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JavaOne

Building JavaServer Faces Applications with Spring and Hibernate

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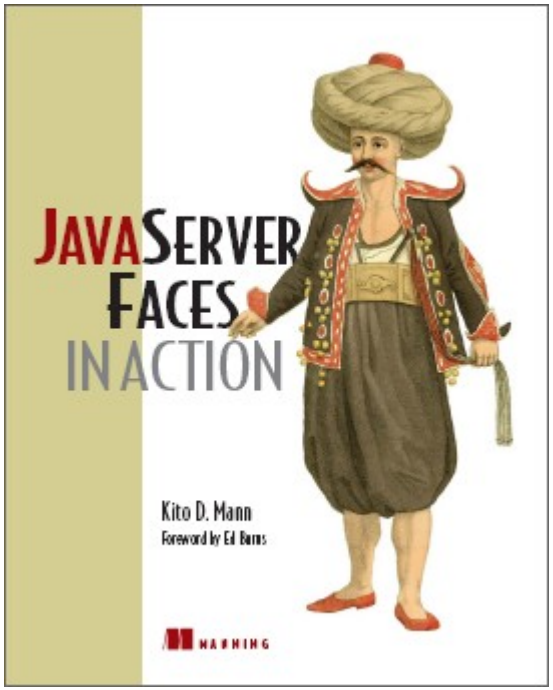
TS-7082

What You Will Learn…

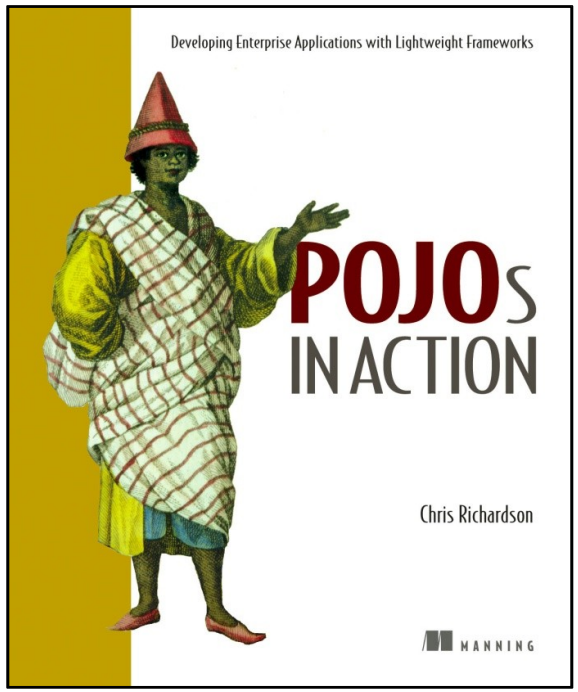
Why You Should Use JavaServer™ Faces Technology, Spring, and Hibernate Together and How to Do It

About Kito Mann



- Author, JavaServer Faces in Action
- Trainer, consultant, architect, mentor
- Internationally recognized speaker
  - The JavaOne℠ Conference, JavaZone, TSS Symposium, Javapolis, NFJS, etc.
- Founder, JSF Central
  - http://www.jsfcentral.com
- Java Community Process℠ (JCP℠) Member
  - JavaServer Faces 1.2 platform, JavaServer Pages 2.1 (JSP™) software, Design-Time API for JavaBeans™ architecture, Design-Time Metadata for JavaServer Faces Components, WebBeans, etc.
- Experience with Java™ platform since its release in 1995
- Web development since 1993

About Chris Richardson



- Grew up in England
- Lives in Oakland, California
- 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 The 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

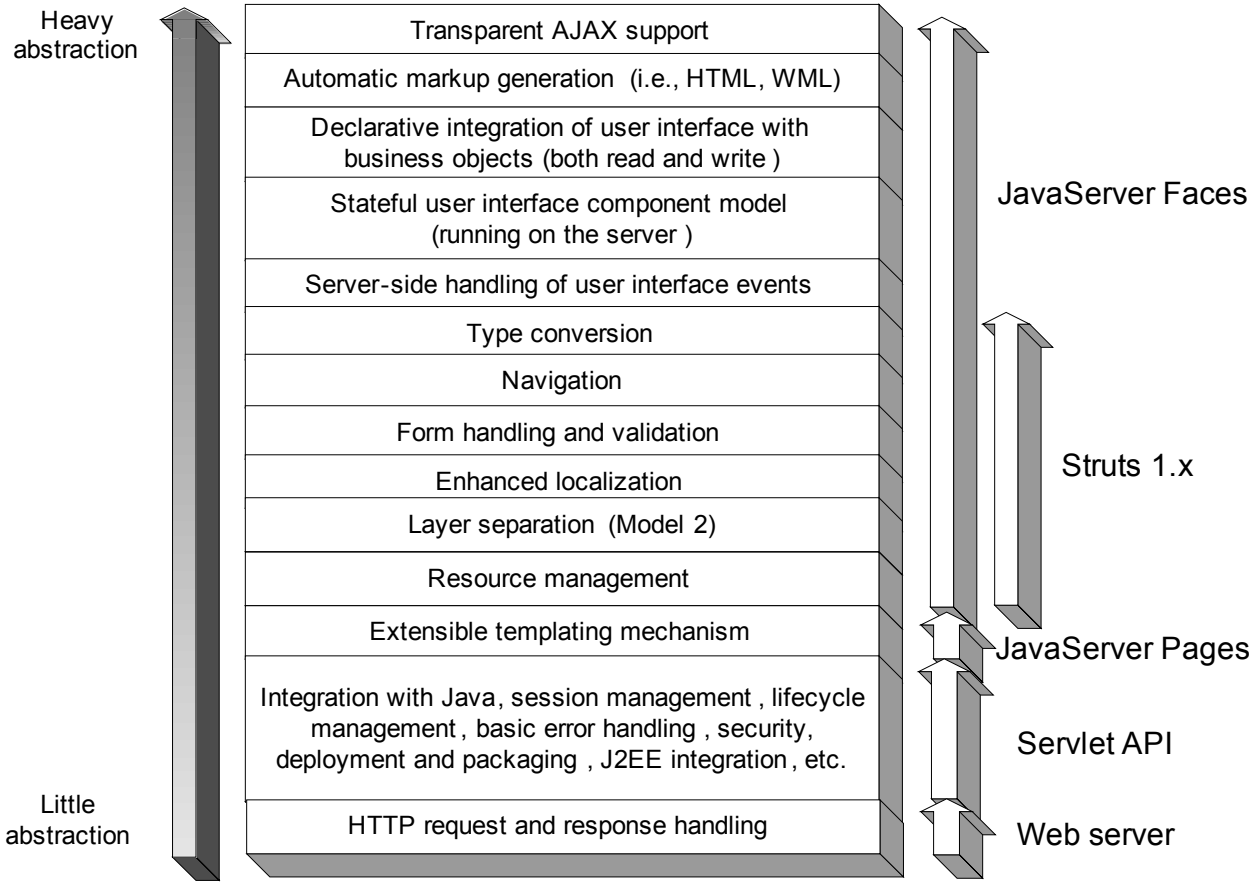
JavaServer Faces Technology Overview

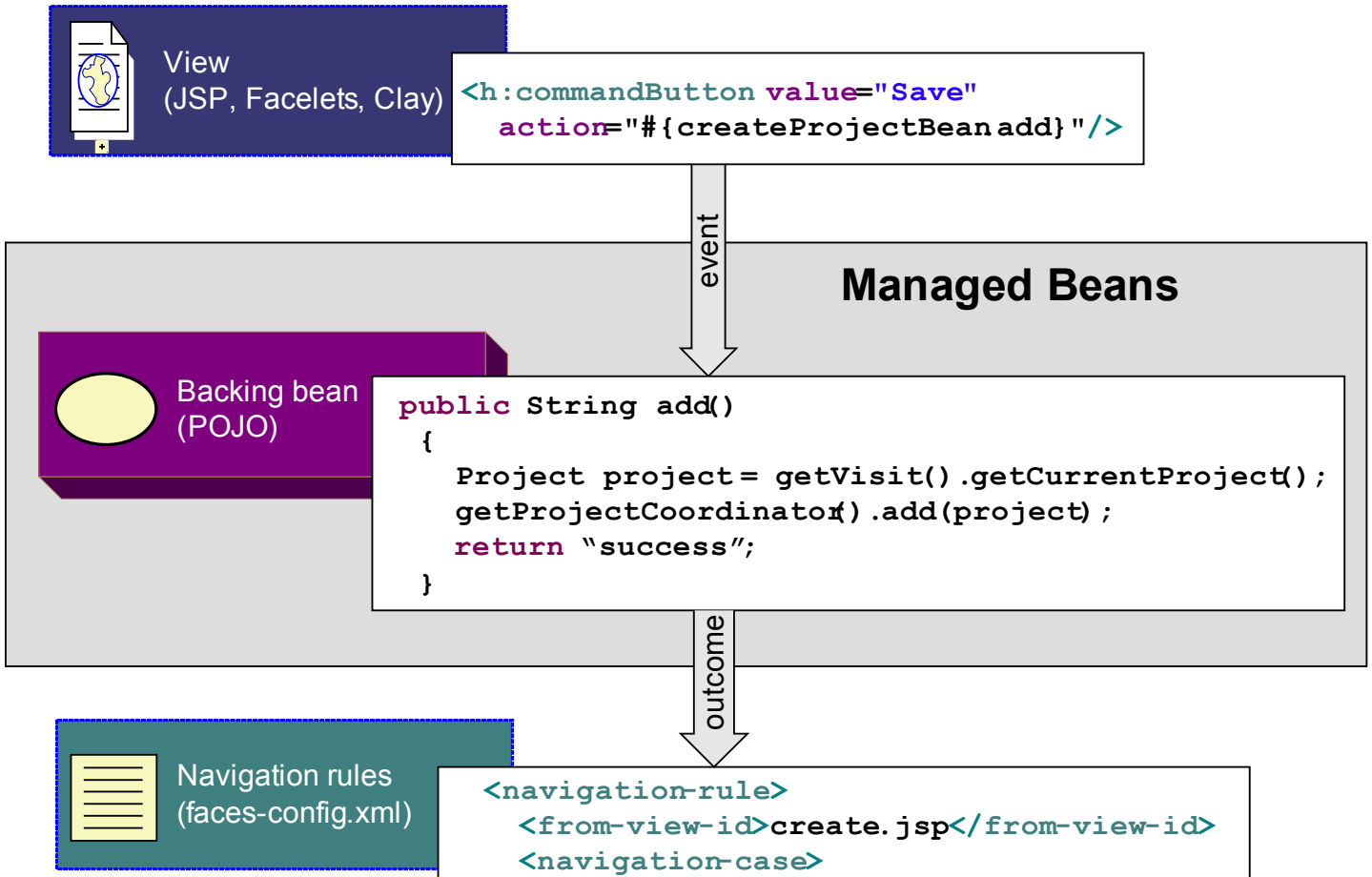
- Can automatically synchronize UI components with application objects
- Includes basic Dependency Injection container
- Extensive tool support
  - Sun, Oracle, IBM, BEA, Exadel, Borland, JetBrains, Genuitec, and others
- Enables RAD-style approach to Java platform web development
- Built on top of Servlet 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, pop-up windows, calendars, etc.
  - Open source and commercial vendors
  - Often have integrated AJAX support

JavaServer Faces Technology vs. Struts

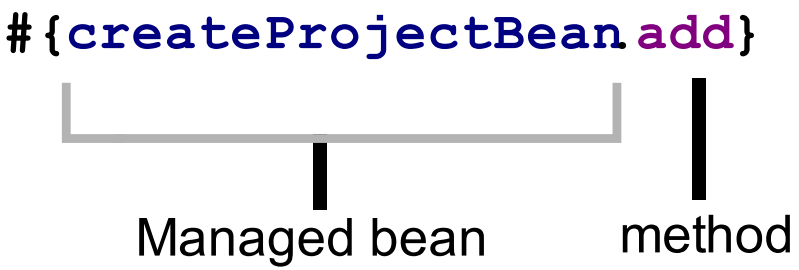




JavaServer Faces Platform Programming Model

The JavaServer Faces Technology Expression Language

- Can reference managed bean properties and methods



The JavaServer Faces Technology Expression Language

- Expression evaluation is pluggable

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

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JavaServer Faces Platform UI Layer

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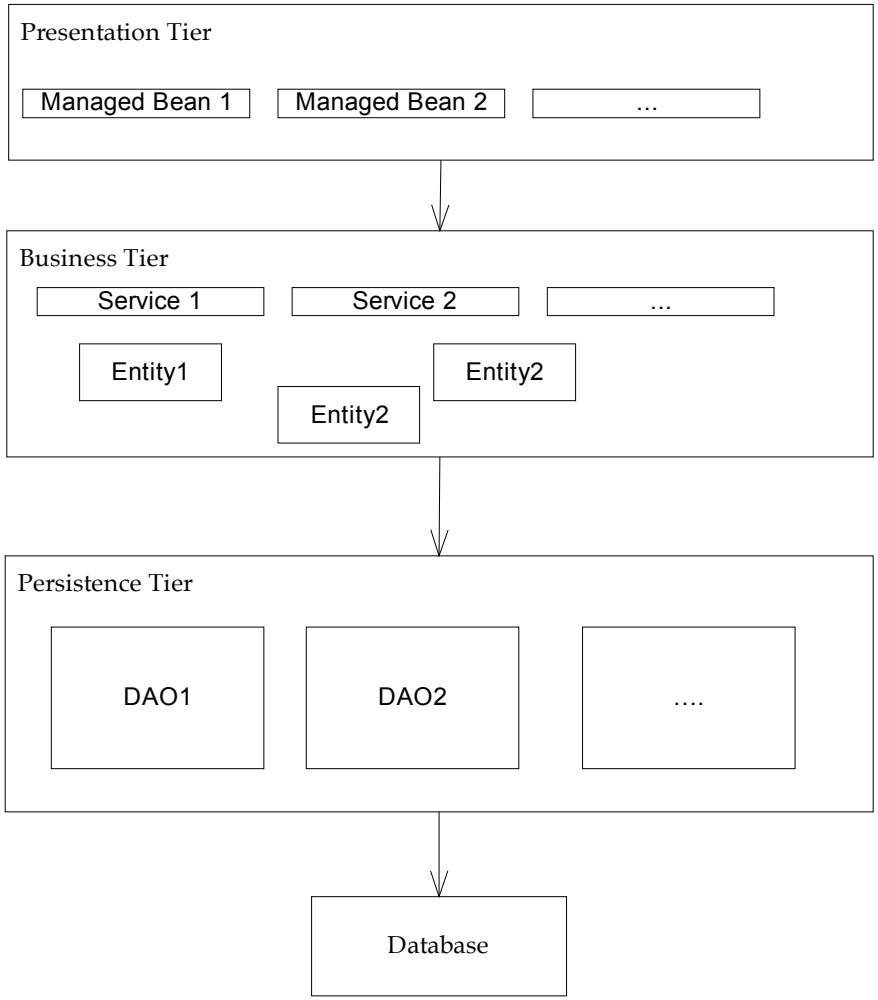
Avoid the Smart UI Anti-Pattern

- 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 3

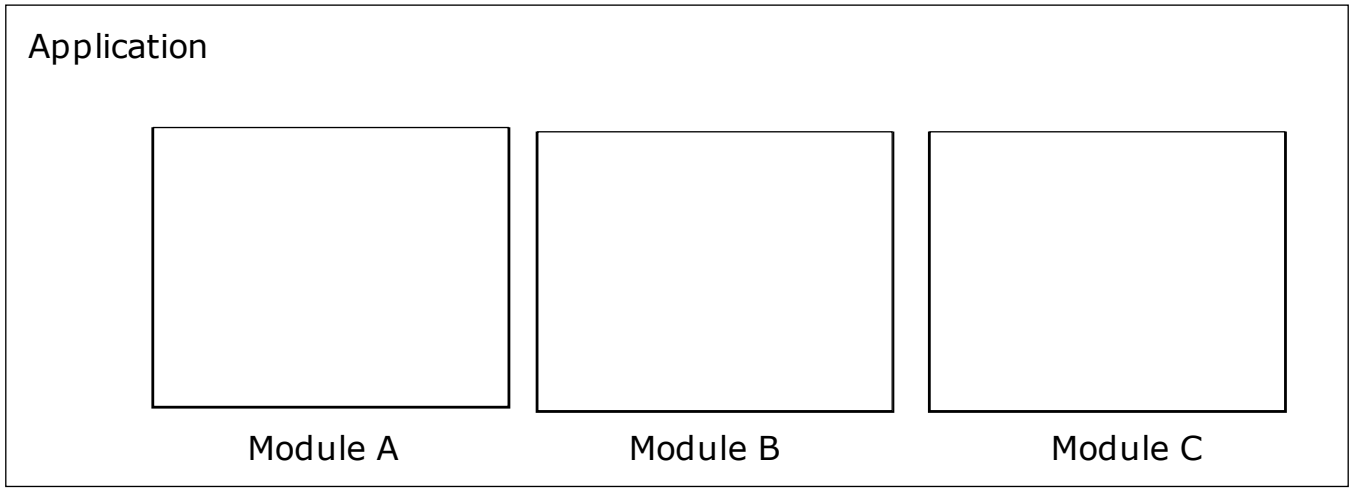
Database Access

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

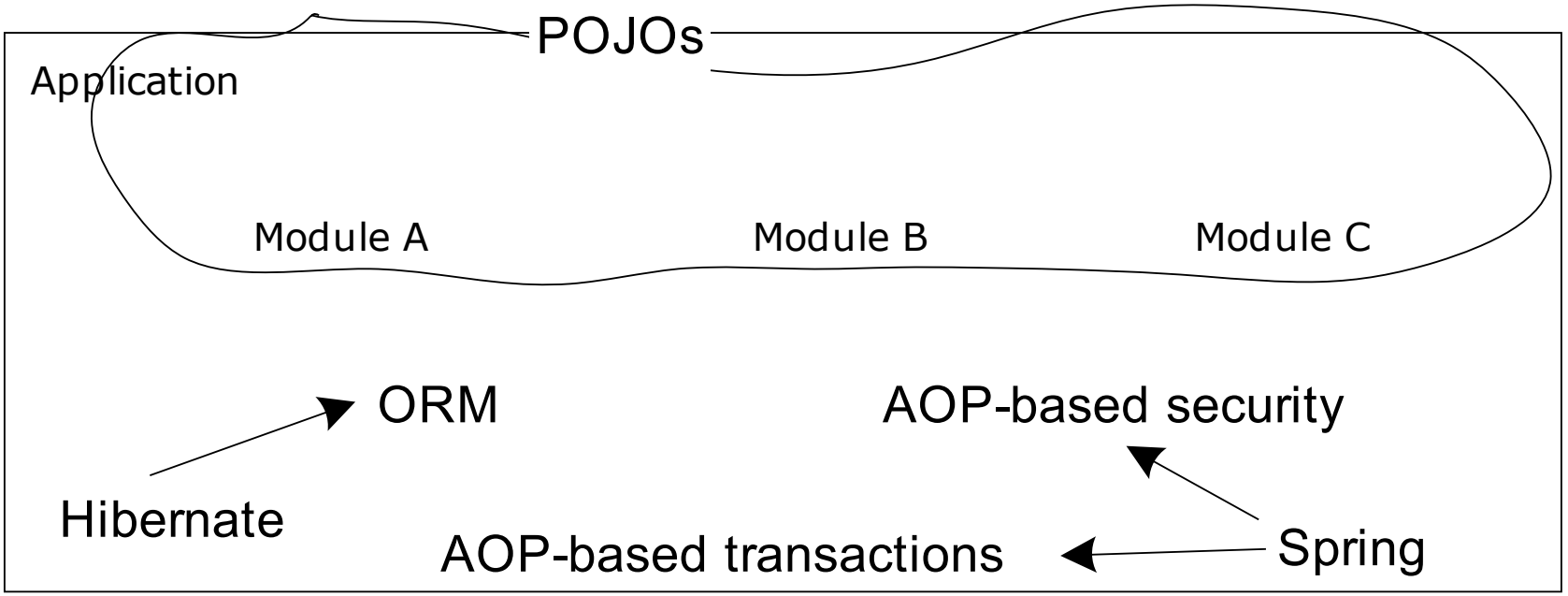
Transactions

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>
```

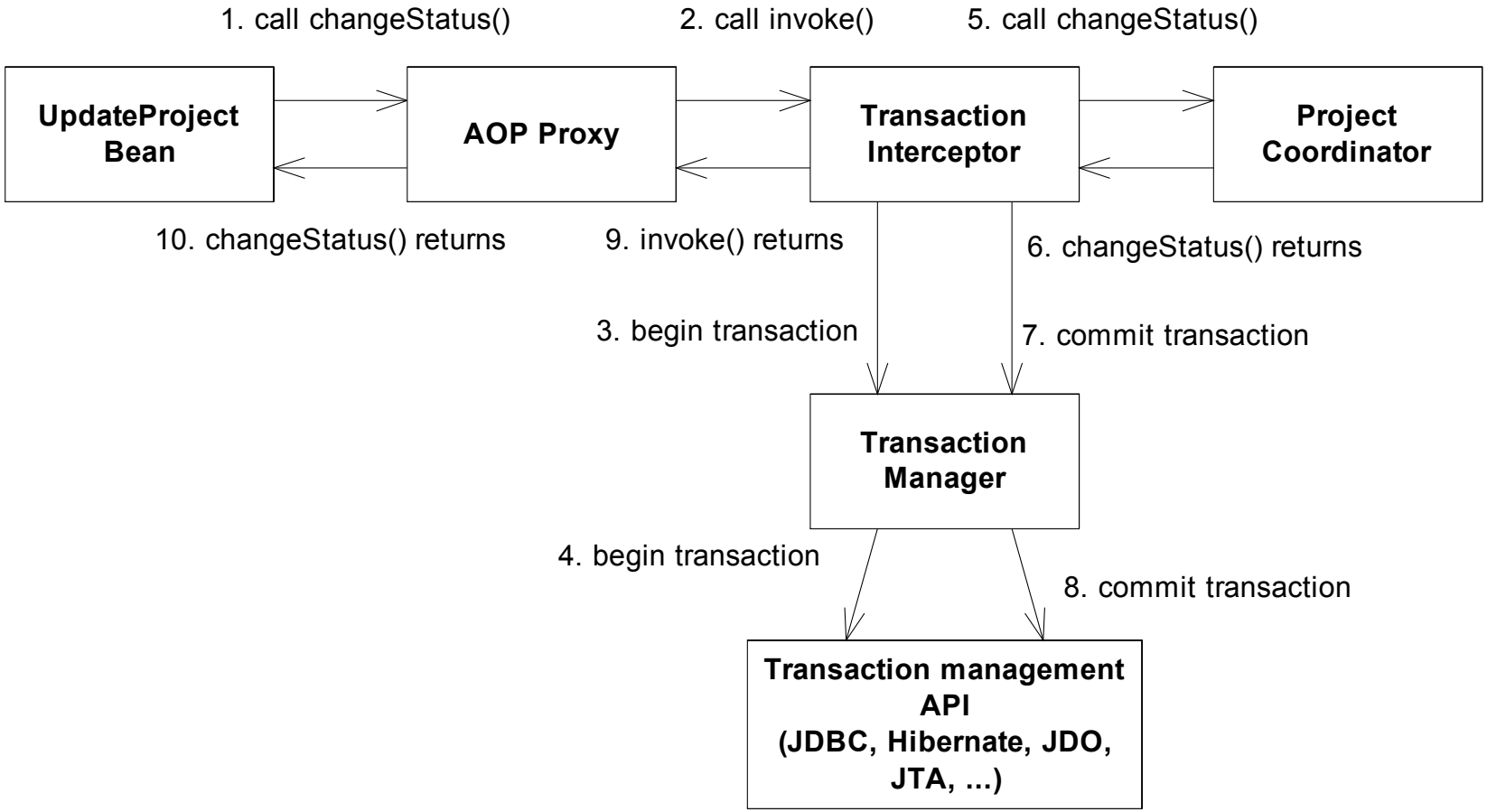
```
public class HibernateProjectRepository
   implements ProjectRepository {
…
}
```

```
<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's simple, but there are important drawbacks
  - Duplication of code
  - Business logic does several things ⇒ more complex
  - Easy to forget ⇒ 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>
```

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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

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Hibernate Data Access Layer

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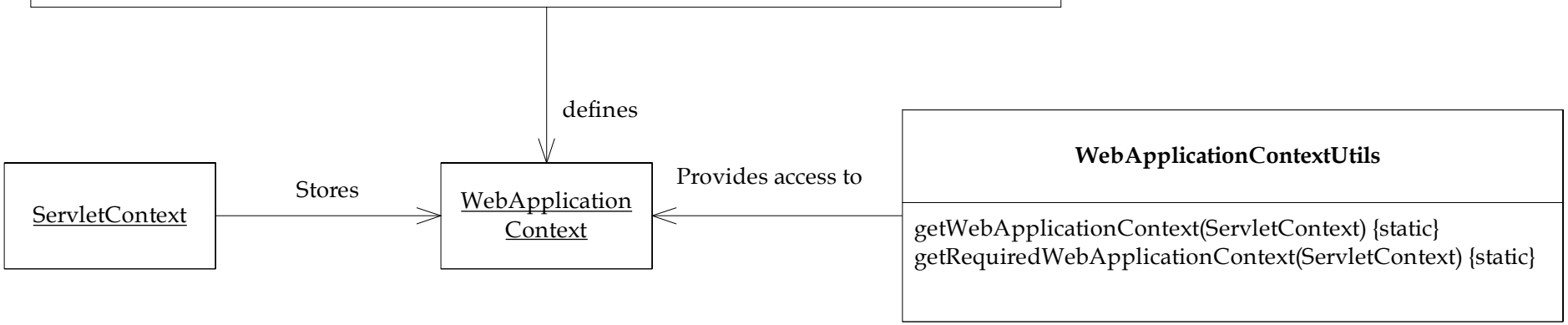
Division of Labor: Managed Beans vs. Spring Beans

- 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 bi-directional 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

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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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