

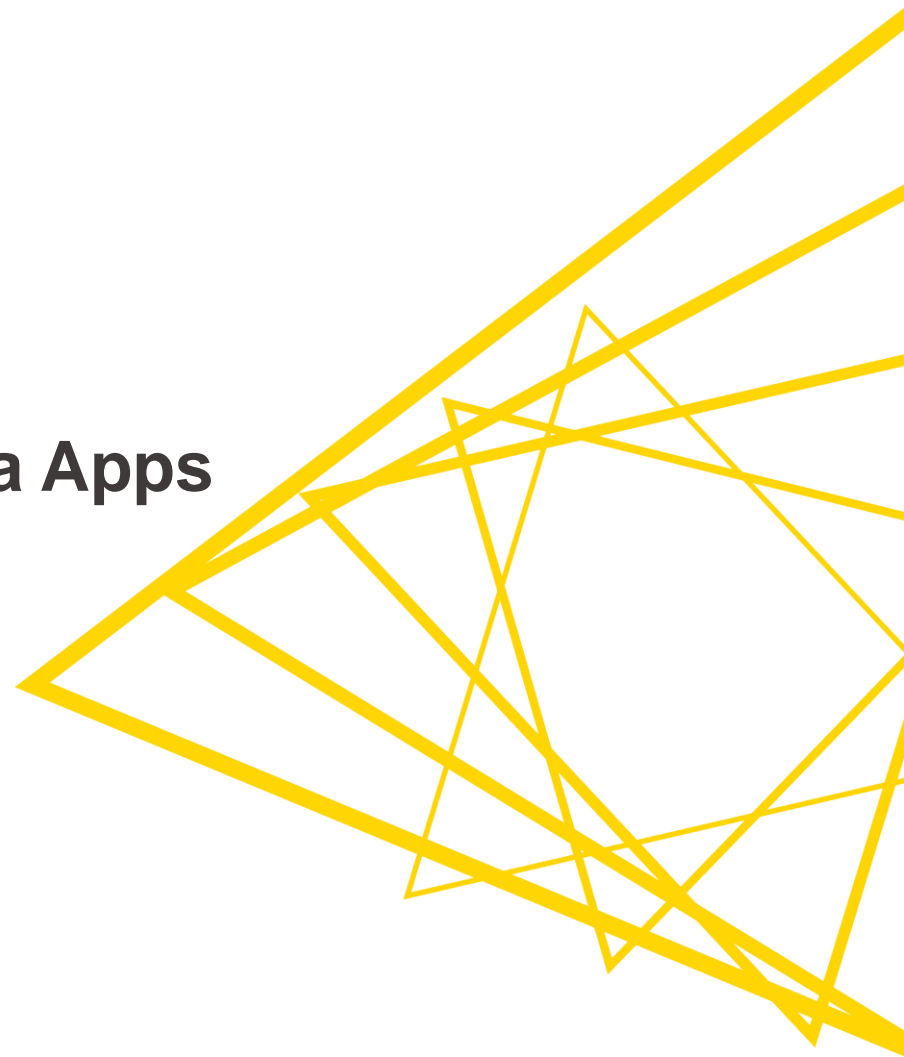


Open for Innovation

KNIME

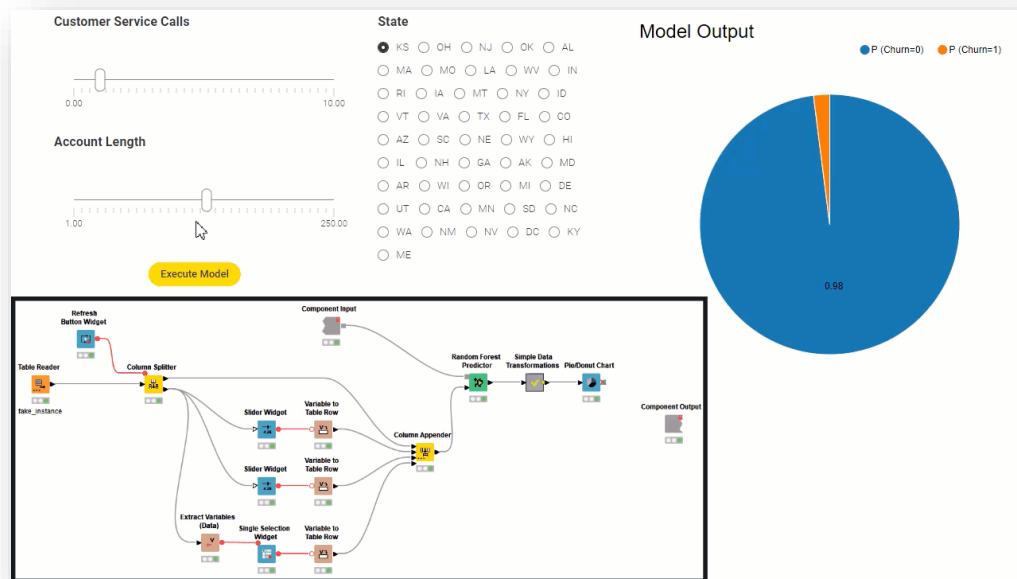
[L3-DA] Productionizing Data Apps

KNIME GmbH



Who is this Course for?

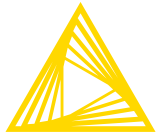
- Anyone who uses (or wants to use) KNIME to:
 - Deploy, share, and monitor data applications that should be made public
 - Build interactive interfaces for data science solutions without using a frontend language
 - Create analytical dashboards that help communicate and share solutions and findings



Structure of the Course

Session	Topic	Duration
Session 1	What happens after the prototype is ready for deployment?	75 min
Session 2	Introduction to KNIME Business Hub	75 min
Session 3	Data Apps	75 min
Session 4	Performance optimization, orchestration, error handling	75 min
Session 5	Wrap-up Session	15 min

Hands on exercises will be provided at the end of each session

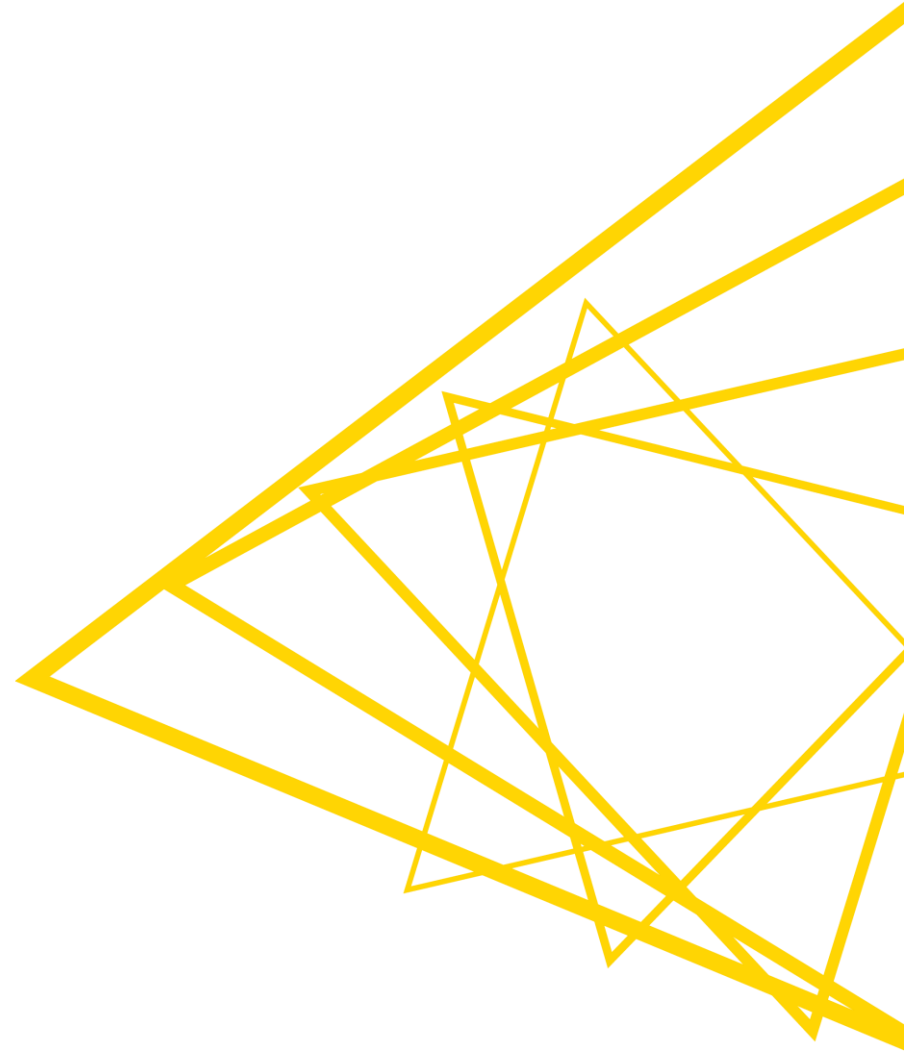


Open for Innovation

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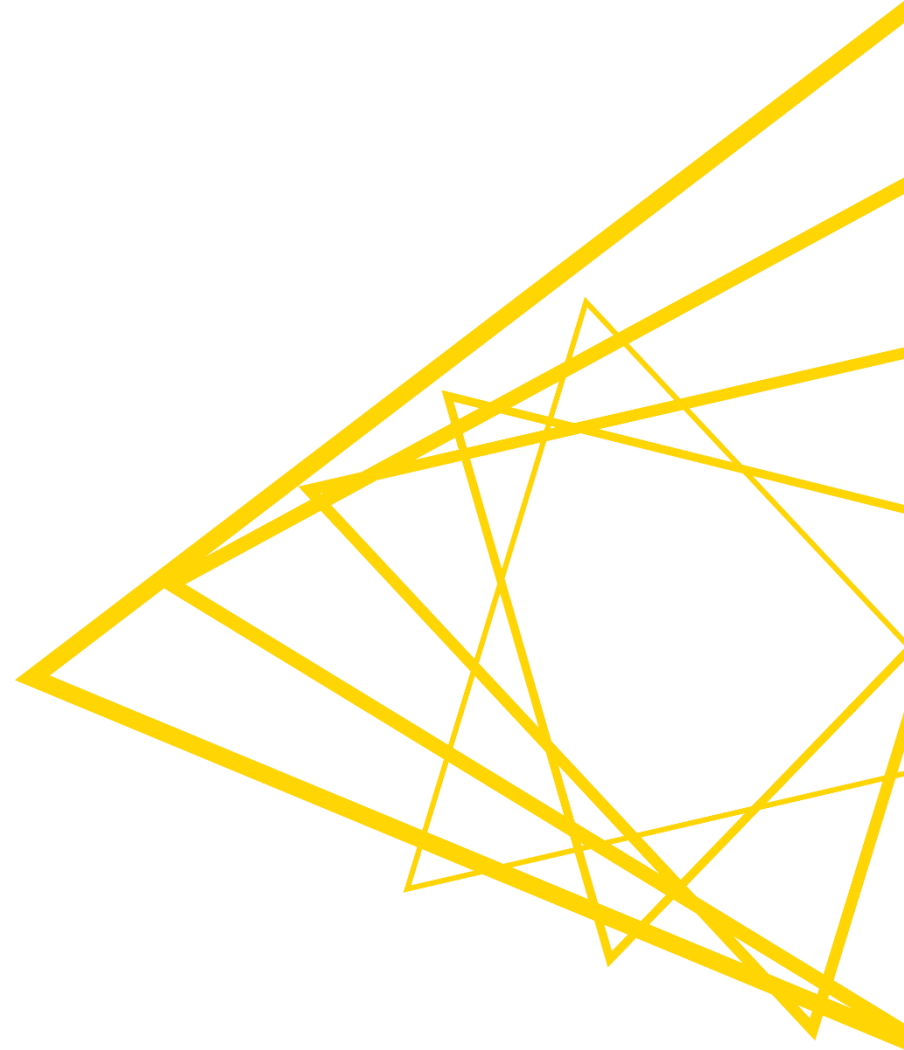
Session 1

What Happens after the Prototype Is Ready for Deployment?

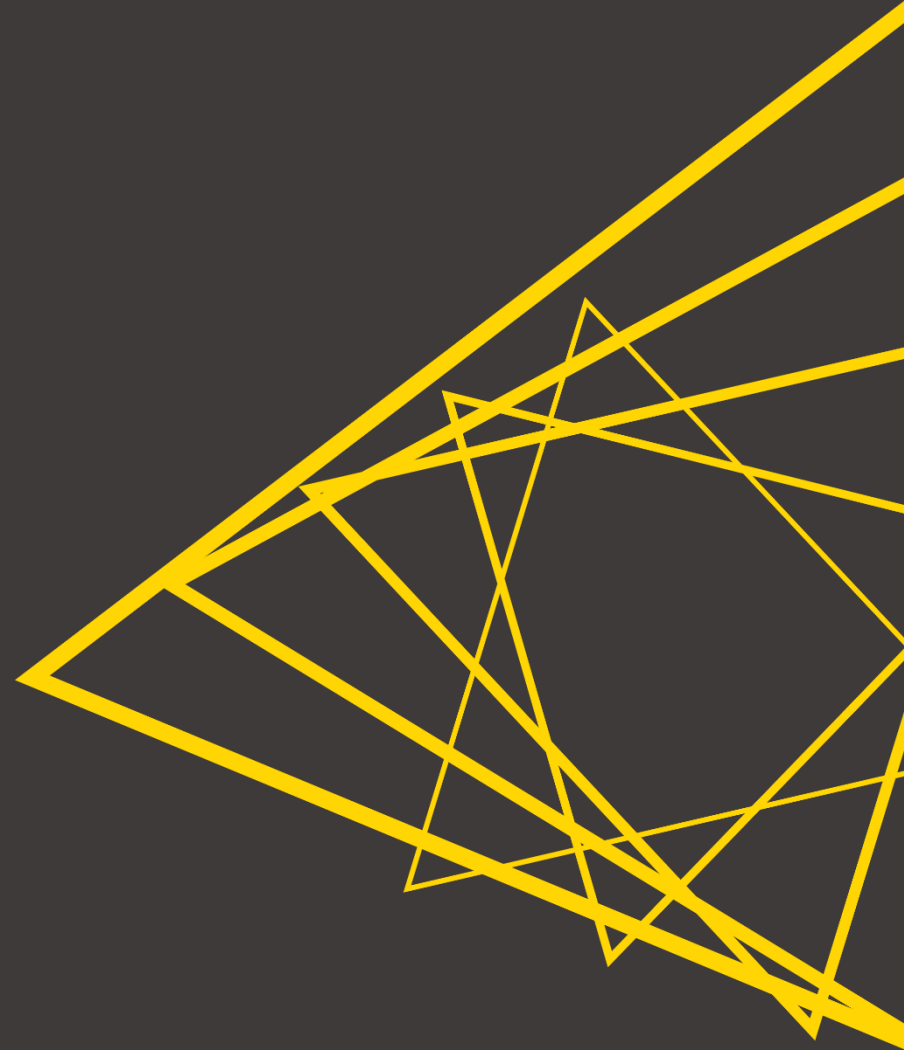


Learning Objectives

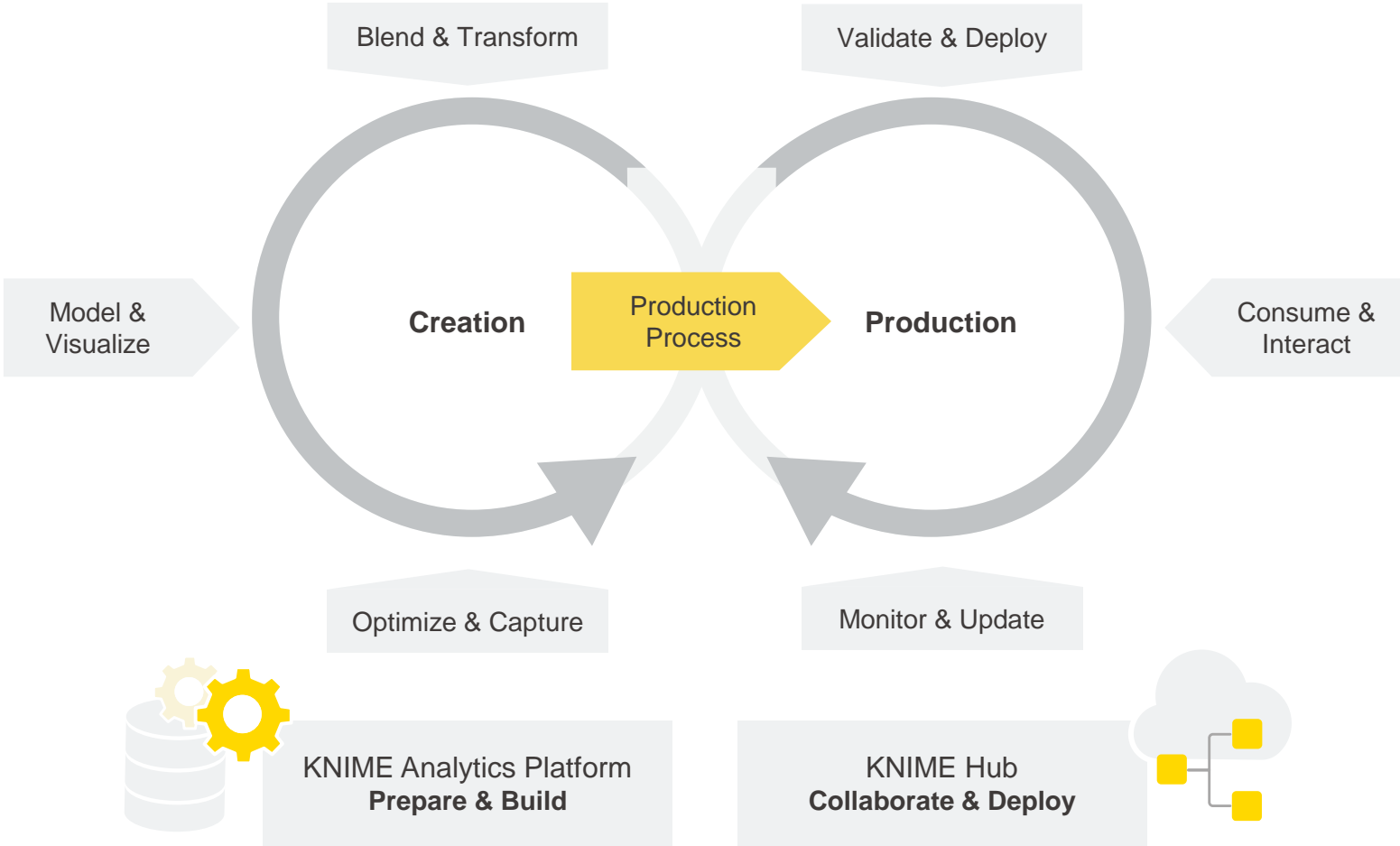
1. Identify the phases of the Data Science Life Cycle
2. Understand the applications of Integrated Deployment and Workflow Services
3. Identify differences and similarities between Integrated Deployment and Workflow Services
4. Use the tools to test workflows, components, and workflow segments
5. Identify the steps to deploy a workflow



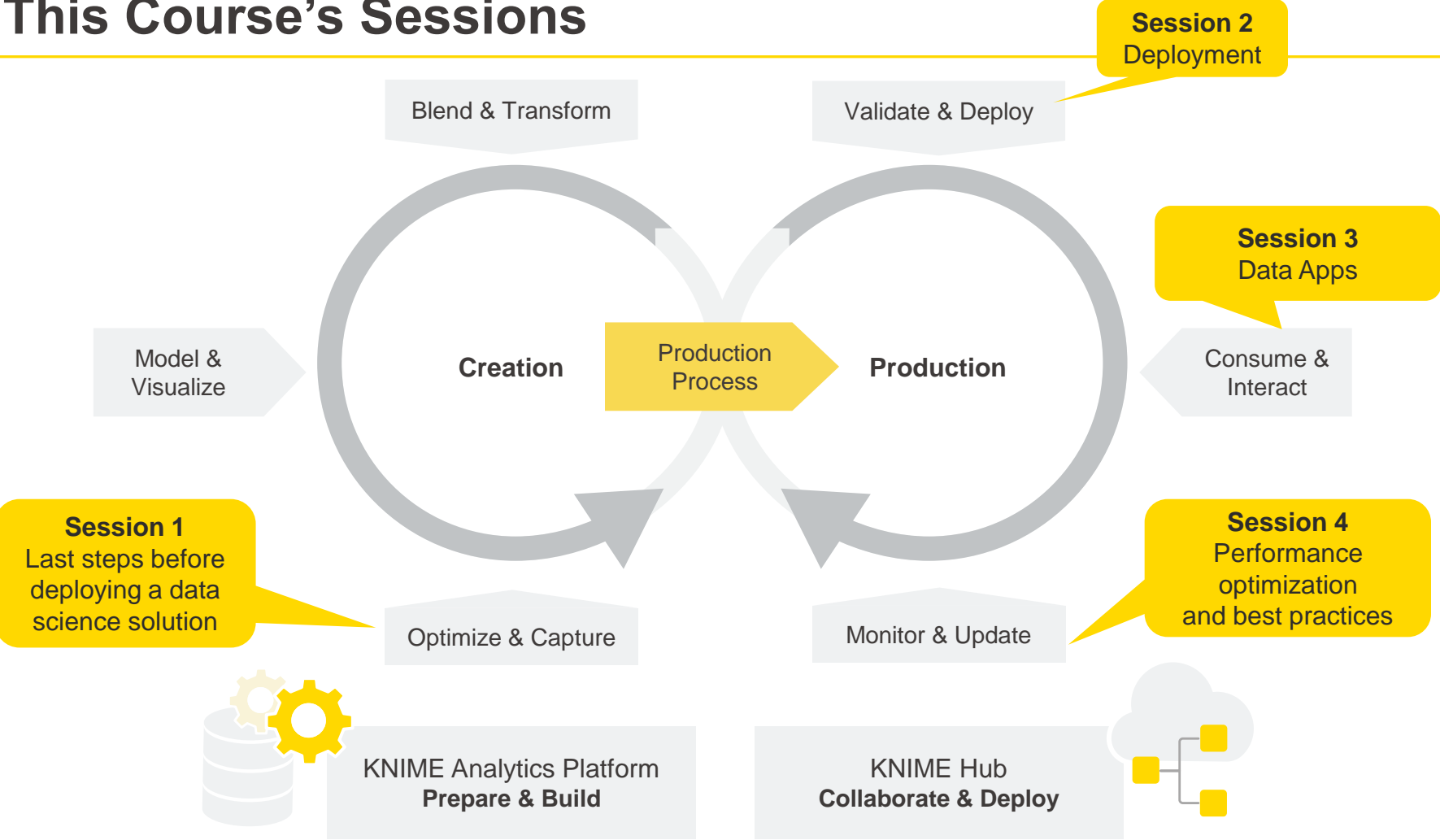
The Data Science Life Cycle



The Data Science Life Cycle

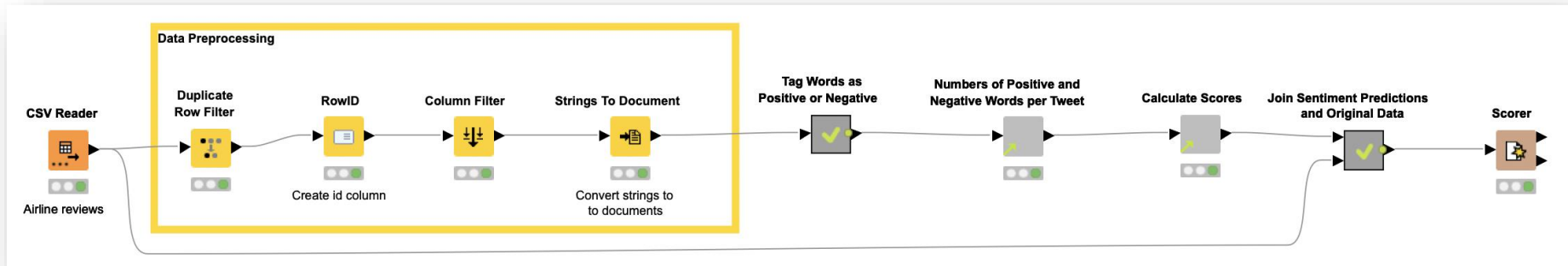


This Course's Sessions



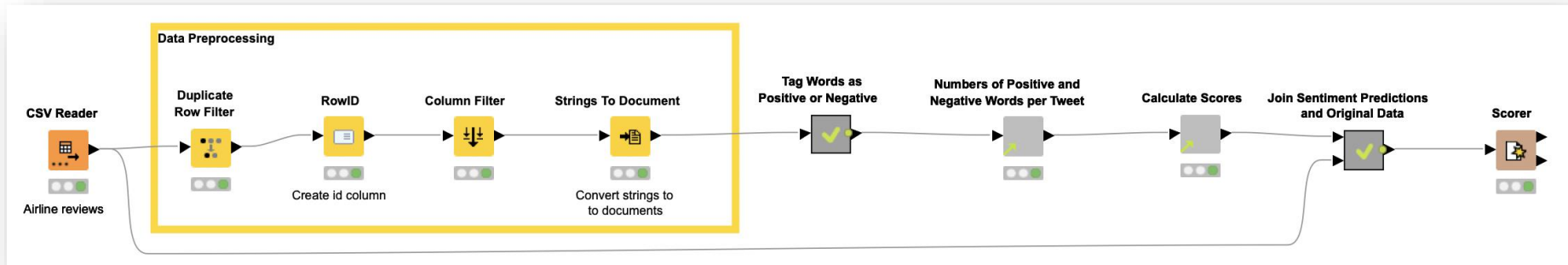
Today's Example

- **Goal:** Productionize a Sentiment Analysis application
 - Lexicon-based predictor: sentiment scores
 - Proof of concept: predictions for a [Kaggle dataset](#) with 14K customer tweets on six US airlines
 - Tweets are labeled as positive, negative, or neutral

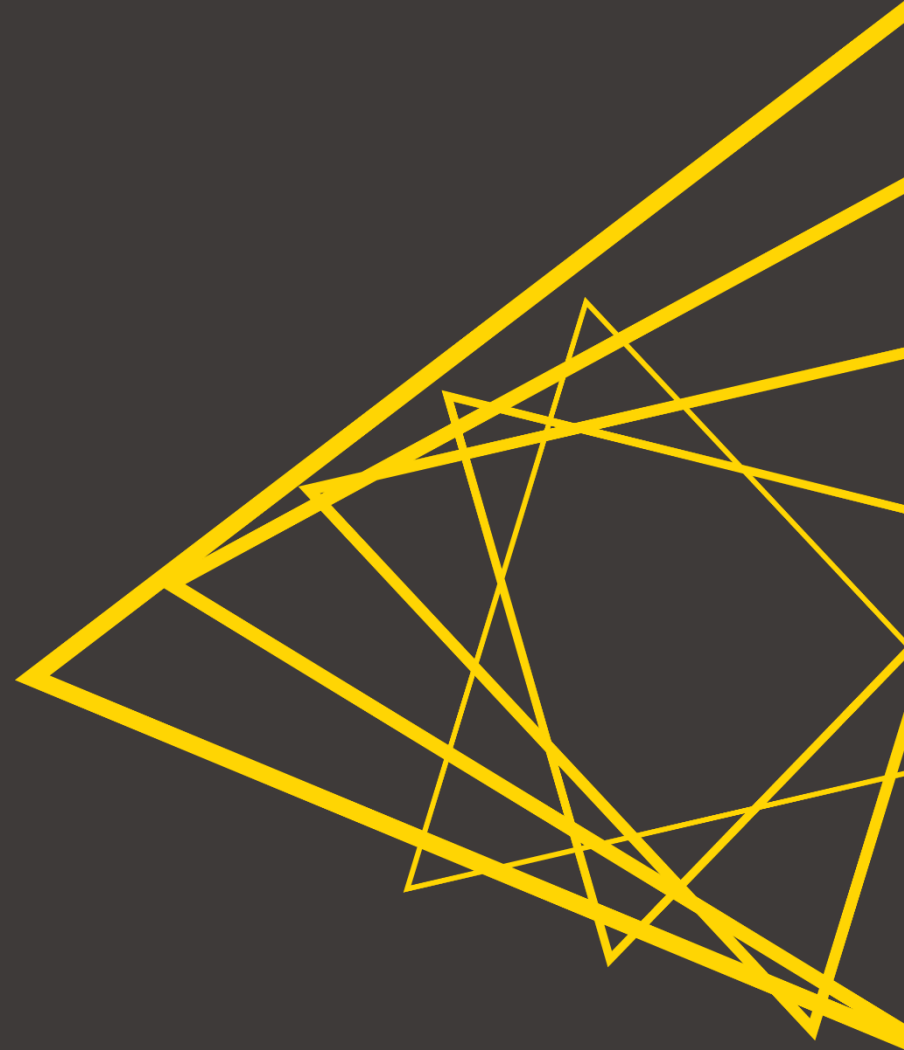


Today's Example

- How can we **test** the different parts of this application for deployment?
- How can we **deploy** it?



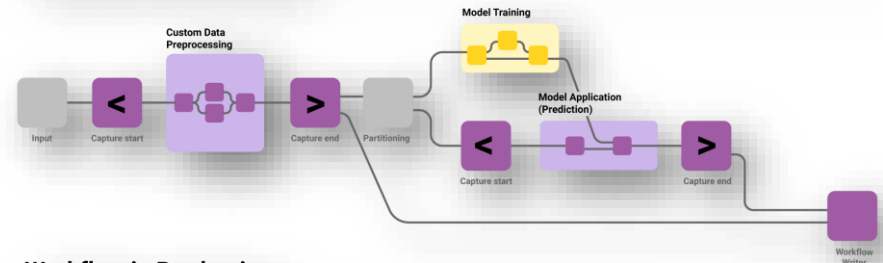
Integrated Deployment



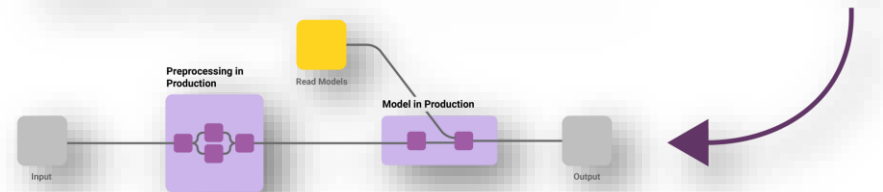
Integrated Deployment

- Integrated Deployment allows you to **capture core segments of your workflow for reuse**
 - Facilitates **independent testing** of different workflow functionalities
 - Facilitates **deployment of relevant parts** of a workflow (e.g., custom data preprocessing, model application for prediction)
- Captured segments are saved automatically as workflows with all the relevant settings and transformations
- Captured segments can be automatically reused with no changes or manual work required

Creating Prediction Model



Workflow in Production



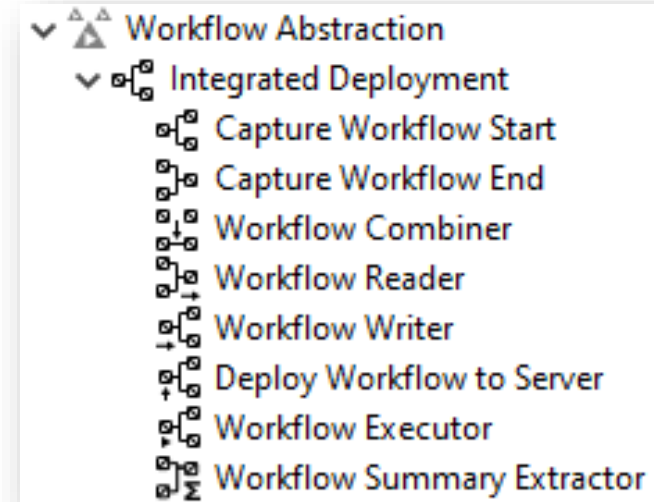
Integrated Deployment

■ Benefits

- Time savings
- Fewer errors
- Increased compliance
- Optimized processes

■ Use cases

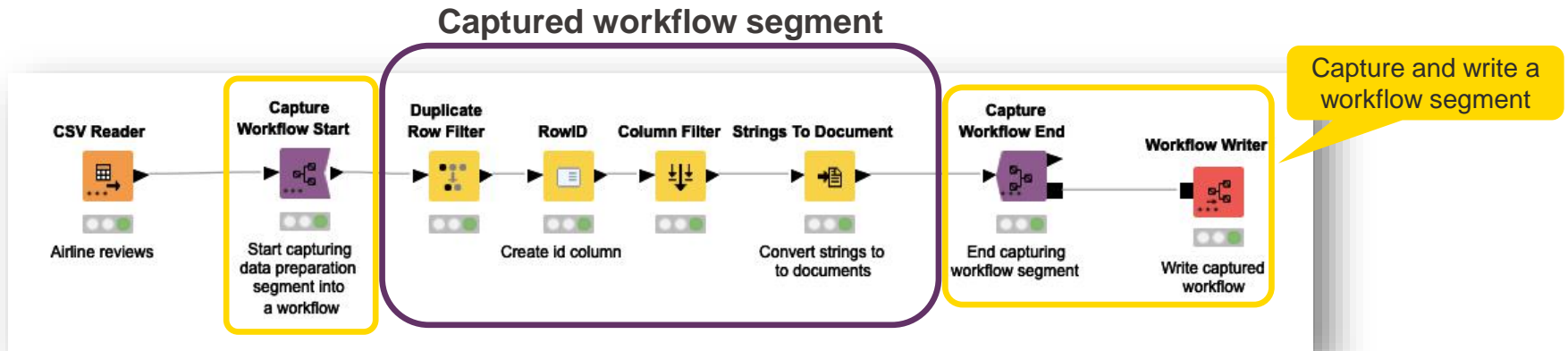
- Data pipeline deployment
- Model deployment
- Ad-hoc testing
- Workflow summary extraction



Since we are discussing testing and deployment today, Integrated Deployment is relevant

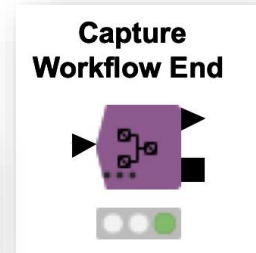
Capturing and Writing Workflow Segments

- Capture a workflow segment and save it using Integrated Deployment nodes



Capture Workflow End Node

- Marks the end of a “to be captured” workflow segment



Dialog - 5:889 - Capture Workflow End (End capturing)

Settings | Input and Output IDs | Flow Variables | Job Manager Selection ▶

Input data

Store input tables

Maximum numbers of rows to store

Variables

Propagate variables

Modify captured segment

Disconnect links of components and metanodes

Custom workflow name

OK Apply Cancel ?

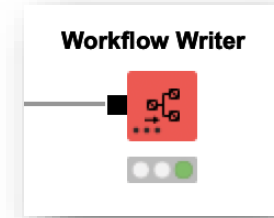
If checked, input tables at the extracted workflow's will be stored

If checked, variables defined (or modified) within the *Capture* block are propagated downstream

If left empty, the original name will be taken.

Workflow Writer Node

- Write captured workflow to selected output location



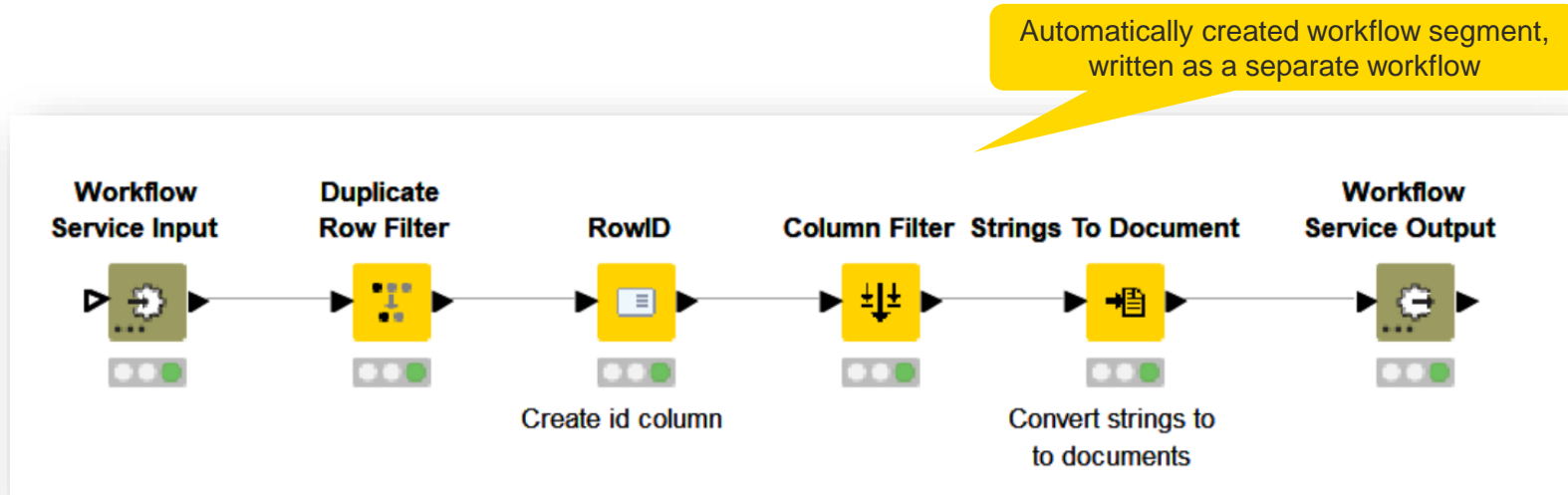
The image shows two overlapping dialog boxes from the Workflow Writer node. The background dialog is titled "Dialog - 7:2405 - Workflow Writer" and has tabs for "Settings", "Deployment Options", "Inputs and outputs", "Flow Variables", and "Job Manager Selection". It is currently on the "Settings" tab. The "Output location" section has "Write to" set to "Relative to" and "Current workflow". The "Folder" is set to "../Workflow_Segments". The "Write options" section has "Create missing folders" unchecked. The "Workflow" section has "If exists" set to "Overwrite" and "Use custom workflow name" checked. The "Custom workflow name" is "01.Captured_Segment_1_D".

The foreground dialog is titled "Dialog - 7:2408 - Workflow Writer" and is on the "Inputs and outputs" tab. It has sections for "Add input node" and "Add output node". The "Add input node" dropdown is open, showing options: "None", "Workflow Service Input" (selected), "Container Input (Table)", and "Container Input (Row)". The "Parameter name" is "workflow-input". The "Add output node" dropdown is set to "Workflow Service Output". The "Parameter name" is "workflow-output".

Two yellow callout boxes provide instructions: one points to the "Add input node" dropdown with the text "Add input node to send data to the workflow you are writing", and another points to the "Add output node" section with the text "Add output node to get data from the workflow you are writing".

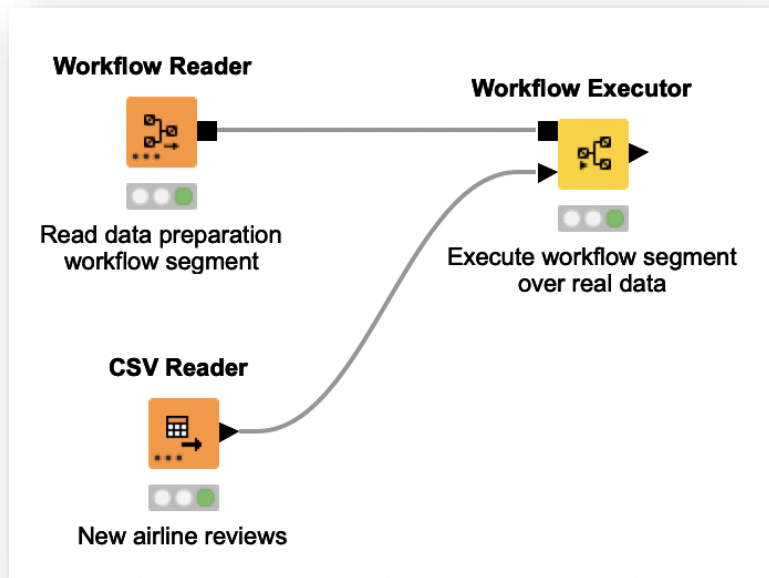
Written Workflow Segment

- Automatically capture a workflow segment and save it using Integrated Deployment nodes



Reading and Executing Workflow Segment

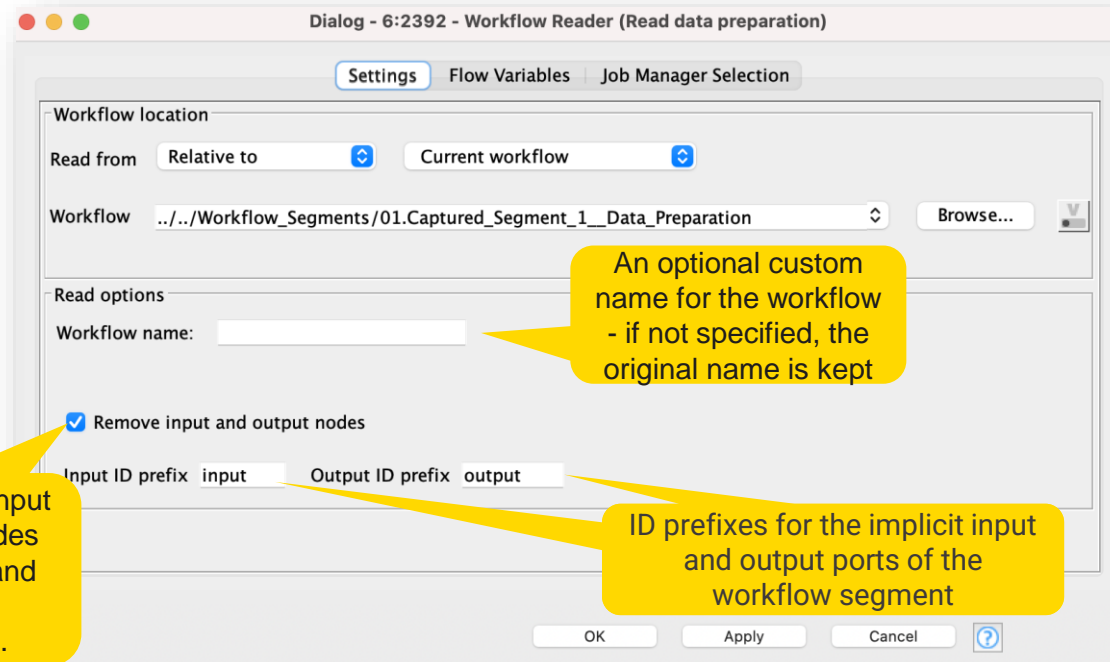
- The Workflow Reader node can be used in conjunction with the Workflow Executor node



Read a workflow segment and execute it using Integrated Deployment nodes

Workflow Reader Node

- Reads a single workflow into a workflow port object



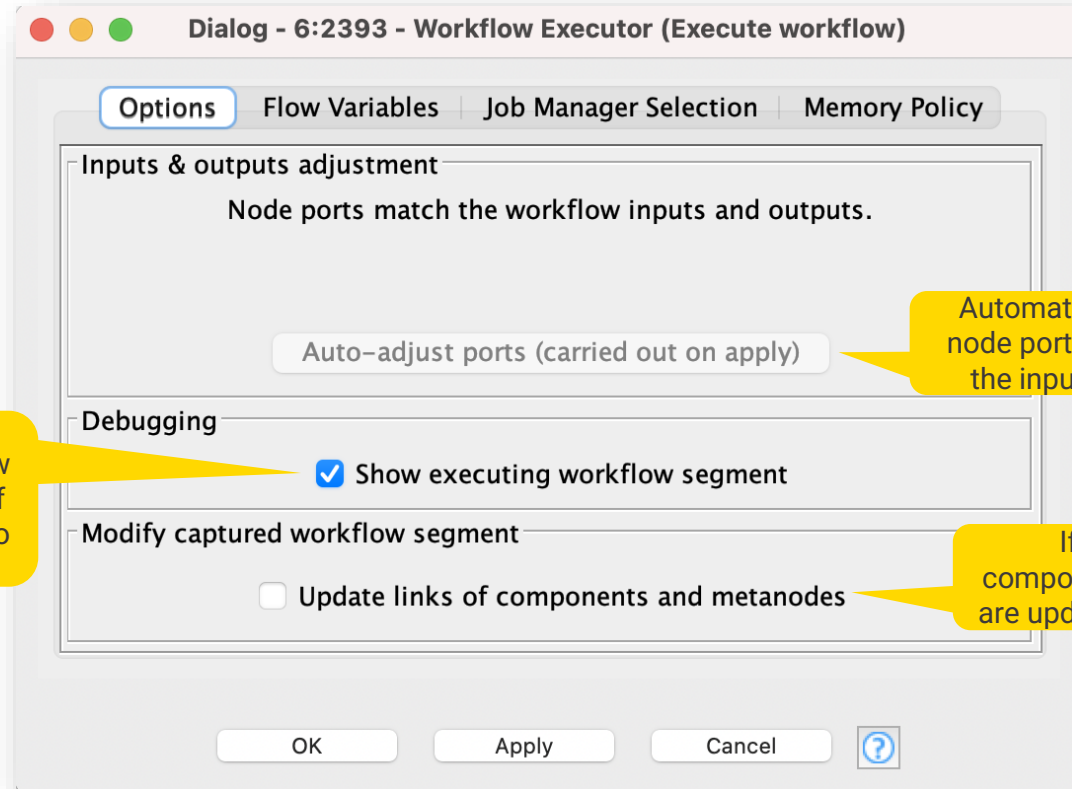
An optional custom name for the workflow - if not specified, the original name is kept

If checked, all input and output nodes are removed and implicitly represented.

ID prefixes for the implicit input and output ports of the workflow segment

Workflow Executor Node

- Executes a workflow provided at the workflow input port



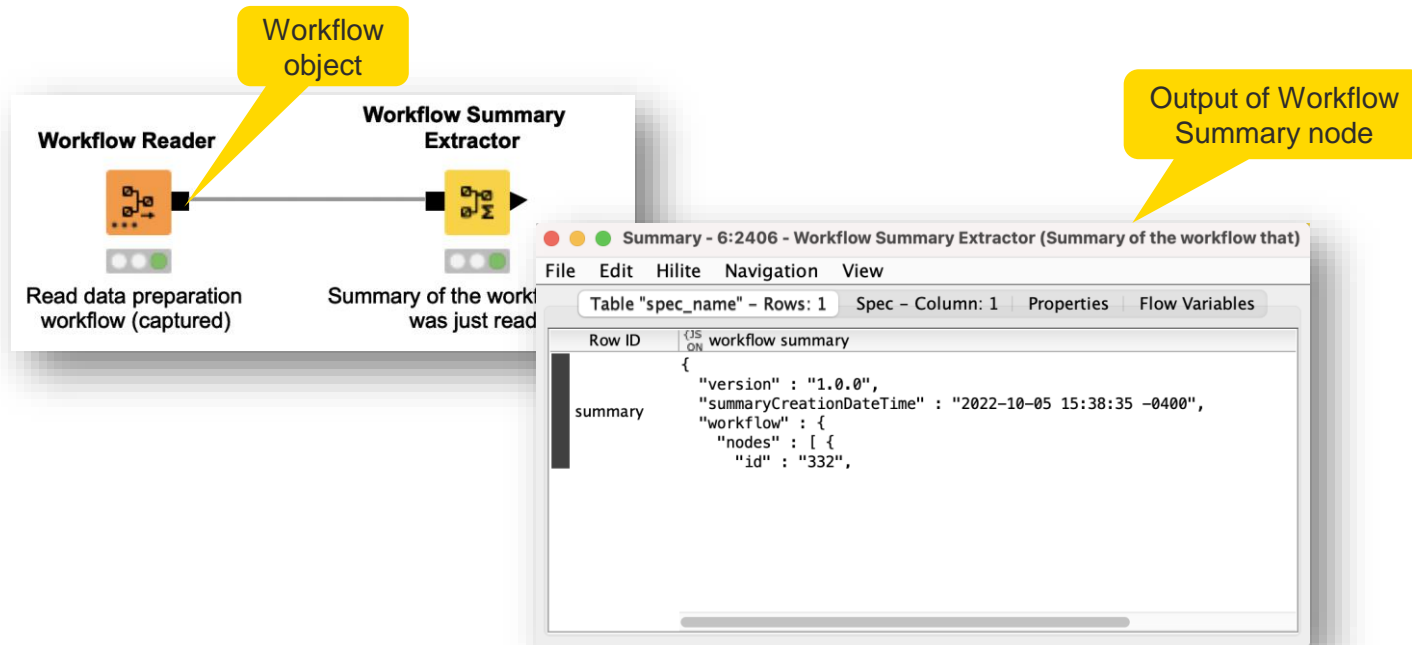
Automatically adjust the node ports with respect to the inputs and outputs

If enabled, the executing workflow is visible as part of a metanode next to this node.

If enabled, linked components and metanodes are updated before execution

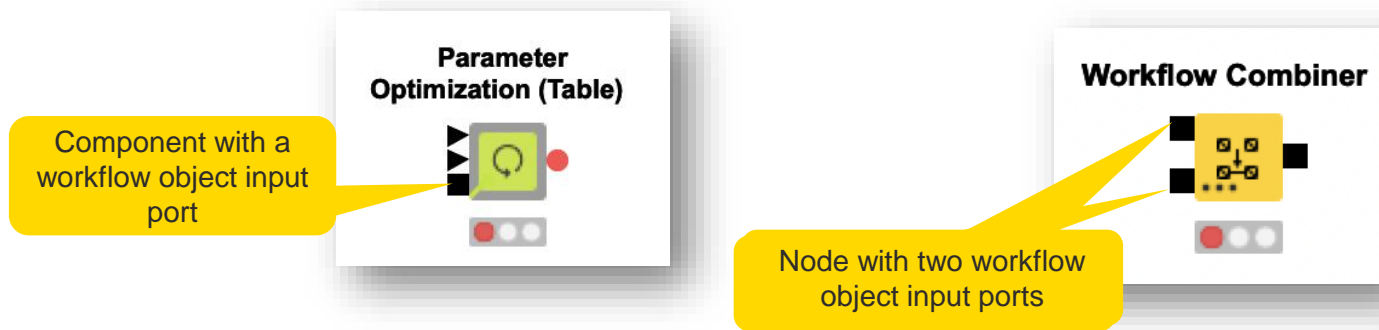
When to Use the Workflow Reader Node?

- If you want to read a workflow object, even if you do not want to execute it right away
 - e.g., if you want to use the Workflow Summary Extractor node to analyze the workflow that was just read



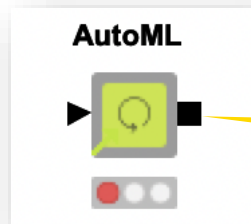
When to Use the Workflow Reader Node?

- If you want to read a workflow object and provide it to a node or component as input
 - The treatment of the workflow object is delegated to the node or component

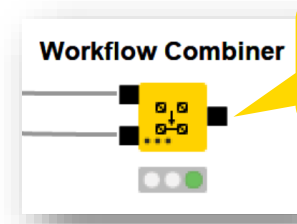


When to Use the Workflow Executor Node?

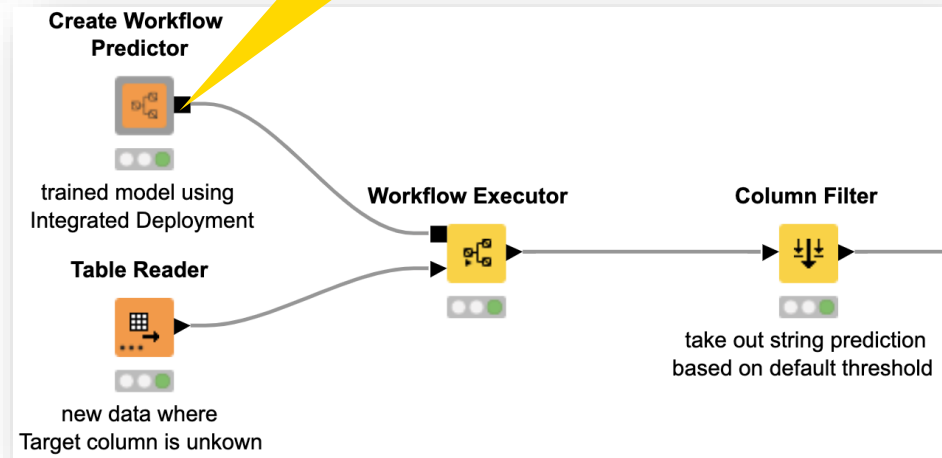
- When you want to execute a workflow object that is the output of a node or component



The output of these components are workflow objects

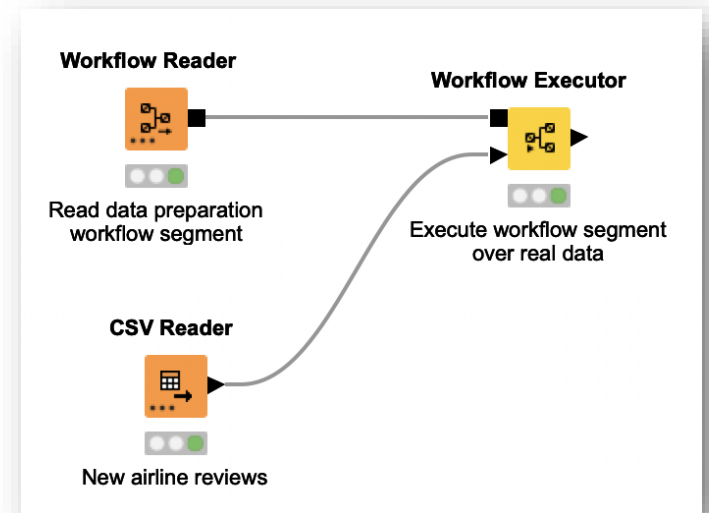


The output of this node is a workflow object

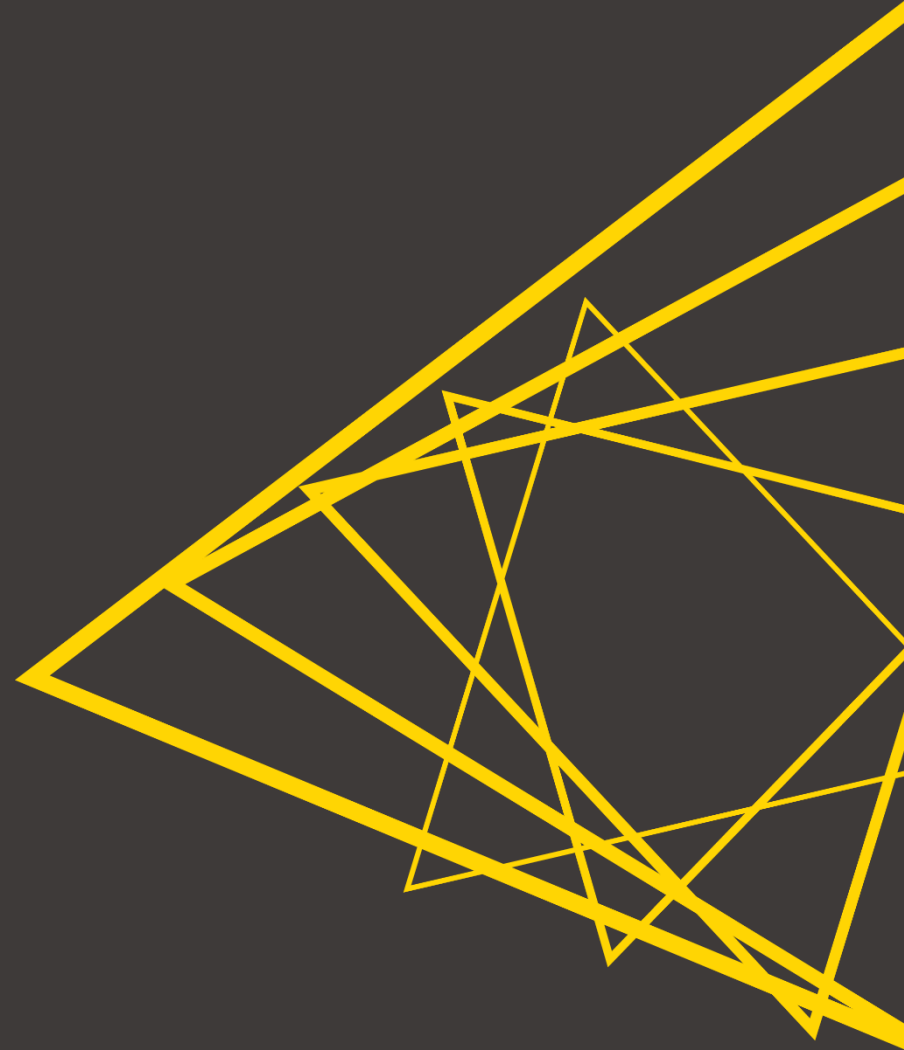


Disadvantages: Workflow Reader and Workflow Executor

- The Workflow Reader node cannot access the data area of the workflow that is read
 - If that data is used during execution, the workflow will crash
- The Workflow Reader node does not read any partially executed workflow - everything gets reset

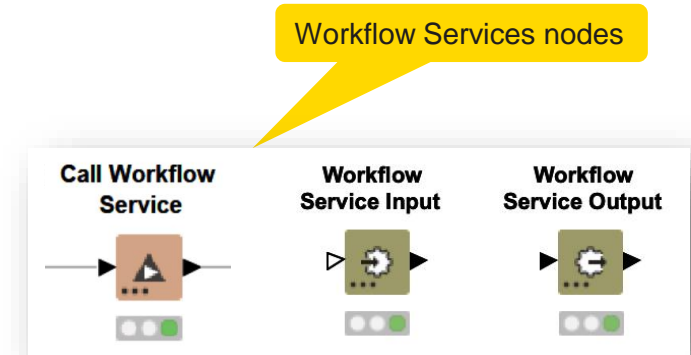


Workflow Services



Workflow Services

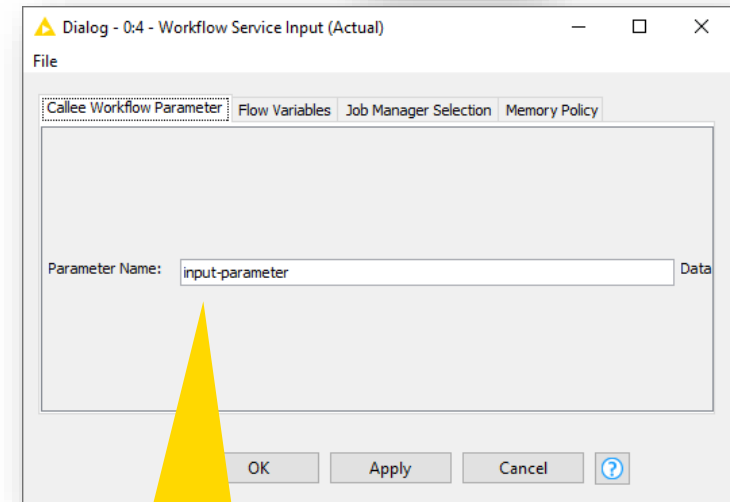
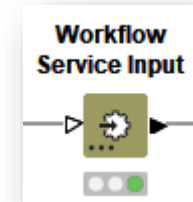
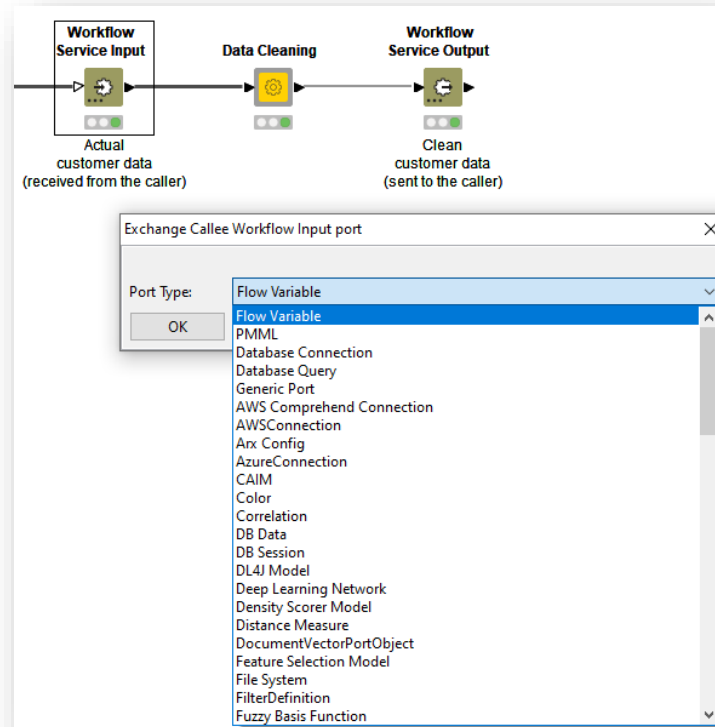
- Workflow Services allow a workflow (caller) to invoke other workflows (callees)
 - Send input to, execute, and obtain output of callee workflows
- Workflow Services:
 - For **KNIME use** only - easier and **faster** to call KNIME workflows from other workflows
 - KNIME native API endpoints – no serialization into/from JSON-objects
 - Share text, models, and many more data types
 - Are commonly used to orchestrate workflows (**Session 4 of this course**)



Since we will be discussing deployment today, the efficiency and flexibility of these nodes is relevant

Workflow Service Input Node

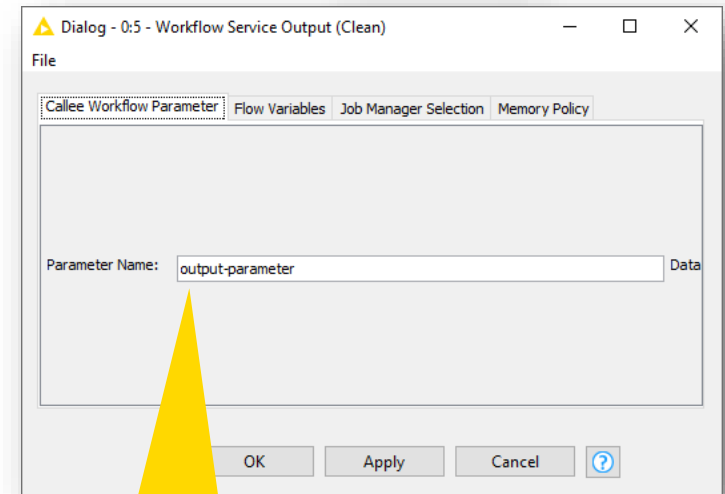
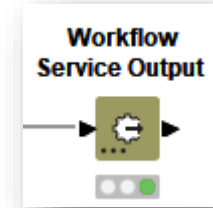
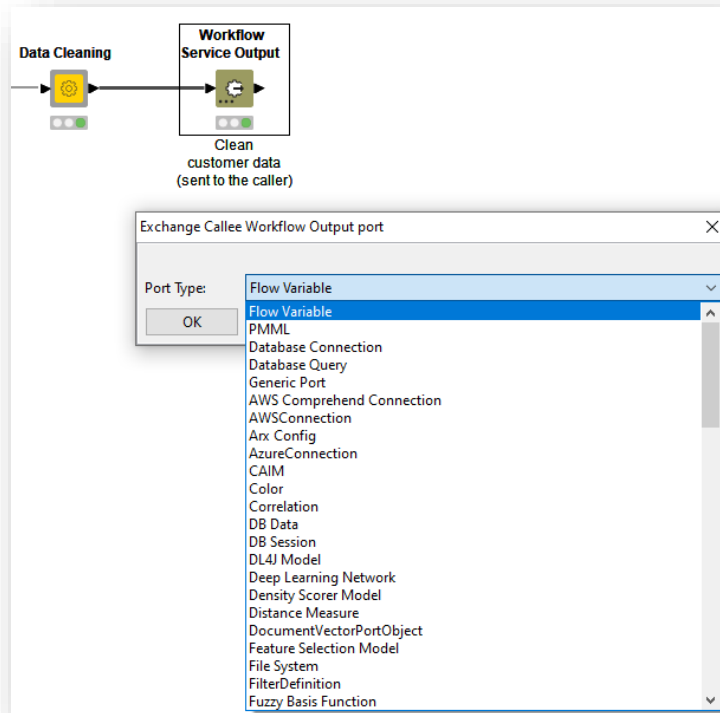
- Receives an object from a caller workflow
- Various port types are available



Give this parameter a meaningful name to recognize it from the Caller workflow

Workflow Service Output Node

- Sends an object to a caller workflow
- Various port types are available



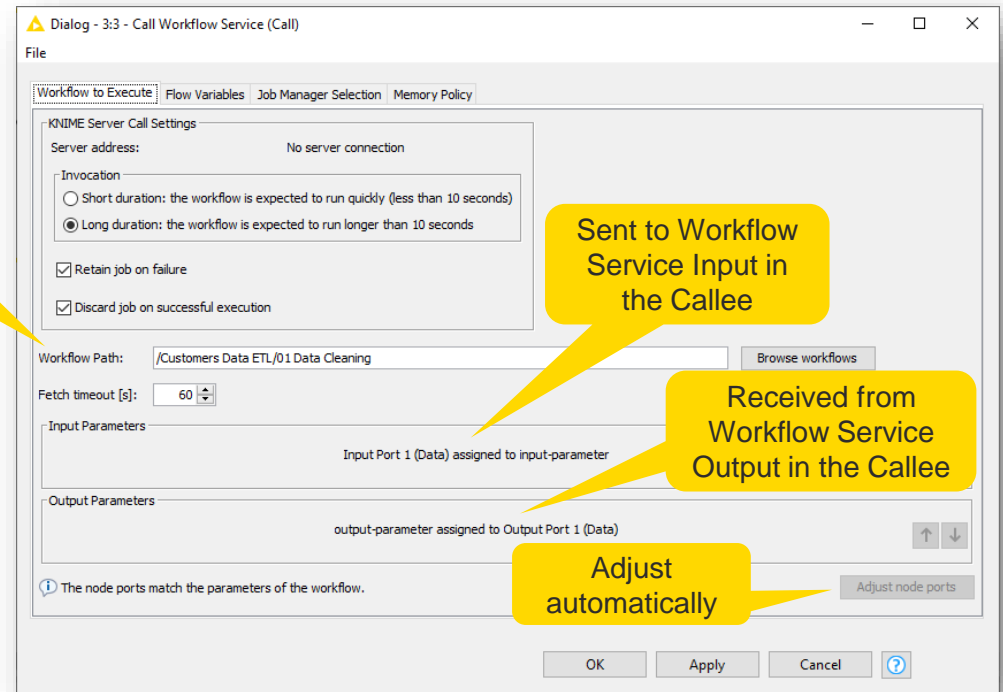
Give this parameter a meaningful name to recognize it from the Caller workflow

Call Workflow Service Node

- Calls other local and remote workflows
- Ports are adjusted automatically in accordance with the callee workflow selected in the configuration dialog
 - Various port types, multiple ports



Path to the Callee



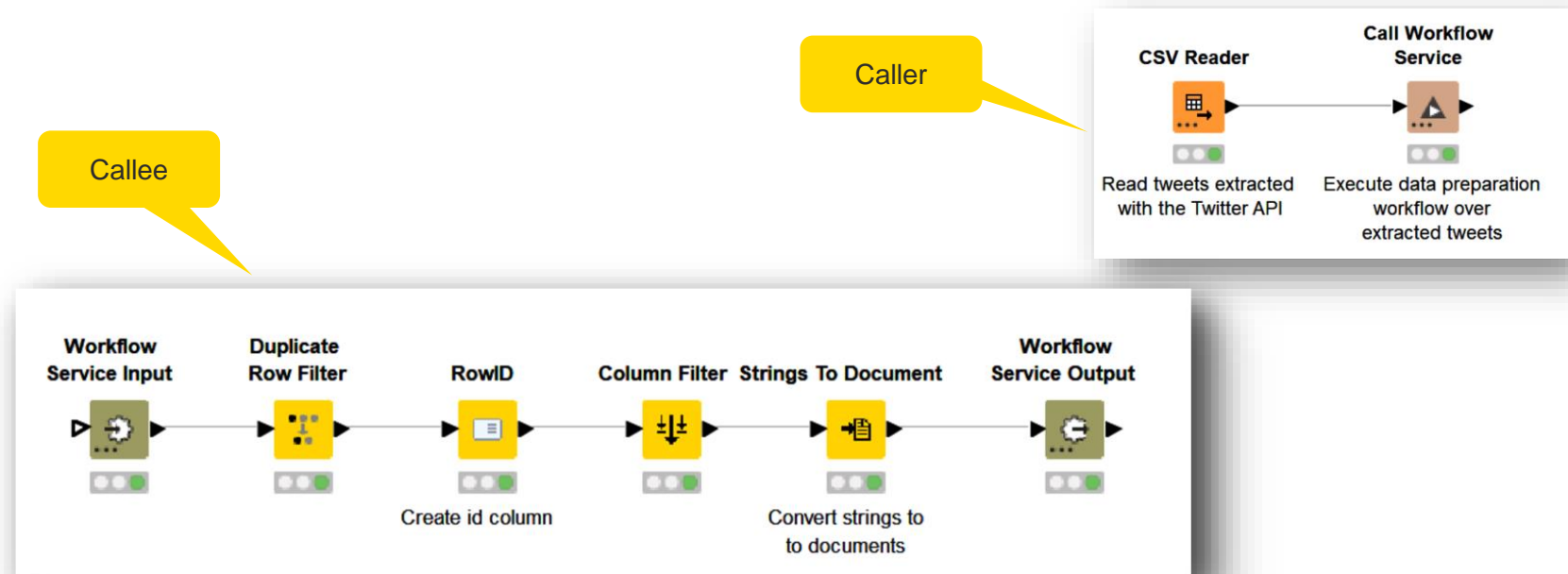
Sent to Workflow Service Input in the Callee

Received from Workflow Service Output in the Callee

Adjust automatically

When to Use the Call Workflow Service Node?

- The Call Workflow Service node can be used any time we want a workflow (caller) to invoke another workflow (callee)
 - Send input to, execute, & receive results from callee workflow

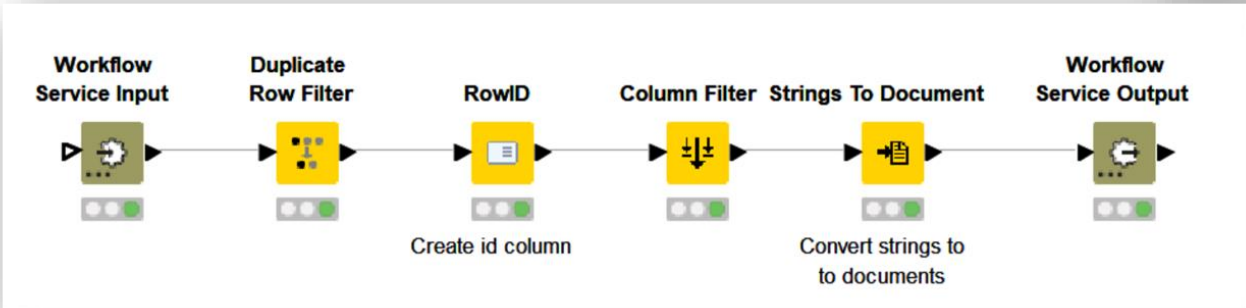
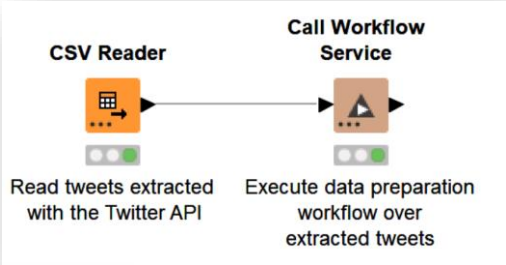


Advantages: Call Workflow Service

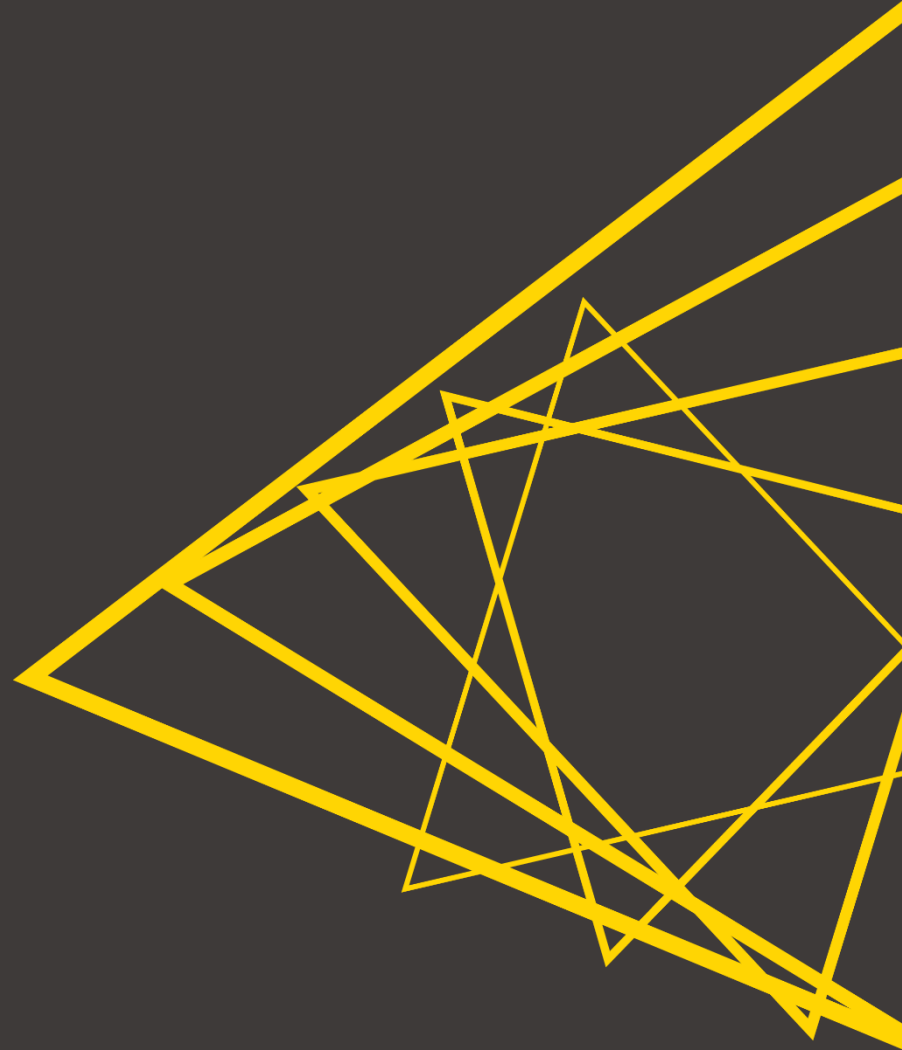
- Advantages w.r.t. Workflow Reader and Workflow Executor nodes:
 - It handles the data areas of invoked workflows adequately
 - It leverages the infrastructure of KNIME Business Hub, leading to better scalability
 - It is more efficient than using Workflow Reader and Workflow Executor nodes

Callee

Caller



Testing



Testing is a Form of Validation

- Why test?
 - Guarantee that a KNIME workflow, component, or workflow segment works as expected
 - Detect issues as early as possible
- When to test?
 - Regularly
 - After changes in the environment
 - For example, new KNIME Analytics Platform release or updates in the workflow
 - **Test before deployment** and create a testing framework for future redeployments
- How to test?
 - Tests should be automated
 - Separate special workflows (testflows) comparing expected outcomes with the actual outcomes of components, workflows, or workflow segments

Different Types of Test

- **Unit test**
 - Checks if a small part of the workflow that can be logically isolated (e.g., a component) is behaving correctly
- **Application test**
 - Checks if an entire application meets functionality, usability, or consistency requirements
- **Model test**
 - Checks if a model reaches the expected performance, and/or behaves as expected for given inputs
- **Integration test**
 - Checks if the integration across different modules in an application works as intended (e.g., the modules communicate without issues)
- **Stress test**
 - Checks if an application is stable and reliable under “stressful” conditions (e.g., too many requests or too much data)

Different Types of Test

- **Unit test**

- Checks if a small part of the workflow that can be logically isolated (e.g., a component) is behaving correctly

Focus today

- **Application test**

- Checks if an entire application meets functionality, usability, or consistency requirements

- **Model test**

- Checks if a model reaches the expected performance, and/or behaves as expected for given inputs

- **Integration test**

- Checks if the integration across different modules in an application works as intended (e.g., the modules communicate without issues)

- **Stress test**

- Checks if an application is stable and reliable under “stressful” conditions (e.g., too many requests or too much data)

Testflows for Unit and Application Tests

- Testflows – KNIME workflows that
 - Provide test input (“golden” or baseline tables or files) to a workflow
 - Check that the outputs align with the test input, otherwise raise alerts
 - Check that things work OR that things break in an expected way

Possible issues

Failing for unexpected reasons, wrong output, unexpected error messages

Possible reasons

Invalid inputs, configuration, changes during an update, changes in external services

“Golden” Tables, Data, Files, etc.

- Golden table is a small sample of input or output data used in the test (same for golden data, files, etc.)
 - Input golden table – processed input to be supplied to the object of testing
 - Output golden table – expected result of the object of testing
- Do not process the golden data to avoid new errors
- Do not change the golden data
 - Keep in the separate folder for testing
 - Restrict permissions if possible

Testing in KNIME Analytics Platform

- KNIME Testing Framework UI extension
- Additionally, use other nodes to set up your custom tests

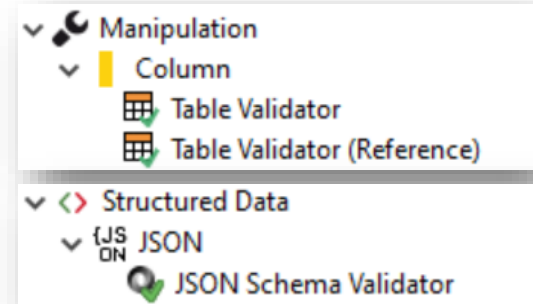
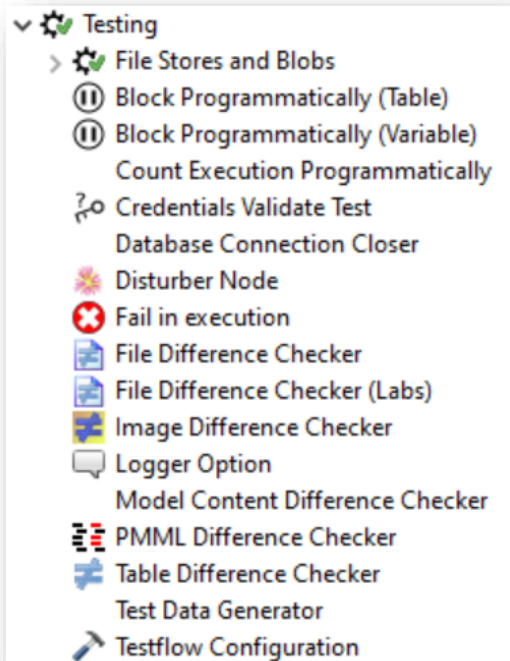


Table Difference Checker & Table Difference Finder Nodes

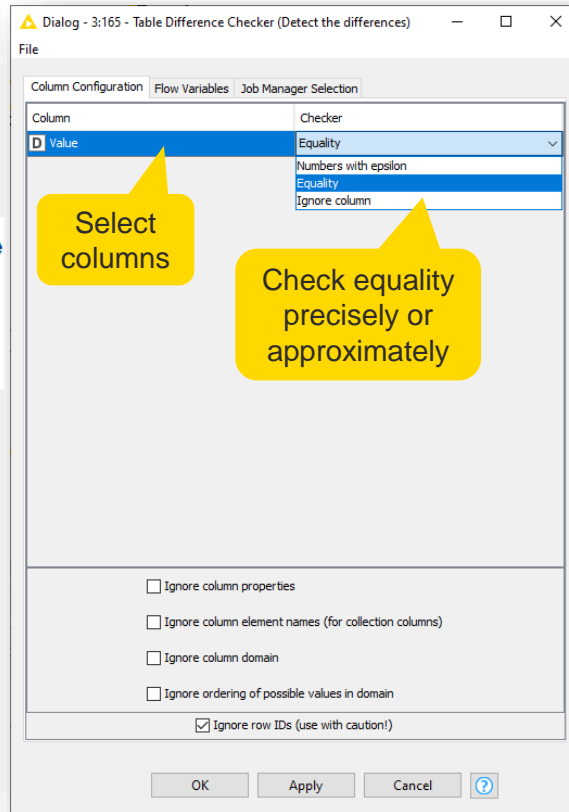
- Determine if there is any difference between two tables

Fails if there are differences

Actual output

Table Difference Checker

Output golden table



Select columns

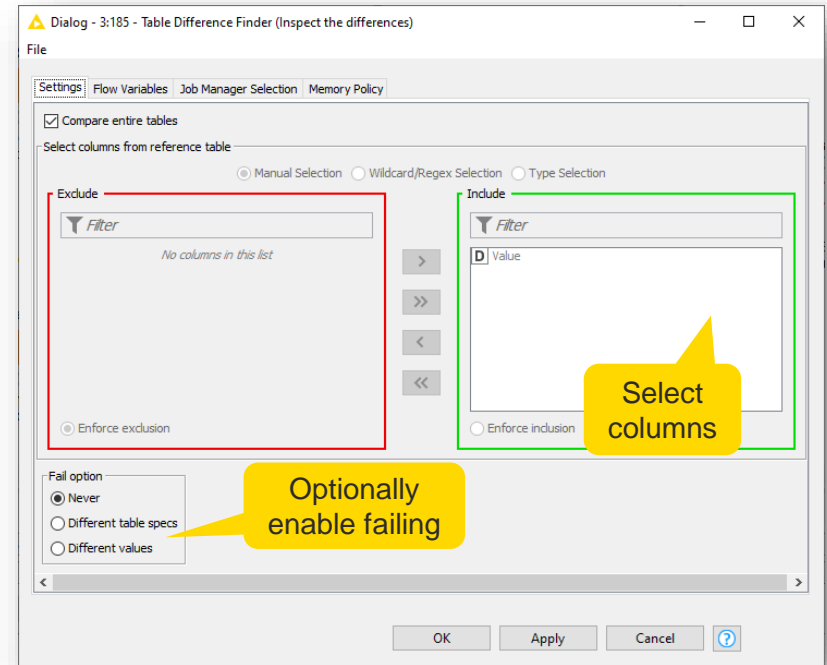
Check equality precisely or approximately

Returns the differences

Table Difference Finder

Value differences

Domain differences



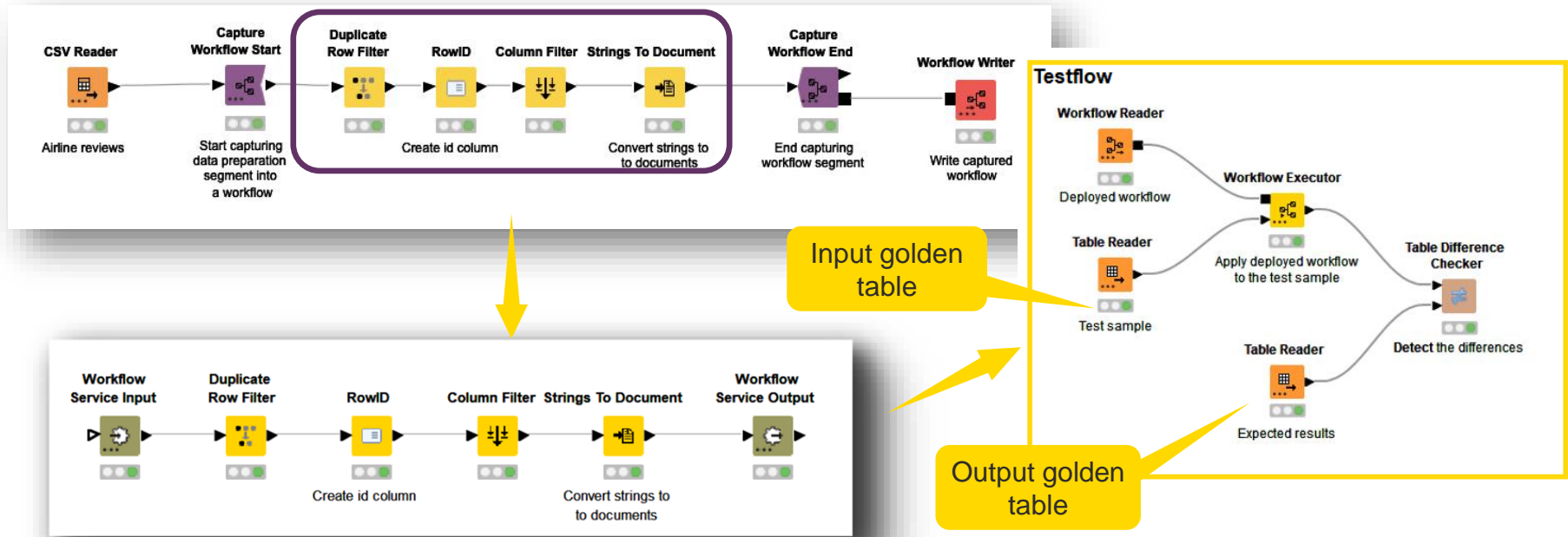
Select columns

Optionally enable failing

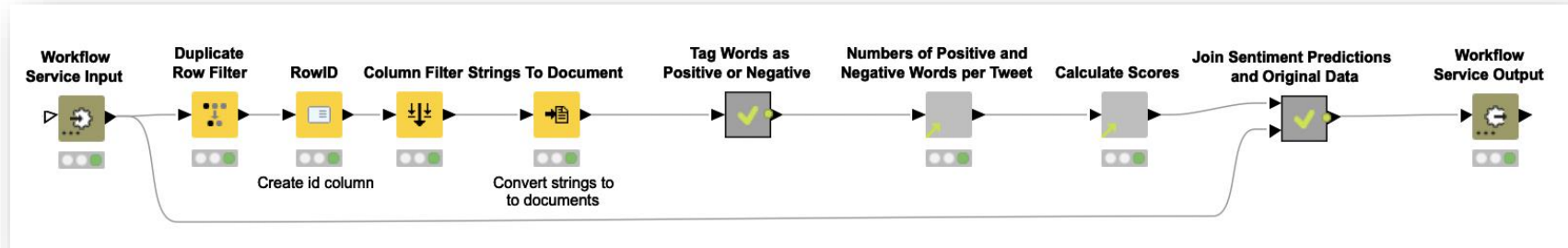
Testing a Workflow Segment: Unit Test

- A simple and elegant way to test workflow segments
 - Capture a workflow segment and save it using Integrated Deployment nodes
 - Provide the Workflow Executor node with the captured workflow and execute it on the test data
 - Perform tests on the output

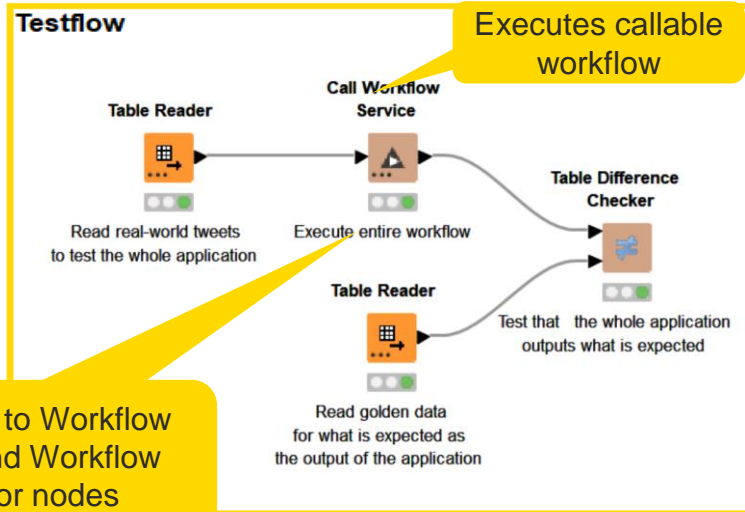
Captured workflow segment



Testing an Entire Workflow: Application Test



Lexicon-based Sentiment Analysis Predictor

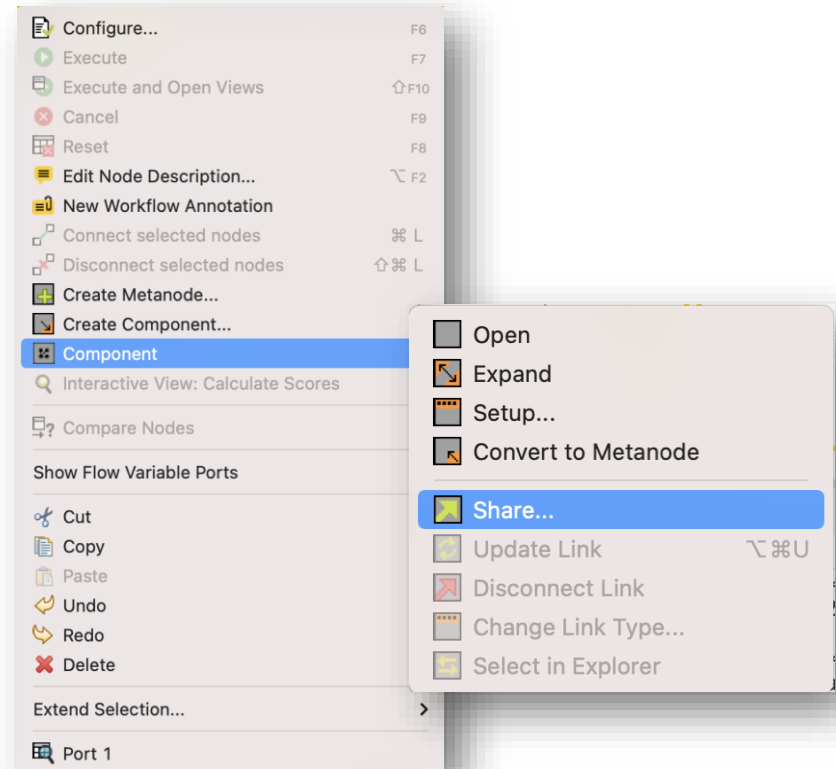
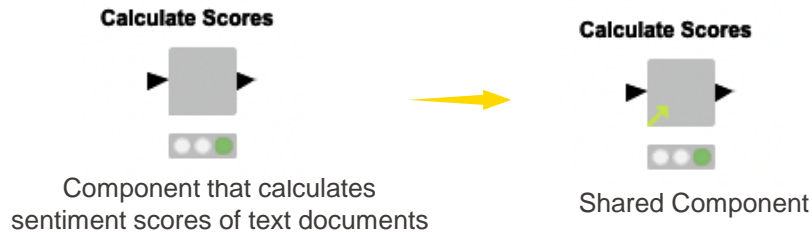


Executes callable workflow

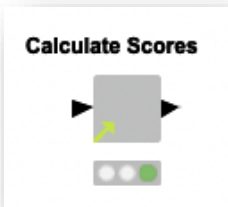
Alternative to Workflow Reader and Workflow Executor nodes

Testing a Component: First We Must Share It

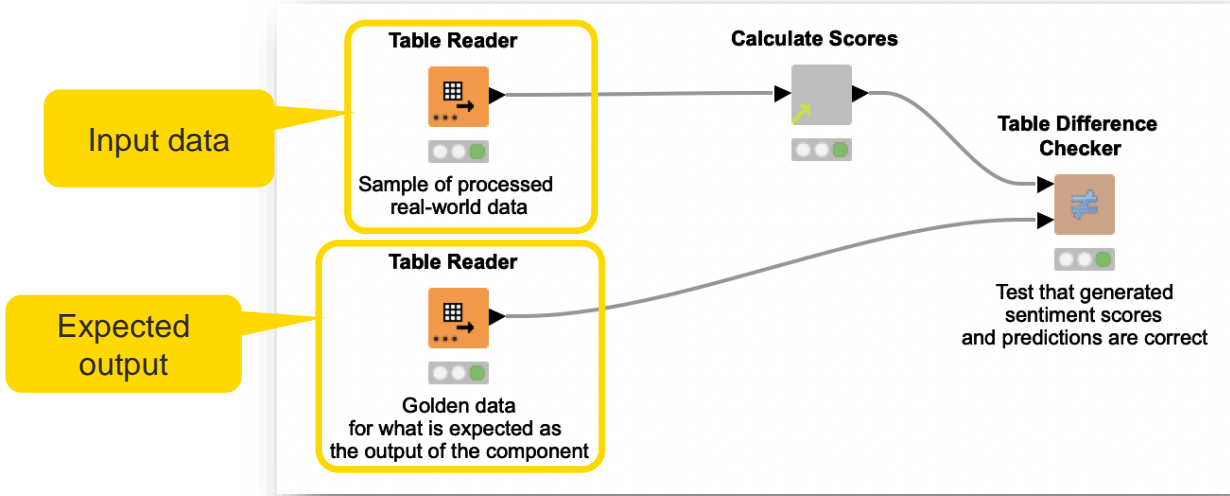
- To test a component independent from what workflows use it, we must share it first
- What is a Shared Component?
 - Components can be saved in your KNIME workspace for later reuse
 - To do this, right-click any Component and select “Share...”
 - Shared Components are read-only instances of a Component
 - Public Shared Components are available on the EXAMPLES Space and on KNIME Community Hub



Testing a Component



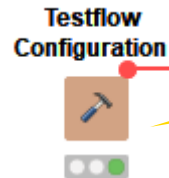
Shared component that calculates sentiment scores of text documents



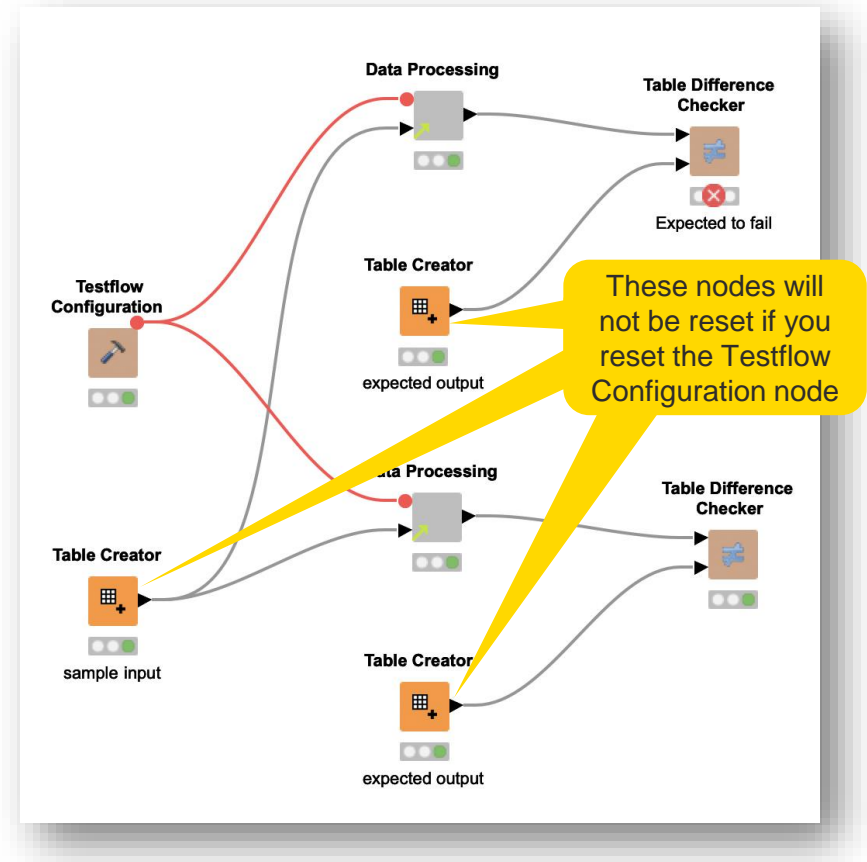
Testflow that checks if component calculates sentiment scores correctly

Executing Multiple Tests in a Single Testflow

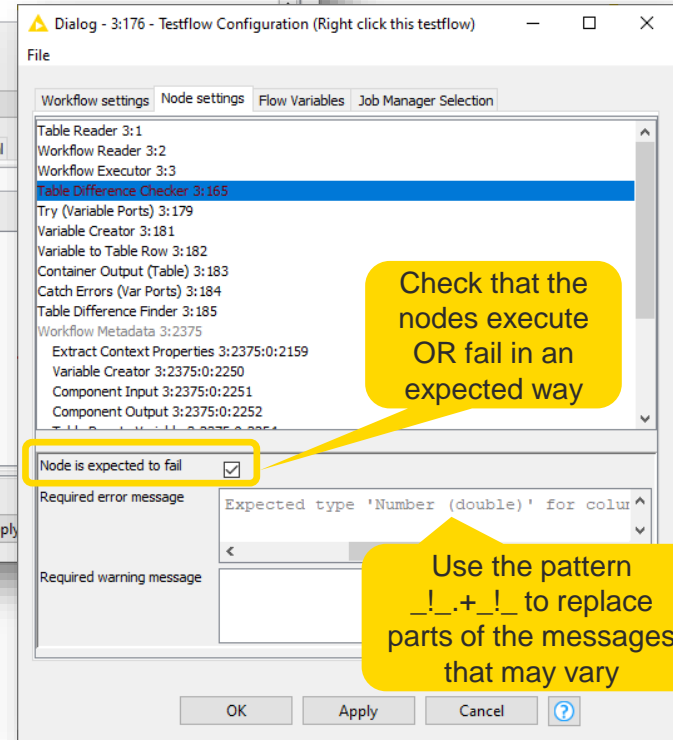
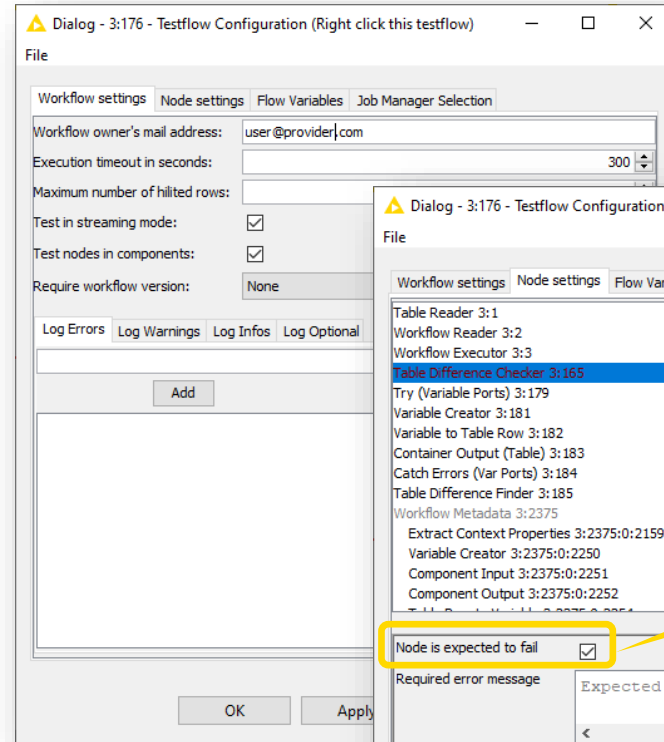
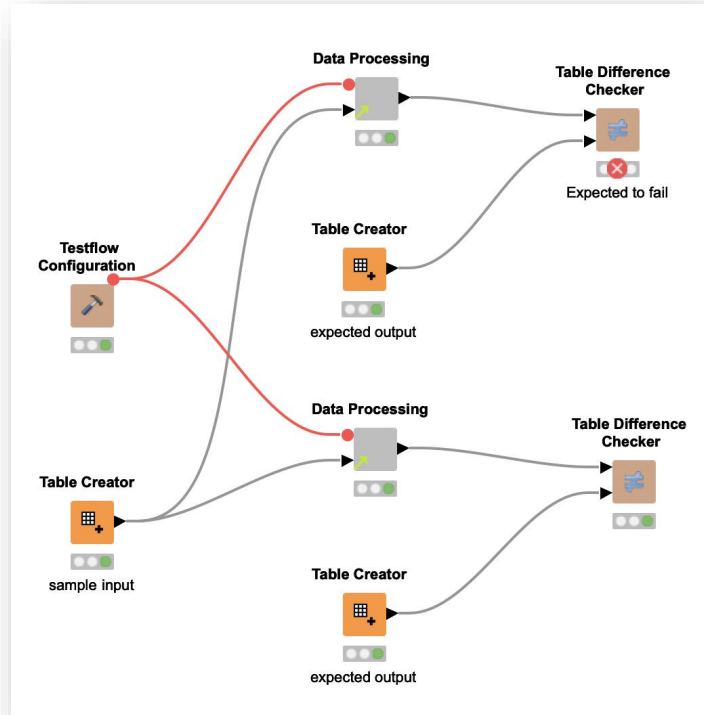
- The Testflow Configuration node can be especially useful here
 - It defines which nodes are expected to fail or succeed



Use flow variable connections to ensure that the nodes to be tested get reset



Testflow Configuration Node



KNIME Testing Framework – JUnit

- Browse the results manually
- Audit failing nodes or unexpected behavior as well as the failure trace

The screenshot displays the KNIME software interface. On the left, a context menu is open for a workflow node, with the 'Run as workflow test' option highlighted in blue. In the center, a 'Testrun Configuration' dialog box is visible, showing various checkboxes for test execution options such as 'Load-save-load instead of load only', 'Check for deprecated nodes', 'Test views (open & close)', 'Test dialogs (load & save)', 'Check log messages', 'Check node messages', and 'Allow tests of streaming API'. The 'Default timeout (in seconds)' is set to 300. On the right, the 'Node Monitor' and 'Console' tabs are active. The console shows the execution of a JUnit test, with a failure trace for a 'Table Difference Checker' node. The failure message is: 'org.junit.framework.AssertionFailedError: Node "Table Difference Checker 0:165" has unexpected error message: Execution failed for test class org.knime.testing.core.ng.WorkflowNodeMessagesTest: java.lang.AssertionError: at org.knime.testing.core.ng.WorkflowNodeMessagesTest.checkSingleNode(org.knime.testing.core.ng.WorkflowNodeMessagesTest.java:133) at org.knime.testing.core.ng.WorkflowNodeMessagesTest.checkNodeMessages(org.knime.testing.core.ng.WorkflowNodeMessagesTest.java:175) at org.knime.testing.core.ng.WorkflowTestSuite.run(org.knime.testing.core.ng.WorkflowTestSuite.java:250) at org.knime.testing.core.ng.WorkflowTestSuite.runTest(org.knime.testing.core.ng.WorkflowTestSuite.java:368) at org.knime.testing.internal.ui.TestflowJob.executeTestflow(TestflowJob.java:175) at org.knime.testing.internal.ui.TestflowJob.run(TestflowJob.java:131) at org.eclipse.core.internal.jobs.Worker.run(Worker.java:63)'. The failure trace is highlighted in yellow.

Executing Multiple Testflows Automatically

- Call all the testflows and collect their results
 - Make sure failing nodes in the testflows are captured in Try&Catch nodes
- Merge the testflows' metadata into one report, e.g., pdf

1. Execute the testflows and import their status and metadata



Get names of all testflows in a folder

Get testflow names in folder Tests

Iterate over testflow names

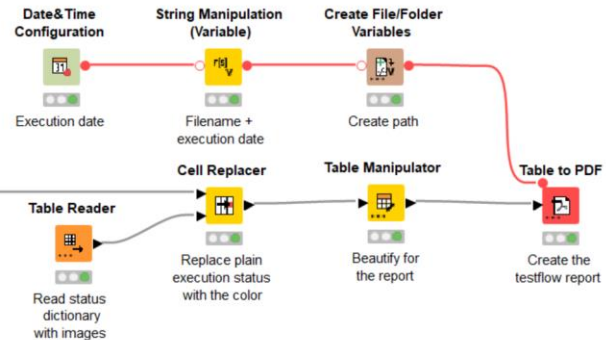
Call testflow

Make sure report columns are always in the same order

Concatenate results

Collect output status of tests

2. Prepare the PDF report. The status of the testflow is 0 in the case of success and 1 in the case of failure. Let's add some colors to the report and replace these plain numbers with a red and a green square images respectively.



Execution date

Filename + execution date

Create path

Read status dictionary with images

Replace plain execution status with the color

Beautify for the report

Create the testflow report

Executing Multiple Testflows Automatically: Report

Testflows Report Whether or not tests passed Knime report powered by Birt

"Status"	"Testflow"	"FailingNode"	"FailingNodeMessage"	"Execution"	"User"
█	01.Testflow_2_Testin	none	none	2022-08-05T17:39:26	alinebessa
█	01.Testflow_3_Testin	none	none	2022-08-05T17:39:26	alinebessa
█	01.Testflow_4_Testin	none	none	2022-08-05T17:39:26	alinebessa
█	01.Testflow_5_Testin	none	none	2022-08-05T17:39:27	alinebessa
█	01.Testflow_6_Testin	none	none	2022-08-05T17:39:27	alinebessa

What nodes failed, if any

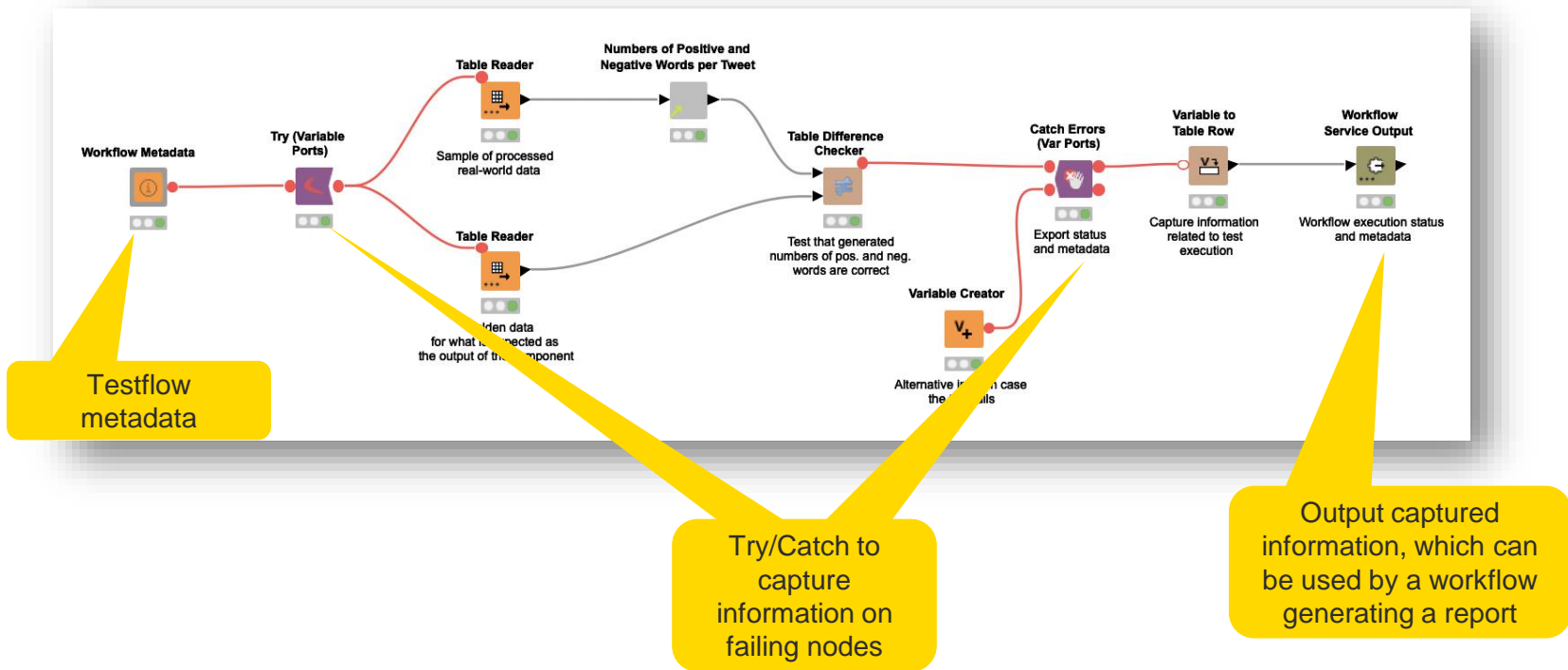
Report timestamp

Report author

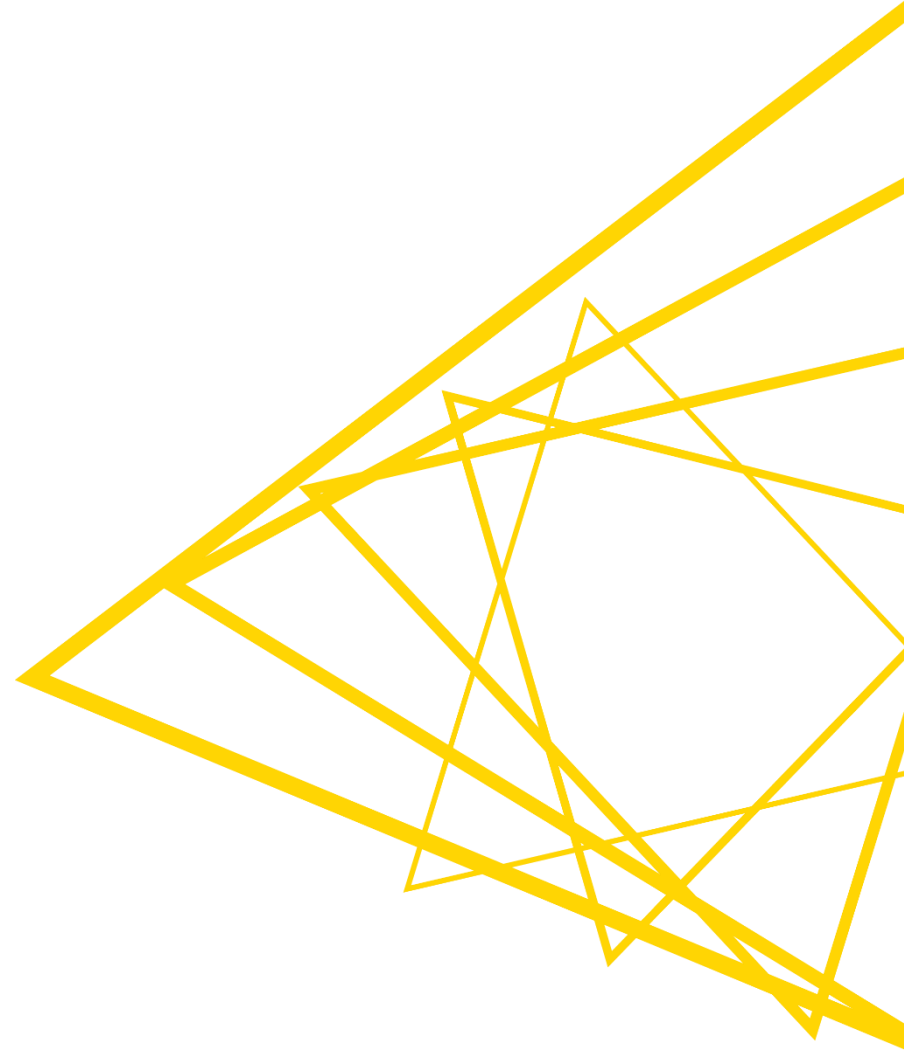
Date: Aug 5, 2022 5:39 PM Author: aline.bessa 1 of 1
www.knime.com

Example of Testflow for a Report

- Unit test with additional structure for a report



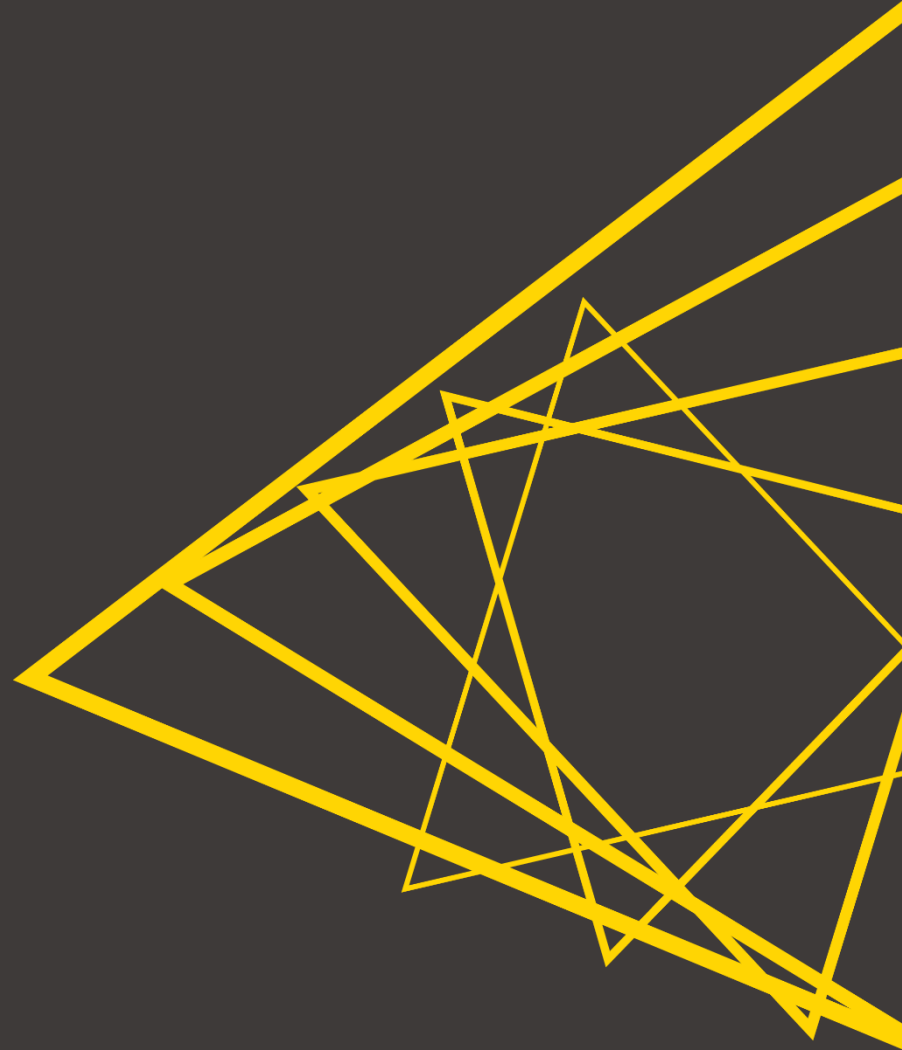
Demo



Best Practices for Testing

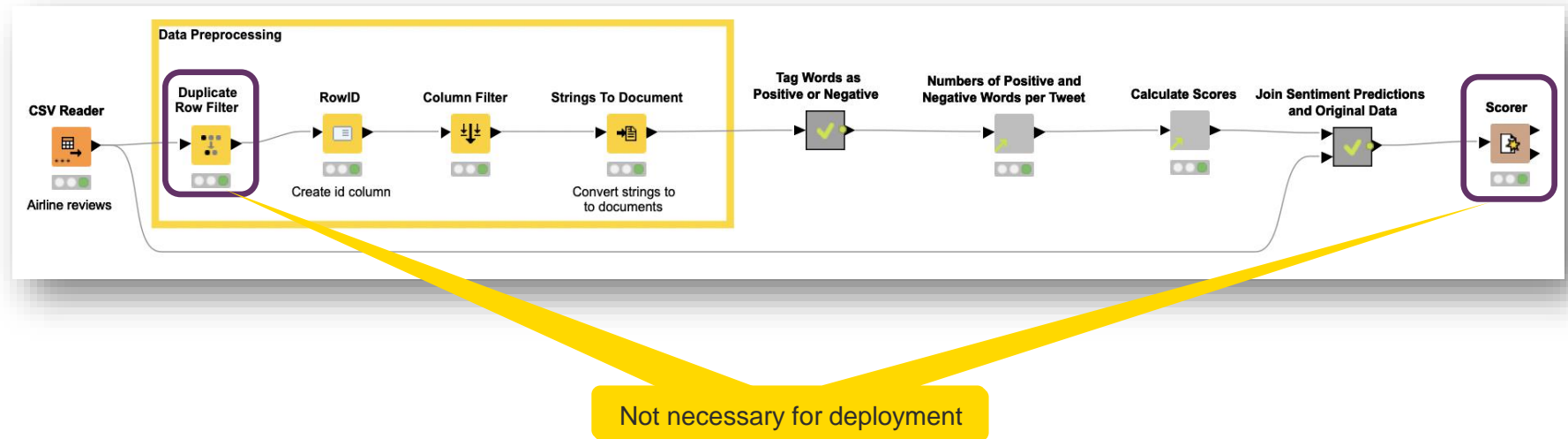
- Keep testflows under a single folder, facilitating their batch execution
 - You can have more than one folder for different types of tests
- A testflow should test one single entity (e.g., a component, a workflow segment)
 - It can have, however, many unit tests for the same single entity
- Create testflows that output useful information
 - Fail with custom error messages when input validation fails or in other expected scenarios
- Test regularly
- Components should be testable independently on the workflows that are using them

Deploying a Workflow



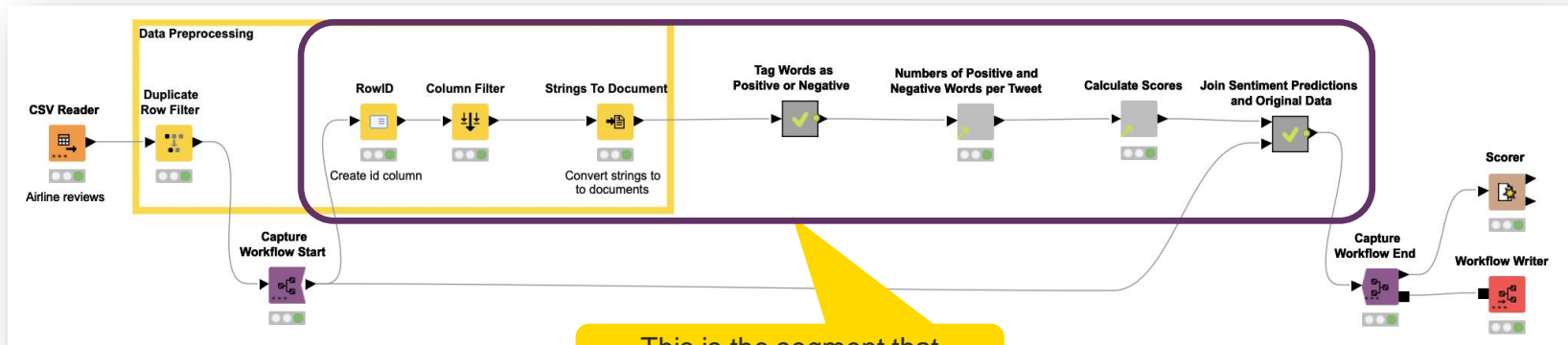
Automatically Creating a Workflow for Deployment

- Lexicon-based sentiment analysis prediction
- Assumptions
 - Once deployed, only one text comes at a time (no need for deduplication)
 - No ground-truth sentiment is given, so performance scoring is not viable



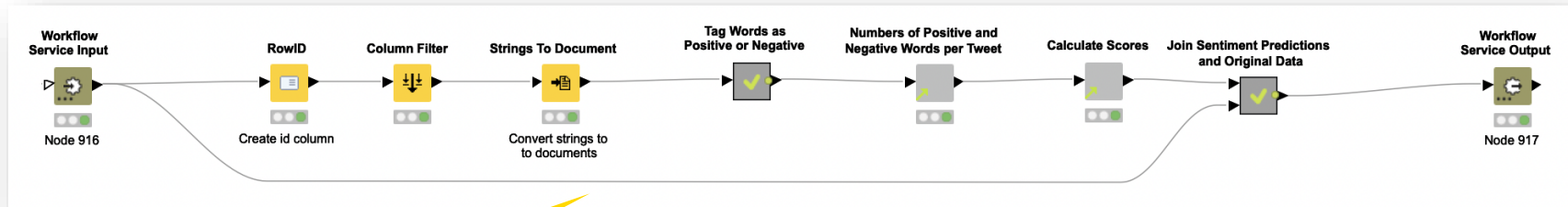
Automatically Creating a Workflow for Deployment

- Let's now use Integrated Deployment to create a workflow for deployment



Automatically Creating a Workflow for Deployment

- Let's now use Integrated Deployment to create a workflow for deployment

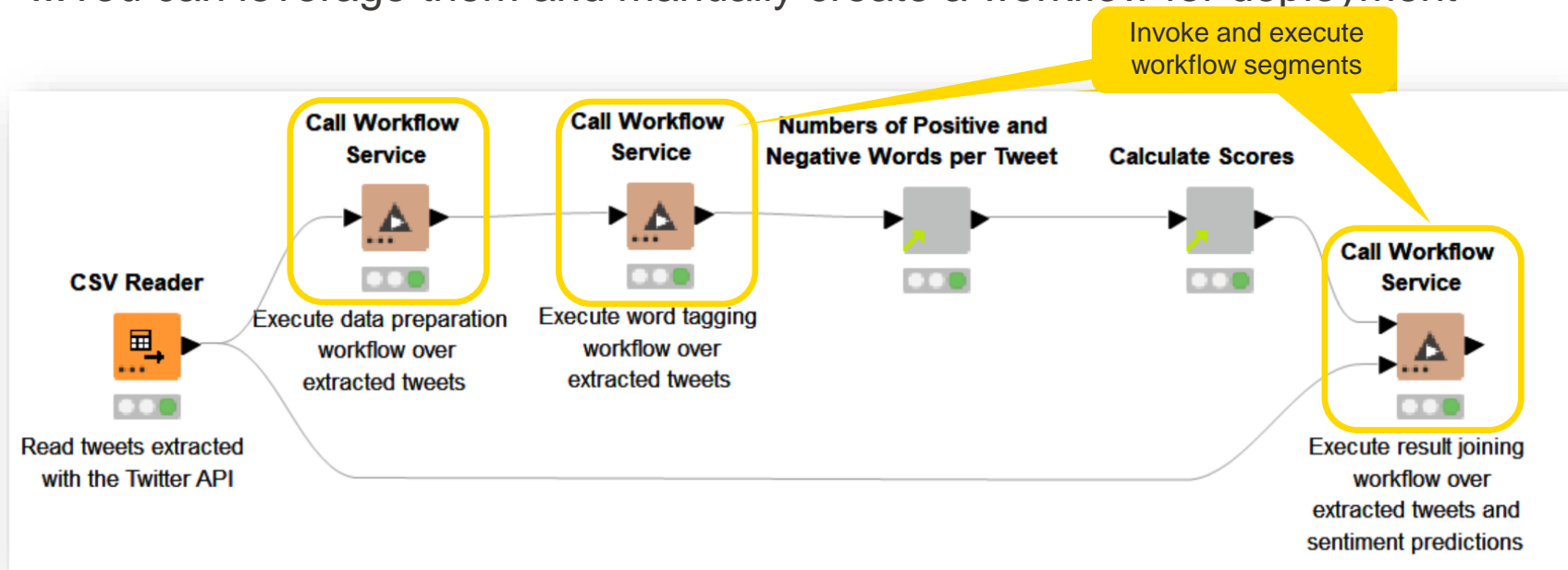


Annotations do not get captured

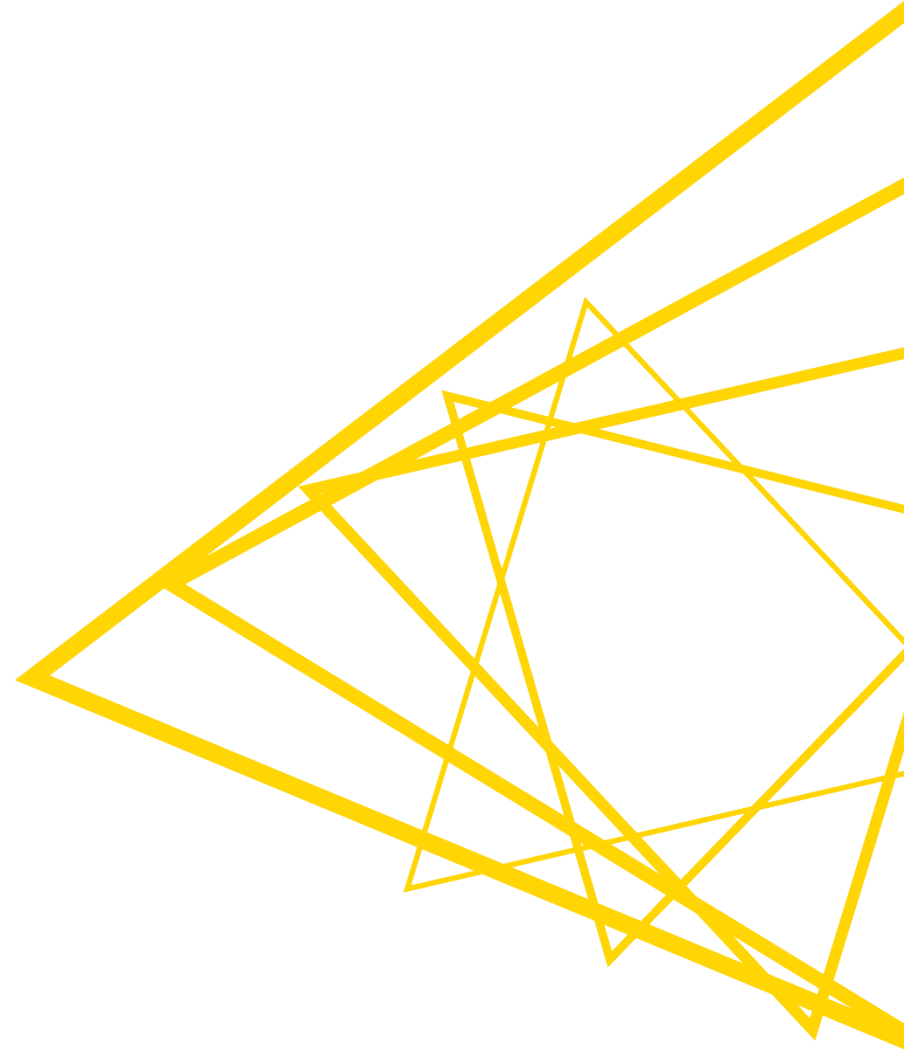
Automatically created workflow for deployment

Manually Creating a Workflow for Production

- If you captured workflow segments for testing, e.g.:
 - Segment for data preprocessing
 - Metanode for word tagging
 - Metanode for joining original data with sentiment predictions
- ...You can leverage them and manually create a workflow for deployment



Demo



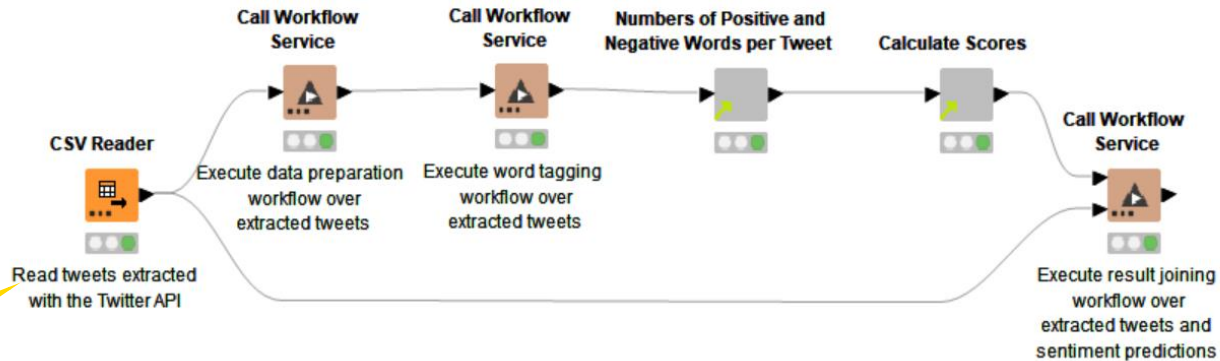
Best Practices for Deploying Workflows

- Document your workflows properly
 - Add annotations to give an overview of what the workflow does
 - Label nodes to highlight what they are used for
 - Use descriptive names for metanodes and components

Annotation

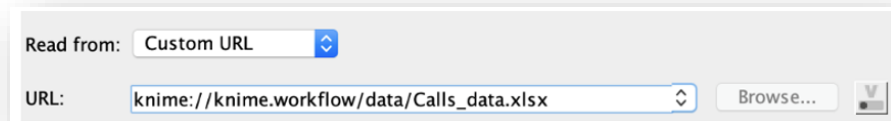
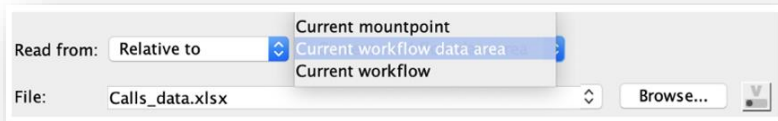
Deploying Sentiment Analysis Predictive Model - Lexicon Based Approach

This workflow applies the lexicon based approach on new tweets to predict their sentiment. Results can be deployed as a web application or as a web service.



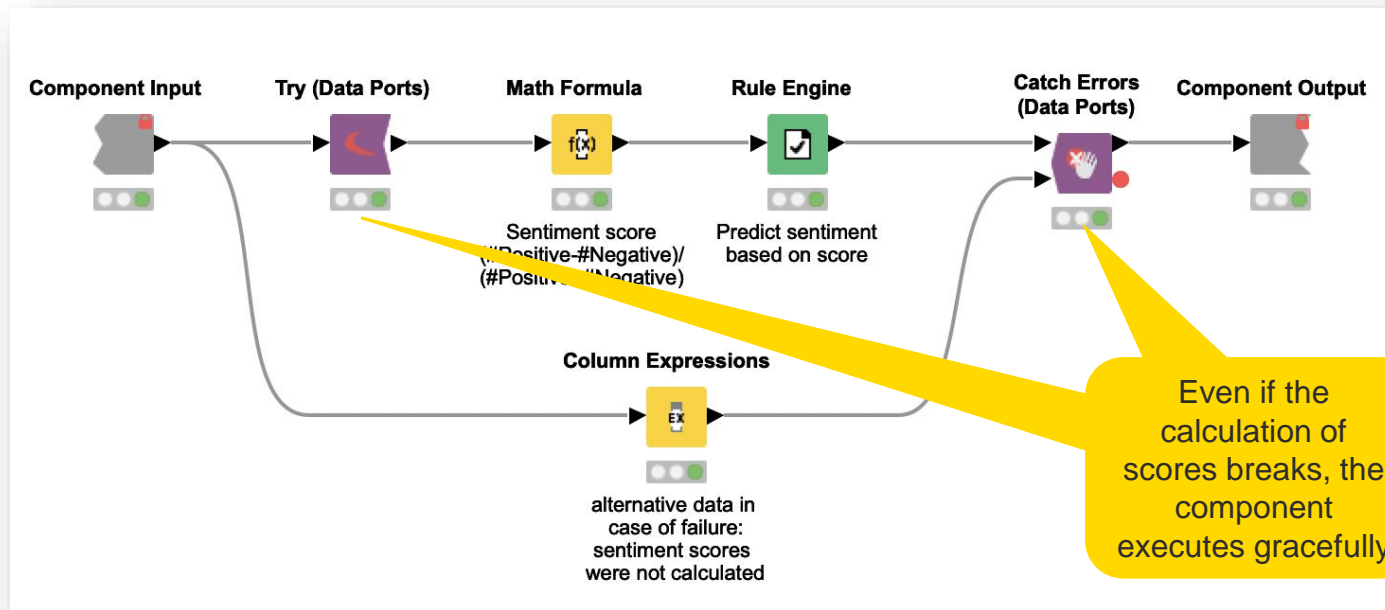
Best Practices for Deploying Workflows

- Do not use local file path types
 - Explicit references to files in your local machine break when the workflow is deployed to KNIME Business Hub
 - Use relative, mountpoint, custom_url, or connected file path types instead



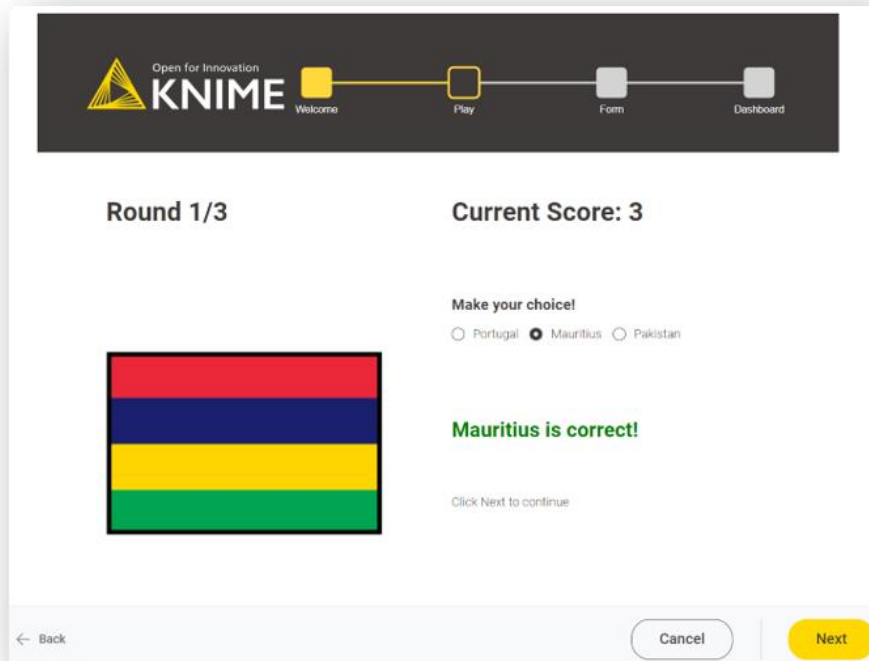
Best Practices for Deploying Workflows

- Make sure that the key functionalities of your workflow work as expected or fail gracefully
 - Test a functionality before deployment to avoid having a broken workflow in production
 - Add Try/Catch nodes to prevent execution problems in production



Deploying a Workflow as a Web Application

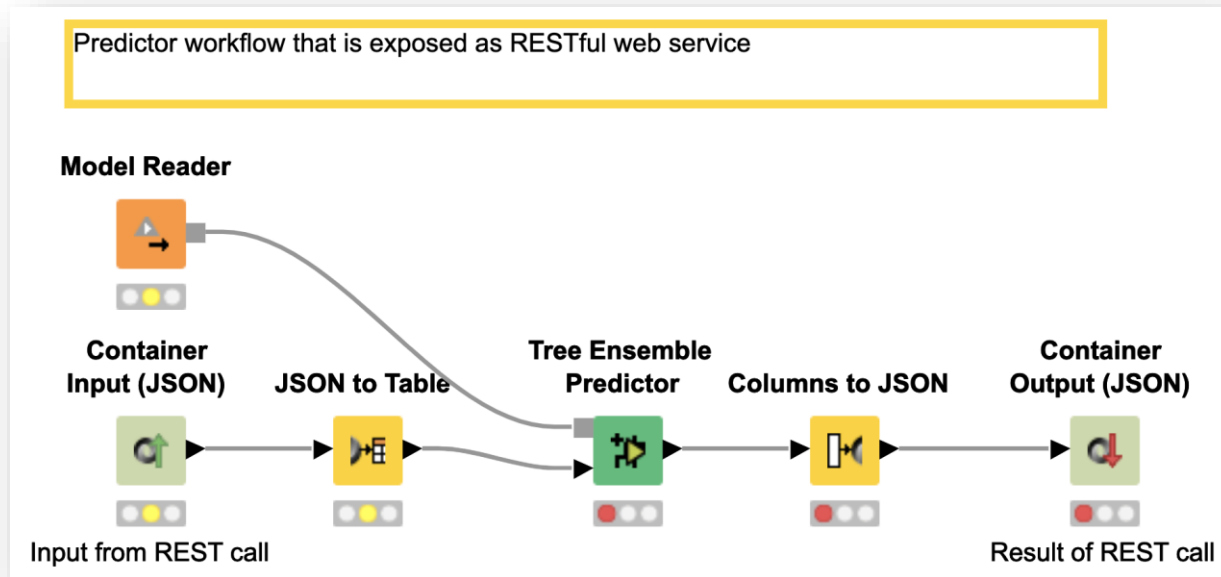
- The workflow is deployed as an application with a UI that can be accessed through a web browser running on the client's machine
- **Data apps in KNIME Business Hub** - focus of this course!



"Guess the Flag" game deployed as a web application on KNIME Business Hub

Deploying a Workflow as a Web Service

- Other workflows or software, which can be in other machines, can interact with your workflow
- Deployment in **KNIME Business Hub**

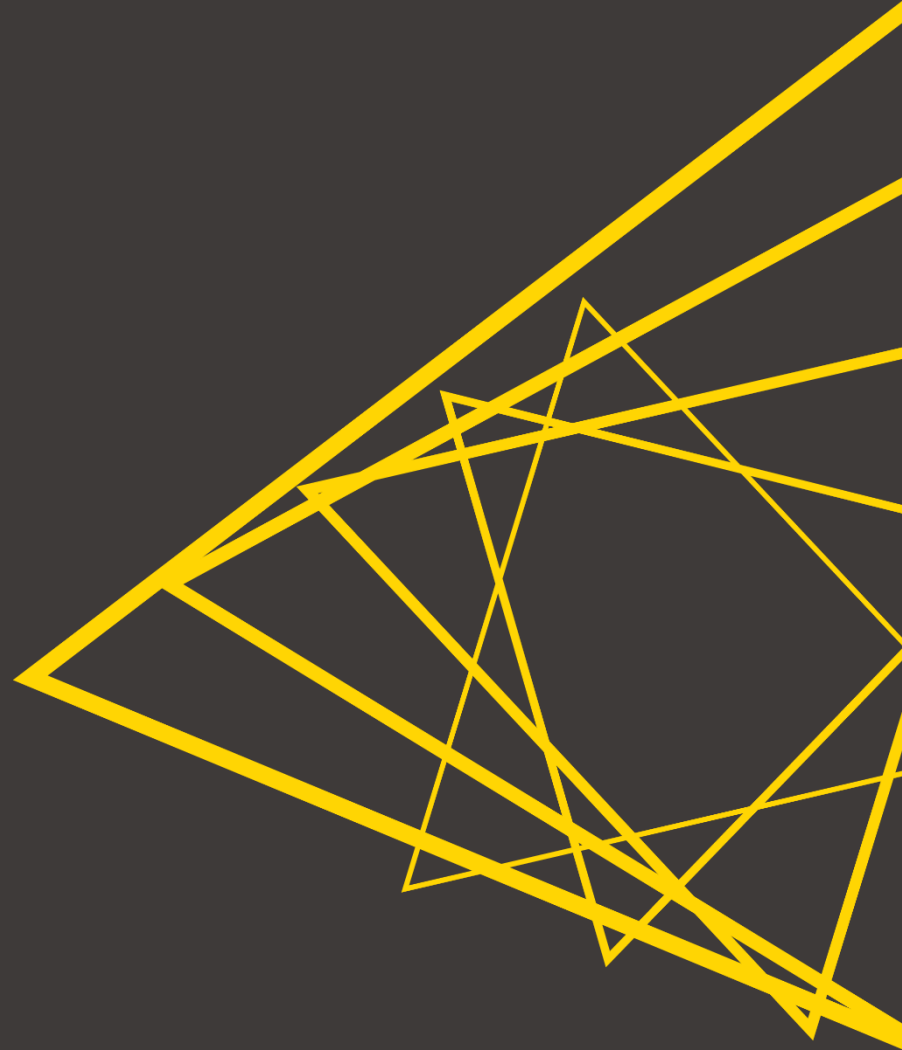


Session 1: Summary

After this session, you should be able to:

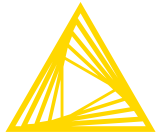
- Identify the different phases of the Data Science Life Cycle
- Understand the applications of Integrated Deployment and Workflow Services
- Identify differences and similarities between Integrated Deployment and Workflow Services
- List and use the tools to test Workflows, Components, and Workflow Segments
- Identify the necessary steps to take before deploying a workflow

Exercises



Exercises Session 1

- **Exercise 01** - Use integrated deployment techniques to capture segments of a workflow that builds a lexicon-based sentiment analysis predictor
- **Exercise 02** - Create a unit test for a component that calculates sentiment scores
- **Exercise 03** - Automate the execution of different testflows and concatenate their results into a test report
- **Exercise 04** - Use workflow services to invoke workflow segments and create a workflow for deployment

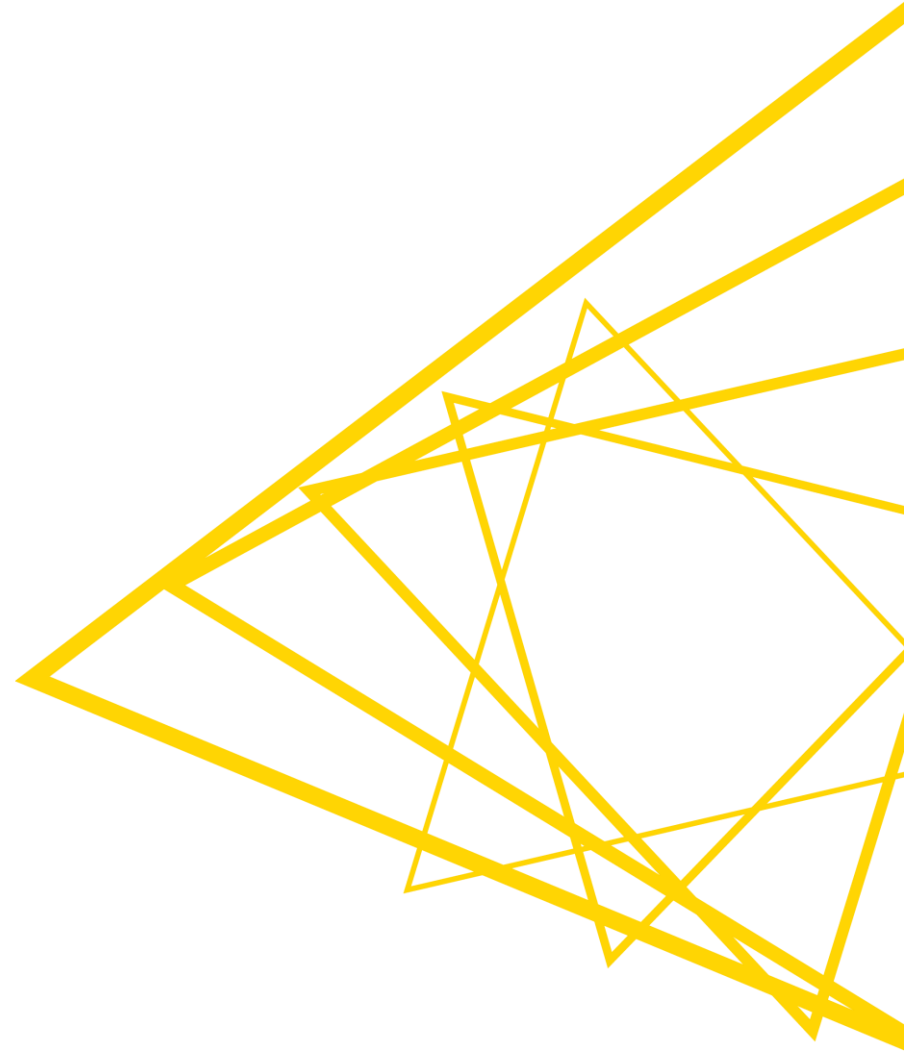


Open for Innovation

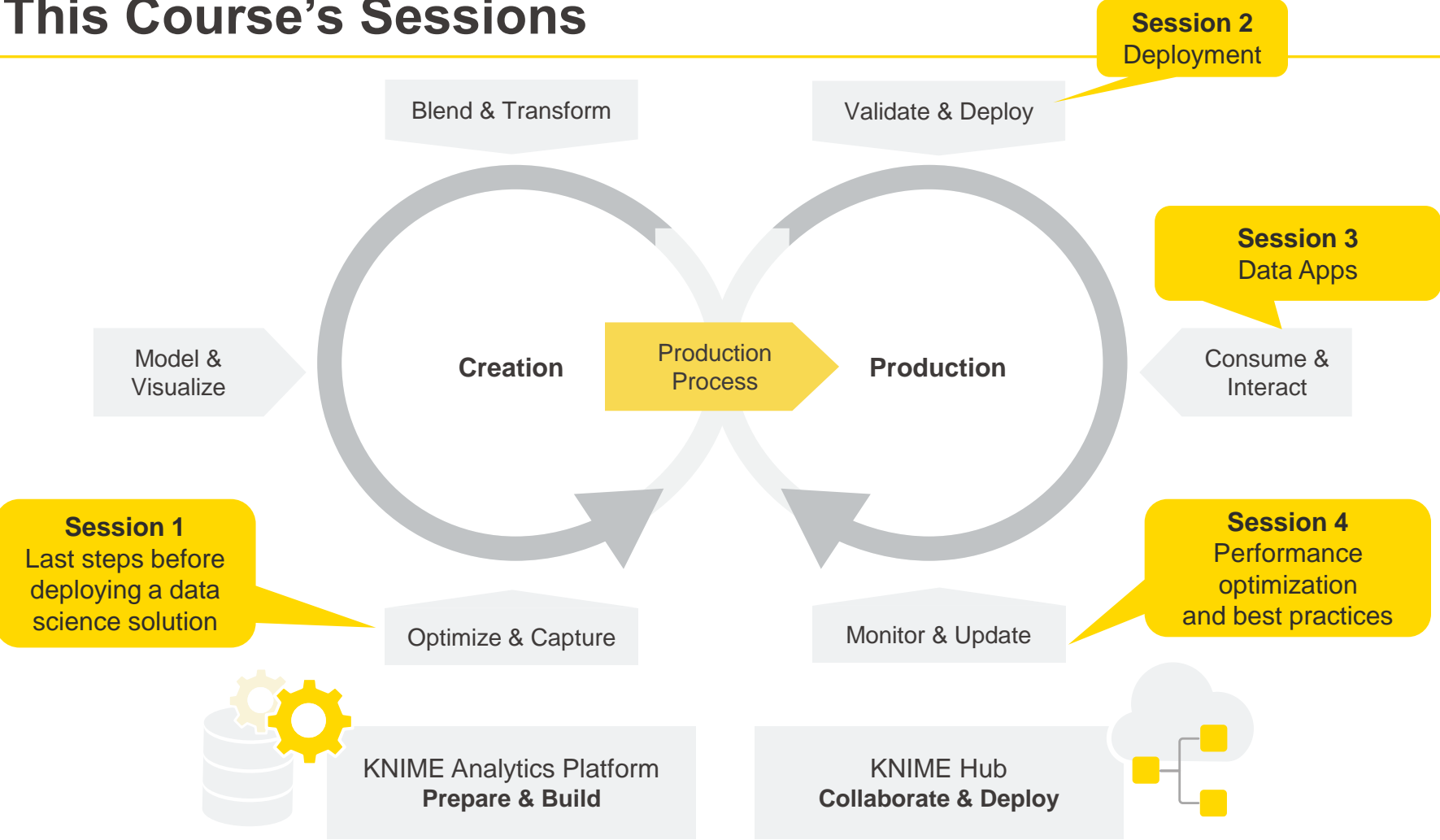
KNIME

Session 2

Introduction to KNIME Business Hub



This Course's Sessions

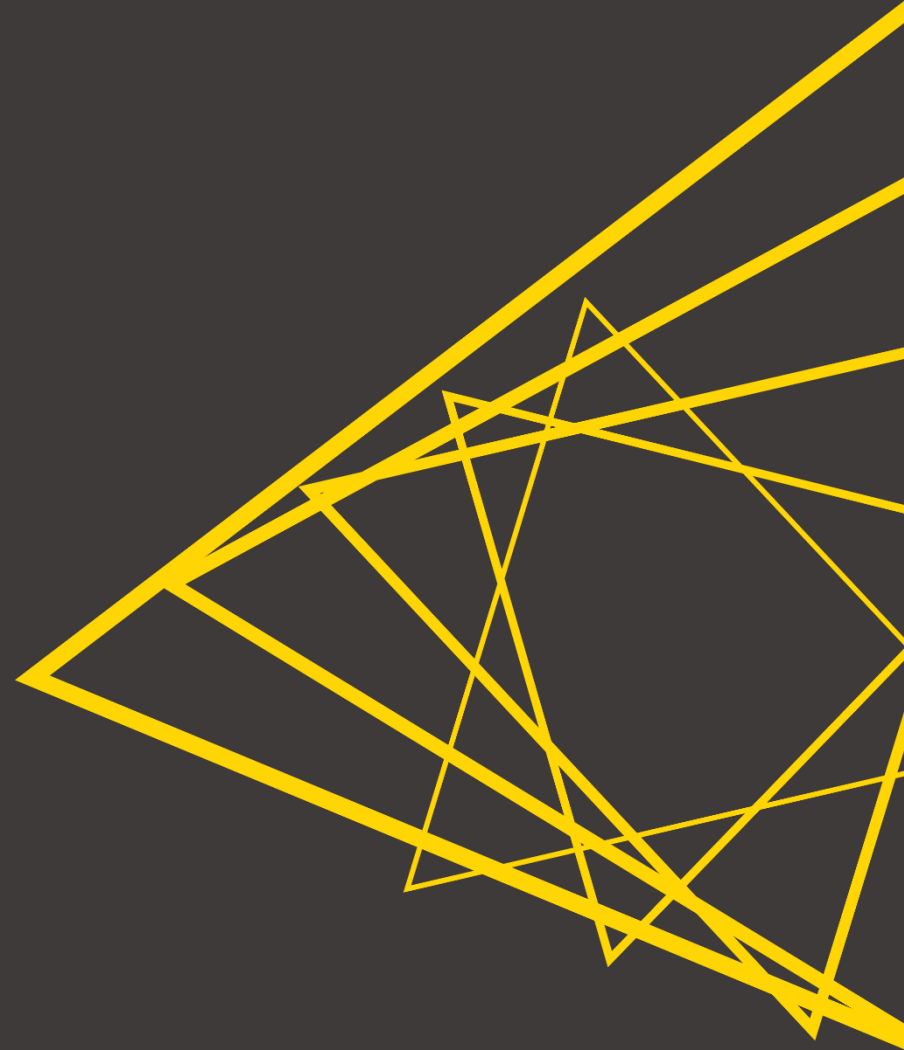


Learning Objectives

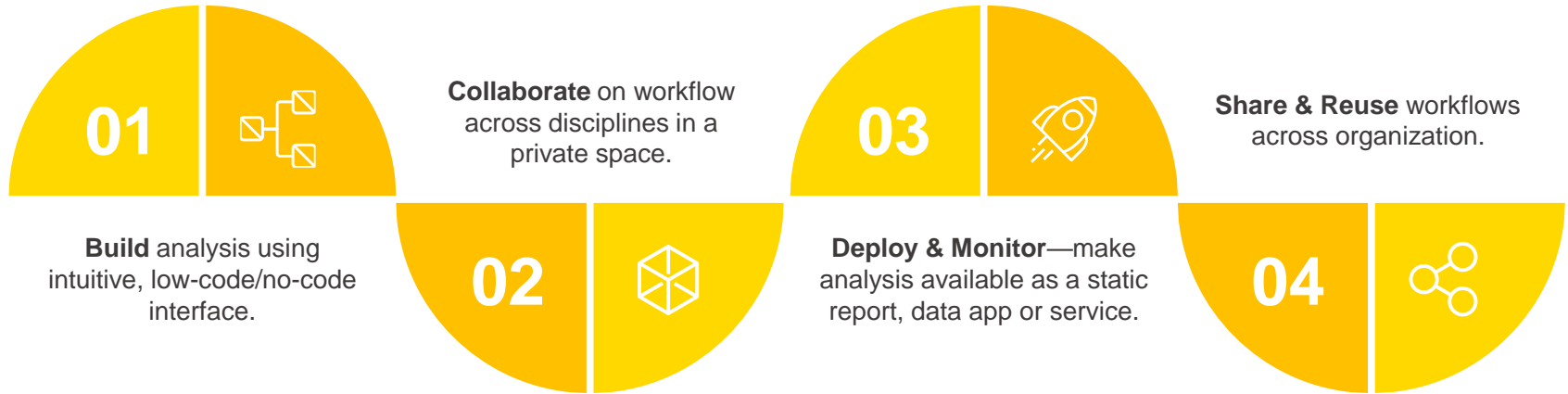
1. Identify the different KNIME Business Hub use cases and stakeholders
2. Understand the steps to connect and upload to KNIME Business Hub
3. Determine who can get access to your spaces and workflows
4. Understand how to version your spaces
5. Learn how to perform workflow execution and deployment in KNIME Business Hub
6. Edit workflows with the Remote Workflow Editor



KNIME Business Hub in a Nutshell



KNIME Software: From Ideation to Production



KNIME Analytics Platform: Free & always open

Available on KNIME Hub: Teams

Dedicated install with KNIME Hub: Business & Enterprise

Collaboration Among Multiple Stakeholders

Data Experts (users)

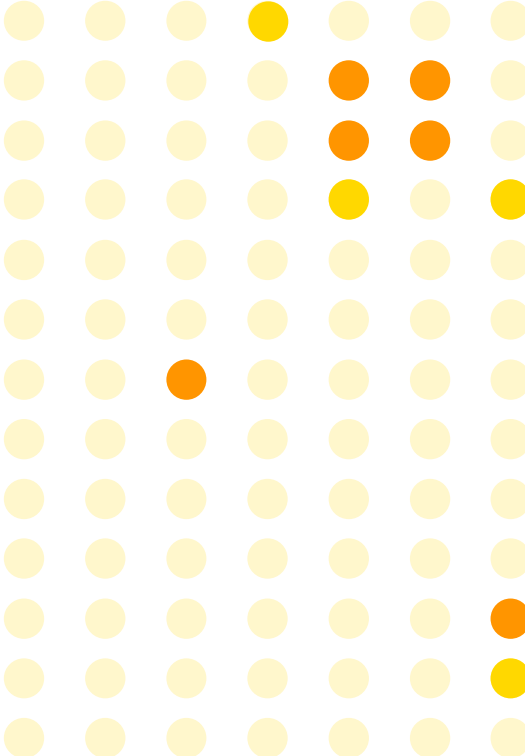
- No-code & low-code workflows
- Create custom nodes for sharing & re-use
- Extensions for advanced analysis

Business & Domain Experts (users)

- No-code & low-code workflows
- Library of pre-built workflows for fast start
- Fast & instant access to insights, without IT

End Users

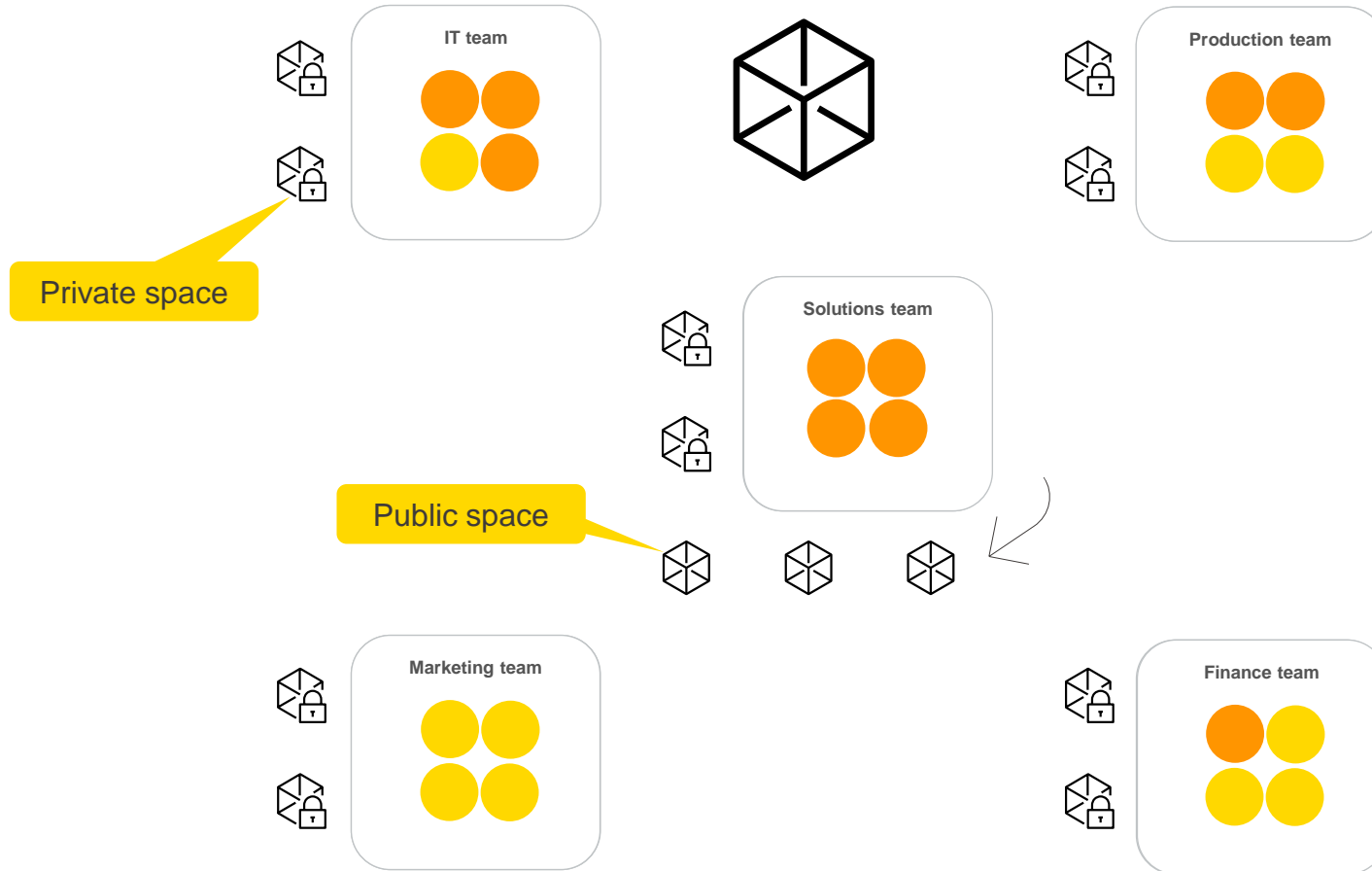
- Data apps for insight
- APIs, running behind-the-scenes
- Automated reports



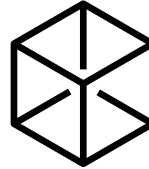
MLOps & IT

- Secure deployment
- Centralized governance

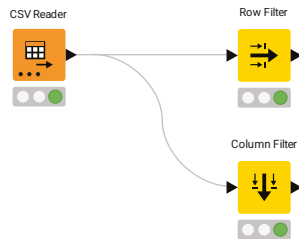
Collaborate Within and Between Teams



Example of a KNIME Business Hub Space



Workflows as blueprints
for common use cases



Components for frequently
performed tasks

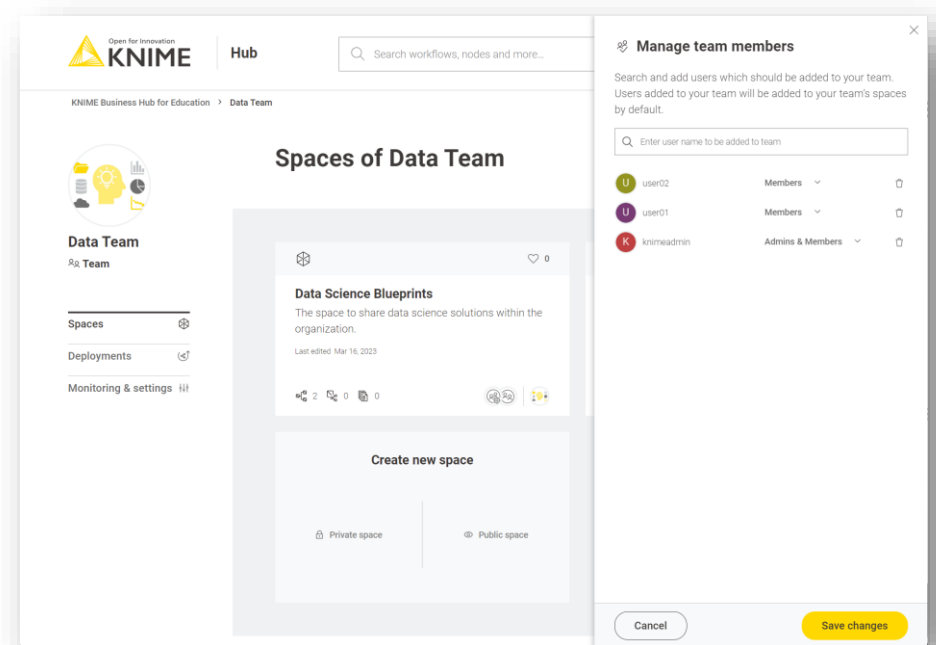


Components abstracting
technical complexity



KNIME Business Hub - Key terms

- UI similar to [KNIME Community Hub](#)
- Users collaborate as **teams** in **spaces** (**public** or **private**)
- **Spaces** store a team's files, components & workflows
 - Accessible via URL
- Each team determines:
 - Read, write or execute **permissions** for its spaces
 - **Execution contexts** (e.g., number of cores, what GPU or CPU) for its spaces' deployments



Deploy Workflows as APIs or Data Apps



Versionable Spaces, Backward Compatibility

Workflows, Components and Collaboration

The screenshot displays the KNIME Hub interface for a 'Demo Space'. The main content area shows a list of workflows: '02_Deployment_workflow' and '03_Computing_predictions'. A 'Space history' panel is open on the right, showing a list of 'Unversioned changes' and a 'Versions' section. The 'Versions' section is highlighted with a yellow oval and contains two entries: 'added deployment' (Mar 21, 2023 3:44 PM) and 'first upload' (Mar 21, 2023 3:43 PM). Each entry has a red 'K' icon and a three-dot menu icon.

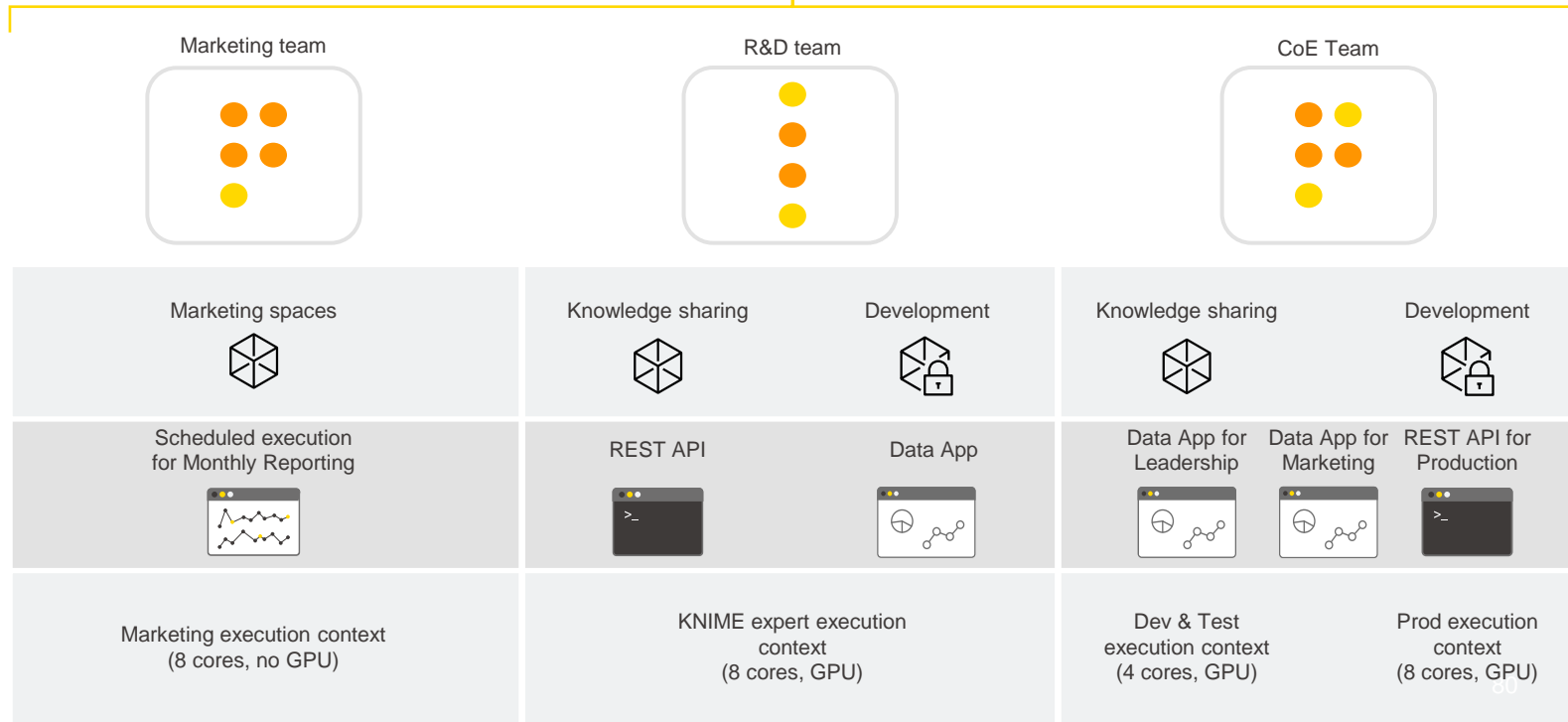
Features:

- Versioned
- Reproducible
 - Guaranteed backward compatible

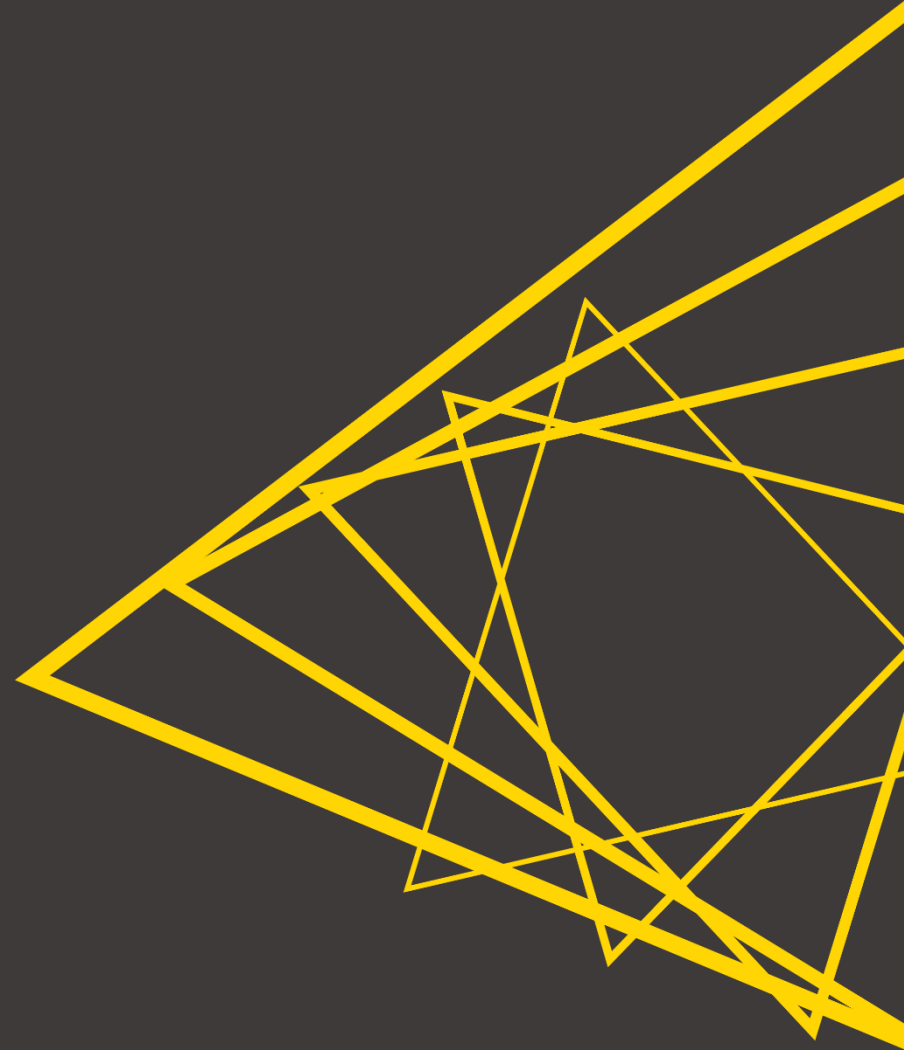
De-Centralized Admin Decreases Reliance on IT

KNIME Business Hub in the Organization

IT only allocates seats
& execution cores per team.



Connecting and Uploading to KNIME Business Hub

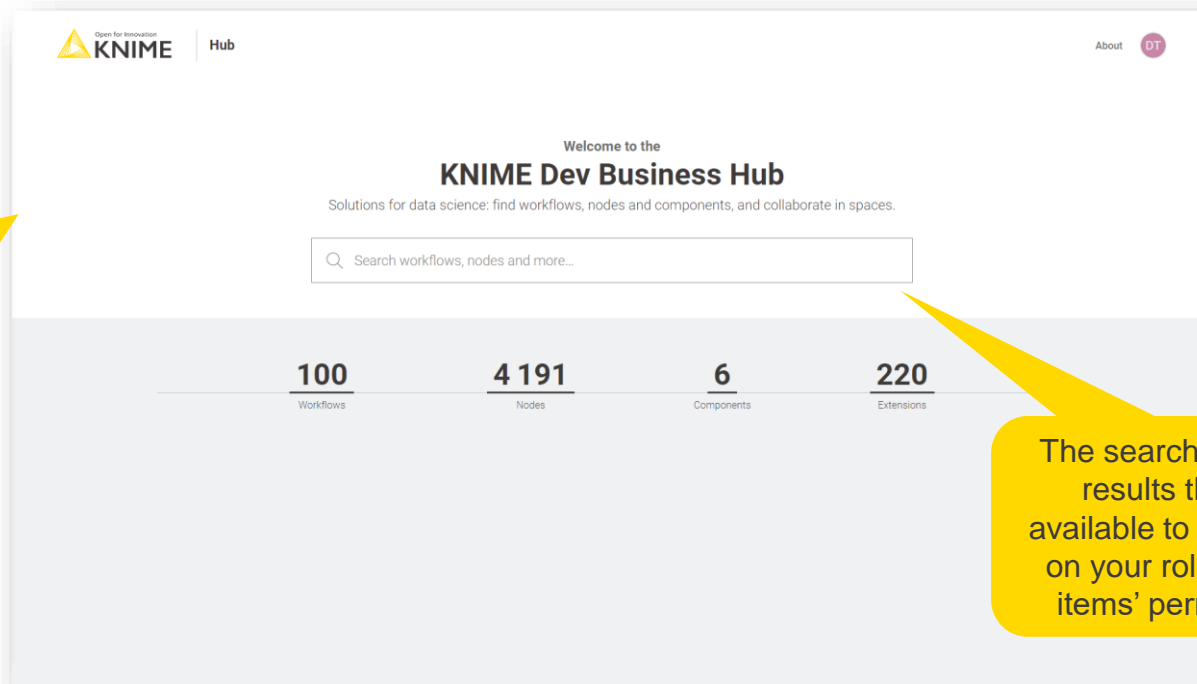


Connecting through a Web Browser

To connect to your KNIME Business Hub instance you need:

- Its address (URL)
- Your credentials (username and password)

After you connect to a KNIME Business Hub instance, you land on a homepage that looks like this one

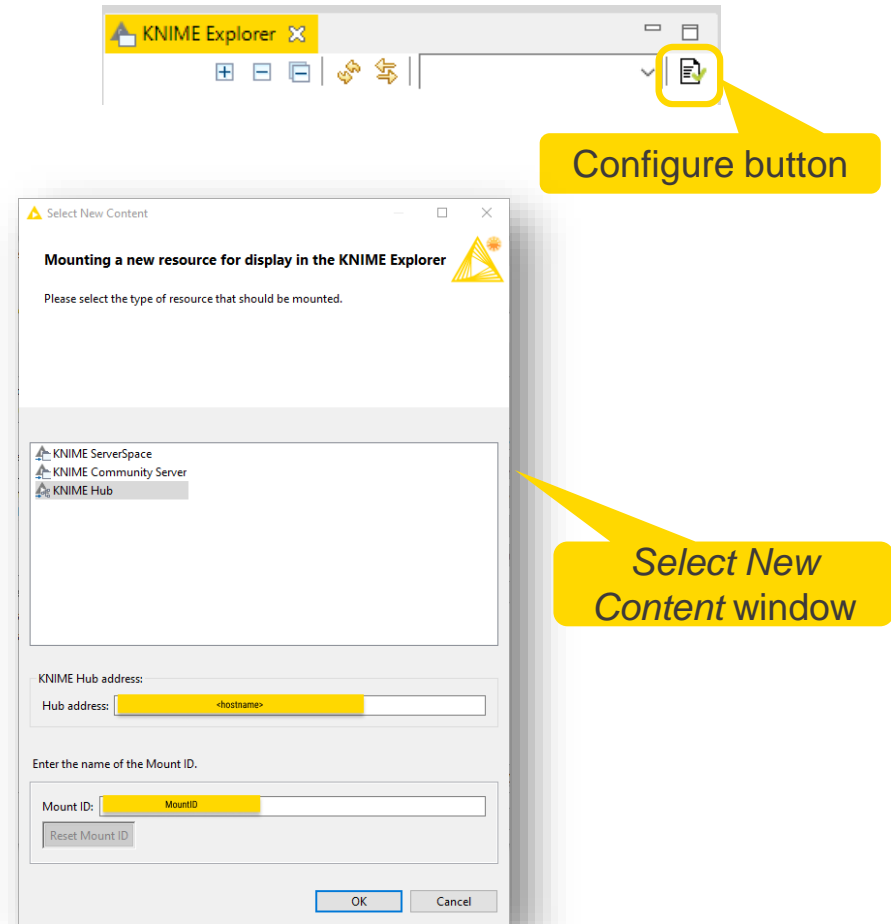


The search will show results that are available to you based on your role and the items' permissions

Connecting through KNIME Analytics Platform

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

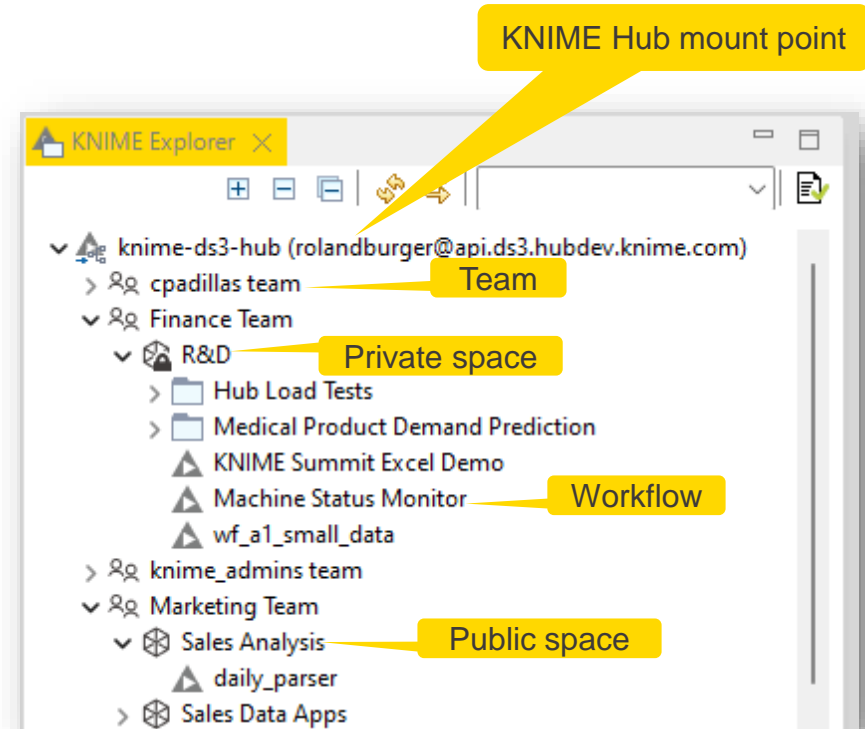
1. Click the Configure button in the KNIME Explorer
2. Click *New...* to add the new Hub mount point
3. In the *Select New Content* window, select KNIME Hub and insert the Hub address



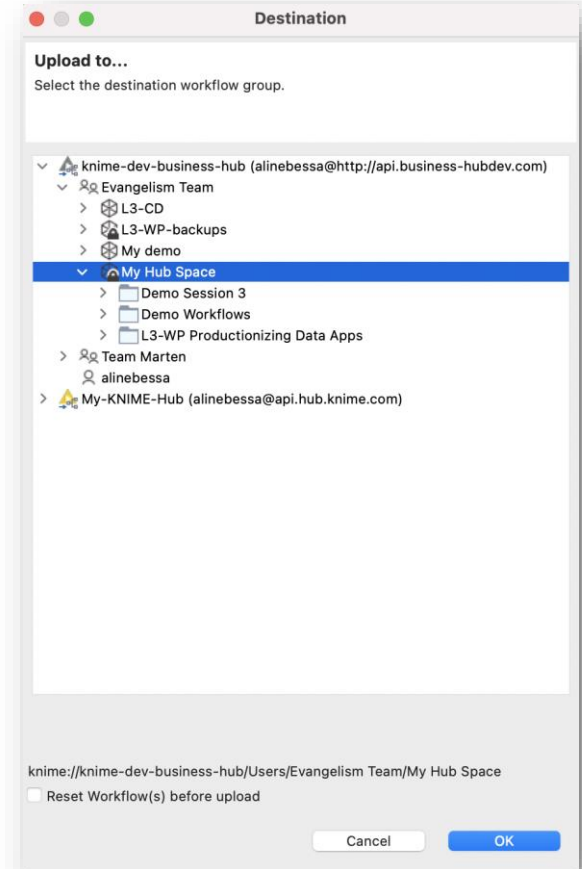
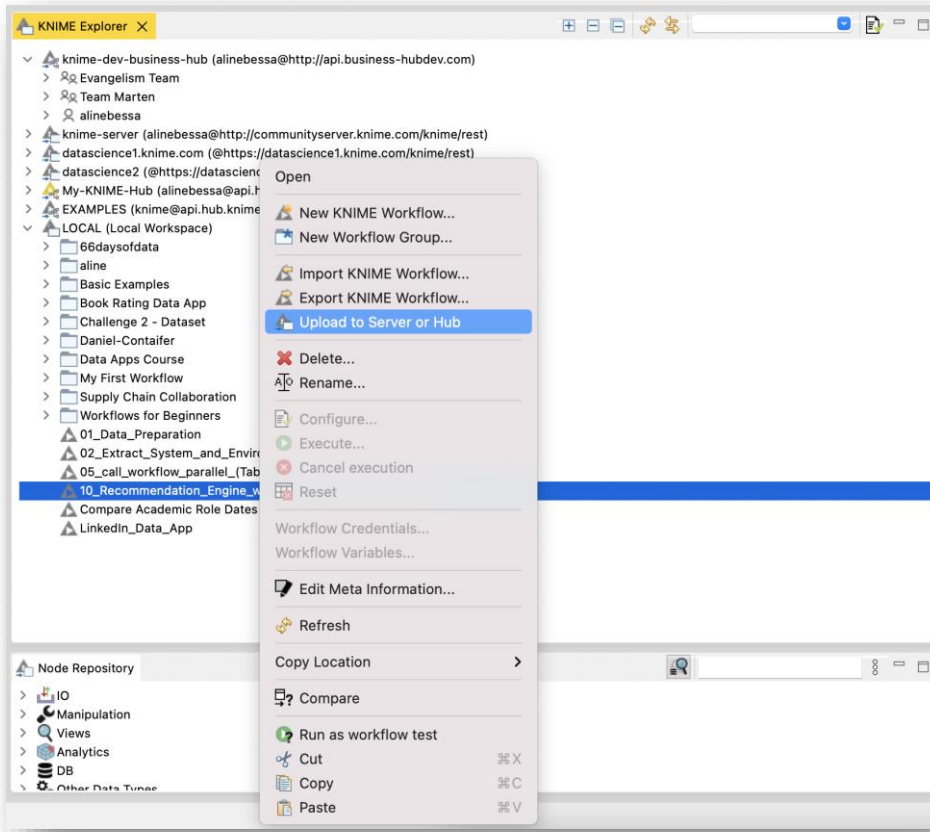
Uploading your Work to KNIME Business Hub

KNIME Business Hub provides an area for sharing work among users.

1. Login from the mountpoint in KNIME Analytics Platform
2. Browse all the **teams** and **spaces** you have access to
3. Upload **workflows, components** and **data**
 - via drag and drop or
 - via copy and paste



Another Way to Upload to KNIME Business Hub



Creating Spaces in KNIME Business Hub

Open for Innovation
KNIME Hub

Search workflows, nodes and more...

KNIME Business Hub for Education > L3-DA

LD

Spaces of L3-DA

L3-DA
Team

Spaces

Deployments

Monitoring & settings

Training Material
Last edited: Feb 21, 2023

Playg
Last edited: ...

Create new space

Private space | Public space

ES U U U U +14 Manage team

Open for Innovation
KNIME Hub

Search workflows, nodes and more...

KNIME Business Hub for Education > L3-DA > Spaces > Sales project

Private space

Sales project

Last edited: Mar 24, 20...

Space history

There are no items in this space yet.

Add description

Delete
This will remove the space with all its content.
Delete space

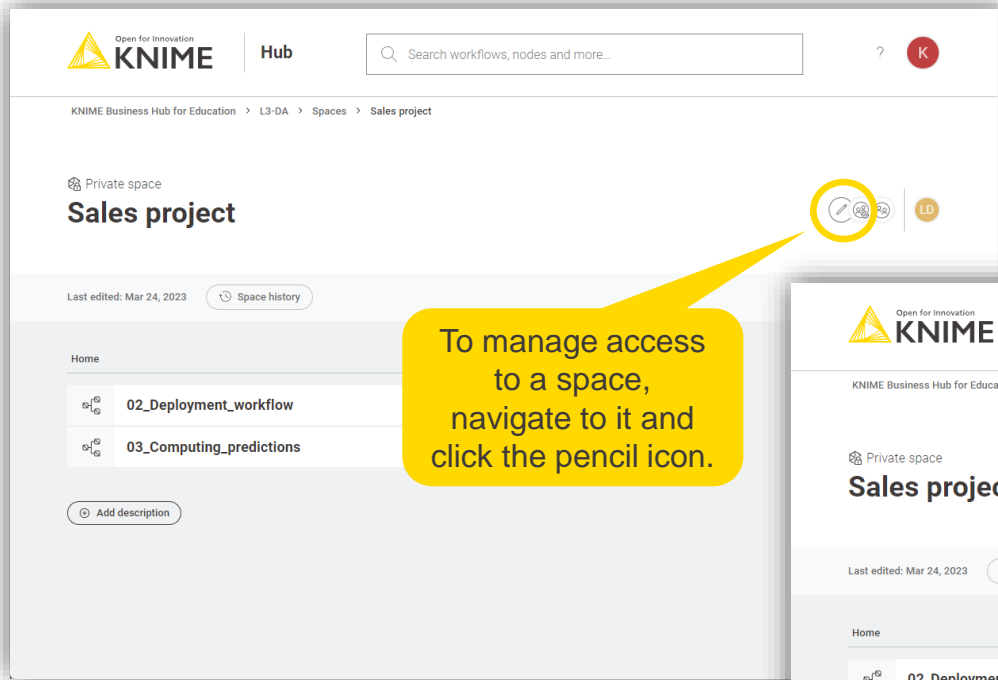
Visibility
This space is private. Make it visible to everyone.
Make public

Inside a team's page, click *Private space* or *Public space* under *Create new space*

Determine space name and add description (optional)

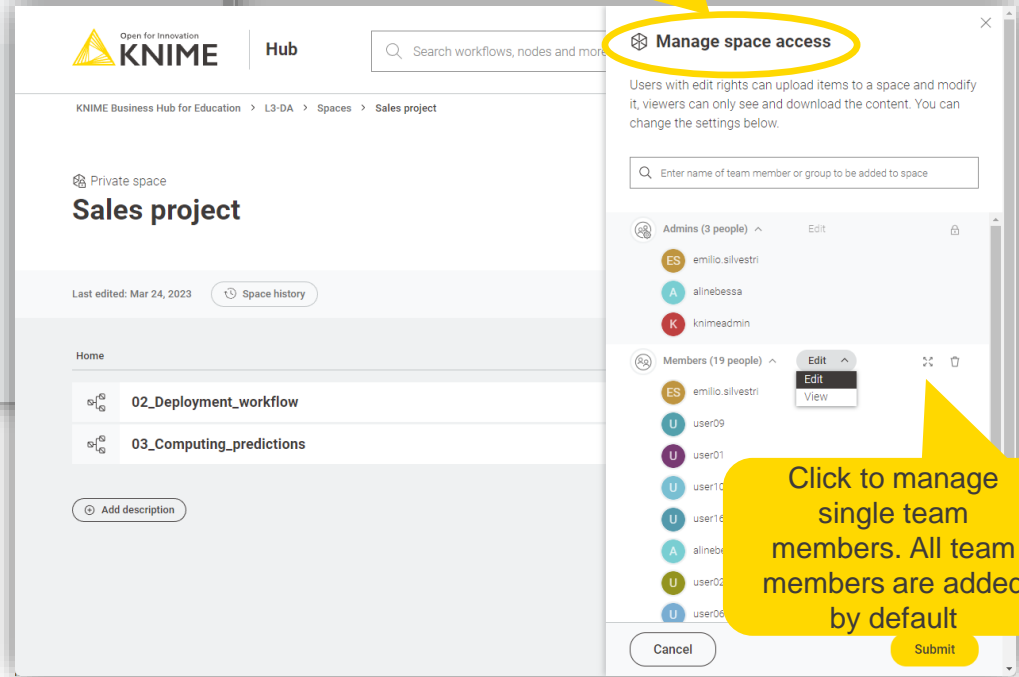
Delete space and change visibility

Managing Space Access in KNIME Business Hub



To manage access to a space, navigate to it and click the pencil icon.

In the *Manage space access* panel that pops up, change the rights of other team members w.r.t. the space's items (*Edit* or *View* rights).

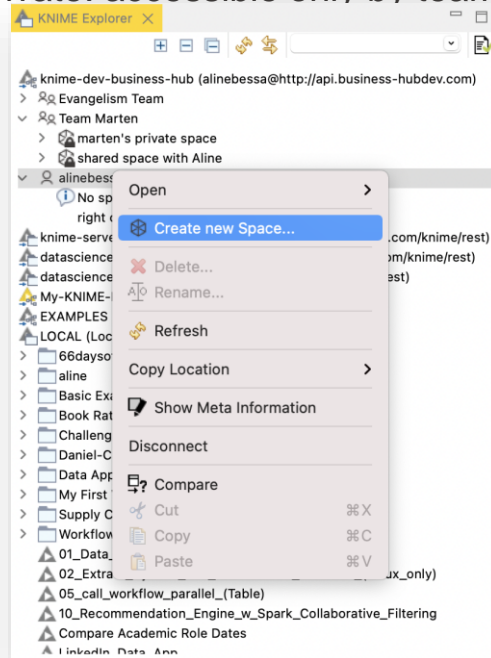


Only team admins can manage space access rights!

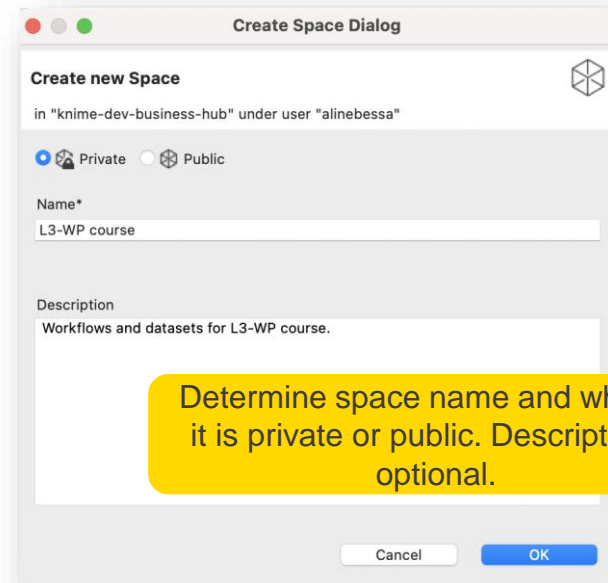
Click to manage single team members. All team members are added by default

Creating Spaces in KNIME Business Hub: Alternative Way

- You can create a space under any of your teams in KNIME Business Hub
- Spaces can be defined as public or private upon creation
 - Public: accessible by everyone, but only team members have upload rights
 - Private: accessible only by team members



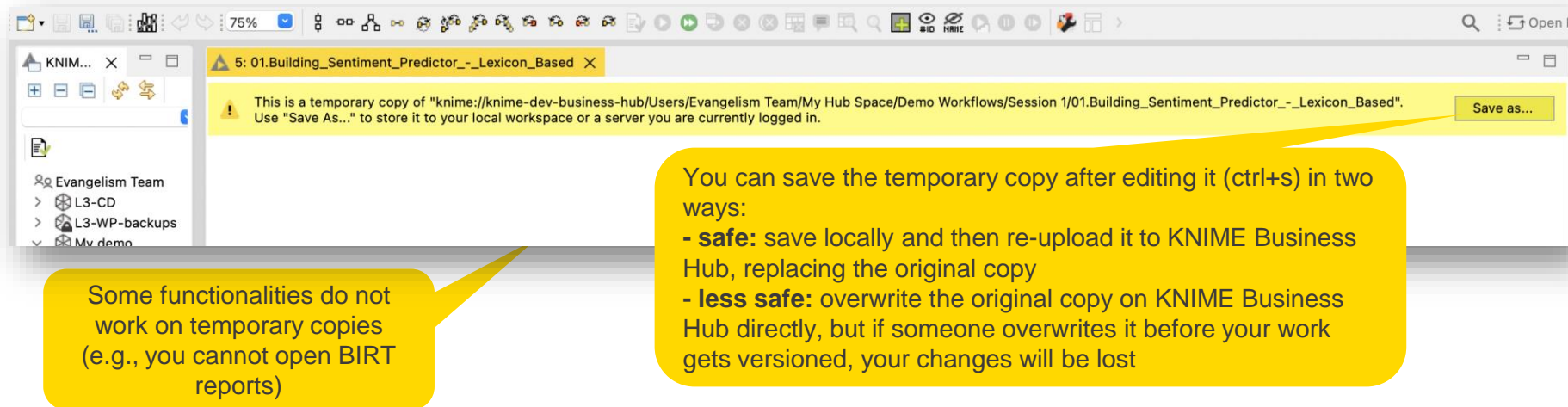
Right-click team in which you want to create a space.



Determine space name and whether it is private or public. Description is optional.

Inspecting a Workflow on KNIME Business Hub

- By double-clicking a workflow on KNIME Business Hub, the client downloads it (to a temporary location) and subsequently opens it automatically
- The **yellow bar at the top** of the editor indicates that this is a temporarily downloaded workflow

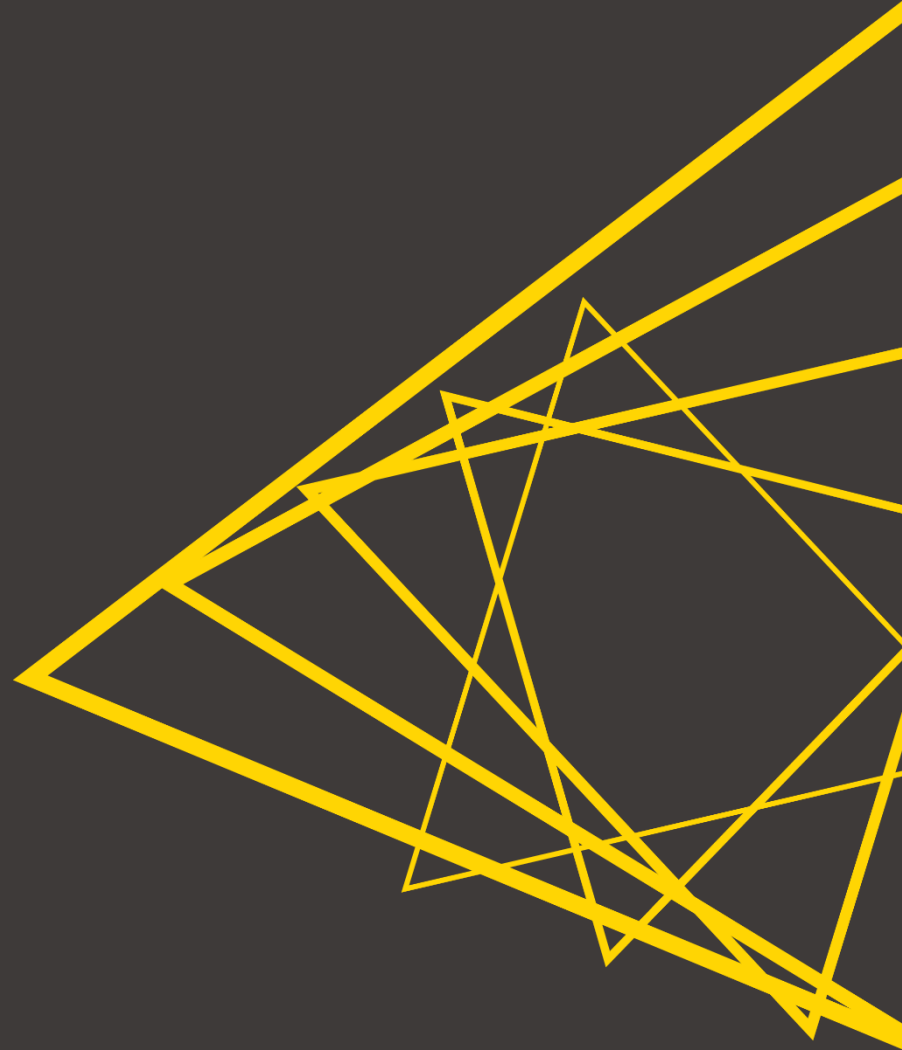


Some functionalities do not work on temporary copies (e.g., you cannot open BIRT reports)

You can save the temporary copy after editing it (ctrl+s) in two ways:

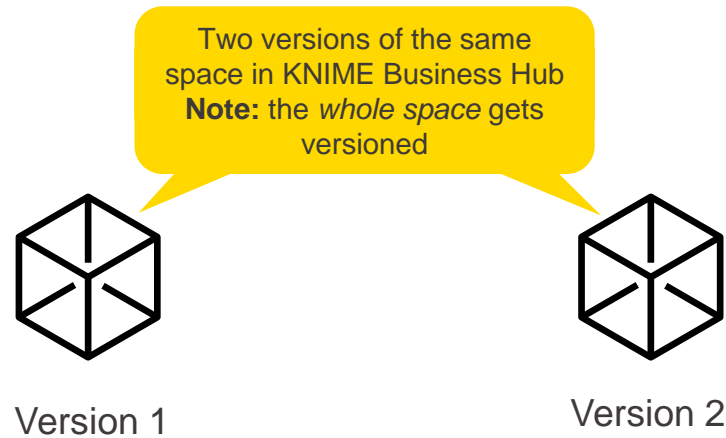
- **safe:** save locally and then re-upload it to KNIME Business Hub, replacing the original copy
- **less safe:** overwrite the original copy on KNIME Business Hub directly, but if someone overwrites it before your work gets versioned, your changes will be lost

Versioning



Versioning: Motivation

- Switch back to a previous, bug-free version of a space
- Compatibility within a group of workflows
- Reproducibility



Creating a Version of a Space on KNIME Business Hub

Open for Innovation
KNIME

Hub

Search workflows, nodes and

KNIME Business Hub for Education > Data Team > Spaces > Demo Space

Private space
Demo Space

Last edited: Mar 21, 2023

Space history

Home

- 02_Deployment_workflow
- 03_Computing_predictions

Add description

Space history

Unversioned changes

Create version

- 03_Computing_predictions
Mar 21, 2023 3:45 PM
- 01_Training_workflow
Mar 21, 2023 3:44 PM
- 02_Deployment_workflow
Mar 21, 2023 3:44 PM

Versions

- added deployment
Mar 21, 2023 3:44 PM
- first upload
Mar 21, 2023 3:43 PM

Go to the space you want to create a version of and click *Space history*

Click *Create version* to create a new version

A panel on the right opens where you can see all the existing versions and all the new changes in the space since the last version was created

Navigating and Downloading a Space Version

The screenshot shows the KNIME Hub interface for a 'Demo Space'. The main area displays the space name and a list of workflows: '02_Deployment_workflow' and '03_Computing_predictions'. A 'Space history' panel is open on the right, showing a list of unversioned changes and a list of versions. The 'Versions' list includes 'added deployment' and 'first upload'. A yellow callout box points to the three dots next to the 'first upload' version entry.

Click the three dots for the version you want to navigate to and click *Show version*. You will be redirected to the space in that specific version. You can download the whole space or a subset of it.

Navigating to a Version of a Workflow

- The *whole space* gets versioned, but it is possible to go back to a specific version of a workflow that is part of the space history

Open for Innovation
KNIME Hub

Search workflows, nodes and more...

KNIME Dev Business Hub > Evangelism Team > Spaces > Versioning Examples > Example 1

Workflow
Example 1

Last edited: Feb 8, 2023 Workflow history

Second Version

CSV Reader → Column Filter → Row Filter

Workflow history

Only changes and versions concerning this item are being displayed. [Show complete space history >](#)

Versions

- Fix + new upload
Feb 8, 2023 9:37 AM
- First version uploaded
Feb 8, 2023 9:32 AM

Click *Workflow history* to see the space's versions that have been created and that contain the workflow

There are two versions of this workflow in the space history

Navigating to a Version of a Workflow

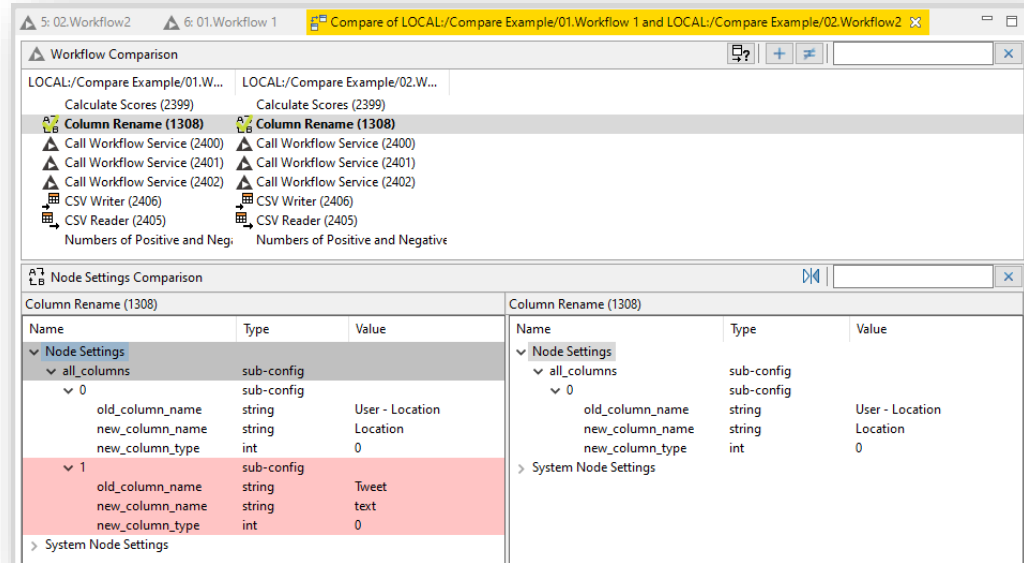
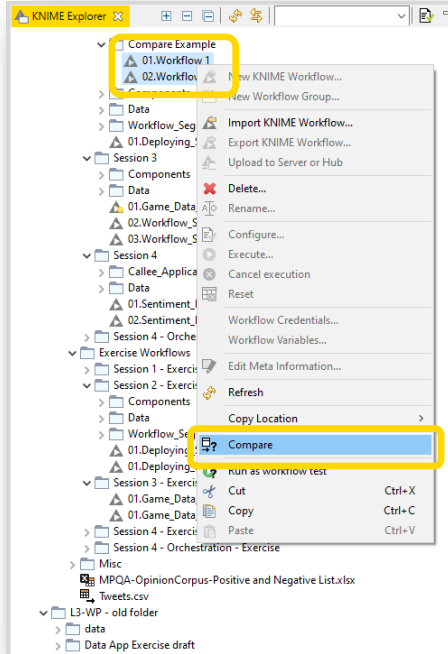
Once a version of a workflow is selected, it can be downloaded, executed, and deployed

A blue border is shown when navigating older versions

The screenshot displays the KNIME Hub interface. At the top, the KNIME logo and 'Hub' are visible, along with a search bar. The breadcrumb navigation path is: KNIME Dev Business Hub > Evangelism Team > Spaces > Versioning Examples > Example 1. The main content area shows a workflow titled 'Example 1' with a version selected: 'Version: "First version uploaded" Feb 8, 2023'. Below this, a workflow diagram is shown, titled 'First Version', containing two nodes: 'CSV Reader' and 'Column Filter', connected by an arrow. A yellow box highlights this diagram. On the right, a 'Workflow history' panel is open, showing a list of versions. The 'First version uploaded' entry is highlighted with a blue border, indicating it is the selected version. The 'Fix + new upload' entry is also visible. The KNIME logo and 'Open for Innovation' tagline are present in the bottom right corner.

KNIME Workflow Difference (1/2)

- Automates identification and comparison of nodes in a workflow, metanodes, and two different workflows
- Identifies insertions, deletions, substitutions, and parameter change



KNIME Workflow Difference (2/2)

Workflow Comparison

knime-server/00_ServerWebinar/...	LOCAL/00_ServerWebinar/03_wo...
Color Manager (101)	Color Manager (101)
Select Data File (158)	Select Data File (158)
Display Cluster Result (130)	Display Cluster Result (130)
Define Cluster Parameters (12)	Define Cluster Parameters (126)
k-Means (138)	k-Means (138)
PMML Writer (156)	PMML Writer (156)
File Reader (91)	File Reader (91)
	Bar Chart (JavaScript) (159)

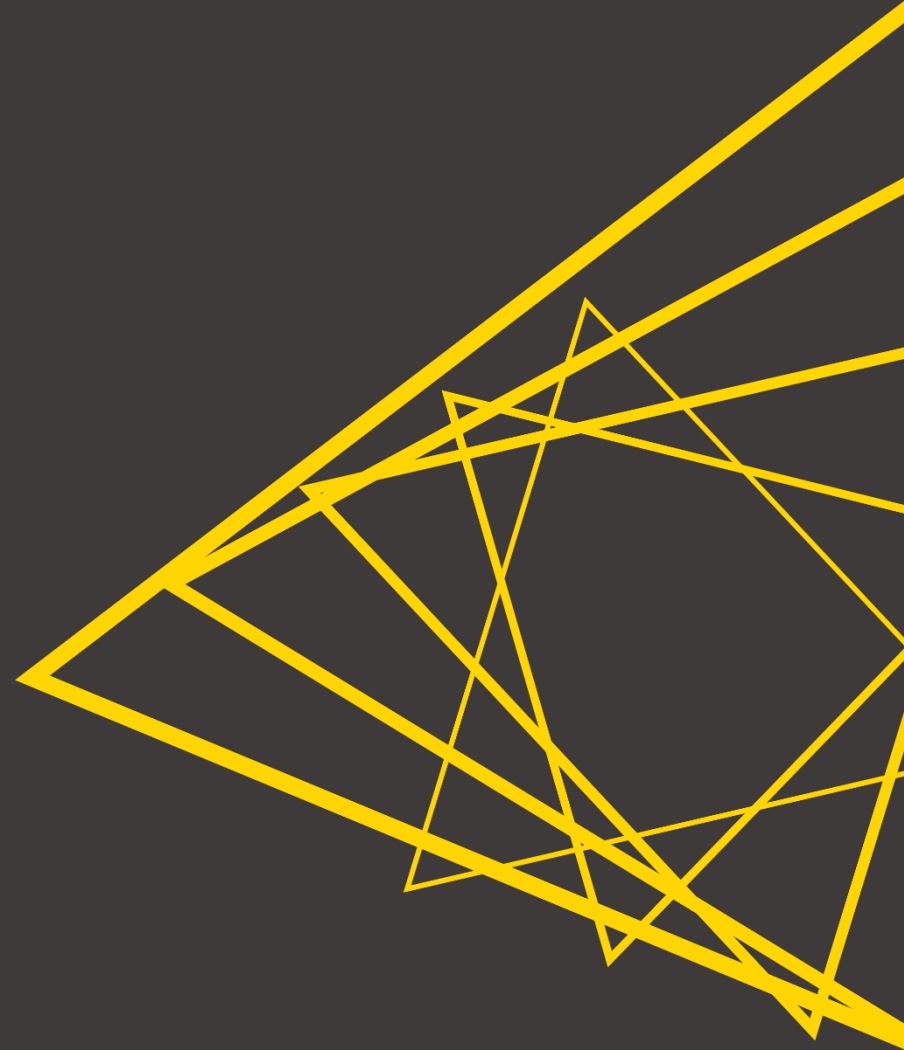
Highlight differences:

- Nodes included/excluded
- Node configurations

Node Settings Comparison

k-Means (138)			k-Means (138)		
Name	Type	Value	Name	Type	Value
Node Settings					
nrClusters_Internals	sub-config		nrClusters_Internals	sub-config	
nrClusters	int	3	nrClusters	int	3
maxNrIterations_Internals	sub-config		maxNrIterations_Internals	sub-config	
maxNrIterations	int	99	maxNrIterations	int	999
cfgColmns_Internals	sub-config		cfgColmns_Internals	sub-config	
cfgColmns	sub-config		cfgColmns	sub-config	
enableHilite_Internals	sub-config		enableHilite_Internals	sub-config	
enableHilite	boolean	false	enableHilite	boolean	false
System Node Settings					

Workflow Execution and Deployment



Executing a Workflow on KNIME Business Hub

- To execute a workflow, an **execution context** is needed
 - It dictates **what computing resources are available** (e.g., number of cores, what GPU or CPU)
 - A team can own multiple execution contexts, owned and managed by the teams' admins
- To deploy a workflow, you need to have created **at least one version** of its corresponding space
- Executions create **jobs**
 - A job is a **copy of the workflow** you want to execute with **specific settings and**



One-time Execution of a Workflow on KNIME Business Hub

- You can perform a one-time execution of your workflows (e.g., to test them)
 - Execution will be performed on the version of the workflow from which the *Run* is initiated -- navigate to the workflow version you want to execute first!

The image shows a sequence of three screenshots from the KNIME Business Hub interface, illustrating the process of running a workflow. The first screenshot shows a workflow page titled "Simple Model Training for Classification" with a yellow callout bubble that says "Go to the workflow page on KNIME Business Hub and click Run". The second screenshot shows the workflow "Visual Analysis of Sales Data" with a yellow callout bubble that says "Select the execution context". The third screenshot shows the "Ad hoc execution" dialog box with a yellow callout bubble that says "By clicking *Enable workflow actions* you can choose if notifications should be sent (*On failure* or *On success*). Multiple emails can also be sent".

Deploying a Workflow on KNIME Business Hub

- A workflow can be deployed in different ways:
 - **Data app** - Provides a user interface for scalable and shareable operations (e.g., visualization)
 - **Schedule** - Runs at specific times and performs actions based on the result of each execution
 - **Service** - Has a REST endpoint and can be called by external services

The screenshot displays the KNIME Business Hub interface. At the top, the 'Hub' logo and navigation links are visible. The main content area shows a workflow titled 'Visual Analysis of' with a flow diagram consisting of five nodes: CSV Reader, Column Filter, Row Filter, Domain Calculator, and Component. A yellow callout box with a speech bubble points to the 'Deploy' button in the top right corner of the workflow view. The callout text reads: 'Go to the workflow page, click *Deploy*, and select which kind of deployment you want to create'. The 'Deploy' dropdown menu is open, showing three options: 'Data app', 'Schedule', and 'Service', each with a 'Create' button.

Go to the workflow page, click *Deploy*, and select which kind of deployment you want to create

CSV Reader
Read sales_2008-2011.csv

Column Filter
Select "country", "date", "amount" and "product" columns

Row Filter
Exclude rows where country unknown

Domain Calculator

Component

Workflow that is built according to the instructions on the "Build a workflow" page and in the KNIME Quickstart Guide

Shows possible steps in analyzing (sales) data

1. Data access - Reading a csv file
2. Data preprocessing - Filtering columns and rows
3. Data visualization - Assigning colors to groups in the data. Building graphs.

External resources

→ Build a workflow → KNIME Quickstart Guide

Data app
Create a data app to interact with the workflow via a user interface.
Create data app

Schedule
Schedule your workflow to run automatically at selected times.
Create schedule

Service
Create a service to use the workflow as an API endpoint.
Create service

Deploying a Workflow on KNIME Business Hub

- A workflow can be deployed in different ways:

Focus today

- Data app** - Provides a user interface for scalable and shareable operations (e.g., visualization)
- Schedule** - Runs at specific times and performs actions based on the result of each execution
- Service** - Has a REST endpoint and can be called by external services

The screenshot displays the KNIME Business Hub interface. At the top, the KNIME logo and 'Hub' are visible. Below, a workflow titled 'Visual Analysis of' is shown with a sequence of nodes: CSV Reader, Column Filter, Row Filter, Domain Calculator, and Component. A yellow callout bubble points to the 'Deploy' button in the top right corner of the workflow view, containing the text: 'Go to the workflow page, click *Deploy*, and select which kind of deployment you want to create'. A modal window is open on the right side, titled 'Data app', 'Schedule', and 'Service', each with a 'Create' button. The workflow description below the nodes reads: 'Workflow that is built according to the instructions on the "Build a workflow" page and in the KNIME Quickstart Guide. Shows possible steps in analyzing (sales) data. 1. Data access - Reading a csv file. 2. Data preprocessing - Filtering columns and rows. 3. Data visualization - Assigning colors to groups in the data. Building graphs. External resources: -> Build a workflow -> KNIME Quickstart Guide'.

Deploying a Workflow

The screenshot shows the KNIME Hub interface for a workflow titled "Visual Analysis of Sales Data". The workflow consists of five nodes: CSV Reader, Column Filter, Row Filter, Domain Calculator, and Component. The CSV Reader node is configured to read "sales_2008-2011.csv". The Column Filter node is configured to select "country", "date", and "amount" columns, excluding "product". The Row Filter node is configured to exclude rows where the country is unknown. The Domain Calculator node is also configured. The Component node is currently disabled, indicated by a red exclamation mark icon.

Deployment options are shown in a dropdown menu:

- Data app**: Create a data app to interact with the workflow via a user interface. (Create data app)
- Schedule**: Schedule your workflow to run automatically at selected times. (Create schedule)
- Service**: Create a service to use the workflow as an API endpoint. (Create service)

A yellow callout bubble points to the "Deploy" button and the deployment menu, containing the text: "After clicking *Deploy*, select how you want to deploy it".

Workflow description: Workflow that is built according to the instructions on the "Build a workflow" KNIME Quickstart Guide. Shows possible steps in analyzing (sales) data:

1. Data access - Reading a csv file
2. Data preprocessing - Filtering columns and rows
3. Data visualization - Assigning colors to groups in the data. Building graphs.

External resources:

- Build a workflow
- KNIME Quickstart Guide

Deploying a Workflow: General Options

Visual Analysis of Sales Data

Deployment name: Data app - Visual Analysis of Sales Data

Version: test3 - Dec 20, 2022 3:43 PM

Select execution context: medium-execution-context-4vcore

Workflow actions: Control basic actions of the workflow execution.

Advanced settings: Change job lifecycle behaviour, timeouts, ...

Workflow steps:

- CSV Reader: Read sales_2008-2011.csv
- Column Filter: Select "country", "date", "amount" and "product" columns
- Row Filter: Exclude rows where country unknown
- Domain Calculator
- Component

These options are available for all deployment types - not only for data apps!

Select a name for the deployment

Select the space version you want to deploy

Select execution context

Cancel Create

Deploying a Workflow: General Options

Workflow actions

Control basic actions of the workflow execution.

Enable workflow actions

Enter one or multiple email addresses to which a notification should be sent after the execution is finished

Notify via email

Email

emilio.silvestri@knime.com

Condition

On success

Email

aline.bessa@knime.com

Condition

On failure

+ Add more

Report formats to attach

- PDF
- HTML
- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint

If the workflow creates reports, *Enable workflow options* also allows you to specify attachment formats for them

Deploying a Workflow: General Options

Workflow
Configuration Options Example

Last edited: Mar 8, 2023

These parameters can be configured when executing the workflow on KNIME Business Hub (Configuration Options panel)

- String Configuration**
User
- String Configuration**
Operation ID
- Single Selection Configuration**
Department

Ad hoc execution

Instant execution of your workflow.

Version
Latest state

Execution context
Evangelism Execution Context (Default)

Workflow actions
Control basic actions of the workflow execution.

Enable workflow actions

Configuration options
Control the parametrization of the workflow execution.

User
user01

Operation ID
989890

Department
Finance

Cancel Run

If the workflow has Configuration nodes at its top level, you can configure their values upon execution

Deploying a Workflow: General Options

Advanced settings

Change job lifecycle behaviour, timeouts, ...

Set >

Set a variety of parameters related to the job: maximum available memory, maximum execution time etc.

← Back to "Create schedule"

Job lifecycle

Discard upon

Successful execution

Failed execution

Max job time in memory

PT1H

Max job life time

PT168H

Max job execution time

PT24000H

Discard after max execution time

Default load timeout

PT5M

Start execution timeout

PT1M

Default swap timeout

PT1M

Default async load timeout

PT5M

Default execution timeout

PT5M

Select when to discard a job (a specific workflow execution)

Deploying a Workflow as a Schedule: Specific Options

Repeat execution after a certain number of minutes, hours, or days -- or add specific start times

Create schedule

Schedule your workflow to run automatically at selected times.

Schedule options

Define when the workflow should be executed.

Initial execution

2023-03-07 15 : 50 : 00

Repeat execution

Every Start times

1 Minutes

Schedule ends date

Never **Date**

Select date

2023-03-08 15 : 50 : 00

Set schedule details **Set >**

Set the jobs to run only on certain days of the week, days of the month, or only in certain months

Back to "Create schedule"

Recurring on

Days of the week

M T W T F S S

Invert selection of days of the week

Days

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	Last day of the month			

Invert selection of days

Months

Jan	Feb	Mar	Apr	May	Jun
Jul	Aug	Sep	Oct	Nov	Dec

Invert selection of months

Execution retries

0

Reset before execution

Skip execution if previous job is still running

Disable schedule

Try executing the workflow a number X of time

Schedules can be disabled temporarily

Sharing Deployments

The screenshot displays the KNIME interface with two main panels. The left panel, titled "Deployments", shows a table of deployment records. The right panel, titled "Manage deployment access", is a modal window for sharing a deployment with other users.

Deployments Panel:

Type of deployment	Name	Workflow	Version	Date of creation ↓	Execution context	Status
Data app	Data app - Building aor_-_Lexicon_Based/	Demo in session 1 fa...	Mar. 25, 2023, 1:03	Evangelism Executio...	

Manage deployment access Panel:

Here you can select with whom to share your deployment with.

Search: Enter user name to be added

- albrecht
- alexander.fillbrunn
- alinebessa (Selected)
- ana-analyst
- arnaud_heitzmann
- attillac

Buttons: Cancel, Apply

List of deployments at the bottom of the workflow's page

Click the three dots for the chosen deployment, select *Manage access*, and the panel on the right will pop up

Enter username of the user you want to share the deployment with and click *Add*, then click *Apply*

Accessing Deployments

Type of deployment	Name	Workflow	Version	Date of creation	Execution context	Status
Data app	Data app - 02_Su...	...tockouts_demo/	fresh upload	Mar. 7, 2023, 10...	Evangelism Exec...	

The workflow page lists all the deployments of a workflow

The Team page lists all the deployments available for the Team

Type of deployment	Name	Workflow	Date of creation	Execution context	Status
Data app	Data app - 02_Supply...	...ds_Stockouts_demo/	Mar. 7, 2023, 10:26	Evangelism Executio...	
Data app	Data app - 02_Deploy...	...ployment_workflow/	Feb. 27, 2023, 15:53	Evangelism Executio...	
Service	01 Service - 02_Deplo...	...ployment_workflow/	Feb. 24, 2023, 12:05	Evangelism Executio...	
Service	Service - 02_Deploy...	...ployment_workflow/	Feb. 23, 2023, 14:42	Evangelism Executio...	
Data app	Data app - 01_Model...	...performance_report/	Feb. 23, 2023, 13:52	Evangelism Executio...	

`apps.<huburl>` lists all the deployments shared with the user

Type	Name
Data app	Data app - 02_Supply_Chain_Dashb...

Executing a Workflow on KNIME Business Hub Remotely

- You can also create workflow executions remotely, through KNIME Analytics Platform

The image shows the KNIME Explorer interface on the left, displaying a tree view of a workspace. A context menu is open over a workflow item, with the 'Execute...' option highlighted. A yellow callout bubble points to this menu with the text: "Navigate through the different tabs to see the options discussed in previous slides". An arrow points from this bubble to the 'Hub Execution Options' dialog box on the right. The dialog box has a tab labeled 'Execute workflow on hub' circled in yellow. Below this, there are settings for 'Execution context', 'Space version', and checkboxes for 'Reset before Execution', 'Discard Workflow Job after successful Execution', and 'Discard Workflow Job after failed Execution'. There is also a section for 'Email' notifications with a table showing an email address and status indicators for 'On success' and 'On failure'.

Execute workflow on hub

Execution context: Evangelism Execution Context
Space version: Fix + new upload

Reset before Execution
 Discard Workflow Job after successful Execution
 Discard Workflow Job after failed Execution
Custom job name (default: workflow name plus execution time)

Actions | Scheduling options | Configuration options

Email action | Report action | Call workflow action

Notify upon completion

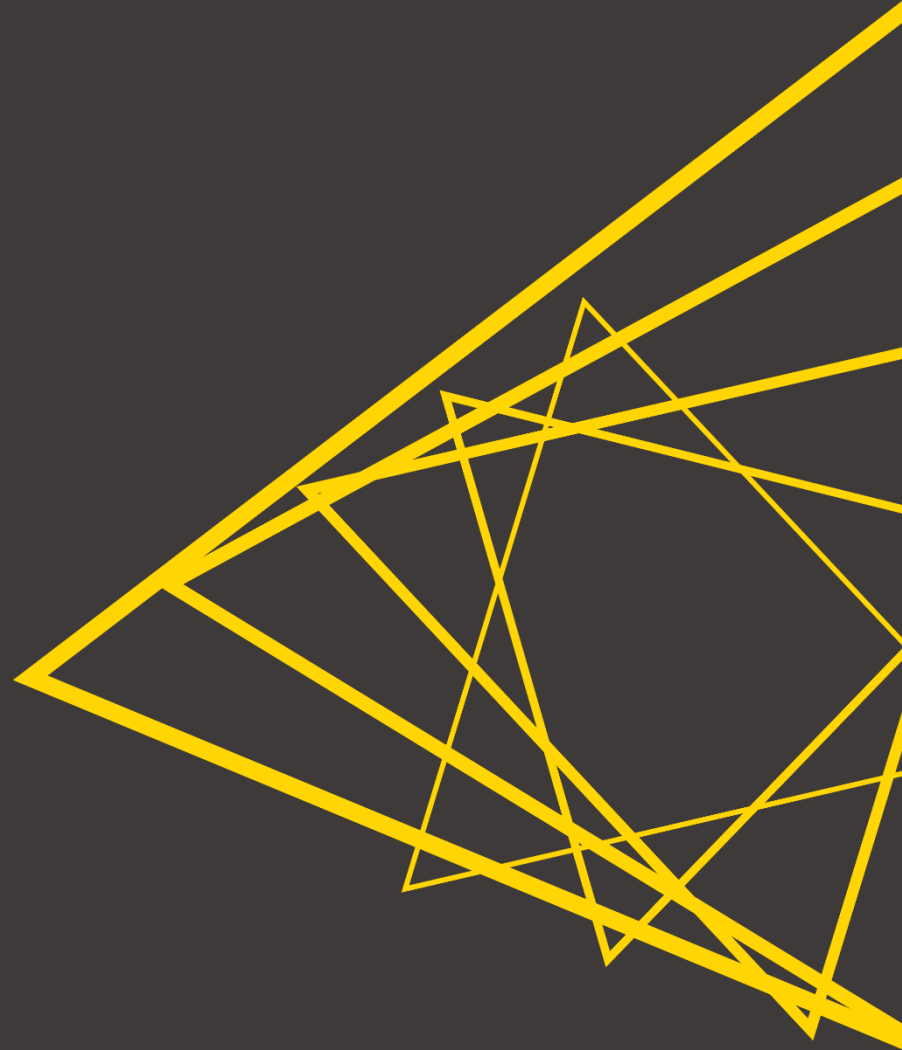
Email	On success	On failure	Add/remove
email@example.com	✓	✗	+

Clear all

Append node messages to notifications
 Notify if job is discarded due to inactivity

OK Cancel

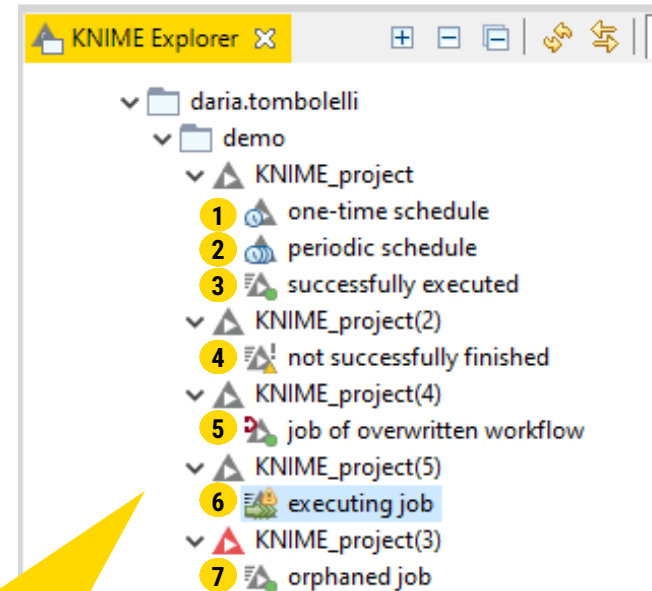
Remote Workflow Editor



Workflow Jobs: More Details

Executed and deployed workflows are run as **jobs**:

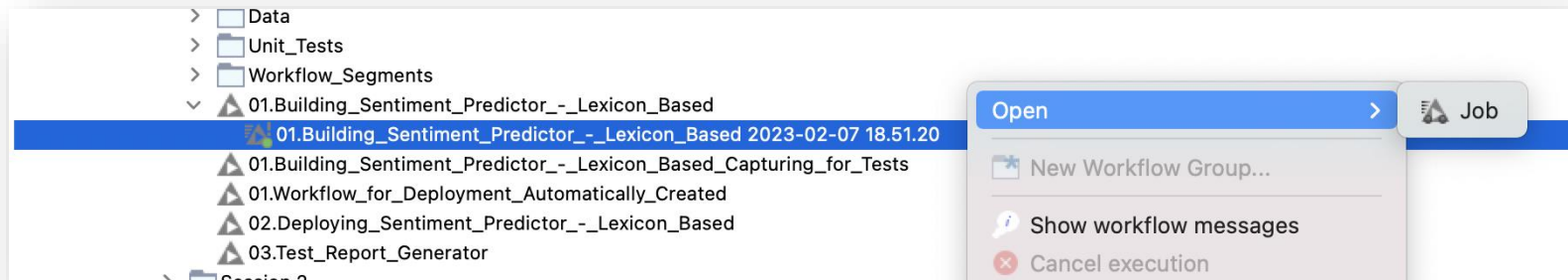
- Copy of the workflow with specific settings and data
- Jobs can be saved as a workflow for data provenance and debugging
 - Right-click → Save as
- Modifying a job doesn't modify its original workflow
- Jobs have messages (e.g. successful or failure)



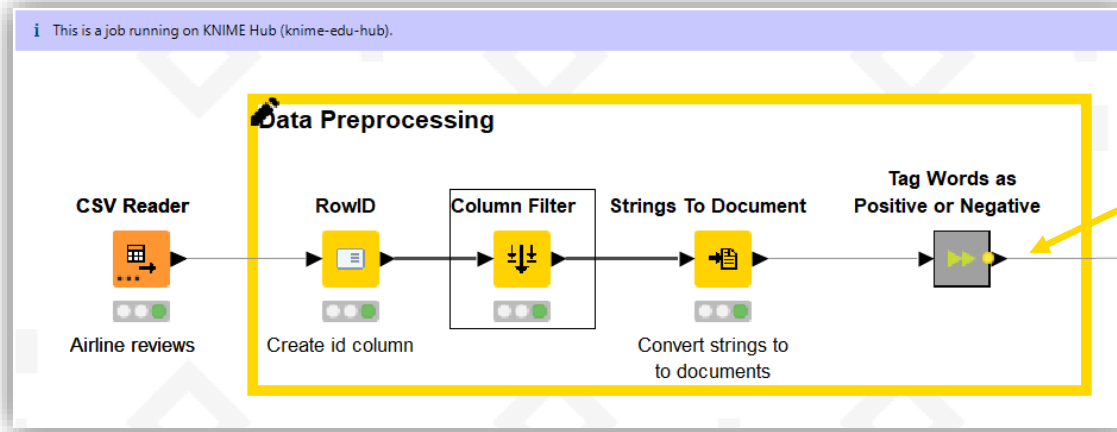
Different jobs statuses on KNIME Analytics Platform

Remote Workflow Editor

- Remote Control of Job running on KNIME Business Hub
- Capabilities:
 - Live update of workflow job execution (executing node and progress)
 - Execute and cancel execution supported
 - Add/delete nodes
 - Change node settings
 - Inspect data tables / flow variables
 - JavaScript nodes can show data/views
- KNIME Remote Workflow Editor extension



Remote Workflow Editor



What's my workflow doing now?

Change node configurations in the Job

JavaScript View support

This screenshot shows a context menu for a "Table View" node in a KNIME workflow. The menu options and their keyboard shortcuts are:

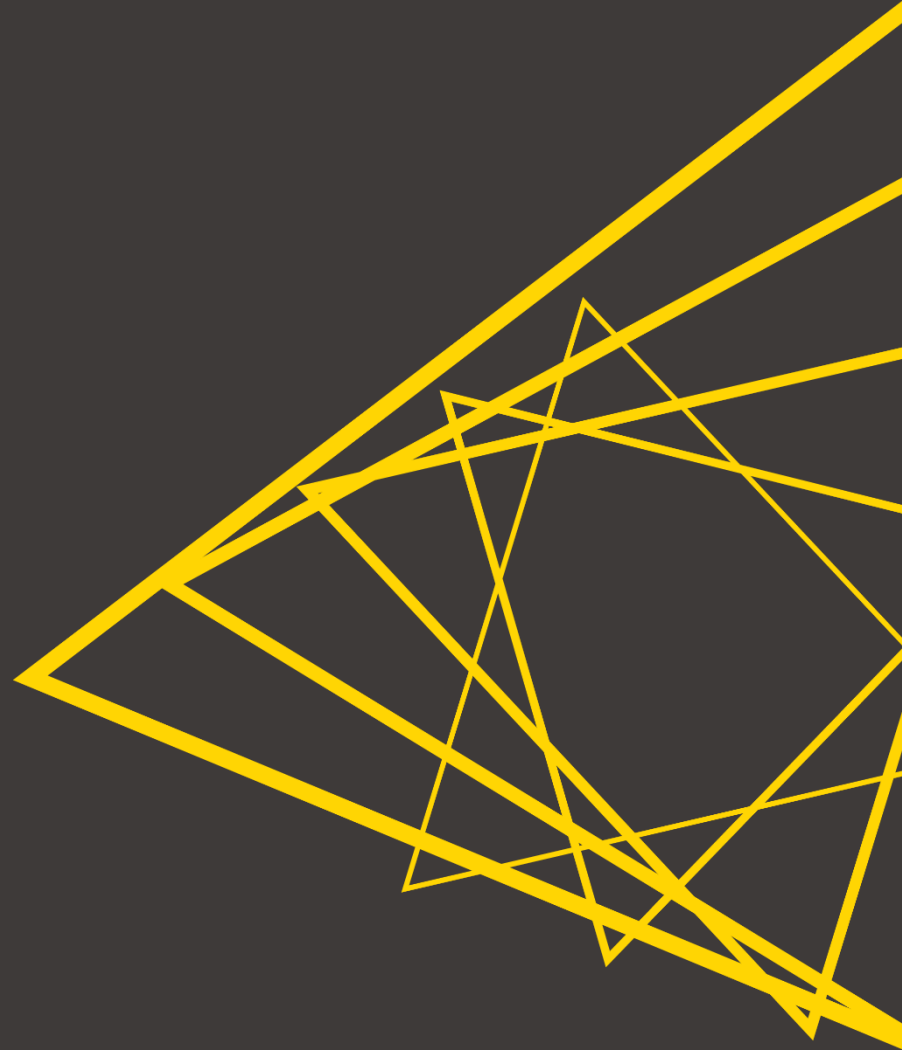
Option	Shortcut
Configure...	F6
Execute	F7
Execute and Open Views	Shift+F10
Cancel	F9
Reset	F8

Session 2: Summary

After this session, you should be able to:

- Identify the different KNIME Business Hub use cases and stakeholders
- Understand the steps to connect and upload to KNIME Business Hub
- Determine who can get access to your spaces and workflows
- Understand how to version your spaces
- Learn how to perform workflow execution and deployment in KNIME Business Hub
- Edit workflows with the Remote Workflow Editor

Exercises



Config Details - Access KNIME Business Hub

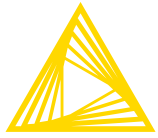
- KNIME Business Hub address: <http://edu-hub.knime.com>

Login credential: *userXX*

Password: *hubXX*

Exercises Session 2

- **Exercise 01** – Upload the workflow group Session 2 to KNIME Business Hub, inside your space.
- **Exercise 02** - Schedule an execution of the Exercise workflow (2 minutes later) and send yourself a notification of successful/unsuccessful execution -- spoiler, it will fail!
- **Exercise 03** - Open the workflow job on KNIME Business Hub, recognize the error, fix it, and re-upload the workflow. Create a new space version with the fixed workflow..
- **Exercise 04** - Execute the workflow again on KNIME Business Hub and check the produced results.

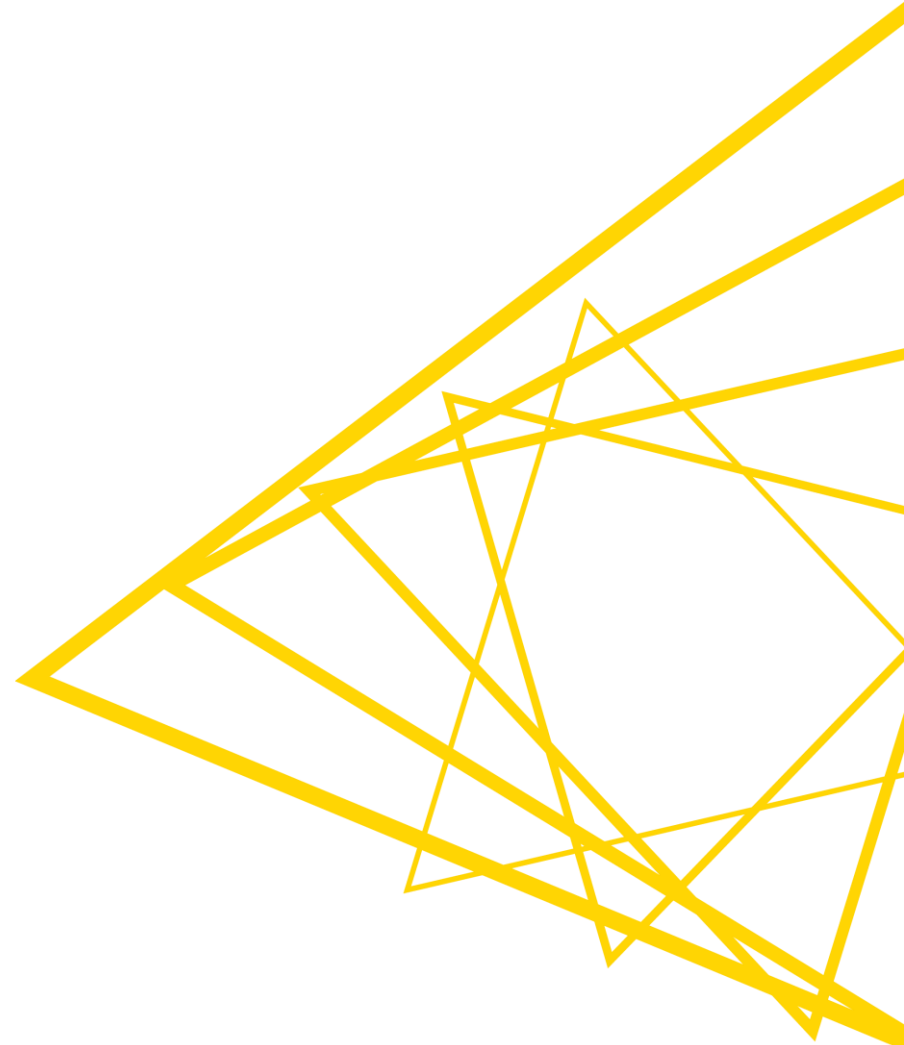


Open for Innovation

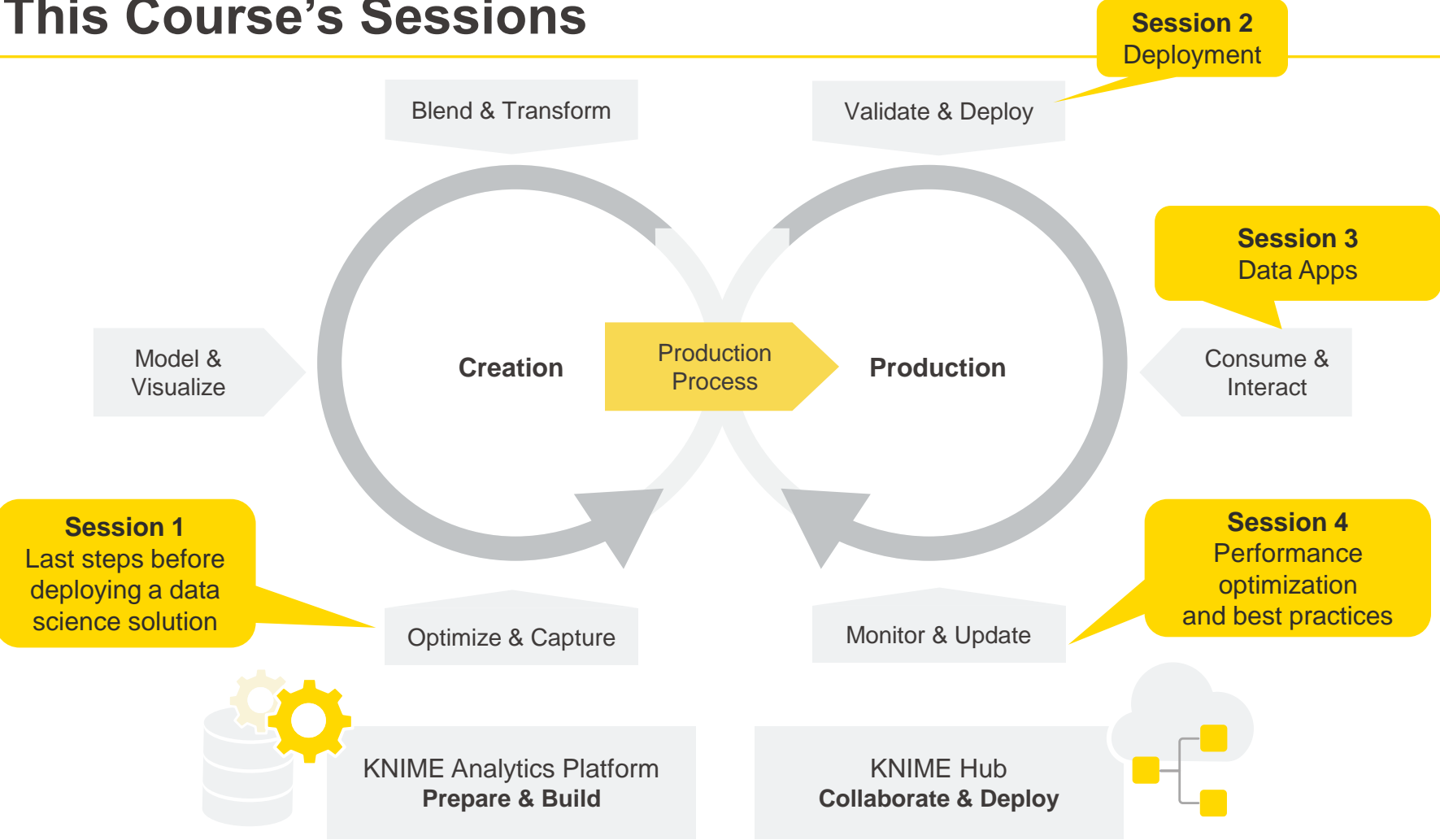
KNIME

Session 3

Data Apps



This Course's Sessions



Learning Objectives

1. Define the concepts of Data Apps in KNIME Business Hub
2. Identify and apply the main Data App functionalities
3. List and use the tools to customize a Data App
4. Outline the steps to deploy and share a Data App

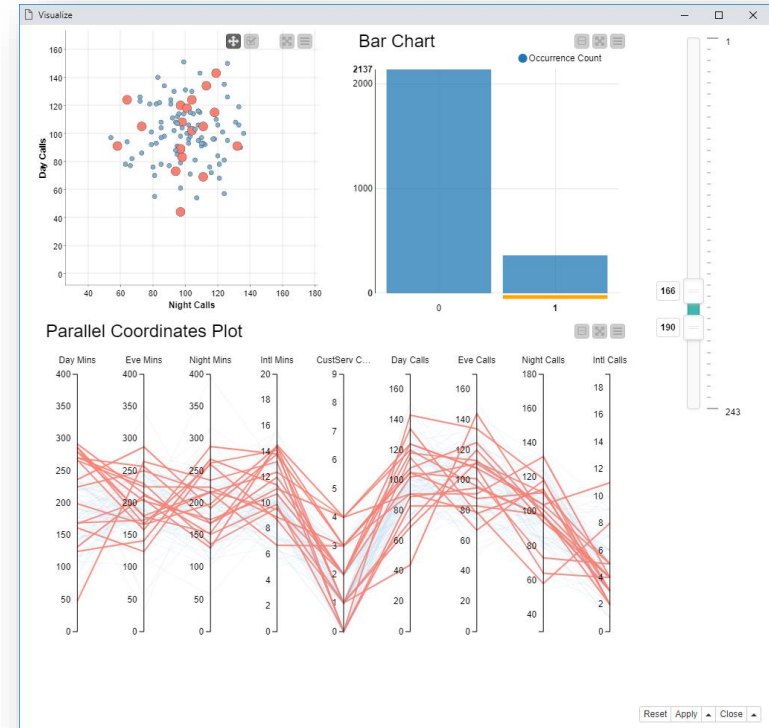
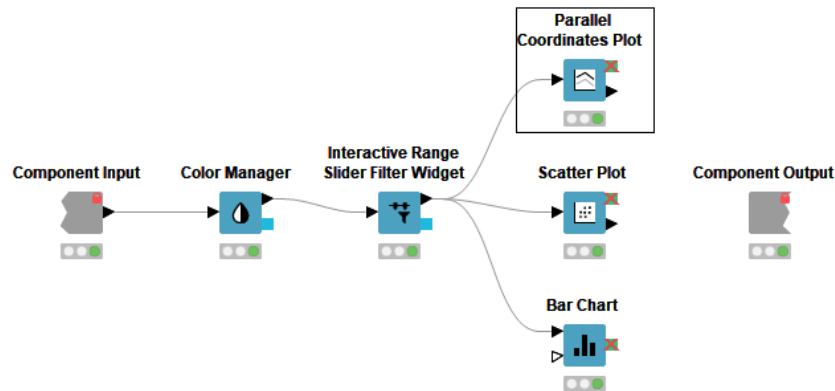


Data Apps in KNIME Business Hub



Refresh: Component Composite View

- Multiple JavaScript View nodes can be combined in Components
- Selections are transmitted to all other views
- Widgets enable interactivity

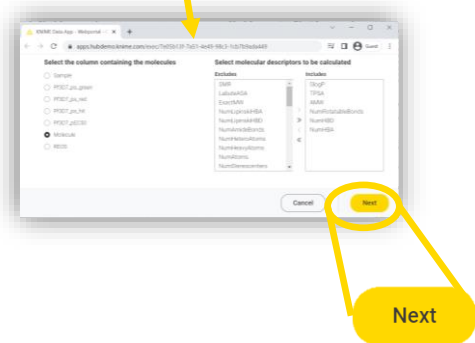


Composite Views: KNIME AP vs Deployed Data App

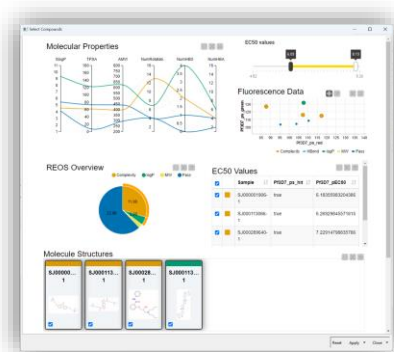
KNIME Analytics Platform (AP)



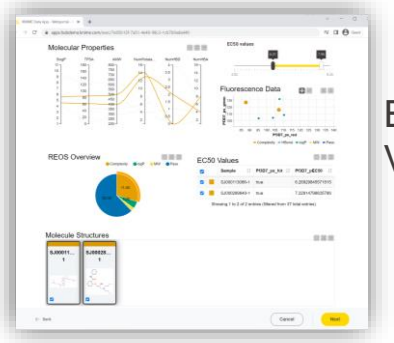
Deployed Data App



Executed locally
Visualized in KNIME AP



Executed on KNIME Business Hub
Visualized in Browser as **Data App**



Refresh: Nodes that appear in the composite view

- If it's blue, you get a view!

The image displays three screenshots of the KNIME Node Repository, each showing a different category of nodes and its corresponding view.

- Widgets:** The first screenshot shows the 'Widgets' category in the Node Repository. A yellow callout box labeled 'Widgets' points to the category. A 'Boolean Widget' node is highlighted, and its corresponding view is shown to the right. The widget is a blue square with a red circle and a green circle, and the view is a simple interface with two buttons.
- JavaScript Views:** The second screenshot shows the 'JavaScript Views' category in the Node Repository. A yellow callout box labeled 'JavaScript Views' points to the category. A 'Bar Chart' node is highlighted, and its corresponding view is shown to the right. The widget is a blue square with a bar chart icon, and the view is a simple interface with a bar chart.
- Lab Views:** The third screenshot shows the 'Lab Views' category in the Node Repository. A yellow callout box labeled 'Lab Views' points to the category. A 'Bar Chart' node is highlighted, and its corresponding view is shown to the right. The widget is a blue square with a bar chart icon, and the view is a simple interface with a bar chart. A yellow callout box labeled 'Improved view and interactive configuration' points to the 'Bar Chart' node in the 'Lab Views' category. Another yellow callout box labeled 'Available in the [KNIME Views \(Labs\)](#) extension' points to the 'Bar Chart' node in the 'Lab Views' category.

Data Apps in KNIME Business Hub

The screenshot displays the KNIME Business Hub interface for a workflow named "01.Game_Data_App". The top navigation bar includes the KNIME logo, the word "Hub", a search bar, and a user profile icon labeled "EB". The breadcrumb trail shows the path: KNIME Dev Business Hub > Evangelism Team > Spaces > My Hub Space > Demo Session 3 > 01.Game_Data_App.

The workflow is identified as a "Workflow" and is last edited on Jan 12, 2023. It has 0 likes and 2 shares. Action buttons for "Run" and "Deploy" are visible. A sidebar on the right, highlighted with a yellow circle, offers options to "Create data app", "Create schedule", and "Create service".

The main workflow diagram, titled "Game Data App", is composed of several pages and nodes:

- Page 1:** Welcome (Static page with widget)
- Page 2:** Counting Loop Start, Play, Variable Loop End (Automatic re-execution, Component in loop)
- Page 3:** Form (Data collection, "Next" triggers re-execution)
- Page 4:** Dashboard, Page 4b (Message: fill the form) (Conditional path, "Back" button for previous view)

Key nodes and their functions are highlighted with yellow boxes:

- Call Workflow Service:** Update global results
- Empty Table Switch:** Triggers re-execution
- Table Row to Variable:** Data collection
- Refresh button to update view:** Conditional path

Data Apps in KNIME Business Hub

The screenshot displays the KNIME Business Hub interface. At the top, there is a navigation bar with the KNIME logo and 'Hub' text. A search bar is present with the placeholder text 'Search workflows, nodes and more...'. Below the navigation, the breadcrumb path reads: 'KNIME Dev Business Hub > Evangelism Team > Spaces > My Hub Space > Demo Session 3 > 01.Game_Data_App'. The main content area shows the workflow '01.Game_Data_App' with a 'Workflow history' button. A yellow callout box points to the 'Deployment options for data apps' section on the right. This section includes a 'Deployment name' field with the value 'Data app - Guess the Flag', a 'Version' field with 'working demo - Jan 12, 2023 2:39 PM', an 'Execution context' dropdown set to 'Evangelism Execution Context (Default)', a 'Workflow actions' section with an unchecked 'Enable workflow actions' checkbox, and an 'Advanced settings' section with a 'Set >' link. At the bottom of the deployment panel are 'Cancel' and 'Create' buttons. The workflow diagram below shows three pages: Page 1 (Welcome), Page 2 (Counting Loop Start, Play, Variable Loop End), and Page 3 (Form). It includes nodes for 'Call Workflow Service', 'Empty Table Switch', and 'Table Row to Variable'. Annotations highlight various features like 'Static page with widget', 'Automatic re-execution', 'Data collection', and 'Conditional path'.

Open for Innovation
KNIME Hub

Search workflows, nodes and more...

KNIME Dev Business Hub > Evangelism Team > Spaces > My Hub Space > Demo Session 3 > 01.Game_Data_App

Workflow
01.Game_Data_App

Last edited: Jan 12, 2023 Workflow history

Game Data App
This workflow builds an interactive data app. Each component represents a page, shown sequentially to the user as the workflow gets executed. The behavior of each page can be customized as needed using widgets, refresh buttons, loops, conditional paths etc.

Page 1: Welcome
Page 2: Counting Loop Start, Play, Variable Loop End
Page 3: Form

Call Workflow Service (Update global results)
Call Workflow Service (Update global form)

Empty Table Switch
Table Row to Variable

Refresh button update view

Static page with widget
Automatic re-execution
Component in loop
Data collection
"Next" triggers re-execution
Conditional path
"Back" button for previous view

Deployment options for data apps

Create data app

Create a data app to interact with the workflow via a user interface.

Deployment name
Data app - Guess the Flag

Version
working demo - Jan 12, 2023 2:39 PM

Execution context
Evangelism Execution Context (Default)

Workflow actions
Control basic actions of the workflow execution.
 Enable workflow actions

Advanced settings
Change job lifecycle behaviour, timeouts, ... Set >

Cancel Create

Used extensions & nodes
Extensions Nodes

Data Apps in KNIME Business Hub

Open for Innovation
KNIME

Hub

Search workflows, nodes and more...

KNIME Dev Business Hub > Evangelism Team > Deployments

ET
Evangelism Team

Team

Spaces

Deployments

Settings

Deployments of Evangelism Team

Manage team

Rows: 1-11 of 11

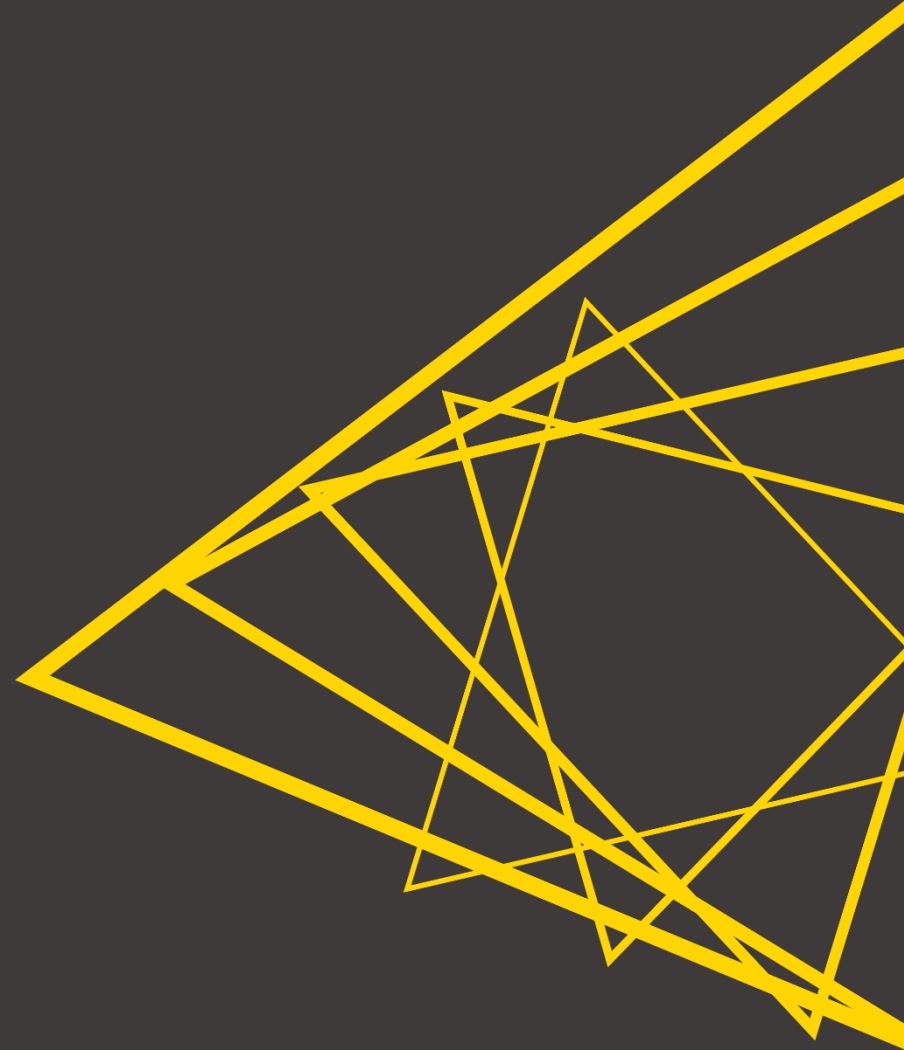
Type of deployment	Name	Workflow	Date of creation	Execution cont...	Status
> Data app	Data app - my_demo 2	...mo space/my_demo/	Jan. 6, 2023, 14:54	Evangelism Executio...	⋮
> Data app	Data app - Game Dat...	..._Data_App - Solution/	Jan. 6, 2023, 16:05	Evangelism Executio...	⋮
> [{}]	Service - Deployed_w...	...orkflow_2023-01-04/	Jan. 4, 2023, 15:38	Evangelism Executio...	⋮
> [{}]	Service - Deployed_w...	...orkflow_2023-01-05/	Jan. 5, 2023, 11:33	Evangelism Executio...	⋮
> Data app	Data app - Guess the/01.Game_Data_App/	Jan. 12, 2023, 13:57	Evangelism Executio...	⋮
> Data app	Data app - Deploye...	...eploy_on_Dashboard/	Jan. 12, 2023, 9:24	Evangelism Executio...	⋮
> [{}]	Service - Simple Calle...	...Callee (Table Based)/	Jan. 4, 2023, 15:48	Evangelism Executio...	⋮
> Data app	Data app - 01.Game_...	.../01.Game_Data_App/	Dec. 20, 2022, 13:37	Evangelism Executio...	⋮
> [{}]	Service2 - Deployed_...	...orkflow_2023-01-05/	Jan. 5, 2023, 11:42	Evangelism Executio...	⋮
> Data app	Data app - my_demo	...mo space/my_demo/	Jan. 6, 2023, 14:40	Evangelism Executio...	⋮
> Data app	Data app - my_demo	...My demo/my_demo/	Jan. 6, 2023, 16:35	Evangelism Executio...	⋮

Rows: 1-11 of 11

50 per page

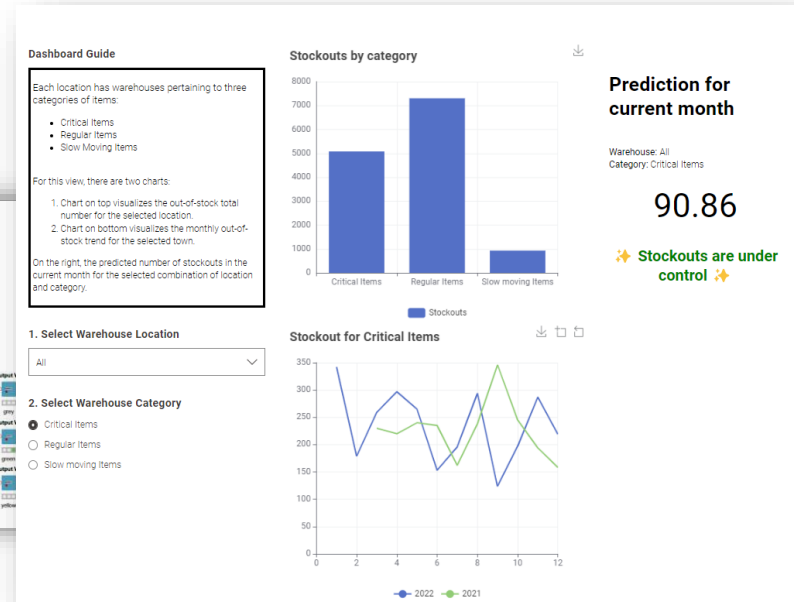
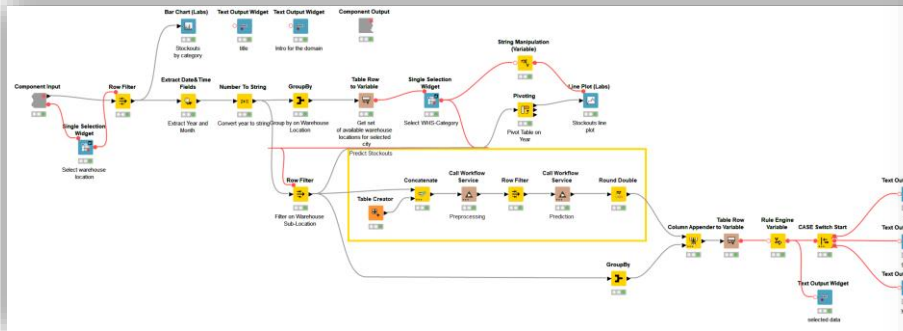
List of deployments available for the Team

Data App Example



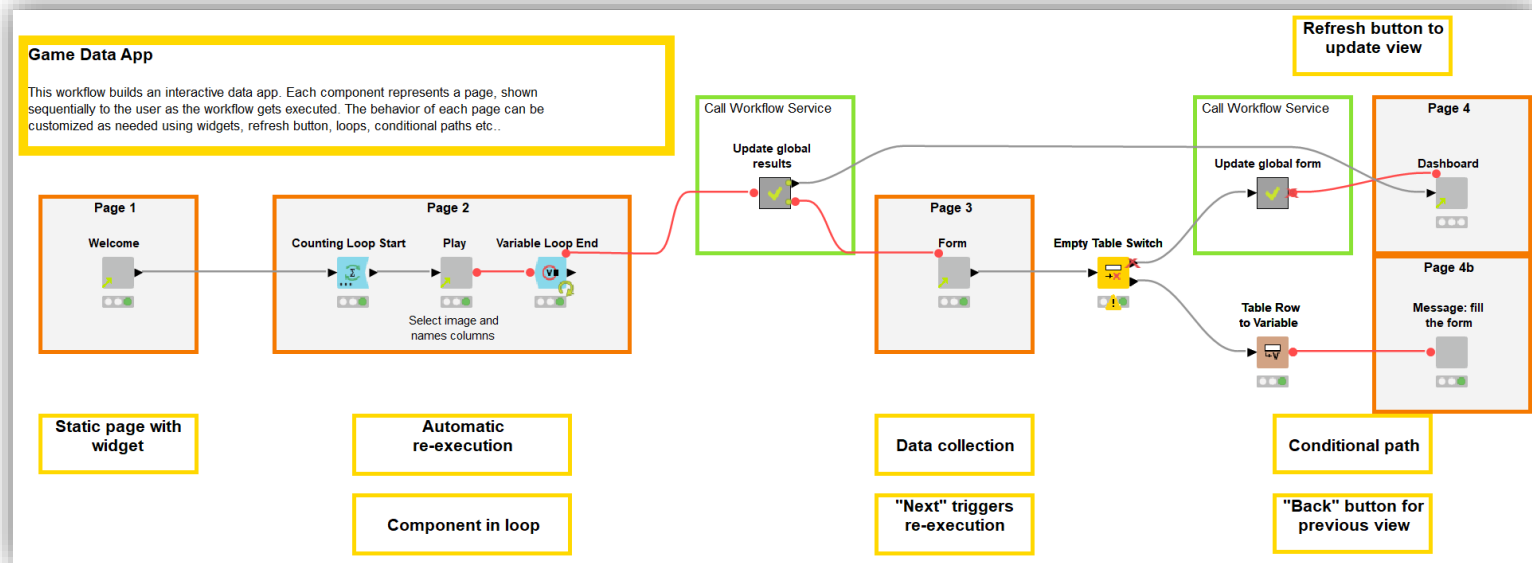
Broaden the Reach of Data Science through Data Apps

- End users can execute workflows of any complexity, without interacting with underlying workflow
- Allow for the consumption of Data Science in an interactive way

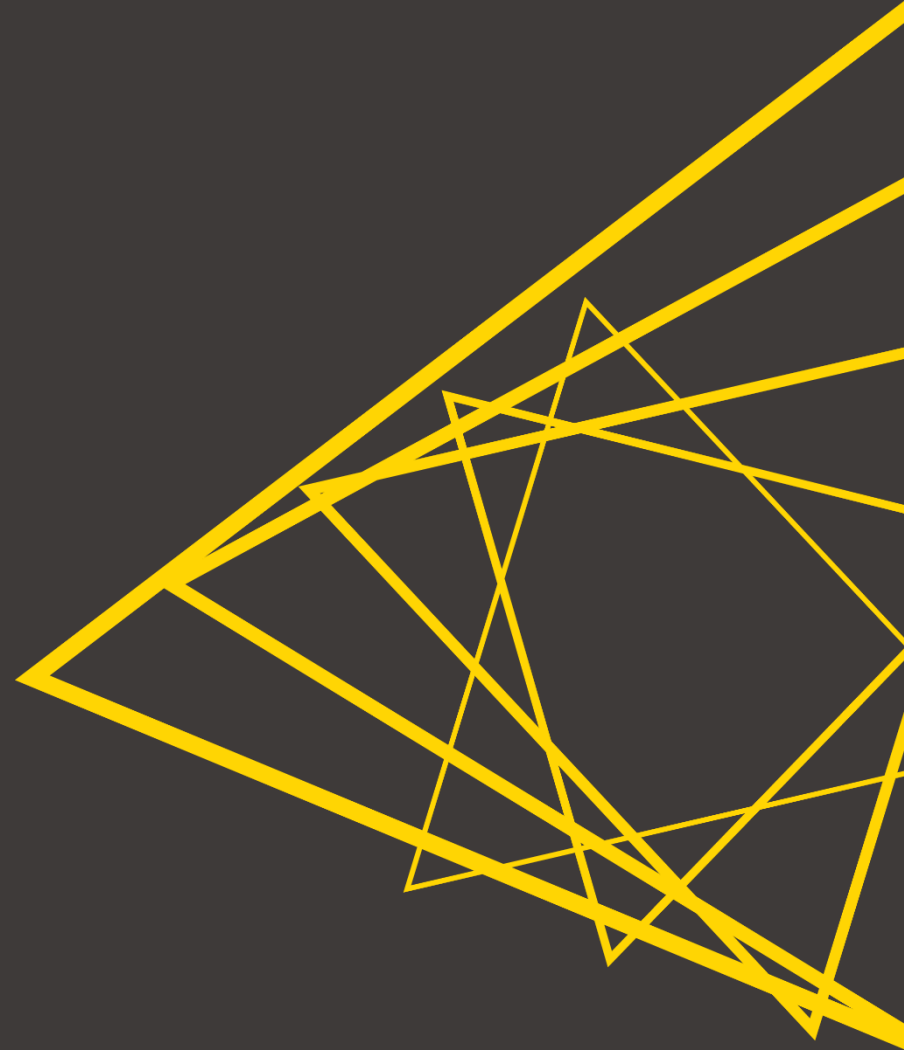


Today's example

- A full web application running on web browser, which embeds
 - A simple guessing game
 - A feedback form
 - An interactive dashboard

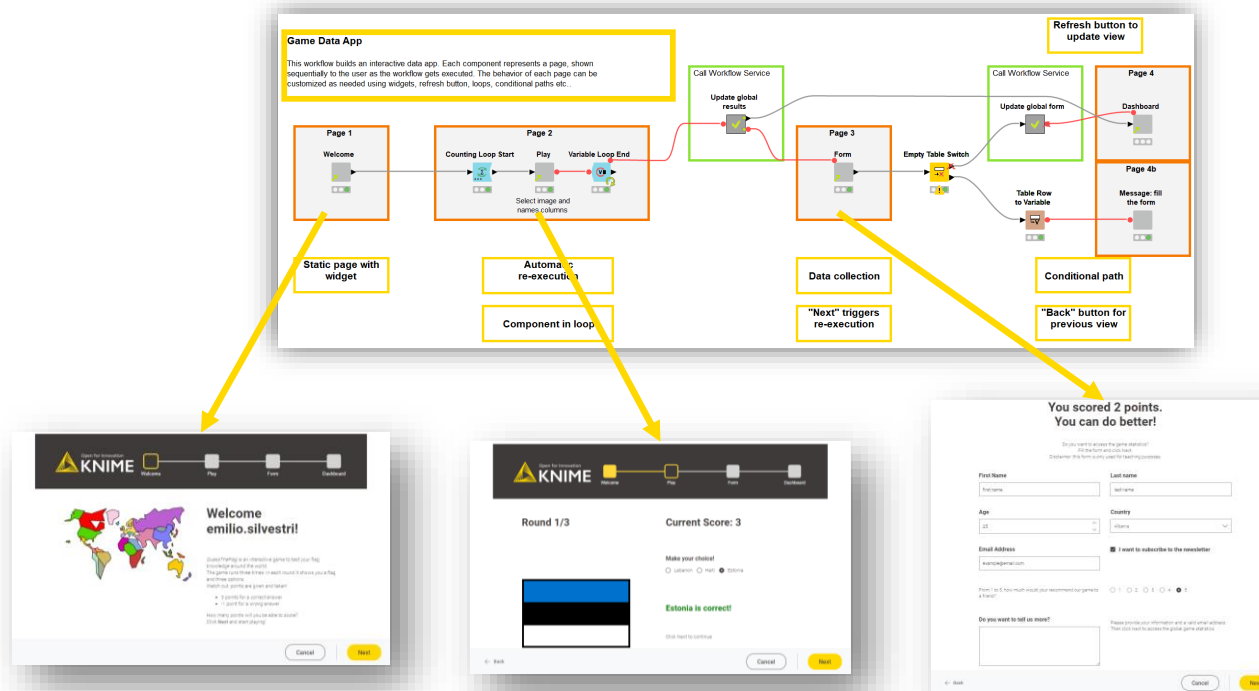


Components and Data App views



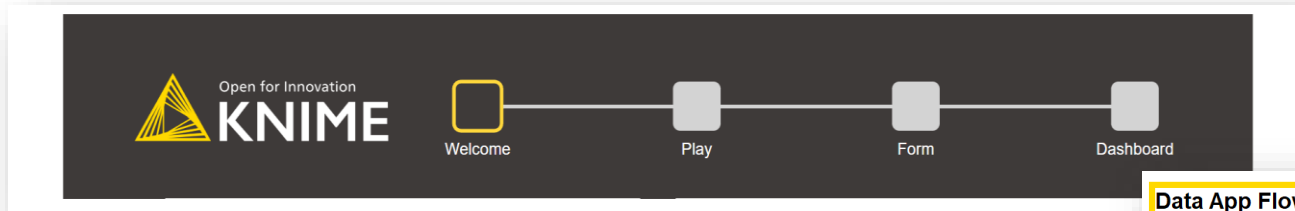
Data App paging functionality

- Component → Data App page
- A sequence of components generates a **sequence of pages**



Data App Flowchart

- Navigation made easy with the [Data App Flowchart](#) verified component



Data App Flowchart usage

- Drag and drop the data app flowchart inside each component
- Define the flowchart by changing the input table
- Customize the appearance via its dialogue
- Make sure it is placed at the top of the composite view via the "Node Usage and Layout"

Table Creator



user journey
data

Data App Flowchart



header flowchart
describing the user
journey in the app

Include it in every
page of the Data App

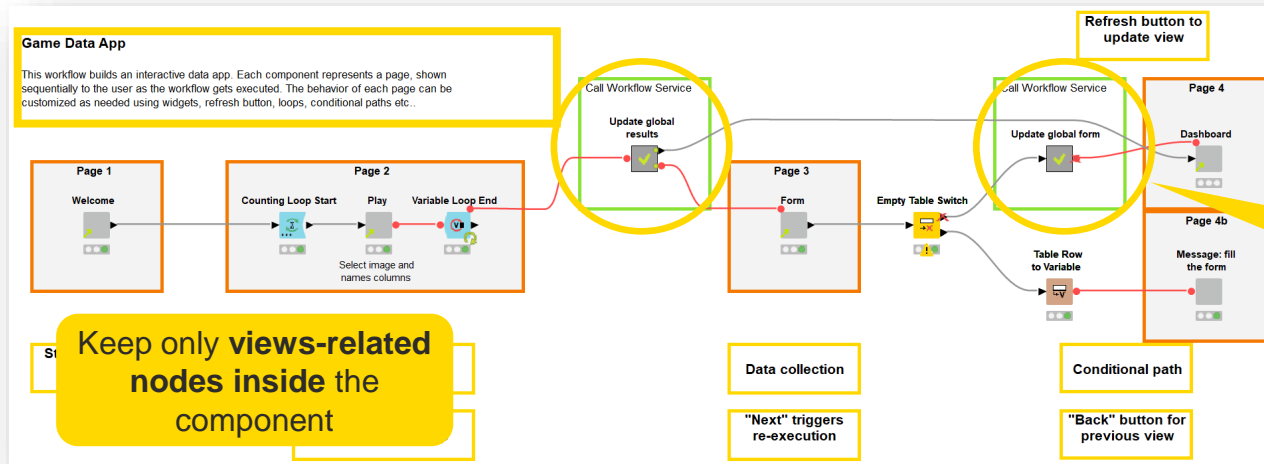
Table "default" - Rows: 4 | Spec - Columns: 2 | Prop

Row ID	steps	active
Row0	Welcome	1
Row1	Play	0
Row2	Form	0
Row3	Dashboard	0

Component re-execution via the “Next” button

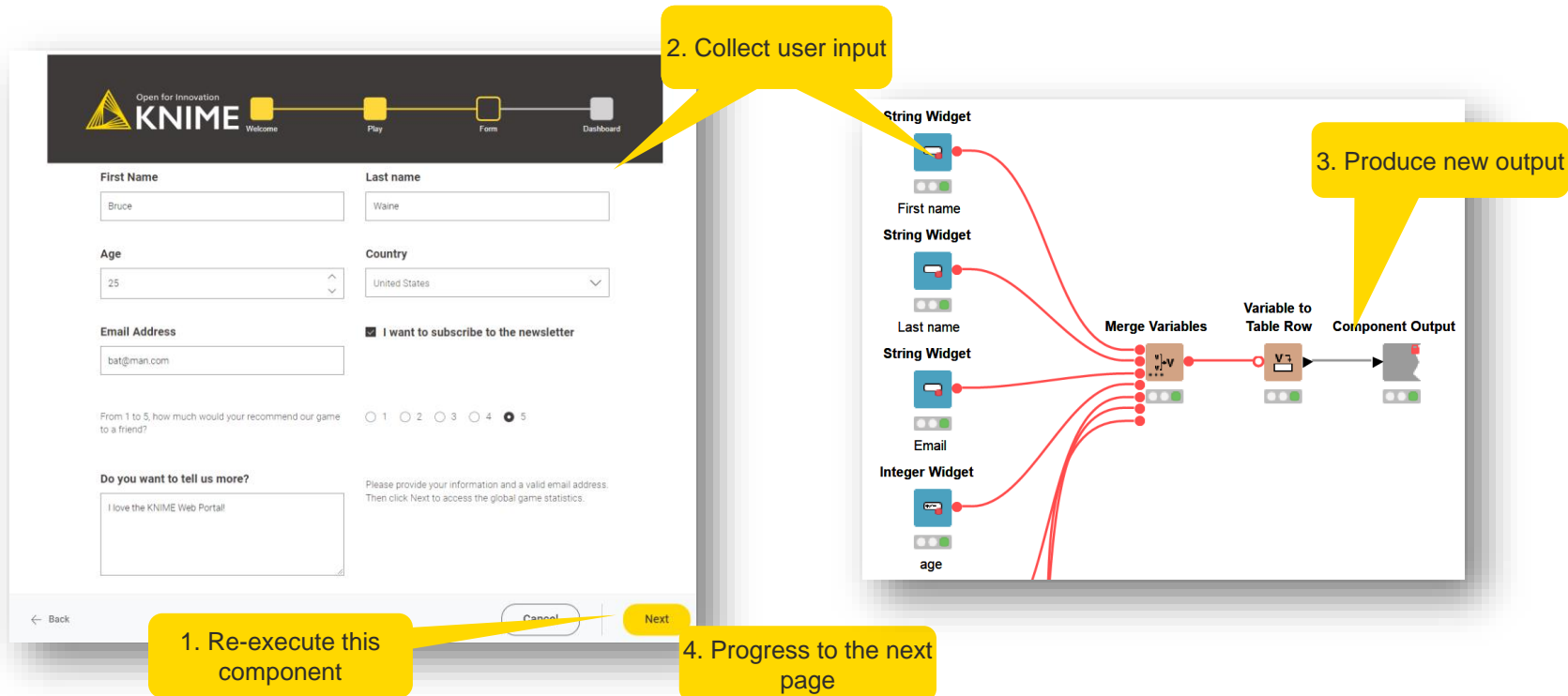
- Components of Data Apps in KNIME Business Hub get executed (at least) twice
- First time to create the displayed web page
- Second time when clicking the “Next” button

Keep **heavy computations** **outside** the components to avoid long execution time



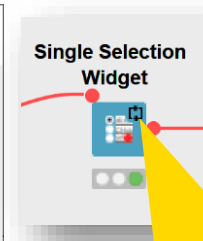
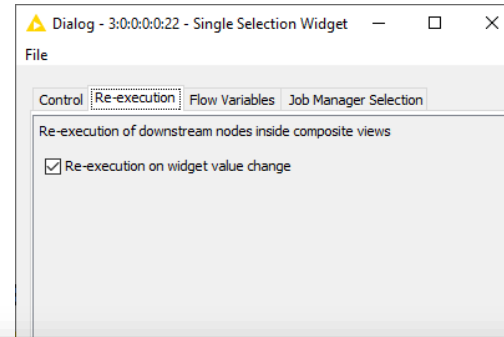
Motivations for re-execution

- Re-execution enables input collection
- The new input can be transmitted to the following page

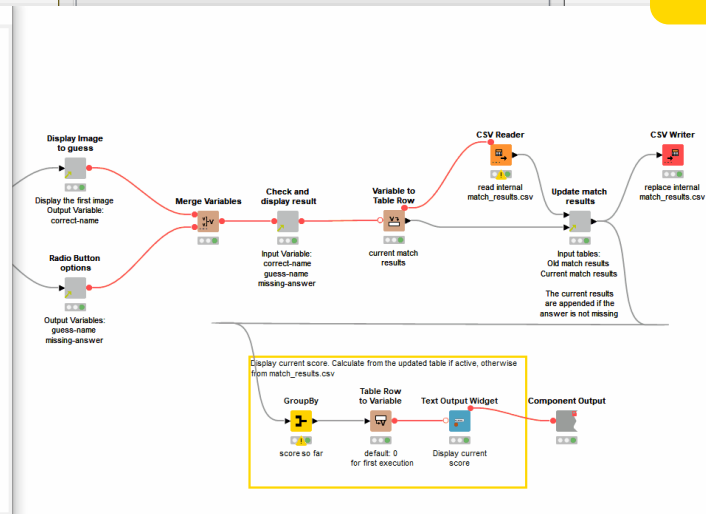
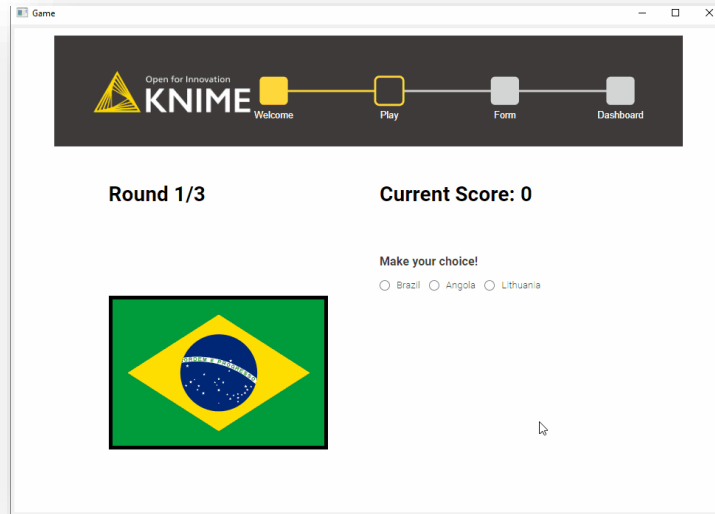


Widget automatic re-execution

- Re-execute downstream nodes on input change
- No need for a Refresh Button

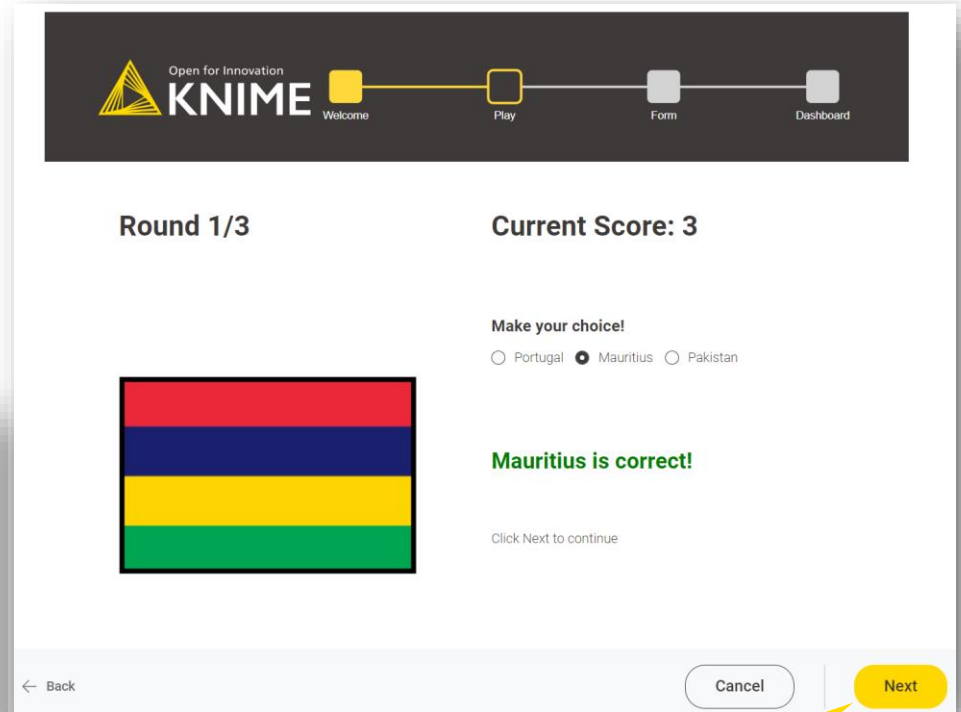
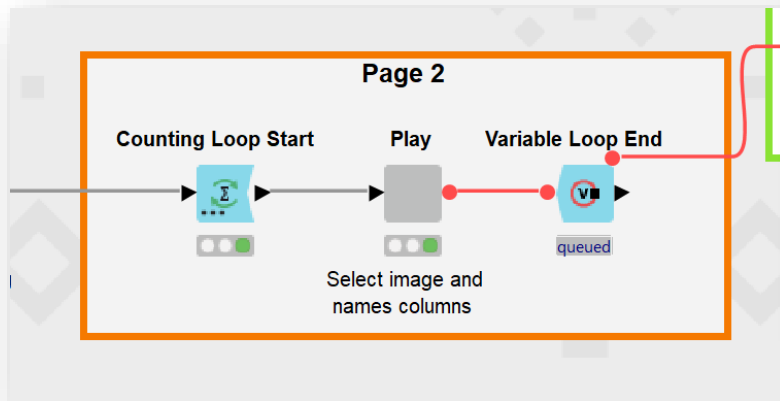


Notice the icon on the node when re-execution is enabled



Repeating page with loops

- The same page can be shown several times if the component is placed between loop nodes

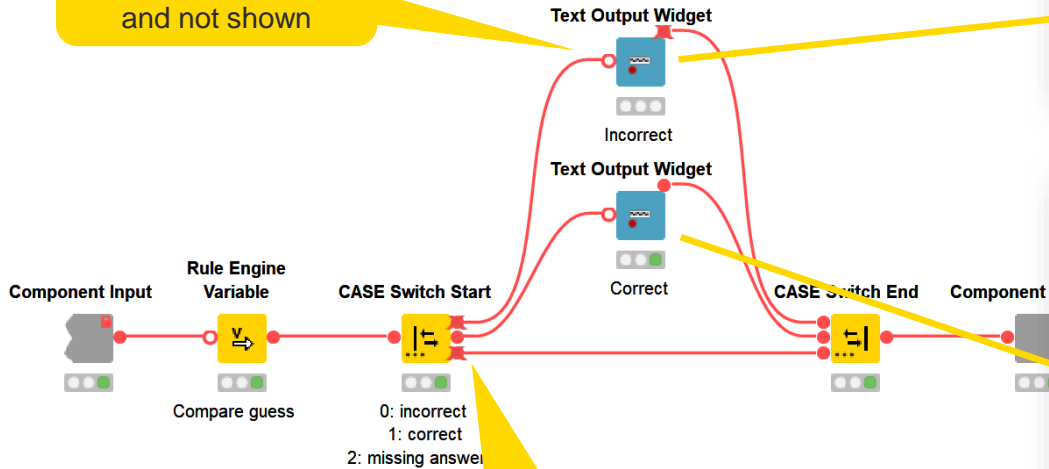


The "Next" button is the loop iterator

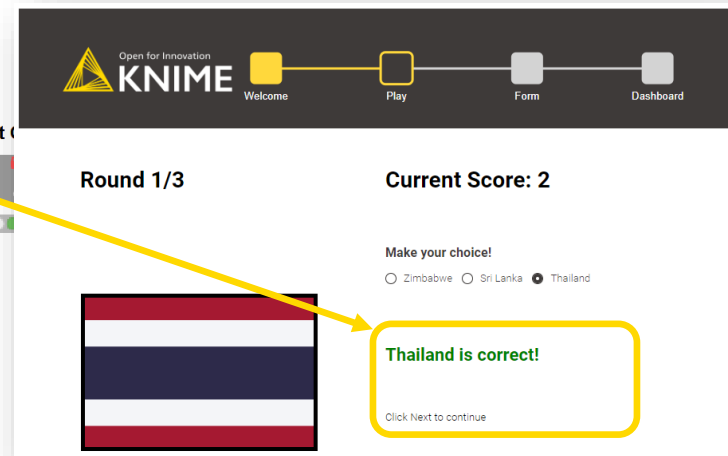
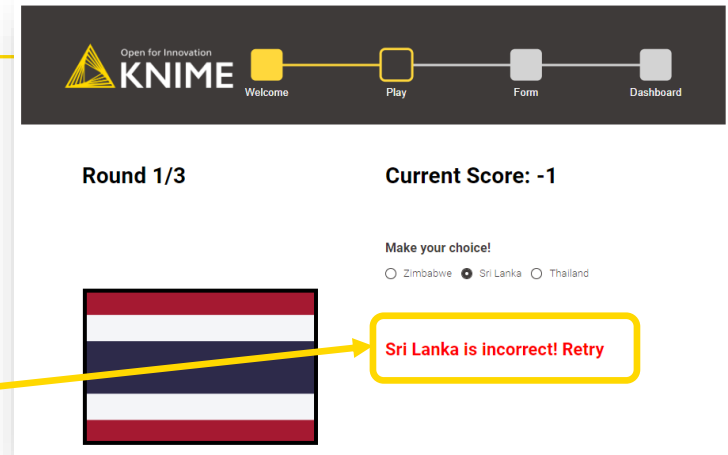
Conditional Views

- Use Switch nodes inside a component to dynamically activate certain views

Nodes of the other branches are inactive and not shown

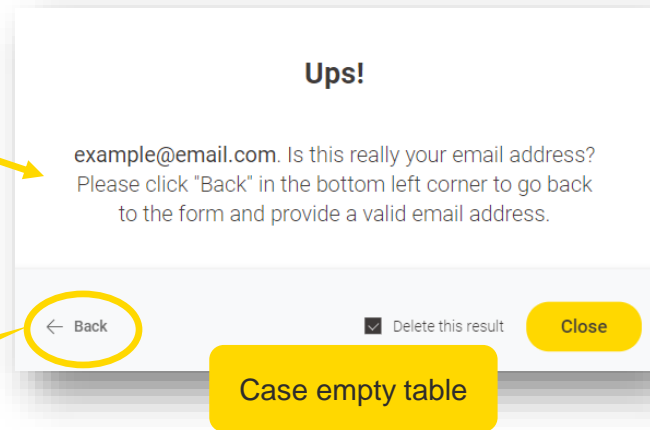
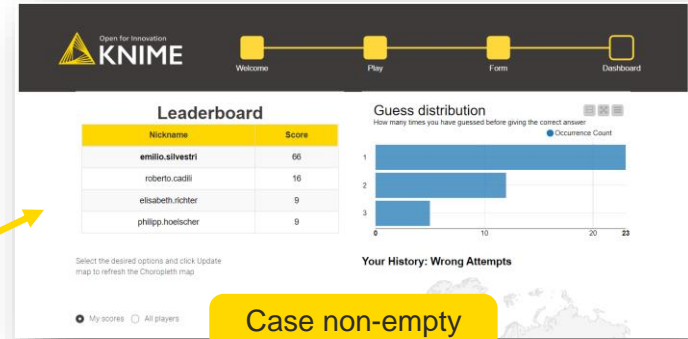
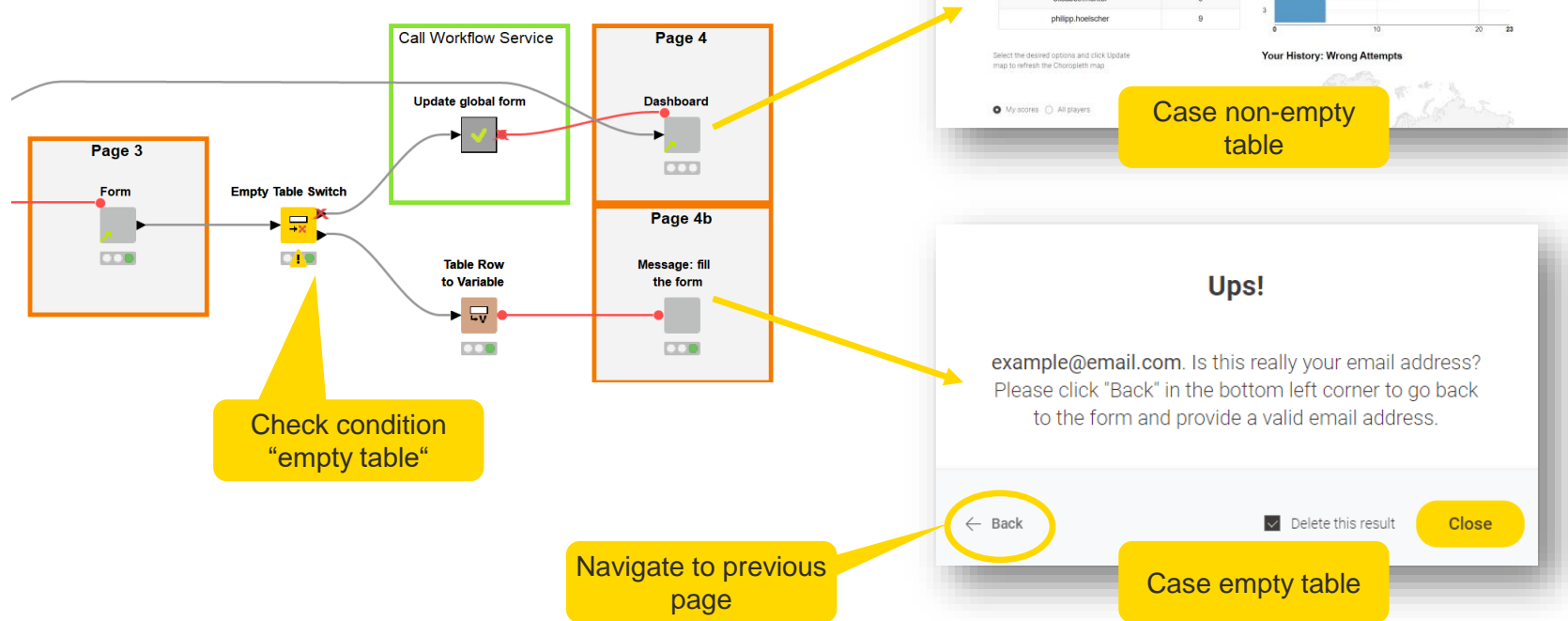


A flow variable selects one active branch



Conditional Path and “Back” button

- Use Switch nodes in the **top-level workflow** to show a different page during data app navigation



Data App features recap

- Data App paging
- Data App Flowchart

- 3 ways for re-execution
 - “Next” button
 - Refresh Button widget
 - Widgets automatic re-execution

- Repeating page with loops
- Conditional views
- Conditional paths

Guide through
multiple pages

Collect and consume
user input

Personalize views
and navigation

The screenshot shows a KNIME Data App interface. At the top, there is a dark header with the KNIME logo and the text "Open for Innovation". Below the header is a progress bar with four steps: "Welcome" (active), "Play", "Form", and "Dashboard". The main content area contains a form with the following fields:

- First Name:** Text input field containing "Bruce".
- Last name:** Text input field containing "Wane".
- Age:** Spin box containing "25".
- Country:** Dropdown menu showing "United States".
- Email Address:** Text input field containing "bat@man.com".
- Subscription:** A checkbox labeled "I want to subscribe to the newsletter" which is checked.
- Rating:** A row of five radio buttons labeled "From 1 to 5, how much would your recommend our game to a friend?". The fourth radio button (4) is selected.
- Feedback:** A text area with the placeholder "I love the KNIME Web Portal".

At the bottom of the form, there is a "Do you want to tell us more?" section with a note: "Please provide your information and a valid email address. Then click Next to access the global game statistics." Below this are three buttons: "Back", "Cancel", and "Next".

**Upload and Download files via
Data App**



Upload and Download files

- So far, user interaction with the Data App limited to clicks and form inputs
- How can the user interact with files?

Open for Innovation
KNIME

Welcome Play Form Dashboard

Welcome emilio.silvestri!

GuessTheCountry is an interactive game to test your knowledge around the world. The game runs three times: in each round it shows you an image and three countries as options. Watch out: points are given and taken!

- 3 points for a correct answer
- -1 point for a wrong answer

How many points will you be able to score?
Click Next and start playing!

Upload a file or use the default dataset

Select file countries-flags-png.table

Open for Innovation
KNIME

Welcome Play Form Dashboard

Leaderboard

Nickname	Score
emilio.silvestri	76
roberto.cadili	16
elisabeth.richter	9
philipp.hoelscher	9

Download leaderboard (csv)

Guess distribution

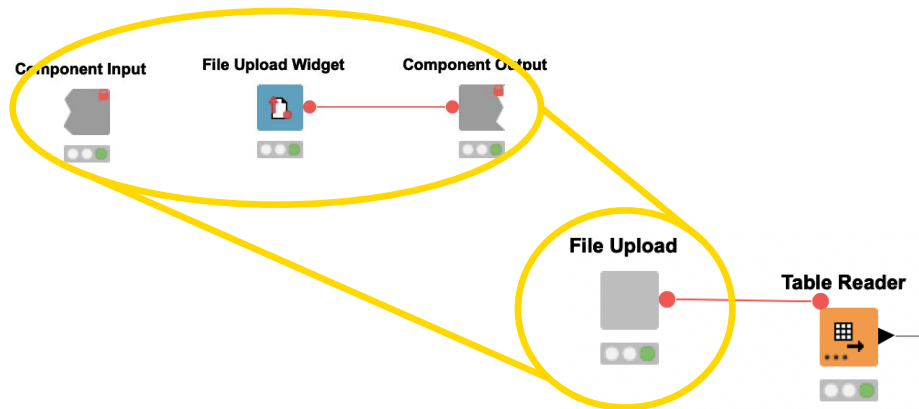
How many times you have guessed before giving the correct answer

● Occurrence Count

Your History: Wrong Attempts

File Upload

- File Upload Widget: enables the user to select a file, which is uploaded to the KNIME Business Hub and the Path Flow Variable is created
- Reader Nodes: Path Flow Variable is passed to the Reader node to read the data into the workflow

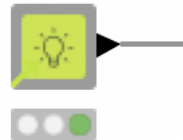


IMPORTANT: User can only upload file types that match the selected Reader node

Verified Component: Generic File Upload

- This component can be used as a generic file upload for the KNIME Business Hub or locally in the KNIME Analytics Platform.
- The user can upload a file of different formats (.csv, .tsv, .xls, .xlsx and KNIME-native .table) and the component selects the correct node to read the data in.

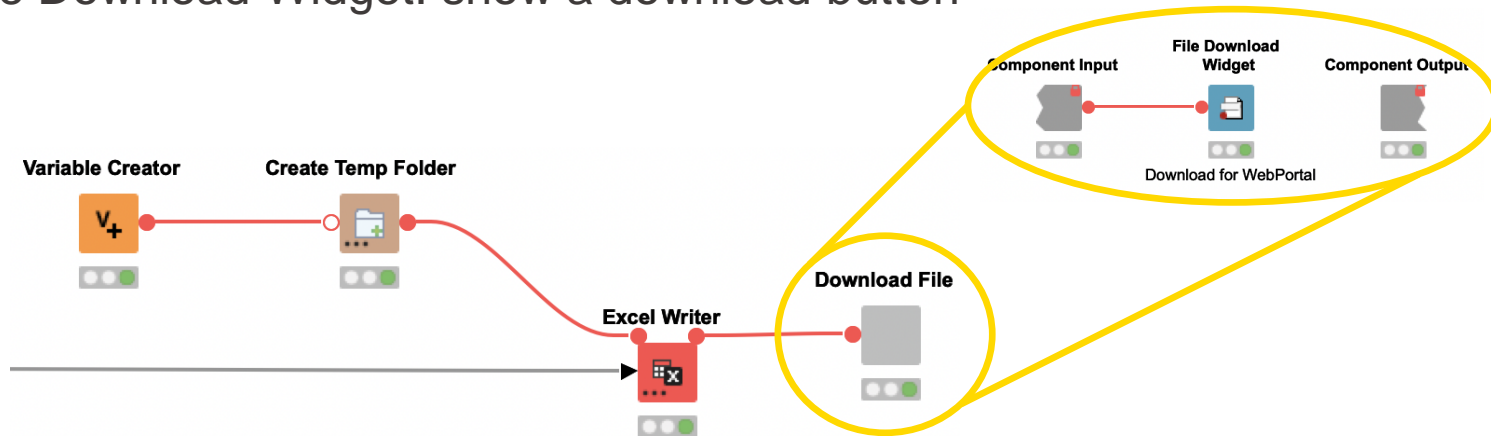
Generic File Upload



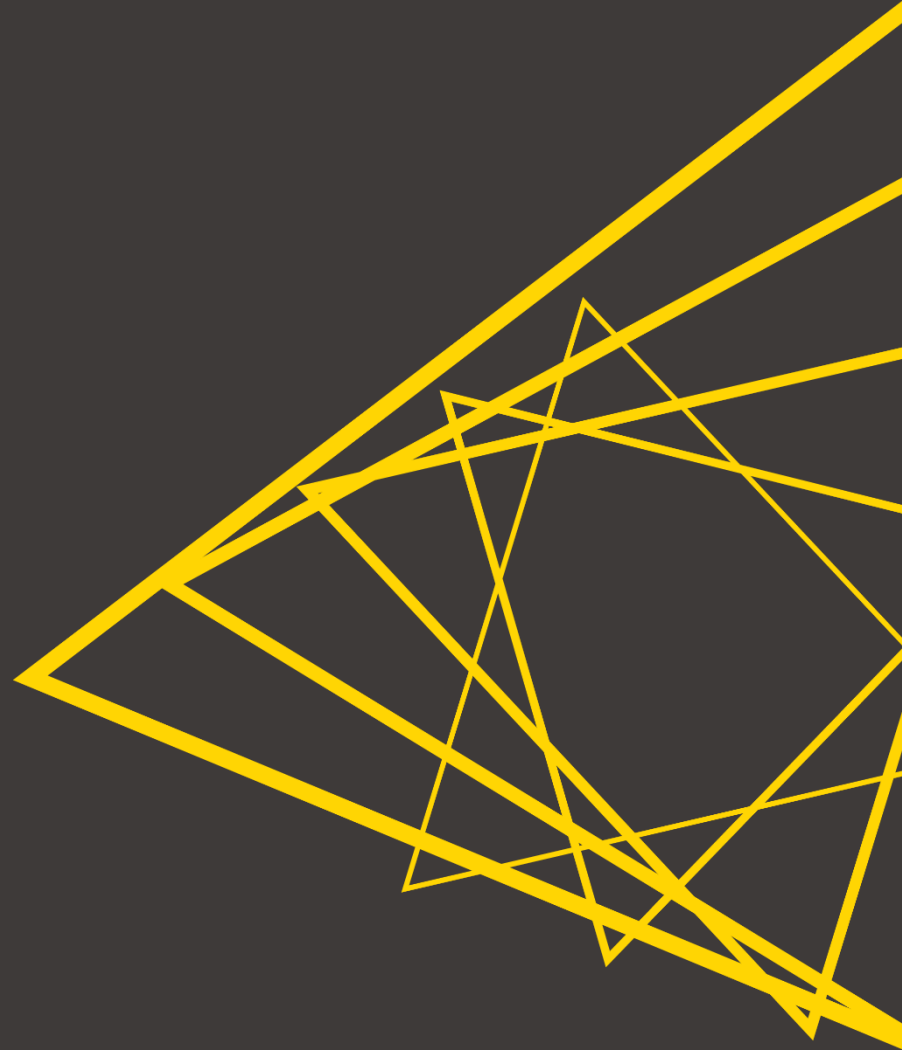
IMPORTANT: This component does not cover all edge-cases for complicated file formats.

File Download

- Variable Creator: create name of file
- Create Temp Folder: create temporary folder, which is deleted with reset of workflow (Pro-Tip: use temporary folder on KNIME Business Hub to avoid pile up of files)
- Excel Writer: write data into file in temporary folder
- File Download Widget: show a download button



Custom Styling of Data apps

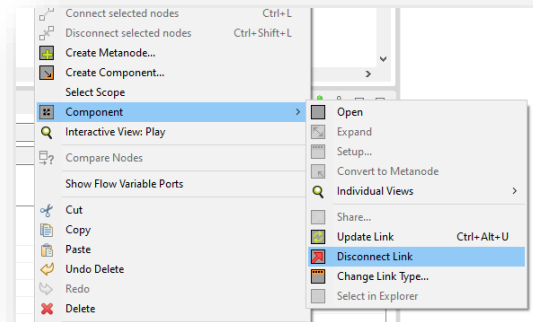


Node Usage and Layout

- Customize the composite view of a component (i.e., a Data App page)
- Open a component and click the layout toolbar icon



- Remark: you can't change the layout of a shared component from a workflow that uses it. Shared components are read-only
- Disconnect the shared component first or use the Component editor to edit the original shared component



Composite View Layout

- Edit the composite view by rearranging the single views
- Group and organize views into rows and columns

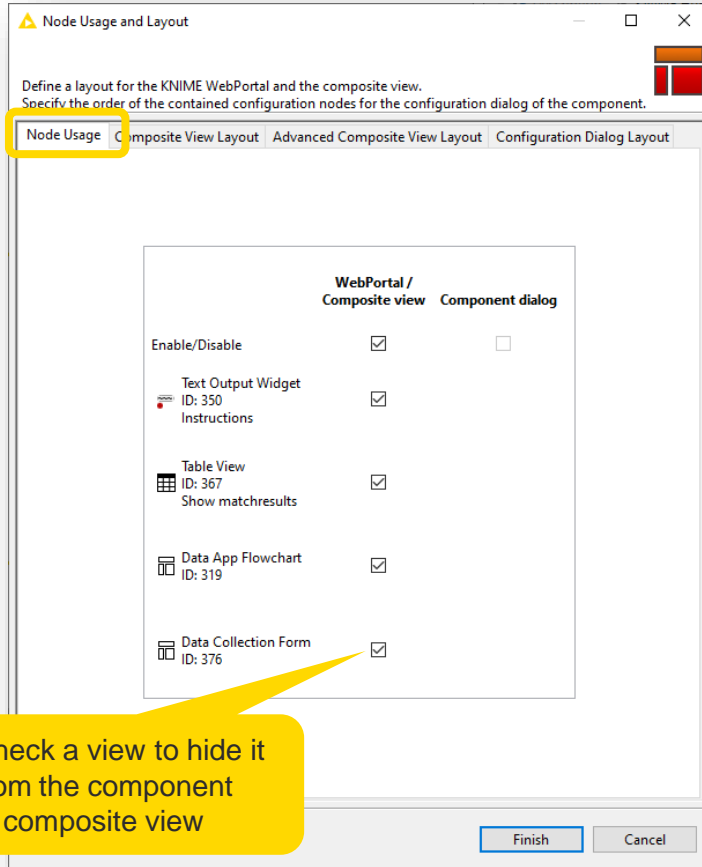
What produces a “view”?

- View nodes
- Widget nodes
- **Nested components**

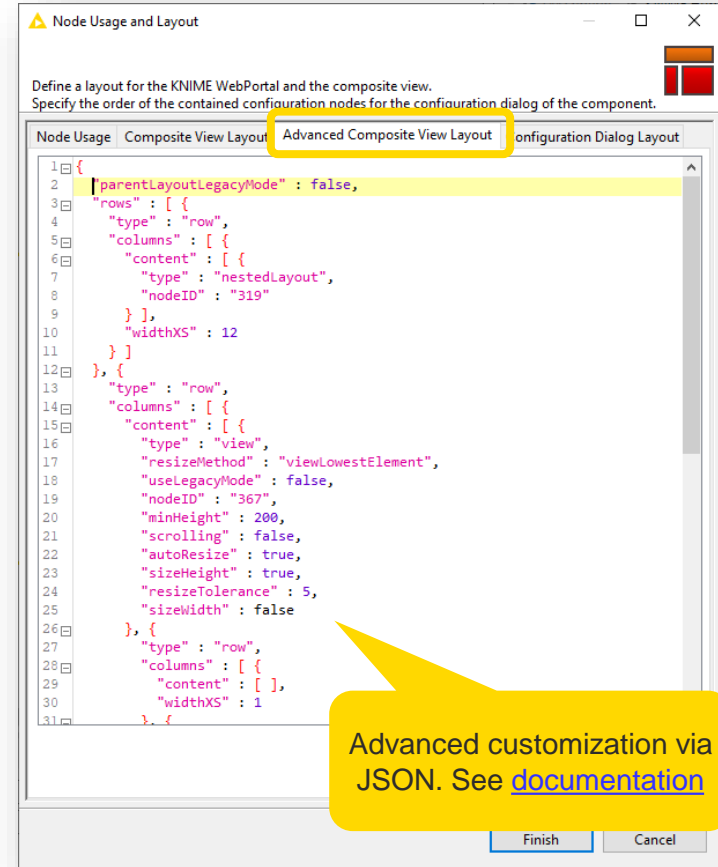
The screenshot shows the 'Node Usage and Layout' dialog in KNIME. The 'Composite View Layout' tab is selected, showing a layout of four nodes: 'Data App Flowchart' (Node 319), 'Table View' (Node 367), 'Text Output Widget' (Node 350), and 'Data Collection Form' (Node 376). The 'Data Collection Form' node is highlighted with a yellow callout box, which contains a detailed view of its internal structure. This view shows a 'User Form' containing a 'Data Collection Form' node, followed by a 'Row Filter' node with the configuration 'check if email changed from default', and finally a 'Component Output' node. The main dialog also features a 'Views drag into layout or click' section and a 'Rows drag into layout or click' section, both with yellow arrows pointing to the corresponding nodes in the layout.

The view of the nested component is shown as a single view in the parent

Node Usage and Advanced Composite View Layout



Uncheck a view to hide it from the component composite view



Advanced customization via JSON. See [documentation](#)

CSS Editor

- Create custom CSS styling of JavaScript views and Widgets
- The same style can be reused in multiple views



Your match results

Round	Country	Number of attempts	Points
1	Estonia	1	3

Showing 1 to 1 of 1 entries

Default view

CSS-customized view

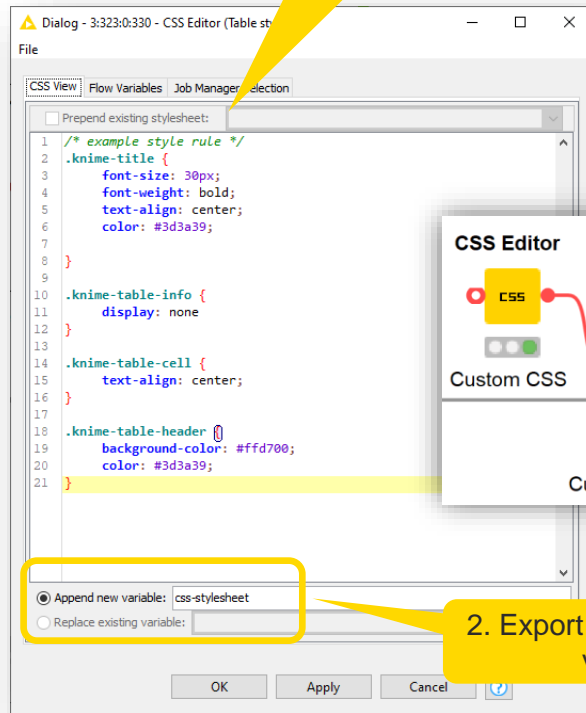
Your match results

Round	Country	Number of attempts	Points
1	Estonia	1	3

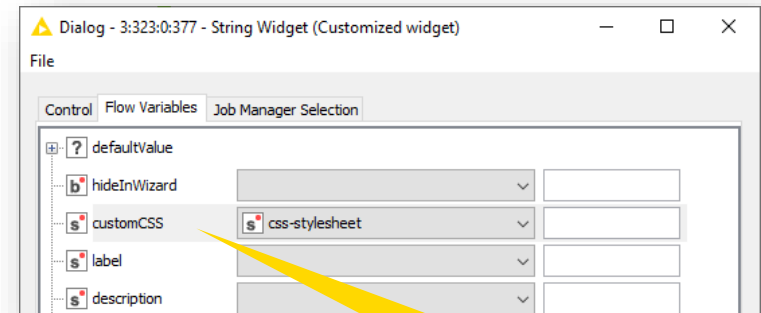
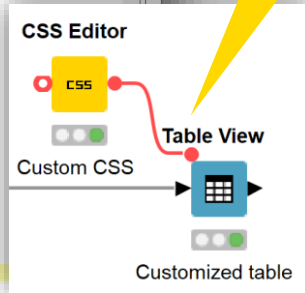
CSS Editor usage

1. Define the CSS.
See [documentation](#)

3. Provide the flow variable to the nodes you want to customize

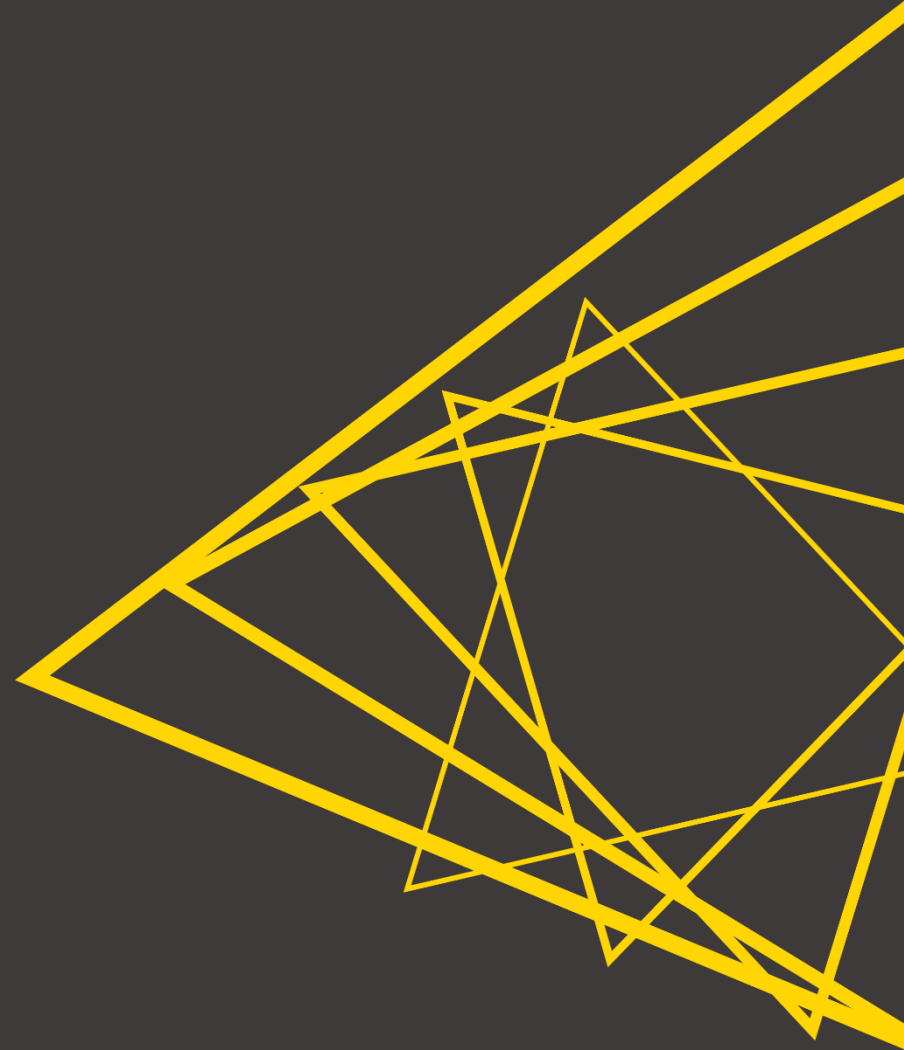


2. Export the CSS as flow variable



4. Open the node configuration and select the 'customCSS' variable

Sharing Data Apps



Manage access to a deployment

- Share a deployment with other KNIME Business Hub members

The screenshot shows the KNIME Business Hub interface. The main area displays a table of deployments. The table has columns for 'Type of deploy...', 'Name', 'Workflow', 'Version', 'Date of cr...', 'Execution cont...', and 'Status'. The first row shows a deployment named 'Data app' with workflow 'Data app - Guess...' and version '...ame_Data_App/ working demo'. A context menu is open over the first row, with the 'Manage access' option highlighted. A dialog box titled 'Manage deployment access' is open on the right. The dialog contains a search bar with the text 'lada' and a search icon. Below the search bar, a user profile for 'lada' is shown. The dialog also has 'Cancel' and 'Apply' buttons at the bottom.

Type of deploy...	Name	Workflow	Version	Date of cr...	Execution cont...	Status
> Data app	Data app - Guess...	...ame_Data_App/	working demo	Jan. 12, 2023, 13...	Evangelism Exec...	

Public Data Apps

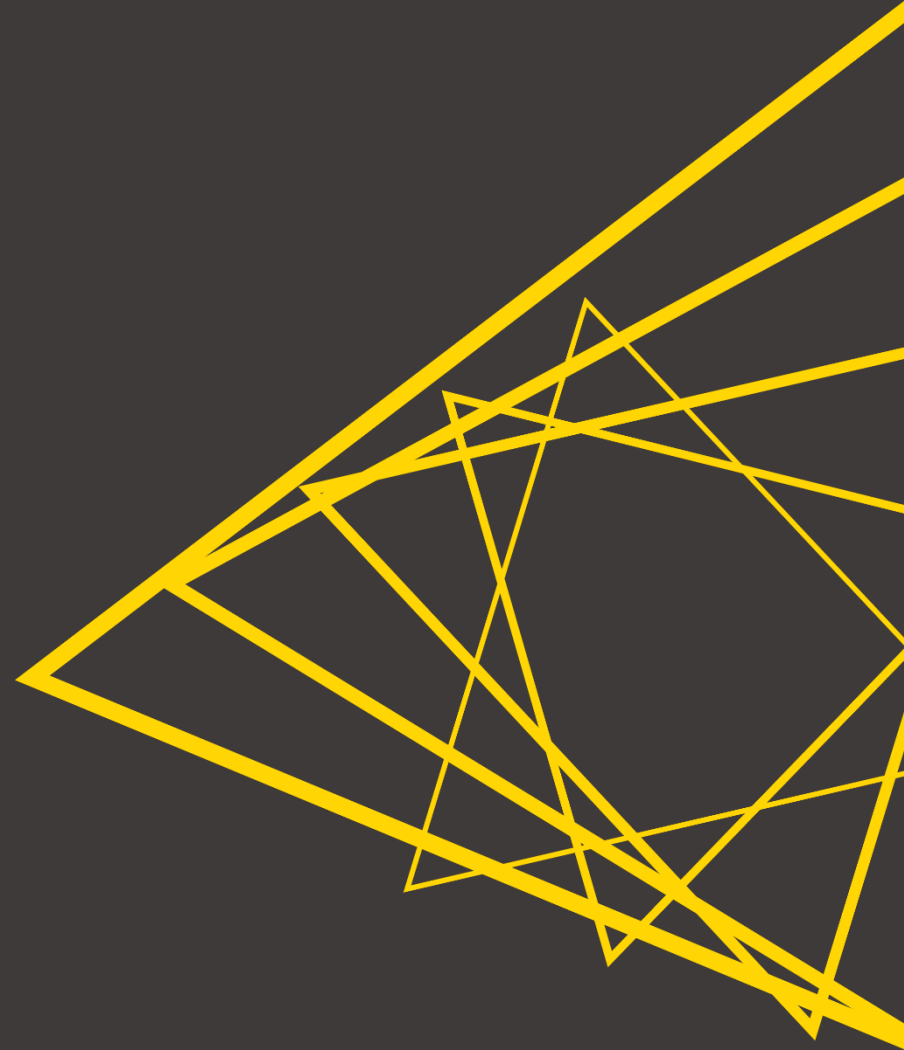
- Execute a Data App **without** logging in to KNIME Business Hub
- Useful to share outside of the organization
- Coming soon...

Session 3: Summary

Now you should be able to:

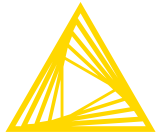
- Define the concepts of Data Apps in KNIME Business Hub
- Identify and apply the main Data App functionalities
- List and use the tools to customize a Data App
- Outline the steps to deploy and share a Data App

Exercises



Exercises Session 3

- **Exercise 01** – Build a simplified, standalone version of the Game Data App. Test your knowledge on
 - CSS customization
 - The Data App Flowchart verified component
 - Widgets
 - Composite View Layout
 - Conditional path
- Upload the workflow on KNIME Business Hub
- Deploy as Data App and execute.

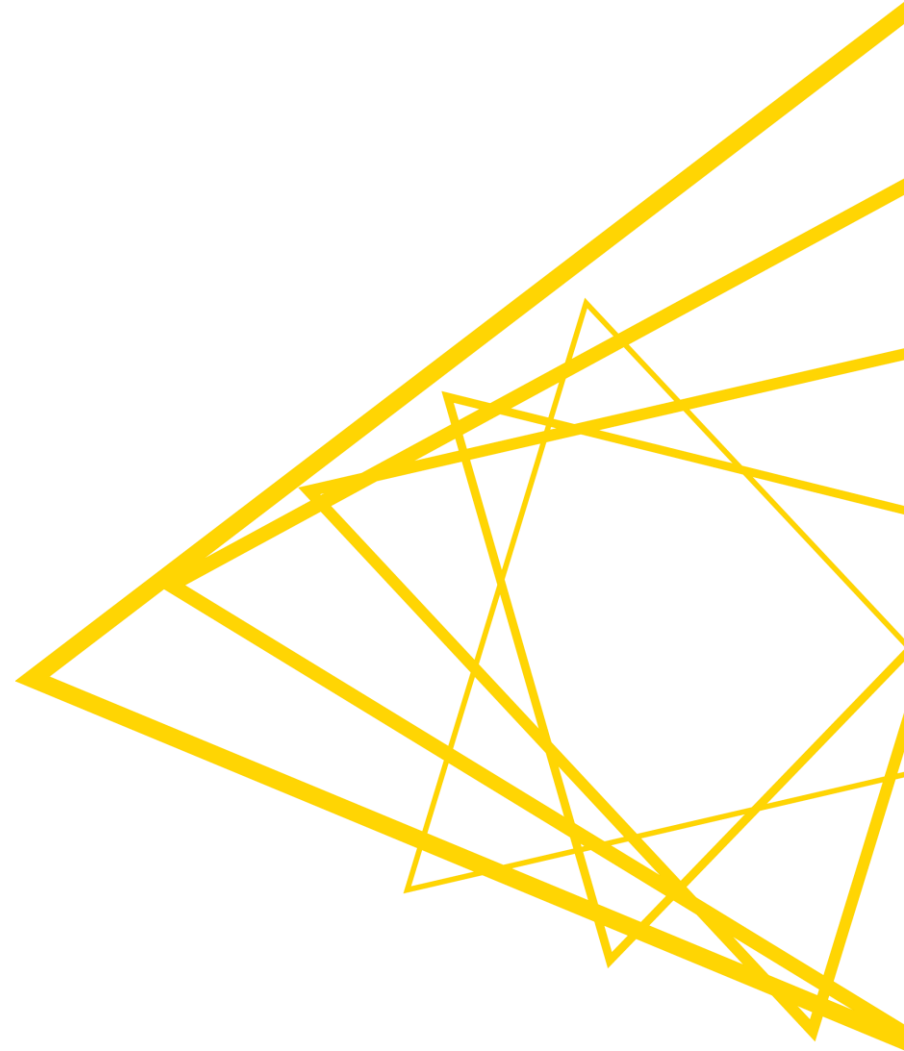


Open for Innovation

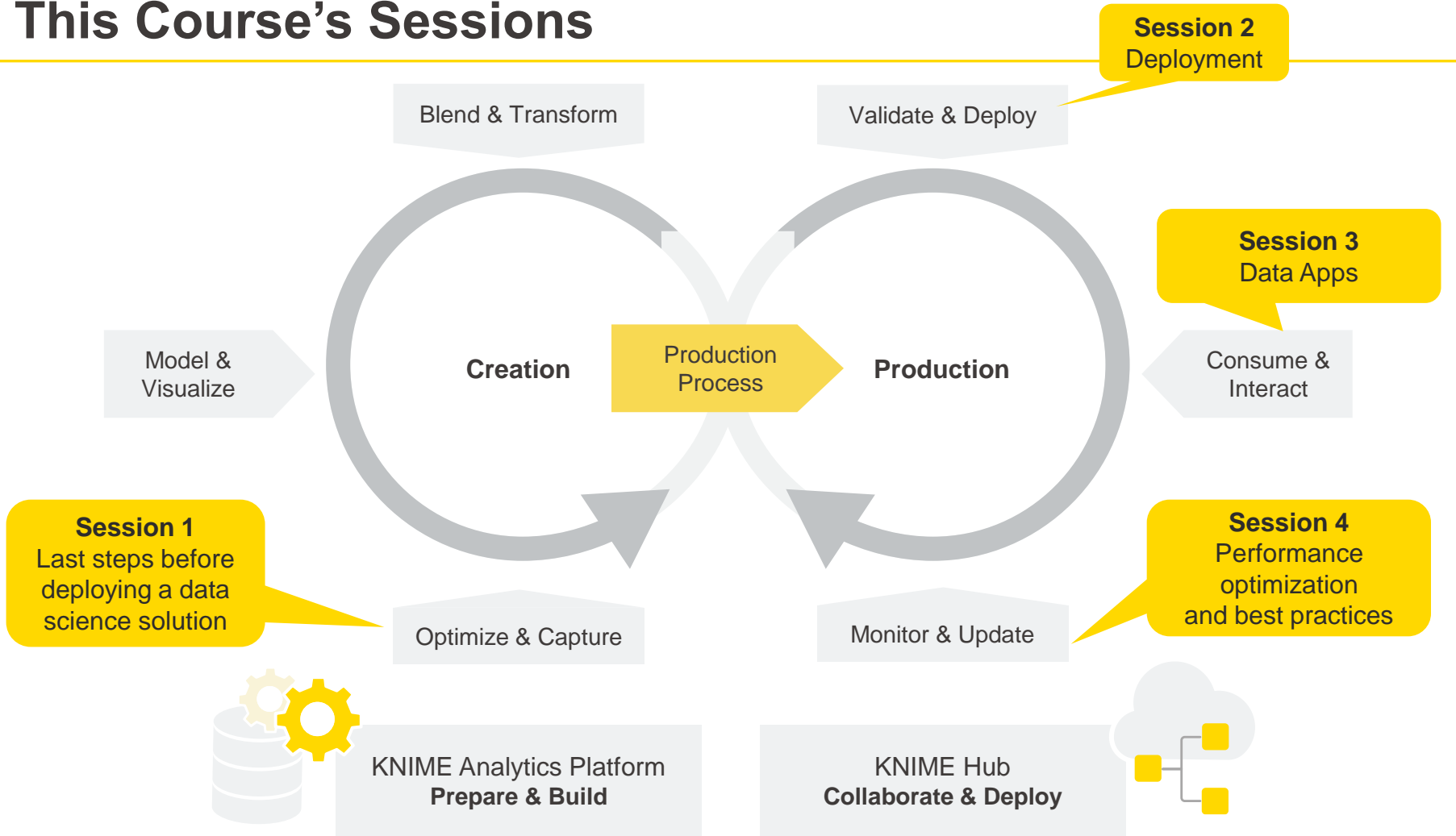
KNIME

Session 4

Performance optimization, orchestration,
error handling, and KNIME Edge

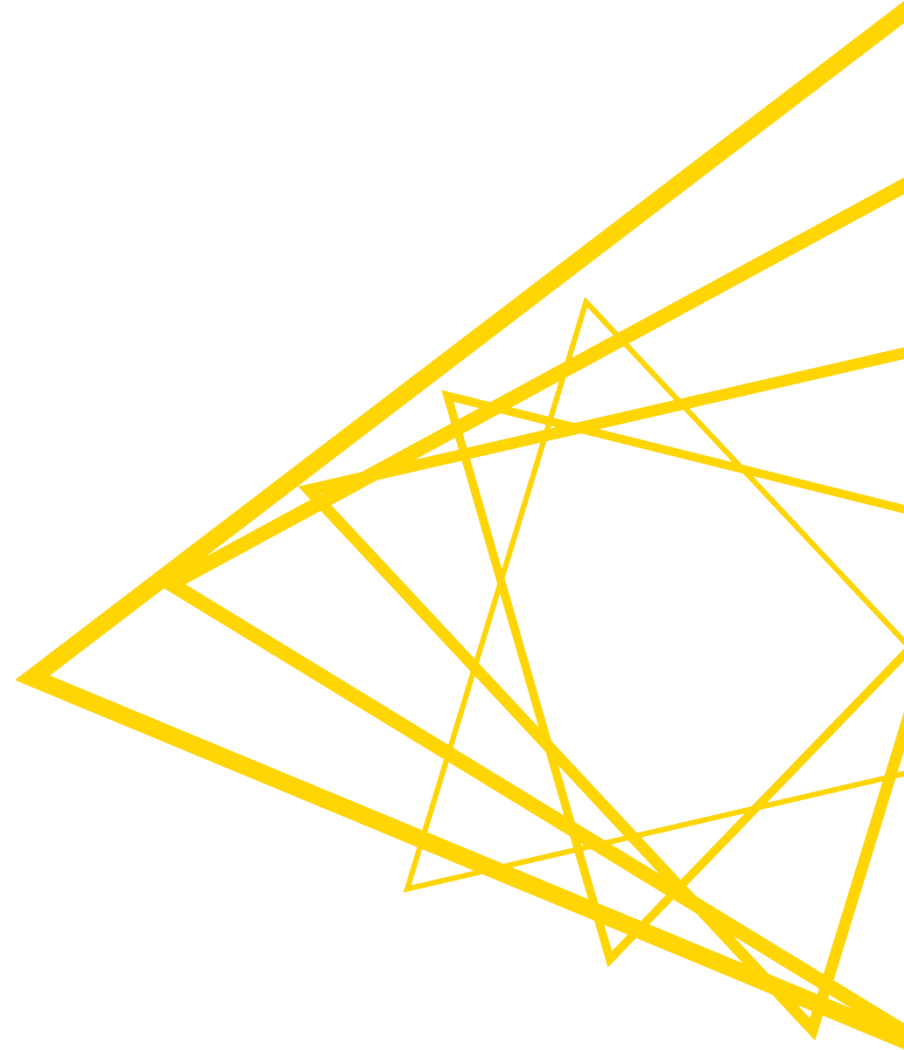


This Course's Sessions

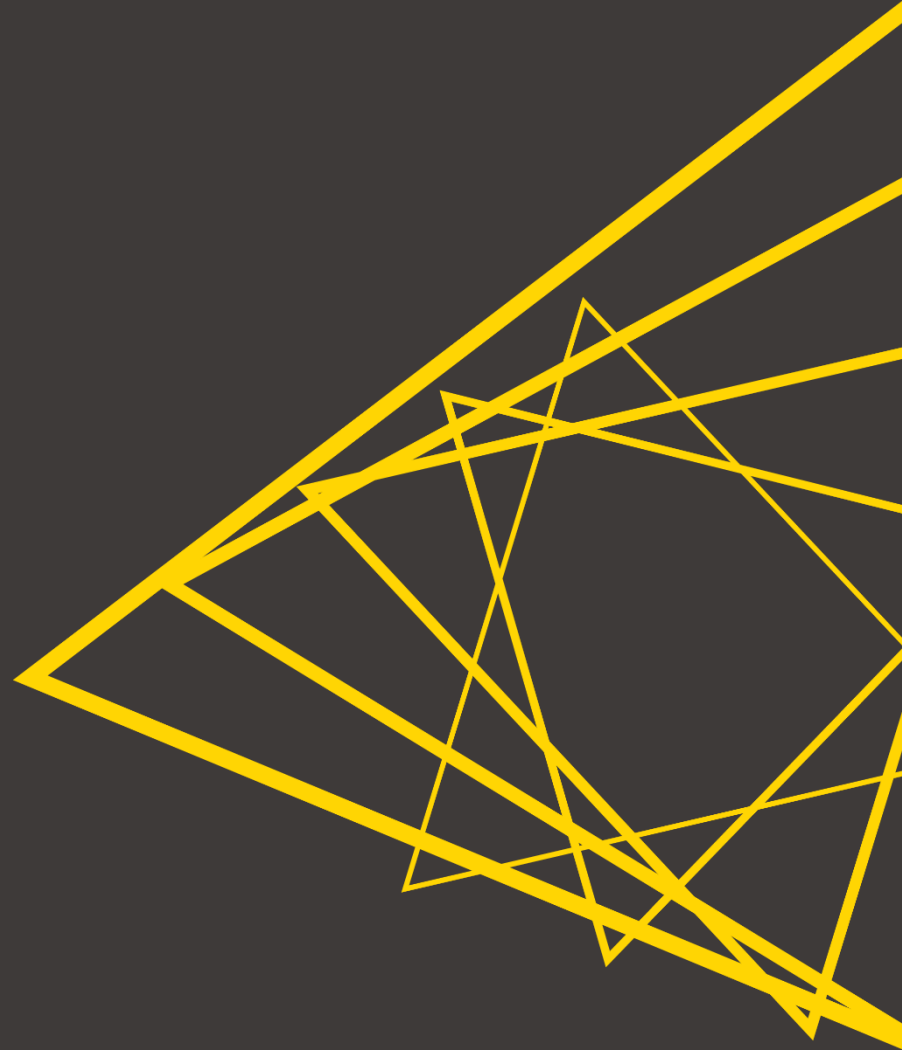


Learning Objectives

1. List the possible performance optimization operations
2. Recall and apply the tools for orchestration offered by KNIME Business Hub
3. Identify the techniques for error handling



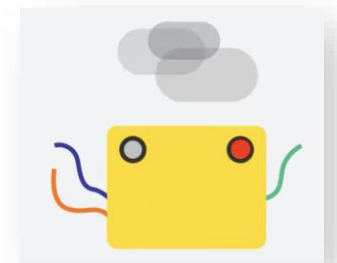
Performance Optimization



Motivation for Performance Optimization

- Will your deployed workflow execute with good performance?
 - Performance matters for better interactivity (data apps) and to reduce the chances of experiencing time out issues (e.g., with web services)
- Stress test your deployed workflow before going public
 - Feed it with large amounts of data (e.g., standalone applications)
 - Simulate interaction with many concurrent users (e.g., data apps)
 - Simulate interaction with many requests (e.g., web services)
- If workflow crashes or takes too long to execute, optimize its performance
 - Move to a better infrastructure
 - Modify the workflow explicitly for better runtime
 - Rely on KNIME Business Hub's functionalities

Large volumes of data



Deployed workflow taking too long to run

Finding Performance Issues with the Timer Info Node

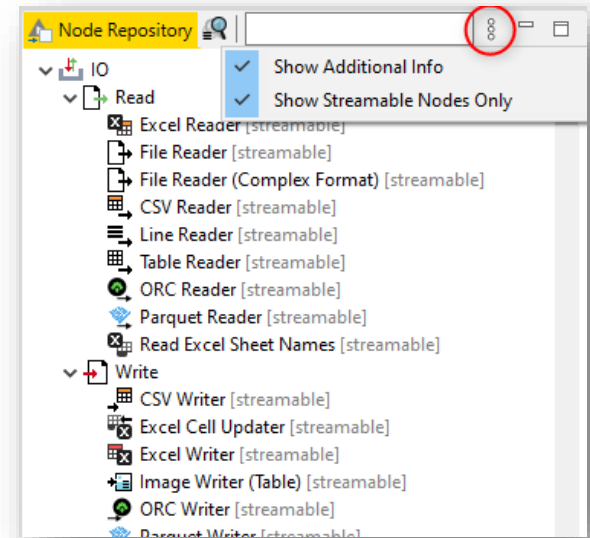
- The Timer Info node allows you to see which nodes in your workflow take the longest to execute
- It helps decide which parts of the workflow could benefit the most from some optimization

Time to execute each node (in ms)

Row ID	Name	Execution Time	Execution Time since last Reset	Execution Time since Start	Nr of Executions since last Reset	Nr of Executions since Start
Node 248	Decision Tree Predictor	520	520	1003	1	2
Node 249	Partitioning	55	55	80	1	2
Node 277	Decision Tree Learner	203	203	450	1	2
Node 312	Scorer	37	37	48	1	2
Node 313	Timer Info	4	0	4	0	1
Node 315	CSV Reader	137	137	137	1	1

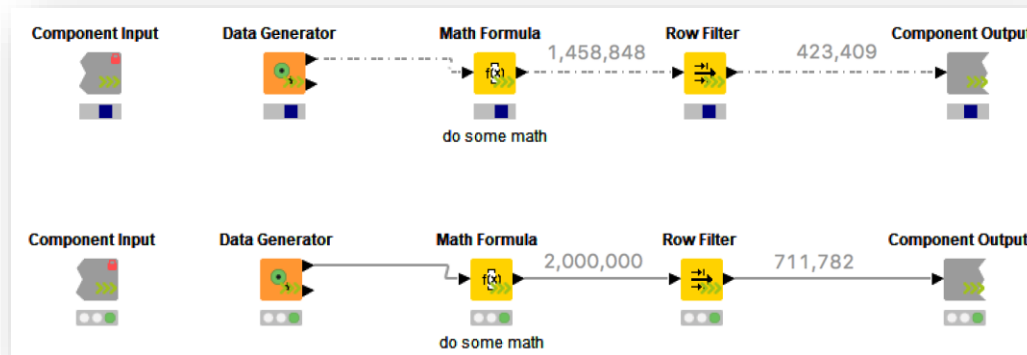
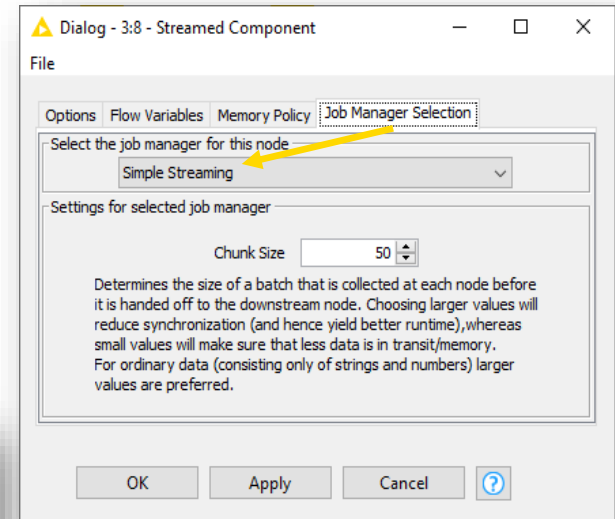
Streaming Execution for Better Performance

- Standard execution: node-by-node
 - Node processes all data, finishes, then passes data to next node etc.
- Streaming execution: nodes executed concurrently
 - Each node passes data to the next as soon as it is available, i.e., before node is fully executed
 - Faster execution, especially for reading/preprocessing data
- Advantages
 - less I/O overhead and faster runtime
- Disadvantages
 - Intermediate results not available since nothing is cached
 - Available for a limited number of nodes



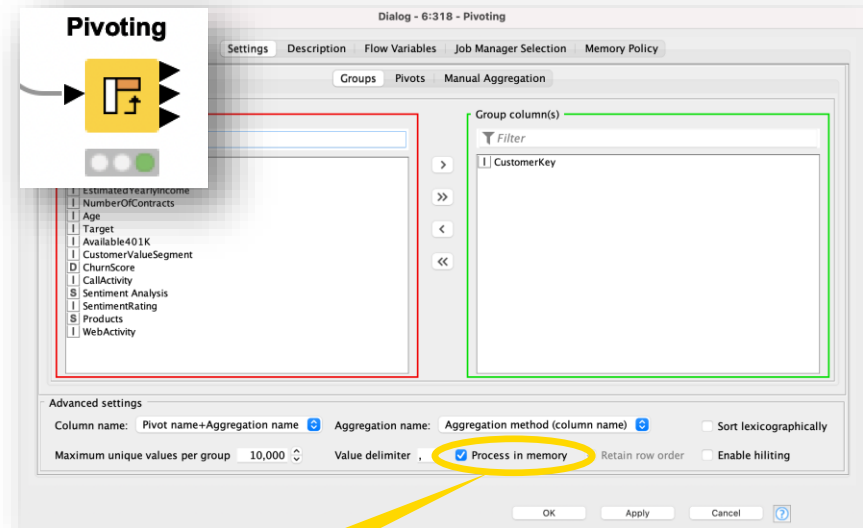
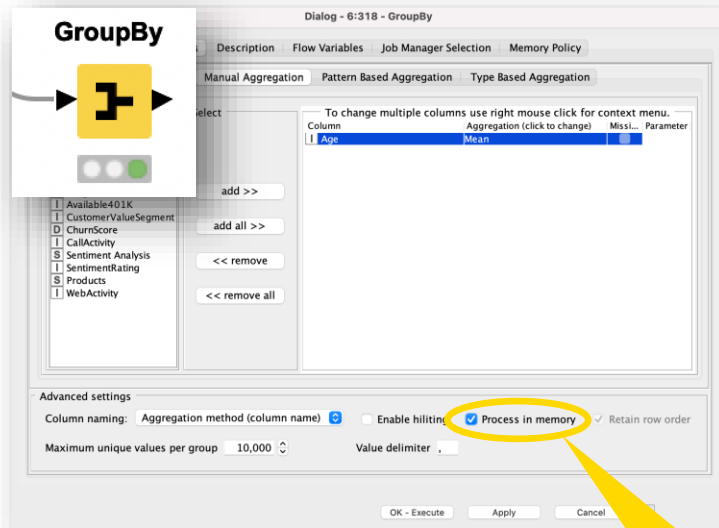
Streaming Execution for Better Performance

- Beta feature
 - Install [KNIME Streaming Execution \(Beta\)](#) extension
- Enable streaming execution in components
 - Create Component -> Configure -> Job Manager Selection -> Simple Streaming



„Process in Memory“ Option

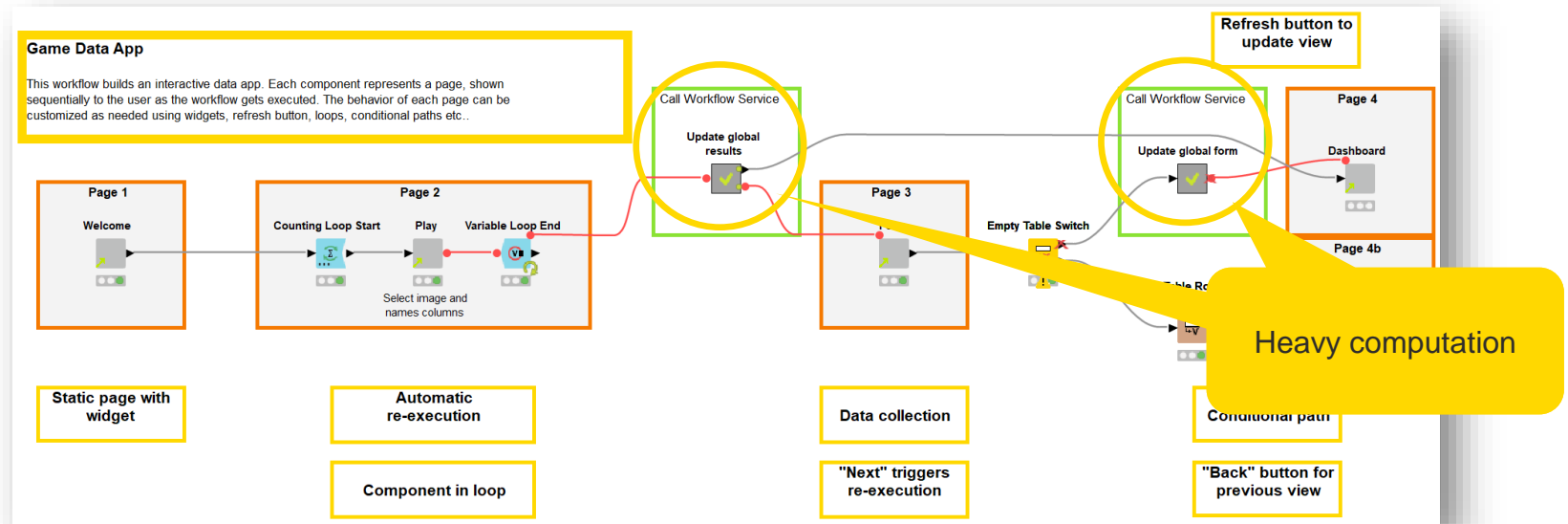
- Option for GroupBy and Pivoting nodes
 - The “Process in memory” option uses up a lot of memory, but it brings a significant performance improvement by reducing swaps to disk



„Process in memory“ option

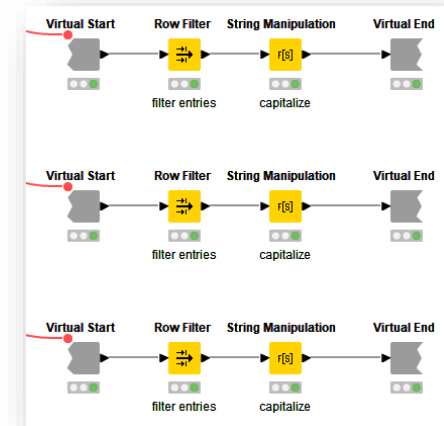
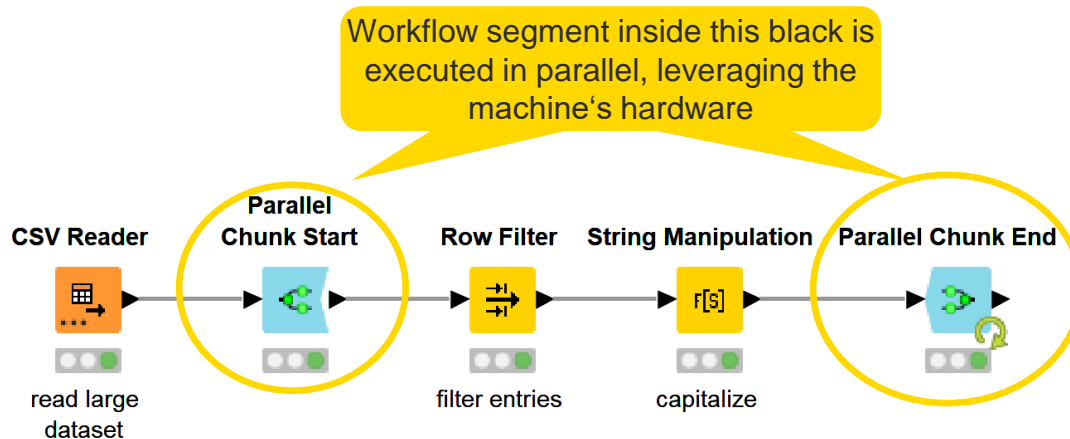
Data Apps: Heavy Computations Outside of Components

- Components of Data Apps in KNIME Business Hub get executed (at least) twice
 - The first time to create the displayed web page, and the second time when one clicks the “Next” button
- To optimize performance, keep heavy computations outside of components
 - e.g., data writing, model training, large data reading



Parallel Chunk Loop Nodes

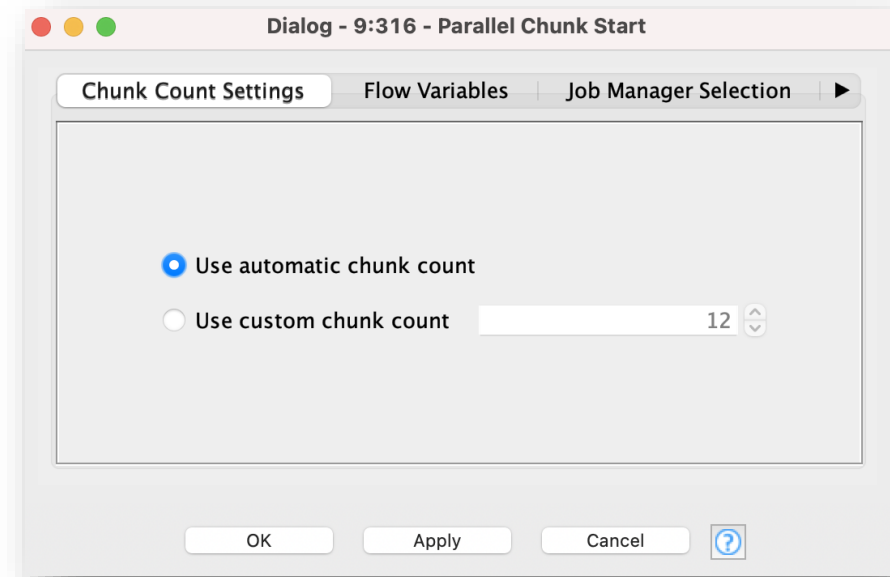
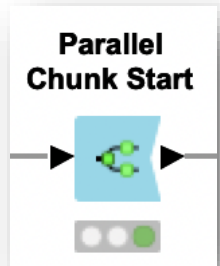
- **Parallel Chunk Start node**
 - It splits the input data into equally sized chunks and executes the body in parallel, each processing one chunk
- **Parallel Chunk End node**
 - It represents the end of a parallel chunked block. Results from all parallel executions are collected and concatenated
- **Install KNIME Parallel Chunk Loop Nodes extension**



Parallel Chunk Loop Nodes

- Parallel Chunk Start node

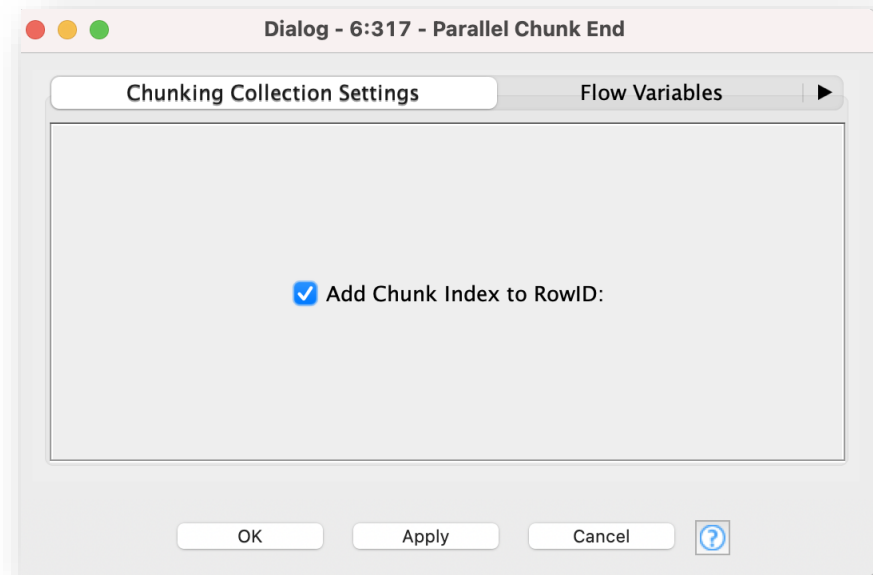
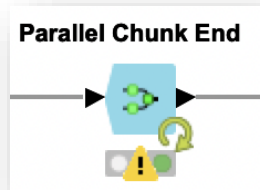
- Split the input data table into equal-size chunk
- Configure the number of chunks in the configuration dialog



Parallel Chunk Loop Nodes

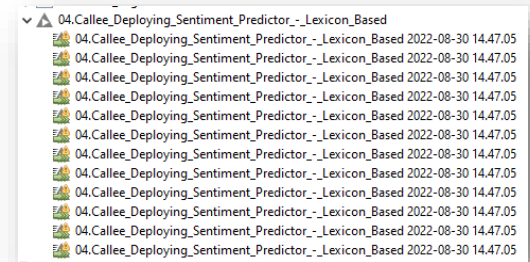
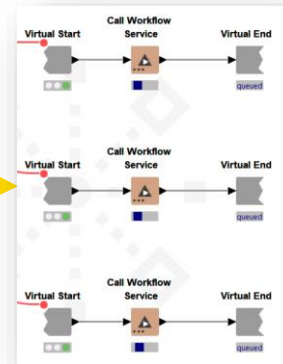
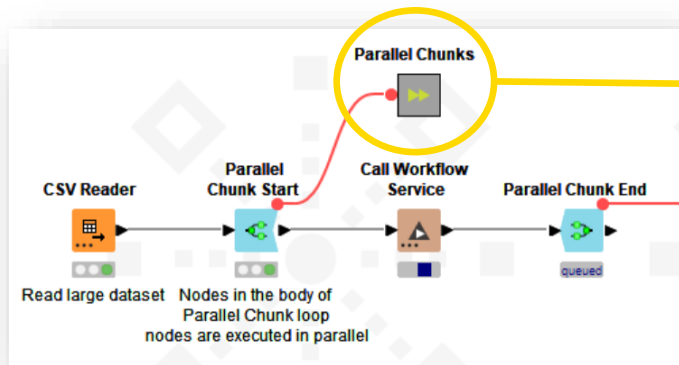
- Parallel Chunk End node

- Concatenate the rows produced by each parallel execution
- Add Chunk index to RowID if the segment in the loop generates tables with repeated RowIDs.



Parallelize Workflow Services in KNIME Business Hub

- Parallelization at his best using
 - Parallel Chunk Loops
 - Workflow Services
 - KNIME Business Hub execution
- KNIME Business Hub creates one job for every parallel Workflow Service



Note: Workflow Service parallelization is possible on **KNIME Business Hub**

Parallel Chunk Loop Nodes - Example

Serial execution on KNIME Business Hub: ~348 s

Lexicon-based Sentiment Analysis workflow

Parallel execution on KNIME Business Hub: ~188 s

For this example, execution in a fraction (~55%) of the time

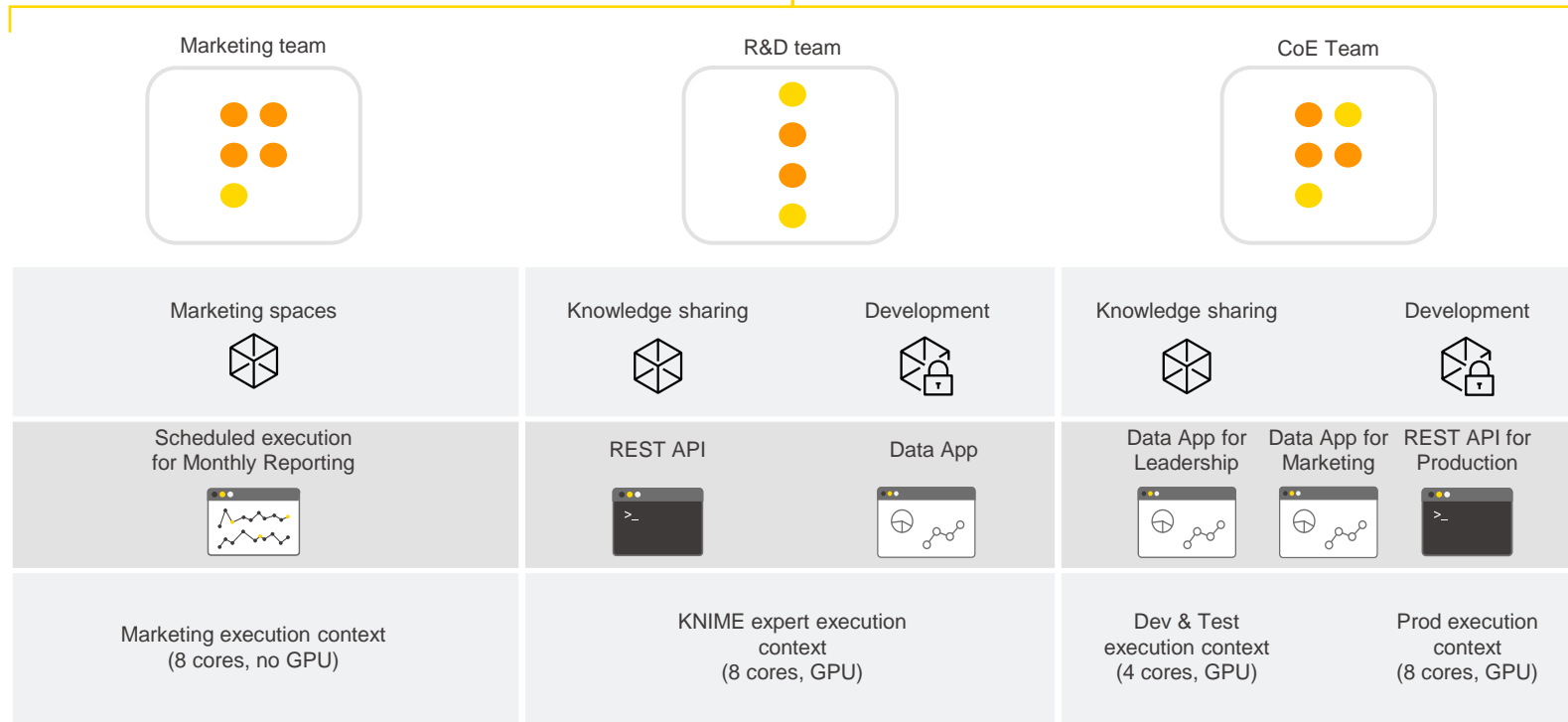
Row ID	S Name	L Execution Time	L Execution Time ...	L Execution ...
Node 82	Timer Info	?	0	0
Node 83	CSV Reader	351	351	351
Node 84	Call Workflow Service	348806	348806	348806

Row ID	S Name	L Execution Time	L Execution Time ...	L Executi...
Node 82	Timer Info	?	0	0
Node 83	Parallel Chunk Start	738	738	738
Node 84	Parallel Chunk End	36155	36155	36155
Node 85	CSV Reader	276	276	276
Node 86	Call Workflow Service	188363	188363	188363

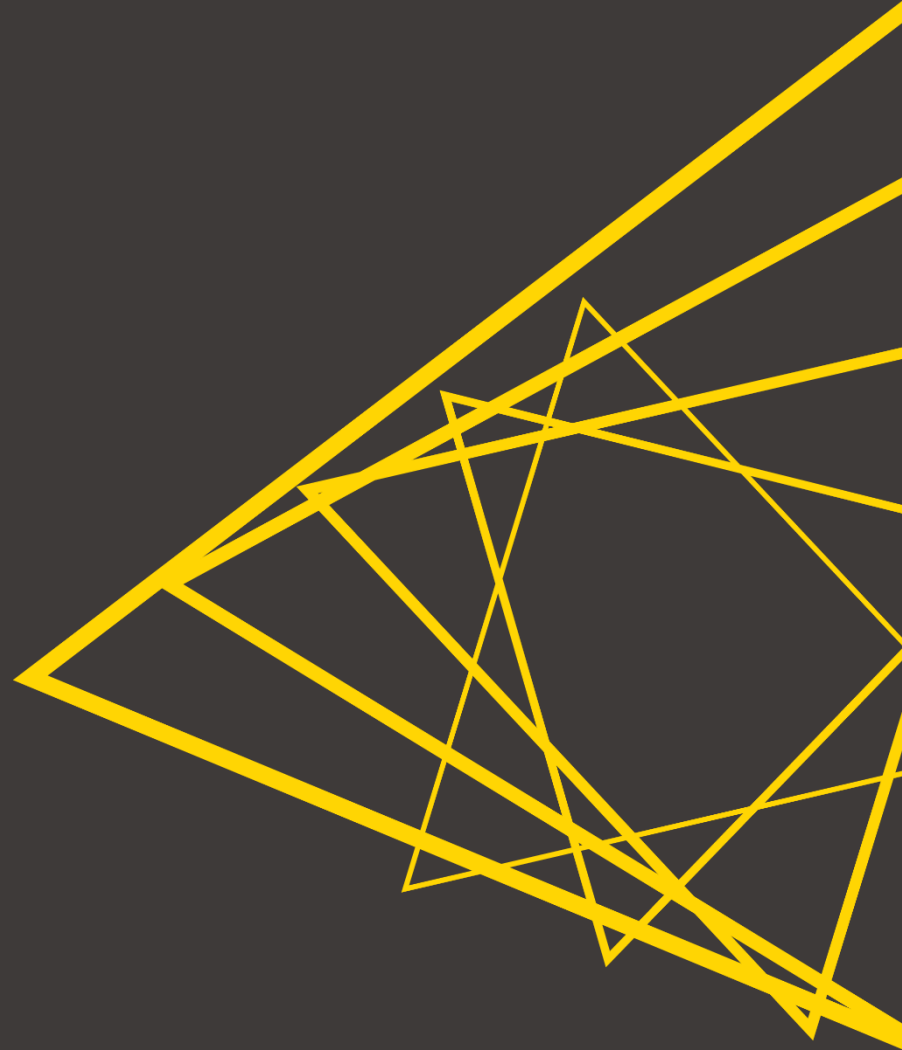
Execution in KNIME Business Hub

KNIME Business Hub in the Organization

IT only allocates **seats**
& **execution cores** per team.

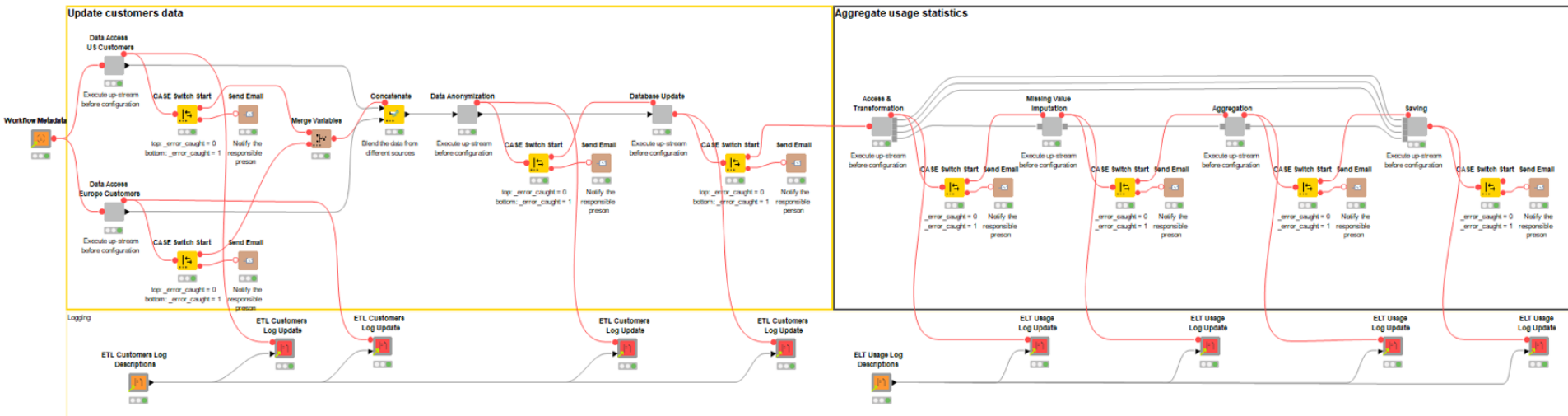


Orchestration



Motivation behind Orchestration

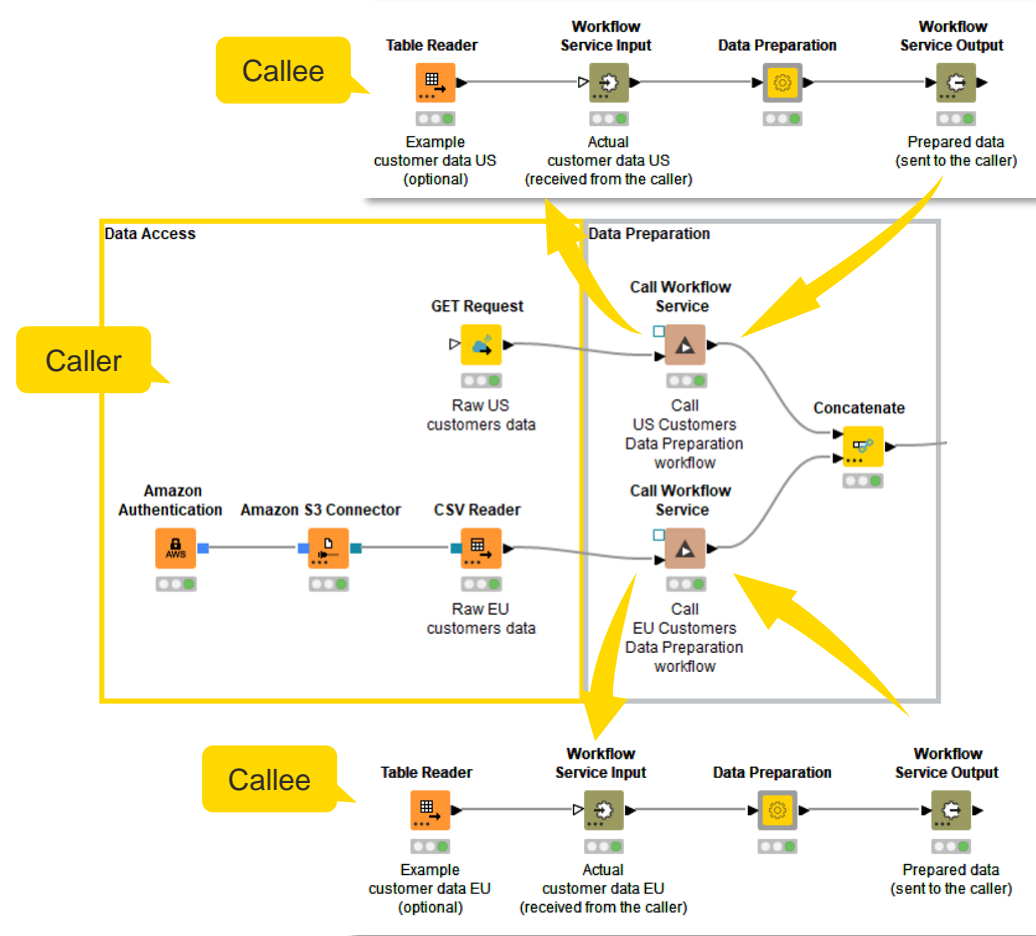
- A large workflow...
 - ...combines many processes and purposes in one
 - ...is difficult to maintain
 - ...is difficult to test
 - ...loads slowly



Orchestration

- Create modular workflows
 - Split workflows that perform different processes (*callee* workflows) and orchestration workflow (*caller*)
 - Callee can get data from and expose data to a caller
 - Call and orchestrate in the caller workflow
- Execute in parallel or setup workflow dependencies or cascades

Classic approach:
one workflow call the other pieces



Orchestration Example

- Collect user feedback via Data App
- Get the sentiment of the feedback (positive, negative, neutral)
- Generate a daily report with the latest feedback

First Name

Last name

Age

Country

Email Address

I want to subscribe to the newsletter

From 1 to 5, how much would you recommend our game to a friend? 1 2 3 4 5

Do you want to tell us more?

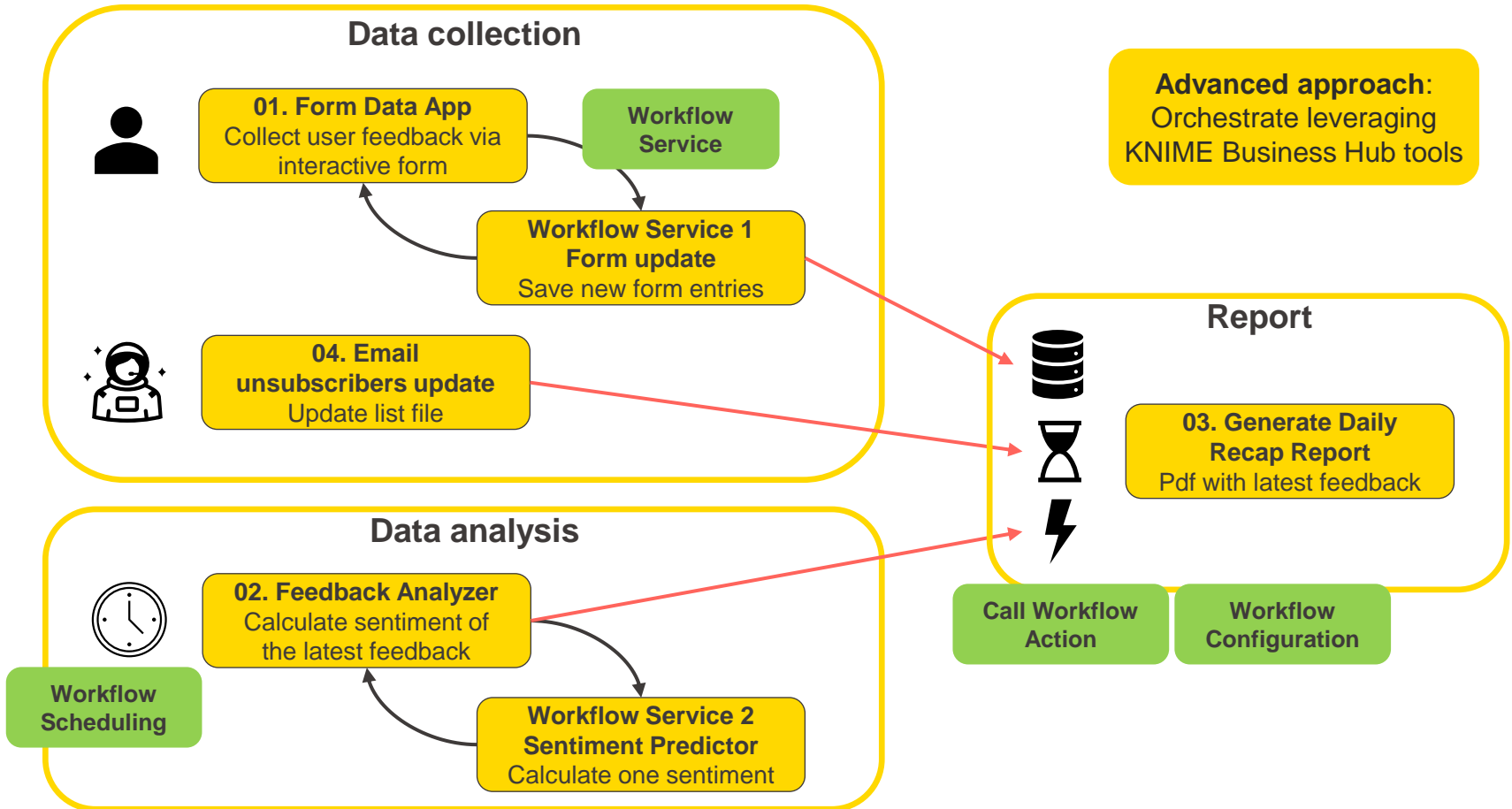
Please provide your information and a valid email address. Then click Next to access the global game statistics.

KNIME Report

KNIME report powered by Birt

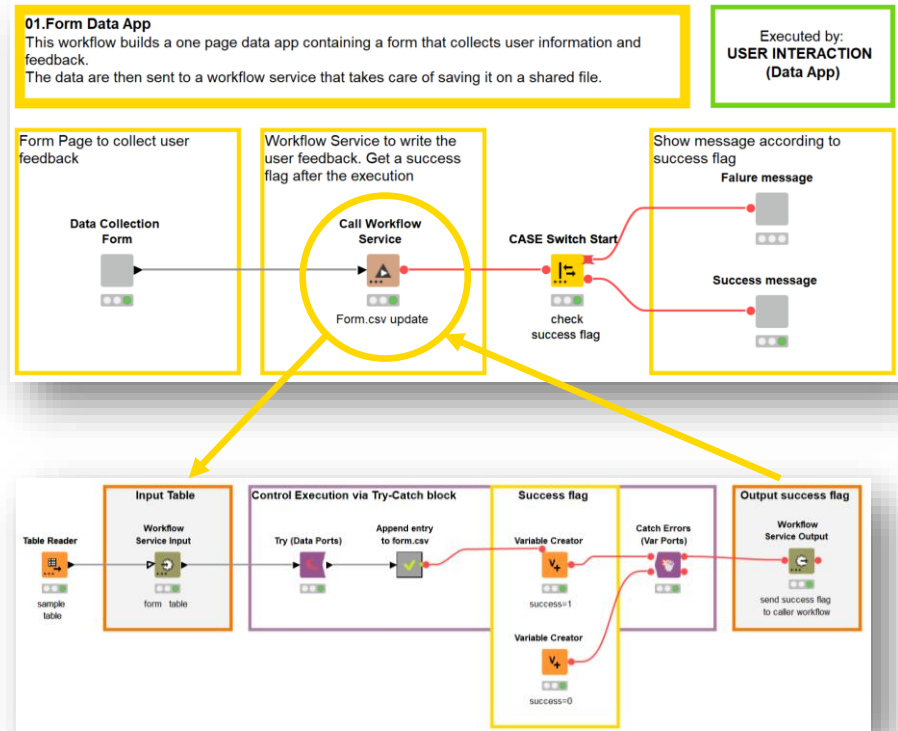
"Sentiment Prediction"	"first-name"	"last-name"	"email"	"rate"	"feedback"	"email_allowed"
negative	Steve	Rogers	the_captain@em	1	I'll leave my negative feedback and disappear.	no
positive	Peter	Parker	iamnotspiderman	5	I really like the experience. Well done!	yes
negative	Bruce	Banner	thehulk@email.cc	1	Such a bad game. I will never play again.	yes
neutral	Natasha	Romanoff	w_black@email.c	3	The interface has some flaws and is not perfect, but the game is overall nice.	yes

Orchestration Example



Workflow Service

- Delegate operations to external workflow
- Enhance modularization
- Enable workflow dependencies
- Can introduce parallel execution



Workflow Scheduling

- Execute a workflow on KNIME Business Hub at a specified time/interval
- Enable automation

In our example:

- Once a day, append sentiment to the latest feedback

The screenshot displays the KNIME Business Hub interface. At the top, there is a search bar and navigation breadcrumbs: "KNIME Dev Business Hub > Evangelism Team > Spaces > My Hub Space > L3-DA 06.03 > L3-DA Productionizing Data Ap". The main content area shows a workflow titled "Feedback Analyzer" under the "Education" category. A yellow callout bubble points to the workflow with the text "Create a space version before scheduling". Below the workflow title, it says "Last edited: Mar 8, 2023" and "Workflow history".

The workflow diagram is annotated with three boxes:

- 02. Feedback Analyzer:** This workflow reads the feedback collected via a user form during the previous days. It calculates the sentiment of the new feedback and adds it to the new_feedback.csv file. After its scheduled execution, the server automatically calls 03.Send_Daily_Recap_Email
- Executed by SCHEDULE (once a day):** This block is connected to the main workflow.
- After execution: "Call workflow action" 03.Generate_Daily_Recap_Report:** This block is triggered after the main workflow completes.

The workflow steps include: CSV Reader, Rule based Flow Splitter, Column Filter, Try (Data Ports), Column Rename, Call Workflow Service, Catch Errors (Data Ports), Log new feedback, Append sentiment to Table Manipulator, and Constant Value Column.

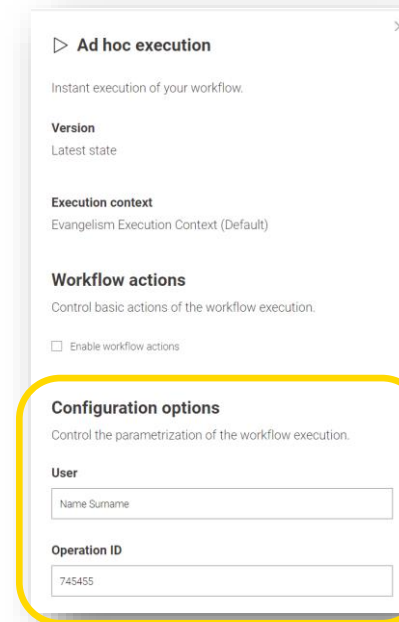
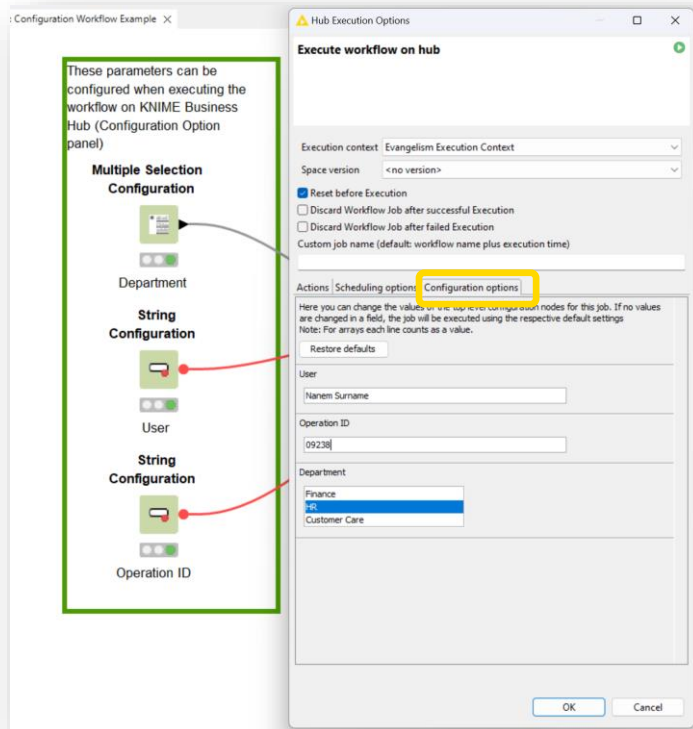
On the right side, the "Create schedule" dialog is open. It includes the following fields:

- Deployment name:** Schedule - Feedback Analyzer
- Version:** removed node - Mar 8, 2023 9:32 AM
- Execution context:** Evangelism Execution Context (Default)
- Schedule options:** Define when the workflow should be executed.
- Initial execution:** 2023-03-08 09:35:00
- Repeat execution:** Every Start times: 1 Days
- Schedule ends date:** Never Date

At the bottom of the dialog, there are "Cancel" and "Create" buttons. Below the dialog, the text reads: "This workflow reads the feedback collected via a user form during the previous days. It calculates the sentiment of the new feedback and adds it to the new_feedback.csv file. After its scheduled execution, the server automatically calls 03.Send_Daily_Recap_Email".

Workflow Configuration

- Configuration nodes in the top-level workflow enable workflow configuration



Example application
Change the behavior
of a workflow upon
execution, no need to
open it

Call Workflow Action

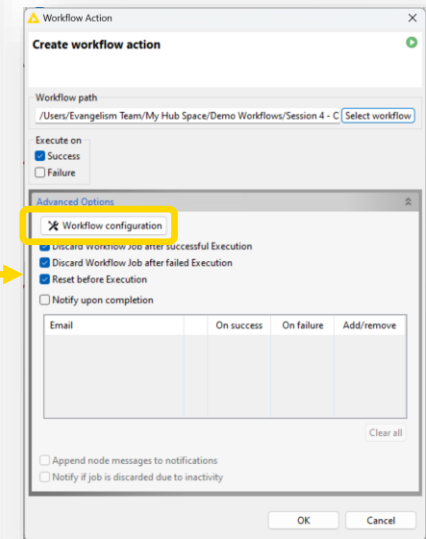
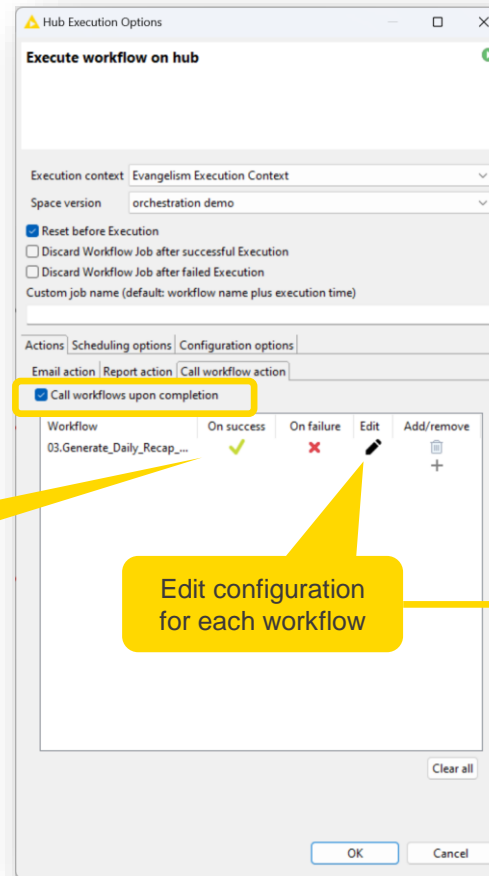
- Trigger the execution of another workflow after this one is completed (only KNIME Business Hub)
- Enable sequential execution
- Decide what to execute next in case of success/failure

Execute on failure and/or on success

Edit configuration for each workflow

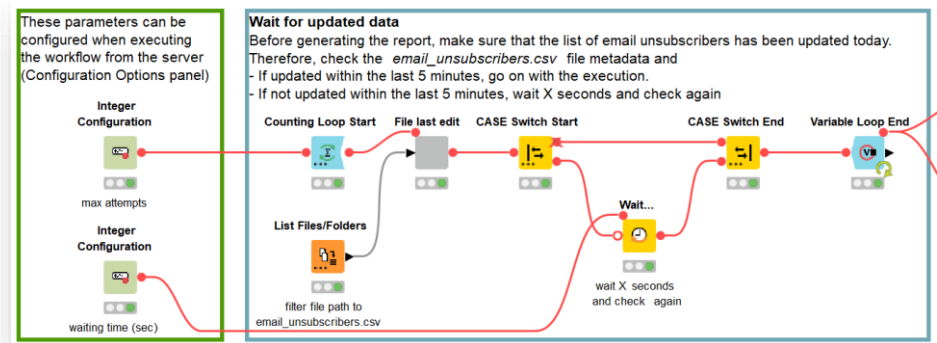
In our example:

- Generate report *after* calculating sentiment feedback



The Wait... node

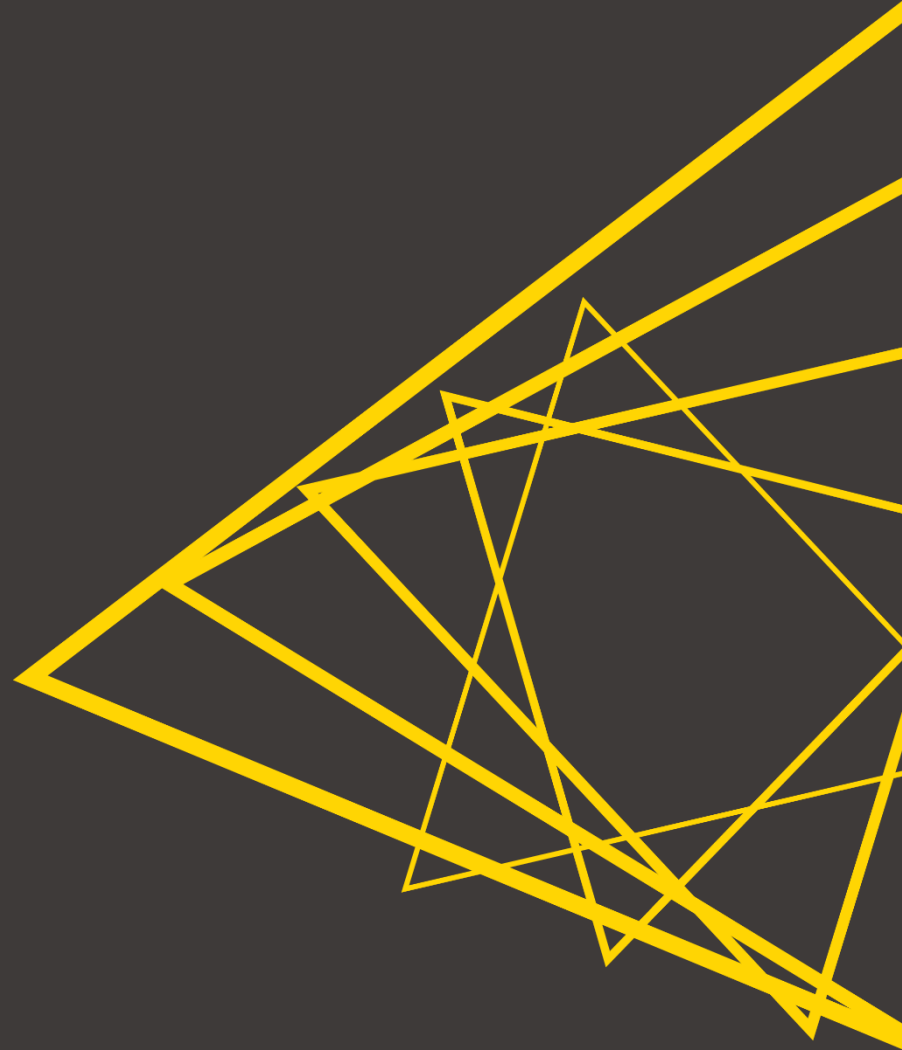
- The Wait... node allows pausing the execution of the workflow
 - Until a specified time
 - For a time interval
 - Until file creation, modification or deletion
- Powerful to model execution dependencies



In our example:

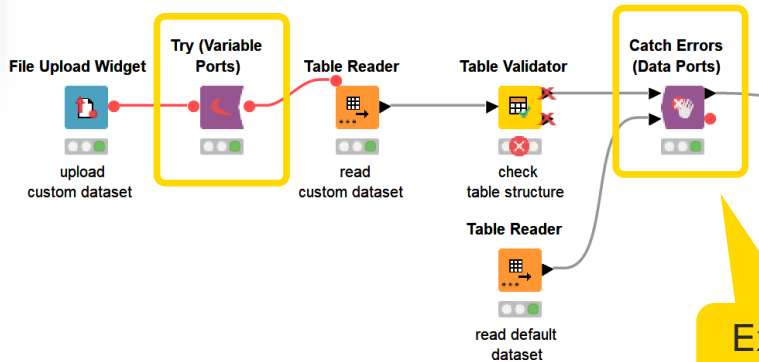
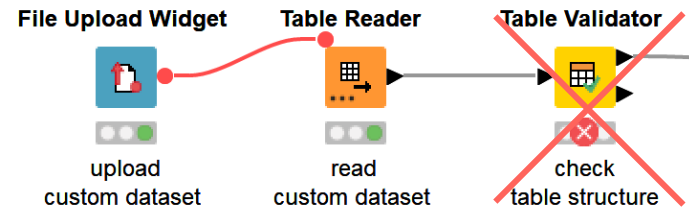
- Wait for data updated by an external department

Error Handling



Handling Errors

- Data App fails if just **one** node fails
 - (Non-expert) end users run into abrupt interruption of Data App execution



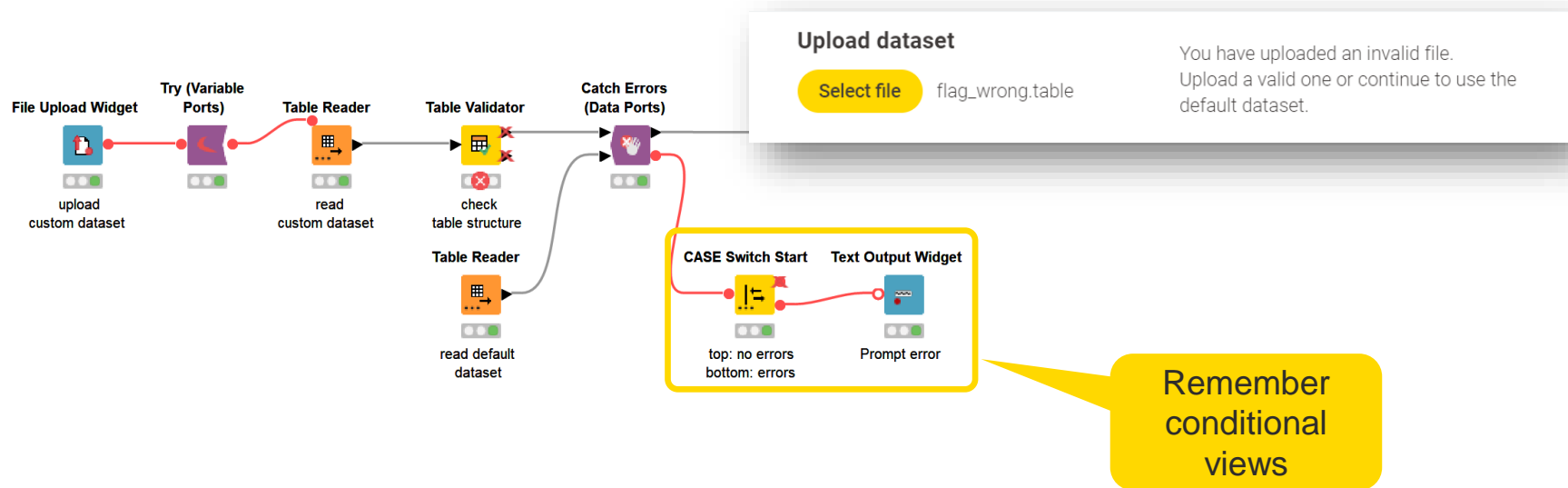
Workflow not executed

ERROR Table Validator 45:370:0:371: Execute failed: Validation failed: Column: 'country' causes validation issue: 'COLUMN_NOT_CONTAINED'. Detailed information: Column 'country' is missing.

- Try & catch nodes let us
 - Continue the execution
 - Nicely notify the user about the error
 - Report failure

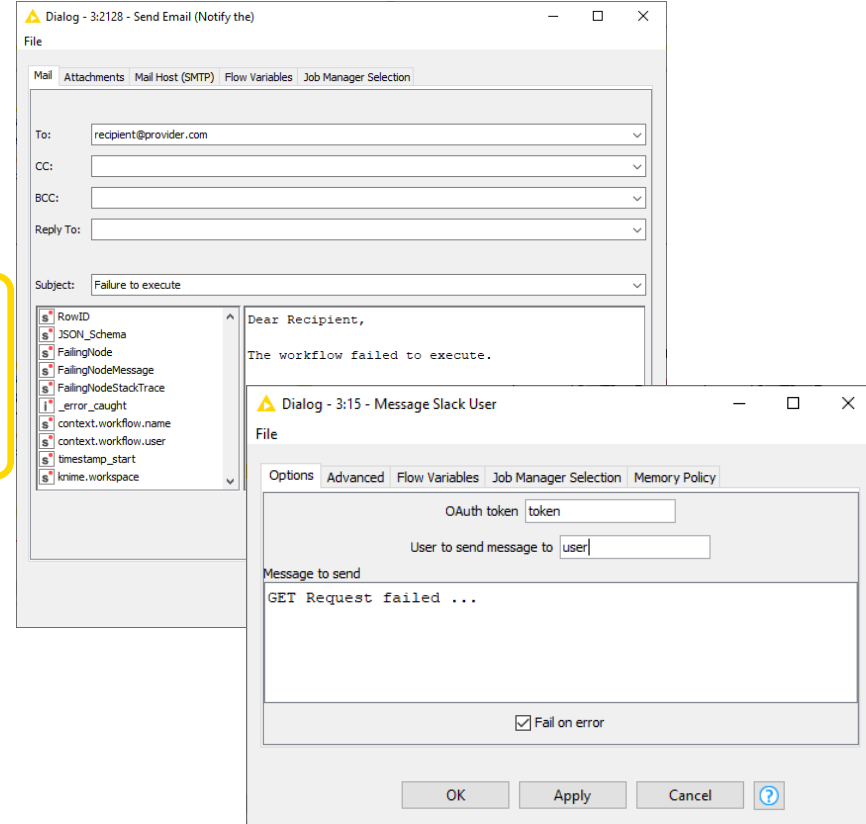
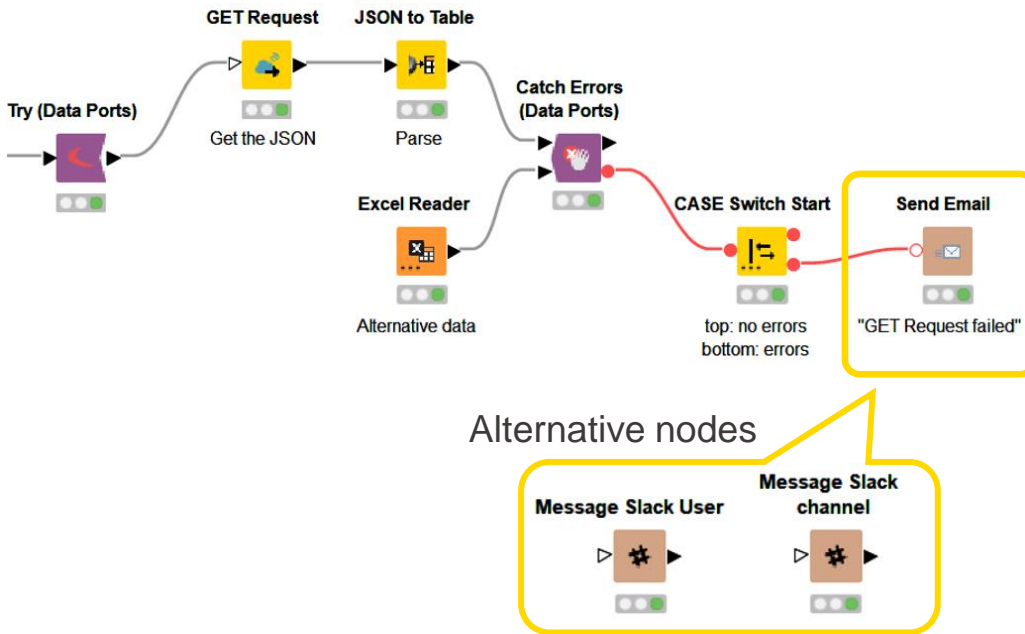
Notify the user

- Inform the user about the error
- Useful if the user can solve the error e.g. by changing input



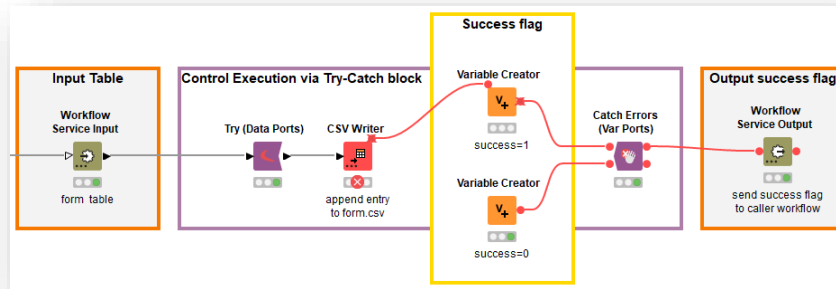
Reporting Failures

- Inform responsible people about a failure

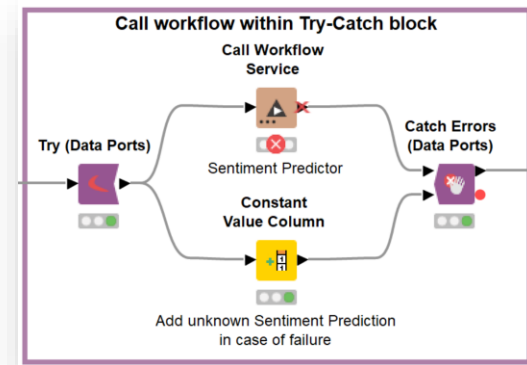


Errors in Workflow Services

- Dealing with Workflow Services, errors can be handled at different levels



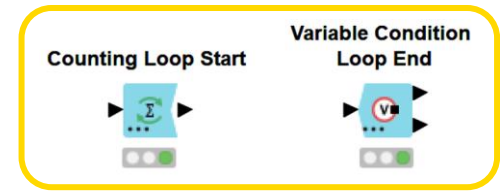
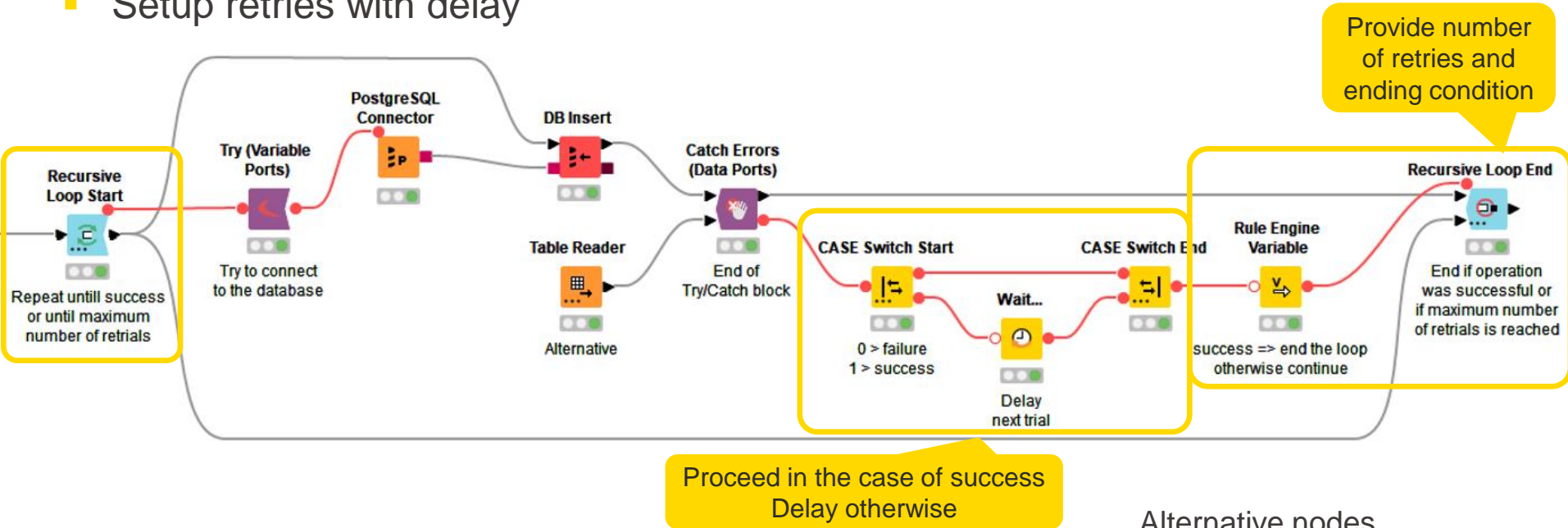
In the **caller** workflow



- The choice depends on the use case

Handling Errors with Retries and Delay

- Setup retries with delay



Handling Errors with Retries on KNIME Business Hub

- Setup several retries when scheduling on KNIME Business Hub

Create schedule

Schedule your workflow to run automatically at selected times.

Initial execution

2023-01-18 15 : 51 : 00

Repeat every

Workflow actions

Control basic actions of the workflow execution.

Enable workflow actions

Advanced settings

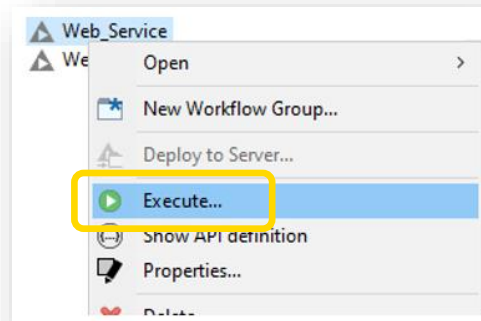
Execution retries

5

Reset before execution

Change job lifecycle behaviour, timeouts, ... [Set >](#)

[Cancel](#) [Create](#)



Hub Execution Options

Execute workflow on hub

Execution context: Evangelism Execution Context

Space version: demo

Reset before Execution

Discard Workflow Job after successful Execution

Discard Workflow Job after failed Execution

Custom job name (default: workflow name plus execution time)

Action: **Scheduling options** | configuration options

Schedule job

First execution: 19/01/2023 15:47

Last execution: 18/01/2023 15:47

Execution retries 5

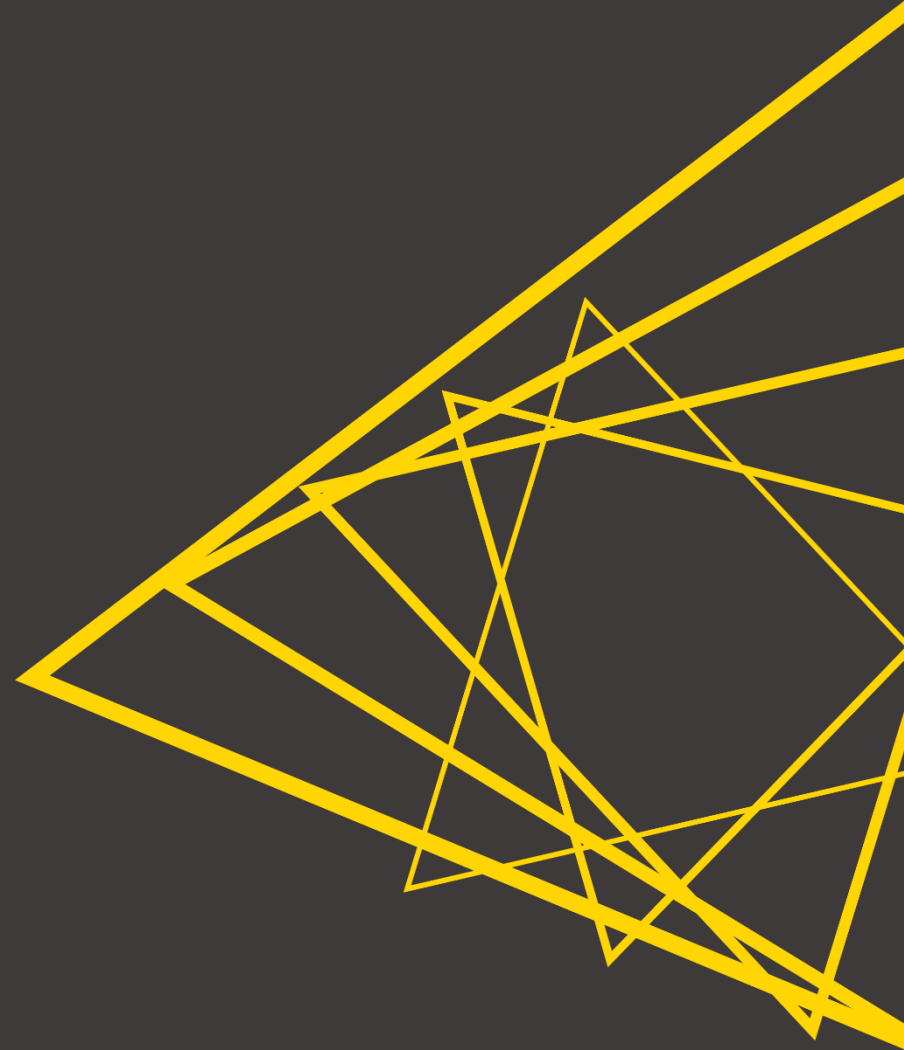
Repeat execution

Session 4: Summary

Now you should be able to:

- List the possible performance optimization operations
- Recall and apply the tools for orchestration offered by KNIME Business Hub
- Identify the techniques for error handling

Exercises



Exercises Session 4

- **Exercise 01** - Use the Parallel Chunk Loop nodes to execute a lexicon-based sentiment predictor in parallel on KNIME Business Hub
- **Exercise 02** - Move the workflows to production by deploying on the KNIME Business Hub and configuring execution dependencies. Practice workflow scheduling, call workflow actions and workflow configuration execution.

Confirmation of Attendance and Survey

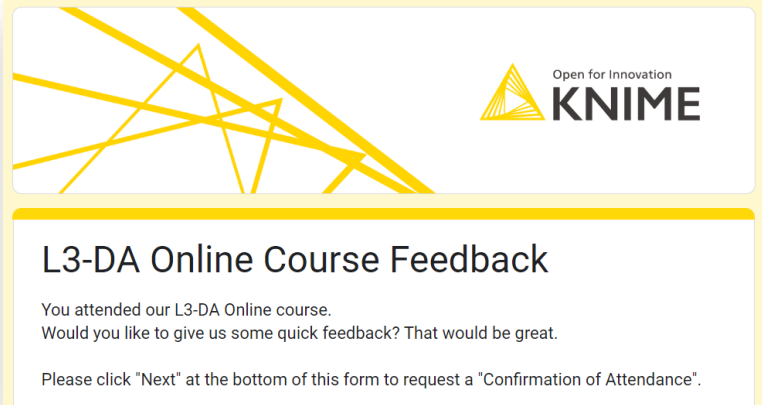
- If you would like to get a “Confirmation of Attendance” please click on the link below*

[Confirmation of Attendance and Survey](#)

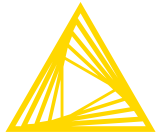
- The link also takes you to our course feedback survey. Filling it in is optional but highly appreciated!

Thank you!

*Please send your request within the next 3 days



The screenshot shows a survey form with a yellow header. The header contains the KNIME logo and the text "Open for Innovation KNIME". The main content of the form is titled "L3-DA Online Course Feedback" and includes the following text: "You attended our L3-DA Online course. Would you like to give us some quick feedback? That would be great." and "Please click 'Next' at the bottom of this form to request a 'Confirmation of Attendance'."



Open for Innovation

KNIME

Thank You!

