SIEMENS

Insights Hub

Insights Hub Monitor

System Manual

03/2024

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

> ⚠ **DANGER**
>
> indicates that death or severe personal injury **will** result if proper precautions are not taken.

> ⚠ **WARNING**
>
> indicates that death or severe personal injury **may** result if proper precautions are not taken.

> ⚠ **CAUTION**
>
> indicates that minor personal injury can result if proper precautions are not taken.

> **NOTICE**
>
> indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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> ⚠ **WARNING**
>
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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

Introduction to Insights Hub Monitor and Insights Hub Monitor Analytics

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1.1 Introduction to Insights Hub Monitor and Insights Hub Monitor Analytics

Insights Hub Monitor is an easy-to-use basic analytics application that enables users to run functions and analysis against their production system and machine performance data.
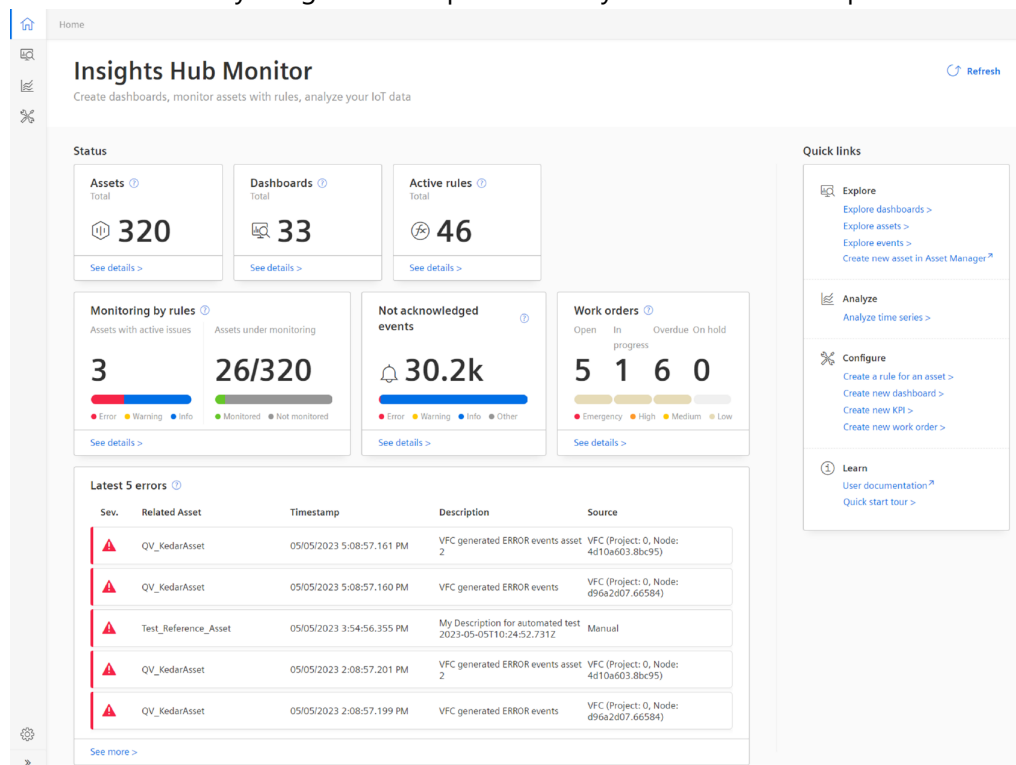
Insights Hub Monitor offers the following functions:

- Management, monitoring and representation of the assets distributed worldwide.
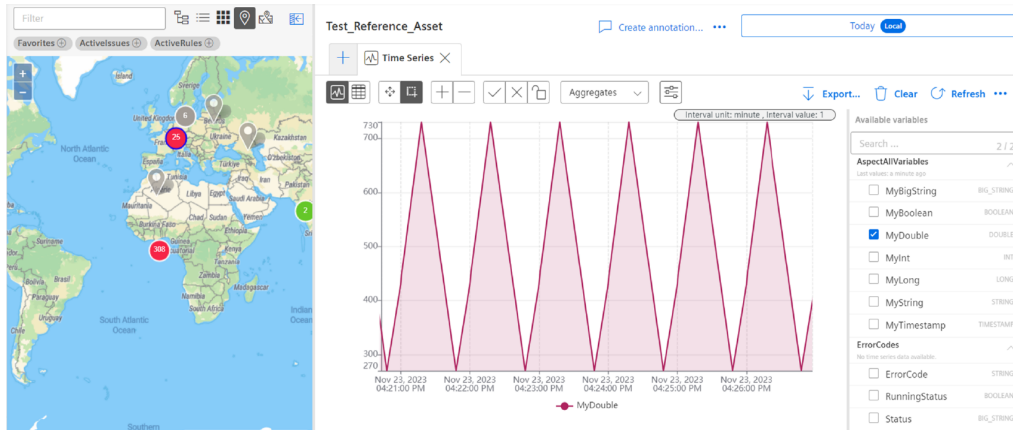
- Visualize time series data using widgets from built-in widgets library.

- Creation of rules for monitoring the assets.
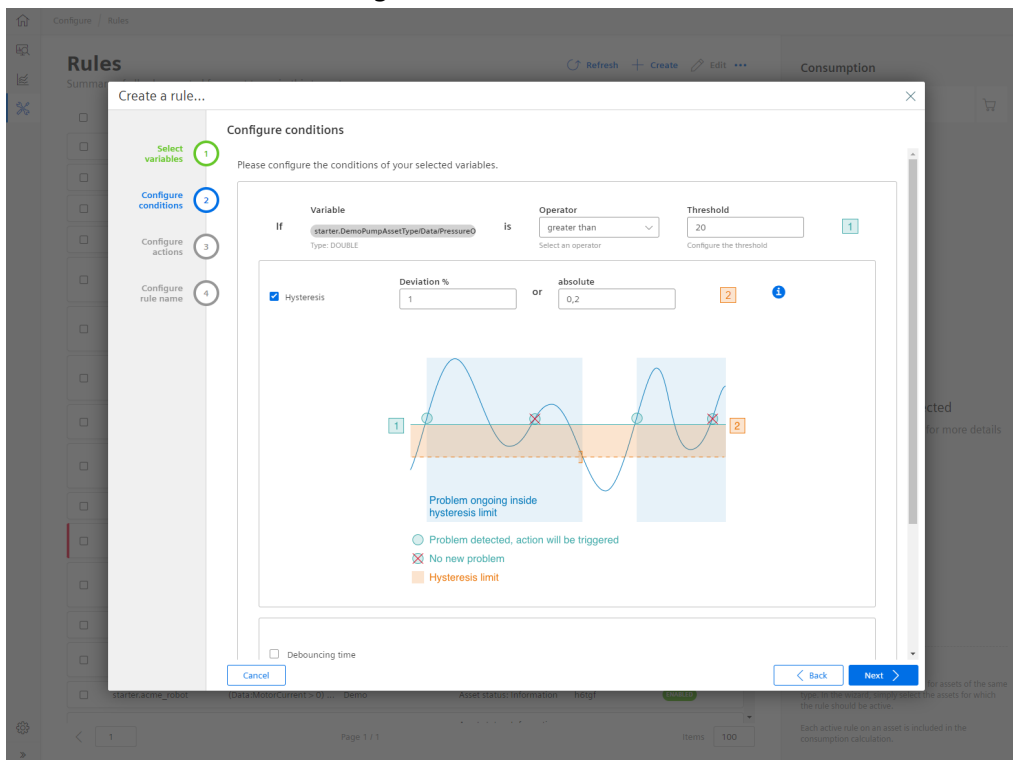
- Visualization of asset relevant information as dashboards.
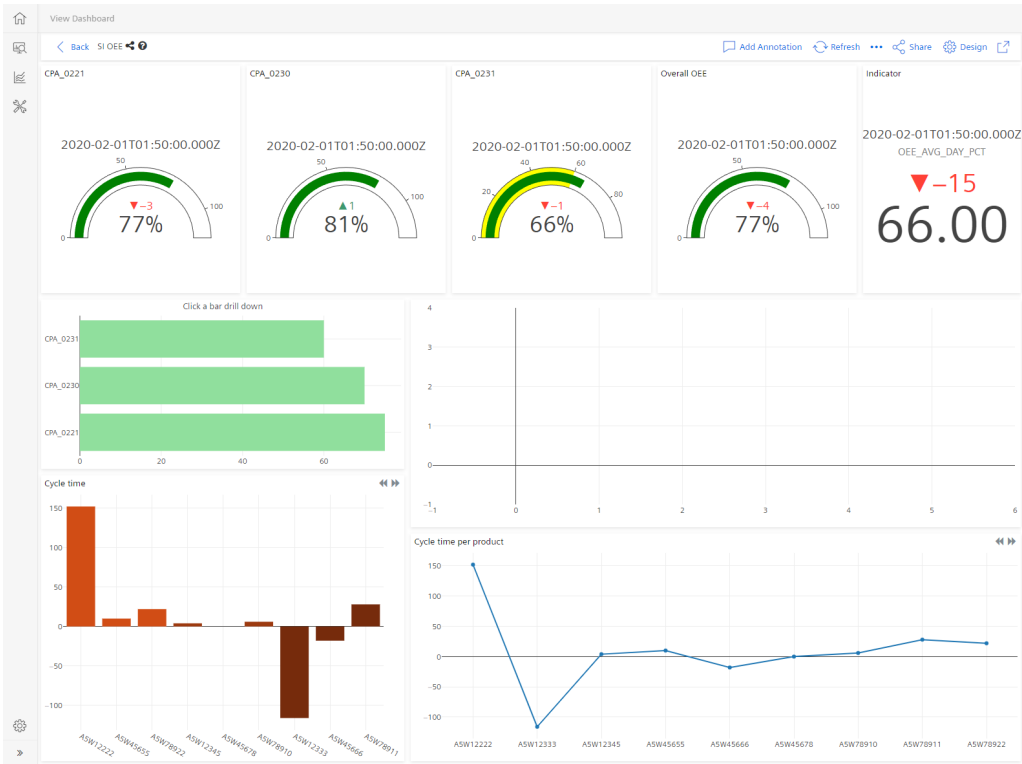
- Comparison of variables of assets that enables analysis of the asset performance.
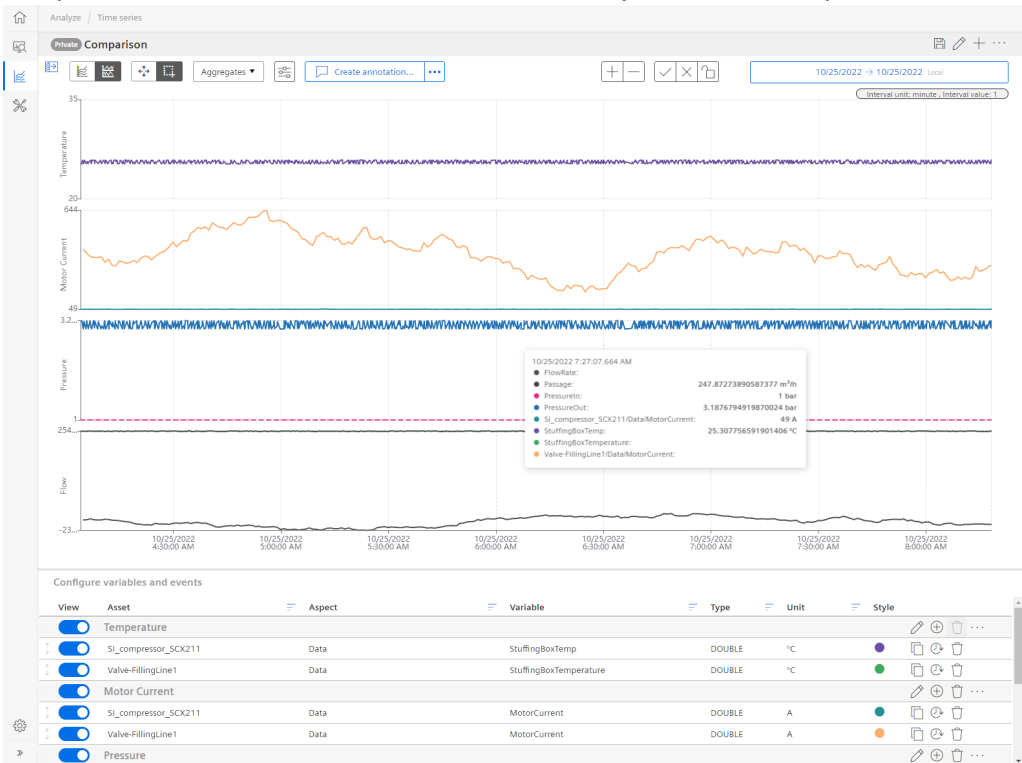
- Creation of simple KPIs using time series data.

- Creation and tracking of work orders related to specific assets

- Developers can extend Insights Hub Monitor with further plugins using the [Insights Hub Monitor Plugin SDK](#)

Insights Hub Monitor Analytics is an extension of Insights Hub Monitor. It adds capabilities to discover advanced insights of your operations and your business through "Configure KPIs" and in "Explore Dashboards".

Insights Hub Monitor Analytics offers you the following functions:

- Access to time series storage or to Integrated Data Lake directly with UI guided selection.

- Creation of advanced KPIs using data from time series Storage or from Integrated Data Lake.

- Setup threshold for KPI and assign it to user who will receive email notification once the value is triggered.

- Visualize data from time series storage or from Integrated Data Lake using additional widgets from built-in widgets library.

- Drill down to discover advanced insights.

User interface

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2.1 User interface

You can access the Insights Hub Monitor application from the Launchpad.

Home screen

The "Home" screen provides a quick overview of all available features.

The Home screen of "Insights Hub Monitor" is as shown below:
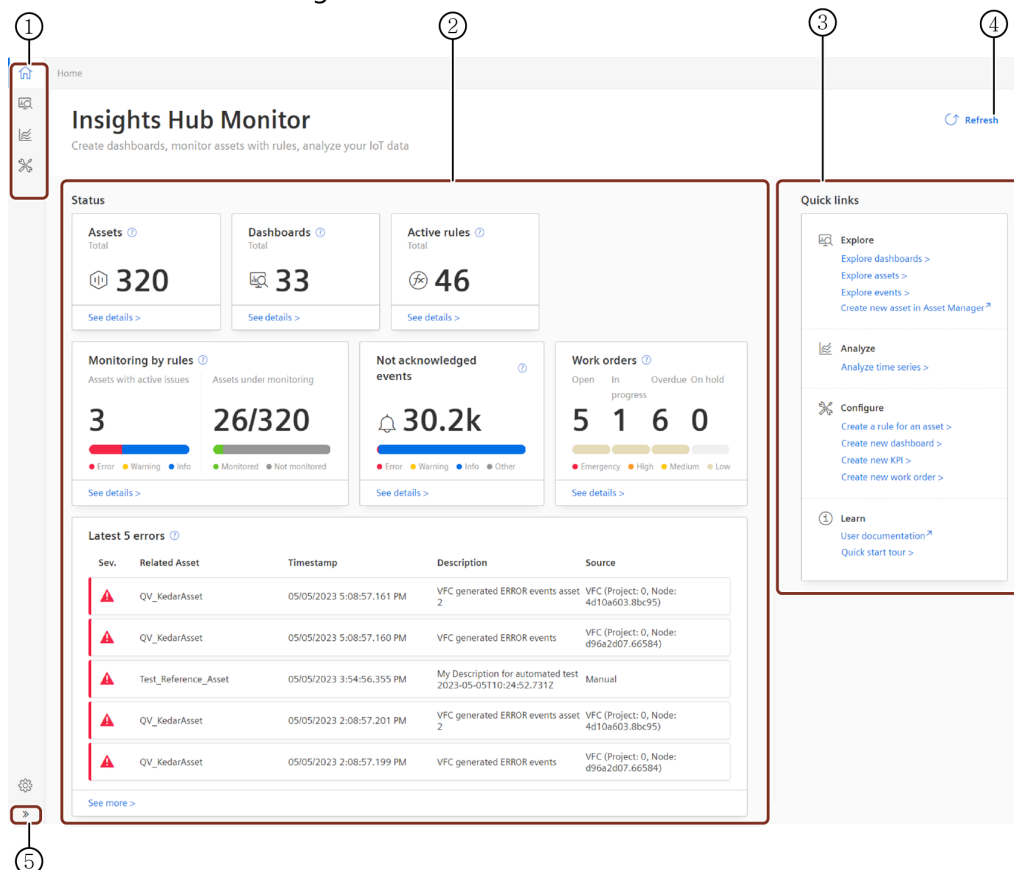
① Main navigation with tab-categories:

- Home

- Explore

  - Dashboards

  - Assets

  - Events

- o Work orders

- Analyze

  - o Time series

- Configure

  - o Rules

  - o KPIs

②   Status: provides the quick overview information of the environment

③   Quick links: provides some useful links within the application

④   Refreshes the dashboard data

⑤   Expands the navigation tab

Status screen

The status screen provides the following information:

Assets: This displays the total number of assets in your environment. The total number also includes the assets, which are shared from other environment using x-tenancy.

Dashboards: This displays the number of dashboards created or shared with you.

Rules: This displays the number of active rules in your environment.

Monitoring by rules: This displays the number of assets which are currently monitored by rules.

A rule can be configured to influence the status of the assets with a "status" aspect of type `core.assetstatus`. Additionally, you see the number of assets with the active issues.

Not acknowledged events: This displays the number of events that have been not acknowledged in your environment.

Work orders: This displays the overview of all work orders in your environment.

Latest 5 errors: This displays the last 5 events with severity error in your environment. Select an "Event" to redirect a related detail view.

> ✏
>
> "See details" redirects to a related detail view in the Insights Hub Monitor.

Appearance

Insights Hub Monitor can be switched to use a dark theme.
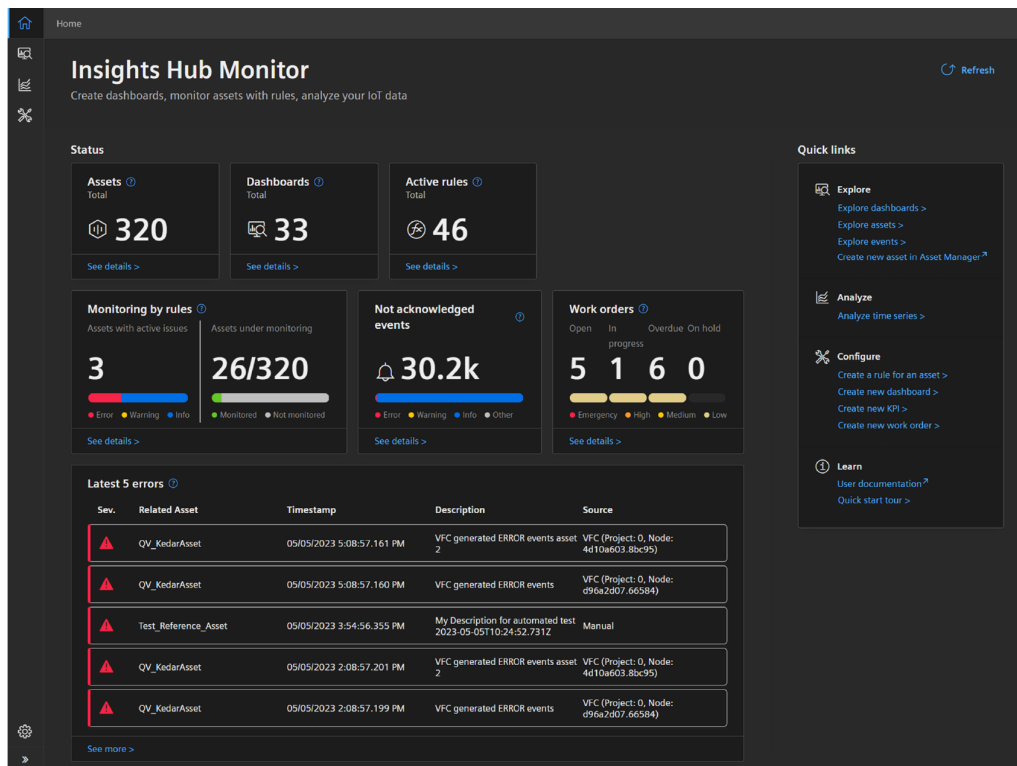
The dark theme is currently not supported by all Insights Hub Monitor plugins.

Time Selection Panel

Time selection panel offers you explore and analyze the data of the selected asset for the defined time range. You can select the required time range in the following ways:

Absolute: Allows you to select the time range between the "From" date to "To" date.

Quick Range: Allows you to select the predefined quick time range.

-

Time Zone: Allows you select the time zone.

-

User rights

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3.1   User rights

Insights Hub Monitor adopts user rights from Settings
The user rights depend on the following user roles:

- oi.creator

- oi.viewer

By default, TenantAdmin and StandardUser will be provided with oi.viewer rights, for additional rights, oi.creator roles has to be assigned separately. For more information on how to assign user roles as tenant admin, refer to user management and roles.

Right	Role: mdsp:core:oi.creator	Role: mdsp:core:oi.viewer
Read timeseries data	✓	✓
Read aggregates data	✓	✓
Create agent diagnostics	✓	✓
Read agent diagnostics	✓	✓
Read assets	✓	✓
Create events	✓	✓
Delete events	✓	✓
Read events	✓	✓
Create rules	✓	
Update rules	✓	
Delete rules	✓	
Read rules	✓	✓
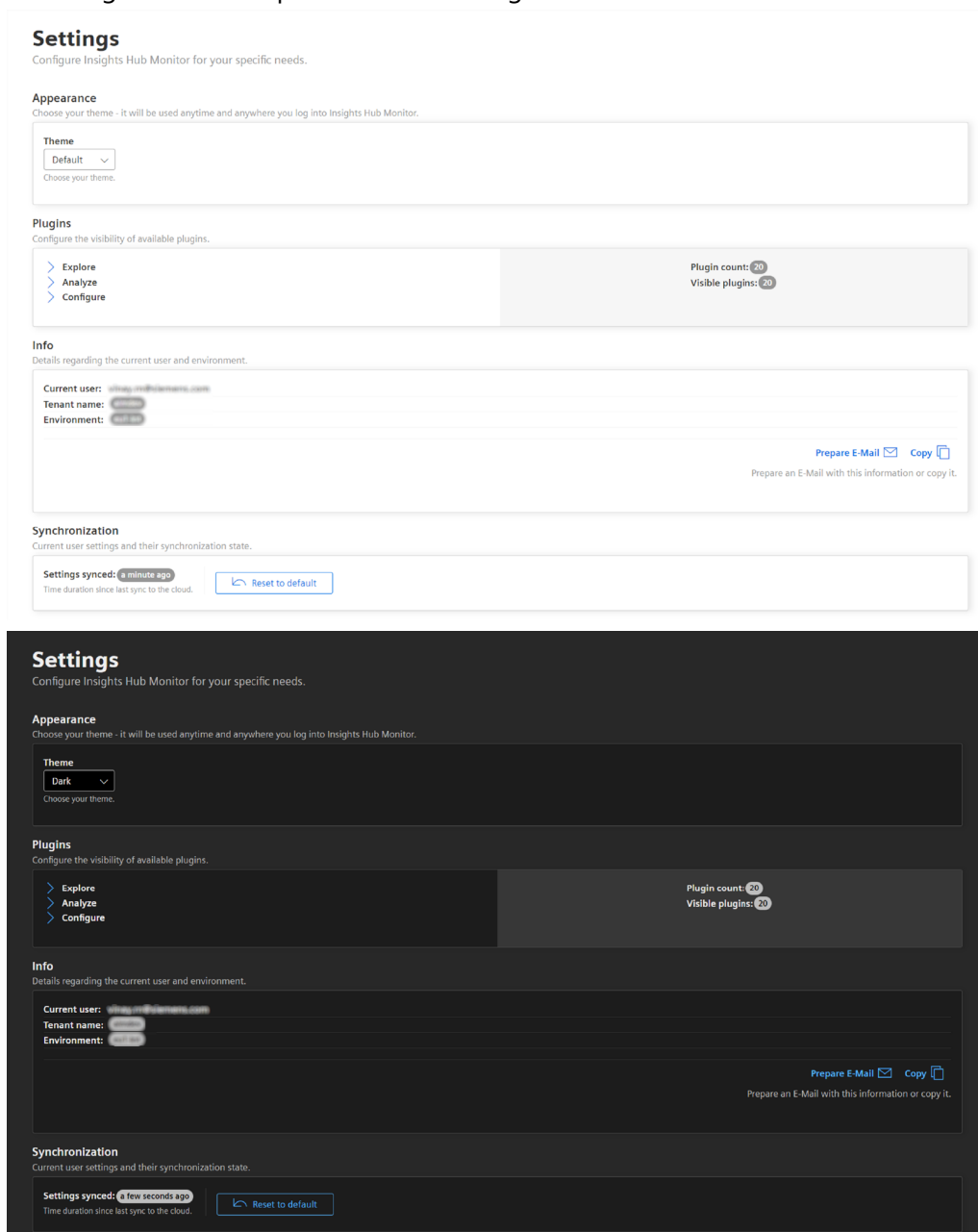
Right	Role: mdsp:core:oi.creator	Role: mdsp:core:oi.viewer
Create dashboards	✓	
Read dashboards	✓	✓
Create work orders	✓	✓
View work orders	✓	✓
Create KPI	✓	
View KPI	✓	✓
Share Analyze Profiles	✓	

Settings

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4.1 Settings

The settings page provides an overview of the configurable settings in Insights Hub Monitor. To open the settings of Insights Hub Monitor, click the gear icon ![icon](./images/Gear icon.png) in the navigation tab. It opens the main configuration screen as shown below:

The Settings screen allows the users to configure the below settings:

- Appearance
    - Theme selection
        - Default (light theme)
        - Dark

✏️

The monitor application is available in Chinese, German, and English languages.

The application's default language is chosen from the language of your browser.

Plugins
- Configure the visibility of plugins

Info
- Provides information about active user and environment

Synchronization

Provides information about the most recent time the settings were synchronized.
- Furthermore, the user settings can be reset to default.

Dashboards

<div style="text-align: right">

5

</div>

5.1 Introduction to Insights Hub Monitor Dashboards

Monitor Dashboards is a feature within Insights Hub Monitor for creating dashboards upon which you can visualize data from Integrated Data Lake (IDL) and IoT Time series data. This documentation includes information on using Monitor Dashboards and is intended for those who want to use Monitor Dashboard's customizable dashboards and widgets to track IoT and IDL data.

About Monitor Dashboards Features

While this document covers all Monitor dashboard features, the dashboard, data source, and widget features available depend on your organization's subscription(s) to applications and/or early access offerings, and the permissions and roles assigned to you by your organization's administrator.
While most dashboard widgets can be used with any data source, some work only with IDL-based or IoT-based data sources. For example, if your organization doesn't store data in IDL, you may not see features that apply only to IDL data sources.

Monitor Dashboards Customizable User Interface (UI)

The Dashboard UI presents a central canvas for widgets and a series of tabs on the right side for adding and configuring data sources and widgets.
You can use widgets immediately - with their default design, or customize their appearance with colors, labels, borders, and legends at any time using the Design a Widget tab.

What You can Do With Monitor Dashboards

The main features and functionality in dashboards:

- Create, edit, rename, delete, and share dashboards

- Read and Write data from Internet of Things (IoT) and Integrated Data Lake (IDL) to Monitor dashboards

- Specify data source filters, groupings, labels, units of measure, and X- and Y-Axis fields for charts

- Apply the automatic update feature to ensure a widget's data is continually refreshed

- Drill down KPI into widget data to view a subset of 'parent' widget data

- Add multiple fields to the Y-Axis in line, bar, and area charts; currently only data lake data is supported

> ✏️
>
> Monitor Dashboards can work with Integrated Data Lake (IDL) and Data Contextualization data sources, which are available to Capability package subscribers.

Viewing a Business Intelligence Dashboard

The Dashboards list includes all the dashboards that you are allowed to access in Business Intelligence.

The "Dashboards" screen also displays dashboards created in the "Business Intelligence" and shared with you. To view the dashboards created with the Business Intelligence, please ensure that you have those Business Intelligence license and one of the following roles assigned:

- mdsp:core:visualexplorer.viewer

- mdsp:core:visualexplorer.publisher

- mdsp:core:visualexplorer.interactor

- mdsp:core:visualexplorer.administrator

To control which dashboards are available for a certain user or user group, you can leverage the fine-grained content access options within Business Intelligence. Here you can manage permissions for projects, workbooks and views individually. For more information on users permissions, refer to [User rights in "Insights Hub Business Intelligence"](#) or [Manage Content Access](#).

For Business Intelligence Dashboards, you can create an annotation. The annotation requires a description and can be enhanced with tags. The annotation is created in the context of the user and with the current timestamp.

All annotations can be found in the "Events" Overview. Here you can also use the filters of the table to find all the annotations with a specific tag.

Viewing a Visual Flow Creator Dashboard

If a role for Visual Flow Creator has been assigned to you, you can seen the existing Visual Flow Creator dashboards in the dashboard overview section.

For Visual Flow Creator Dashboards, you can create an annotation. The annotation requires a description and can be enhanced with tags. The annotation is created in the context of the user

and with the current timestamp.

All annotations can be found in the Events Overview. Here you can also use the filters of the table to find all the annotations with a specific tag.

Viewing Dashboards in Full Screen

Dashboards are opening by default in full screen mode.

To exit the full screen mode, press the ESC key in the keyboard.

5.2   Navigating Monitor Dashboards

There are several ways to open Dashboards from the Insights Hub Monitor landing page.

To view a list of the dashboards you have access to, click the:

- **Explore** icon and select Dashboards.

- **See details** link in the Status area

- **Explore dashboards** link under Quick links > Explore

To create dashboards, navigate by either of these paths:

- **Create new dashboard** link under Quick links > Configure

- **Add a Dashboard** link on the Dashboards summary page

Dashboard Links Illustration

Here is an example of the Insights Hub Monitor landing page, showing the location of the links described above.
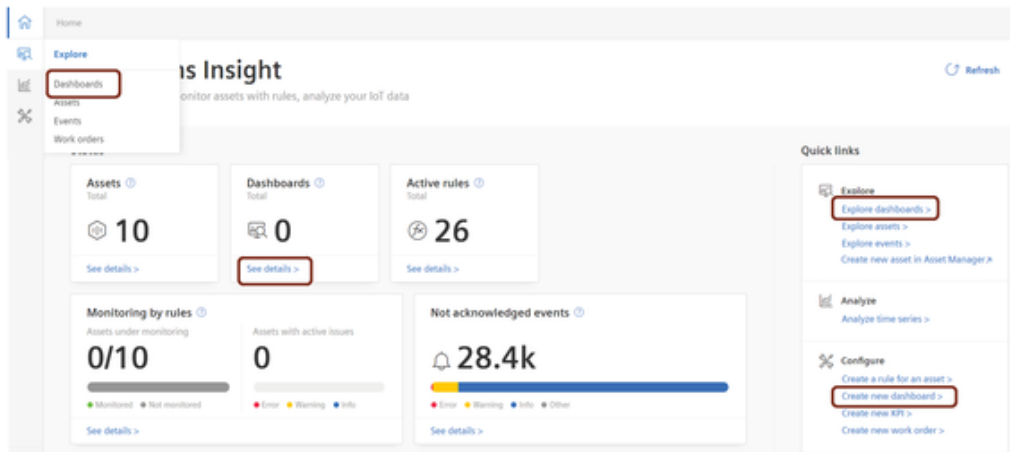
Expanding and Collapsing the Side Bars

Use the double chevrons at the top and bottom of the Dashboard page to expand or collapse the side bars. For example, if you want the Widget Library to display, click the double chevron icon to collapse the tabs.

5.3   Actions and Icons

Actions and Icons

Most of the icons on the Dashboard page relate to functionality, such as opening configuration panels, pop-up windows, or selection lists. Some convey or link to information, such as an icon that indicates a dashboard has been shared, or an icon that links to additional resources, such as the Help icon.

Dashboard icons appear in visually distinct groupings as follows:

- **Informational**: related to additional resources or navigation, such as directing you to Help documentation, expanding or collapsing panels, or messages that confirm success of the most recent action.

- **Dashboard**: apply actions to the dashboard currently open, such as saving, or sharing the dashboard.

- **Widget**: apply actions currently selected widget such as refreshing its data or copying the widget.

- **Configuration**: open tabs on the right side of the UI for adding data sources, configuring data sources, and designing widgets.

Main Insight Hub Monitor Page

Icons	Description
❓	Opens the Help documentation
⚠️	Indicates changes have been made, but not yet saved
👥	Indicates current dashboard has been shared
💡	Displays on-screen guidance in the application
»	Expands a side panel
«	Collapses a side panel

Dashboards

+ New	Creates a new dashboard
✓ Save	Saves a dashboard
Delete	Deletes currently opened dashboard
⮷ Share	Opens a share dialog where you select other users to share the dashboard with

Widgets

Icons	Description
⚪🔵	When toggled on, this automatically refreshes widget data according to frequency you specify.
🔄	Manually refreshes the widget data
↺	Undoes the last action taken with the widget
↻	Reapplies the last action taken with the widget

Icons	Description
	Copies the widget
	Cuts the widget
	Pastes the widget
	Deletes the widget

Configuration

	Opens Design a Widget tab
	Opens Configure a Data Source tab
	Opens Add Data Sources tab

5.4 Dashboard Actions

Dashboard action icons make it easy to perform common dashboard tasks. You can edit a dashboard any time by opening it and making changes—click Save and you're done.
This topic includes step-by-step instructions for:

- Opening an existing dashboard

- Adding an annotation (note) to a dashboard

- Saving a dashboard

- Renaming a dashboard

- Sharing a dashboard

- Deleting a dashboard

Illustration of the Dashboard Action Icons

Here are the Dashboard action icons:

Opening an Existing Dashboard

Here is an image that shows where you can Select Dashboards from the Explore menu on the Insights Hub Monitor landing page:
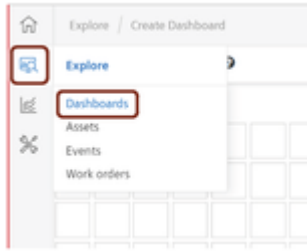
How to Open an Existing Dashboard

Follow these steps to open an existing dashboard:

1. Click the "Explore" icon in the menu bar. A submenu displays a list of objects to explore.

2. Click "Dashboards". The Dashboards page displays the dashboards you have access to.

3. Click the "name" of the dashboard you want to open. The Insights Hub Monitor landing page closes and the Dashboard page opens.

How to Add an Annotation to a Dashboard

Add an annotation to a dashboard when you want to explain or comment. Annotations are timestamped and belong to the user who creates them. You can also add tags to the annotation for easy look-up, or search for all annotations that contain a certain tag. To view your annotations, select "Events" from the Explore menu.
Follow these steps to add an annotation to a dashboard:
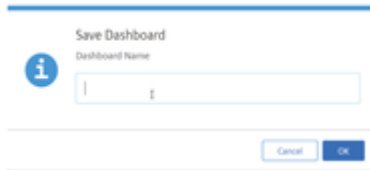
1. Click the "Add Annotation" icon. An annotation pop-up window displays.

2. Enter a description for the note (required).

3. Enter a unique tag in the Tags field, and press "Enter" to add it to the annotation.

4. Continue to add relevant tags until you are done.

5. Click "Create". Your annotation is saved to your dashboard.

How to Save a Dashboard

Once you create or open a dashboard, follow these steps to save it:

1. Click the "Save" icon. A Save Dashboard pop-up window opens:
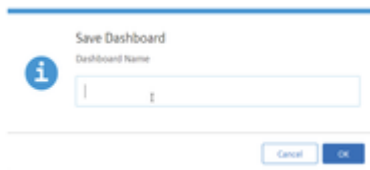
2. Enter a name in the "Dashboard Name" field.

3. Click the "Save" button. A message indicates the dashboard was successfully saved and the Save Dashboard pop-up window closes.

How to Rename a Dashboard

Follow these steps to rename a dashboard:

1. Open the dashboard you want to rename.

2. Click the "Save" icon. A Save Dashboard pop-up window opens:

3. Enter the new name in the Dashboard Name field.

4. Click the "Save" icon. A message indicates the dashboard was successfully saved and the Save Dashboard pop-up window closes.

Sharing Dashboards

You can share your dashboards with your organization's users and user groups that have the appropriate permissions; however, shared dashboards cannot be edited by those with whom the dashboard has been shared.
Here is an example of the Share Dashboard dialog:

Sharing dashboards among subtenant users is not supported.

How to Share a Dashboard

Open the dashboard you want to share, and follow these steps:

1. With the dashboard open on your screen, click the "Share" icon. The Share Dashboard window displays the list of available users and user groups.

2. Select the "+" icon next to the email addresses or group designation you want to share the dashboard with. The username and email address or group designation is added to the "Shared with" list.

3. When you finish, click "Share". A message indicates the dashboard was successfully shared and a Shared icon displays next to the Dashboard name at the top of the Dashboard window.

How to Link a Dashboard to an Asset

You can link a dashboard to a specific asset, which is helpful when you want to see the dashboard KPIs at the asset level. Follow these steps to link your dashboard to an asset:

1. Click the "Explore" icon in the menu bar.

2. Select "Dashboards" from the list of objects to explore. The Dashboards page displays the dashboards you have access to.

3. Select the dashboard you want to link and click the "Link" button. A list of assets displays.

4. Select the assets you want to link, click "Save".

> ✏️
>
> Sharing dashboards among subtenant users is not supported.

How to Delete a Dashboard

To delete a dashboard, switch to Design mode (otherwise the Delete button may not appear) and follow these steps:

1. Open the dashboard you want to delete.

2. Select or switch to 'Design mode'.

3. Click the "Dashboard Delete" icon. An Are You Sure? message displays.

4. If you're sure, click "OK". A message indicates the dashboard was successfully deleted.

5.5 Creating a Dashboard Overview

Creating a dashboard takes two to four steps, depending on whether or not you want to 'keep it simple' or take advantage of the data source configuration filters, and widget design options in Insights Hub Monitor Dashboards. You also have the option when creating a dashboard to navigate to Dashboard Designer to create the dashboard, as discussed below.
The four steps are, in order of use:

- Add the "data sources" you plan to use in the dashboard. Refer to Adding Data Sources to Dashboards for more information.

- Drag "widgets" onto the design space. Refer to Adding Widgets to Dashboards.

- Optionally "configure the data source" with filters, dates, variables, etc. Refer to Configuring Data Sources Overview.

- Optionally design your widget with color, labels, positioning, legend, borders, etc. Refer to Design a Widget tab.

Using Dashboard Designer for Dashboard Design

You can also design your dashboard in Dashboard Designer. After you click the "Add a Dashboard" link, the Dashboard Designer button displays in the top row of icons. Click the button to navigate to Dashboard Designer. You can begin creating your dashboard. If you need help in Dashboard Designer, click the magnifying glass icon at the top left of the page, next to the side bar.

Icons on the Dashboard Page

The dashboard user interface contains navigation links on the left side of the page, a central space that holds widgets, and tabs on the right for adding and configuring data sources and designing widgets.

There are two banks of icons at the top of the design space:

- The center bank of icons (highlighted in "light red") applies to the widget you select.

- The bank of icons toward the right at the top of the design space (highlighted in "blue") are for quick actions like, adding, saving, deleting, and sharing dashboards.

- The three icons at the far right (surrounded in "light blue line") open panels where you can add and configure data sources and design widgets.

Illustration of the Dashboard Page Icons

This image illustrates the Dashboard page with notations showing which parts of the dashboard (widgets, data sources, or entire dashboard) the action icons apply to, as discussed above.
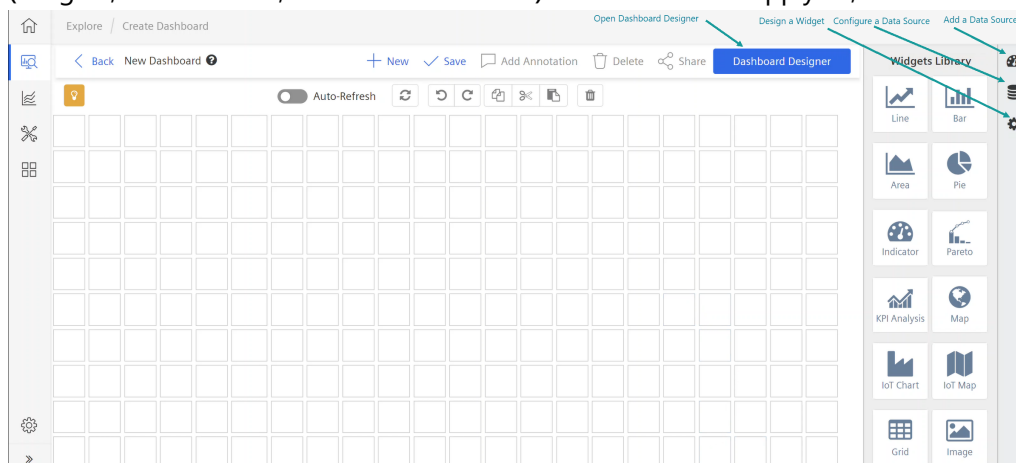
①   Opens Help documentation
②   Add Data Sources
③   Configure a Data Source
④   Design a Widget

5.6   Adding Data Sources to Dashboards

Adding Data Sources to Dashboards Overview

This topic covers the first step in creating a dashboard—adding the data sources you want to use in your dashboard. You can mix and match different types of data sources on a dashboard, but can only use one data source type per widget.

About Adding Data Sources to Dashboards

Here are some features to be aware of, in general, when adding data sources:

- If the Widget Library is hidden, click the double-chevron icon to collapse the configuration tabs. Click to expand; Click to collapse.

- You can upload a new Integrated Data Lake (IDL) data source in the same window in which you select an IDL data source.

- As you select data sources, the names display in the Data Sources tab as hyperlinks, along with:

  ○ Data source name.

  ○ Data type—a badge displays to indicate the data source origin.

  ○ A delete icon.

  ○ The data source names that display on the Data Sources tab are hyperlinks. Click one to open the data source for viewing or editing.

  ○ If you add a data source but don't have time to configure it or add it to a widget, Dashboards automatically saves it to the dashboard.
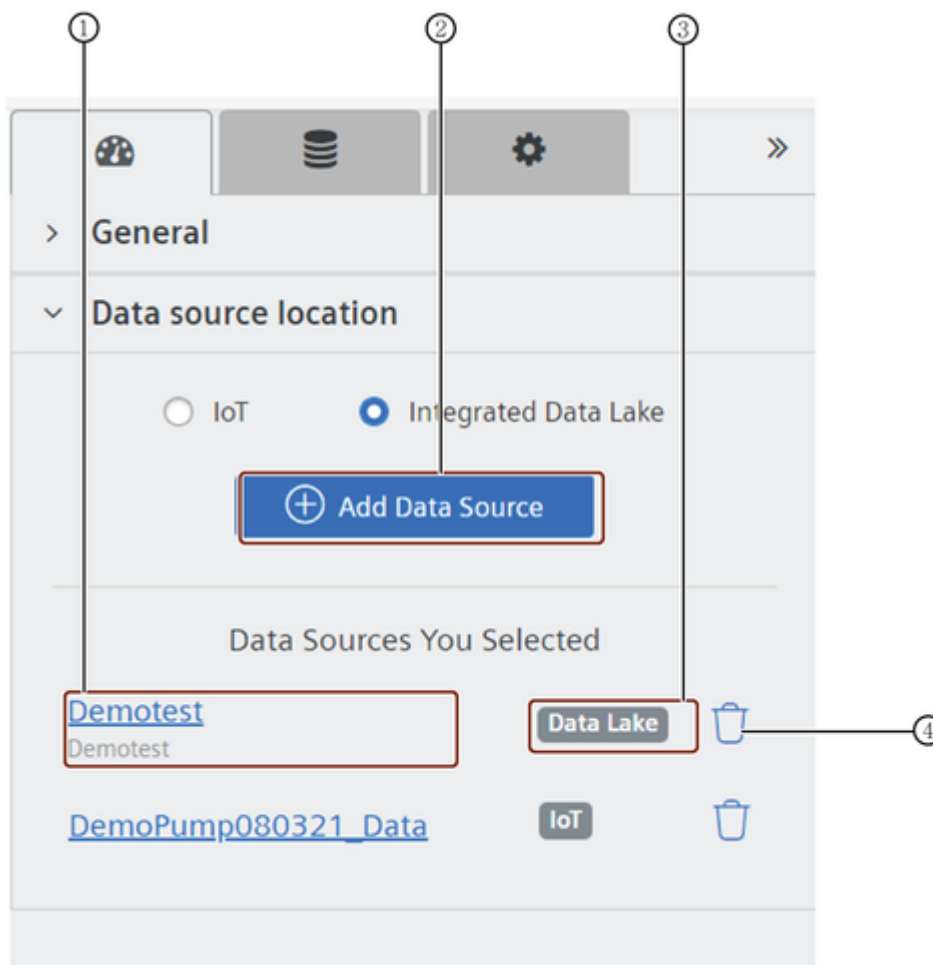
① Data Source names are hyperlinked. Click a name to open the View/Edit Data source page.

② Add Data Source

③ Badge indicate the origin of the Data Source.

④ Delete

How to Add an Integrated Data Lake (IDL) Data Source to a Dashboard

Dashboards is capable of reading data—unstructured and structured—stored in the Integrated Data Lake, and writing that data to your dashboard, where you can use it immediately in widgets, or you can configure the data with settings that can focus on specific attributes and values.

About Chart Widgets Based on Data Sources with a Relative Time Range

When you select auto-refresh for a chart widget based on the data configured with a relative time range (today, yesterday, last seven days, last thirty days, this month, last month), the chart widget will advance as time moves forward and the widget will be refreshed according to the relative time range.

How to Add an IDL Data Source to a Dashboard

Follow these steps to add an IDL data source to your dashboard:

1. Click the "Add Data Sources" tab, then select the "Integrated Data Lake" radio button.

2. Click the "Add Data Source" button. The Integrated Data Lake Data Sources window displays.

3. Select the CSV radio button, then select the "folder" that holds the file you want to use on your dashboard.

4. To see the file schema (optional), click the "filename". The schema displays to the right but is not editable in this window.

5. Click the "Add Data Source" button. The pop-up window closes and the data source name displays in the Data Sources You Selected list.

6. Repeat "steps 1-7" to add additional data sources to your dashboard.

Next Step: **Adding widgets to your dashboard**. Refer to ["Adding widgets to your dashboard"](#) for step-by-step instruction.

How to upload a new data source to IDL

If you need to use an IDL data source that you have not yet uploaded to the data lake, you can do so directly from the IDL window in which you select a data source. Follow these steps to upload a new data source to IDL:

1. Navigate to the folder in the data lke where you want to upload the new data (see steps 1-3 in the section for adding an IDL data source).

2. Click the "Upoad to IDL" button. The IDL Data Explorer window opens.

3. Click "Upload Objects". Your File Manager window opens.

4. Select the file to upload. The file name displays in the Upload Objects window.

5. Click the Upload button. The system displays a Success message and the data displays in your IDL folder next time you open it.

How to Add a Time Series Data Source to a Dashboard

The IoT Time Series widget allows you to query and view time series data with precision to one millisecond. Dashboards can read IoT Time Series data from an asset and its aspects, and write that data to your dashboard, where you can use it immediately. This topic covers adding an IoT Time Series data source to your dashboard.
Follow these steps to add an IoT TS data source to your dashboard:

1. Click the "Add Data Sources" icon. The Add Data Sources tab opens.

2. Select the "IoT" or "Time Series" radio button.

3. Click the "+Add Data Source" button. The IoT Time Series pop-up window opens.
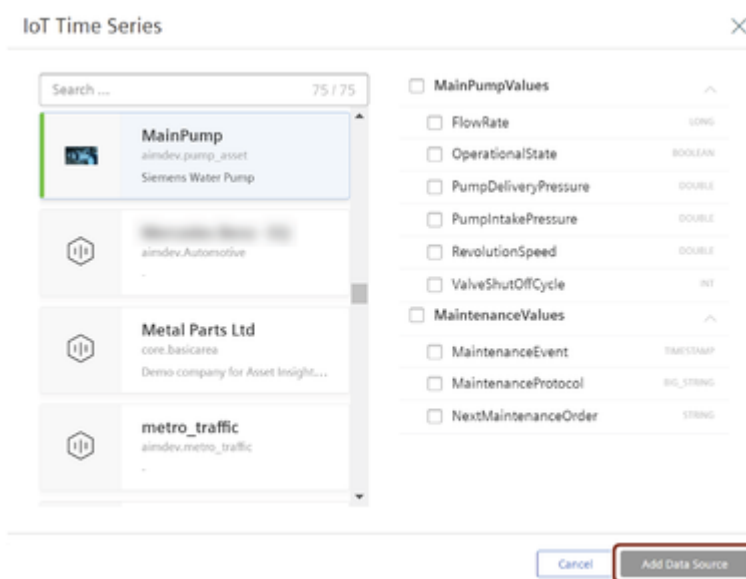
4. Select or search for the "asset" you want to use. The aspects associated with the asset display in the list to the right.

5. Select the "aspects" you want to use, or select the "check box" at the top of a list section to select all.

6. Click the "Add Data Source" button. The pop-up window closes and the data source name displays in the Data Sources You Selected list.

7. Repeat steps 1-7 to add additional data sources to your dashboard.

Click [Adding widgets to your dashboard](#) for step-by-step instructions on adding widgets to your dashboard.

5.7 Adding Widgets to Dashboards

Widgets Overview

The typical process of creating a dashboard starts with adding data sources, followed by adding widgets to the dashboard, but you can open any dashboard and add widgets to them at any time. For information on customizing the widget appearance, please see the "Designing Widgets" section in this Help document.

This topic covers adding a widget or widgets to a dashboard, and you can follow links at the bottom of this page to navigate to step-by-step instructions for Adding a specific Dashboards widget to your dashboard.

Widget Library

There are more than a dozen widgets in the library, although the widgets that display in your instance of Insights Hub Monitor Dashboards vary according to the apps, subscriptions, packages, and/or services your organization has purchased.

Some widgets are obviously suited to specific data types or the data source; for example, the map widget uses geographic data that typically involves fields like latitude and longitude and is unsuitable for use with other types of data. If your organization doesn't involve machines or manufacturing, you will probably not use the IoT Chart widget or IoT times Series data sources that are used to track and analyze production data from manufacturing lines and machine tools.

Widget Library Example

Here is an example of the Widget Library:
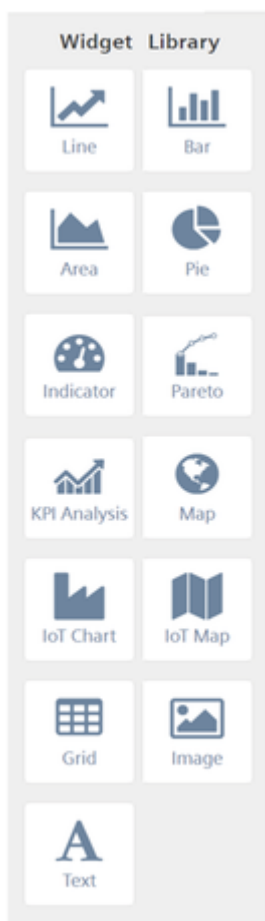
The Pie chart widget is not supported in all subscriptions and offerings. The KPI Analysis Widget in only available if your organization subscribes to Insights Hub Monitor's KPI Analyzer app.

About Chart Widgets

Chart widgets contain some additional functionality within the widget itself:

- Zoom: Zoom in on chart data by dragging a selection rectangle with your mouse around the area you want to zoom in on.

- Scroll: You can also click the double arrows in the upper right corner of a widget to scroll to the right or left along the X-Axis.

- Export: You can optionally display an Export icon on the widget for conveniently exporting the data.

- Auto-Refresh: When you select auto-refresh for a chart widget based on data configured with a relative time range (today, yesterday, last seven days, last thirty days, this month, last month), the chart widget will advance as time moves forward and the widget will refresh according to the relative time range. You may see a progress spinner when data is refreshing.

Widget Action Icons

Widgets are controlled through the action icons at the top of the design space:

Click an action icon to:

- Auto-Refresh—move the slider to the "On" position to continuously and automatically refresh the widget. If you turn on auto-refresh, the system retains the setting and refreshes data automatically.

- Refresh now—refresh widget data (for widgets not set to auto-refresh)

- Undo—undo the last action taken

- Redo—redo the last action taken

- Copy—copy the selected object and place it on the clipboard

- Cut—cut the selected object and place it on the clipboard

- Paste—paste the object from your clipboard onto the design space

- Delete—delete the selected object; this does not place the object on the clipboard.

Widget Settings

When you add a widget to a dashboard, it displays dummy data, and default settings, such as where the legend is placed. Some visualization settings, like the widget name, subtitle, and description, are configured when you add a data source to the widget. The rest of the visualization settings are optional—you can customize the widget appearance in the Design a Widget tab, or you can use the default settings. To open widget settings, click the gear icon in the upper right corner of the widget, then select the Design a Widget tab.
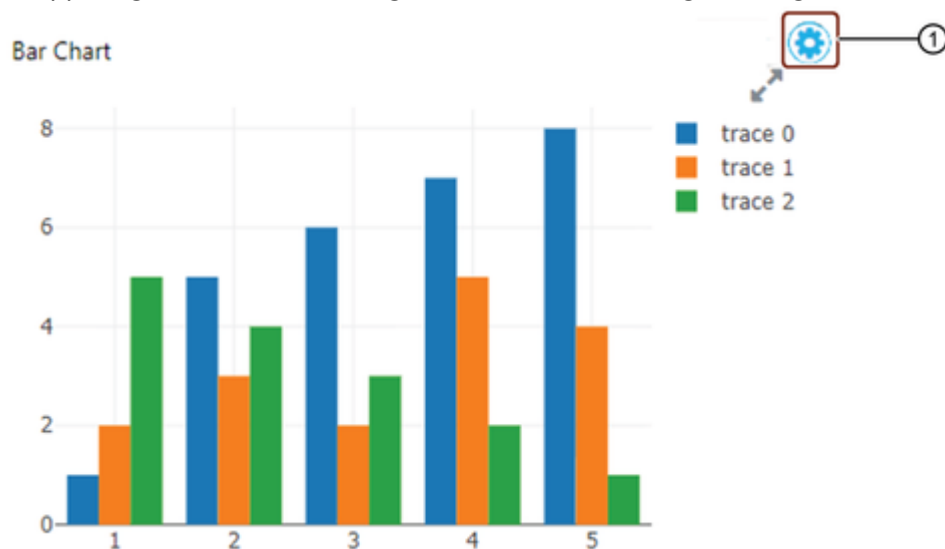
①   Click to open widget settings

Default Display Settings for Widgets

If you decide to use the default widget settings rather than customizing the widget, the list below describes what the default settings are. Not all settings are used in all widgets; for example, a map widget will not use settings for vertical and horizontal grid lines.
Here are the default settings:

- Title: generic name, such as "Bar", "Line", "Grid", "Map", etc.

- Title alignment: left, top

- Title color: black

- Title font size: 12

- Subtitle: blank

- Description: blank

- Legend: show

- Legend position: right

- Vertical grid lines: show

- Horizontal grid lines: show

- Maximize widget arrows: show

- Legend position: right

- Show Legend: show

Configuring Widget Settings

Each widget type has unique settings. Click a link to go to instructions on configuring a certain widget type:

- Line Chart

- Bar Chart

- Area Chart

- Pie Chart

- Indicator

- Pareto

- KPI Analysis

- Map

- IoT Chart

- IoT Map

- Grid

- [Image](#)

- [Text](#)

Line Chart Widget

This topic is for the step of adding a Line Chart widget to your dashboard.

Here is an example of the Line Chart widget icon:
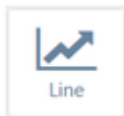
How to Add a Line Chart Widget to a Dashboard

Follow these steps to add a line chart widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Enter or make selections for the fields in the General, Vertical Axis, Horizontal Axis, and Widget Appearance sections. The system automatically saves your entries and selections.

Click [here](#) for step-by-step instructions on configuring a data source for your widget.

Bar Chart Widget

This topic is for the step of adding a Bar Chart widget to your dashboard.

Here is an example of the Bar Chart widget icon:

How to Add a Bar Chart Widget to a Dashboard

Follow these steps to add a bar chart widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter the widget name in the "Title" field, and optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Enter or make selections for the fields in the General, Vertical Axis, Horizontal Axis, and Widget Appearance sections. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Area Chart Widget

This topic is for the step of adding an Area Chart widget to your dashboard.
Here is an example of the Area Chart widget icon:
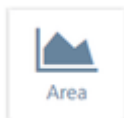
How to Add an Area Chart Widget to a Dashboard

Follow these steps to add an area chart widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter the widget name in the "Title" field, and optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Enter or make selections for the fields in the General, Vertical Axis, Horizontal Axis, and Widget Appearance sections. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Pie Chart Widget

> ✏️
>
> The Pie chart widget is not supported in all Insights Hub Monitor subscriptions and offerings.

The steps below are for adding a Pie Chart widget to your dashboard.
Here is an example of the Pie Chart widget icon:

How to Add a Pie Chart Widget to a Dashboard

Follow these steps to add a Pie chart widget to a dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Select whether to display the bar or line chart as the default display. You can switch between them on the widget.

7. Either accept the default visualization settings for the widget, or proceed to step 6.

8. Enter or make selections for the fields in the General, Vertical Axis, Horizontal Axis, and Widget Appearance sections. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Indicator Widget

This topic is for the step of adding an Indicator Chart widget to your dashboard.
Here is an example of the Indicator widget icon:

How to Add an Indicator Widget to a Dashboard

Follow these steps to add an indicator widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Enter or make selections for the fields in the General and Widget Appearance sections. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Pareto Widget

This topic is for the step of adding a Pareto chart widget to your dashboard. Go here for information on customizing the widget design.
Here is an example of the Pareto Chart widget icon:

How to Add a Pareto Chart Widget to a Dashboard

Follow these steps to add a Pareto chart widget to a dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Select whether to display the bar or line chart as the default display. You can switch between them on the widget.

7. Either accept the default visualization settings for the widget, or proceed to step 6.

8. Enter or make selections for the fields in the General, Vertical Axis, Horizontal Axis, and Widget Appearance sections. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

KPI Analysis Chart Widget

> 🖉
>
> The KPI Analysis Widget in only available if your organization subscribes to Insights Hub Monitor's KPI Analyzer app.

The steps below are for adding a KPI Analysis chart widget to your dashboard. Go here for information on customizing the widget design.
Here is an example of the KPI Analysis widget icon:

How to Add a KPI Analysis Widget to a Dashboard

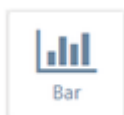Follow these steps to add a KPI analysis widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Enter or make selections for the fields in the General, Vertical Axis, Horizontal Axis, and Widget Appearance sections. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Map Widget

This topic is for the step of adding a Map widget to your dashboard. Go <u>here</u> for information on customizing the widget design.

If your intention is to add an "IoT Map" widget, go <u>here</u>, as this topic is for generic map widgets. Here is an example of the Map widget icon:

How to Add a Map Widget to a Dashboard

Follow these steps to add a map widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Select or enter values for the fields in the General and Widget Appearance sections. The system automatically saves your entries and selections.

Click <u>here</u> for step-by-step instructions on configuring a data source for your widget.

IoT Chart Widget

This topic is for the step of adding an IoT Chart widget to your dashboard. Go <u>here</u> for information on customizing the widget design.

Here is an example of the IoT Chart widget icon:
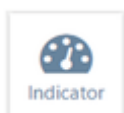

How to Add an IoT Chart Widget to a Dashboard

Follow these steps to add an IoT chart widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Select or enter values for the IoT Settings and Widget Appearance fields. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

IoT Map Widget

This topic is for the step of adding an IoT Map widget to your dashboard. Go here for information on customizing the widget design.
The Map widget uses the coordinates of the asset data. To change them, access them in the Asset Manager.
Here is an example of the IoT Map widget icon:
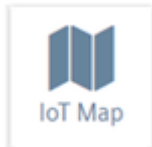
How to Add an IoT Map Widget to a Dashboard

Follow these steps to add an IoT map widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 6.

7. Select or enter values for the General and Widget Appearance fields. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Grid Widget

This topic is for the step of adding a Grid widget to your dashboard. Go here for information on customizing the widget design.

Here is an example of the Grid widget icon:

How to Add a Grid Widget to a Dashboard

Follow these steps to add a grid widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Either accept the default visualization settings for the widget, or proceed to step 5.

7. Select or enter values for the General and Widget Appearance fields. The system automatically saves your entries and selections.b.

Click here for step-by-step instructions on configuring a data source for your widget.

Image Widget

This topic is for the step of adding an Image widget to your dashboard. Go here for information on customizing the widget design.

Here is an example of the Image widget icon:
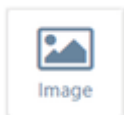
How to Add an Image Widget to a Dashboard

Follow these steps to add an image widget to your dashboard:

1. Drag the widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

6. Select or enter values for the "Image Stretch", "Image Source", and "Image URL" fields. The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Text Widget

This topic is for the step of adding a Text widget to your dashboard. Go here for information on customizing the widget design.
Here is an example of the Text widget icon:
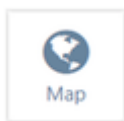

How to Add a Text Widget to a Dashboard

Follow these steps to add a Text widget to your dashboard:

1. Drag the text widget and drop it onto the dashboard.

2. Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

3. Click the Configuration ⚙ icon. The Configure a Data Source tab opens and displays a drop-down list of data sources you have added to the dashboard.

4. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab.

5. Enter a name for the widget in the "Title" field, and enter an optional "subtitle", and optional "description". The system automatically saves your entries and selections.

Click here for step-by-step instructions on configuring a data source for your widget.

Advanced Widget Functionality

Creating Integrated Data Lake (IDL) Charts with Multiple Y-Axes

Multiple Y-Axes are available for bar, line, and area charts that use IDL data sources. The greatest advantage of multiple Y-Axes is in revealing relationships among multiple fields that are not readily apparent when switching between two or more single Y-Axis charts. They often reveal data trends that otherwise might go unnoticed.

Dashboards supports multiple Y-Axes in the following chart types:

- Line

- Bar

- Area

Split Y-Axis Check Box Illustration

The split Y-Axis feature is available as a check box option in the General section of the Design a Widget tab:

About IDL Charts with Multiple Y-Axes

While there is no limit to the number of fields you can add to a Y-Axis, there are limitations that are important to familiarize yourself with, including:

- With the exception of the two cases below, you can add an unlimited number of fields to the Y-Axis configuration box, however:

    ○ When multiple fields have already been added to the Y-Axis configuration box, the system blocks adding fields to the Group By (X-Axis) configuration box.

    ○ If there are already fields in the Group By (X-Axis) configuration box, the system allows only one field in the Y-Axis configuration box.

- While there are no limitations on the data types you can add to the Y-Axis configuration box, when multiple data types are added (e.g., string, numeric), the Y-Axis values will render as stacked. Numeric values, including double, integer, etc., will be combined, but not stacked.

- When the Y-Axis configuration box holds two numeric fields, and the X-Axis configuration box holds one field, the Y-Axis displays a number range that provides for both numeric fields; if an additional field of date or text type is added to the Y-Axis configuration box, the Y-Axis in the chart renders the original number range, plus a range for the stacked text/date with the numeric range.

Examples of Multiple Y-Axes Charts

Here are examples of the line, bar, and area charts configured with multiple Y-Axes, and one line chart with a split Y-Axis:

5.7 Adding Widgets to Dashboards

How to Configure a Chart with Multiple Y-Axes

You can configure bar, line, and area charts based on IDL data sources with multiple Y-Axes and split Y-Axes.

Drag the type of chart widget to the workspace, select and configure its IDL data source, then follow these steps to configure the widget with multiple Y-Axes or split Y-Axes:

1. Select the line, bar, or area Chart widget you want to add multiple Y-Axes to.

2. Click the Configuration ⚙ icon in the widget. The Configure a Data Source tab opens.

3. Enter a name for the widget in the "Title" field, add content to the "Subtitle" field (optional), and the "Description" field (optional).

4. Under General, select an option from the "Chart Type" drop-down list, and select the "Split Y-Axis" check box.

5. Select the "Show Legend" check box if you want the widget to display the selected fields.

6. Drag as many fields from the data source to the Value Y-Axis box as you want. The system displays the field names in the legend the Value Y-Axis list and renders data for each field on the chart's left vertical Y-Axis.

7. Continue to enter or select values for the remaining (optional) fields in the "Design a Widget" tab.

8. When finished, click the "double chevron" to close the tab.

9. Click ✓ Save to save your widget and dashboard. The system displays a Success message.

Drilling Down Into Data in a Chart Widget

This topic covers the Insights Hub Monitor dashboard feature that allows you to drill down into successive layers of data from a widget. If you haven't done so already, please read the Adding Labels to Data Sources to Facilitate Drilling Down Into Data topic in this Help.
Creating a widget that depends on another widget's data is another way of saying, "create a 'child' widget". In such a scenario, you add a data source to a chart widget which you can configure with the dates and attributes involved in the process or object you are tracking, then select a data point to view the attributes that make up the data point you are interested in. That requires some preparation so that when you click a data point in the 'parent' widget, the 'child' widget is able to display the attributes that make up the data point in the 'parent' widget.
This topic covers several aspects of the dashboard drill-down functionality. Follow a link below to navigate to a specific section:

- Data Dependency—Setting up the relationship between 'parent' and 'child' widgets

- Label Mapping Between Data Sources

- IoT Chart Widget—Behaviors and limitations

- IoT Chart Widget Drill Down Example

- IDL Chart Widget—Behaviors and limitations

- IDL Chart Widget Drill Down Hierarchy in Group By (X-Axis) Box Example

- IDL Chart Widget Drill Down Example

Multiple X-Axis Fields Scenarios

While there are different requirements for the X-Axis fields for both IDL and IoT chart widgets, there are some scenarios, in general, that are important to be aware of about multiple X-Axis fields in a chart, including:

- When you add more than one field to a chart's X-Axis, this step actually turns on the drill-down functionality. Clicking a data point in the chart makes the widget drill down into its own data.

- When multiple X-Axis fields are present, each drill-down zooms into the X-Axis fields sequentially, in the order in which they were added.

- With one widget selected, adding a widget as a 'child' in the 'data dependency' section connects the two, so when you click a data point in the first 'parent' chart, the drill-down results are written to the connected 'child' widget.

- You can turn on the drill-down functionality by adding multiple fields to the chart's X-Axis, and select an existing widget from the drop-down list in the 'Data Dependency' section. These selections, combined, creates a scenario in which when you select a data point in the first 'parent' widget, both the 'parent' and 'child' widgets reflect the drill down.

About Drilling Down Into Data

You can drill down from data sources derived from the data lake (IDL) and select an IoT chart to visualize the details, and vice versa. Drilling down into data in a chart widget is roughly the same for both IoT and IDL data sources. The Behaviors sections below describe how the drill down feature works for both IDL and IoT data sources and describes the features, prerequisites, and limitations.

In both IDL and IoT chart widgets, you can use the hyperlinked breadcrumb trail at the top of the 'child' widget to navigate back to any layer of the drill down:
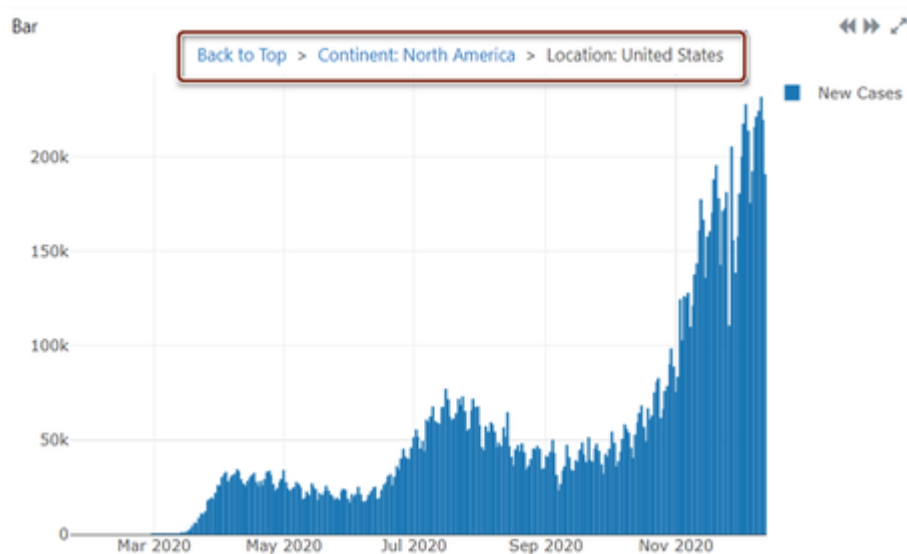
- As long as the widget meets the prerequisites discussed below, you can drill-down. Also, two visual indicators signal a chart widget can serve as a parent for drilling down:
    - "Click a data point to drill down" displays at the top of the chart, as shown in the image below.

When you hover your mouse over a data point (such as a bar in the image below),

○ it turns red.
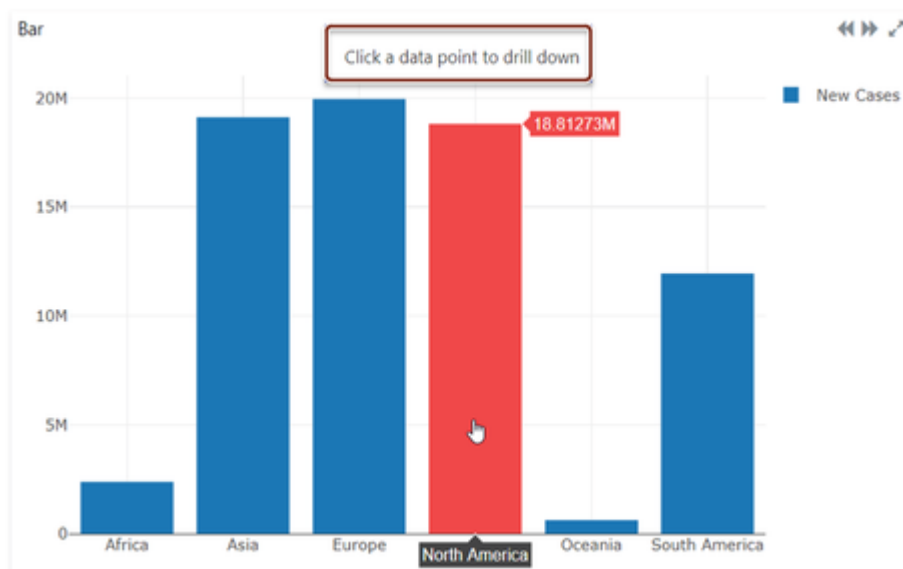
Prerequisites for Drilling Down for both IoT and IDL Chart Widgets

These conditions affect whether you can drill down into chart widget data:

• Data sources must contain at least 5,000 records. Records for the CSV data source type means the number of rows; for Parquet, it means the number of columns.

• IDL charts must have two or more fields in the Group By (X-Axis) configuration box.

• These types of chart widgets with IoT or IDL data sources support drilling down:

  ○ Line

  ○ Bar

  ○ Area

Drilling Down: Setting Up 'Parent' and 'Child' Widgets

The Drill-down widget drop-down list displays the names of all the widgets that appear on your dashboard. To create the relationship between the 'parent' and 'child' widget so you can drill down from one to the other, you have set up the relevant widgets with the asset / aspect and/or folder / file you want to use; once you have those set up, then you can select the 'parent' widget on your dashboard. With that widget selected, select the 'child' widget from the drop-down list to create that connection.

This image shows the drop-down list where you select the 'child' widget; the 'child' widget depends on the 'parent' widget's data:

① Select the parent widget on your Dashboard

② Select a widget from the drop-down list to serve as the 'child' widget

Example of an IoT Chart Widget Drill Down

In this example, a user wants to see the details of a machine on an assembly line when that machine hits a peak in consuming resources during a manufacturing run. The user wants to see the status, pressure, temperature, and velocity data at a particular time.

Two chart widgets should be set up for the drill down: one (the parent) displays the amount of resources consumed during a manufacturing run, and the second (the child) displays the aspects of the asset involved for the data point you select in the 'parent' widget.

Drilling Down: IoT Chart Widgets

When using IoT chart widgets for drilling down into data, please be aware of the following limitations and behaviors:

- One level of drilling down is supported for IoT chart widgets.

- In configurations in which further drill downs are allowed, the drill-down cannot drill deeper than a one minute time increment.

- You cannot select a time range of more than 90 days for IoT drill downs.

- The time stamp data of the parent chart carries through to the child.

- When you select time ranges of:

    o 1 - 90 days, the results are aggregated and values display as days.

- 1 hour - 1 day, the results are aggregated and values display as hours.

- Less than one day, the results are aggregated and values display by the hour.

- When you select:

  - 1 hour, the system displays aggregated values by the minute for the hour selected.

  - Ranges of less than one minute (To value) to less than one hour (From value) the time displays by minute.
    Ranges of less than one second (To value) to less than one minute (From value), the time displays as IoT TS raw data.

Drilling Down: IDL Chart Widgets

When using IDL chart widgets for drilling down into data, please be aware of the following limitations and behaviors:

- You can drill down into IDL data an unlimited number of times, but certain factors affect the number of drill downs you can perform, such as:

- Drill down depth is limited by the number of attributes you drop into the Group By / X-Axis configuration box.

- Attributes that display in 'child' charts is determined by the order in which you add the attributes to the Group By / X-Axis configuration box of the 'parent' chart widget.

- Use drag and drop to rearrange attributes in the Group By / X-Axis configuration box.

Example of a Group By (X-Axis) Drill Down Hierarchy

This image demonstrates the hierarchy in IDL chart drill downs—'Continent' was the first field added to the Group By / X-Axis configuration box in the 'parent' chart, therefore, the drill down 'child' chart displays the Continent field attributes, namely, the countries data that make up the continent field. When you drill down into one of the bars (continents) in the 'child' chart, the subsequent chart will display the attributes of that bar, namely, "location", and so on, as you continue to drill down.
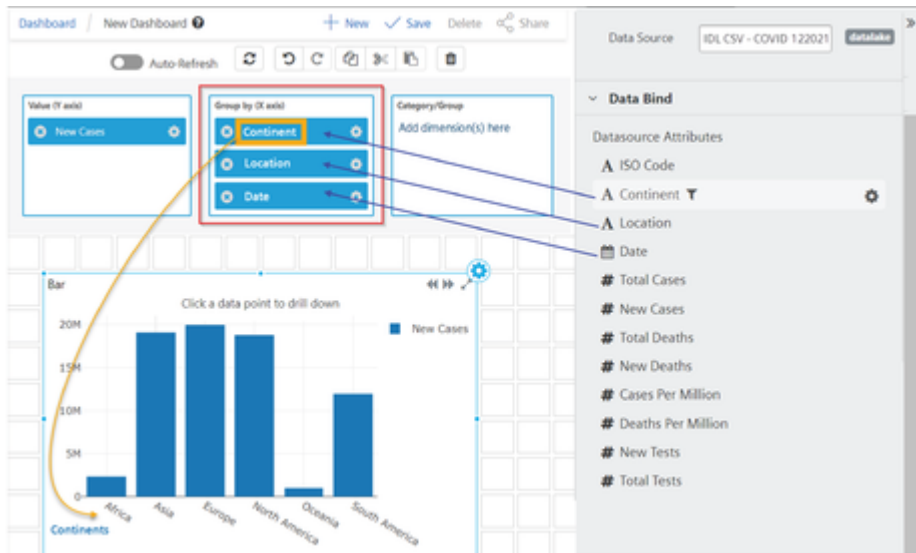
Example of an IDL Chart Widget Drill Down

This image illustrates the relationship of each drill down iteration, from left to right, then bottom, if no more than 1 X-Axis field is included:
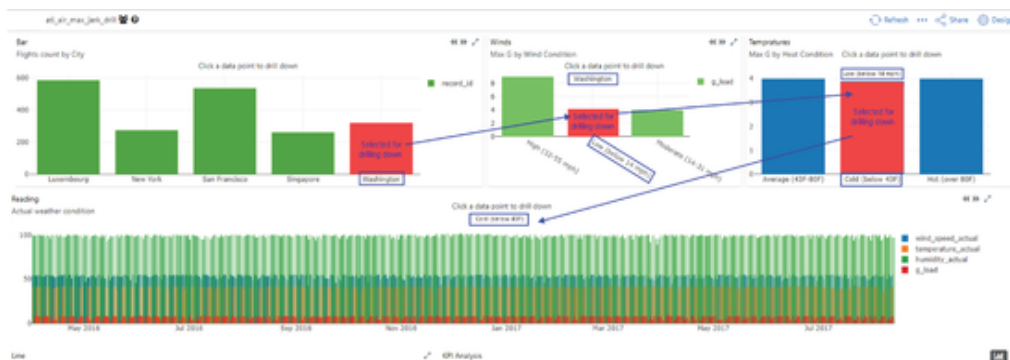
5.8   Configuring Data Sources

Configuring Data Sources Overview

Insights Hub Monitor dashboards are capable of reading very large files from a variety of sources. There are many strategies employed in large data repositories like data lakes and the cloud, that allow you to focus on portions of data both before reading the data source and after the data is written to your dashboard.

Data source configuration in dashboards begins after reading the data from the source and writing it to your dashboard. Once the data source is added to your dashboard, its name appears as a hyperlink in the "Data Sources You Selected" section on the Data Source Configuration tab:
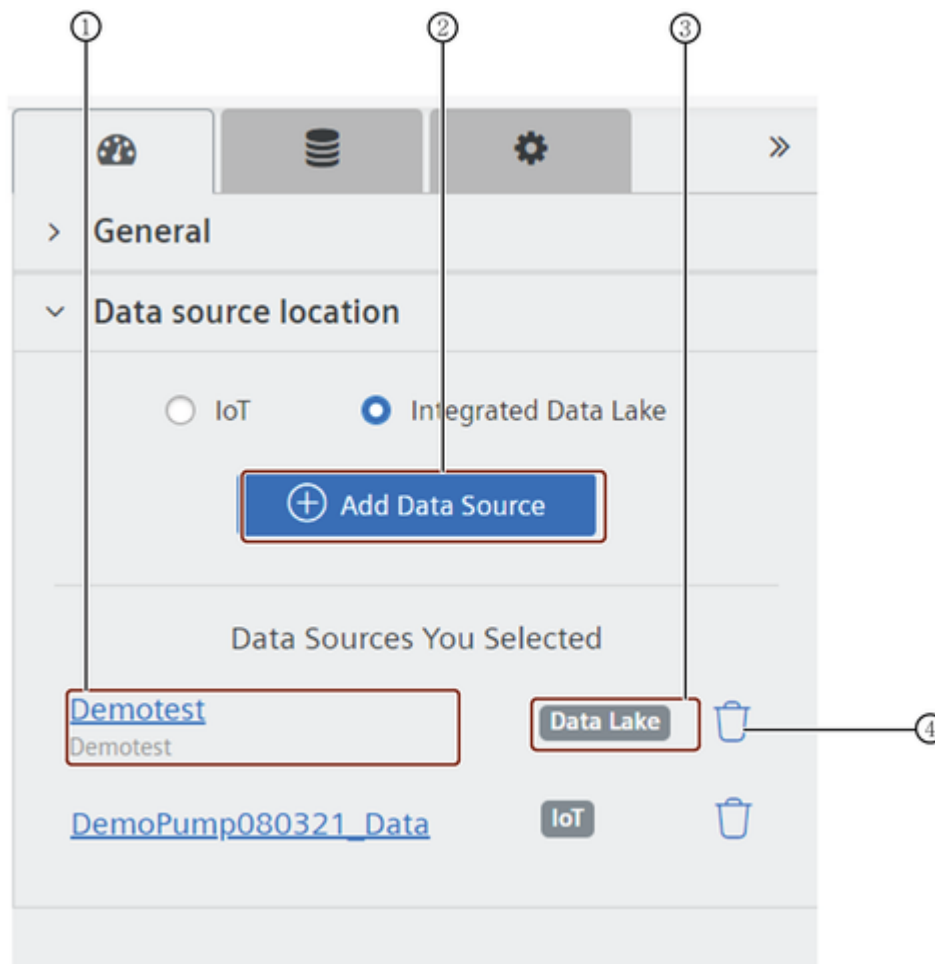
①   Data Source names are hyperlinked. Click a name to open the View/Edit Data source page.

②   Add Data Source

③   Badge indicate the origin of the Data Source.

④   Delete

About Configuring Data Sources

Here are some helpful points to be aware of when configuring data sources:

- **Widget Library**: often the widget library is hidden by the configuration tabs; if you don't see it, click the double chevron.

- **Data Sources**: configuration options depend on the data source and widget involved, so each configuration is unique. OI Dashboards comes with default visualization settings that you can accept, or you can tap into the myriad options for customizing widget data and appearance.

- **Select All**: where lists of objects appear, often there are check boxes near the top that allow you to 'select all' or 'select none'; this comes in handy when you want to include almost all, or exclude almost all attributes, filters, etc.

- **Toggle**: used in many data source pop-up windows, toggles appear gray when inactive: ; and turn blue when you side the dot to the right:

View Data Source Page Example

This example of the Data Source View/Edit page is annotated with explanations about various features:

Jump to step-by-step instructions on <u>How to Configure an IDL Data Source</u>.

Jump to step-by-step instructions on <u>How to Configure an IoT Data Source</u>.

Configuring an IDL Data Source

This topic explains how to configure an IDL data Source for use in dashboard widgets. We highly recommend that you read the <u>Adding Data Sources to a Dashboard Overview</u> topic, if you haven't already done so.

About Adding IDL Data Sources to a Dashboard

Here are some important points to be aware of when adding IDL data sources:

- Data Lake stores both CSV (a row-based storage format) data and Parquet (a columnar storage format) data.

- Files that reside in the IDL "root" folder cannot be used as a data source.

- To view the data source schema, select the folder that holds the data source file and click the filename.

- After adding the data source, you can edit the fields and labels, change data types, and apply other filters, as described below.

- You can add a data source and come back later to configure it or add it to a widget, the dashboard automatically saves it.

> ✏️
>
> When adding a CSV data source make sure to not use spaces or hyphens in the column names or filenames. Also, if the data source has a Date field formatted as, "yyyy-mm-dd", do not convert it to a timestamp data type, as this will cause your KPI to fail.

Configuring an IDL Data Source Chart Widget

While the configuration steps are similar, there are some differences between IoT and IDL Data Sources; this section applies to IDL data sources alone.
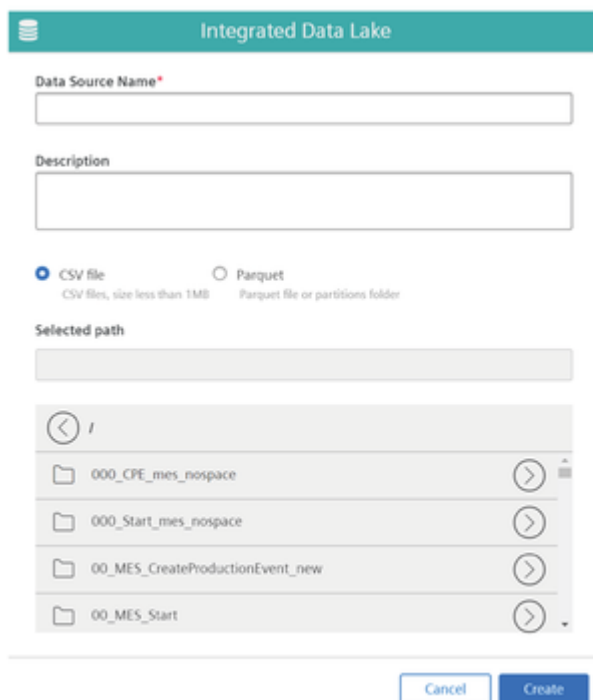
Prepare Data Sources and Chart Widgets

Before configuring a data source, if you have not done so already, you must add two items to the dashboard:

- The data source you want to use

- A chart widget or widgets for visualizing the data source

IDL Data Source Selection Pop-up Window Illustration

Here is an illustration of the Integrated Data Lake pop-up window where you select the folder that contains the data source file you want to use:

Example of the Data Source Configuration Page for an IDL Data Source

Here is an example of a dashboard with the Configure a Data Source tab open with the Data Source fields displayed beneath "Data Source Attributes":
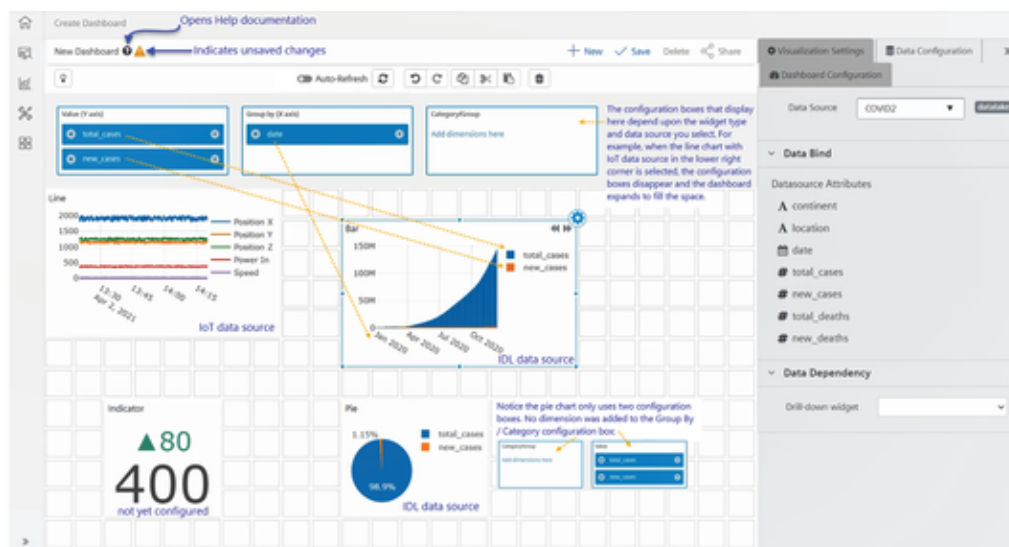
How to Configure an IDL Data Source for a Chart Widget

When you select an IDL data source, depending on the widget type, some configuration boxes may display above the center of the dashboard, allowing you to drag and drop attributes (dimensions) from the Configure a Data Source tab to the boxes. This is especially true for line, bar, and area chart widgets. The image above points out that for a pie chart, for example, the number of configuration boxes is different from line or bar charts above it, and will be labeled differently, as well.

Follow these steps to configure an IDL data source:

1. Select the "Widget" you want to add the data source to.

2. Click the "Configure ⚙ " icon in the upper-right corner. The Configure a Data Source tab opens and present a drop-down list of data sources you have added to the dashboard.

3. Select the data source you want to use from the "Data Source" drop-down list. The data source attributes display in the Configure a Data Source tab.

4. Select the "attributes" you want to use in the widget. A Select "All" check box may display at the top of the Data Source Attributes list; click to select All if you want to use all the attributes in your widget; or select "None" so you can individually select attributes by sliding the gray toggle button to the right. The toggle turns blue, the top of the Data Source Attributes list displays the number of attributes you selected.

5. Drag attributes from the Configure a Data Source tab to the "Y-Axis", "X-Axis", and "Group By/Category" configuration boxes at the top of the dashboard space. The widget displays the data according to your selections.

6. If you want to "edit" data source attributes, follow this link to the section, [Editing Data Sources](#).

Configuring a IoT Data Source

This topic covers important information about using time series data, how to prepare the data and widget, and how to configure the data source.

About Adding IoT Time Series Data Sources to Dashboards

Here are some important points to be aware of when adding IoT time series data sources to dashboards:

- Use the Search box to quickly find an asset.

- You can add only one asset at a time, but can add an unlimited number of aspects of an asset.

- The aspect list (on the right) populates only after you select an asset (on the left).

- Select the top, or left-most check boxes to select all fields in the aspect list.

- The far right column identifies the data type (string, date, numeric, timestamp, double) of each aspect.

- After adding the data source, you can edit the fields and labels, change data types, and apply other filters.

- If you add a data source and don't want to configure it or add it to a widget, it is automatically saved with the dashboard.

Prepare Data Sources and Chart Widgets

Before configuring a data source, if you have not done so already, add to the dashboard:

- The data source you want to use

- A chart widget or widgets for visualizing the data source

Example of the Data Source Configuration Tab for an IoT Data Source

Here is an example of a dashboard with the Data Source configuration tab open and the IoT Data Source Attributes displayed in the Configure a Data Source tab:
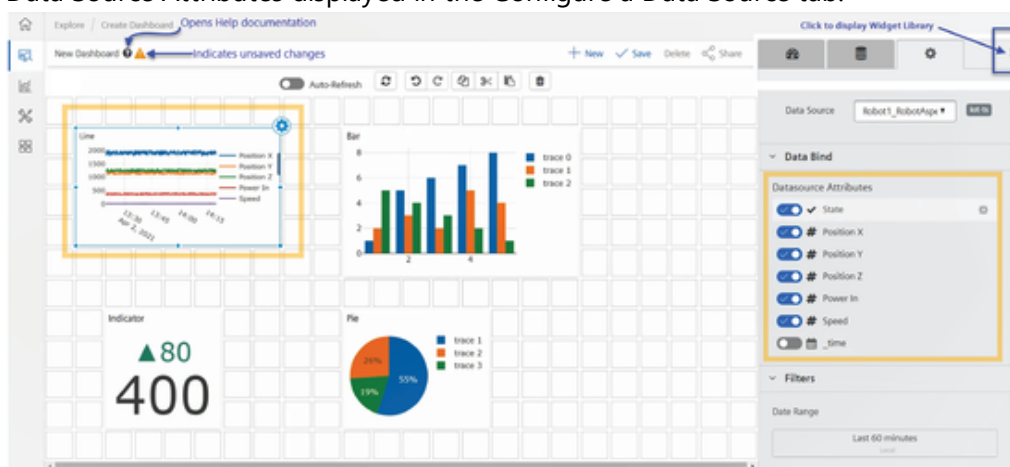
How to Configure an IoT Data Source for a Chart Widget

With an IoT data source, as soon as you select the data source from the drop-down list, the widget populates with the data source fields. You can then expand the widget to see all the attributes and you can also toggle off data source fields you don't want to track in the widget. Follow these steps to configure an IoT data source:

1. Select the "Widget" you want to add the data source to.

2. Click the "Configure" icon in the upper-right corner. The Configure a Data Source tab opens and present a drop-down list of data sources you have added to the dashboard.

3. Select the data source you want to use from the "Data Source" drop-down list. The data source fields display in the Configure a Data Source tab and also populate the chart.

4. Select "All" at the top of the fields list if you want to use all the attributes in your widget; or select "None" so you can individually select fields by sliding the gray toggle button to the right. The toggle turns blue, the top of the Data Source Fields list displays the number of attributes you selected, and the chart refreshes with your field selections.

5. If you want to "edit" data source fields, follow this link to the Help section, Editing Data Sources.

Editing Data Sources

You can edit a data source, the fields contained in a data source, and add other features that will assist you later in more complex dashboard and widget tasks.
Once you've added a data source, there are two ways to open the data source to view or edit its properties. You can:

- Click the data source name on the Add a Data Source tab

- Click the Configure icon in the widget

About Editing Data Sources

While you cannot change the name of a field in a data source, you can add an "alias" and display the alias in place of the field name.
Here are some of the main features of data source editing:

- Indicate the unit of measure a particular field uses; this may come from the data, or you can manually enter a unit of measure.

- Add a description for yourself or for other users (optional).

- Change the data type for a field; for example, you may want to change a data source type so you can run functions against it, so change it from 'string' to 'number'.

- Add labels to a data source that can aid you in drilling down into data when field names don't match from one data source to another.

- Toggle on the Format Values slider to view formatting added to data source fields.

- Delete data sources no longer needed.

Editing Field Names and Data Type in the Dataset Preview Window

This image illustrates the View/Edit Data Source page:

Editing Data Source Fields

There are two ways to open the Edit Field pop-up window:

- At the top of the Dataset Preview table on the View Data Source page, click the pencil icon next to the field you want to edit.

- On the Configure a Data Source tab, select the field, and hover the mouse over the right side of that row to trigger the "Edit" icon to show and click on it. To edit the data source, proceed as follows:

Example of the Edit Field pop-up window

Here is an example of the pop-up window where you can edit a data source field:

Information You can Edit

You can add to or change the following information in the Edit Field pop-up window:

- **Edit the Field Alias**: while the actual field name cannot be changed, the alias field name can be changed.

- **Edit the Data Type for a field**: use the Data Type drop-down list to select another data type.

- **Add Labels to the Data Source**: add up to three labels to the data source; only the first one must have a unique name. Labels can be helpful when categorizing or grouping data sources or dashboards, but their most important feature is to connect fields from different data sources when field names don't match. See the Configuring Data Sources topic for more information.

- **Unit of Measure**: if not already specified, you can enter the unit of measure the field utilizes. In the above example, the field Total Cases is a "number" data type, and uses percentage as the unit of measure.

Editing Data Source Fields

When you click the edit (pencil) icon next to a field name in the Dataset Preview table (see the image above), the Edit Field pop-up window opens.

About Fields in the Edit Field Pop-up Window

The following fields may be pre-populated by the data source. Some fields can be edited, some cannot:

- **Field Alias**: the field name you selected to edit feeds into this field, but you can change the Field Alias, while you cannot change the field name itself. Alias names for fields come in handy when you want something other than the actual field name to display on widget charts and dashboards.

- **Field Label**: field labels (sometimes called 'tags') can be valuable for locating certain data, but they also serve as a way to connect data. For example, if you want to work with two data sources that store city names, but one source stores it in a field called 'Location', and the other stores it in a field called 'Center', adding labels to one or both makes it possible for the system to match the fields.

- **Field Name**: this value cannot be changed.

- **Unit of Measure**: sometimes this value comes in from the data source, but you can change it. The value in this field appears elsewhere in the Dashboard UI when the mouse hovers over the symbol for a data type; if there is no value in the unit of measure field, hovering displays "undefined".

- **Data Type**: data types can be changed easily by making a selection from the Data Type drop-down list.

Example of Changing the Data Type of a Field Example

In the example below, the user wants to convert the data type of the 'region' field from string to number so she can group the data numerically, according to the region numbers, because they contain number sequences that indicate which coast the region is in, and whether it is above or below a dividing line in the country. This change allows her to filter on certain number sequences that can capture a group of regions.

Here is an example of the Edit Field pop-up window that shows the field name, "region" in the Field Alias field and indicates "String" as the existing data type, and the drop-down list, where a different data type can be selected:

How to Edit Data Source Fields

Follow these steps to edit fields or in the Dataset Preview table:

1. Click the ✏ "Edit" icon next to any field in the Data Source preview table you want to edit. The Edit Field pop-up window opens.

2. If you want to display something other than the actual field name in your widget, enter it in the "Field Alias" field; otherwise skip to Step 3.

3. Enter an optional unique (within this data source) label in the "Field Label" field and press your keyboard 'comma' key. The text turns into a 'tag'.

4. Enter text for up to two more "labels" (optional) if needed.

5. Enter or change the value in the "Unit of Measure" field (optional). The value in this field displays in the Edit Data Source window when your mouse hovers over the data type symbol.

6. Click "Update". The Edit Field window closes and the changes display in the Dataset Preview table.

7. If you are finished editing fields, click ✓ Save at the top of the Data Source window. The editing window closes and the dashboard displays.

How to Delete a Data Source

Follow these steps to delete a data source:

1. Select the data source from the "Data Sources" drop-down list.

2. Click the "Delete" icon. An 'Are you sure?' confirmation message displays.

3. Click "OK" to confirm the deletion. The system deletes the data source.

Advanced Data Source Configuration Features

Adding an Aggregate Function to Y-Axis Chart Values for Integrated Data Lake (IDL) Data Sources

Working with an IDL data source and a line, bar, or area chart widget, this feature allows you to add and run an aggregate function against Y-Axis chart values. This feature is available for data lake data sources only at this time.
Available aggregate functions are:

- Value

- Count

- Sum

- Average

- Minimum

- Maximum

Illustration of the Value (Y-Axis) Aggregate Area for an IDL-Based Chart Widget

Here is an image that shows the Value (Y-Axis) area of an IDL chart widget where you can add an aggregate:
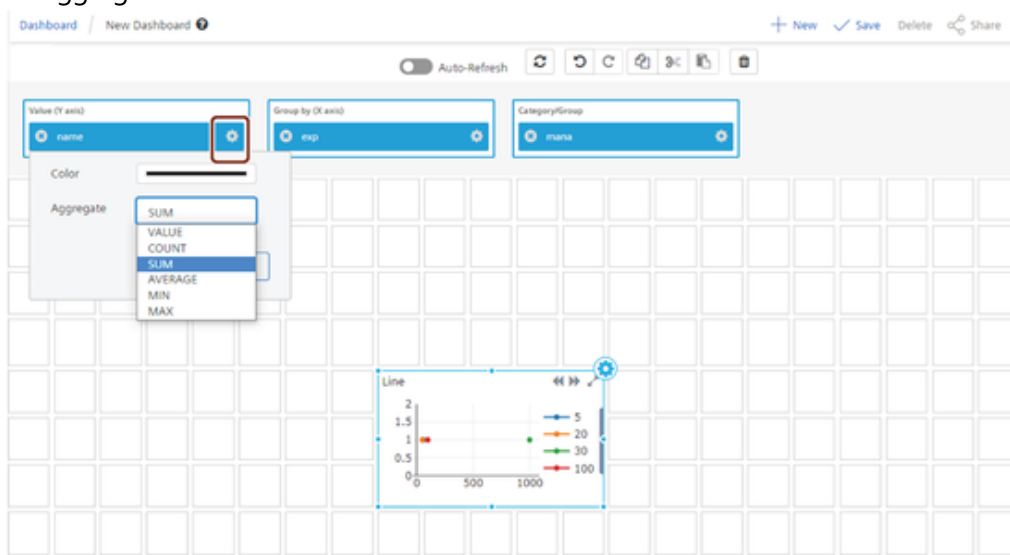
How to Add an Aggregate Function to Y-Axis IDL Chart Values

Follow these steps to add an aggregate function to an IDL-based chart widget:

1. Select the "widget" you want to add the aggregate function to. The dashboard displays the Value (Y-Axis), Group by (X-Axis), and Category/Group area at the top of the dashboard.

2. Click the "Configuration" icon for the Y-Axis field whose values you want to run an aggregate function against. A configuration pop-up window opens.

3. Click the "drop-down arrow" to expand the Aggregate selection list.

4. Select an "aggregate function" from the list and click "Update". The pop-up window closes and your changes are saved to the Value (Y-Axis).

Creating Integrated Data Lake (IDL) Charts with Multiple Y-Axes

Multiple Y-Axes are available for bar, line, and area charts that use IDL data sources. The greatest advantage of multiple Y-Axes is in revealing relationships among multiple fields that are not readily apparent when switching between two or more single Y-Axis charts. They often reveal data trends that otherwise might go unnoticed.
Dashboards supports multiple Y-Axes in the following chart types:

- Line

- Bar

- Area

Split Y-Axis Check Box Illustration

The split Y-Axis feature is available as a check box option in the General section of the Design a Widget tab:

About IDL Charts with Multiple Y-Axes

While there is no limit to the number of fields you can add to a Y-Axis, there are limitations that are important to familiarize yourself with, including:

- With the exception of the two cases below, you can add an unlimited number of fields to the Y-Axis configuration box, however:

- When multiple fields have already been added to the Y-Axis configuration box, the system blocks adding fields to the Group By (X-Axis) configuration box.

- If there are already fields in the Group By (X-Axis) configuration box, the system allows only one field in the Y-Axis configuration box.

- While there are no limitations on the data types you can add to the Y-Axis configuration box, when multiple data types are added (e.g., string, numeric), the Y-Axis values will render as stacked. Numeric values, including double, integer, etc., will be combined, but not stacked.

- When the Y-Axis configuration box holds two numeric fields, and the X-Axis configuration box holds one field, the Y-Axis displays a number range that provides for both numeric fields; if an additional field of date or text type is added to the Y-Axis configuration box, the Y-Axis in the chart renders the original number range, plus a range for the stacked text/date with the numeric range.

Examples of Multiple Y-Axes Charts

Here are examples of the line, bar, and area charts configured with multiple Y-Axes, and one line chart with a split Y-Axis:

How to Configure a Chart with Multiple Y-Axes

You can configure bar, line, and area charts based on IDL data sources with multiple Y-Axes and split Y-Axes.

Drag the type of chart widget to the workspace, select and configure its IDL data source, then follow these steps to configure the widget with multiple Y-Axes or split Y-Axes:

1. Select the line, bar, or area Chart widget you want to add multiple Y-Axes to.

2. Click the Configuration ⚙ icon in the widget. The Configure a Data Source tab opens.

3. Enter a name for the widget in the "Title" field, add content to the "Subtitle" field (optional), and the "Description" field (optional).

4. Under General, select an option from the "Chart Type" drop-down list, and select the "Split Y-Axis" check box.

5. Select the "Show Legend" check box if you want the widget to display the selected fields.

6. Drag as many fields from the data source to the Value Y-Axis box as you want. The system displays the field names in the legend the Value Y-Axis list and renders data for each field on the chart's left vertical Y-Axis.

7. Continue to enter or select values for the remaining (optional) fields in the "Design a Widget" tab.

8. When finished, click the "double chevron" to close the tab.

9. Click ✓ Save to save your widget and dashboard. The system displays a Success message.

Adding Labels to a Data Source

When working with data sources that have different schemata, fields can hold the same type of data but their field names can be different. Labels can facilitate matching between data sources.

About Label Mapping Between Data Sources

When field names don't match precisely, even though they contain the same type of data, you can use labels to map field names, which is especially valuable when drilling down into data. The system first tries to match by field names, then by label to field, then by label to label.
For example, one data source schema may use the field name "plant" to identify which manufacturing facility produces a certain product, and another schema may use the field name "siteno" to identify the same thing, namely which manufacturing facility produced a certain product. Labels can facilitate the field matching and either of the following will work:

• Label to Label: add the label "location" to both data sources, or,

• Field name to Label: add a label to one data source field that matches the field name in the other data source, e.g., add the label "siteno" to the data source that uses "plant" to identify the manufacturing facility, as shown in this example:

5.9   Designing Widgets (Visualizations)

Widget Settings

Visualization settings allow you to specify the visual characteristics for a widget, from its title and visual appearance, to the chart properties and axis titles. All visualization settings are optional. The dashboard visualization settings allow users to:

- Read data from various sources and write the data into dashboards where it can be refined, filtered and configured for use

- Drag and drop data source variables and widgets to dashboards

- Specify ranges, filters, and units of measure

- Shrink a widget to one block, or enlarge to a full page

Widget Parameters

Line Chart Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the line chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Dashboards defaults for the fields below or configure them as much as you want:

General

- **Chart Type**: display the chart data as lines, vertical bars, horizontal bars, or area

- **Stacked**: stack data results in one line

- **Split Y-Axis**: display two attributes on the Y axis

- **Show Legend**: display a list of descriptors for each bar/line/area/sector of a chart

- **Legend Position**: position the legend on top, bottom, left, or right of chart

- **Font Size**: font size of widget and axis titles

Vertical Axis

- **Title**: title to display on the Y-Axis

- **Show Grid Lines**: display vertical grid lines in the widget chart

Horizontal Axis

- **Title**: title to display on the X-Axis

- **Show Grid Lines**: display horizontal grid lines in the widget chart

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Bar Chart Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the bar chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Dashboards defaults for the fields below or configure them as much as you want:

General

- **Chart Type**: display the chart data as lines, vertical bars, horizontal bars, or area

- **Stacked**: stack data results in one line

- **Split Y-Axis**: display two attributes on the Y axis

- **Show Legend**: display a list of descriptors for each bar/line/area/sector of a chart

- **Legend Position**: position the legend on top, bottom, left, or right of chart

- **Font Size**: font size of widget and axis titles

Vertical Axis

- **Title**: title to display on the Y-Axis

- **Show Grid Lines**: display vertical grid lines in the widget chart

Horizontal Axis

- **Title**: title to display on the X-Axis

- **Show Grid Lines**: display horizontal grid lines in the widget chart

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Area Chart Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the area chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Dashboards defaults for the fields below or configure them as much as you want:

General

- **Chart Type**: display the chart data as lines, vertical bars, horizontal bars, or area

- **Stacked**: stack data results in one line

- **Split Y-Axis**: display two attributes on the Y axis

- **Show Legend**: display a list of descriptors for each bar/line/area/sector of a chart

- **Legend Position**: position the legend on top, bottom, left, or right of chart

- **Font Size**: font size of widget and axis titles

Vertical Axis

- **Title**: title to display on the Y-Axis

- **Show Grid Lines**: display vertical grid lines in the widget chart

Horizontal Axis

- **Title**: title to display on the X-Axis

- **Show Grid Lines**: display horizontal grid lines in the widget chart

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Pie Chart Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the pie chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Dashboards defaults for the fields below or configure them as much as you want:

- **Title**: title to appear in the widget

- **Subtitle**: optional subtitle to appear below the title

- **Description**: free-form field to describe widget content, purpose, etc.

General

- **Chart Type**: display the chart data as a pie or donut

- **Hide Labels**: display or hide labels

- **Show Legend**: display a list of descriptors for each bar/line/area/sector of a chart

- **Legend Position**: position the legend on top, bottom, left, or right of chart

- **Font Size**: font size of widget and axis titles

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Pareto Chart Widget Design Options

The Pareto widget is different from other chart widgets in that it displays two different visual representation of data:

- **Bars**: vertical bars display **causes** on the x-axis, and **count** of occurrences on the left y-axis, in **descending** order.

- **Line**: tracks **cumulative percentages** of **causes** on the right y-axis, in **ascending** order toward 100 percent.

The modes are displayed at the top of the widget so you can toggle between views:
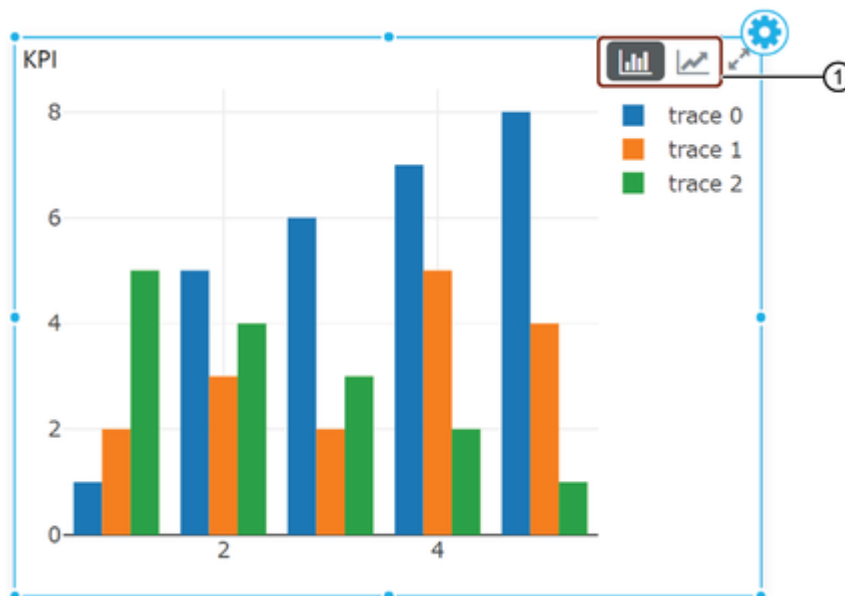
①   Switch between Bar and Pareto chart views

The following fields are completed in an earlier step, when you add a data source to the bar chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Dashboards defaults for the fields below or configure them as much as you want:

General

- **Stacked**: stack data results in one line

- **Show Legend**: display a list of descriptors for each bar/line/area/sector of a chart

- **Legend Position**: position the legend on top, bottom, left, or right of chart

- **Font Size**: font size of widget and axis titles

Vertical Axis

- **Title**: title to display on the Y-Axis

- **Show Grid Lines**: display vertical grid lines in the widget chart

Horizontal Axis

- **Title**: title to display on the X-Axis

- **Show Grid Lines**: display horizontal grid lines in the widget chart

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

KPI Analysis Widget Design Options

This widget allows you to store, run, and share a KPI analysis on a Insights Hub Monitor dashboard. Like the Pareto chart widget, the KPI analysis widget also allows switching between bar and Pareto chart views.

The following fields are completed in an earlier step, when you add a data source to the KPI analysis chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (option)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

General

- **Chart Type**: display the chart data as lines, vertical bars, horizontal bars, or area

- **Stacked**: stack data results in one line

- **Split Y-Axis**: display two attributes on the Y axis

- **Show Legend**: display a list of descriptors for each bar/line/area/sector of a chart

- **Legend Position**: position the legend on top, bottom, left, or right of chart

- **Font Size**: font size of widget and axis titles

Vertical Axis

- **Title**: title to display on the Y-Axis

- **Show Grid Lines**: display vertical grid lines in the widget chart

Horizontal Axis

- **Title**: title to display on the X-Axis

- **Show Grid Lines**: display horizontal grid lines in the widget chart

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

IoT Chart Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the IoT chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

IoT Settings

- **Data Source**: select the data source from the drop-down list

- **Local**: select Date and Time, absolute time, a quick range, and time zone

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

IoT Map Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the IoT map widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

IoT Map Widget Settings

You can configure the following settings for a map widget:

- **Title**: enter a title to appear in the upper left corner of the widget

- **Subtitle**: appears below the title

- **Description**: free-form field that describes widget content, purpose, etc.

- **IoT Map**: select a data source from the drop-down list

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Grid Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the grid widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

- **Title**: title to appear in the widget

- **Subtitle**: optional subtitle to appear below the title

- **Description**: free-form field to describe widget content, purpose, etc.

General

- **Font**: select a font size for title, subtitle, and axis labels

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center.

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Indicator Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the indicator widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

General

- **Background Color**: display a user-selected color in the background

- **Symbol**: display the $, #, or % symbol

- **Delta**: display differential

Map Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the map widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

- **Title**: title to appear in the widget

- **Subtitle**: optional subtitle to appear below the title

- **Description**: free-form field to describe widget content, purpose, etc.

Widget Appearance

- **Hide Header**: hide the widget title and subtitle

- **Align Title**: position the title to the left, right, or center

- **Title Color**: select a color, or enter RGB color values

- **Show Border**: render a border around the widget

- **Show Maximize**: display a full-screen icon in the widget

Image Widget Design Options

The following fields are completed in an earlier step, when you add a data source to the image widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the Monitor Dashboards defaults for the fields below or configure them as much as you want:

- **Image Stretch**: display the image in its original dimensions, or scale, fill, or crop the image

- **Image Source**: select a local source or URL for the image you want to use

- **Image URL**: the internet address for an image

How to Add an Image Widget

Follow these steps to add an image widget to your dashboard:

- Drag the widget and drop it onto the dashboard.

- Click the widget to select it. Borders, drag handles, and the configuration icon display in the widget.

- Click the Configuration ⚙ icon. The Design a Widget tab opens.

- Enter the widget name in the "Title" field, and optional "subtitle", and optional "description".

- Select or enter values for the fields in the Visualization settings. The system automatically saves your entries and selections.

Text Widget Design Options

You can enter any text you want in the body of a text widget and you can customize the text with standard text formatting features as well as hyperlinks.
The following fields are completed in an earlier step, when you add a data source to the bar chart widget:

- **Title**: title to appear in the widget (required)

- **Subtitle**: subtitle to appear below the title (optional)

- **Description**: free-form field to describe widget content, purpose, etc. (optional)

Customizing Your Widget (optional)

You can accept the OI Dashboards defaults for the fields below or configure them as much as you want:
Widget Appearance

- **Font**: apply a Heading 1,2,3,4,5, or 6 or Normal

- **Text Formatting**: apply bold, italic, underline, reverse (black against white), colored background, or colored type

- **Paragraph Formatting**: apply formatting such as numbered list, bullet list, alignment (right, left, center, justified), and hyperlink

Next-gen Dashboards 6

6.1 Introduction

Welcome

Next-gen Dashboards leverage dashboard and visualization technology for a seamless integration with Insights Hub Monitor applications.

Anyone can use Next-gen Dashboards to create beautiful, informative dashboards. No programming knowledge needed.

Gain insights into your data by visualizing it in the way that makes sense to you.

> ✏️
>
> Next-gen Dashboards are not available for Private Cloud.

Capability Packages

Next-gen Dashboards are available in all capability packages, however each package varies in the visualizations and plugins included.

Basic capability packages for **Next-gen Dashboards** include the following visualizations and plugins:

- Clock

- Pie Chart

- Table

- Gauge

- Text

- Dashboard List

- Graph

Premium / Standard capability packages for **Next-gen Dashboards** include the vizualizations and plugins in the Basic package, plus:

Advanced Visualizations

- Bar Gauge

- Heatmap

- Discreet Panel

- Singlestat

New Third-Party Visualizations

- ImageIt

- Breadcrumb

- Cal-Heatmap

- Statusmap

- Traffic Light

Dashboard Designer Add On capability packages include visualization panels from the Premium / Standard package, plus:

- SVG Maker Panel - allows you to create sophisticated visualizations using JavaScript.

- An icon on the Insights Hub Launchpad for direct access to Dashboard Designer Add On.

Access the documenation for **Dasboard Designer Add On** by following this link.

> ⓘ
>
> For **guage**, **bar guage**, and **Singlestat** visualizations: there is an issue with color selection: you must double-click the color in the dialog box because a single click results in the box closing without saving your color selection.

Security Information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks. To protect against cyber threats, Siemens's products and solutions implement and continuously maintain a holistic and state-of-the-art industrial security concept.
Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.
For additional information on industrial security measures that may be implemented, please visit the Industrial Security page on the Siemens website.

General Data Protection Regulation

Siemens observes the principles of data protection, in particular the principle of data minimization (privacy by design). Next-gen Dashboards processes/stores the following personal

data: User email address, user role, dashboard templates, and dashboard usage data. The above data is required for logging on, billing, and internal user administration. The storage of data is reasonable and limited to what is necessary, since it is essential to identify authorized operators. Data cannot be stored anonymously or pseudonymized because of the essential need to identify authorized operators.

Next-gen Dashboards does not offer automatic deletion of data. Data delettion can be done manually. Please contact customer support concerning deleting data.

Plugins

3rd party visualization panel cannot be introduced to Next-gen Dashboards by users. More plugins are coming in future releases. Please see Visualization and Plugins for more information.

User Roles

Admin users can define roles, access, editing, and viewing permissions through the Settings app on the Launchpad for individuals, groups, and teams within their organization.
Here is a brief description of Next-gen Dashboards user roles:

- Admin: this role gives full access to all functionalities.

- Creator: users with this role can create and edit dashboards.

- Viewer: this role allows a user to view dashboards.

Usage Quotas

Next-gen Dashboards subscriptions include a quota on the number of dashboards created. Please see our Technical Limitations.

6.2   Identity and Access Management

For Organizations

Your subtenants are represented as "Organizations" (Orgs) in Next-gen Dashboards. Orgs are automatically created when a subtenant user first logs in to Next-gen Dashboards.

Default User Roles

Next-gen Dashboards users can access dashboards and assets according to the user role assigned to them:

Admin: allows full access to all Next-gen Dashboards functionality. Admin users can define and override dashboard editing and viewing settings for individual users and groups, allowing control of user access. Only users with the Admin role can access and switch

- between Orgs (subtenants).

- Creator: allows creating and editing dashboards.

- Viewer: allows users to view dashboards, but cannot make changes.

Teams

Teams are groups of users.

6.3   Navigating Next-gen Dashboards

View Modes

Next-gen Dashboards have three view modes that you can switch between by clicking the Cycle view mode icon in the upper right corner of the screen. Here is a brief description of the view modes:

Home when you open Next-gen Dashboards, your home screen displays the navigation bar, starred and recently-viewed dashboards, and a link to the Monitor Legacy Dashboard app.

Basic when you open a dashboard, it displays on the basic screen, along with the navigation bar and dashboard action icons.

Kiosk mode displays when you click the Cycle view mode icon once. It hides the navigation bar and dashboard action icons, and expands the display to full screen. Press the Esc key to see the navigation bar and dashboard action icons.

Side Panel Icons and Navigation

This image shows the navigation and submenu items for each:

Next-gen Dashboards have three view modes that you can switch between by clicking the Cycle view mode icon in the upper right corner of the screen. Here is a brief description of the view modes:

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Kiosk mode displays when you click the Cycle view mode icon once. It hides the navigation bar and dashboard action icons, and expands the display to full screen. Press the Esc key to see the navigation bar and dashboard action icons.

Side Panel Icons and Navigation

This image shows the navigation and submenu items for each:

> ✏️ Click the "Configure" or "Server Admin" icon to navigate to the Server Admin page.

Plugins

Please see the *Visualizations & Plugins* topic for more information.

User profiles

You can open your user profile settings by clicking the icon. Your icon will differ from the example shown in this image:
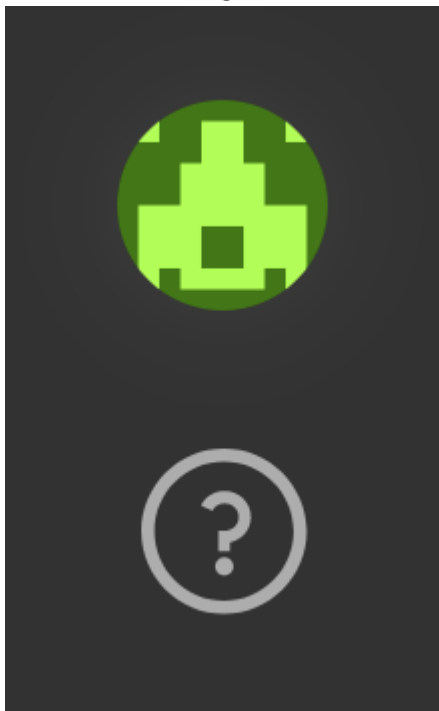
Keyboard Shortcuts

This image shows keyboard shortcuts:

6.4 Getting Started

Prerequisites

Before starting, please make sure you have:

- Editor/admin access to Next-gen Dashboards

- Some asset data in your current set-up

> ✏️
>
> - Please use either Chrome or Firefox Internet browsers, not Internet Explorer.
>
> - Next-gen Dashboards is not applicable for Private Cloud.

Best Way to Learn

Open another page of Next-gen Dashboards side-by-side with this tutorial so you can try out some steps.

Creating Dashboards

A dashboard gives you an at-a-glance view of your data and lets you track metrics through different visualizations.

Panels

Each panel on a dashboard represents a part of the story you want your dashboard to tell. A panel consists of a:

- Query: defines which data to display

- Visualization: defines how the data displays
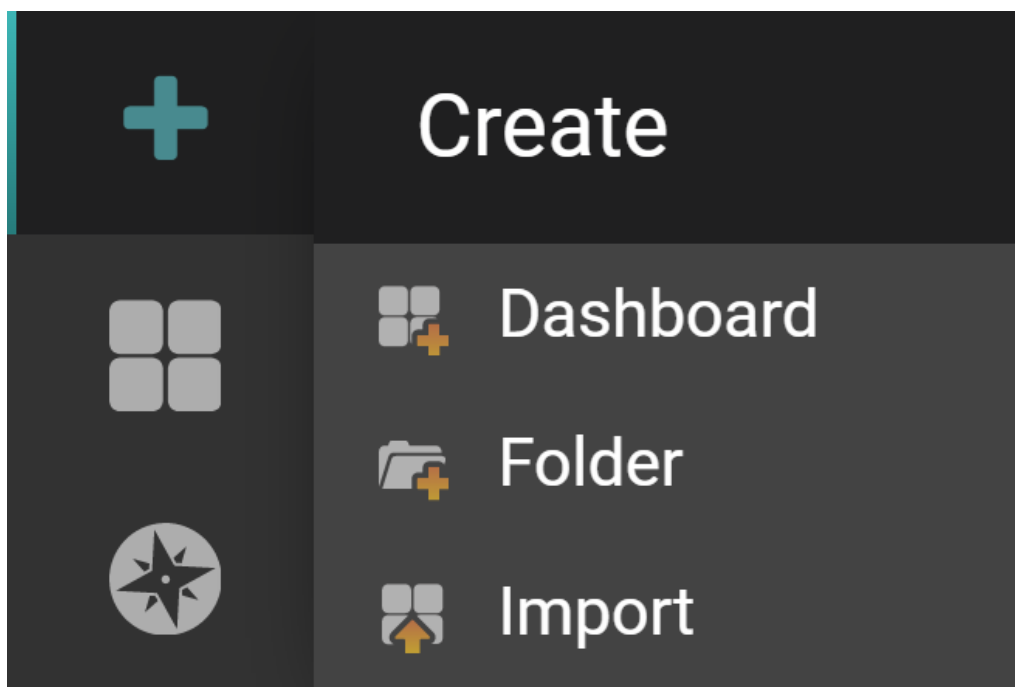
The Panel Edit Page

The Panel Edit page displays three tabs on the left:

- Query: where you create the query to pull your data into a Dashboard.

- Visualization: where you can select a visualization panel to show the data. You can also change the visualization settings of the panel.

- General: displays the panel's title and settings, such as if the panel hyperlinks to another dashboard.

How to Create a New Dashboard

Follow these steps to create new dashboard:

1. Hover over the + button on the side panel, and click "Dashboard" to create a blank dashboard with an empty panel.

2. Click "Add Query" to open the panel edit page.
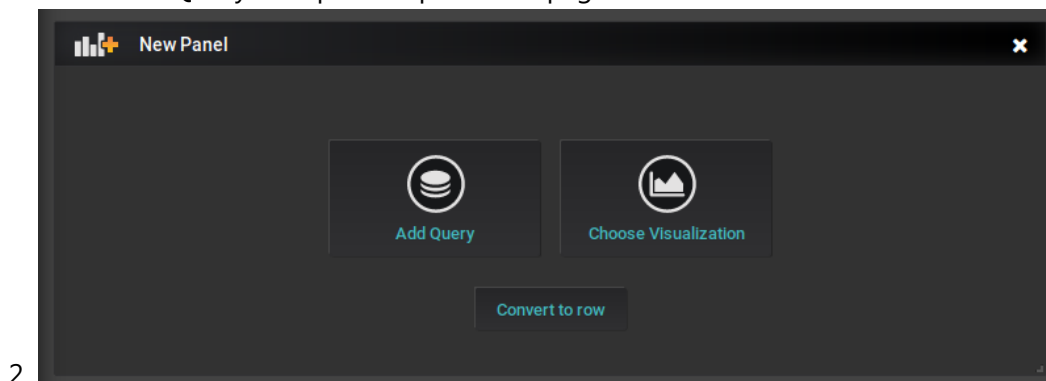
3. If you have asset data available, you can continue this tutorial with your data; if not, you can use the provided test data.

Getting Your Data into a Next-gen Dashboard

The steps below apply to IoT data. See *Using IDL Data Sources in Next-gen Dashboards* for information on using Integrated Data Lake (IDL) data.

Follow these steps to retrieve your IoT data:

1. Click "select metric" or enter an asset name in the search field. Aspects included in the asset display.

Select_Asset

2. Select an aspect. The aspect's variables display.

Select_Aspect

3. Select a variable.
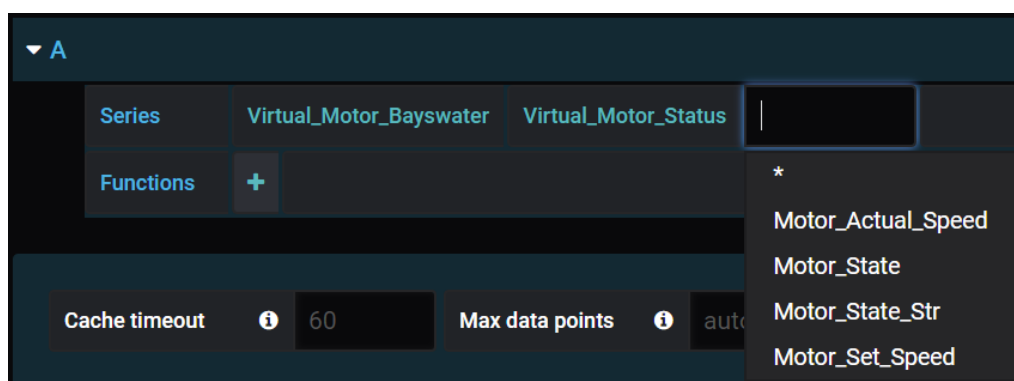
> **ℹ**
>
> If no data is available, it's likely that the default time range does not contain data from your asset. Try selecting different time ranges from the time selector drop-down list. If you continue to experience issues in retrieving data, try using the generated test data for the next steps.

> **✏**
>
> Next-gen Dashboards does not support variables assigned directly to asset types.

Connecting to Data

If you are already getting data, skip step 1 below; otherwise, follow these steps to connect data:

1. Select "testData" from the drop-down list. Random data is used by default, but you can use other data scenarios.

2. When your data shows, click the Esc key (or back button) to return to the dashboard page. Your dashboard displays with the new panel.

3. To create another panel, click the "Add panel" button.

Adding a Visualization Panel

Follow these steps to add a visualization panel:

1. Click the "Choose Visualization" option. The Visualization tab opens under the "Panel edit" page.

2. Click the graph drop-down list and select "Gauge" from the list.

3. Click the "Query" tab.

4. Select some of your data or test data. When the data comes in, press the Esc key or the Back button to go back to the Dashboard page.

5. Duplicate the panel using one of the methods discussed in "Additional Panel Actions", which appears right after the Visualization image below.

Your dashboard should now look similar to this:
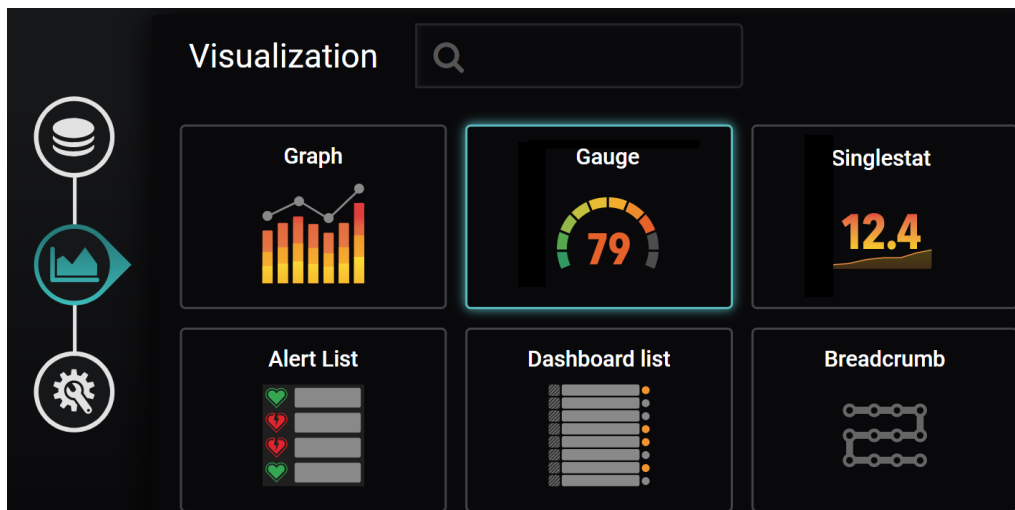
Additional Panel Actions

Some additional actions you can take with panels are:

- Resize panel: click and drag the lower right corner of the panel to resize it up or down.

- Duplicate: select "More" from the drop-down list at the top of the panel, then click "Duplicate". Alternatively, you can left-click anywhere on the panel, then press "p" and "d".

After duplicating the panel, we recommend trying a different query so different data displays.

Saving Your Panel(s)

Follow these steps to save your panel:

1. Click anywhere on the panel and press "e" on your keyboard, or click the heading of the panel and select "Edit". The "panel edit" page displays.

2. Navigate to the "General" tab, and enter a name for the panel. Repeat as needed for other panels in your dashboard.

Saving Your Dashboard

Follow these steps to save your dashboard:

1. Click the 'save disc' icon in the top right corner of the dashboard. The save dialog displays.

2. Enter a name for the dashboard.

3. Select (optional) a folder to store the dashboard.

6.5   Creating Dashboards

About Next-gen Dashboards

Next-gen Dashboards are composed of individual panels arranged on a grid, and each panel represents a part of the story you want to tell through your dashboard.

Each panel consists of a query and a visualization. Queries define the data you want to display, and visualizations define how it's displayed.

In addition to the panel, query, and visualization, Next-gen Dashboards includes plugins--tools you can use in conjunction with visualizations for even more ways to display data on a panel.

Dashboard Data Limitations

Next-gen Dashboards supports up to ten columns and three thousand (3,000) rows of data in a dashboard.

Panel Edit Page Tabs

The "Panel edit" page contains three tabs on the left side. The tabs are:

- **Query**: where you create queries that bring data into your panel.

- **Visualization**: where you select widgets and plugins to visualize data according to your preferences.

- **General**: where you select panel titles, links to other panels or dashboards and other general settings.

How to Create a New Dashboard

Follow these steps to create a new dashboard:

1. Hover over the **+** button on the side panel, and click "Dashboard". A new dashboard with a blank panel displays.

2. Click "Add Query" to open the panel edit page.

3. If you have asset data available, you can continue to the next steps using this data; if not, you can use the provided test data.

Getting Data into a Dashboard

The sections below guide you in using differing kinds of data. You can proceed using data from:

- Internet of Things (IoT)

- Integrated Data Lake (IDL)

- Test data

See the section below that applies to the data you are using.

Using IoT Data

Follow these steps to read your data from its IoT location and write it to your dashboard:

1. Click "Select metric" to select the asset that has the data you want to read.

2. Use search to locate an asset or enter its name in the asset field and select the "asset". Its aspects display.

3. Select an "aspect" in the next select metric box. Its variables display.

4. Select all, or select the variables to include.

5. Click "Add Data Source". The path to your data source displays in the Data Source Location section.

If no data is available, sometimes it's because the default time range does not contain asset data. To remedy this, try the following:
Click the time picker drop-down and try various time ranges. If you still have issues getting data, try the next steps using generated test data.

> Assigning a variable directly to an asset type is not yet supported in Next-gen Dashboards.

Using IDL Data

Follow these steps to read your data from its IDL location and write it to your dashboard:

1. Hover over the **+** button on the side panel, and click "Dashboard". A new dashboard with a blank panel displays.

2. Click "Add Query". The Panel edit page displays.

3. Select the Integrated Data Lake radio button. The IDL pop-up window displays.

4. Select the file type of your data (CSV or Parquet). Folders display according to the file type you select.

5. Select the folder that contains your data or use the search bar to locate it. Folder contents display to the right.

6. Select check boxes for each field to include in the query.

7. Click "Add Data Source". The path to your data source displays in the Data Source Location section.

Using Generated Test Data

If you are already reading data from your data source locations, you can skip this process. Follow these steps to use generated test data:

1. Select testData from the drop-down.

2. By default, 'random walk' (random data) is used. Feel free to try other data scenarios.

3. Once data shows, click the Esc key or Back button. Your dashboard with the new panel displays.

4. Continue to add panels by clicking the "Add panel" button.

Specifying Visualization Options

Follow these steps to specify visualization options for a panel, beginning on the Panel edit page:

1. Click the "Graph" drop-down and select "Singlestat" from the list of available plugins.

2. Click the "Query" tab.

3. Select the name of the data you want to use from the drop-down list.

4. Once data shows, click the Esc key or Back button. Your dashboard with the new panel displays.

5. Continue to add panels by clicking the "Add panel" button.

6. Resize the Singlestat panel by clicking and dragging its lower right corner.

7. Duplicate the panel by selecting "More" from the drop-down at the top of the panel, then select "More", and "Duplicate".

> ✏️
>
> We recommend giving the duplicate panel a different query to bring in different data.

How to Save your Dashboard

Follow these steps to save your dashboard:

1. Navigate to the "Panel edit" page and select the "General" tab.

2. Enter a name for the panel in the "Name" field.

3. Repeat for any unnamed panels on your dashboard.

4. Click the "Save" icon in the top right corner of the dashboard.

5. Enter a name for your dashboard and select a folder where you want to store it (optional).

6.6　Using Integrated Data Lake (IDL) Data Sources in Next-gen Dashboards

IDL data sources are accessible in the data sources drop-down list when you create a new panel and select a visualization, or when you create or edit a query. This allows you to:

- Bring CSV and Parquet data in from IDL

- Visualize multiple IDL queries in a single widget

- Visualize IoT and IDL data in a single widget

IDL Data Source Limitations

- Annotations are not supported for IDL data sources.

- A maximum of 4,000 records is supported in IDL queries.

- Aggregated data is not currently supported in queries, but is planned for a future release. The exception is the Gague widget, which auto-aggregates the data returned by a query.

- A query time range of up to five years is supported.

- Access controls may not extend to all data in IDL files and folders. For example, if two IDL files with access restrictions reside within an IDL folder that is unrestricted, and a user queries the unrestricted folder, all the files are returned, irrespective of restrictions on the IDL files or the user who creates the query.

- IDL data sources do not support annotations.

Example of the IDL Data Source Selection

How to Write IDL Data to Your Dashboard

Follow these steps to read your data from its IDL location and write it to your dashboard:

1. Hover over the **+** button on the side panel, and click "Dashboard". A blank dashboard with an empty panel displays.

2. Click "Add Query". The Panel edit page displays.

3. Select the Integrated Data Lake radio button. The IDL pop-up window displays.

4. Select your data's file type (CSV or Parquet).

5. Click the folder containing your data or use the search bar to locate it. Folder contents display to the right.

6. Select check boxes for each field to include in the query.

7. Click "Add Data Source". The path to your data source displays in the Data Source Location section.

Here is an image of the Data Source drop-down list for a query:
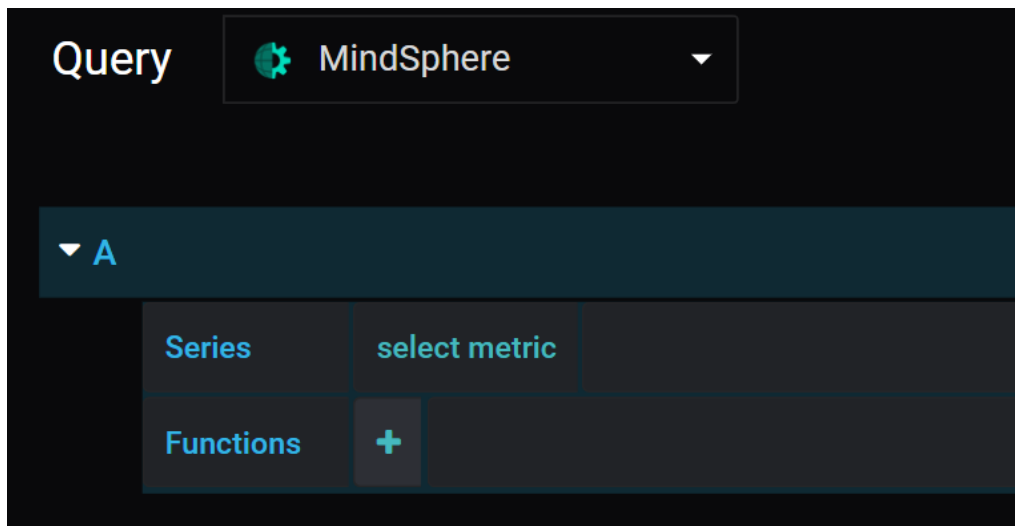
How to Select the Date Options for an IDL Data Source

Follow these steps to format the date fields:

1. Select a value from the time column drop-down list.

2. Select a date-time format. Data renders at the top of the screen according to your entries.

3. Continue to add additional queries by clicking the Add Query button and repeating the steps above.

6.7 Functions

Functions are used to associate or transform raw data into useful formats for creating meaningful dashboards. Functions only display when you select Insights Hub or Default data sources.

Data requested is automatically aggregated by default. If your raw data must be queried in a different way, use the Functions feature to modify the query. Functions appear when you select a "Insights Hub" or "Default" data source. Functions you add to a query will override default Query settings.

> Next-gen Dashboards is not available for Private Cloud.

Functions Overview

A query can have multiple functions and you can access them by opening a panel and navigating to the Query page:
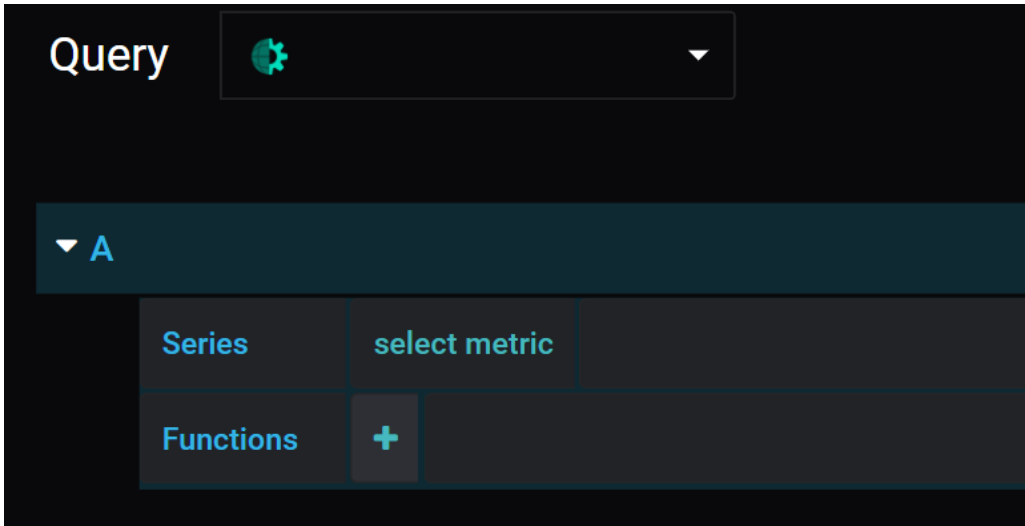
Adding a Function to a Query

When you build a query, you can add functions to it by hovering over the + symbol. Click the + symbol to open a scrollable drop-down list of functions. You can add multiple functions to a single query.
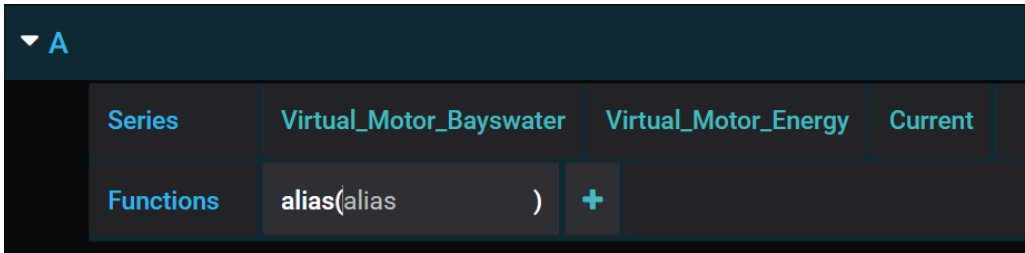
How to Add Functions to a Query

Follow these steps to add a function to a query:

1. Click the + icon next to "Functions".

2. Hover over the data source name ("Insights Hub") and select a function from the drop-down list.

Removing a Function from a Query

Click a function name to open a pop-up window, and select "x" to remove a function.

Getting Help on Using a Function

Click a function name to open a pop-up window, and select "?" to see information on the function.

How to Create an Alias for a Query String

In graphs and charts, each variable displays the full query string in the legend. Queries are usually long and can clutter up the legend, so the alias function allows you to substitute a short name for the query string.

Syntax: alias(QUERY, alias)

Follow these steps to create an alias:

1. Create a query and select alias from the list of functions. The tag 'alias' displays in the function row and a text cursor displays inside the bracket.

2. Enter inside the brackets the alias you want to use for the variable.

To change the name again, click the text inside the brackets. Spaces are ignored but underscores can be used.

✏️

If you deselect the function before typing anything inside the brackets you will have to remove the function and add it again to rename the variable.

Functions and Syntaxes

This section describes the various functions available, when to use them, and gives examples where needed.

Alias

For single variable queries, renames a series to the user's input.

Syntax: alias(QUERY, alias)

AliasByName

For multi-variable queries, renames a series to the user's input; use it when you want to call an entire aspect. Add * as the final query in the string to return all aspect variables; in this scenario, the function will rename all variables to have the same name.

If you want to rename individual variables, select the aliasByName function from the function drop-down list. You can also stack this function with itself, using **aliasByName_stacked** which allows you to rename each variable. Here is an image that shows the 'aliasByName' function in a Query:
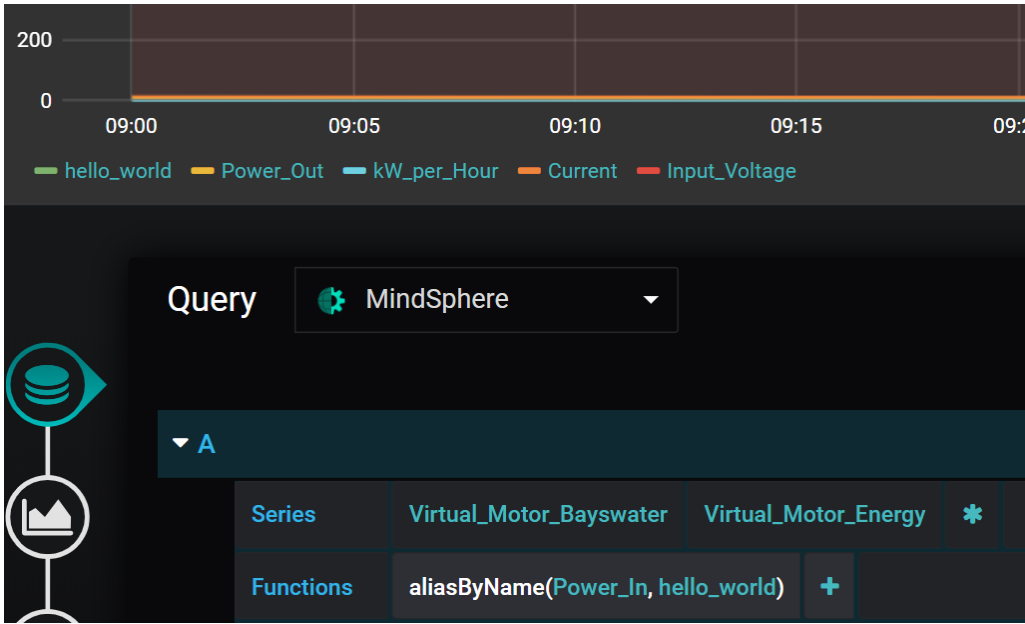
Syntax: `aliasByName(QUERY, name, Replacement String)`

AliasByTime

Returns grouped series under aliases based on time, and is useful for comparing data from different time periods. The input for aliasType can be weekdays, weekNumbers, months, or years. The timezoneOffset input adds a time offset from UTC in hours and can use positive or negative numbers.

Syntax: `aliasByTime(QUERY, aliasType, timezoneOffset)`

The first image below shows data returned with no AliasByTime function, followed by the same data, but grouped by the weekday of the data's timestamp:
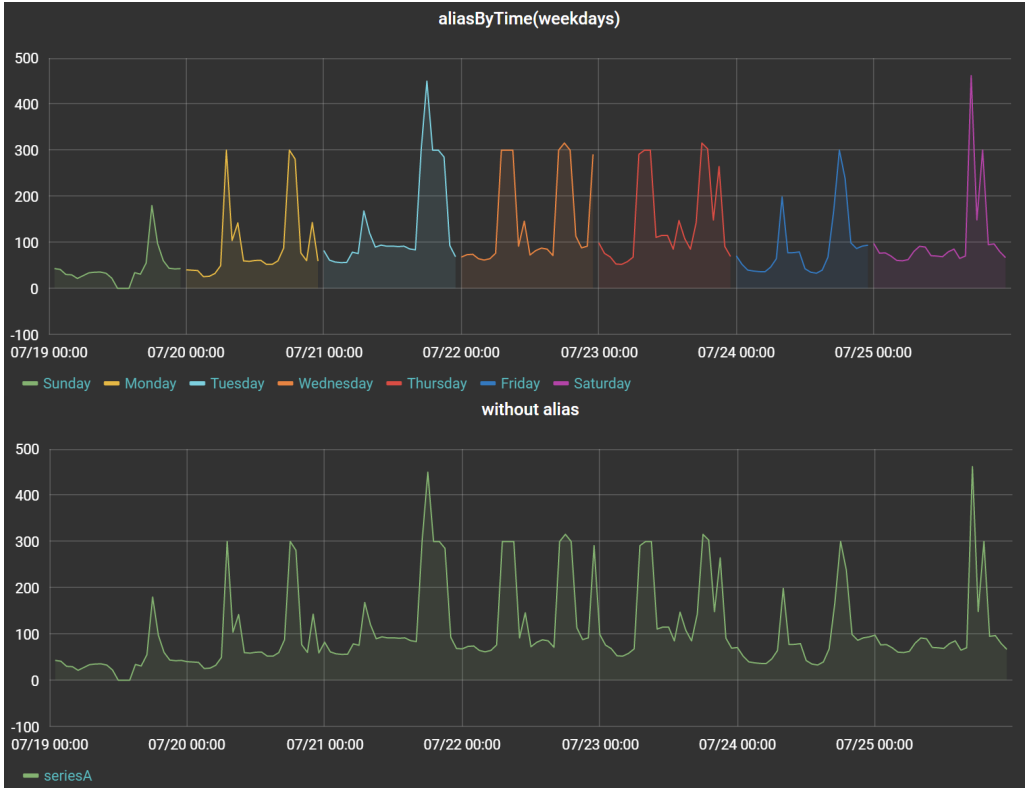
IgnoreValue

Returns queried data without the variable(s) specified, and is useful for filtering variables when the query has a variable wildcard, e.g., Asset/Aspect/*.

Syntax: `ignoreValue(QUERY, value)`

Value input can be:

Syntax	Meaning
`*`	wildcard - matches everything
`?`	matches any single character
`[seq]`	matches any character in seq
`[!seq]`	matches any character NOT in seq

IgnoreVariable

Returns queried data without the variable(s) specified, and is useful for filtering variables when the query has a variable wildcard e.g.Asset/Aspect/*.

Syntax: `ignoreVariable(QUERY, variable)`

Variable input can be

Syntax	Meaning
`*`	wildcard - matches everything
`?`	matches any single character
`[seq]`	matches any character in seq
`[!seq]`	matches any character NOT in seq

Maths

Performs basic mathematical operations on returned variable data.

Maths functions can be stacked, and they execute in the order written. Maths functions apply to all data returned by the query. Here is an example:
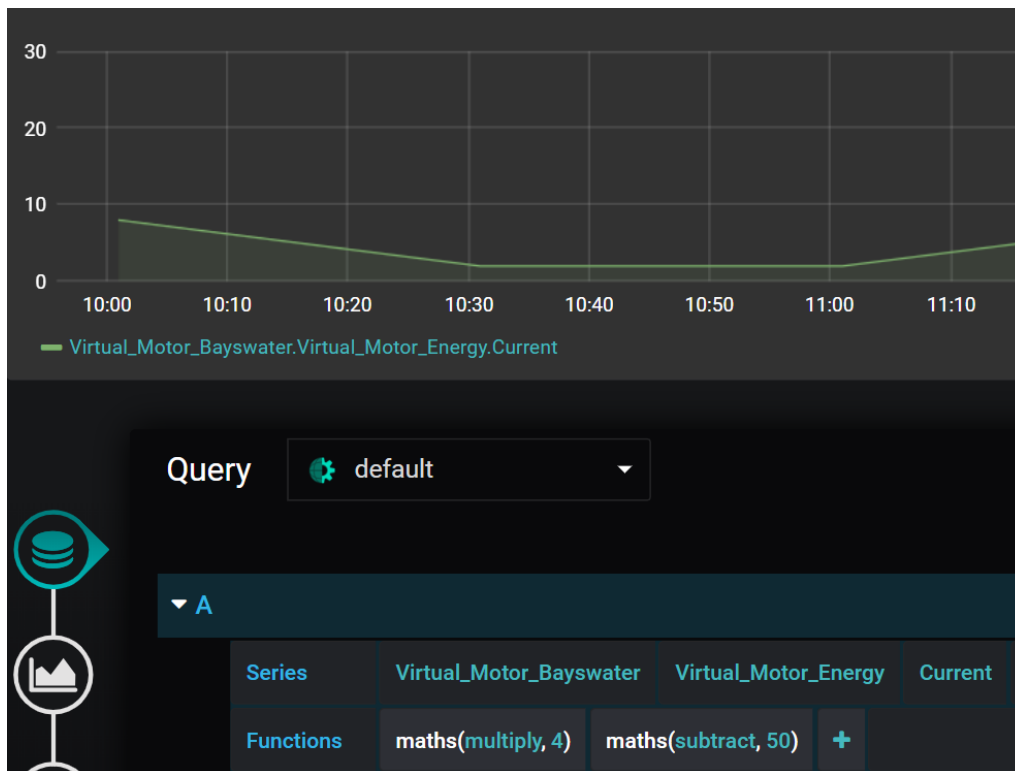
Syntax: `maths(QUERY, function, value) or math_stacked`

MSrawTimeseries

Returns raw data from a Insights Hub data source and overrides the default aggregation; instead, it returns non-aggregated or non-interpolated time series data.

When querying strings, use this function to retrieve the data, as Insights Hub's default aggregation cannot aggregate strings. This function can only retrieve up to the 2000 most-recent time series data points; a data point can contain multiple values if they share the same time index.

Syntax: `MSrawTimeseries(QUERY)`

MSassetID

Returns Insights Hub's Asset ID for the asset of the variable you select.

Syntax: `MSassetID(QUERY)`

MSmostRecentValueWithinTimeRange

Retrieves the most recent value within the queries time window using the IOT TimeSeries API. If this function does not retrieve values reliably, please use *MSaggregate(lastvalue)*.

This function retrieves the latest time index of the aspect that the variable is within. If the variable is not present in the latest time index it returns nothing. To avoid, try separating the data points you always wish to retrieve the last value of and put them in their own aspect or make sure their data is written to the latest time index.

Syntax: `MSmostRecentValueWithinTimeRange(QUERY)`

MSmostRecentValueWithinNowto90Days

Retrieves the most recent value within the last 90 days, using the IoT TimeSeries API, and regardless of the query's time window.

This function is useful for dashboards that look within a small range of time, such as a day, when you want to display the most recent value of less frequent data that does not fall within the time range. If this function does not retrieve values reliably, please use MSaggregate(lastvalue).

It retrieves the latest time index of an aspect that the variable is within. If the variable is not present in the latest time index it will return nothing. To avoid, try separating the data points.

you always want to retrieve the last value of and put them in their own aspect or make sure their data is written to the latest time index.

Syntax: `MSmostRecentValueWithinNowto90Days(QUERY)`

MSboolAggregates

Returns a boolean value, according to automatically selected time ranges.

Standard Insights Hub aggregation rules cause boolean values to be misrepresented because the average aggregation rule causes the booleans to be displayed as decimals between 0 and 1. This function aggregates the booleans and returns a boolean value by looking at the average value of booleans within the aggregated time range. If the value is below 0.5 it becomes a 0, if it is above it becomes a 1.

It allows aggregation of booleans, but still accurately represents them.

Syntax: `MSboolAggregate(QUERY)`

MSautoAggregate

Returns automatically aggregated data based on aggregation method.

This function automatically calculates time ranges in order to automatically aggregate data using the 'average' aggregation method. This function gives power users the option to choose their own aggregation method, without having to calculate time ranges and groupings of data.

The IoT Time Series (TS) Aggregates Service creates aggregated summaries of numeric time series data and provides interfaces to read them. This allows applications to retrieve smaller datasets that cover a long time range with much better performance than processing all the raw time series data.

For example, an aspect could create new data every second, which adds up to ~2.5 million records per month. An application could use the IoT TS Aggregates Service to retrieve a summary for each day of the month, obtaining only 30 records.

Syntax: `MSautoAggregate(QUERY, method)`

MSaggregate

Returns aggregated data based on the specified intervals and method.

This function automatically calculates time ranges to automatically aggregate data by default. This function gives users the option to fully customize how aggregates are calculated.

The IoT Time Series (TS) Aggregates Service creates aggregated summaries of numeric time series data and provides interfaces to read them. This allows applications to retrieve smaller data sets that cover a long time range with much better performance than processing all the raw time series data.

For example, an aspect could create new data every second, which adds up to ~2.5 million records per month. An application could use the IoT TS Aggregates Service to a summary for each day of the month, obtaining only 30 records.

Syntax: `MSaggregate(QUERY, intervalUnit, intervalValue, method)`

onlyChanges

Returns only the rising and falling edges of the query.

Syntax: `onlyChanges(QUERY)`

percentageOfTimeAs

Returns the amount of time each unique value was held as a percentage of the total time range, which is useful for displaying machine states and summarizing the time elapsed in each state. This function can also stack with other functions; for example, if a variable is a string, you can stack "percentageOfTimeAs" with "MSrawTimeseries", as shown here:
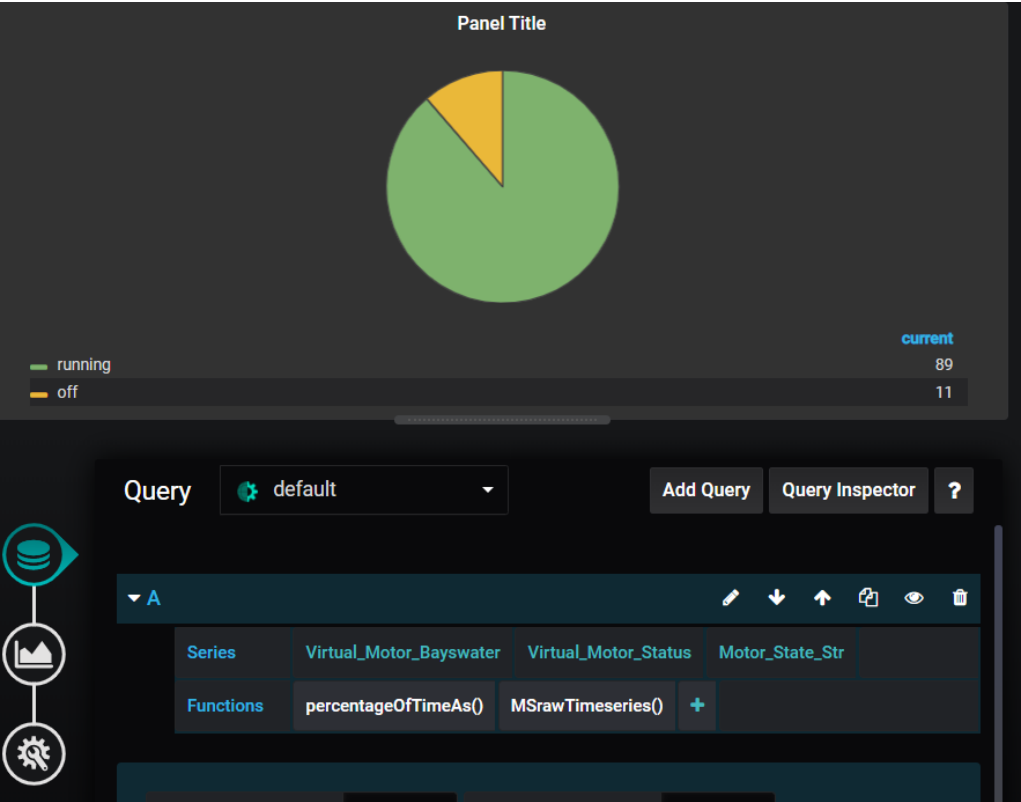
Syntax: `PercentageOfTimeAs(QUERY)`

StringToValue

Replaces strings with a number.

When displaying strings, such as in a table, you may need to change a word to a number or another descriptor, as shown here:

For example, whenever the string 'running' is found in the data it will be returned as the new designated value of '100':

Time ▼	Virtual_Motor_Bayswater.Virtual_Motor_Status.Motor_State_Str
2020-06-02 17:32:57	100.00
2020-06-02 17:29:45	off
2020-06-02 17:28:19	100.00
2020-06-02 17:26:57	100.00

Syntax: `stringToValue(QUERY, string, replacementValue)`

TimeOf

Returns the timestamp of the data points in Unix time. Use this function when you need to know the timestamp of a dataset, you can from the function.

unixTime

Making timestamps more readable in a Table panel requires that you define the datatype as 'date' in the table options. Navigate to options in the visualization tab and select 'date' from the dropdown list next to 'type'.

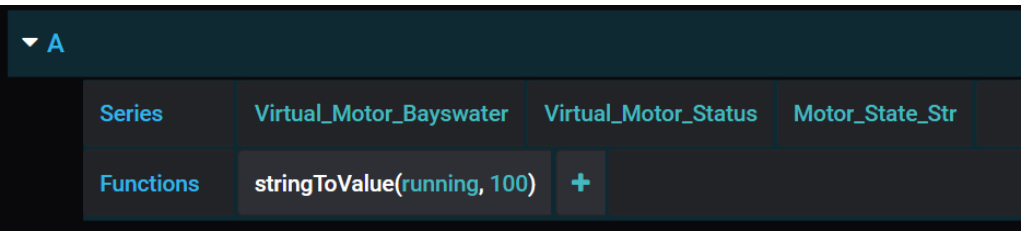| Time ▼	Virtual_Motor_Bayswater.Virtual_Motor_Status.Motor_State
2020-06-02 23:04:00	1.59 Tri
2020-06-02 22:08:00	1.59 Tri
2020-06-02 21:04:00	1.59 Tri
2020-06-02 17:36:00	1.59 Tri
2020-06-02 17:28:00	1.59 Tri

Because the timestamp is returned as a Unix timestamp, some additional steps may need to be carried out to make it more readable:
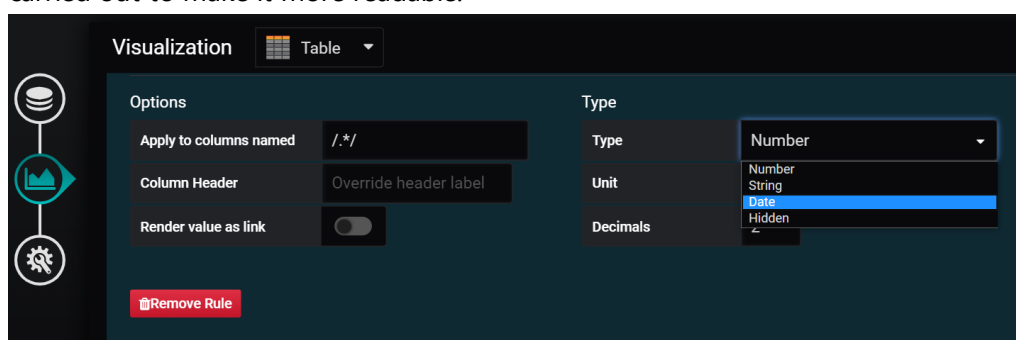
The results are much more readable:

Time ▼	Virtual_Motor_Bayswater.Virtual_Motor_Status.Motor_State
2020-06-02 23:04:00	2020-06-02T23:04:00+10:00
2020-06-02 22:08:00	2020-06-02T22:08:00+10:00
2020-06-02 21:04:00	2020-06-02T21:04:00+10:00
2020-06-02 17:36:00	2020-06-02T17:36:00+10:00
2020-06-02 17:28:00	2020-06-02T17:28:00+10:00

Syntax: `timeOf(QUERY)`

date_type

Displays the value in a human readable fashion.

Syntax: `date_type`

date_readable

Other panel types can also support dates (e.g. single stat). When using the timeOf function be sure to change the type or unit of the panel if it is to be displayed in a readable manner.

Syntax: `date_readable`

timeShift

Offsets a query by 86400 seconds (24 hours) by default. This is useful for overlaying data from the previous day with today's data, or overwriting the time zone of the data:
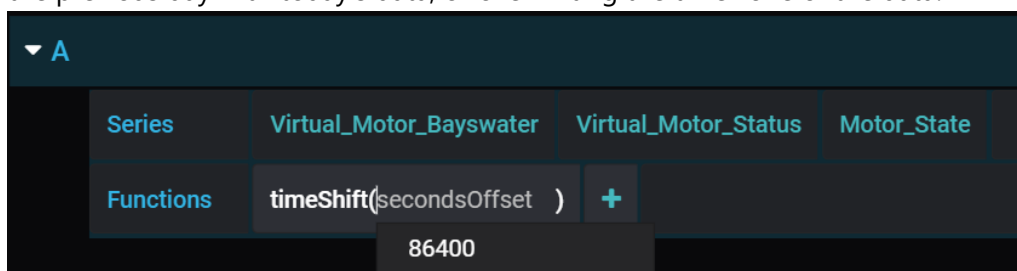
When you set up two queries for the same variable, you can overlay one with the offset and one without:
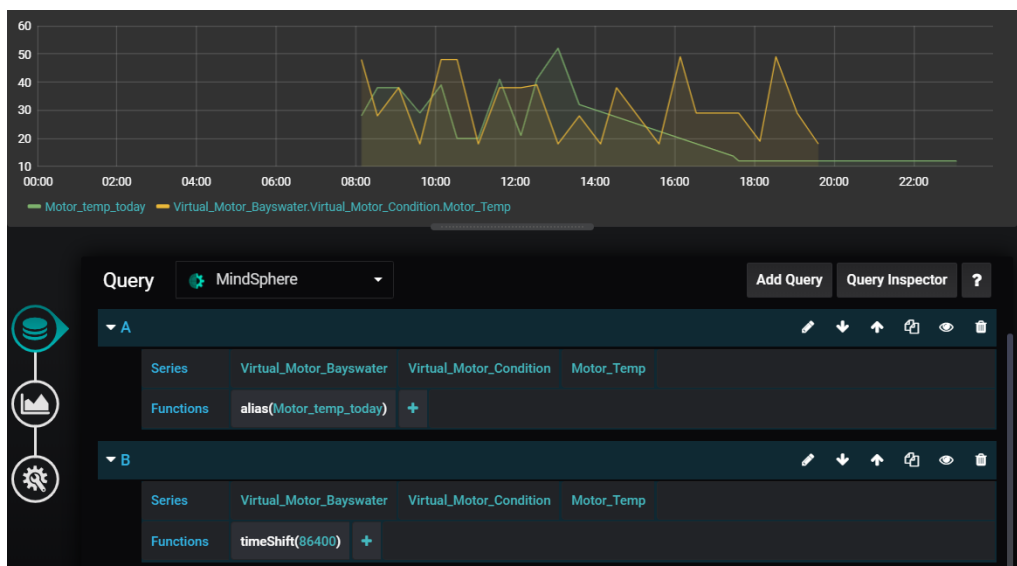
Syntax: `timeShift`

timeShift_noalias

When you notice that data displays with incorrect coloring and joining between points, this is because the graph colors and joins data based on its name. You can fix this by using the alias function to rename any variables that share the same name.

Syntax: `timeShift_noalias`

ValueToString

Replaces a value with a string. For example, in a table that displays machine state values, you can use this function to change the value to a more descriptive word:

Here is an example of a query looking for instances of "0" in the data and returning a user-selected string, "Machine_off":

Time ▾	Virtual_Motor_Bayswater.Virtual_Motor_Status.Motor_State
2020-06-02 23:04:00	Machine_off
2020-06-02 22:08:00	Machine_off
2020-06-02 21:04:00	Machine_off
2020-06-02 17:36:00	0.33
2020-06-02 17:28:00	0.33

Syntax: `valueToString(QUERY, value, replacementString)`

valueToString_filled

When the value '0' is found in data, it returns the new designated string, for example, 'Machine_off'. Replacement strings do not support spaces.

Syntax: `valueToString_filled(QUERY, value, replacementString)`

VFCrequest

Creates a request to the http in blocks in Visual Flow Creator (VFC).
The method parameter in the VFCrequest function defines the method of the call. The format of the endpoint parameter requires an endpoint in this format:
/public/<tenant>/<route>?key=<secret>
This function triggers a flow in VFC, and data can be returned from VFC for visualization, which requires a subscription and access to VFC.
There are also limitations with this function, including:

- Only the 'Get' method is supported, it is selected by default.

- Panels that use this function cannot have other queries added to the panel.

queryParams

Additional custom parameters sent to VFC as a part of the request. You can create a compatible flow in VFC by setting up the http in node as 'httpin_node'. Double click to open settings and enter the endpoint name to use.

Syntax: `VFCrequest(method, endpoint, queryParams) httpin_endpoint`

httpin_access

Changes the access method to public access using keys: httpin_generate, saves the flow, and copies the link address of the http in node.

httpin_key

As the endpoint parameter, this prepares the URL for use by the VFCrequest function.

If you copy the URL, be sure to remove the host URL preceding "/public".

The flow must have an "http out" at the end to cause VFC to respond, as shown in the example flows below.

Once the endpoint is created, the flow will run every time the visualization panel refreshes.

To trigger a VFC flow that displays data, use the following JSON structure:

```
[
    {
        "datapoints": [
            [
                value,
                unix timestamp
            ],
            [
                value,
                unix timestamp
            ],
            [
                value,
                unix timestamp
            ]
        ],
        "tag": {
            "name": "variablename1"
        },
        "target": "variablename1"
    },
    {
        "datapoints": [
            [
                value,
                unix timestamp
            ],
            [
                value,
                unix timestamp
            ],
            [
                value,
                unix timestamp
            ]
        ],
        "tag": {
            "name": "variablename2"
        },
        "target": "variablename2"
    }
]
```

Here is an example that uses real data:

```
[
  {
    "datapoints": [
      [
        2384.045,
        1598382900
      ],
      [
        2387.24,
        1598383200
      ],
      [
        2414.01,
        1598383500
      ]
    ],
    "tags": {
      "name": "POWER_GENERATION"
    },
    "target": "POWER_GENERATION"
  }
]
```

Security information

Creating an http in node with a public access key means that the particular flow triggered by the http in node can potentially be accessed externally. Thus, it is important to protect your data and prevent unauthorized access. Please handle the access keys with care.

Creating an Access Control Node

Create an "access control" node after the http in node so it's possible to determine that the flow is being requested.
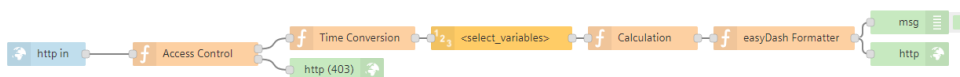
This 'access control' node, shown above, is a function node with this code:
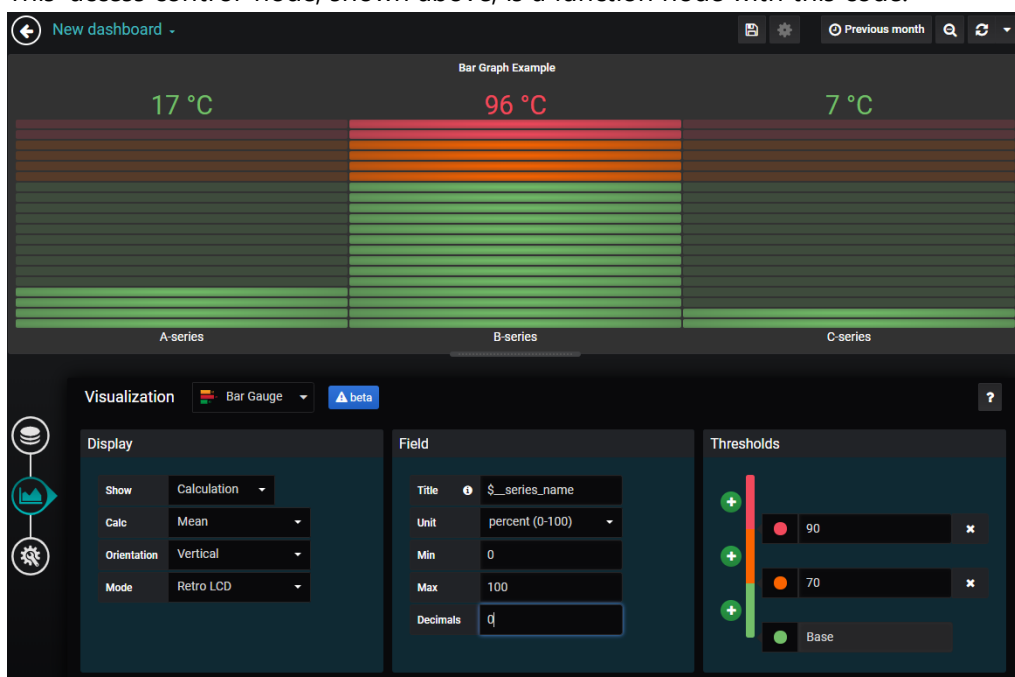
Example Flows

Follow these steps to import the example flow code:

1. Copy the code displayed below to your clipboard.

2. Open Visual Flow Creator.

3. Select "Import" and "New flow" from the app menu and paste the code.

Double click the ReadMe nodes for more information.

Basic Flow Example

```
[
{
    "id": "6dc5e5d4.be494c",
    "type": "comment",
    "z": "392f23c2.fd446c",
    "name": "Read me",
    "info": "Access Control Node:\n    The access control node is to reduc
e the risks of using a public key.\n    This node checks the referer of th
e incoming request - if the referer does \n    not match the expected orig
in (the data source) \n    then an error 403 \"forbidden\" will be returne
d to the requester.\n    \n    \n\nTime Conversion Node:\n    Converts tim
estamps to the format that VFC uses \n    \nRead Timeseries Node:\n    Sel
ect the variable(s) you wish to manipulate and display. \n    Make sure th
at the \"Mode\" is set to \"Interval\" and that the interval fields \n
are left blank if you want the time range to match that of the dashboard
\n    making the request.\n    \n\"Calculation\" Function Node:\n    The C
alculation node in this example flow is a Function node and has a very\n
simple calculation - it divides all the values by 2.\n    \n\"Formatter\"
Function Node:\n    This is an example node which provides a method of con
verting a typical\n    MindSphere response and a typical analytics node re
sponse. \n    If custom analytics functions are being implemented then it
is likely that\n    this node will need adjustment.",
    "sticky": 0,
    "x": 340,
    "y": 1200,
    "wires": [],
    "_type": "node"
},
{
    "id": "11c225e8.96268a",
    "type": "debug",
    "z": "392f23c2.fd446c",
    "name": "",
    "active": true,
    "console": "false",
```

```
            "xaxis": "_time",
            "complete": "true",
            "x": 1250,
            "y": 1220,
            "wires": []
        },
        {
            "id": "5bc50450.2a2fec",
            "type": "function",
            "z": "392f23c2.fd446c",
            "name": "Access Control",
            "func": "let refererURL = \"https://<tenantname>-dashboarddesigner-dat
asource\";\nif(msg.req.headers.referer == refererURL){\nreturn [msg,null];
\n}else{\n    console.log(\"Forbidden\");\n    msg = {};\n    msg.statusCo
de = 403;\n    \n    return [null,msg];\n}\n",
            "outputs": "2",
            "noerr": 0,
            "x": 340,
            "y": 1260,
            "wires": [
                [
                    "e8fdc546.0c8628"
                ],
                [
                    "37466b30.e8dfa4"
                ]
            ]
        },
        {
            "id": "e8fdc546.0c8628",
            "type": "function",
            "z": "392f23c2.fd446c",
            "name": "Time Conversion",
            "func": "msg.from = new Date(parseInt(msg.req.query.from));\nmsg.to =
new Date(parseInt(msg.req.query.to));\nreturn msg;",
            "outputs": 1,
            "noerr": 0,
            "x": 540,
            "y": 1240,
            "wires": [
                [
                    "285dd047.2206f"
                ]
```

```
        ]
    },
    {
        "id": "f09ef087.5c316",
        "type": "function",
        "z": "392f23c2.fd446c",
        "name": "Calculation",
        "func": "for (let i in msg.payload){ \n    for (let key in msg.payload
[i]) {\n        if (key != \"_time\") {\n            msg.payload[i][key] =
(msg.payload[i][key]/2);\n        }\n    }\n}\n\nreturn msg;",
        "outputs": 1,
        "noerr": 0,
        "x": 910,
        "y": 1240,
        "wires": [
            [
                "fe227dcc.84658"
            ]
        ]
    },
    {
        "id": "fe227dcc.84658",
        "type": "function",
        "z": "392f23c2.fd446c",
        "name": "Dashboard_Designer Formatter",
        "func": "let msVariables = {};\n\n// this function makes a number of a
ssumptions about the data coming in and was written for data outputs of th
e VFC analytics nodes\nif(!Array.isArray(msg.payload)){ // this function c
heck to see if the payload is an array, which is required for the formatti
ng\n    console.log(\"payload is not the correct format, attempting to rea
djust\"); \n    if(typeof(msg.payload)!=='object' && msg.parameter){\n
msg.payload = { [msg.parameter]: msg.payload };\n    }\n    if(!msg.payloa
d._time){ // assuming there is only one data point in the payload that tri
ggers this function - typical outputs of analytics nodes will have one val
ue and no timestamp - this ensures the data will populate the visualizatio
n panel\n        msg.payload._time = msg.to;\n    }\n    msg.payload = [ms
g.payload]; // once the above checks have been made we must make an array
for the next function to execute properly.\n}\nif(Array.isArray(msg.payloa
d)){\n    for (let i in msg.payload){ \n        for (let key in msg.payloa
d[i]) {\n            if (key != \"_time\") {\n                if (!msVaria
bles[key]) {\n                    msVariables[key] = { \"datapoints\": [],
\"tag\": {\"name\": key}, \"target\": key }; //our Dashboard_Designer obje
ct\n                }\n                msVariables[key].datapoints.push([m
```

```
sg.payload[i][key],new Date(msg.payload[i]._time).getTime()/1000]);\n
}\n        }\n    }\n    msg.payload = [];\n    for (let i in msVariables)
{\n        msg.payload.push(msVariables[i]);\n    }\n    return msg;\n}els
e{\n    console.log(\"Data could not be formatted correctly\");\n}\n",
    "outputs": 1,
    "noerr": 0,
    "x": 1090,
    "y": 1240,
    "wires": [
        [
            "11c225e8.96268a",
            "3c3e8ca3.ac8b14"
        ]
    ]
},
{
    "id": "9368a33c.14e98",
    "type": "http in",
    "z": "392f23c2.fd446c",
    "name": "http in",
    "endpoint": "",
    "method": "get",
    "upload": false,
    "access": "private",
    "key": "",
    "users": "",
    "x": 170,
    "y": 1260,
    "wires": [
        [
            "5bc50450.2a2fec"
        ]
    ]
},
{
    "id": "3c3e8ca3.ac8b14",
    "type": "http response",
    "z": "392f23c2.fd446c",
    "name": "",
    "statusCode": "",
    "headers": {},
    "x": 1250,
    "y": 1260,
```

```
        "wires": []
    },
    {
        "id": "37466b30.e8dfa4",
        "type": "http response",
        "z": "392f23c2.fd446c",
        "name": "",
        "statusCode": "403",
        "headers": {},
        "x": 520,
        "y": 1280,
        "wires": []
    },
    {
        "id": "285dd047.2206f",
        "type": "read timeseries",
        "z": "392f23c2.fd446c",
        "name": "",
        "topic": "",
        "topicLabel": "",
        "assetName": "",
        "period": "60",
        "offset": "0",
        "mode": "interval",
        "from": "",
        "datetimepickerFrom": "",
        "to": "",
        "datetimepickerTo": "",
        "timezoneoffset": 0,
        "x": 720,
        "y": 1240,
        "wires": [
            [
                "f09ef087.5c316"
            ]
        ]
    }
]
```

Analytics Example: Moving Average

```
  [
    {
        "id": "693080.833c5f8",
```

```
    "type": "comment",
    "z": "392f23c2.fd446c",
    "name": "Read me",
    "info": "Access Control Node:\n    The access control node is to reduc
e the risks of using a public key.\n    This node checks the referer of th
e incoming request - if the referer does \n    not match the expected orig
in (the data source) \n    then an error 403 \"forbidden\" will be returne
d to the requester.\n\n \n\nTime Conversion Node:\n    Converts timestamps
to the format that VFC uses \n    \nRead Timeseries Node:\n    Select the
variable(s) you wish to manipulate and display. \n    Make sure that the
\"Mode\" is set to \"Interval\" and that the interval fields \n    are lef
t blank if you want the time range to match that of the dashboard \n    ma
king the request.\n    \n\"Formatter\" Function Node:\n    This is an exam
ple node which provides a method of converting a typical\n    MindSphere r
esponse and a typical analytics node response. \n    If custom analytics f
unctions are being implemented then it is likely that\n    this node will
need adjustment.",
    "sticky": 0,
    "x": 320,
    "y": 1440,
    "wires": [],
    "_type": "node"
},
{
    "id": "4dea3605.6899e8",
    "type": "debug",
    "z": "392f23c2.fd446c",
    "name": "",
    "active": true,
    "console": "false",
    "xaxis": "_time",
    "complete": "true",
    "x": 1230,
    "y": 1460,
    "wires": []
},
{
    "id": "2ec0625a.b5ad7e",
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "Access Control",
    "func": "let refererURL = \"https:// Dashboard_Designer-datasource-sil
opsms.apps.eu1.mindsphere.io\";\nif(msg.req.headers.referer == refererURL)
```

```
{\nreturn [msg,null];    \n}else{\n    console.log(\"Forbidden\");\n    ms
g = {};\n    msg.statusCode = 403;\n    \n    return [null,msg];\n}\n",
    "outputs": "2",
    "noerr": 0,
    "x": 320,
    "y": 1500,
    "wires": [
        [
            "aee3ad9b.e4ad"
        ],
        [
            "62e6b5bb.c58bcc"
        ]
    ]
},
{
    "id": "aee3ad9b.e4ad",
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "Time Conversion",
    "func": "msg.from = new Date(parseInt(msg.req.query.from));\nmsg.to =
new Date(parseInt(msg.req.query.to));\nreturn msg;",
    "outputs": 1,
    "noerr": 0,
    "x": 520,
    "y": 1480,
    "wires": [
        [
            "8ab9a317.bcd2a"
        ]
    ]
},
{
    "id": "f0f3fae1.aff638",
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "Dashboard_Designer Formatter",
    "func": "let msVariables = {};\n\n// this function makes a number of a
ssumptions about the data coming in and was written for data outputs of th
e VFC analytics nodes\nif(!Array.isArray(msg.payload)){ // this function c
heck to see if the payload is an array, which is required for formatting\n
console.log(\"payload is not the correct format, attempting to readjust
\"); \n    if(typeof(msg.payload)!=='object' && msg.parameter){\n        m
```

```
    sg.payload = { [msg.parameter]: msg.payload };\n    }\n    if(!msg.payloa
    d._time){ // assuming there is only one data point in the payload that tri
    ggers this function - typical outputs of analytics nodes will have one val
    ue and no timestamp - this ensures the data will populate the visualizatio
    n panel\n        msg.payload._time = msg.to;\n    }\n    msg.payload = [ms
    g.payload]; // once the above checks have been made we must make an array
    for the next function to execute properly.\n}\nif(Array.isArray(msg.payloa
    d)){\n    for (let i in msg.payload){ \n        for (let key in msg.payloa
    d[i]) {\n            if (key != \"_time\") {\n                if (!msVaria
    bles[key]) {\n                    msVariables[key] = { \"datapoints\": [],
    \"tag\": {\"name\": key}, \"target\": key }; //our Dashboard_Designer obje
    ct\n                }\n                msVariables[key].datapoints.push([m
    sg.payload[i][key],new Date(msg.payload[i]._time).getTime()/1000]);\n
    }\n        }\n    }\n    msg.payload = [];\n    for (let i in msVariables)
    {\n        msg.payload.push(msVariables[i]);\n    }\n    return msg;\n}els
    e{\n    console.log(\"Data could not be formatted correctly\");\n}\n",
        "outputs": 1,
        "noerr": 0,
        "x": 1070,
        "y": 1480,
        "wires": [
            [
                "4dea3605.6899e8",
                "ee0fa9f.f331758"
            ]
        ]
    },
    {
        "id": "b19229df.5310f8",
        "type": "http in",
        "z": "392f23c2.fd446c",
        "name": "",
        "endpoint": "",
        "method": "get",
        "upload": false,
        "access": "private",
        "key": "",
        "users": "",
        "x": 170,
        "y": 1500,
        "wires": [
            [
                "2ec0625a.b5ad7e"
```

```
            ]
        ]
    },
    {
        "id": "ee0fa9f.f331758",
        "type": "http response",
        "z": "392f23c2.fd446c",
        "name": "",
        "statusCode": "",
        "headers": {},
        "x": 1230,
        "y": 1500,
        "wires": []
    },
    {
        "id": "62e6b5bb.c58bcc",
        "type": "http response",
        "z": "392f23c2.fd446c",
        "name": "",
        "statusCode": "403",
        "headers": {},
        "x": 500,
        "y": 1520,
        "wires": []
    },
    {
        "id": "63fcd020.91557",
        "type": "moving average",
        "z": "392f23c2.fd446c",
        "name": "",
        "parameter": "",
        "parameterout": "",
        "windowSize": 3,
        "algorithm": "simple",
        "alpha": 0.5,
        "x": 880,
        "y": 1480,
        "wires": [
            [
                "f0f3fae1.aff638"
            ]
        ]
    },
```

```json
{
    "id": "8ab9a317.bcd2a",
    "type": "read timeseries",
    "z": "392f23c2.fd446c",
    "name": "",
    "topic": "",
    "topicLabel": "",
    "assetName": "",
    "period": "60",
    "offset": "0",
    "mode": "interval",
    "from": "",
    "datetimepickerFrom": "",
    "to": "",
    "datetimepickerTo": "",
    "timezoneoffset": 0,
    "x": 700,
    "y": 1480,
    "wires": [
        [
            "63fcd020.91557"
        ]
    ]
}
    ]
```

Access Query Parameters Sent to VFC

```json
 [
{
    "id": "3703d4c5.4b51ac",
    "type": "comment",
    "z": "392f23c2.fd446c",
    "name": "Read me",
    "info": "This flow provides an example of how the query parameters can
be accessed from within a Visual Flow Creator flow.",
    "sticky": 0,
    "x": 540,
    "y": 1600,
    "wires": [],
    "_type": "node"
},
{
    "id": "1edecaa1.50b9b5",
```

```
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "Access Control",
    "func": "let refererURL = \"https:// Dashboard_Designer-datasource-sil
opsms.apps.eu1.mindsphere.io\";\nif(msg.req.headers.referer == refererURL)
{\nreturn [msg,null];   \n}else{\n    console.log(\"Forbidden\");\n    ms
g = {};\n    msg.statusCode = 403;\n    \n    return [null,msg];\n}\n",
    "outputs": "2",
    "noerr": 0,
    "x": 551.5,
    "y": 1661,
    "wires": [
        [
            "3f44162d.f2f52a"
        ],
        [
            "fcfa3a54.111b18"
        ]
    ]
},
{
    "id": "3f44162d.f2f52a",
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "debug query param",
    "func": "console.log(msg.req.query.exampleQueryParam);\n\nreturn ms
g;",
    "outputs": 1,
    "noerr": 0,
    "x": 761.5,
    "y": 1641,
    "wires": [
        []
    ]
},
{
    "id": "e9b94d90.5d4a6",
    "type": "http in",
    "z": "392f23c2.fd446c",
    "name": "",
    "endpoint": "",
    "method": "get",
    "upload": false,
```

```
        "access": "private",
        "key": "",
        "users": "",
        "x": 381.5,
        "y": 1661,
        "wires": [
            [
                "1edecaa1.50b9b5"
            ]
        ]
    },
    {
        "id": "fcfa3a54.111b18",
        "type": "http response",
        "z": "392f23c2.fd446c",
        "name": "",
        "statusCode": "403",
        "headers": {},
        "x": 731.5,
        "y": 1681,
        "wires": []
    }
 ]
```

string_table

!!! note Replacement strings do not support spaces.

VFCrequest

Creates a request to the http in blocks in Visual Flow Creator (VFC). Data can be returned from VFC for visualization. This requires a subscription and access to Visual Flow Creator.
Important Points About VFC Requests:

- Only the GET method is currently supported and is selected by default.

- A panel that uses VFCrequest cannot have additional queries in the same panel.

- No asset query is required for this function, as the data is retrieved via Visual Flow Creator.

- The method parameter defines the method of the call.

The format of the endpoint parameter requires an endpoint which follows this format:
`/public/<tenant>/<route>?key=<secret>`.

Syntax: `VFCrequest(method, endpoint, queryParams)`

queryParams

Additional custom parameters that can be sent to VFC as a part of the request; this creates a compatible flow in Visual Flow Creator when you set up the http in node in Visual Flow Creator.

httpin_node

Double click to open the settings and enter the endpoint name that you wish to use.

httpin_endpoint

Changes the Access method to Public access using keys.

httpin_generate

Save this flow and copy the link address of the http in node.

httpin_key

The URL used by the VFCrequest function as the endpoint parameter. If you copied the URL manually, be sure to remove the host URL preceding /public. For Visual Flow Creator to respond, the flow should have an http out at the end as seen in the example flows below.
Once the endpoint is created, the flow will run every time the visualization panel refreshes, as long as it is formatted correctly. The visualization panel can only display the data configured with the correct JSON structure, as shown in the example below.

Security Information

Creating an http in node with a public access key means that the particular flow triggered by the http in node can potentially be accessed externally. Thus, it is important to protect your data and prevent unauthorized access. Please handle the access keys with care.
It is recommended to create an "access control" node after the http in node so that the flow can determine if the flow is being requested by the visualization panel.
The "access control" node shown above is a function node with the code:
Importing an Example Flow
To import an example flow from below, copy the code and select Import > new flow from the app menu in Visual Flow Creator. Double-click the Read me nodes for more information.

Example: Access Query Parameters Sent to VFC

```
[
{
    "id": "3703d4c5.4b51ac",
    "type": "comment",
    "z": "392f23c2.fd446c",
```

```
    "name": "Read me",
    "info": "This flow provides an example of how the query parameters can
be accessed from within a Visual Flow Creator flow.",
    "sticky": 0,
    "x": 540,
    "y": 1600,
    "wires": [],
    "_type": "node"
},
{
    "id": "1edecaa1.50b9b5",
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "Access Control",
    "func": "let refererURL = \"https://Dashboard_Designer-datasource-silo
psms.apps.eu1.mindsphere.io\";\nif(msg.req.headers.referer == refererURL)
{\nreturn [msg,null];    \n}else{\n    console.log(\"Forbidden\");\n    ms
g = {};\n    msg.statusCode = 403;\n    \n    return [null,msg];\n}\n",
    "outputs": "2",
    "noerr": 0,
    "x": 551.5,
    "y": 1661,
    "wires": [
        [
            "3f44162d.f2f52a"
        ],
        [
            "fcfa3a54.111b18"
        ]
    ]
},
{
    "id": "3f44162d.f2f52a",
    "type": "function",
    "z": "392f23c2.fd446c",
    "name": "debug query param",
    "func": "console.log(msg.req.query.exampleQueryParam);\n\nreturn ms
g;",
    "outputs": 1,
    "noerr": 0,
    "x": 761.5,
    "y": 1641,
    "wires": [
```

```
            []
        ]
    },
    {
        "id": "e9b94d90.5d4a6",
        "type": "http in",
        "z": "392f23c2.fd446c",
        "name": "",
        "endpoint": "",
        "method": "get",
        "upload": false,
        "access": "private",
        "key": "",
        "users": "",
        "x": 381.5,
        "y": 1661,
        "wires": [
            [
                "1edecaa1.50b9b5"
            ]
        ]
    },
    {
        "id": "fcfa3a54.111b18",
        "type": "http response",
        "z": "392f23c2.fd446c",
        "name": "",
        "statusCode": "403",
        "headers": {},
        "x": 731.5,
        "y": 1681,
        "wires": []
    }
        ]
```

6.8   Visualizations and Plugins

Visualization options allow you to get the most out of the data you want to visually analyze. This section includes both overviews and details that describe what each visualization panel does and its options and features.

About Functions

Functions associate or transform raw data into useful outputs that help you create meaningful dashboards. When queries request data, the data is automatically aggregated in a format similar to other Insights Hub Monitor apps.

Default Query Settings Overrides

When you want to query data in a way that differs from the default query settings, you can use functions to override the default query settings. See the Functions topic for more information.

Graph

Allows for the representation of multiple values over a period of time or as a histogram. This graph also displays data point details when you hover over a specific point:
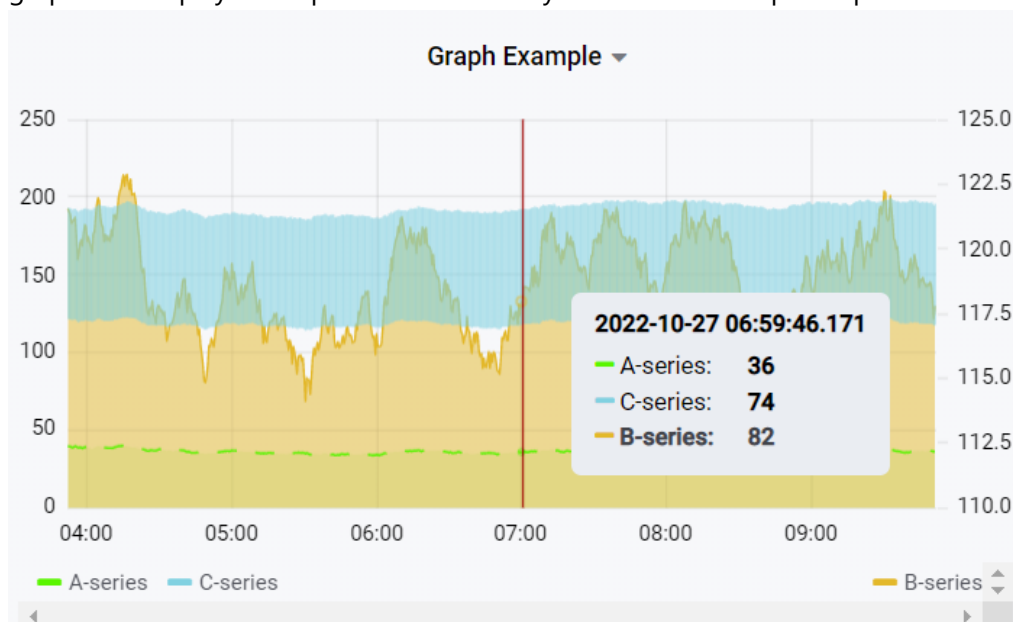
Draw Modes

Bars displays the data as a bar chart.
Lines displays the data as a line graph.
Points displays the data as points on a graph.

Mode Options

Fill fills the area between the graph and the X- axis. (0 = no fill, 10 = full fill).
Line Width allows you to specify the width of the lines that display in a graph.
Staircase displays the data as a stepped line graph.

Hover Tooltip Modes

All Series displays graph series as a tool tip when you hover over graph data.

Single displays a single series as a tool tip when you hover over graph data.

Sort Order requires you to select "All Series" first, then you can change the tool tip order to 'none' which, in turn, allows the query's setting to prevail and the order, ascending or descending, is determined by what you select.

Stacking & Null Values

Stack enables data queries to stack on top of one another.

Null Value allows you to choose how null values display.

Connected skips null values and connects the graph's line to the next non-null value.

Null creates a gap in the line graph.

Null as zero renders null values as zeroes.

Series Override

Allows the selected series to display in a style different from the other elements.

Axes

Show displays the chosen axis. To assign data to the right Y-axis, use the Series Override function.

Unit allows you to select a unit for the axis data.

Scale changes the scale of the axis from Linear to log (base 2), log (base 10), log (base 32) and log (base 1024).

Y-Min & Y-Max sets the minimum of maximum value for the axis.

Decimals sets the number of decimals to display for the axis data.

Label displays labels on the axes.

X-Axis Mode

Time displays the data with reference to time.

Series displays the data grouped by series, and allows changing the type of data represented by selecting from the drop-down list options, avg, min, max, total, count, and current.

Histogram groups values as ranges, and allows customizing the number of ranges (buckets) to display, and filters to leave out specified min and max values.

Legend Options

Show displays the graph legend with the series name and color.

As table displays the legend as a table.

To the right displays the legend to the right of the graph.

Width sets the minimum width for the table (in pixels).

Values displays toggled values in the legend.

Hide series hides series that return only nulls or zeros.

Threshold & Time Regions

Threshold overlays visual thresholds on the graph to indicate greater than (gt) or less than (lt) the described value.

You can customize the threshold color, fill, line and which y-axis the threshold applies to.

Time Region overlays a visual indication of a time range (different days of the week); to time series data.

> ✏️
>
> Raise or lower the threshold value by dragging the threshold value displayed on the right side of the graph.

Singlestat

Displays the value of the queried data and only displays a single query.
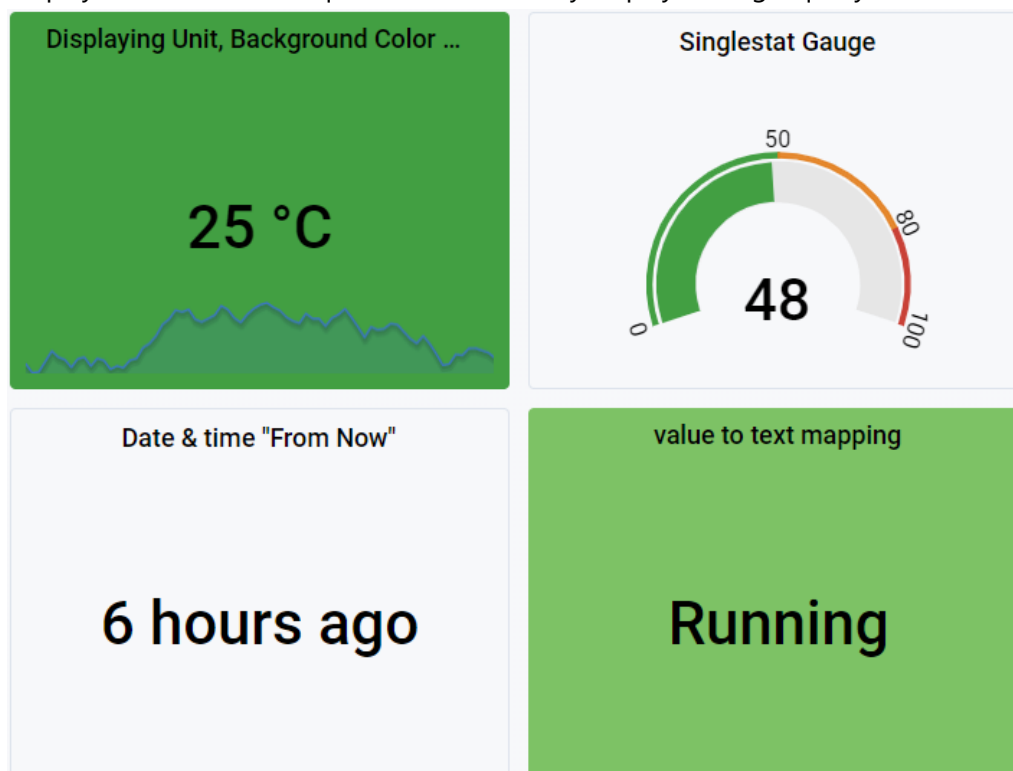
Value displays the data according to the option selected within the selected time range. Includes Min, Max, Average, Current (latest), Total, Name (of series), First, Delta (total incremental increase (of a counter) in the series), Difference, Range and Time (stamp) of last point.

Prefix adds a prefix to the value.

Postfix adds a postfix to the value. Useful for custom units.

Unit adds a unit to the value, before the postfix.

Decimals sets the number of decimals that display.

Coloring

Background adds the selected color to the background of the panel.

Value adds the selected color to the value text.

Prefix adds the selected color to the prefix text.

Postfix adds the selected color to the postfix text.

Thresholds sets the thresholds for colored visualization.

Colors sets the colors that the threshold values represent.

Spark lines adds a basic line graph to the panel with custom visualization options available.

Gauge adds a gauge visualization behind the single stat with custom visualization options available.

Value Mappings allow values, or a range of values, to display as text.

> 🖊
>
> If you want the visualization of a Boolean value to render in color, set the threshold value to "0.1, 0.9", which changes the first and last color to the color you specify.

Gauge

Displays a gauge with slightly different options compared to Singlestat.

All Values displays a separate gauge for each row of data, and the "Limit" input restricts it to a maximum number of rows.

Calculation displays a calculated value within the chosen data range.

Calculations you can select include:

- Last (current value)

- Minimum

- Maximum

- Mean

- Total count

- Delta (total incremental increase (of a counter) in the series

- Step (minimum interval between values)

- Difference

- Min (above zero)

- Change count (number of times the value changes)

- Distinct count (number of unique values)

Labels displays the gauge labels that are set in the "Thresholds" section

Markers displays the gauge color markers that are set in the "Thresholds" section)

Field Title adds a title or description beneath the value

Unit selects the unit of measure for the value

Min and Max select the minimum and maximum values for the gauge

Decimals sets the number of decimals to display

Thresholds sets the threshold value and associated color

Value Mappings allows for values (or a range of values) to display as text

Bar Gauge

Displays single data points in bars.
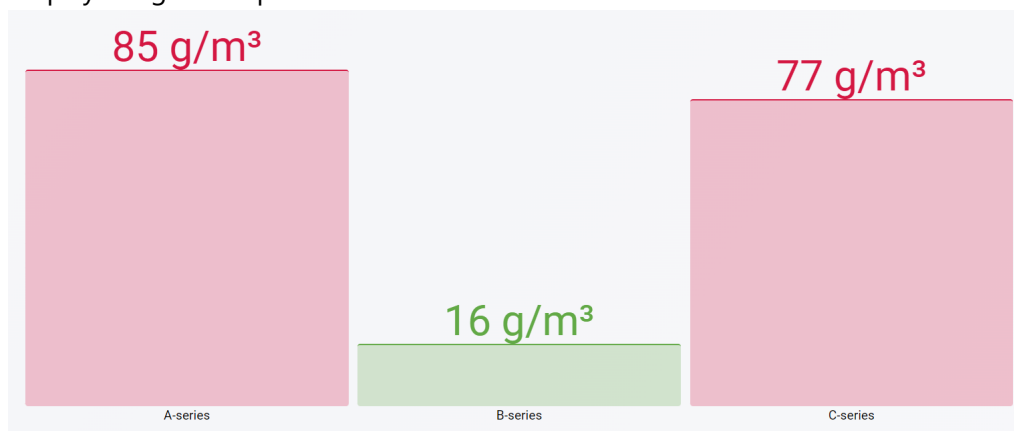
Show All Values displays a separate gauge for each row of data, the "Limit" input keeps it to a maximum number of rows

Calculation displays a calculated value within the chosen data range. Calculations you can select include:

- Last (current value)

- First

- Minimum

- Maximum

- Mean

- Total count

- Delta (total incremental increase (of a counter) in the series)

- Step (minimum interval between values)

- Difference

- Min (above zero)

- Change count (number of times the value changes)

- Distinct count (number of unique values)

Bar Gauge Display

Orientation sets the bars to display horizontally or vertically
Mode selects the way to visually represent the bar gauge: Basic, Retro LED, or Gradient.

Fields

Title ads a title and description above the bar gauge
Unit select the unit for the value
Min and Max select the minimum and maximum values for the gauge
Decimals sets the number of decimals to display
Threshold sets the threshold value and the associated color
Value Mappings allows for values (or a range of values) to display as text

Breadcrumb

Breadcrumb is a panel plugin that tracks dashboards you visit during a session and displays them as a breadcrumb.
Dashboards are listed once even if you visit them more, and the names are hyperlinked for easy returns. Navigating back to a dashboard resets any navigation movements made after the dashboard you return to.

> 🖊
>
> Breadcrumbs only track dashboards that include a Breadcrumb panel.

Is Root

Is Root sets the current dashboard as the root and clears breadcrumbs in the root dashboard.
Is root dashboard clears the breadcrumb in the root dashboard.
Hide text in root dashboard displays nothing if the breadcrumb has only one item.
Limit the amount of breadcrumb items to limits the number of breadcrumb items and removes the oldest item when the number of items is surpassed.

Limit sets a limit on breadcrumb items. When the item limit is reached, the oldest item drops from the breadcrumb when a new one is added.

Table

Displays data in a table format.

Table Data

Table Transform sets the type of transformation(s) required:

Time Series to rows automatically sets columns as Time, Series Name, and Value.

Time Series to Column automatically sets columns as Time and Value.

Time Series Aggregations automatically sets columns as Series Name and Average, although you can substitute Min, Max, Avg, Total, Current (last value), or Count for Average.

JSON Data displays raw value data and timestamp data in JSON format.

Paging offers options for large amounts of data, like limiting the number of rows per page, adding page scrolling, and changing font size.

Column Styles

All column styles are editable. Use the:

Options identify the specific column to change by using the "Apply to columns named" input. You can change the column title (header) now, and, if you want, render the value as a link to click through.

Type depending on the column content data type, i.e., number, string, date, hidden, you can customize thresholds, apply colors to values, cells, and rows, and add value mapping, which transforms values or value ranges to text.

Text

Text is a simple panel that displays text that you can add using MarkDown or HTML formats.

Heatmap
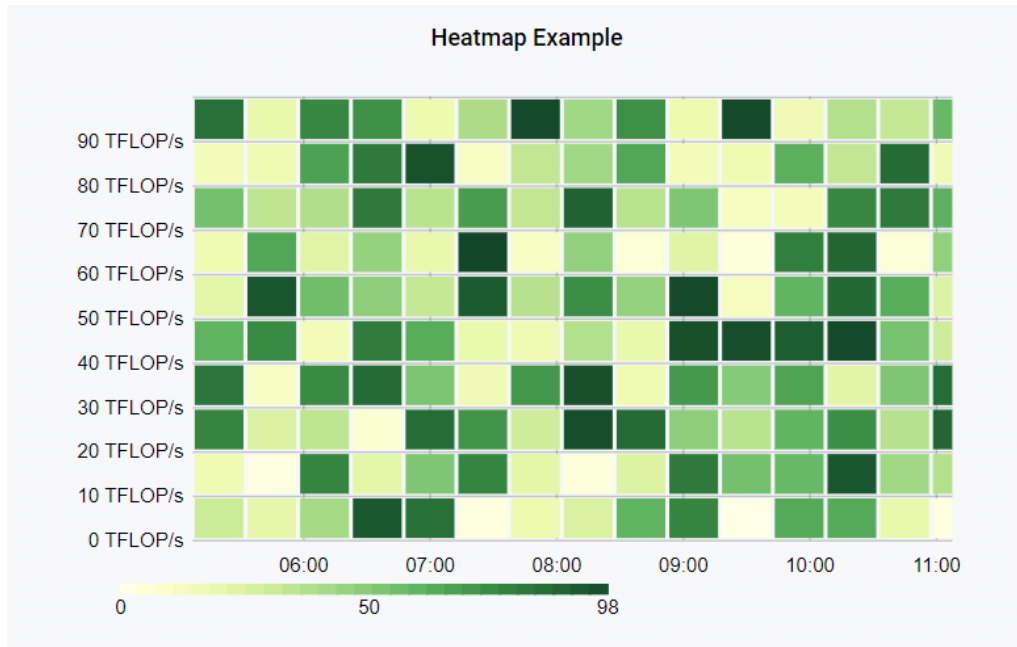
Y-Axis

Unit: sets the unit for axis values.
Scale changes the axis scale from Linear to log (base 2), log (base 10), log (base 32) and log (base 1024).
Y-min & Y-max sets the minimum of maximum values for the axis
Decimals: sets the number of decimal placess to display for axis values.

Buckets

You can change both the number and size of data buckets according to visualization requirements for both the Y- and X-axes.

Data Format

You can change between time series and time series buckets.

Display

Numerous visualizations are available, for example, color mode (spectrum or opacity), color scale, show/hide legend, bucket visualizations, bucket spacing and shape, and tool tip display.

Dashboard List

Dashboard List Options

Starred displays favorite dashboards

Recently Viewed displays recently viewed dashboards

Search allows users to search dashboards from a panel

Show Headings displays dashboard headings

Max Items displays the input amount of dashboards

Search when "search" is enabled, dashboard display can be limited to set queries, folders or tags

Clock
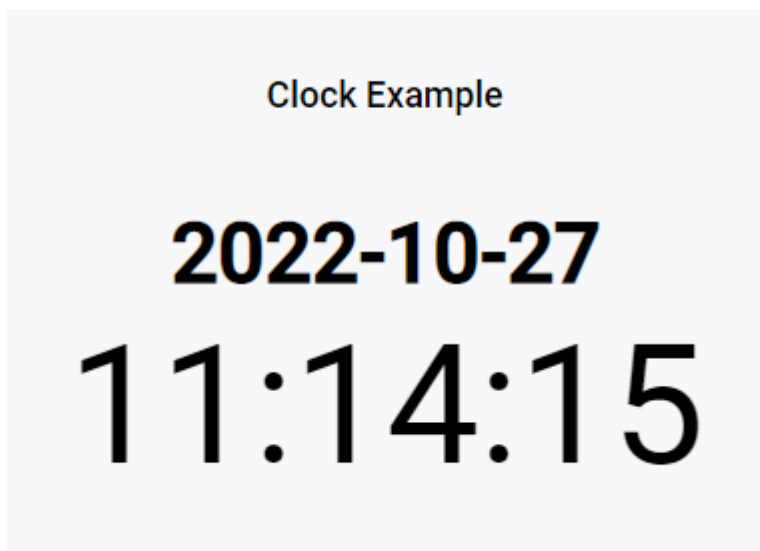
Clock Options

Clock Mode sets the clock to show time or a countdown.

Background color sets the background color of the clock panel.

Countdown sets an action to trigger when the 'countdown' completes, like generating a text message.

Time format when you select "time", additional options appear, including changing between 12 and 24 hours and changing the font size and weight.

Time Zone in both countdown and time clock modes, you can change the time zone display. Your selections here override settings specified for the dashboard. To change your dashboard's time zone, navigate to the dashboard and click the configure icon (upper right) and select the time zone (default, local or UTC in the General settings).

Refresh interval enables the Sync option so the clock synchronizes each time the page refreshes.

Pie Chart

Displays bucket data in a pie or donut chart.

Pie (Donut) Chart Example

		current	percentage
	0	17 kg	5%
	10	57 kg	16%
	20	18 kg	5%
	30	21 kg	6%
	40	52 kg	15%
	50	19 kg	5%
	60	12 kg	3%
	70	54 kg	16%
	80	3 kg	1%
	90	95 kg	27%
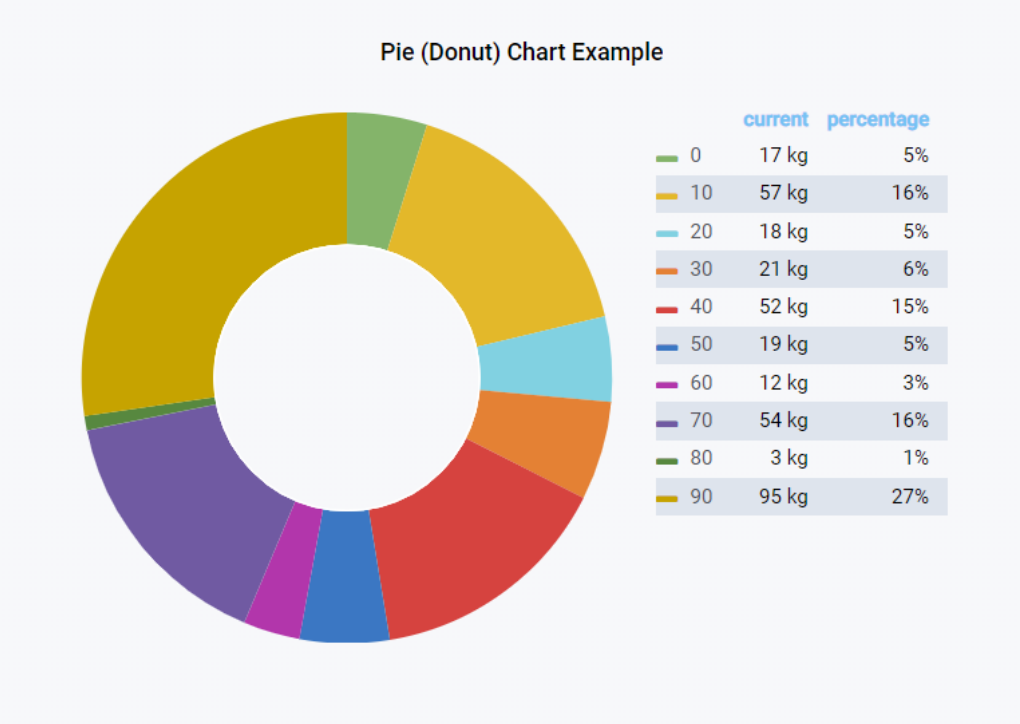
Unit specifies a unit for pie chart values.

Value sets the value or calculation to apply to data from current (last value), minimum, maximum, average and total.

Divider width sets the width in pixels between pie chart segments.

Pie Chart Legend

Show Legend dipslays the legend on the panel.

Position sets the position of the legend relative to the pie chart.

Legend Breakpoint/ Width sets the relative size of the legend relative to its position on the panel.

Legend Values displays the values of the Pie Chart.

Values header overrides the name of the value column.

Values decimals sets the number of decimals to display.

Show Percentage displays the percentages of values that contribute to the segments in a pie chart.

CombineThreshold combines all values that are below a certain threshold. For example, if the range is 0 to 1, and you combine segments of less than 5%, the value combined is entered as 0.05 in the input.

Label provides a label to the combined segments.

> ✏️
>
> In case of trouble in displaying Pie Chart data, try changing the query's function to PercentageofTimeAs.

Scalable Vector Graphics (SVG)

The SVG panel can display displayng metric-sensitive SVG images. SVG is useful for defining vector-based graphics for websites in XML format. All elements of the attributes in SVG files can be animated, and animation events can be triggered by incoming data.

Demo SVGs

Check out the SVG demonstration examples provided with the SVG panel by navigating to the bottom of the options page and clicking the corresponding button.

Use SVG Builder allows the use of the SVG Builder.

SVG Data opens a field into which you can input SVG data.

Events: allows you to write events in JavaScript so your code executes upon every refresh.

Add SVG repository facilitates users' custom SVG graphics by forking the original project and adding them to the assets folder. If your repository is of general concern, and your license allows sharing, you can add it to the panel plugin via a pull request.

SVG Data pastes your svg code here. You must include a viewbox and IDs for all relevant objects.

> ✏️
>
> You cannot use the SVG Data editor together with the SVG Builder option checked!

onHandleMetric events execute upon every refresh; onHandleMetric(ctrl: MetricsPanelCtrl, svgnode: HTMLElement) ctrl passes a Dashboard_Designer MetricsPanelCtrl object that contains all data relevant to the current panel. You may want to use the ctrl.data array property to access the current measurement data.

svgnode passes the HTMLElement of the svg object on the panel. You can access the elements of the svg itself by using the integrated Snap Library. (http://snapsvg.io/)

Separator

Creates a blank panel you can use as a separator between dashboard panels.

ImageIt

Displays an image and overlays Insights Hub data on top of it.

Settings

Image URL is where you enter the URL of the image you want to display.

To display an image from an IoT file service, input the URL of the image service address followed by a back slash and the image filename.

Size Coefficient scales the size of the image.

Query you can add query values on top of the image using the sensor feature. For example, on the image of a factory floorplan, you can display the values of assets in different locations directly over the asset image on the floorplan.

Metric selects a previously selected query and displays it on top of the image.

Postfix overrides the name of the query.

Unit adds a unit to the value.

Decimals sets the number of decimals to display.

Display Name adds the name you configure to the variable, before the prefix.

Size Coefficient scales the size of the value.

Position selects the position of the sensor according to its X- and Y-coordinates.

Link adds a link that you can click to navigate to; for example, the link could open a dashboard related to the asset.

Hover text specifies text to display when users hover over the value.

Appearance changes how the value is displayed on top of the image. You can also create color mappings that trigger when value thresholds are crossed.

Traffic Lights

Show status data in traffic lights.
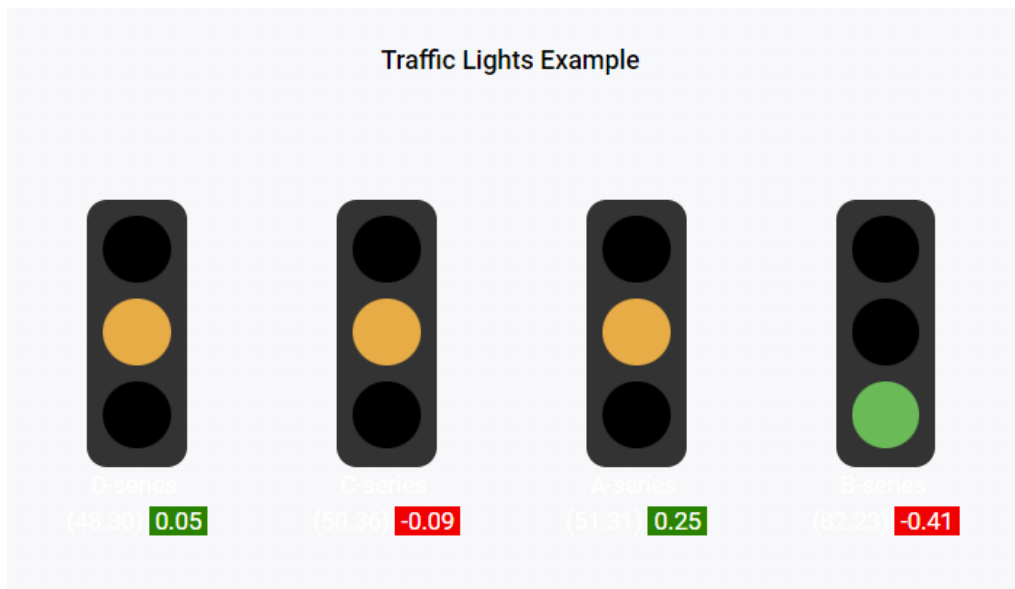
Traffic Light Options

Width limits the traffic light to a specified pixel width.

Font Size changes the font size displayed on the traffic light.

Font Color changes the font color displayed on the traffic light.

Show Value displays the value on the traffic light.

Unit adds a unit to the value.

Digits sets how many Digits are displayed.

Show Trend shows the trend of the data within the set time range.

Sort Lights changes the position of lights according to the values.

Render as link renders the traffic light as a link. Set up the URL in the Link section.

Design spreads traffic lights equidistant across the panel when more than one query is running.

Thresholds: Invert Scale Inverts the traffic light colors to display green at the top and red at the bottom.

Thresholds changes the threshold that activates the lights.

6.9   Welcome to Tips and Tricks for Using Next-gen Dashboards

While easy to use, Next-gen Dashboards has many techniques for creating more advanced visualizations and user interactions. This section's topics show some of these advanced techniques.

Since Next-gen Dashboards is built using a variety of commonly-used open-source applications, you can find many answers on the Internet by searching with the keyword "grafana".

Optimizing Dashboard Performance

When using data sources, dashboard performance usually depends on how the data is structured and how you are retrieving it. This section presents many tips for optimizing your dashboard's performance.

It is important to plan ahead during the design phase to maximize the performance of your dashboards. Considering the points below will help ensure the best performance.

For IoT data sources, ensure the aspect's variables have similar sampling rates

Let's consider, for example, an asset type with this aspect:

- Aspect 1 Sampling rate

- Batch_ID 1 Hour

- Material_ID 1 Hour

- Energy_Usage 15 Seconds

- Motor_Speed 15 Seconds

If you try to retrieve the raw timeseries data of 'Batch_ID' in the past 24 hours, the query request will have to filter through and ignore all the variables that have a 15 seconds sampling rate in the past 24 hours--resulting in a slower response due to the nature of the timeseries API.

Best practice: group variables with similar sampling rates to make the API requests more efficient. For example:

- Aspect 1 Sampling rate

- Batch_ID 1 Hour

- Material_ID 1 Hour

- Aspect 2 Sampling rate

- Energy_Usage 15 Seconds

- Motor_Speed 15 Seconds

Use the correct functions

By default, all data requests are aggregated. If your visualisation only shows 1 data point (e.g. singlestat, gauge, bar gauge), consider using this function: 'MSmostRecentValueWithinTimeRange'.

For example:

- 'MSmostRecentValueWithinTimeRange' runs faster than 'MSmostRecentValueWithin90Days'

- 'MSrawTimeseries' function can have a payload of maximum 4000 data points; if your visualization uses less data points, you should set a limit via the Max Data Points setting.

Consider a longer auto-refresh time setting

A short auto-refresh cycle slows dashboard performance. Also note that a refresh will also run when the response time is longer than the auto-refresh cycle.

Events as annotations

Use annotations to integrate event data into your graphs. Annotations are visualized as vertical lines and icons on all graph panels. Hover over an annotation icon to see the description & severity for an event.

To add events to your dashboard, navigate to:

Dashboard Settings > Annotations > Add Annotation Query and follow these steps:

1. Select a repsository from the Data Source drop-down list.

2. Enter an asset name to retrieve its events. Optionally filter for events of a particular severity by adding a severity field after the asset name.

Using variables to create a template dashboard

Variables allow you to create more interactive and dynamic dashboards by replacing hard-coded elements such as assets and aspects in your metric queries with variables.

A variable is a placeholder for a value that you can use in:

- metric queries

- panel titles

If you have multiple assets that share the same asset type, it is useful to create a reusable dashboard. This makes it possible to quickly browse through all of the assets/aspects by using variables.

When you change a value by selecting from the drop-down list at the top of the dashboard, the panel's metric queries change accordingly.

How to add an asset variable

To add an asset variable, navigate to Dashboard Settings > Variables > Add Variables and follow these steps:

1. Enter a name for the variable (e.g. 'Asset'), followed by the repository name in the Query Options field under Data Sources.

2. Enter the * symbol in the Query field in Query Options.

3. Add a regex filter to the query options to refine the filter. For example, if you have multiple pump assets named 'pump_1', 'pump_2', 'pump_3' ... You can filter for all the pump assets by entering "pump.*". This filters for all asset names beginning with "pump". View the preview of values to be sure your variable are correct.

4. Optionally check the potential values for your variable are correct under "Preview of values".

5. When finished, click "Add" on the bottom of the screen to add the variable. The variable displays in your dashboard "Asset" drop-down list.

6. To use the variable, enter "$variableName" when you create a new data query; in this example, we would enter, "$Asset", then enter the aspect and variable of the query as you normally do. You can change the assets on the panel after you finish your query.

How to add an aspect variable

To add an aspect variable, navigate to Dashboard Settings > Variables > Add Variables (if you already created a variable, select "New") and follow these steps:

1. Enter a name for the variable (e.g. 'Aspect').

2. Enter assetName.* in the query. This queries for all the aspects of the asset you specified.

3. Add a regex filter to the query options to refine the filter for the aspect's variables.

4. Optionally check that the values for the variable are correct under "Preview of values".

5. When finished, click "Add" on the bottom of the screen to add the variable. When you have created the variable, you should now see the 'Asset' dropdown on your dashboard, allowing you to change between the assets.

How to use the aspect variable

To use the variable, enter '$variableName' when you create a new query; in this example, '$Asset' in the asset metric and '$Aspect' in the aspect metric. Enter the variable of the query as you normally do.
Once you set your query, you can make changes to the aspects on the panel.

User interactions with drill-downs and dashboard links

When creating dashboards, it is important to consider your users and that they have different needs.
Some users want their dashboard to **quickly answer questions** like, '*Is there an emergency alarm?*, or '*Has my machine stopped?*, or '*How are today's KPIs tracking?*
Some users want to **drill down to find any issues or trends**.
Some users want **both** quick Q&A and drill-downs on the same dashboard, however, too many questions answered on a single dashboard makes it messy and complex.
Best practice: create multiple dashboards and allow users to navigate between them.

Understanding dashboard URLs

Every dashboard in Next-gen Dashboards has a unique UID and unique URL. Look at the current URL of this tutorial page; it can be broken down into sections:
baseURL /Next-gen Dashboards /d /{dashboardUID} /{dashboardName}

For example:

tenant-Next-gen Dashboards-silopsms.eu1.mindsphere.op/Next-gen

Dashboards/d/TzRQFzkGz/factory-dashboard

Depending on your dashboard, the URL can have other parameters such as date time and

variables:

... ?orgid ={organisation(subtenant) ID} &from ={timeFrom} &to ={timeTo} &var- {variableName}

={variable}

For example:

tenant-Next-gen Dashboards-silopsms.eu1.mindsphere.op/Next-gen

Dashboards/d/G2JVBTwEk/factory-dashboard?orgID=1&from=1586318878357&to=now&var-

Asset=Motor_A

How to create a drilldown link on a dashboard panel to another dashboard

🖉

Certain plugins may not support drilldown links.

Navigate to the Panel Edit page for any dashboard and go to the General tab. Follow these steps
to create a drill down link to another Next-gen dashboard:

1. Select Absolute from the Type drop-down list in the Drilldown Links section.

2. Enter the dashboard URL in the URL field beneath the Type field. The base URL is already included, so subtenant (organization) and dashboard names are not required.

3. Change or skip the 'time' and 'variable' fields depending on whether you want to carry over your current dashboard settings.

4. To customize time and variable settings, turn off Include time range > Include variables, and manually enter them in the URL params field; for example:
&var-Asset=Pump_05&from=now-90d&to=now or include them in the absolute URL.

!!! Info You can use variables in the URL and Url params, e.g, &var-Asset=$Asset.

Creating dashboard navigation using dashboard links

Dashboard links appear in the top right corner of your dashboard and act as links to either
dashboards or external links. You can add tags to dashboards under Dashboard Settings >
General > Tags.

How to create a dashboard link

Follow these steps to create a dashbord link:

1. Navigate to Dashboard Settings > Links > Add Dashboard Link.

2. Select links from the Type drop-down list.

3. Select the dashboard you want to link to. 4. To link to all dashboards, select dashboards from the Type drop-down list.

Creating a "batch list" or "shift list" with tables

Selecting a link on a dashboard allows you to navigate from your dashboard to any link, internal, another dashboard with a specific URL, or external, for example a customer support website.

> ✏️
>
> We recommend reading section 4 which covers user interactions with drill downs and dashboard links before starting.

Even though Next-gen Dashboards has a comprehensive time picker, industrial use cases often require that dashboard data be segregated by *shifts* or *batches*. You can achieve this with a table panel. Depending on the available raw data, there are multiple ways to create the table. Here are some examples.

Best practice: data structure with start and end time available in "Unix timestamp" format. If possible, record the batch or shift start and end time in Unix format, this allows the datapoint to be directly used in Next-gen Dashboard's URLs without any transformation. Here is an example of this data structure:

Variable Data Type Example Data Explanation

Batch_ID STRING/INT/DOUBLE B1001 A batch or shift number Start_Time STRING/INT 1577845800000 2020-01-01 13:30:00 in Unix format (UTC) End_Time STRING/INT 1577856600000 2020-01-01 16:30:00 in Unix format (UTC)

> ℹ️

You can use the Visual Flow Creator (VFC) app to convert standard time to Unix epoch. If you have start and end events (e.g. in boolean format) you can also use VFC to create the start and end times based on the events.

By default, UTC time is converted to your local time. If your time is not stored in UTC, use can also use math functions to convert it.

How to create the batch table

Follow these steps to create a batch table:

1. Create a panel using the Table plugin.

   Query for the required data points. Strings can only be retrieved using the MSrawTimeseries function. This example queries the entire 'batch_info' aspect via a * wild card. This applies the

2. alias function to our results.

3. Navigate to Column Style > Add column style in the Visualization tab of the table panel.

4. Enter the name of the column for your batch/shift data, and enable 'Render value as link'.

5. Enter the target dashboard URL in this format:
/Next-gen Dashboards /d /{dashboardUID} &from ={timeFrom} &to ={timeTo}

Formatting the URL to connect to a specific time period

Use a dynamic {timeFrom} and {timeTo} in the link URL by using values from the 'Start Time' and 'End Time' columns.

You can use special variables to specify cell values in the URL --- ${__cell} refers to current cell value. ${__cell_n} refers to Nth column value in the current row. Column indexe start at 0. For example, ${__cell_1} refers to second column's value.

The variable '{timeFrom}' time is the 'Start Time' variable, from the 3rd column, and you can reference it using ${__cell_2} and the '{timeTo}'. Time is the 'End Time' variable, from the 2nd column. Reference it using ${__cell_1}.

You can hide unneeded columns in the bathch/shfit table by selecting Hidden from the Type drop-down. This preserves the column positions in the table so the URL variables will still work.

If you only have start and end events

You can retrieve the Unix timestamp of an event using the timeOf function.

If you do not have end times available

If you are only recording a batch/shift ID you can still use the timestamp of your batch/shift datapoint to segregate data. Variable Data Type Example Data Explanation Batch_ID STRING/INT/DOUBLE B1001 A batch or shift number

When a timestamp of timeseries data is retrieved by Next-gen Dashboards, it is stored in Unix epoch format by default. The steps to create a batch/shift list from this is very similar. The only difference is when referencing the date & time value in your table URL, you will have to use {_cell_n:raw} to read the Unix epoch value of the timestamp. For example, {Next-gen Dashboards/d/TzjGZFkEp?from=$(_cell_0:raw}

Show assets on a floorplan or map using the Imageit plugin

You can use the Imageit plugin to create a map or floorplan of your site and overlay it with data.

The Imageit plugin can show "sensors" which contains a metric value and a position value. You can add a "sensor" to your image by clicking on Add Sensor under the visualisation tab, and:

- In the sensor settings, select your Metric values from a dropdown; this is populated by the your query results which can be renamed using the alias function.

- The X position of the "sensor" is a value between 0 and 100. 0 being the leftmost position on the image, 100 being the rightmost position on the image.

- This value can be the Y-position of the "sensor" is a value between 0 and 100. 0 being the topmost position on the image, 100 being the bottommost.

If your asset's location is static

You will have to manually type in the X & Y position of your "sensor" in the sensor options.

> ✏️
>
> The Grafana plugin that allows the user to drag the sensor around is not supported in Next-gen Dashboards.

If your asset is moving

You will need to first convert your asset's position data into an X & Y position format, then scale it to 100. You can use the math function for scaling: X_pos_scaled = X_pos / (X_max - X_min) * 100 Y_pos_scaled = Y_pos / (Y_max - Y_min) * 100

Defining edit/view rights for specific users or teams

Further user access control can be managed using the Permissions settings. You can:

- Overwrite the default Next-gen Dashboard roles, delete the editor and viewer role by clicking on the red *.

- Give a specific user or team the rights to view, edit or administrate the dashboard, click Add Permission.

How to Import a Dashboard

To import a dashboard, follow these steps:

1. Go to JSON Mode. This page shows the raw code behind your current dashboard.

2. If you want to save a local copy of the dashboard, copy the JSON text and save it in a ".json" file.

3. On the sidebar, hover your mouse over the * icon and select Import.

4. Paste the copied JSON model and click Load.

5. If you have an identical dashboard in your current tenant and do not wish to overwrite it, give your dashboard a new name.

6. Click the change button and delete the existing UID so the system generates a Unique identifier (UID) for the dashboard.

7. Click Import.

Copy a panel

To copy a panel, click the top of the panel and select Copy from the More menu. and go to More > Copy. Then paste the panel by creating a new panel and select Paste copied panel.

Duplicate a panel

To duplicate a panel,select the panel and press p + d, or click on the top of the panel and go to More > Duplicate.

Copying a panel's JSON model

To copy a panel's JSON model, click on the top of a panel and go to More > Panel JSON. In the new window, click Copy to clipboard. On a new panel, click on the top of the panel and go to More > Panel JSON, then paste the copied panel in the new window and select Update.

Official IoT TS Aggregates Service documentation: Version 4.x - What's New?

10.1 IoT Aggregates v4 changes and limitations

- The v3 to v4 upgrade changes have impact to Msaggregation > MsautoAggregation > MsboolAggregation functions only. If no function is selected in the Query configuration, the MsautoAggregation function is applied by default.

- Changes to supported aggregation units:

- second – not supported in V4 (removed)

- minute – supported

- hour – supported

- day – supported

- week – supported (added)

- month – supported (added)

- inute – aggregation unit range limit: 48 hours. If selected date range exceeds 48 hours the user gets an error message.

- hour – aggregation unit renage limit: 30 days. If selected date range exceeds 30 days the user gets an error message.

- day, week, month – aggregate unit range limit: 5 years. If selected date range exceeds 5 years the user gets an error message.

v4 introduces API requests rate limit – the number of allowed requests per minute depends on your subscription.

Possible drawbacks and solutions

The cases described below can be observed only in conjunction with Msaggregation > MsautoAggregation > MsboolAggregation functions. If no function is selected in the Query configuration, then the function is applied by default.

Minute aggregation unit

If the selected date range exceeds 48 hours for the minute aggregation unit then the widget will display an error message:
The problem can be resolved by either of the options:

- Select less than 48 hours date range for the dashboard

- Use hour aggregation unit instead of minute.

- Override widgets date range using Relative time configuration

10.2.2 Hour aggregation unit

If the selected date range exceeds 30 days for the hour aggregation unit then the widget will display an error message:
The problem can be resolved by either of the options:

- Select less than 30 days date range for the dashboard Use day aggregation unit instead of hour Override widgets date range using Relative time configuration

10.2.3 API rate limit

Depending on the dashboard configuration the user may start getting API rate limit exceeded error messages. This can be caused by big amount of aggregation functions used by dashboard configuration or high dashboard refresh rate. If the API rate limit is exeeded the widget will display an error message:
The problem can be resolved by either of the options:

- Increase dashboard refresh interval

- Decrease amount of aggregation functions on the dashboard

- In certain cases (e.g. Gauge, Bar Gauge) it is advised to use
  MSmostRecentValueWithinTimeRange function instead of aggregation

10.2.4 How to get sub-minute aggregation data

As second aggregation unit is not support by v4 the sub-minute data can be visualized by:

- Use the MsrawTimeseries function to get raw time series data

- Use VFC application to define custom aggregation logic

Assets

<div style="text-align: right; font-size: 3em;">7</div>

7.1   Assets

An asset is a digital representation of a machine or an automation system with one or multiple automation units (for example PLC) connected to Industrial IoT.

Insights Hub Monitor uses assets, aspects and variables as data model for its functions.

Aspects are combined, pre-configured data and form the context for the evaluation of industrial processes.

Asset health shows the active state and the historical state of an asset. You can automatically influence the asset health state with a rule, for more information on rules, refer to [Rules](). Asset health is currently only available for assets having an aspect named "status" of type 'core.assetstatus'. To achieve this, enable the action checkbox "Asset Status" in the rules wizard.

Asset Health status

Asset health shows the active state of the asset. Asset health is currently only available for assets having an *aspect named "status"* of *type core.assetstatus*.

You can influence the asset health state in several ways:

Asset Health via rule

You can set the asset state depending on the outcome of a monitoring rule, e.g. you may set the status to "Error" if an asset variable crosses a pre-configured threshold

- To achieve this, enable the action checkbox "Asset Status" in the rules wizard.

- The rule engine will set the configured status to the asset.

- For more information on rules, refer to [Rules]()

Asset Health via VFC (Visual Flow Creator)

The asset status can also be set by Visual Flow Creator node "Asset Status".

- To achieve this, configure the node in your workflow, and set the status as desired

- In this case do not configure a rule to set the asset status. As the rule would overwrite the status as determined by your VFC node

Asset Health via a custom application

You can also create your own application

- To achieve this, use the API to set the asset state as per the table shown below

- In this case do not configure a rule or VFC node to set the asset status, too. Otherwise the status as determined by your application code will get overwritten.

- For more information please refer to the [Industrial IoT 'timeseries' API](#)

- For more information on the allowed asset health values please refer to the table at the end of this page

How Asset Health status is shown within Insights Hub Monitor

On the homepage you can detect easily the status of the monitored assets and get an impression about the health of your plant.
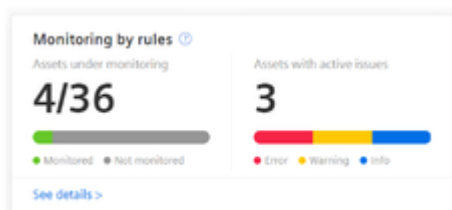
In the "Asset" view, the asset status will guide you quickly to the assets that need your attention. This is indicated via colored icons. Insights Hub Monitor will automatically aggregate the most relevant status to the highest concerned level.

Also the map shows the status of the asset with colored pins:

Furthermore, the quick filters and the asset hierarchy tree on the "Assets" window helps you to easily find your monitored assets.
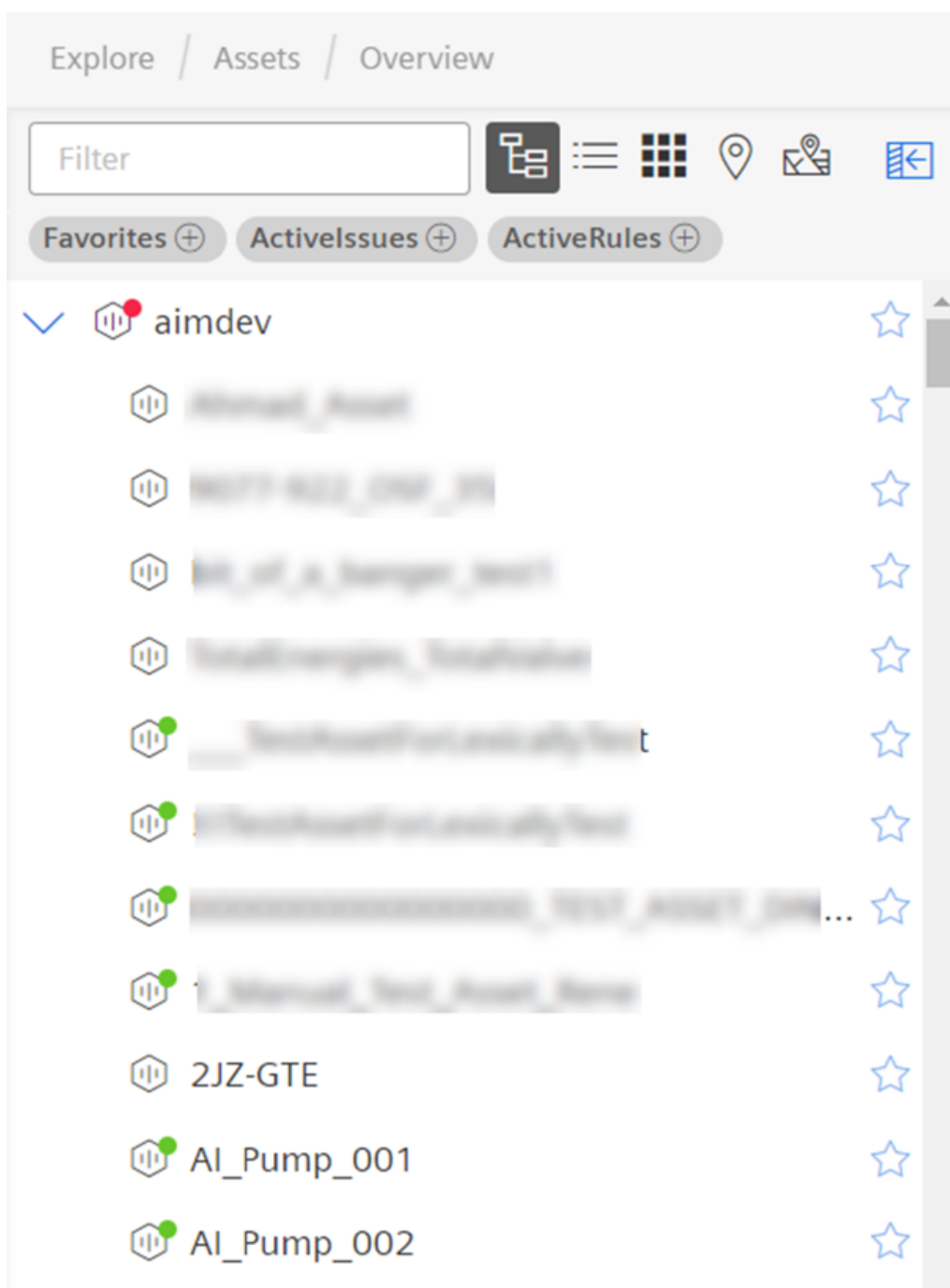
Asset Health status via custom code

The following table shows the valid values for asset health and their meaning:

Asset-color	Error code	Status
Grey	0	Shows that the asset state is not monitored / Unknown
Red	20	Shows the "Error" asset health state
Yellow	30	Shows the "Warning" asset health state
Blue	40	Shows the "Information" asset health state

Asset-color	Error code	Status
Green	50	Shows the "Ok" asset health state
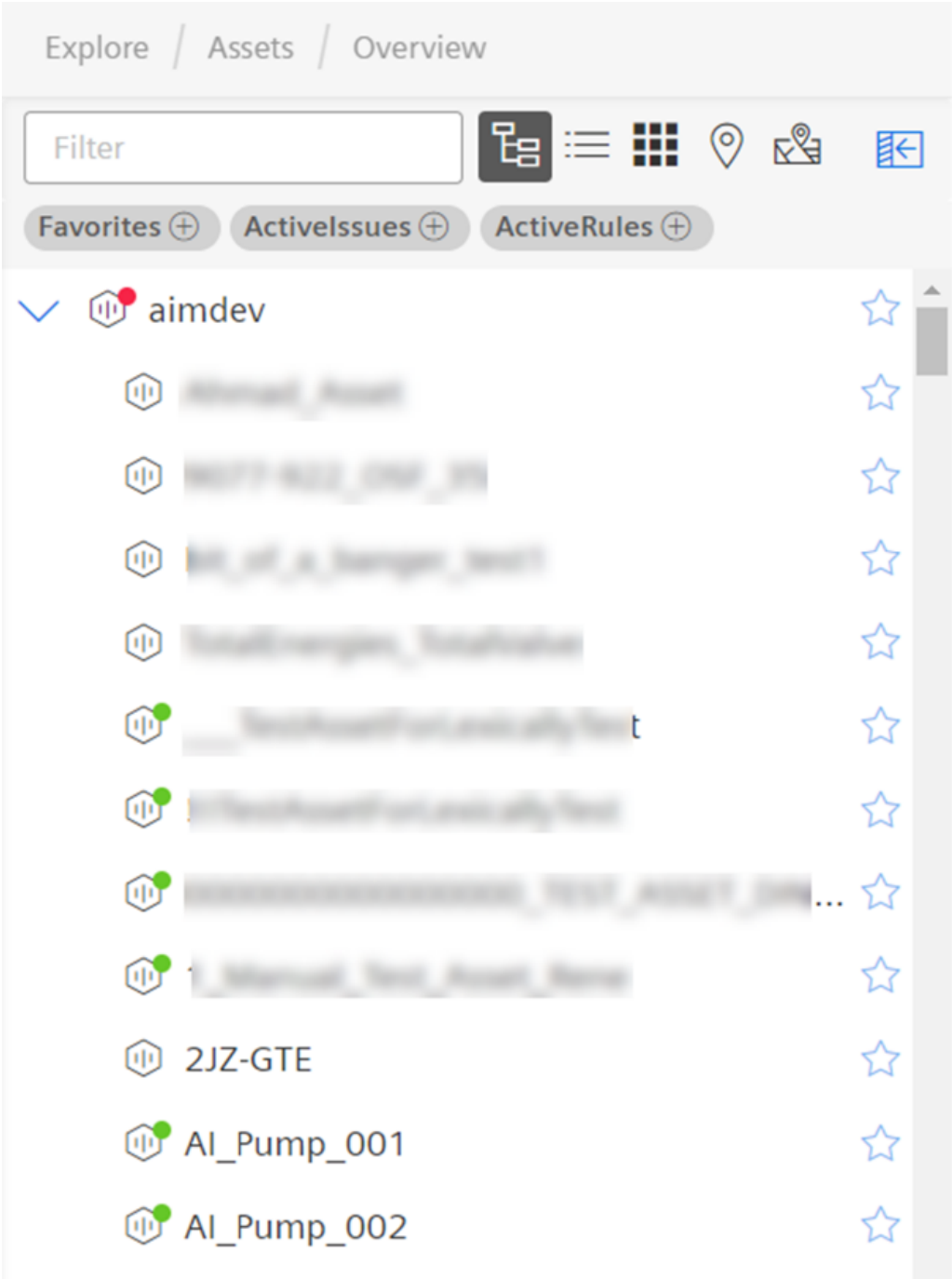
7.2   Asset Navigation

You select assets using the navigation. You have the option of changing the navigation view.

Asset navigation offers you the following options:

- Searching, filtering assets

- Selecting using the map

View of asset navigation

You can choose between the flat view or the hierarchical view in the asset navigation:

View	Symbol	Description
Compact tree view		Shows an overview of all the assets in a compact hierarchy view.
Tree view		Shows all the assets in a hierarchy view along with the Asset information like asset picture, description, asset type.
Card view		Shows all the assets in a grid view
Map view		The map view provides an overview of the locations of your assets.
Custom Map view		The custom map view provides an overview of the hierarchy of your assets as per the custom uploaded map images.

Search

The search field offers an easy way to search for the following meta information:

- Asset name

- Asset type

- Asset id

- Address / country / location

- Description

Quick filters

The quick filters can be used for

- Favorites

- Active issues (Assets where rules are triggered and the action "set asset state" is active.)

- Active rules

If quick filter is active, direct matching assets are shown and assets which are necessary to display the hierarchy structure.

7.3   Map view

With the world map, you have the option of selecting your assets on the world map.
The following figure shows the world map view:
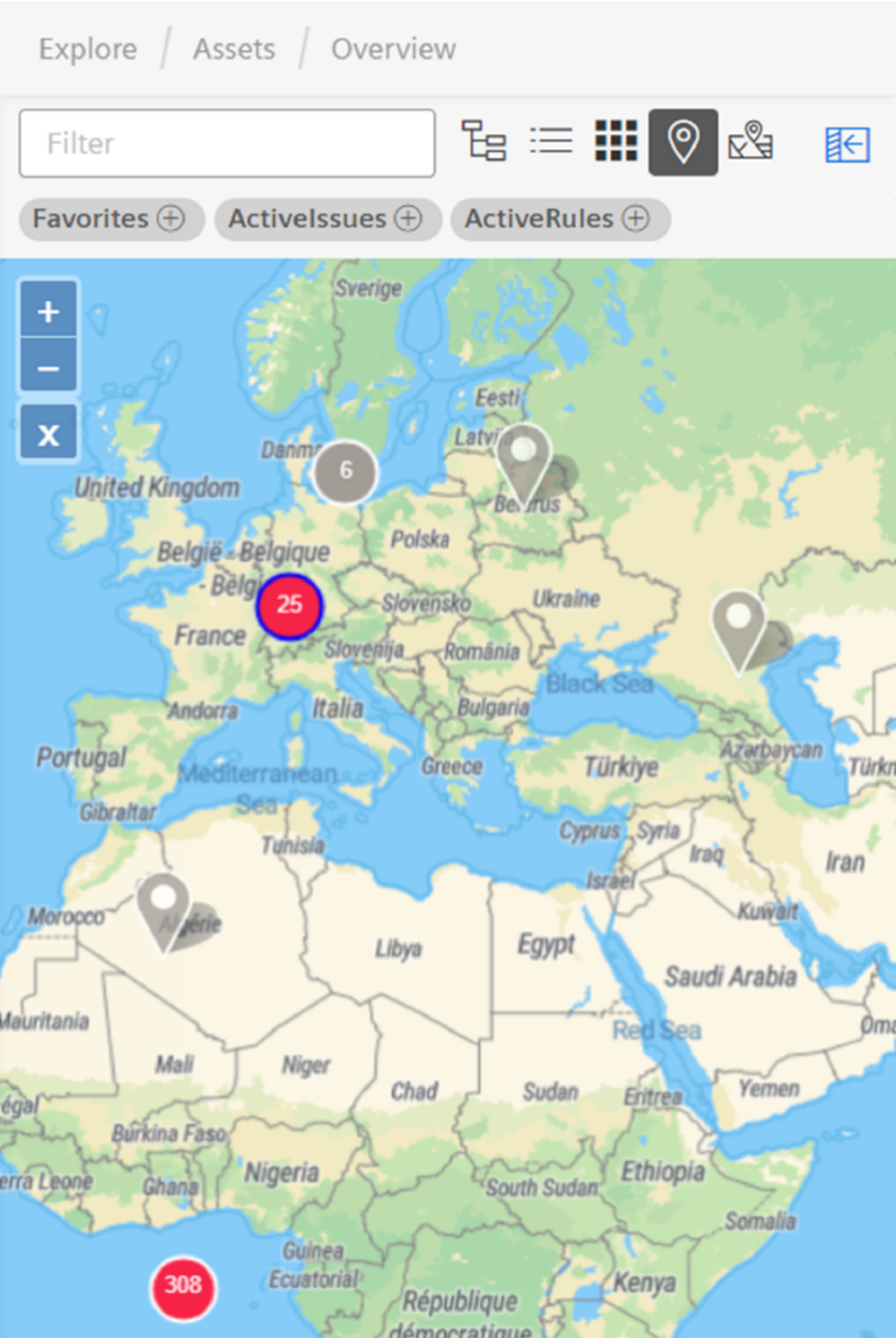
Use the zoom function to analyze areas in more detail. Each zoom level combines closely spaced
assets into a group. The map displays the selected asset as a pin. The map pin displays the
number of assets in the respective area. To view the asset details, click on the map pin. The map
highlights the area with the selected asset in the form of a marker.

The following table shows the colors of the pins and their meaning:

Pin color	Description
Blue	Shows the "Information" asset state.
Yellow	Shows the "Warning" asset state.
Red	Shows the "Error" asset state.

The map view also takes into consideration search parameters entered and activated filters. The map hides assets which do not match the search parameters.

7.4 Custom Map view

The custom map view shows the assets on different levels within the hierarchy structure. The custom map shows the area and customer hierarchy objects as rectangles and the assets as pins in the map.

In the custom map view, you can identify and structure your assets using configured images or maps.

By default when the custom map is not configured, an empty screen is shown, which invites to upload a custom map. Once the custom map is uploaded, normal assets are shown as pins / node assets which can guide you to the next hierarchy level are displayed through rectangular boxes.

As custom map images you can upload `*.jpeg` and `*.png` files.

With edit option, you can move the positions of these elements on the map using drag and drop option. It is only possible to move single assets at a time on the map. If multiple assets are grouped, zoom in to see the single asset, which is again moveable by drag and drop.

The asset pins and rectangular boxes show the status of the asset respective the aggregated status of an underlying hierarchy.

The following figure shows the area map view:
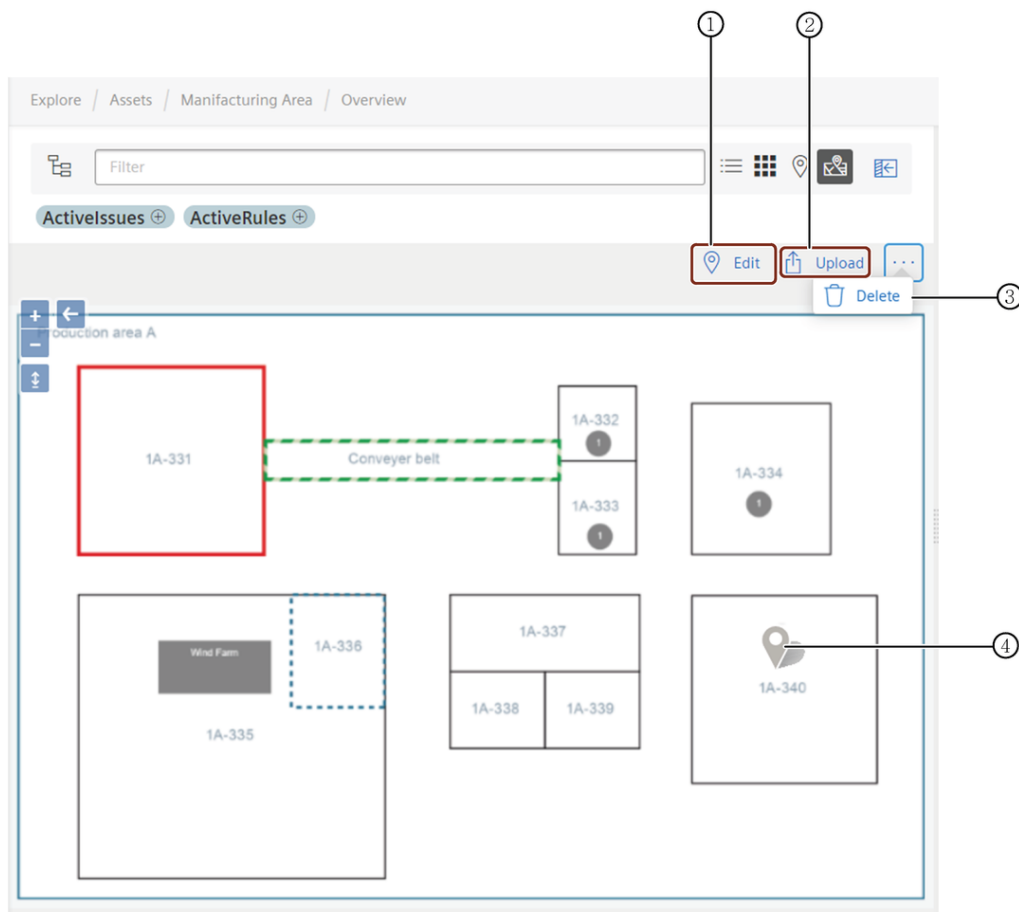
① Allows you to edit the Asset location

② Uploads the custom map image

③ Deletes the custom map image

④ Shows an asset

7.5 Plugin Overview

In the "Explore > Assets" section, various plugins provides different functionality to visualize different data of a selected asset. By default the plugins "Time Series", "Rules", "Events", "Info","Attachments" and "Dashboards" are available.
Additionally this interface can be extended by custom plugins using the Insights Hub Monitor Plugin SDK.
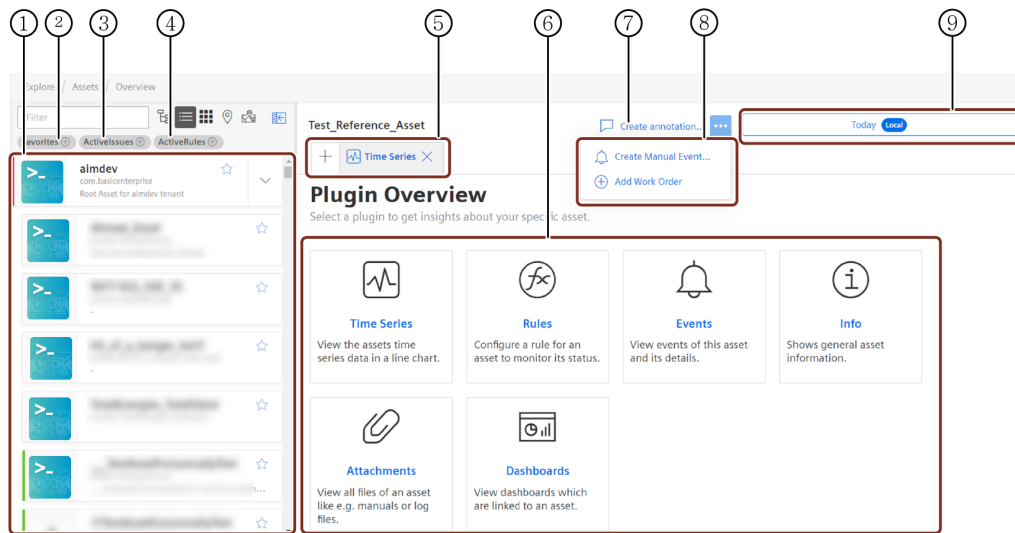
① List view of the assets

② Lists the assets which are marked as favorites

③ Lists the assets with active issues

④ Lists the assets with active rules

⑤ Shows the tab of an open extension

⑥ Shows the overview of all extensions

⑦ Allows you to comment on the data for the selected Timestamp

⑧ Creates a manual event and a work order for the selected asset

⑨ Timepicker: Selection and specification of the time zone and the time period of the visualization

Basically, you open the desired plugin and select an asset on the left side for this purpose. This will cause the plugin to update the view and show the data in the associated context.

7.6   Timeseries

Introduction

The "Timeseries" extension provides the visualization of raw timeseries data. Visualization modes can be switched between raw, aggregates or an automatic mode for time-series visualization.
Up to 10 variables of an asset can be listed and added to a line chart.
The user can select the data source for the line chart: Aggregates, Raw or Auto.
In Auto mode, the chart will automatically switch between Raw and Aggregates mode. If the selected time range is less than 2 minutes, data from IoT TimeSeries API is shown. Otherwise, the data from IoT Aggregates API is shown. The interval (for example, 2min, 1hour or 1day) is chosen depending on the time range automatically.
When using Aggregates the start, end, min, and max values are used in an aggregate interval to draw the line chart.
In Raw mode, the last 2000 values of the variables are shown.

If there is more data for this time range, a dotted line is shown to indicate that, after which the user can zoom into this range to detect more data.

Timeseries data types

The "Timeseries" extension supports the dynamic datatypes which have been defined for this asset type for the visualization of the variables. Timeseries extension shows data in both table and chart mode for all supported datatypes. The timeseries data's variables are shown as line diagrams in the chart view and as a table with the quality code values in the table view.
The data variables can be selected from the select variables section and based on the variables selected, the data will be displayed.
The following list shows the supported data types:

- Integer: Data is displayed as a linear line chart

- Double: Data is displayed as a linear line chart

- Long: Data is displayed as a linear line chart

- Boolean: Data is displayed as a step line chart

- String: Data is displayed as icons

- Big String: Data is displayed as icons

- Timestamp: Data is displayed as icons

"Timeseries" extension user interface

The "Timeseries" extension graphically depicts timeseries data of your asset.
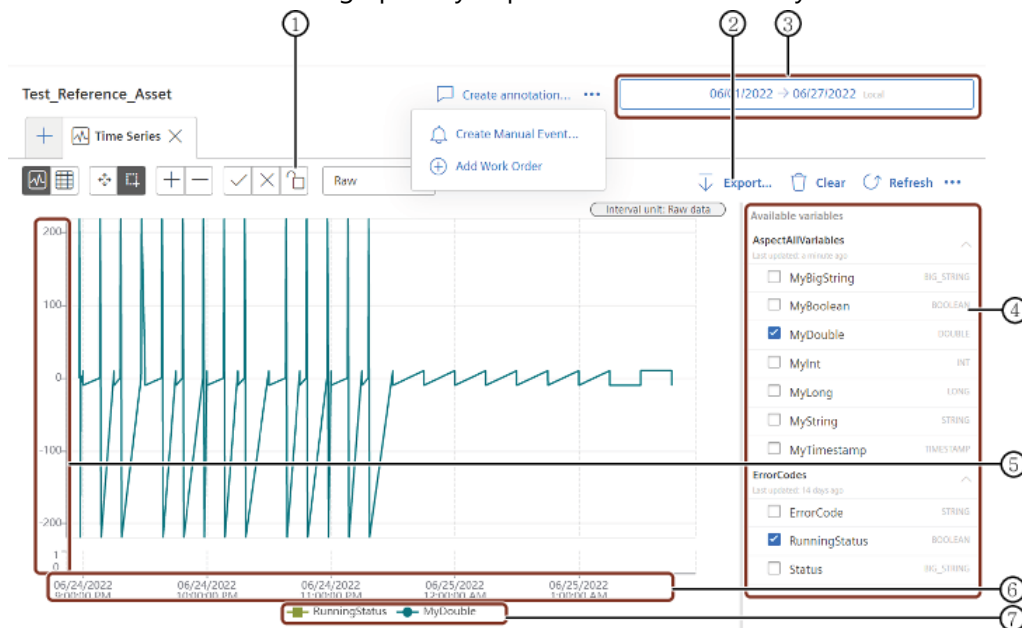
①   Locks the Timeseries chart and no further requests submitted to Timeseries API
②   Exports the Timeseries data

③　Timepicker: Selection and specification of the time zone and the time period of the visualization

④　Available variables: Selection of the various variables of the visualization

⑤　Y-axis

⑥　X-axis with the specification of time intervals

⑦　Selected variables

The table view of the "Timeseries" extension is as shown below:

Symbols

The following table shows the buttons of the "Timeseries" extension:

Button	Description
	Graph view of the data
	Table view of the data
	Allows to move the Time range by drag
	Allows to select the Time range by drag
	Zoom in
	Zoom out
	Apply the Time range selected by the zoom in or zoom out of the chart
	Resets back the chart to the applied Time range after zoom in or zoom out of the chart
	Unlocked:Chart can be refreshed while zooming

Button	Description
	Locked: No requests to timeseries api are submitted
	Allows to switch between the visualization modes
Clear	Clear icon
Refresh	Refreshes the chart
Compare assets	Opens Timeseries section with the selected variables

Visualization modes

Visualization modes allows you to switch between raw, aggregates or an automatic mode for timeseries visualization.
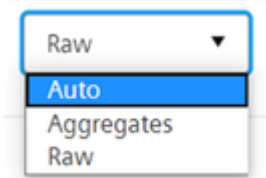
In Auto mode the chart will switch to timeseries data, if the selected time range is less than 2 minutes.
In Raw mode the last 2000 values of the variables are shown.

"Time selection panel" user interface

The graph shows the set time period in the Time selection panel.
Time selection panel offers you to select the required time range in the following ways:

Absolute: Allows you to select the time range between the "From" date to "To" date.

Quick Range: Allows you to select the predefined quick time range.

Time Zone: Allows you select the time zone.

-

Export Timeseries data

You can export the Timeseries data of your assets from the Timeseries plugin. Following functions are supported:

- Saving the exported data to a CSV or JSON file

- Selection of the desired aspects for which the data should be exported

- Selection of the desired time period

To export the Timeseries data, proceed with the following steps:

1. In the "Timeseries" plugin for the selected asset, Click "Export".

2. Select the aspects of your choice.

3. Select the time period for which the data should be exported.

4. Select the file type of your choice:

    o JSON

      or

    o CSV

      If you select CSV type file, you can also define the delimiter.

5. Define the data point count limit for the file.

The maximum limit that can be set per file is 10000 count.

With the data point count you can influence the size of the exported file.

6. Click Start.

The file is downloaded by default to the standard download directory of your browser.

7.7   Analyze Graphs

The "Time Series" extension visualizes the time series data of the selected asset within a coordinate system. The line chart offers the following aids for analysis and display:

• Data values

• Selecting the data variables

• Zoom function

Showing Data values

To show the data values in the graph, move the mouse pointer over the lines in the graph. The vertical gray line shows the exact time on the time axis.

Selecting data variables

The variables of the time series data can be selected from the available variables section. The variables selected are saved per asset type in your user settings. If you switch to another asset of the same type, the same variables are selected as before.

To show or hide a variable in the graph, click on the variable below the graph.

> ✏️
>
> Maximum of 10 variables can be added to the chart.

Zoom Function

You have the possibility to analyze the graph with the zoom function. You can activate the zoom function by using the mouse wheel to zoom into and out of the graphs.
You can also use the zoom in or zoom out icons available next to the graph.

7.8   Rules

A rule automatically triggers events. It detects the overshooting or undershooting of a defined threshold value and can change status as well as send notifications by email. The rule automatically logs each deviation with an event.

This Rules plugin allows you to create rules and define the exact threshold value to trigger an event for the selected asset.

You can use the rule to change the asset state.

The below picture shows the summary of all the rules created for the selected asset:

For more information on monitoring Rules, refer to the [Rules](#) chapter.

7.9 Events

Events can have multiple source points. The events can be created in any of the following ways:

- They can be created manually while analyzing conspicuous measuring points in the graph.

- They can be created automatically while monitoring your IoT data via the Rules engine.

- They can be created by your MindConnect elements directly on the device to log important timestamps.

- They can be created by other applications to indicate important events or findings.

In the event extension, all these events of different sources can be displayed in a table view for the selected asset. Additionally, filtering functionality helps to find the specific events.
The below picture shows the summary of all the events created for the selected asset:

①   Overview of all the events created for the selected asset

②   Details of the selected event

For more information on monitoring events, refer to the [Events](#) chapter.

7.10   Info

Insights Hub Monitor has the "Info" extension for displaying the general details (such as Asset type, Location, Static Variables, etc.) of your assets.

The "Info" extension enables you to fetch information and properties for your assets. Also, provides information about the connection to other assets and analyze MindConnect logs.

"Info" extension user interface

①   Asset name and Type

②   Opens the selected asset in "Asset Manager"

③   Refresh the data in the info extension

④   Image and details of an asset

⑤   Static Variables of an asset

⑥   Static Aspect details of an asset

⑦   Asset Health of an asset

⑧   Connectivity info of an asset

⑨   Location of an asset

7.11   Attachments

The "Attachments" extension provides you with a secure way to save or open files from any device with access to Industrial IoT.
The "Attachments" extension offers you the following functions:

- Upload, Download and delete files for your assets

- Upload and manage files

- Filter and sort files
  The filter in the table header searches for files that exactly match the search string. Wildcards with * at the beginning or end of the search string can be used to make the search more tolerant. Please note that the search with wildcards can take more time if there are many files.

Uploading files to the "Attachments" extension consumes space in your Insights Hub environment, even if it is done by another user.

To import files with the "Attachments" extension, proceed as follows:

1. Click "Upload".
The "Open File" dialog box opens.

2. Select one or multiple file(s) and confirm your selection.

> **Limitations**
>
> Please note that the IoT File Service supports only an offset of 10.000 files. If more files are displayed in the current view (see the number in the lower right corner), you can reduce the number of displayed files using filters (e.g. time range or file name).

The uploaded files can be used within the selected Insights Hub applications. For example, the Dashboard Designer add-on can use an image file from Attachments as a dashboard background. To use an attachment, click "Copy path" from the selected attachment. This copied path can then be used while configuring dashboards.

7.12 Dashboards

Overview

The "Dashboards" plugin in "Explore > Assets" allows you to view dashboards in the context of a selected asset.
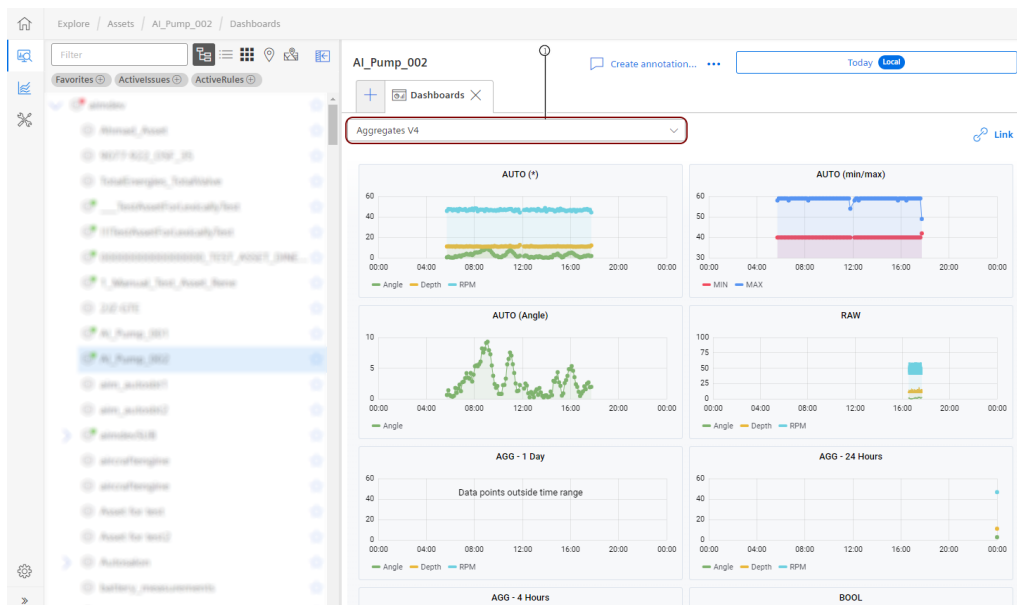
① Drop-down list of all the linked dashboards

First of all, an asset has to be selected in the asset view. Initially, no dashboard is linked by default.
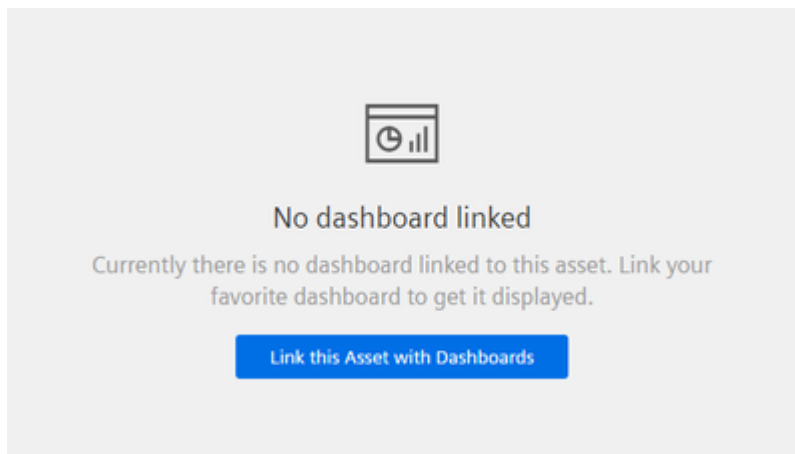
With "Link this Asset with Dashboards" all accessible dashboards in the current tenant are listed and one or more can be selected to be linked to this asset. After saving the selection, the dashboards are listed in a dropdown list.

To view the dashboards linked to your assets, click "Assets" in the "Explore" tab and select the "Dashboards" plugin.

> 🖊
>
> The linked dashboards are saved as a global setting for all users. So if there is any change, it will effect all users of the environment.

Working with parameters

Creating dashboards for each and every asset and link them can be time consuming. Also changes in existing linked dashboards are hard to maintain.

Therefore you can use parameters in context of linked Dashboard Designer dashboards.

In this case a dashboard is created one time and configured with parameterized values, which then can be reused.

The following parameters are currently supported:

Parameter	Description
asset	Asset Name
assetId	Asset ID
assetType	Asset Type

Furthermore internally the selected theme and time range is also forwarded to the dashboard. With that information you can configure the parameterized dashboard:

- Open the dashboard in Dashboard Designer

- Open the dashboard settings
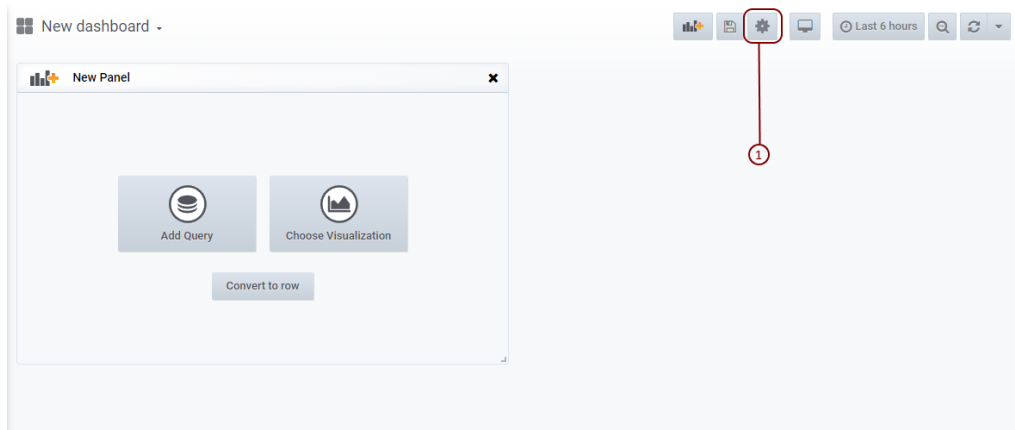
- Add new variables and name it with the parameter names from above

Events

<div align="right">

8

</div>

8.1 Introduction to Events

The events overview is used to display different types of events related to your IoT data. Events can have multiple source points.

- They can be created manually while analyzing conspicuous measuring points in a graph.

- They can be created automatically while monitoring your IoT data via the Rules or API.

- They can be created by your MindConnect elements directly on the device to log important timestamps.

- They can be created by other applications to indicate important events or findings.

In the event overview, a table displays all events available in the tenant from different sources. Additionally, filtering functionality helps to find the specific events.
Events are only shown for the configured time to live of the related event type, after that they will automatically be deleted.

MindSphere Standard Events

The Events extension will show MindSphereStandardEvent type as the default.
This event type provides the following properties:

Property	Description
Severity	Describes the severity of the event. For more information, refer to the table below.
Asset Name	Name of the Asset.
Timestamp	The timestamp when this event occurred.
Description	A description of what happened in this event.
Source	The source of the event - like "manual event" or another application or device.
Acknowledged	A Boolean value which indicates the state of this event, if a user has already acknowledged this event, or if this is a new event. - New events have acknowledged state "false" - Acknowledged events have state "true"

The severity is an integer value with the following meaning:

Icon	Description	Number
⚠️	Error	20
🔶	Warning	30
ℹ️	Information	40
💬	Annotation	80

- Some devices or applications might provide a different number for special uses cases. In this case, only the number instead of an icon is displayed.

- Events with Annotation has the specific event type as "Insights HubAnnotation".

- Events from shared assets can only be displayed, but not acknowledged, updated or deleted.

8.2 User Interface of Events

To view the summary of all the events created on this tenant, click "Events" in the "Explore" Tab. The "Events" overview provides the following user interface:

① Lists all the events in the environment

② Refreshes the event list

③ Acknowledges the event

④ Deletes the event
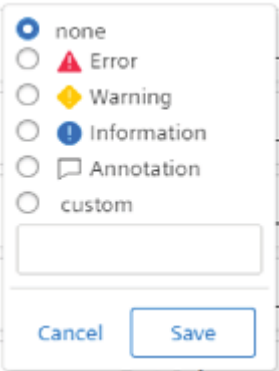
⑤   Allows you to add a comment or note

⑥   Creates a work order for the event

⑦   Preview of the event

Filtering and Sorting Events

Within the table header, supported properties can be filtered or sorted.
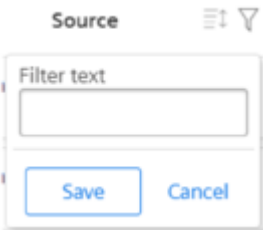
The filter is generic based on the datatype of the property. See the following examples:

Severity: can be filtered by severity value or custom. If custom is selected, severity can be filtered by entering the number of the severity (see table above)
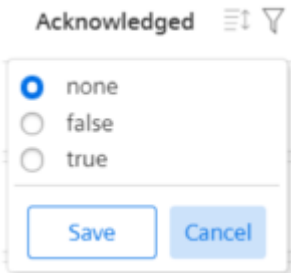
Source: can be filtered for strings. The filter checks if the value contains this property.
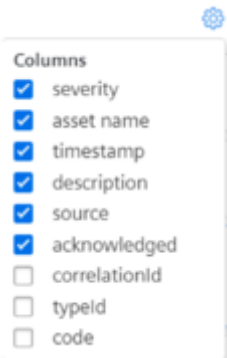
Acknowledged: can be filtered for Boolean (true/false) of even if the value is not set (none).

Settings: Select the event properties to be displayed as columns. The configured settings will be saved in the local storage of the browser per selected event type.

Details of an Event

An event can provide additional properties. These details will be displayed if an event is selected by a click in the table row.
The properties of this event are shown. The properties are sorted alphabetically.

Event details

ACKNOWLEDGED
false

ASSETNAME
T_L_A_Honing_CNC

CORRELATIONID
0dbfe8f05bba8907

DESCRIPTION
Unknown production state

ENTITYID
c14bae5526954f22a44f2458a3f6cd43

ID
8d7fa432-e86e-48b6-83ca-58c78df0bf0a

PROPERTY
NC_Operation_State/OpMode

RULEID
997847

SEVERITY
20

SOURCE
Rules

TIMESTAMP
2020-11-26T08:14:39Z

TYPEID
c33d9fcf-64ca-4e6d-9f17-16da9c70dbca

The event details can also be viewed from the "Events" plugin in the "Assets" tab.
Developers can edit or copy values of interest by using the edit or copy button next to a property value from the "Events" plugin in the "Assets" tab. These action buttons are displayed by hovering the mouse over the event details row.
Example:

①   Edits the Event details
②   Copies the Event details

Other Event Types

Depending on the use case, you might be interested in events of special types since they provide more information or specific properties.
Resetting a selected event type will reset the default MindSphereStandardEvent.
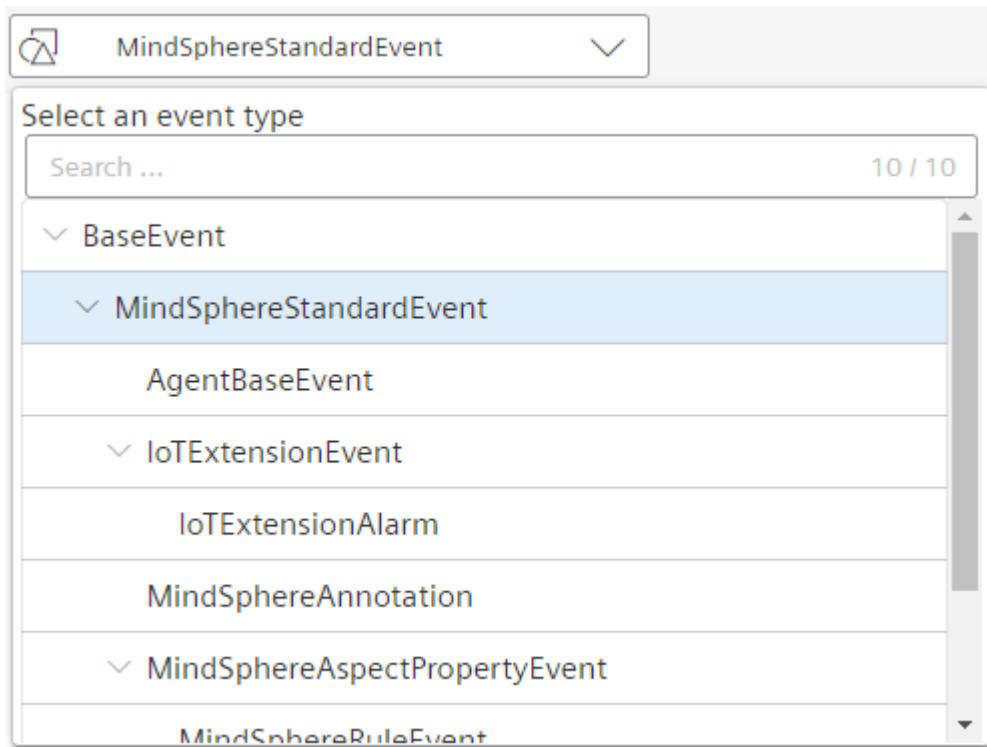
8.3 Annotations

Annotations are used to comment different scenarios with tags. They can be created in different screens in Insights Hub Monitor to annotate the viewed data.
Currently annotations can be created from the following screens:

- Dashboards in "Explore" section

- Visual Flow Creator Dashboards

- Insights Hub Business Intelligence Dashboards

- Assets in "Explore" section

- Events in "Explore" section

- Time Series in "Analyze" section

These Annotations are displayed in the "Events" Overview, where you can also filter for tags. Annotations are linked to the root assets.

Viewing MindSphere Annotation Events

To view only the events of Annotation type and all required columnns, select "MindSphereAnnotation" in the Events type filter.
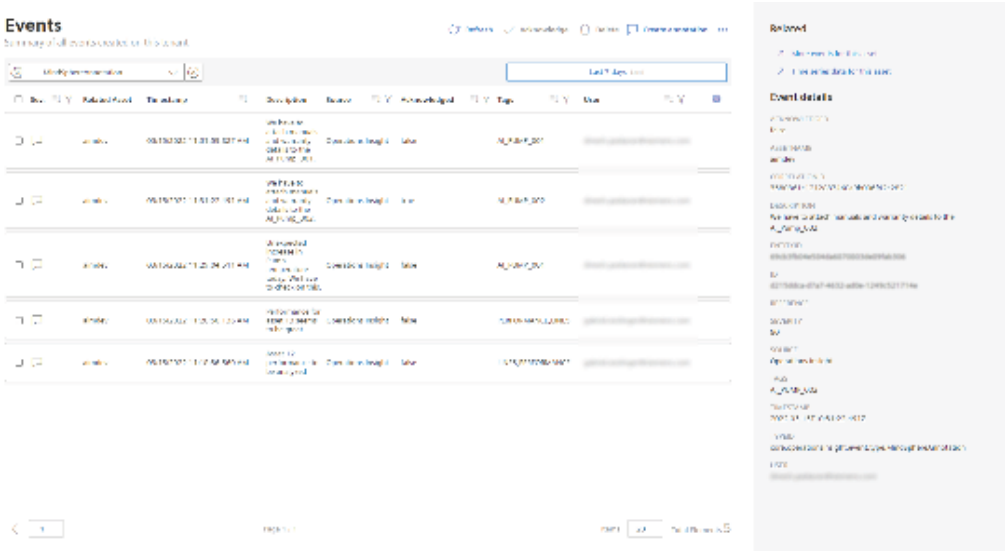
8.4 Create Events

In Insights Hub Monitor, you can create events in the following ways:

- Time series: Create manual events from "Timeseries" tab.

- Rules: Create automatic events from "Rules" tab.

The "Events" extension shows the source of the events in the overview.
Also, the events created by other applications are displayed in the Events overview.

Creating a manual event

To create a manual event, open "Time series" in "Analyze" and proceed in the following ways:

> ✎
>
> It is also possible to create manual events from the "Assets" tab of "Explore" section or "Timeseries" tab of "Analyze" tab.

1. Select an Asset.

2. Select the Variables.

3. Activate the events either from "Activate events" button or from variable action panel, click at the specific point of time.
The selected time will automatically be taken for event, then click "Create manual event".

4. Enter the required details, click "Create".

Parameters	Description

Parameters	Description
Description	Description of an event
Severity	The severity of an event defines in terms of: - Error - Warning - Information
Timestamp	Date and time of an event.
Variable	Variable for which an event is created.

Creating automatic events

You can create automatic events using a rule. You create rules in the "Rules" extension. For more information on rules, refer to Rules.

8.5   Acknowledge Events

Events for the selected events can be acknowledged in the following section:

- "Events" section in "Explore".

- "Events" extension of "Assets" section in "Explore".

Procedure

To acknowledge an event, follow these steps:

1. Click "Events" in "Explore".

2. Select the check box next to the event whose state you want to change.

3. Click the "Acknowledge" button.

Result

The selected event is acknowledged.

8.6   Delete Events

Events for the selected events can be deleted in the following section:

- "Events" section in "Explore".

- "Events" extension of "Assets" section in "Explore".

Procedure

To delete an event, follow these steps:

1. Click "Events" in "Explore".

2. Select the check box next to the event, which you want to delete.

3. Click "Delete".

Result

The selected event is deleted.

Work orders

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9.1 Work orders

"Work orders" is a basic workflow to digitize work requests (such as maintenance, repair, inspection and incident handling) that are essential to monitor asset health and to detect technical issues before they lead to asset failure and downtime. You can create, track and update work orders in multiple ways within the application.

9.2 User Interface of Work orders

The summary of the work orders can be viewed in the following ways:

- Work order overview

- Work order list view

Work order overview

This page shows the summary of work orders according to their current status in tabular view. Each tab shows work orders that have same state. Each tab shows latest 15 work orders created in the application. User can change the selected page size from Items dropdown.

Work order list view

This page shows the list of the latest 15 work orders created in the application. The user can change the selected page size from Items dropdown. It also shows summary of work orders according to their state and priority.

The preview of the work order can be viewed on the right side of the screen by selecting the work order.

9.3   Create a Work order

Insights Hub Monitor application enables you to create work orders in the following ways:
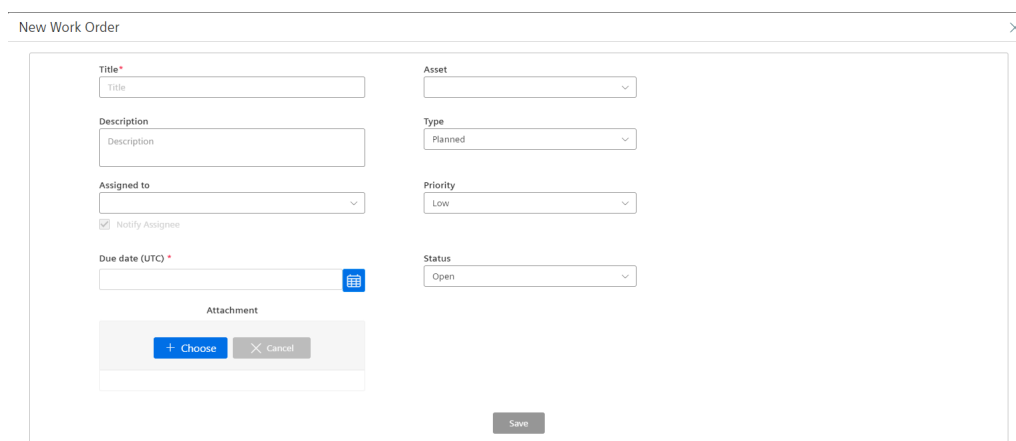
- Create Work orders

- Create Work orders for assets from "Assets" window.

- Create Work orders for events.

Create a Work order

To create a new work order from Work orders tab, proceed as follows:

1. Open "Work Orders" page.

2. Click "Add a Work Order".

3. Enter the required details and click "Save".

You can view a newly created work order in "Work Orders" page.

Create Work orders for assets from "Assets" window

To create a new work order for assets from the "Assets" tab in "Explore", proceed as follows:

1. Open "Assets" page.

2. Select an asset.

3. Click "Add Work Order".

4. Enter the required details and click "Save".

A work order for the asset is created.

Currently, the display and configuration of time and date in work orders is in UTC.

Create Work orders for events

To create a new work order for events, proceed as follows:

1. Open "Events" page.

2. Select an Event.

3. Click "Add Work Order for Events".

4. Enter the required details and click "Save".

A work order for the event is created.

9.4 View a Work order

Insights Hub Monitor application enables you to view the details of the work orders.

To view the details of the work order from Work order page, proceed as follows:

1. Open "Work orders" page.

2. Select the work order.

3. Click " ↗ " in the preview of the selected work order.

9.5 Edit a Work order

To edit the work order, proceed as follows:

1. Open "Work orders" page.

2. Select the work order.

3. Click " ↗ " in the preview of the selected work order.

4. Click " ✏ Edit ".

5. Enter the required changes and click "Save".

9.6 Delete a Work order

To delete the work order from Work orders page, proceed as follows:

1. Open "Work orders" page.

2. Select the work order.

3. Click " [🗑] ".

4. Click "Delete" to delete the work order.
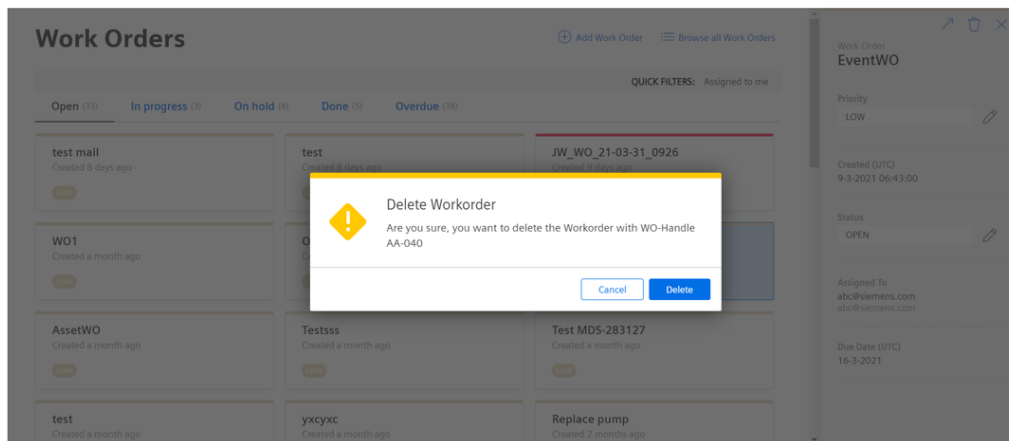
Timeseries   10

10.1 Introduction

The "Time Series" window describes the basic use cases to analyze IoT time series data. It shows how to select the variables of an asset and visualize data as per the selected variables data type. By creating an event, the following information can be obtained:

- Analyze the performance like produced quantities.

- Compare the performance of the current week and the previous week.

- Analyze the performance of same production line on multiple sites.

Features

Time Series offers you the following functions:

- Monitor one or multiple data points in a chart.

- Evaluate historical time series data of multiple assets in a single view.

- Display aspects and variables in a line chart with Raw and Aggregate view.

- Create customize views and share data with your organization.

- Combine variables of different aspects.

- Compare functions for example, create time offset, that allows to analyze assets performance within different time ranges.

- Enhanced charts for boolean and event datatype allows to find correlations to performance data easily.

- Use manual events to log detected anomalies.

- Flexible UI and visualization options.

- Save an analyzed chart.

10.2 Timeseries user interface

The following screen depicts "Timeseries" user interface:

①   Asset selection panel

②   Variable selection panel

③   Analysis profile panel

④   Time selection panel

⑤   Data visualization area

⑥   Variable action panel

⑦   Event chart activation

By using the asset selection panel, you can select the asset of your choice to display the asset data in data visualization area. You can also add variables or events to your asset by using "Activate events" and "Add variables" buttons.

10.3   Asset selection panel

Asset selection panel displays all the assets that are connected to the environment. To search for the asset, enter the name or part of the name, or the asset id within the search bar. The assets are automatically loaded whenever an asset is created in Asset Manager. When an asset is selected, the available asset variables will be listed within the variable selection panel. For more information, refer to the Asset Manager documentation.

Asset selection screen
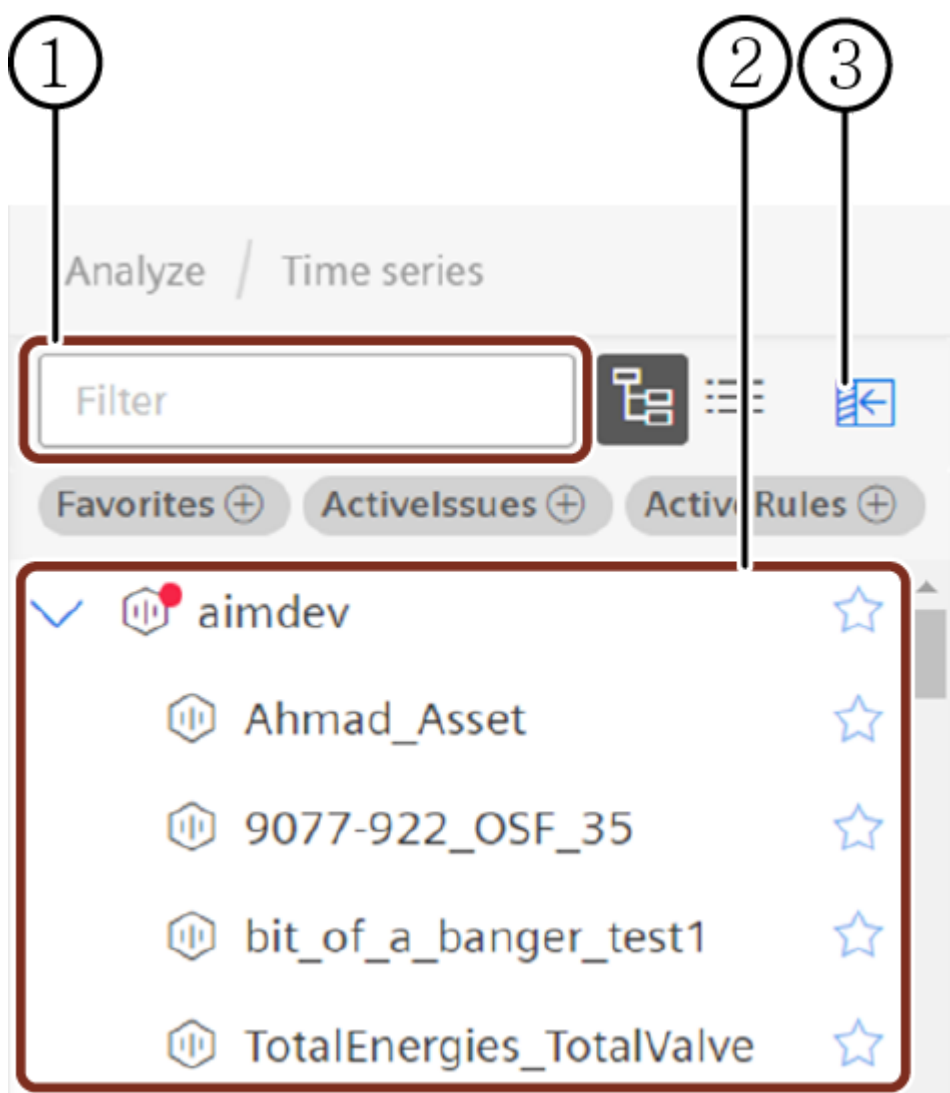
① Search tab to search for the required assets by the following options:

• Asset name

• Asset id

② Asset list

③ Display and hide bar

10.4 Variable selection panel

Variable selection panel displays all the variables of the selected asset which can be used for data visualization. Added variables will be displayed within the variable action panel. Variable selection panel also displays when the variables are last updated.

The following list shows the supported data types:

• Integer: Data is displayed as a linear line chart

• Double: Data is displayed as a linear line chart

• Long: Data is displayed as a linear line chart

- Boolean: Data is displayed as a step line chart

- String: Data is displayed as icons

- Big String: Data is displayed as icons

- Timestamp: Data is displayed as icons

Variable selection panel

10.5   Event chart creation

Event chart activation is used to display the events of the selected asset. Events can be displayed by the "Activate events" toggle button or by the toggle button available in the variable action panel of an asset. Once the events are activated, they will be displayed in the event chart of data visualization area.

The following screen displays "Activate events" toggle button:
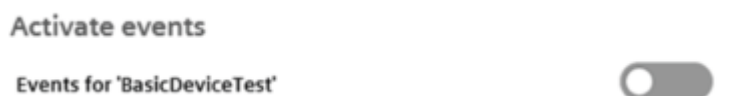
The following screen shows the events in the event chart:

- In an event chart, maximum of 5 events can be displayed at a time.

- Events can only be activated, if they are not shared from another environment.

10.6   Variable action panel

Variable action panel displays all the variables and their metadata which were added to the visualization area. By using the toggle button, the variables can be displayed or hidden within

the visualization area.

Variable action panel screen

You can perform the following actions in variable action panel:

- View the currently selected variables from multiple assets.

- Sort the variables within the table by using drag and drop.

- Add individual axis for variables by adding multiple groups and adding multiple variables of different assets into the group. Variables can be added to a group through drag and drop.

- Display or hide variables within the visualization area. It can be done by the toggle button.

- Customize the colors, marks and ticks of the time series chart. It helps to differentiate among various variables in the time series chart. It can be done by clicking on the colored dot in style section.

- Duplicate variables by clicking duplicate icon or by adding variables from variable selection panel.

- Set time shift to the selected time range by creating an offset to a variable. Select a variable to set a time offset, click on offset icon to set a time range.

10.7 Data visualization area

Data visualization area displays the data of the selected variables. The time range of the displayed data can be selected within the time selection panel. By default, the data visualization is set for 1 hour duration.
Visualizations can be of the following types:

- Line chart based on aggregating the supported numeric and boolean variable data types.

- Event chart displaying events for example, data of 1 to 5 assets at a time.

- Zoom-in and Zoom-out through zoom controls. You can zoom to a specific time range in visualization area and can view expanded chart representation.

- By using stack mode, you can view separate chart for every group variable.

- Raw, Auto, and Aggregate chart view to visualize data within the selected time period.

Data visualization screen
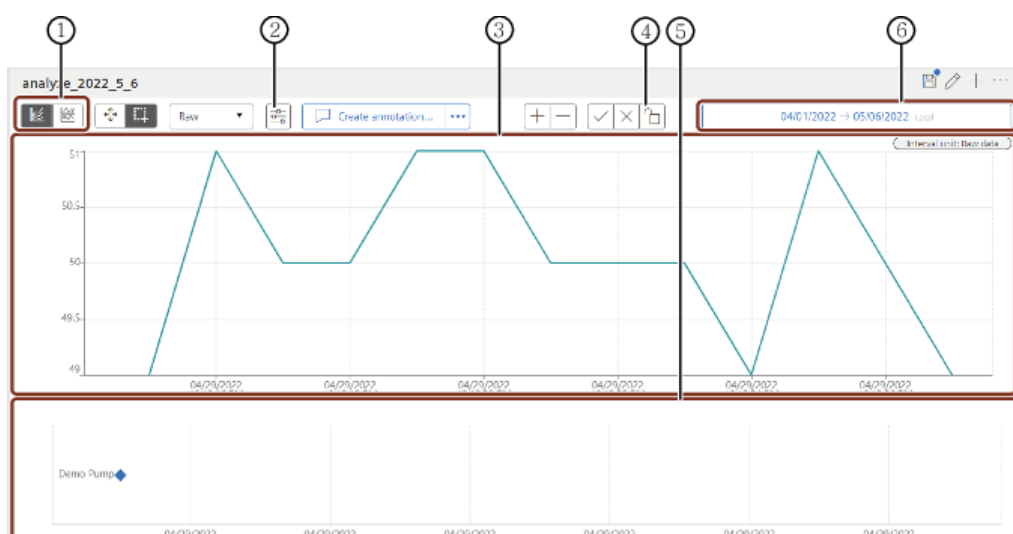
①   Visualization options

②   Chart options: Enables interpolations in tooltip and enables you to see the data with the filled line area

③   Asset data visualization in Aggregates view

④   Locks time series API request

⑤   Events visualization chart

⑥   Time selection panel

- By default, "Aggregates" view is selected with "Last hour" time period. The dotted lines in the "Raw" chart represents additional data. You can Zoom-in or scroll the cursor in the chart to visualize additional data.

- In "Raw" chart, if the time period exceeds 90 days then an error message is displayed. You have to reduce the time period below 90 days. It also allows you to switch between Raw and Aggregate view.

10.8   Time selection panel

The graph shows the set time period in the Time selection panel.

Time selection panel offers you to select the required time range in the following ways:

Absolute: Allows you to select the time range between the "From" date to "To" date.

Quick Range: Allows you to select the predefined quick time range.

Time Zone: Allows you select the time zone.

10.9 Analysis profile panel

The analysis profile panel allows you to save the configured analysis in the context of your user and share a copy of this profile within your environment. You can also rename, create new or delete existing profiles.

The analysis profile panel consists of the following types of profiles:

1. Private: These are the profiles created by you.

2. Shared: These are the profiles that are shared by you or other users in the environment.

Only the users with oi.creator role can share the saved analyzed profiles and update the shared profiles. Normal users can only view the shared profiles but cannot update them.

Shared profiles are always a copy of a profile, so updating a shared profile does not change the original private profile.
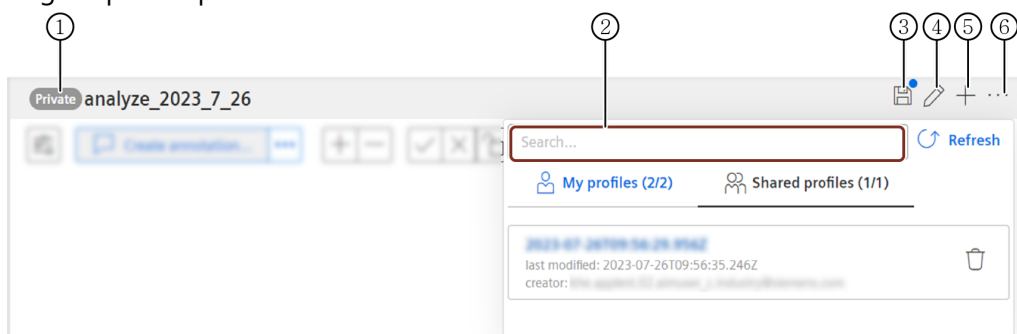
①   Profile type

②   Searches the saved or shared profiles

    ③   Saves the analyzed profile

    ④   Edits the profile name

    ⑤   Creates a new profile (removes all the variables from the config)

    ⑥   Lists the saved profiles

Currently, 400 profiles can be saved or shared.

To share a saved profile from the list, select the profile of your choice and click ⤴. In the confirmation question, click ✓. The profile is successfully shared and other users of your environment can access it.

> 🖊
>
> Sharing of `Analyze Profiles` is currently not supported for sub environment users.

```
The profiles have a time to live (ttl) of 180 days. If profiles are not us
ed during this time (like opened or edited), they will be automatically de
leted.
```

10.10   Data visualization

This section describes some basic use cases to analyze IoT timeseries data. It shows how to select the variables of an asset and visualize data as per the selected variables data type. By creating an event, the following information can be obtained:

- Analyze the performances like produced quantities.

- Compare the performances of the current week and the previous week.

- Analyze the performance of same production line on multiple sites.

Procedure

To visualize the performance of an asset, follow these steps:

1. Select "Time series" in the "Analyze" tab.

2. Search and select an asset from the asset selection panel.

3. Variables of the selected asset are displayed in the variable selection panel. Click "Add" on "Add variable" panel to visualize the variable in variable action panel.

4. Select the required time range.

5. To compare the past period data, click ⟲ displayed next to the variable to be analyzed with a time delay.

Manual events can be created directly within the data visualization area. Manual events are used to note or log incidents of assets or devices. For more information on creating manual events, refer to [Events](#).

Result

You have successfully visualized the asset performance.

10.11 Adding event variables to chart

The visualization of events of an asset allows to detect correlations between events and time series data of assets. For visualization, events of an asset are displayed in the event chart. Events need to be activated in the variable selection panel by "Activate events" toggle button, after which they will be displayed in variable action panel.

> ✏️
>
> The latest 100 events are displayed in the chart. Depending on the time range, it might be useful to zoom into a smaller time range to see events in more detail.

10.12 Analyze asset data

Adding variables to chart

When an asset is selected, all its variable will be listed in the variable selection panel. You can select one or multiple variables of an asset that will be added to the variable action panel. Variables can be placed in one or different groups by using drag and drop. For every group different color can be selected, it will ease the data representation in the chart. The asset group needs to be activated in the variable action panel.

Set time offset

Set time offset

The time offset feature allows to compare multiple asset variables. You can analyze the assets performance in the data visualization area. By creating a time offset, you will be able to compare the performance of an asset. These variables can be added to the variable action panel by the

variable selection panel. It can also be done by duplicating the variable from the variable action panel.

Example scenario

A production manager is analyzing data and detects some unexpected issues or behavior. To document the results of investigation or the need for further maintenance tasks, a variable time offset can be created. It allows to compare the data with a past period, click ⟳ icon to create a "Time offset" function, in which you can visualize the variable with a time delay.

Customize view of group variables

You can configure group variables visualization from variable action panel. According to the set customization, group variables are displayed in the time series chart. You can set distinguish color, mark, and tick to view variable in the chart. It will help in identifying the group variables separately in data visualization area.

Procedure

To customize group variable separate view, follow the steps:

1. Click a group variable, and then click the colored dot next to every variable.

2. Customize the color, mark, and tick for a variable from the pop up screen.
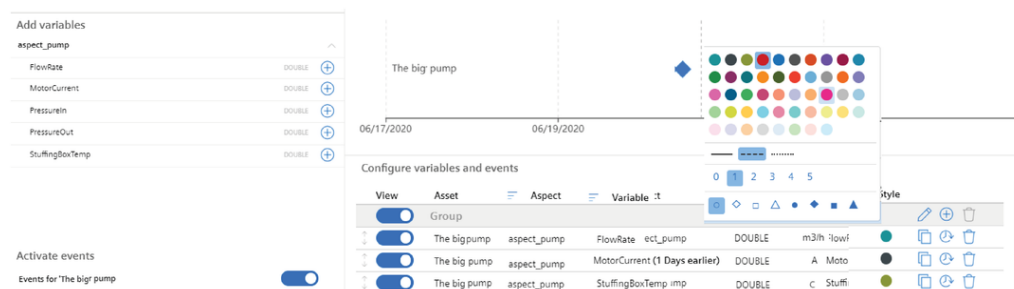
Result

You have successfully set the new customization of a group variable.

10.13   Adding variables to chart

When an asset is selected, all its variable will be listed in the variable selection panel. You can select one or multiple variables of an asset that will be added to the variable action panel. Variables can be placed in one or different groups by using drag and drop. For every group different color can be selected, it will ease the data representation in the chart. The asset group needs to be activated in the variable action panel.

10.14   Set time offset

Set time offset

The time offset feature allows to compare multiple asset variables. You can analyze the assets performance in the data visualization area. By creating a time offset, you will be able to compare the performance of an asset. These variables can be added to the variable action panel by the variable selection panel. It can also be done by duplicating the variable from the variable action panel.

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A production manager is analyzing data and detects some unexpected issues or behavior. To document the results of investigation or the need for further maintenance tasks, a variable time offset can be created. It allows to compare the data with a past period, click ⟳ icon to create a "Time offset" function, in which you can visualize the variable with a time delay.

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You can configure group variables visualization from variable action panel. According to the set customization, group variables are displayed in the time series chart. You can set distinguish color, mark, and tick to view variable in the chart. It will help in identifying the group variables separately in data visualization area.

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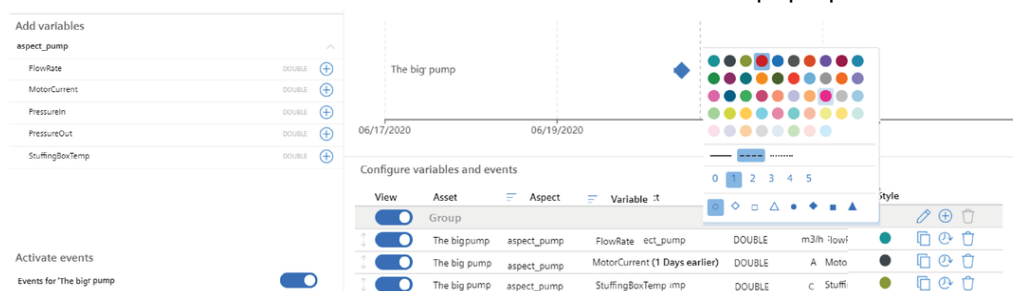
Result

You have successfully set the new customization of a group variable.

Predict

11

11.1 Predict

Predict offers you an out-of-the-box journey to create predictive models for faster and better forecasting and anomaly detection on your TimeSeries data using advanced artificial intelligence and machine learning technologies.

Predict uses time series data from asset as dataset and does easy configuration for forecast and anomaly model building, schedule, execute, achieve and visualize immediate insights.

The below graphic depicts the workflow of Predict:
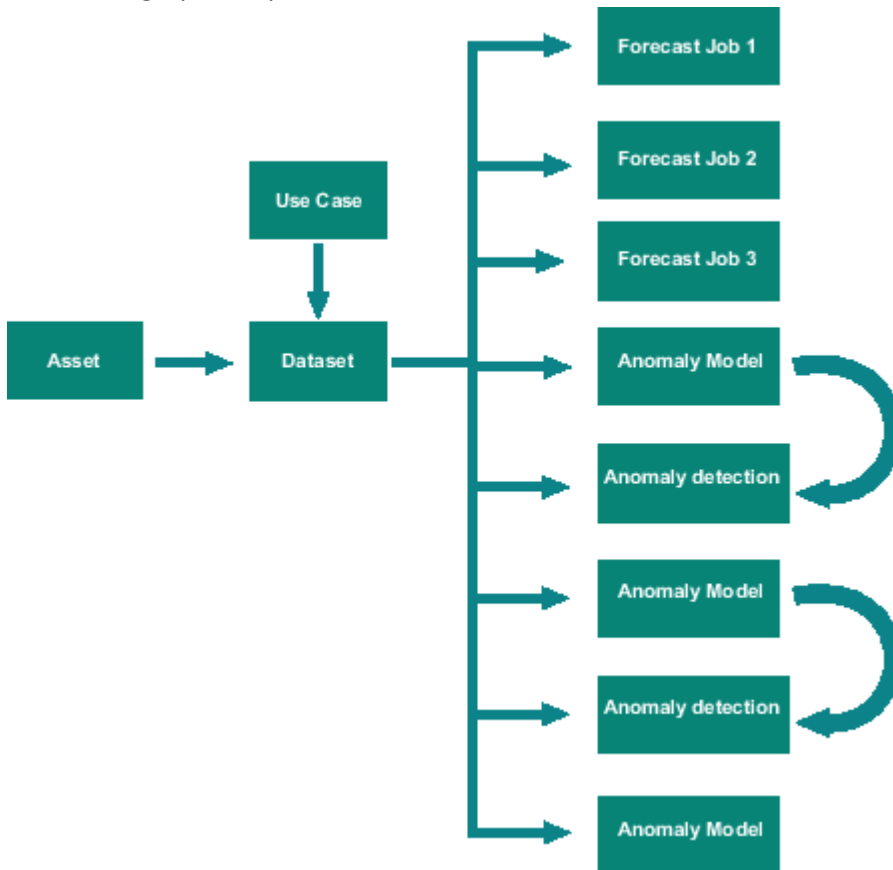
The following screen displays the home screen of Predict:
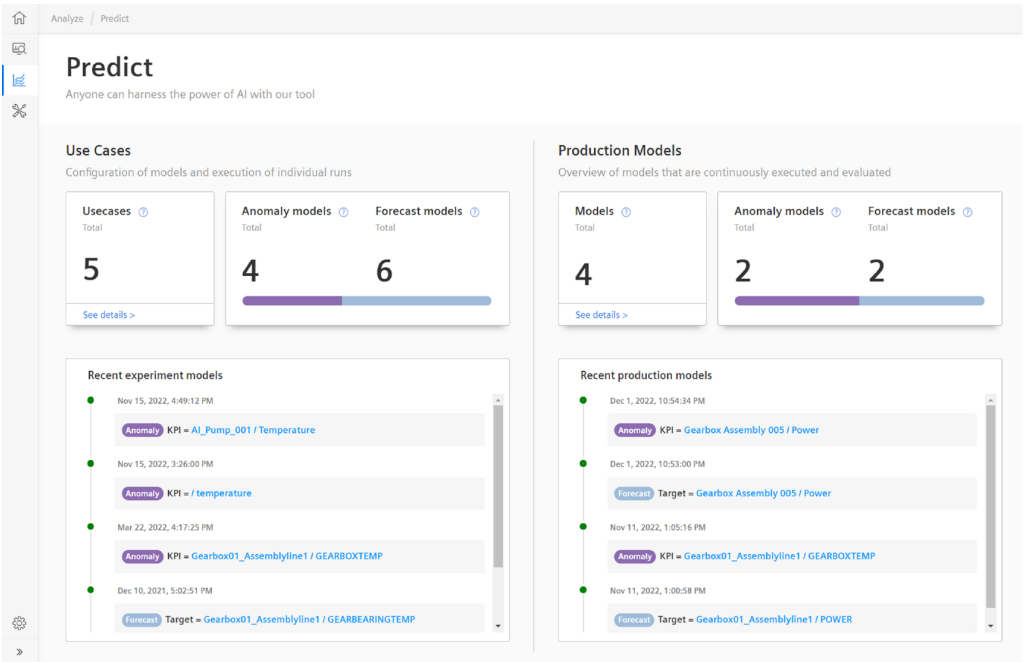
11.2 Use Case

Predict allows you to create use cases, which are used to track and manage both Forecast and Anomaly detection jobs and link the dataset.
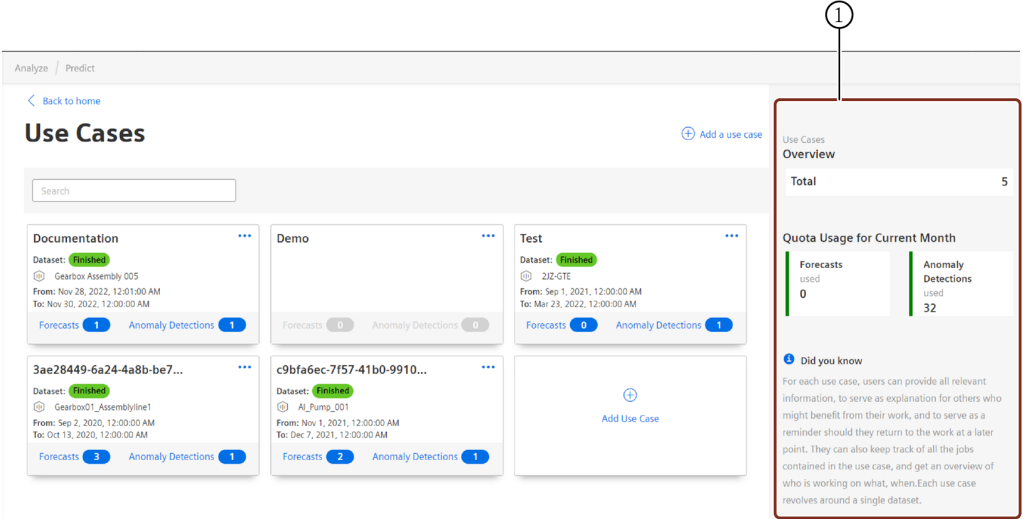
① Overview of the use cases in the tenant

Create a Use Case

To create a use case, proceed with the following steps:

1. Open "Predict" in the "Analyze" tab.
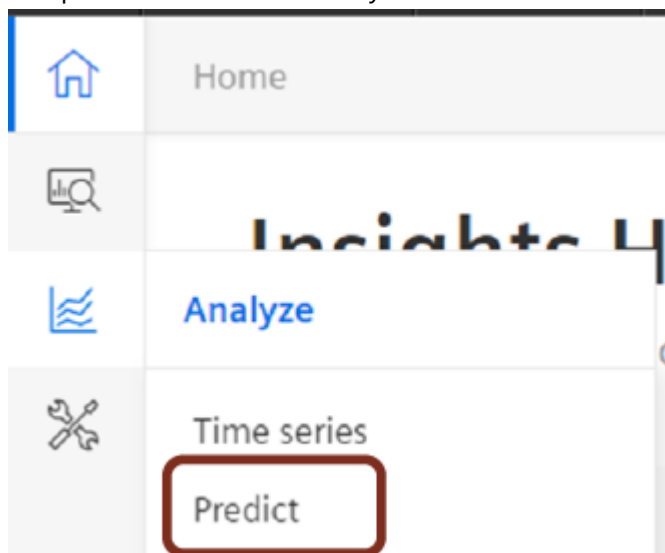
2. Click "See details" in the Use cases section.

3. Click "Add a use case".

4. Enter the name and description of your choice.
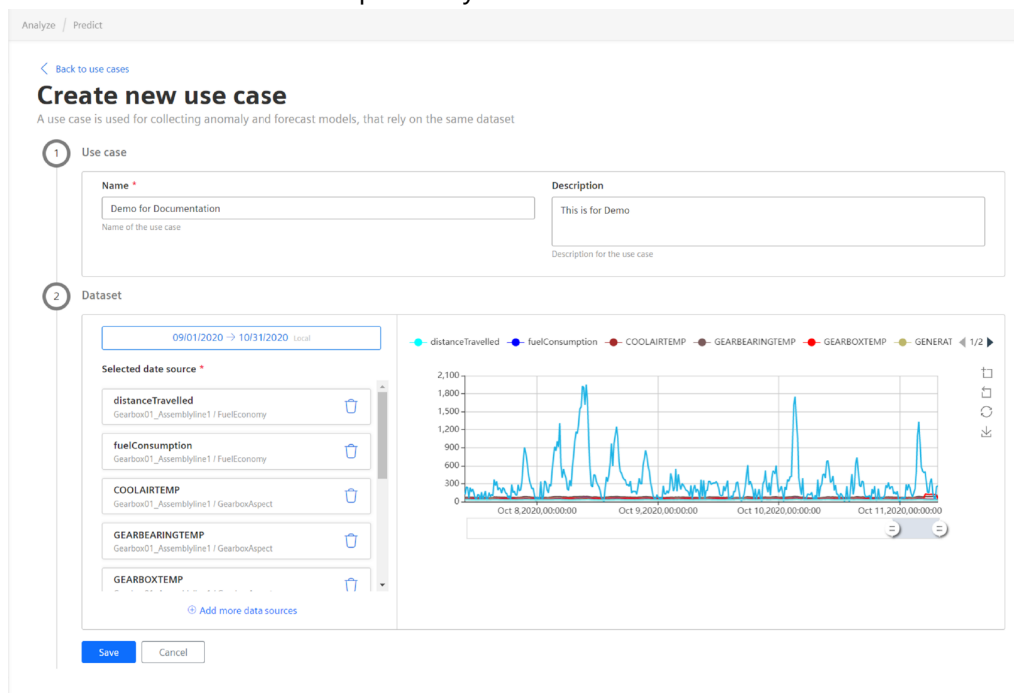
5. Select the preferred date range.

6. Click "Add more data sources".
"Add data source" page is displayed, in this page:

- Select the Asset, Variables for the preferred dataset.

- Click Add data source.

7. Click "Save".

A use case to manage both forecast and anomaly jobs is created.

Edit or Delete a Use Case

To edit an existing use case, proceed as follows:

1. In the "Use Cases" screen, select the existing use case.

2. Click ⋯ and click Edit.

3. In the Edit Use Case screen, update the required fields.

4. Click "Save".

To delete an existing Use Case, select the use case, click ⋯ and click "Delete". In the confirmation Dialog, click "Delete".

11.3   Timepicker

The graph shows the set time period in the Time selection panel.
Time selection panel offers you to select the required time range in the following ways:

- Absolute: Allows you to select the time range between the "From" date to "To" date.
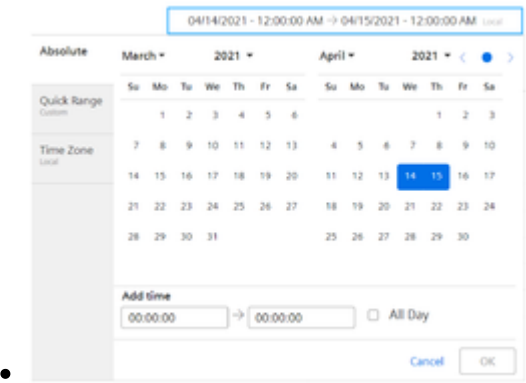
- Quick Range: Allows you to select the predefined quick time range.
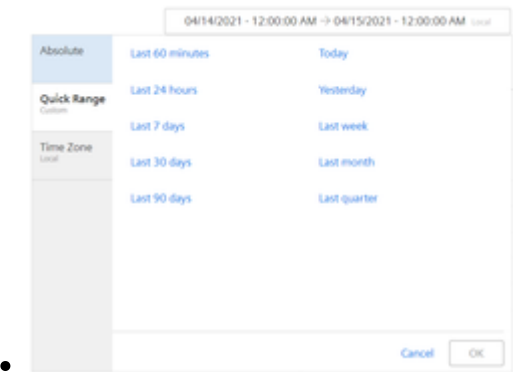
Time Zone: Allows you select the time zone.
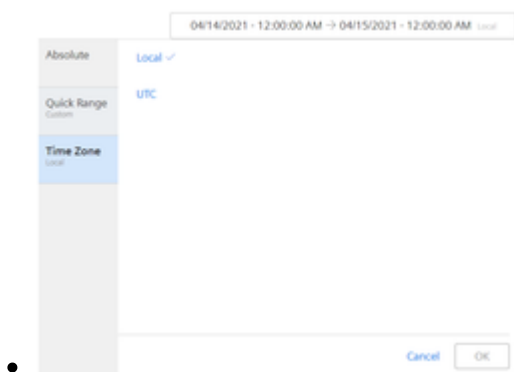
11.4   Production models

Predict allows you to track and manage both Forecast and Anomaly detection jobs, which are continuously executed and evaluated as per the jobs scheduled.

Using the Production models, the users track and monitor the forecast and anomaly reports for models that are frequently executed in accordance with the schedule.
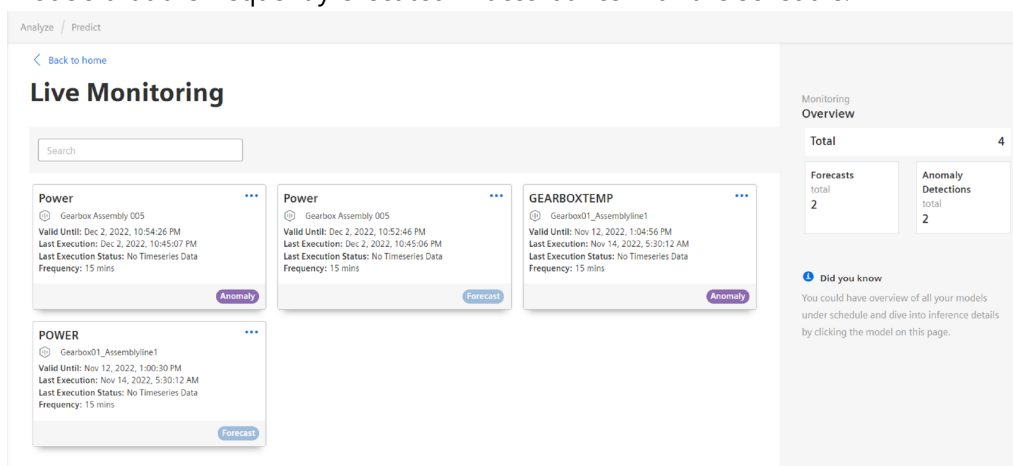
11.5   Forecast

The "Forecast" extension is introducing the forecasting capability as part of Predict offering, which offers an out-of-the-box model building to forecast your future time series data values, using advanced artificial intelligence and machine learning technologies.

The "Forecast" extension uses time series data from asset as dataset and does easy configuration for forecast model building and execution.

The "Forecast" extension visualizes forecasting results which could be further utilized for your targeted use cases like comparing with threshold value, reviewing historic forecasting records for model selection.

User interface of the Forecast

The following figure shows the "Forecast" screen:
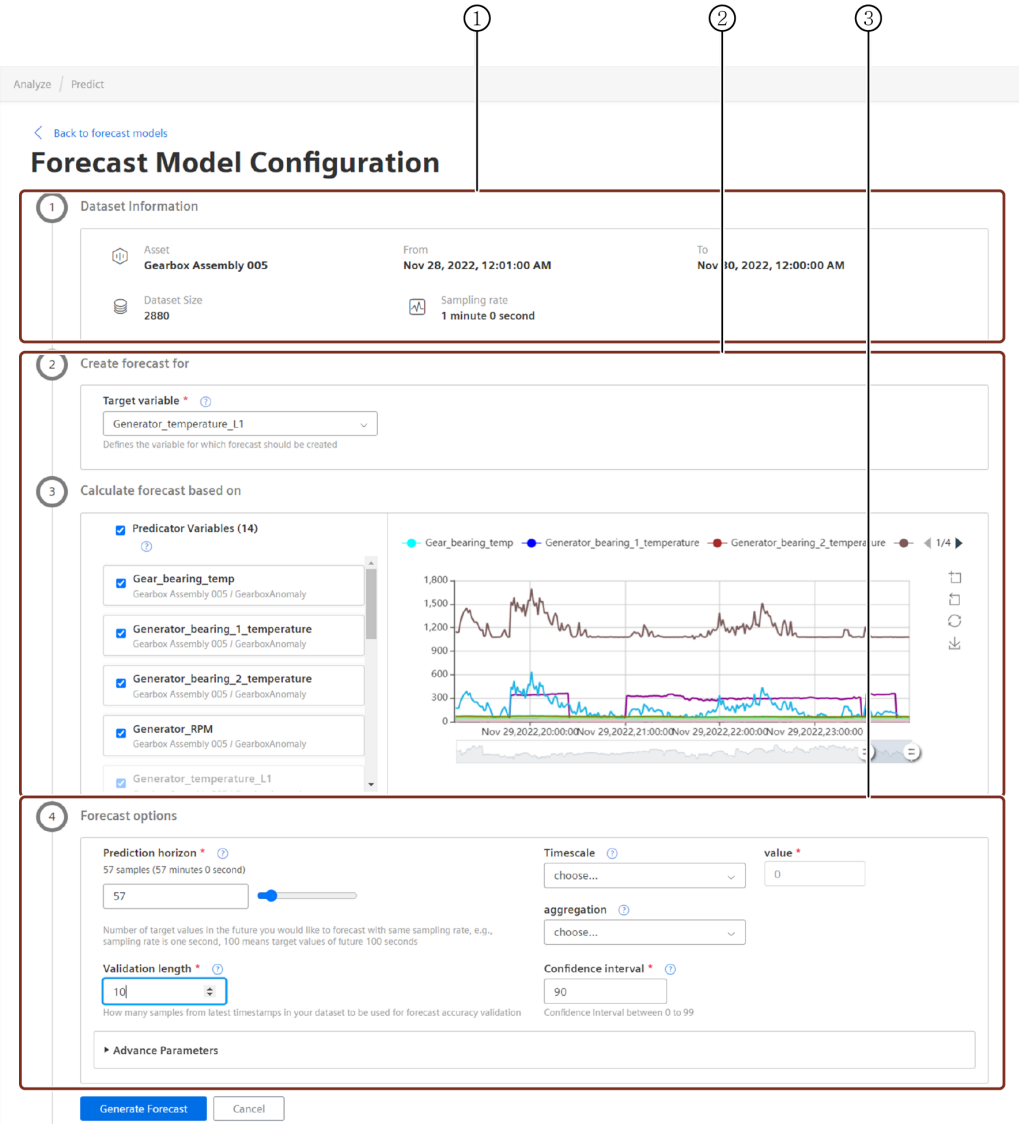
①   Dataset information

②   Use case details of the forecast

③   Forecast Configuration settings

Generate the Forecast model

To generate the forecast report, proceed with the following steps:

1. Open "Predict" in the "Analyze" section.

2. Select the "Use Case", and click "Forecast Jobs".

3. Select the targeted variable of your choice.
The forecast prediction is prepared for the selected target variable.

4. Select the input variables of your choice.

5. Configure the below settings to generate the forecast report.

   ○ Prediction Horizon: Number of samples or time period in the future for forecasting

   ○ Validation Length: Back-testing length from dataset for accuracy metrics generation

   ○ Confidence Interval: A measurement of percentage to represent the confidence level

   ○ Allow offset: A boolean value that decides whether to use offsets of predictors in model

6. Click "Generate Forecast".

Forecast model

The generated forecast model can be used to predict the future data for the selected variables of the asset.
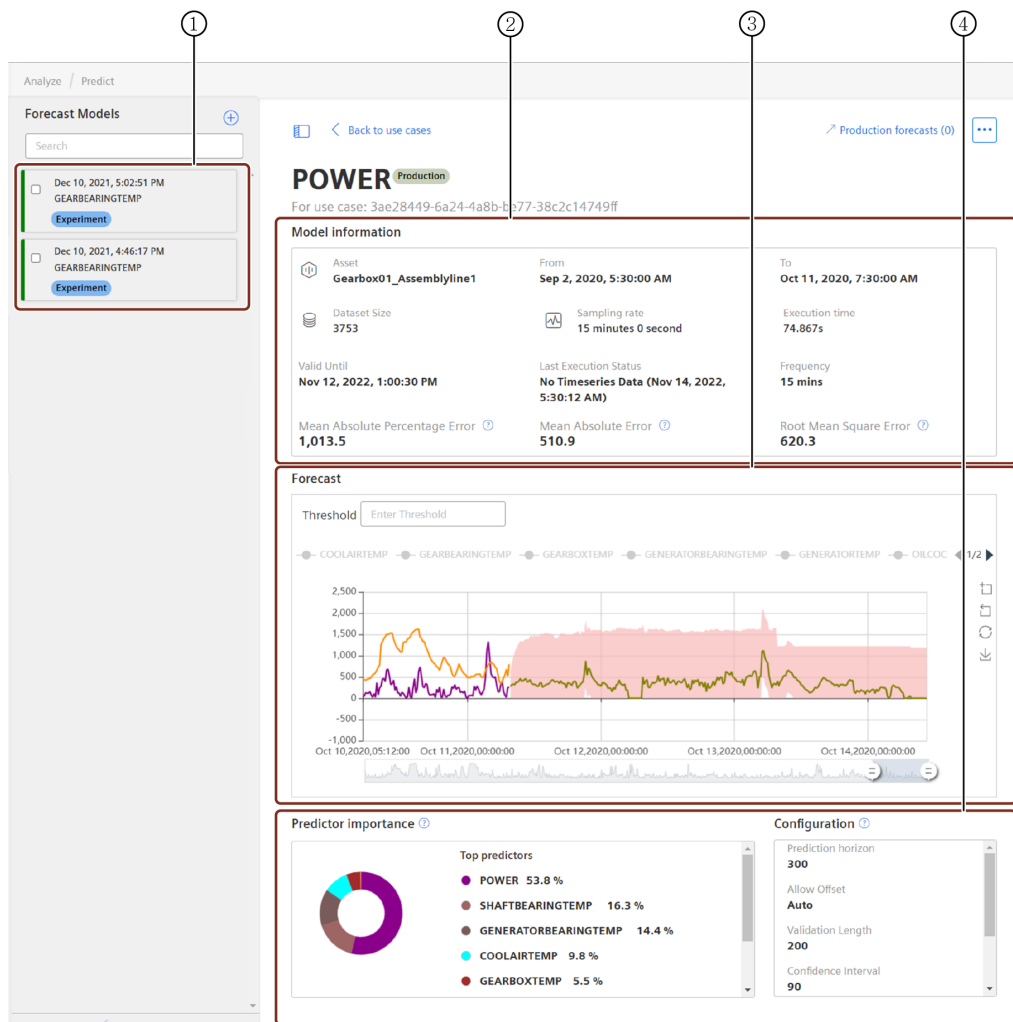
①	Forecast Models
②	Model information
③	Forecast report
④	Predictor importance indicators

Schedule the forecast model for production

It is now possible to plan and schedule the production of the forecast model which can be executed and evaluated on the frequent intervals as per the preferred time range.

To schedule the production run of the forecast model, proceed with the following steps:

1. Open "Predict" in the "Analyze" tab.

2. Select the "Use Case", and click "Forecast".

3. Select the preferred model from the list of available models.

4. Click "Schedule for production".

   Select the preferred frequency for executing the models.

5. The forcast models can be executed as per the below intervals:

   ○ Minutes

   ○ Hourly

   ○ Daily

   ○ Weekly

6. Select the preferred date range.

7. Click Save.

Forecast report

Once the forecast is scheduled for production, the forecast reports are generated as per the schedule. The generated forecast report can be used to predict the future data for the selected variables of the asset. To view the forecast report, click "Production forecasts" and select the preferred report from the "detail result for forecast execution" drop-down.
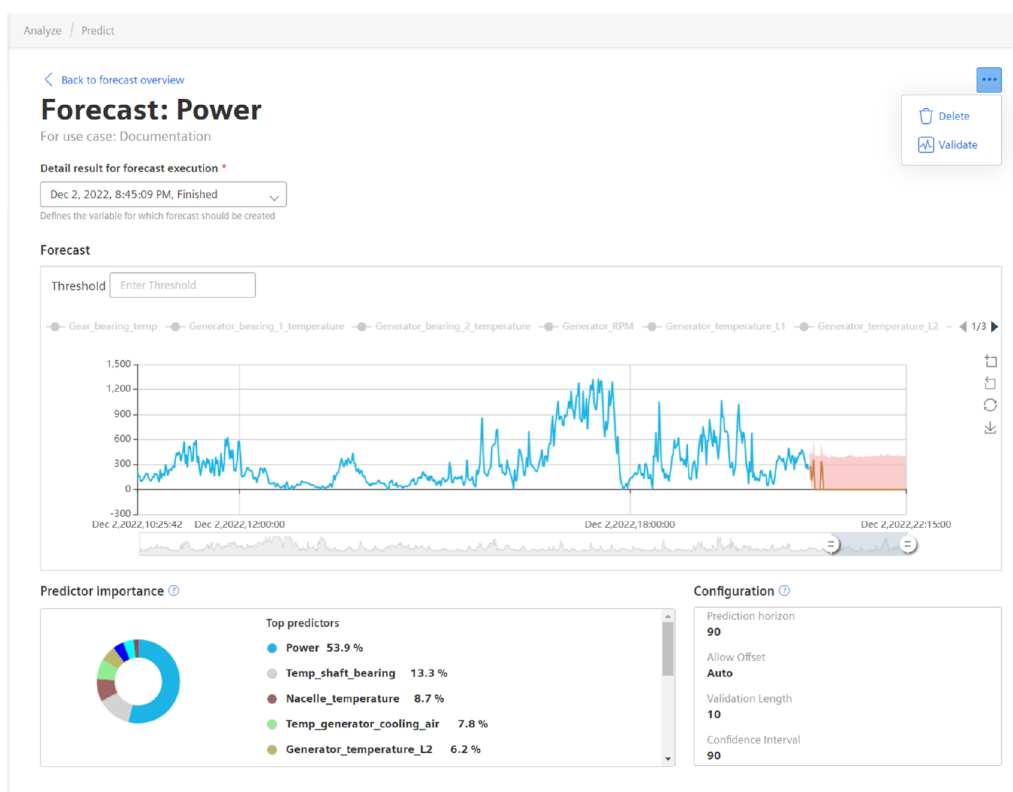
Save Forecast report in IoT store

Once the forecast reports are generated as per the schedule, then the aggregates (mean, min and max) are calculated based on the forecast prediction results. This report containing aggregated data is inserted back into Insights Hub IoT store. Rules engine can be configured to generate events based on Forecast prediction results.

Compare the Forecast report

The "Forecast" extension allows you to predict the future data on multiple instances and compare them for analysis. This comparision of historic forecasting records assits in the better model selection.

Once the forecast report is generated, make the required changes in the "Forecast Configurations" and click "Regenerate Forecast" and compare the two reports.

To compare the forcasting reports, select the various forcasting reports and click "Compare".

The following figure shows the comparision of the two forecast reports:

Save the Forecast report

The Forecast Extension allows you to upload the generated reports to integrated Data Lake application.
To save the generated forecast reports, select the report and Click "Save".
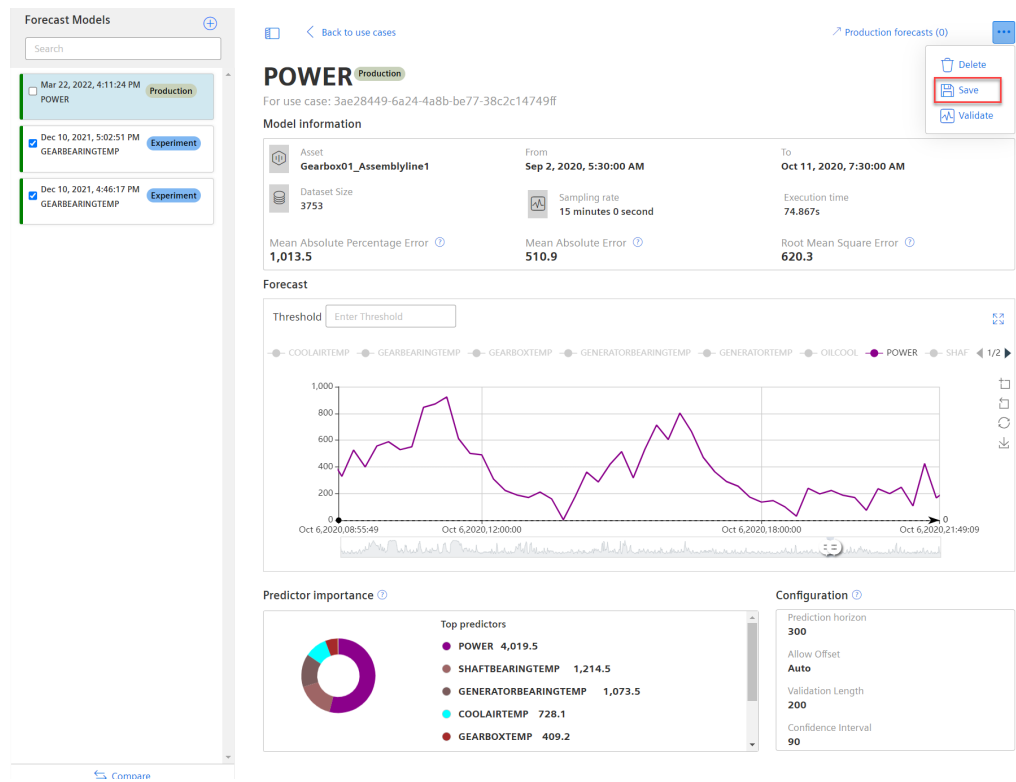
Validate the Forecast Report

The Forecast Extension allows you to compare and validate the actual asset data with the forecast reports.

> ✏️
>
> In order to compare the actual asset data with the forecast report, ensure the actual asset data is uploaded to integrated Data Lake.

To compare and validate the forecast reports with Actual asset data, select the report and click "Validate".
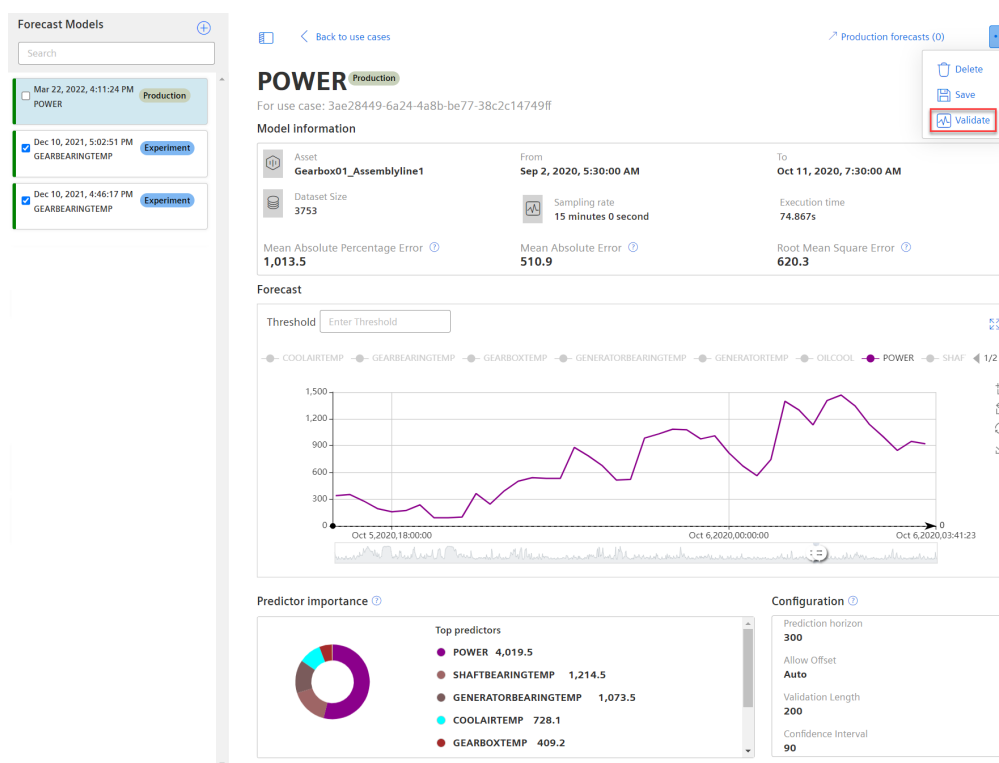
Delete Forecast Reports

To delete the generated forecast reports, select the forecast reports from the list, click ••• and select "Delete".

11.6 Anomaly Detection

The Anomaly detection extension as part of Predict offering, offers an out-of-the-box model building and detect the variations in your time series data values, using advanced artificial intelligence and machine learning technologies.

Anomaly detection uses time series data from asset as dataset and does easy configuration for model building and detection of anomalies.

The Anomaly detection report visualizes the anomaly spots, indicators, which could be further utilized for your targeted use cases like comparing with threshold value, reviewing historic records.

User Interface of the Anomaly Detection

The following figure schows the anomaly detection screen:

①   Dataset information

②   Details of the Anomaly detection

③   Data visualization area

④   Anomaly detection configuration settings

Build the Anomaly Detection model

To build the anomaly detection model, proceed with the following steps:

1. Open "Predict" in the "Analyze" tab.

2. Select the "Use Case", and click "Anomaly Detections".

3. In the "In-sample Period" configure setting, select the time period required for the training dataset for the model building.

4. Select the target variable and the input variable of your choice in the Influencers setting.

5. Configure the Perspective and Sensitivity settings:

- ○ Residual Sensitivity: Detects the residuals with significantly higher magnitude than those observed on the in-sample period as anomalous.

- ○ Residual Change: Detects the most extreme changes compared to the anomalous behavior model can see on the in-sample period.

- ○ Fluctuation: Anomalous behavior model detects anomalies if different fluctuations are observed than those which were present during the in-sample period.

- ○ Fluctuation Change: The fluctuation change perspective focuses on the fluctuation of the residuals output similarly to the fluctuation perspective. However, the difference is that the fluctuation change perspective seeks only for the change in the fluctuation.

- ○ Imbalance Sensitivity: The imbalance perspective helps to detect anomalies accompanied by deviation of the residuals output from zero for a longer period of time.

- ○ Imbalance Change: Anomalous behavior model with an imbalance change perspective is suited for detecting anomalies that occur when a change of imbalance in the residuals output is observed.

6. Configure the Normal Behaivor setting.

7. Configure the Data Imputation setting.

8. Click "Build a model".

Schedule the Anomaly model for production

It is now possible to schedule the production of the anomaly model which can be executed and evaluated on the regular intervals as per the preferred time range.

To schedule the production run of the anomaly model, proceed with the following steps:

1. Open "Predict" in the "Analyze" tab.

2. Select the "Use Case", and click "Anomaly Detections".

3. Select the preferred model from the list of available models.

4. Click Schedule for production.

5. Select the preferred frequency for executing the models.
The anomaly models can be executed as per the below intervals:

- Minutes

- Hourly

- Daily

- Weekly

6. Select the preferred date range.

7. Click Save.

Anomaly Detections

Once the anomaly detection is scheduled for production, the anomalies are generated as per the schedule. The generated anomalies can be used to analyze the data for the selected variables of the asset. To view the anomaly detection, click "Production detections" and select the preferred anomaly detections from the "detail result for forecast execution" drop-down.
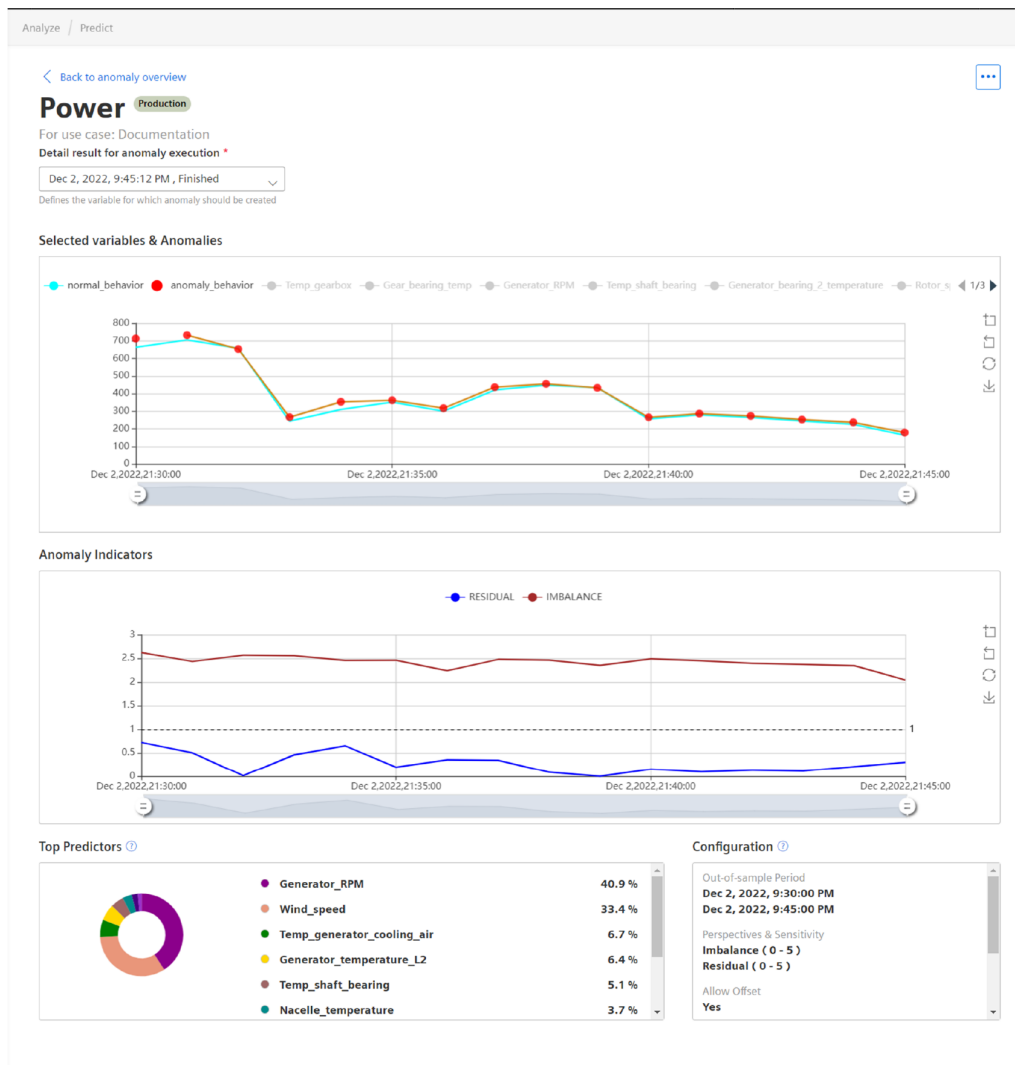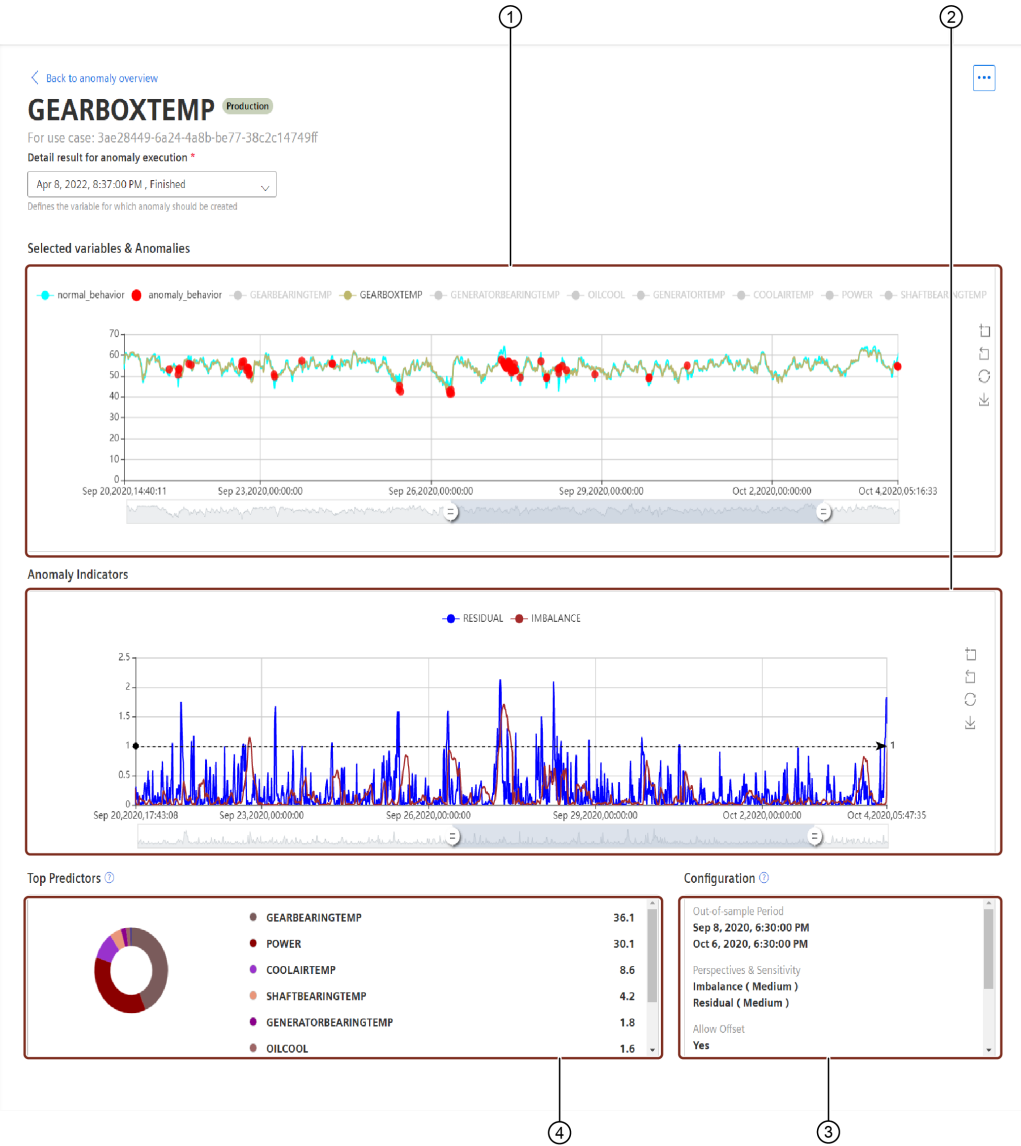
Detect the Anomalies

Once the model for anomaly detection is built, configure the "Out of sample period" setting, the time period to execute the anamoly detection. Click "Detect" to start detecting the anomaly spots for the selected dataset.
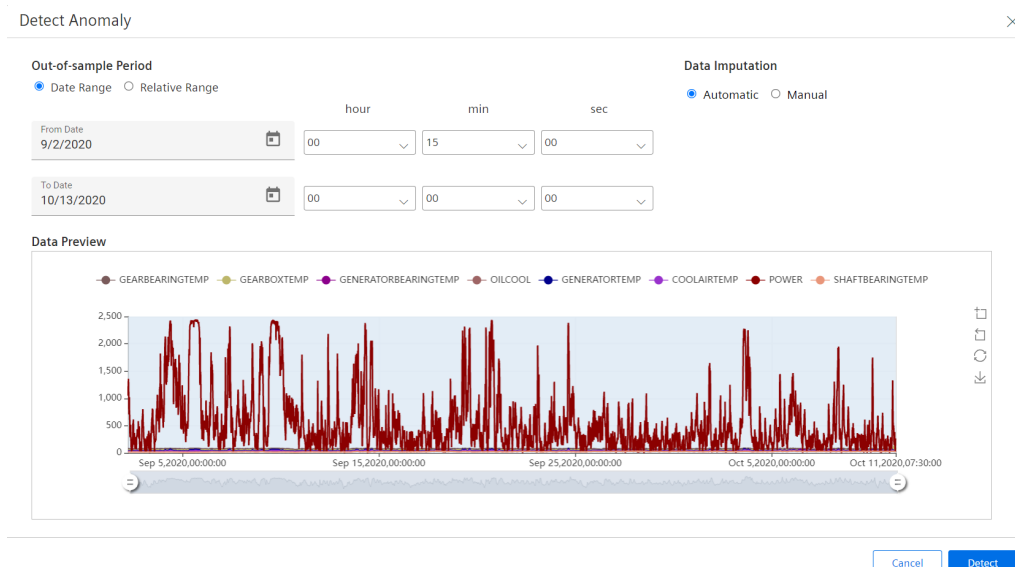
Once the Anomaly detection is completed, the anomaly spots are displayed as shown below:

①   Selected variables and Anomalies

②   Anomaly indicators as per the perspectives

③   Anomaly detection configuration

④   Top Predictors

Delete Anomaly Detections

To delete the generated anomaly detections, select the anomaly delections from the list, click ⋯ and select "Delete".

Rules

<div style="text-align: right; font-size: 3em; font-weight: bold;">12</div>

12.1 Introduction to Rules

A rule automatically triggers events once the defined condition has been met. The rule detects the overshooting or undershooting of a defined threshold value. The rule automatically logs each deviation with an event.

You define the exact threshold value in the rule configuration.

After creating a new rule, the rules engine will use the last 3 hours of the related data for the initial analysis.

You can use a rule to change the asset state. The state of an asset is indicated with color in the asset navigation. Multiple rules can be created for a single asset. The state of this asset will display the highest severity level of the triggered rules. The asset navigation takes on the color of the asset state with the highest severity.

> ✏ **Deleted assets and rules**
>
> If you delete an asset the rule will also be deleted. Deleting the rule can take up to half an hour after the asset has been deleted.

> ✏
>
> The rule engine triggers only in case of state changes. If values are still violated the rules are not triggered again. For Example: A rule has been created to monitor a value greater 90. Now the value changes from 89 to 91 - means a state change happens - and the rule will be triggered and perform the configured actions. Next the value changes from 91 to 100 - here no state change happens, due to the rule is already violated - and the rule won't be triggered again.

> ✏
>
> - For Insights Hub value plan subscribers, the number of rules that can be configured is limited as per the package.
>
> - For Insights Hub capability packs subscribers, rules can be added as required. Rules consumption above the limit in the subscribed package will be charged separately.

> ✏️ **Rules on 'Insights Hub Start for Free' accounts**
>
> - Rules are running only for 24 hours. After that they are disabled automatically. A user can enable it again if needed for further 24 hours.

12.2 User Interface of Rules

You manage the rules using the main navigation of the "Rules" extension.
To view the summary of all the rules created on this tenant, click "Rules" in "Configure" tab.

① Lists all the rules in the environment

② Creates a new rule

③ Allows you to edit the selected rules

④ Allows you to view the configuration of the selected rule

⑤ Refreshes the current rules list

⑥ Copies, Activates, Deactivates or Deletes the selected rules

⑦ Consumption data of the Rules

⑧ Preview of the rule

In the "Rules" overview you can see that the Rule indicated in blue has been triggered at least once.

By selecting the rule, you can find more details of the rule and also can find, which asset has been triggered. Using the quick links you directly jump to the asset to analyze further.

Parameters of the "Rules" extension

The "Rules" user interface contains the following parameters:

Parameter	Description
Asset Name	Name of the asset.
Name	Name of the rule.
Description	Shows the description of the rule.
Additional actions	Shows the actions that are to follow the violation of the rule.
Assets	Name and number of the assets associated with the rule for the asset type.
Status	- Enabled refers to an active rule - Disabled refers to a deactivated rule

12.3   Create a Rule

Rules can be created for an asset type. This means, you can create a rule one time and use the same rule definition for all instances of this asset type.
Rule can be created from the below two screens:

- Open "Rules" in "Configure" section and click Create, where you can also find all the rule definitions in the environment.

- Open "Assets" in the Explore section and select the "Rules" plugin, click "Create". Here you can create a rule directly for the selected asset. In this case the asset type and the asset instance is already preselected in the wizard.

The rule query enables you to create a new rule and enter the individual parameters.
The rule wizard guides you through the below steps to create a rule.

Parameter overview of rule query

The following table describes the parameters for defining rules:

Select Variables:

In this step, you select the asset type, up to 3 Variables to be monitored, and the assets, the rule shall be activated. For Consumption data, one rule is calculated for each selected asset.

1.
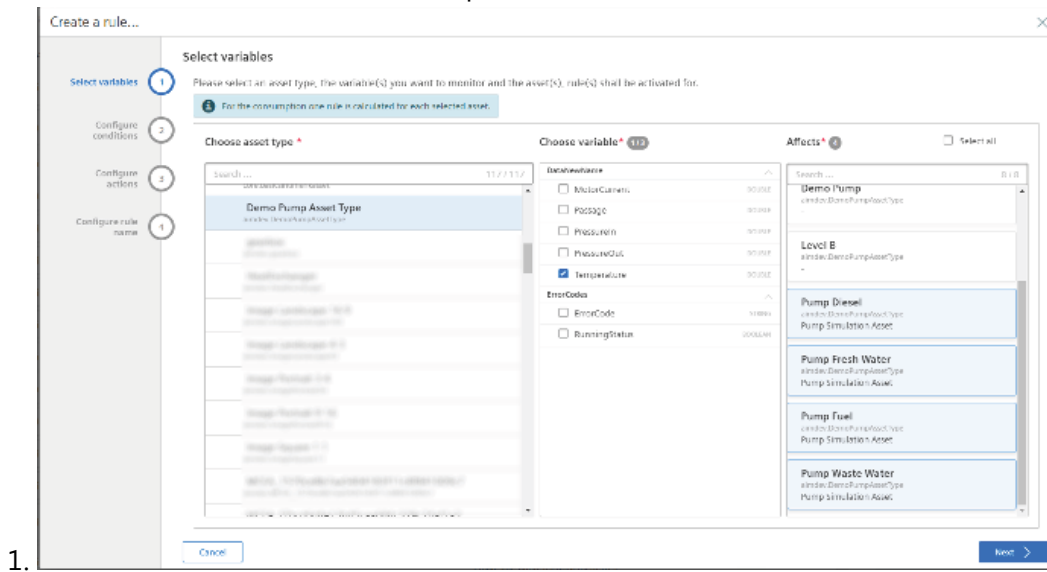
Configure conditions:

In this step, you can change the operators and thresholds and also configure hysteresis or debouncing time if needed. Follow the info pictures for more information.

2.
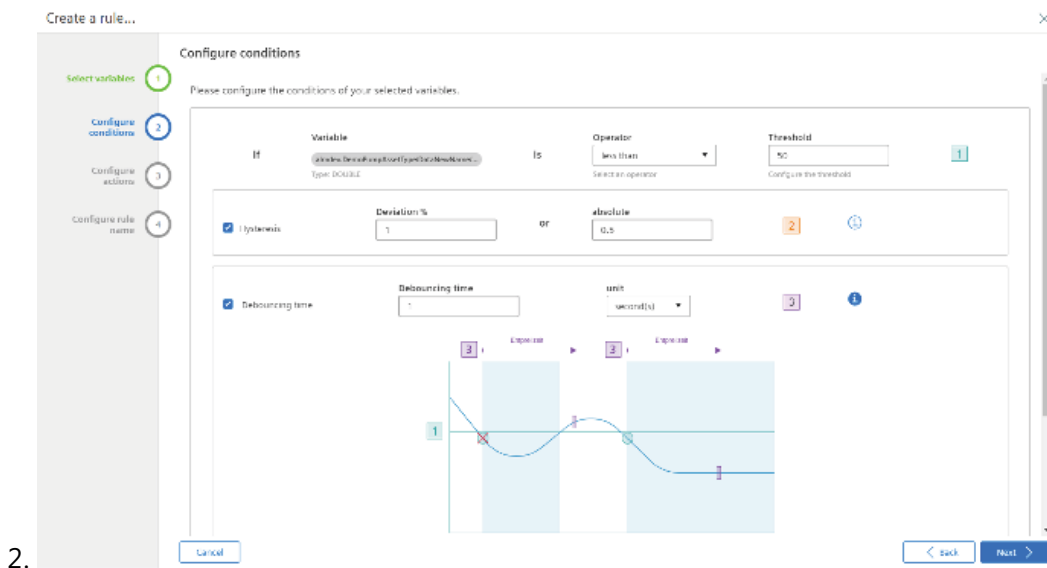
Configure actions:

3. In this step, you can configure the actions which are executed after a rule triggers.

- Mandatorily always an event will be triggered. For that the description and severity (Information, Warning, Error) can be configured.

- You can limit the events, that not every rule violation leads to an event.

Furthermore there are following actions available:

1. Set asset state:

The asset status of the affected asset will be set according to the severity of the event. The status is displayed in the asset view on every asset with a colored indicator.

2. Notify by email:

The received email will contain all necessary information about the triggered rule like the tenant, asset, severity, description and so on. Multiple email addresses can be inserted. Confirm each valid email-address with 'Enter'.

Furthermore you can copy/paste semicolon separated email addresses into the input field.

3. Trigger VFC Flow:

With this powerful action you can trigger a flow in the application <u>Visual Flow Creator</u>
For that you need to use a `rules trigger` node in a VFC flow. This node can trigger custom actions like sending a web request, sending a message, creating a work order and so on. The rule wizard just shows available nodes, which you can select to be triggered. All other business logic can be implemented in Visual Flow Creator.
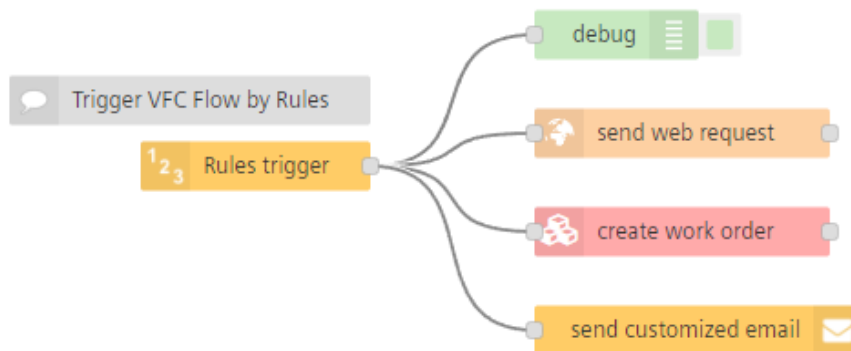
4. Notify by Simatic Notifier:

Optional you can enable the "Notify by Simatic Notifier" button to receive the notifications in the <u>Simatic Notifier</u> application or on mobile devices.

An additional SIMATIC Notifier license is required in order to receive the push notifications on mobile devices. To buy a notifier license, please refer to [SIMATIC](#)

[Notifier documentation](#).

4.Configure rule name:

In this step, you configure the name of the rule. It is also possible to automatically generate the Rule name based on the selected variables and the conditions. To automatically create a name, click Generate.

5.Click "Submit" to save the Rule.

If the rule query screen does not display the "Set asset state" selection under "Additional actions", this may have the following cause:

The asset does not have an aspect with name "status" of type `core.assetstatus`. For your own asset types you could add this status aspect by using `Asset Manager`.

Copy a Rule

Insights Hub Monitor will allow the users to save a copy of the existing rules and reuse them for their assets. When a rule is copied, all the information in the rule will be copied, the users can make the necessary changes as per their choice and use these rules.

To copy the rules, proceed as follows:

1. Select the rules of your choice from the "Rules" overview page.

2. Click ⋯ and select "Copy".

"Copy a rule..." window opens. By default, the same variables, conditions and actions are applied on the copied rule, if you want to make any changes to these variables, conditions or actions, refer to the procedural steps 1 to 3 from the section "Parameter overview of rule query".

3. Configure the name of the rule as per your choice.

By default, the same name of the rule will be copied.

4. Click "Copy".

The copied rule will be available in the "Rules" overview page.

12.4   Deactivate a Rule

You have the option of temporarily deactivating rules. You can deactivate a rule completely, so that it is not executed anymore in total. Or you can just deselect an asset in the rule wizard, which ensures that only this asset is not analyzed anymore.

You can reactivate a rule which has been deactivated.

> ✏️
>
> The rule quota considers only active rules.

Analytics

<div style="text-align: right">

13

</div>

13.1 Overview

With Insights Hub Monitor Analyzer, users can access time series, non-time series, and aggregate data stored in the Integrated Data Lake (IDL), or in Internet of Things (IoT) databases.

Simple KPIs

Simple KPIs provide a quick means of monitoring machine or production line data by running the KPI on a schedule and writing the KPI calculation results data to a user selected variable in asset model. Simple KPIs are written in Javascript, can include conditional loop statements, and be scheduled to run automatically on the day and time you select.
Simple KPIs are processed internally by Visual Flow Creator, and utilize an output variable that must be created beforehand as part of the asset model created in Asset Manager. Configuration options include:

- Up to five input variables, with one output variable

- Simple or advanced calculation cycles

Advanced KPIs

Advanced KPIs utilize a KPI format with easy-to-use features, such as drag and drop functionality for KPI components, and operators that cycle through +, -, /, * by clicking. Advanced KPIs support calculation filters to include or exclude specific values or ranges of values from the source data. Advanced KPIs support aggregated time series data and non-time series data stored in IDL or IoT databases.

> ✏️
>
> Data sources located in the IDL and Data Contextualization are available to Capability Package subscribers only.

Advanced KPIs and Analysis

You can add an analysis directly to an advanced KPI without leaving the page. When the KPI analysis runs, it produces a chart and results grid, each with additional configuration features and

drill-down.

> ✏️
>
> Data sources located in the IDL and Data Contextualization are available to Capability Package subscribers only.

Adding an analysis to a KPI provides additional configuration options, including:

- Sorting and filtering results table data individually by column

- Customizing how the analysis results are grouped on the chart's X-Axis (and table columns)

- Drilling down into analysis data

- Viewing the history of the KPI's field combinations

- Scheduling the KPI to run automatically

- Setting a value threshold that, when crossed, notifies you

- Setting up an auto-discovery configuration to run automatically when a threshold is crossed

13.2   KPI List Page

About the KPI List Page and KPI Details

The KPIs page displays basic information about KPIs you have access to, such as the number of each type—simple and advanced.
Double clicking a KPI row opens the Edit KPI page where you can make changes and save the KPI and/or KPI analysis.
Here are some important points to be aware of when using the KPIs page:

- The Filter field at the top of the page can help narrow the number of KPIs that appear in the list.

- View statistics about your KPIs in the Overview section on the right.

- View all, simple, or advanced KPIs via the Type field at the top of the list.

- You can jump to creating a KPI via the Create simple KPI and Create advanced KPI links at the top of the page.

Illustration of the KPIs Page

This is an example of the KPIs page:

①   Filters the KPI list

②   List of KPIs

③   Opens the create a simple KPI page

④   Opens the create advanced KPI page

⑤   Filters the KPI list by the type

⑥   Displays a summary of the KPIs you have access to in the list

KPI Details

Click a row in the KPI list to view KPI details to the right of the list. In addition to displaying information about the KPI, such as the calculation cycle, formula and the inputs and outputs. The icons (outlined in the image below serve as shortcuts to KPI functionality):
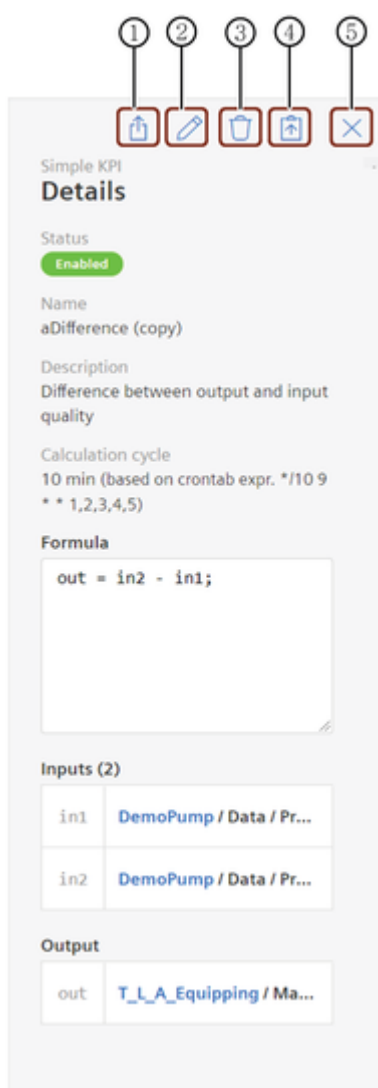
①   Lets you export the KPI to Visual Flow Creator

②   Opens a window for editing the KPI configuration

③   Deletes the KPI

④   Copies the KPI

⑤   Closes the KPI Details view

13.3   Creating a Simple KPI

Simple KPIs use time series data and can display up to one month of data. Here are some additional characteristics of simple KPIs:

- Mathematical calculations are written in JavaScript and display the Formula window. At the end of this topic are two example KPIs-one demonstrates using math in a KPI, the other using JavaScript.

- The name you give to a simple KPI must be unique within your organization.

- You can select up to one month of data to display, and this selection is made in the "Select a variable" pop-up window.

- Calculation cycles of 1 to 59 seconds and 1 to 90 minutes are supported.

- Advanced calculation settings can specify time ranges, time zone, and which days to run.

Simple KPIs Limitations

The following limitations apply to simple KPIs:

- Simple KPIs are for time series data only.

- A KPI must include at least one input variable and no more than five.

- The output variable must be created beforehand as part of the asset model configuration in Asset Manager.

Illustration of the Create a Simple KPI Page

①   Toggle to activate the KPI immediately
②   Advanced calculation cycle settings

How to Configure the General settings for a Simple KPI

Follow these steps to configure the general settings for a simple KPI:

1. Click the "Create a simple KPI" link at the top of the KPI page. The Create a Simple KPI page displays.

2. If you do not want the KPI to be immediately available, slide the "Enabled" toggle to the left. The Enabled toggle turns gray and displays, "Disabled".

3. Enter a value and select "seconds" or "minutes" for the calculation cycle.

4. Select the "Use advanced settings" check box to set more specific settings. Additional configuration settings display.

5. Select the time range, time zone, and days of the week to run the KPI.

Configuring the Input and Output Variables

When you select the input asset, its aspects display; when you select an aspect, its variables display. This is an example of the pop-up window in which you select time series data for your KPI input and output variables:
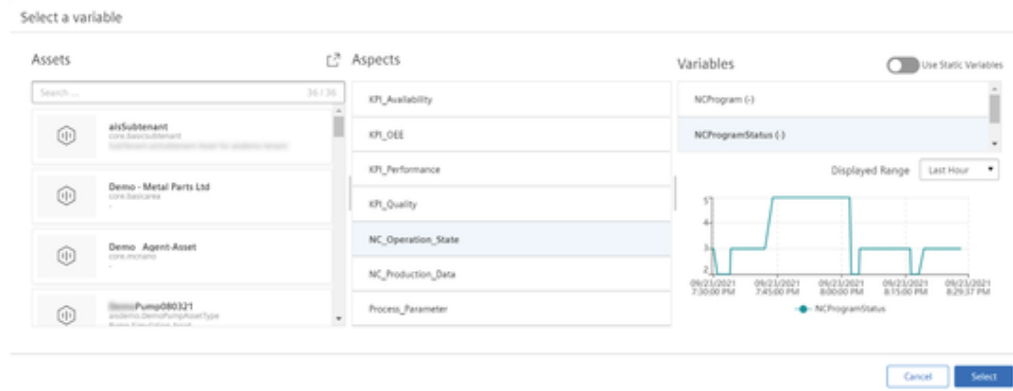
How to Configure the Input Variables

Follow these steps:

1. If you plan to use an aspect with static variables, slide the "Use Static Variables" toggle to the right. The slider turns blue.

2. Click the "Add Input" link. The Select a variable pop-up window opens.

3. Select an asset. The asset's aspects display in the next column.

4. Select an aspect. The aspect's variables display in the next column.

5. Select the input variable you want to use in the KPI.

6. Repeat step 4 to add additional input variables, up to five.

7. Click "Select". The pop-up window closes and your input selection displays in the Inputs area of the KPI.

> ✏️
>
> If the application doesn't display the variables you expect, try selecting a longer time range from the Displayed Range drop-down list at the bottom of the Variables display.

How to Configure the Output Variables and Save the KPI

Follow these steps:

1. Click the "Add Output" link. The Select a variable pop-up window opens.

2. Select an asset. When aspects display, select an aspect.

3. When variables display, select the output variable you want to use in the KPI.

4. Click "Select". The pop-up window closes and your output selection displays in the Output area of the KPI.

5. Using JavaScript, enter additional formula details in the formula section.

6. Click "Save". The KPI is saved and the system displays a Success message.

An Example of a Simple KPI that uses Math

This example demonstrates a KPI that uses a math script to calculate the length of a vector from origin to point, using using a math script.

How to Create a KPI that Uses Math

Here is an image of the KPI settings:

Follow these steps to create a KPI that uses math:

1. Click "Create a Simple KPI".

2. Enter "Milling-vector" in the Name field.

3. Enter "Length of Vector" in the Description field.

4. Enter "10 minutes" as the Calculation cycle.

5. Select "T_L_A_Equipping > Machine_KPIs > Quality" for "in1".

6. Select "T_L_A_Equipping > Machine_KPIs > Quality" for "in2".

7. Select "T_L_A_Milling_CNC > KPI_Quality > Quality" for "out". Your formula will look like this: $const X = in1;const Y = in2;out = Math.sqrt(X * X + Y * Y)$

8. Click Save.

Milling Vector KPI Output Results

The KPI output is listed on the KPIs page. You can add your KPI to a dashboard using the KPI widget. See [Dashboards Actions](#) for more information.
This illustrates the Milling Vector KPI on the KPIs page:

An Example of a Simple KPI that Uses JavaScript

This example demonstrates using JavaScript to calculate the speed of a CNC milling machine spindle.

How to Create a KPI that Uses JavaScript

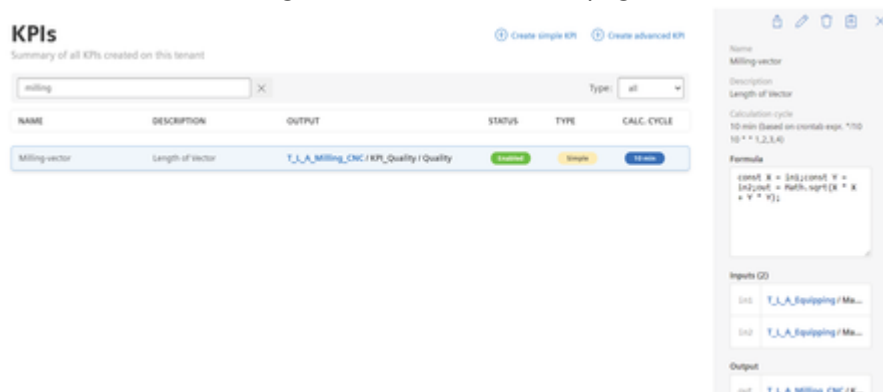Follow these steps to create a KPI that uses JavaScript:

1. Click "Create a Simple KPI".

2. Enter "Speed" in the Name field.

3. Enter "Spindle speed" in the Description field.

4. Enter "10 minutes" as the Calculation cycle.

5. Select "T_L_A_Equipping > Machine_KPIs > Quality" for "in1".

6. Select "T_L_A_Equipping > Machine_KPIs > Quality" for "in2".

7. Select "T_L_A_Milling_CNC > KPI_Quality > Quality" for "out". Your formula will look like this:

```
const last = flow.get('lastSpeed'); if (last !== null && last !==
undefined) { out = in1 - last;} if (in1 !== null && in1 !== undefined)
{ flow.set('lastSpeed', in1);}
```

8. Click Save.

CNC Milling Machine Spindle Speed KPI Output

The KPI output displays on the KPIs page. You can add your KPI to a dashboard using the KPI widget. See [Dashboards Actions](#) for more information.
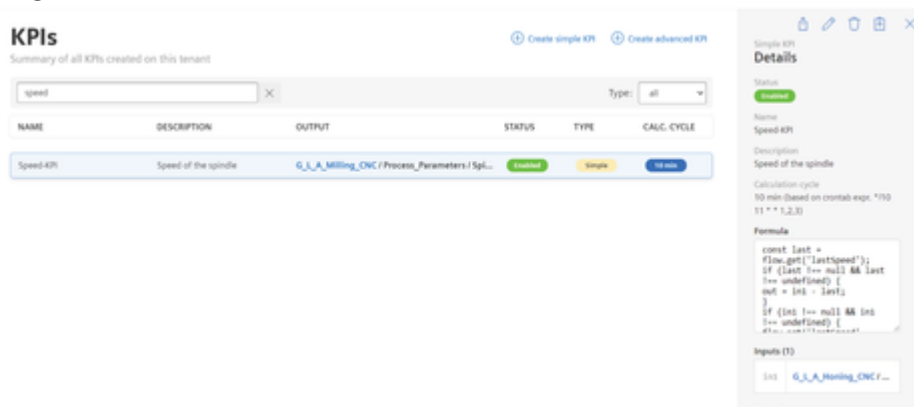
13.4 Advanced KPIs

Advanced KPIs are highly configurable and, in addition to being able to use time series, non-time series, and aggregated data stored in the Integrated Data Lake or Internet of Things (IoT) databases, here are some of the main features of advanced KPIs:

- Input fields are depicted in the KPI calculation as "in1", "in2", "in3", and so on.

- You can add up to five input fields by clicking the Add Input link at the top of the Calculation section or in the KPI formula, circled in red in the illustration below.

- Input fields can serve in the numerator or denominator (up to 3) and you can drag them to where you want in the KPI formula.

- Click the operators to cycle through options (+, –, *, /) between components; you can also click the operator in front of the first input field to change the value to negative.

- The following operations are supported in KPI formulas:

    - a+b

    - a-b

    - a*b

    - a/b
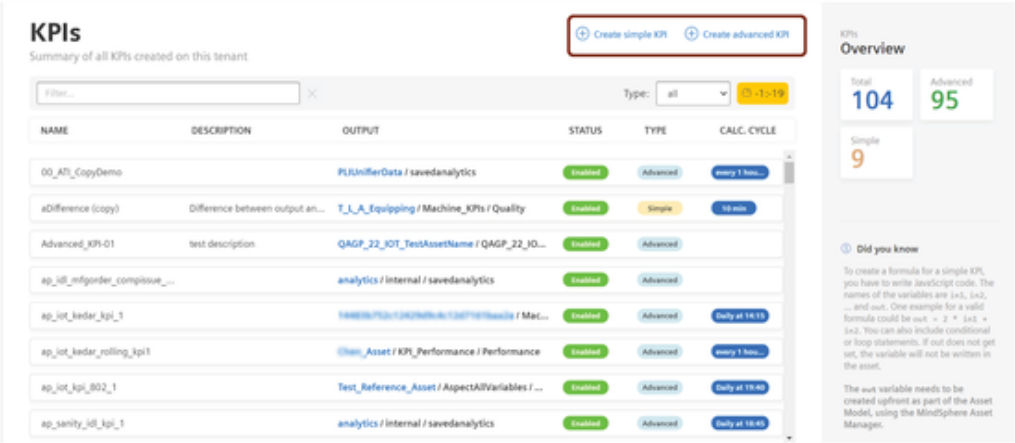
KPI calculations are made up of:

- Inputs

- Output(s)

- Aggregation selection (average, count, max, min, sum)

- Filters that you apply to the component inputs

KPI Component Functionality

This example shows the KPI formula inputs, aggregation selection, the field or variable drop-down list, and the filter icon which allows you to filter which data will be calculated in the component:
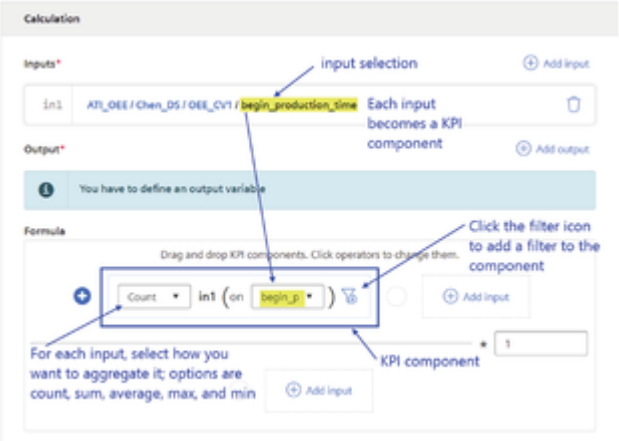
For IDL data sources, the Output field is supplied by the system and cannot be edited.

How to Create an Advanced KPI

Follow these steps to create an advanced KPI:

1. Select the "Create an Advanced KPI" in the KPI overview page. The "Create an Advanced KPI" page displays.

2. Select the "Time Series" or "Data Lake" radio button.

3. Enter the "Name" and the 'Description" for the KPI.

4. Click the "Add Input" button. The data source selection pop-up window opens. For "IDL" KPIs input, select the "Folder" and "File". Use the Folder and path field to search for a folder and to

select a file.

For the "Time Series" KPIs input, select the "asset", "aspect", and "variable" and click "Select".

Continue adding KPI input fields (up to five) by repeating step 4 until you're finished.

How to Add the Output Field to the KPI Formula

If you select Integrated Data Lake in Step 2, above, the system populates the Output field for you, and it is not editable; therefore, skip this section.
If you select Time Series in Step 2, follow these steps to add the time series output field to the KPI:

1. Click the "Add Output" link. The data source selection pop-up window opens.

2. Select the "asset", "aspect", and "variable" for the KPI. This variable are created while configuring the asset in Asset Manager.

3. Click "Select". The pop-up window closes and your selection appears in the Calculation Inputs fields, as well as in the Formula builder.

4. Click "Save" button if you are finished configuring the KPI, otherwise proceed to the next topic, Applying Optional Additional Filters to KPI Components.

13.5   Adding Additional Filters to KPI Component Fields

The option of adding additional filters to a KPI fields allows you to focus the KPI on very specific data. You can add filters when you create the KPI or later, via the editing functionality.

KPI Formula Illustration

Here is an example of the KPI formula canvas that shows the component-level filtering functionality:
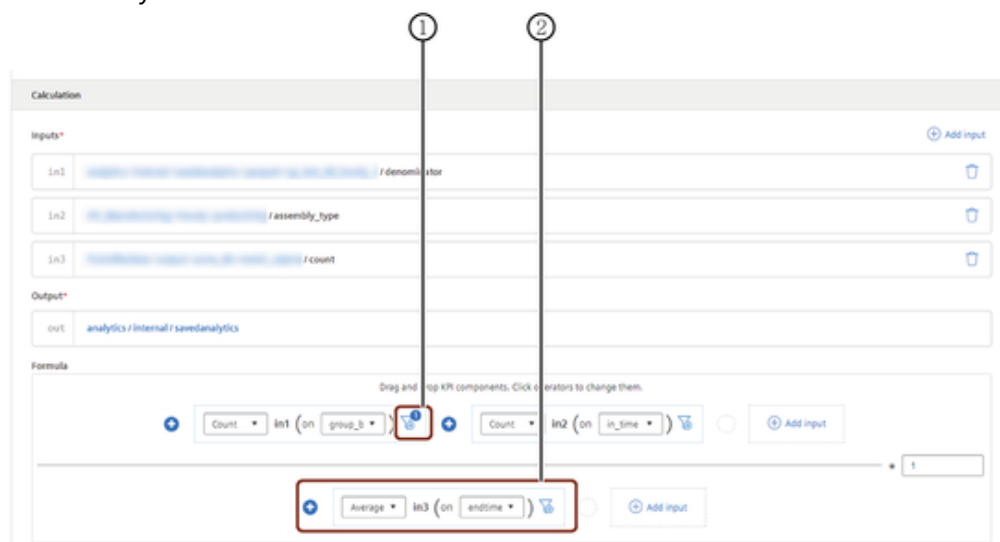
① Click the filter icon to add filter settings to the component field

② A KPI component is made up of a function (for example: count), and input label (example: in1), a field from the data, and optional filters.

Applying Additional Filters to KPI Component Fields

You can use all the data from the input you select or, if you want to use only some of the data, you can add additional filters to include or exclude specific values or a range of values.

Filter Icon and Add filter Pop-up Window Illustration

When you click the Filter ⟟ icon inside a KPI component, the Add filter pop-up window allows you to configure the additional filters by selecting a variable and measure, and entering a value. Here is an example of the Add filter pop-up window:
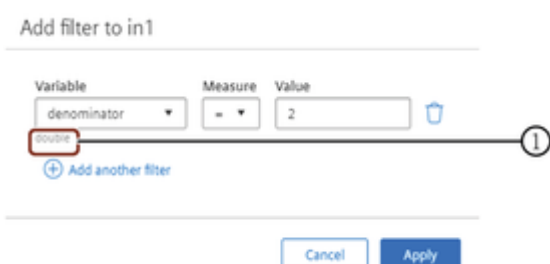
① Indicates the type of the data used in the duration field

✏️

Filters added in the Add filter pop-up window apply to only the KPI component in which you click the Filter icon.

How to Add Additional Filters to a KPI Component and Save the KPI Analysis

Follow these steps to add a filter to a KPI component:

1. Select a field from the Variable drop-down list. The Add Filter pop-up window opens.

2. Select = or ≠ from the Measure drop-down list.

3. Enter a value. The filter is set and the +Add another filter link displays. Repeat as needed.

4. When finished, click Apply. The Add filter pop-up window closes. The number of filters added to the KPI component display next to the filter icon.

5. If you do not want to make the KPI available to others, click to clear the Make KPI Active check box. The system overrides the default setting and makes the KPI inactive.

6. Refer to "Applying Additional Filters to KPI Component Fields" for step-by-step instructions on adding optional filter(s) to the KPI fields or, if finished, proceed to the next step to save the KPI.

7. Click "Save" to finish creating the KPI. The system displays a Success message.

Refer to [Adding an Analysis to an Advanced KPI](#) to see the step-by-step instructions for adding an analysis to your KPI.

13.6 KPI Analysis Introduction

You can add an analysis to an advanced KPI in the same window in which you create the KPI. You can also open a previously saved advanced KPI and add an analysis to it via the Edit Advanced KPI page. When you run a KPI analysis, the system opens an additional browser window where it displays the analysis results in a chart and results table. Results tables can display up to 2,000 rows of data. Results are stored in the default Output location provided by the system for Integrated Data Lake data sources. You can open KPI analyses results in an Insights Hub Monitor dashboard using the KPI Analysis widget.

KPI Analysis features include

- **Monitoring**: a two-dimensional analysis of KPI results charted against a variable, such as the time dimension or another field in the data. This type of analysis is used for Integrated Data Lake data sources, and helps users monitor KPI values for a specific field/variable. Users can switch the display for a monitoring analysis back and forth between bar and line charts.

- **Discovery**: a multi-dimensional analysis that displays a bubble chart. Bubble size and placement represent the distribution of KPI values against contributing factors. This type of analysis helps users discover data trends and outliers among the KPI analysis data. Discovery analyses can contain up to seven Group Results By settings. The bubbles in the discovery analysis chart display the value for the field relative to the whole, that is, by weighted percentage; however, the data in the results table is rendered in values, rather than wieghted percentage.

- **Data Drill Down**: a feature of the Analysis Results table that allows you to drill down into the data for any of the fields contained in the analysis results. Group by filters applied in the analysis carry into this drill down.

- **Combination History**: a feature of the Analysis Results table that lets you examine the history of the various field combinations contained in the analysis results. the discovery analysis feature that lets you drill down into the analysis data from the analysis results table to analyze the impact of various combinations of the analysis fields. Group by filters applied in the analysis carry into this drill down.

About Configuring Analysis Fields in General

Here are some important points to bear in mind when working with KPI Analysis configurations:

- All analysis settings are optional except the first Group Results By setting.

- If you don't set a Group Results By setting, the system will distribute KPI analysis results along the X-Axis by the default grouping, which is by date with month as the time interval for Integrated Data Lake data sources, or by minute with 2 minutes as the time interval for time series data sources.

- Analysis settings are independent; thus, configuring one area, such as adding a schedule, does not require you to configure another area, with two exceptions:

  - Notification: if you want to be notified when analysis results cross a threshold, you must configure a threshold.

  - Autodiscovery: to add autodiscovery, a threshold is required.

Analysis Settings Description

Here is a brief description of the settings for an analysis:

Group Results by with Integrated Data Lake (IDL) sources: when using IDL data sources, you can group results by date or field and can add a minimum of one and up to a maximum of seven groupings. Adding one or two Group Results By settings produces a monitoring analysis. Adding three Group Results By settings (and up to a maximum of
- seven) produces a discovery analysis.

Group Results by with Time Series data sources: when using time series data sources you can add only one Group Results By setting by selecting a time interval and specifying a number; for example, you could select an interval of 'Minute' and specify a number from 1-60, or 'Hour' and a number from 1 -24, or 'Day', and 1 day. The time series
- configuration produces a monitoring analysis.

Filters: you can add filters to both dates and fields. Date filters can be fixed dates or rolling dates, and you can narrow analysis data by adding a filter to any field in the data. Note: only filters that have been configured with the Group Results By setting display in the
- Variables drop-down list.

- **Schedule**: schedule the KPI analysis to run automatically at the date and time you specify.

Share and Notify: set up a threshold that, when crossed by analysis results, notifies you and those you share the notification option with. The share feature applies to the
- notification only, and does not mean you have shared the KPI or KPI analysis with others.

- **Autodiscovery**: add autodiscovery to a KPI analysis to run when a threshold is crossed.

13.7   Adding an Analysis to an Advanced KPI

Analysis configuration settings allow you to specify how the analysis data is filtered, grouped, and displayed; when and how often to run it; what threshold will trigger an alert when results cross it; who to notify for an alert, and what KPI analysis to run for autodiscovery.

Analysis Settings Illustration

This example shows the four settings areas (blocks) for an analysis. All analysis settings are optional, with the exception of the Group Results By field; the system applies the following defaults, unless you specify otherwise:

- **Time Series**: results are grouped by minute, with an interval of 2

- **Integrated Data Lake**: results are grouped by date, with an interval of month
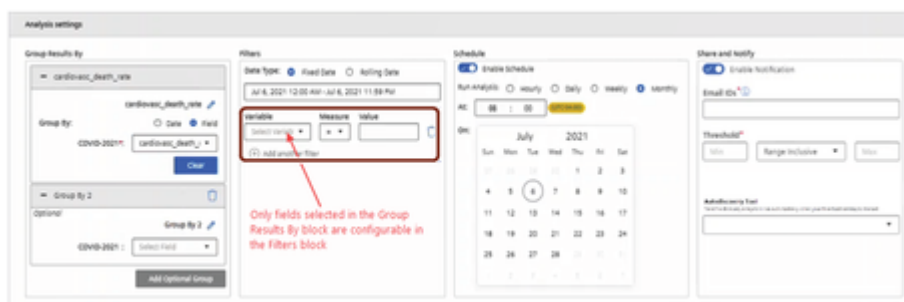
13.8   Configuring Fixed and Rolling Date Filters for a KPI Analysis

You can fine-tune your KPI analysis by applying filters to fields or dates in the analysis. The filter area displays only the attributes or fields you select in the Group Results By section. Use filters to control which data is included or excluded in the analysis.

For date filtering, select:

- Fixed Date: when you want to specify a date range to cover by the KPI analysis

- Rolling Date: when you want to specify a date range that advances forward as the calendar advances

About Rolling Dates, Quick Dates, and Relative Dates

Rolling dates, as well as fixed date ranges that use one of the "quick dates" on the left side of the calendar picker, are relative dates. Relative means that they change, moving forward in time as the time or date moves forward. For example, if you select "Last 7 days", the date range covers from 7 days ago to midnight yesterday. When at midnight tonight when the day changes, your relative date range will also move forward, so the "quick date" is always relative to "now", that is, the current day and time.

How to Configure a Fixed Date Filter

Follow these steps to configure the Date Filter:

1. Select the "Fixed Date" radio button.

2. Click anywhere in the Date field. The Date pop-up window opens.

3. Select a "quick date" on the left, or select "From" and "To" dates from the calendars. If you select from the calendars, the selector moves to "Custom Range" and your selections display next to the Cancel and Apply buttons.

4. Click "Apply". The calendar pop-up window closes and your date selection shows in the Date Filters window.

About Rolling Date Filters

The rolling date feature allows you to select a time period that advances forward as the calendar advances. For example, you may want the KPI to show you the most recent 90-day period, but the beginning and ending date of that period needs to change every day, advancing the 90-day period day-by-day along with the calendar. Rolling date filter settings allow you to do this.

- Rolling Type is the time unit involved in the date filter, i.e., hours, days, weeks, or months.

- Range establishes the overall time period for the filter. The system subtracts the Range value from the Offset date and the result becomes the From date in the date/time range.

- Offset supplies the value for the To field by subtracting the offset value (number of time units) from the current date when calculating the overall range.

For example, let's assume we are starting from a current date of January 15, 2021and want to set up a rolling date that will always give values for the previous twelve months, but we don't want to include the current month (January), we would select the following:
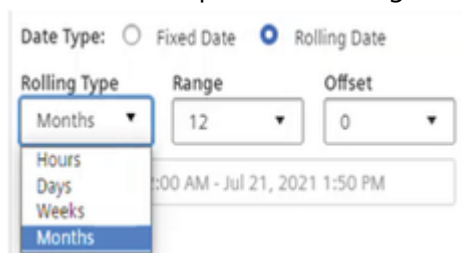
Rolling type: month

Range: 12

Offset: 1

Rolling Date Pop-Up Window

Here is an example of the Rolling Date pop-up window:

How to Configure a Rolling Date Filter

Follow these steps to configure a rolling date:

1. Select the "Rolling Date" radio button. The Rolling Type, Range, and Offset fields display.

2. Select a value from the "Rolling Type" drop-down list to set the time or date unit to use in the analysis.

3. Select a value from the "Range" drop-down list to set the "From" time or date.

4. Select a value from the "Offset" drop-down list to set the "To" time or date. The system saves your date settings.

13.9   Configuring Group Results By Settings for a KPI Analysis

Group Results By settings are optional, but the settings determine how analysis results data displays in the chart and results table; for example, you would select group results by field, if you want to see the analysis results grouped by one of the fields in the data, such as location, color, supplier, and so on; or if you want to see the analysis results grouped by date, you can select that along with the interval, such as hour, day, month, and so on. The data will be grouped and distributed along the X-Axis according to your selection.

Group Results By settings are optional, but the system has to have some way to distribute the analysis results along the X-Axis, so if you don't select anything for the group results by setting, the system uses the default setting, which is to group results by date and the time increment is month. You can add up to seven groupings of analysis results. Also, the system applies default names your Group Results By selections, "Group By 1", "Group By 2", but you can change these using the edit (pencil) icon alongside the Group By # name.

Example of the Group Results By Section

Here is an example of the Group Results By section, which expands with each click of the Add Optional Group button:

How to Configure the Group Results By Settings for Time Series Data Sources

For Time Series data, Group Results By options for 1-60 minutes, 1-24 hours, or 1 Day intervals are supported.

Follow these steps to configure the Group Results By fields:

1. Accept the default setting (group results by minute and 2 as the interval) or click the drop-down arrow to select hour or day.

2. Continue to the [Filters](), [Schedule and Share and Notify]() topics for additional instructions.

> ✏️
>
> - You may see a visual reminder in the Group Results By section if you have not yet added at least one input to the KPI formula; the Group Results By feature requires at least one input.
>
> - For discovery analyses, you can configure up to seven Group Results By settings.

How to Configure the Group Results By Settings for Integrated Data Lake Data Sources

Follow these steps to configure the Group Results By fields:

1. Accept the default setting (group results by month) or, click the drop-down arrow to select hourly, daily, or weekly. The system displays an Add Optional Group button.

2. Click "Add Optional Group" for each grouping you want to add, up to seven.

3. To group results by a field, click the "Field" radio button, and click the down caret. The available fields display in a drop-down list.

4. Select a "field" from the drop-down list. Repeat as needed to add additional groupings.

13.10   Configuring the Scheduling, Share and Notify, and Thresholds for a KPI Analysis

The Analysis Settings area provides the following configuration options:

- **Scheduling**: you can set dates and times for automatically running a KPI analysis. When you create a KPI analysis, you can add it to a dashboard using the KPI Analysis widget, set it to auto-refresh, and monitor the analysis on your dashboard.

- **Sharing and Notifying**: share the KPI analysis with other users and set notification parameters so the system notifies you (and those you have shared it with) when KPI analysis data crosses the threshold you set.

- **Thresholds**: when you set a threshold for an analysis, the system will notify you (and those you add in the Notifying section) when the KPI analysis results data crosses the threhold. The threshold crossing also comes into play with the autodiscovery feature, which is an optional setting. See [Adding Autodiscovery to an Analysis]() for more information.

About Schedule Settings

This is an example of the Schedule/Share and Notify areas:

About Setting a Threshold

Setting a threshold in a discovery analysis means you will be notified if the discovery analysis results cross the threshold you set.

How to Configure the Schedule, Share and Notify, and Thresholds for the Analysis

Follow these steps to share your KPI and/or add notifications, and optionally set up the autodiscovery tool:

1. Slide the "Enable Schedule" toggle to the right. The toggle turns blue and displays the Run Analysis fields.

2. Select a radio button for the time unit to use and a value for how often you want the analysis to run.

3. To be notified when analysis results cross a threshold, slide the "Enable Notification" toggle to the right. The toggle turns blue and displays additional fields.

4. Enter the email addresses for users you want to share notifications with, separated by a semi-colon.

5. Select the mathematical phrase you want to apply to the threshold values, and enter values for the "minimum" and "maximum" fields.

13.11   Adding Autodiscovery to a KPI Analysis

Autodiscovery provides the opportunity to set up in advance, a KPI analysis that can run against an advanced KPI analysis configured with a threshold; when the threshold is crossed by the analysis data, the autodiscovery automatically runs and saves its results.

Manual Troubleshooting vs. Using Autodiscovery

Normally, when you receive a notice that a KPI analysis threshold has been crossed, your first response would be to troubleshoot the issue. To troubleshoot, you would create a new KPI discovery analysis with the same parameters as the analysis whose threshold was crossed. Thus, by manually creating and running a new discovery analysis against the results of the first analysis, you jumpstart the process of determining which fields and factors caused the data to cross the threshold.

> ✏️
>
> An autodiscovery analysis is created using the same steps as used in creating any advanced KPI. See How to Create an Advanced KPI, here.

The autodiscovery feature allows you to set up this troubleshooting analysis ahead of time, and link it to the first analysis that you want to troubleshoot. With the two analyses linked, the system now triggers the troubleshooting analysis to run automatically when data in the first analysis crosses the threshold you set.

About Autodiscovery

This feature allows you to set up a relationship between two analyses; in the first analysis, you set a threshold so the system notifies you if the analysis results cross it; you set the second analysis up to run against the results of the first analysis when results cross the threshold. You set the second analysis up as a troubleshooting analysis that runs automatically, in essence, to assist you in determining causal factor(s) of the first analysis exceeding the threshold.
Example: For explanatory purposes, let's call the two analyses 'DiscoveryAnalysis 1' (DA1) and 'Discovery Analysis 2' (DA2). There is nothing special or different about these two discovery analyses, other than setting a threshold in DA1. If the threshold is crossed when DA1 runs, you receive a notification about it. This also triggers DA2 (the troubleshooting analysis) to run against the results of DA1.

Helpful Naming Convention

Following this naming convention when you create and save an analysis configured with autodiscovery can help you identify it on the KPI list page.
If you name the first analysis in this relationship, "Line3Yield", it is helpful to give the second analysis (which is used to troubleshoot the first analysis) a name that is similar to the first analysis, such as "Line3YieldTRBLshoot", or something similar for two reasons, so:

- the two related analyses appear adjacent to one another in the KPI list

- you can easily distinguish troubleshooting analyses from other analyses

How to Configure the Autodiscovery Settings

This section presumes that you have already configured the schedule, share, and notify settings for your analysis.

Follow these steps to add autodiscovery to your analysis:

1. To automatically run an additional discovery analysis when data in this KPI analysis crosses the threshold, select a KPI discovery analysis from the "Autodiscovery" drop-down list.

2. Click "Save". The system saves your KPI and displays a Success message.

13.12   KPI Analysis Charts

Overview

There are many powerful features built into KPI analysis charts. This topic introduces chart and results table features. KPI Analytics charts display differently, depending on the analysis type:

- **Monitoring**: a bar chart that displays counts, and the display can be switched back and forth between 'bar' and 'line' chart.

- **Discovery**: a bubble chart in which the size and placement of each bubble displays the value relative to the whole, when three or more group results by settings are configured in the analysis, the analysis results display in a bubble chart with weighted percentages.

Chart Features

Here are features that apply to all analysis charts:

- Interactive Selections: select a bar or line in a monitoring chart and its correlate row in the results table is highlighted, and vice versa.

- Bar and Line Chart Toggle: at the top of a monitoring chart, two icons ⬚⬚ are clickable, allowing you to toggle between bar and line charts.

- Hover Information Display: hover over a line, bubble, or bar to see the extended value (beyond the decimal) of the data point.

Chart and Results Table user interface

This annotated image displays many KPI analysis chart and results table features:
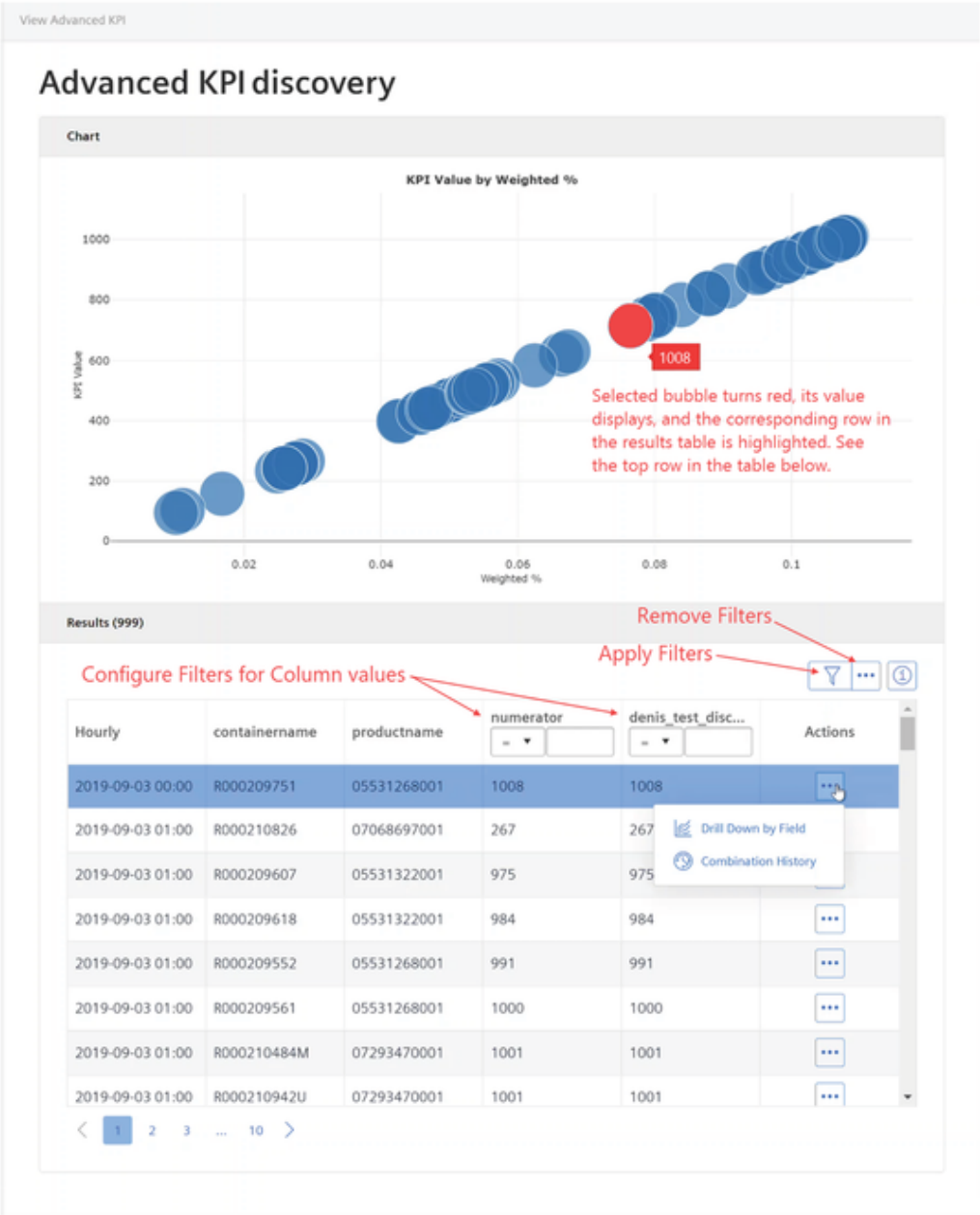
Chart Red vs. Selection Red

Unique Red: when you click a bar or line in a monitoring chart, the selected bar/line turns red; to explain, this example talks about bar charts only. Since some bar charts may already have a red bar as part of the normal chart display; we developed a unique red color to symbolize selection, so users can differentiate between a red bar that has been selected and a red bar that is just red. This image shows a snippet of a bar chart on the top that has a green bar (third bar from the left). When I select that bar, it turns to the color red in the bottom row. You can see that the selected bar red is lighter and brighter than the red of a non-selected bar.

Chart Axes

Analytics charts display the following information on the chart axes:

- X-Axis—the count or percentage of the first "Group Results By" selection. If nothing is selected for grouping the results, the system automatically applies "Date" and "month" to display the analysis results.

- Y-Axis—the count or percentage of the KPI value.

13.13   KPI Analysis Results Table

In addition to drilling down into analysis results, and viewing the history of field combinations, you can also filter the analysis data to hone in on specific values. At the top of the columns in the analysis results table, filterable columns are indicated by the equal symbol and drop-down caret, and the empty field next to it, in which you can enter a parameter.

Discovery Chart and Results Table Illustration

This image highlights many of the features of KPI analysis chart and results table:
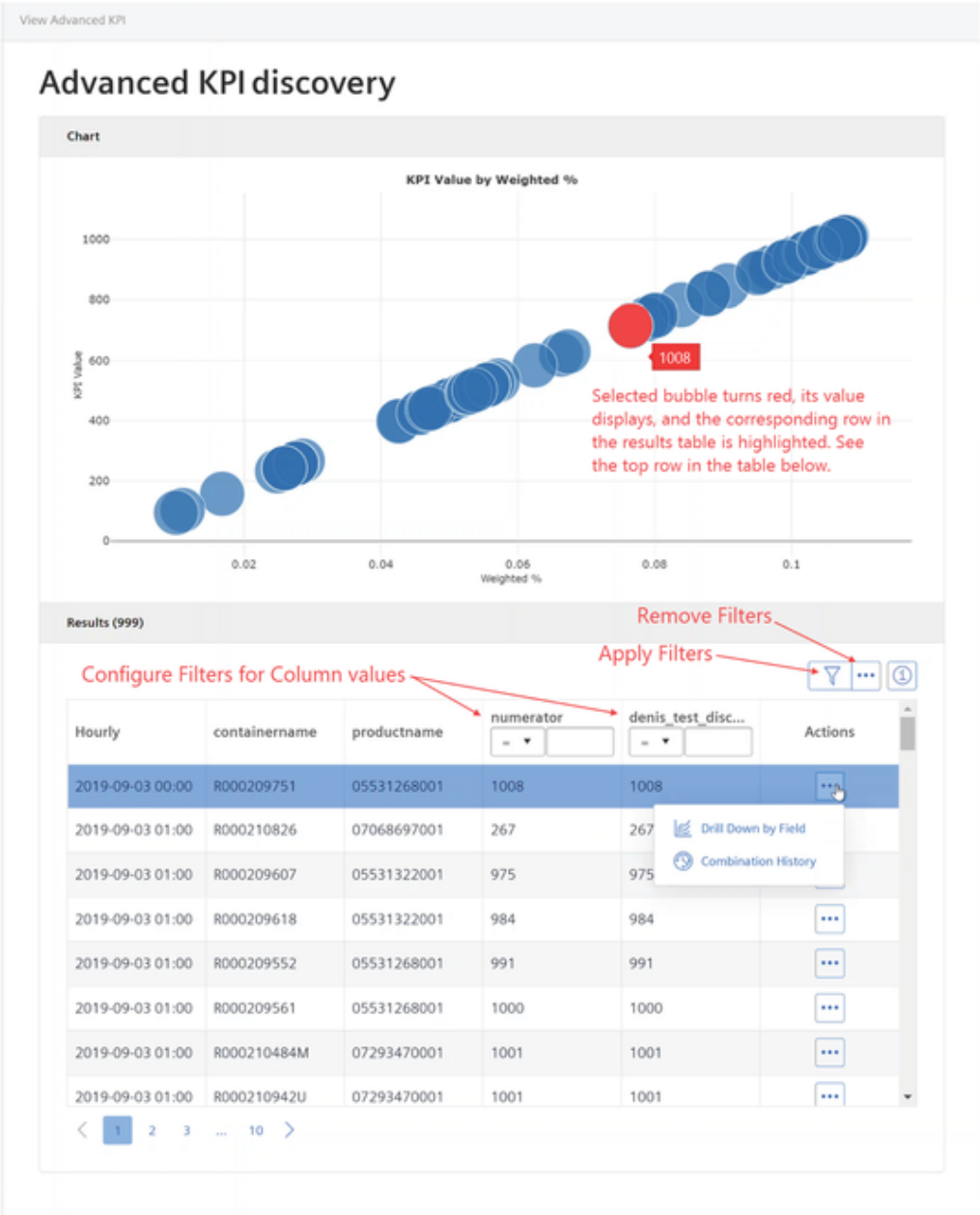
How to Apply Filters to Analysis Results Data

Follow these steps to apply filters to analysis results:

1. At the top of the column you want to filter, select less than or equal to (<), greater than or equal to (>), or equal to (=) from the drop-down list.

2. Enter a value in the text field and click the Apply Filters ▽ icon to filter the data. The table data refreshes to show only those rows which match the filter you entered.

3. To return results table data to the original state, click the Remove Filters ⦙⦙ icon. The filter is removed table data refreshes to the original data.

13.14   Drilling Down Into Discovery Analysis Data

One of the most effective tools for identifying root causes of analysis issues is the KPI Analysis drill-down feature for Discovery analyses. Drilling down takes place in the analyses results table.

Drilling Down Discovery Analysis User Interface

Results Table Actions Column

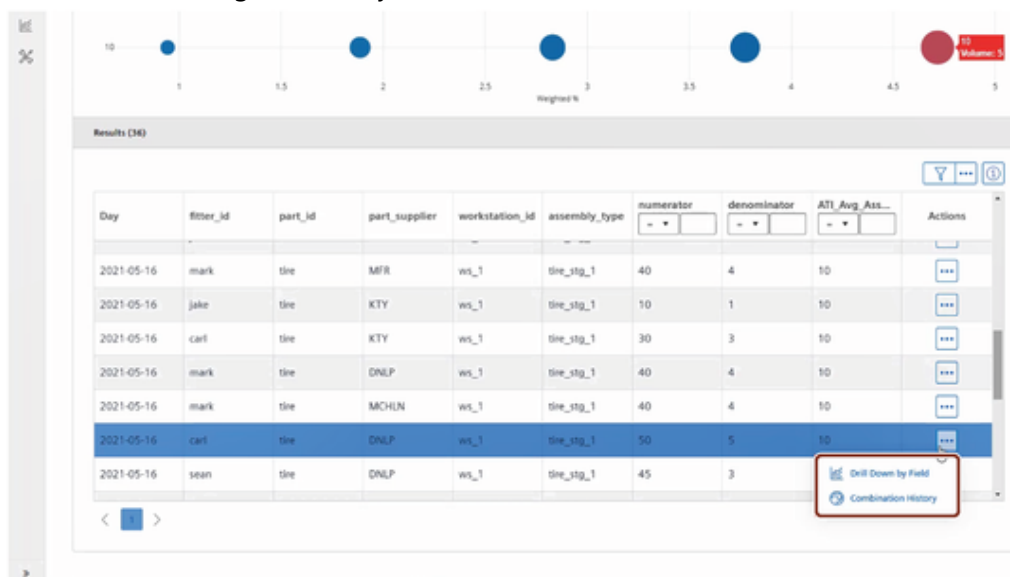This image illustrates the Actions column. When you click the ellipses in the Actions column, a dialog window pops up, as illustrated below. This dialog pop-up is where you start drilling down into data or viewing the history of KPI field combinations:

Drilling Down Pop-up Window

This is what the pop-up window looks like when you select the "Drill Down by Field" action; notice that the drop-down list allows you to select any field present in the KPI analysis data source:
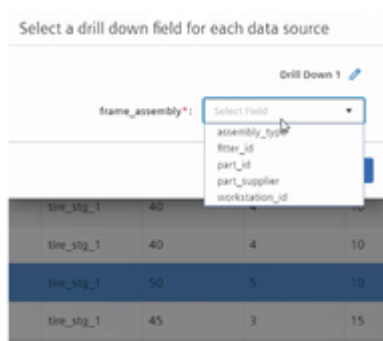
About Drilling Down Into Analysis Data

Here are some important points to be aware of about drill-down functionality:

- The system applies default labels to each drill down you create, like "Drill Down 1", for example. You can change the name of the drill-down by clicking the edit icon (pencil) next to the drill-down label, as shown in the image above.

- You can select any field that exists in the KPI analysis and drill down into it.

- When you click "Apply" in the Drill-down pop-up window, the drill-down results display in a new tab.

How to Drill Down Into KPI Analysis Data

Follow these steps to drill down into KPI analysis data:

1. Create or open the monitoring analysis you want to drill-down into. The Analysis Results table displays.

2. Locate the row of data you want to drill down into in the Analysis Results table.

3. Click the ellipses icon in the Actions column for that row, and select Drill Down by Field. A pop-up window opens in which you can select a drill down field for each data source.

4. Select a field to drill down by for each Data Source drop-down list.

5. Accept the default label "Drill Down 1" or click the edit icon to enter a different label for the drill down.

6. Click "Apply". The Drill Down pop-up window closes and the system displays the analysis results in a new tab

13.15   Viewing the Combination History for KPI Analysis Fields

A powerful feature in KPI Analytics is the ability to view the history of particular field combinations in a discovery analysis.

About Combination History Analyses

For any row in a KPI Analysis results table, you can look at the history of field combinations. Here are some points to be aware of when running a combination history analysis:

- When you select combination history, the results open in a new tab.

- The row you select from the results table determines the KPI filters that display.

- Discovery analysis settings affect combination history results as follows:

  ○ Date range selected in the original analysis is applied to the combination history.

  ○ The attributes of the selected row are included in the drill-down results.

  ○ Rolling date type (daily, monthly) does not affect the results grouping.

  ○ Group by date settings from the analysis configuration are retained.

- For discovery analyses, the group by field setting is replaced by group by month.

- The filters and other selections in a combination history are editable.

Combination History Analysis User Interface

This is an image of the analysis results table which shows the Actions pop-up window that opens when you click the ellipses.
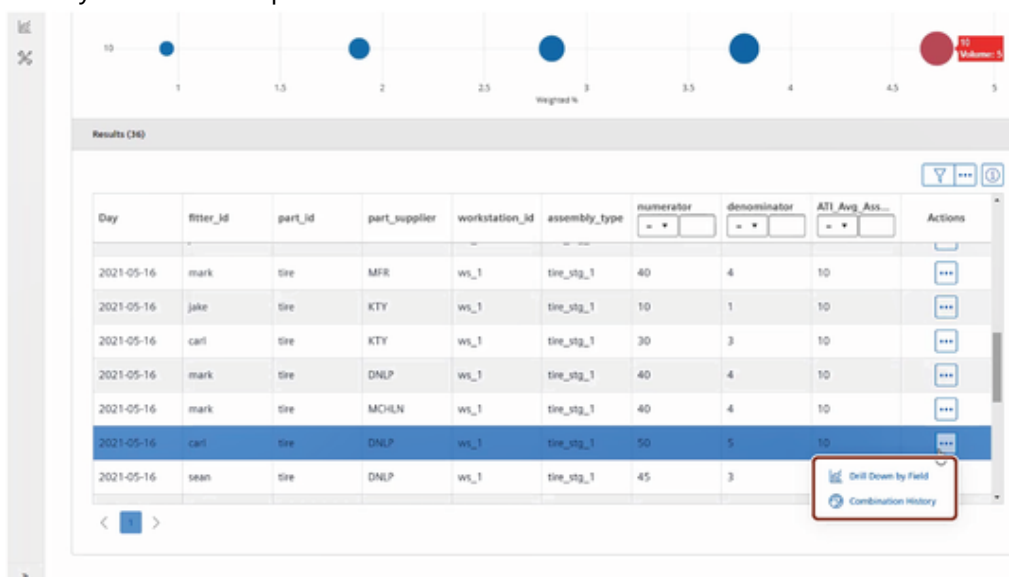
How to Run a Combination History Analysis

Follow these steps to run a combination history analysis:

1. In the analysis results table, locate the row you want to run a combination history for.

2. Click the ellipses in the "Actions" column for that row. The available actions display.

3. Click "Combination History". A dialog box displays and contains a drop-down list for each of the data sources in your analysis.

4. Select a "field" for each of the data sources.

5. Accept the default label, or enter a new "label", and click "Apply". The dialog closes, and the combination history displays in a new tab.

Limitations

14

14.1   Limitations

This section describes the limitations of "Insights Hub Monitor":

Notifications

Email notifications included in "Configure Rules" and "Explore Work Orders" has the following limitations:

- Limited to one email notification per minute per rule.

- Maximum number of active concurrent rules is 400.

Rules

- Asset status will be calculated only once per minute.

- The Rules service assumes that the time series data is received in a chronological order. This means that if data with an older timestamp is received after the data with a more recent timestamp, it will not be processed.

- Default value for limit actions in time is one minute. Debouncing time allows only 10 minutes.

- After continuous data ingest breaks, only time series data for the last week (7 days from the break) is considered. Also, if there is a break in data ingest for 90 days, then the rule is reset to initial state.

Maps

- Number of requests to underlying map service is limited to 25000 requests per month.

Sub Tenancy

Currently, the following features are not supported for sub tenant users:

- Rules tenant overview

- Work orders

- Sharing Analyze Profiles

Cross Tenancy

Currently, the following features are not supported for cross tenant users:

- Rules

- Attachments

Analyze Time Series

- Maximum of 400 analyze profiles can be saved or shared.

Timeseries

- Maximum of Timeseries data points export is limited to 10.000

- Maximum of 10 variables can be selected for visualizing the data (In Analyze Timeseries section, you can enable more number of variables but a hint is provided that more number of variables will slow down the chart)

14.2 Predict Limitations

This section describes the limitations of "Insights Hub Predict":

Default

- Limited to 20 Forecasts per month. Purchase Forecasts upgrade package to add additional 200 Forecasts.

- Limited to 20 Anomaly Detections per month. Purchase Anomaly Detections upgrade package to add additional 200 Anomaly Detections.

- Maximum 120K records per dataset is allowed.

- Maximum file size for dataset is 150 MB.

Rules

- No special characters are allowed in usecase name and description.

- Minimum 4 data blocks and of same frequency are needed for model execution.

- Dataset creation and patching should be of the same frequency otherwise dataset patching will fail.

- Empty variable should be passed during dataset creation and patching.

FAQs

<div style="text-align: right; font-size: 3em; font-weight: bold;">15</div>

15.1 FAQs

General

1. What should be done if some information is not updated automatically, like status of rules, the various tiles on the home page? Currently, for updating the page use the reload functionality of your browser or press F5.

2. What is the preferred web browser for the best user experience? Use the latest version of Google Chrome or Mozilla Firefox for the best user experience.

3. What should be done if the authentication of the plugin fails? On the error message, click "Re-authenticate" button to open the plugin in new tab. Close the new tab and reload the page to get the successful plugin authentication.

Home

1. The homepage shows 2 assets under monitoring, but I have created rules for 5 different assets. How does this work together? "Assets under monitoring" counts only assets which have an aspect named "status" of assettype "core.assetstatus". Only these assets support the status.

Dashboards

1. How can I see the dashboard created by other users of the same environment? Dashboards have to be explicitly shared with a user. The owner / creator of a dashboard can share and assign it to users of the environment.

2. What is the size limit for the images? File size for image widget is currently limited to 150 kB.

Assets

1. What is the preferred approach to remember the selected variables in the Time Series plugin? Currently, the selected variables are only saved in the local storage of your browser. Using a

browser in the incognito mode won't save the variables, hence consider using the browser in normal mode to remember the selected variables.

2. What is the meaning of the different color codes used to mark assets?
The colors marked to the assets indicates the status of the assets.

- Red: error

- Yellow: warning

- Blue: information

- Green: ok

- Grey: no status rule exists

For more information on assets, refer to "Assets".