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April 19–24, 2015 • Mandalay Bay • Las Vegas, NV

Lab Guide

Jelly 301:

Advanced UI Development with Jelly Script

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Lab Goal

This lab gives you an in-depth understanding of Jelly. You should leave this lab feeling not only like you can read Jelly code, but that you can write it yourself.

Lab 1
Understand Jelly

The jelly Tag

We begin by talking about the jelly tag. The example shows the base tag at the root of a Jelly script document.

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
</j:jelly>
```

The **xmlns:j** and the **xmlns:j2** are Jelly tags, defined in CoreTagLibrary.java. They include:

- if
- while
- set

The **xmlns:g** and xmlns:**g2 tags** are Glide tags, defined in GlideTagLibrary.java. They include:

- evaluate
- breakpoint
- set_if

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Two-Phase Rendering

One thing that commonly confuses Jelly users is two-phase rendering. Before exploring **why** it is important, we explain how it works.

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:evaluate var="jvar_records" object="true">
       var records = new GlideRecord('incident');
       records.get(RP.getParameterValue('sysparm_sys_id'));
       records;
 </g:evaluate>
 <j2:if test="${jvar_records.isValidRecord()}">
       We found ${jvar_records.getValue('number')}
 </j2:if>
</j:jelly>
```

When this script executes, phase 1 content runs first. What does this mean? Every tag starting with **g:** or **j:** is runs as well as all of the JEXL statements that have curly braces **{}**. Everything outputs as text, so no variables are left when it fully renders (this means that variables do not really carry over to phase 2).

Before you run phase 2 Jelly, change the name spaces of the **j2** and **g2** to **jelly:core** and **glide**, meaning that those tags will now run.

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="jelly:core"
xmlns:g2="glide">
 <j2:if test="true">
       We found INC100001
 </j2:if>
</j:jelly>
```

When you run phase two, the **g2:** and **j2**: tags run, as well as the square brackets **[]**. All that is left is **We Found INC100001**.

You may wonder, “Why do we have two phases? What’s the meaning behind that?” The answer is that the **results of the phase 1 render are cached on the server**. **This makes your system faster**. This also carries with it a cost. Use phase 1 for things such as system configuration. For data such as incident data, use phase 2 scripting. Otherwise, updating records may not cause your page to change content.

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Tags – evaluate

The **evaluate** tag helps you to write server-side script as Rhino. Use all the script APIs that you are familiar with in Business Rules. The variable output of the last line is assigned to the variable indicated.

Attributes:

- **var** - The name of the variable that will be set to the result of the script. For best results, start your variable with jvar_
- **object - If set to true**, the result of the expression will be treated as an object (GlideRecord) instead of a primitive variable (string or integer variable values).
- **jelly - If set to true**, allows Jelly context variables to be referenced in the script.
- **expression** - This is an expression to be executed for the value to put in **var**. The expression can be either of two places. First, it can be an attribute on the evaluate tag itself. Otherwise, the content between the beginning tag and ending tag is the expression. The last line of the expression is the actual value passed into **var**.

Sample:

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:evaluate var="jvar_username">
       var user = gs.getUserName();
       if (user == 'guest')
             user = 'Not logged in';

       user;
 </g:evaluate>
 ${jvar_username}
</j:jelly>
```

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Tags – evaluate – Use as a library

If you do not specify the **var** attribute, the variables set inside of a **g:evaluate** tag is left in the Rhino controller. Leveraging this lets you make small libraries in the Jelly code:

```
<g:evaluate>
    function hello_english(name) {
        return "Hello, " + name;
    }
    function hello_spanish(name) {
        return "Buenas tardes, " + name;
    }
</g:evaluate>
<p>
    English: ${hello_english('Francis')}
</p>
<p>
    Spanish: ${hello_spanish('Pancho')}
</p>
```

Tags – if

The **if** tag performs an **if** statement. If the test parameter evaluates to false, then the contents of the tag are simply discarded from the output. (**Note**: there is no **else** tag.)

Attributes:

- **test** - The condition for applying the true or false value to the variable. Use a JEXL expression to output the string true or false to this attribute.

Sample:

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <j:if test="${gs.isLoggedIn()}">
       You are logged in as user ${gs.getUserName()}
 </j:if>
 <j:if test="${!gs.isLoggedIn()}">
       You are not logged in!
 </j:if>
</j:jelly>
```

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Tags – set

The **set** tag sets a variable to a given value.

Attributes:

- **var** - The name of the variable that will be set to the result of the script.
- **value** - The (string) value to assign to the **var**

Sample:

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <j:set var="jvar_username" value="${gs.getUserName()}"/>
 ${jvar_username}
</j:jelly>
```

Tags – set_if

Simply stated, think of the **set_if** tag as a combination of the **set** tag and the **if** tag.

Attributes:

- **var** - The name of the variable that is set to the **result** of the script.
- **test** - The condition for applying the true or false value to the variable. Use a JEXL expression to output the string **true** or **false** to this attribute.
- **true** - The value assigned to **var** if the test is **true**.
- **false** - The value assigned to **var** if the test is **false**.

Sample:

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:set_if test="${gs.isLoggedIn()}"
       var="jvar_login_message"
       true="You are logged in as user ${gs.getUserName()}"
       false="You are not logged in!"/>
 ${jvar_login_message}
</j:jelly>
```

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Tags – while

The **while** tag helps to loop over a set of data. If you are familiar with the **GlideRecord.next()** form of iterating over records, then this is useful when iterating over record data.

Attributes:

- **test**- The condition for applying the true or false value to the variable. Use a JEXL expression to output the string **true** or **false** to this attribute.

Sample:

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:evaluate var="jvar_records" object="true">
       var gr = new GlideRecord('incident');
       gr.addQuery('assigned_to', gs.getUserID());
       gr.query();
       gr;
 </g:evaluate>
 <j:while test="${jvar_records.next()}">
       You own ticket ${jvar_records.getValue('number')}
 </j:while>
</j:jelly>
```

Tags – breakpoint

The **breakpoint** tag is useful when debugging script. Sometimes script does not output what you expected. This tag helps you find the value that you meant to output.

Attributes:

- **var** - (optional) - The parameter to show in the logs. If omitted, all variables are output into the log.

Sample:

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:breakpoint var="sysparm_parameter"/>
</j:jelly>
```

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Tags – Choose/when/otherwise

These tags are the closest thing to an **if/else** syntax. **Choose** starts the clause, **when** is like an **if**, and **otherwise** is like an **else** or base case.

Sample:

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:evaluate var="jvar_incidents" object="true">
       var gr = new GlideRecord('incident');
       gr.addQuery('assigned_to', gs.getUserID());
       gr.query();
       gr;
 </g:evaluate>
 <j:while test="${jvar_incidents.next()}">
     <j:choose>
         <j:when test="${jvar_incidents.getValue('priority') == 1}">
             <b>${jvar_incidents.getDisplayValue()} is a big deal!</b>
         </j:when>
         <j:otherwise>
             ${jvar_incidents.getDisplayValue()} is not important!
         </j:otherwise>
     </j:choose>
     <br/>
 </j:while>
</j:jelly>
```

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Organizing Code

Organizing code is important. Organize your code into smaller components, like fields and rows of tables, and reuse them as necessary. UI Macros make this possible.

Macro Invoke

If you have a UI Macro titled **include_me_macro**, you can include it on a page in any of the following ways:

1. Use the UI Macro name as a tag.

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <g:include_me_macro/>
</j:jelly>
```

2. Use the **macro_invoke** tag.

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <g:macro_invoke macro="include_me_macro"/>
</j:jelly>
```

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Dynamic Variables in UI Macros

Sometimes you want to add dynamic variables into the UI macros and call them like functions. Here is an example UI macro:

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <label>${jvar_label}
        <input type="${jvar_type}" value="${jvar_value}"/>
    </label>
</j:jelly>
```

There are a two ways to call this UI macro:

1. Declare the variables beforehand.

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <j:set var="jvar_label" value="Test Field"/>
    <j:set var="jvar_type" value="text"/>
    <j:set var="jvar_value" value="Test Value"/>
    <g:label_and_field />
</j:jelly>
```

2. Include the parameters when you call the UI Macro.

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <g:label_and_field label="Test Field" type="text" value="Test Value" />
</j:jelly>
```

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Macro Tag

Use the **Macro** tag to set default values to variables. This allows you to build more robust code as you plan for the circumstance where not all variables are defined.

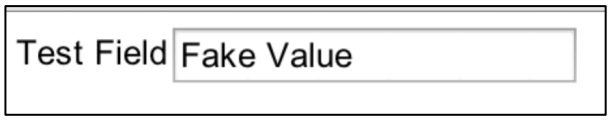
Here is a UI macro titled **label_and_field_with_defaults**.

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <g:macro type="text" value="Fake Value"/>
    <label>${jvar_label}
        <input type="${jvar_type}" value="${jvar_value}"/>
    </label>
</j:jelly>
```

You can call this macro with the following UI page.

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <g:label_and_field_with_defaults label="Test Field"/>
</j:jelly>
```

Output from UI page:



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insert Tag

When a macro is called from another Jelly script, the insert tag output the contents of the calling tag.

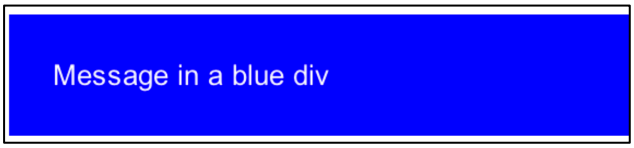
UI Page (caller)

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
     <g:blue_div>
         Message in a blue div
     </g:blue_div>
</j:jelly>
```

UI Macro: blue_div

```
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <div style="background-color:blue; color:white; padding: 20px;">
        <g:insert/>
    </div>
</j:jelly>
```

Output



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Security

The following are aids to make the scripts as secure as possible.

Escaping – HTML

Before	After
&	
<	<
>	>

Look at the following script.

```
<p>
    Hello ${sysparm_name}, and welcome to the site!
</p>
```

This code is insecure and may be susceptible to scripting attacks. This is because if the variable **sysparm_name** were coming from a URL parameter or user-submitted value, the variable may be output literally and unintended script may be executed. The following example improves the script:

```
<p>
    Hello ${HTML:sysparm_name}, and welcome to the site!
</p>
```

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Escaping – JS

Before	After
‘	\’
“	\”
CR	blank
NL	\n (the string “\n”)
<script…>	<script…>
</script>	</script…>
If phase 1	
&	&
<	\\u003C

Look at the example script.

```
<span>
    Hello, <span id="the_name_container"></span>!
</span>
<script type="text/javascript">
    $('the_name_container').innerHTML = '${sysparm_name}';
</script>
```

The script above may be susceptible to XSS scripting attacks. The following script is improved.

```
<span>
    Hello, <span id="the_name_container"></span>!
</span>
<script type="text/javascript">
    $('the_name_container').innerHTML = '${JS:sysparm_name}';
</script>
```

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Escaping – No Escape

Look at the example script, designed to output the text from a KB article.

```
<g:evaluate var="jvar_kb_article">
    var gr = new GlideRecord('kb_knowledge');
    gr.get('number', 'KB0000012');
    gr;
</g:evaluate>
${gr.text}
```

The script above does not output properly because **gr.text** output is escaped. If **gr.text** output **Text**, it would output that text instead of the intended output, **Text**. The below example forces the system not to escape the output. Be very careful with this, and make sure that the source of the script is trusted to prevent arbitrary script injection.

```
<g:evaluate var="jvar_kb_article">
    var gr = new GlideRecord('kb_knowledge');
    gr.get('number', 'KB0000012');
    gr;
</g:evaluate>
<g:no_escape>${gr.text}</g:no_escape>
```

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Client Side JavaScript

Certain characters are appropriate for JavaScript but not for Jelly XML Script. For example, the **<=** and **&&** characters are not XML-compliant. The system does not let you save them.

Result:

```
    <span id="script_result"></span>
    <script type="text/javascript">
        var result = "";
        for (var i = 1; i <= 100; i++) {
            if (i % 3 == 0)
                result += 'Fizz';
            if (i % 5 == 0)
                result += 'Buzz';
            if (i % 3 != 0 && i % 5 != 0)
                result += i;
            result += '<br/>';
        }
        $('script_result').innerHTML = result;
    </script>
```

The below script is improved. Instead of **&&**, use **$[AND].** Instead of **<=**, **use !=**. If you have to use less than (**<**), switch the statement and use greater than (**>**).

```
<span id="script_result"></span>
<script type="text/javascript">
    var result = "";
    for (var i = 1; i != 101; i++) {
        if (i % 3 == 0)
            result += 'Fizz';
        if (i % 5 == 0)
            result += 'Buzz';
        if (i % 3 != 0 $[AND] i % 5 != 0)
            result += i;
        result += '<br/>';
    }
    $('script_result').innerHTML = result;
</script>
```

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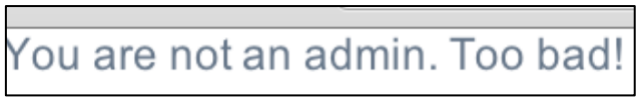
Exercises

DISCLAIMER: *This lab was intended to be done without looking at this section*. We think you will learn more if you try to look at this section as infrequently as possible. But should you fall behind, this section has you covered. It is the answer key.

Exercise 1: Create a Jelly segment of code to output a message based on if they are an admin.

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <j:if test="${gs.hasRole('admin')}">
       Hello admin, you've logged in!
 </j:if>
 <j:if test="${!gs.hasRole('admin')}">
       You are not an admin. Too bad!
 </j:if>
</j:jelly>
```

Sample output:

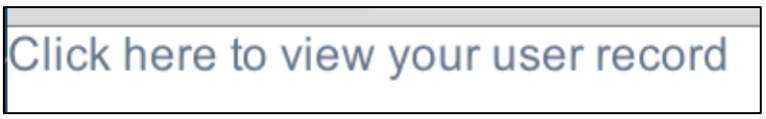


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Exercise 2: Create a segment that sets a variable with the link of the current user's record

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <j:set var="jvar_user_link" value="sys_user.do?sys_id=${gs.getUserID()}"/>
 <a href="${jvar_user_link}">Click here to view your user record</a>
</j:jelly>
```

Sample output:



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Exercise 3: Greet admins with the message “Welcome!” and others with a different message

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
 <g:set_if
       test="${gs.hasRole('admin')}"
       var="jvar_message"
       true="Welcome!"
       false="Welcome, non-admin user!"/>
 ${jvar_message}
</j:jelly>
```

Sample output:



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Exercise 4: Output a tree of incidents and their parent incidents

```
<?xml version="1.0" encoding="utf-8" ?>
<j:jelly trim="false" xmlns:j="jelly:core" xmlns:g="glide" xmlns:j2="null"
xmlns:g2="null">
    <!-- execute the incident query and pull the record set -->
    <g:evaluate var="jvar_incident" object="true">
          var gr = new GlideRecord('incident');
          gr.addNotNullQuery('parent');
          gr.orderBy('number');
          gr.query();
          gr;
    </g:evaluate>
    <table>
          <thead>
                <!-- column headers -->
                <tr>
                      <th>Number</th>
                      <th>Short Description</th>
                      <th>Parent Number</th>
                      <th>Parent Short Description</th>
                </tr>
          </thead>
          <tbody>
                <!-- display each incident with its parent -->
                <j:while test="${jvar_incident.next()}">
                      <tr>
                            <td>${jvar_incident.getValue('number')}</td>
                            <td>${jvar_incident.getValue('short_description')}</td>
                            <td>${jvar_incident.getValue('parent.number')}</td>

    <td>${jvar_incident.getValue('parent.short_description')}</td>
                      </tr>
                </j:while>
          </tbody>
    </table>
</j:jelly>
```

(Sample output on next page)

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Sample output:

Number	Short Description	Parent Number	Parent Short Description
INC0000002	Can't get to network file shares	INC0000002	Can't get to network file shares
INC0000014	missing my home directory	INC0000005	The sales department is uncool
INC0000015	I can't launch my game anymore	INC0000005	The sales department is uncool
INC0000017	How do I create a sub-folder	INC0000002	Can't get to network file shares
INC0000019	Can't launch X-Win32	INC0000002	Can't get to network file shares
INC0000025	I need more memory	INC0000005	The sales department is uncool
INC0000029	I can't get my weather report	INC0000002	Can't get to network file shares
INC0000031	EMAIL Server Down	INC0000002	Can't get to network file shares
INC0000040	JavaScript error	INC0000005	The sales department is uncool
INC0000041	My cubical phone does not work	INC0000005	The sales department is uncool
INC0000044	Can't log into SAP again	INC0000002	Can't get to network file shares
INC0000046	Can't access SFA software TEST again	INC0000002	Can't get to network file shares
INC0000047	Issue with email	INC0000005	The sales department is uncool
INC0000048	Having problems with performance on the Sales Tools	INC0000002	Can't get to network file shares
INC0000050	Exchange server appears to be down...lots of users impacted	INC0000002	Can't get to network file shares

Additional Resources

Jelly Tags
https://wiki.servicenow.com/index.php?title=Jelly_Tags

Extensions to Jelly Syntax
http://wiki.servicenow.com/index.php?title=Extensions_to_Jelly_Syntax

How to Escape in Jelly
https://wiki.servicenow.com/index.php?title=How_to_Escape_in_Jelly

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