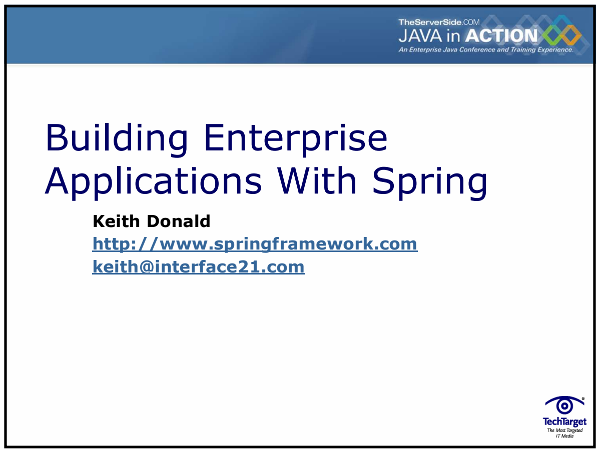
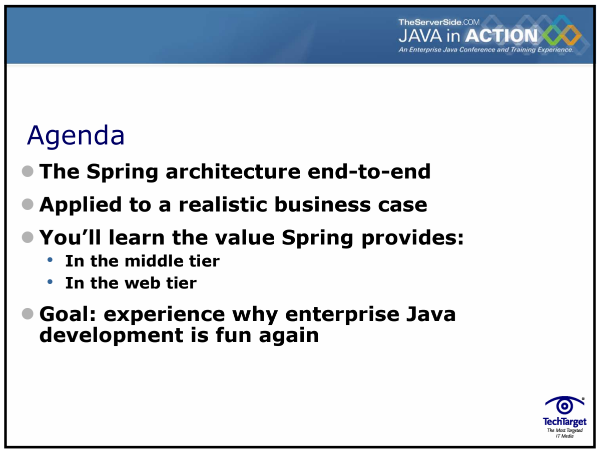


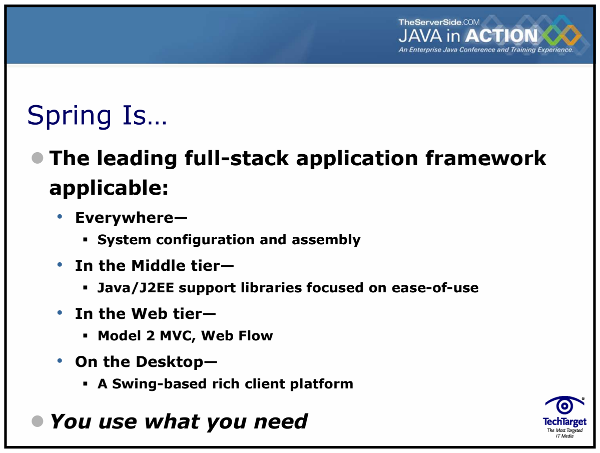
Building Enterprise Applications With Spring

Keith Donald
http://www.springframework.com
keith@interface21.com



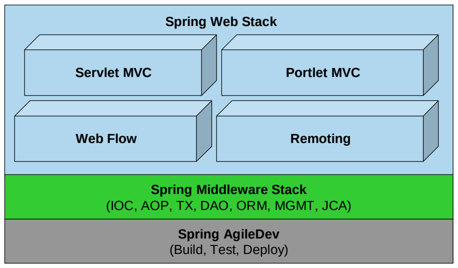
Agenda

- **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**



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***



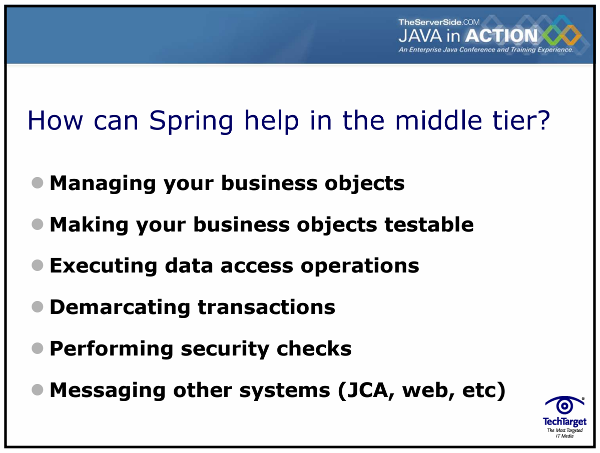
Many view Spring increasingly as an integration platform of best-of-breed components…

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**

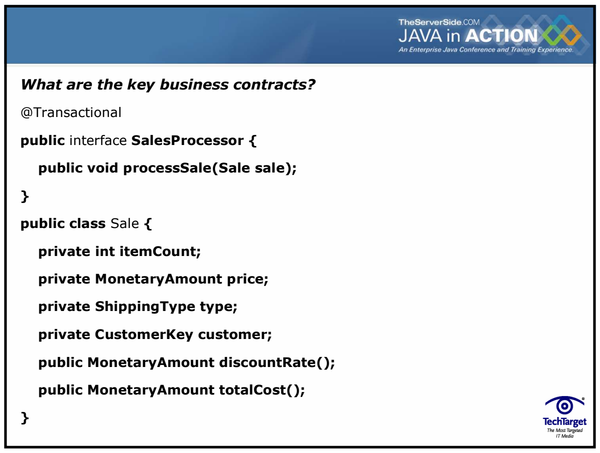
Spring Point of Sale (POS)™

- **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**



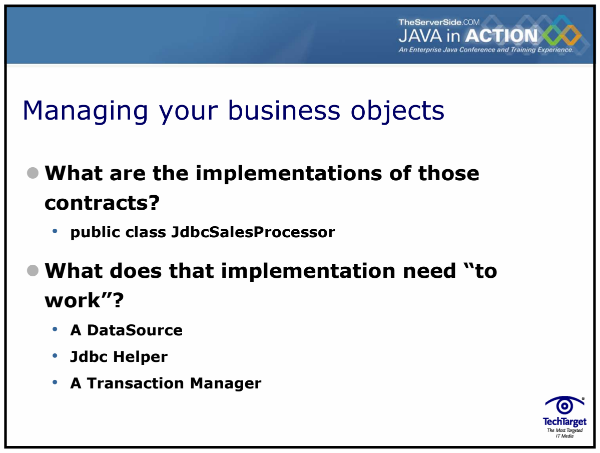
How can Spring help in the middle tier?

- 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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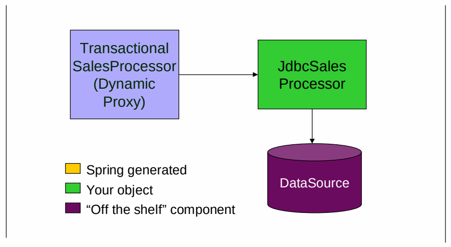
Managing your business objects


Transactional SalesProcessor (Dynamic Proxy)
JdbcSales Processor
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

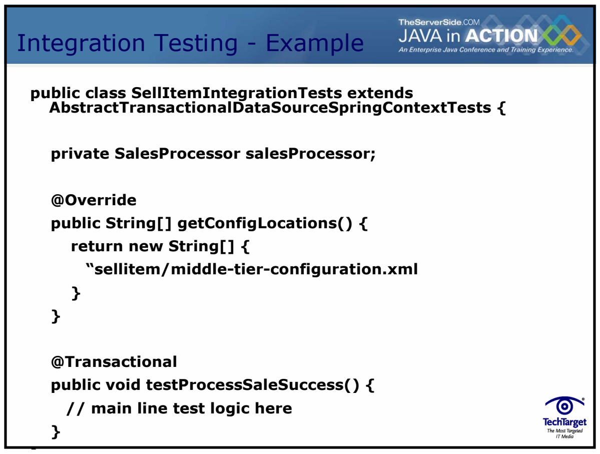
- Unit tests test an object implementation in isolation
- No need for the Spring container
- Just extend TestCase, use the new operator to create objects to test
- Use mocks if necessary

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());
   }
}
```

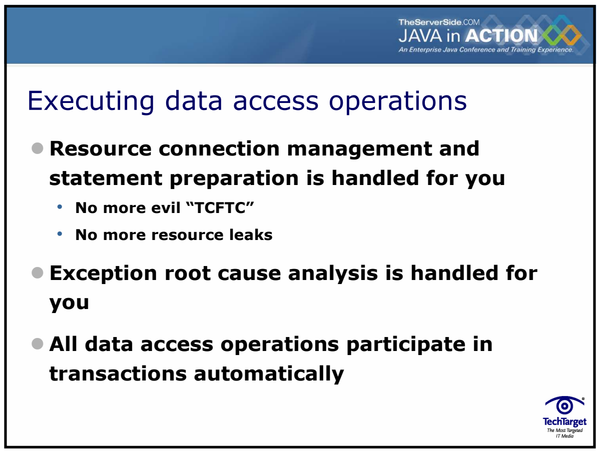
Integration Testing

- **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



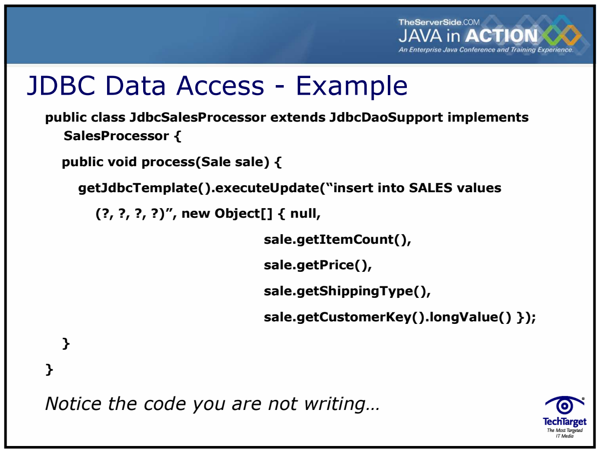
Integration Testing - Example

```
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

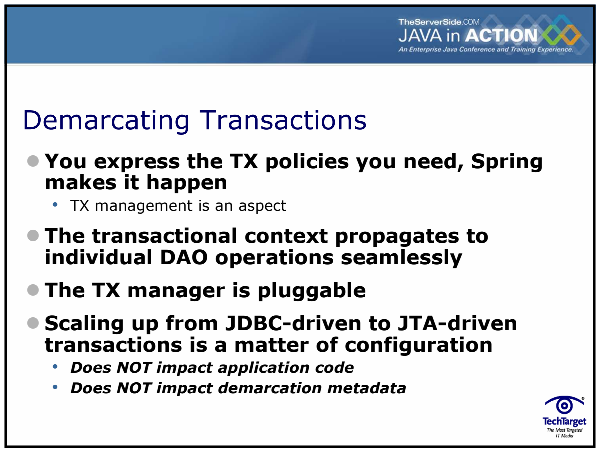
- Resource connection management and statement preparation is handled for you
  - No more evil "TCFTC"
  - No more resource leaks
- Exception root cause analysis is handled for you
- All data access operations participate in transactions automatically



JDBC Data Access - Example

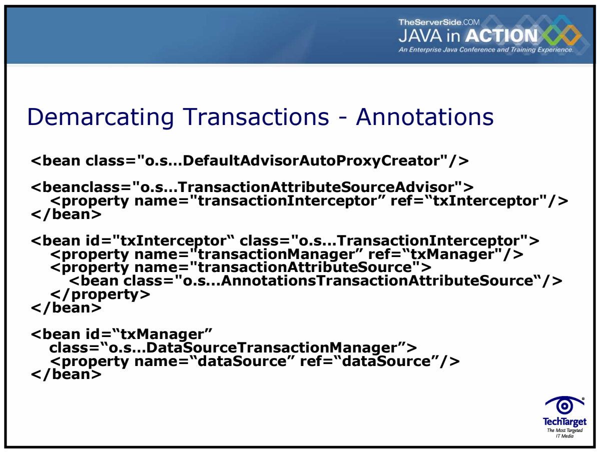
```
public class JdbcSalesProcessor extends JdbcDaoSupport implements
   SalesProcessor {
   public void process(Sale sale) {
      getJdbcTemplate().executeUpdate("insert into SALES values
         (?, ?, ?, ?)", new Object[] { null,
                                   sale.getItemCount(),
         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

Notice the code you are not writing…



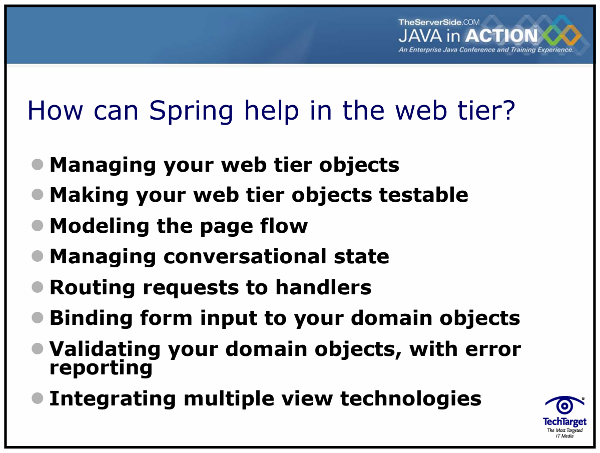
Demarcating Transactions

- **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"/>

<beanclass="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?

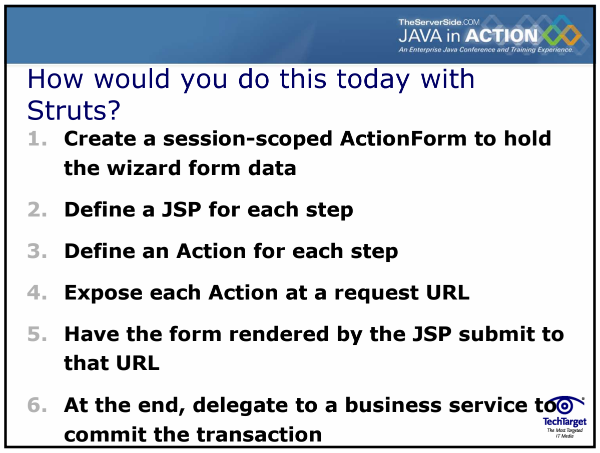
- **Managing your web tier objects**
- **Making your web tier objects testable**
- **Modeling the page flow**
- **Managing conversational state**
- **Routing requests to handlers**
- **Binding form input to your domain objects**
- **Validating your domain objects, with error reporting**
- **Integrating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

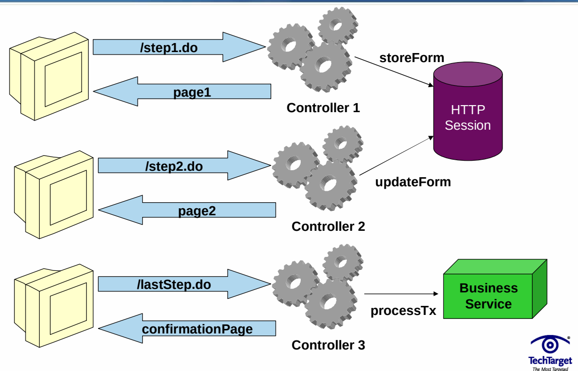
- A wizard for a phone operator to use to sell items to her customers
- Characteristics:
  - An "application transaction" or "conversation" that spans several steps
  - Some steps solicit user input
  - Some steps are decision points
  - Some steps perform calculations
  - Navigation from step-to-step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

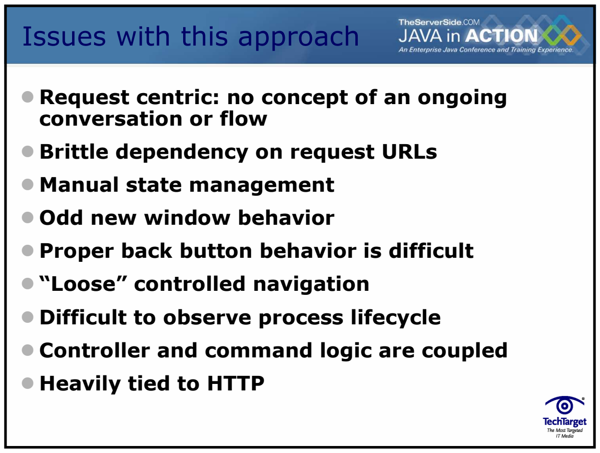


How would you do this today with Struts?

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





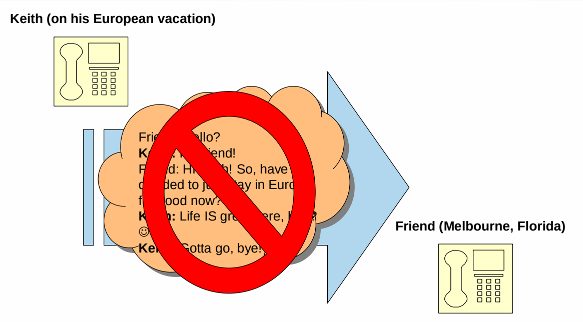
Issues with this approach

- **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**

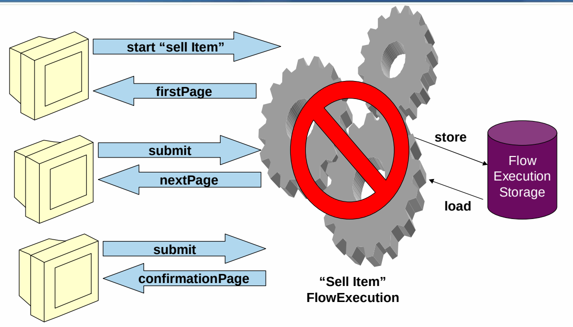
Consequences

- 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



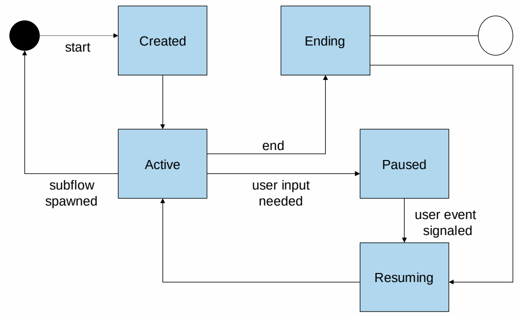
The SWF approach



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

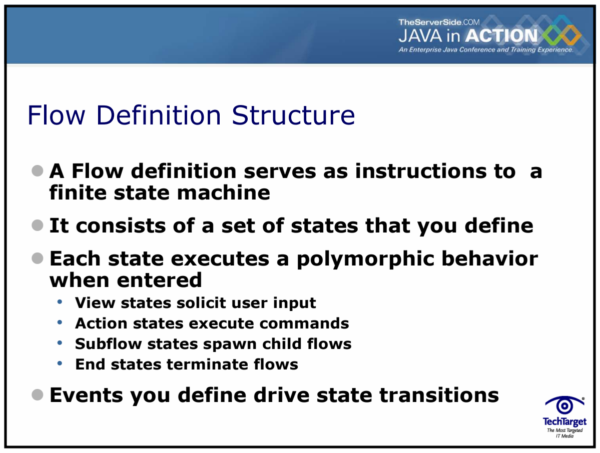


Question

Q: How do you program the Flow?

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

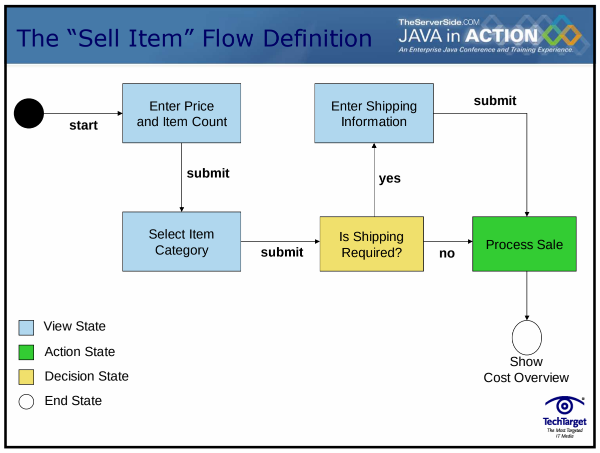
A: You create a Flow definition



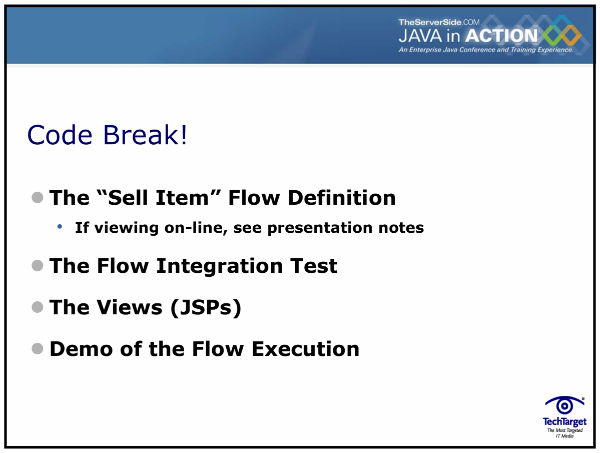
Flow Definition Structure

- 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

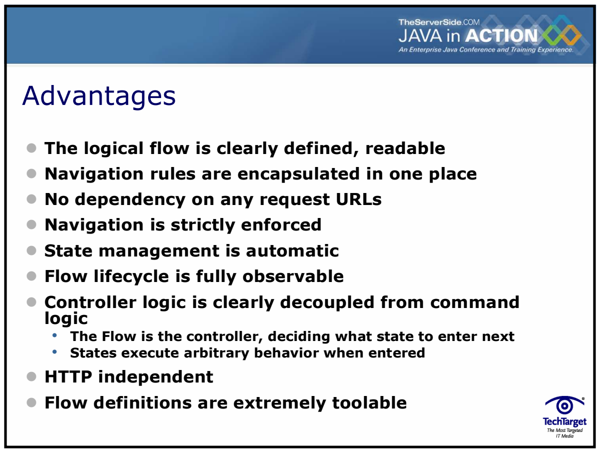


- 🟦 View State
- 🟩 Action State
- 🟨 Decision State
- ○ End State



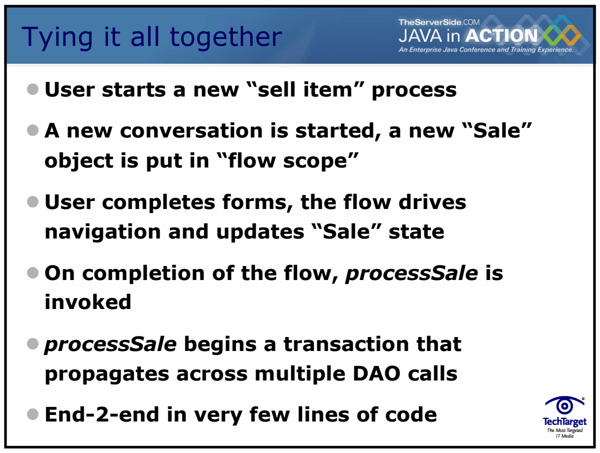
Code Break!

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



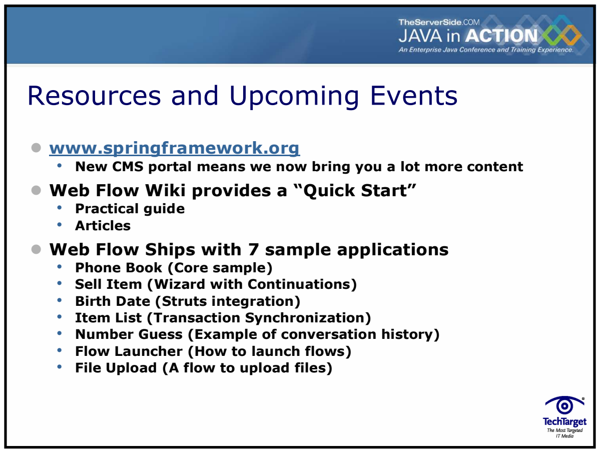
Advantages

- 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



Tying 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)

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?***