



# Performance Insight for Industrial Edge

Update V1.3, October 2021



# Introducing **Industrial Edge**

An open software platform that makes shop-floor IT simple, scalable and manageable.



# Edge Computing introduces IT-mechanisms to the shop-floor to provide local data processing and -analytics capabilities in the most easiest way



Provides decentralized and **local** data

- acquisition,
- storage,
- analytics and
- transfer capabilities



Increases a **flexibility** by allowing to deploy **any** software fast and **reliably** on to the shop-floor



**Reduces complexity and IT-costs by** providing Edge device and –application lifecycle management functionalities



Reduces infrastructure costs for data storage and transfer and allows **secure data** handling **within production**





## Low-Code platform

Build apps faster for cloud, on-premise or hybrid infrastructure

## IIoT as a service

Centralized compute & storage, with solutions, apps & services

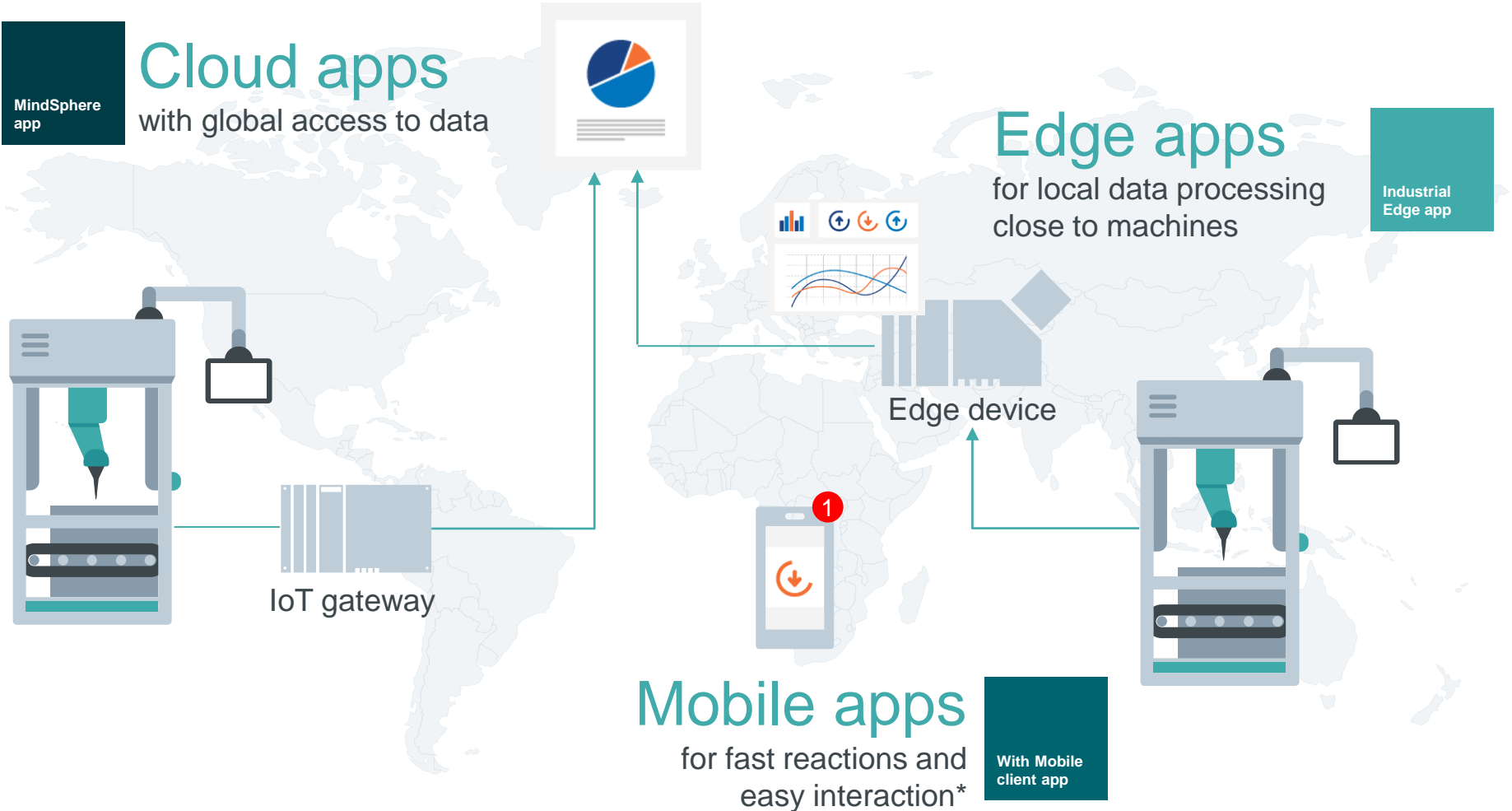
## Edge Computing

Decentral compute & storage with device runtime, apps & management

## Field/Control

Automation runtime & engineering connectivity

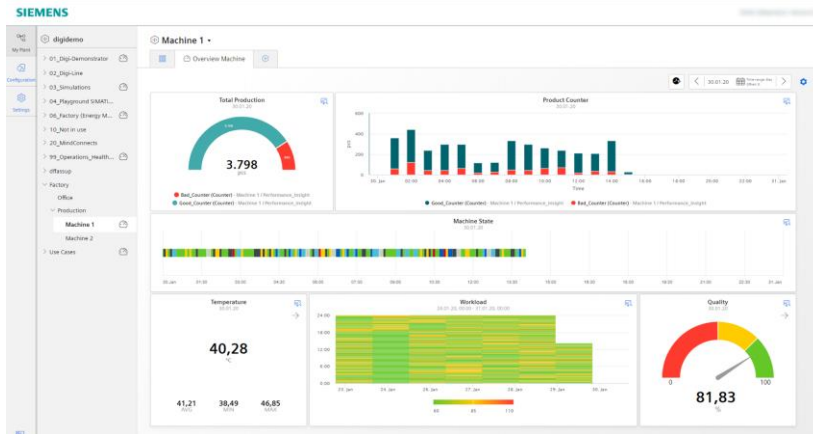
# Industrial IoT apps add value to our open IoT ecosystem around MindSphere and Siemens Industrial Edge



\* Mobile Client apps in addition to Cloud or Edge apps

# Performance Insight

## Easy transparency about machinery



*Performance Insight* is the tool to increase productivity for any machine, line or plant. Calculate and visualize key performance indicators to detect optimization potentials worldwide.

### Benefits

- ▶ Calculate KPIs based on individual formulas to determine machine and plant performance
- ▶ Access machine and plant performance worldwide
- ▶ Get the most valuable information for precise decision-making to optimize machine availability and performance

### Features

- ▶ Performance overview of machines, lines and the whole plant
- ▶ Flexible dashboard configuration with detail views
- ▶ Support of different widgets (charts, gauge, bar, Gantt) to visualize machine states and performance indicators over time
- ▶ Choose time period to detect unused performance potential in retro perspective

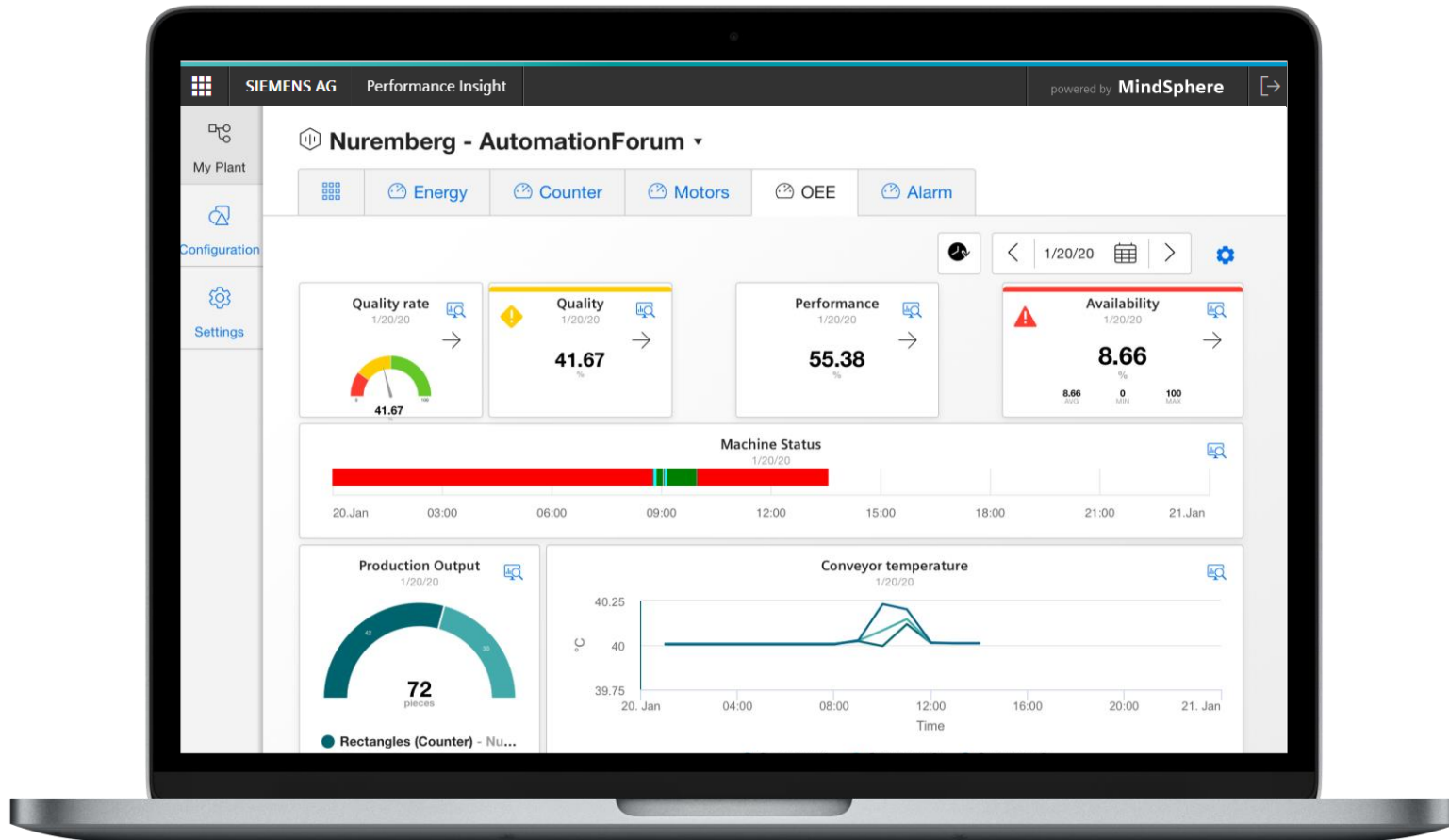
### Industry focus

Cross industry based on flexible dashboard and KPI calculation

# | Product Overview

Performance Insight

# Easy transparency about machinery with Performance Insight



## Increase productivity for machines, line or plant

- Flexible tool for calculating and visualizing the machine condition to get additional machine transparency
- Optimize assets by gaining transparency about OEE, quality and further KPIs
- Generic visualization enables an integration of all kind of machines



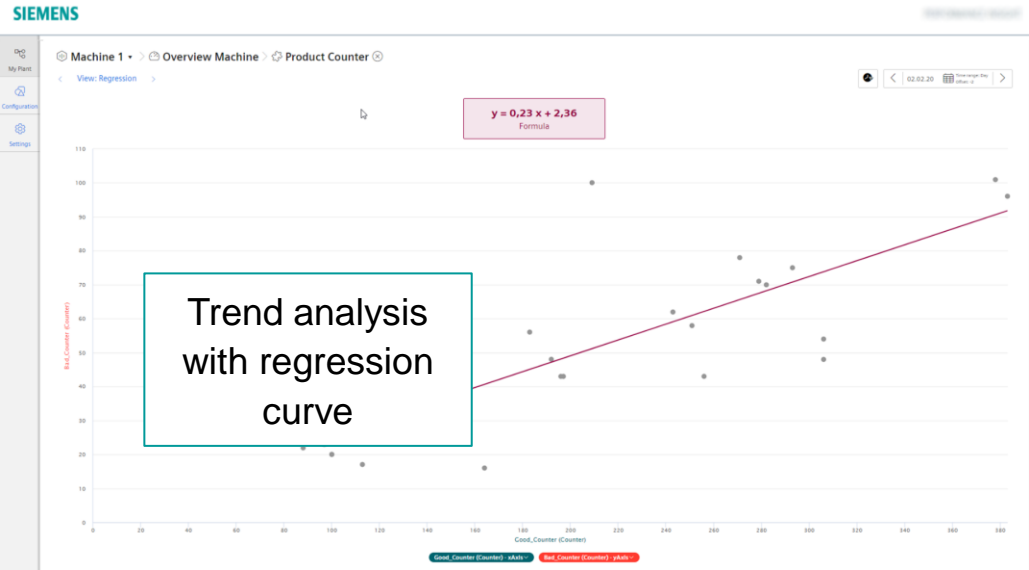
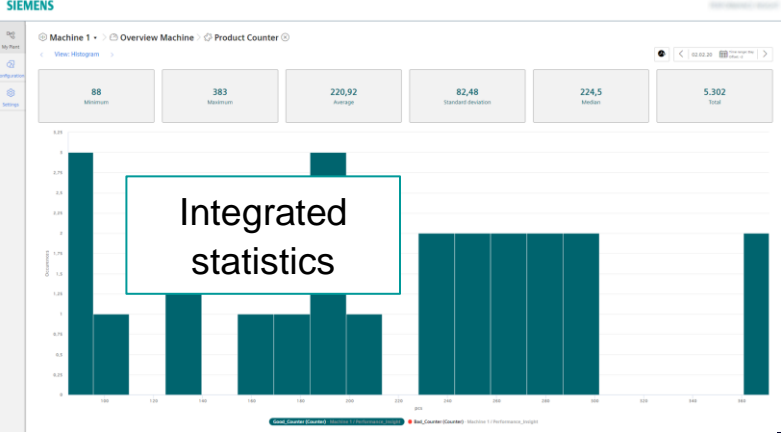
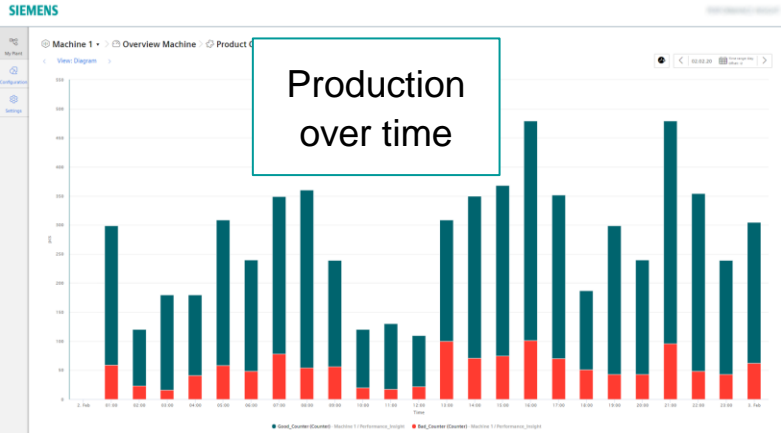
# Transfer data to information with Performance Insight



Using custom dashboard with different widgets to transfer data to information

- Gauge Widget provides an overview about the Quality of your machine
- In the heat map the value is represented as color. → see when the Workload was on point.
- Additional Widget types like Pie Chart, Value, Diagram, Gantt are used to display KPIs in a way that measures can derived immediately.

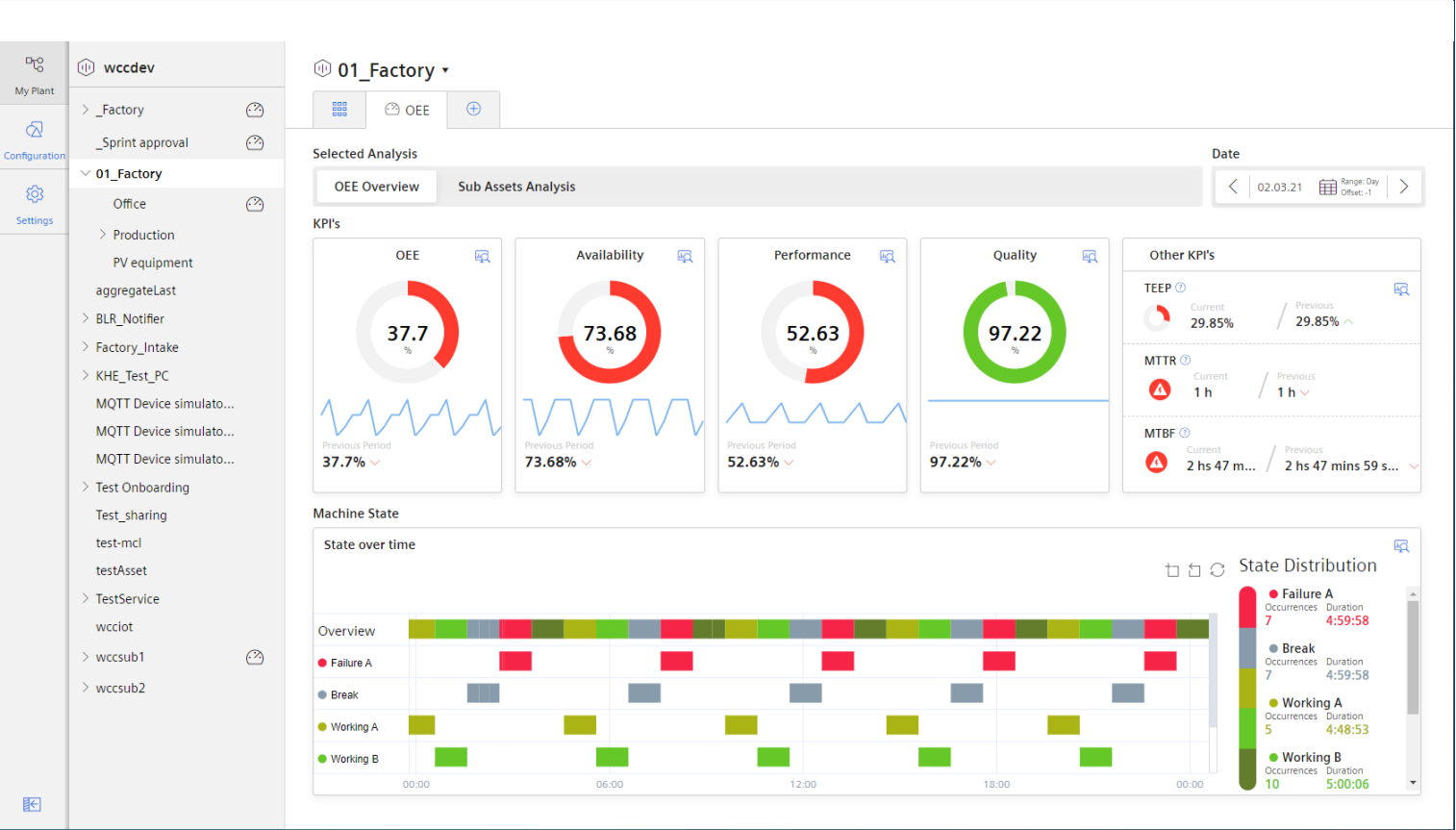
# Out of the box analysis with Performance Insight



Detailed information for each widget in the dashboard

- Statistic view provides a histogram for each parameter including the statistic. (min, max, average, median, standard deviation and sum)
- Regression view provides the possibility to display the data in a x-y chart including a trend representing the plant characteristic.

# Out of the box OEE monitoring with Performance Insight



With just a view clicks to a holistic view about the machine or the line performance

- Analysis capabilities with charts, statistics or time comparison
- Transparency about machine states for route cause analysis
- Time model analysis to visualize the Performance



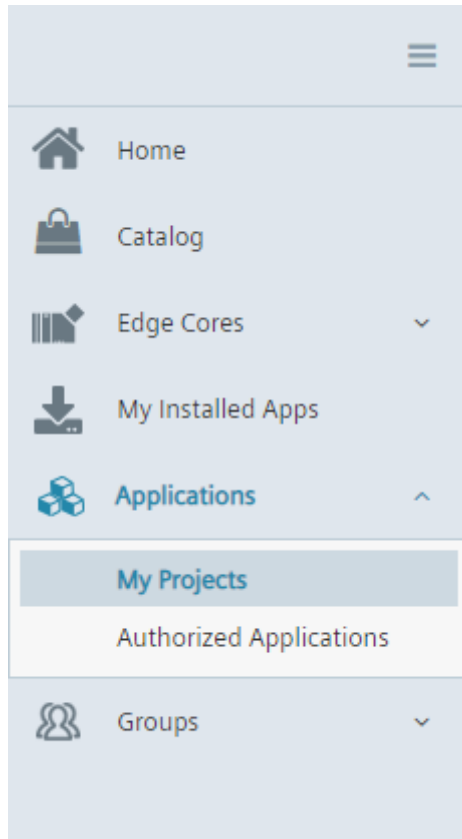
# | User management

Performance Insight

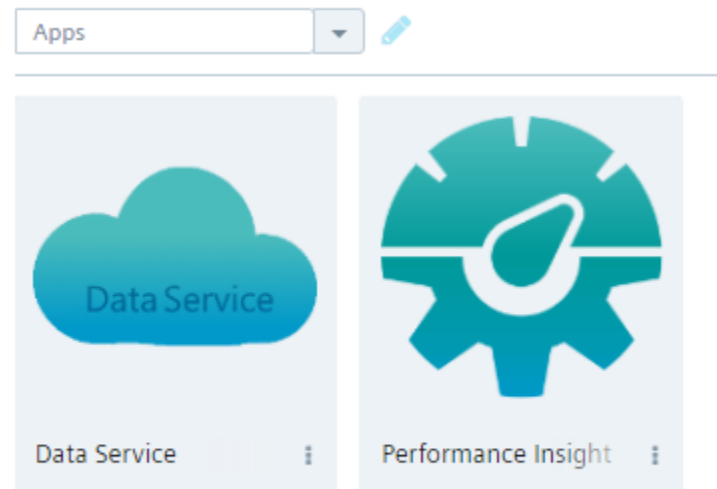
# Assign Roles to users & Add Apps to the User Groups

## Assign Roles in Industrial Edge Management

- 1 Open “My projects” in the Industrial Edge Management



- 2 Check, that the Data Service is under “My Projects”



Make sure, that the App is available in “My Projects”

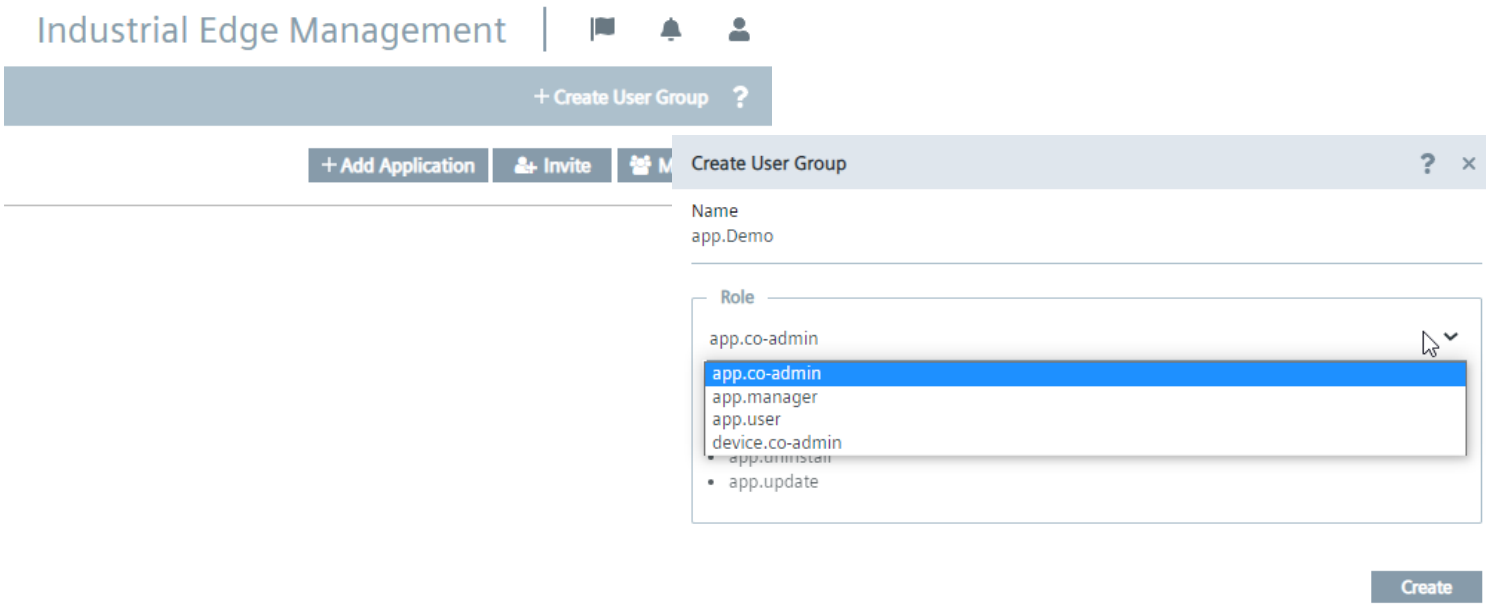
# Assign Roles to users & Add Apps to the User Groups

## Assign Roles in Industrial Edge Management

- 1 Open “My User Groups” in the Industrial Edge Management



- 2 Create User Groups and assign the roles



A user with tenant admin privileges can assign the appropriate app to a Industrial Edge user

Following steps are required:  
Open “My User Groups” in the Industrial Edge Management

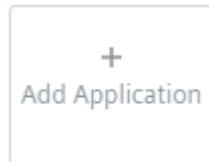
- Create a User Group
- Admin role: app.co-admin
- User role: app.user



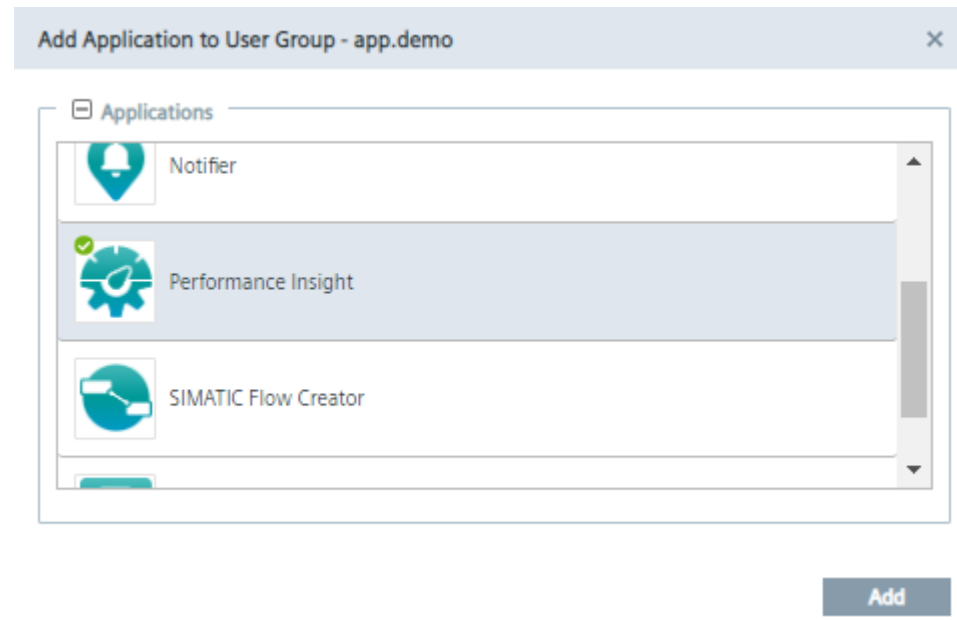
# Assign Roles to users & Add Apps to the User Groups

## Add Apps to the User Groups

- 3 Add the Application to the User Groups



Click ? for help.






The Apps must be available in "My projects"

- Add a new App
- Select the App from the selection

# Assign Roles to users & Add Apps to the User Groups

## Add Apps to the User Groups

### 4 Invite the User to the Group


Industrial Edge Management |   

+ Create User Group ?

+ Add Application   Invite   Members

Invite to User Group - app.Monitor ×

Email +

Email	Action
test@test.com	

Invite

Invite the members to the Group



# Install and start the Apps on the Unified Comfort Panel Overview

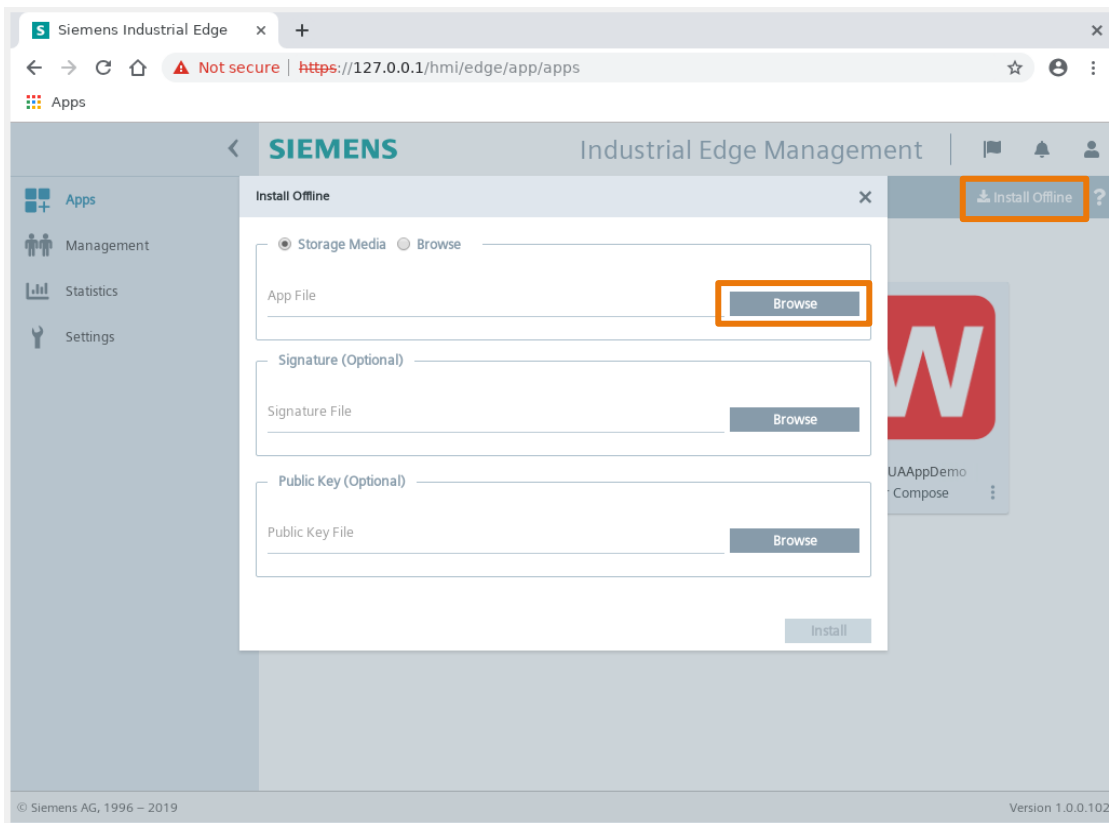
Performance Insight



# Install the App on the Unified Comfort Panel

## Install Offline

- 1 Click the “Install Offline” Button
- 2 Browse the \*.app file



To install the App on the Unified Comfort Panel you need to save the \*.app file on the USB Stick and plug it into the slot

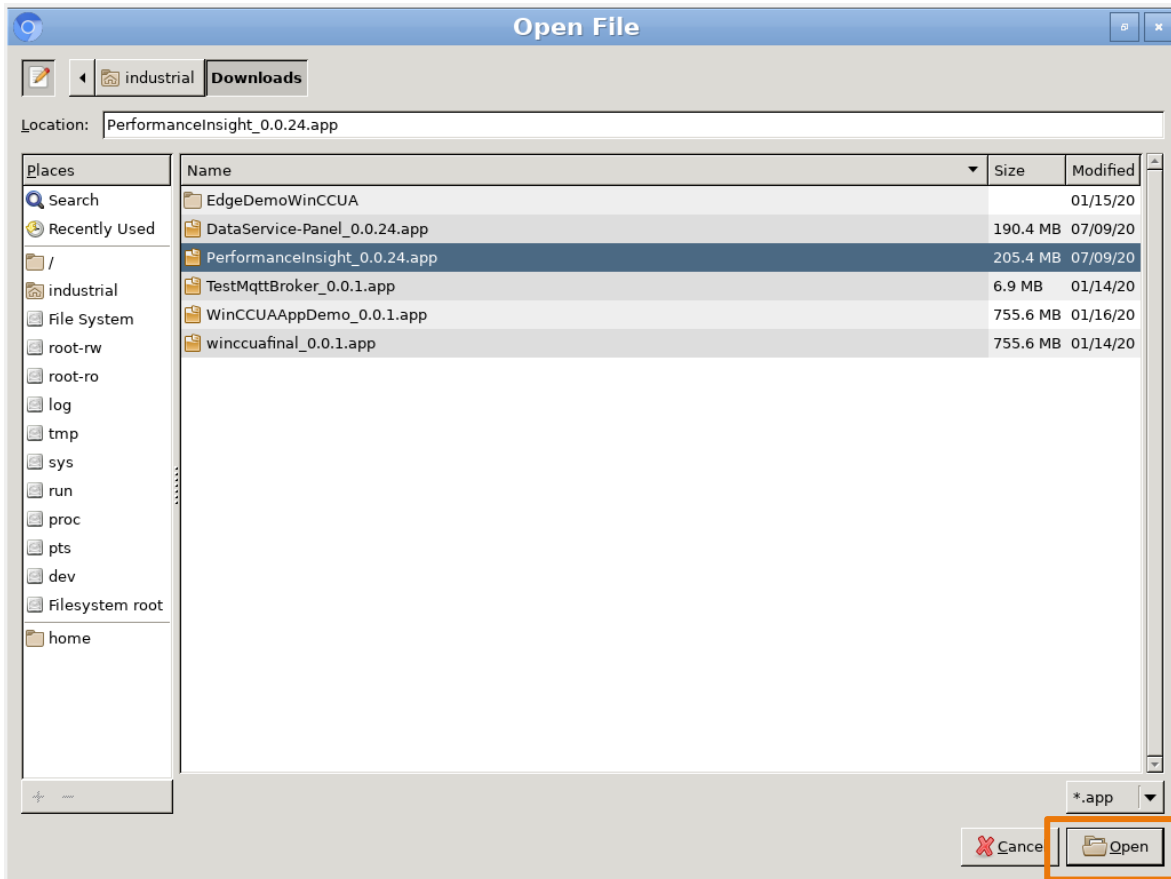
- Click on “install Offline”
- Browse the \*.app File

# Install the App on the Unified Comfort Panel

## Install Offline

3 Select the \*.app file

4 Open the \*.app file

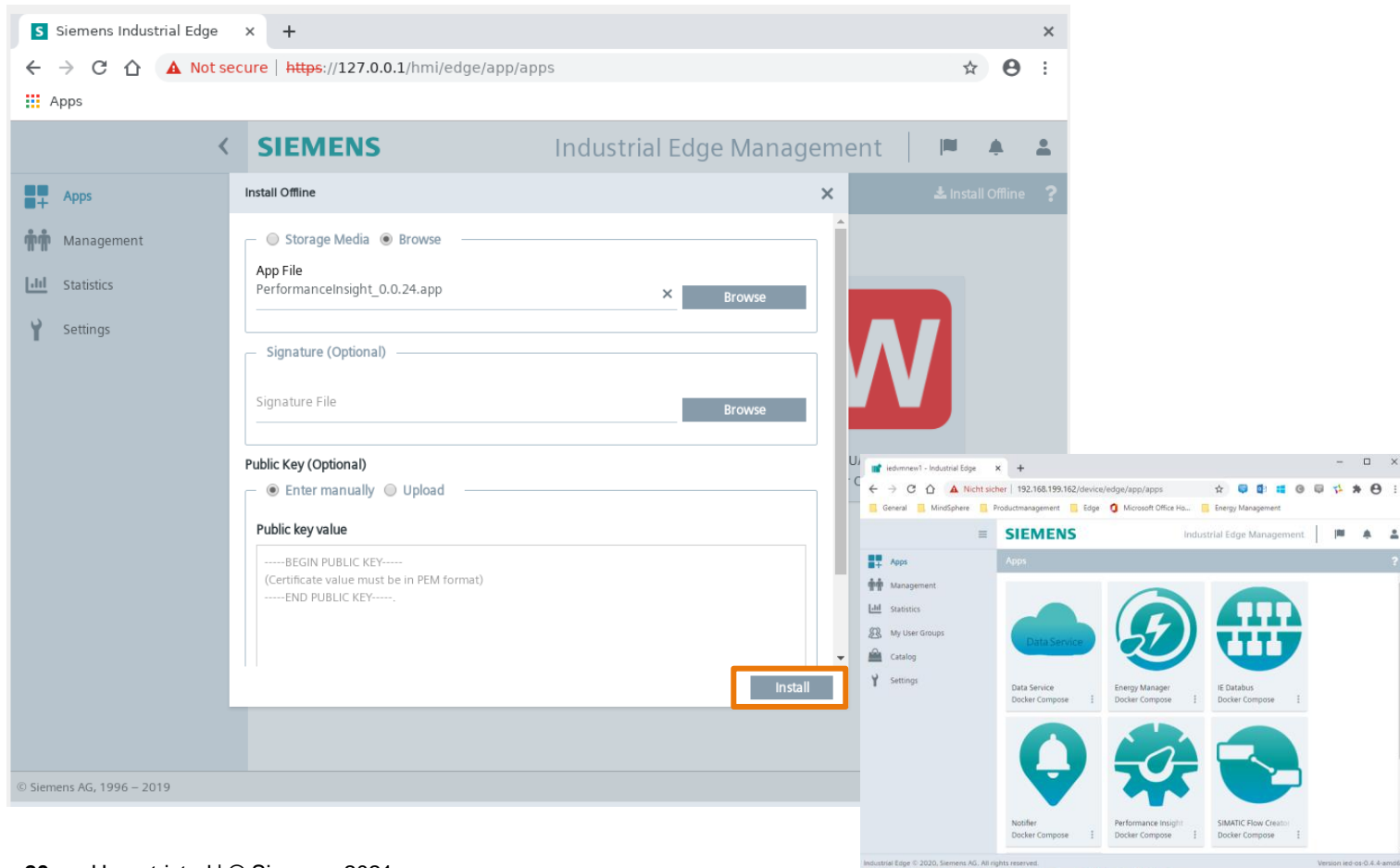


To install the App on the Unified Comfort Panel you need to select and open the \*.app file.

# Install the App on the Unified Comfort Panel

## Install Offline

5 Install the \*.app file



To install the App on the Unified Comfort Panel you need to install the App on the UCP.

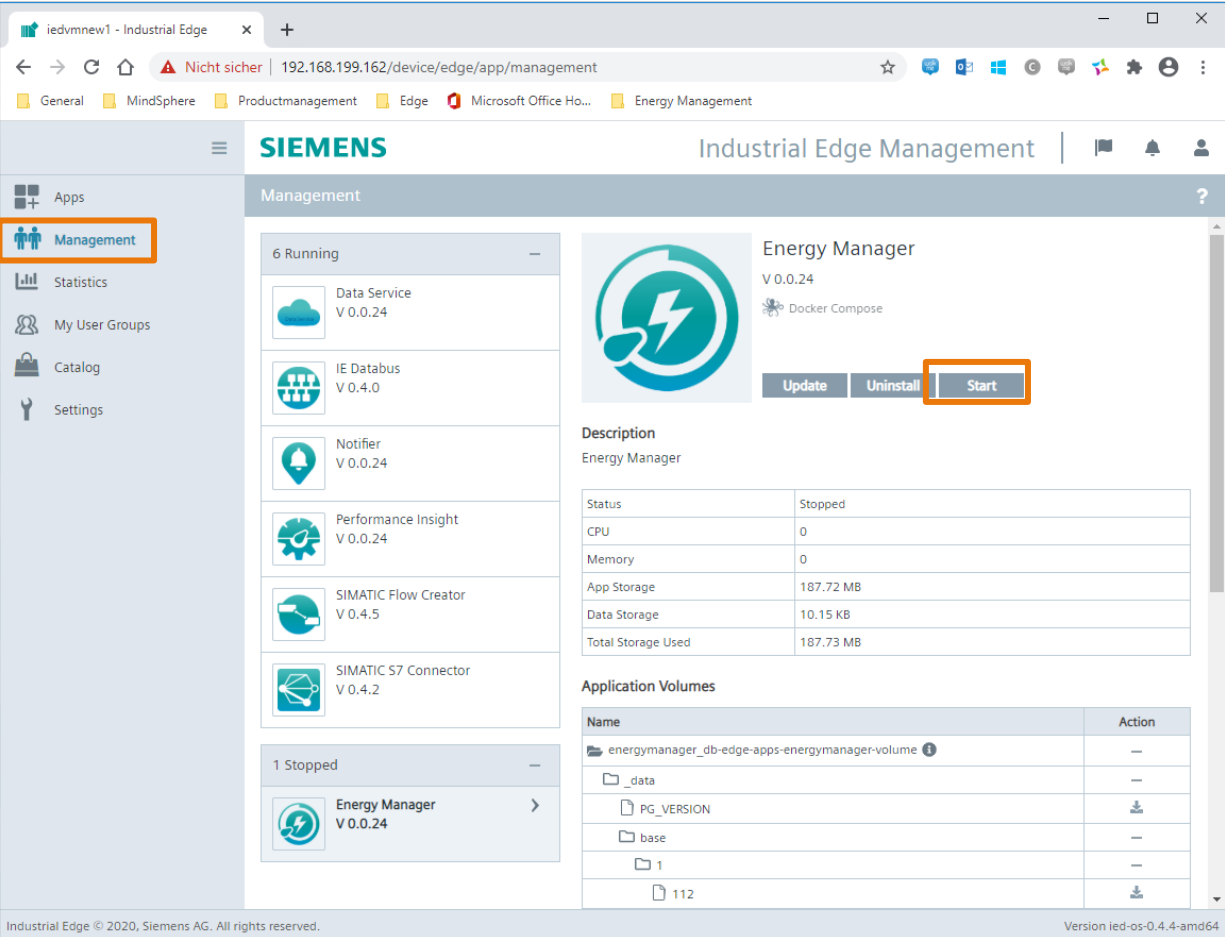
After the successful installation, the App Home screen appears



# Start the App on the Unified Comfort Panel

## Start the App

### 6 Start the App



To start the App, go to the “Management” view and start the App.



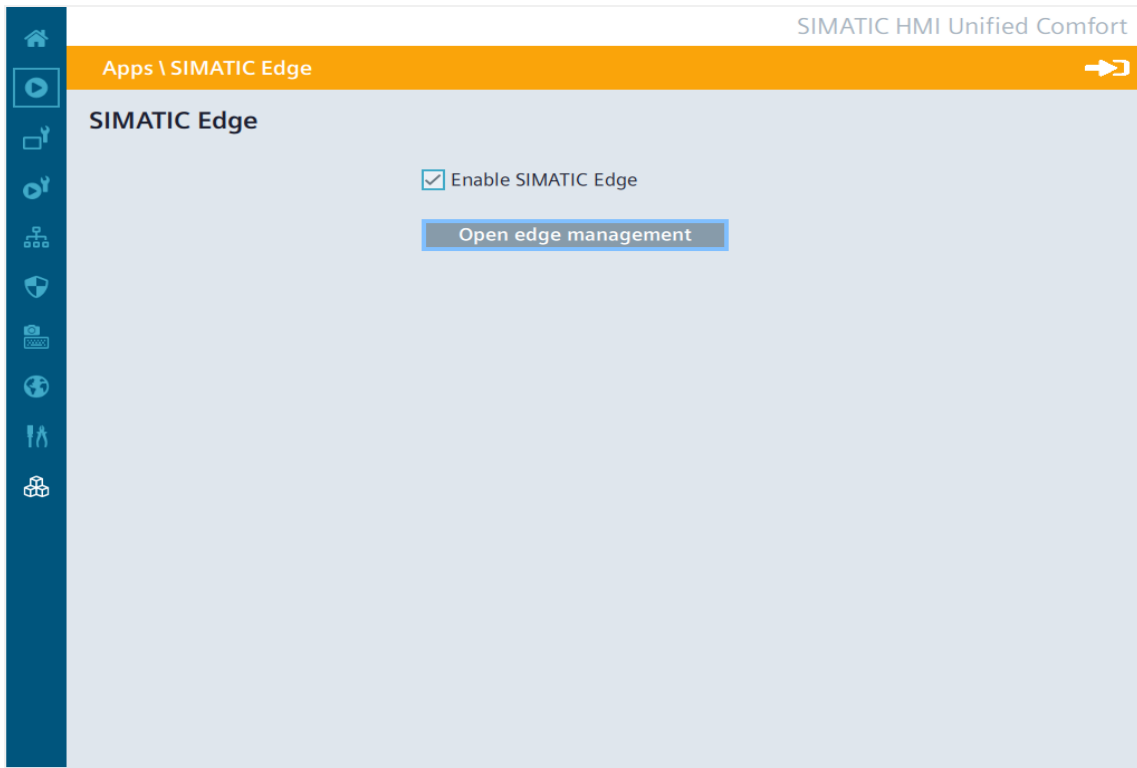
# User Management Unified Comfort Panel

Performance Insight

# Add Users to the Panel and open the Edge Management

## Add Users to the Panel

- 1 Create the User in the TIA Portal project
- 2 Download the project to the Panel
- 3 Open the SIMATIC Edge on the Unified Comfort Panel

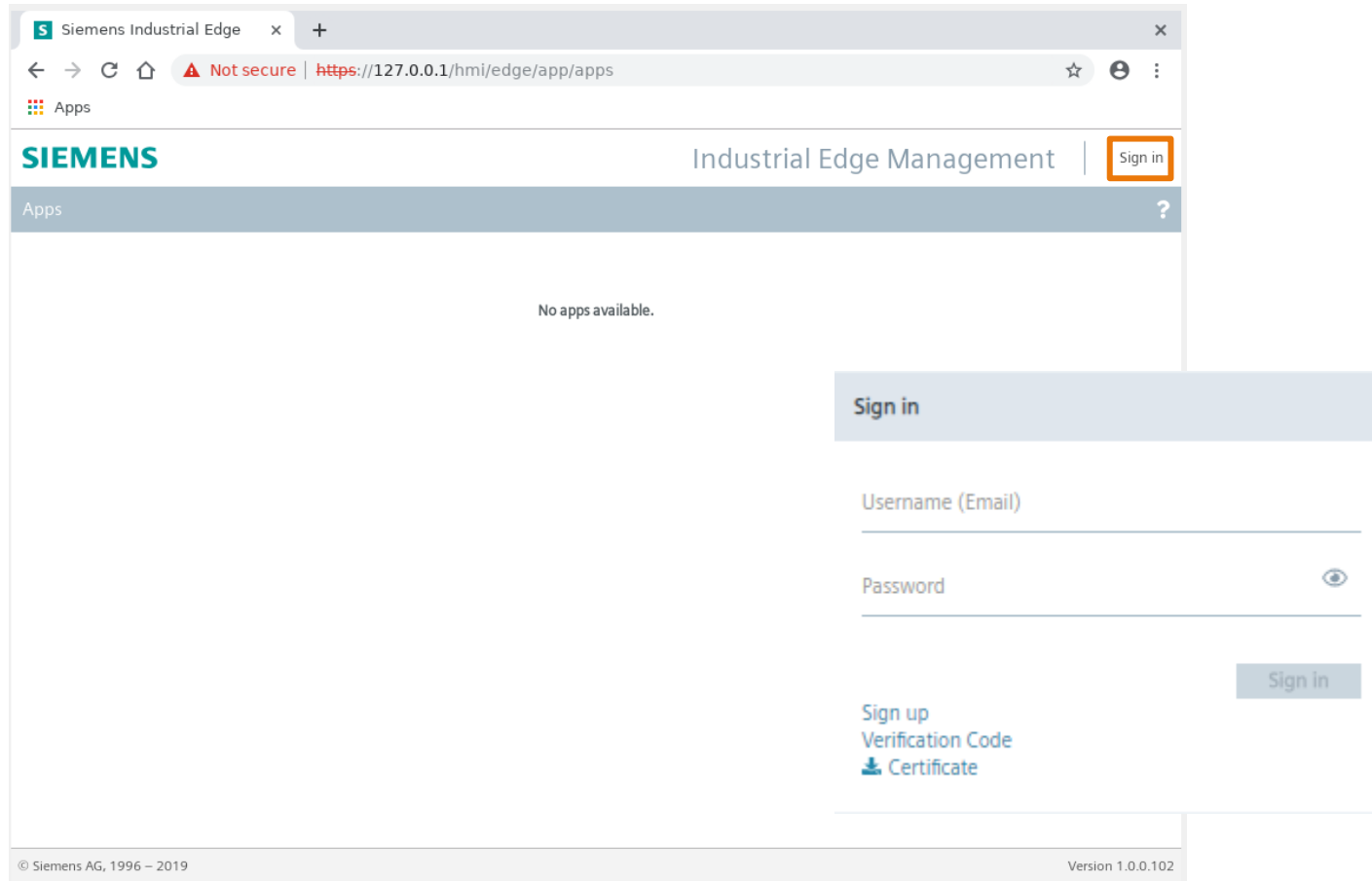


The Users for the Apps on the Unified Comfort Panel need to be created in the TIA Portal project.

The Industrial Edge Management is opened via the Board.

# Add Users to the Panel and open the Edge Management Login to the Industrial Edge Management

## 4 Login to the Unified Comfort Panel



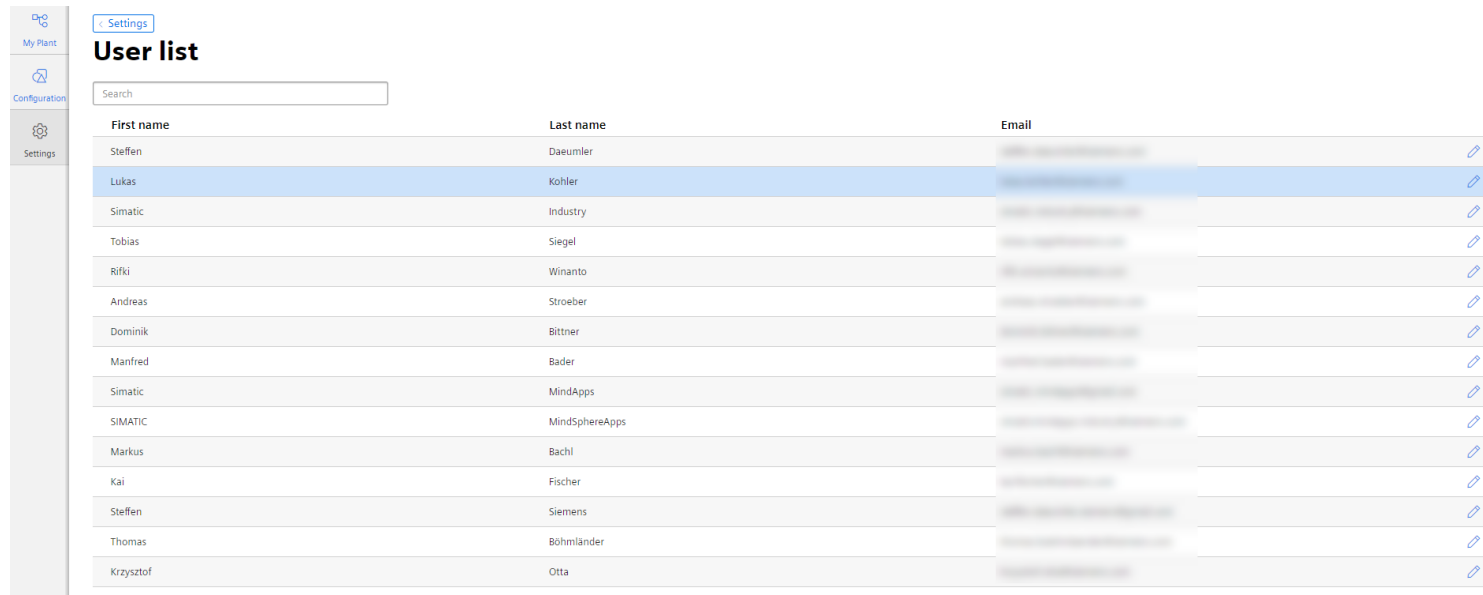
The Users created in the TIA Portal project are the same Users that the apps on the Unified Comfort Panel work with.


















# The user list keeps track on all active users

Go to Settings/User list

- After first login, user information is stored in the app data base. This is required for the billing process.
- The app administrator gets an overview of all registered users and has the option to edit these users



First name	Last name	Email	
Steffen	Daeumler		
Lukas	Kohler		
Simatic	Industry		
Tobias	Siegel		
Rifki	Winanto		
Andreas	Stroeber		
Dominik	Bittner		
Manfred	Bader		
Simatic	MindApps		
SIMATIC	MindSphereApps		
Markus	Bachl		
Kai	Fischer		
Steffen	Siemens		
Thomas	Böhmländer		
Krzysztof	Otta		

# | Configuration

Performance Insight

# Status mapping helps to assign different machine states for later use in e.g. Gantt Chart

**Configuration**

- Status mappings**  
A list of all existing status mappings
- KPI types**  
A list of all existing KPI types
- Periods**  
A list of all existing periods

**Status mappings**

Search + New status mapping

Name	Description		
AE_StatusMapping			
Bool Mapping	Map FALSE to red and TRUE to green		
BraumatRecipe			
DigiDemo Mapping			
F&B - Material			
OMAC_DigiLine			
Opening Hours			
Simulation			
testMapping			
Webianr_Mapping			

Go to Configuration/Status Mappings

- App admins can add, modify or delete a status mapping table which is used in Gantt chart widgets.

# Machine states are configured in the mapping table

**Create new status mapping**

Name \*  
Asset XY  
The status mapping name must be unique.

Description  
Description

Use time categories  
Time category is used for eg: OEE calculation

Color *	Value *	Label *	Time Category *	Description
	1	Running	Net Production Time	Description
	2	Break	Planned Downtime	Description
	3	Error	Unplanned Downtime	Description
	4	No Material	Planned Downtime	Description

[+ New row](#)

\* These fields must be filled out.

[Save](#) [Cancel](#)

Add or modify a status mapping table

- App admins can add a status with a color, a value, a label and optionally a description.
- Each status can be assigned to a time category which is used to calculate how long the machine is in a dedicated time category or how often one of the assigned machine state were in a dedicated time category.
- If no match between the received value and the definition in the status mapping table is given, a state “undefined” with color white is used.
- User can change the order in the status list to define the order in the Gantt chart detailed view.

# Calculate individual KPIs based on machine parameters

The screenshot displays the Siemens configuration interface. On the left is a sidebar with 'My Plant', 'Configuration', and 'Settings' options. The main area is titled 'Configuration' and contains three panels: 'Status mappings', 'KPI types', and 'Periods'. A yellow arrow points from the 'KPI types' panel to a detailed view of the 'KPI types' configuration. This detailed view includes a search bar, a '+ New KPI type' button, and a table of KPI types with edit and delete icons for each.

Name	Edit	Delete
AE_Quality		
Availability_EAS		
AwesomeKPIType		
BSA_KPI		
Demo-Test_1		
DigiDemo - Availability		
DigiDemo - Performance		
DigiDemo - Quality		
DigiLine - Quality		
F&B - Filling Overall		
F&B - Lost		
F&B - Lost Overall		
F&B - Silo Filllevel		
Loss counter		
my quality rate		
MyAwesomeKPI		

Only app admins can add, modify or delete KPIs

Note:  
A KPI Type can only be deleted if there is no linked KPI Instance available



## KPIs are configured in an excel-like formula editor

< Back

### Create new KPI type

Name \*  
Availability

Unit \*  
%

Formula editor \*

+ - ÷ × ( ) Operand Constant Time Category ?

TIME CATEGORY  
Net Production Time ▾ Duration /

TIME CATEGORY  
Available Production Time ▾ Duration \* CONSTANT  
100

\* These fields must be filled out.

Save Cancel

A KPI Type is defined by its Name, its unit of measure and its formula

Within the formula the user can add operands, constants, time categories and calculation operations

The name of the operands can be changed as well. An operand can be copied to be used several times in the same formula.

Operands are placeholders for the real variable assigned in the KPI Instance.

## Pre defined KPI Types for OEE Performance monitoring

$$OEE [\%] = \frac{Availability * Performance * Quality}{10\ 000}$$

$$Availability [\%] = \frac{Net\ Production\ Time.Duration}{Available\ Production\ Time.Duration} * 100$$

$$Performance [\%] = \frac{TotalCount [pcs]}{TheoreticalSpeed \left[\frac{pcs}{s}\right] * Available\ Production\ Time.Duration[s]} * 100$$

$$Quality [\%] = \frac{GoodCount}{TotalCount} * 100$$

$$TEEP [\%] = \frac{Available\ Production\ Time.Duration}{Total\ Calendar\ Time.Duration} * OEE$$

$$MTTR [s] = \frac{Unplanned\ Downtime.Duration}{Unplanned\ Downtime.Occurrence}$$

$$MTBF [s] = \frac{Net\ Production\ Time.Duration}{Unplanned\ Downtime.Occurrence}$$

- Pre defined OEE KPI-Types are available from scratch
- The formula editor is extended by a “Time Category” option
- For the time category the function “Duration [s]” and Occurrence are available

Overall Equipment Effectiveness (OEE)

Total effective equipment performance (TEEP)

Mean time to repair (MTTR)

Mean time between failure (MTBF)









# Define custom time periods

**Configuration**

- Status mappings**  
A list of all existing status mappings
- KPI types**  
A list of all existing KPI types
- Periods**  
A list of all existing periods

**Periods**

Search + New period

Name	Description	Tenant	
Day		Tenant	
Week		Tenant	
Month		Tenant	
Year		Tenant	
The last 3 hours		Tenant	
The last 7 days		Tenant	
The last 14 days		Tenant	
The last 30 days		Tenant	
Day plus 6 hours		Tenant	
Week +6h		Tenant	 
Month +6h		Tenant	 
Beispiel-Zeitbereich	Die ist ein Beispiel für einen selbst definierten Zeitraum.	Tenant	 
....		Tenant	 

In the configuration area a new card “Periods” is available

Only app admins can add, modify or delete time periods

A time period defined by subtenant A can only be adjusted or deleted by the tenant admin or a subtenant A admin and is not visible for other sub tenants

**Note:**

The pre-defined time period can not be adjusted or deleted.

# Define custom time period

[Back](#)

## Edit "day +6h"

**General**

Name \*  
day +6h

Description  
Description

**Configuration**

Duration for the calculated period of time  
1 Day

Start time (relative to current/given time)  
Hour / 6 (s) ago  
Defines the starting point of the period relative to the current timestamp Shifts the starting point to the past or future

Offset  
Shifts the calculated period for a defined timerange  
0 Minute

Next period  
 Starts at the beginning of the selected starting time  
 Starts right after the previous one (i. e. rolling shifts)

\* Required fields

Save Cancel

**Preview for calculated time range**  
Calculated from current time  
28.09.21, 11:38

Previous	04 00 28.09.2021	>	04 00 29.09.2021
Current	05 00 28.09.2021	>	05 00 29.09.2021
Next	06 00 28.09.2021	>	06 00 29.09.2021

In the configuration section the user can define time period like

- Day that starts at 6:00 a.m. and ends at 6:00 a.m. of the next day.
- A shift that starts at 6:00 am and is defined to have a duration of 8 hours.
- A part of a day starting at 06a, and ending at 8pm

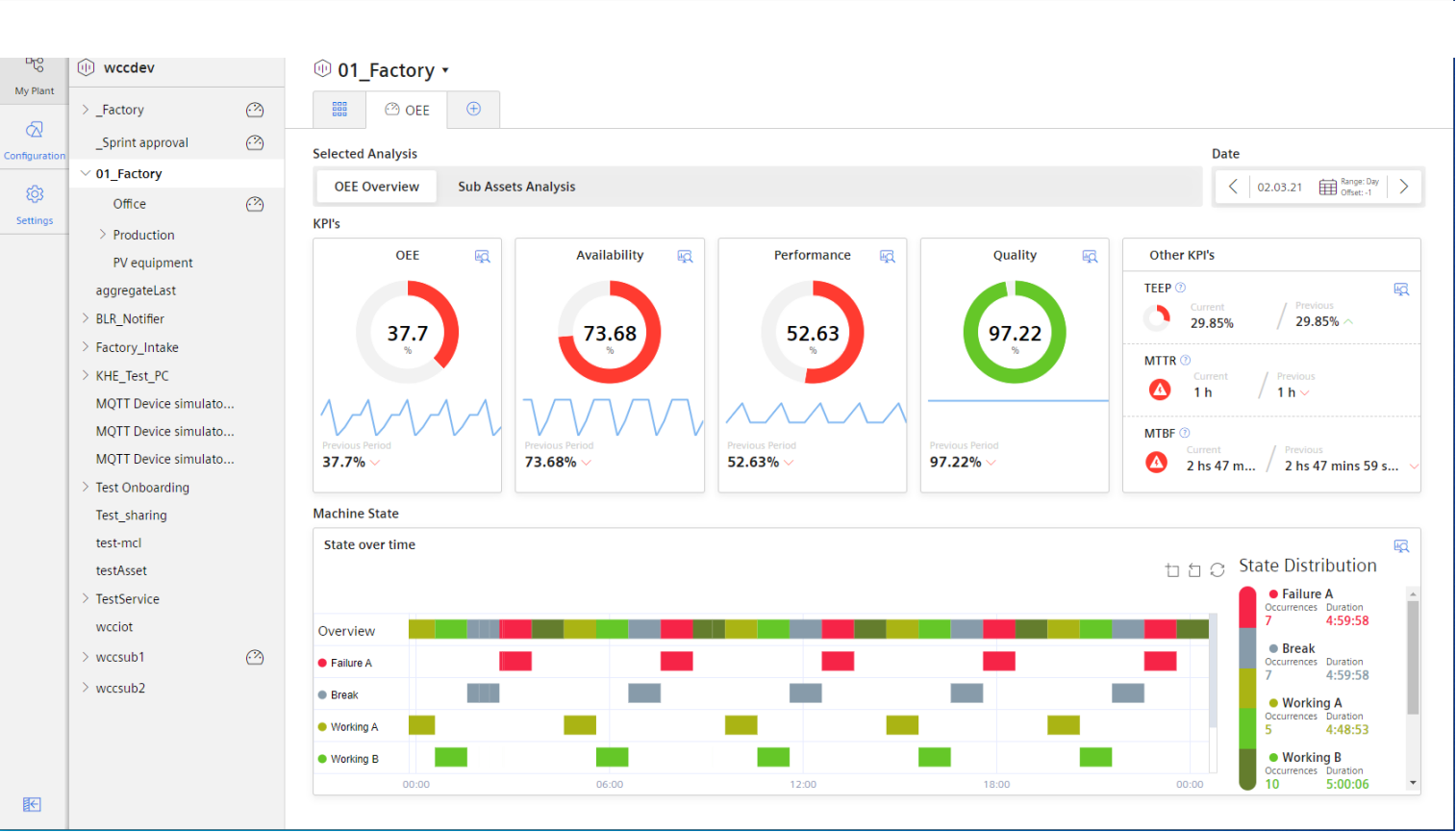
These time periods can be used in the dashboard like the predefined periods

# Out of the box OEE monitoring

Performance Insight

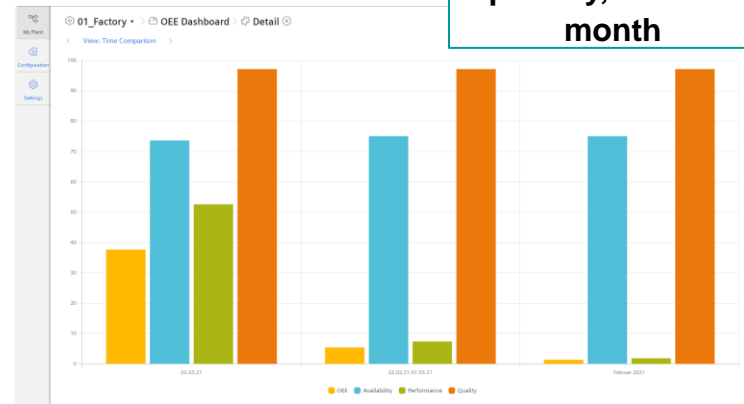
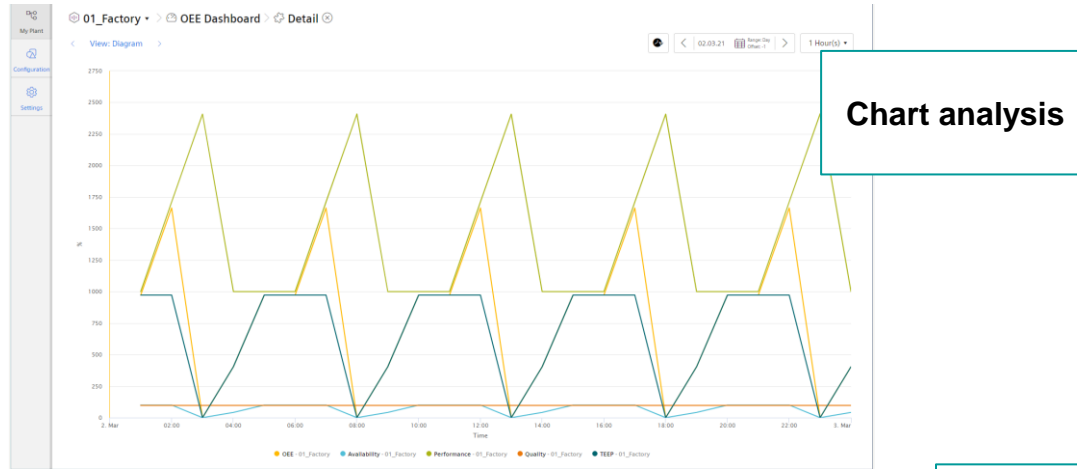


# Performance Insight offers an out of the box OEE dashboard



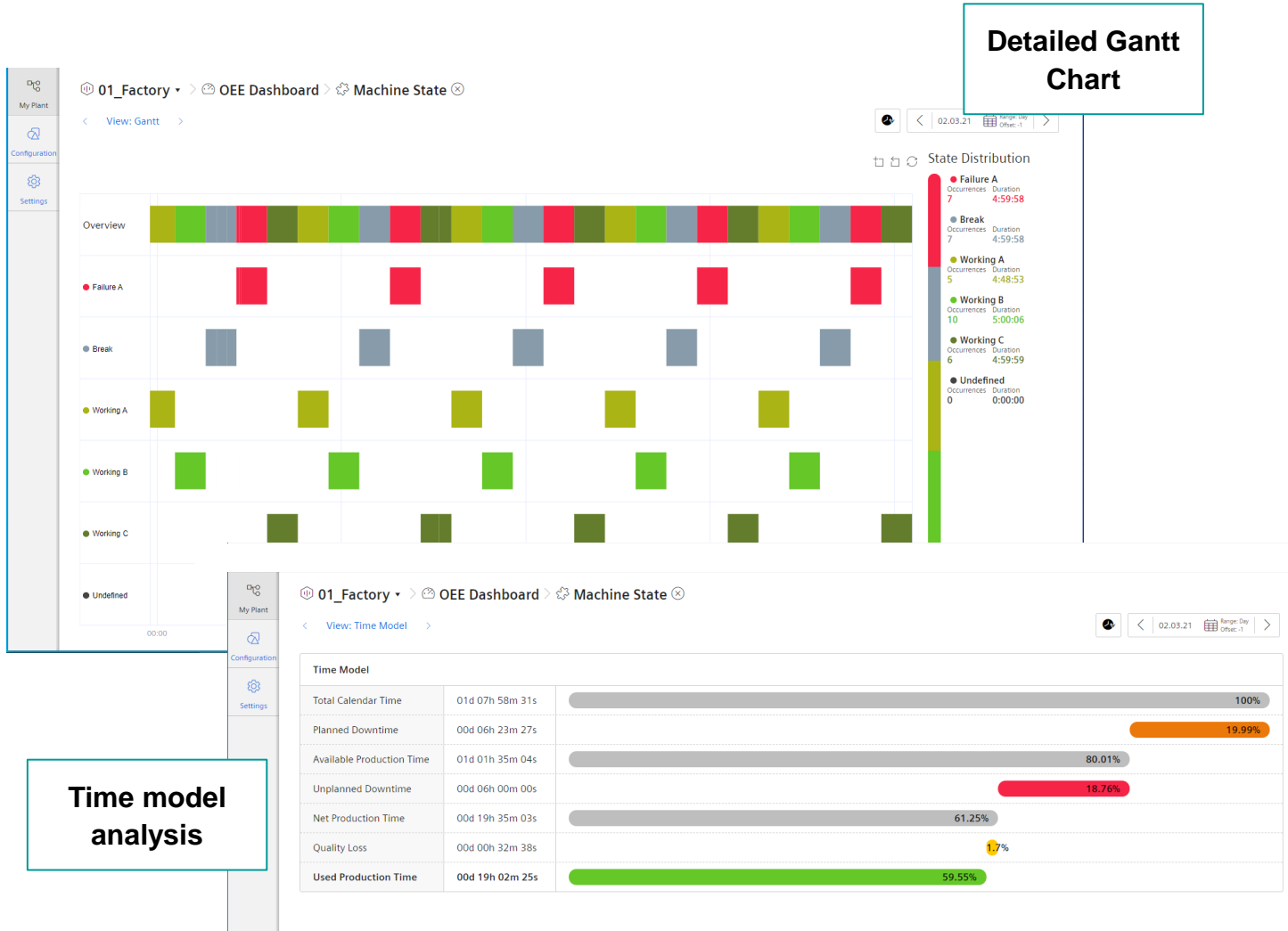
- As soon as the OEE settings are defined for the asset, the dashboard will be displayed
- The main KPIs are displayed including the value of the previous period and the detailed data in the preview area
- The limits are pre-defined but can be adjusted for each KPI
- The Gantt Chart provides an overview about the individual machine states including a summary
- As soon as if an OEE Configuration is available for a sub asset, the button “Sub Asset Analysis” is active.

# Detail view for Performance KPIs



- Detail view of each KPI Widget provides all relevant KPIs in a line chart (TEEP, OEE, Performance, Availability and Quality)
- Change the analysis period or the resolution using the time picker
- Histogram view is available providing statistic information
- In the Time Comparison view, Performance KPIs are compared for the previous day, the previous week and the previous month, to detect deviations

# Detail view for the Performance Gantt chart



Detailed Gantt Chart

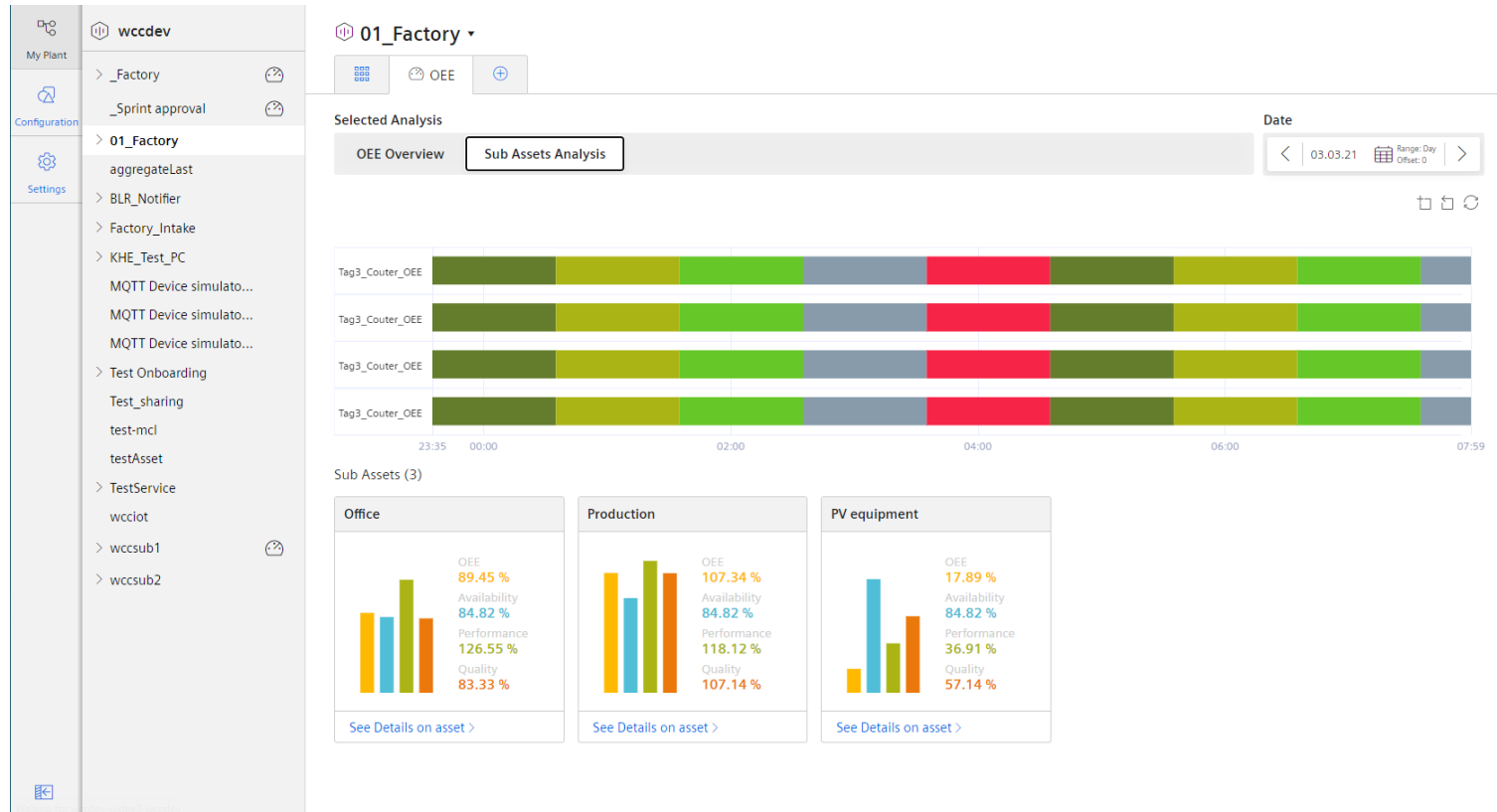
Time model analysis

The Time Model analysis provides the overview about the total calendar time and the portion of Planned Downtime, the Unplanned Downtime and further the Net Production Time.

The Quality losses are also considered but this is a calculated value based on the quality rate

Example: If the net production time is 60% and the quality rate is 90%, the Quality losses are  $60 * (1 - 0.9) = 5,4\%$

# Sub asset OEE analysis



As soon as if one of the sub assets has an OEE configuration, the sub asset analysis is available.

The Gantt chart provides an overview about the complete line as well as the overview for each sub asset.

For each sub asset the main KPIs (OEE, Performance, Availability and Quality) are displayed for a fast comparison.

The OEE configuration for the line is similar to the configuration of a dedicated asset. The produced pieces can be used from e.g. the bottleneck machine.



Note: The aggregation from machine performance to line performance (several machines) has to be implemented in Visual Flow Creator, the PLC, or in a similar tool.

# Easy and fast OEE configuration

The screenshot shows the 'Define OEE Settings' configuration page. It includes a breadcrumb trail: 01\_Factory > Asset Configuration > OEE Settings. The main heading is 'Define OEE Settings' with a sub-heading: 'By using this configuration several OEE KPIs are generated out of the box and used on pre...'. There are three main steps:

- 1. Choose a status mapping for your time model \***: A dropdown menu is set to 'OMAG'. A callout box labeled 'Time model for status mapping (e.g. OMAG)' points to this dropdown.
- 2. Choose parameter representing your machine status \***: A dropdown menu is set to 'VAR Tag3\_Couter\_OEE'. A callout box labeled 'Machine state' points to this dropdown.
- 3. Please link each operand with a variable to proceed \***: This step contains three rows of configuration:
  - 'GoodCount' is linked to 'VAR Tag3\_Couter\_OEE' with a 'Counter' unit.
  - 'TotalCount' is linked to 'VAR Tag2\_Couter\_0\_50' with a 'Counter' unit.
  - 'TheoreticalSpeed (pcs/s)' is linked to a text input '1'.A callout box labeled 'Assigning the appropriate variable for produced pieces' points to the 'TotalCount' configuration.

At the bottom, there are 'Save', 'Cancel', and 'Delete' buttons. A note states: '\* These fields must be filled out.' To the right, the 'OEE KPIs' section shows the resulting formulas for TEEP, OEE, Availability, Performance, Quality, and MTBF.

In the Asset Configuration the user can define parameters used for several KPI Instances

The user can select the status mapping where also the machine states are mapped to the time categories

The user can select the variable representing the machine state

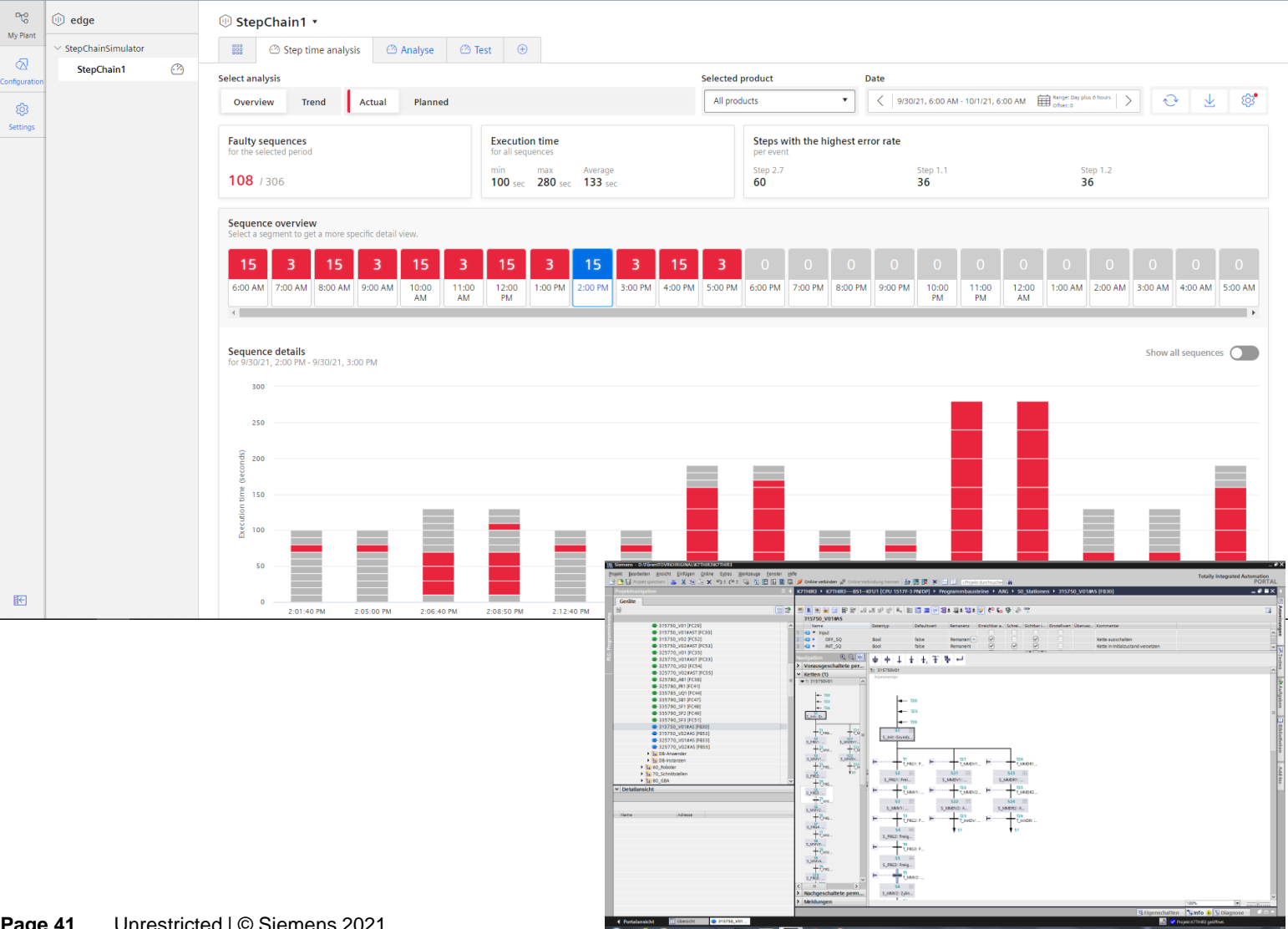
The user can assign the variable for GoodCount, TotalCount and the TheoreticalSpeed in pce/sec.

# | Step time analysis

Performance Insight



# Performance Insight Step chain analysis



## Situation

- Insufficient data and analytics capabilities
- Inability to conduct detailed analysis
- Decision based on assumption instead of facts

## Requirements

- Easy to apply the applications to existing infrastructures
- Transparency about all sequences and the dedicated step times with very low engineering effort

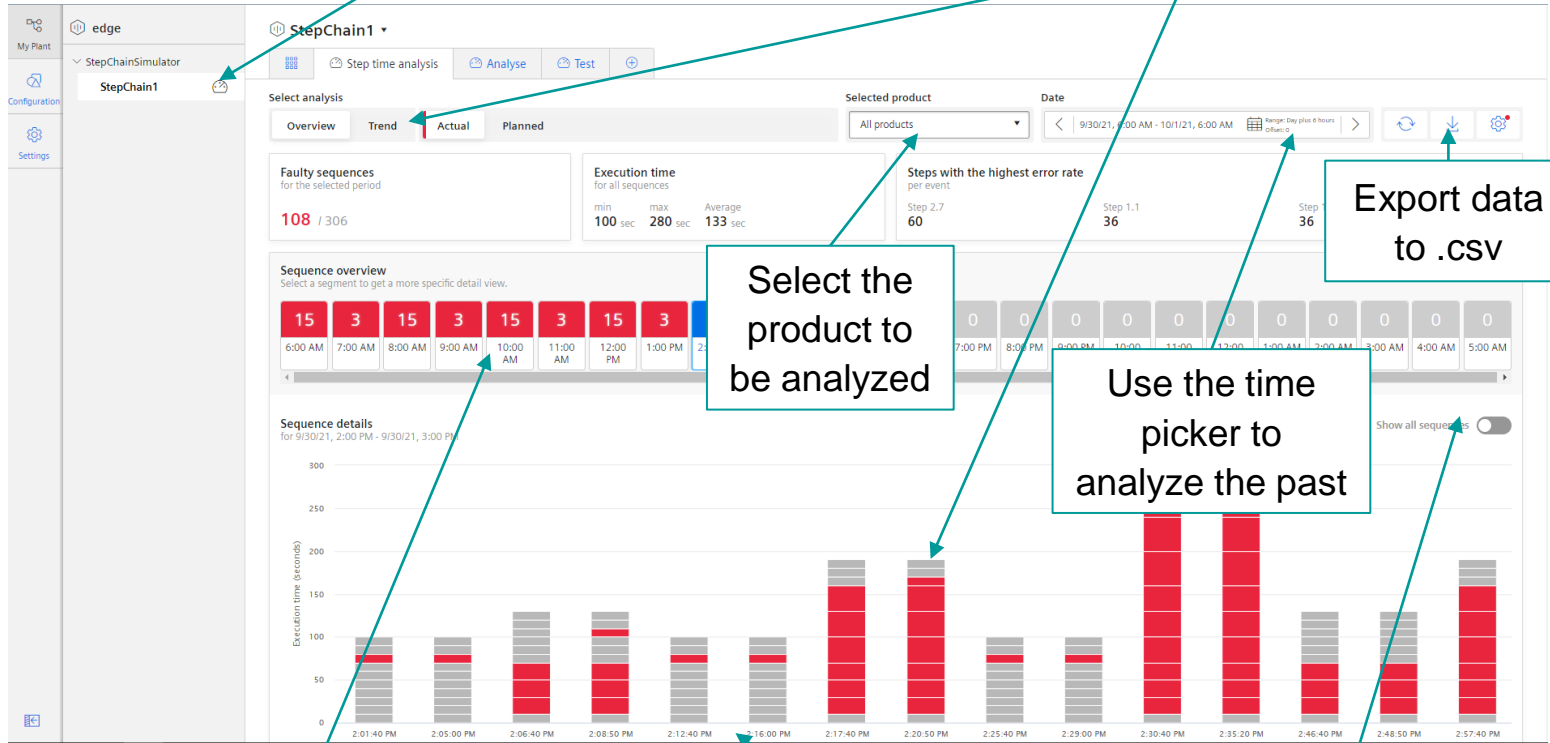
## Benefits

- Providing a holistic view about the sequences and the individual steps
- Comprehensive analysis functions to investigate and improve the sequences
- Derive measures to increase the output per time based on the provided information

# Performance Insight Step chain analysis

A step chain is represented by an asset

User can click on a step in the chart to get detailed data or click on Tendency



Export data to .csv

Select the product to be analyzed

Use the time picker to analyze the past

For a better overview the amount of faulty steps is displayed in the hourly sequence overview

Each bar represents a step chain and each segment represents the step time

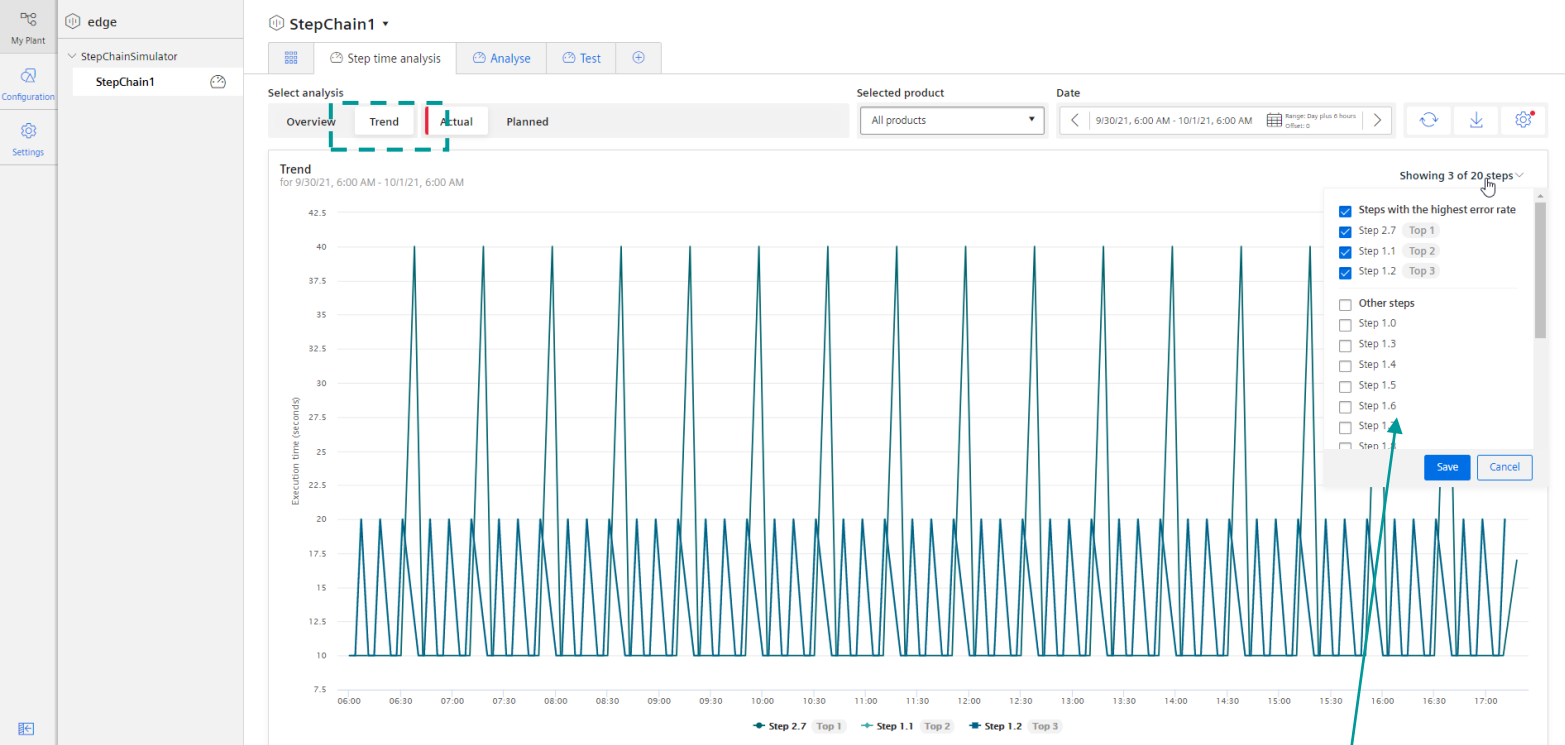
User can either display only faulty step chains or all

Using the pre-defined Step time analysis dashboard to

- Identify steps where the step time exceed the limit
- Use the product filter to perform analysis just for a dedicated product
- Use the statistic of Execution time and derive the optimization potential
- Export the data to .csv for further detailed analysis

# Performance Insight

## Step chain detailed analysis



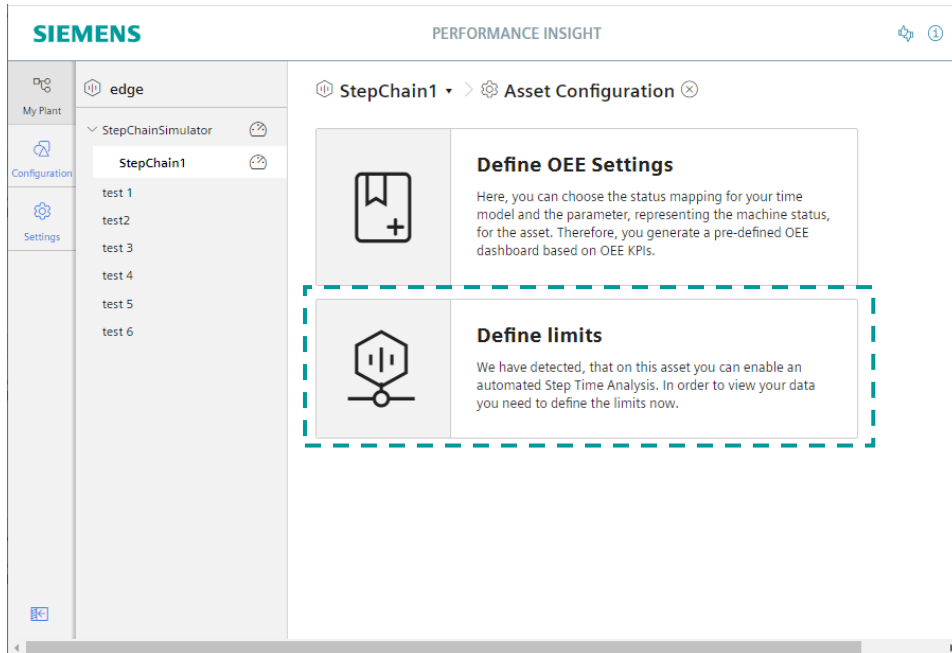
In the Tendency tab the user can

- analyze step time in detail by selecting the appropriate steps
- change the product filter to focus on a dedicated product
- Analyze the past by using the time picker
- Export the data to .csv for further detailed analysis

User can select the step which should be displayed

# Performance Insight

## Define limits for each step in the chain

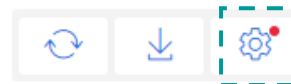


Selected product

All products

Date

< 9/30/21, 6:00 AM - 10/1/21, 6:00 AM Range: Day plus 6 hours Offset: 0 >



Limits can be defined

- By clicking on the “Define limits” card in the asset configuration or directly in the dashboard on the appropriate icon.
- If no limits are defined the user gets an appropriate information.
- If a product is available with no limits in the analysis period the user get an additional information as red dot on the limits icon

# Performance Insight

## Define limits for each step in the chain

**Define step time analysis settings**  
To enable the automated step time analysis limits for each product must be defined

Available products: Product Blue, Product Green, Product Red

Configuring "33"  
To activate the automatic step time analysis, you must set the corresponding limits for each required step.

Display name:

Define limits per step

Step name	Planned step time limit	Actual step time limit *	Minimum	Maximum	Average
Step 1.0	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	10.0 sec	10.0 sec
Step 1.1	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	20.0 sec	13.29 sec
Step 1.2	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	20.0 sec	13.29 sec
Step 1.3	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	20.0 sec	13.29 sec
Step 1.4	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	30.0 sec	14.39 sec
Step 1.5	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	30.0 sec	14.39 sec
Step 1.6	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	30.0 sec	14.39 sec
Step 1.7	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	40.0 sec	13.29 sec
Step 1.8	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	40.0 sec	13.29 sec
Step 1.9	<input type="text"/> ms	<input type="text"/> ms	10.0 sec	40.0 sec	13.29 sec

Configuration for: 33  
Configured steps: 0 From 20

Planned limit: 0.0 sec  
Actual limit: 0.0 sec

Total values: min 197.0 sec, max 560.0 sec, Average 266.0 sec

Buttons: Save, Cancel

In the limit settings the user

- gets an overview about all products produced in the observation period with an appropriate state indicating if limits are defined

In the set limits dialog per product the user

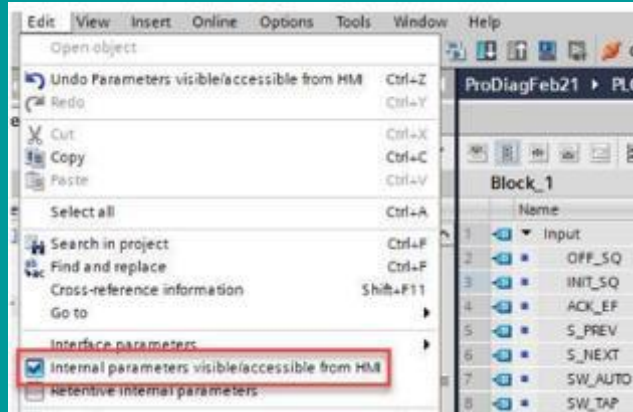
- get an overview about the Minimum, Maximum, Average of each step and the total step chain
- can select e.g Minimum and can define a percentage which comes on top of the value and can define all limits with just one click
- can define/change the step time limit for each step

# Performance Insight

Activate the step chain analysis with engineering steps as follows

## S7 – Connector

- Activate “Internal parameters visible/accessible from HMI”



- Browse the PLC by using a filter to avoid exceeding the limit of 6k variables
- Define a unique name for each variable like SQ1\_S1\_active, SQ1\_S2\_active, SQ1\_Product

## Data Service

- Define the asset model for the PLC and for each working group
- Define an asset for each sequence
- Select the aspect “Initial step” for the initial step and assign the MQTT Topic SQ1\_Product and SQ1\_S1\_active
- Select the aspect “Step” for each further step and map the MQTT topic SQ1\_Product and SQ1\_S2\_active
- Use a meaningful name for the aspect which represents the step (e.g. S2 - S\_FRG1: Freigabe Beladen Türinnenteil 315720R01 (E74...

## Performance Insight

- Define the limits for each product by simply use the shortest Sequence and defining the tolerance which can be accepted.

→ Start analyzing the data

## Systemlimits

- Max. 50 steps per sequence
- Max. 25 sequences per PLC
- Max. 8 PLCs per Edge Device
- Minimum supported step time = 110ms
- Min sequence time 5s



# Parameter view, Variable Configuration and KPI Instances

Performance Insight

# All available parameters and KPIs per asset can be accessed in Parameter View

02\_Simulation\_VFC > Parameter

Search

All VAR KPI

New KPI instance

	Name	Aspect name	Data type	Unit	Notifications activated
VAR	Bad_Counter	Simulation_Counter	Int32	pcs	
VAR	Good_Counter	Simulation_Counter	Int32	pcs	
VAR	Product_Counter	Simulation_Counter	Int32	pcs	
VAR	Available	Simulation_States	Bool		
VAR	E_Stop	Simulation_States	Bool		
VAR	Error_Code	Simulation_States	Int32		
VAR	Fault	Simulation_States	Bool		
VAR	NotifierAlarm	Simulation_States	Bool		
VAR	Power_Off	Simulation_States	Bool		
VAR	State	Simulation_States	Int32		
KPI	quality_vfc		Double	%	
KPI	minutesAvailable		Double	min	
KPI	boolToInt		Double		

**Set filters for Variables and KPIs**

In the Parameter view you can see all the Variables and KPI-Instances of the selected Asset

The user can edit the Uploaded MindSphere Variables as well as can define/update/delete KPI-Instances.

The user can use a filter to display only Variables or KPIs or both

# Parameters from connected machines (=variables) can be edited for better use in Performance Insight

< Back

## Edit variable "Bad\_Counter"

General Limits

**Define general settings for "Bad\_Counter"**

Specify an alternate unit, the acquisition category that you use to define the type of data collected, and how the value should be interpreted.

**Unit**

Unit from Asset Management: pcs

Unit of measurement

**Acquisition category \***

ProcessValue  Type: Int32

Select category

**Cycle**

The value is aggregated.  
The value represents the end of the time range.

\* These fields must be filled out.

Save Cancel

## Define additional variable settings

- The admin user can define a new unit, if the MindSphere unit is not defined well
- The acquisition category allows a classification which is linked to a default aggregation algorithm
- Define if the value is aggregated or not
  - If the value is not aggregated, the values are continuously (actual values) transferred to MindSphere when the value changes. The transferred value is valid until the next value is transferred to MindSphere.
  - If the value is aggregated, the value represents a period, e.g. 15 minutes.

# Easy configurable Counters sum up single machine signals

Counter (1)

Valid from 01.01.20, 00:00 [Delete](#)

Date (from) \*  dd.mm.yy Time (from) \*  hh:mm:ss

Counter constant \*  Value for the up and down counter

Counter type \*  Up counter  Up & Down counter

Reset behavior

Triggered reset The counter is reset per cycle or by an event.

Range start  Limit range end

Value at installation  Value at replacement

[+ Add new definition](#)

\* These fields must be filled out.

[Save](#) [Cancel](#)

- Define the settings for a counter (Acquisition category "Counter")
- Define the installation date/time
  - Define the counter constant
  - Define the counter type
  - Define the overflow behaviour
    - Triggered reset means that the counter starts from 0 without an overflow limit consideration
    - If you define the start and end range, the overflow takes place at the overflow limit.
  - Define the value at installation and value at replacement if necessary

# Limits can be defined in Performance Insight and handed over to Notifier in case of an exceedance

The Admin User can define limits for each variable  
Define if the notification shall be handed over to Notifier\*  
Define which cycle shall be analyzed (e.g. 15min counter difference) or if each value should be validated  
Limits for variables of type Number, String and Boolean can be defined  
The limits defined on the variable instance is inherited by default to the widget configuration.

**Edit variable "Bad\_Counter"**

General Limits

**Define limits for "Bad\_Counter"**  
Set limits and define whether you want to receive notifications.

Note: This function is only available if the SIMATIC Notifier MindSphere app is available on your tenant.

Low limit alert     Low limit warning     High limit warning     High limit alert  100

Alert Warning OK Warning Alert

min max

**Notification**

Check raw data  
Define whether the raw data or the aggregated data should be validated.

Calculation cycle: 15min  
Aggregation: Counter

Note: Calculation cycle is based on UTC (Universal Time Coordinated)

\* These fields must be filled out.

Save Cancel

\*) To use this functionality, Notifier for MindSphere is required

# Calculate individual KPIs based on machine variables

**Add new KPI instances**

**Edit and delete unused KPI instances**

	Name	Aspect name	Data type	Unit	Notifications activated
VAR	Bad_Counter	Simulation_Counter	Int32	pcs	
VAR	Good_Counter	Simulation_Counter	Int32	pcs	
VAR	Product_Counter	Simulation_Counter	Int32	pcs	
VAR	Available	Simulation_States	Bool		
VAR	E_Stop	Simulation_States	Bool		
VAR	Error_Code	Simulation_States	Int32		
VAR	Fault	Simulation_States	Bool		
VAR	NotifierAlarm	Simulation_States	Bool		
VAR	Power_Off	Simulation_States	Bool		
VAR	State	Simulation_States	Int32		
KPI	quality_vfc		Double		
KPI	minutesAvailable		Double	min	
KPI	boolToInt		Double		

For creating a new KPI instance go to the tab “parameter” in the module “My Plant” or click the button New KPI Instance in the Widget Configuration

User can edit the KPI Instances.

It is possible to link the operands to other parameters (variables in MindSphere Tenant or other KPI Instances).

Note: KPI instances will be charged monthly

# KPI types are used to duplicate KPIs faster

KPIs based on a KPI type help to duplicate one and the same calculating scheme for different KPIs

Select a KPI basis to duplicate calculating schemes

The screenshot shows the 'Edit KPI instance "Availability"' configuration page. It features a 'General' tab and a 'Limits' tab. The 'General' section includes a 'KPI instance name' field with the value 'Availability'. Below this is the 'Select a KPI basis' section, where the 'On basis of a KPI type (typed)' radio button is selected. The 'KPI type' dropdown is set to 'Availability'. The 'Formula preview' section shows a calculation: 
$$\frac{\text{Net Production Time}}{\text{Available Production Time}} \times 100$$
 The 'Choose parameter representing your machine status' section has 'State' selected. The 'Choose a status mapping that represents your time model' section has 'OMAG' selected. At the bottom, there are 'Save', 'Cancel', and 'Delete' buttons, along with a red asterisk warning: '\* These fields must be filled out.'



# KPI Instances

## Link the appropriate Object

The screenshot displays a four-step configuration process for a KPI instance:

- 1. Formula editor:** Shows a toolbar with mathematical operators (+, -, ÷, ×, (, )) and buttons for 'Operand', 'Constant', and 'Time Category'. Below, the 'OPERAND' field contains 'Energy' and the 'TIME CATEGORY' field contains 'Unplanned Downtime' and 'Duration', separated by a multiplication symbol (\*).
- 2. Choose parameter representing your machine status:** Features a 'Find parameter' button.
- 3. Choose a status mapping that represents your time model:** Includes a 'Select status mapping' dropdown menu. A callout box notes: 'Only available if a time category is in use'.
- 4. Link each operand to a tag to continue:** Shows the 'Energy' operand with a link icon, a 'Find parameter' button, the word 'OR', and a 'Set static value' button. A callout box notes: 'Only available if an operand is in use'.

As soon as if a “Time Category” is used in the KPI definition, the user has to assign the variable representing the machine state and the status mapping table.

Only those status mapping tables are listed which have assigned the time category

Only if a “Operand” is in use in the KPI definition, the user has to assign the parameter or now also available can directly enter a value.

Instead of selecting a parameter, a value can be defined which is used in the formula

# Value aggregation helps to map a sliding period

- "Counter" aggregation function	
<p>"The value is aggregated" = not activated</p> <p>Calculation example: The calculation period is from 00:10 to 00:50. Result: <math>1 + 1 + 1 + 1 = 4</math></p>	<p>"The value is aggregated" = activated</p> <p>Calculation example: The calculation period is from 00:10 to 00:50. Result: <math>1 + 1 + 1 + 1 = 4</math></p>
- "Average" aggregation function	
<p>"The value is aggregated" = not activated</p> <p>Calculation example: The calculation period is from 00:10 to 00:50. <math>(10 + 20 + 30 + 40) / 40 = 2.5</math> (average value across the calculation period)</p>	<p>"The value is aggregated" = activated</p> <p>Calculation example: The calculation period is from 00:10 to 00:50. <math>(20 + 30 + 40 + 50) / 40 = 3.5</math> (average value across the calculation period)</p>
+ "Min", "Max" and "Last" aggregation functions	
- "Sum" aggregation function	
<p>"The value is aggregated" = not activated</p> <p>Calculation example: The calculation period is from 00:10 to 00:50. <math>1 + 2 + 3 + 4 = 10</math></p>	<p>"The value is aggregated" = activated</p> <p>Calculation example: The calculation period is from 00:10 to 00:50. <math>2 + 3 + 4 + 5 = 14</math></p>

What does "value is aggregated mean

- If the value is not aggregated, the values are continuously (actual values) transferred to MindSphere when the value changes. The transferred value is valid until the next value is available
- If the value is aggregated, the value represents a period, e.g. 15 minutes. The timestamp is always at the end of the period

# Data aggregation and KPI calculation

Performance Insight

# Performance Insight allows to aggregates incoming data

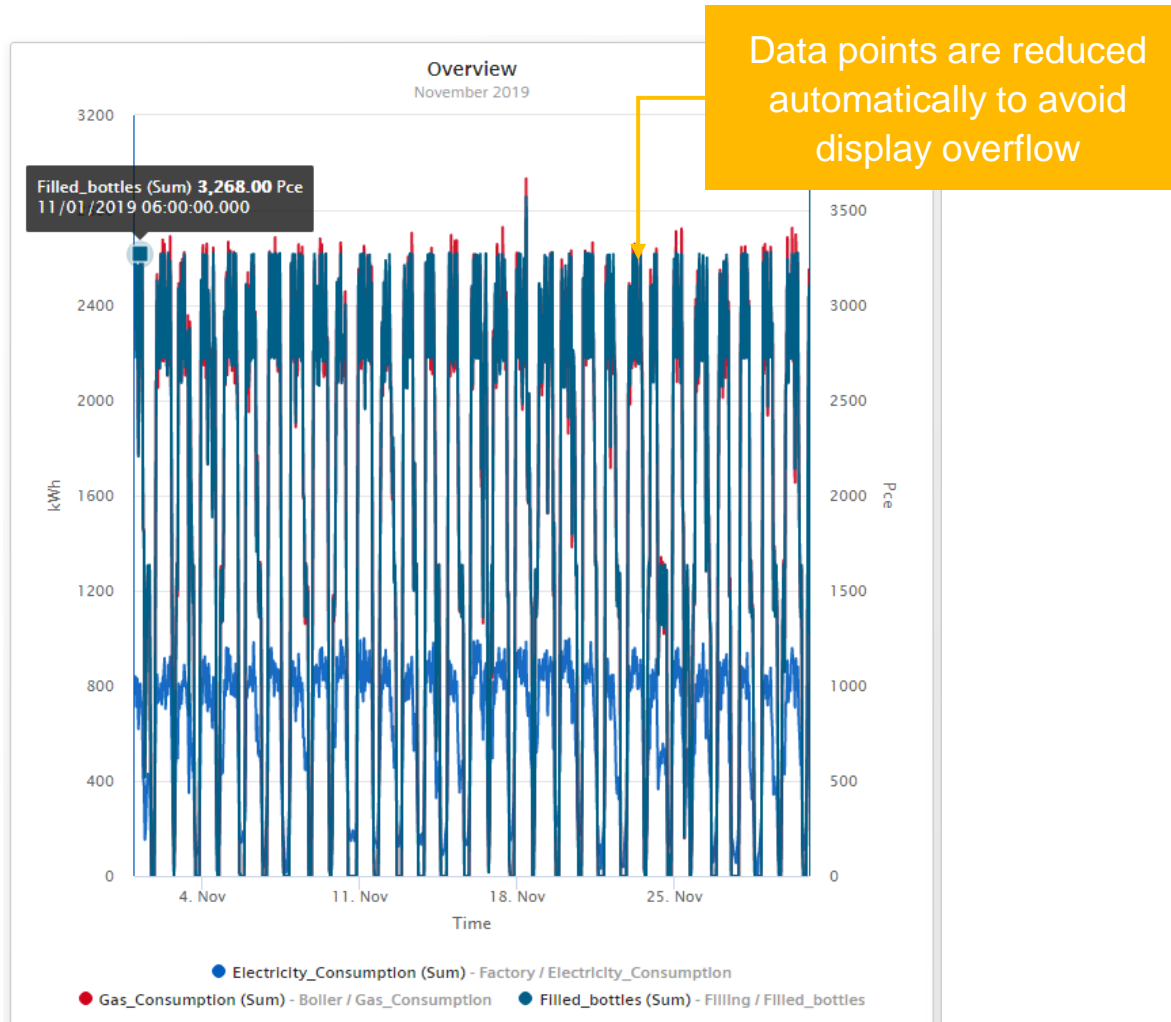
Algorithm	Description
Average	Calculates the time-weighted average value of the read values.
Min, Max	Minimum, Maximum value in time range
Sum	Summarize all values
Last	Last value in time range
Counter	Counts all positive value changes; Counter difference (last – first value) considering counter resets.
Timer	The Timer calculates the time interval in which the variable was not 0. Unit = milliseconds.
EnergyToPower	A consumption value can be converted into power. This aggregation function can only be selected in combination with the acquisition category consumption value (Energy) and Counter.
PowerToEnergy	Power can be converted into a consumption value. This aggregation function can only be selected in combination with the acquisition category power value (Power).
AmountToFlow	An amount (per hour) can be converted directly into a flow value. This aggregation function can only be selected in combination with the acquisition category amount value (Amount) and Counter.
FlowToAmount	A flow value (amount/h) can be converted directly into an amount value. This aggregation function can only be selected in combination with the acquisition category flow value (Flow).

## Aggregation algorithm:

The user can define the aggregation algorithm at each place where the variable can be selected.

- Widget configuration
- Asset media assignment
- KPI Instance configuration

## An algorithm for data reduction optimizes the displayed data



Example scenario:

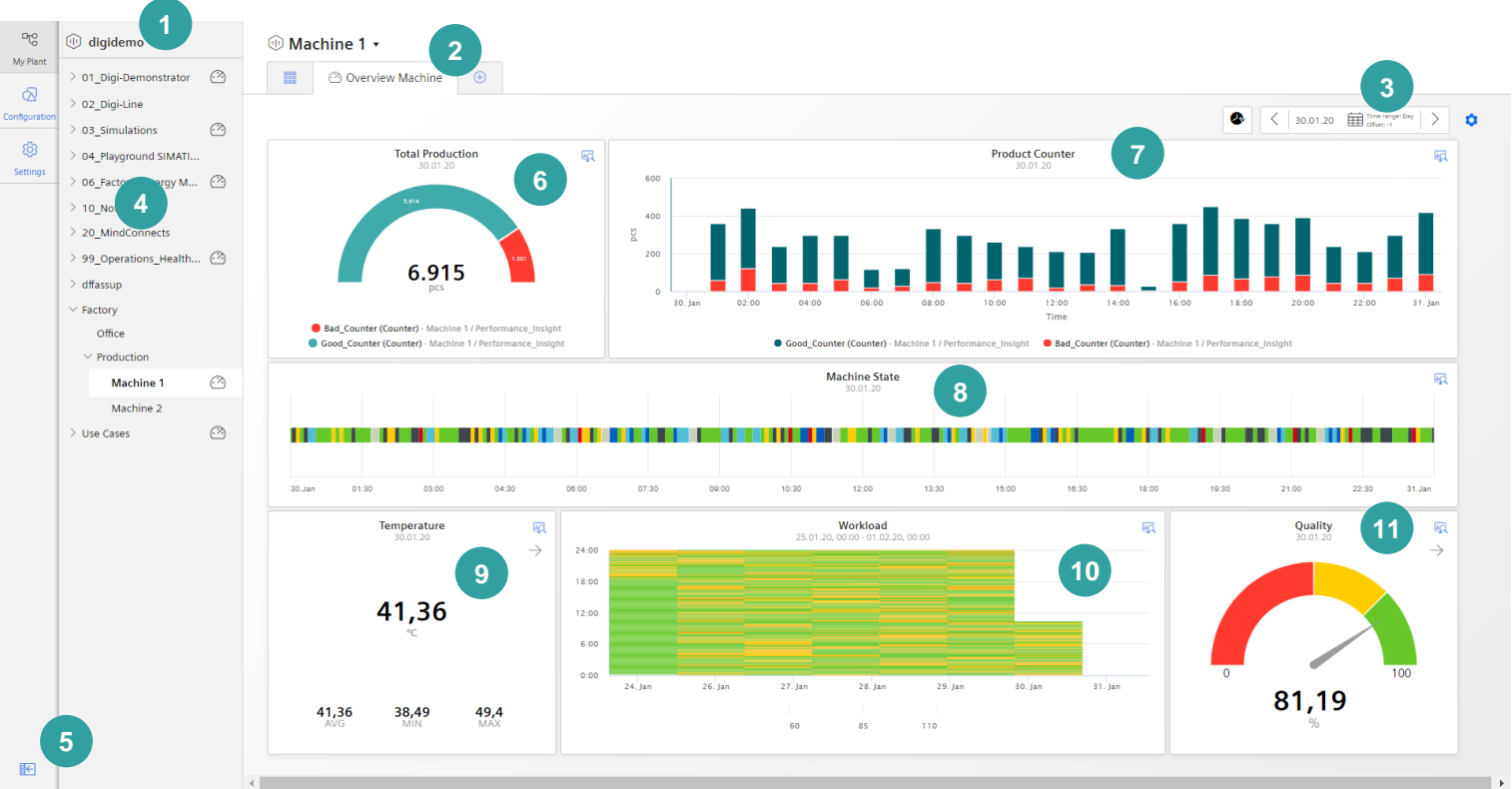
The user is interested in a large time range with high frequency data

- A variable value is stored every minute in MindSphere. (Values per day = 1440; Values per year = 512640 ~ half million).
- To reduce the amount of transferred data a reduction algorithm is applied which takes the available pixel into account.
- To reduce the amount of data the requested time range is divided into sections (number of pixels). From each of this sections the minimum and the maximum value is calculated and transferred

# | Dashboards and widgets

Performance Insight

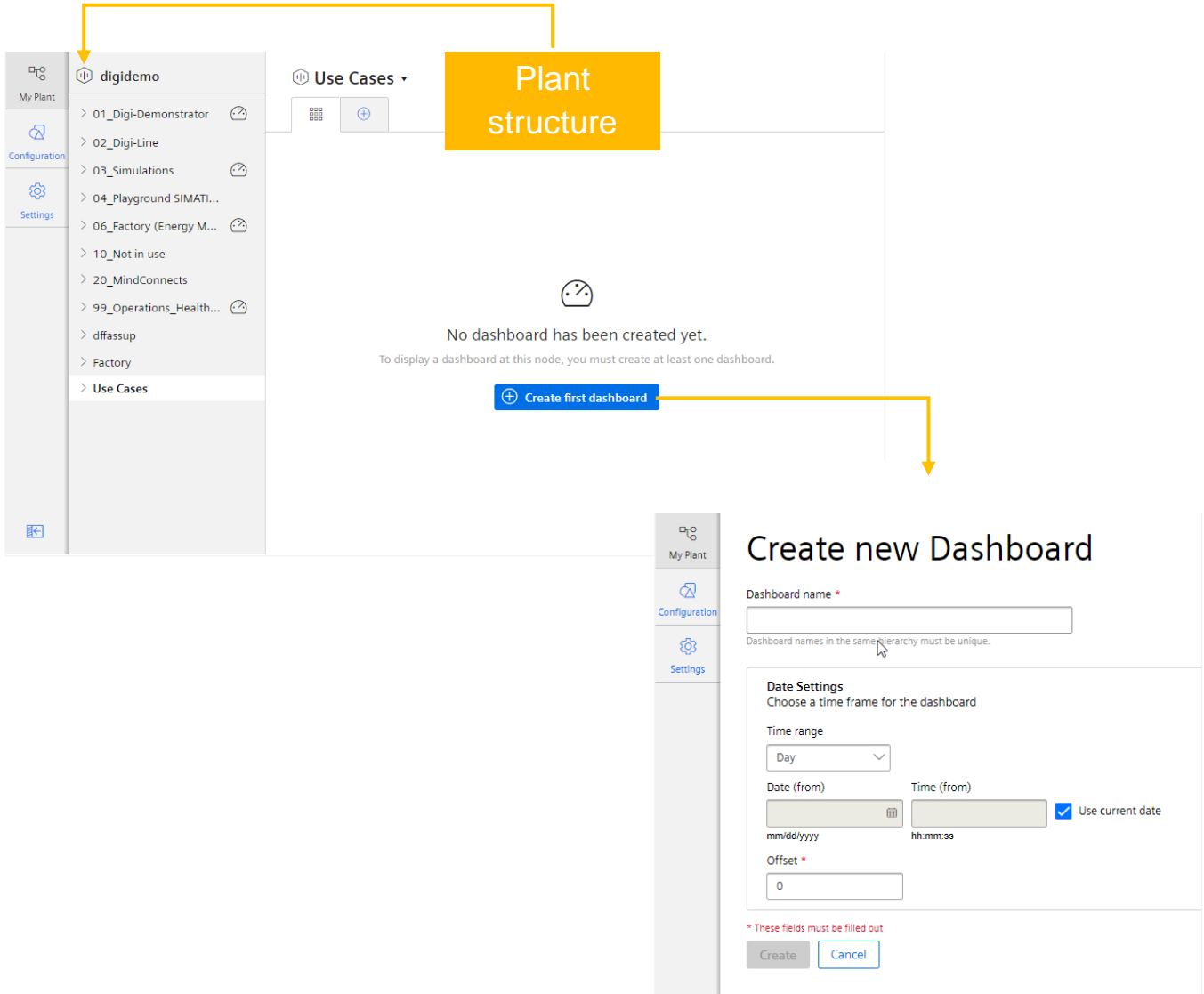
# Dashboard Overview



- 01: Asset model root
- 02: Dashboard name
- 03: Time Picker
- 04: Asset Structure
- 05: Show/Hide Asset Structure
- 06: Pie Widget
- 07: Chart Widget
- 08: Gantt Widget
- 09: Value Widget
- 10: Heatmap Widget
- 11: Gauge Widget



# Adding a new dashboard in Performance Insight



The plant structure is defined by the MindSphere asset model. For each asset you can define up to 5 dashboards

- Creating a dashboard:
- Click the button “Create first dashboard” or click the + in the tab.
- Define the name of the dashboard.
- Define the default time range for widgets with the time picker.
- With the Offset you can move the time range to the past.

## Show data in individual time intervals with time picker

Time picker configuration showing two calendar views (From and To) for October 2019. The date 29 is selected in both. The Range dropdown menu is open, showing options: User-defined (checked), Day, Week, Month, Year, The last 3 hours, The last 7 days, The last 14 days, and The last 30 days. The dialog also includes OK and Cancel buttons.

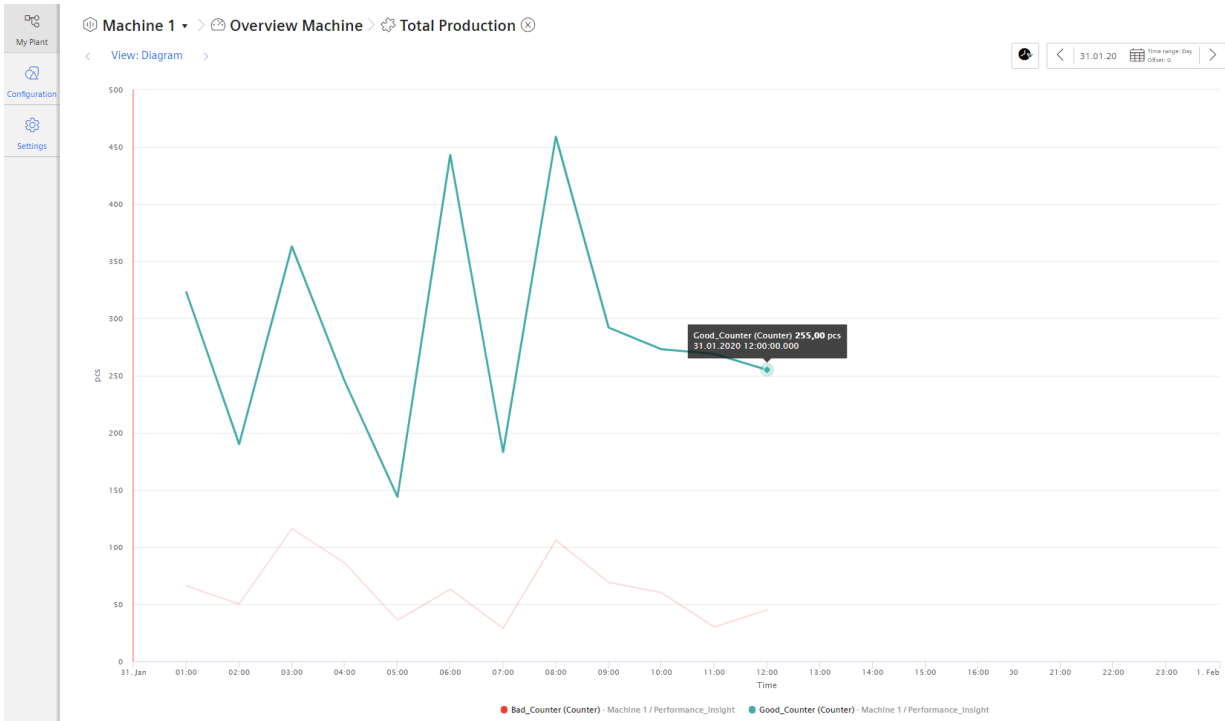
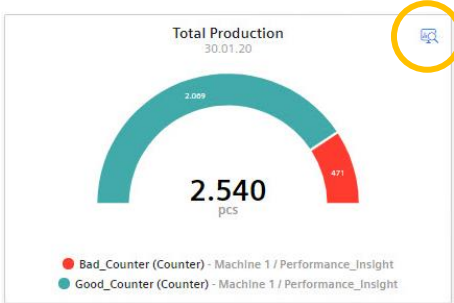
Time picker for showing the dashboard in the desired time range

The initial time picker configuration can be defined in the dashboard configuration

Supported time ranges:

- User-defined: the begin & end date incl. time can be defined
- Day: 00:00 – 00:00
- Week: Monday – Sunday
- Month: 1st – last day of month
- Year: January – December
- The last 3 hours, last 7 days, last 14 days, last 30 days

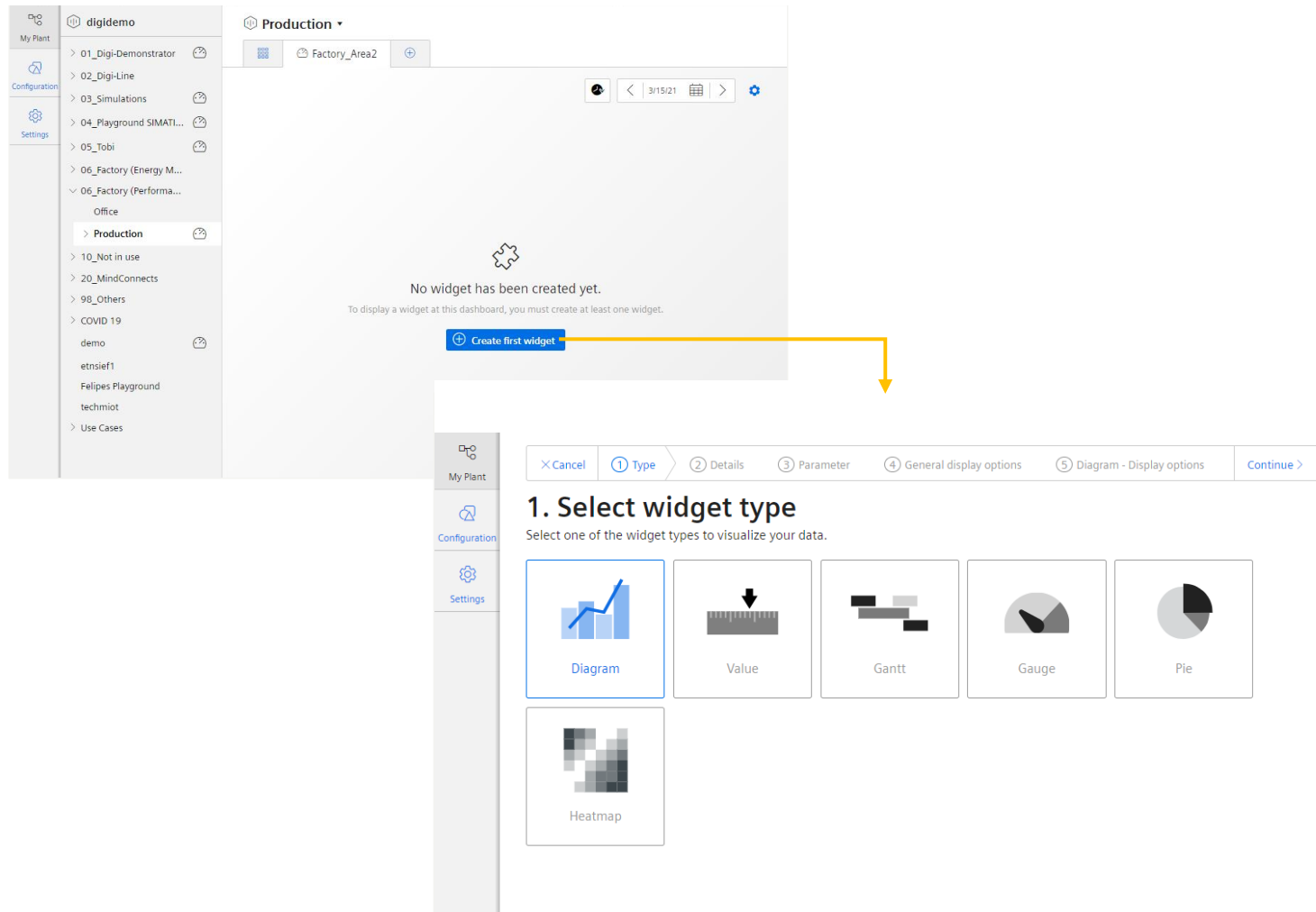
# Widgets have a detail view that includes historical data



Detail view opens data in full screen with for detailed analysis capabilities and historical data

# Add Widgets to the dashboard

## 1. Select Widget Type



Create the widget:

1. Select the widget Type
2. Define the details like name and time picker behavior
3. Select the parameter which should be displayed
4. Define the parameter specific settings like limits, color, decimal places or an alternative name
5. Define the widget specific settings like line type, visibility or if the lines shall be stacked

# Add Widgets to the dashboard

## 2. Define time settings

The screenshot shows a web interface for configuring a widget. At the top, there is a breadcrumb navigation bar with five steps: 1. Type, 2. Details (active), 3. Parameter, 4. General display options, and 5. Diagram - Display options. Below this, the main heading is '2. Define details' with a sub-heading 'Enter a suitable widget name and complete the remaining information.' The form contains three main sections: 1. 'Widget name \*' with a text input field containing 'Overview'. 2. 'Date settings' with a checked checkbox 'Use the date settings from the dashboard.' 3. 'Interval for the time range' with a 'Calculation period \*' section containing a text input '1' and a dropdown menu 'Hour(s)'. A red asterisk note at the bottom states '\* These fields must be filled out.'

### Step 2: Define time settings

Enter a unique name for the widget

Define the date/time settings:

- Use the date settings from the dashboard
- Dedicated date & time definition by selecting the time range and optionally an Offset.

The interval for the time range is used for the KPI calculation or the Variable aggregation

# Add Widgets to the dashboard

## 3. Select the parameter

My Plant

Configuration

Settings

Cancel 1 Type 2 Details 3 Parameter 4 General display options 5 Diagram - Display options < Back Continue >

Create new widget > Diagram > Overview

### 3. Select parameter

Select KPI instances or tags.

ID	Name	Path	Type	Aggregation	Action
01	Gas_Consumption (S... Gas_Consumption	digidemo / 06_Factory (Energy Manager) / Office	VAR	Sum	⊗
02	Water_Consumption (... Water_Consumption	digidemo / 06_Factory (Energy Manager) / Office	VAR	Sum	⊗
03	Electricity_Consumpti... Electricity_Consumption	digidemo / 06_Factory (Energy Manager) / Office	VAR	Sum	⊗

Select an additional parameter.

New KPI instance

If no matching KPI instance exists, you can create a new KPI instance.

+ New KPI instance

Select parameter

All VAR KPI Asset

digidemo > 06\_Factory (Energy Manage... > Office

- VAR Gas\_Consumption  
Gas\_Consumption
- VAR Water\_Consumption  
Water\_Consumption
- VAR Electricity\_Consumption  
Electricity\_Consumption

3 selected parameter(s) Choose Cancel

### Step 3: Select parameter

The user can select one or several variables or KPI instances based on the widget type

#### Variable

- Available MindSphere variables can be selected
- For the variable the user can select the aggregation algorithm. NONE means displaying the raw data which is only applicable in the chart

#### KPI Instances

- If there is no matching KPI Instance a new KPI Instance can be created

# Add Widgets to the dashboard

## 4. Define the display options

The screenshot shows the configuration interface for a widget. At the top, there is a navigation bar with steps: 1 Type, 2 Details, 3 Parameter, 4 General display options (current step), and 5 Diagram - Display options. Below the navigation bar, the title is "4. Define general display options" with the subtitle "Define the general display options for the selected parameters." The main configuration area is for parameter "01 Gas" (Gas\_Consumption) with a path of "digidemo / 06\_Factory (Energy Manager) / ...". The configuration is divided into three sections: "Alternative label" (input field with "Gas"), "Number of decimal places" (input field with "2"), and "Color" (color selection). Below these is the "Limits" section, which is optional and used for general restrictions. It features four input fields for "Low limit alert" (0), "Low limit warning" (0), "High limit warning" (1200), and "High limit alert" (1400). Below the input fields is a horizontal bar with five colored segments: red (Alert), yellow (Warning), white (OK), yellow (Warning), and red (Alert). A yellow callout box with the text "Limits help to identify deviations" points to the limit input fields. Below the main configuration area, there are two other parameters listed: "02 Water\_Consumption" and "03 Electricity\_Consumption".

Step 4:

The User can define general settings for each parameter in the Widget:

- Set an alternative label which is used in e.g. the legend
- Set the number of decimal places
- Set the color of the graphs
- Set the lower and higher limits



# Add Widgets to the dashboard

## 5. Define display options

The screenshot shows the configuration interface for a widget. The breadcrumb trail is: 1 Cancel > 2 Type > 3 Details > 4 Parameter > 5 Diagram - Display options > Back Finish. The main heading is "5. Diagram - Define display options" with the subtext "Define the widget specific display options." A yellow callout box labeled "Display options for parameters" points to a dropdown menu for "Type" which includes options: Line, Spline, Area, Bar, and Scatter. Below this, there are checkboxes for "Visible" (checked) and "Stacked". A second yellow callout box labeled "Define multiple y-axis" points to a section titled "Y-axis (2)" which contains two y-axis configuration panels. The first panel is for "kWh" and the second for "m³". Each panel includes fields for "Name", "Low limit", and "High limit", and a list of parameters to assign to the axis. The "kWh" axis has parameters "VAR Gas" and "VAR Electricity\_Consumption (Sum)". The "m³" axis has parameter "VAR Water\_Consumption (Sum)". A "New Y-axis" button is at the bottom.

### Step 5:

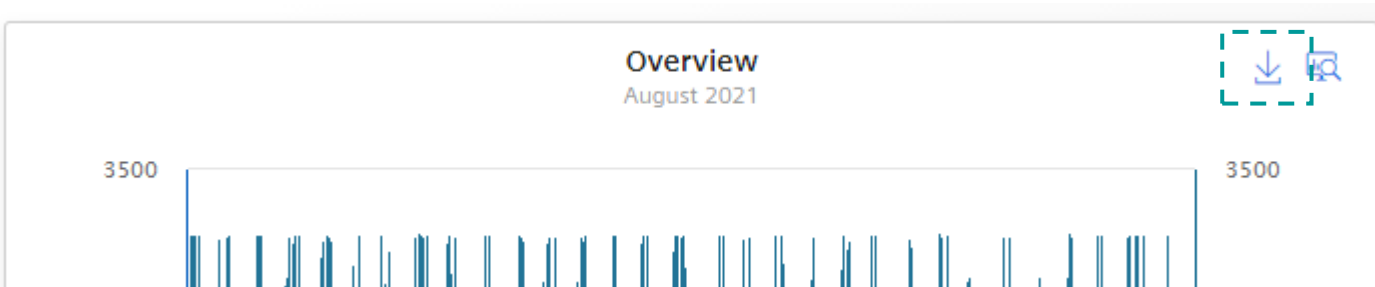
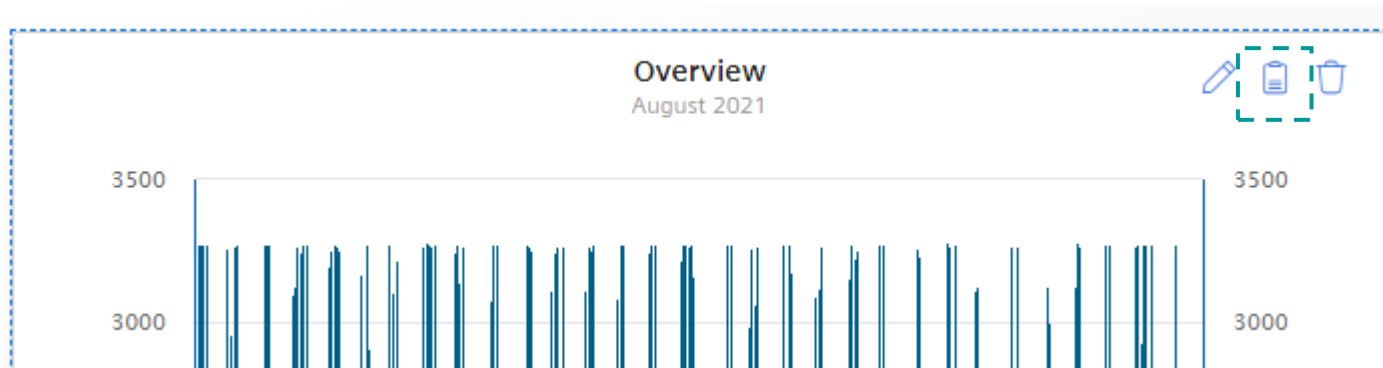
The User can set the display option for each parameter in the Widget:

- Line Type (Line, Spline, Area, Bar, Scatter)
- Visibility
- Stacked

The user can define up to 5 y-axis and can configure the scaling option

- Autoscaling (two blank fields)
- 0 Point scaling (Lower Limit = 0)
- Fix Range (e.g lower limit, 10 upper limit 100)

## Copy a widget or export data



### Copy a widget

- In the Dashboard edit mode, the user can copy a widget and paste it. After pasting the user can define a new name or change the analysis period

### Export data to a csv file

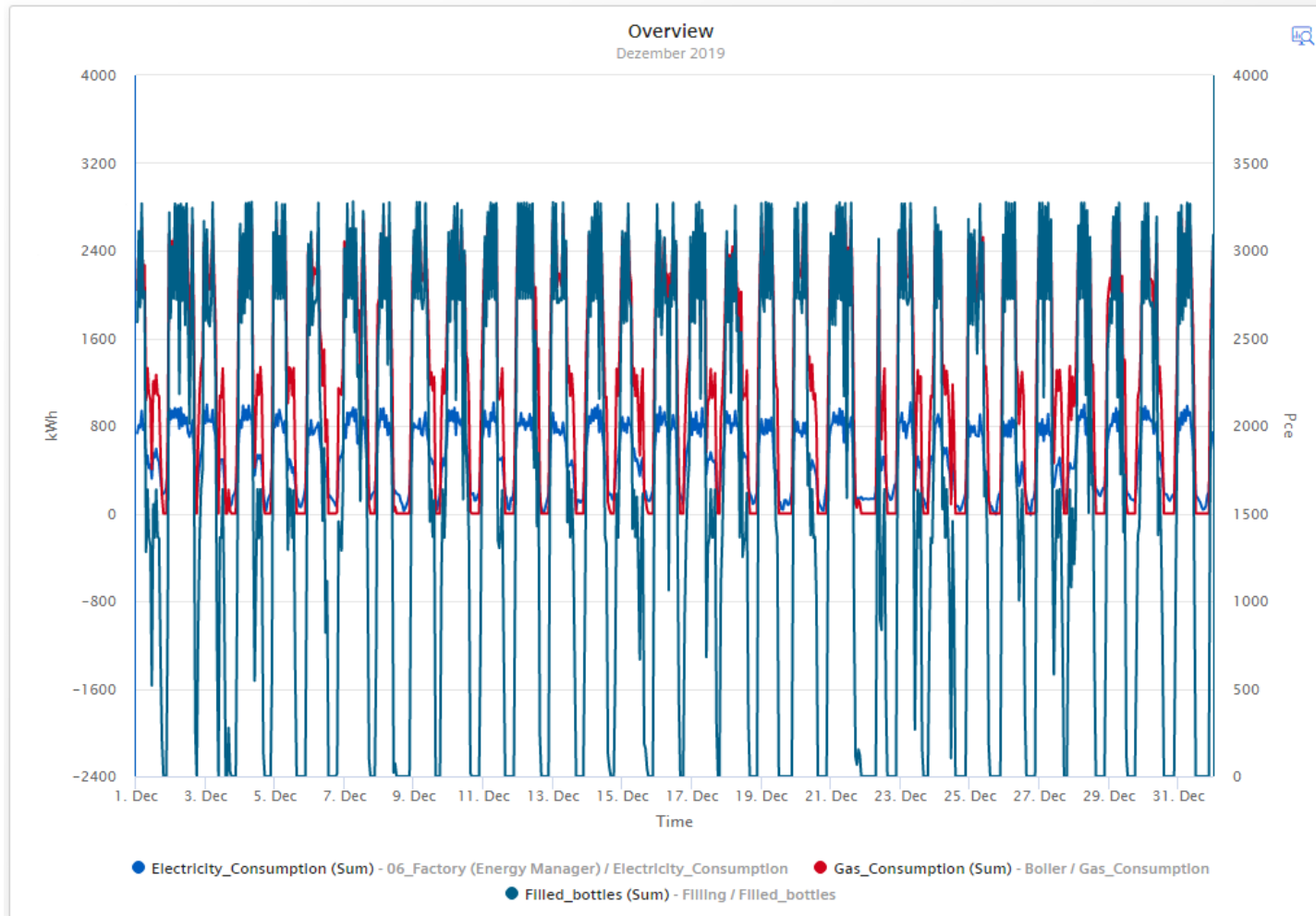
- The user can export the widget data to a csv file
- In the csv file, the value with both time stamps (local time and UTC) are available

# | Widget types

Performance Insight

# Widget types

## Diagram - Chart widget



User can perform data analysis by using the functions as follows:

- Changing time range, Using the zoom functionality
- Hide or unhide a graph; show the limits for an individual parameter
- Use the tooltip for the exact value
- Using up to 10 variables and up to 5 Y-Axis
- The following detailed views are available
  - Chart displaying detailed data
  - Histogram including statistic values
  - Regression analysis

## Widget types

### Value widget



User overview about the KPI or aggregated variable:

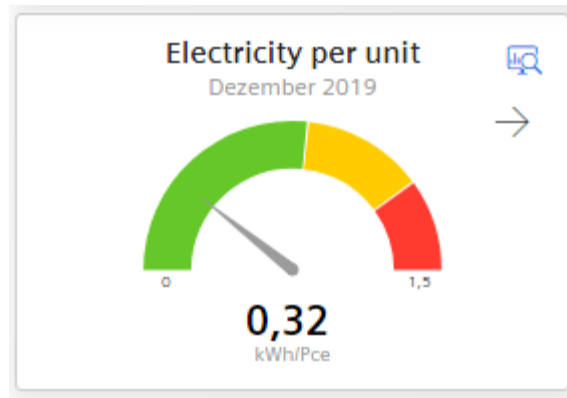
- Display the statistic (Note: The statistic is based on the KPI or variable aggregation based on the interval for the time range )
- The arrow represent the trend of the displayed value compared to the previous period

The following detailed views are available

- Chart displaying detailed data
- Histogram including statistic values

## Widget types

### Gauge widget



With the Gauge Widget the user gets an overview about higher and upper limits of values

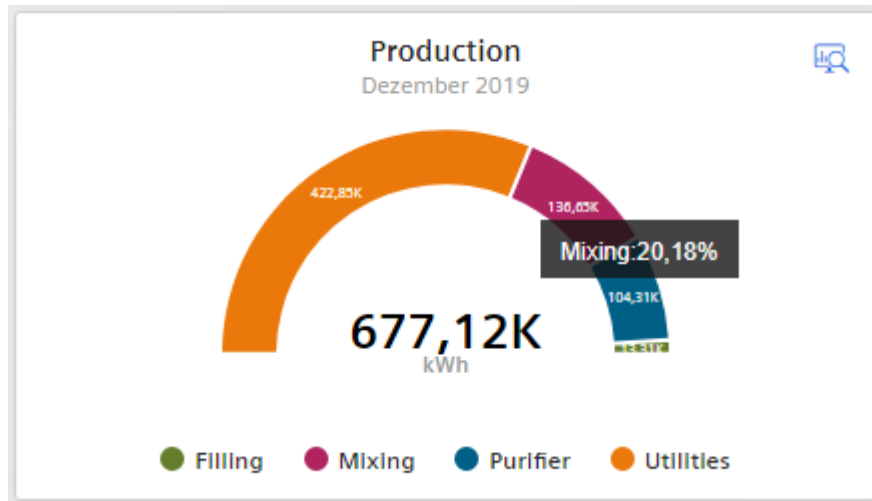
- The user can define the limits for the sections whereby the limits for the parameter are used.
- The arrow represent the trend of the displayed value compared to the previous period

The following detailed views are available

- Chart displaying detailed data
- Histogram including statistic values

## Widget types

### Pie widget



With the Pie Widget the user gets an overview about the distribution of quantities

- With a click on the section the section is highlighted and user gets the corresponding value

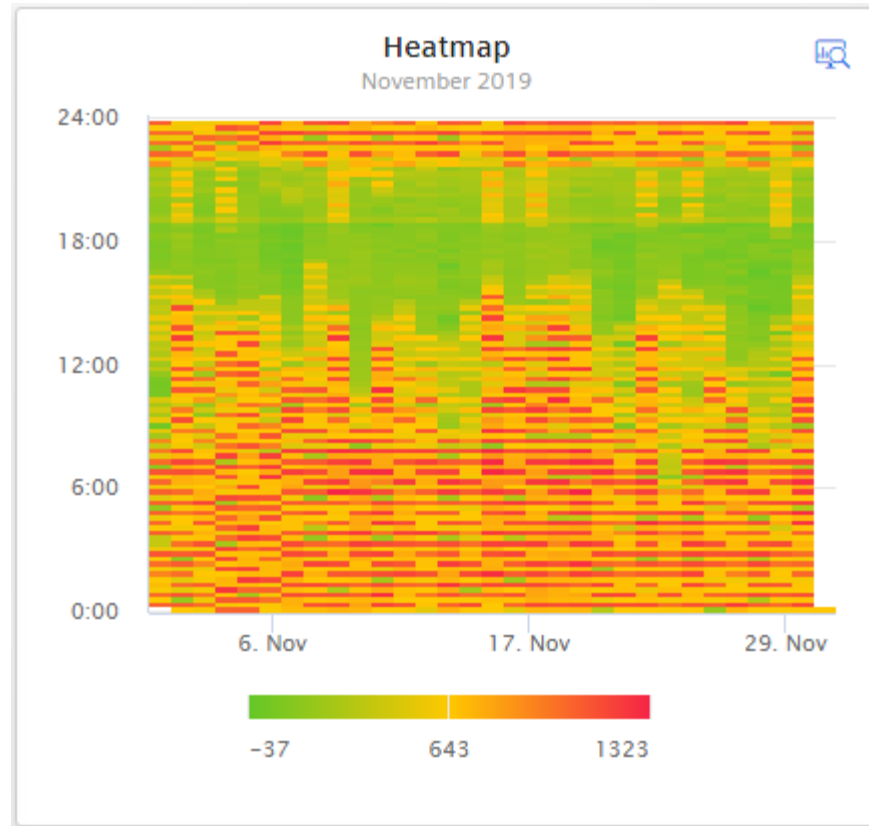
The following detailed views are available

- Chart displaying detailed data
- Histogram including statistic values
- Regression analysis



## Widget types

### Heatmap



With the Heatmap Widget the user gets an overview about when (time of the day) the peaks appear. The value is represented by a color

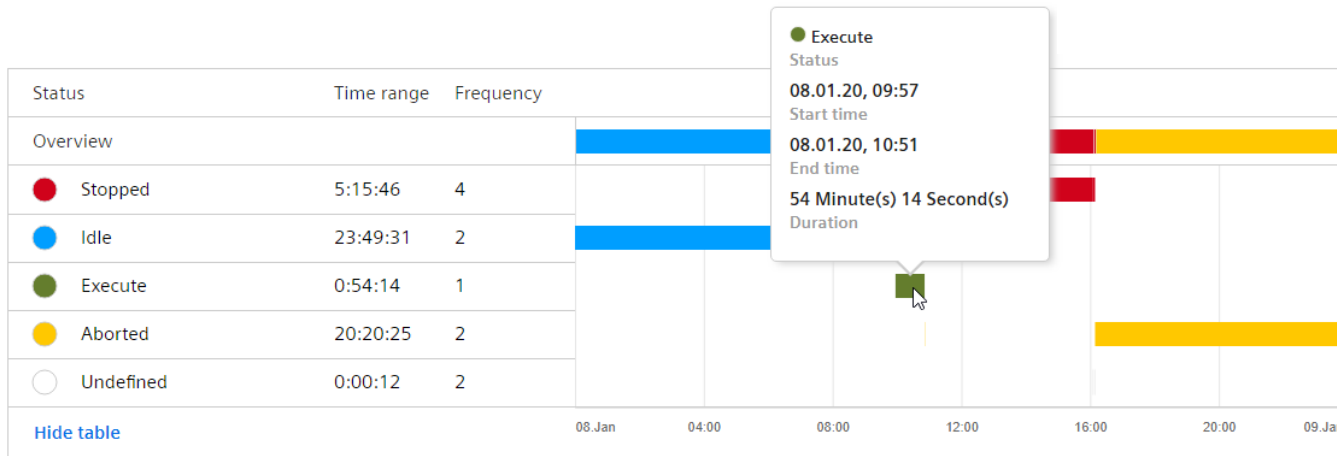
- Zoom in to get details
- A tooltip provides the exact value

The following detailed view is available

- Heatmap
- Chart displaying detailed data
- Histogram including statistic values

# Widget types

## Gantt chart



With the Gantt Chart Widget, the user gets an overview about the machine state

- User can change the time range
- Use the tooltip for the exact values
- Use the Advanced Gantt View to see in detail, how often and how long the machine was in the different defined machine states
- Use “Show table” to show the time range and frequency

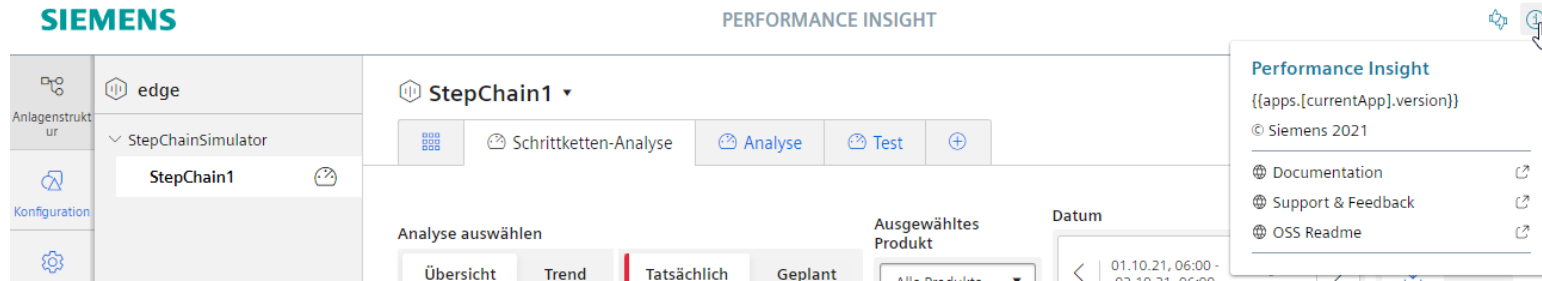
Note: For the first and the last state period, the actual start and end time is used. Also in cases if this is out of the observation period.

This is the reason why the sum of all time ranges can be greater than the observation period.

# | App OS bar

Performance Insight

# OS bar








Use the OS bar to access information about the app

- Version Information
- Copyright
- Documentation
- Support & Feedback
- Product sheet & OSS Readme



# | Ordering

## Machine Insight Order information

01		<b>Industrial Edge Hub Access</b> Get Initial Access to IE Hub	6ES7823-0EE00-4AX0	<a href="#">SDEX</a>
02		<b>Industrial Edge Devices</b>	Device specific	Device specific
03		<b>Industrial Edge Management Device Licence</b> Per device per year	6ES7823-0EE00-4AY0	<a href="#">SDEX</a>
04		<b>Performance Insight</b> base subscription incl. 3 assets	6AV2170-0JA10-0AA0	<a href="#">SDEX</a>
05		<b>Performance Insight 1</b> additional asset	6AV2170-0JA11-0AA0	<a href="#">SDEX</a>

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