

A Step-by-Step Guide to Building Data Apps

For practitioners looking to scale the impact of data science in their organization.



Shorten the Time Between Idea and Production

Opportunities to gain meaningful insights out of data are abundant at any organization. At a chemical plant, you may want to put machine performance data into the hands of an engineer on a factory floor, so they can better estimate when maintenance is needed. At a brick-and-mortar retail store, you may want to put historical store traffic into the hands of a store manager for workforce planning. You may want to give financial advisors product recommendations for their high-profile clients, based on the predictions of a machine learning model.

But in most organizations, data is under control of a few. Data teams, in or outside of IT, become the gatekeepers, and even straightforward dashboards can take months or quarters to roll out. These delayed insights end up having little value and can cost opportunities, wasted time—and even safety and revenue.

Data apps put actionable insights in the hands of the end-users, without requiring them to do any coding or analysis. With KNIME, data experts can not only build predictive models and reports via visual interface, without any coding, they can also put a front end to these workflows and deploy them as data apps, specific to their business use, thus putting the power in the hands of end users. All, without writing a single line of code, or bothering IT.

In this paper, you will find a complete walkthrough of how to build and deploy a data app with KNIME.

Part of a Complete Data Science Platform

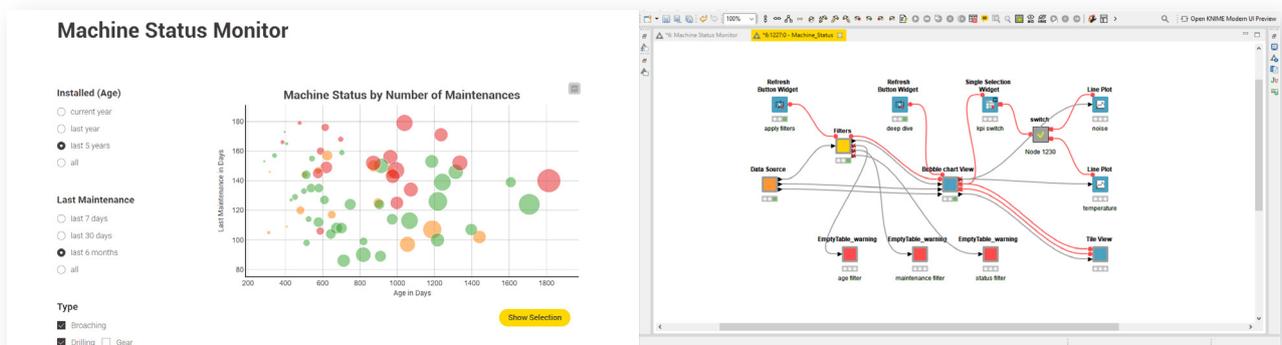
KNIME is a complete data science platform, supporting data experts in every step of the analytic lifecycle from data access, through to deployment and monitoring.

The tool offers users a consistent no-code/low-code framework in an open source environment. Users can choose to use KNIME for any, all or some of the process of building and deploying an analytics solution. End to end, building a data app with KNIME might look something like this:

- 1.** Access and blend your data in KNIME's visual programming environment.
- 2.** Reach out to any number of technologies integrated in KNIME's open ecosystem including connecting to data warehouses like Snowflake or Databricks, utilizing scripting languages like R and Python, and integrating with any popular machine learning library, like H2O.
- 3.** Construct your analytical model in a visual, intuitive environment, and put a front end to that workflow to create a data app using the same interactive environment, by dragging and dropping nodes or components onto the page.
- 4.** Specify permissions. Share your data app through a secure connection or create a shareable, embeddable link
- 5.** Share with 5, 10, or 1000 end users.

KNIME Data App: An Overview

In KNIME Analytics Platform, users can build Data Apps with visual workflows, rather than with lines of code. They can then make it accessible to business users by deploying it to KNIME Server. The business user ultimately interacts with the data from their browser, via KNIME WebPortal, with no need to touch the workflow that is working under the hood.



On the right is the workflow that is built by a KNIME user. On the left is the resulting data app that can be accessed by an end user—in this case an engineer—from their browser.

When developing a KNIME Data App, a workflow developer has complete control over the interactivity that will be available to the end-user and the complexity of the underlying workflow. Alongside accessing KNIME's visual programming environment, KNIME Data Apps also provide the possibility to reach out to any number of technologies that are integrated into KNIME's open ecosystem (scripting languages like Python, machine learning libraries like H2O, etc). Finally, you can share your data app with any number of end users.

Part I

Building Your First KNIME Data App

You can follow along with the first part of this guide for free, by [downloading the free and open source KNIME Analytics Platform](#).

By the end of this first section, you'll get a sense of the no-code/low-code framework, and how your data app would look should you choose to deploy it to business or domain experts within your organization.

KNIME Data Apps are built using special nodes in KNIME Analytics Platform that allow the user to update the look and feel of each page, build in interaction, and

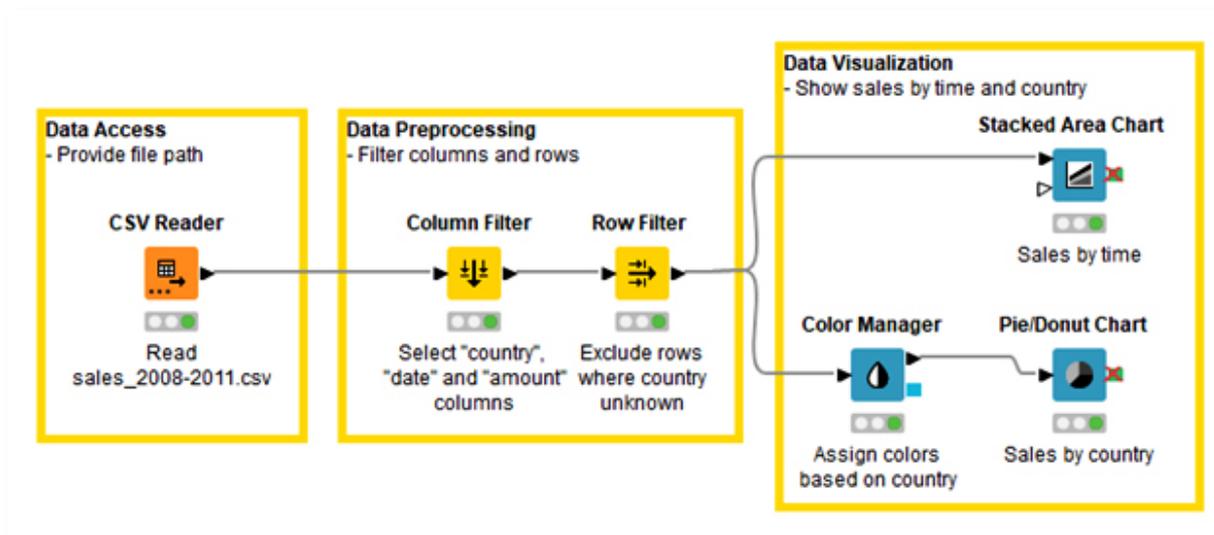
combine multiple pages in the app.

This section provides a step-by-step guide for building and deploying a simple KNIME Workflow as a KNIME Data App by building a composite view with re-execution capabilities. Any workflow that is built in KNIME Analytics Platform can be deployed as a data app, provided the appropriate components are included. This gives the workflow developer significant control over the data science operations and user interface.



In this guide, we'll be running you through an example workflow, that you can download and tinker with as you read. For the sake of simplicity, we've chosen a workflow that demonstrates how to access, preprocess and visualize sales data. [Download the workflow from KNIME Hub here.](#)

Follow steps one to five to adapt the workflow and build your first Data App.



Workflow for visualization of sales data

Step 1

Create a Component

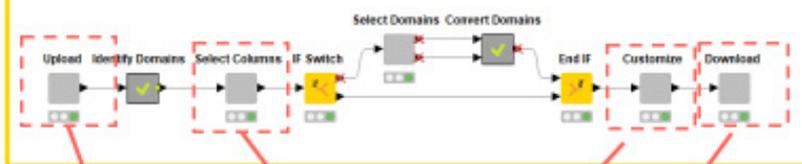
A workflow segment can be encapsulated in a component. In other contexts, this is simply a way to abstract and simplify parts of a workflow. In the context of a data app, however, a component is a basic building block.

In fact, the composite views of all root level components of your workflow will correspond to pages in the data app. This means that if you have more than one component on the root level, the data app will be a multi-page application, and the end-user will be able to navigate back and forth through the pages.

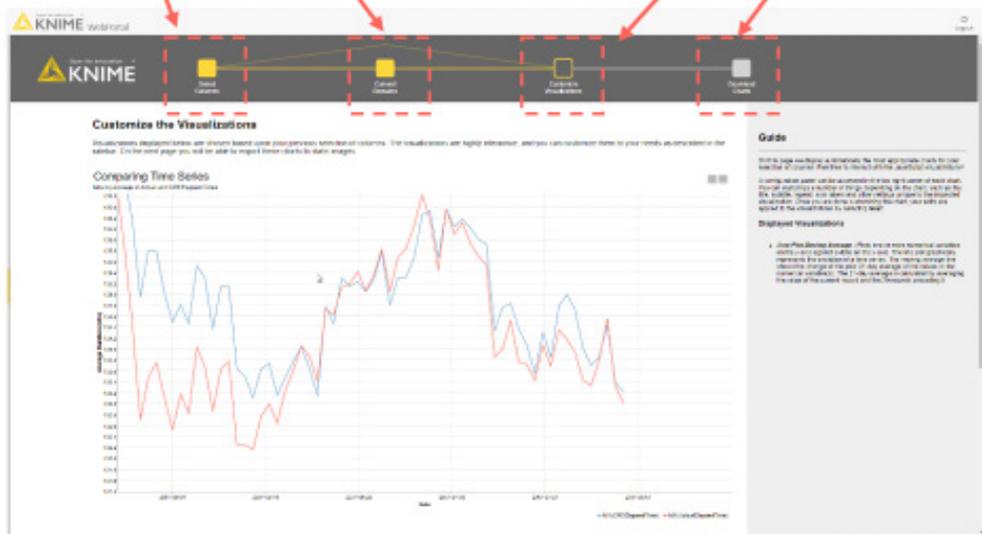
Data expert designs process using KNIME components.

The Process Step by Step

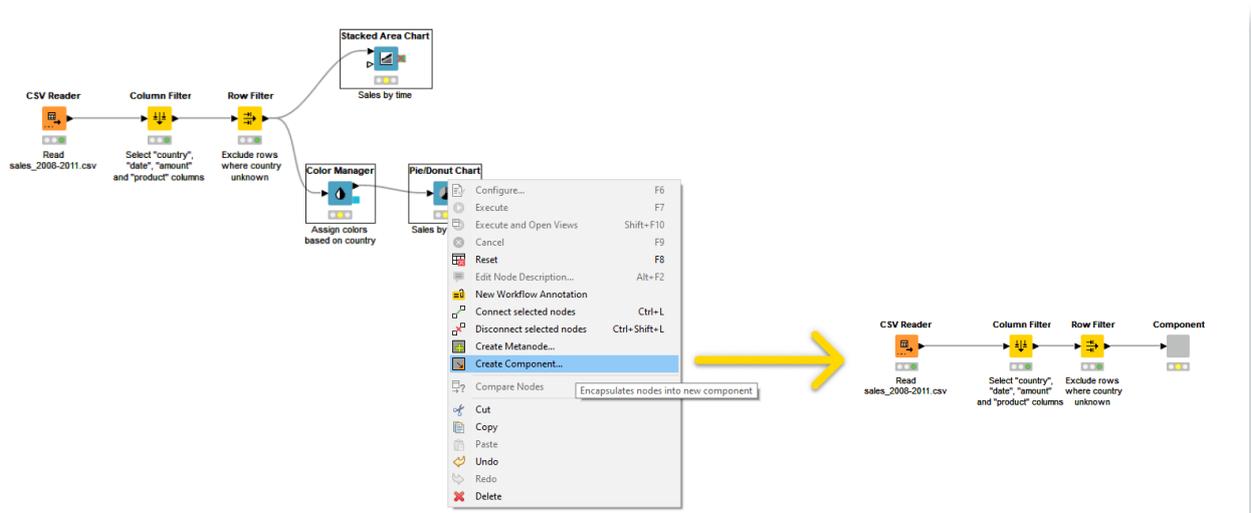
1. Upload your data / Select one of the available databases
2. Select the columns to visualize (maximum 3)
3. Convert the domain of the columns (OPTIONAL)
4. Customize the visualizations interactively
5. Download the images of the customized charts



End user views and interacts in a data app.



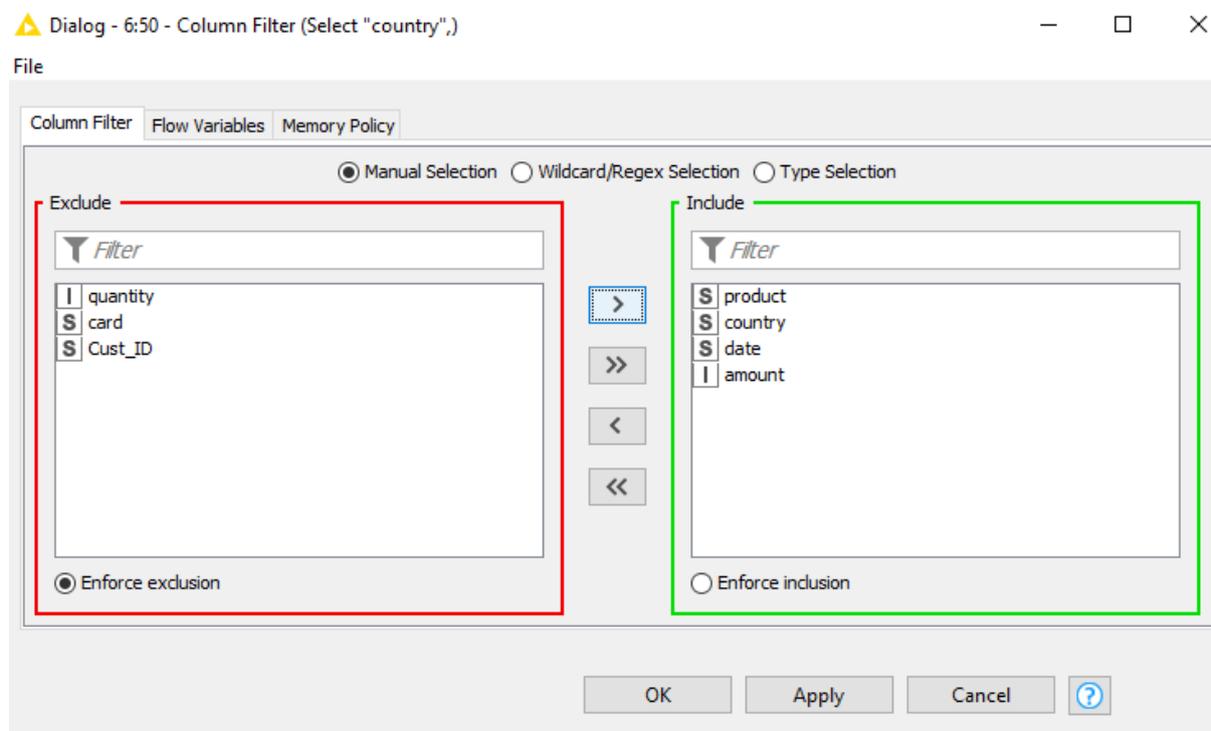
The first step, therefore, in creating any data app is to encapsulate the View nodes in a component. To create a component you will select the nodes you want to encapsulate, right-click and select Create Component... from the context menu as shown below.



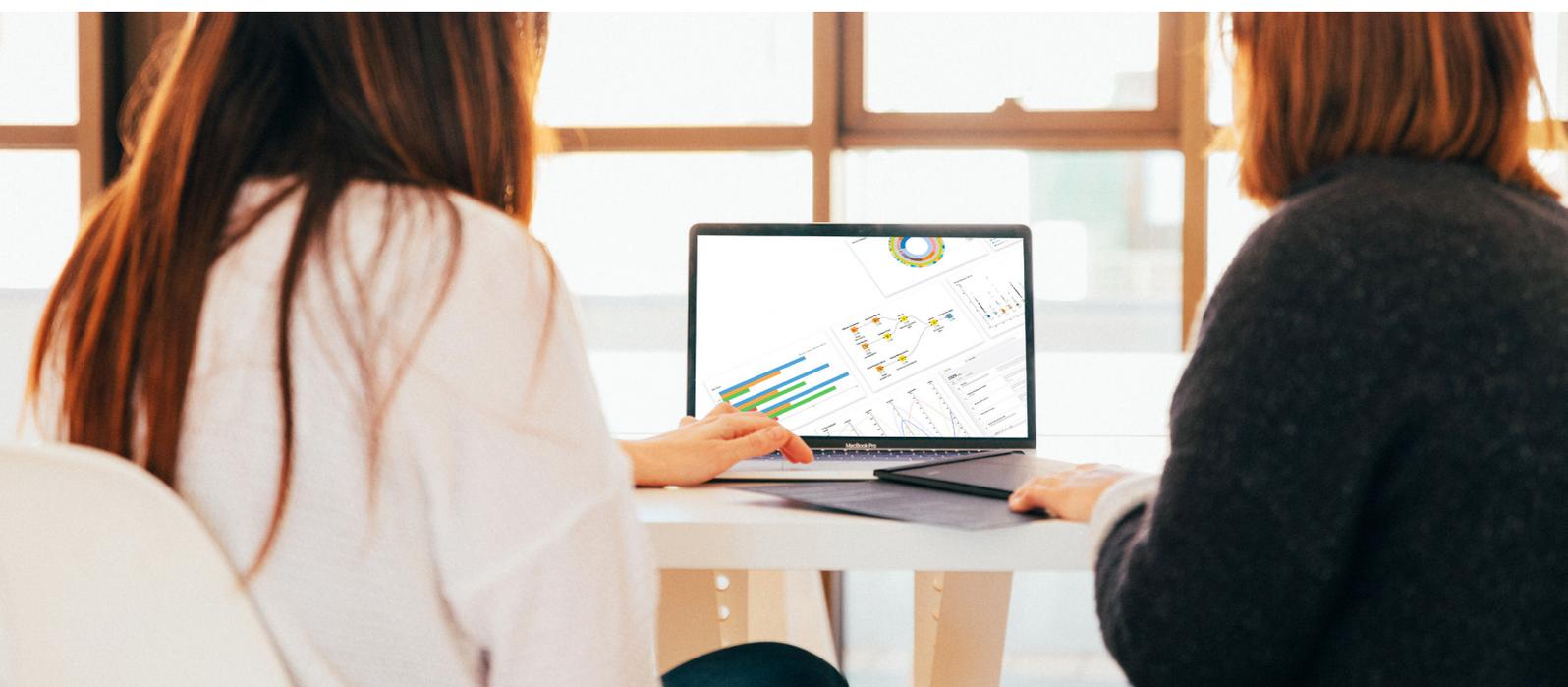
If you deploy this workflow on KNIME Server, you can enable other users to start the data app in their browser, via the KNIME WebPortal. The data app will comprise a single page that will show the same view of the component you just created.

If you add a second component, the data app will ultimately be a multi-page data app and you will enable the end-users to navigate through pages via a next button.

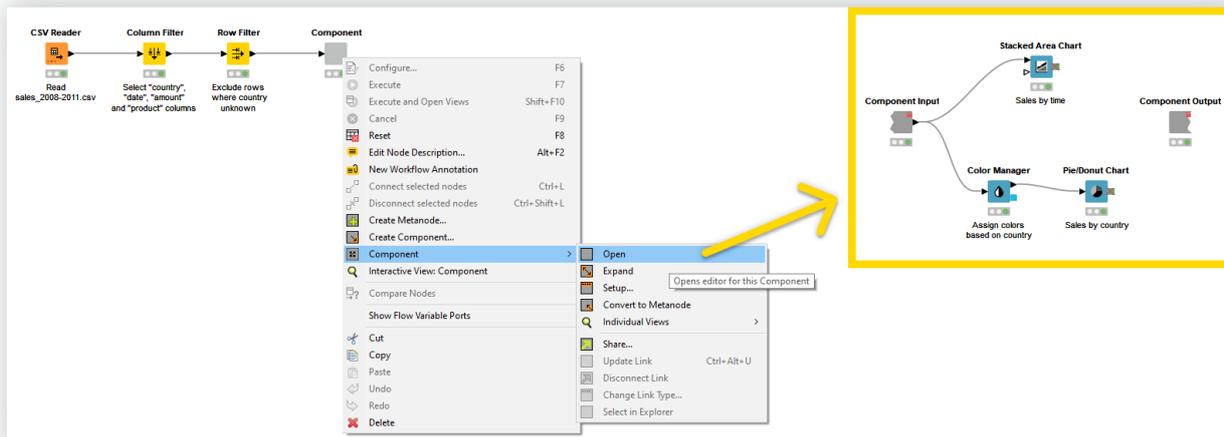
To adapt the given workflow for our analysis we will reconfigure the Column Filter Node in the given example to include some of the columns that were previously excluded as shown below.



Every node that performs an action on data can be configured. Adjust the configuration for the Column Filter node as shown above.

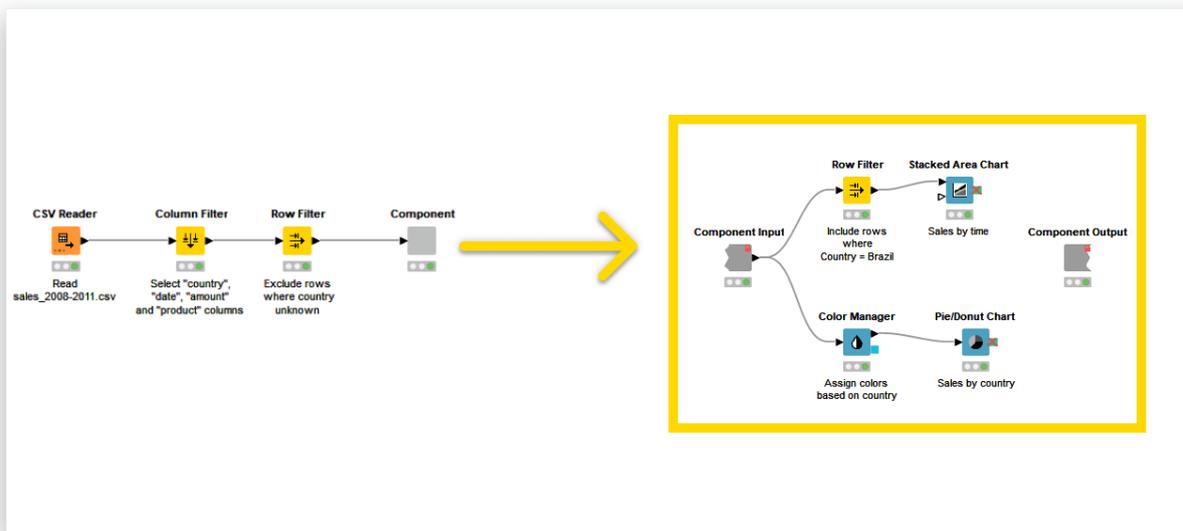


Now, let's say you want to give the end user a more filtered view of their data. To do so, first open the component encapsulated in the previous step to add additional nodes. To open the component, right-click it, select Component > Open.



A component encapsulates a segment of a workflow, which you can edit at any time by opening via the menu that comes up upon right clicking.

Suppose you would like the end user to view only sales by time for a specific country "Brazil". Add a Row Filter node into the component, as shown below, and configure it to show results for Brazil.



Adding a Row Filter node enables you to analyze country-specific data.

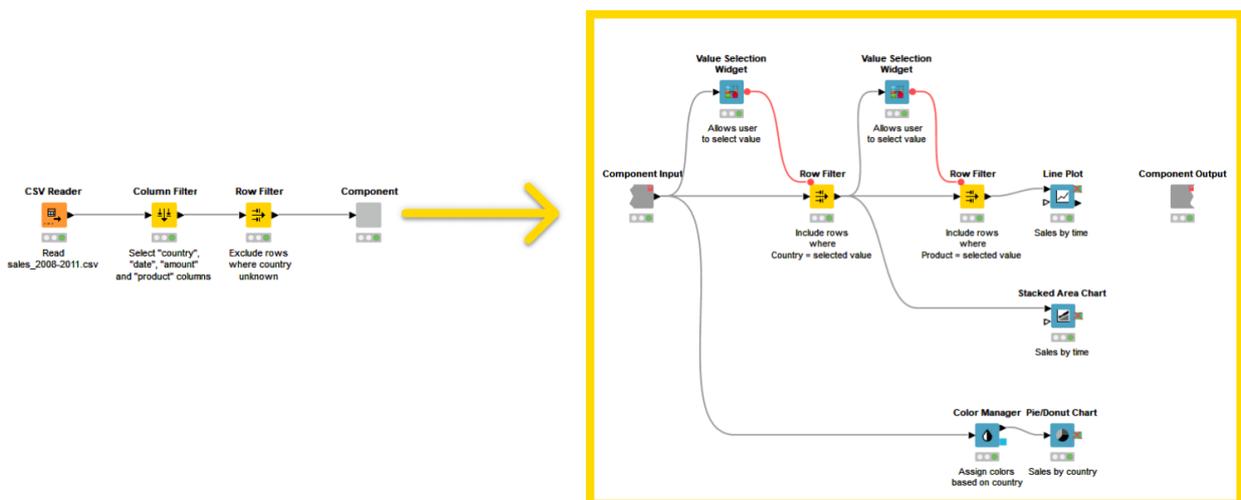
Step 2

Add Widget Node

In the previous step, we have manually configured the Row Filter node to display and analyze specific data. But let's say we would like to enable the end-user to choose different filters each time—interacting with their data. For that, you can use a Widget node.

The Value Selection Widget node gets the data you want to filter as an input flow variable that reflects the user's choice in the Widget node. The Row Filter node will then automatically be configured to use the incoming flow variable to filter rows that have the value of Country equivalent to the flow variable.

From here, let's say you want to enable value selection for another part of the data app. Let's assume you want the user to be able to narrow down which products are represented in the line plot for this workflow. To do so add another Value Selection Widget as a downstream node to the first Widget node as shown below.

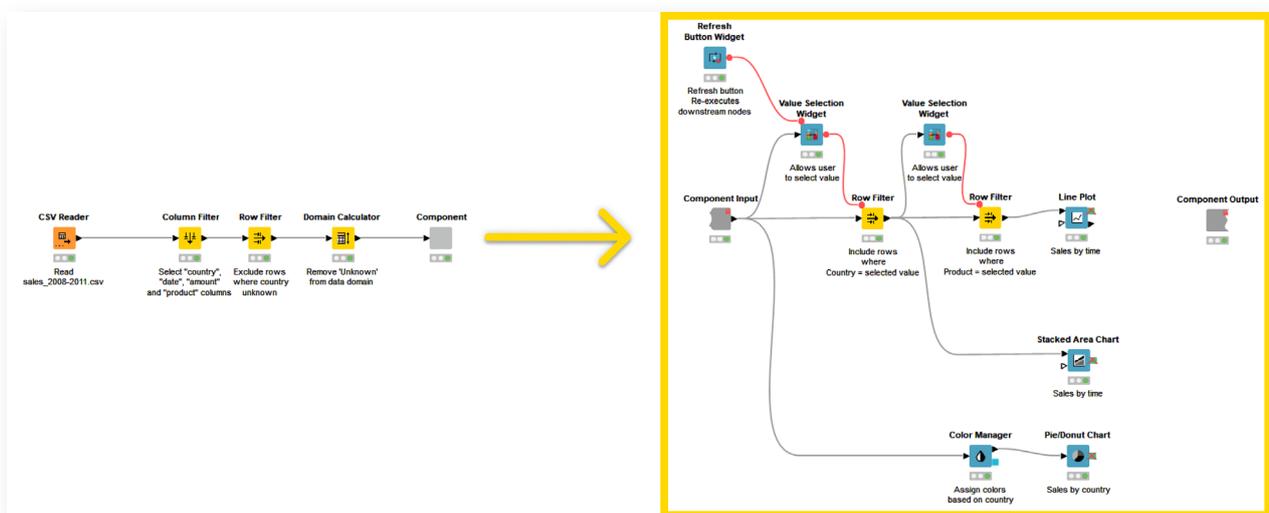


An example of Selection Widget nodes to provide user input

Step 3

Add Refresh Button Widget Node

Now, you need to make sure that the desired visualizations will update right after the user selects their parameters. To do so you need to add re-execution capabilities to the workflow. Add a Refresh Button Widget node and connect its flow variable port to the Widget node, as shown in Figure 7. This will add a Refresh Button in the visualization.



Data app with re-execution capabilities

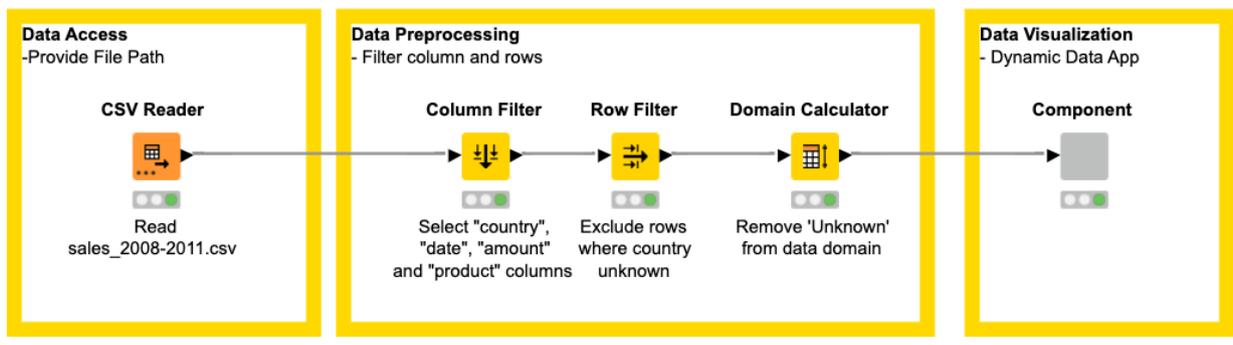
In addition to Refresh Button Widget, you can also choose to configure the Value Selection Widget node so that the user interaction directly triggers re-execution of the downstream nodes. This will result in the update of the visualizations of the composite view corresponding to the Widget and the View nodes that are in the branch downstream to the re-executable Widget node.

For this option, open the Widget node configuration dialog, go to the Re-execution tab, and check the option "Re-execution on widget value change." Refer to Re-execution of Widget Nodes section of this guide for more details.

Step 4

Add Domain Calculator Node (Optional)

The Value Selection Widget shows the label option 'unknown' for Country by default. To skip the 'unknown' option in the selection widget you can use a Domain Calculator node before the component. It will recalculate the domain and apply the filter to the data. The complete workflow is shown below.



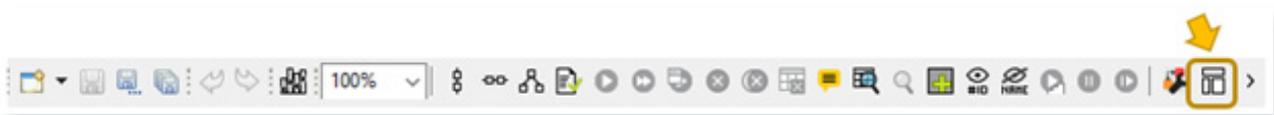
Data app for visualization of sales data



Step 5

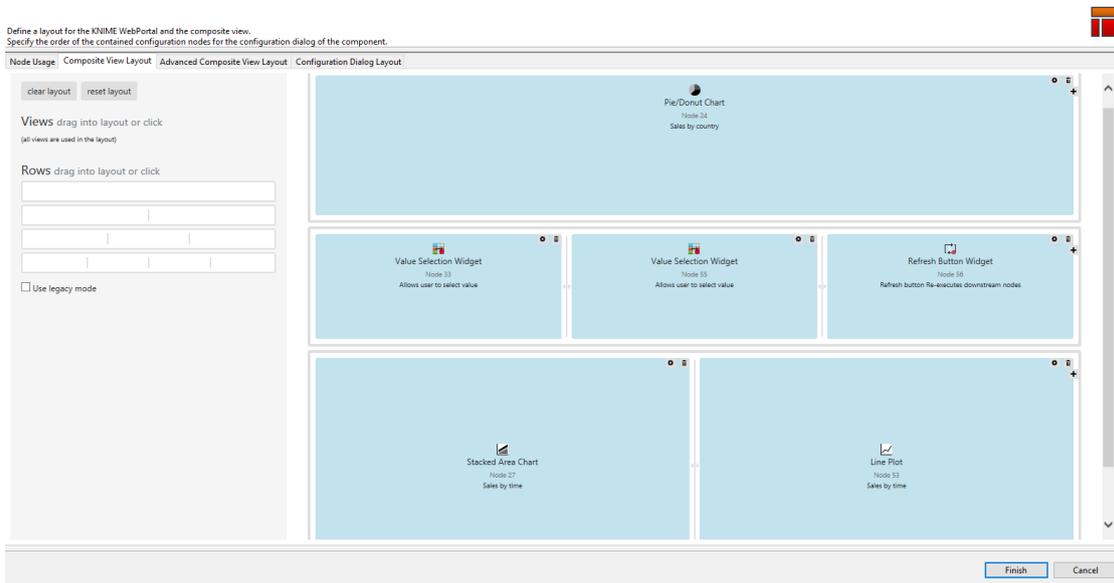
Change the Layout of the Composite View

Finally, you might want to change the layout of your data app. You can do this through the Visual Layout Editor that provides a simple drag-and-drop editor. To do so, right-click the component and click Open. The layout editor button in the toolbar is now accessible to you.



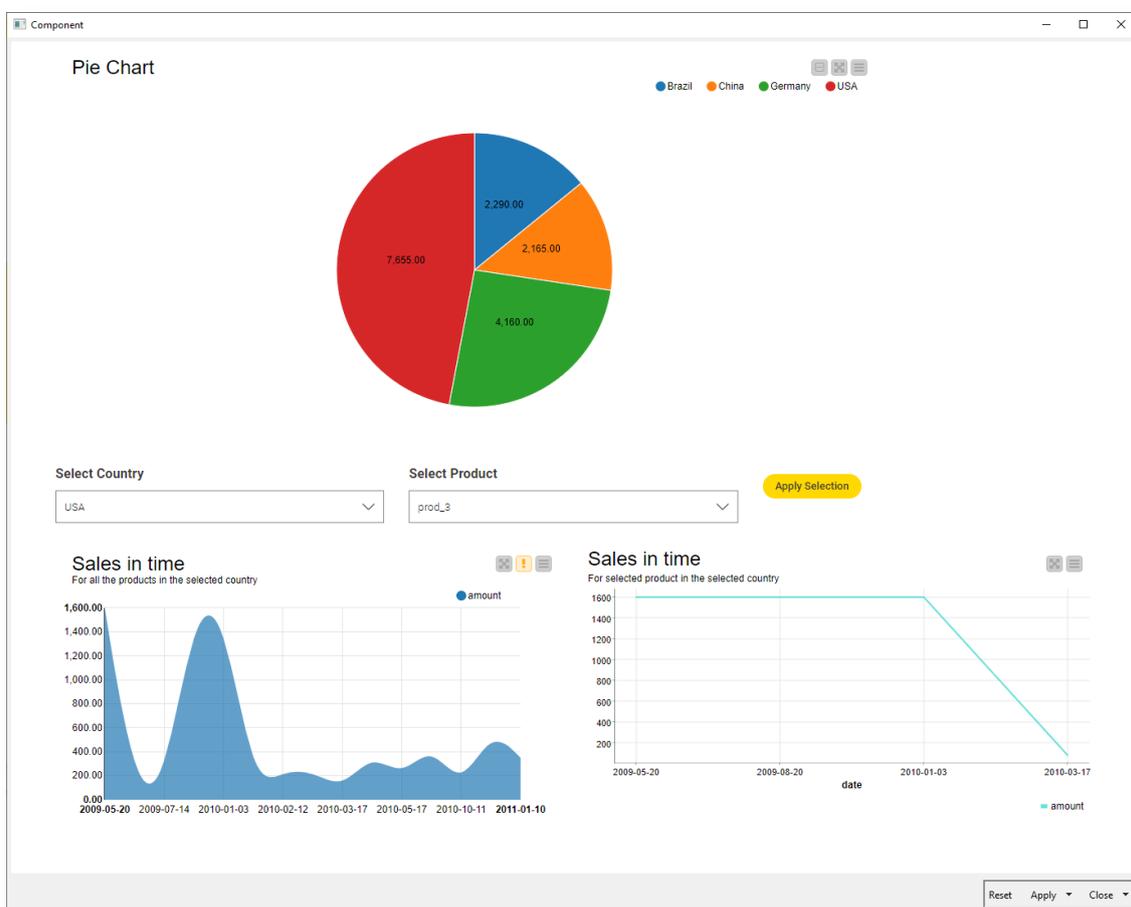
The Layout Editor Button in the toolbar

You can adjust the layout by defining which Widget and View nodes should be displayed next to or below each other.



Composite View Layout Editor

The final Interactive Composite View that would be visible to the user is depicted below.



The GUI that, ultimately, the end user will interact with in your data app.

Your Data App is Ready for Deployment

At this point, you should have a sense for how to use the no-code, low-code framework to build a workflow, and then, using the same drag-and-drop capabilities, put together a data app. To make your GUI accessible to users who don't have access to your workflow, however, you'll need to deploy your data app to the KNIME Server.

The remainder of this guide explains how to do so, but first, you'll need a KNIME Server license. Learn more about KNIME Server [here](#), and request a demo for it [here](#).

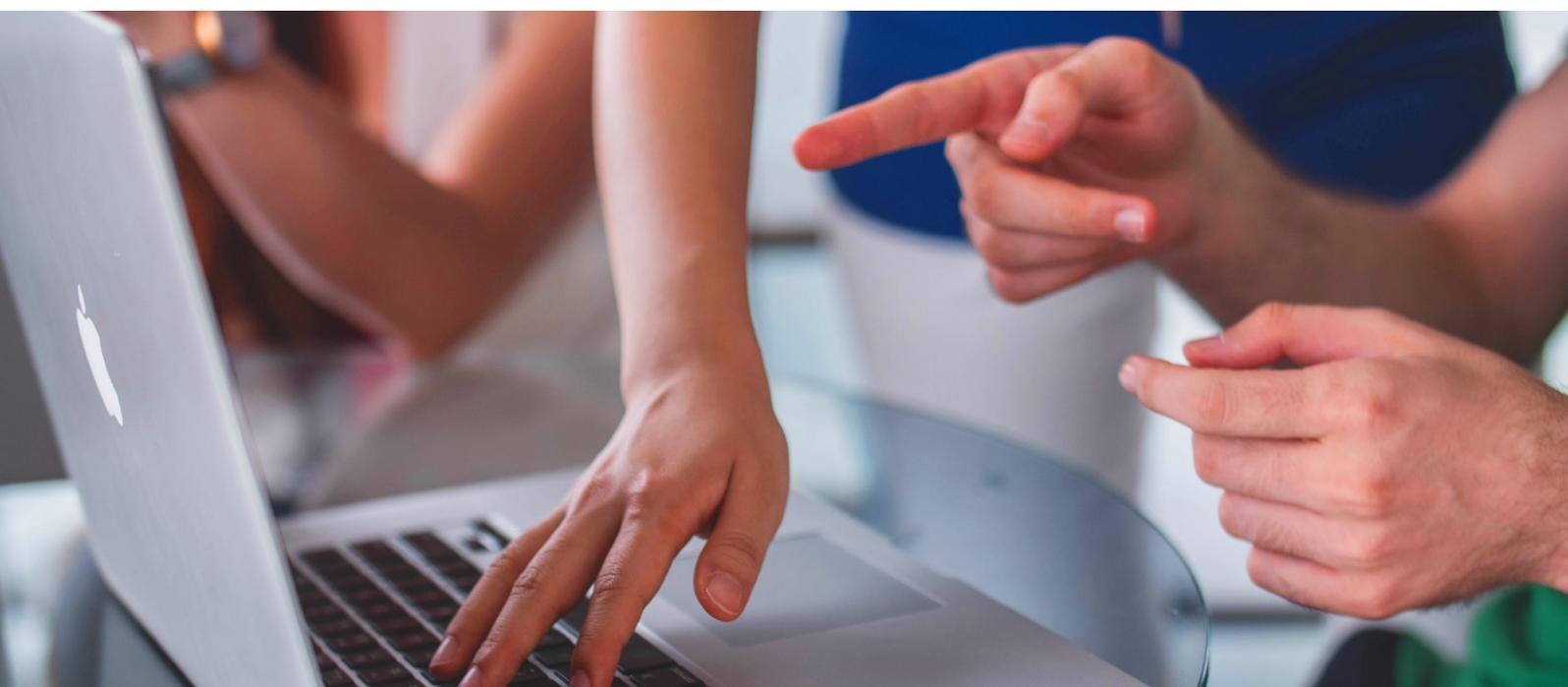
Part II

Put Data Apps into Context via the KNIME WebPortal

KNIME WebPortal provides a web interface that lists all accessible workflows deployed to KNIME Server. The WebPortal enables business or domain experts to access and interact with your tailor-built data apps via their browsers. The input and output of workflows can be parameterized, and their visualizations customized, using

Configuration and Widget nodes, Interactive Widget and View nodes.

Workflows are published on KNIME WebPortal by simply uploading the workflow from the local workspace to the corresponding KNIME Server mount point. Follow the steps below in order to deploy a data app to KNIME WebPortal.



Step 1

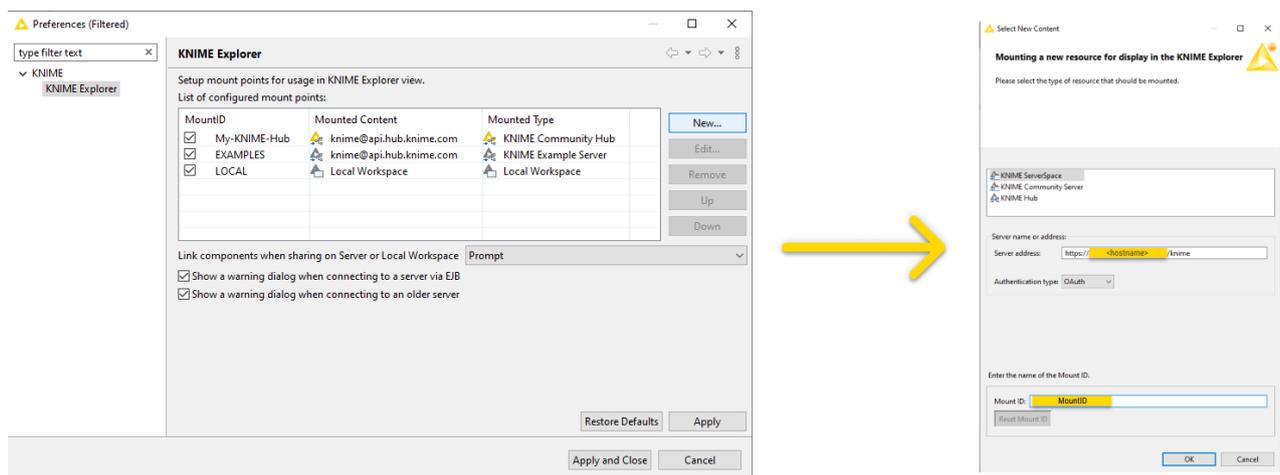
Connect to KNIME Server

In KNIME Analytics Platform, go to the KNIME Explorer and click the preferences button in the toolbar.



Preferences button of the KNIME Explorer toolbar

In the preferences window, click New... to add the new Server mount point. In the Select New Content window, shown below, select KNIME ServerSpace and insert the Server address.



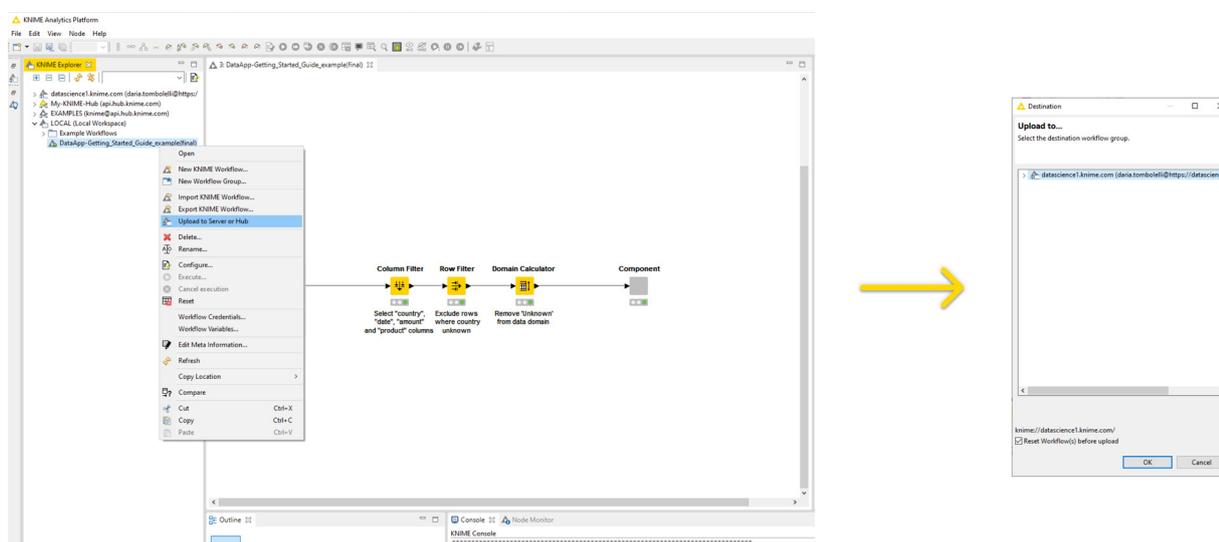
Add new Server mount point

If you get stuck here, refer to the section on [how to connect to KNIME Server](#) in the KNIME Server User Guide.

Step 2

Deploy Your Data App on KNIME Server

To deploy the Data App to your KNIME Server, right-click the workflow in the KNIME Explorer and select Upload to Server or Hub from the context menu. Then select the destination Server in the Destination window, as shown below.



1. Right click the workflow from the KNIME Explorer to upload it to your KNIME Server

2. Select the destination Server for deployment

Deploy workflow to KNIME Server

Step 3

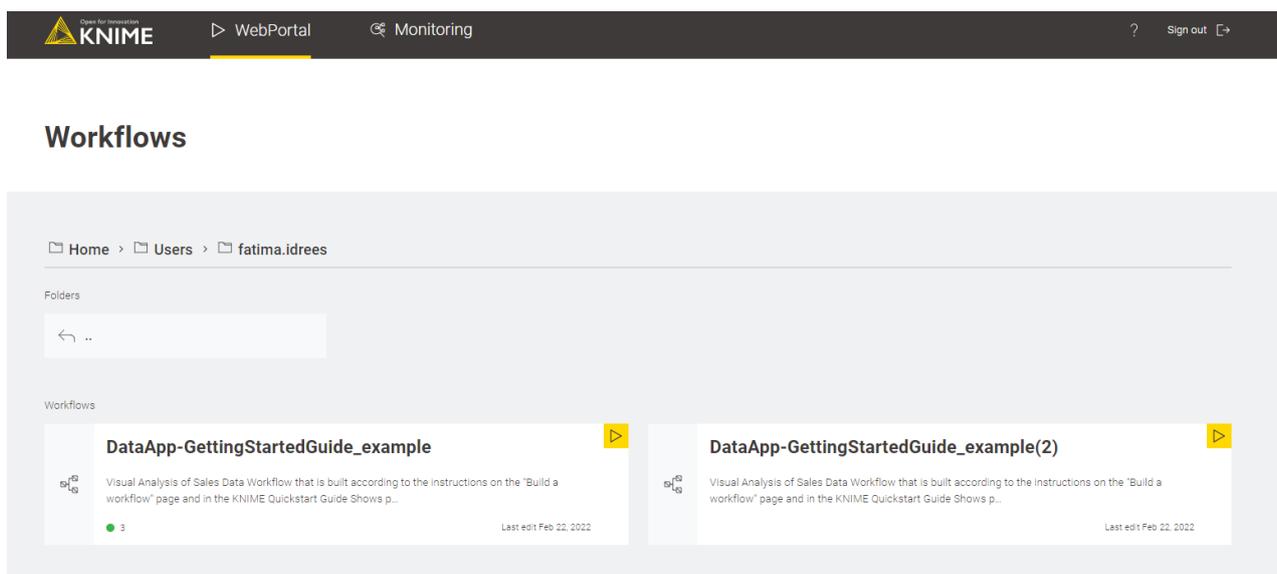
Run a Data App on KNIME WebPortal

To open the data app in KNIME WebPortal, right-click the workflow in KNIME Explorer, select Open and then select in WebPortal. Alternatively, you can use a standard web browser to connect to KNIME WebPortal. The address (URL) to get to the login page is:

```
`https://<server-address>/knime/webportal/`
```

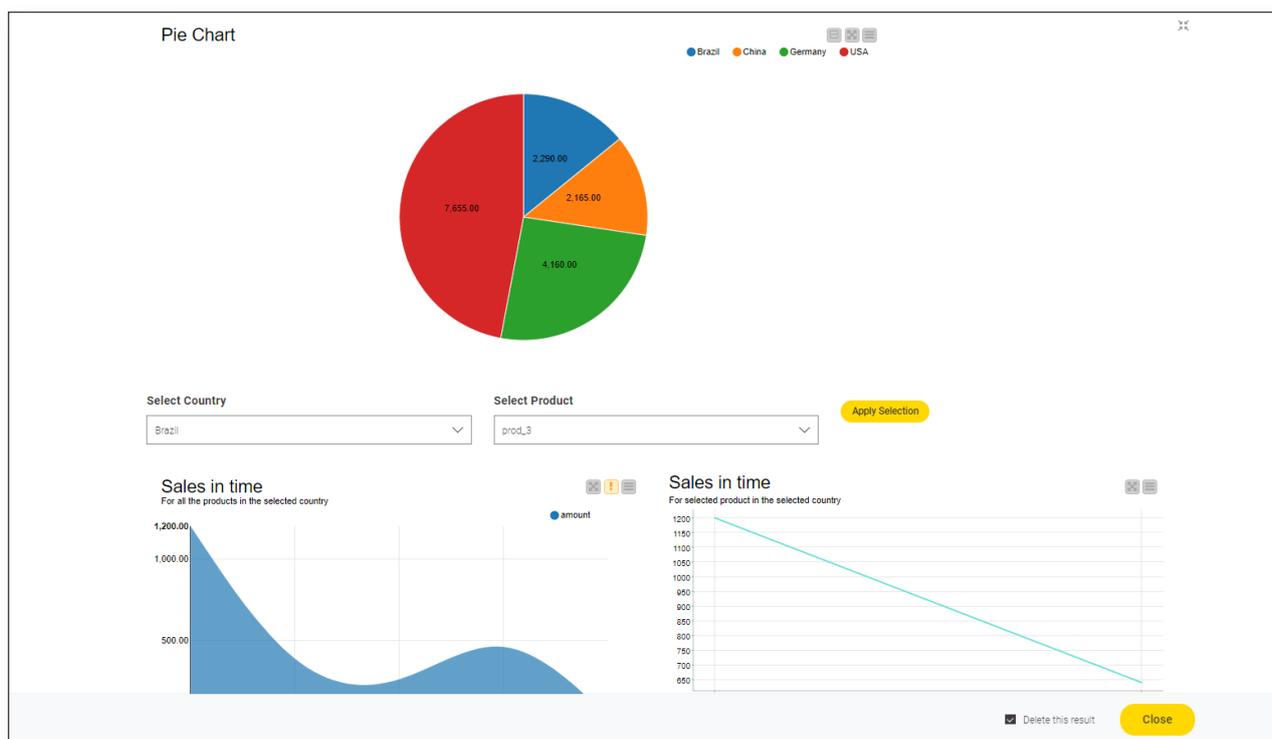
After signing in, the main page for the KNIME WebPortal is displayed, showing the available spaces or workflows. For more information on KNIME WebPortal read about [Navigating KNIME WebPortal](#).

Clicking on a folder redirects you to a new page, where all the workflows available inside the folder are shown. You can click the yellow “play” button in the upper-right corner of the corresponding tile to execute the workflow.



KNIME WebPortal page with workflows tiles

Alternatively, you can also click the workflow tile and click the “Run” button to execute the workflow. For our example, after running the workflow, the result will be displayed as a single page data app since there is only one component.



Data app result, once executed in WebPortal

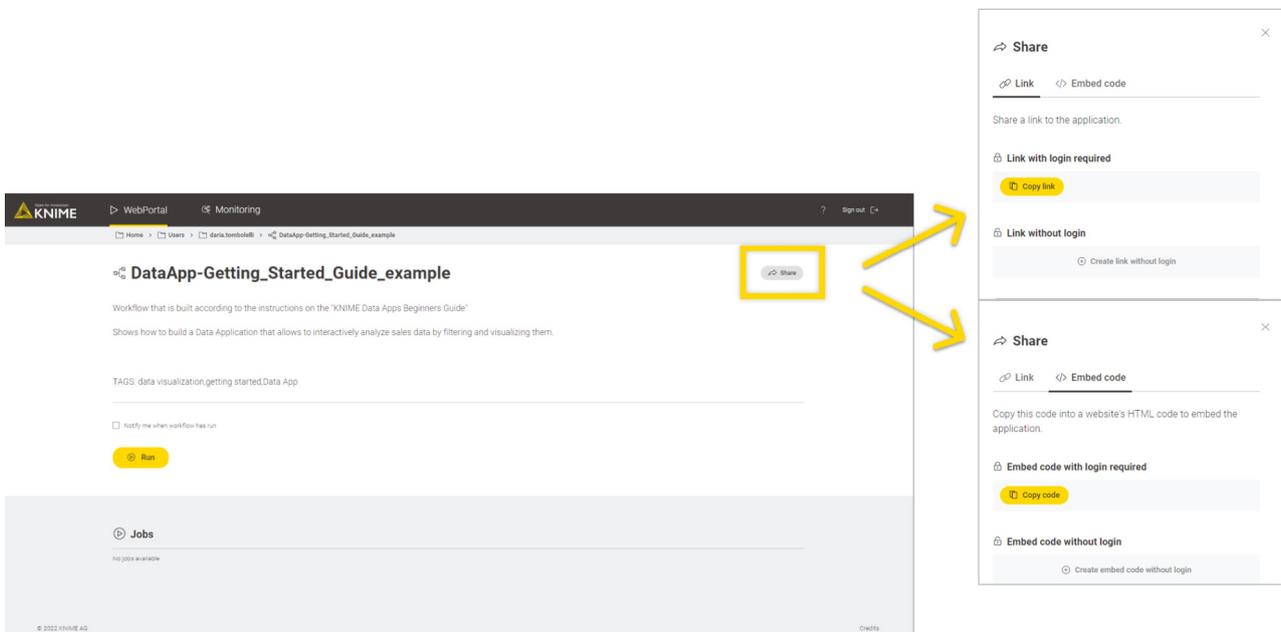
The following points about the data app are worth noting:

- Each page of your data app will depict the execution of one component which encapsulates widgets, views, and intermediate nodes.
- You can define the layout of each component.
- Parts of a page that should be updated after a user input are implemented via a Refresh Button Widget node or the Re-execution tab of a Widget node (optional).

Step 4

Share (or Embed) your Data App

You can share the executed workflow with your colleagues who will only need to interact with GUI on the KNIME WebPortal, and not the underlying workflow. This can be done by clicking the Share option on the top left corner of the workflow page. You can either use the share link or the embedded link.



Sharing data apps from KNIME WebPortal

With that, you have successfully built and deployed your first data app on KNIME WebPortal.

Start Building Data Apps Today

Data apps provide faster, actionable insights to your end-users, shortening the time to decisions. KNIME enables you to build and deploy custom data apps, specific to your business purpose, in record time, without any coding. Take the first step, and enable your business and technical users alike.

Now that you have done it once, are you ready to build more? If so, explore other examples on [KNIME Hub](#).

Want to learn more about building Data Apps with KNIME, or explore KNIME's commercial offering, reach out to the KNIME customer care team and [request a demo](#).