
regoUniversity 2017
GEL Scripts | Advanced
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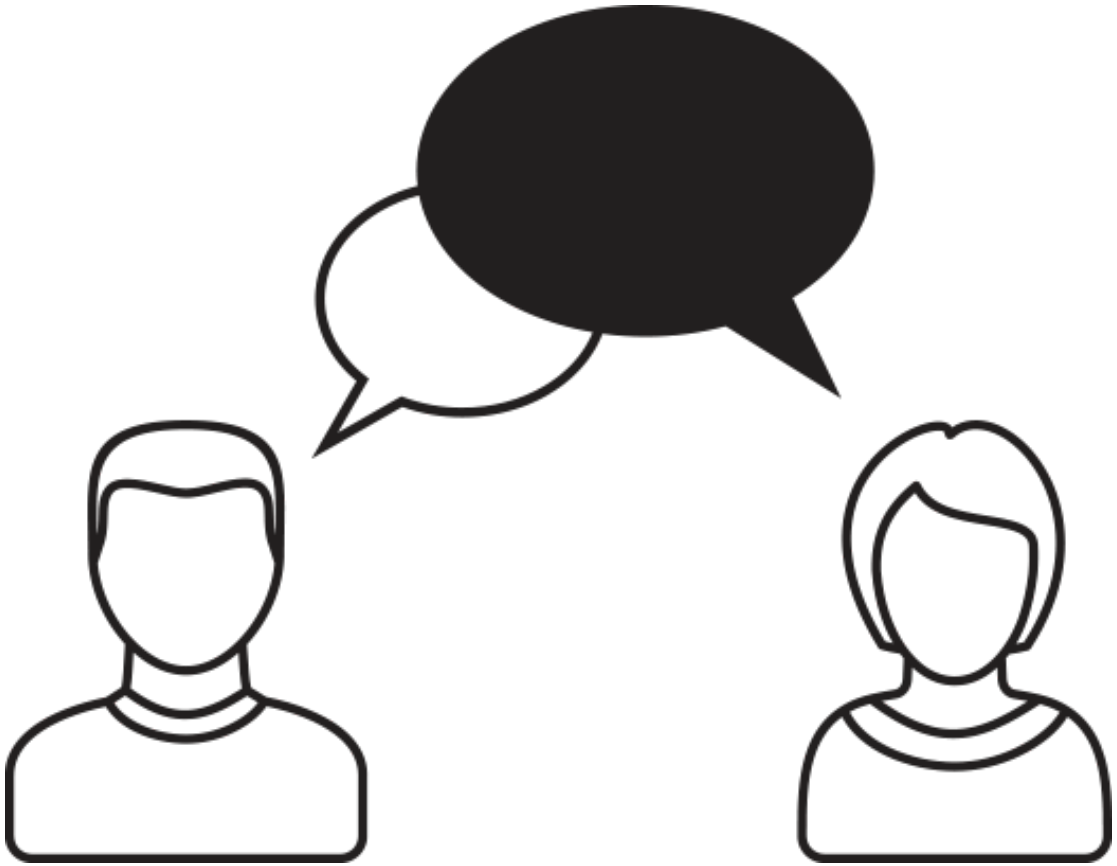
Introductions

- Take 5 Minutes
- Turn to a Person Near You
- Introduce Yourself



Agenda

- Accessing JAVA Classes and Methods
- SOAP Web Services (XOG)
- REST Web Services
- File Handling
- Integrations

Accessing JAVA Classes and Methods

- Instantiate Java Classes and Call Java Methods
  - core:new
    - Use this GEL tag to instantiate Java classes
    - For Ex:

```
<core:new className="java.net.URL" var="myUrl">
    <core:arg type="java.lang.String" value="${myUrlString}" />
</core:new>
```

  - core:invoke
    - Use this GEL tag to call a method on an instantiated object
    - For Ex:

```
<core:invoke method="openConnection" on="${myUrl}" var="myConnection"/>
```

Accessing JAVA Classes and Methods Cont'd

- core:expr
  - Use this GEL tag to call a method on an instantiated Java object where you do not require access to the result of the operation.
  - In the REST calls, this tag can be used to set request headers
  - For Ex:

```
<core:expr value='${connection.setRequestMethod("POST")}'/>
```

- core:invokeStatic
  - Use this GEL tag to call a static method of a Java class
  - For Ex:

```
<core:invokeStatic className="com.niku.union.utility.Base64" method="encode" var="encodedString">
    <core:arg value="${valueToEncode}"/>
</core:invokeStatic>
```

SOAP Web Services (XOG): Namespaces

- Think of XML namespaces as a way to organize tag names (and attribute names) into groups
- The namespaces below are required to call CA PPM SOAP Web Services (XOG)

```
<gel:script xmlns:core="jelly:core"
    xmlns:gel="jelly:com.niku.union.gel.GELTagLibrary"
    xmlns:xog="http://www.niku.com/xog"
    xmlns:soap="jelly:com.niku.union.gel.SOAPTagLibrary"
    xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
```

SOAP Web Services (XOG): Obtain Session ID

- The following snippet is used to generate a Session ID. This approach cannot be used for cross-environment SOAP calls

```
<!-- Get sessionId by username -->
<gel:parameter var="username" default="admin"/>
<core:new className="com.niku.union.security.DefaultSecurityIdentifier" var="secId" />
<core:invokeStatic var="userSessionCtrl" className="com.niku.union.security.UserSessionControllerFactory" method="getInstance" />
<core:set var="secId" value="${userSessionCtrl.init(username, secId)}"/>
<core:set var="sessionID" value="${secId.getSessionId()}"/>

<core:choose>
    <core:when test="${sessionID == null}">
        <gel:log level="ERROR"> Unable to obtain a Session ID. </gel:log>
    </core:when>
    <core:otherwise>
        <!-- Execute XOG -->
    </core:otherwise>
</core:choose>
```

SOAP Web Services (XOG): Build XML

- Use the <gel:parse> tag to build a XOG XML
  - For Ex:

```
<gel:parse var="userXML">
  <NikuDataBus xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:noNamespaceSchemaLocation="../xsd/nikuxog_user.xsd">
  <Header action="write" externalSource="NIKU" objectType="user" version="13.3.0.286"/>
    <Users>
      <User externalId="" isLDAP="false" uiThemeDefaultPartitionCode="" userLanguage="English"
        userLocale="en_US" userName="${row.userName}" userStatus="${row.userStatus}"
        userTimezone="America/Los_Angeles" userType="INTERNAL">
        <PersonalInformation emailAddress="${row.email}" firstName="${row.firstName}" lastName="${row.lastName}"/>
        <Resource resourceId="${row.resourceId}"/>
        <Groups>
      <Group id="${row.groupId}">
            <nls description="${row.groupDescr}" languageCode="en" name="${row.groupName}"/>
       </Group>
    </Groups>
      </User>
    </Users>
  </NikuDataBus>
</gel:parse>
```

SOAP Web Services (XOG): Read, Write, Delete Nodes

- Read Node
  - Use the below snippet to read the description of a group from userXML

```
<gel:set asString="true"
    select="$userXML//Users/User/Groups/Group/nls/@description"
    var="groupDescr"/>
```

- Write Node
  - Use the below snippet to create a new group node in the userXML

```
<gel:parse var="insertNode">
   <Group id="pm">
      <nls description="Project Managers Group" languageCode="en" name="Project Managers"/>
   </Group>
</gel:parse>
<gel:set insert="true" select="$userXML//Users/User/Groups/Group" value="${insertNode}"/>
```

SOAP Web Services (XOG): Read, Write, Delete Nodes

- Delete Node
  - Use the below snippet to delete a group node from userXML

```
<gel:set select="$userXML//Users/User/Groups/Group[@id='pm']" var="groupToDelete" />
<core:set value="${groupToDelete.getParentNode()}" var="parent" />
<core:set value="${parent.removeChild(groupToDelete)}" var="void" />
```

SOAP Web Services (XOG): Execute XOG

- Use the below snippet to execute a XOG SOAP web service call

```
<!-- Execute XOG -->
<soap:invoke endpoint="internal" var="result">
  <soap:message>
    <soapenv:Envelope>
      <soapenv:Header>
        <xog:Auth>
          <xog:SessionID>${sessionID}</xog:SessionID>
        </xog:Auth>
      </soapenv:Header>
      <soapenv:Body>
        <gel:include select="$userXML"/>
      </soapenv:Body>
    </soapenv:Envelope>
  </soap:message>
</soap:invoke>
```

SOAP Web Services (XOG): Execute XOG Cont'd

- Obtaining XOG endpoint
  - endpoint = "Internal"
    - Quick way to setup SOAP call to the same instance

```
<!-- Execute XOG -->
<soap:invoke endpoint="internal" var="result">
    …
    …
</soap:invoke>
```

  - From properties.xml using JAVA Classes

```
<core:invokeStatic className="com.niku.union.config.ConfigurationManager" method="getInstance" var="config" />
    <core:set var="URL" value="${config.getProperties().getWebServer().getWebServerInstance(0).getSslEntryUrl()}" />
<gel:log level="INFO">Environment is: ${URL}</gel:log>
```

SOAP Web Services (XOG): Execute XOG Cont'd

- From properties.xml using GEL tags
  - If the entryUrl doesn't work, the sslEntryUrl or schedulerUrl can be pulled

```
<core:invokeStatic className="java.lang.System" method="getenv" var="nikuHome">
    <core:arg value="NIKU_HOME"/>
</core:invokeStatic>
<gel:parse file="${nikuHome}/config/properties.xml" var="propertiesXML"/>
<gel:set asString="true"
    select="$propertiesXML/properties/webServer/webServerInstance[@id='app']/@entryUrl"
    var="host_url"/>
<gel:log level="INFO">Host URL: ${hostUrl}</gel:log>
<gel:log>${hostUrl}/niku/xog</gel:log>
```

SOAP Web Services (XOG): Parse Output

- To ensure success and as part of error handling the following snippet demonstrates how to parse through the XML response returned by the SOAP call to the XOG interface

```
<!-- Parse Results -->
<gel:set asString="true" select="$result//XOGOutput/Status/@state" var="XOGState"/>
<gel:set asString="true" select="$result//XOGOutput/Statistics" var="xogStats"/>
<gel:set asString="true" select="$result//XOGOutput/Statistics/@failureRecords" var="XOGFailures"/>

<core:choose>
  <!-- Success -->
  <core:when test="${XOGState == 'SUCCESS' and XOGFailures == 0}">
    <gel:log level="INFO">User XOG Stats: ${xogStats} </gel:log>
  </core:when>
  <!-- Failure -->
  <core:otherwise>
    <gel:log level="INFO">User XOG Stats: ${xogStats} </gel:log>
    <gel:log level="WARN"><gel:expr select="$userXML/"/></gel:log>
    <gel:log level="ERROR"><gel:expr select="$result/"/></gel:log>
  </core:otherwise>
</core:choose>
```

SOAP Web Services (XOG) : XOG Logout

- Use below snippet to end the XOG session

```
<soap:invoke endpoint="internal" var="xogLogOut">
  <soap:message>
    <soapenv:Envelope>
      <soapenv:Header>
        <xog:Auth>
          <xog:SessionID><![CDATA[${cSessionID}]]></xog:SessionID>
        </xog:Auth>
      </soapenv:Header>
      <soapenv:Body>
        <xog:Logout />
        <gel:log level="INFO">Logged Out of XOG</gel:log>
      </soapenv:Body>
    </soapenv:Envelope>
  </soap:message>
</soap:invoke>
```

REST Web Services

- A RESTful API is an application program interface (API) that uses HTTP requests to GET, PUT, POST and DELETE data.
- REST technology is generally preferred to the more robust SOAP technology because REST leverages less bandwidth, making it more suitable for internet usage.
- Results typically JSON (JavaScript Object Notation) response format
- Currently CA PPM REST APIs are not supported for customer or partner use
- The steps described here can be used to call REST APIs of any application from CA PPM

REST Web Services – Authentication

- Below are the most commonly used authentication methods for REST web services
  - Basic Authentication
    - Authenticate using Base64 encoded string of Username and Password

```
<core:invokeStatic className="com.niku.union.utility.Base64" method="encode" var="encodedString">
    <core:arg value="${userName}:${password}" />
</core:invokeStatic>
<core:set value="Basic ${encodedString}" var="authKey" />
```

  - Token Based Authentication
    - Token from Login and Logout API
    - OAuth 2.0 tokens
    - Application generated tokens

REST Web Services – REST Call

- Maintain Session
  - CA PPM REST API requires to maintain the session. Use the below snippet to maintain the CA PPM REST session

```
<core:new className="java.net.CookieManager" var="cManager" />
<core:getStatic var="cPolicy" className="java.net.CookiePolicy" field="ACCEPT_ALL"/>
<core:invoke var="setCPolicy" method="setCookiePolicy" on="${cManager}" >
    <core:arg value="${cPolicy}"></core:arg>
</core:invoke>
<core:invokeStatic className="java.net.CookieHandler" method="setDefault">
    <core:arg type="java.net.CookieHandler" value="${cManager}" />
</core:invokeStatic>
```

REST Web Services – REST Call Cont'd

- Below are the steps to Call CA PPM REST API
  - Form Input JSON

```
<core:set var="requestJSON" escapeText="false">
    {
      "code": "REST01",
      "isOpenForTimeEntry": "true",
      "description": "Project Created via REST",
      "isActive": "true",
      "name": "REST Project"

    }
</core:set>
```

  - Open Connection to CA PPM REST URI

```
<core:set var="restEndPoint" value="http://ppm.example.com/ppm/rest/v1/projects"/>
<core:new var="restUrl" className="java.net.URL">
    <core:arg type="java.lang.String" value="${restEndPoint}"/>
</core:new>
<core:invoke var="connection" on="${restUrl}" method="openConnection"/>
```

REST Web Services – REST Call Cont'd

- Set Request Headers

```
<core:expr value='${connection.setRequestMethod("POST")}'/>
<core:expr value='${connection.setRequestProperty("Authorization", authKey)}'/>
<core:expr value='${connection.setRequestProperty("Content-type", "application/json")}'/>
<core:expr value='${connection.setRequestProperty("Accept", "application/json")}'/>
<core:expr value='${connection.setRequestProperty("Connection", "keep-alive")}'/>
<core:expr value="${connection.setDoOutput(true)}"/>
```

- Write Input JSON to REST API

```
<core:invoke var="outputStream" on="${connection}" method="getOutputStream" />
<core:new var="outputStreamWriter" className="java.io.OutputStreamWriter">
    <core:arg type="java.io.OutputStream" value="${outputStream}" />
</core:new>
<core:expr value="${outputStreamWriter.write(requestJSON)}" />
<core:expr value="${outputStreamWriter.close()}" />
```

REST Web Services – REST Call Cont'd

- Process REST Output

```
<core:invoke var="restOutput" on="${connection}" method="getInputStream" />
<core:invoke var="restResponseCode" on="${connection}" method="getResponseCode" />
<core:choose>
    <core:when test="${restResponseCode == '200'}">
        <gel:log>Successfully created CA PPM Project</gel:log>
        <!-- Convert REST output stream to String -->
        <core:invokeStatic className="org.apache.cxf.helpers.IOUtils" method="toString" var="projectOutputString">
            <core:arg type="java.io.InputStream" value="${restOutput}"/>
            <core:arg value="UTF-8"/>
        </core:invokeStatic>
        <core:expr value="${restOutput.close()}"/>
        <!-- Convert output string to JSON Object -->
        <core:new className="org.json.JSONObject" var="projectJsonObject">
            <core:arg type="java.lang.String" value='${projectOutputString}'/>
        </core:new>
        <core:set var="prjInternalID" value="${projectJsonObject.get('_internalId')}"/>
        <gel:log>Project Id: ${prjInternalID}</gel:log>
    </core:when>
    <core:otherwise>
        <gel:log>Failed to create CA PPM Project</gel:log>
    </core:otherwise>
</core:choose>
</core:catch>
```

File Handling: Overview

- The CA provided GEL tag libraries can
  - Read files and write to a file
  - Perform a set of FTP operations
  - Parse nodes and attributes of XML or comma-delimited files with some limitations
- The CA provided GEL tag libraries cannot
  - Create a directory to put files in
  - Move files around
  - Delete files after it is done with them
- Java can almost always fill in the gaps

File Handling: Read File

- Below is the example script to read a pipe delimited file

```
<gel:script xmlns:core="jelly:core"
    xmlns:gel="jelly:com.niku.union.gel.GELTagLibrary"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:files="jelly:com.niku.union.gel.FileTagLibrary">

    <gel:parameter var="vFileName" default="/fs0/CA PPM1/share/RESOURCES.CSV"/>

    <files:readFile fileName="${vFileName}" delimiter="\|" var="vResourceData" embedded="false"/>

    <core:forEach items="${vResourceData.rows}" var="row" begin="1" end="10">
        <gel:log level="INFO"> Resource Last Name: ${row[0]} </gel:log>
        <gel:log level="INFO"> Resource First Name: ${row[1]} </gel:log>
    </core:forEach>

</gel:script>
```

  - ‘embedded’ attribute determines if data is surrounded by quotes or not. Default value is false.

File Handling: Write File

- Writing files is a way to export data, perhaps to be used in an integration by another application

```
<file:writeFile delimiter="," embedded="false" fileName="Resources.csv">
    <sql:query dataSource="${CA_PPMDS}" escapeText="false" var="result">
        <![CDATA[
        SELECT  u.first_name firstName,
                u.last_name lastName,
                u.user_name userName
        FROM    cmn_sec_users u
        WHERE  u.user_status_id = 200
        ]]>
    </sql:query>
    <core:forEach items="${result.rows}" trim="true" var="row">
        <file:line>
            <file:column value="${row.userName}"/>
            <file:column value="${row.lastName}"/>
            <file:column value="${row.firstName}"/>
        </file:line>
    </core:forEach>
</file:writeFile>
```

  - Use serialize tag to write XML content to an XML file

```
<gel:serialize fileName="C:\XOG\output\lookup_mapping.xml" var="${loadContent}"/>
```

File Handling: FTP

- By including the namespace for the FTPTagLibrary, GEL has the ability to read and write files on an FTP Server
  - This library does not support SFTP, FTPS or passive mode
  - Namespace
    - <gel:script **xmlns:gel="jelly:com.niku.union.gel.FTPTagLibrary"**>
  - Tags
    - ftp:open
    - ftp:put
    - ftp:get

File Operations: FTP Cont'd

- Below is the snippet to read a file from FTP location

```
<ftp:open hostName="myclarityserver" user="niku" password="clarity">
    <ftp:get localDir="c:/temp" fileName="app-ca.log" remoteDir="/niku/clarity/logs"/>
</ftp:open>
```

- Below is the snippet to write a file to FTP location

```
<ftp:open hostName="localhost" user="niku" password="clarity">
    <ftp:put localDir="/home/niku/xog/bin" fileName="gel.bat" remoteDir="/tmp"/>
</ftp:open>
```

Integrations: Overview

- Integration Triggers
  - Manual (User initiated)
  - Scheduled
  - Event Based

- Integration Methods
  - Flat Files
  - Web Services
  - Database Links
  - Third Party Tools

Integrations: Methods

- Flat File Based Integration
  - Based on extract from source system
  - Not a real time integration but a scheduled job
  - Needs coordination between both application teams
  - Complexity of the development is medium
- Web Service Based Integration
  - Applications should be able to access web services
  - Can provide near real time integration
  - Both application teams needs involvement in case of bi-directional integration
  - Complexity of the development is high

Integrations: Methods Cont'd

- Database Links Based Integrations
  - Applications should provide direct database connections
  - High risk, high performance
  - Less complex to develop
- Third Party Tools
  - Integration can be a real time or a scheduled job
  - More dependency on the third party tools
  - Less complex to implement
  - Can be difficult to troubleshoot issues

Integrations: Details

- Staging areas should often be utilized to load and validate the data prior to pushing the data into the final destination inside CA PPM
  - This helps reduce errors during the data load and can allow user interaction to correct the values prior to processing
- A combination of GEL tag libraries, Java, and SQL can be utilized in integration code
  - A GEL script inside a process
  - A SQL stored procedure inside a job definition
  - A Java executable inside a job definition
  - Note that stored procedures and Java executables are unsupported in on-demand environments for security and stability reasons

Integrations: Details Cont'd

- A typical flat file approach for exporting data from a GEL script:
  - A query is ran to gather data to be sent to the other application
  - The data is formatted into a file using the writeFile tag
  - The file is uploaded to a FTP server using the FTPTagLibrary open and put tags
  - The process containing the GEL script is scheduled to run at an agreed time
- The same process, instead of being scheduled, can be invoked by the external application.

Questions?

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