Spring in the insurance world

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in <code> we trust

EXM

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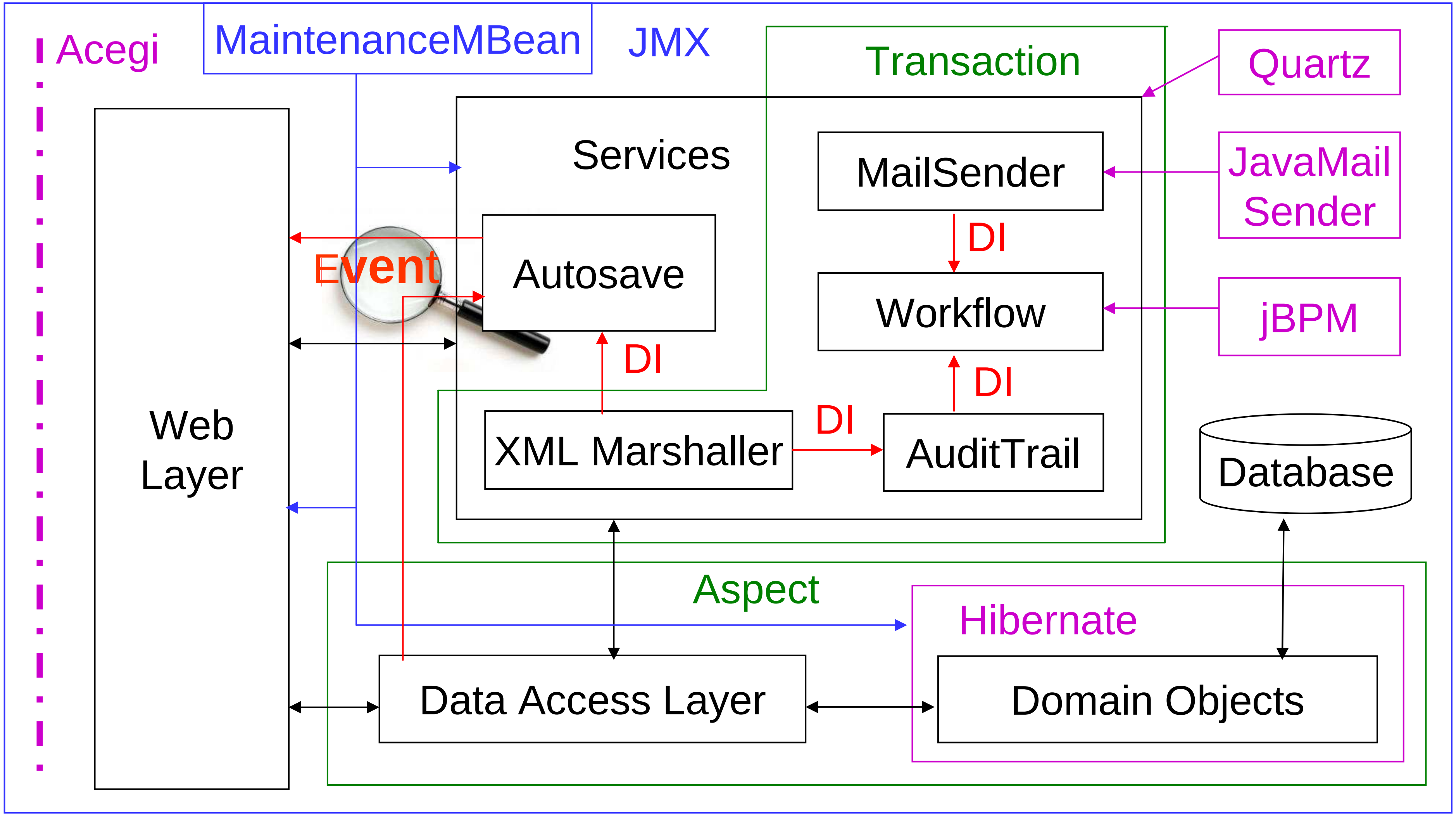
Agenda

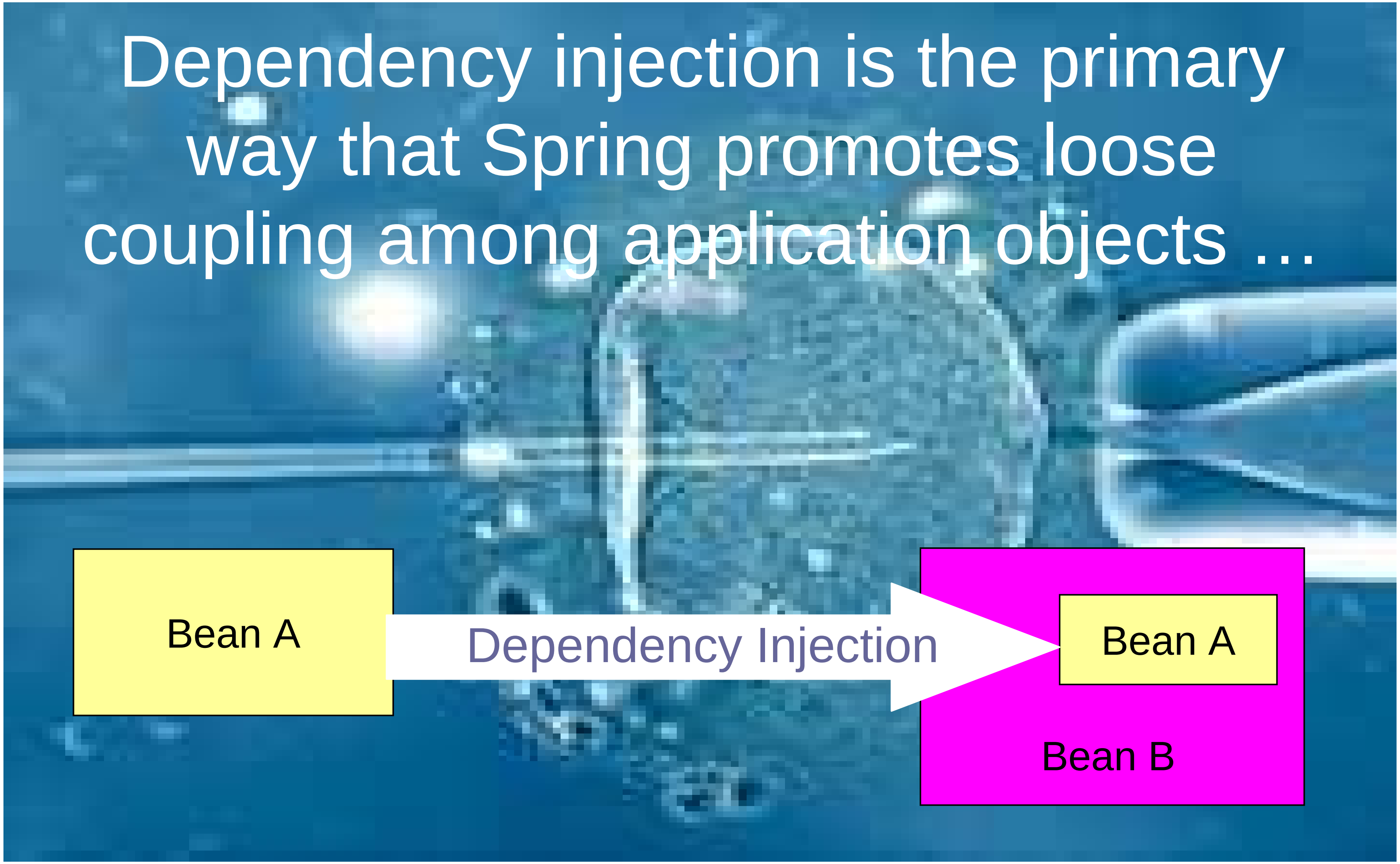
- **System architecture**
  - The big picture
  - How Spring fits all
- **Spring features**
  - Decoupling with application **events**
  - Implementing a workflow with **jBPM**
  - Managing **transactions** declaratively

The big picture



🟥 Bean Wiring 🟩 AOP Services ▬ External tools ▬ JMX

Decoupling dependecies with DI



Dependency injection is the primary way that Spring promotes loose coupling among application objects …

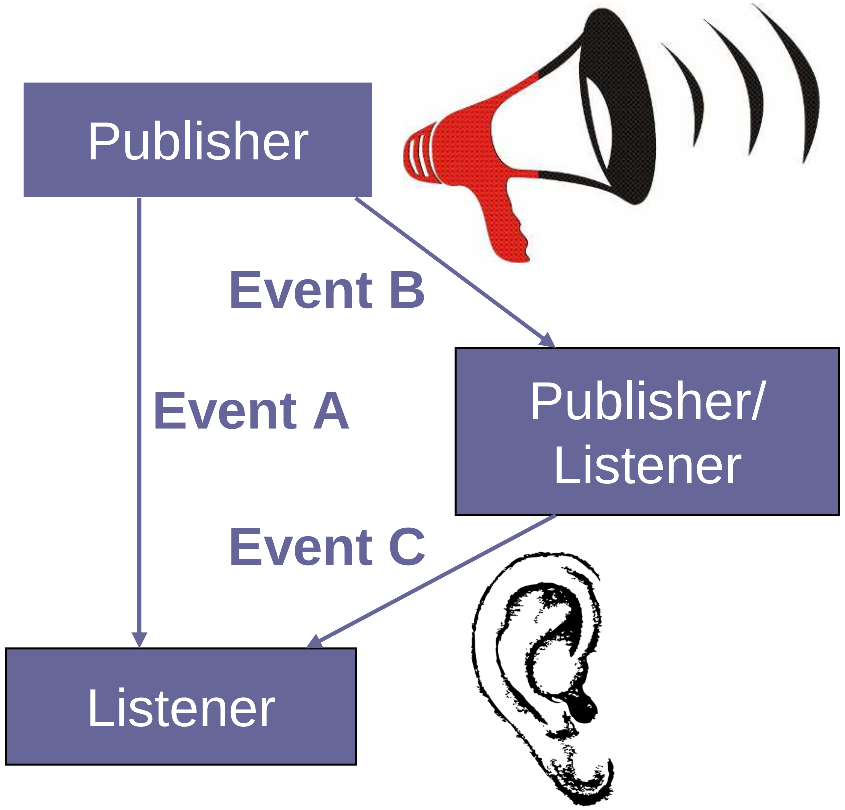
Decoupling dependecies

… but it isn't the only way

Decoupling with applications events

The loosest coupled way for objects to interact with one another is to publish and listen for application events.

- An **event publisher** object can communicate with other objects without even knowing which objects are listening
- An **event listener** can react to events without knowing which object published the events
- In Spring, any bean in the container can be either an event listener, a publisher, or **both**



Publishing events

To publish an event first it needs to **define the event** itself:

```
public class CustomEvent extends ApplicationEvent {
        public CustomEvent(Object source) {
                super(source);
        }
}
```

Next you can **publish the event** through the `ApplicationContext`:

```
applicationContext.publishEvent(new CustomEvent(this));
```

This means that, in order to publish events, your beans will need to have access to the `ApplicationContext`. The easiest way to achieve it is to **hold a static reference** to the context in a singleton that's made aware of the container by implementing `ApplicationContextAware`

Listening for application events

To allow a bean to listen for application events, it needs to register it within the Spring context and to implement the `ApplicationListener` interface

```
public class CustomListener implements ApplicationListener {
      public void onApplicationEvent(ApplicationEvent event) {
            if (event instanceof TypedEvent) {
                  // Reacts the the event ...
            }
            // Discards the non interesting event
      }
}
```

Unfortunately, this will make your bean to **listen for ALL the events** triggered inside the container and you'll have to **discard** the non Interesting ones (the biggest part) typically by some **`instanceof`**

Listening for a specific event

We fixed this issue by **replacing** the Spring’s default **events multicaster** with one that notifies only the interested listener

```
<bean id="applicationEventMulticaster"
      class="ch.exm.util.event.TypedApplicationEventMulticaster“/>
```

Overriding the event multicaster

```
public class TypedApplicationEventMulticaster
                                               extends
SimpleApplicationEventMulticaster {

public void addApplicationListener(ApplicationListener listener) {
      if (listener instanceof TypedApplicationListener) {
             listenerMap.put(listener.getListenedEventClass(),
listener);
      } else super.addApplicationListener(listener);
}

public void multicastEvent(ApplicationEvent event) {
      notifyListener(listenerMap.get(event.getClass()));
}


private void notifyListener(TypedApplicationListener listener) {
      getTaskExecutor().execute(new Runnable() {
             public void run() { listener.onTypedEvent(event); }});
}
```

indexes the listeners by listened event type

notifies only the interested listeners ...

... in a separate thread

Listening for a specific event

Through the **`TypedApplicationEventMulticaster`** your bean can be notified of just a specific class of events by implementing this interface

```
interface TypedApplicationListener<T extends ApplicationEvent>

      void onTypedEvent(T event);

      Class<T> getListenedEventClass();
}
```

Reacts only to events of type T

Declares the Class of events this bean is listening for

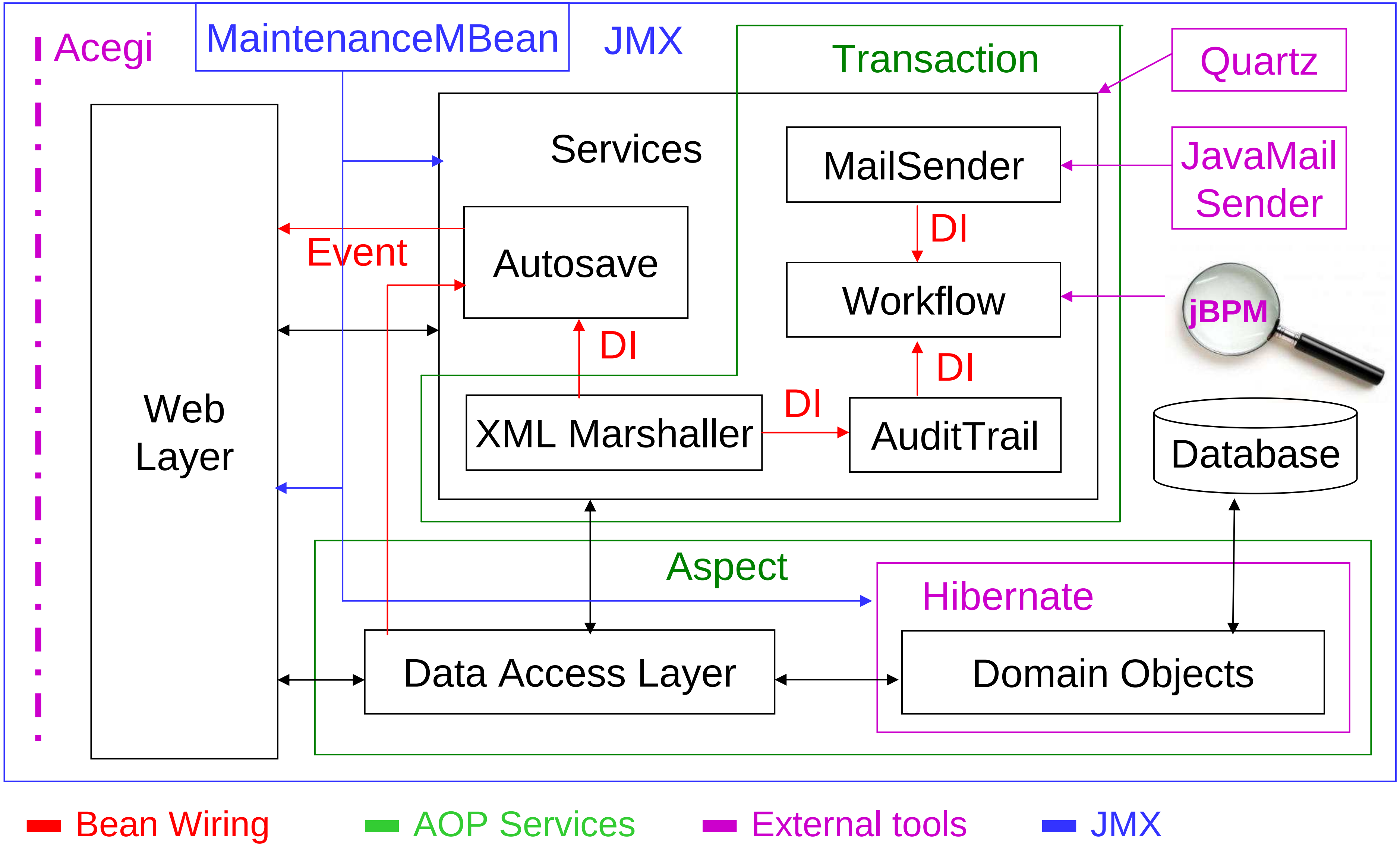
or even easier by extending the following abstract class

```
abstract class TypedApplicationListenerAdapter<T>
                                              implements TypedAppli
      public void onApplicationEvent(ApplicationEvent event) {
            onTypedEvent((T) event);
      }
}
```

The event multicaster notifies this listener only for the event of type T

Implementing a workflow with jBPM

Integrating jBPM and Spring



Implementing a workflow with jBPM

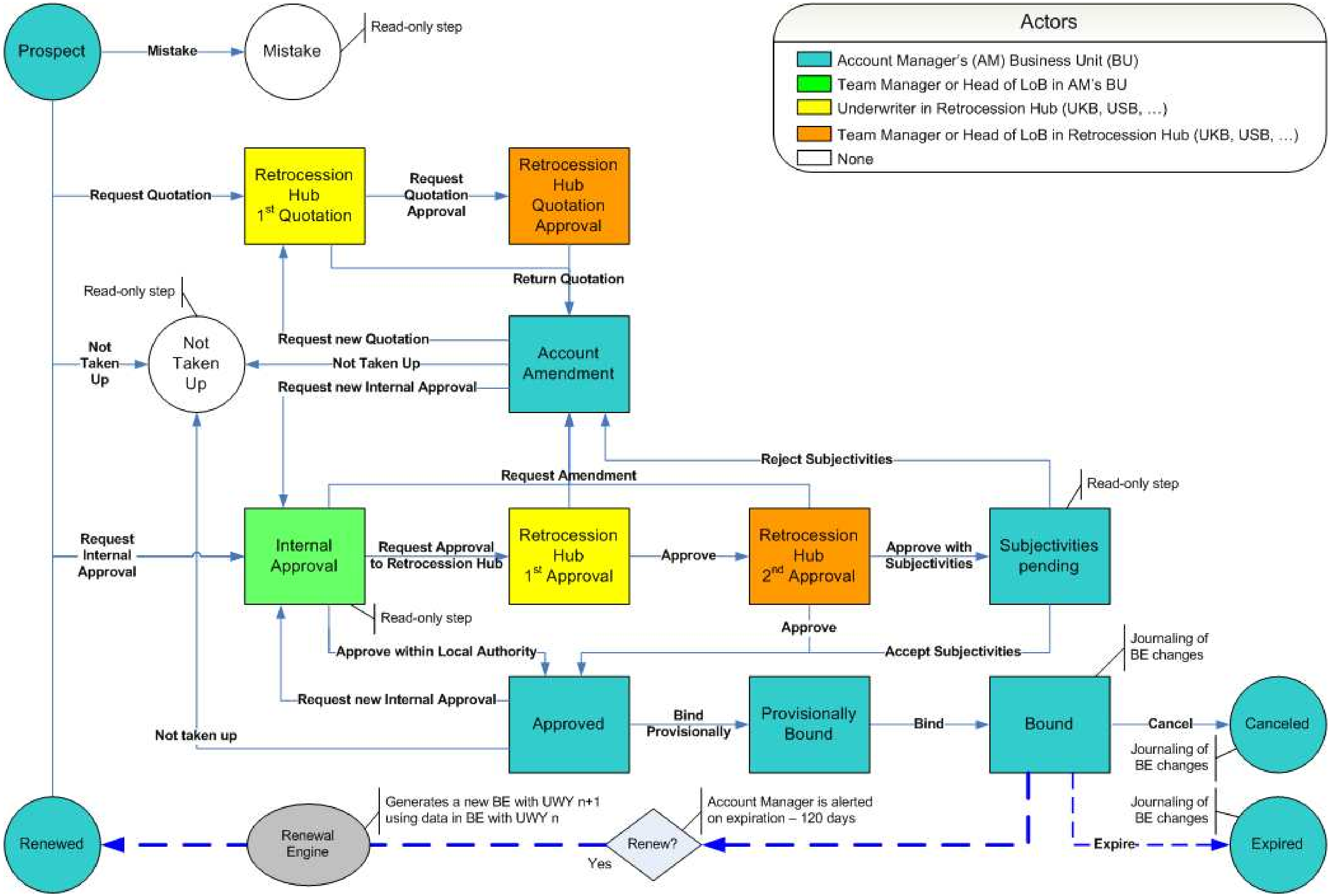
jBPM is the JBoss implementation of a BPM (**Business Process Management**) system. Its main characteristics and feature are:

- It can be configured with any database and it can be deployed on any application server or used a simple java library
- It allows to **configure a workflow process** via a simple XML file where workflow's state and transition are defined as it follows

```
<start-state name="start">
      <transition name="start" to="prospect"></transition>
</start-state>
<state name="prospect">
      <transition name="request_approval" to="uw_approval“/>
      <transition name="request_quotation" to="retro_quotation“/>
</state>
```

- It has an **extensible engine** that executes process definitions with tasks, fork/join nodes, events, timers, automated actions, etc.

An insurance policy lifecycle



Actors

- 🟦 Account Manager's (AM) Business Unit (BU)
- 🟩 Team Manager or Head of LoB in AM's BU
- 🟨 Underwriter in Retrocession Hub (UKB, USB, …)
- 🟧 Team Manager or Head of LoB in Retrocession Hub (UKB, USB, …)
- ⬜ None

Integrating jBPM in Spring

There's a Spring Module that makes it easy to **wire jBPM** with Spring

It allows jBPM's underlying Hibernate **`SessionFactory`** to be configured through Spring and jBPM actions to access Spring's context …

```
<bean id="jbpmConfiguration" class="org.springmodules.
                           workflow.jbpm31.LocalJbpmConfigurationFact
       <property name="sessionFactory" ref="sessionFactory"/>
   <property name="configuration" value="classpath:jbpm.cfg.xml"/>
</bean>
```

… and offers convient ways of working directly with process definitions as well as jBPM API through the **`JbpmTemplate`**

```
<bean id="jbpmTemplate" class="org.springmodules.
                                                            workflow.
       <property name=" jbpmConfiguration" ref=" jbpmConfiguration"/>
</bean>
```

Calling jBPM API with JbpmTemplate

`JbpmTemplate` eases to **work with the jBPM API** taking care of handling exceptions, the underlying Hibernate session and the jBPM context.

For instance to **execute a workflow transition** in a transactional way:

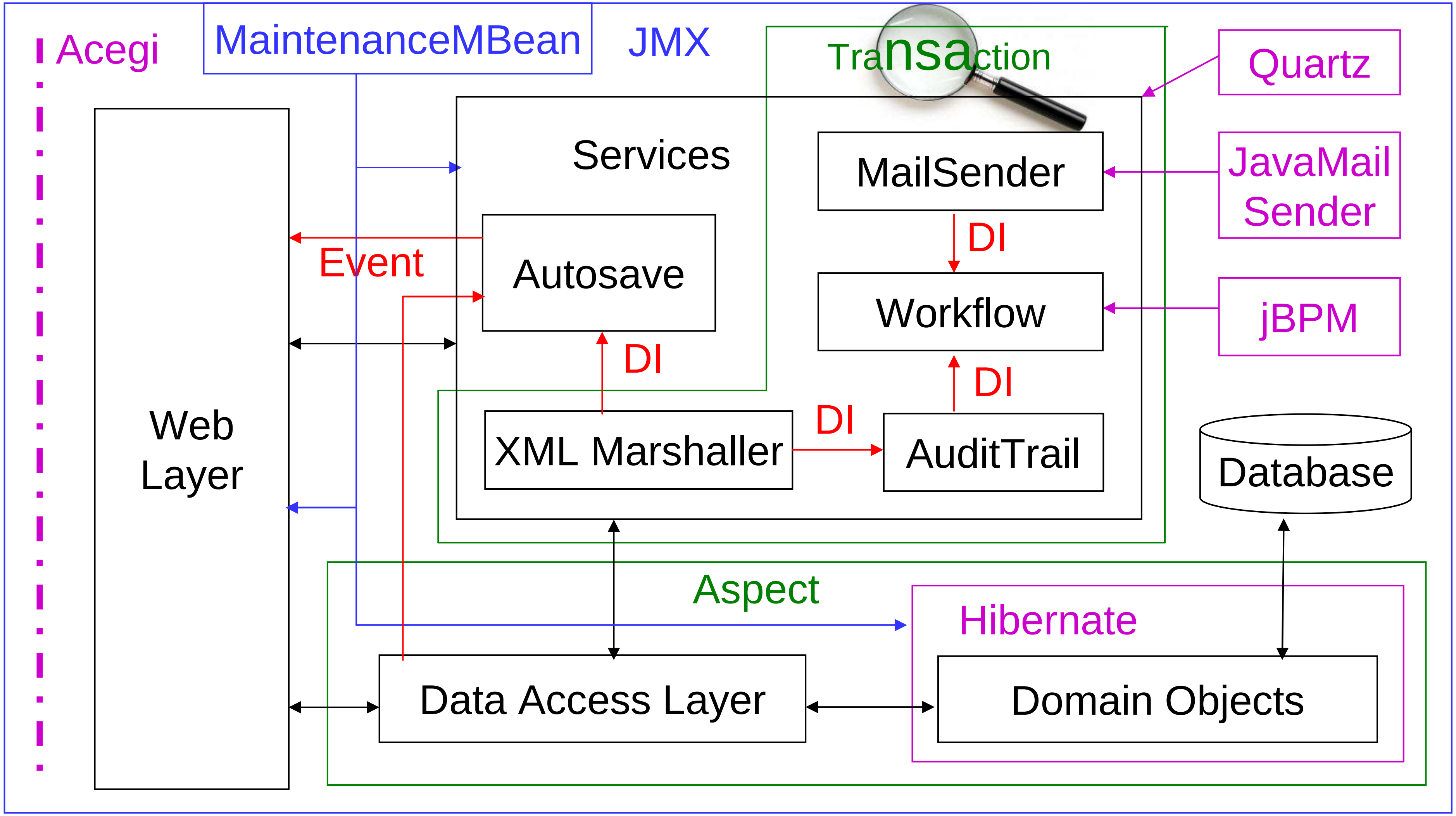
```
      jbpmTemplate.signal(processInstance, transactionId);
```

It's also possible, as with every **Spring-style template**, to directly access to the native **`JbpmContext`** through the **`JbpmCallback`**:

```
public ProcessInstance createProcessInstance() {
      return (ProcessInstance)jbpmTemplate.execute(new
JbpmCallback(){
            public Object doInJbpm(JbpmContext context) {
                  GraphSession g = context.getGraphSession();
                  ProcessDefinition def =
g.findLatestProcessDefinition();
                  ProcessInstance instance =
def.createProcessInstance();
                  jbpmContext.save(instance);
                  return instance;
```

Transactions in Spring

Transactions in Spring



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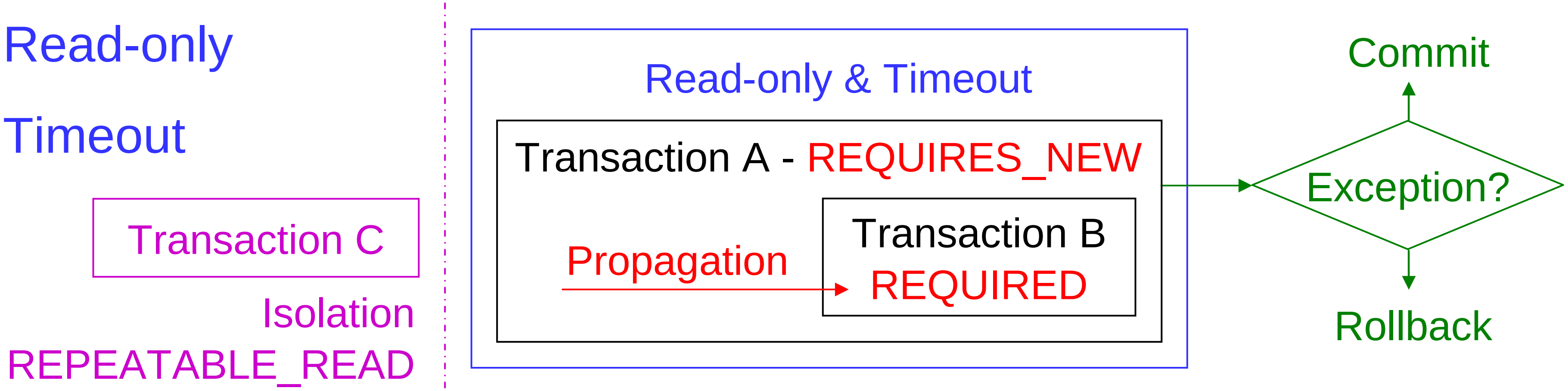
Transaction's attributes

In Spring declarative transactions are implemented through its AOP framework and are defined with the following attributes:

- Propagation behavior defines the boundaries of the transaction
- Rollback rules define what exception prompt a rollback (by default only the runtime ones) and which ones do not
- Isolation level defines how much a transaction may be impacted by the activities of other concurrent transactions
- Read-only
- Timeout



Choosing a transaction manager

Spring supports transactions **programmatically** and even **declaratively** by proxying beans with AOP. But unlike EJB, that’s coupled with a JTA (Java Transaction API) implementation, it **employs a callback mechanism** that abstracts the actual transaction implementation from the transactional code.

Spring **does not directly manage transactions** but, it comes with a set of transaction managers that **delegate responsibility** for transaction management to a platform-specific transaction implementation.

For example if your application’s persistence is handled by Hibernate then you’ll choose to delegate responsibility for transaction management to an **`org.hibernate.Transaction`** object with the following manager:

```
<bean id="transactionManager“ class="org.springframework.

       orm.hibernate3.HibernateTransactionManager">
       <property name="sessionFactory" ref=“sessionFactory"/>
       <property name="dataSource" ref=“dataSource"/>
</bean>
```

Managing transactions declaratively

Spring 2.0 adds **two new kinds** of declarative transactions that can be configured through the elements in the tx namespace:

```
        xmlns:tx=http://www.springframework.org/schema/tx
```

by adding the spring-tx-2.0.xsd schema to the Spring configuration file:

```
        http://www.springframework.org/schema/tx/spring-tx-2.0.xsd
```

The first way to declare transactions is with the `<tx:advice>` XML element:

```
<tx:advice id="txAdvice“ transaction-manager="transactionManager">
<tx:attributes>
       <tx:method name=“set*" propagation="REQUIRED" />
       <tx:method name=“get*" propagation="SUPPORTS“ read-only="true"/
</tx:attributes></tx:advice>
```

This is only the **transaction advice**, but in order to define where it will be applied, we need a **pointcut** to indicate which beans should be advised:

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

Defining annotation-driven transactions

The second (and easiest) way to declaratively define transactions in Spring 2.0 is through **annotations**. This mechanism can be enabled as simple as adding the following line of XML to the application context:

```
<tx:annotation-driven transaction-manager="transactionManager"/>
```

This configuration element tells Spring to **automatically advise**, with the transaction advice, all the beans in the application context that are annotated with `@Transactional`, either at the class level or at the method level. This annotation may also be applied to an interface.

The **transaction attributes** of the advice are defined by parameters of the `@Transactional` annotation. For example our previously illustrated `WorkflowService` performs a workflow transition in a transactional way:

```
@Transactional(propagation=Propagation.REQUIRED, readOnly=false)
void doWkfTransition(WkfObj wkfObj, String transitionName);
```

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