring beans and JavaServer Faces technology managed beans
 - Managed beans can refer to Spring beans
 - Spring beans can refer to managed beans
- Enables integration between Spring MVC and JavaServer Faces technology
- Supports JavaServer Faces 1.1 platform and Spring 2.0
- Open source on SourceForge
 - Sponsored by mindmatters

JBoss Seam Integration

- Spring DelegatingVariableResolver
- Spring integration module
 - Injecting Seam components into Spring beans
 - Injecting Spring beans into Seam components
 - Making a Spring bean into a Seam component
 - Seam-scoped Spring beans
- Some Seam features will be standardized as parts of JavaServer Faces 2.0 platform and the WebBeans JSR



DEMO

JavaServer Faces Technology/
Spring Integration



Summary

- JavaServer Faces technology, Spring and Hibernate work well together
 - JavaServer Faces technology implements the presentation tier
 - Spring provides dependency injection and AOP
 - Hibernate transparently persists POJOs
- JavaServer Faces technology and Spring are seamlessly integrated through dependency injection
 - Spring 2 integration
 - JavaServer Faces technology-Spring
 - Seam Spring integration

For More Information

- ProjectTrack Sample Code
 - <http://code.google.com/p/projecttrack/>
- POJOs in Action, Chris Richardson
 - <http://www.manning.com/crichardson>
- JSF in Action, Kito D. Mann
 - <http://www.manning.com/mann>
- Official Spring Site
 - <http://www.springframework.org>
- Official Hibernate Site
 - <http://www.hibernate.org>
- Official JavaServer Faces Technology Site
 - <http://java.sun.com/javaee/javaserverfaces/>



For More Information

- JSF-Spring
 - <http://jsf-spring.sourceforge.net/>
- JSF Central
 - <http://www.jsfcentral.com>
- Sessions and BOFs
 - TS-6178—Simplifying JavaServer Faces Component Development
 - TS-4439—Minimalist Testing Techniques for Enterprise Java Technology-Based Applications
 - BOF-4400—Improve and Expand JavaServer Faces Technology with JBoss Seam
 - TS-4514—Three Approaches to Securing Your JavaServer Faces Technology/Spring/Hibernate Applications



Q&A

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