ui:repeat and Handling Variable-Length Data

JSF 2.2 Version

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Topics in This Section

• **Options for handling variable-length data**
  – Building strings or simple HTML from a bean property
  – Using a built-in component like h:dataTable
  – Making your own composite component
  – Looping with ui:repeat

• **Using ui:repeat**
  – Simple loops
  – Nested loops
  – varStatus
  – Conditional output
    • #{someCondition ? simpleVal1 : simpleVal2}
    • <h:outputText rendered="…" …/>
    • <ui:fragment rendered="…”>…</ui:fragment>
**Issue**

- **Goal**
  - You want results pages to be simple and HTML-oriented
    - Separation of concerns
    - Allows Web page developers to build GUI

- **Problem**
  - What if the action controller method produces data whose length can change? How do you generate output without resorting to JSP scripting and explicit Java looping?

- **Solutions**
  - There are a number of alternatives, all of which would work well in some circumstances. The issue is how much control the Web page author needs.
    - We will cover `ui:repeat` in the most detail, but the other alternatives are also reasonable in real life

**JSF Constructs for Handling Variable-Length Data**

- **Bean**
  - Have bean getter method spit out string or super-simple HTML based on a collection

- **h:dataTable**
  - Use a builtin component that builds a table from a collection. 3rd-party variations such as `t:dataList` (MyFaces/Tomahawk) give even more options.

- **Your own composite component**
  - Make own component that builds some HTML construct (e.g., `<ul>` list) from a collection

- **ui:repeat**
  - Do explicit looping in results page
Competing Concerns

• **Principles**
  – Simplicity is better in the .xhtml pages
  – Layout and formatting decisions should be made by the author of the results page, not by the Java programmer

• **General approach**
  – Use the simplest option that gives the Web page author enough control for the specific situation

• **Notes**
  • We only briefly survey composite components & h:dataTable here. We cover them in detail later in tutorial.
  • Although composite components are simpler than ui:repeat to use once they are created, they are more complex to build and often use ui:repeat internally. So, we cover them here after ui:repeat.

When to Use Which: Summary

• **Bean**
  – Write a getter method in the bean that turns collection into plain text or HTML.
    • Programmer knows #{programmer.languageList}.
    • Results in “Programmer knows Java, C++, and Ruby

• **When it works well**
  – You output plain text or very simple HTML.
  – You use the same output format several places, with no customization beyond what CSS provides.

• **When it works poorly**
  – The page author needs more control over the output format.
When to Use Which: Summary

• **h:dataTable**
  – Use the builtin component that turns a collection into an HTML table
    • `<h:dataTable var="programmer" value="#{corp.hackers}">
      <h:column>#{programmer.firstName}</h:column>
      ….
    </h:dataTable>

• **When it works well**
  – You want to build an HTML table out of the data
    • Where each entry in data corresponds to a table row

• **When it works poorly**
  – You want to build something other than an HTML table
  – Different parts of the table come from different sources
    • Although you could make new bean with composite data

When to Use Which: Summary

• **Your own composite component**
  – Make a new component that turns a collection into HTML (usually something other than a table)
    • `<utils:list value="#{programmer.languages}"
        styleClass="some-css-name"/>
    • Result: `<ul class="some-css-name">
      <li>Java</li>
      ….</ul>`

• **When it works well**
  – You want to build something other than a table
  – You can anticipate the options that page designer needs

• **When it works poorly**
  – Data is in a slightly different format than expected
  – Page author wants even a small change that was not anticipated by component author
When to Use Which: Summary

• **ui:repeat**
  – Use facelets looping to build the HTML inside page
    • `<ul>
      <ui:repeat var="language" value="#{person.languages}">
        <li>#{language}</li>
      </ui:repeat>
      </ul>`

• **When it works well**
  – The page designer needs explicit control over the result
  – One of the previous options is not sufficient

• **When it works poorly**
  – The page becomes so complex that it is hard to maintain by HTML-oriented page author

Example Notes

• **Data**
  – Normally, the data is produced in the action controller.
    • E.g., you collect a bank customer ID and month in a form, and then the button says
      `<h:commandButton … action="#{user.findChanges}"/>
    where findChanges finds the deposits and withdrawals in the month and puts them into an array or List.
  – Here, we will hardcode the data for simplicity.

• **Order of topics**
  – Your own composite component is listed before ui:repeat because it is usually simpler for a page author to use a composite component than an explicit loop.
  – But, building a composite component is more complex and requires ui:repeat internally, so is covered after ui:repeat in this tutorial.
Using ui:repeat – Getting Started

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Big Idea

• Situation
  – You have variable-length data, but don’t want to output an HTML table.
  – You can’t easily build a composite component that gives the page designer enough flexibility.

• Approach
  – Use ui:repeat almost exactly as you would use JSTL’s c:forEach.

• Pros
  – Gives page author explicit control
  – Far simpler and more readable than a JSP scripting loop

• Cons
  – Regular HTML has no loops, so page is complex
Syntax Summary

- **Basics**
  ```xml
  <ui:repeat var="someVar" value="#{someBean.someCollection}"
    <someHTML>#{someVar.someProperty}</someHTML>
  </ui:repeat>
  ```

- **Analogous Java code**
  ```java
  for(SomeType someVar: someCollection) {
    doSomethingWith(someVar);
  }
  ```

- **Warnings**
  - Value can be only array or List (or ResultSet). Not Map.
    Cannot use int[] or double[] or other array of primitives
    - Use Integer[] or Double[] instead
  - JSF 2.3 promises to support Map and Iterable

Steps to Using `ui:repeat`

- **Include the facelets namespace**
  ```html
  <html … xmlns:ui="http://xmlns.jcp.org/jsf/facelets">
  ```

- **Make collection accessible**
  - Make getter method that returns List, array, or ResultSet
    - E.g., getColors

- **Use loop in facelets page**
  ```html
  <ul>
  <ui:repeat var="color" value="#{test.colors}"
    <li>#{color}</li>
  </ui:repeat>
  </ul>
  ```
Why Not JSTL?

• **Question**
  – We know JSTL and c:forEach, why learn something new?

• **Answers**
  – c:forEach runs when the component tree is being built.
    ui:repeat runs when the tree is being rendered. The latter is when you usually want it to run.
  – ui:repeat is virtually identical in syntax and behavior to c:forEach anyhow, so if you know c:forEach, it is very simple to learn ui:repeat
    • For the data, just use “value” instead of “items”

• **Caveat**
  – You need c:forEach when you want ui:include inside a loop, since ui:include runs when tree is being built
    • For info on ui:include, see tutorial section “Page Templating with Facelets”.

Simplifying Testing of ui:repeat Features

• **Usual usage**
  – Action controller method gets list or array back from business logic, results page needs to display it

• **Usage when practicing**
  – Make managed bean with getter method that returns list or array. Test it in one standalone JSF page.

• **Example**
  <ui:repeat var="something"
    value="#{myBean.myProperty}">
    … #{something} …
  </ui:repeat>
  • If JSF cannot find myBean in existing scope, it instantiates it on the spot (assuming it is a managed bean).
Simplifying Testing of ui:repeat Example

<table>
<thead>
<tr>
<th>Bean</th>
<th>Standalone Test Page</th>
</tr>
</thead>
</table>
| @ManagedBean  
public class Test {  
private static String[] colors =  
{ "red", "green", "blue" };  
public String[] getColors() {  
return(colors);  
}  
} | <!DOCTYPE ...>  
<html xmlns="http://www.w3.org/1999/xhtml"  
xmlns:h="http://xmlns.jcp.org/jsf/html"  
xmlns:ui="http://xmlns.jcp.org/jsf/facelets">  
...  
<ul>  
<ui:repeat var="color" value="#{test.colors}">  
<li>#{color}</li>  
</ui:repeat>  
</ul>  
... |

• red  
• green  
• blue

Using ui:repeat – Basics
Simple Loop: Facelets Code (Top)

```html
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
     xmlns:h="http://xmlns.jcp.org/jsf/html"
     xmlns:ui="http://xmlns.jcp.org/jsf/facelets">
    <h:head><title>Looping with ui:repeat</title>
        <link href="/css/styles.css" rel="stylesheet" type="text/css"/>
        <style type="text/css">
            .evenLang { color: blue }
            .oddLang { color: red }
        </style>
    </h:head>
    <h:body>
        We use `ui:repeat` and possibly other `ui:` elements, so we have to add this namespace.
        These styles are used in a later example (re the varStatus attribute).

        Simple Loop: Facelets Code (ui:repeat Part)

        ```html
        <ul>
            <li>Level: #{person1.level}</li>
            <li>First name: #{person1.firstName}</li>
            <li>Last name: #{person1.lastName}</li>
            <li>Languages:
                <ul>
                    <ui:repeat var="language" value="#{person1.languages}">
                        <li>#{language}</li>
                    </ui:repeat>
                </ul>
            </li>
        </ul>
        ```

        Code for the person1 managed bean shown earlier. The getLanguages method returns String[].
Simple Loop: Results

Sometimes using a bean or a composite component does not give enough control to the Web page designer, so you need to do explicit looping in the page.

- Level: Junior
- First name: Larry
- Last name: Ellison
- Languages:
  - SQL
  - Prolog
  - OCL
  - Datalog

Nested Loop: Java Code

```java
@ManagedBean(eager=true)
public class Company1 {
    private List<Programmer> programmers;

    public Company1() {
        programmers = new ArrayList<>();
        programmers.add(new Person1());
        programmers.add(new Person2());
        programmers.add(new Person3());
    }

    public List<Programmer> getProgrammers() {
        return (programmers);
    }
}
```
Nested Loop: Facelets Code

```html
<ui:repeat var="programmer" value="#{company1.programmers}"
<h2>#{programmer.firstName} #{programmer.lastName}
  (#{programmer.level}-level)
</h2>
<ul style="margin-top: -1em;">
<ui:repeat var="language" value="#{programmer.languages}"
  <li>#{language}</li>
</ui:repeat>
</ul>
</ui:repeat>
```

Nested Loop: Results

![Nested Loops](image)

**Corporate Developer Capabilities**

**Larry Ellison (Junior-level)**

- SQL
- Prolog
- OCL
- Datalog

**Larry Page (Junior-level)**

- Java
- C++
- Python
- Go

**Steve Ballmer (Intermediate-level)**

- Visual Basic
- VB.NET
- C#
- Visual C++
-Assembler
Conditional Text Inside Loops

Conditional Text in JSF

• Alternatives
  – #{someCondition ? simpleVal1 : simpleVal2}
  – <h:outputText value="#{someValue}" rendered="#{someCondition}"/>
    • Or, in general, use h:blah and the “rendered” attribute
  – <ui:fragment rendered="#{someCondition}">
    <someHTML>…</someHTML>
  </ui:fragment>

• Note to JSTL developers
  – c:if and c:choose don’t interact properly with ui:repeat because they run when component tree is built, not when it is rendered.
  • So, don’t use the JSTL conditional evaluation tags
Conditional Text with `#{ condition ? val1 : val2 }`

**Idea**
- The EL directly supports limited conditional output via the ternary operator (test ? thenResult : elseResult).
  Supply a boolean for the test, put conditional content after the `"?"` and/or the `":"`. Values can be literal strings or EL expressions, but they cannot contain HTML tags.

**Examples**
- `<td class="#{customer.balance < 0 ? 'red': 'black'}">`
- `#{ !status.last ? ',' : '' }

**When used**
- When you are outputting simple text (no HTML).

---

Conditional Text with `h:outputText` and “rendered”

**Idea**
- Pass a boolean to the “rendered” attribute, put conditional content in “value” attribute. The value can be a literal string or an EL expression, but the literal string cannot contain HTML tags.

**Examples**
- `<h:outputText rendered="#{!status.last}" value="","/>
- `<h:outputText rendered="#{status.index > 5}" value="#{user.someWarning}" escape="false"/>

**When used**
- When you are outputting simple text (no HTML) or when the HTML comes from a bean.

---

If you want to output HTML, you could use the ternary operator within `h:outputText` and supply escape="false". But in that case, one of the other two upcoming alternatives is probably simpler.
More on “rendered” Attribute

• **Almost all h:bl...**
  – So, you can insert almost any JSF element conditionally.

• **Example**
  – Insert either textfield followed by button *or* simple value
    (full example in tutorial section on h:dataTable)

```xml
<h:inputText value="#{programmer.level}" size="12"
    rendered="#{programmer.levelEditable}"/>
<h:commandButton value="Update"
    rendered="#{programmer.levelEditable}">
    <f:ajax render="@form" execute="@form"/>
</h:commandButton>
<h:outputText value="#{programmer.level}"
    rendered="#{!programmer.levelEditable}" />
```

Example: Use of “rendered”

Idea

If checkbox selected, use textfield and “Update” button. Otherwise just show current value.

Full example in tutorial section on h:dataTable
Conditional Text with ui:fragment

• Idea
  – Pass a boolean to the “rendered” attribute, put conditional content in body content. The value can be a literal string or an EL expression, and the literal string can contain HTML tags.

• Example
  – `<ui:fragment rendered="#{!status.last}">
      <b>,</b>
    </ui:fragment>`

• When used
  – When you are outputting literal HTML.
    • Can always be used in lieu of h:outputText, but if no HTML, h:outputText is more succinct.

Using ui:repeat – Advanced Attributes
Feature Summary

• Additional attributes

```xml
<ui:repeat var="someVar" value="#{someBean.someCollection}" varStatus="statusVariable" offset="…" size="…" step="…">
  ...
</ui:repeat>
```

### ui:repeat Attributes

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Description</th>
<th>c:forEach Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>var</td>
<td>String giving the local variable name that will refer to each element in the collection. E.g.: `&lt;ui:repeat var=&quot;name&quot; value=&quot;#{party.names}&quot;&quot;&gt;</td>
<td>var</td>
</tr>
<tr>
<td>value</td>
<td>EL expression specifying the collection itself.</td>
<td>items</td>
</tr>
</tbody>
</table>
| varStatus | String giving a variable name that will refer to a status object. The status object has the following properties:  
  • begin, end, step: values of offset, size, and step attributes  
  • index: the current index (int)  
  • first/last: is this the first/last iteration? (boolean)  
  • even/odd: is this even/odd iteration? (boolean) (1st iteration is 0: even)  
  Do something with #{status.first} or #{status.even}, etc. | varStatus |
| offset | An int specifying how far into the collection to start. Default is 0. E.g., offset="1" means to skip the first (0th) element. | begin |
| size | An int specifying how far down the collection to go. Default is the end of the collection. | end |
| step | An int specifying how far to jump down the collection after each item. Default is 1. | step |
Example 1: Overview

• **Goal**
  – From a list of strings, generate
    “String1, String2, …, and StringN”.

• **Approach**
  – Track iteration status
    • `<ui:repeat ... varStatus="status">`
  – Output a comma *except* in last iteration
    • `<h:outputText rendered="#{!status.last}" value=","/>`
  – Output “and” *only* in last iteration
    • `<h:outputText rendered="#{status.last}" value=" and "/>`

---

Example 1: Facelets Code

```xml
<ui:repeat var="programmer" value="#{company1.programmers}">
  <h2>${programmer.firstName} ${programmer.lastName}
    (#{programmer.level}-level)
  </h2>
  <ui:repeat var="language" value="#{programmer.languages}" varStatus="status">
    <h:outputText value=" and ">
      rendered="#{status.last}"/>
    ${language}<h:outputText value=",">
      rendered="#{!status.last}"/>
  </ui:repeat>
</ui:repeat>
```
Example 1: Results

Quick Aside: StringJoiner in Java 8

- Big ideas
  - Java 8 added new StringJoiner class that builds delimiter-separated Strings, with optional prefix and suffix
  - Java 8 also added static “join” method to the String class; it uses StringJoiner internally
- Quick examples (result: "Java, Lisp, Ruby")
  - Explicit StringJoiner with no prefix or suffix
    StringJoiner joiner1 = new StringJoiner(" ", ");
    String result1 =
      joiner1.add("Java").add("Lisp").add("Ruby").toString();
  - Usually easier: String.join convenience method
    String result2 = String.join(" ", "Java", "Lisp", "Ruby");
    String[] languages = {"Java", "Lisp", "Ruby"};
    String result3 = String.join(" ", languages);
Example 2: Overview

• **Goal**
  – From a list of strings, generate a bulleted (<ul>) list.
    • Have every other entry in a different style

• **Approach**
  – Track iteration status
    • <ui:repeat ... varStatus="status">
  – Output one type of li in even iterations
    • <ui:fragment rendered="#{status.even}">
      <li class="evenLang">#{language}</li>
    </ui:fragment>
  – Output another type of li in odd iterations
    • <ui:fragment rendered="#{status.odd}">
      <li class="oddLang">#{language}</li>
    </ui:fragment>
  – Use style sheet to map the styles
    • evenLang and oddLang

Example 2: Facelets Code

<ui:repeat var="programmer" value="#{company1.programmers}">
  <h2>#{programmer.firstName} #{programmer.lastName}
   (#{programmer.level}-level)
  </h2>
  <ul style="margin-top: -1em;">
    <ui:repeat var="language" value="#{programmer.languages}"
      varStatus="status">
      <ui:fragment rendered="#{status.even}">
        <li class="evenLang">#{language}</li>
      </ui:fragment>
      <ui:fragment rendered="#{!status.even}">
        <li class="oddLang">#{language}</li>
      </ui:fragment>
    </ui:repeat>
  </ul>
</ui:repeat>
Example 2: Results

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- C#
- Visual C++
- Assembler

Example 2: Alternative

• Example did this
  <ui:fragment rendered="#{status.even}">
    <li class="evenLang">#{language}</li>
  </ui:fragment>

  <ui:fragment rendered="#{!status.even}">
    <li class="oddLang">#{language}</li>
  </ui:fragment>

• It could have done this
  <li class="#{status.even ? 'evenLang' : 'oddLang'}">#{language}</li>

• General point
  – If you want to conditionally include large chunks of
    literal HTML, use ui:fragment, not h:outputText.
Wrap-Up

Summary

- **ui:repeat basics**
  
  ```
  <ul>
  <ui:repeat var="color" value="#{item.availableColors}">
    <li>#{color}</li>
  </ui:repeat>
  </ul>
  ```

- **Other ui:repeat capabilities**
  - `varStatus` attribute
    - Especially first, last, even, and odd boolean properties
  - Conditional output
    - Use "rendered" attribute of `h:outputText` or `ui:fragment`

- **Consider alternatives to ui:repeat**
  - Bean getter method that builds result (only if very simple)
  - `h:dataTable` – covered in separate tutorial section
  - Composite component – covered in separate tutorial section
    - Especially one that uses `ui:repeat` internally
Questions?

More info:
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http://www.coreservlets.com/JSF-Tutorial/primefaces/ - PrimeFaces tutorial
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