Java EE Architecture with the Spring Framework

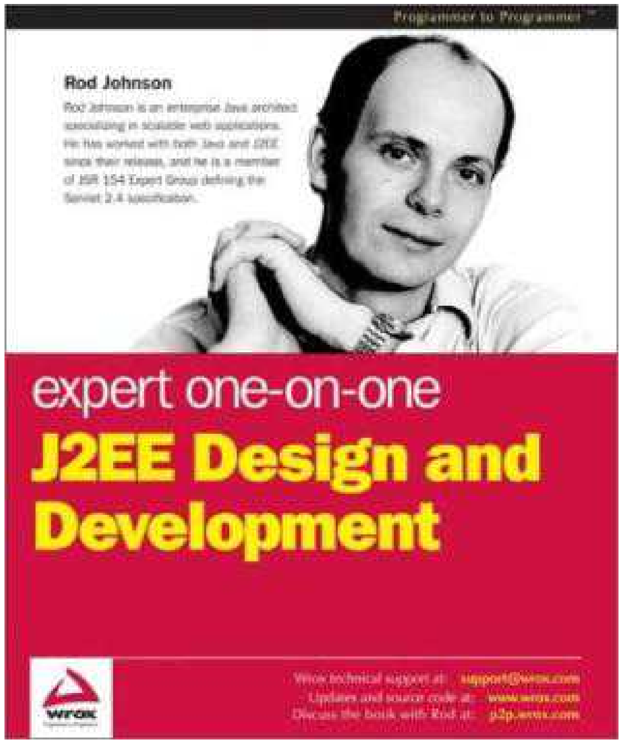
Peter Thomas

Satyam Computer Services Ltd.

Overview

- Spring: quick intro
- JTrac – a real-life Spring web-app
- Architecture
  - DI / IoC
  - Spring DAO / Hibernate support
  - Spring AOP / Declarative TX
  - Spring MVC / Webflow
  - Acegi Security Framework
  - Spring Modules
- Spring implications
- Selected best practices

Spring – History

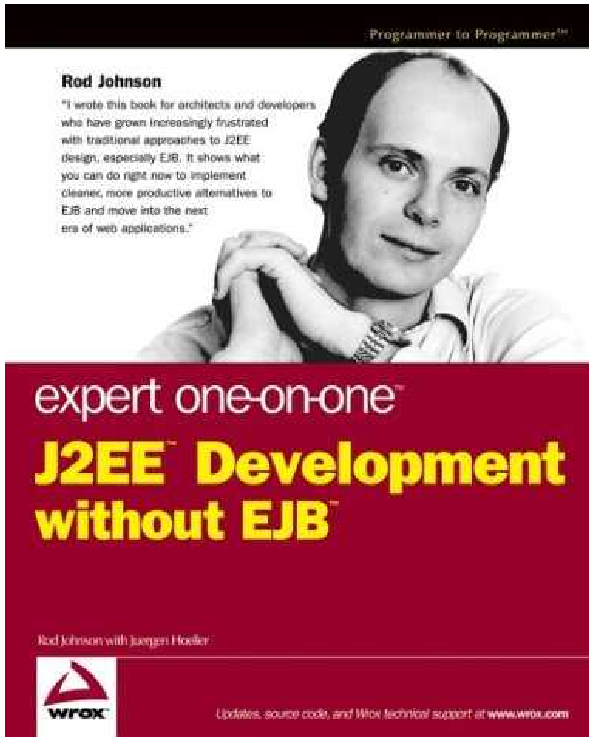


Nov 2002

Feb 2003: SourceForge Project founded

Aug 2003: 1.0 M1

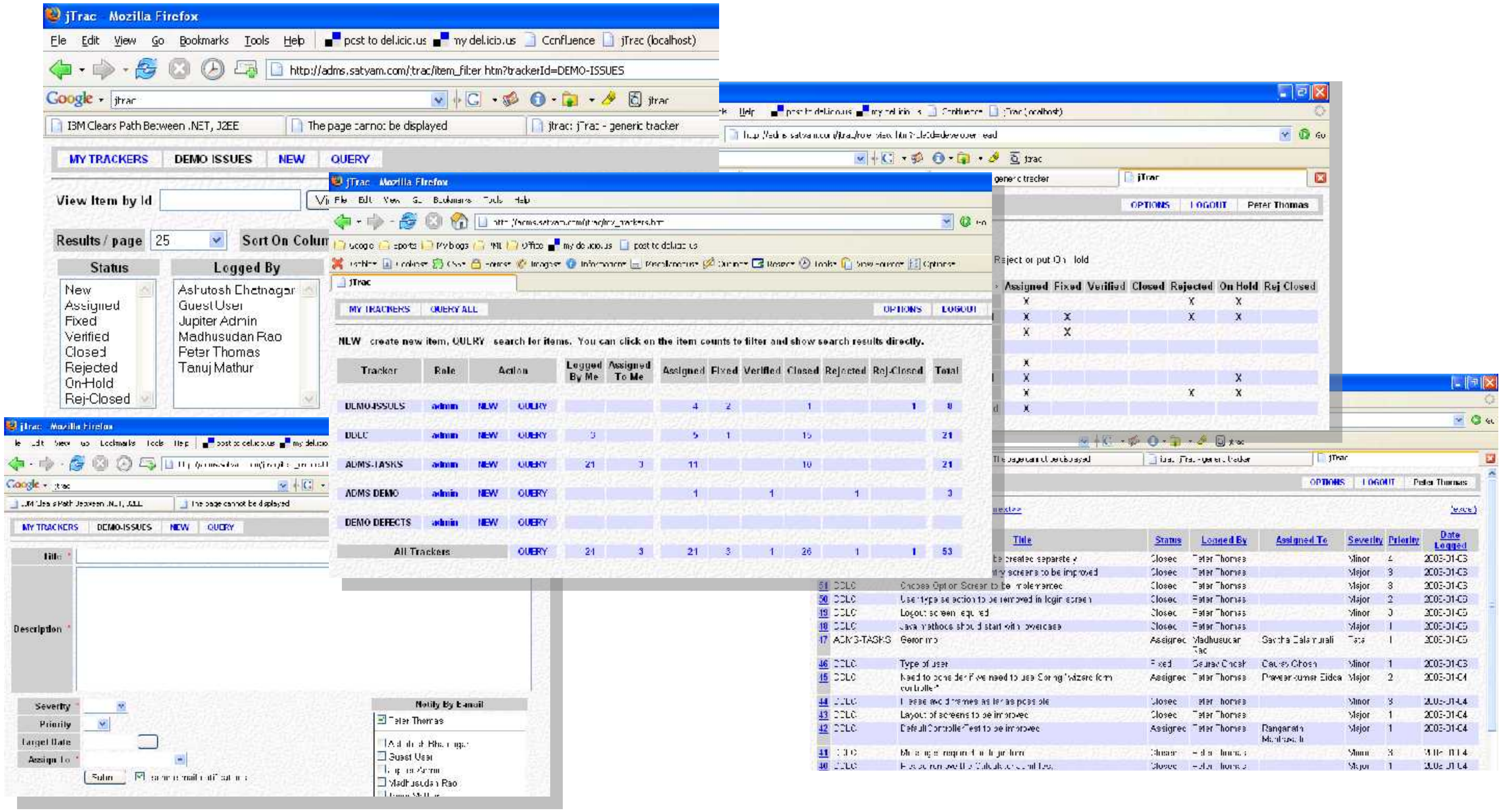
Mar 2004: 1.0


Programmer to Programmer™
Rod Johnson
expert one-on-one
J2EE™ Development without EJB™
Rod Johnson with Juergen Hoeller
wrox

Jul 2004

JTrac – http://jtrac.info

- JTrac: highly customizable issue tracking



NEW - create new item, QUERY - search for items. You can click on the item counts to filter and show search results directly.

Tracker	Role	Action		Logged By Me	Assigned To Me	Assigned	Fixed	Verified	Closed	Rejected	Rej-Closed	Total
DEMO-ISSUES	admin	NEW	QUERY			4	2		1		1	8
DDLC	admin	NEW	QUERY	3		5	1		15			21
ADMS-TASKS	admin	NEW	QUERY	21	3	11			10			21
ADMS DEMO	admin	NEW	QUERY			1		1		1		3
DEMO DEFECTS	admin	NEW	QUERY									
All Trackers			QUERY	21	3	21	3	1	26	1	1	53

View Item by Id

Results / page: 25 — Sort On Column

Status	Logged By
New	Ashutosh Chetnagar
Assigned	Guest User
Fixed	Jupiter Admin
Verified	Madhusudan Rao
Closed	Peter Thomas
Rejected	Tanuj Mathur
On-Hold	
Rej-Closed	

Title *

Description *

Severity *

Priority

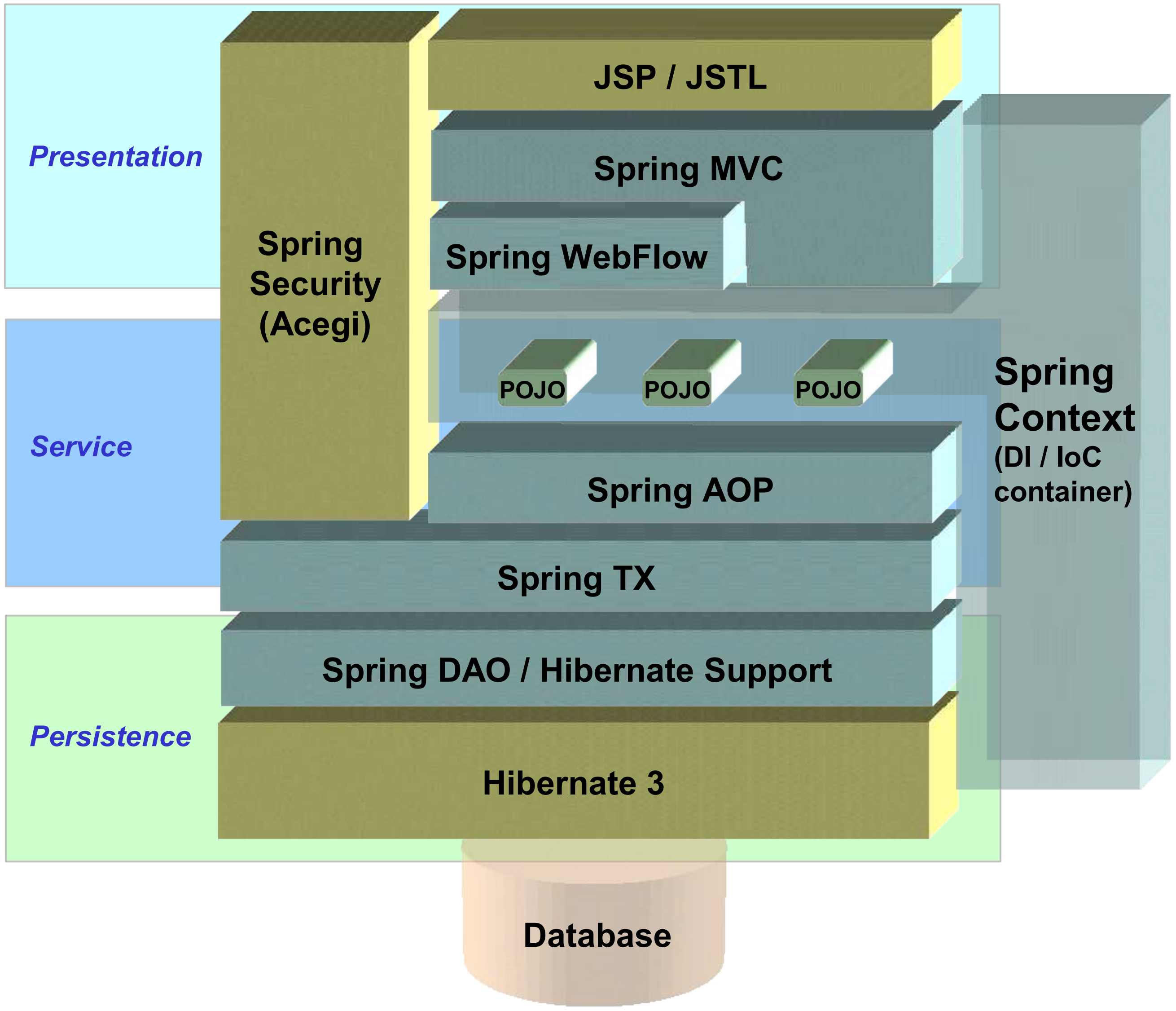
Target Date

Assign To *

Notify By E-mail: Peter Thomas, Ashutosh Chetnagar, Guest User, Jupiter Admin, Madhusudan Rao, Tanuj Mathur

ID	Tracker	Title	Status	Logged By	Assigned To	Severity	Priority	Date Logged
51	DDLC	Choose Option Screen to be made more...	Closed	Peter Thomas		Major	3	2006-01-03
50	DDLC	User type selection to be removed in login screen	Closed	Peter Thomas		Major	2	2006-01-03
19	DDLC	Logout screen required	Closed	Peter Thomas		Minor	3	2006-01-03
18	DDLC	Java methods should start with lowercase	Closed	Peter Thomas		Major	1	2006-01-03
17	ADMS-TASKS	Generic...	Assigned	Madhusudan Rao	Sachin Balamurali	Task	1	2006-01-03
46	DDLC	Type of user	Fixed	Saurav Ghosh	Gaurav Ghosh	Minor	1	2006-01-03
15	DDLC	Need to consider if we need to use Spring Wizard form controller	Assigned	Peter Thomas	Praveen Kumar Sidda	Major	2	2006-01-04
44	DDLC	[illegible]	Closed	Peter Thomas		Minor	3	2006-01-04
43	DDLC	Layout of screens to be improved	Closed	Peter Thomas		Major	1	2006-01-04
42	DDLC	Default Controller Test to be improved	Assigned	Peter Thomas	Ranganath Madhusudan	Major	1	2006-01-04
41	DDLC	[illegible]	Closed	Peter Thomas		Minor	3	2006-01-04
40	DDLC	[illegible]	Closed	Peter Thomas		Major	1	2006-01-04

JTrac Architecture



Dependency Injection

```
<bean id="jtrac" class="info.jtrac.JtracImpl">
    <property name="dao" ref="dao"/>
</bean>
```

JtracImpl.java

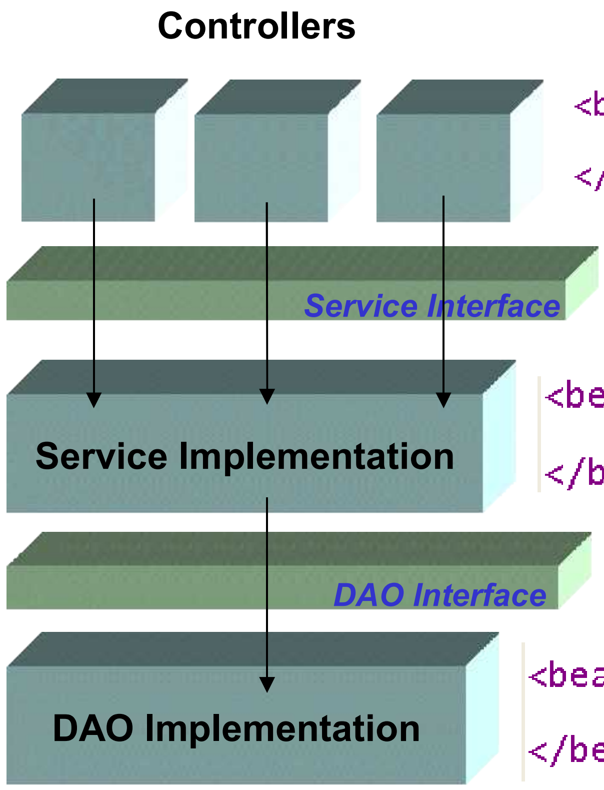
```
private JtracDao dao;

public void setDao(JtracDao dao) {
    this.dao = dao;
}

public void storeUser(User user) {
    dao.storeUser(user);
}
```

```
<bean id="dao" class="info.jtrac.hibernate.HibernateJtracDao">
    <property name="sessionFactory" ref="sessionFactory"/>
</bean>
```

Dependency Injection (2)



```
<bean id="userFormAction" class="info.jtrac.webflow.UserFormAction
    <property name="jtrac" ref="jtrac"/>
</bean>
```

```
<bean id="jtrac" class="info.jtrac.JtracImpl">
    <property name="dao" ref="dao"/>
</bean>
```

```
<bean id="dao" class="info.jtrac.hibernate.HibernateJtracDao">
    <property name="sessionFactory" ref="sessionFactory"/>
</bean>
```

Hibernate with Spring

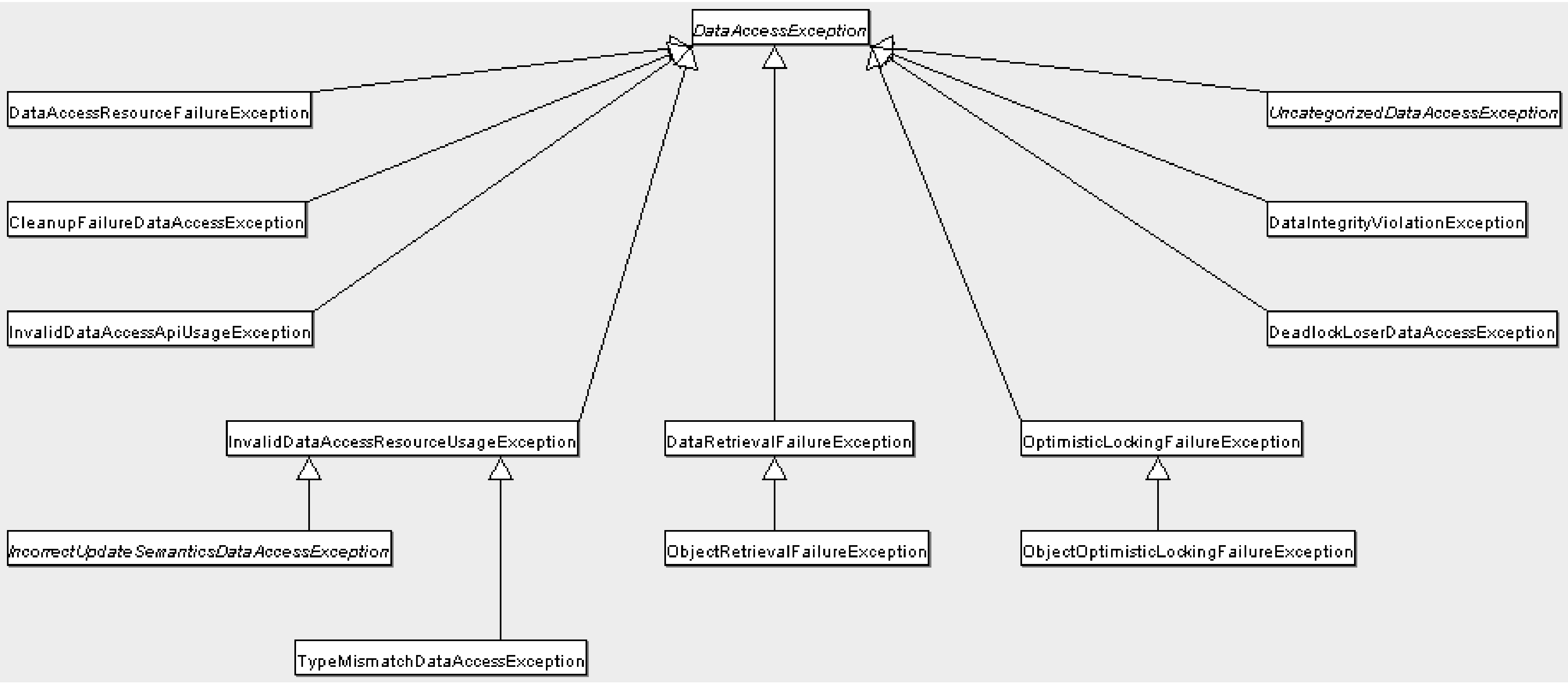
- One liners
- Template pattern
- No need to deal with TX, Session etc.

```
public void storeUser(User user) {
    getHibernateTemplate().merge(user);
}

public User loadUser(long id) {
    return (User) getHibernateTemplate().get(User.class, id);
}

public List<User> findAllUsers() {
    return getHibernateTemplate().find("from User user order by user.name");
}
```

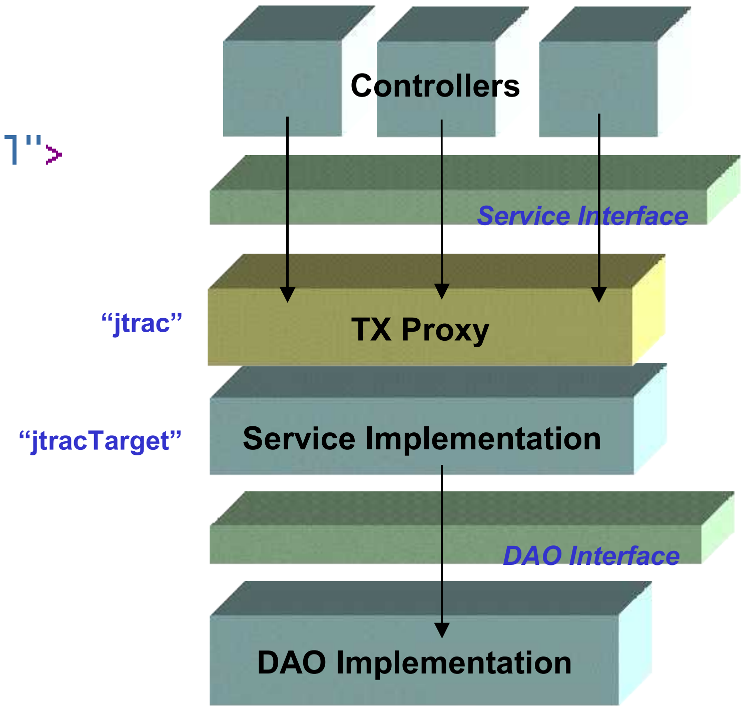
Spring DAO – Exception Hierarchy


DataAccessException
DataAccessResourceFailureException
CleanupFailureDataAccessException
InvalidDataAccessApiUsageException
InvalidDataAccessResourceUsageException
IncorrectUpdateSemanticsDataAccessException
TypeMismatchDataAccessException
DataRetrievalFailureException
ObjectRetrievalFailureException
OptimisticLockingFailureException
ObjectOptimisticLockingFailureException
UncategorizedDataAccessException
DataIntegrityViolationException
DeadlockLoserDataAccessException

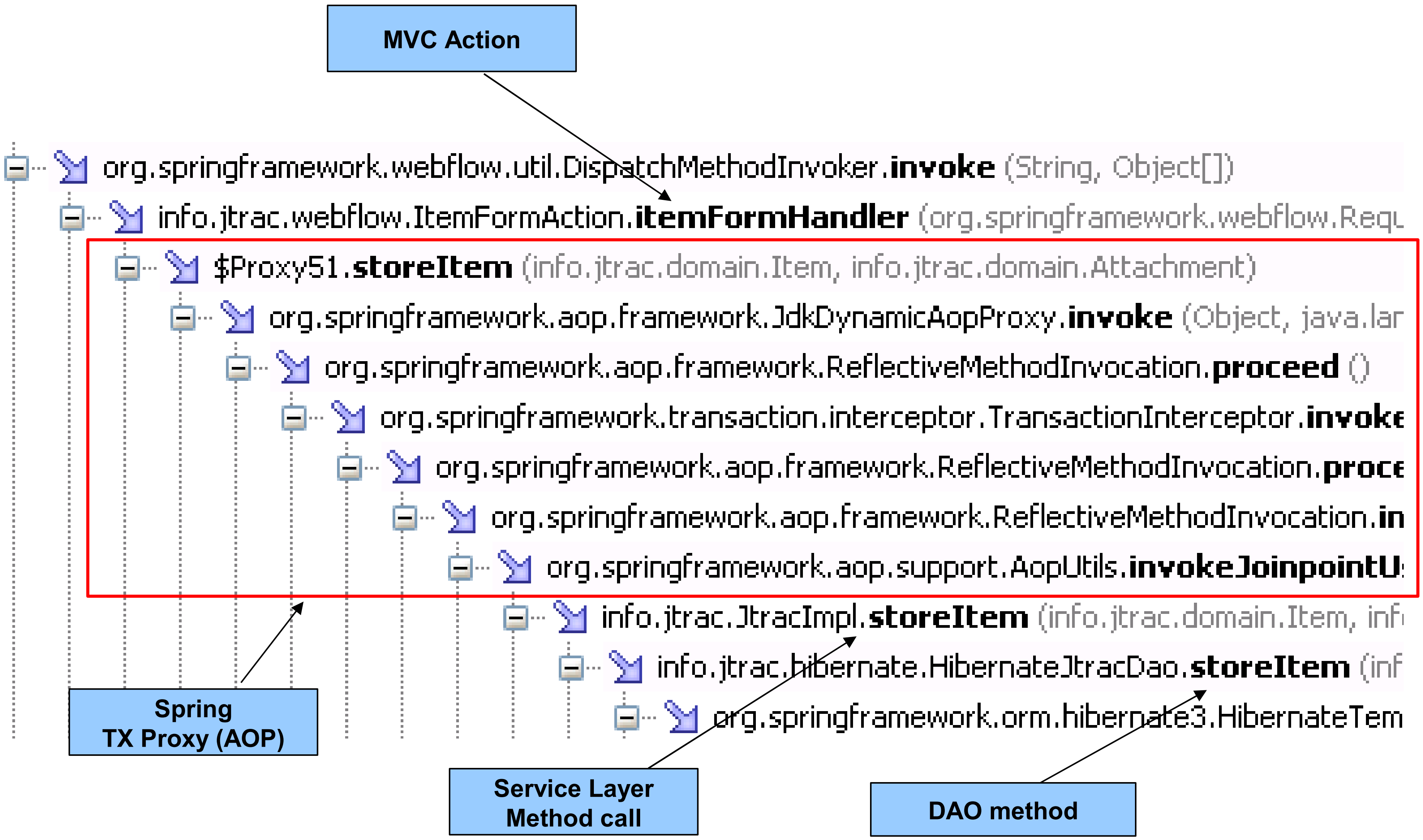
Spring AOP / Declarative TX Mgmt.

```
<bean id="jtrac" class="org.[sf].transaction.interceptor.TransactionProxyFactoryBean">
    <property name="transactionManager" ref="transactionManager"/>
    <property name="target" ref="jtracTarget"/>
    <property name="transactionAttributes">
        <props>
            <prop key="store*">PROPAGATION_REQUIRED</prop>
            <prop key="remove*">PROPAGATION_REQUIRED</prop>
            <prop key="*">PROPAGATION_SUPPORTS,readOnly</prop>
        </props>
    </property>
</bean>

<bean id="jtracTarget" class="info.jtrac.JtracImpl">
    <property name="dao" ref="dao"/>
</bean>
```



Spring AOP (contd…)



```
org.springframework.webflow.util.DispatchMethodInvoker.invoke (String, Object[])
  info.jtrac.webflow.ItemFormAction.itemFormHandler (org.springframework.webflow.Requ
    $Proxy51.storeItem (info.jtrac.domain.Item, info.jtrac.domain.Attachment)
      org.springframework.aop.framework.JdkDynamicAopProxy.invoke (Object, java.lar
        org.springframework.aop.framework.ReflectiveMethodInvocation.proceed ()
          org.springframework.transaction.interceptor.TransactionInterceptor.invoke
            org.springframework.aop.framework.ReflectiveMethodInvocation.proce
              org.springframework.aop.framework.ReflectiveMethodInvocation.in
                org.springframework.aop.support.AopUtils.invokeJoinpointU
                  info.jtrac.JtracImpl.storeItem (info.jtrac.domain.Item, inf
                    info.jtrac.hibernate.HibernateJtracDao.storeItem (inf
                      org.springframework.orm.hibernate3.HibernateTem
```

Spring Web Flow

```
<flow start-state="userForm">

    <input-mapper>
        <mapping source="space" target="flowScope.space"/>
    </input-mapper>

    <view-state id="userForm" view="user_form">
        <entry-actions>
            <action bean="userFormAction" method="setupForm"/>
        </entry-actions>
        <transition on="cancel" to="userListView"/>
        <transition on="submit" to="checkIfSpaceFlow">
            <action bean="userFormAction" method="bindAndValidate"/>
            <action bean="userFormAction" method="userFormHandler"/>
        </transition>
    </view-state>

    <decision-state id="checkIfSpaceFlow">
        <if test="${flowScope.space == null}" then="userAllocateFlow" else="userListView"/>
    </decision-state>

    <subflow-state id="userAllocateFlow" flow="userAllocate">
        <attribute-mapper>
            <input-mapper>
                <mapping source="requestScope.userForm.user" target="user"/>
            </input-mapper>
        </attribute-mapper>
        <transition on="userListView" to="userListView"/>
    </subflow-state>

    <end-state id="userListView" vie
        <output-mapper>
            <mapping source="flowSco
        </output-mapper>
    </end-state>

</flow>
```

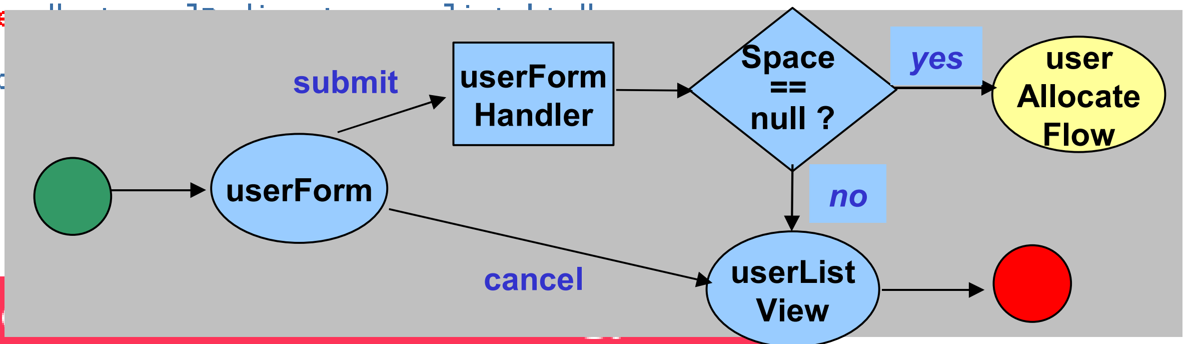
Logical View Name

State Transitions

backend logic call (normal Java method)

Flow Decision

Re-usable Flow invocation



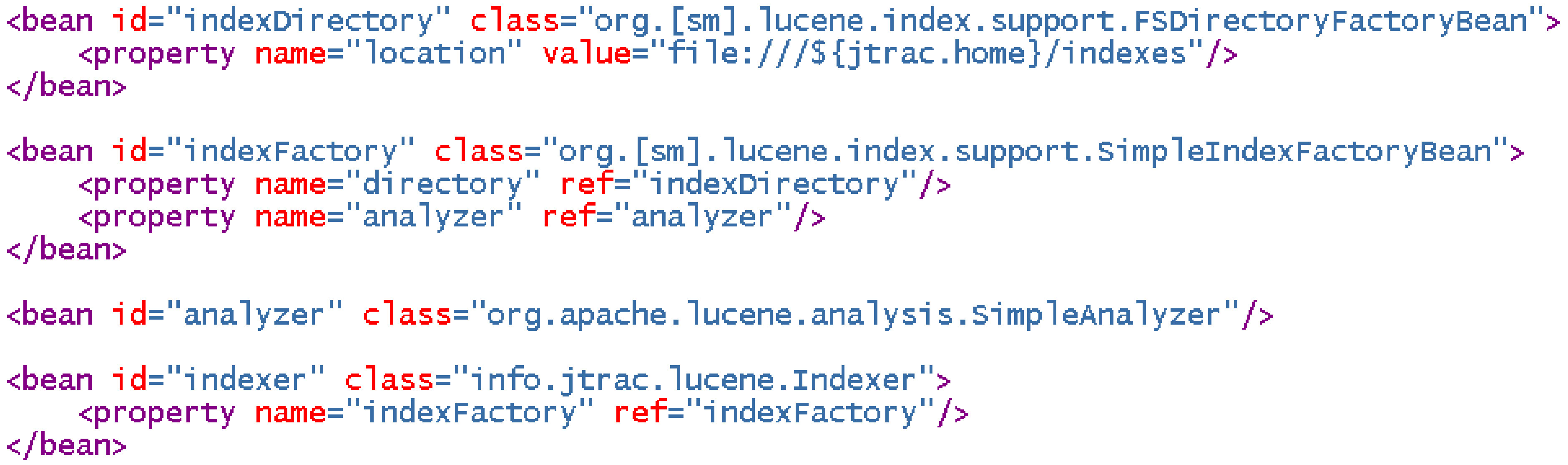
Security with Acegi

```
<bean name="authorizationFilter" class="org.acegisecurity.intercept.web.Fi
    <property name="authenticationManager" ref="authenticationManager"/>
    <property name="accessDecisionManager">
        <bean class="org.acegisecurity.vote.AffirmativeBased">
            <property name="allowIfAllAbstainDecisions" value="false"/>
            <property name="decisionVoters">
                <list>
                    <bean class="org.acegisecurity.vote.RoleVoter"/>
                </list>
            </property>
        </bean>
    </property>
    <property name="objectDefinitionSource">
        <value>
            PATTERN_TYPE_APACHE_ANT
            /login.htm*=ROLE_ANONYMOUS,ROLE_USER
            /logout.htm=ROLE_ANONYMOUS,ROLE_USER
            /admin/**=ROLE_ADMIN
            /**=ROLE_USER
        </value>
    </property>
</bean>
```

any URL request within the "/admin/" directory or path can only be allowed for "ROLE_ADMIN"

Any other request has to be allowed only for authenticated users

Spring Modules example: Lucene

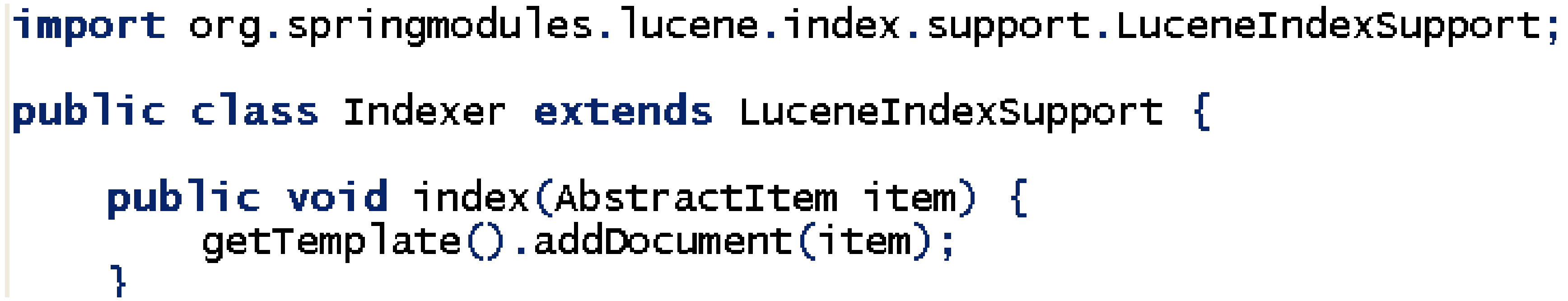


```xml
<bean id="indexDirectory" class="org.[sm].lucene.index.support.FSDirectoryFactoryBean">
    <property name="location" value="file:///${jtrac.home}/indexes"/>
</bean>

<bean id="indexFactory" class="org.[sm].lucene.index.support.SimpleIndexFactoryBean">
    <property name="directory" ref="indexDirectory"/>
    <property name="analyzer" ref="analyzer"/>
</bean>

<bean id="analyzer" class="org.apache.lucene.analysis.SimpleAnalyzer"/>

<bean id="indexer" class="info.jtrac.lucene.Indexer">
    <property name="indexFactory" ref="indexFactory"/>
</bean>
```



```java
import org.springmodules.lucene.index.support.LuceneIndexSupport;

public class Indexer extends LuceneIndexSupport {

    public void index(AbstractItem item) {
        getTemplate().addDocument(item);
    }
```

JTrac: Spring implications

- Application deployed as a WAR file
- Portable: Tomcat, Jetty, JBoss or any Java EE app server
- Easily unit-testable
- Faster build-deploy-test cycles
- Clean OO design, designed to interfaces
- No EJBs
- No Singletons
- No Service Locator / JNDI lookup
- No custom “Factory Pattern” implementation
- No DTOs / VOs
- No Annotations (optional)
- JSTL / JSP

Why not RoR :)

- Spring
- Hibernate
  - Lazy Loading
- HSQLDB
  - Embedded database
- Jetty
  - Small footprint
  - Embedded app-server + web server !
- Libraries
  - JavaSVN, JFreeChart, Lucene, Apache POI
- i18n

Notable in Spring 2.0

- Async task execution
- Portlet MVC
- Use Groovy, JRuby etc. for config
- MVC: Custom taglib for form controls (like Struts)
- Message driven POJOs
- JPA support
- Simplified XML config option
- AspectJ integration

Agile Development with Spring + Hibernate

- Spring
  - No need of container
  - JUnit support classes
  - POJOs inherently easy to test
- Hibernate
  - Completely abstracts DB
  - HSQLDB can be used for testing
  - Unit tests can assume that DB exists, no mocks reqd.

clean	Delete all previous build artifacts / database files from file system
compile	Compile all code and unit tests
db-start	Boot a fresh instance of the HSQLDB database server
db-create	Connect to the database and forward-generate the schema from the mapping files using Hibernate.
test	Run unit-tests.
db-stop	Shutdown database.
reports	Generate Reports

DEMO

- Unit + Integration Testing

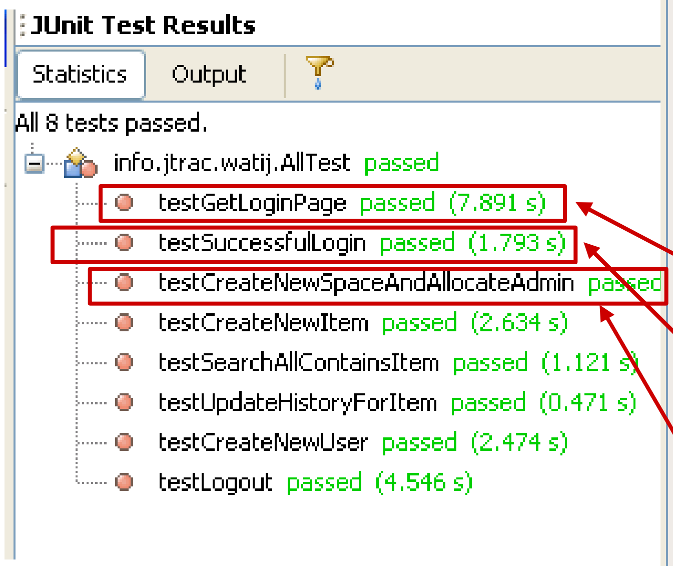
Watij [http://watij.com/]

- A new class of web test automation tools
  - Watir
    - Web Application Testing in Ruby
  - Selenium
  - Watij
    - Web Application Testing in Java
- Focus on using a real browser, not simulating one
- Especially important when lots of Javascript / AJAX

Watij Features

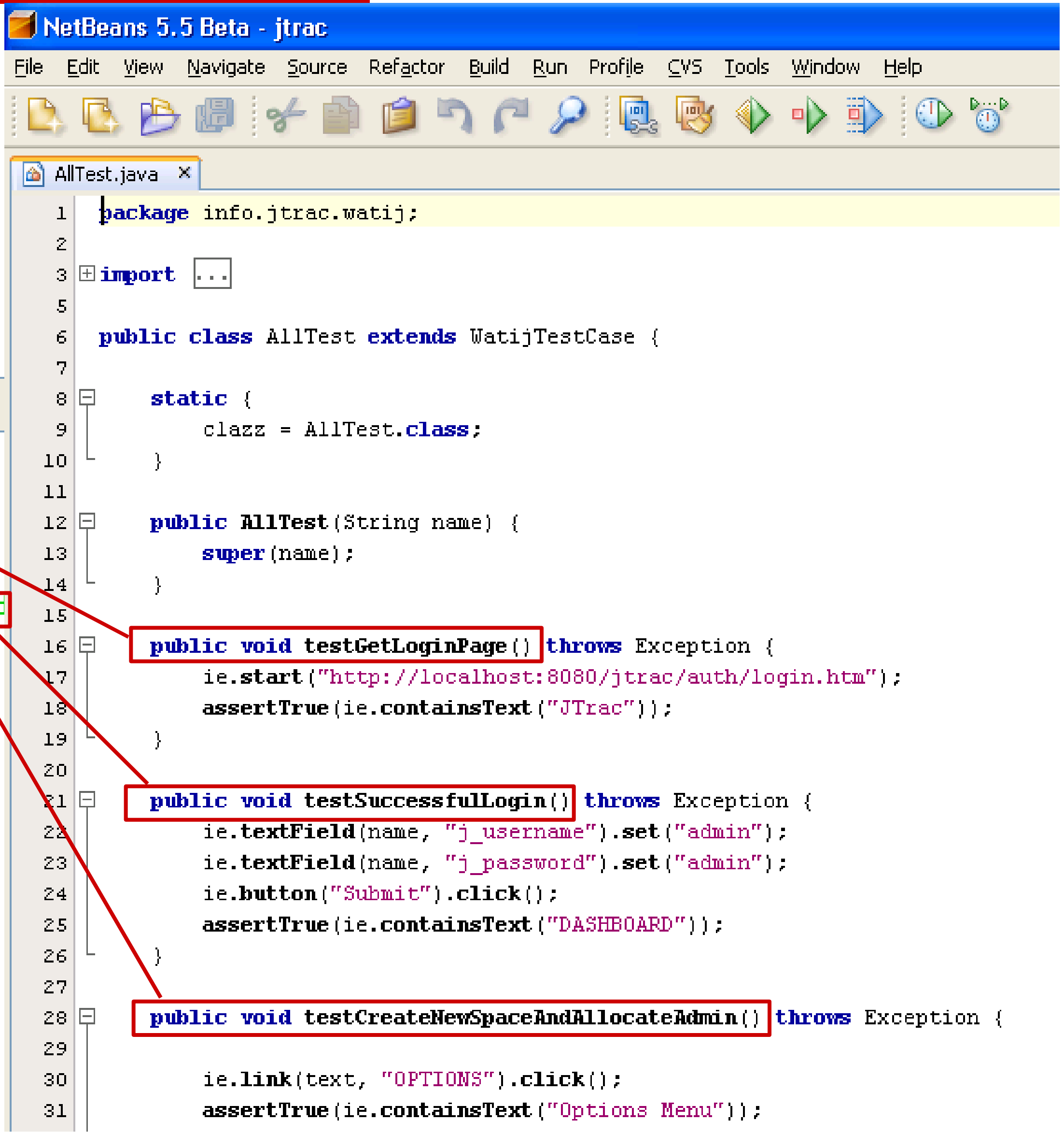
- Write tests in pure Java
- Interactively script tests using BeanShell
- Possible to drive tests using JUnit
- No setup required on the Server Under Test
- Support for nested tables, frames
- Good “popup” and multi-window support
- And also “brute-force” keystroke support…

Watij in conjunction with JUnit



JUnit Test Results

```
All 8 tests passed.
info.jtrac.watij.AllTest passed
    testGetLoginPage passed (7.891 s)
    testSuccessfulLogin passed (1.793 s)
    testCreateNewSpaceAndAllocateAdmin passed
    testCreateNewItem passed (2.634 s)
    testSearchAllContainsItem passed (1.121 s)
    testUpdateHistoryForItem passed (0.471 s)
    testCreateNewUser passed (2.474 s)
    testLogout passed (4.546 s)
```



NetBeans 5.5 Beta - jtrac

```java
package info.jtrac.watij;

import ...

public class AllTest extends WatijTestCase {

    static {
        clazz = AllTest.class;
    }

    public AllTest(String name) {
        super(name);
    }

    public void testGetLoginPage() throws Exception {
        ie.start("http://localhost:8080/jtrac/auth/login.htm");
        assertTrue(ie.containsText("JTrac"));
    }

    public void testSuccessfulLogin() throws Exception {
        ie.textField(name, "j_username").set("admin");
        ie.textField(name, "j_password").set("admin");
        ie.button("Submit").click();
        assertTrue(ie.containsText("DASHBOARD"));
    }

    public void testCreateNewSpaceAndAllocateAdmin() throws Exception {

        ie.link(text, "OPTIONS").click();
        assertTrue(ie.containsText("Options Menu"));
```

DEMO

- Watij
- Driving functional tests with JUnit

Thank you

http://jtrac.info