Open for Innovation

KNIME

KNIME Server Workshop

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KNIME.com AG

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Architecture & Administration

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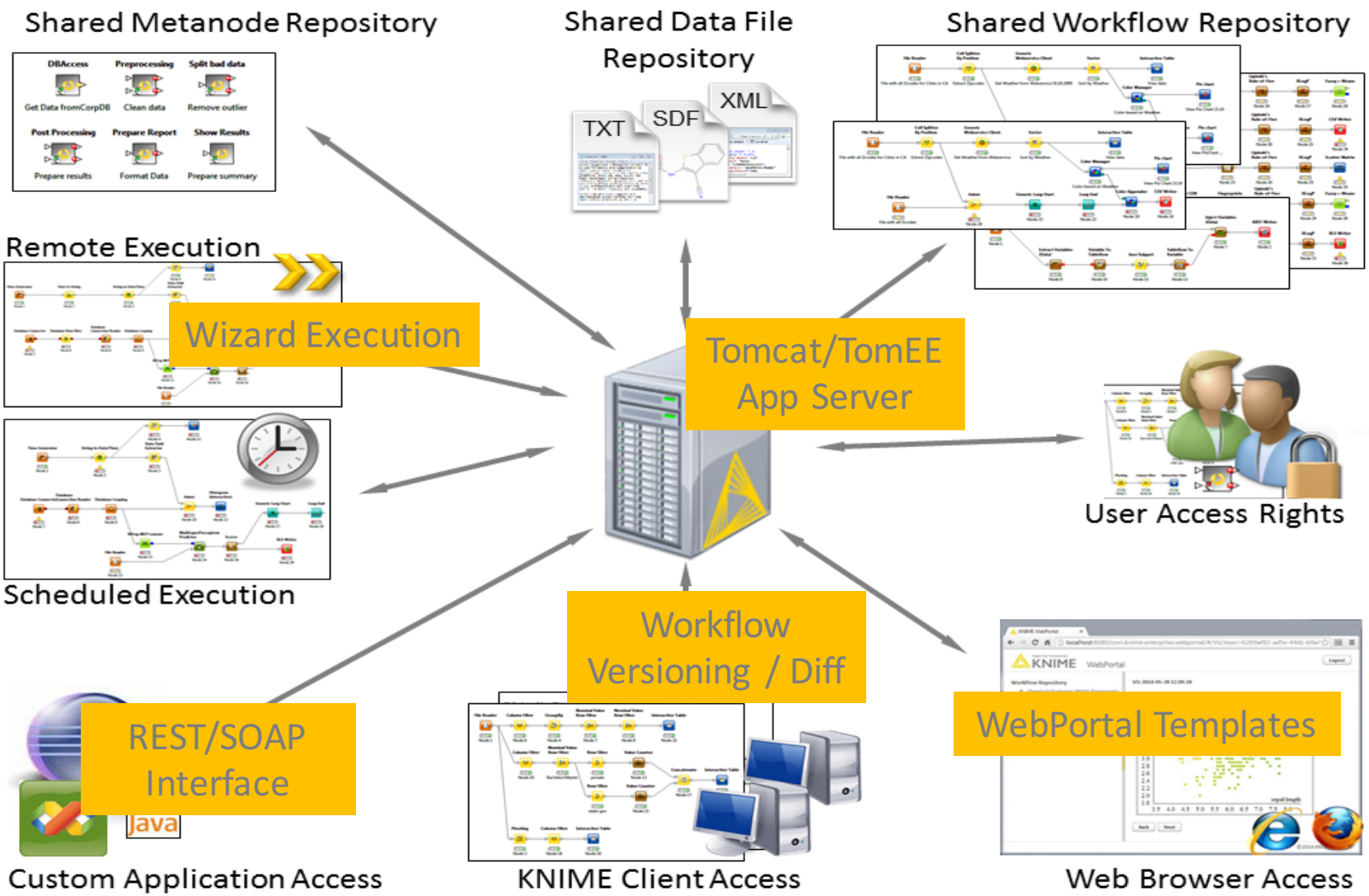
KNIME Server – Functional Setup



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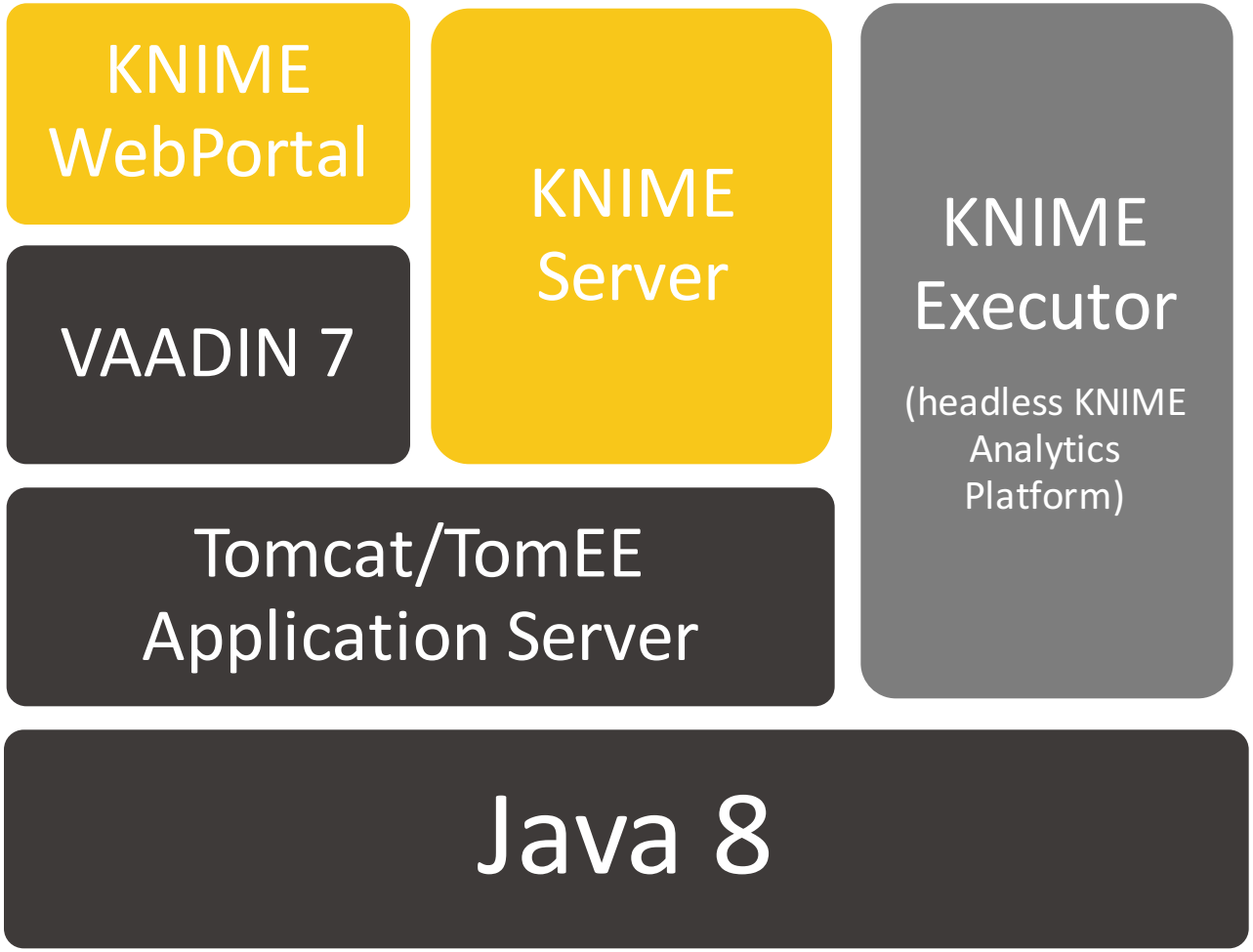
KNIME Server – Architecture



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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

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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

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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

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Client Access

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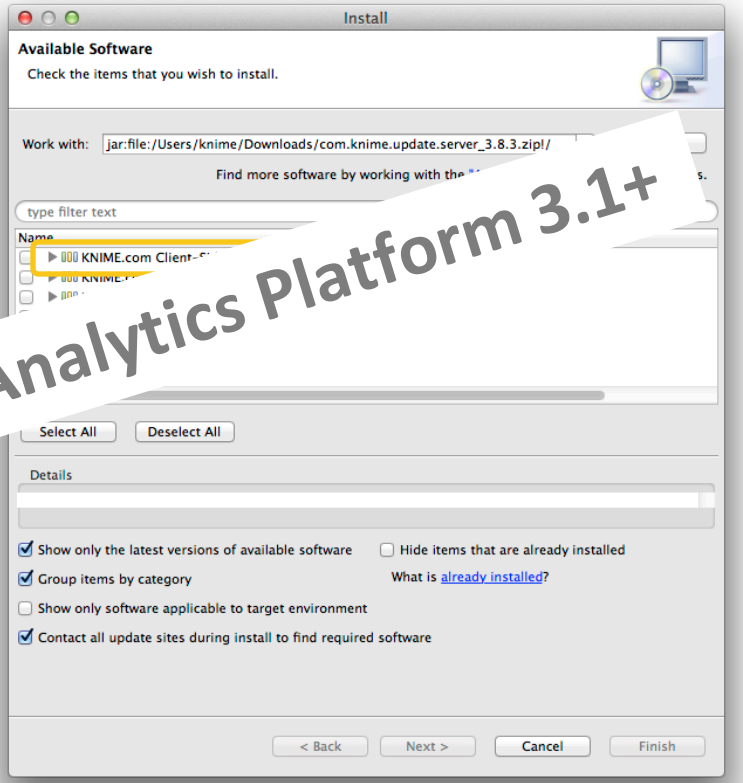
KNIME Server Client Extensions

New features are needed for the KNIME Analytics Platform to access the Server.

Install the KNI[illegible] Side [illegible] [illegible]in the [illegible]erver update site.

No longer required for KNIME Analytics Platform 3.1+



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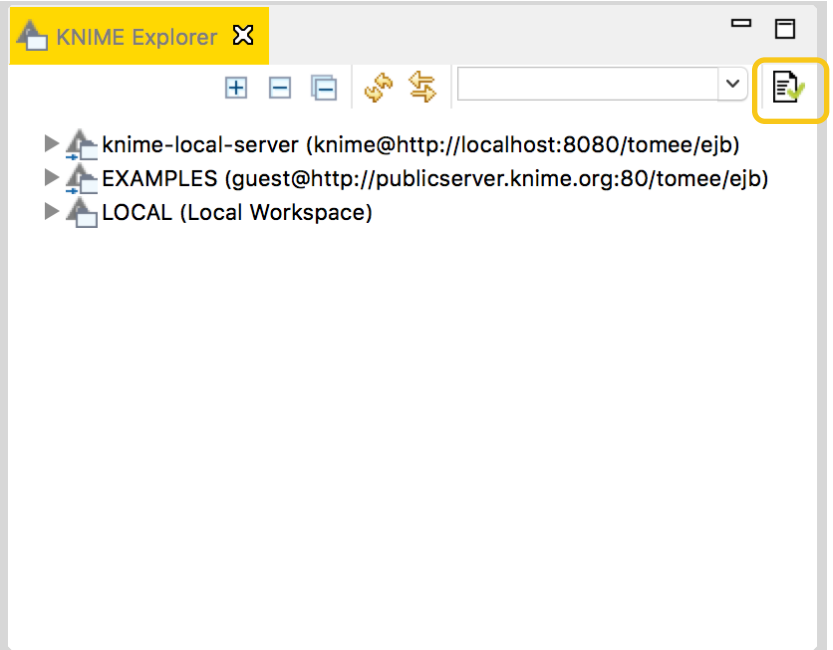
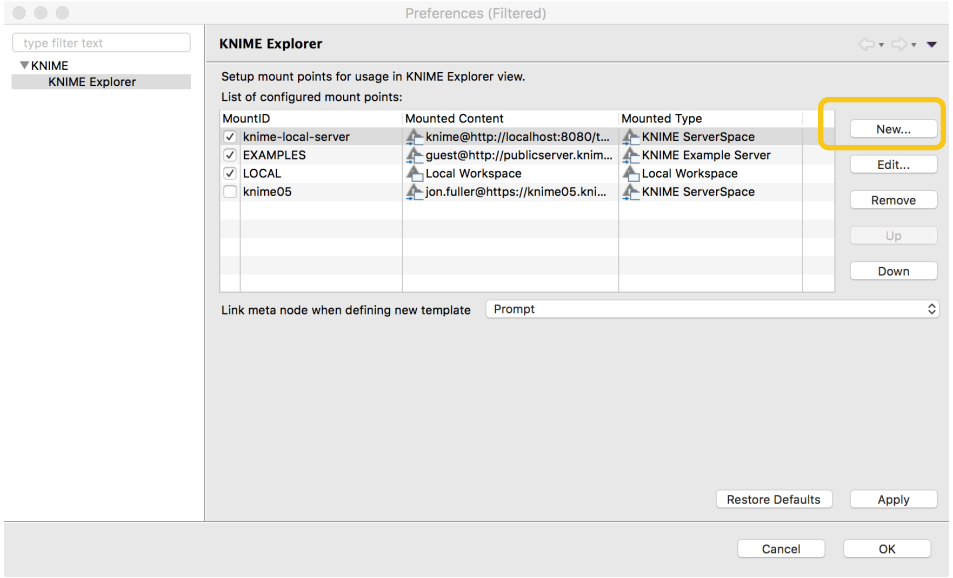
Defining a new ServerSpace

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





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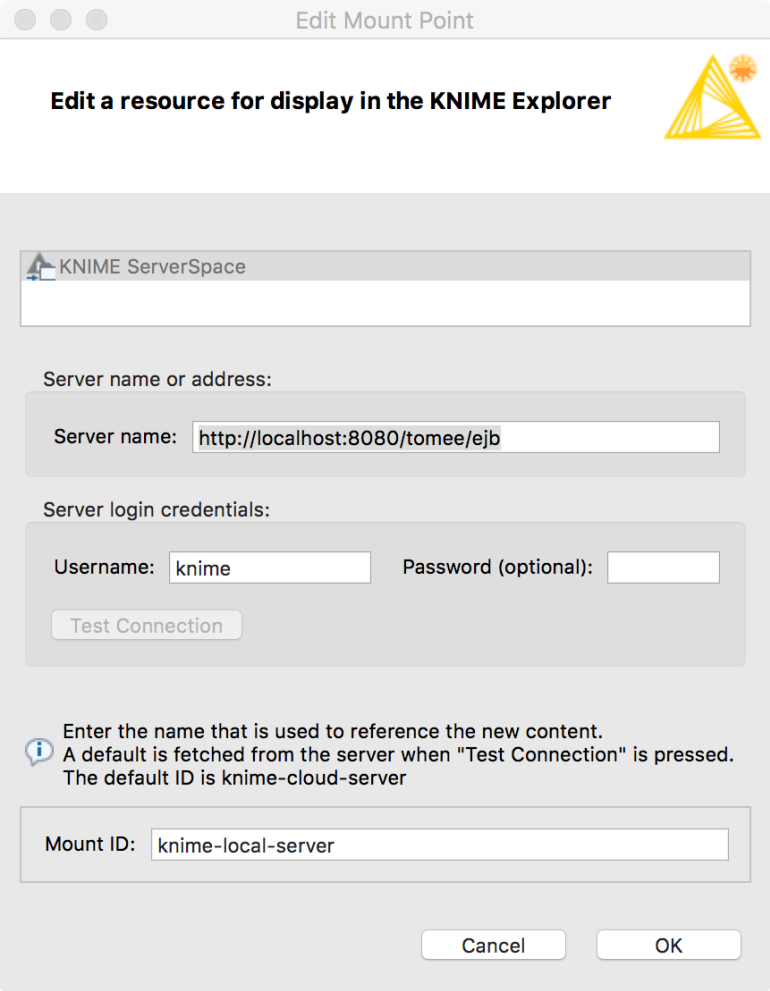

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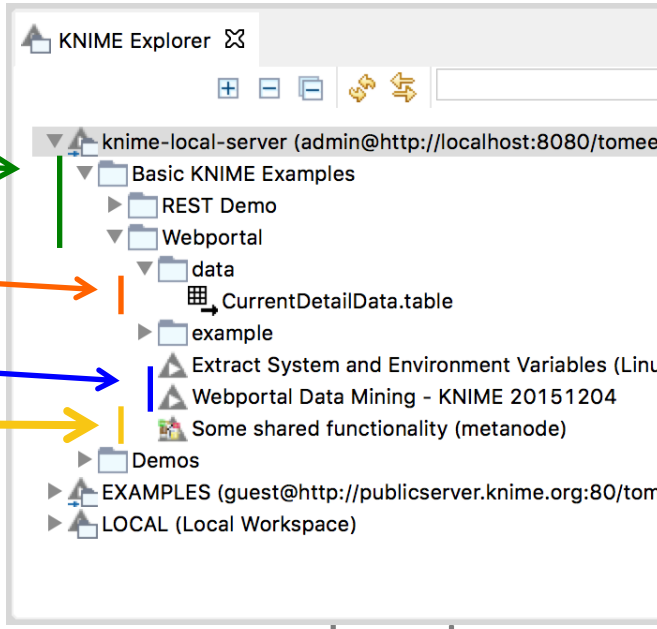
ServerSpace as a shared repository

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

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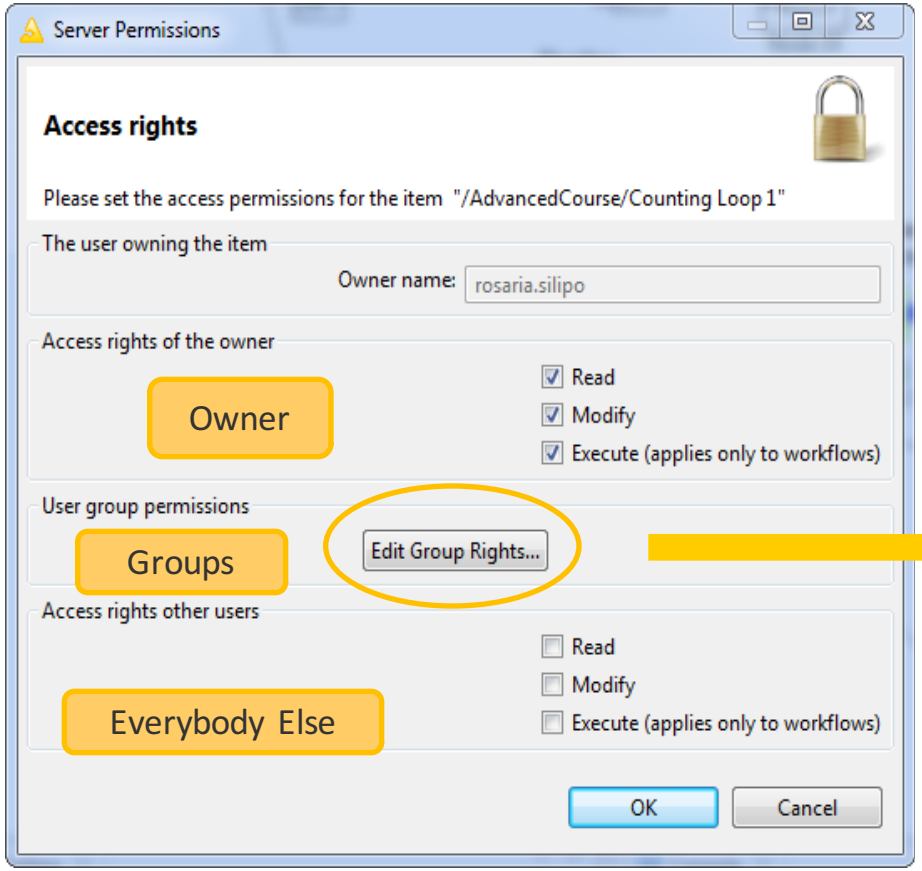
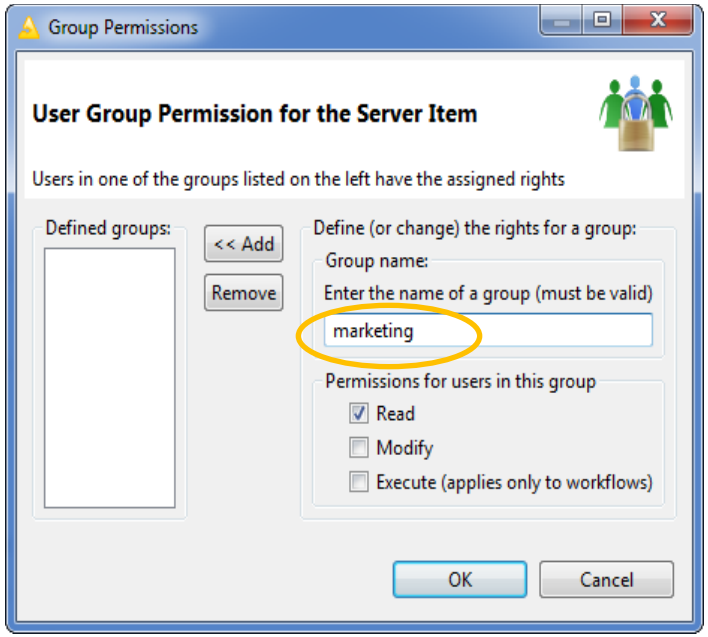
Permissions





Available in KNIME Server

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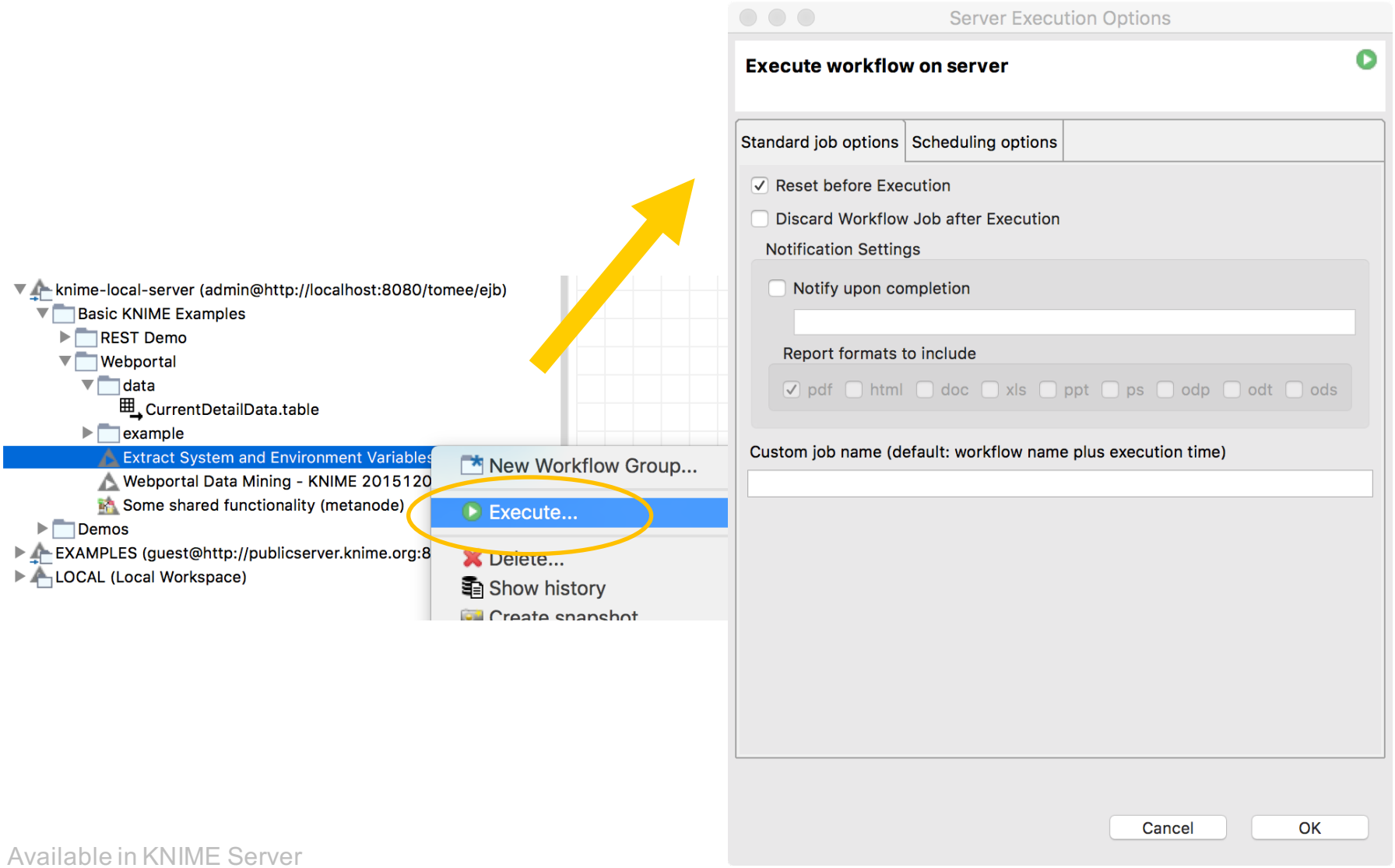
Remote Execution and Scheduling



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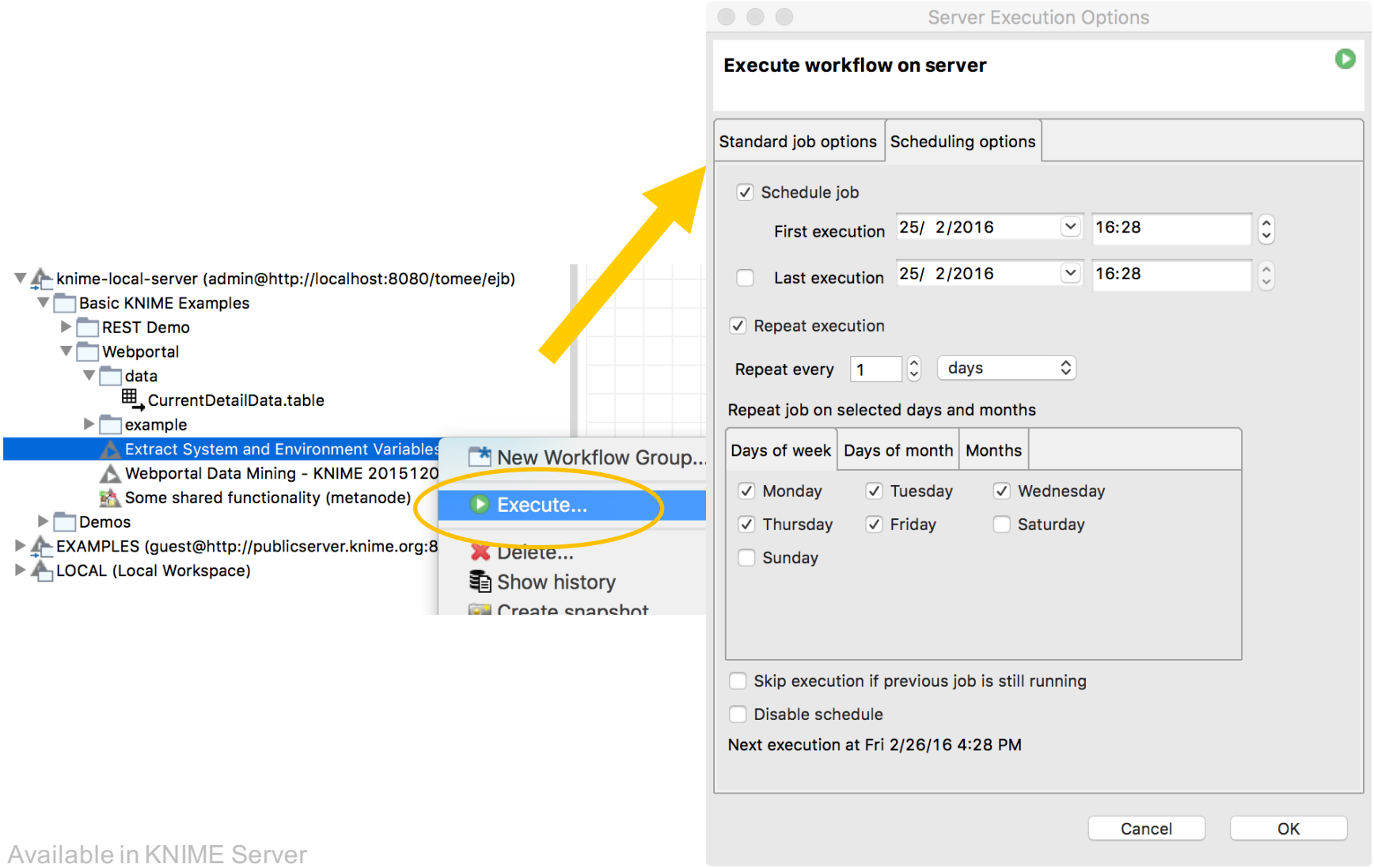
Remote Execution and Scheduling



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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)

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KNIME WebPortal

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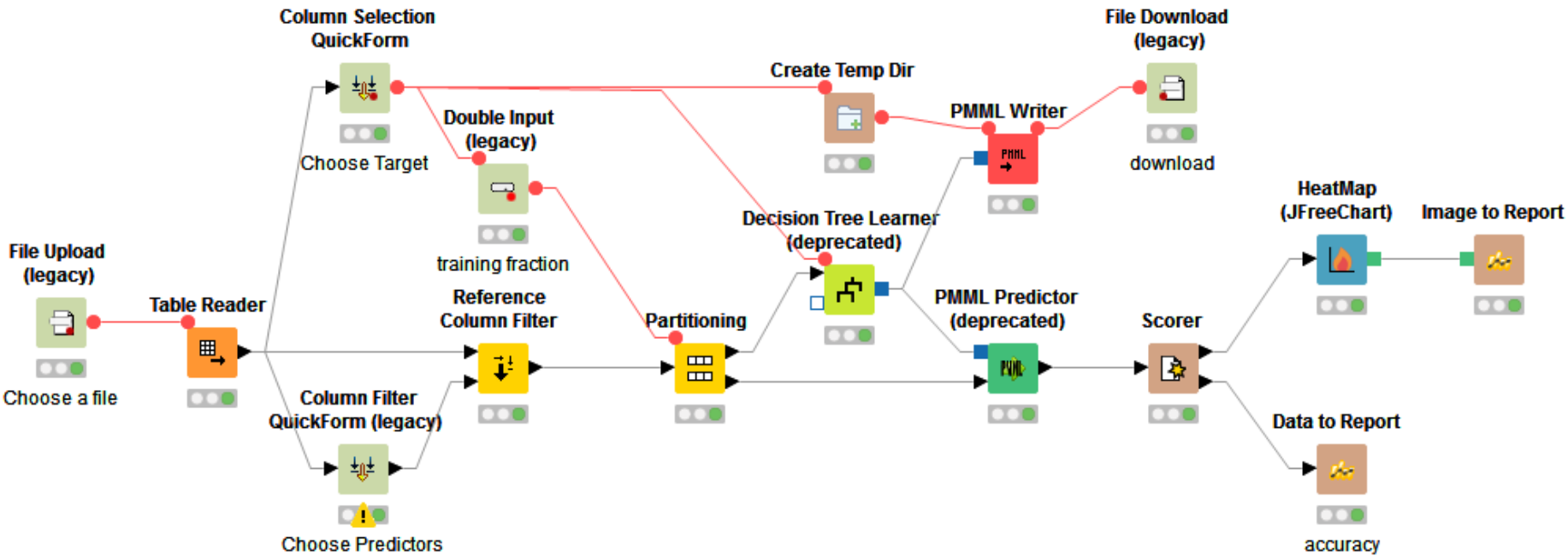
WebPortal Enabled Data Mining (legacy)



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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

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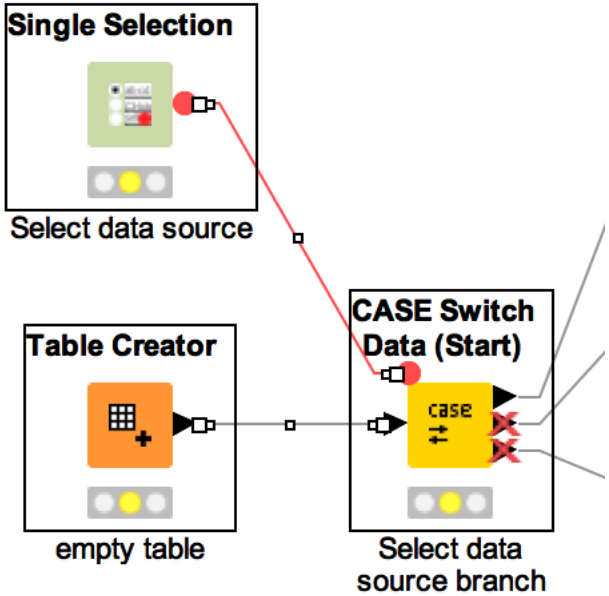
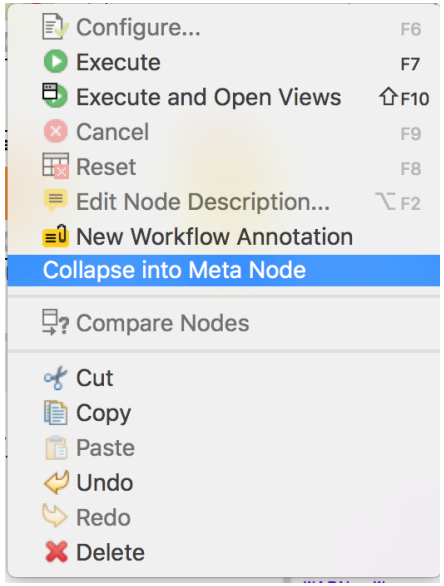
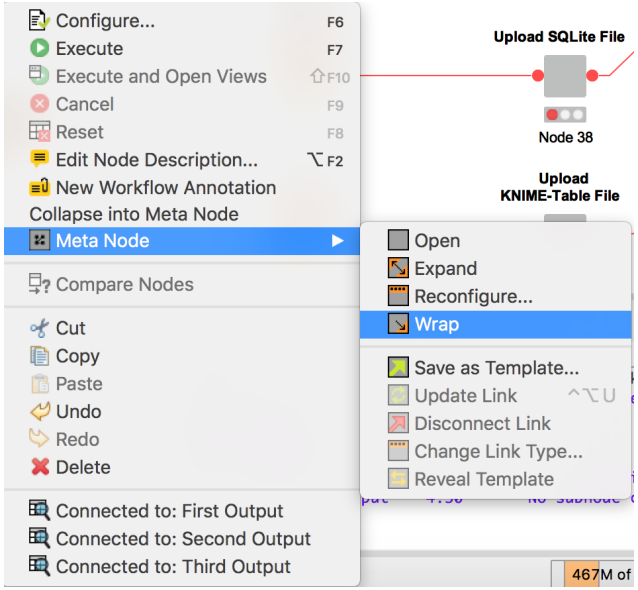
Wrapped Metanodes



Select



Collapse



Wrap

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Metanodes vs. Wrapped Metanodes (WebPortal)

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

* Valid for KNIME Analytics Platform 3.1 and above

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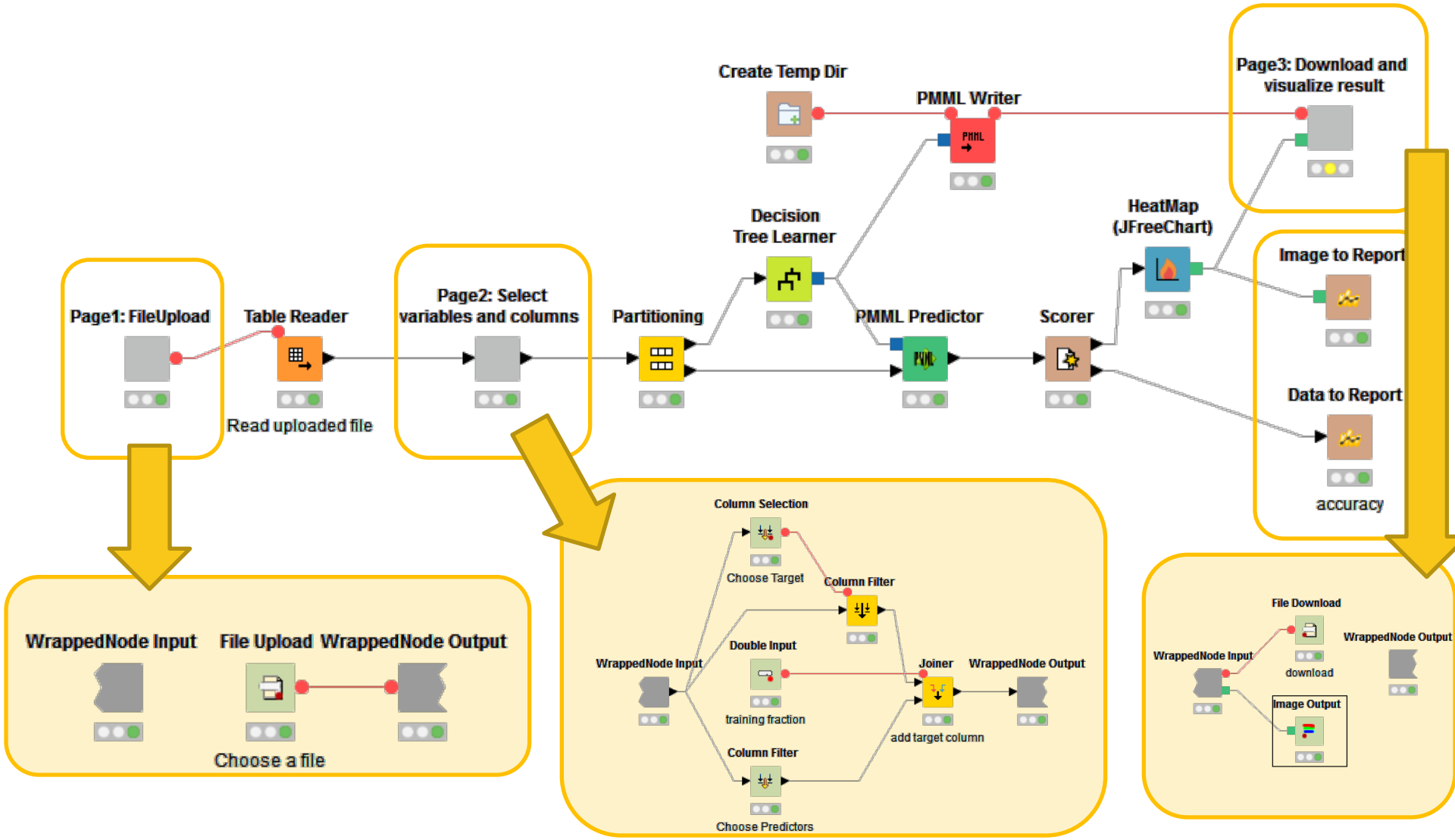
WebPortal Enabled Data Mining



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Webportal Enabled Data Mining

Execution on Server via WebPortal - 1

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Logout

Workflow Repository

- Basic KNIME Examples
  - REST Demo
  - Webportal
    - Extract System and Environmen
    - Webportal Data Mining - KNIM
    - WebportalDataMining

WebportalDataMining

No variables or credentials are defined for this workflow.

☐ Mail notification on completion

Start

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Webportal Enabled Data Mining

Execution on Server via WebPortal - 2

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Logout

Workflow Repository

- Basic KNIME Examples
  - REST Demo
  - Webportal
    - Extract System and Environmen
    - Webportal Data Mining - KNIM
    - WebportalDataMining

WebportalDataMining 2016-02-03 11.04.43

File

Select File <no file selected>*

Back Next

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Webportal Enabled Data Mining

Execution on Server via WebPortal - 3

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Logout

Workflow Repository

- Basic KNIME Examples
  - REST Demo
  - Webportal
    - Extract System and Environmen
    - Webportal Data Mining - KNIM
    - WebportalDataMining

WebportalDataMining 2016-02-03 11.04.43

File

Change File Uploaded file "CurrentDetailData.table" (214 KB) *

Back Next

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Webportal Enabled Data Mining

Execution on Server via WebPortal - 4

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Logout

Workflow Repository

- Basic KNIME Examples
  - REST Demo
  - Webportal
    - Extract System and Environmen
    - Webportal Data Mining - KNIM
    - WebportalDataMining

WebportalDataMining

Predictors

Excludes

MaritalStatus
Gender
Target
Available401K
CustomerValueSegment
ChurnScore
CallActivity
SentimentRating
Products
WebActivity

> >> < <<

Includes

EstimatedYearlyIncome
NumberOfContracts
Age

Target column

Gender

Training Fraction

0.5

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Webportal Enabled Data Mining

Execution on Server via WebPortal - 5

Webportal Enabled Data Mining

Execution on Server via WebPortal - 6

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Logout

Workflow Repository

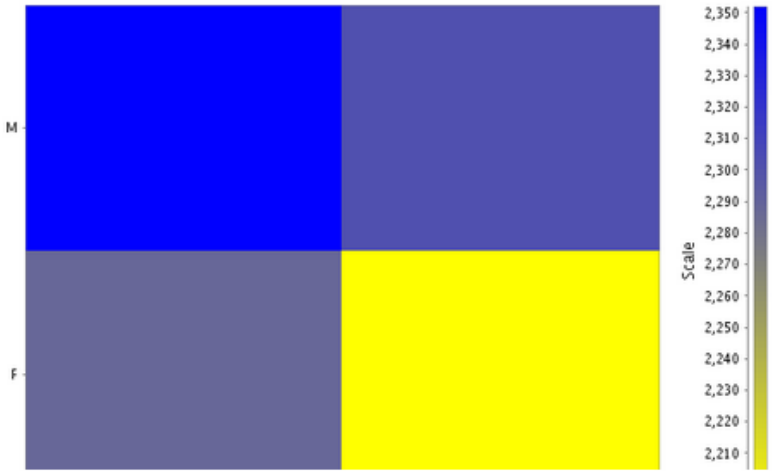
- Basic KNIME Examples
  - REST Demo
  - Webportal
    - Extract System and Environmen
    - Webportal Data Mining - KNIM
    - WebportalDataMining

WebportalDataMining

Back | Workflow executed successfully | Discard

Report Preview for WebportalDataMining 2016-02-03 11.04.43

My Report



Open HTML preview in a new window

Download Report as

PDF DOC XLS PPT PS ODP ODT ODS

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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

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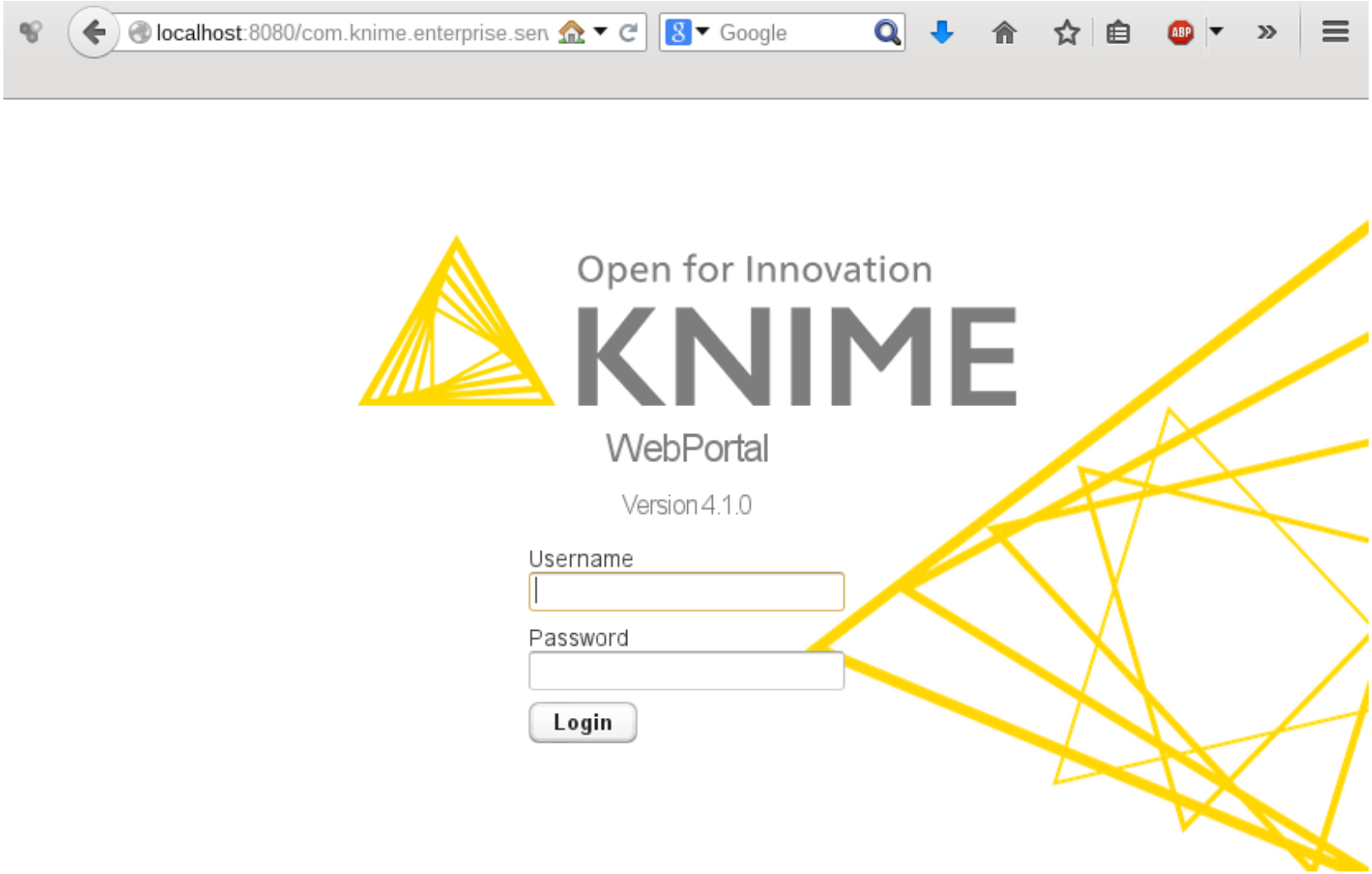
WebPortal Templates (I)



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WebPortal Templates (II)

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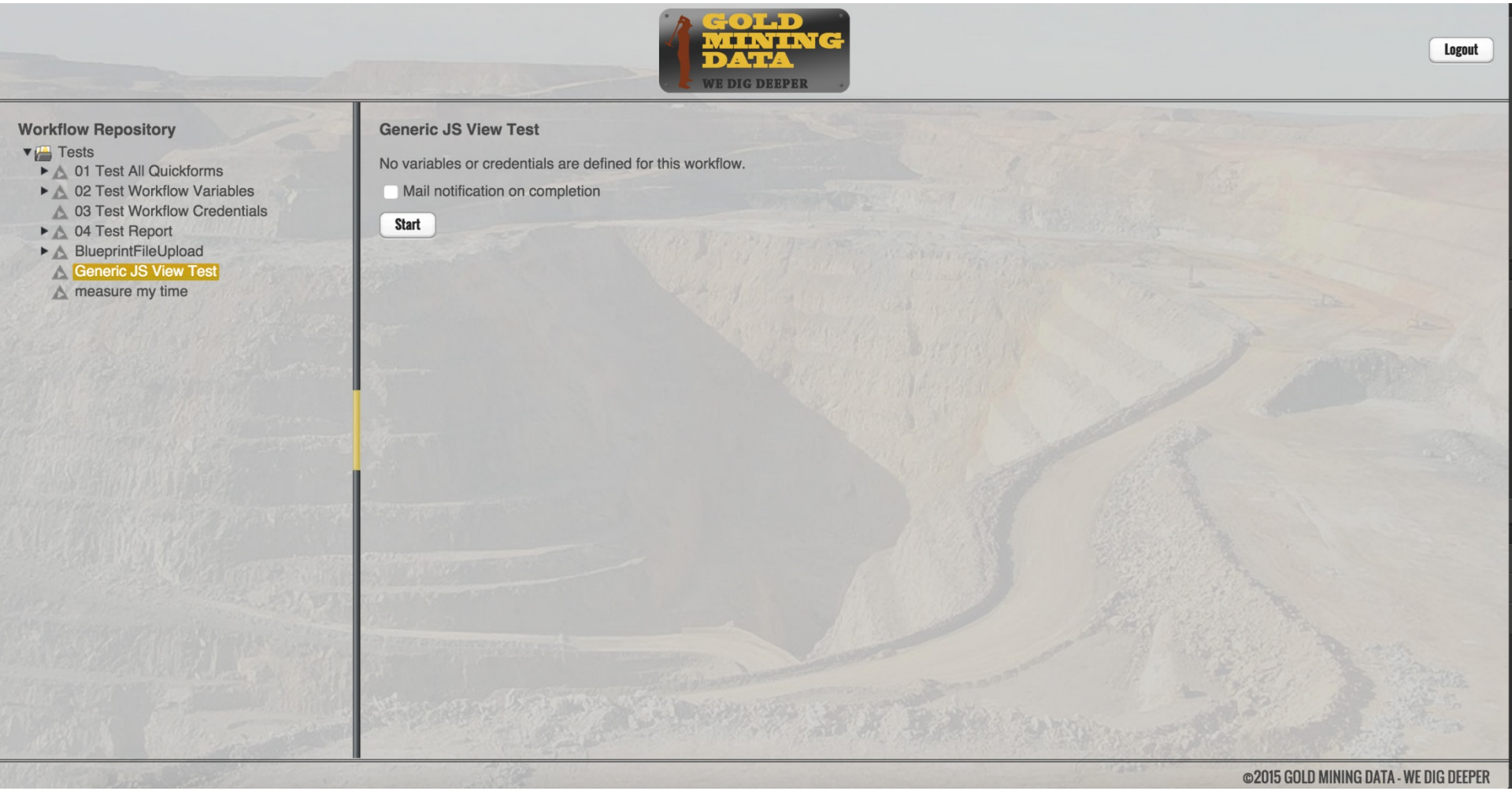
WebPortal Templates (III)



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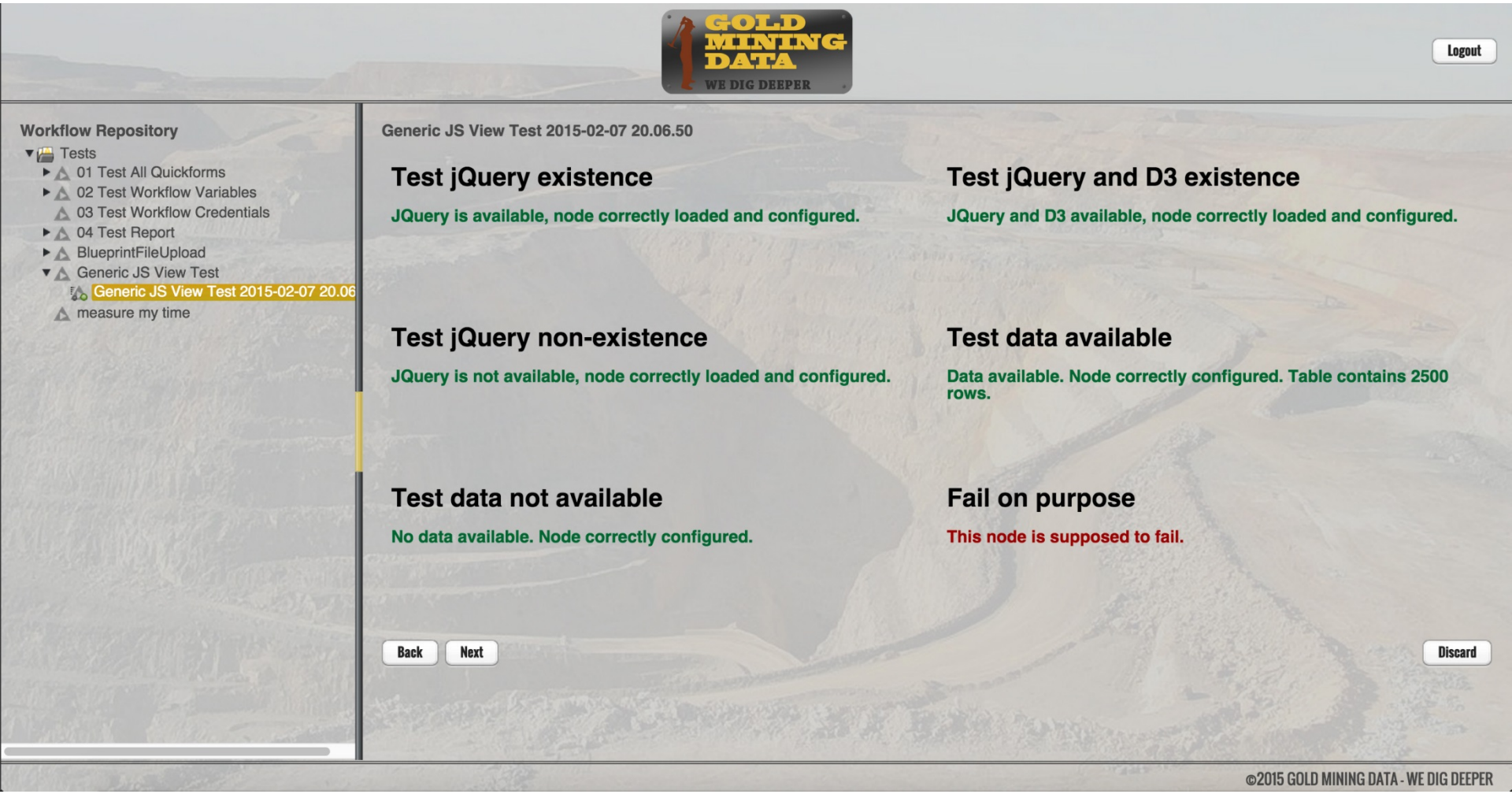
WebPortal Templates (IV)



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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

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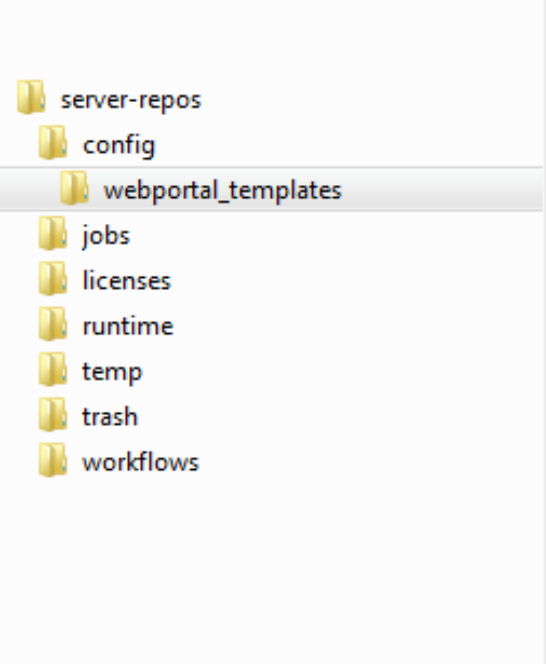
WebPortal Templates (VI)

- Templates are part of the configuration and are not overridden by updates



big_pit.jpg	06.02.2015 10:14	IrfanView JPG File	198 KB
big_pit_trans.png	06.02.2015 16:20	IrfanView PNG File	745 KB
hor-bg.png	06.02.2015 23:57	IrfanView PNG File	16 KB
knime_template.css	07.02.2015 01:10	Kaskadierendes St...	4 KB
knime_template_footer.html	07.02.2015 00:45	Firefox HTML Doc...	1 KB
knime_template_header.html	06.02.2015 23:53	Firefox HTML Doc...	1 KB
knime_template_job_executing.html	07.02.2015 00:46	Firefox HTML Doc...	1 KB
knime_template_job_prompt.html	07.02.2015 00:52	Firefox HTML Doc...	1 KB
knime_template_job_result.html	07.02.2015 00:55	Firefox HTML Doc...	1 KB
knime_template_job_start.html	07.02.2015 00:46	Firefox HTML Doc...	1 KB
knime_template_login.html	06.02.2015 23:04	Firefox HTML Doc...	1 KB
knime_template_main.html	06.02.2015 23:23	Firefox HTML Doc...	1 KB
logo.png	06.02.2015 11:28	IrfanView PNG File	168 KB
logo_s.png	06.02.2015 22:59	IrfanView PNG File	101 KB

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Webservice Access (SOAP and REST)

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SOAP Webservice API

- SOAP Based, Installed with the KNIME Server application

  http://<servername>:8080/GenericWorkflowService/GenericWorkflow?wsdl

- Supports authentication

- Execute workflows from within KNIME or other applications

- Code examples available upon request

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KNIME Server: Webservice Interface

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

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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(...);
```

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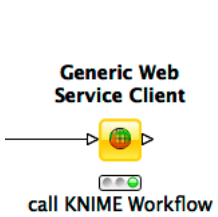
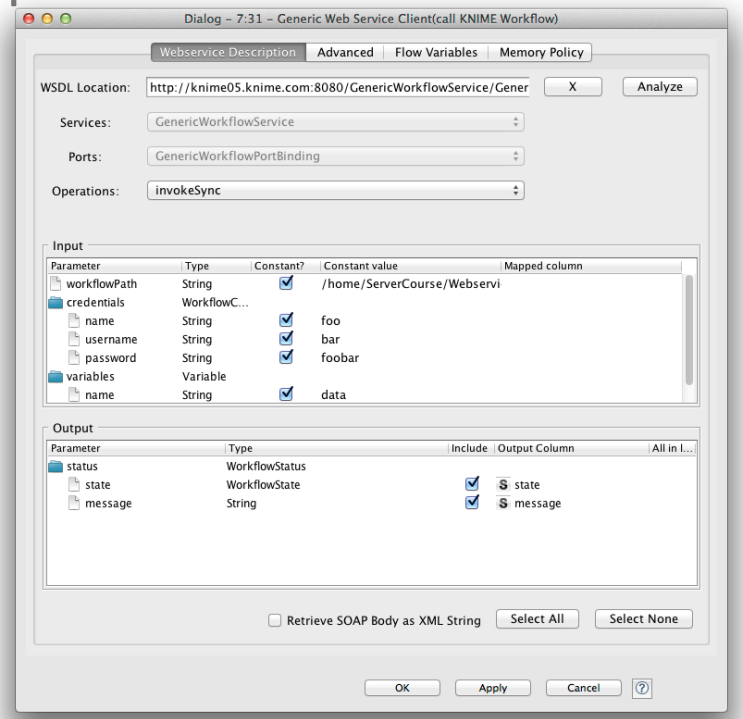
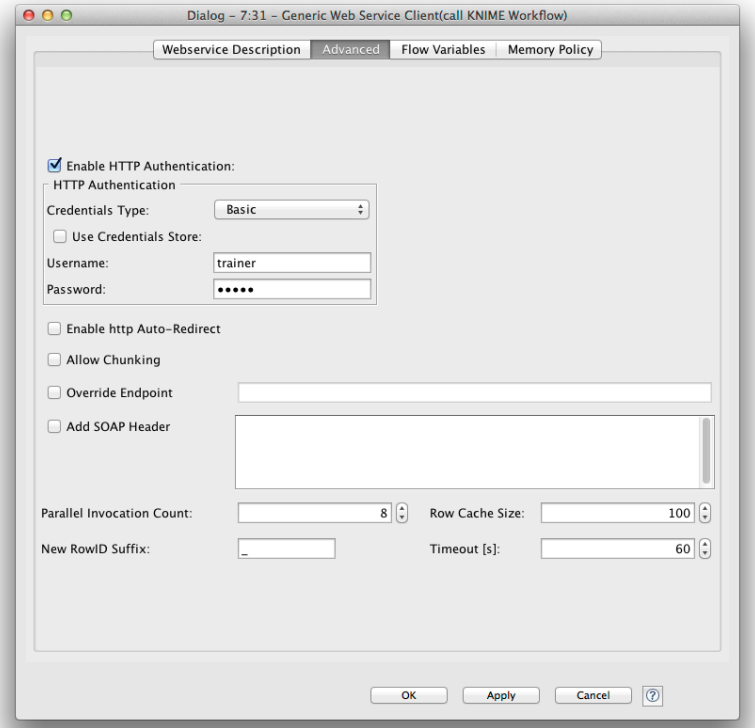
SOAP Nodes

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







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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

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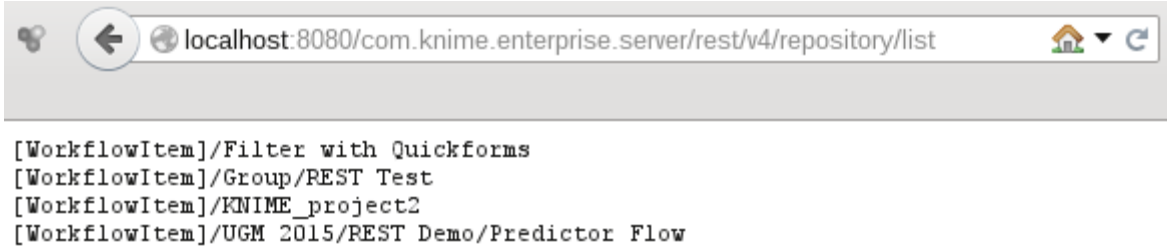
REST Example: List Workflows (I)

- Via browser
  - http://localhost:8080/com.knime.enterprise.server/rest/v4/**repository/list**
  - Requires user authentication



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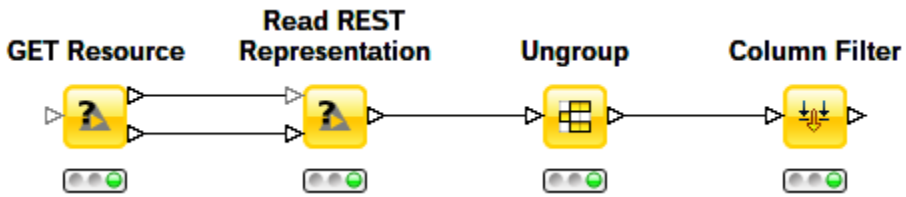
REST Example: List Workflows (II)

- Via KNIME and KREST nodes



File

Properties | Flow Variables

Table "default" - Rows: 4 | Spec - Column: 1

Row ID	S allPaths.jsonArray
Row0_1	/Filter with Quickforms
Row0_2	/Group/REST Test
Row0_3	/KNIME_project
Row0_4	/UGM 2015/REST Demo/Predictor Flow

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REST Example: Execute Workflow (I)

- Via browser
  - Load workflow
    - http://localhost:8080/com.knime.enterprise.server/rest/v4/**jobs/load**/UGM 2015/REST Demo/Report
    - Returns unique job ID
  - Execute job
    - http://localhost:8080/com.knime.enterprise.server/rest/v4/**jobs/syncExec**/24a76fec-a74e-45ba-b03f-cabf528b6a69
    - Returns final status
  - Render report
    - http://localhost:8080/com.knime.enterprise.server/rest/v4/**jobs/renderReport**/24a76fec-a74e-45ba-b03f-cabf528b6a69/**PDF**
    - Format can be specified in request

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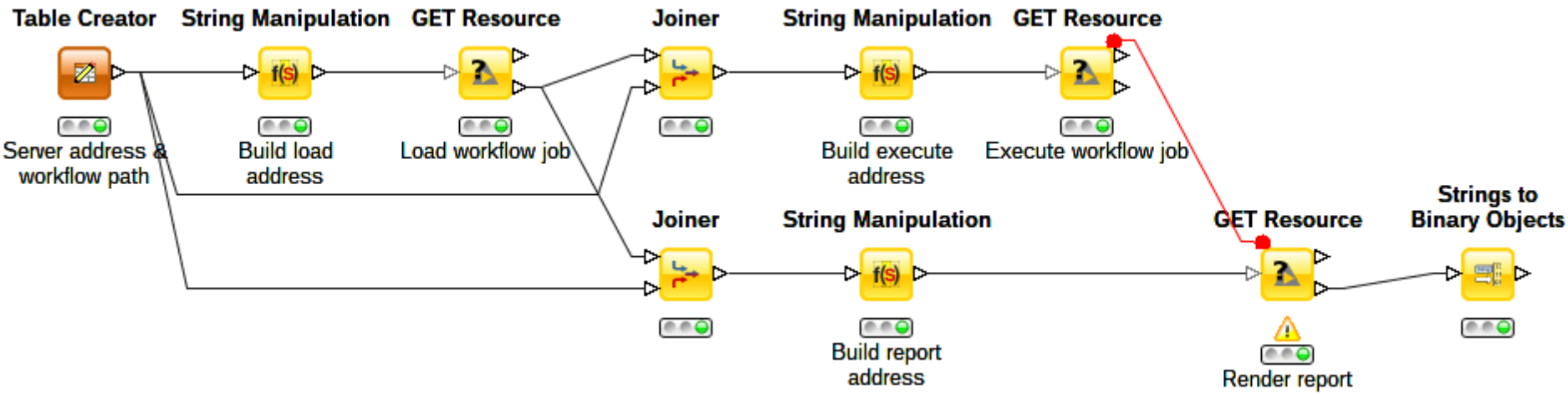
REST Example: Execute Workflow (II)

- Via KNIME and KREST nodes



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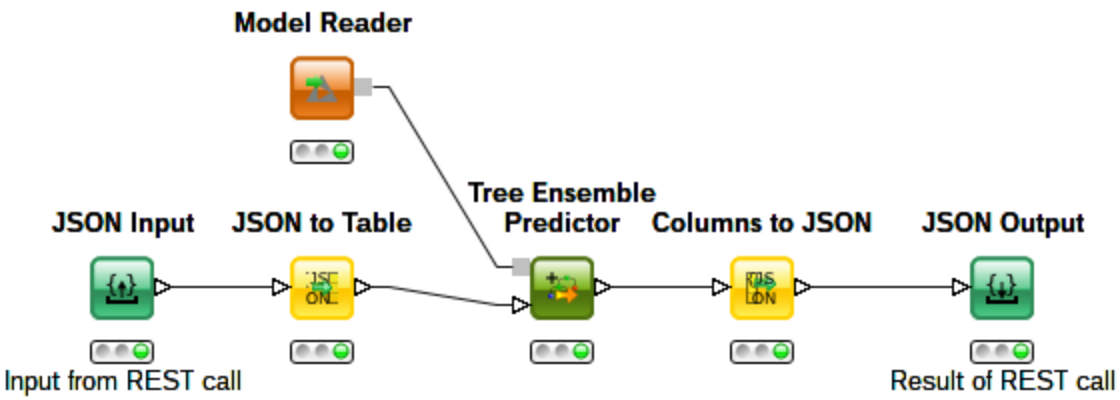
REST Example: Live-Scoring on server (I)

- Get expected parameter format from workflow
- Set input parameters in input quickform nodes
- Execute workflow
- Get results from quickform output nodes



Scoring workflow, called via REST

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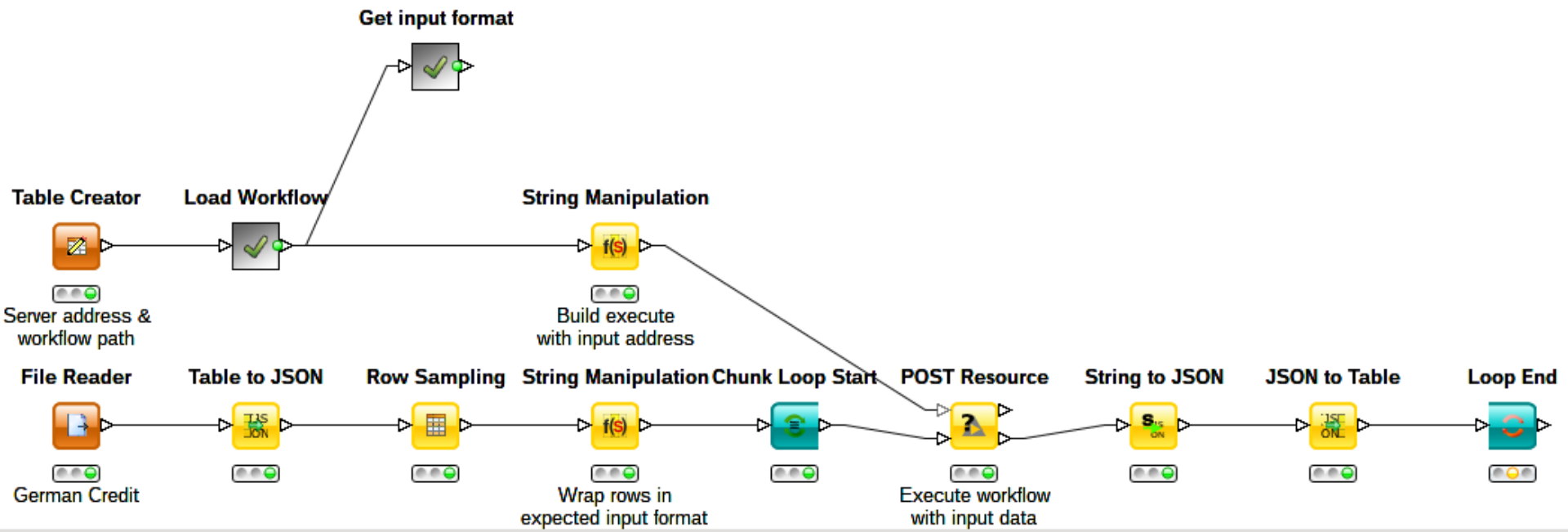
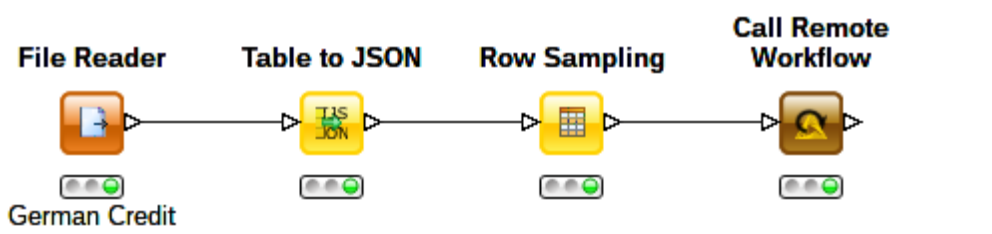
REST Example: Live-Scoring on server (II)

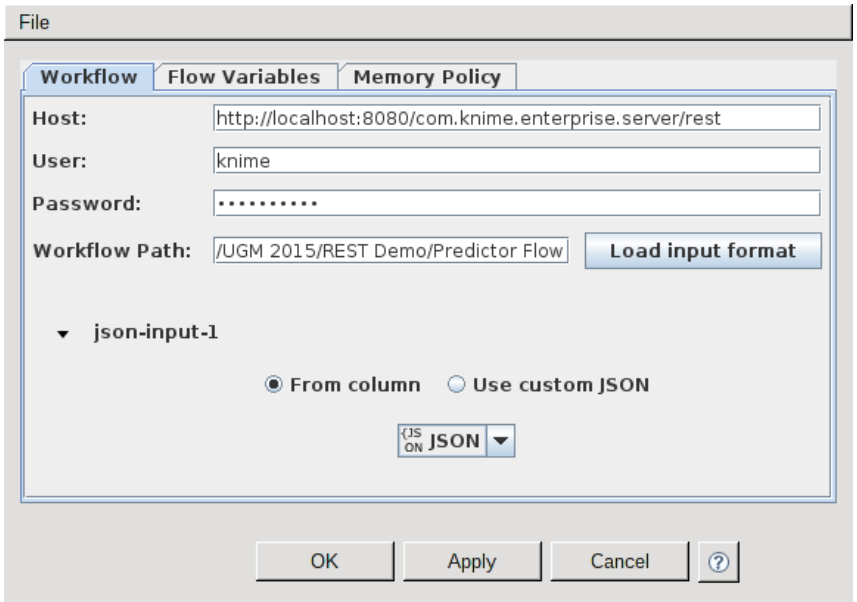
- Get expected parameter format from workflow
- Set input parameters in input quickform nodes
- Execute workflow
- Get results from quickform output nodes



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





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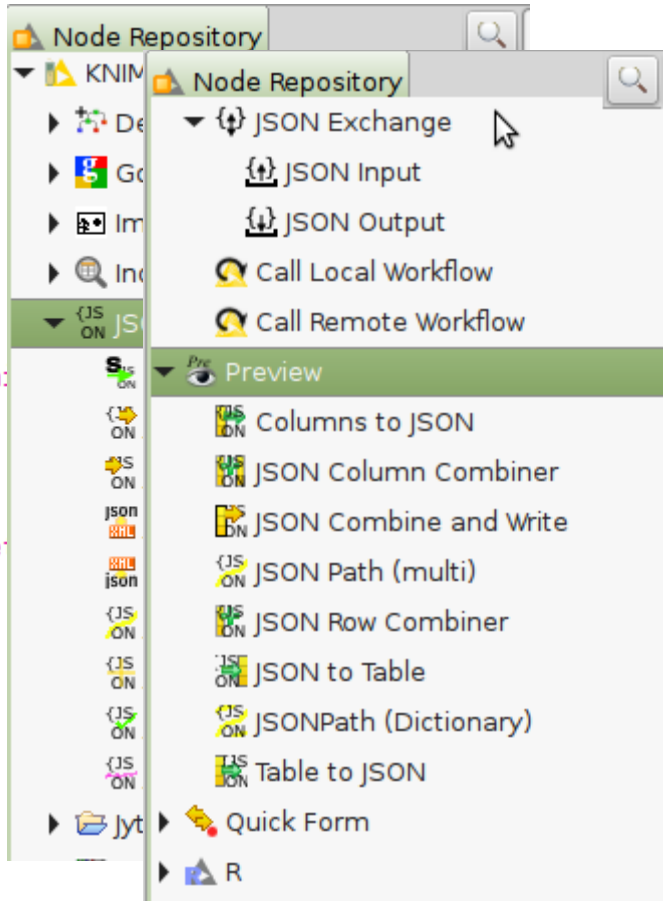
JSON Type & Utility Nodes

- JSON – JavaScript Object Notation
- Hierarchical data format

```
1
2 {
3     "UGM sessions":{
4         "session title":"Money, Love and Gambling",
5         "talks":[
6             {
7                 "presenter":"Jörg Neumann",
8                 "title":"Successful Cross Selling – Automated Data Min
9                 "duration":30
10            },
11            {
12                "presenter":"Cathy Pearl",
13                "title":"What's Love Got To Do With It? Analyzing Twee
14                "duration":30
15            },
16            {
17                "presenter":"Walter Bonifazi",
18                "title":"Bet Responsibly. On Your CRM Too.",
19                "duration":30
20            }
21        ]
22    }
23 }
```



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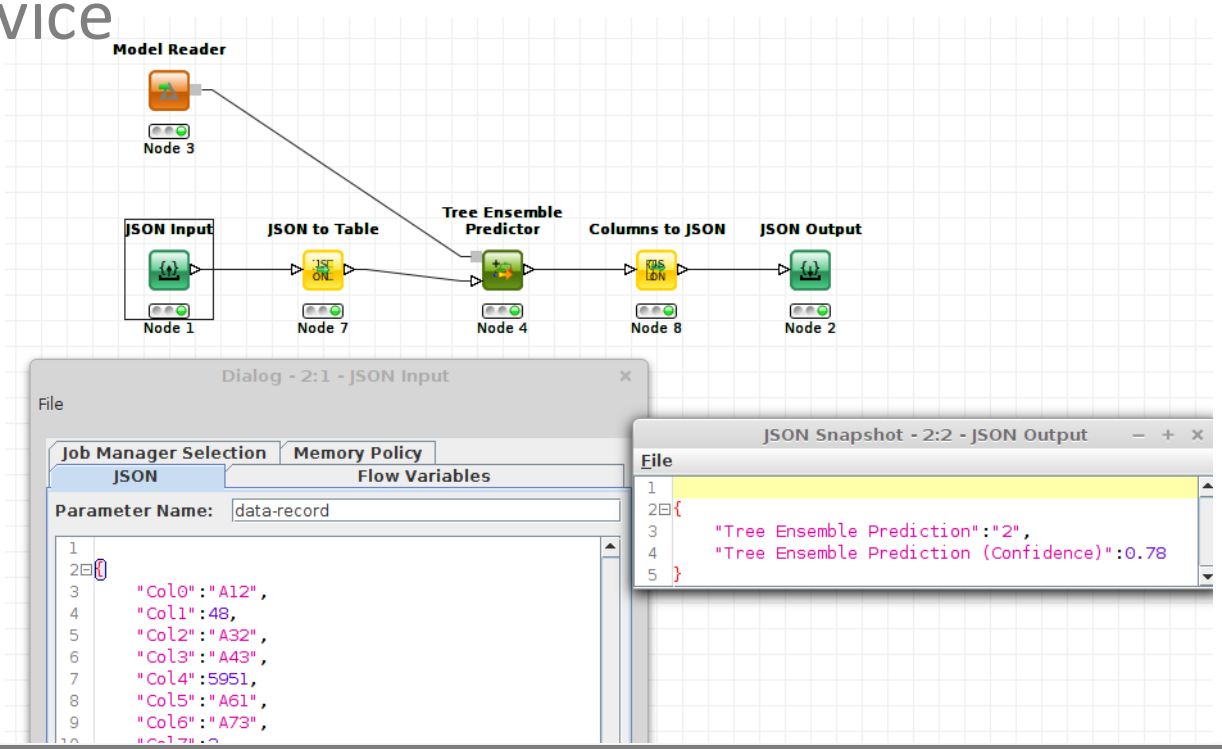
JSON Type & Utility Nodes - Applications

- Web Service consumption ((K)REST)
- NoSQL databases / MongoDB
- KNIME Web Service



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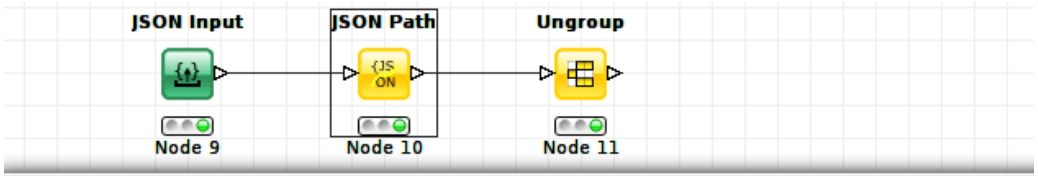
JSON – “JSON Path”




```
1
2 {
3     "UGM sessions":{
4         "session title":"Money, Love and Gamb
5         "talks":[
6             {
7                 "presenter":"Jörg Neumann",
8                 "title":"Successful Cross Sel
9                 "duration":30
10            },
11            {
```

Dialog - 2:10 - JSON Path

File

Settings | Flow Variables | Job Manager Selection | Memory Policy

Input column: JSON ON json

Remove source column

New column: Presenters

Path: $.['UGM sessions'].['talks'].[*].['presenter']

Return the paths instead of values

Data table - 2:11 - Ungroup

File

Table "default" - Rows: 3 | Spec - Columns: 2 | Properties | Flow Variables

Row ID	JSON ON json	S Presenters
Row0_1	{ "UGM sessions":{ "session title":"Money, "talks":[{	
Row0_2	{ "UGM sessions":{ "session title":"Money, Love and Gambling", "talks":[{	Cathy Pearl
Row0_3	{ "UGM sessions":{ "session title":"Money, Love and Gambling", "talks":[{	Walter Bonifazi

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

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