



Using the JSP Standard Tag Library (JSTL) with Struts

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Taught by the author of *Core Servlets and JSP*, *More Servlets and JSP*, and this tutorial. Available at public venues, or customized versions can be held on-site at your organization.

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Agenda

- **Obtaining JSTL documentation and code**
- **The JSTL Expression Language**
- **Looping Tags**
 - Looping a certain number of times
 - Looping over data structures
- **Conditional Evaluation Tags**
 - Single choice
 - Multiple choices
- **Database Access Tags**
- **Other Tags**

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Overview and Installation

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JSTL Overview

- **JSTL is the recommended replacement for the Struts looping and logic tags**
- **JSTL is not part of the JSP 1.2 or 2.0 Specs**
 - It is a separate specification that requires a separate download
 - Available only in servers that support servlets 2.3 and JSP 1.2 or later. Cannot be retrofitted into JSP 1.1.
- **The JSTL expression language is now part of JSP 2.0**
- **The JSTL Specification is available in PDF**
 - <http://jcp.org/aboutJava/communityprocess/final/jsr052/>

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Installing JSTL

- **Some servers come with JSTL preinstalled**
 - E.g., Caucho Resin
- **Official reference implementation**
 - <http://jakarta.apache.org/builds/jakarta-taglibs/releases/standard/>
- **JSTL (like JSP) is a specification, not an implementation**
 - Code is portable but not all versions are equal
 - Speed, tools, and development environments vary
- **To install:**
 - Download zip file
 - Unzip into directory of your choice (e.g., C:\jakarta-taglibs).
 - Copy install_dir/standard-1.0.1/lib/jstl.jar and install_dir/standard-1.0.1/lib/standard.jar to the WEB-INF/lib directory of your Web application

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The JSTL Expression Language

- Accessed via `${expression}`
- Similar to JavaScript and XPath
- Provides shorthand notation to access:
 - Attributes of standard servlet objects
 - Bean properties
 - Map, List, and Array elements
- Is standard part of JSP 2.0
 - In JSTL, EL can be used only in attributes of JSTL tags
 - In JSP 2.0, the EL can be used anywhere
 - *web.xml* element and page directive attribute let you disable the EL for backward compatibility
- Covered in separate lecture

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Iteration Tags

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Looping Tags: Summary

- **Looping with explicit numeric values**

```
<c:forEach var="name" begin="x" end="y" step="z">
  Blah, blah <c:out value="\${name}"/>
</c:forEach>
```

- **Looping over data structures**

- Can loop down arrays, strings, collections, maps

```
<c:forEach var="name"
  items="array-or-collection">
  Blah, blah <c:out value="\${name}"/>
</c:forEach>
```

- **Looping down delimited strings**

- forTokens

Looping Tags: Motivation

- **JSP without JSTL**

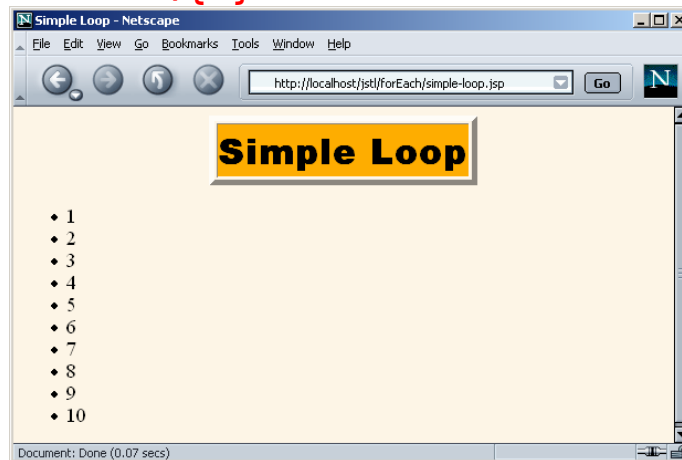
```
<UL>
<%
for(int i=0; i<messages.length; i++) {
  String message = messages[i];
%>
<LI><%= message %>
<% } %>
</UL>
```

- **JSP with JSTL**

```
<UL>
<c:forEach var="message" items="\${messages}">
  <LI><c:out value="\${message}"/>
</c:forEach>
</UL>
```

Looping with Simple Numeric Values

```
<%@ taglib prefix="c"
      uri="http://java.sun.com/jstl/core" %>
<UL>
<c:forEach var="i" begin="1" end="10">
  <LI><c:out value="{i}"/>
</c:forEach>
</UL>
```



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Looping with a Designated Step Size

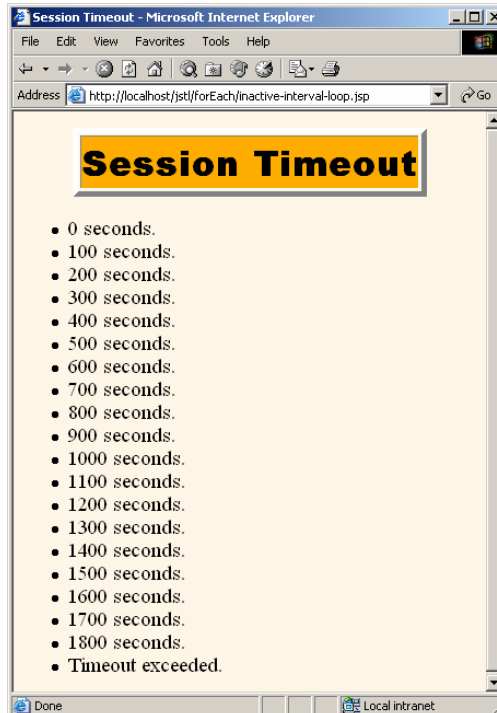
```
<%@ taglib prefix="c"
      uri="http://java.sun.com/jstl/core" %>
<UL>
<c:forEach
  var="seconds"
  begin="0"
  end="{pageContext.session.maxInactiveInterval}"
  step="100">
  <LI><c:out value="{seconds}"/> seconds.
</c:forEach>
<LI>Timeout exceeded.
</UL>
```

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Looping with a Designated Step Size (Results)



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Looping Down Arrays

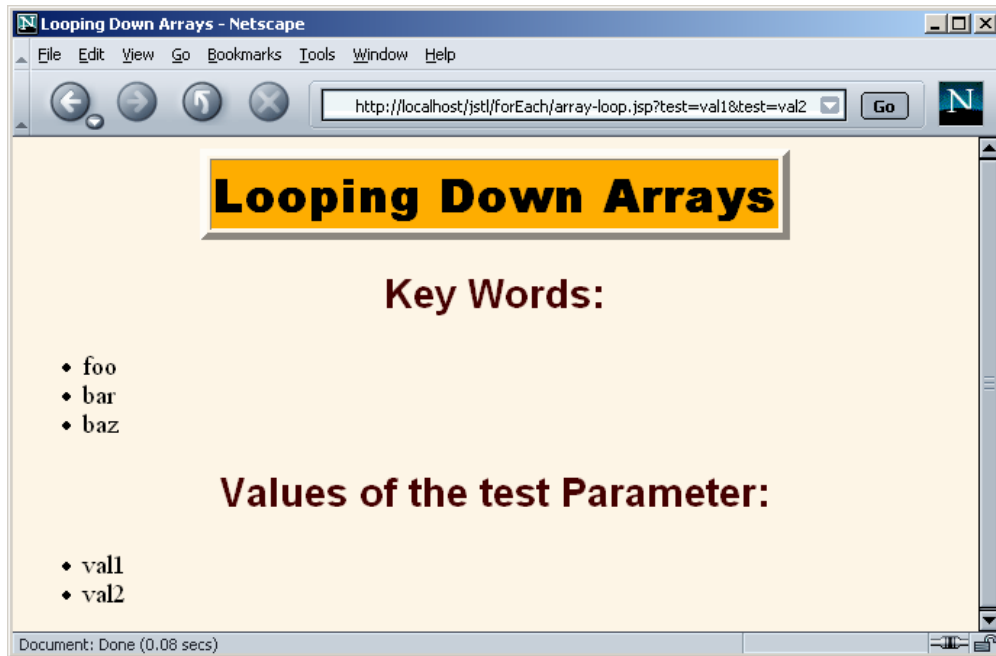
```
<% String[] words = { "foo", "bar", "baz"};  
    pageContext.setAttribute("words", words); %>  
<%@ taglib prefix="c"  
    uri="http://java.sun.com/jstl/core" %>  
<H2>Key Words:</H2>  
<UL>  
<c:forEach var="word"  
    items="{words}">  
    <LI><c:out value="{word}"/>  
</c:forEach>  
</UL>  
<H2>Values of the test Parameter:</H2>  
<UL>  
<c:forEach var="val"  
    items="{paramValues.test}">  
    <LI><c:out value="{val}"/>  
</c:forEach>  
</UL>
```

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Looping Down Arrays (Results)



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Looping Down Comma-Delimited Strings

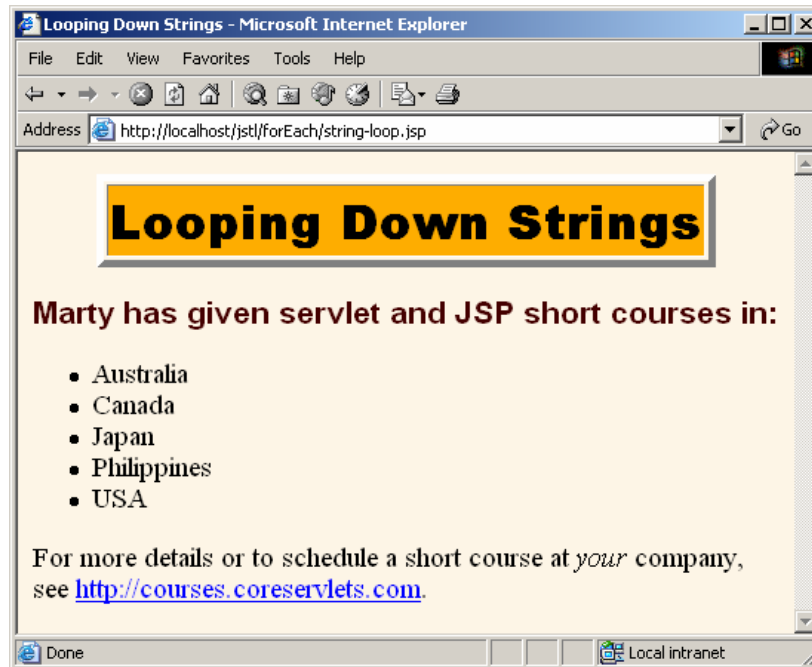
```
<%@ taglib prefix="c"
      uri="http://java.sun.com/jstl/core" %>
<UL>
<c:forEach
  var="country"
  items="Australia,Canada,Japan,Philippines,USA">
  <LI><c:out value="{country}" />
</c:forEach>
</UL>
```

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Looping Down Comma-Delimited Strings (Results)



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Looping Down Arbitrarily-Delimited Strings

```
<%@ taglib prefix="c"
      uri="http://java.sun.com/jstl/core" %>
<UL>
<c:forTokens var="color"
  items="(red (orange) yellow)(green)((blue) violet)"
  delims="( )">
  <LI><c:out value="\${color}"/>
</c:forTokens>
</UL>
```

- **Point:**
 - forTokens
 - built on forEach:
 - you can build your own custom tags
 - based on JSTL tags



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Logic Tags

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Conditional Evaluation Tags

- **One choice: if**

```
<c:if test="\${someTest}">  
  Content  
</c:if>
```

- **Lots of choices: choose**

```
<c:choose>  
  <c:when test="test1">Content1</c:when>  
  <c:when test="test2">Content2</c:when>  
  ...  
  <c:when test="testN">ContentN</c:when>  
  <c:otherwise>Default Content</c:otherwise>  
</c:choose>
```

- **Caution: resist use of business logic!**

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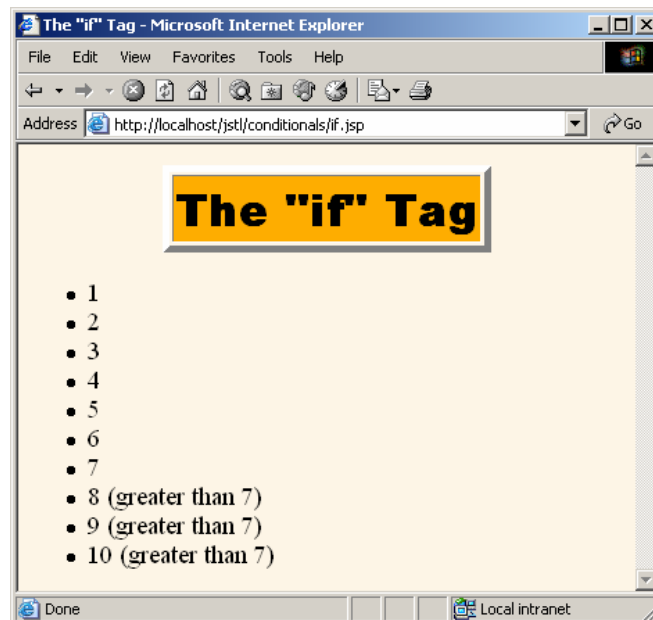
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The "if" Tag

```
<%@ taglib prefix="c"
      uri="http://java.sun.com/jstl/core" %>
<UL>
<c:forEach var="i" begin="1" end="10">
  <LI><c:out value="{i}"/>
    <c:if test="{i > 7}">
      (greater than 7)
    </c:if>
</c:forEach>
</UL>
```

The "if" Tag (Results)



The "choose" Tag

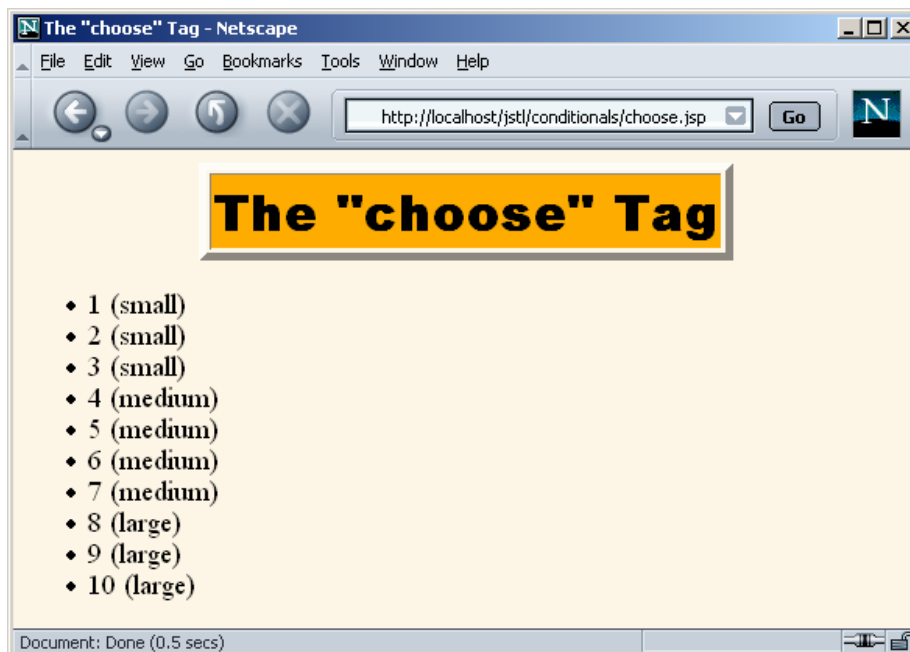
```
<%@ taglib prefix="c"
      uri="http://java.sun.com/jstl/core" %>
<UL>
<c:forEach var="i" begin="1" end="10">
  <LI><c:out value="{i}" />
    <c:choose>
      <c:when test="{i < 4}">
        (small)
      </c:when>
      <c:when test="{i < 8}">
        (medium)
      </c:when>
      <c:otherwise>
        (large)
      </c:otherwise>
    </c:choose>
  </c:forEach>
</UL>
```

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The "choose" Tag (Results)



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Database Access Tags

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Database Access Tags

- **<sql:setDataSource>**
 - Specifies data source (can also be set by config settings)
- **<sql:query>**
 - Queries database and stores ResultSet in variable
 - Warning: this usage violates rule of keeping business logic out of presentation layer. Instead, do database access in servlet and pass results to JSP via MVC.
- **<sql:update>**
- **<sql:param>**
- **<sql:dateParam>**
- **<sql:transaction>**
 - Performs the enclosed <sql:query> and <sql:update> actions as a single transaction

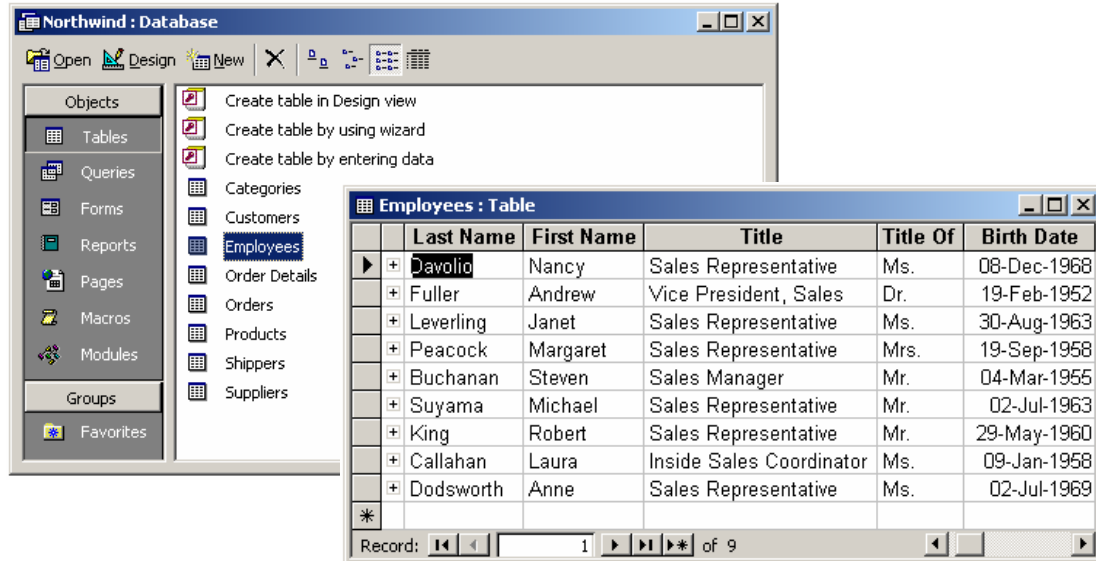
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Aside: The Microsoft Access Northwind Database

- Database that comes preinstalled with Microsoft Office



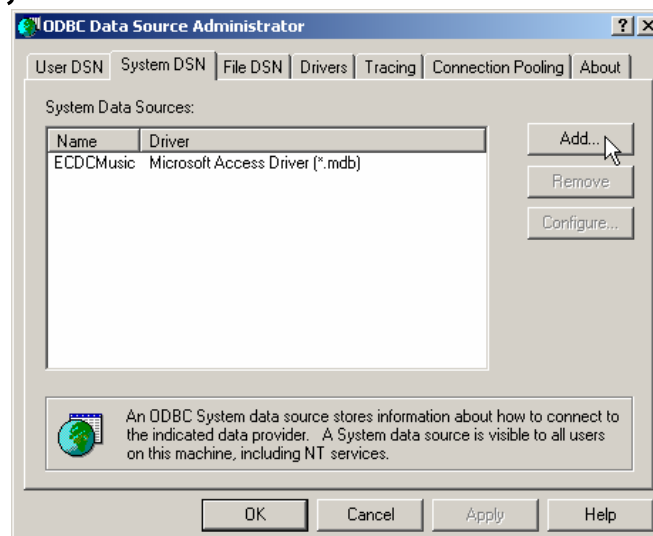
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Using Microsoft Access via ODBC

- Click Start, Settings, Control Panel, Administrative Tools, Data Sources, System DSN, and select Add



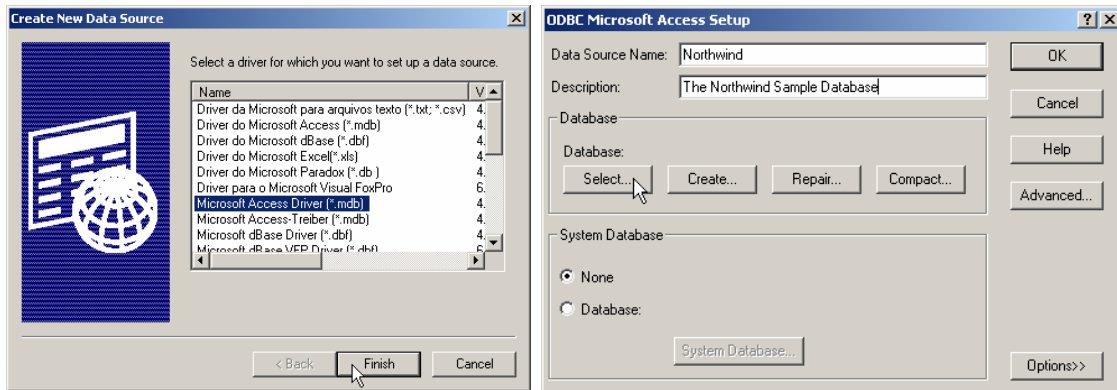
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Using Microsoft Access via ODBC (Continued)

- Select Microsoft Access Driver, Finish, type a name under Data Source Name, and hit Select



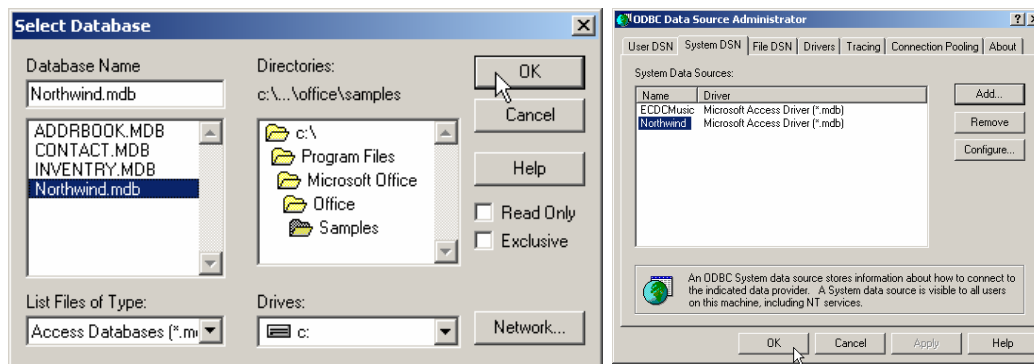
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Using Microsoft Access via ODBC (Continued)

- Navigate to the Samples directory of MS Office, select Northwind.mdb, hit OK, then hit OK in following two windows



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Using Microsoft Access via ODBC (Continued)

- **Driver**
 - sun.jdbc.odbc.JdbcOdbcDriver
 - Comes bundled with JDK
- **URL**
 - jdbc:odbc:Northwind
 - Local access only; for testing. Not for serious applications.
- **Username**
 - Empty string
- **Password**
 - Empty string

sql:setDataSource

- **You can set a data source globally via configuration settings or application-scoped variables.**
 - Preferred approach in real applications
- **Or, you can set it on a specific page**

```
<%@ taglib prefix="sql"
    uri="http://java.sun.com/jstl/sql" %>
<sql:setDataSource
    driver="sun.jdbc.odbc.JdbcOdbcDriver"
    url="jdbc:odbc:Northwind"
    user=""
    password="" />
```

sql:query

- **Form 1: use the sql attribute**

```
<sql:query var="results" sql="SELECT * FROM ..."/>
```

- **Form 2: put the query in the body of the tag**

```
<sql:query var="results">
```

```
    SELECT * FROM ...
```

```
</sql:query>
```

- **Options**

- dataSource

- maxRows

- startRow

- **Caution**

- Embedding SQL directly in JSP may be hard to maintain.

Simple Example

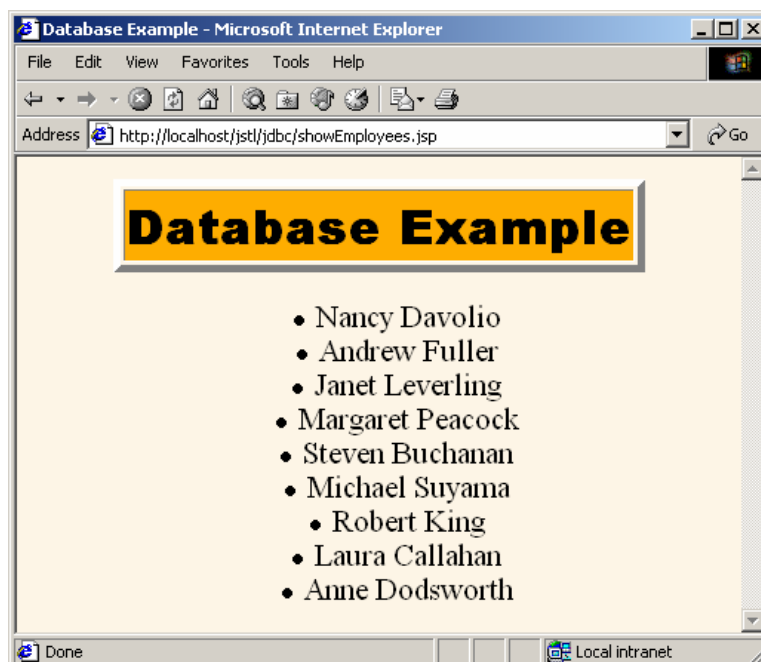
```
<%@ taglib prefix="c"
        uri="http://java.sun.com/jstl/core" %>
<%@ taglib prefix="sql"
        uri="http://java.sun.com/jstl/sql" %>
<sql:setDataSource
    driver="sun.jdbc.odbc.JdbcOdbcDriver"
    url="jdbc:odbc:Northwind"
    user=""
    password="" />
```

Simple Example (Continued)

```
<sql:query var="employees">
  SELECT * FROM employees
</sql:query>

<UL>
<c:forEach var="row" items="{employees.rows}">
  <LI><c:out value="{row.firstname}"/>
    <c:out value="{row.lastname}"/>
</c:forEach>
</UL>
```

Simple Example: Results





Other Tags

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URL-Handling Tags

- **<c:import>**
 - Read content from arbitrary URLs
 - Insert into page
 - Store in variable
 - Or make accessible via a reader
 - Unlike <jsp:include>, not restricted to own system
- **<c:redirect>**
 - Redirects response to specified URL
- **<c:param>**
 - Encodes a request parameter and adds it to a URL
 - May be used within body of <c:import> or <c:redirect>

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Formatting Tags

- **<fmt:formatNumber>**
 - Formats a numeric value as a number, currency value, or percent, in a locale-specific manner
- **<fmt:parseNumber>**
 - Reads string representations of number, currency value, or percent
- **<fmt:formatDate>**
- **<fmt:parseDate>**
- **<fmt:timeZone>**
- **<fmt:setTimeZone>**

Internationalization (I18N) Tags

- **<fmt:setLocale>**
 - Sets Locale
- **<fmt:setBundle>**
- **<fmt:bundle>**
- **<fmt:message>**
 - Retrieves localized message from a resource bundle
- **<fmt:param>**

XML Manipulation Tags

- **Core**
 - `<x:parse>`
- **XPath**
 - `<x:if>`
 - `<x:choose>`
 - `<x:when>`
 - `<x:otherwise>`
 - `<x:forEach>`
- **XSLT**
 - `<x:transform>`
 - `<x:param>`

Summary

- **JSTL is similar to the old Struts looping and logic tags, but better**
- **JSTL is standardized, but not a standard part of JSP 1.2 or 2.0**
 - It must be downloaded and installed separately
- **Supports a concise expression language**
 - Lets you access bean properties and implicit objects in shorthand manner
 - Is standard part of JSP 2.0
- **Looping tags**
 - Explicit numeric values
 - Arrays, collections, maps, strings, etc.
- **Conditional evaluation tags**
 - Single options
 - Multiple options

Summary (Continued)

- **Database Access Tags**
 - sql:setDataSource to specify a database
 - sql:query to perform query
 - Loop down results using iteration tags
- **Other tags**
 - Handling URLs
 - Internationalizing pages
 - Formatting strings
 - Manipulating XML



Questions?

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