from Excel® to KNIME®

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This book has been updated for KNIME **4.6**.

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Spreadsheets

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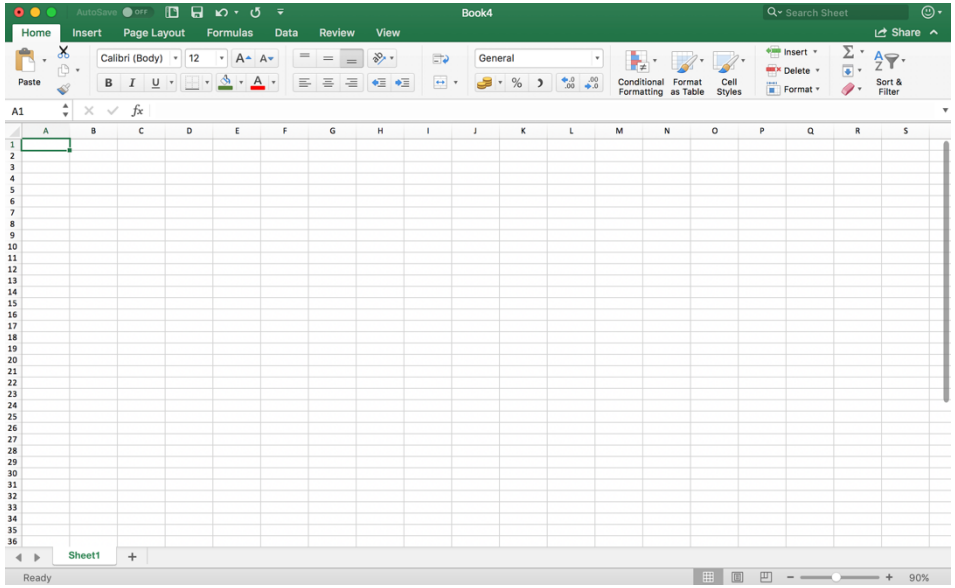
Excel

Microsoft Excel is a spreadsheet program, which features calculation, graphing tools, pivot tables, and a macro programming language (Visual Basic for Applications, VBA for short).

By using cell mathematics, macros, and VBAs you can edit a sheet. This can be really easy cell mathematics, like summarizing the values from cells A1 and B1 (= SUM(A1, B1)), but can be also really complex, embedded logic.

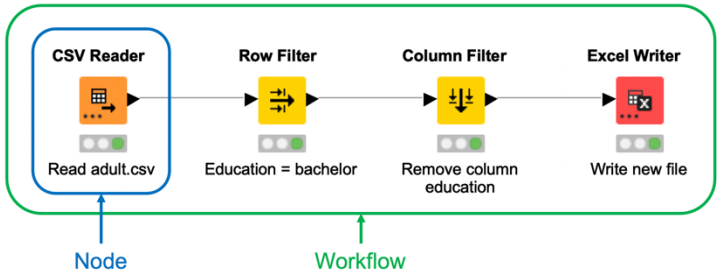


KNIME Analytics Platform

KNIME Analytics Platform implements **visual** programming. This means that each data analysis step is represented by means of an icon block, called a **node**, in a graphical editor. Each node can perform one specific task. For example the Excel Reader node can read one sheet of an Excel file or the Row Filter node allows to filter rows based on a filter criterion.

A sequence of connected nodes is called a **workflow** and is the corresponding concept of an Excel sheet with many functions and/or VBAs.

Data is organized through data tables, where each data cell is identified by a column header and a Row ID. To visualize the content of a data table, see page 11.



Note. Nodes have four possible states displayed by a little traffic light under the node itself:

- Not configured -> **red light**
- Configured -> **yellow light**
- Successfully executed -> **green light**
- Executed with error -> **red light with cross**

For more details about KNIME Analytics Platform, check:

- *S. Hayasaka, R. Silipo, "**KNIME Beginner's Luck**", KNIME Press, 2021*
- *R. Silipo, V. Palacios, "**KNIME Advanced Luck**", KNIME Press, 2021*

Folders

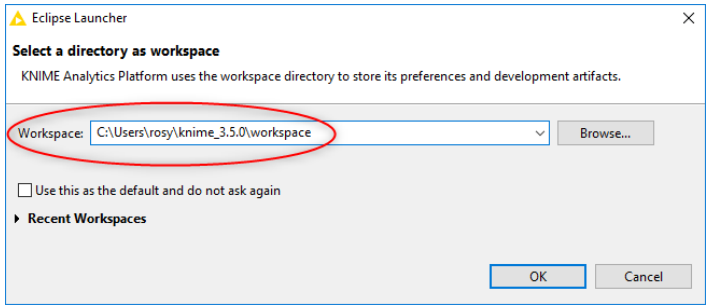
Workspace

Excel

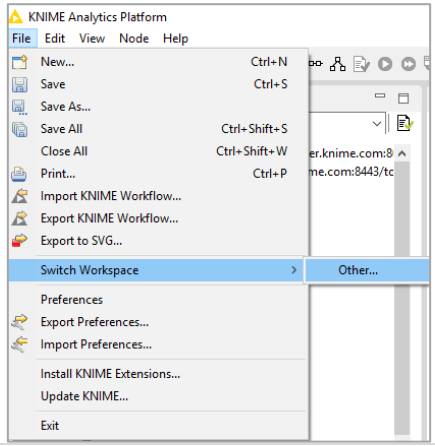
Excel files are normally saved in different folders. A single Excel file can contain multiple sheets.

KNIME Analytics Platform

The workspace defines the **folder** where all workflows, data and intermediate data are saved. One workflow corresponds to an Excel sheet with all formulas, visualizations and VBAs. All the projects and datasets saved in a workspace are available in the KNIME Explorer, located in the top left corner of the KNIME workbench. The path to the workspace is selected at the very beginning, after starting *KNIME Analytics Platform*.

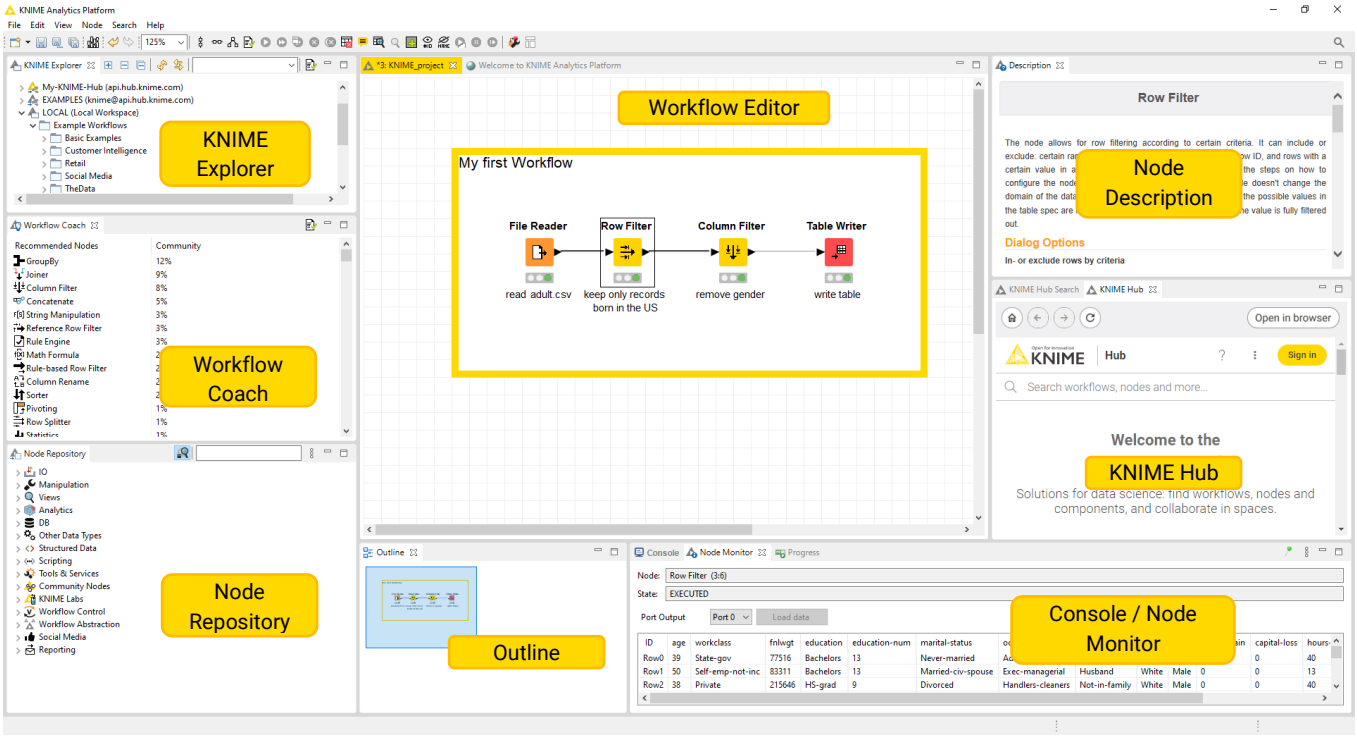


You can still change the workspace after KNIME Analytics Platform has been launched, by going to “File” in the top menu and selecting “Switch Workspace”. You can have multiple workspaces, e.g. for different projects or customers.



The KNIME Workbench

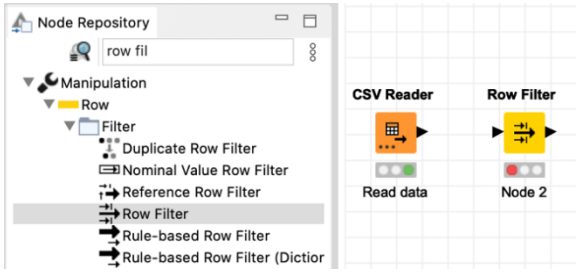
After downloading and installing KNIME Analytics Platform you can start it from the desktop or from the installation folder. The KNIME workbench, which you can see below, opens including the following panels:
"**KNIME Explorer**" showing the list of currently available workflows and KNIME servers for the selected workspace and the My-KNIME-Hub mountpoint.
"**Workflow Coach**" recommending the next node based on the KNIME user statistics and the node currently selected in the "Workflow Editor".
"**Node Repository**" containing all currently installed nodes. A "**Search**" box is available at top of this panel to search for nodes.
"**Workflow Editor**" in the center allowing for the creation and editing of workflows.
"**Node Description**" showing a text describing the node task and configuration settings, for the selected node either in the "Workflow Editor" or in the "Node Repository" panel.
"**Node Monitor**" showing a preview of the output table of the node selected in the "Workflow Editor"
"**KNIME Hub**" allowing use of the KNIME Hub to search for nodes, workflows, components, and extensions.
"**Outline**" offering an overview of the workflow
"**Console**" showing execution messages, e.g. error and warning messages.



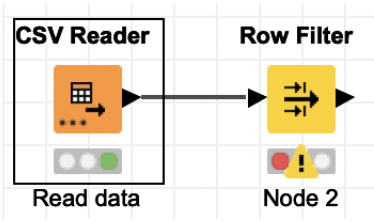
Building a KNIME Workflow

KNIME workflows are **created** by **dragging&dropping** nodes from the "Node Repository" or "Workflow Coach" panel to the "Workflow Editor". Use the search box on the top of the Node Repository or browse through the nodes, sorted by different categories to find the correct node for your next step.
Nodes are **connected** to each other through their input and output ports. Just click the output port of the first node and release at the input port of the second node.
Nodes that have just been created show a red light status: not yet configured. To **configure** a node, right-click the node and select the option "Configure" or alternatively double-click the node. The node "Configuration" window opens. Configure the node and close the configuration window. If the configuration is successful, the node status changes to a yellow traffic light.
The node is now configured, but not yet executed. To **execute** the node, right-click the node and select the "Execute" option. If the execution is successful, the node changes its status to a green light.

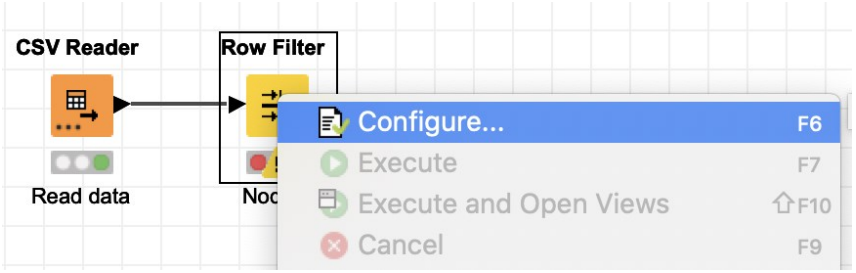
Step 1: Search and create a node via drag& drop



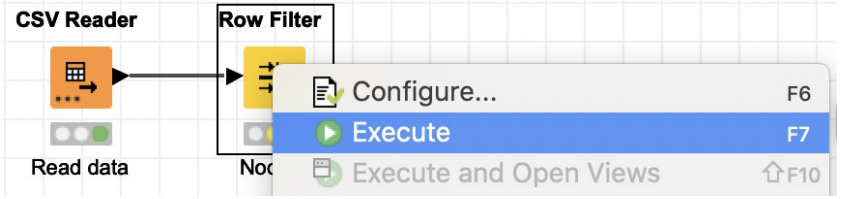
Step 2: Connect the nodes



Step 3: Configure the node



Step 4: Execute the node



Note 1: To create a new, empty workflow right click in the KNIME Explorer panel, select "Create New KNIME Workflow…" and define the name and destination of the new workflow in the new window.
Note 2: Click the magnifier next to the search box in the node repository to change the mode of the search box to a fuzzy search. This makes finding the correct node easier in the beginning.
Note 3: The "Getting Started Guide" guides you step by step through building your first example workflow.

Display Data Table

Excel

In Excel what you see is what you get. This means that the data table you see is the final data table.

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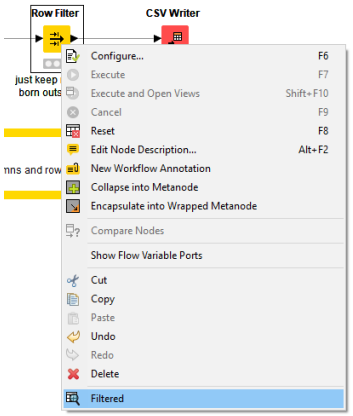
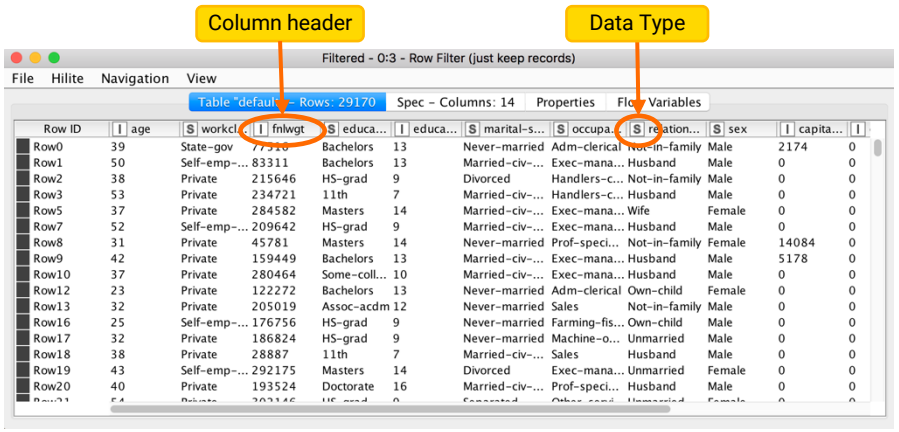
The output data tables produced after node execution are always available. To see them:

- Right-click the node in the workflow
- Select the last option in the context menu





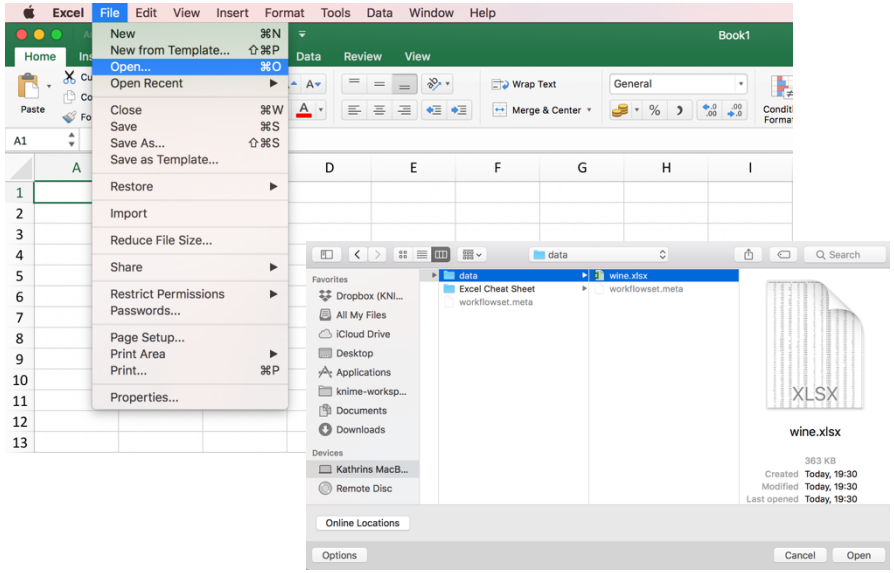
Note: Some nodes, like plotting and modeling nodes, also have a more complex "View" function. The option leading to this "View" is usually displayed in the middle of the context menu.

Input/Output

Opening an Excel File

Excel

To open an Excel file you can either double click the file or open Excel, go to “File” in the top menu, select “Open…” and then browse to the file you want to open.



Excel Reader Node

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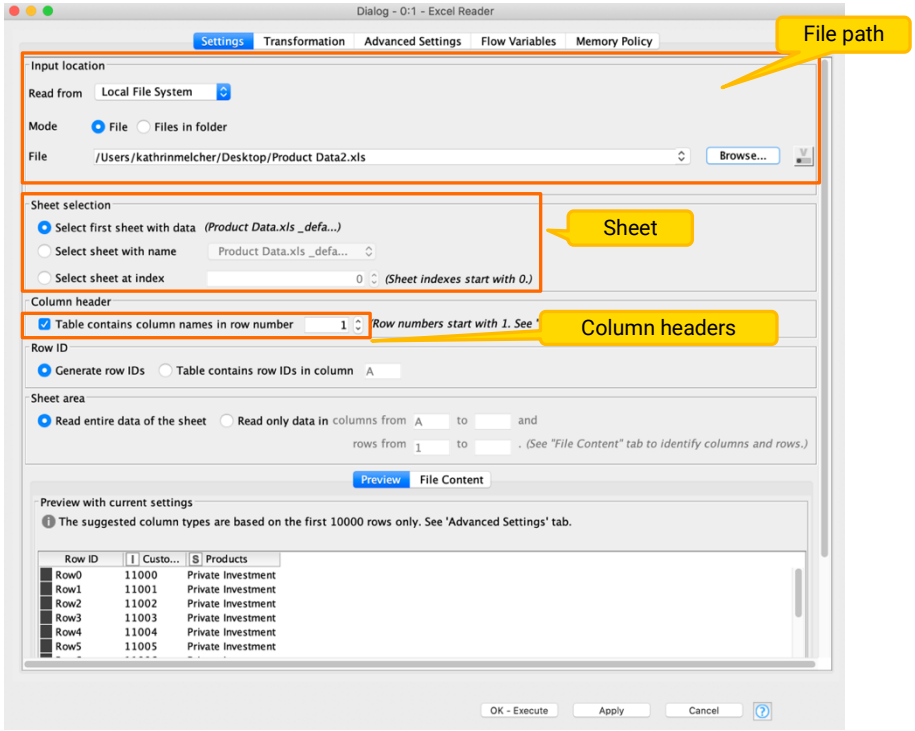
The Excel Reader node reads a single sheet of an Excel file. Similar to Excel you first have to define the file path. Next you can select the sheet. The additional setting options enable you to define whether the table has column headers and / or row IDs and to specify which part of the sheet you want to read.

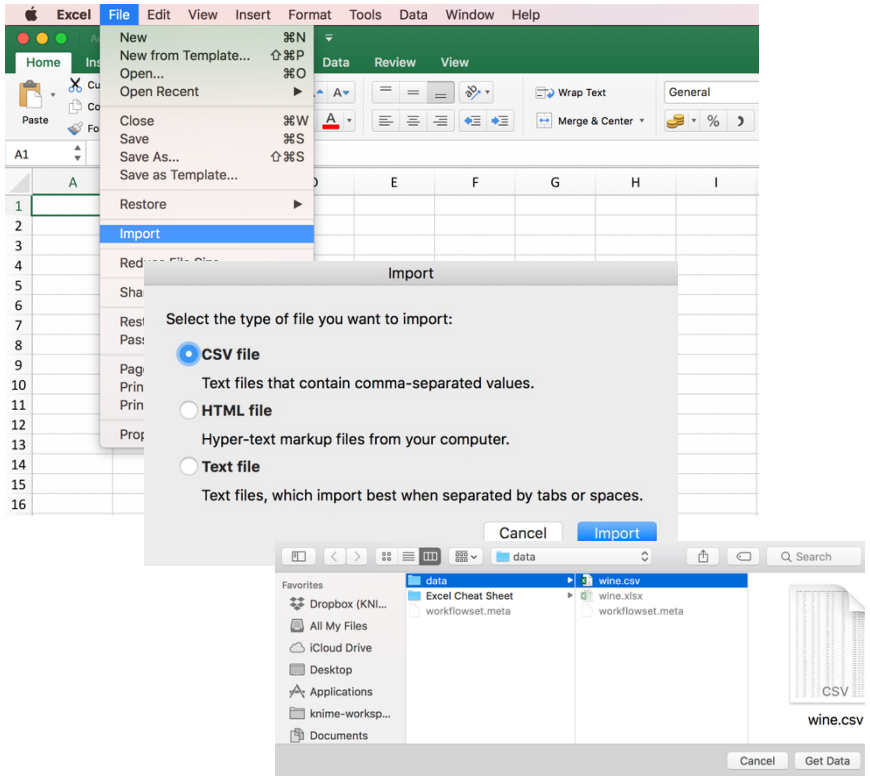


Note: Page 15 shows how to read and concatenate multiple Excel files which have the same column headers.

Opening a CSV or txt File

Excel

To open a CSV file click “File” in the top menu and select “Import”. Select CSV file and then choose the file you want to open.
Fill in all necessary options, such as the separating character, to correctly read the file.



CSV Reader Node

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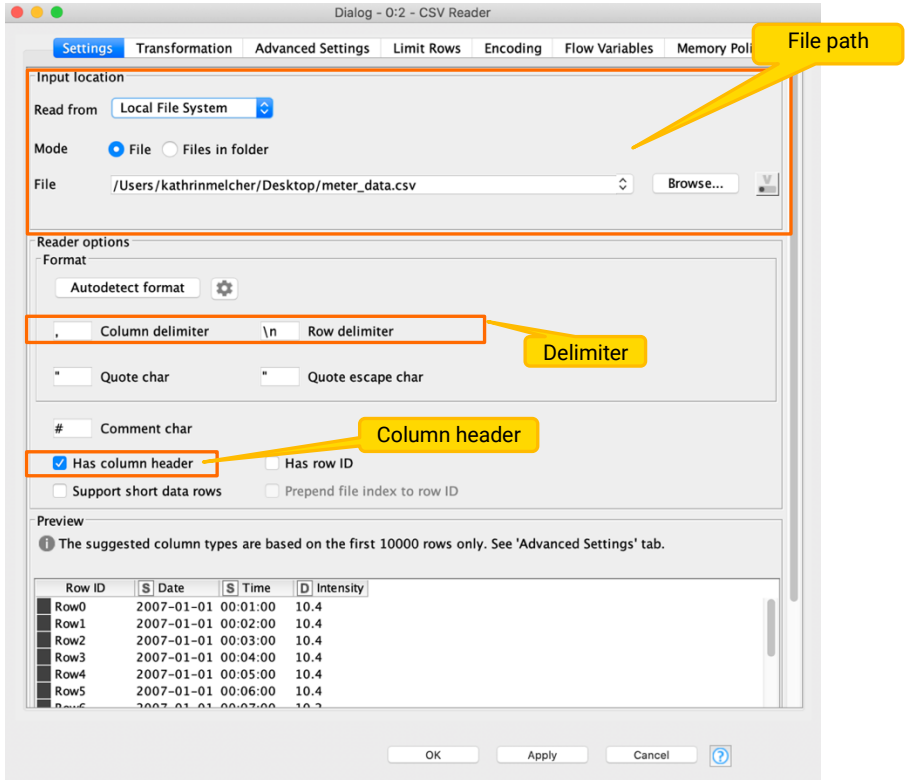
The CSV Reader node reads various text based files, e.g. CSV files. In the configuration window you can set all the necessary options, such as separating character, to correctly read the file.



Note 1: Click the “Autodetect format” button if the node doesn’t create the preview.
Note 2: Check out the additional tabs to limit the number of rows or to change the encoding.

Importing Content from Multiple Files of the same Type to a Single Table

Excel

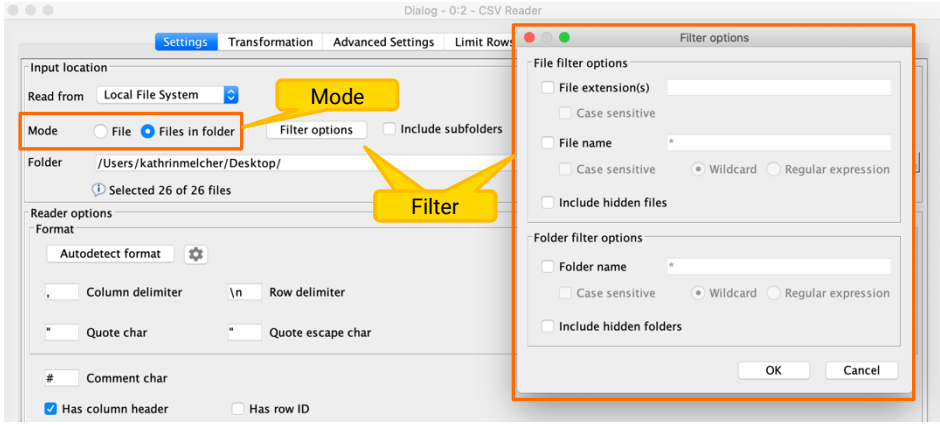
If you have a folder containing multiple files of the same type (e.g. CSV), you can open them all at the same time in different Excel instances. Follow the instruction from the previous page and select all the files you want to open.

To move data tables together into one single sheet, you have to proceed manually using copy and paste.

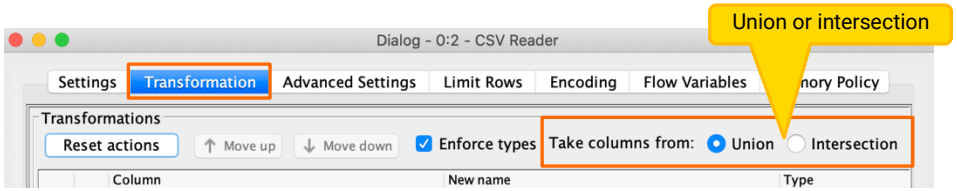
Note: Before copying and pasting, ensure that all files have the same column order.

KNIME Analytics Platform

Many reader nodes in KNIME Analytics Platform support reading multiple files in a folder and combining them into one table. For example the CSV Reader can read multiple text-based files.
To read multiple files select the “Mode” “Files in folder” and specify the folder using the “Browse” button. A little note tells you how many files are currently selected. In case you don’t want to read all the files in a folder, click the button “Filter options” to specify which files should be included according to their file extension and/or name. Lastly you can also include files from subfolders by activating the checkbox “Include subfolders”.



Note: In the Transformation tab you can define whether you want to use the union or the intersection of the columns from the different tables.



Importing Content from Multiple Sheets into a Single Table

Excel

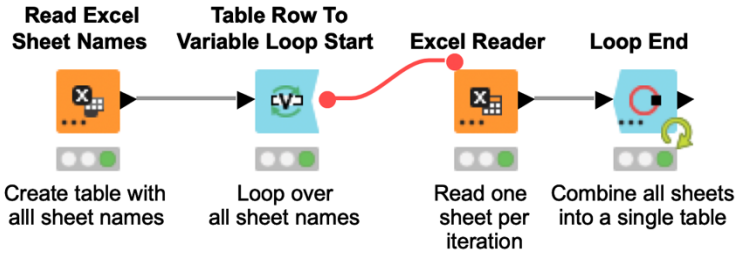
To move data from multiple Excel sheets into one Excel sheet you proceed manually, using copy and paste.

Note: Before copying and pasting, ensure that all files have the same column order.

KNIME Analytics Platform

With a simple loop you can read all sheets of an Excel file automatically.

The Read Excel Sheet Names node creates a list of all sheet names. The loop (the part in between the blue nodes) reads one sheet of the Excel file at each iteration. Therefore, at each iteration the Table Row to Variable Loop Start node creates a flow variable with the sheet name as its value. This flow variable is used in the Excel Reader node to control the sheet selection. The Loop End concatenates the content from the different tables.



Note 1: Lesson 3 of the free KNIME Self-Paced Course L2-DW KNIME Analytics Platform for Data Wrangles course introduces flow variables.

Note 2: Lesson 4 of the free KNIME Self-Paced Course L2-DW KNIME Analytics Platform for Data Wrangles introduces loops in KNIME.

Saving an Excel File

Excel

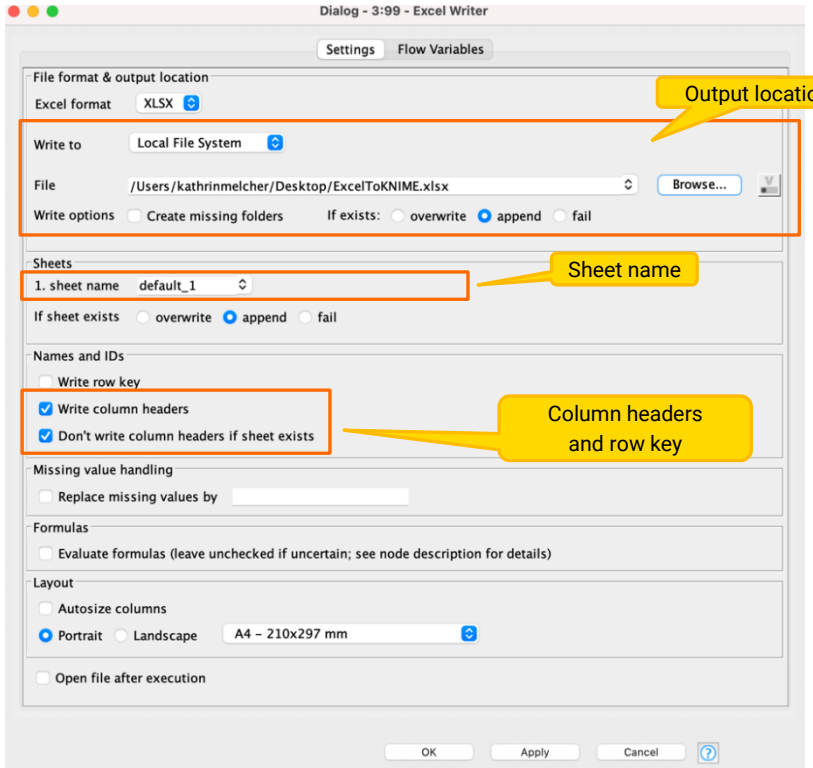
To save the sheet of an Excel file you have different options:

- Click File->Save As… and define the output location
- Or press Shift+Ctrl+s and define the output location

Excel Writer Node

KNIME Analytics Platform

The Excel Writer node writes or append the input data table into a sheet in an Excel file, in either xls or xlsx format.
In the configuration window you can set the output location and sheet name. The additional setting options enable you to overwrite an existing file and to define whether you want to write the column headers / row ids into the first row / column of your Excel sheet.



Note 1: To write multiple tables into different sheets you can add dynamic input ports and define a sheet name for each input table.
Note 2: Select “append” for the settings “Write options” and “If sheet exists” to append the input data after the last row of an existing sheet.

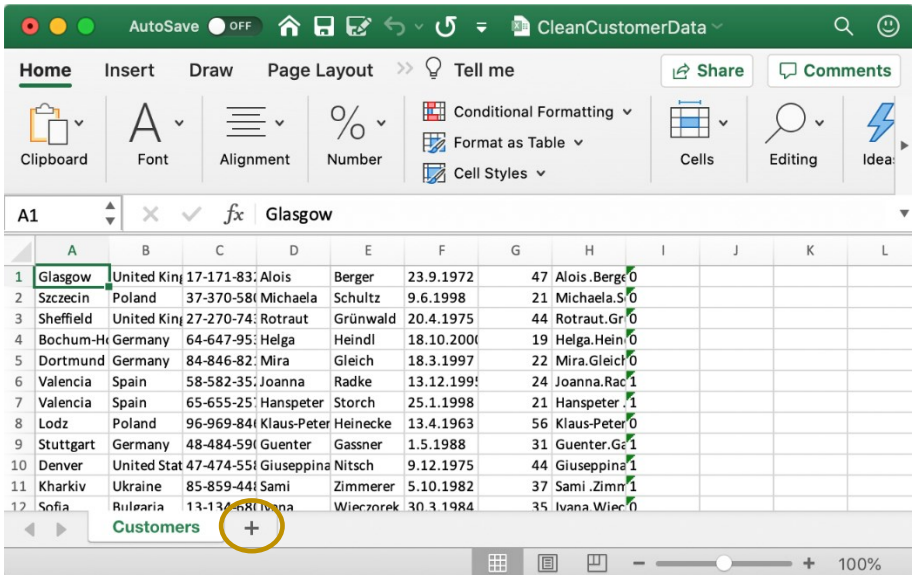
Adding a Sheet to an Excel File

Excel Writer Node

Excel

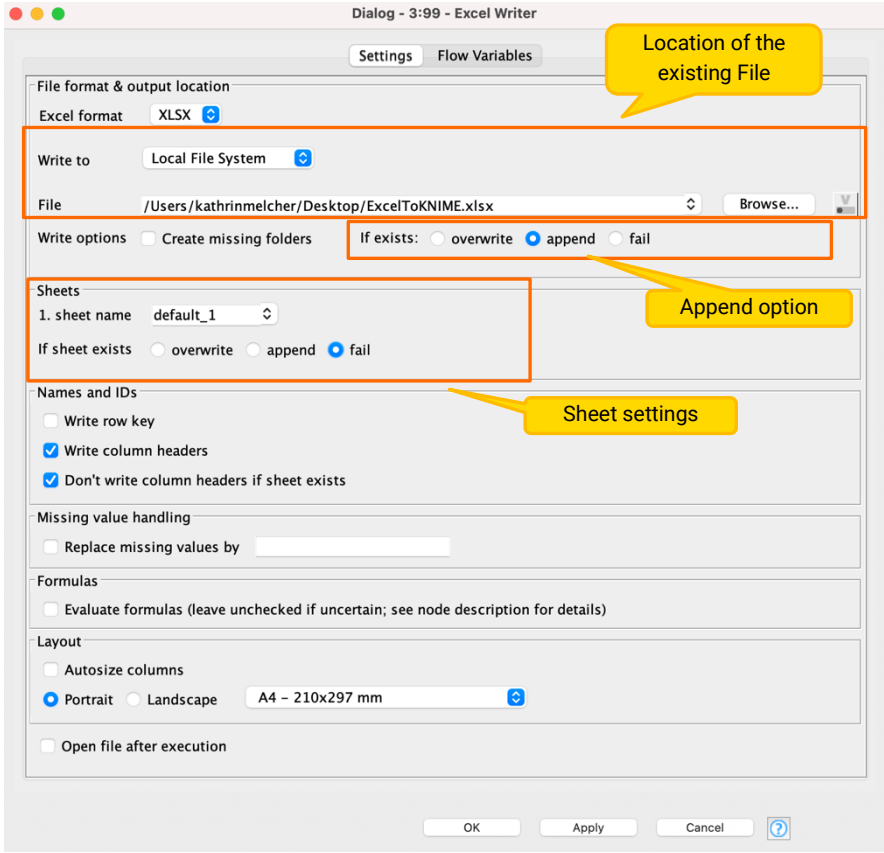
To add a new sheet to an existing Excel file you have to click the plus below the table, next to the already existing sheets.

To add a table from another Excel file you can copy & paste the table manually.



KNIME Analytics Platform

The Excel Writer node can also add sheets to an existing Excel File. In the configuration window you can set the location of the existing Excel file and select “append” for the setting option “If exists”. In the “Sheets” part you can define the new sheet name and whether the node should overwrite or fail in case a sheet with the defined sheet name exists already.



Updating Cells in an Existing Excel Sheet

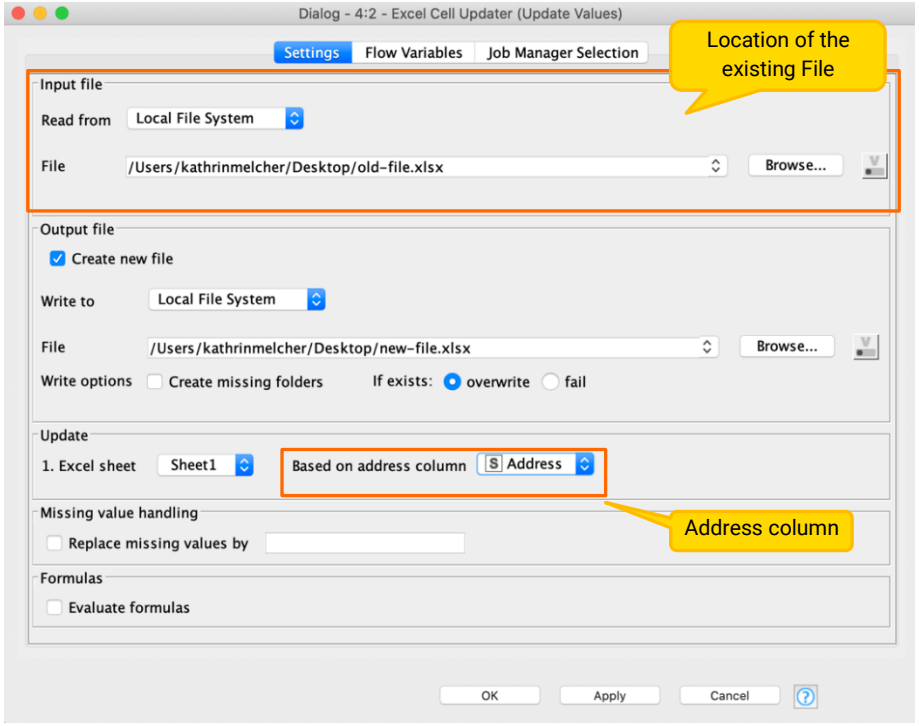
Excel

To edit the content of an existing Excel Sheet, you can open it and edit different cells manually.

Excel Cell Updater Node

KNIME Analytics Platform

The Excel Cell Updater node updates the cells in an existing Excel sheet, based on an input data table.
The input table needs a column with the cell address that should be updated e.g., B2 or 2:2. In addition the table needs one column for each datatype with the new cell content. Each row is only allowed to have one value.



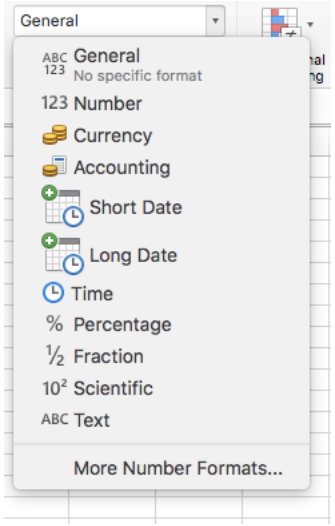
Note 1: Activate the checkbox “Evaluate formulas” to evaluate all formulas using the new cell content.
Note 2: Activate the checkbox “Create new file” to keep the original file.
Note 3: Example Workflow on the KNIME Hub.

Data Types in Excel

Data Types in KNIME

Excel

The screenshot on the right shows you the different available datatypes in Excel.

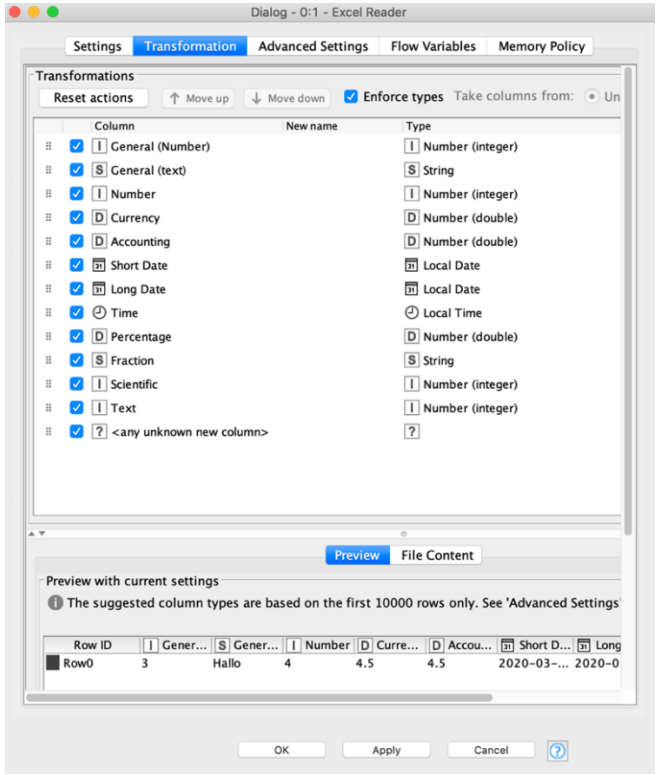


They can be mapped to the following data types in KNIME Analytics Platform

Excel	KNIME Analytics Platform
General	Number or String
Number	Number
Currency (e.g. 50,25 €)	Number (Integer or double) (e.g. 50,25)
Accounting (e.g. 50,25 €)	Number (Integer or double) (e.g. 50,25)
Short Date	Local Date
Long Date	Local Date
Time	Local Time
Percentage (e.g. 50%)	Number (double) (e.g. 0,5)
Fraction	Number (double)
Scientific (e.g. 5,00E+02)	Integer (e.g. 500)

KNIME Analytics Platform

KNIME Analytics Platform supports reading all data types from Excel, and even more. When reading a file, KNIME Analytics Platform tries to autodetect the correct data type. If you want to change this during reading you can use the Transformation tab of the Excel Reader node.



Note 1: The Transformation tab is also available in other reader nodes.
Note 2: In the Transformation tab you can also rename, remove, and change the order of columns.
Note 3: To change the data type later in the workflow you can use one of the following nodes: String to Number, Number to String, or Table Manipulator.

Connect to a Database

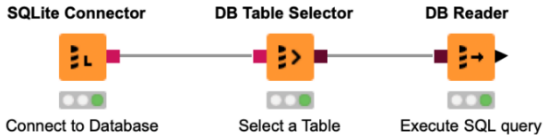
Database Connector Nodes

Excel

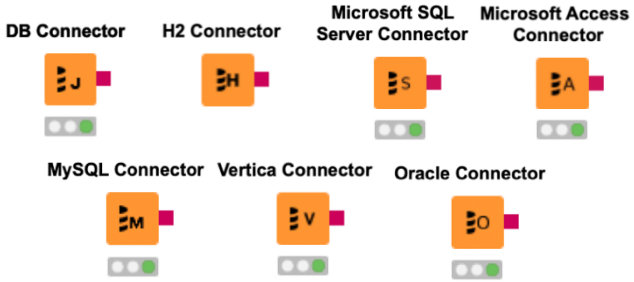
You can connect to a database in Excel. A description about how to do this is available via the following link: http://www.erpsoftwareblog.com/2017/01/microsoft-excel-connections-sql-databases/

KNIME Analytics Platform

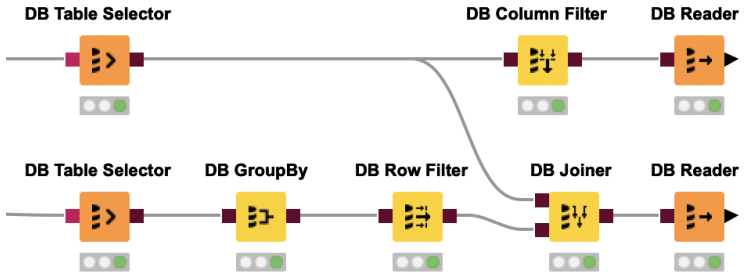
Reading data from a database follows three steps: connect, select, and extract. The workflow is built step by step with a Connector, a DB Table Selector, and a DB Reader node. Database nodes simply build the SQL query, they do not execute it. Only the final node, e.g. the DB Reader node, executes the SQL query and extracts the data.



A number of database connector nodes are available to connect to the most commonly used databases. However, the DB Connector node allows you to connect to all JDBC compliant databases.



There are more database nodes to help build a SQL query for in database processing. You can use them in between the DB Table Selector and the DB Reader node.



Tips on Reading Data with KNIME Analytics Platform

All reader nodes require a path to the input file location. Let's collect some Tips&Tricks for this:

Tip&Trick 1: Use drag&drop from the KNIME Explorer:

Data files saved in the workspace folder are available in the KNIME Explorer panel (top left panel). To read in one of these files, you just drag&drop the file from the KNIME Explorer panel to the workflow editor. KNIME automatically creates the correct reader node and sets the path of the input location.

Tip&Trick 2: Different options to define a file path:

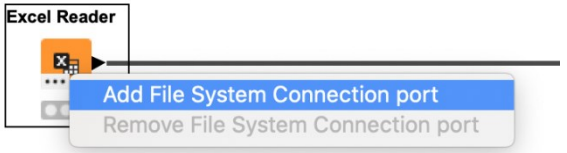
In KNIME we have different options to provide a file path. This becomes important when you start sharing your workflows or exporting them to other KNIME Analytics Platform installations or KNIME Servers. There are four default file systems available in KNIME Analytics Platform.

- *Local File System:* Allows you to select a file/folder from your local system.
- *Mountpoint:* You can connect to a KNIME Server or the KNIME Hub via additional mountpoints in the KNIME Explorer. To read data from either LOCAL or another mountpoint select "Mountpoint". When selected, a new drop-down menu appears so that you can choose the mountpoint. Unconnected mountpoints are grayed out but can still be selected (note that browsing is disabled in this case). Go to the KNIME Explorer and connect to the mountpoint to enable browsing.
- *Relative to:* Allows you to choose whether to resolve the path relative to the current mountpoint, current workflow, or the current workflow's data area. When selected a new drop-down menu appears to choose which of the three options to use.
- *Custom/KNIME URL:* Allows to specify a URL (e.g. file://, http:// or knime:// protocol). Browsing is disabled for this option.

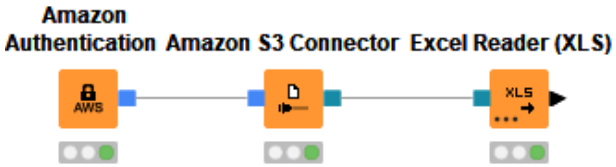
Tip&Trick 3: Reading from another file system:

KNIME Analytics Platform allows you to connect and read from many different sources / file system, e.g. Amazon S3, Microsoft SharePoint Online, Databricks to name just a few. Three steps are necessary (the file handling guide gives you further information).

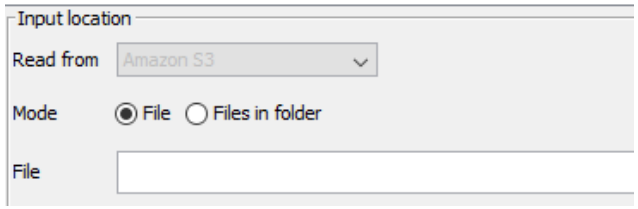
Step 1: Click "**...**" in the bottom left corner of the reader node icon to add a *File System Connection port*



Step 2: Connect to the desired file system via the dedicated connector node and connect it with the reader node



Step 3: Select the file/folder in the connected file system



Appending / Joining Data

Appending Data

Concatenate Node

Excel

To append data to a table select manually the area you want to append and copy and paste the content below the first table.

Note 1: Before copying and pasting ensure that all tables have the same column structure.

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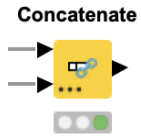
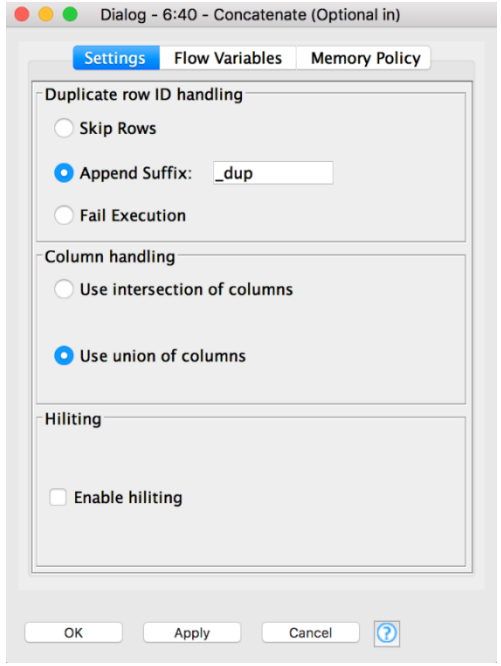
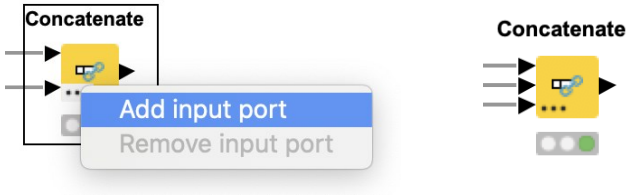


The Concatenate node writes two or more tables below each other.



Note 1: The order of the column doesn't have to be the same.
Note 2: You can decide whether you want the intersection or the union of the columns.
Note 3: The Concatenate node has the option to add more input ports, to concatenate more than two tables. To add an additional input port, click on the three dots on the lower left of the node and select "Add input port".



VLOOKUP

Filter and Joiner Node

Excel

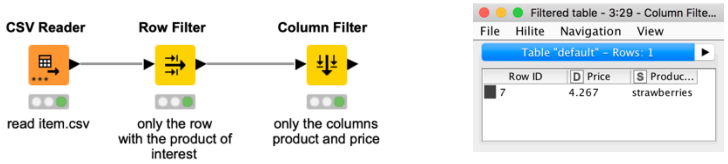
The VLOOKUP function is used for different tasks. The most common uses are:

1. Look up a certain value, e.g. the price of a certain product.
2. Join columns based on a primary key (look up value), e.g. join product information based on the product ID.

An alternative function for the second task is INDEX MATCH.

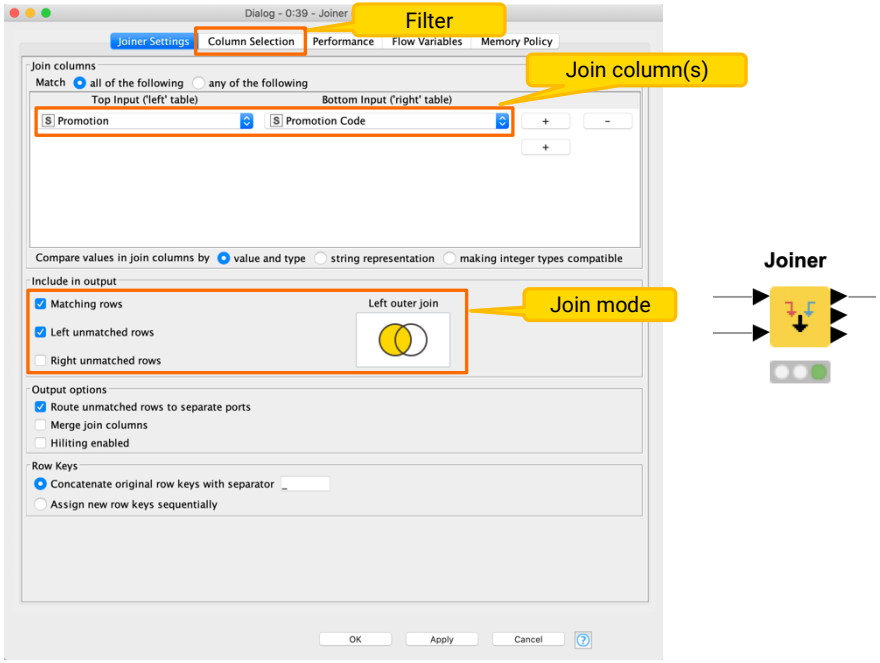
KNIME Analytics Platform

1. To look up a certain value, e.g. the price of a certain product



Note 1: Your full original table is still available at the output port of the Table Reader node. See more information about the Row Filter and Column Filter nodes on pages 26 and 30.

2. Join columns based on a joining column, e.g. join product information based on product ID.



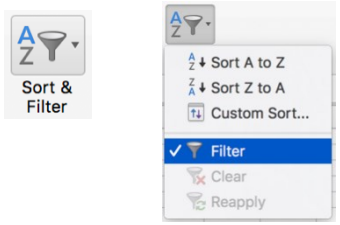
Note 1: The "Joining Column" is the look up value column.
Note 2: For task 2. you can also use the Cell Replacer node

Filtering and Transformations

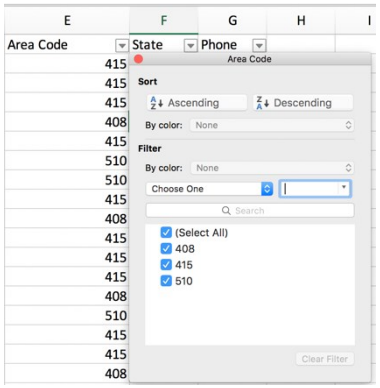
Filtering / Removing Rows with a Specific Value — Row Filter

Excel

To **filter** data select a random cell in the data table, go to the Home tab, click the “Sort& Filter” button and select “Filter”.



Select the value you are interested in from the drop down menu.



To **remove** rows, select the rows you want to delete, right click and select “Delete Rows”.

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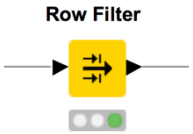
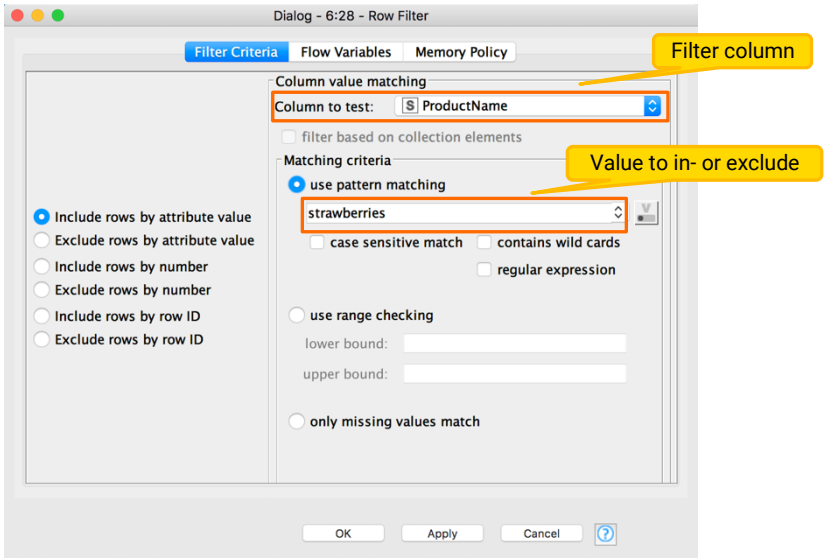
In KNIME Analytics Platform there is no difference between filtering and removing rows, as the original table is not deleted and is still available at the output port of the previous node.



The Row Filter node filters the table based on a filter criteria, e.g. by including / excluding all rows with a certain value in the filter column.

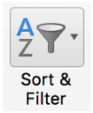


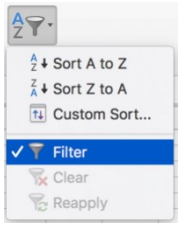
Note 1: On the left you can choose whether you want to include or exclude the rows with the matching value
Note 2: If you only interested in the rows with one specific value you can use the Row Filter node.
Note 3: If you want to include rows based on different values you can use the Rule-based Row Filter. (See next page).
Note 4: Further filter options are available, e.g. on a numerical range, filter rows by row number or row ID, or missing values only.

Filtering / Removing Rows with Different Values — Rule-based Row Filter

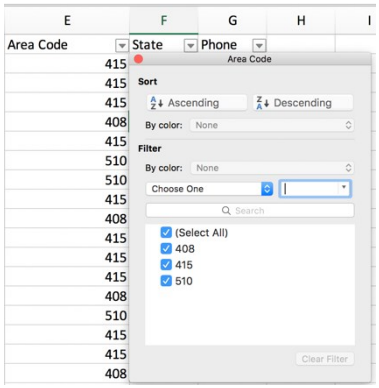
Excel

To **filter** data select a random cell in the data tables, click on “Sort& Filter” and select “Filter”.





Select the values you are interested in from the drop down menu.



To **remove** rows you have to select the rows you want to delete, right click and choose “Delete Rows”.

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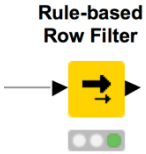
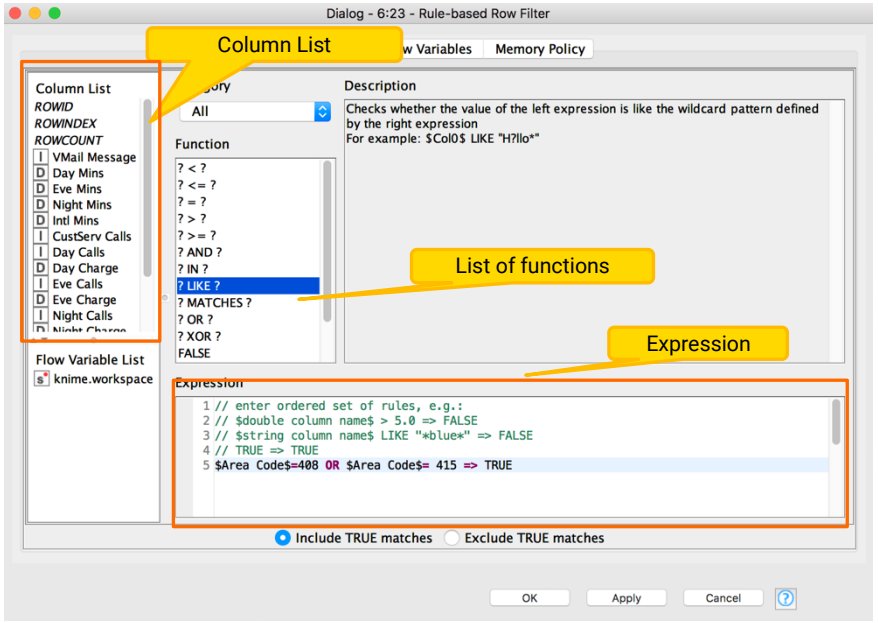


In KNIME Analytics Platform there is no difference between filtering and removing rows, as the original table is not deleted and is still available at the output port of the previous node.

The Rule-based Row Filter node filters rows in or out according to a set of rules. To include / exclude rows with two different values you can use the following expression
$Column_Name$ = “Value 1” OR $Column_Name$ = “Value 2”=> TRUE



Note 1: At the bottom of the configuration window you can choose whether you want to include or exclude TRUE matches.
Note 2: Columns are given by their name surrounded by $. Add them to the expression frame by double clicking a column name in the Column List.
Note 3: The Rule-based Row Filter node has a number of different functions for many advanced filter options.
Note 4: Different rows in the expression frame work like an OR conjunction.

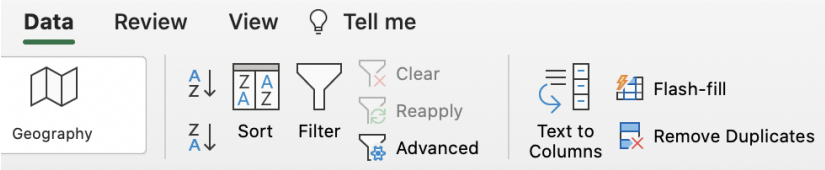
Removing Duplicates

Duplicate Row Filter

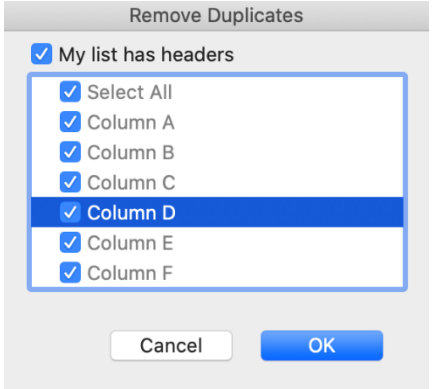
Excel

To remove duplicates

- Select the range of cells that might have duplicates that you want to remove.
- Go to the Data tab and select “Remove Duplicates”



- Select the columns for duplicate detection and click “OK”



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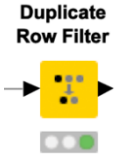
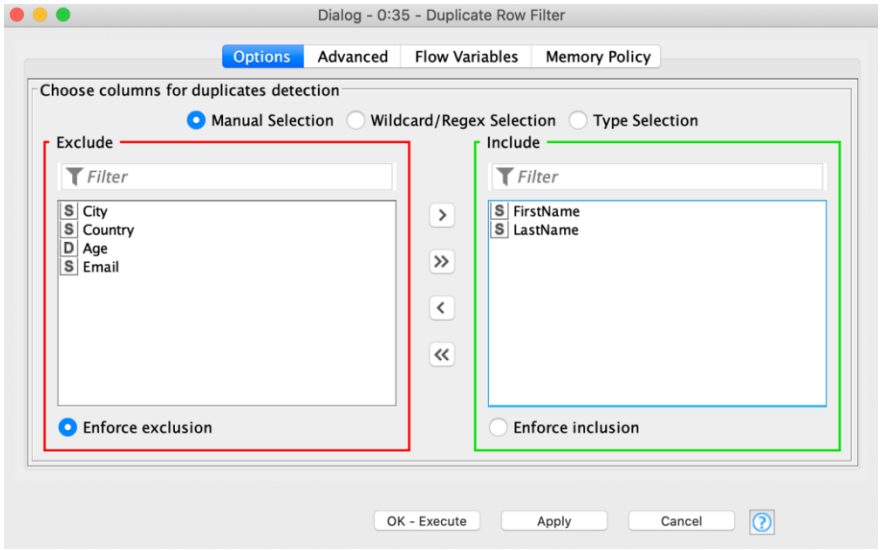
The Duplicate Row Filter node detects and treats duplicates. The default treatment removes duplicate rows like in Excel. The columns in the “Include” frame correspond to the selected columns for duplicate detection in Excel. This means rows that have the same values in these columns are detected as duplicates.





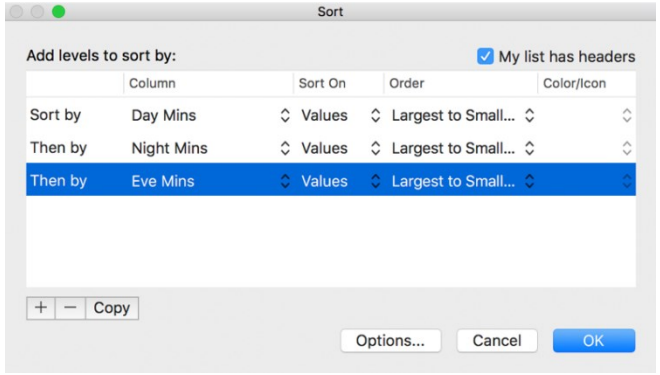
Note 1: In the “Advanced” tab you can change the treatment for duplicates, for example to keep duplicate rows and to add a column showing which of the rows are unique, chosen, or duplicates.

Sorting Rows by Multiple Key Columns

Sorter Node

Excel

To sort rows by multiple columns, select the columns by which you want to sort. Then click on Sort&Filter and select “Custom Sort”.



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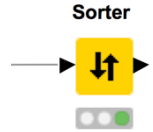
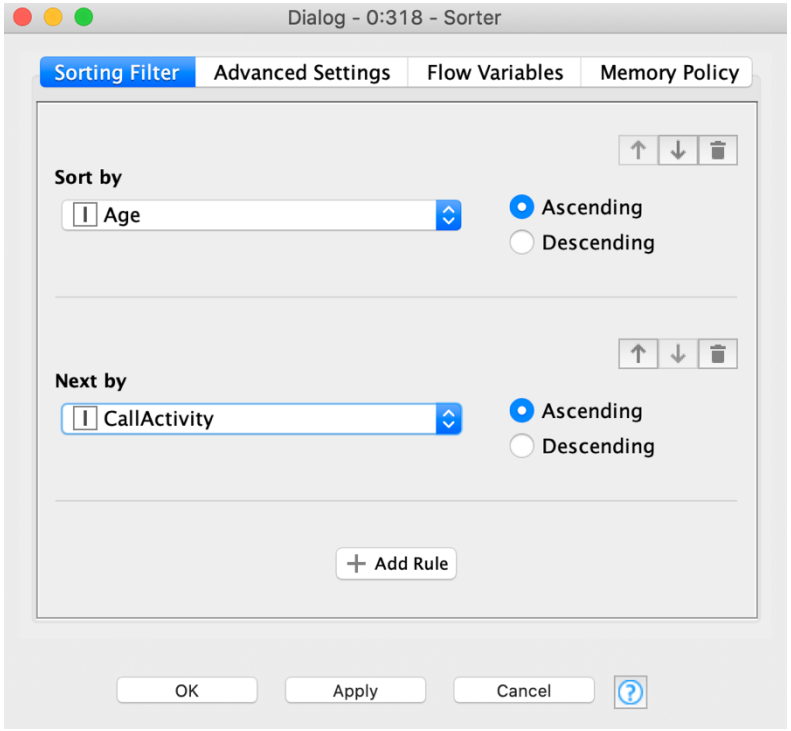
With the Sorter node you can sort by one or more columns in either ascending or descending order.





Note 1: You can add as many key-columns as you want by clicking the “Add Rule” button.
Note 2: You can temporarily sort the output table of a node. Click on the column header based on which you want to sort and select whether you want to sort ascending or descending.

Removing Columns

Column Filter Node

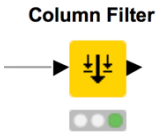
Excel

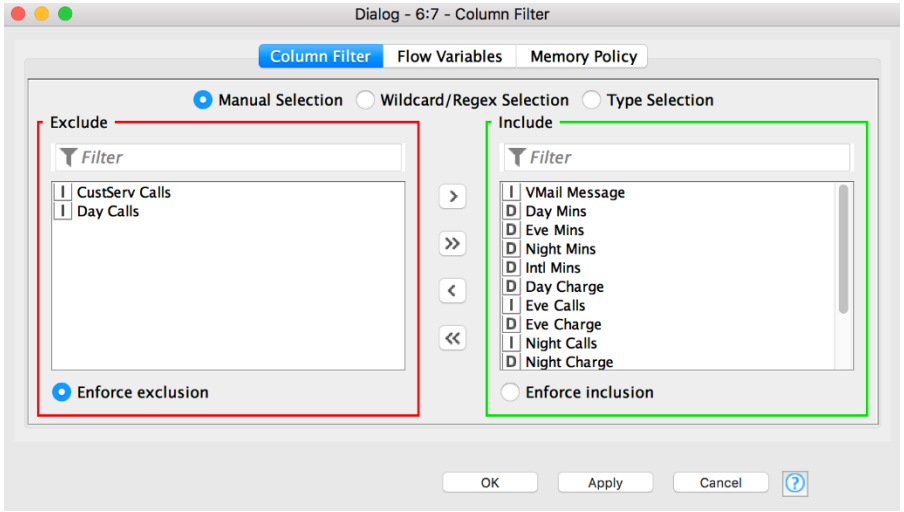
To remove columns just select and delete the superfluous columns.

Remember: If you remove a column used in a calculation field this will break your formula.

KNIME Analytics Platform

With the Column Filter node you can delete superfluous columns. Remember that the full data table will be still available at the output port of the previous node and for calculations you run upstream.





Note 1: You can use the arrow buttons in the middle to move columns from the Include to the Exclude frame and vice versa.
Note 2: You can use the Wildcard/Regex Selection to automatically remove columns by a name patter.
Note 3: You can use the Type Selection to automatically remove columns by data type.

Reordering and Renaming Columns

Column Resorter and Column Rename Node

Excel

To reorder columns:

- Select the column header of the column you want to move
- Press ctrl + shift + down arrow
- Click and hold the green outline of the column you want to move
- Drag your column to the desired position

To rename a column just click on the column cell and change the cell value.

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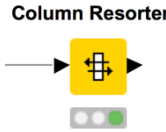
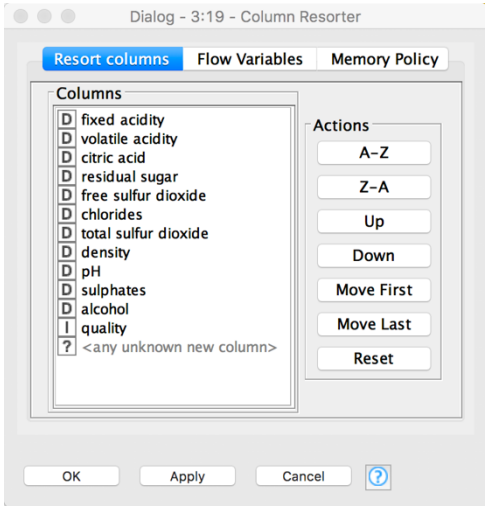
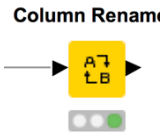
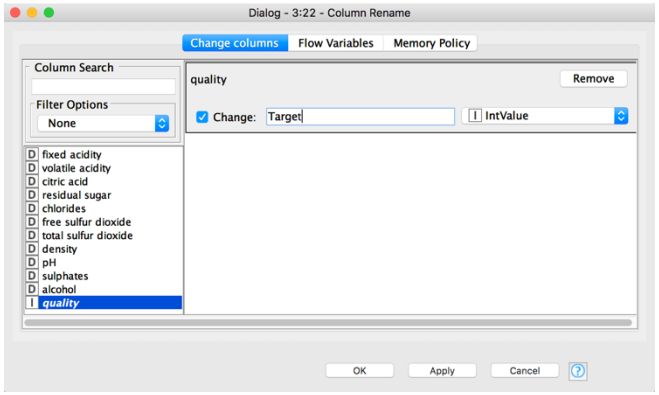
To resort columns you can use the Column Resorter node. Define the desired order of the columns by selecting the one you want to move and using the "Actions" buttons on the right.





To rename columns you can use the Column Rename node. Double click the column you want to rename, activate the checkbox "Change" and define the column header in the textbox.



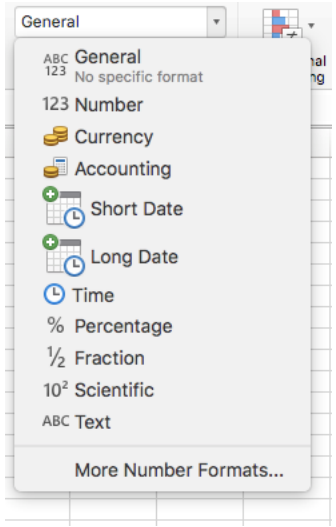


Changing Data Types

String to Number and Number to String

Excel

To change the data type of a column or a cell, select it and go to the home tab. Then use the drop down menu in the middle.



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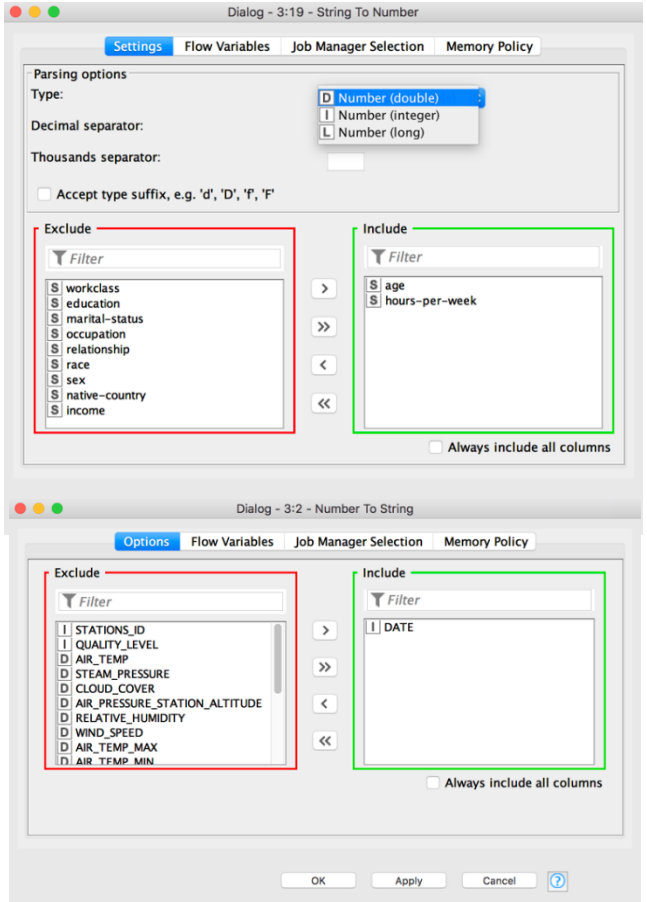
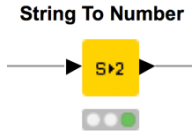
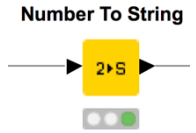
To change the data type of a column you can use either the String to Number or the Number to String nodes.







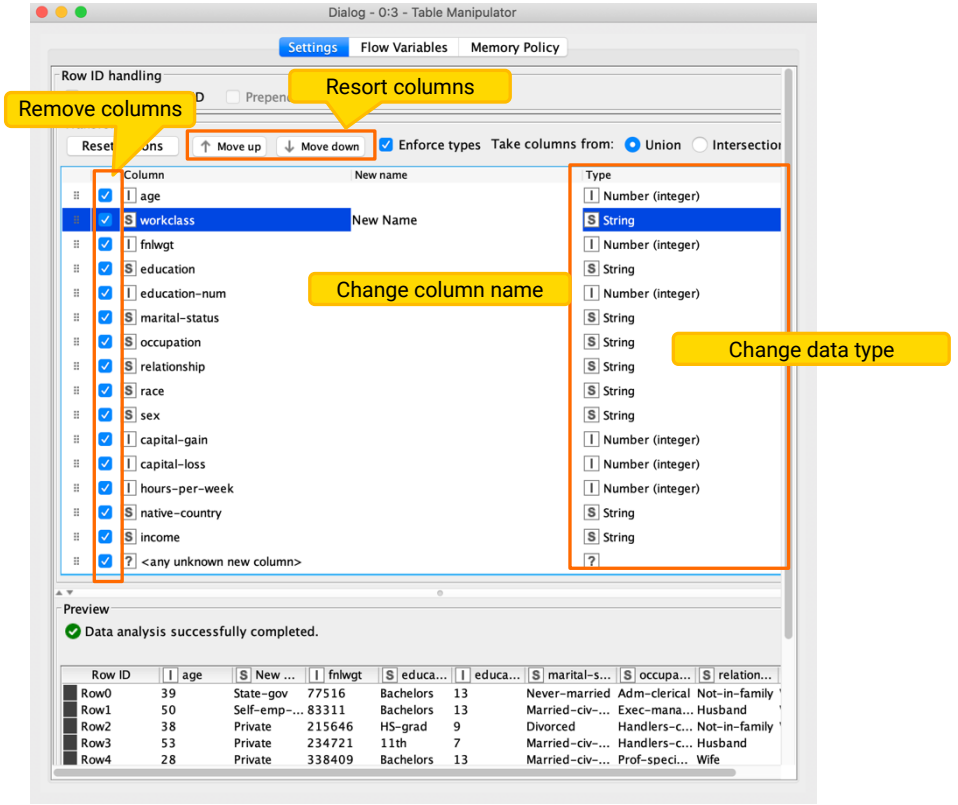
Note 1: In the String to Number node you can choose between different numerical types, e.g Double, Integer, and Long.

Tip on Data Manipulation with KNIME Analytics Platform

Table Manipulator

The Table Manipulator node allows you to perform a lot of the described transformations in one node. You can use it to:

- Concatenate multiple tables (after adding dynamic input ports by clicking on … on the lower left of the node)
- Filter, resort, and rename columns
- Change the data type of column



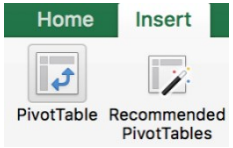
Data Aggregation

Pivot Tables

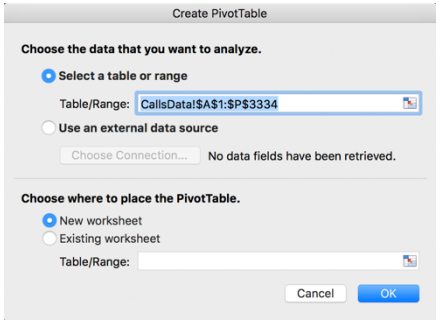
Excel

To create a pivot table in Excel

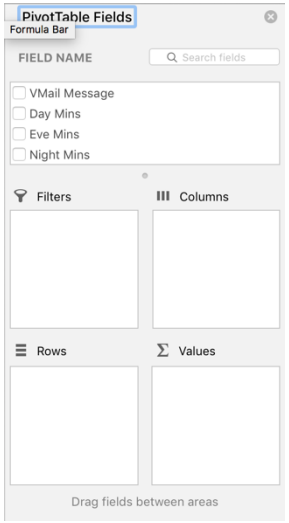
- Click on any single cell inside the data set
- Go to the Insert tab and click Pivot Table



- Select table / range and output location

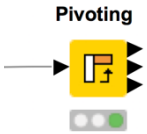


- Choose pivot table fields by dragging them into “Columns”, “Rows” and “Values”.



Pivoting Node

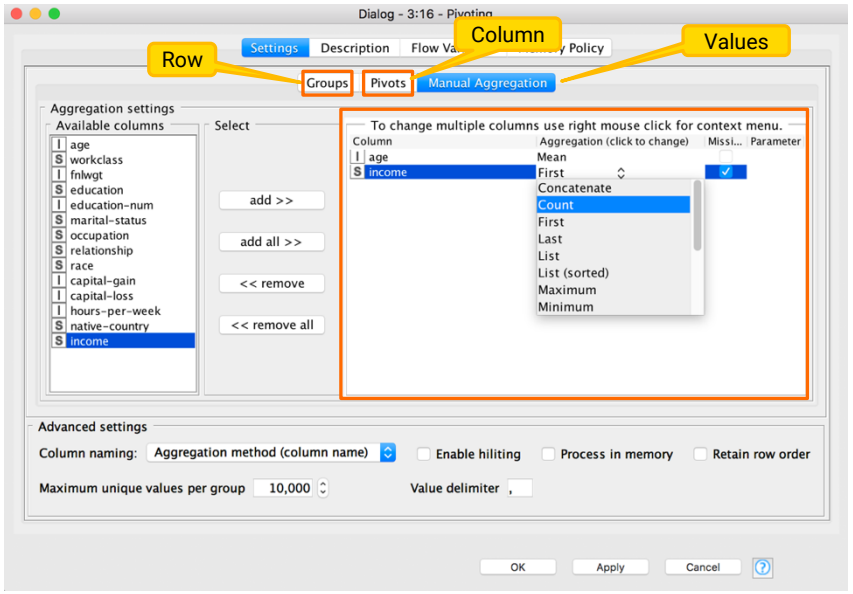
KNIME Analytics Platform



The Pivoting node is configured via three tabs:

- “**Groups**” defines the group columns, aka columns in the “**Rows**”-frame in Excel (final row IDs)
- “**Pivots**” defines the pivoting columns, aka columns in the “**Columns**”-frame in Excel (final column headers)
- “**Manual Aggregation**” corresponds to the “Value” setting option. Select one or more columns for aggregation from the available columns list and select an aggregation method for each selected column.

The Pivoting node produces three output tables: the pivot table and the total values for columns and rows.



Note 1: The Pivoting node doesn’t have “Filter” options, but you can simply use a Row Filter node beforehand.
Note 2: In KNIME you have to choose at least one column for the Groups and Pivots. In case you want to choose only “Rows” you can use the GroupBy node.

Pivot Table without Columns

GroupBy Node

Excel

Create a pivot table as described on the previous page and drag only columns into the “Rows” and “Values” frames.

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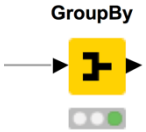
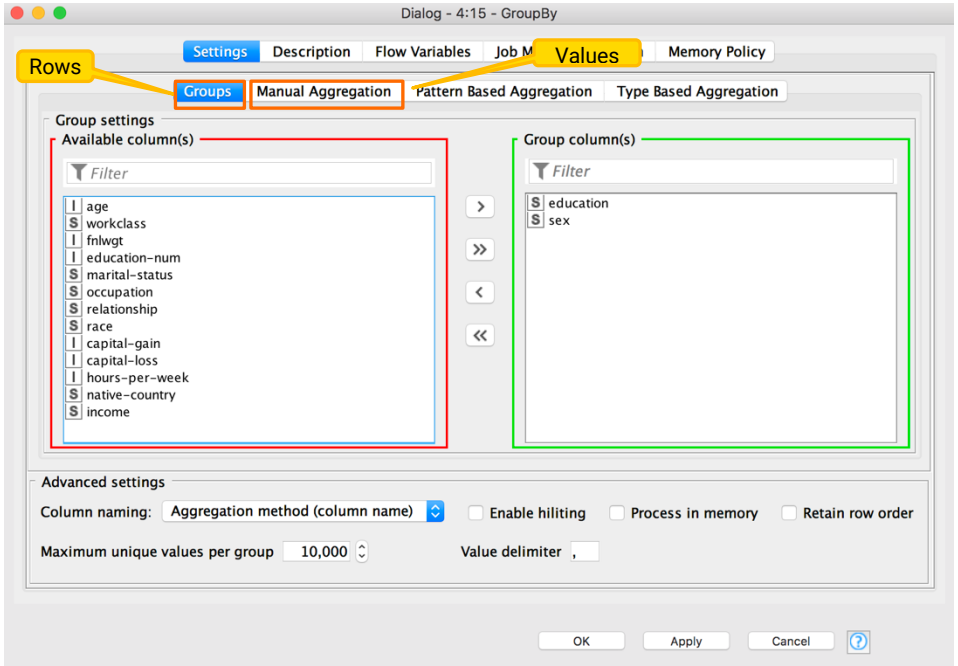


The GroupBy node is configured via two tabs:

- “**Groups**” defines the group columns, aka columns in the “**Rows**” frame in Excel (final row IDs)
- “**Manual Aggregation**” corresponds to the “Value” setting option. Select one or more columns for aggregation from the available columns list and select an aggregation method for each selected column.

The “**Value**” setting option corresponds to the “**Manual Aggregation**” tab.

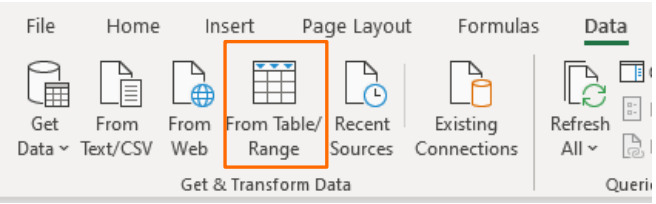


Unpivot

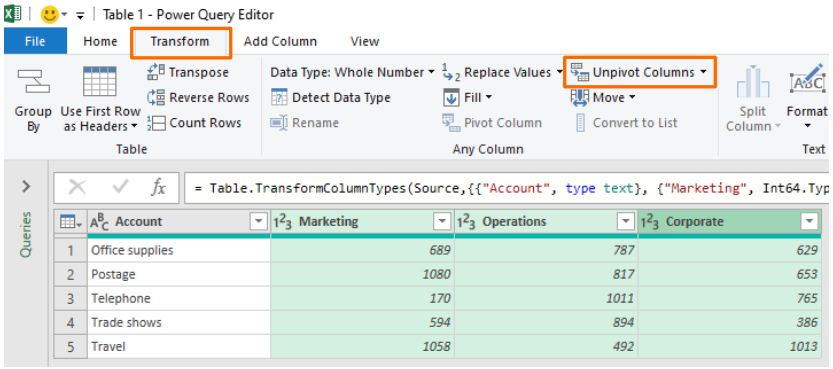
Excel

To create an unpivot table in Excel

- Store the dataset in a table.
- Select any cell in the table.
- Click the “Data” tab and select “From Table/Range”.



- This opens the “Power Query Editor”. Select the columns to unpivot by holding down the shift key.
- Click the “Transform” tab of the Power Query Editor and select “Unpivot Columns”.



- Click the “Home” tab of the “Power Query Editor”, and select “Close & Load” to save the data unpivoted back in the Excel workbook.

Note 1: The unpivot command is available without any additional downloads in Excel 2016 for Windows. If you are using a different version, you may need to first download the free Power Query add-in from the Microsoft site. Authoring in the Power Query Editor is not supported for Mac yet.

Unpivoting Node

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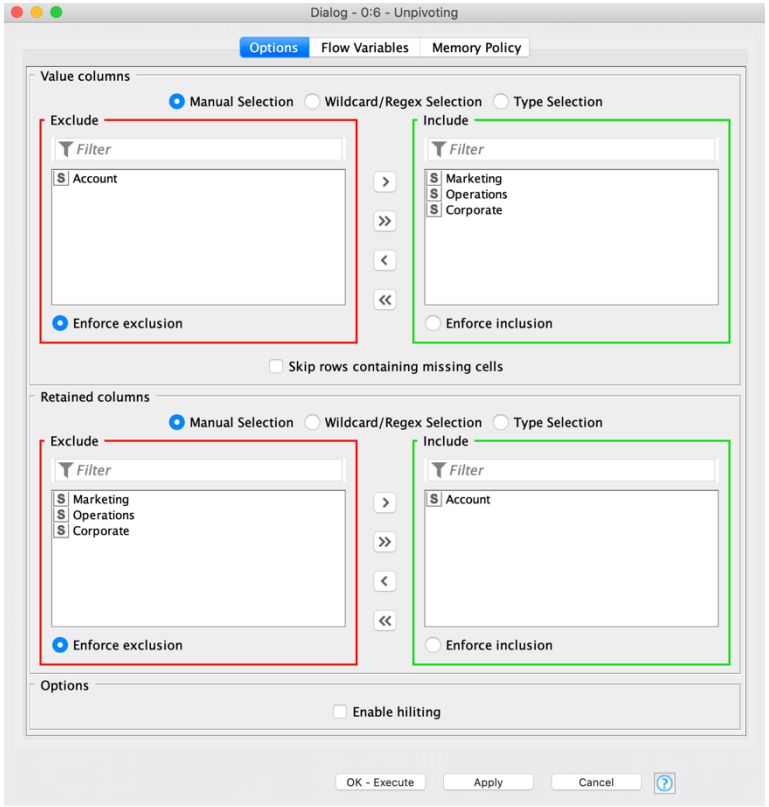
The Unpivoting node is configured via one tab:

- In the upper section, **“Value columns”** defines the column(s) to unpivot, aka column selection in Excel.
- In the lower section, **“Retained columns”** defines the column(s) that remains unchanged, aka unselected columns in Excel.



Note 1: the Unpivoting node requires selecting at least one column in the “Value columns” section.

Math Functions and Text Functions

Math Functions

Excel

Here is a list of frequently used math formulas in Excel. You will find a translation into the KNIME formulas on the next page:

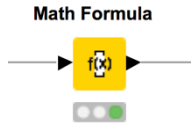
- SUM
- AVERAGE
- MEDIAN
- SUMPRODUCT
- ABS
- SUMIF
- Round functions
    - ROUND
    - ROUNDUP
    - ROUNDDOWN

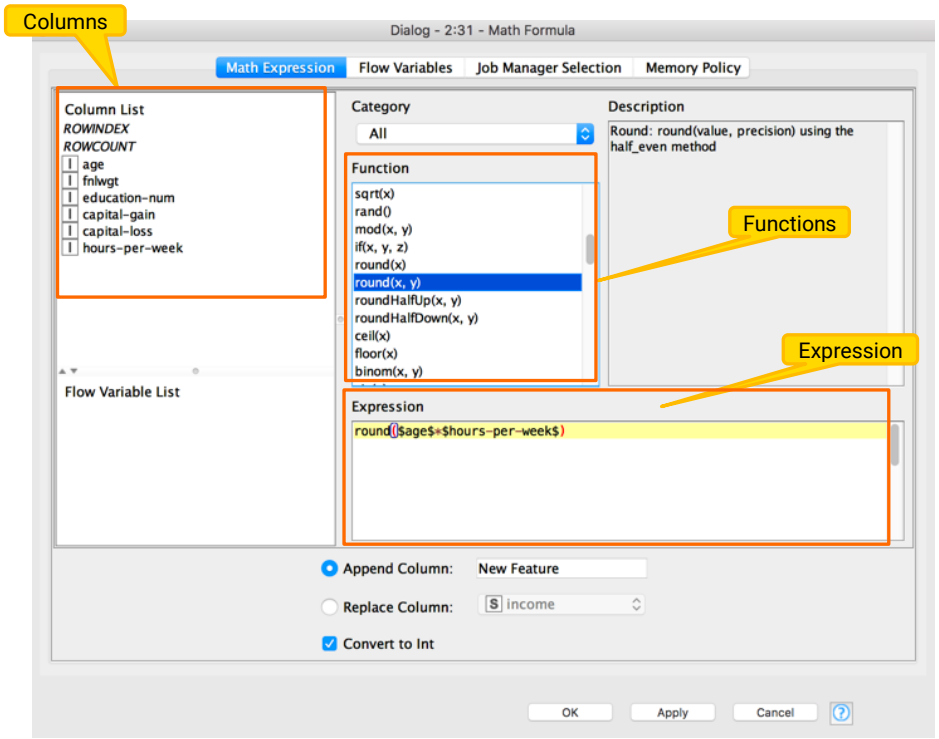
If you're often used math formula is missing sent a message to kathrin.melcher@knime.com.

Math Formula Node

KNIME Analytics Platform

The Math Formula node evaluates a mathematical expression based on the values in a row. It has a long list of functions. The table on the next page provides a translation of the most used Excel functions.





Note 1: You can decide whether you want to append a new column or replace one of the columns, by using the checkboxes underneath the Expression frame.
Note 2: By activating the checkbox "Convert to Int" you can ensure that your output appended / replaced column is of type Integer.
Note 3: To perform the same mathematical expression on multiple columns you can use the Math Formula (Multi Column) node.

Math Functions

Math Formula Node

Excel	KNIME Analytics Platform
SUM(number1;number2;…)	COL_SUM(Col) = Sum of the values in the selected column. Col1 + Col2. = Sum of the values in Col1 and the values in Col2 for each row.
AVERAGE(number1;number2;…)	COL_MEAN(col_name) = Average of the values in the selected column. average(Col1, Col2,…) = Average of the values of the selected columns for each row.
MEDIAN(number1;number2;…)	COL_MEDIAN(Col_name) = Median of the values in the selected column. Median(Col1, Col2,…) = Median of the values of the selected columns for each row.
SUMPRODUCT(number1;number2;…)	Sequence of two “Math Formula” nodes: First one: Multiply the two columns using the expression Col1*Col2 and Append a new column. Second one: Use COL_SUM on the new column.
ABS(number1)	abs(Col) = The absolute value for all values in the selected column
SUMIF(range; criteria)	Sequence of two “Math Formula” nodes: First one: Append new column with if(criteria, column to sum ,0) Second one: Use COL_SUM on the new column
Round functions: ROUND(number1, num_digits) ROUNDUP(number1, num_digits) ROUNDDOWN(number1, num_digits)	round(Col, NumberOf Digits) = Number of digits is optional. ceil(Col*10^(num_digits))/10^num_digits floor(Col*10^(num_digits))/10^num_digits

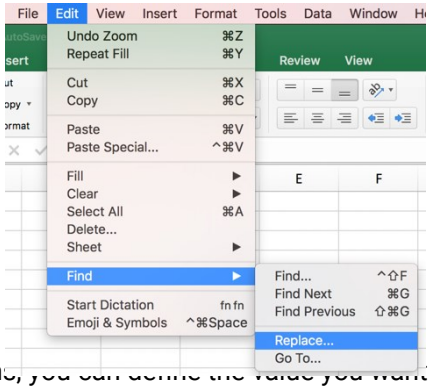
Concatenation and Find& Replace

String Manipulation Node

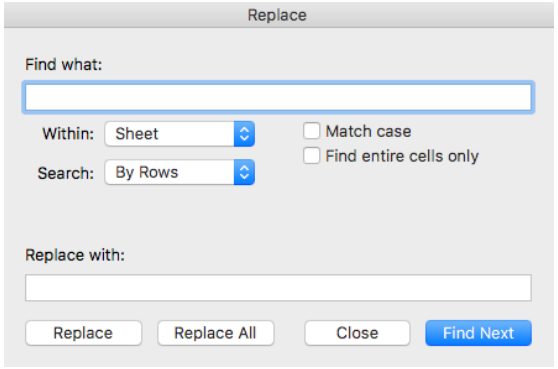
Excel

1. The function CONCATENCATE(text1, text2,..) combines different texts into one cell.

2. To find and replace a certain value you have to go to “Edit -> Find -> Replace…” to open the dialog below.

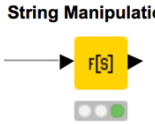


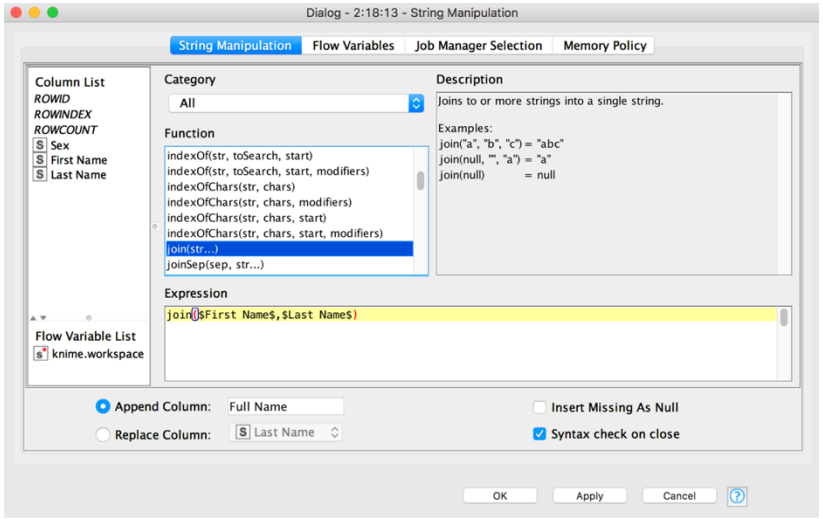
In the dialog that opens, you can define the value you want to replace and the value you want to replace it with.



KNIME Analytics Platform

The String Manipulation node manipulates columns of type String based on the defined expression. A lot of different functions are available.





1. CONCATENATE (text1, text2,..) from Excel

join(col1, col2 ,…) or **join(col1, “your own string”,…)**
Note 1: You can either join the values of different columns row wise, or add also another String value to a column.

2. Find&Replace

Replace(string, search, replace)
Note 1: “string” corresponds to the column where you want replace something.
Note 2: To perform the same manipulation on multiple string columns you can use the String Manipulation (Multi Column) node

Formatting Excel Tables

In chapter 1 we introduced the Excel Writer, which you can use to write your result table into an Excel Sheet. By default, this is a simple table without any formatting like colors, border cells, etc. In this chapter, we want to show you how to use the XLS Formatting nodes of the community extension Continental Nodes for KNIME. These nodes enable you to add formatting instructions and advanced settings to already existing XLS files, so that you can create Excel reports that have the look and feel you used to.

The key to your formatted Excel sheet is an additional XLS Control Table of the same size as the original file with one or more comma separated tag values, e.g. header, border, etc. Different XLS Formatter nodes assign different formatting instructions to the cells based on these tags, e.g. you can change the background color for all cells that are tagged “header”. Your formatting can then be applied to an already existing Excel sheet with the XLS Formatter (apply) node.

Hint: Use a flow variable connection to make sure that the Excel files are already written.

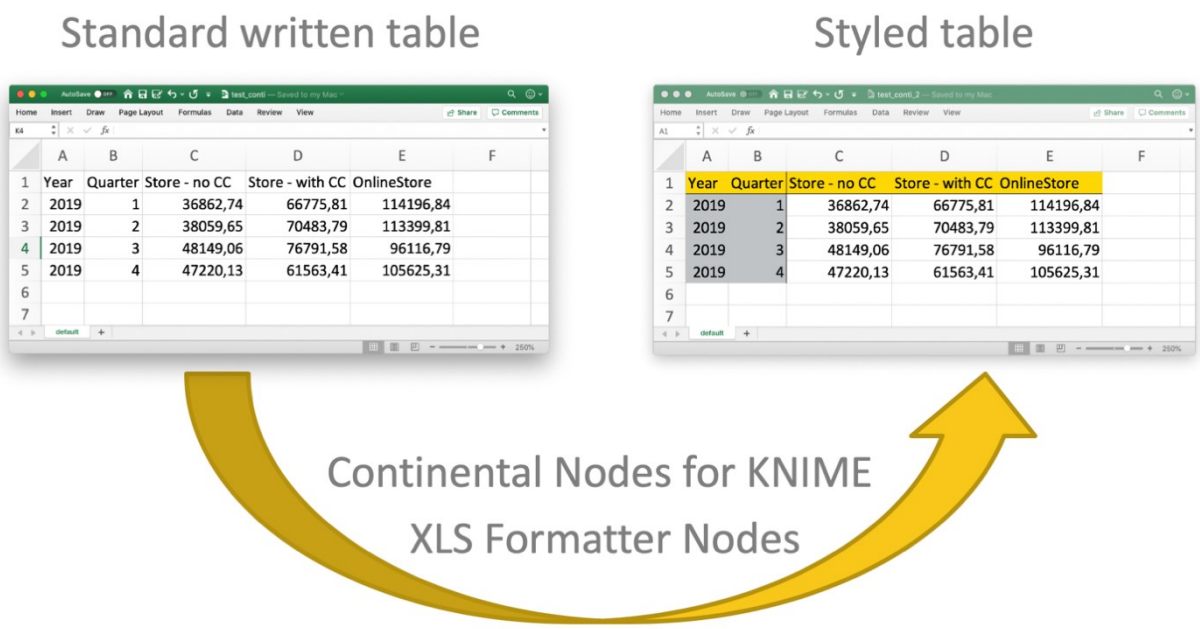


Figure 1 On the left you can see an Excel table created by an Excel Writer node without formatting, and on the right a styled table after formatting information have been added with the XLS Formatter nodes, e.g. yellow background for the headers.

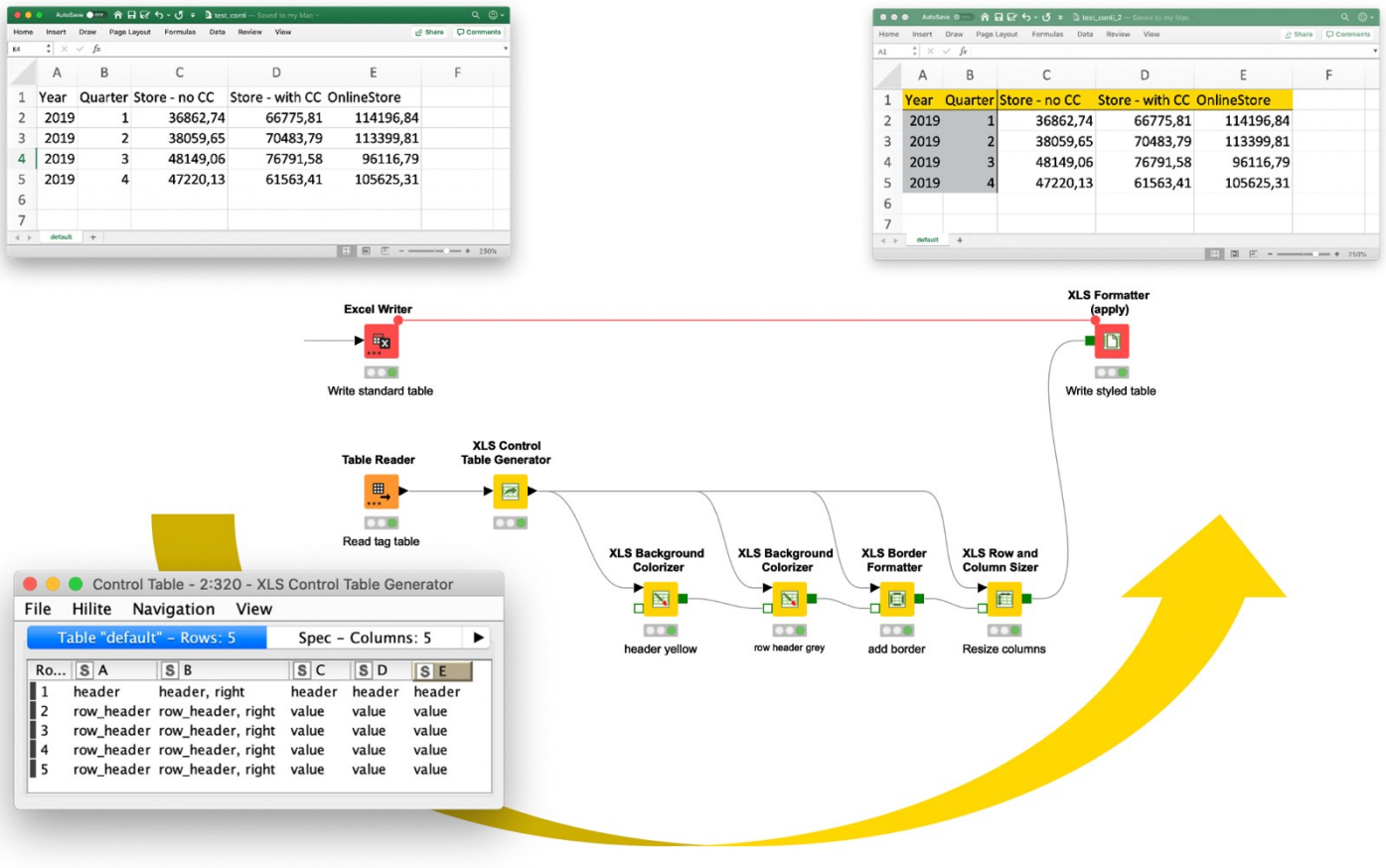


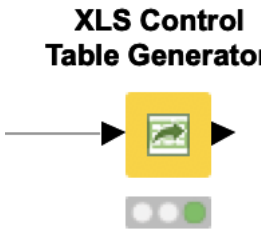
Figure 2 Bottom left you can see a control table with tag values, which is the key for your styled table. Based on the tag values the yellow XLS formatting nodes collect formatting instructions, which are them applied by the XLS Formatter (apply) node, producing the styled table (top right).

To summarize, this means we have to perform the following steps:

1. Write the table to an Excel Sheet
2. Create an XLS Control Table with tag values
3. Add formatting instructions based on tag values
4. Apply the formatting instructions to the existing Excel Sheet

This chapter is divided into two sections. The first section of this chapter shows two ways of creating an XLS Control Table with tags. The second section introduces some of the nodes that are available to add formatting instructions.

Hint: You can't find the nodes in your node repository? The Continental Nodes for KNIME are a community extension that you can install by dragging the extension from the KNIME Hub to KNIME Analytics Platform or by installing the extension as described in this video.



Creating an XLS Control Table with Tag Values

As the saying goes, many roads lead to Rome. This section introduces two different roads or approaches for creating an XLS Control Table. (The second approach happens to be my personal favorite!) The "key node" in both examples is the XLS Control Table Generator node.

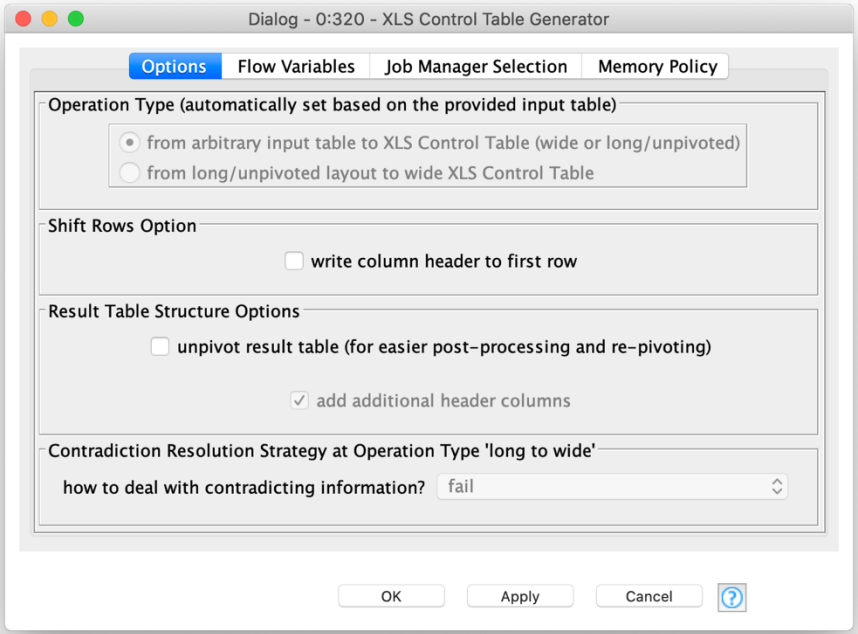


Figure 3 The configuration dialog for the XLS Control Table Generator node

Approach 1: Table Creator + XLS Control Table Generator

The first approach to create an XLS Control Table with tags involves a combination of a Table Creator and an XLS Control Table Generator node. This is an easy approach, however the downside is that it entails a lot manual work creating the tag table and you have the problem that the tag table is static. Therefore, this approach is only recommended for small tables, where the number of rows and columns won't change.

Open the configuration window of the Table Creator node to add one or multiple tag values for each cell. If you want to enter multiple tags, remember to separate them with a comma. The XLS Control Table Generator node transforms the table into an XLS Control table and replaces the column names with letters and the row IDs with numbers. The checkbox "write column header to first row" gives you the option of retaining the column headers, similar to the option "add column headers" in the Excel Writer node.

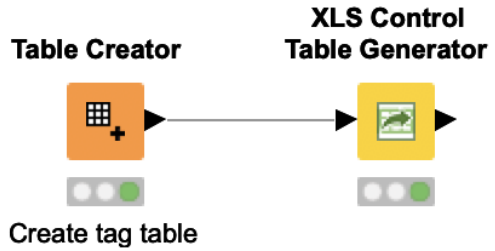


Figure 4 Here you can see one option to create a control table using the Table Creator node and the XLS Control Table Generator node

Approach 2: XLS Control Table Generator + Rule Engine

The second approach we want to show uses a combination of two XLS Control Table Generator nodes with the unpivot option activated and a Rule Engine node.

Activate the checkbox "unpivot result table" in the configuration window of the first XLS Control Table Generator node to output a table that has one row for each cell in the input table, including the value, the row number, the column header, and more.

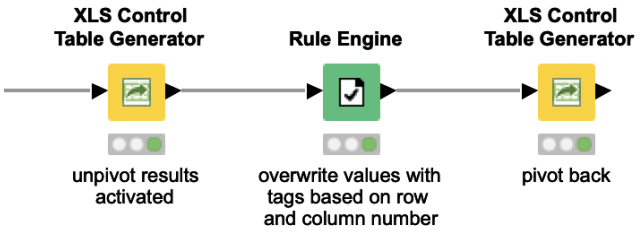


Figure 5 Here you can see another option to create a control table using a combination of two XLS Control Table Generator nodes and a Rule Engine node. The Rule Engine node is used to define tag values based on the row and column number.

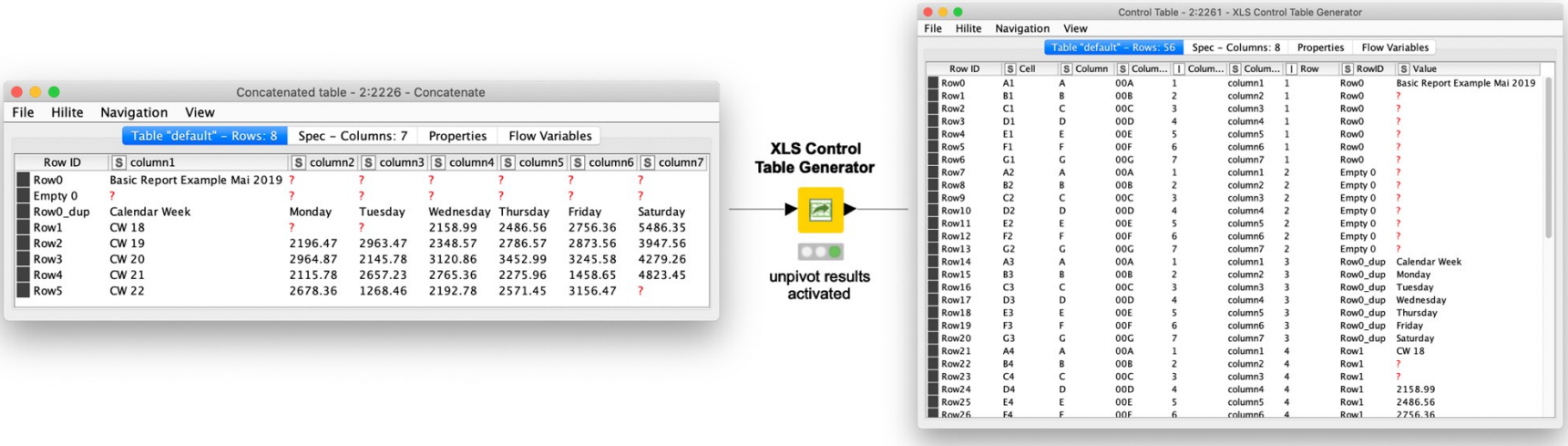


Figure 6 Here you can see the resulting table when activating the checkbox "unpivot result table" in the XLS Control Table Generator node. The node creates one row for each cell including value, row number, column header, etc.

This table is a great basis to now transform values into tags with the Rule Engine node. For example, we can replace all values in the first row with the tag "header", or replace all values in the first column that have a row number higher than 3 three with the tag value "cw".

Hint: Activate the checkbox "Replace Column" and select the column "Value".

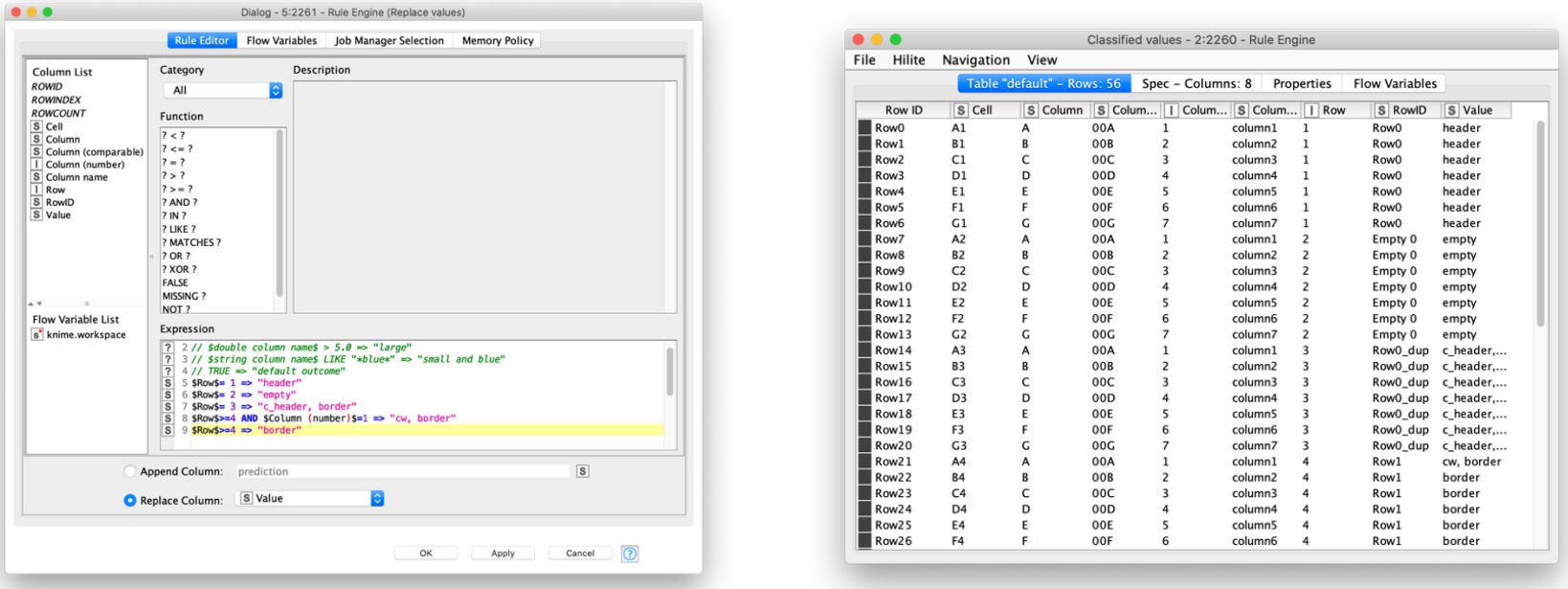


Figure 7 On the left is the configuration dialog of the Rule Engine node. In the Expression section you can see defined rules to replace the original values with tags, based on the row and column number. On the right you can see the output table where the rules are applied, and the values are replaced with the different tags

A second XLS Control Table Generator node can transform this table back into its original form, where the values are replaced with the different tag. This feature is automatically activated when the node detects an input table that was created by an XLS Control Table Generator node in unpivot mode.

This approach involves much less manual work compared to the first approach and can be implemented in a way to handle changing table dimensions gracefully.

Hint: Another helpful node to create a static XLS Control Tables is the XLS Control Table from Cell Range node.

Adding Formatting Actions based on Tag Values

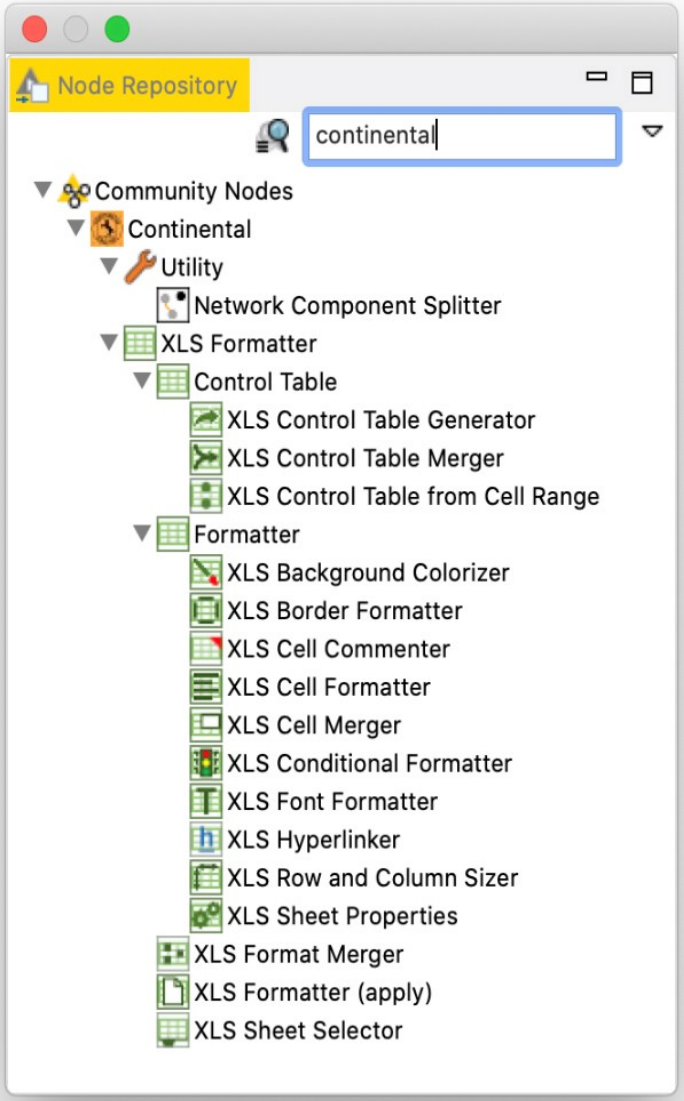
The next step to adding background colors or a border, etc. to your table is a sequence of XLS Formatting nodes, similar to the workflow in figure 2.

As you can see all nodes in the example workflow have two input ports and one output port:

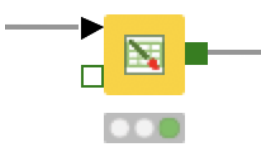
- a data input port
- an optional XLS Formatter input port (square with green border)
- an output port, which is an XLS Formatter port

> The green square is a special port type of the extension, which collects the different formatting instructions. The data input port expects the table with the tag values. The optional input port can be used to feed an XLS Formatting table with previous formatting instructions to which the instructions of the node should be added.

The figure on the right shows you an overview of all the nodes in the Continental extension. I will introduce my favorite ones and leave it up to you to explore the others.

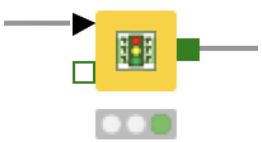


XLS Background Colorizer



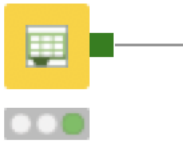
The XLS Background Colorizer node changes the background color of cells. You can assign either a static color and / or pattern fill. One option is to assign the same color to all cells with a specific tag value, e.g. all cells with tag “header” should have a yellow background. Another option is to use RGB values in either hex syntax #FFD800 or decimal syntax R/G/B as tags and use them as the background color.

XLS Conditional Formatter



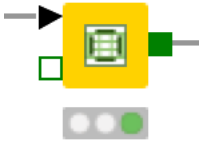
The XLS Conditional Formatter node changes the background for the cells with a certain tag value according to their numerical value. In the configuration window you can define a color scale by setting a minimum and maximum value and assigning a color to each. Optionally you could set a mid point value and assign a color to that. Cells with values higher or lower than the thresholds will have the background color of the minimum /maximum value.

XLS Sheet Selector

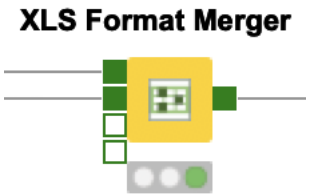


The XLS Sheet Selector and the XLS Merger node are really helpful nodes if your EXCEL file has more than one sheet. By default the formatting is always applied to the first sheet. So, if you have an Excel file with only one sheet you don’t have to worry about these two nodes. However, if you have multiple sheets the XLS Sheet Selector allows you to define which sheet your XLS Control table is for.

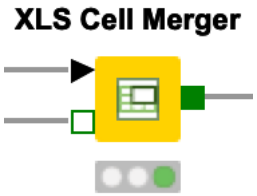
XLS Border Formatter



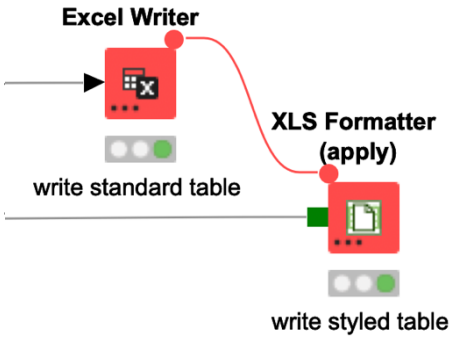
The XLS Border Formatter node can add borders to a given range specified by a certain tag or by all tags. By activating the corresponding checkboxes, you can add borders to the top, right, bottom, and left. In addition to adding a border around the range specified by the tags, the node gives you the option to use inner vertical and horizontal boarder lines in each cell, too.



The XLS Format Merger node allows you to either combine formatting instructions for different sheets prior to using the XLS Formatter (apply) node or when applied to the same sheet, it merges the properties at the lowest detail level (e.g. the formatting instructions for the cell A1 is bold in control table one and italic in control table two. The subsequent formatting instruction for A1 is italic and bold). Thereby, the upper input port overwrites a lower one in case of conflicting information (e.g. two different font colors for the same cell).



The XLS Cell Merger node merges the cells for given rectangular ranges of input tags into one cell. For example, we can merge all cells in the first row and centralize the title with the XLS Font Formatter node. This node works only on strictly rectangular ranges. The value of the merged cell is the value of the most top left cell of the merged range.



The XLS Formatter (apply) node reads an unformatted Excel file, applies all the collected formatting instructions, and saves the nice Excel file in the defined output location.

This was a short introduction. You can find further information about the different XLS Formatter nodes in the Continental extension in the documentation https://www.knime.com/community/continental-nodes-for-knime-xls-formatter or, from within KNIME Analytics Platform, by looking in the node description of each individual node.

The KNIME Booklet for Excel Users

Are you an experienced Excel user and want to start using KNIME Analytics Platform?

It's sometimes difficult to switch from one software tool to another. But this booklet is the perfect starting point as it maps the most commonly used Excel functions and techniques to their KNIME equivalents. Find out, for example, how data reading, filtering, sorting, and vlookup work in KNIME.

For a complete introduction to KNIME, please refer to my book "KNIME Beginner's Luck" available from KNIME Press under https://www.knime.com/knimepress

About the Author

Kathrin Melcher is currently a Data Scientist at KNIME. She holds an MSc in Mathematics, from the University of Konstanz, Germany. She joined the KNIME Evangelism team in May 2017 and has a strong interest in data science, machine learning, and algorithms. She enjoys teaching and sharing her knowledge on these topics.