Open for Innovation

KNIME

KNIME Server Workshop

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KNIME Server – Architecture

- KNIME WebPortal
- KNIME Server
- KNIME Executor (headless KNIME Analytics Platform)
- VAADIN 7
- Tomcat/TomEE Application Server
- Java 8
Why TomEE?

• Apache TomEE is based on Apache Tomcat
  – Much higher adoption than Glassfish
  – Additional libraries to support EJB
• Communication solely via HTTP
  – Less firewall problems
  – SSL Encryption for client- and web-to-server communication
• Installation and deployment considerably easier
• Better user and group management
• Simultaneous connection to multiple servers
• KNIME Server 4.0 available mid of 2015
Installation Overview

- Install Java 8
- Install KNIME Analytics Platform
- Create shared workflow repository
- Install Tomcat/TomEE 1.7
- Configure Application Server
  - JVM Options
  - KNIME Server settings
  - Create email resource
- Define users (or configure LDAP/AD)
- Deploy KNIME Server
- Deploy KNIME WebPortal
Administration Overview

Typical responsibilities of the KNIME Server Administrator:

- Perform server side updates (~ 2x per year)
  - Intermediate bug fix releases provided if necessary
- Structure the workflow repository
- Manager user access via permissions
Client Access
New features are needed for the KNIME Analytics Platform to access the Server.

Install the KNIME Server Client Extensions from the Server update site.
Defining a new ServerSpace

Server connections are shown as “mount points” in the KNIME Explorer. To add a new mount point simply:

1. Click on the configure button in the KNIME Explorer.
2. Click New...
3. Configure a ServerSpace with your details
Defining a new ServerSpace

Server connections are shown as “mount points” in the KNIME Explorer. To add a new mount point simply:

1. Click on the configure button in the KNIME Explorer.
2. Click New...
3. Configure a ServerSpace with your details
ServerSpace as a shared repository

The Server provides an area in the Explorer for sharing work with your colleagues. Use workflow groups to organize your workflows, metanodes, and data files.

- Workflow groups
- Data files
- Workflows
- Metanodes

To move resources simply drag and drop or copy and paste
Permissions

Access rights

Please set the access permissions for the item "folder/AdvancedCourse/Counting Loop 1"

The user owning the item: Owner name: rosalia.silipo

Access rights of the owner:
- Read
- Modify
- Execute (applies only to workflows)

User group permissions:
- Groups
  - Edit Group Rights...

Everybody Else:
- Read
- Modify
- Execute (applies only to workflows)

User Group Permission for the Server Item

Users in one of the groups listed on the left have the assigned rights

Defined groups:
- << Add
- Remove
- marketing

Define (or change) the rights for a group:
- Group name
- Enter the name of a group (must be valid)

Permissions for users in this group:
- Read
- Modify
- Execute (applies only to workflows)

Available in KNIME Server
Remote Execution and Scheduling

Available in KNIME Server
Remote Execution and Scheduling

Available in KNIME Server
Workflow Jobs

Remotely executed workflows are run as “Jobs”

- A workflow job is a copy of the workflow with specific settings and data.
- Jobs are tied to a particular version of a workflow
- Orphaned jobs are colored red
- Jobs have messages (e.g. successful, or failure)
- Can be saved as workflow for data provenance and debugging (right-click save as)
KNIME WebPortal
WebPortal Enabled Data Mining (legacy)
Wrapped Metanodes

- Similar to Metanodes
- Differ in key areas:
  - Limited variable scope (c.f. global scope for Metanodes)
  - Use with Quick Form nodes (Analytics Platform 3.1+)
- Key to advanced functionality in KNIME products:
  - Use for new WebPortal pages
Wrapped Metanodes

Select

Collapse

Wrap
## Metanodes vs. Wrapped Metanodes (WebPortal)

<table>
<thead>
<tr>
<th></th>
<th>Metanodes</th>
<th>Wrapped Metanodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Forms</td>
<td>Legacy</td>
<td>Standard</td>
</tr>
<tr>
<td>Variable scope</td>
<td>Global</td>
<td>Local</td>
</tr>
<tr>
<td>WebPortal Execution</td>
<td>Old</td>
<td>New (work with loops/switches)</td>
</tr>
<tr>
<td>JavaScript views in WebPortal</td>
<td>Not supported</td>
<td>Supported</td>
</tr>
<tr>
<td>WebPortal Usage</td>
<td>Quickforms used globally</td>
<td>Views/Quickforms must be embedded in a Wrapped Metanode</td>
</tr>
<tr>
<td>Recommended uses</td>
<td>Legacy workflows</td>
<td>New developments</td>
</tr>
<tr>
<td>Compatibility</td>
<td>KNIME Server 3.x/4.x</td>
<td>KNIME Server 4.2+</td>
</tr>
</tbody>
</table>

* Valid for KNIME Analytics Platform 3.1 and above
WebPortal Enabled Data Mining
Webportal Enabled Data Mining

Execution on Server via WebPortal - 1
Webportal Enabled Data Mining

Execution on Server via WebPortal - 2
Webportal Enabled Data Mining

Execution on Server via WebPortal - 3
Webportal Enabled Data Mining

Execution on Server via WebPortal - 5
Webportal Enabled Data Mining

Execution on Server via WebPortal - 6

My Report
KNIME WebPortal: URL Parameter

http://<Server_Address>:<port>/<ContextRoot>#/<ItemPath>&<WorkflowParameters>

<ItemPath> = The path to a workflow, workflow group, or workflow job.

(A workflow job is referenced with its ID like: WorkflowGroup/Workflow?exec=job_id)

<WorkflowParameters> can appear in any order, but have to be after the <ItemPath>. Parameters are always appended with a leading ‘&’

Available Workflow Parameters

&single - Single mode: hides the workflow tree, so that only the selected item is visible.

&run - Auto run: If appended to workflow path, a new job is automatically executed.

&wv:<name>=<value> - Set variable: Sets the named workflow variable to the specified value.

&cr:<name>=<user>:<password> - Set credentials: Sets the user name and password for the named workflow credentials. Please note that the credentials and user name cannot contain the “=” and “;” symbols and that the password is transmitted in plain text.

&emails=sample@mail.com – Enable email notification: enables email notification and sets the specified comma separated list of email addresses.

&formats=<formats> - Set report formats: sets the report formats included as attachments in the notification email specified by a comma separated list. Available formats are: pdf (enabled by default), html, doc, xls, ppt, ps, odt, ods and odp.

A complete URL might look like:

http://localhost:8080/webportal/#/demo/file%20to%20csv&wv:title=foo&emails=sample@mail.com&run&single
WebPortal Templates (I)
WebPortal Templates (II)

Login to mine data gold!
Username
Password
Login
WebPortal Templates (III)

Workflow Repository

- Tests
  - 01 Test All Quickforms
  - 02 Test Workflow Variables
  - 03 Test Workflow Credentials
  - 04 Test Report
  - BlueprintFileUpload
  - Generic JS View Test
  - measure my time

Generic JS View Test

No variables or credentials are defined for this workflow.

- Mail notification on completion

Start
WebPortal Templates (IV)

Test jQuery existence
jQuery is available, node correctly loaded and configured.

Test jQuery and D3 existence
jQuery and D3 available, node correctly loaded and configured.

Test jQuery non-existence
jQuery is not available, node correctly loaded and configured.

Test data available
Data available. Node correctly configured. Table contains 2500 rows.

Test data not available
No data available. Node correctly configured.

Fail on purpose
This node is supposed to fail.
WebPortal Templates (V)

- Layout can be configured by templates
  - Footer & header
  - Main panel
  - Login page
  - ...
- Custom stylesheet
- Custom JavaScript libraries
  - Can be re-used in JS-based views
WebPortal Templates (VI)

- Templates are part of the configuration and are not overridden by updates
Webservice Access (SOAP and REST)
SOAP Webservice API

• SOAP Based, Installed with the KNIME Server application

• Supports authentication

• Execute workflows from within KNIME or other applications

• Code examples available upon request
## KNIME Server: Webservice Interface

<table>
<thead>
<tr>
<th>Operation (Method)</th>
<th>Input</th>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>listWorkflows</td>
<td>&lt;none&gt;</td>
<td>String[]</td>
<td>Get all workflow paths of workflows visible to the current user</td>
</tr>
<tr>
<td></td>
<td></td>
<td>list of available workflows</td>
<td></td>
</tr>
<tr>
<td>listWorkflowCredentials</td>
<td>String</td>
<td>WorkflowCredentials[]</td>
<td>Get a list of workflow credentials defined on a given workflow</td>
</tr>
<tr>
<td></td>
<td>workflow path</td>
<td>List of all workflow credentials defined on this workflow</td>
<td></td>
</tr>
<tr>
<td>listWebServiceVariables</td>
<td>String</td>
<td>WebServiceVariable[]</td>
<td>Get a list of workflow variables for a given workflow</td>
</tr>
<tr>
<td></td>
<td>workflow path</td>
<td>List of all workflow variables with their default assignment</td>
<td></td>
</tr>
<tr>
<td>invokeSync</td>
<td>String</td>
<td>WorkflowStatus</td>
<td>Execute a workflow, wait for it to finish.</td>
</tr>
<tr>
<td></td>
<td>workflow path</td>
<td>status of flow after execution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WebServiceVariable[]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>list of flow variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>invokeAsync</td>
<td>String</td>
<td>String</td>
<td>Execute a workflow, get job ID representing pending task</td>
</tr>
<tr>
<td></td>
<td>workflow path</td>
<td>job ID</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WebServiceVariable[]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>list of flow variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>getStatus</td>
<td>String</td>
<td>WorkflowStatus</td>
<td>Get status of a running job</td>
</tr>
<tr>
<td></td>
<td>job ID</td>
<td>status of workflow</td>
<td></td>
</tr>
<tr>
<td>generateReport</td>
<td>String</td>
<td>byte[]</td>
<td>Generates the report associated with the executed flow (if any)</td>
</tr>
<tr>
<td></td>
<td>Job ID</td>
<td>content of the generated report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>String</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>reportformat (&quot;pdf&quot;, &quot;ppt&quot;, &quot;doc&quot;, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>discard</td>
<td>String</td>
<td>&lt;none&gt;</td>
<td>Cancel and/or discard a running or completed job</td>
</tr>
<tr>
<td></td>
<td>job ID</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Programmatic access

URL wsdlURL = ...;

QName name = new QName("http://www.knime.com/soap",
   "GenericWorkflowService");

Service knimeService = Service.create(wsdlURL, name);

GenericWorkflowWebService accessor =
   knimeService.getPort(GenericWorkflowWebService.class);

BindingProvider bin = ((BindingProvider) accessor);

Map<String, Object> requestContext = bin.getRequestContext();

requestContext.put(BindingProvider.USERNAME_PROPERTY, user);

requestContext.put(BindingProvider.PASSWORD_PROPERTY, pass);

accessor.listWorkflows();
accessor.invokeAsync(...)
SOAP Nodes

- Use to access KNIME Web services (or others)
- Supports workflow credentials
REST Interface

• Main addition to KNIME Server 4.1
• REST = Representational State Transfer
  – Communication based on HTTP
  – Usually clear text
• Many possible clients
  – Web browser
  – Java applications (e.g. via JAX-RS)
  – KREST nodes
• https://www.knime.org/blog/the-knime-server-rest-api
• https://www.knime.org/blog/giving-the-knime-server-a-rest
REST Example: List Workflows (I)

• Via browser
  – Requires user authentication

![Screenshot of a browser window displaying workflows](image-url)
REST Example: List Workflows (II)

- Via KNIME and KREST nodes
REST Example: Execute Workflow (I)

- **Via browser**
  - **Load workflow**
    - Returns unique job ID
  - **Execute job**
    - [http://localhost:8080/com.knime.enterprise.server/rest/v4/jobs/syncExec/24a76fec-a74e-45ba-b03f-cabf528b6a69](http://localhost:8080/com.knime.enterprise.server REST/v4/jobs/syncExec/24a76fec-a74e-45ba-b03f-cabf528b6a69)
    - Returns final status
  - **Render report**
    - Format can be specified in request
REST Example: Execute Workflow (II)

• Via KNIME and KREST nodes
**REST Example: Live-Scoring on server (I)**

- Get expected parameter format from workflow
- Set input parameters in input quickform nodes
- Execute workflow
- Get results from quickform output nodes
REST Example: Live-Scoring on server (II)

- Get expected parameter format from workflow
- Set input parameters in input quickform nodes
- Execute workflow
- Get results from quickform output nodes
REST Example: Live Scoring on server (III)

- **Via Call Remote Workflow node**
  - Analyzes input parameters
  - Prepare input data accordingly
  - Executes job and gets back results
JSON Type & Utility Nodes

- **JSON** – JavaScript Object Notation
- **Hierarchical data format**
JSON Type & Utility Nodes - Applications

- Web Service consumption ((K)REST)
- NoSQL databases / MongoDB
- KNIME Web Service
JSON – “JSON Path”

```
"UGM sessions":{
  "session title":"Money, Love and Gambling",
  "talks":[
    {
      "presenter":"Jörg Neumann",
      "title":"Successful Cross Sell",
      "duration":30
    },
    {
    }
  ]
},
```

$['UGM sessions']['talks'][*]['presenter']