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Building Enterprise Applications With Spring


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Agenda


- **The Spring architecture end-to-end**
- **Applied to a realistic business case**
- **You'll learn the value Spring provides:**
 - In the middle tier
 - In the web tier
- **Goal: experience why enterprise Java development is fun again**



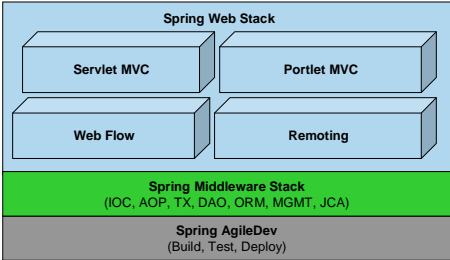
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Spring Is...

- **The leading full-stack application framework applicable:**
 - Everywhere—
 - System configuration and assembly
 - In the Middle tier—
 - Java/J2EE support libraries focused on ease-of-use
 - In the Web tier—
 - Model 2 MVC, Web Flow
 - On the Desktop—
 - A Swing-based rich client platform
- ***You use what you need***



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The diagram illustrates the Spring Stack Architecture, which is built on top of the Spring AgileDev (Build, Test, Deploy) layer. The Spring AgileDev layer is divided into two main sections: the Spring Middleware Stack (IOC, AOP, TX, DAO, ORM, MGMT, JCA) and the Spring Web Stack. The Spring Web Stack is further divided into four components: Servlet MVC, Portlet MVC, Web Flow, and Remoting.

Many view Spring increasingly as an integration platform of best-of-breed components...

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People like Spring because it...

- **Is not invasive**
- **Brings leverage**
- **Lets you focus**
- **Provides choices in a consistent manner**
- **Delivers on power *and* convenience**
- **Is sustainable**
 - Interface21, BEA, Oracle all provide professional Spring support

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Spring Point of Sale (POS)TM

- **The best way to learn is by example**
- **Retail industry, order provisioning module**
- **This vertical slice must:**
 - Allow a sales rep
 - To place a product order
 - On behalf of a customer
- **Goal: implement this "end-2-end" slice in the next 45 minutes**

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How can Spring help in the middle tier?

- **Managing your business objects**
- **Making your business objects testable**
- **Executing data access operations**
- **Demarcating transactions**
- **Performing security checks**
- **Messaging other systems (JCA, web, etc)**



What are the key business contracts?

@Transactional

```
public interface SalesProcessor {  
    public void processSale(Sale sale);  
}  
  
public class Sale {  
    private int itemCount;  
    private MonetaryAmount price;  
    private ShippingType type;  
    private CustomerKey customer;  
    public MonetaryAmount discountRate();  
    public MonetaryAmount totalCost();  
}
```



Managing your business objects

- **What are the implementations of those contracts?**
 - public class JdbcSalesProcessor
- **What does that implementation need "to work"?**
 - A DataSource
 - Jdbc Helper
 - A Transaction Manager



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Managing your business objects

```

    graph TD
      A[Transactional SalesProcessor  
(Dynamic Proxy)] --> B[JdbcSales Processor]
      B --> C[(DataSource)]
  
```

- Spring generated
- Your object
- "Off the shelf" component

- **Spring drives object assembly**

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```

<beans>
  <import resource="transaction-proxy-creators.xml"/>
  <bean id="salesProcessor" class="sellitem.JdbcSalesProcessor">
    <property name="dataSource" ref="dataSource"/>
  </bean>
  <bean id="dataSource" class="org.apache.dbcp.BasicDataSource">
    <property name="driverClassName" value="{db.driver}"/>
    <property name="url" value="{db.url}"/>
    <property name="username" value="{db.username}"/>
    <property name="password" value="{db.password}"/>
  </bean>
</beans>
  
```

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Making your business objects testable

- **Your business objects are J2SE POJOs focused on "main line" logic**
- **They are handed what they need "to work"**
 - They don't ask for it
 - So they don't hard code dependencies on expensive resources
- **What they need to work can be mocked to test main line logic in isolation**

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Unit testing

- **Unit tests test an object implementation in isolation**
- **No need for the Spring container**
- **Just extend TestCase, use the new operator to create objects to test**
- **Use mocks if necessary**



Unit Testing - Example

```
public class SaleUnitTests extends TestCase {  
    public void testCalculateDiscountRate() {  
        MonetaryAmount amt = new MonetaryAmount(100);  
        Sale sale = new Sale(5, amt);  
        sale.setCategory(Category.A);  
        assertEquals(new MonetaryAmount(20), sale.getDiscountRate());  
    }  
}
```



Integration Testing

- **Integration tests test object interaction to complete a use case**
- **Spring's container handles system test configuration**
- **Each test runs in its own transaction**
- **With automatic transaction rollback on test tear down**
- **Testing is fast**
 - No need to deploy to a J2EE container



Integration Testing - Example

```
public class SellItemIntegrationTests extends
AbstractTransactionalDataSourceSpringContextTests {

    private SalesProcessor salesProcessor;

    @Override
    public String[] getConfigLocations() {
        return new String[] {
            "sellitem/middle-tier-configuration.xml"
        }
    }

    @Transactional
    public void testProcessSaleSuccess() {
        // main line test logic here
    }
}
```



Executing data access operations

- **Resource connection management and statement preparation is handled for you**
 - No more evil "TCFTC"
 - No more resource leaks
- **Exception root cause analysis is handled for you**
- **All data access operations participate in transactions automatically**



JDBC Data Access - Example

```
public class JdbcSalesProcessor extends JdbcDaoSupport implements
SalesProcessor {

    public void process(Sale sale) {
        getJdbcTemplate().executeUpdate("insert into SALES values
            (?, ?, ?, ?)", new Object[] { null,
                sale.getItemCount(),
                sale.getPrice(),
                sale.getShippingType(),
                sale.getCustomerKey().longValue() });
    }
}
```

Notice the code you are not writing...



Demarcating Transactions

- **You express the TX policies you need, Spring makes it happen**
 - TX management is an aspect
- **The transactional context propagates to individual DAO operations seamlessly**
- **The TX manager is pluggable**
- **Scaling up from JDBC-driven to JTA-driven transactions is a matter of configuration**
 - Does NOT impact application code
 - Does NOT impact demarcation metadata



Demarcating Transactions - Annotations

```
<bean class="o.s...DefaultAdvisorAutoProxyCreator"/>  
<bean class="o.s...TransactionAttributeSourceAdvisor">  
  <property name="transactionInterceptor" ref="txInterceptor"/>  
</bean>  
<bean id="txInterceptor" class="o.s...TransactionInterceptor">  
  <property name="transactionManager" ref="txManager"/>  
  <property name="transactionAttributeSource">  
    <bean class="o.s...AnnotationsTransactionAttributeSource"/>  
  </property>  
</bean>  
<bean id="txManager"  
  class="o.s...DataSourceTransactionManager">  
  <property name="dataSource" ref="dataSource"/>  
</bean>
```



How can Spring help in the web tier?

- **Managing your web tier objects**
- **Making your web tier objects testable**
- **Modeling the page flow**
- **Managing conversational state**
- **Routing requests to handlers**
- **Binding form input to your domain objects**
- **Validating your domain objects, with error reporting**
- **Integrating multiple view technologies**



Hosting your web-tier services

- You can “spring to life” your web tier, too
- Spring glues your web-tier with your middle-tier—seamlessly
- Examples of web-tier services:
 - Controllers
 - Flows
 - View Resolvers
 - Message Sources





Flow Architecture

- A wizard for a phone operator to use to sell items to her customers
- Characteristics:
 - An “application transaction” or “conversation” that spans several steps
 - Some steps solicit user input
 - Some steps are decision points
 - Some steps perform calculations
 - Navigation from step-to-step is controlled

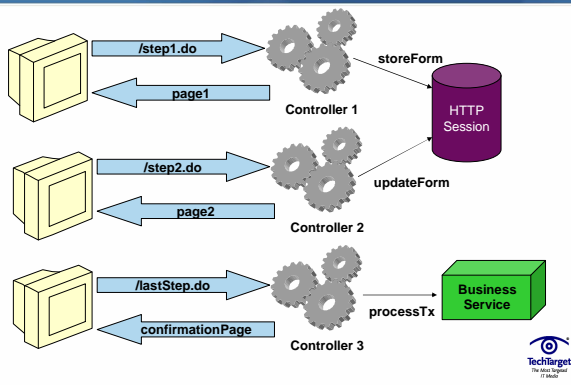


How would you do this today with Struts?

1. **Create a session-scoped ActionForm to hold the wizard form data**
2. **Define a JSP for each step**
3. **Define an Action for each step**
4. **Expose each Action at a request URL**
5. **Have the form rendered by the JSP submit to that URL**
6. **At the end, delegate to a business service to commit the transaction**



What this looks like



Issues with this approach

- **Request centric: no concept of an ongoing conversation or flow**
- **Brittle dependency on request URLs**
- **Manual state management**
- **Odd new window behavior**
- **Proper back button behavior is difficult**
- **“Loose” controlled navigation**
- **Difficult to observe process lifecycle**
- **Controller and command logic are coupled**
- **Heavily tied to HTTP**



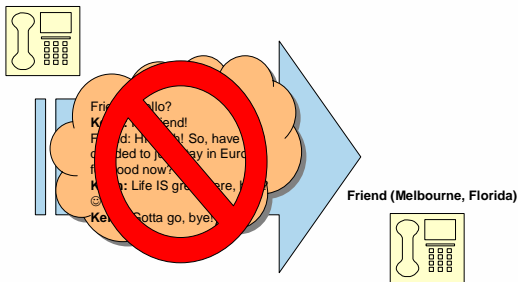
Consequences

- Many lines of custom code are written to address these issues
- As an application grows more complex maintainability breaks down
- Fundamentally, something is missing
- Traditional approaches today lack a key abstraction: the Flow
- A Flow is typically longer than a single request but shorter than a session: a conversation!

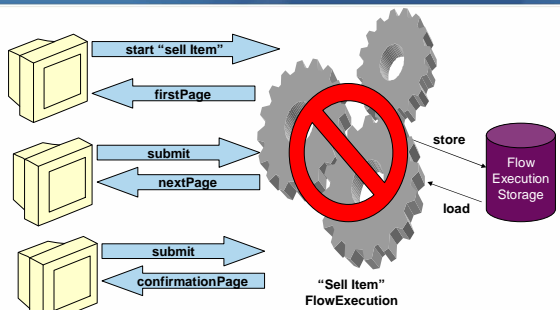


Flow Conversation Analogy

Keith (on his European vacation)



The SWF approach

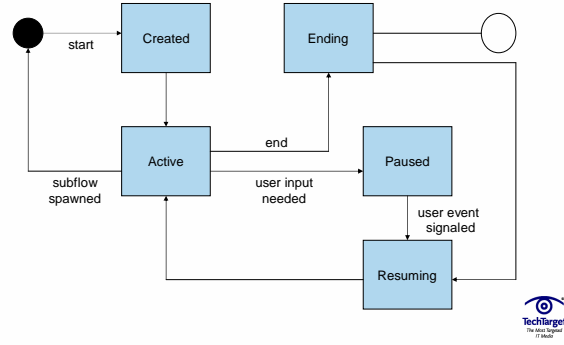


Significant architectural differences

- One flow drives the entire conversation
- When user input is required, the flow “pauses” and control returns to the client
- Clients “signal” events to tell the flow what happened
- The flow responds to events to decide what to do next
- What to do next is fully encapsulated
 - Flows are modular “black boxes”



Flow Execution State Transition Diagram



Question

Q: How do you program the Flow?

Q: How does it know what to do in response to user events?

A: You create a Flow definition

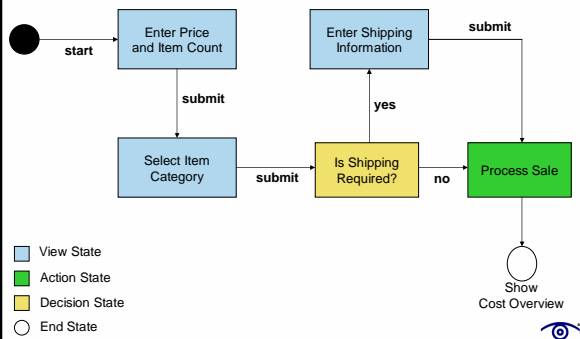


Flow Definition Structure

- **A Flow definition serves as instructions to a finite state machine**
- **It consists of a set of states that you define**
- **Each state executes a polymorphic behavior when entered**
 - View states solicit user input
 - Action states execute commands
 - Subflow states spawn child flows
 - End states terminate flows
- **Events you define drive state transitions**



The "Sell Item" Flow Definition



Code Break!

- **The "Sell Item" Flow Definition**
 - If viewing on-line, see presentation notes
- **The Flow Integration Test**
- **The Views (JSPs)**
- **Demo of the Flow Execution**



Advantages

- The logical flow is clearly defined, readable
- Navigation rules are encapsulated in one place
- No dependency on any request URLs
- Navigation is strictly enforced
- State management is automatic
- Flow lifecycle is fully observable
- Controller logic is clearly decoupled from command logic
 - The Flow is the controller, deciding what state to enter next
 - States execute arbitrary behavior when entered
- HTTP independent
- Flow definitions are extremely toolable



Typing it all together

- User starts a new "sell item" process
- A new conversation is started, a new "Sale" object is put in "flow scope"
- User completes forms, the flow drives navigation and updates "Sale" state
- On completion of the flow, *processSale* is invoked
- *processSale* begins a transaction that propagates across multiple DAO calls
- End-2-end in very few lines of code



Resources and Upcoming Events

- www.springframework.org
 - New CMS portal means we now bring you a lot more content
- Web Flow Wiki provides a "Quick Start"
 - Practical guide
 - Articles
- Web Flow Ships with 7 sample applications
 - Phone Book (Core sample)
 - Sell Item (Wizard with Continuations)
 - Birth Date (Struts integration)
 - Item List (Transaction Synchronization)
 - Number Guess (Example of conversation history)
 - Flow Launcher (How to launch flows)
 - File Upload (A flow to upload files)




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Resources and Upcoming Events


- **Public Spring Training**
 - 4-day "bootcamps" across North America, Europe
 - www.springframework.com/training
- **The Spring Experience**
 - International conference for agile Java developers
 - <http://www.thespringexperience.com>
 - December 7 – 10th, 2005, Sheraton Resort, Bal Harbour Beach Florida
 - 40+ technical sessions across four tracks: Web, Enterprise, Process, Beyond J2EE
 - **Featuring**
 - Rod Johnson (Spring Founder, i21 CEO)
 - Juergen Hoeller (Spring Co-Founder, i21 CTO)
 - Adrian Colyer (AspectJ Founder, i21 Chief Scientist)
 - Rob Harrop (Author, Pro Spring)
 - ... and many more
- **Super early bird registration period open now**



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Conclusion

- **Spring is a complete, modular, pragmatic full-stack application framework**
- **It adds serious value in:**
 - The middle tier
 - The web tier
- **Spring will continue to innovate**
- **Spring will continue to simplify**
- **Got Spring?**

