PQSCADA Sapphire user manual

Version 1.0.0.xx

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1. Introduction

In today's world, power distribution networks deploy an array of protection equipment, power quality analyzers, revenue meters and other monitoring equipment to ensure high quality and reliable power flow as well as energy efficiency. Therefore, the ability to analyze synchronized data from a variety of data sources within one system is essential in order to meet today's highest level of reliability, quality and energy efficiency.

PQSCADA Sapphire's multi-vendor support sets new standards in power monitoring management software. This unique feature enables the acquisition and analysis of all field generated data on a central software solution, regardless of IED manufacturer. PQSCADA Sapphire is an expandable platform - further capabilities can be easily added as add-ons or it can be developed independently through the use of API to meet your custom needs and applications.

PQSCADA can be installed in a single node system and also fits a distributed client/server structure.

Key Features

- ### Multi-Vendor Support

  PQSCADA Sapphire acquires, processes and stores recorded data from any recording device through a variety of communication protocols and file formats. PQSCADA Sapphire will automatically calculate and store ~5,000 power parameters including individual harmonics from acquired waveform signals.

- ### Simplifies IT Environment

  PQSCADA Sapphire simplifies your IT environment by eliminating the need to purchase, install and train users, and maintain multiple systems.

- ### No Missed Events

  PQSCADA Sapphire has sophisticated event detection capabilities enabling the devices to record only raw data. PQSCADA Sapphire will find events according to user defined thresholds during post-processing.

- ### Secured Access

  PQSCADA Sapphire data can be reached from any location using standard secured, firewall friendly protocols.

- Get Notifications

  PQSCADA Sapphire preconfigured scenarios enable to send emails, SMS and Push notifications to users.

- Easily Fix Misconfigurations

  PQSCADA Sapphire allows to correct device installation and configuration errors by recalculating recorded data. Reverse Polarity, swap phases, connection type, VT/CT ratio and time inaccuracy can be corrected easily in past and future measurements.

- Reporting & Compliance

  PQSCADA Sapphire offers a comprehensive reporting and compliance engine allowing the design of report templates and compliance policies according to various standards or custom requirements. Reports can be generated manually or on a daily, weekly, monthly or yearly schedule. Reports can also be triggered by compliance policy violation or by event occurrence.

- See the Whole Picture

  PQSCADA Sapphire offers a unique set of charts and reports empowering your ability to plan, control and make data-driven decisions. Get an overview of the electrical network and measuring devices over a geographic map.

- Control

  PQSCADA Sapphire allows to upgrade and/or configure deployed devices within the network. The tasks automatically update the devices with any Firmware/Configuration files.

- Synchronized Monitoring

  A unique time synchronization algorithm assures that logged data from multiple units is synchronized and displayed on the same time scale with typical 0.5µs resolution. Each event on the grid is accurately analyzed for precise root cause analysis, behavior propagation and, it can be traced to its source.

- BlackBox Devices

  PQSCADA SAPPHIRE collects compressed recorded raw waveform data using ELSPEC PQZ patented protocol. Raw data is processed, stored and retrieved upon demand as continuous information. This ensures getting all the information needed in order to keep the network fully functioning and safe.

2. License selection guide

The table below shows specifications and benefits according to each plan. Choose the plan that best fits your needs.

File protocol	Express	Professional	Enterprise
PQZIP	Import/Export	Import/Export	Import/Export
PQZ	Import/Export	Import/Export	Import/Export
COMTRADE	Import/Export	Import/Export	Import/Export
PQDIF	Import/Export	Import/Export	Import/Export
Excel	Export	Export	Export
CSV	Export	Export	Export
Supported protocols			
PQZ	N/A	Yes	Yes
MODBUS	N/A	Per license	Per license
IEC 61850	N/A	Per license	Per license
Investigation			
Measurement points/investigation	2	Unlimited	Unlimited
Trend Chart	Yes	Yes	Yes
Grid Chart	Yes	Yes	Yes
Summary Chart	Yes	Yes	Yes
Spectrum Chart	Yes	Yes	Yes
Statistics Chart	Yes	Yes	Yes
Event Chart	Yes	Yes	Yes
Scatter Event Chart	Yes	Yes	Yes
Scatter parameters chart	N/A	Yes	Yes
Cyclic Histogram	N/A	Yes	Yes
Phasors	N/A	Yes	Yes
Tasks			
Schedule task	N/A	N/A	Yes
Triggered by event	N/A	N/A	Yes
Manual	Yes	Yes	Yes
Reports			
Compliance report	Yes	Yes	Yes
NRS 048	Optional	Optional	Optional
GOST	Optional	Optional	Optional
Prodist	Optional	Optional	Optional
Fault location	N/A	Per license	Per license
Components			
Auto fetching	N/A	Yes	Yes
Number of Auto Fetching components Elspec brand	N/A	Per license	Per license
Number of Auto Fetching components other brand	N/A	Per license	Per license
Server			
Concurrent users	1	1	Per license
Security	N/A	N/A	Yes
System Service	N/A	N/A	Yes
Remote access	N/A	N/A	Yes
Servers hierarchy	N/A	N/A	Yes

Data Base			
Data Base size	3 months of continuous recording	1 year of continuous recording	Unlimited
SQL Light	Yes	Yes	Yes
MS SQL server	N/A	N/A	Yes
Client module and features			
Overview	N/A	Per license	Per license
Tags	N/A	Per license	Per license
Notifications			
Emails	N/A	N/A	Yes
SMS	N/A	N/A	Yes
Calculated parameters			
RMS	Yes	Yes	Yes
THD	Yes	Yes	Yes
Unbalance	Yes	Yes	Yes
PST	Yes	Yes	Yes
PLT	Yes	Yes	Yes
Active Power	Yes	Yes	Yes
Reactive power	Yes	Yes	Yes
Apparent Power	Yes	Yes	Yes
Power factor	Yes	Yes	Yes
Energy	Yes	Yes	Yes
Waveform	Yes	Yes	Yes
Under deviation	Yes	Yes	Yes
Over deviation	Yes	Yes	Yes
IL 15 Min	Yes	Yes	Yes
IL 30 Min	Yes	Yes	Yes
TDD 15 Min	Yes	Yes	Yes
TDD 30 Min	Yes	Yes	Yes
TIF	Yes	Yes	Yes
Harmonics	up to 50	Yes	Yes
Harmonics %	up to 50	Yes	Yes
Inter-harmonics	Yes	Yes	Yes
Spectrum	Amplitude	Amplitude + Angle	Amplitude + Angle
RMS Fundamental	N/A	Yes	Yes
THD Even	N/A	Yes	Yes
THD Odd	N/A	Yes	Yes
Fundamental Waveform	N/A	Yes	Yes
Harmonics Waveform	N/A	Yes	Yes
Active Power Harmonics	N/A	Yes	Yes
Reactive Power Harmonics	N/A	Yes	Yes
Apparent Power Harmonics	N/A	Yes	Yes
CBC Frequency	N/A	Yes	Yes
HRMS	N/A	Yes	Yes
Crest Factor	N/A	Yes	Yes
K Factor	N/A	Yes	Yes
Positive Sequence	N/A	Yes	Yes
Negative Sequence	N/A	Yes	Yes
Zero Sequence	N/A	Yes	Yes
Cyclic Histogram	N/A	Yes	Yes

3. Getting started

3.1 Installation

Download

Download PQSCADA Sapphire set-up file from Elspec *website*.

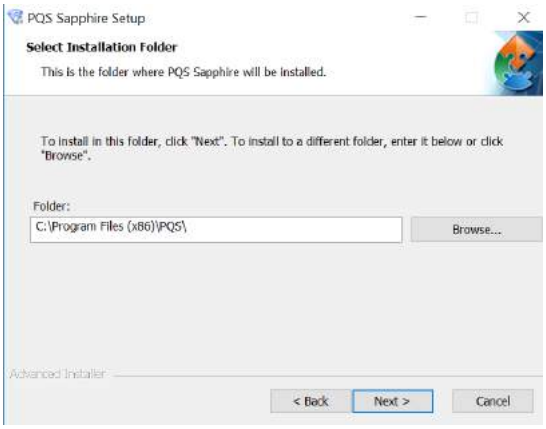
Double click on *Elspec Sapphire Setup v1.x.x.xx* file to run the setup wizard.

Welcome page

Click *Next* to start the installation.

Installation folder

Select the installation folder and click *Next*.

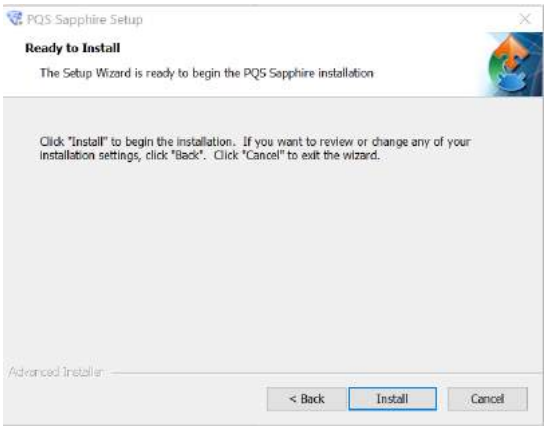


License agreement

Once the license agreement is read and approved, select *I accept the terms in the license agreement* option and click *Next*.

Install

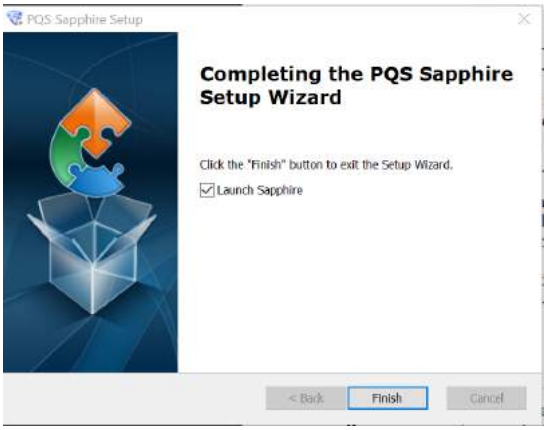
Click *Install* to start the installation process.



Wait while the program is installing

Finish

Check the *Launch sapphire* box and click *Finish* to start working.



3.2 License Activation

3.2.1 On-line activation

To run *On-line* activation, Make sure that your computer is connected to the internet.

Launch *Upgrade License* wizard by clicking the *Setup menu* and selecting *Install/Upgrade* license.

Activation for enterprise edition must run on the server machine.

Step 1: Select License Activation Mode

On the *License Activation Mode*, select On-line by downloading the license.

Click *Next* to go to the *License Key* page.

Step 2: License Key

On the *License Key* page, enter your license ID in the field provided. It is recommended to copy and paste the ID to avoid problems distinguishing letters and numbers.

Click *Next* to run the activation.

On a successful license activation, click *Close*.

Step 3 (enterprise edition only): service installation

With Enterprise edition license ID, PQSCADA Sapphire service installation wizard will open automatically. On the PQSCADA Sapphire service installation wizard, do the following:

1. On the welcome page Click *Next*
2. Read and agree to the End-User license agreement
3. Select the installation folder and click *Next*.
4. Click *Install* to start the installation process. Wait while the program installs.
5. Click *Finish* to close the installation wizard.

Step 4 (enterprise edition only: create Instance DB)

1. Open PQSCADA Sapphire
2. On the System module, right click the server Instance and select create server.
3. On the Database page, configure the following options:

   DB Type – SELECT the database type in which PQSCADA Sapphire will store the data. PQSCADA Sapphire supports two DB types:

   - SQLite.
   - MS SQL server (MSSQL).

   If MSSQL was selected, configure the following options:

   - DB URL – enter the DB URL, or click *Browse*, to search for SQL service in your network.
   - DB user name: enter you DB user name.
   - Password: enter your DB password.
   - Check the *save as default* to keep these settings as default. You can use *set default*, to fill in the default settings in the future.
   - Click *Test*, to verify the connection with the DB.

4. Click *add* to close the wizard.

3.2.2 Off-line activation

Launch *Upgrade License* wizard by clicking *on the Setup menu then select Install/Upgrade* license.

Activation for enterprise edition must run on the server machine.

Step 1: Select License Activation Mode

On the *License Activation Mode*, select *by email (No internet connection)*.

Click *Next* to go to the *License Key* page.

Step 2: License Key

On the *License Key*, enter your license ID in the field provided. It is recommended that you copy and paste your ID to avoid problems distinguishing letters and numbers.

Click *Next* to go to *Create License Request File*.

Step 3: Create License Request File

On the *Create License Request Files* page, select one of the following:

- *Save* – To open Windows explorer to select a place to store the *license request file*.
- *Send By Email* – To open your default email client to send the *license request file*.

Click *Finish* to close the wizard.

Step 4: create license file

1. Copy the license request file to computer with internet connection.
2. Browse to Elspec *licensing website*.
3. On Elspec licensing website, click *ACTIVATE LICENSE* on the top right corner of the screen.
4. Drop the license request file into the designated window.
5. Download the license file to your local computer.

Step 5: activate the license file

Copy the license file into the PQSCADA Sapphire computer.

Launch *Upgrade License* wizard by clicking the *Setup menu* and select *Install/Upgrade* license.

On the *License Activation Mode*, do the following:

1. Select *By email (No internet connection)*.
2. Click *I have a license file* to open Windows explorer and select the license file.

Click *Close*.

Step 6 (enterprise edition only): service installation

With Enterprise edition license, PQSCADA Sapphire service installation wizard will open automatically. On the PQSCADA Sapphire service installation wizard, do the following:

1. Click *Next* on the welcome page
2. Select the installation folder and then click *Next*.
3. Click *Install* to start the installation process. Wait while the program is installing.
4. Click *Finish* to close the installation wizard.

Step 7 (enterprise edition only): create Instance DB

1. Open PQSCADA Sapphire
2. On the System module, right click the server Instance and select create DB.
3. On the Database page, configure the following options:

   DB Type – SELECT the database type in which PQSCADA Sapphire will store your data. PQSCADA Sapphire supports two DB types:

   - SQLite.
   - MS SQL server (MSSQL).

   If MSSQL was selected, configure the following options:

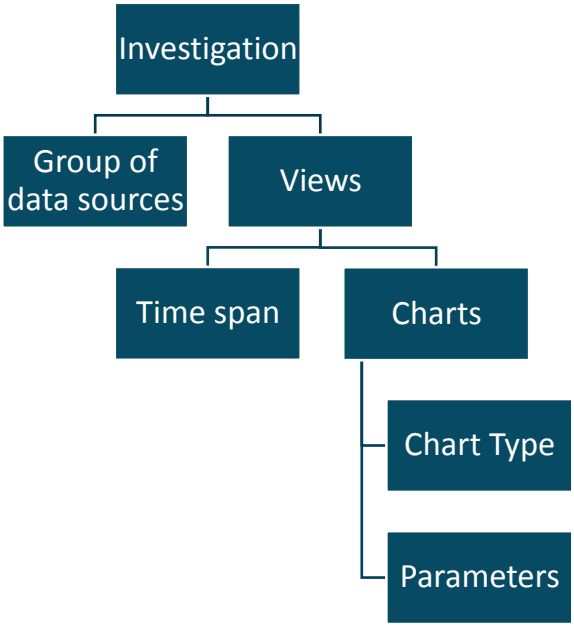
   - DB URL – enter the DB URL, or click the *Browse button*, to search for SQL service in your network.
   - DB user name: enter you DB user name.
   - Password: enter your DB password.
   - Check the *save as default checkbox* to keep these settings as default. You can use the *set default button*, next time to fill in the default settings.
   - Click the *Test button*, to verify the connection with the DB.
4. Click *add* to close the wizard.

4. Investigation Module

The Investigation module is used to perform power quality analysis based on one or more measuring points (components). It provides a variety of powerful tools to assist in the data analysis process.

To fully understand how to operate this module, it is important to know how items on the screen are tied together and how to manipulate them.

The investigation module consists of four objects: *Investigation*, *View*, *Chart* and *Parameter*, in the following hierarchy:



Investigation:

The *Investigation* is at the top level of the module's hierarchy. Each Investigation contains a group of data sources (components) and one or multiple Views.

View:

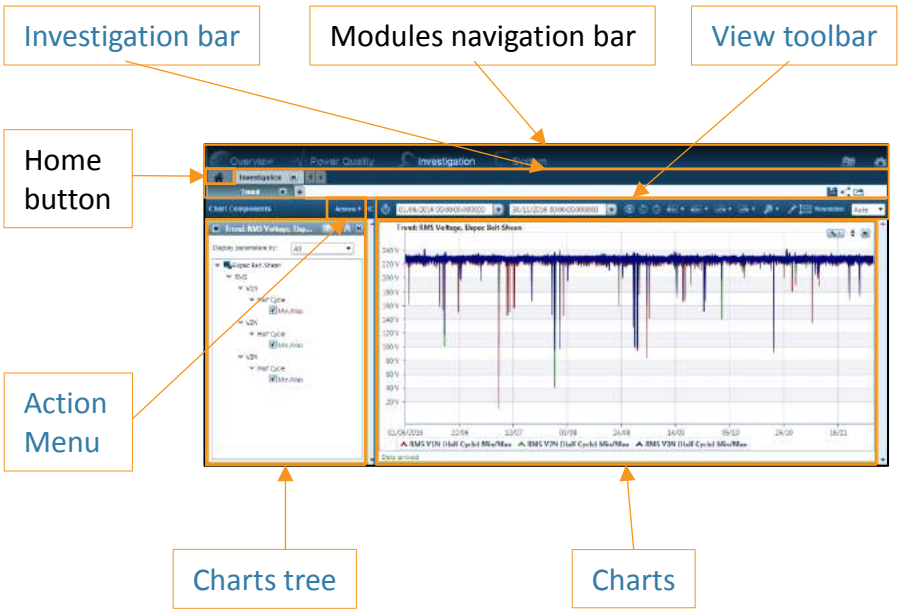
Each View contains a single time interval and one or multiple charts.

Chart:

Each chart contains at least one parameter. PQSCADA Sapphire supports thousands of parameters in 10 different chart types.

Parameter:

A numerical or other measurable factor that can be plotted in the selected chart.



The *Investigation module* screen is divided into two main sections: the left section displays the *Charts tree*, and the right section displays charts - in the selected view. These sections are divided by the splitter control (a vertical line between the sections).

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device. The *Charts tree* section can be hide by clicking *Hide parameters tree* on the upper right corner of the *Charts tree* section.

Investigations and Views are displayed as Tabs in the *Investigation bar*.

4.1 Drag and drop files to PQSCADA Sapphire.

1. Click the home button in the Investigation module.
2. Drag and drop supported files into the *Drag file to create new investigation* folder.

Notes:

- Multiple files can be opened if you hold down the SHIFT or CTRL keys and click on another filename(s).
- A COMTRADE file is a pair of two files (.CFG and .DAT). The leading file name must be identical for the two files and both must be dragged/selected at the same time.
- New Investigation is opened based on predefined templates

4.2 Start new investigation wizard

Launch start new investigation wizard by one of the following methods:

- In the Investigation module home screen, click *start new investigation*.
- In the Investigation module, click the + button in the *Investigation bar*.

4.2.1 Start new investigation wizard – import files from local computer.

Step 1: selecting the data source

On the *data source* page, select *File/Folder*.

Click *Next* to go to the *File/folder* page.

Step 2: Selecting the files

On the *File/folder* page, select one of the following options:

- *Select files* – will open Windows explorer to select specific file/s.
- *Select folder* – will open Windows explorer to select specific folder/s.

A list of the selected files/folders will be present at the bottom part of the page.

Click *Finish* to start process the files.

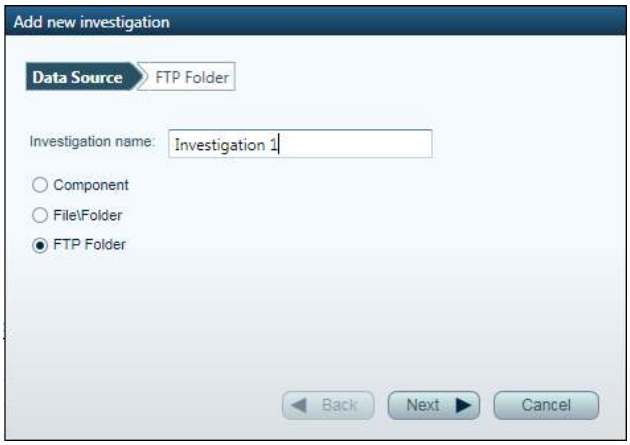
Notes:

- Multiple files can be opened if you hold down the SHIFT or CTRL keys and click on another filename(s).
- A COMTRADE file is actually a pair of two files (.CFG and .DAT). The leading file name must be identical for the two files and both must be drag/select at the same time.
- New Investigation is opened based on predefined templates

4.2.2 Start new investigation wizard – import files from FTP server.

Step 1: selecting the data source

On the *data source* page, select *FTP Folder*



Click *Next* to go to the *File/folder* page.

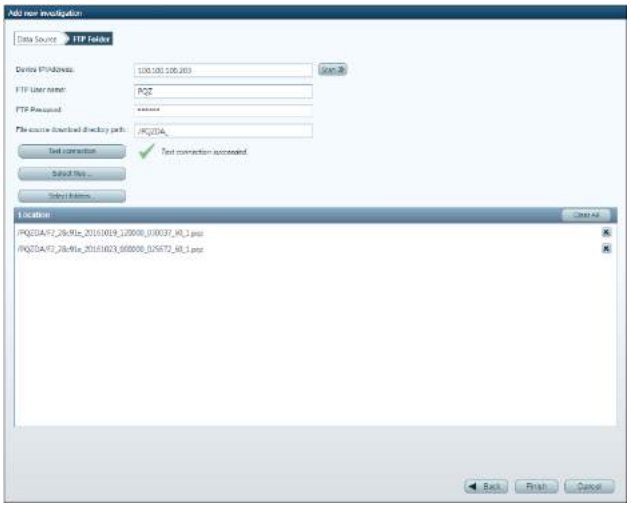
Step 2: Selecting the files

The FTP option was optimized to import PQZIP/PQZ files from Elspec BlackBox devices.

On the *File/folder* page, configure the following options:

- *Device IP address* – Enter the ftp server address or click *Scan >>* to search for available BlackBox devices on the network.
- *FTP User name* – enter the ftp user name. By default the user name is set to the default user name of the selected device (e.g. for G4k device it is ftpuser).
- *FTP Password* – enter the ftp password. By default the password is set to the default password of the selected device (e.g. for G4k device it is ftppassword).
- *Files source download directory path* – Enter the path to the folder where the files are located. By default the path is set to the default path of the selected device (e.g. for G4k device it is /CF_UPMB/PQZIPDATA_).
- *Select files* – will open Windows explorer to select specific file/s.
- *Select folder* – will open Windows explorer to select specific folder/s.

A list of the selected files/folders will be presented at the bottom part of the page.



Click *Finish* to start processing the files.

Notes:

- Multiple files can be opened if you hold down the SHIFT or CTRL keys and click on another filename(s).
- A COMTRADE file is actually a pair of two files (.CFG and .DAT). The leading file name must be identical for the two files and both must be drag/select at the same time.
- New Investigation is opened based on predefine templates

4.2.3 Start new Investigation wizard – from Component

If data was already uploaded and processed you can start a new Investigation based on existing components.

Step 1: selecting the data source

On the *data source* page, select the *Component* option.

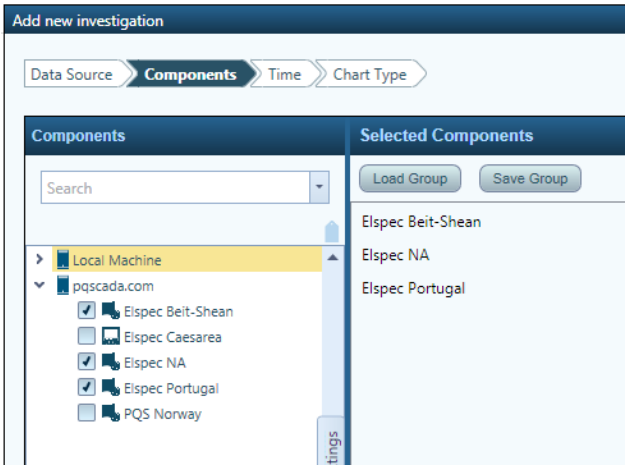
Click *Next* to go to the *Component* page.

Step 2: Component selection.

On the *Component page*, select the components to include in the investigation by one of the following options:

- Check the component boxes in the *Component section* on the left side of the *Component page*. Click the Tag *icon* to sort component by tags. To reset tags click the Open tree settings.
- Click the *Load Group* button in the *Component section* on the right side of the *Component page*.

A list of selected components appear on the right section of the page. To save the selected list, click *Save Group*

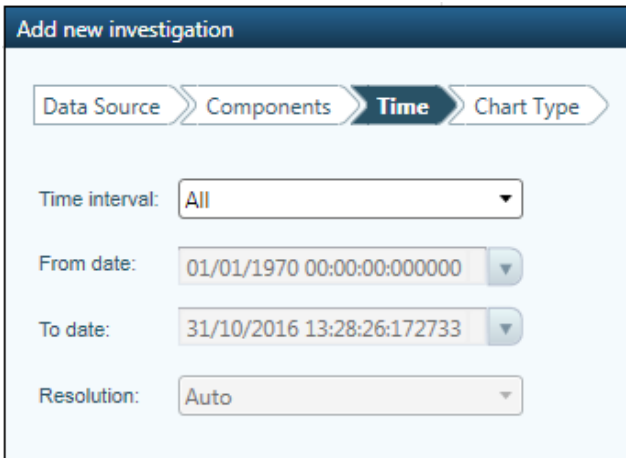


Click *Next* to go to the *Time* page.

Step 3: Time selection.

On the *Time page*, configure the following options:

- *Time intervals* – The fix time interval is a list of predefined time intervals used as shortcuts. Selecting *All* will set the time interval to all the data available in the database. In addition, the time interval can be manually configured in the *From date* and *To date* fields when *Selected time interval* is selected
- *Resolution* – Defines the displaid resolution of the selected parameter. *Auto* will optimize the resolution to the screen size, screen resolution, chart type and selected parameter.



Click *Next* to go to the *Chart Type* page.

Step 4: Chart type selection.

On the *Chart Type page*, select one of the *chart type* options or *Template*.

Click *Next* to go to the *Parameters* page.

Notes:

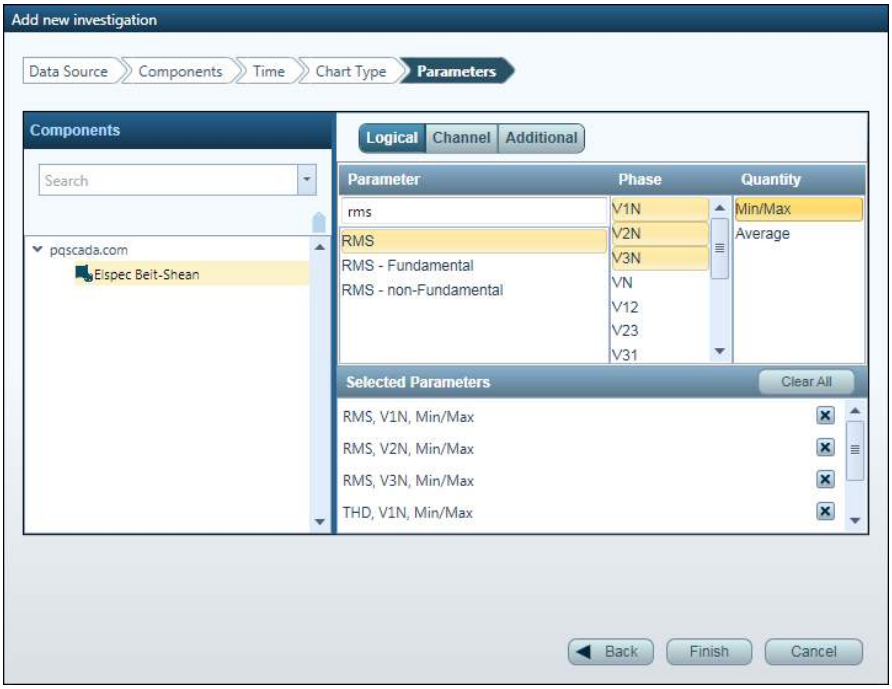
- The *Event chart* leads to *Event types*. Check the even type to display
- The *template chart* leads to *Templates*. Select the template to display

Step 5: Parameters selection.

On the *Parameters page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged.
  - Channels – parameters are stored without any power topology and can be selected by channel name.
  - Additional – non-power parameters such as Temperature are selected.
- Select components in the *Component section* on the left side of the *Parameters page*. Multiple components can be selected by holding down the SHIFT or CTRL keys and by clicking on another component. Click the *Tag* icon to sort components by tag.
- Select the parameter in the parameter column on the right side of the Parameter page. The list of available parameters is dynamic and depends on the selected component and time interval.
- Click on the phase to select. Second click cancel the selection. Multiple phases can be selected.
- One Click selects the quantities. Second click cancel the selection. Multiple quantities can be selected. Quantities are graphical representations in a chart of measured data. Each quantity consists of a collection of series with slightly different characteristics, for example a Min/Max, Average and a sample.
  - Min/Max – displays the minimum and maximum values during a period of time.
  - Average – displays the average value during a period of time
  - Sample – displays the native resolution of a parameter without any aggregation.

A list of the selected parameters are displayed at the bottom of the page.



Click *Finish* to open the investigation.

4.3 Investigation bar

The *Investigation bar* presents all opened Investigations and views as Tabs. In addition the Investigation bar includes tools icons for save, share and export Investigations.

4.3.1 Save Investigation

To save an Investigation click the *Save* icon at the top right section. Windows explorer will pop up; save the investigation.

4.3.2 Share Investigation

To share an Investigation click the *Share* icon at the top right section. Your default email application will open with the investigation files attached.

> **Notes:**
>
> The Investigation files contain the Investigation, Views, charts and parameter properties as well as the parameters data.

4.3.3 Export Investigation

To export Investigation click the *Export* icon at the top right section. A drop down menu with the export formats will open to choose from.

> **Notes:**
>
> PQSCADA Sapphire uses a predefine xml *export template* for the word export.

4.3.4 Open saved Investigation

Open saved Investigation in one of the following options:

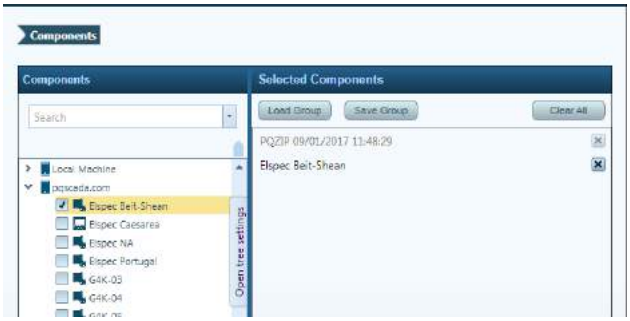
- Drag and drop the .inv files into *Drag file to create new investigation* folder on the left side of the Investigation module home screen
- Double click the .inv file to open automatically the Investigation module in the PQSCADA Sapphire
- Click the ▼ icon next to the Investigation tab in the Investigation bar, and select *Import Investigation.*

> **Notes:**
>
> The data stored in the files has the same resolution and time range as the one configured in the charts. Therefore if you open a saved Investigation on a computer that does not have open communication to the data source (component) new data queries, such as drill in/out will not work and Exclamation mark will appear next to the component name in the component tree.

4.3.5 Add component to Investigation

1. Right click the Investigation tab in the investigation bar, and select *Add component*.
2. On the *Component window*, select component/s in one of the following options:
   - Check the component boxes in the *Component section* on the left side of the *Component page*. Click the *Tag* icon to sort components by tag.
   - Click the *Load Group* button.

A list of selected components are displayed on the right section of the window. To save the selected list, click *Save Group*



3. Click Finish to close the *Component* window

4.3.6 Rename Investigation

1. Right click the Investigation tab in the investigation bar, and select *Rename*.
2. In the *Rename* window, enter the new investigation name.
3. Click O.K to apply changes.

4.3.7 Move Investigation tab

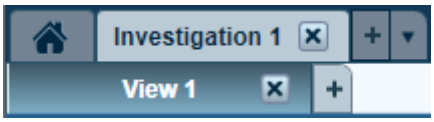
Right click the Investigation tab in the Investigation bar, and select move left or move right.

4.4 View

The view is the second level object of the investigation. The view consist of multiple charts with one common time span.

4.4.1 Add new View

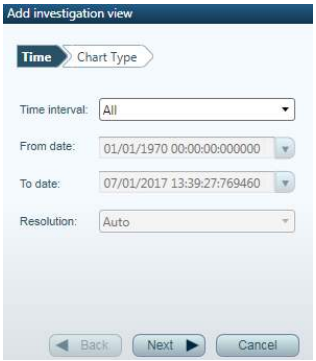
Launch *Add new investigation view* wizard by + clicking the button next to the view tab in the investigation bar.



Step 1: Time selection.

On the *Time page*, configure the following options:

- *Time intervals* – The fix time interval is a list of predefined time intervals used as shortcuts. Selecting *All* will set the time interval to all the data available in the database. In addition, the Time interval can be manually configured in the *From date* and *To date* fields when *Selected time interval* is selected
- *Resolution* – Defines the displaid resolution of the selected parameter. *Auto* will fit the best resolution to the screen size, the screen resolution, the chart type and the selected parameter.



Click *Next* to go to the *Chart Type* page.

Step 2: Chart type selection.

On the *Chart Type page*, select one of the *chart type* options or *Template*.

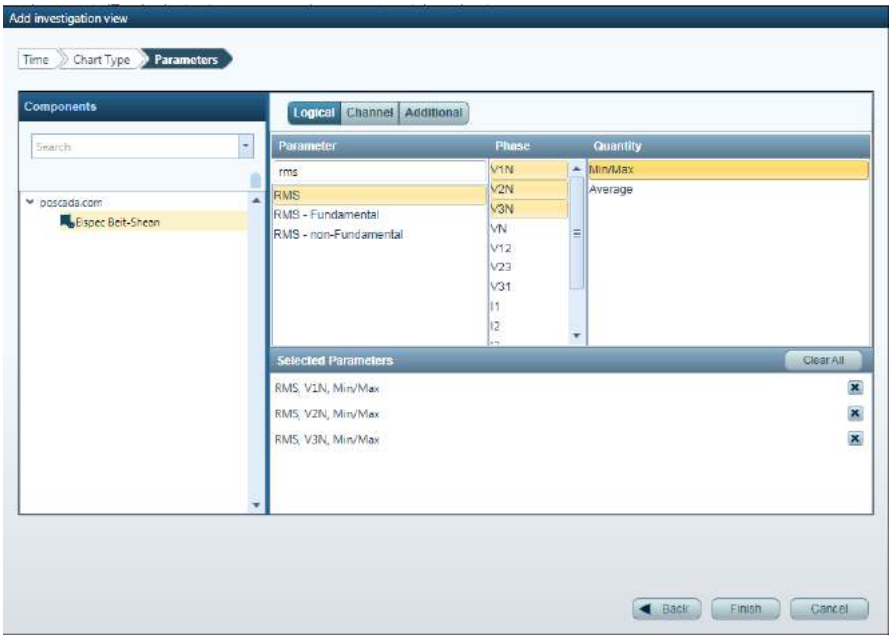
Click *Next* to go to the *Parameters* page.

Step 3: Parameters selection.

On the *Parameters page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters are stored without any power topology. They can be sorted by channel name.
  - Additional – non-power parameters such as Temperature are selected.
- Select components in the *Component section* on the left side of the *Parameters page*. Multiple components can be selected by hold down the SHIFT or CTRL keys and by clicking on another component. Click *Tag* to sort components by tag.
- Select the parameter in the parameter column on the right side of the Parameter page. The list of available parameters is dynamic and depends on the selected component and the time interval.
- Click on the phase to select. Second click cancel the selection. Multiple phases can be selected.
- One click selects the quantity. Second click cancel the selection. Multiple quantities can be selected. Quantities are graphical representations in a chart of measured data. Each quantity consists of a collection of series with slightly different characteristics, for example min/max, avg. and sample.
  - Min/Max – displays the minimum and maximum values during a period of time.
  - Average – displays the average value during a period of time
  - Sample – displays the native resolution of a parameter without any aggregation.

A list of the selected parameters are displayed at the bottom of the page.



Click *Finish* to open the view.

4.4.2 The action menu

The action menu includes a list of features/actions that will be applied to the view

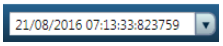
- *Add new Chart* – Launches the Add new chart wizard
- *Hide charts legend boxes* – Hide the chart legend box for all the charts in the view.
- *Normalized display mode* – Normalize the data for all the charts in the view. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals. To undo Normalized display mode, click on *Regular display mode*
- *Save as template* – save the current view as *template* for future investigations
- *Export* – export this view to selected file format
- *Clone view* – open new view with the exact same view characteristics
- *Create new task* – open the *Add new task* wizard based on the selected time frame and components of the view.

4.4.3 View toolbar

Once a view is established, it is possible to change the view settings from the *View toolbar*.

Fixed time interval – select a predefined time intervals used as shortcuts. Selecting *All* will set the time interval to all the data available in the database.

Start time – sets the start time of the view



End time – sets the end start time of the view

Start new query – To enable changes on time interval you required to click the start new query button

Previous time/Next time – Move back to the previous time selection. To move in the opposite direction, use *Next time*.

Append back – *Appending back* leaves the end time intact and moves the start time back by a selected amount.

Back –Shifts back the current time duration to a specified amount of time.

Forward – Moves forward the current time duration for a specified amount of time.

Append forward –leaves the start time intact and moves the end time forward by a selected amount of time.

Drill out –Expends the time interval equally in both direction at a specified magnitude.

Zoom mode – PQSCADA Sapphire support two zoom modes: drill and digital. The drill mode requires changes in the time frame of a new query from the server and the displayed data is optimized to the time interval and screen resolution.

To drill in, select the drill navigation mode and click and hold it in the chart. Right click to open the new time interval in a new view.

To zoom in, select the Zoom navigation mode and click + Shift, the zooming is performed by dragging out a rectangle in the chart

Fit charts in view – Organizes the size's chart in two modes:

- Fit charts to screen –Resized to enter to the screen height.
- Best fit with scrolling –optimized chart height to the screen height to enable scrolling.

Resolution – The resolution property defines the number of points to be displayed on the chart. In auto mode PQSCADA Sapphire optimizes the number of points to the screen resolution.

4.4.4 Rename View

1. Right click the View tab in the investigation bar, and select *Rename*.
2. On the *Rename* window, enter the new investigation name.
3. Click O.K to apply changes.

4.4.5 Move the View tab

Right click the View tab in the Investigation bar, and select move left or move right.

4.5 Charts

The PQSCADA Sapphire Investigation module offers numerous chart types to choose from. Each chart type has its unique characteristics and tools option.

4.5.1 Add new Chart

Launch *Add new chart* wizard by clicking the action menu and select add new chart.

Step 1: Chart type selection.

On the *Chart Type page*, select one of the *chart type* or *Template*.

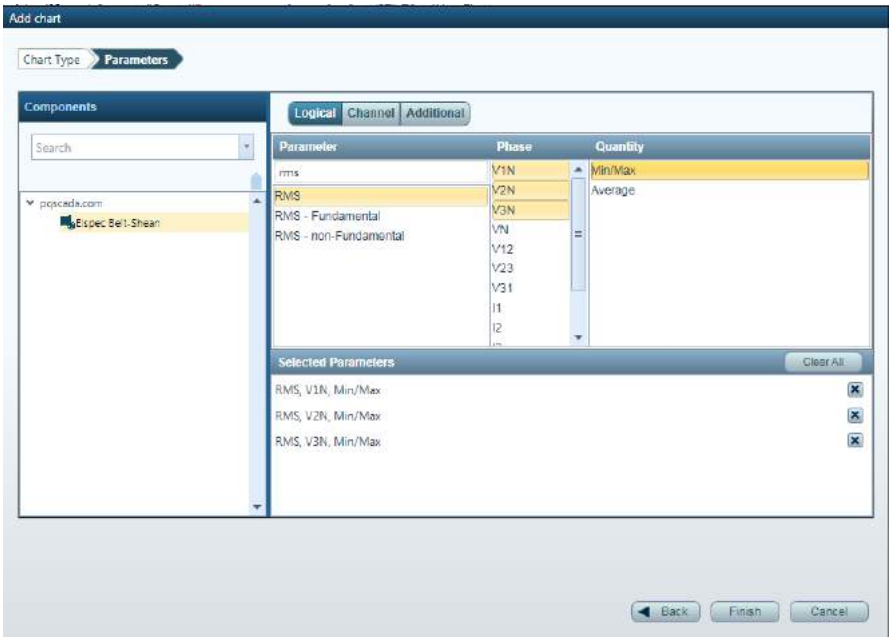
Click *Next* to go to the *Parameters* page.

Step 2: Parameters selection.

On the *Parameters page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters stored without any power topology and can be sorted by channel number.
  - Additional – none power parameters such as Temperature.
- Select components in the *Component section* on the left side of the *Parameters page*. Multiple components can be selected if you hold down the SHIFT or CTRL keys and click on another component(s). Click the *Tag* button to sort components by tag.
- Select the parameter in the parameter column on the right side of the Parameter page. The list of available parameters is dynamic and depends on the selected component and time interval.
- Click on the phase to select. Second click cancel the selection. Multiple phases can be selected.
- Click on the quantity to select. Second click cancel the selection. Multiple quantities can be selected. Quantities are graphical representations in a chart of measured data. Each quantity consists of a collection of series with slightly different characteristics, for example a min/max, Avg and a sample.
  - Min/Max – displays the minimum and maximum values during a period of time.
  - Average – displays the average value during a period of time
  - Sample – displays the native resolution of a parameter without any aggregation.

A list of the selected parameters will be present at the bottom part of the page.

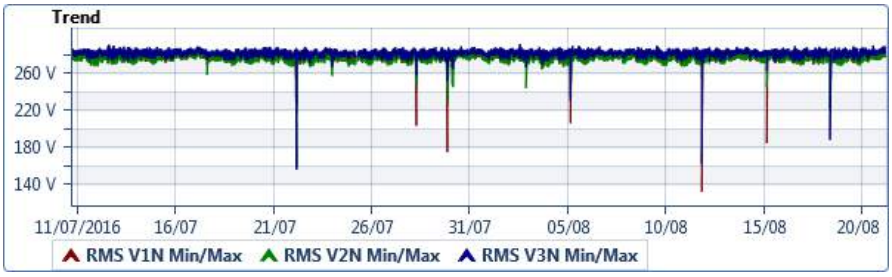


Click *Finish* to open the view.

4.5.2 Charts types

4.5.2.1 Trend chart

Trend chart allows to view parameters for a selected time range.



Trend chart tools

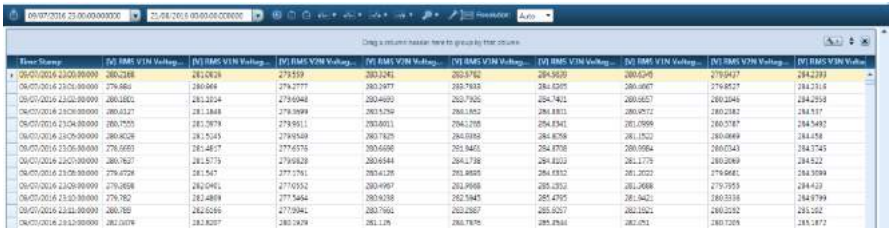
Click the *tools* button at the top right corner of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *trend chart* tool menu include the following options:

- ***Hide/Show legend box***
- ***Hide/Show crosshair***
- ***Hide/Show grid lines***
- ***Export***
- ***Normalized display mode*** - Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals
- ***Axis Y settings***
- ***Split to charts***
- ***Change color***
- ***Bring parameter to front***
- ***Show/Hide min/max values***

4.5.2.2 Grid chart

View selected parameters for selected time range in a table.



Grid chart tools

Click the *tools* button at the top right corner of the chart to open the tools menu.

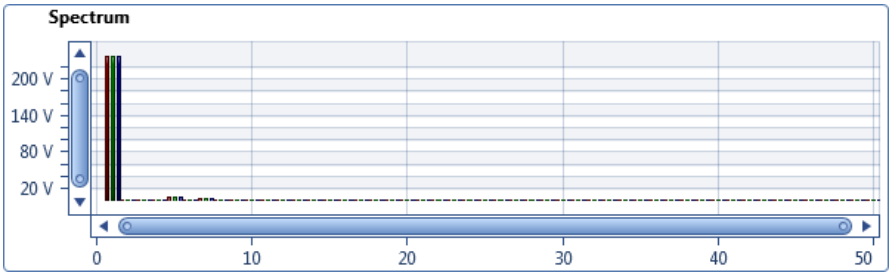
Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *grid chart* tool menu include the following options:

- ***Split to charts***
- ***Export to Excel***
- ***Normalized display mode*** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals
- ***Resolution –*** The grid chart resolution can be different than the view resolution. The available resolution options depend on the selected time interval. In auto mode the grid will include 100,000 points at resolution equal to the [***time interval***]/100,000. In view mode the grid resolution is the same as the ***View*** resolution.

4.5.2.3 Spectrum chart

View selected parameters for selected time range in a bar graph. This allows viewing and investigating frequency domain phenomenon.

Unlike the trend chart the X axis in the spectrum chart is not the time domain therefore the *drill in* option is not available and the digital zoom option is enabled by default.



Spectrum chart tools

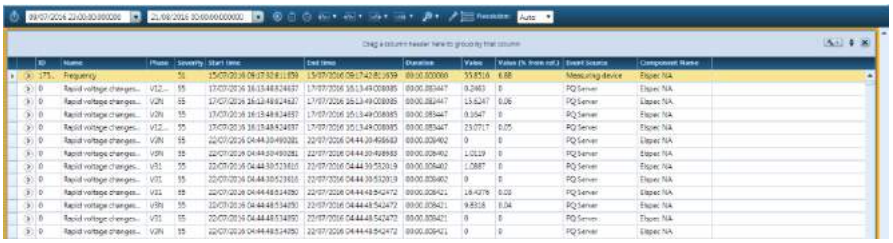
Click the *tools* button at the top right corner of the chart to open the tools menu

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Spectrum chart* tool menu include the following options:

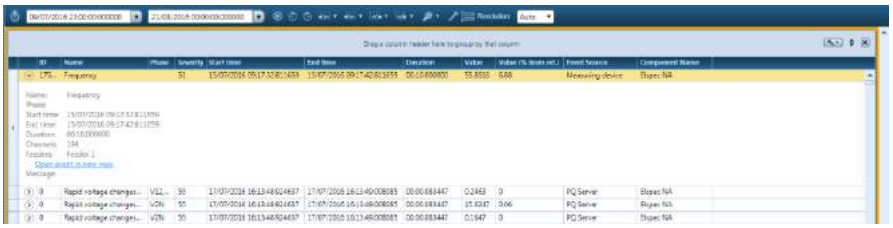
- ***Hide/Show legend box***
- ***Hide/Show crosshair***
- ***Hide/Show grid lines***
- ***Export***
- ***Split to charts***
- ***Change color***
- ***Bring parameter to front***
- ***Disable/Enable fundamental*** – disable the fundamental bar to rescale the Y axis for better view of the none fundamental harmonics

4.5.2.4 Event chart

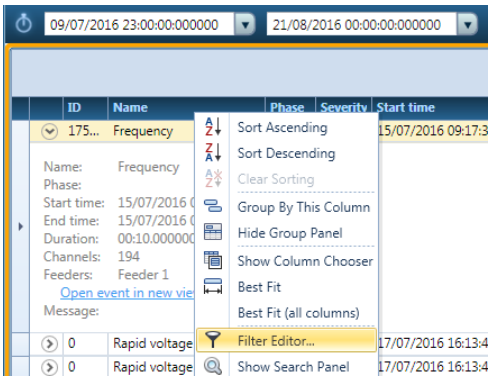
View system, power quality, I/O and custom events in a table for a selected time range. This table provides valuable information such as occurrence, duration and severity of those events.



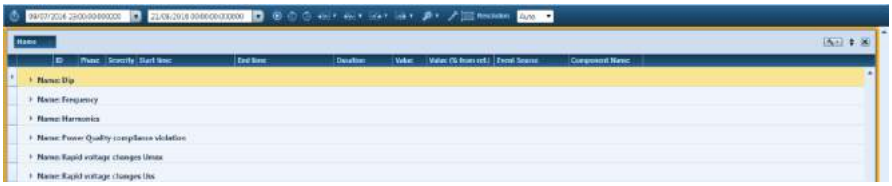
Click the expend button to open the detailed bar that include more information on the event with a link to open the event in a different view based on a predefined *template*.



Right click on each of the cells in the header row to open the table tools.



Dragging each one of the header cell to the upper bar will group the table according to the column values. Multiple cells can be dragged to create hierarchy.



Event chart tools

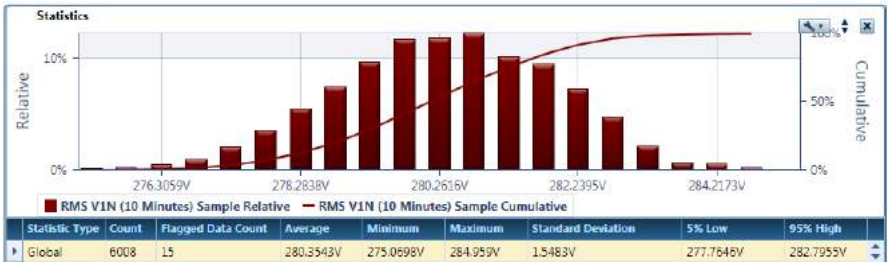
Click the *tools* button at the top right corner of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Event chart* tool menu include the following options:

- ***Export chart to excel***
- ***Separate/aggregate PQ events*** – by default power quality events are aggregated. If events of the same type overlap in time, PQSCADA Sapphire will aggregate them to a single event. The aggregated start time is the time that one of the phases entered to the event condition. The end time is the time that the last phase exited from the event condition. The depth is the highest phase aggregated.
- ***Display oldest event first***
- ***Set maximum events to display***

4.5.2.5 Statistics chart

View selected parameters for a selected time range. It shows two statistical calculations: relative statistic and cumulative, and static data table.



Statistic Type	Count	Flagged Data Count	Average	Minimum	Maximum	Standard Deviation	5% Low	95% High
Global	6008	15	280.3543V	275.0698V	284.959V	1.5483V	277.7646V	282.7955V

Statistic Type – the statistic chart can work in two modes:

- Global – the statistical calculation refers to the entire parameter range
- Range – the statistical calculation refers to the specific selected range as shown in the chart.

Count – the number of point included in the statistical calculation

Flagged data count – the number of point that were ignored from the statistical calculation, due to flags.

Average – the average value of the selected parameter during the selected time interval and the parameter range.

Minimum – the minimum measured value of the selected parameter during the selected time interval and the parameter range.

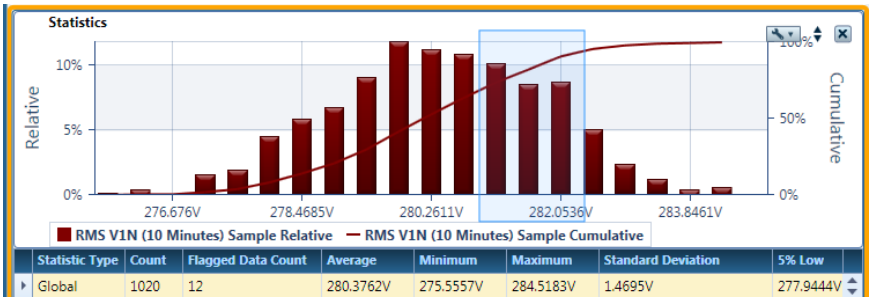
Maximum – the maximum measured value of the selected parameter during the selected time interval and the parameter range

Standard Deviation – the standard deviation value of the selected parameter during the selected time interval and the parameter range.

5% Low – percentile value low

5% High – percentile value high

The chart automatically split the selected parameter entire range (V1 in our example) into 20 equal subranges. Each subrange is displayed as a bar in the chart with its relative statistic value. To drill in to specific range, left click and drag the mouse to a specific range.



Statistic Type	Count	Flagged Data Count	Average	Minimum	Maximum	Standard Deviation	5% Low
Global	1020	12	280.3762V	275.5557V	284.5183V	1.4695V	277.9444V

Statistic chart tools

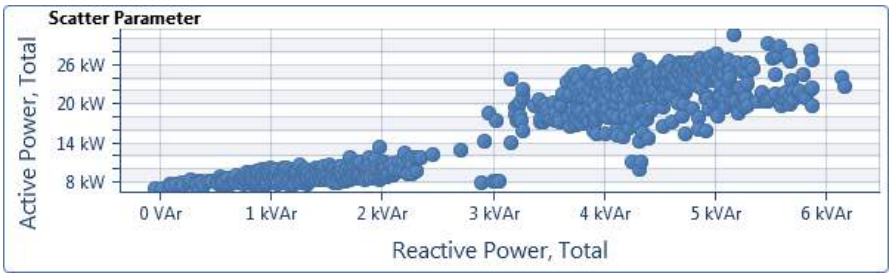
Click the *tools* button at the top right of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Statistic chart* tool menu include the following options:

- ***Hide/Show legend box***
- ***Hide/Show crosshair***
- ***Hide/Show grid lines***
- ***Export***
- ***Normalized display mode*** – Normalizes the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals
- ***Split to charts***
- ***Hide/Show statistics data***
- ***Range mode*** – toggle between *Range mode and Global mode*
- ***Back to default range*** – if drill in was performed, click the *Back to default range* to drill out.
- ***Bring parameter to front***
- ***Change color***
- ***Change percentage values*** – click to Change new low and high percentage values.
- ***Include/exclude flagged data*** – by default flagged data are excluded from the statistic calculation, click *Include/exclude flagged data* to toggle between states.

4.5.2.6 Scatter parameters chart (Professional and enterprise only)

View selected parameters for a selected time range. It allows to review scattered dots of a specific parameter in relation to another parameter.



Scatter Parameter chart tools

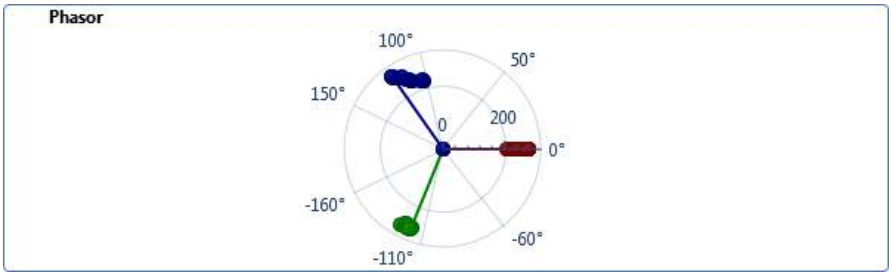
Click the *tools* button at the top right of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Scatter Parameter chart* tool menu include the following options:

- ***Hide/Show legend box***
- ***Hide/Show crosshair***
- ***Hide/Show grid lines***
- ***Export***
- ***Normalized display mode*** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals
- **Change color**

4.5.2.7 Phasor (Professional and enterprise only)

View the phasor's amplitude and angle for a selected time range.



Phasor chart tools

Click the *tools* button the top right of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Phasor chart* tool menu include the following options:

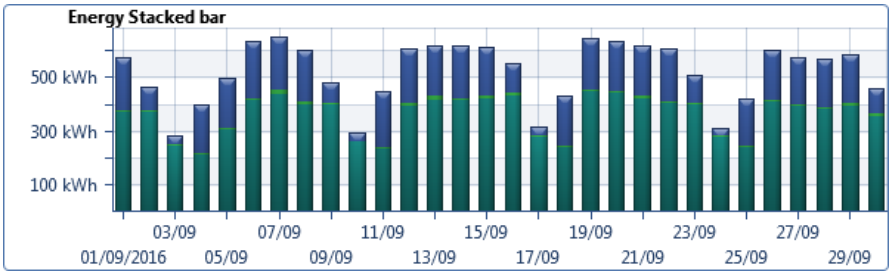
- ***Hide/Show legend box***
- ***Split to charts***
- ***Export***
- ***Normalized display mode*** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals
- ***Change color***
- ***Set zero origin*** – by default, zero origin is set to 3 o'clock. Click *Set zero origin* to select new origin.
- ***Show limit series*** – click *Show limit series* to enter a limit radios to be displayed in the phasor chart.

4.5.2.8 Energy

View Energy data from multiple components for a selected time range. It allows to review energy data in 4 charts layout types: stacked bars, side-by-side bars, Trend and Pie

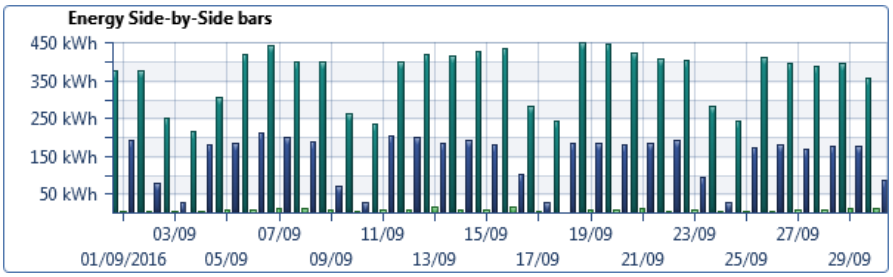
Stacked bars

The *stacked bars* allow you to view energy data from multiple components one on top of the other.



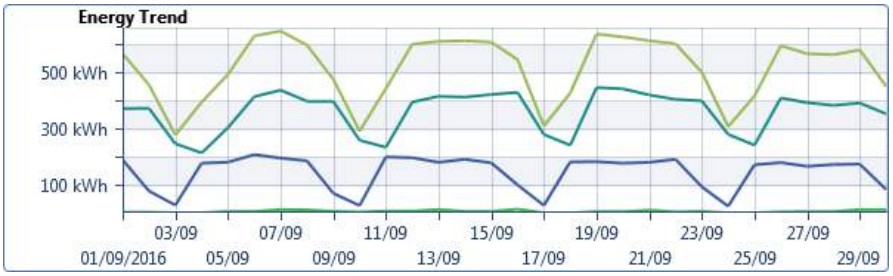
Side-By-Side Bars

The *Side-By-Side bars* allow you to view energy data from multiple components next to each other to display the side-by-side view, click on the tool icon and choose chart layout



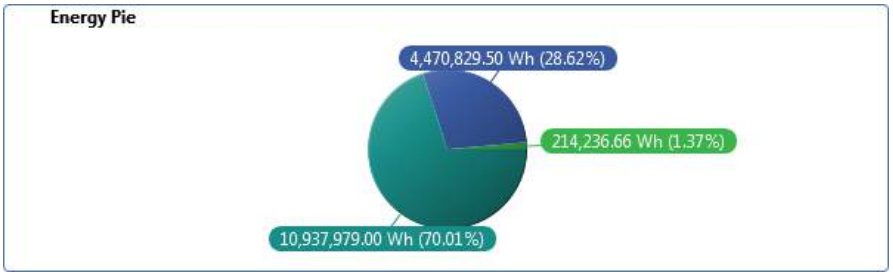
Trend

The *trend chart* allows you to view energy data over time as a trend. When multiple component are selected, the summary trend of all components on the chart can be displayed. To display the trend view, click on the tool icon and choose chart layout



Pie

The *Pie chart* allows you to view how the energy is distributed between different components of the same chart. To display the pie view, click on the tool icon and choose chart layout



Energy chart tools

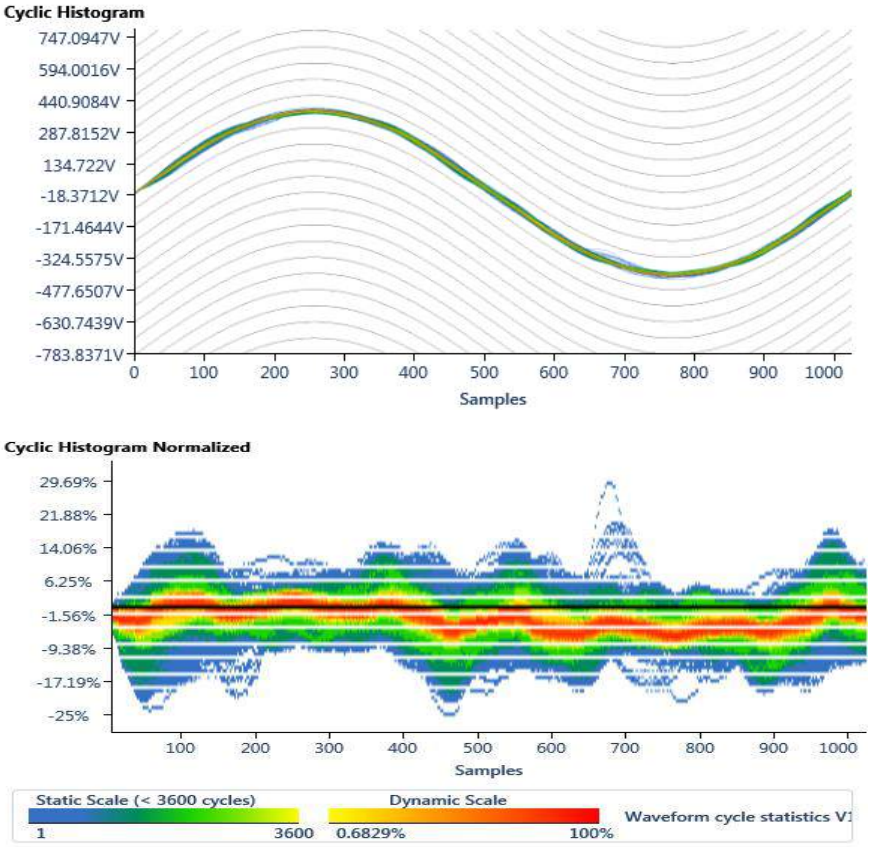
Click the *tools* button the top right of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Energy chart* tool menu include the following options:

- ***Hide/Show legend box***
- ***Split to charts***
- ***Export***
- ***Chart layout*** – click *select new chart layout*.
- ***Change color***
- ***Show total series (Trend only)*** – click to add total series to display the total energy of all selected components.

4.5.2.9 Cyclic histogram (Professional and enterprise only)

View overlaid waveform cycles for a selected time range. It is made possible thanks to the unique continuous recording mechanism of Elspec *BlackBox* analyzers. The histogram shows the deviation from the expected ideal waveform by overlaying the waveforms.



Cyclic histogram chart tools

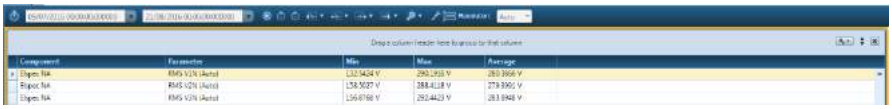
Click the *tools* button on the top right of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Cyclic histogram chart* tool menu include the following options:

- ***Hide/Show legend box***
- ***Reset zoom to 100%***
- ***Export***
- ***Change background color***
- ***Edit chart title***
- ***Edit axis Y scale***
- ***Grid***
- ***Normalized display mode*** – Normalizes the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals

4.5.2.10 Summary chart

View parameters for a selected time range. This chart displays the minimum, maximum and average value of each parameter.



Summary chart tools

Click the *tools* button the top right of the chart to open the tools menu.

Most of the tool options are self-explanatory, detail explanation is given to options that might require more information. The *Summary chart* tool menu include the following options:

- ***Export to Excel***
- ***Normalized display mode*** – Normalizes the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals

4.5.3 Min/Max view

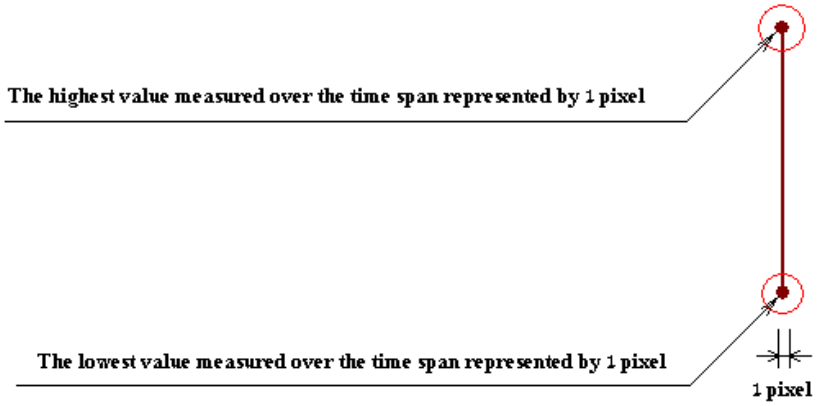
PQSCADA sapphire is capable to store waveform signal continuously for extended time periods. This creates a tremendously amount of data which is available to the user at every single moment, since the component was initially configured.

When the user commences an Investigation from a time interval of over a year, the large quantity of data exceeds the resolution capabilities of the display and the one of the human eye.

For example: When displaying the RMS values for a time interval of 1 year, there are more than 1,892 million cycles (60Hz x 60sec x 60min x 24hours x 365days). However, the screen resolution is typically around 1,000 pixels, therefore, on this time interval, each pixel on the screen represents roughly 1.89 million cycles. By only averaging these values spikes and aberrations will be missed.

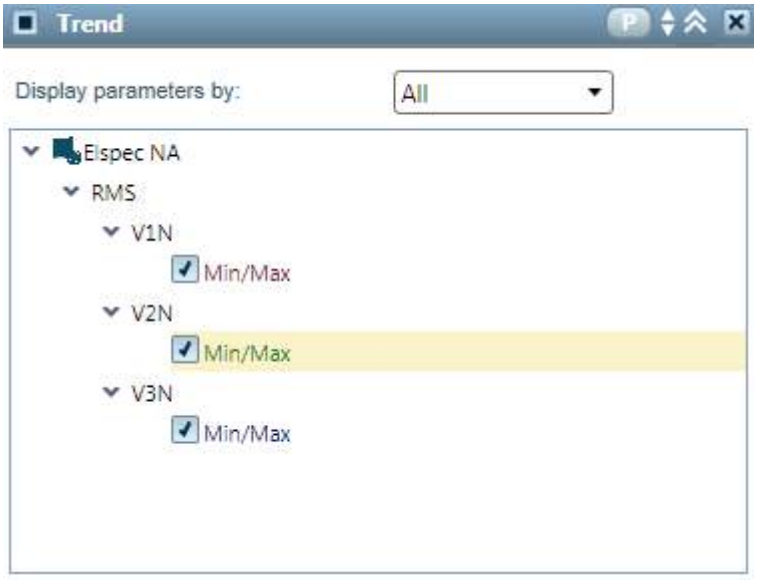
In order to be able to spot these occurring spikes and aberrations over a 1 year time interval, the “Min/Max view” was introduced. The “MinMax view” allows the representation of every horizontal pixel as a vertical bar (1 pixel wide) while its high end represents the maximum measured value, and its low end represents the minimum measured value. As a result, significant aberrations will be clearly visible.

By drilling in, the event can be isolated to the original time span over which it occurred.



4.6 Charts tree

The *chart tree* includes a list of parameters represented on the chart.



Use the following icons located on the chart tree bar to:


Hide chart – click *Hide chart* to hide/unhide chart from the view.


Add Parameter – click *Add parameter* to add parameters to chart.


Move chart – click *Move chart* to move the location of the chart in the view.


Minimize chart tree –click *minimize chart tree* to minimize the chart tree


Delete chart – click *Delete chart* to delete chart from the view

Minimize parameter – click *Minimize parameter* to minimize it in the chart tree


Hide parameter – click *Hide parameter* to hide/unhide specific parameter from the chart.

Display parameters by – parameters in PQSCADA Sapphire can be displayed as channels (e.g. channel 1, 2, 3, etc.), logical (e.g. V1, V2, V3, etc.) or additional (e.g. temperature). Use the *display parameter by* to sort parameters according to the channel type.

4.6.1 Move parameters between charts

Moving parameters between charts is done by drag and drop parameters between the chart trees.

To move parameter into a new chart, drag it outside the chart tree border.

4.7 Templates

A template is an xml file used as a starting point for a new Investigation. Templates contain topologies, charts and parameters.

For example, you might use a template in PQSCADA Sapphire formatted for an event investigation. The template would likely include high resolution parameters relevant to the specific event (e.g. Voltage RMS for DIP).

You can create your own custom template and store, reuse and share them with others.

4.7.1 Investigation template

Instead of creating the structure of a new investigation from scratch, you can use an Investigation template with predefined topology, charts and parameters. To open a new Investigation/View from Template, select Template from the Chart type page of the *Add new Investigation/View wizard*.

4.7.1.1 Create new Investigation template

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component
2. Click *actions* and then select *save as template.*
3. In the *Save template* window, do the following
   - Under Template type, select Investigation
   - Give the new template a name
   - Under *Topology*, select the topology in which this template will be active
   - Check the Create a separate view for each of the following events check box if you wish the template to include events. And then check the events you wish to include.
4. Click *save*

4.7.1.2 Modify Investigation template

A single template can include different parameters for different power topologies. For example, the same template will include differential voltages when you open a component configured as Delta and phase to neutral voltages when you open a component configured as WYE.

1. Create View with all the charts and parameters you wish to include in the modify template. The view cannot include more than 1 component
2. Click *action* and select *save as template.*

3. In the ***Save template*** window, do the following
    - Under Template type, select Investigation
    - Select the template you want to modify
    - Under *Topology*, select the topology in which this template will be active
    - Check the *Create a separate view for each of the following events* check box if you wish the template to include events. And then check the events you wish to include.
4. Click save

4.7.2 Include event in a template

Templates have the option to open separate views for selected events. For example the template will open the first view according to the template you configured but if during the selected time interval of the view 3 dips occurred, PQSCADA Sapphire will open additional 3 views, 1 for each dip.

4.7.3 Event template

Event template are used to open a view with predefined charts and parameters for a specific event type. For example a template for dip will include voltage waveform and RMS charts, while Harmonic event will include a spectrum chart.

4.7.3.1 Create new Event template

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component
2. Click *action* and select *save as template.*
3. In the *Save template* window, do the following
   - Under Template type, select Events
   - Under *Topology*, select the topology in which this template will be active
   - Select the event type
   - Check the *enable user tags*, to select the user tags range.
4. Click save

4.7.3.2 Modify Events template

Single template can include different parameters for different power topologies. For example, the same template may include differential voltages when you open a component configured as Delta and phase to neutral voltages when you open a component configured as WYE.

1. Create View with all the charts and parameters you wish to include in the modify template. The view cannot include more than 1 component
2. Click *action* and select *save as template.*
3. In the *Save template* window, do the following
   - Under Template type, select Events
   - Under *Topology*, select the topology in which this template will be active
   - select the event type
   - Check the *enable user tags*, to select the user tags range.
4. Click save

4.7.4 Files template

Files template is used when you open a new investigation based on PQZIP and PQZ files. The file template defines the initial investigation when it is uploaded to PQSCADA Sapphire.

4.7.4.1 Create new File template

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component
2. Click *action menu* and select *save as template*.
3. In the *Save template* window, do the following
   - Under Template type, select File.
   - Under *Topology*, select the topology in which this template will be active.
   - select the file type
4. Click save

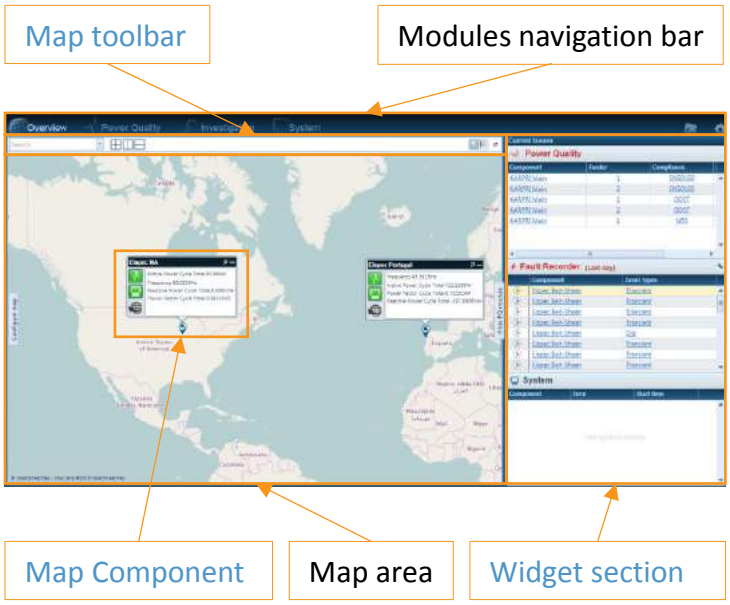
4.7.4.2 Modify File template

Single template can include different parameters for different power topologies. For example, the same template will include differential voltages when you open a component configured as Delta and phase to neutral voltages when you open a component configured as WYE.

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component
2. Click *action* and select *save as template*.
3. In the *Save template* window, do the following
   - Under Template type, select File
   - Under *Topology*, select the topology in which this template will be active
   - select the file type
4. Click save

5. Overview module

The overview module is designed to display all measurement points on a live geographical map with real time data and general statuses.



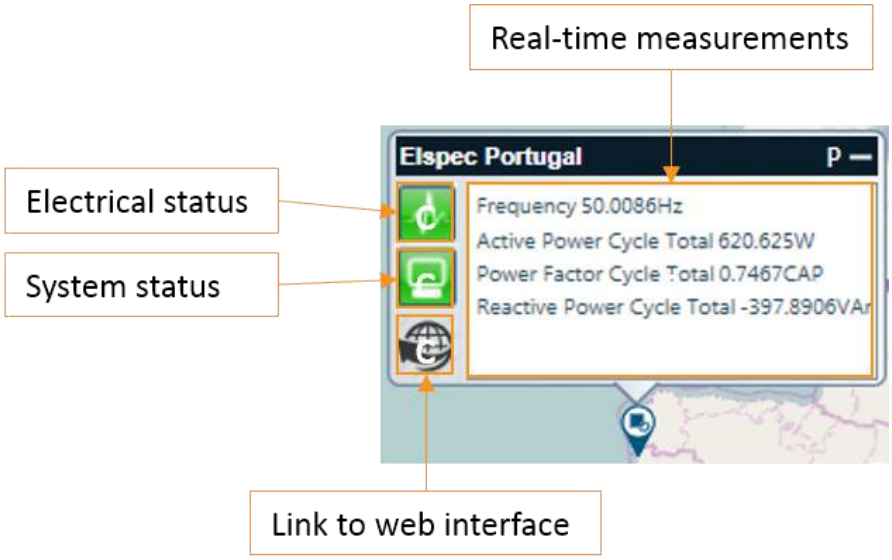
The *Overview module* is divided into two main sections – the left section displays the connected *Instances* and their hosted components either as a live geographical map or as -a table, and the right section displays the *widgets*. These sections are divided by the splitter control (a vertical line between the sections).

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

5.1 Map component

The map component include

- Two live statuses:
  - Electrical: Green as long as the electrical conditions at the specific measurement point are according to preconfigured grid code.
  - System: Green as long as the measuring device is at operation condition.
- A Link to the component web interface, if applicable.
- Display of real time measurement.



5.2 Add component to map

1. Click *configure map* to open the map component setting
2. Click and hold on the *component* you wish to add and drag it to its location.
3. Click *save changes*.

> **Notes:**
>
> In order to add or remove components from the map, you must have rights permission.

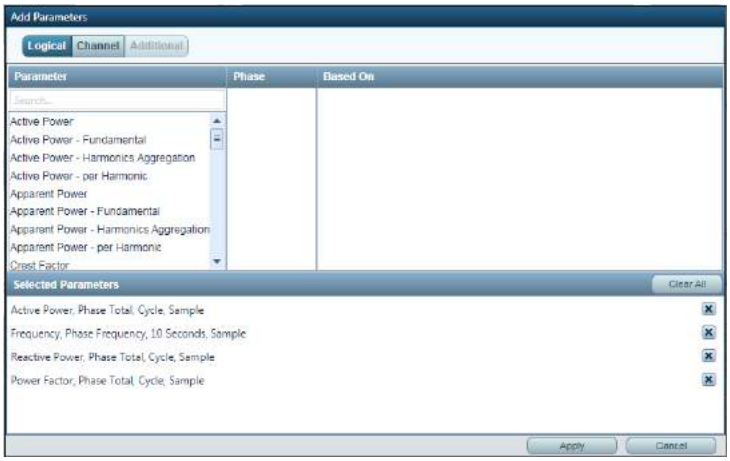
5.3 Add/remove real time parameter to a component

To add real time parameter to a component follow the instruction below:

1. Click *parameter* on the top right corner of the *map component* or right click on a component in the component tree to open the *Add Parameter* configuration window.
2. Select the desire parameter from the *parameter* list and click *Apply*.

To remove real time parameter from the component follow the instruction below:

1. Click *parameter* on the top right corner of the *map component* or right click on a component in the component tree to open the *Add Parameter* configuration window.
2. Click the *delete* button from the list at the bottom part of the *Add Parameter* window or click ***clear all*** to remove all parameters.



5.4 Map toolbar

Search – search component on the map.

Split view – split the view vertically, horizontally or to 4 equal areas.

Toggle Map/Table view – toggle between map view to table view.

Pop-up – unattached map from the main PQSCADA Sapphire window.

Close map – close the map window.

5.5 Widgets

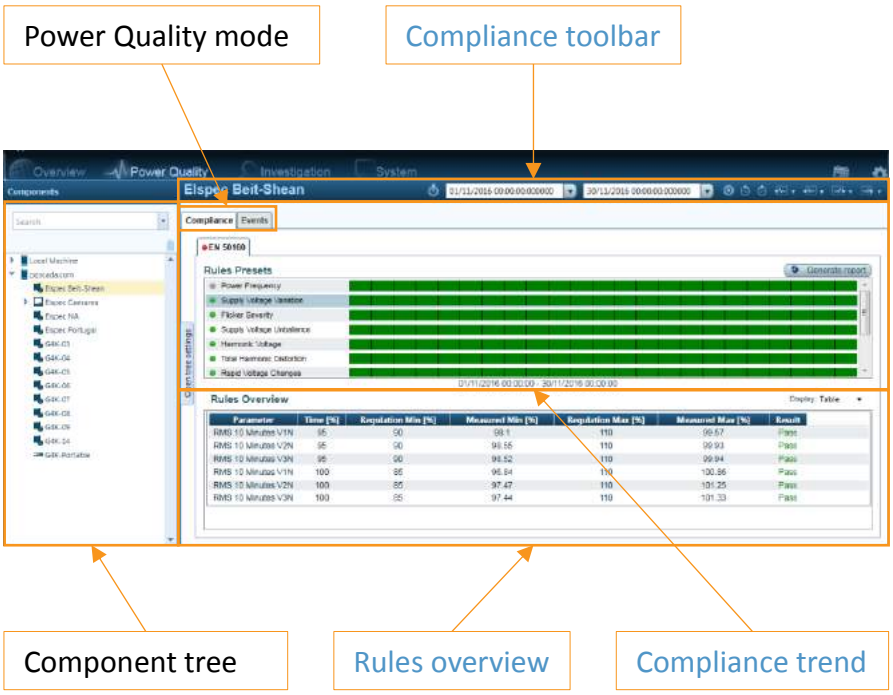
Three widgets are available to display the status of the electrical network:

- **Power quality:** The power quality widget displays a list of measurement points that are in violation of the preconfigured grid code. A link to the map or to the Power Quality module is available for quick access.
- **Disturbances:** The disturbances widget displays a list of short predefined events that have occurred during the last hour/day/week/month. A link to the map or investigation is available for quick access. Investigation for a specific event in the list will be opened according to the *event template*

  To set the preferences of this widget click the tools button.
- **System:** The system widget displays a list of system messages/warnings about operation condition. A link to the system module is available for further investigation.

6. Power Quality module

The power Quality module shows at a glance the status of the entire network or individual measurement point for a selected period of time. The power quality conditions are configurable and can meet any power quality compliance standards such as the EN 50160. Therefore, Identifying the root cause and type of violation is quick and easy. Multiple compliance conditions can apply to a single measurement point for comparison. A comprehensive report, based on the power quality compliance conditions, can be easily generated from the power quality module.



The *Power Quality module* screen is divided into two main sections – the left section which displays the connected *Instances* and their hosted components, and the right section which displays the compliance results of each of those objects, while they are selected. These sections are divided by the splitter control (a vertical line between the sections).

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

6.1 Start new compliance investigation

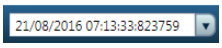
1. Select the time interval From the *compliance toolbar* with one of the following options:
   a. Click *fixed time intervals* to select a fixed time interval.
   b. Type the *Start* and *End times* in the time picker box.
2. Select the component from the component tree. Click the *Tag* button to sort component by tags. To reset tags click the Open tree settings.

6.2 Compliance toolbar

Once a compliance is established, it is possible to change the compliance view with *compliance toolbar*.

Fixed times interval – The *fix time interval* is a list of predefined time intervals used as shortcuts. Selecting *All* will set the time interval to all the data available in the database.

Start time – sets the start time of the view.



End time – sets the start time of the view

Start new query – To enable changes on time interval click the start new query button

Previous time/Next time – Move back to the previous time selection, use *Previous time*. To move in the opposite direction, use the *Next time* button.

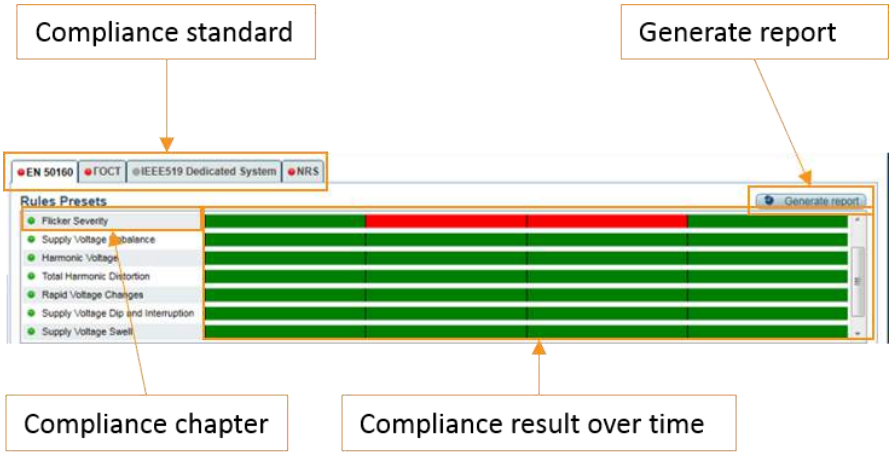
Append back – Appending back: Leave the end time intact and move the start time back by a selected amount.

Back –Select *Back* to shift the current time duration back to a specified amount of time.

Forward – You may select *Forward* to shift the current time duration forward to a specified amount of time.

Append forward – Appending forward: Leave the start time intact and move the end time forward by a selected amount of time.

6.3 Compliance Trend



Compliance standard

Multiple compliance conditions can apply to a single measurement point for comparison. Select the standard you want to investigate.

Compliance chapter

Compliance is built from group of rules based on a chapter. Each chapter has its own rules, evaluation window, observation window, and sliding window and result over time.

Compliance result over time

Compliance is a statistical assessment over time. EN50160 as for example has evaluation period of 1 week. Therefore each 7 days gets 1 result. The sliding window will determine how often you will have a result. For example, if the sliding window is set for 1 day you will have 1 result every day that represent the last 7 days.

The *compliance result over time* section is therefore split into sub-time-intervals representing the result of the compliance for each sliding window. For example, if you select time interval of 10 days (May 1st to May 10th) for a compliance standard with evaluation window of 7 days and sliding window of 1 day. PQSCADA Sapphire will display 3 sub-time-intervals: the first represents the result from the 1st to the 7th, the second the 2nd to the 9th, and the third the 3rd to the 10th. The maximum number of sub-time-intervals is 96. In case the time interval needs a higher number division of sub-time-intervals, each sub-time-intervals will include more than 1 sliding window period.

PQSCADA Sapphire use 3 colors to display the results:

- **Green** – pass
- **Red** – fail
- **Gray** – not enough data

Generate a report

Click *generate report* to run a report based on the configured compliance standards.

6.3.1 Drill in

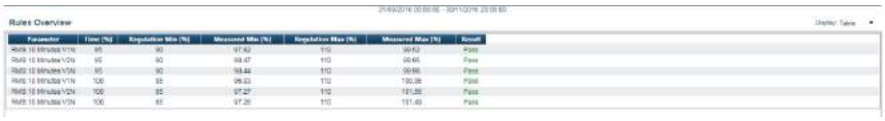
1. Click the *sub-time-intervals* to open the *List of sliding windows* pop-up window.

2. Click the row you wish to drill-in
   a. One click will only change the observation window for the *Rules overview* section.
   b. Double click will change the compliance window time interval to the selected sliding window.

6.4 Rules overview

The *rules overview* section is a detailed overview of a specific chapter and observation window. In this section you can see the list of the rules for a specific chapter and the result of each rule in a specific time interval. In the example below we can see the rules for the voltage variation chapter for a time period of 40 days

The rules overview section is governed by the compliance trend section. The detailed data can be displayed as a table or as a chart. To switch between the two modes, click *Rules overview* on the *display* drop down menu at the upper right section.



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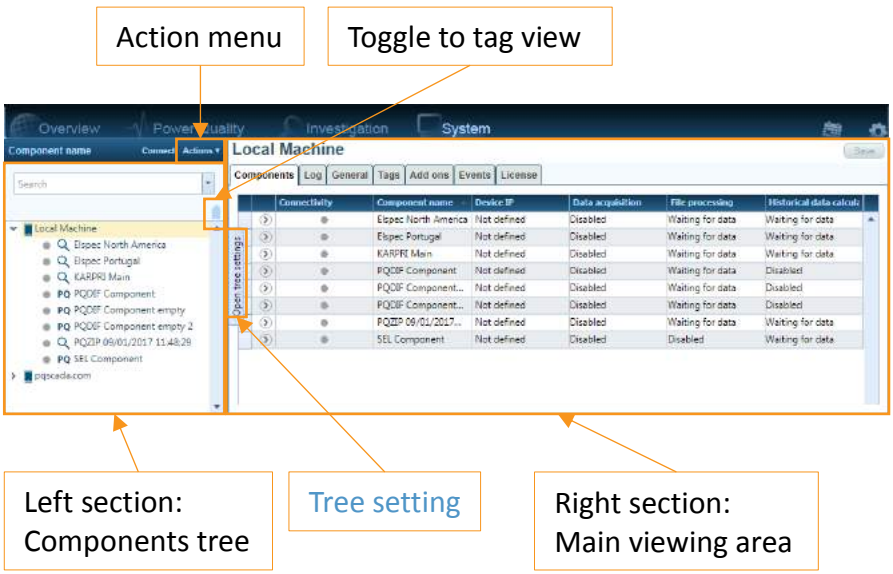
7. System module

The system module is used to configure and monitor the PQSCADA Sapphire's objects. PQSCADA Sapphire supports two types of objects:

- *Instance* – representation of a physical computer on which PQSCADA Sapphire is running. PQSCADA Sapphire supports two types of instances:
  - *Local Machine* – PQSCADA Sapphire runs as a user process on the local machine (express and professional editions).
  - *Server* – PQSCADA Sapphire runs as a Windows service on a local or remote location (Enterprise edition).
- *Component* – A Component is a logical representation of a physical device. Components are hosted under an instance. PQSCADA Sapphire supports two main types of components:
  - *Investigation component* – created by fetching files manually.
  - *Auto Fetching component* – a component that supports various communication protocols to fetch data automatically (Professional and enterprise editions only).



The *System module* screen is divided into two main sections – the left section displays the connected *Instances* and their hosted components, and the right section displays the properties of each of those objects, while they are selected. These sections are divided by the splitter control (a vertical line between the sections).

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

7.1 Connect to a server (enterprise edition only)

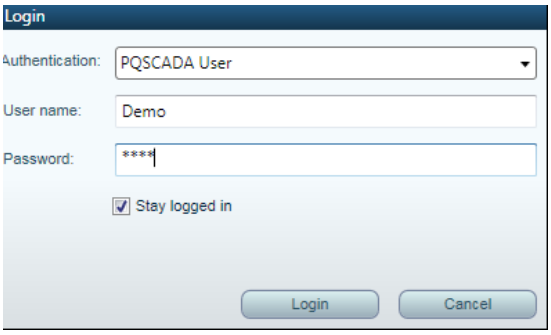
1. Click *connect button* from the upper right part of the component tree to open *add server* configuration window.
2. In *add server* window, do the following:
   - Under *server Address*, select the service URL. Click *Browse* to search for active services in your network.
   - Under *Authentication* select the authentication manager.
   - Under *User name* select the user name.
   - Under *password* select the password.
   - Check the *Stay logged in checkbox* to keep PQSCADA Sapphire connected to this service.
3. Click *Add* to connect.

7.2 Disconnect server (Enterprise edition only)

1. Right click on the server in the component tree
2. Select *Disconnect server*

7.3 Login to a server (Enterprise edition only)

1. Right click on a server in the component tree
2. Select *Login* to open the *Login configuration window*
3. In the *Login window*, do the following:
   - Under *Authentication* select the authentication manager
   - Under *User name* select the user name
   - Under *password* select the password
   - Check the *Stay logged in checkbox* to keep PQSCADA Sapphire connected to this service.
4. Click *Login* to connect.

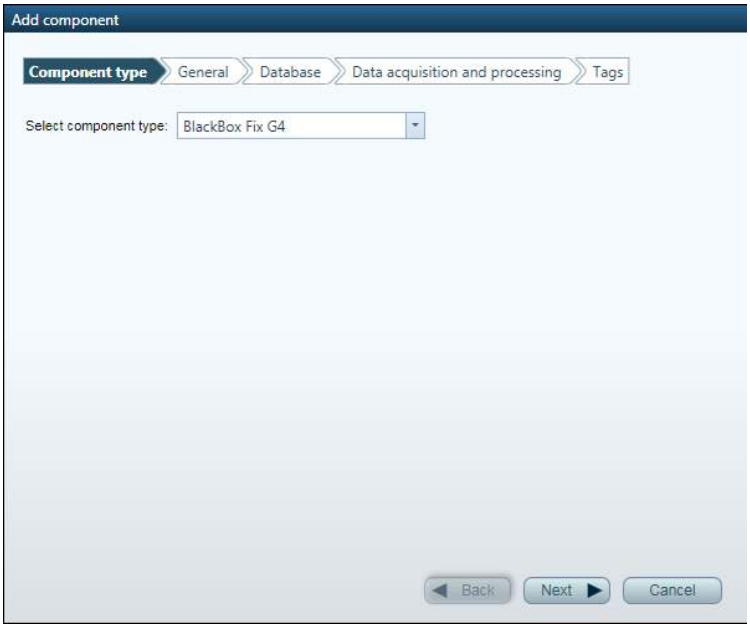


7.4 Add Component (Professional and Enterprise editions only)

Click *action* on the top right of the splitter to select *Add Component*

Step 1: select the component type

Select *Component type* and click *Next*.



NOTE:

- PQSCADA Sapphire supports various component types. To integrate PQSCADA Sapphire with other component types of different vendor, call our support team.
- For the purpose of this description we assume that you add ***BlackBox fix G4*** component. This will ensure that all of the steps in the wizard are fully explored.

Step 2: General

Name the component in *Name* and click *Next*.

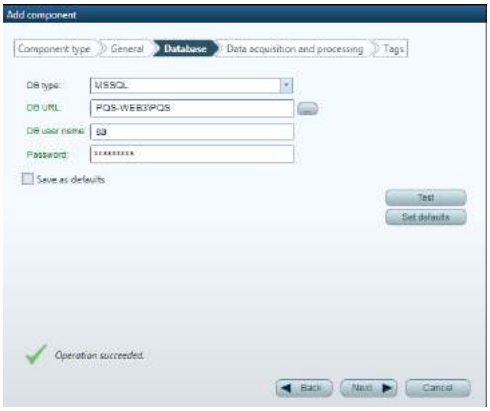
Step 3: Database (enterprise edition only)

On the Database page, configure the following options:

- DB Type – SELECT the database type in which PQSCADA Sapphire will store your data. PQSCADA Sapphire supports two DB types:
  - SQLite.
  - MS SQL server (MSSQL).

  If MSSQL was selected, configure the following options:

  - DB URL – enter the DB URL, or click *Browse button*, to search for SQL service in your network.
  - DB user name: enter your DB user name.
  - Password: enter your DB password.
  - Check *save as default* to keep these settings as default. You can use *set default* next time to fill in the default settings.
  - Click *Test*, to verify the connection with the DB.

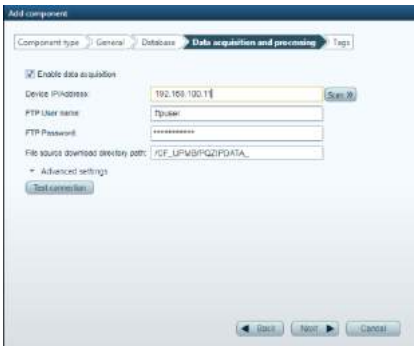


Click *Next*, to move to the next step.

Step 4: Data acquisition and processing

On the Data acquisition and processing page, configure the following options:

- Check *Enable data acquisition* box, to start downloading data on component creation.
- *Device IP/Address* – enter the device IP address/URL, or click *Scan n* to search devices connected to your network.
- *FTP User name* – enter the ftp user name. By default the user name is set to the default user name of the selected device (e.g. for G4k device use ftpuser).
- *FTP password* – enter the ftp password. By default the password is set to the default password of the selected device (e.g. for G4k device use ftppassword).
- *Files source download directory path* – Enter the path to the folder where the files are located. By default the path is set to the default path of the selected device (e.g. for G4k device it is /CF_UPMB/PQZIPDATA_).
- *Advance settings* – use the advance setting to limit the downloaded data to a specific time range.
    a. Check the *Start time checkbox* and enter date & time to exclude data from previous date.
    b. Check the *End time checkbox* and enter date & time to exclude data from later date
- Click the *Test connection button*, to verify the connection with the device.

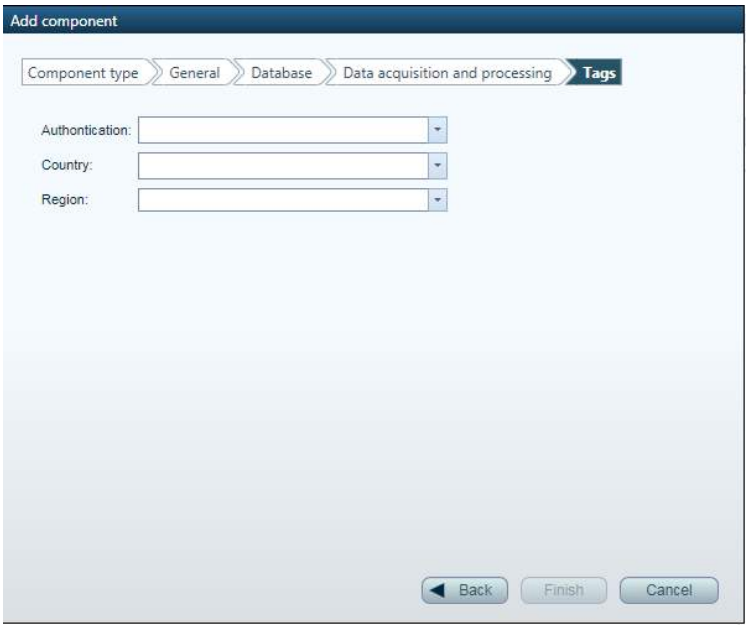


Click *Next*, to move to the tag page where applicable or

Click *Finish*, to add a new component

Step 5: Tags

Configure tags if *tags* were configured in the Instance configuration.



Click *Finish*, to add a new component.

7.5 Attach a Component

An existing, previously detached component can be attached to an instance. This may be particularly useful when exchanging processed data with colleagues, or when upgrading to a new computer.

In order to attach a component:

1. Right click the instance and select *Attach a component*.
2. Select database type – SQLite, or MSSQL (Enterprise edition only).
   - If MSSQL was selected, enter the required connection details and click *Next* to display a list of available components. Check the *Create component* box next to each component you would like to attach and click *finish*.
   - If SQLite was selected, select *Reattach existing components* and click *Next* to display a list of available components. Check the *Create component* box next to each component you would like to attach and click *finish*. Alternatively, you can directly import a database file (.sqlite extension), and Sapphire will automatically build the required folders structure.

7.6 Delete component

Deleting a component will remove any database files and folders

structure that is associated with it. This action is irreversible.

In order to delete a component:

1. Right click the component that you wish to delete and click *Delete*.
2. Confirm by clicking *Yes.*

7.7 Detach component

Detaching a component will remove it from the instance, however database files and folders structure will remain intact. You can later *reattach* the component.

In order to detach a component:

1. Right click the component that you wish to detach and click *Detach*.
2. Confirm by clicking *Yes*.

7.8 Delete data from component

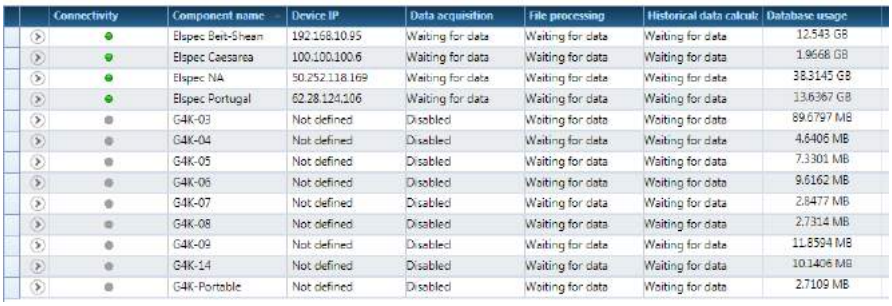
3. Right click the component you want to delete data from, and select *Delete data from the database in time range*.
4. In the *Delete data from the database in time range*, do the following:
   a. Select the start time
   b. Select the end time
   c. Check the *delete system events (Log) checkbox* to delete the events as well.
5. Click *delete*.

7.9 Instance configuration

To change the Instance configuration click on the Instance object in the component tree. The available configuration tabs, based on the Instance type and the user authentication, will open.

7.9.1 Component

The component tab displays data of all hosted components with statuses of the selected *Instance*s.



Connectivity	Component name	Device IP	Data acquisition	File processing	Historical data calcul	Database usage
●	Elspec Beit-Shean	192.168.10.95	Waiting for data	Waiting for data	Waiting for data	12.543 GB
●	Elspec Caesarea	100.100.100.6	Waiting for data	Waiting for data	Waiting for data	1.9668 GB
●	Elspec NA	50.252.118.169	Waiting for data	Waiting for data	Waiting for data	38.3145 GB
●	Elspec Portugal	62.28.124.106	Waiting for data	Waiting for data	Waiting for data	13.6367 GB
●	G4K-03	Not defined	Disabled	Waiting for data	Waiting for data	89.6797 MB
●	G4K-04	Not defined	Disabled	Waiting for data	Waiting for data	4.6406 MB
●	G4K-05	Not defined	Disabled	Waiting for data	Waiting for data	7.3301 MB
●	G4K-06	Not defined	Disabled	Waiting for data	Waiting for data	9.6162 MB
●	G4K-07	Not defined	Disabled	Waiting for data	Waiting for data	2.8477 MB
●	G4K-08	Not defined	Disabled	Waiting for data	Waiting for data	2.7314 MB
●	G4K-09	Not defined	Disabled	Waiting for data	Waiting for data	11.8594 MB
●	G4K-14	Not defined	Disabled	Waiting for data	Waiting for data	10.1406 MB
●	G4K-Portable	Not defined	Disabled	Waiting for data	Waiting for data	2.7109 MB

Connectivity – represented as color indicator:

- Green – connection to the device is enabled and working
- Red – connection to the device is enabled but doesn't work
- Gray – connection to the device is disabled.

Component name – the name of the component

Device IP – the IP address of the device.

Data acquisition – this column shows the acquisition status of the component:

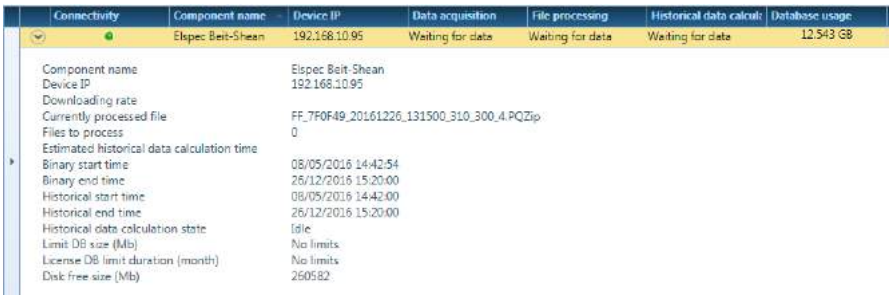
- Waiting for data – downloading is finished, wait for the next connection attempt.
- Scanning folder – component scans for new files in the device
- Downloading – percentage indication of the current file downloading progress.
- Disabled – downloading is disabled.
- Failed to connect – communication error.

Files processing – this column shows the status of the file processing of the component.

Historical data calculation – this column shows the status of the historical data calculation process.

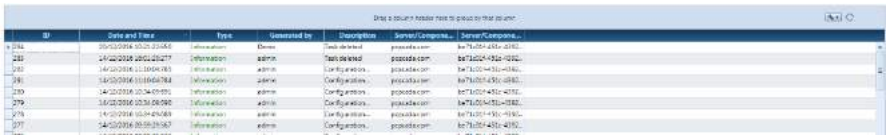
Database usage – this column shows the DB size of the component.

Click the expend icon to display more information.



7.9.2 Log

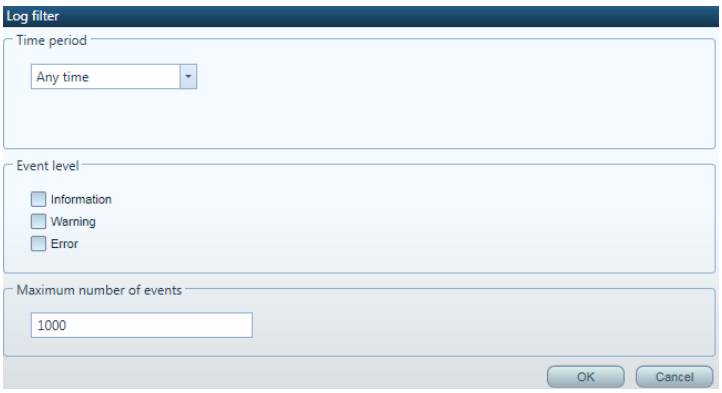
The *Log tab* displays specific information related to log entries.



To narrow-down your view click *Tool* on the upper right corner of the *main viewing area.*

In the *Log filter menu*, do the following:

- Select time period
- Select the event level:
  - Information: includes general information on actions taken in PQSCADA Sapphire.
  - Warning: - includes any malfunctions that the PQSCADA Sapphire will resolve by itself.
  - Error: Includes malfunctions that the PQSCADA Sapphire was unable to resolve (e.g. failed Tasks due to an incorrect E-Mail address).
- Select the *maximum number of events* to be displayed.
- Click - *OK* -



- To refresh the *Log* entries click –*Refresh Log* ***on the top right of the main screen***- .

7.9.3 General

The general tab includes the following - properties:

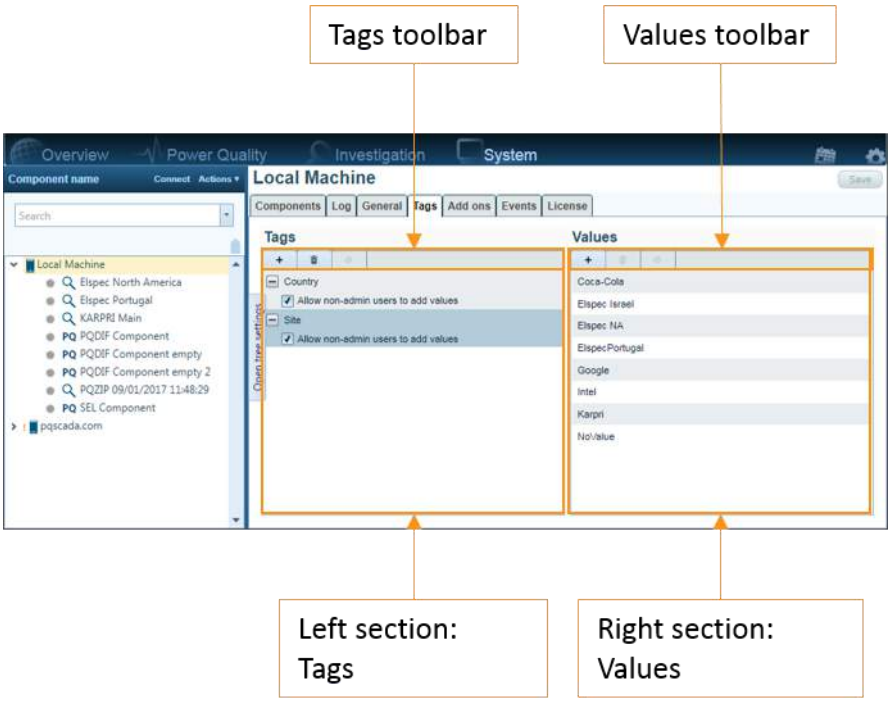
- *Instance* version
- *Instance URL*
- ***Instance** ID number*

To change the *Instance* name click on the *Name* text box and type the Instance name.

Click the *Save button* to apply changes.

7.9.4 Tags

Tags in PQSCADA Sapphire are used to organize and group components. Components may be assigned to several different tags and vice-versa.



The *Tag Tab* area is divided into two sections – the left section displays a list of enabled Tags, and the right section displays the values of each of those Tags, while selected.

7.9.4.1 Enable Tags

1. Click *+* in the Tags toolbar to open the *Tag selection* window
2. Check the Tag boxes to enable
3. Click *Add* to save and close the *Tag selection* window. To cancel the selection, click on the cancel icon
4. Click *Save* to apply changes

7.9.4.2 Disable Tag

1. Click the *Tag* you wish to disable
2. Click *Trash* in the Tag toolbar. To cancel the selection, click on the cancel icon
3. Click *Save* to apply changes

7.9.4.3 Configure Tag

The tag is built with: Name, Description and list of values. The values can be either a closed list editable by the system admin only, or an open list editable by any user

To set the tag list as open/closed, do the following:

1. Click *+* next to the Tag name to expend the tag row.
2. Check *Allow non-admin users to add values*.
3. Click *Save* to apply changes.

To add values to a tag:

1. Click *+* in the Values toolbar. The *Tag value addition* window will pop-up.
2. Enter the new value in the text box.
3. Click *OK*.
4. Click *Save* to apply changes.

7.9.4.4 Add new Tag

1. Click *+* in the Tags toolbar, to open the *Tag selection* window
2. Click *create tag* to open the *New tag configuration* window
3. In the *New tag configuration* window, do the following:
   - Name the tag
   - Add a Tag description
   - The tag values can be either a close list edited by the system admin or an open list that add new value when non-admin user configure a component. Check *Allow non-admin users to add values* to allow an open list.
   - If *Allow non-admin users to add values* is unchecked, add values to the tags in the ***Add Value*** text box, and click ***Add value button***, to add new value.
   - Click *Add* to add the new tags to the tags list.
   - Click *Save* to apply changes

7.9.5 Apply tags to the component tree

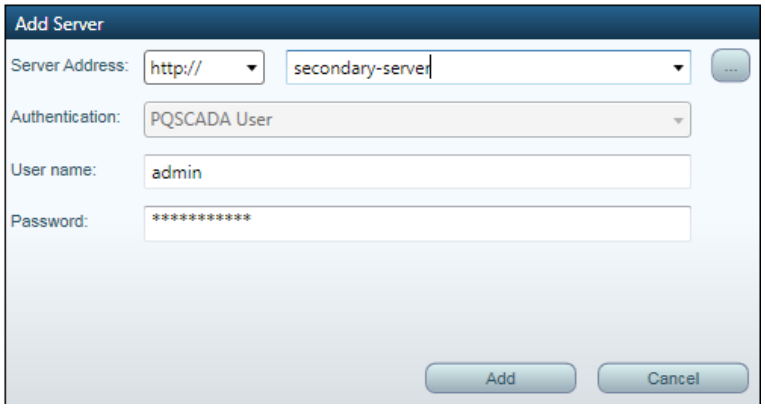
1. Click on *Open tree setting* button, located on the splitter control.
2. Select the Instance to apply *the Tags* on.
3. Check the *Show tags* box to enable *Tags*.
4. Check the Tags boxes you want to display in the component tree. A list of the selected tags will be displayed in the bottom part of the *Tree setting window*. By Default the tag hierarchy is set according to the selection order.
5. To filter tags values, click on the expend button next to the tag checkbox and uncheck the values to be filtered.
6. To change tags hierarchy, drag and drop tags, up or down, in the *Selected tag hierarchy* section located at the bottom part of the *Tree setting* window.

7.9.6 Secondary server (Enterprise edition only)

PQSCADA Sapphire allows the administrator to organize networked servers into a hierarchy. PQSCADA Sapphire servers are united into a master server – the secondary server hierarchy. Each PQSCADA Sapphire server can have more than one secondary servers within a hierarchy.

7.9.6.1 Add secondary server

1. Click *+* in the *Secondary server table*, to open the *Add Server* configuration window
2. In the *Add Server* configuration window, do the following:
   a. Under ***server** Address*, select the server URL. Click *Browse* to search for active servers on your network
   b. Under Authentication select the authentication provider
   c. Under *User name* enter the *Admin* user name
   d. Under *password* enter the *Admin* password
   e. Click *Add*



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7.9.6.2 Remove secondary server

1. Select the server you wish to remove in the *Secondary server table*.
2. Click *Trash* to remove the secondary server.

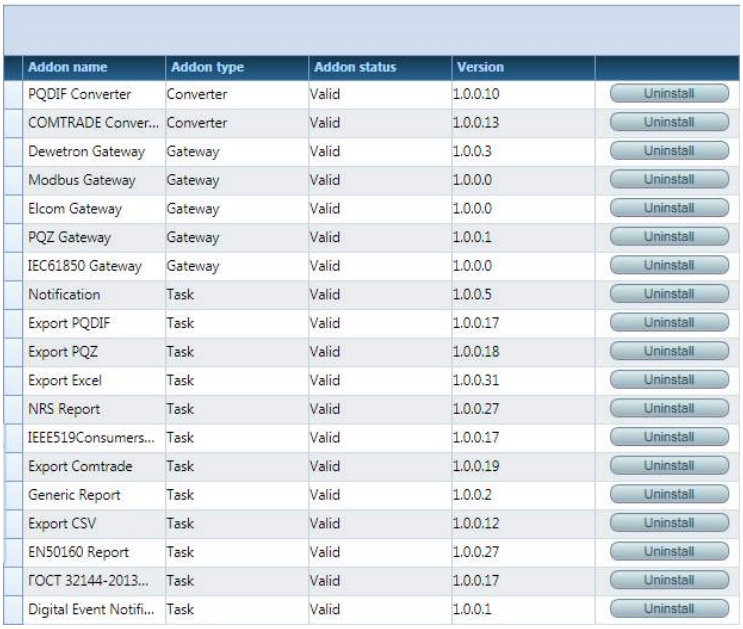
7.9.7 Add-ons

PQSCADA Sapphire is a modular software enabling the user to extend the PQSCADA Sapphire capabilities to meet any application and/or requirement. PQSCADA Sapphire supports the following add-on extensions types:

1. *Gateway* (Professional and Enterprise edition only): designed to extend PQSCADA Sapphire communication options. Modbus and IEC 61850 gateways are already implemented and they are part of the professional and enterprise edition package.
2. *Converter*: designed to extend PQSCADA Sapphire importing options. COMTRADE and PQDIF converters are already implemented and they are part of the PQSCADA Sapphire package for all editions.
3. *Tasks*: designed to extend PQSCADA Sapphire's capabilities of

reporting, exporting and controlling. Various tasks were already implemented and part of the PQSCADA Sapphire package, depends on the license edition.

The Add-ons tab displays a list of installed add-ons in your Instance.



Addon name	Addon type	Addon status	Version	
PQDIF Converter	Converter	Valid	1.0.0.10	Uninstall
COMTRADE Conver...	Converter	Valid	1.0.0.13	Uninstall
Dewetron Gateway	Gateway	Valid	1.0.0.3	Uninstall
Modbus Gateway	Gateway	Valid	1.0.0.0	Uninstall
Elcom Gateway	Gateway	Valid	1.0.0.0	Uninstall
PQZ Gateway	Gateway	Valid	1.0.0.1	Uninstall
IEC61850 Gateway	Gateway	Valid	1.0.0.0	Uninstall
Notification	Task	Valid	1.0.0.5	Uninstall
Export PQDIF	Task	Valid	1.0.0.17	Uninstall
Export PQZ	Task	Valid	1.0.0.18	Uninstall
Export Excel	Task	Valid	1.0.0.31	Uninstall
NRS Report	Task	Valid	1.0.0.27	Uninstall
IEEE519Consumers...	Task	Valid	1.0.0.17	Uninstall
Export Comtrade	Task	Valid	1.0.0.19	Uninstall
Generic Report	Task	Valid	1.0.0.2	Uninstall
Export CSV	Task	Valid	1.0.0.12	Uninstall
EN50160 Report	Task	Valid	1.0.0.27	Uninstall
ГОСТ 32144-2013...	Task	Valid	1.0.0.17	Uninstall
Digital Event Notifi...	Task	Valid	1.0.0.1	Uninstall

7.9.7.1 Install new add-on

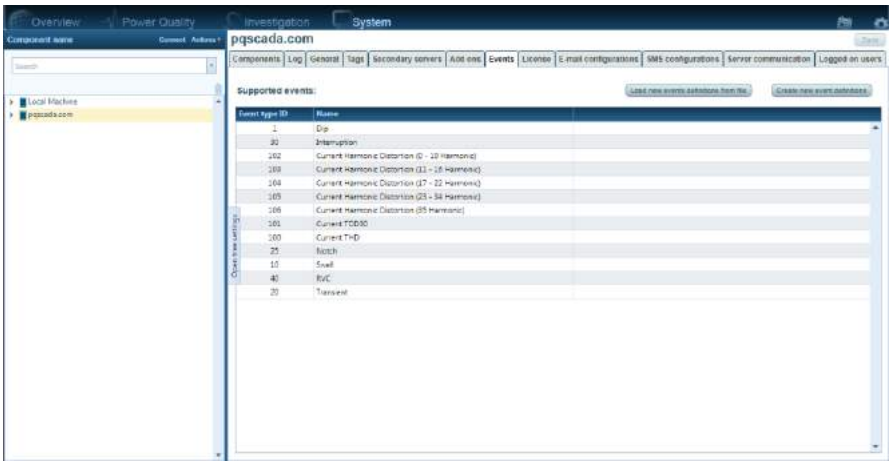
1. Click *Install Add on* at the upper right corner.
2. Click *browse* to open windows explorer.
3. Select *Add-on* installation files, and wait for validation.
4. Click *Install add on* to start the installation.
5. Click the *Close button* to close the *Install add-on* window.

7.9.7.2 Uninstall add-on

1. Click the *Uninstall button* from the add-ons table.
2. Click *Yes* in the *Uninstall add-on* pop-up window.
3. Click *Close* to close the *Uninstall add-on* pop-up window.

7.9.8 Events

The Events tab displays a list of all installed events in your Instance.

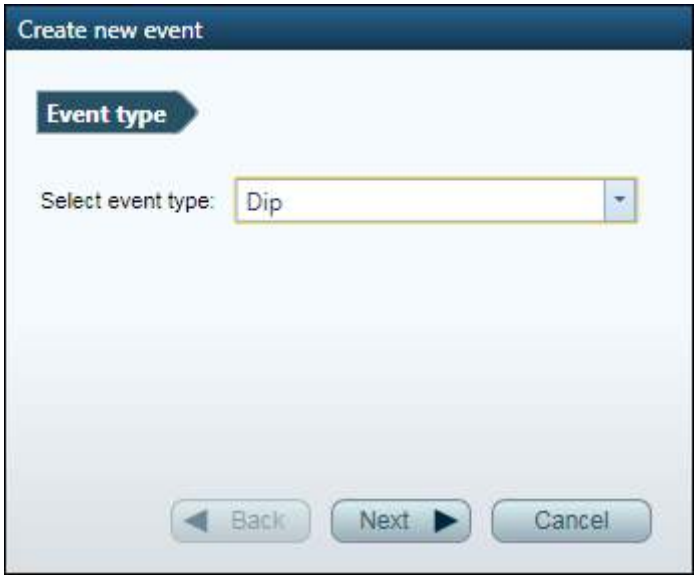


7.9.8.1 Create new Dip event

Click *Create new event definitions* to launch the *Create new event definition* wizard.

Step 1: Select event type

On the *Event type* page, select *Dip*.

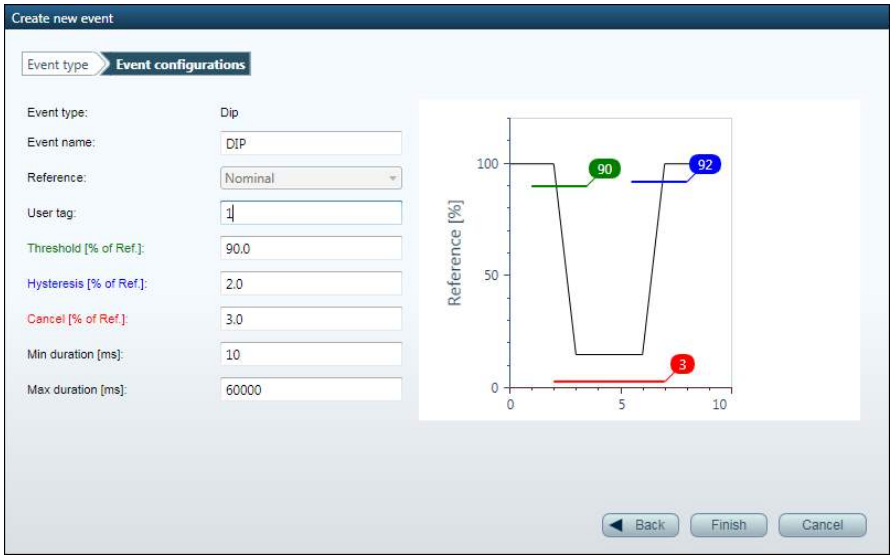


Click *Next* to go to *Event configuration* page.

Step 2: Event configuration

On the *Event configuration* window, configure the following options:

- Event name – type the event name
- User tag –used to distinguish between events of the same type
- Threshold [% of Ref] – defines the start event limit in percentage of nominal
- Hysteresis [% of Ref] – defines the end event limit in percentage of nominal. End event limit = Thresholds + Hysteresis
- Cancel [% of Ref] – defines the limit in which an event will be cancelled
- Min. duration [ms] – defines the time length (in milliseconds) a parameter may pass out of bounds without failing.
- Max. duration [ms] – defines the maximum time allowed (in milliseconds) for an event to be active before it is cancelled.



Click *Finish* to save changes.

Notes:

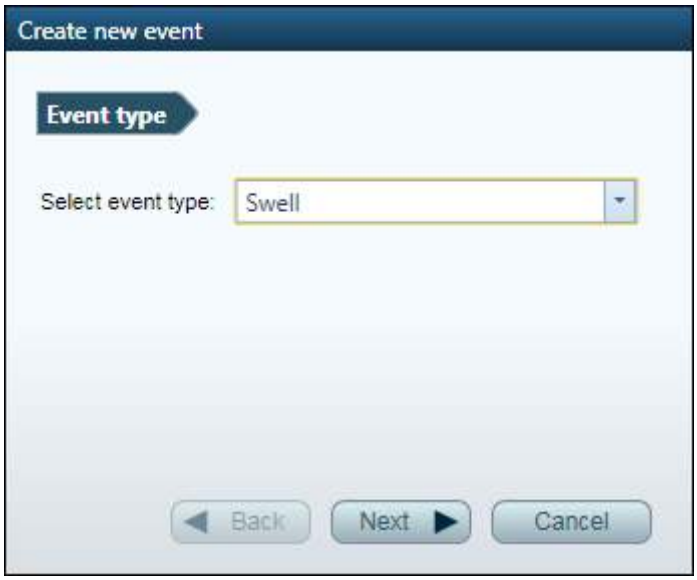
- To assign an event to a component go, to the Power Quality tab on the component configuration.
- A Dip event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

7.9.8.2 Create new Swell event

Click *Create new event definitions* to launch the *Create new event definition* Wizard.

Step 1: Select event type

On the *Event type* page, select *Swell*.



Click *Next* to go to *Event configuration* page.

Step 2: Event configuration

On the *Event configuration* window, configure the following options:

- Event name – type the event name
- User tag –used to distinguish between events of the same type
- Threshold [% of Ref] – defines the start event limit in percentage of nominal
- Hysteresis [% of Ref] – defines the end event limit in percentage of nominal. End event limit = Thresholds + Hysteresis
- Cancel [% of Ref] – defines the limit in which an event will be cancelled
- Min. duration [ms] –defines the time length (in milliseconds) a parameter may pass out of bounds without failing.
- Max. duration [ms] – defines the maximum time allowed (in milliseconds) for an event to be active before it is cancelled.

Click *Finish* to save changes.

Notes:

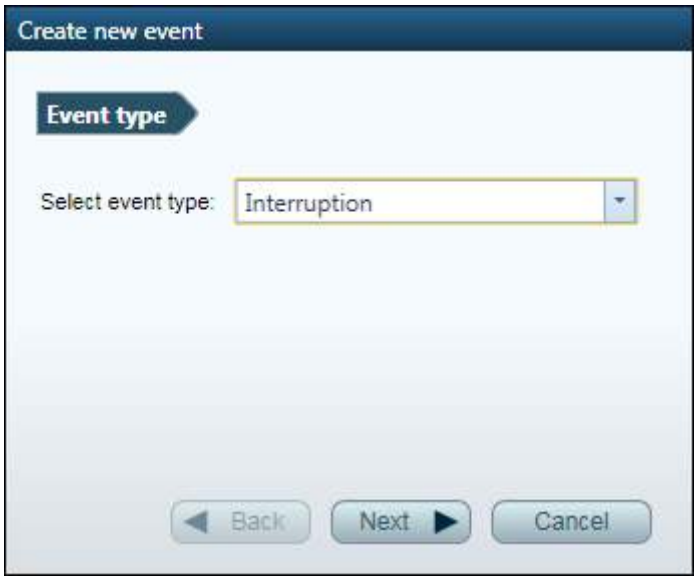
- To assign an event to a component, go to the Power Quality tab on the component configuration.
- A Swell event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

7.9.8.3 Create new Interruption event

Click *Create new event definition*s to launch the *Create new event definition* Wizard.

Step 1: Select event type

On the *Event type* page, select *Interruption*.

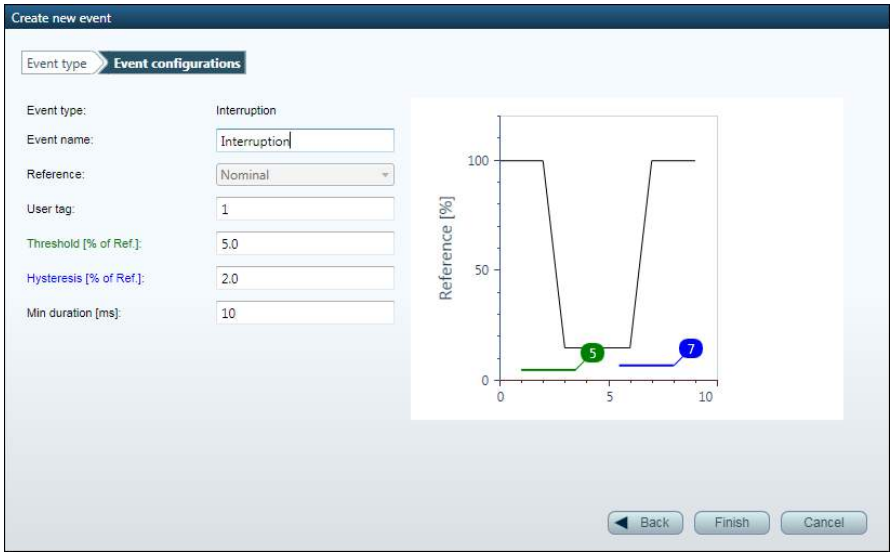


Click *Next* to go to *Event configuration* page.

Step 2: Event configuration

On the *Event configuration* window, configure the following options:

- Event name – type the event name
- User tag –used to distinguish between events of the same type
- Threshold [% of Ref] – defines the start event limit in percentage of nominal
- Hysteresis [% of Ref] – defines the end event limit in percentage of nominal. End event limit = Thresholds + Hysteresis
- Cancel [% of Ref] – defines the limit in which an event will be cancelled
- Min. duration [ms] –defines the time length (in milliseconds) a parameter may pass out of bounds without failing.
- Max. duration [ms] – defines the maximum time allowed (in milliseconds) for an event to be active before it is cancelled.



Click *Finish* to save changes.

Notes:

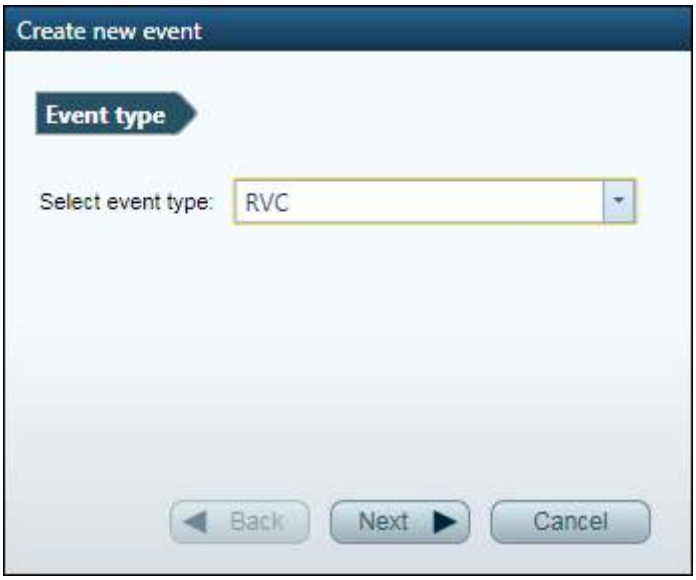
- To assign an event to a component, go to the Power Quality tab on the component configuration.
- An Interruption event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

7.9.8.4 Create new RVC event

Click *Create new event definitions* to launch the *Create new event definition* Wizard.

Step 1: Select event type

On the *Event type* page, select *RVC*.

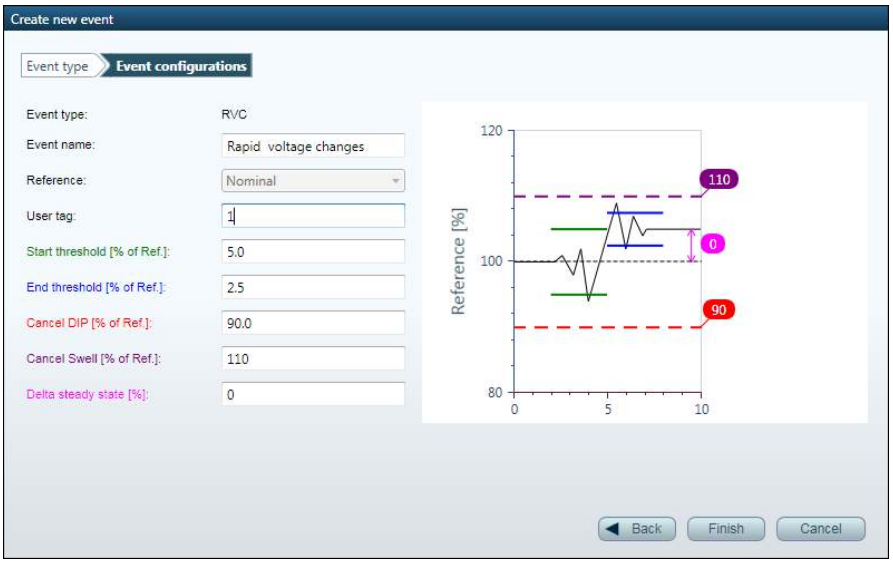


Click *Next* to go to *Event configuration* page.

Step 2: Event configuration

On the *Event configuration* window, configure the following options:

- Event name – type the event name
- User tag –used to distinguish between events of the same type
- Threshold [% of Ref] – An RMS voltage is in a steady-state condition if all 1/2 cycle 100/120 RMS values (50/60 Hz respectively) remain within the RVC threshold from the average of those 100/120 RMS values. The RVC threshold is set by the user as a percentage of Nominal.
- End Threshold [% of Ref] – define the end event limit.
- Cancel Dip [% of Ref] – defines the lower limit to cancel an event.
- Cancel Swell [% of Ref] – defines the upper limit to cancel an event.
- Delta steady state [%] – define the maximum allowed difference between two steady state conditions. Leave 0 to disable this condition.



Click *Finish* to save changes.

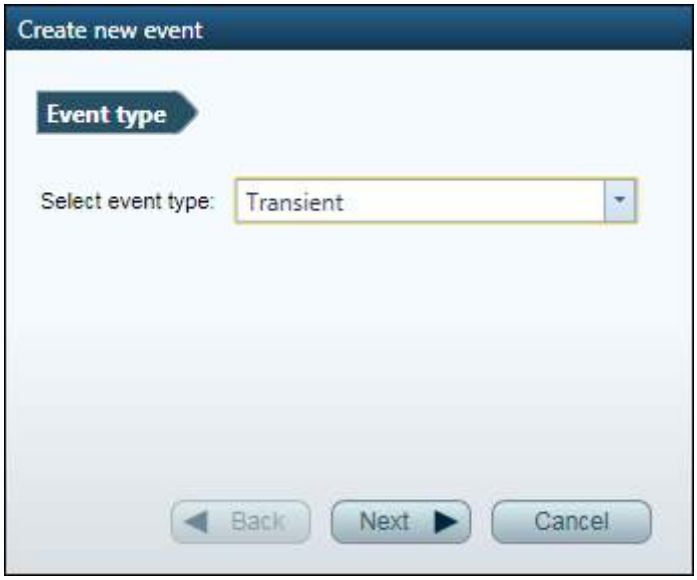
Notes:

- To assign an event to a component, go to the Power Quality tab on the component configuration.
- RVC event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

7.9.8.5 Create new Transient event

Step 1: Select event type

On the *Event type* page, select *Transient*.

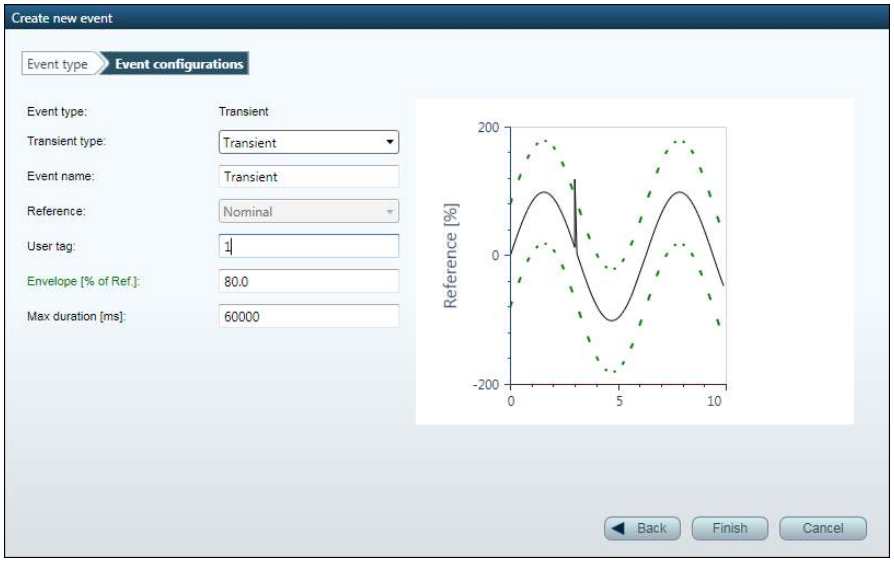


Click *Next* to go to *Event configuration* page.

Step 2: Event configuration

On the *Event configuration* window, configure the following options:

- Transient type – select Transient or Notch.
- Event name – type the event name here.
- User tag – user tag is used to distinguish between events of the same type.
- Envelope [% of Ref] – Transient event triggered when the measured waveform cross a virtual envelope. Envelope size defined in percentage from the nominal waveform peak.
- Max duration [ms] – if parameter stays in event condition longer than the configured Max duration, event will be canceled.



Click *Finish* to save changes.

Notes:

- To assign an event to a component, go to the Power Quality tab on the component configuration.
- Transient event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

7.9.9 License

The license tab displays the license type and expiry date.

7.9.10 E-mail configuration (Enterprise edition only)

1. Enter the following configurations according to your SMTP server:
   - SMTP gateway: Enter the SMTP server hostname or IP address
   - SMTP port: Enter the SMTP server port
   - If the SMTP server requires authentication:
     - Email username: the username
     - Email password: the password.
   - From: email source (example: John@yourdomain.com).
   - Enable SSL: Check if your SMTP server requires encryption.
   - Allow attachments: Check to allow PQSCADA to attach files to emails
2. Enter an email address and click *test email configuration*.
3. Click ***Save***, to apply changes.

7.9.11 SMS configuration (Enterprise edition only)

This tab includes the SMS configuration options

1. Enter the following configuration according to your modem:
   - Modem port: The serial com port to which your modem is connected
   - Baud rate: Baud rate supported by your modem
   - Data bits: The number of bits per one character of data supported by your modem
   - Parity: The number of check bits supported by your modem
   - Flow control: The flow control supported by your modem
   - Send attempts: Number of times PQSCADA Sapphire will send the SMS before failure
2. Enter a phone number and click *test SMS configuration*.
3. Click *Save*, to apply changes.

7.9.12 Server communication (Enterprise edition only)

Protocol:

1. HTTP – for unsecured communication. By default PQSCADA Sapphire service binds to port 80. If port 80 is already in use, the service automatically falls back to port 8080 and then to port 8081. In addition, the port can be manually configured in the *HTTP port* field.
2. HTTPS – for secured communication. By default PQSCADA Sapphire service binds to port 443. If port 443 is already in use, the port can be manually configured in the *HTTPS port* field. A valid certificate must be installed on the server machine, and selected in the *Certificate* field.

7.9.13 Logged on users (Enterprise edition only)

Displays a list of currently logged on users.

7.10 Component configuration

A Component is a logical representation of a physical device – a set of configuration parameters, defined in two xml files:

- **Common** – set of configurations that apply to all components types (for example, component name).
- **Specific** – set of configurations that apply to a specific component type (for example, device IP address is a specific configuration parameter since some components don't support LAN communication).

Each configuration parameter is attached to a configuration tab (e.g. *General*, *Data acquisition and processing*, etc.) in the user interface. Therefore different component types will include different configuration parameters in different configuration tabs.

To view/modify the component configurations click on the component object in the component tree. The available configuration tabs, based on the component type and the user authentication, will open.

7.10.1 Component

The component tab display general statuses of the selected component:

Connectivity – represented as color indicator:

- Green – connection to the device is enabled and working
- Red – connection to the device is enabled but does not work
- Gray – connection to the device is disabled

Component name – the name of the component

Device IP – the IP address of the device

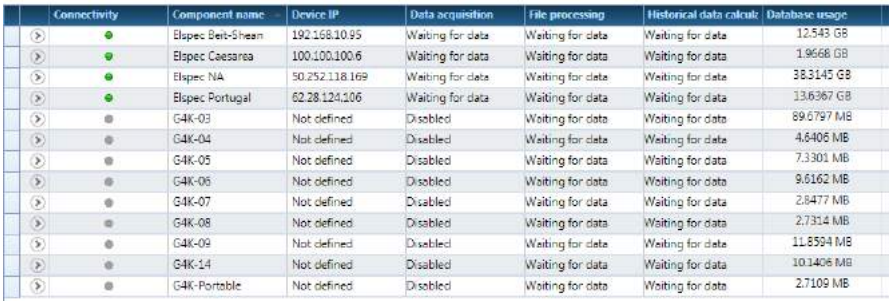
Data acquisition – this column shows the acquisition status of the component:

- *Waiting for data* – downloading is finished, wait for the next connection attempt.
- *Scanning folder* – the component scans for new files in the device
- *Downloading* – the percentage indication of the current file downloading progress
- *Disabled* – downloading is disabled
- *Failed to connect* – communication error

Files processing – this column shows the status of the file processing of the component.

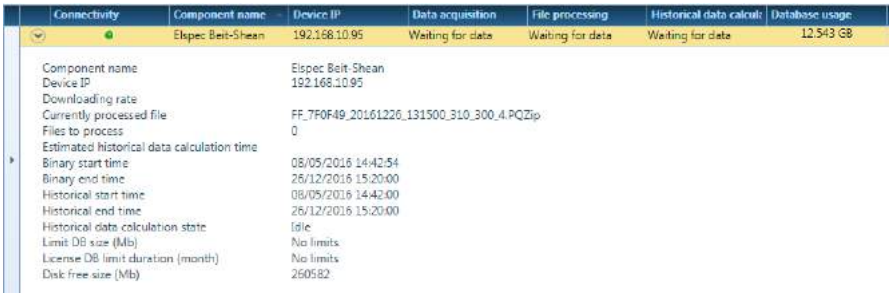
Historical data calculation – this column shows the status of the historical data calculation process.

Database usage – this column show the DB size of the component.



Connectivity	Component name	Device IP	Data acquisition	File processing	Historical data calculc	Database usage
●	Elspec Beit-Shean	192.168.10.95	Waiting for data	Waiting for data	Waiting for data	12.543 GB
●	Elspec Caesarea	100.100.100.6	Waiting for data	Waiting for data	Waiting for data	1.9668 GB
●	Elspec NA	50.252.118.169	Waiting for data	Waiting for data	Waiting for data	38.3145 GB
●	Elspec Portugal	62.28.124.106	Waiting for data	Waiting for data	Waiting for data	13.6367 GB
●	G4K-03	Not defined	Disabled	Waiting for data	Waiting for data	89.6797 MB
●	G4K-04	Not defined	Disabled	Waiting for data	Waiting for data	4.6406 MB
●	G4K-05	Not defined	Disabled	Waiting for data	Waiting for data	7.3301 MB
●	G4K-06	Not defined	Disabled	Waiting for data	Waiting for data	9.6162 MB
●	G4K-07	Not defined	Disabled	Waiting for data	Waiting for data	2.8477 MB
●	G4K-08	Not defined	Disabled	Waiting for data	Waiting for data	2.7314 MB
●	G4K-09	Not defined	Disabled	Waiting for data	Waiting for data	11.8594 MB
●	G4K-14	Not defined	Disabled	Waiting for data	Waiting for data	10.1406 MB
●	G4K-Portable	Not defined	Disabled	Waiting for data	Waiting for data	2.7109 MB

Click the ⊙ button to expend the table for more information.

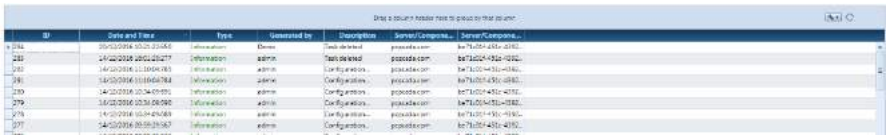


Connectivity	Component name	Device IP	Data acquisition	File processing	Historical data calculc	Database usage
●	Elspec Beit-Shean	192.168.10.95	Waiting for data	Waiting for data	Waiting for data	12.543 GB

Component name	Elspec Beit-Shean
Device IP	192.168.10.95
Downloading rate	
Currently processed file	FF_7F0F49_20161226_131500_310_300_4.PQZip
Files to process	0
Estimated historical data calculation time	
Binary start time	08/05/2016 14:42:54
Binary end time	26/12/2016 15:20:00
Historical start time	08/05/2016 14:42:00
Historical end time	26/12/2016 15:20:00
Historical data calculation state	Idle
Limit DB size (Mb)	No limits
License DB limit duration (month)	No limits
Disk free size (Mb)	260582

7.10.2 Log

The *Log tab* enables you to see specific information related to log entries.



To narrow down your view, click *Tool* at the upper right *main viewing area*

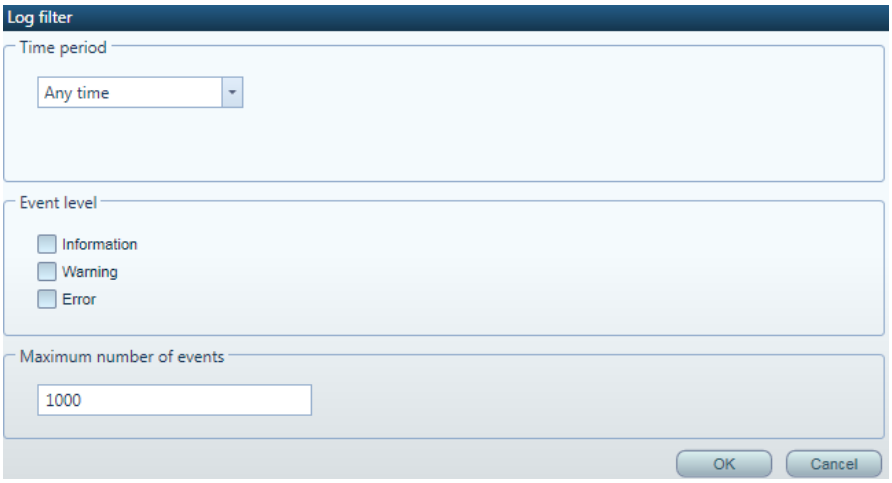
In the *Log filter* menu, do the following:

- Select the time frame
- Select the event level:
  - Information: includes general information on actions taken in PQSCADA Sapphire
  - Warning: -includes any malfunction- that the PQSCADA Sapphire will resolve by itself
  - Error: Includes malfunctions that the PQSCADA Sapphire was unable to resolve. For example failed Tasks due to an incorrect E-Mail address
- Select the *maximum number of events* to be displayed
- Click *OK*.

To refresh the *Log* entries click *Refresh* .

7.10.3 General

The general tab includes the following configurations:



Component Type: informative only

Name: the component name. By default *the Investigation component* name is set as the date & time of the component creation

ID: each component has a unique ID provided by PQSCADA Sapphire. Informative only

Custom time zone:

Other configuration of parameters can be included depending on the component type.

7.10.4 Data acquisition and processing.

Acquisition of data can be achieved by downloading files, data streaming, or all of the above. For example, acquiring data from G4k devices is possible by downloading PQZIP files using FTP, and streaming of real time data by using MODBUS.

For the purposes of this description we assume that you have selected *a BlackBox fix G4* component type. This will ensure that most of the options in the *Data acquisition and processing tab* are fully explored.

Data Acquisition:

Enable data acquisition – check *Enable data acquisition* to enable file downloading.

Device IP/Address – enter the device IP address or click **Scan** to search G4k devices in your network.

File source download directory path – Enter the path to the folder where the files are located. By default the path is set to the default path of the selected device (e.g. for G4k device it is /CF_UPMB/PQZIPDATA_).

Limit download period – use the *Limit download period* to limit the downloaded data to a specific time range:

- Check the *Start time box* and enter date & time to exclude data from previous date.
- Check the *End time box* and enter date & time to exclude data from a later date

Test connection – click *Test connection* to verify connection to the device.

Gateway – the gateway method is defined in the *component xml configuration file* and is presented as information. The gateway communication for G4k devices is Modbus. Therefore port, Slave ID and Modbus mapping need to be configured. For G5DFR and PureBB components, the gateway is PQZ and username and password need to be configured.

Advance settings:

Scan files every (min) – set the scanning period. The default equals 2 minutes.

Override existing database records with the newest data – new data fetched to a component overrides existing data. Uncheck to discard new data with overlapping timestamps with existing data in the database.

Allow files download while scanning with multiple FTP connections – if multiple FTP connections are available check to allow scan and download simultaneously.

Save files to backup folder – check to keep PQZIP files on the instance machine.

Data Processing:

Enable file process – check to enable the processing and storage of binary data.

Enable historical data calculation – check to enable the calculation of summary data.

7.10.5 Power quality

The *power quality tab* defines the compliance, events and parameters to be calculated and stored as part of the *acquisition process.* The *Power quality tab* has three sections: *Compliance*, *Events* and *Parameters*, displayed as a horizontal stackable list with a show/hide functionality. When a label is clicked, it expands the section showing the content within.

3. Compliance

The *compliance section* has two columns: *Recalculate* and *Compliance*. The *Compliance* column includes a list of supported compliance standards.

1. Check compliance you want to apply to component
2. Check *recalculation* if you want the *Instance* to *recalculate* the compliance.
3. Click save on the top right of the screen to apply changes.
4. If you check *recalculation*, the *save configuration* window will pop-up. Under the *save configuration* window, do the following:
   a. Select the *Start time* for the *recalculation*.
   b. Select the *End time* for the *recalculation*.
   c. To prioritize the *recalculation* over the *acquisition process*, check *start recalculation and discard the data in processing phase*

Parameters (voltage RMS for example) and events (dip for example) that are required for the compliance process will be automatically selected in the *Parameters* and *Events* sections and highlighted in yellow.

4. Events

The Event section displays a list of events, preconfigured in the *Instance Events tab*. Events are acquired by PQSCADA Sapphire in two modes:

- *Fetch from device* – PQSCADA Sapphire acquires the events logs directly from the device.
- *Calculate and Fetch from device* – PQSCADA detects and logs the events from the stored historical data. In addition, events logs are acquired directly from the device.

Events highlighted in yellow are required by the selected compliance standard.

1. For each one of the events in the list select the *Mode* of logging.
2. Check *recalculation* if you want the *Instance* to *recalculate* the event detection. Apply to events in *calculate and Fetch from device* mode.
3. Click save to apply changes.
4. If you check the *recalculation* box, the *save configuration* window will pop-up. Under the *save configuration* window, do the following:
   a. Select the *Start time* for the *recalculation*.
   b. Select the *End time* for the *recalculation*.
   c. To prioritize the *recalculation* over the *acquisition process*, check *start recalculation and discard the data in processing phase*

5. Parameters

The Parameters section displays a table with a list of parameters *Group* (RMS for example refers to all RMS data from all channels, voltage and/or current) and its supported resolutions (parameter *Group* can support multiple resolutions, such as: 1/2 cycle, 10/12 cycles, 150/180 cycles, etc.). This section applies to the *Summary* data only.

Parameters highlighted in yellow are required by the selected compliance standard, and cannot be disabled.

1. For each one of the cells in the table, select the operation mode Depending on the component type, options may vary:
   - *Calculate historical data by Instance* – the instance will calculate and store *summary* data based on the stored *binary* data.
   - *Calculated by device* – *Summary* data is fetched from file.
   - *Fetch historical from device* – *Summary* data will be fetched directly from the device using the component gateway.
   - *Fetch instance data from device* –PQSCADA Sapphire will fetch real-time high resolution data from the device, using the component gateway. *Summary* data will be calculated by PQSCADA Sapphire. For example, PQSCADA Sapphire will fetch RMS V1 at 1 second resolution as *Instance data*, and will calculate and store summaries for every 1 minute.
   - *Receive report from device* – acquire data using the report option of the IEC61850 protocol.
   - *Do not calculate* – PQSCADA Sapphire will not calculate nor fetch any *summary* data.
   - *Do not calculate and delete* – PQSCADA Sapphire will not calculate *summaries* for future data and will delete *summaries* stored in the database
2. Check *recalculation* if you want the *Instance* to *recalculate* parameter
3. Click save to apply changes.
4. If you check *recalculation*, the *save configuration* window will pop-up. Under the *save configuration* window, do the following:
   a. Select the *Start time* for the *recalculation*.
   b. Select the *End time* for the *recalculation*.
   c. To prioritize the *recalculation* over the *acquisition process*,

check *start recalculation and discard the data in processing phase*.

7.10.6 Database

The *Database* tab includes the following configurations:

DB type – Choose MSSQL or SQL light

DB URL – Enter the DB URL address

DB limit size (Mb) – check *DB limit size* to allow the instance to truncate older data once the database size limit is reached.

7.10.7 Tags

The tags tab lists the enabled tags of the instance.

7.10.8 Unit configuration

The *Unit configuration* tab defines the channel mapping of a component containing waveform data. The *Unit configuration* tab is dividing into 3 sections: *Physical channels*, *Auxiliary channels* and *Virtual channels*, displayed as a horizontal stacked list using the show/hide functionality. When a label is clicked, it expands the section showing the content within.

The Unit configuration tab has two states:

- *Synchronize with component* – PQSCADA Sapphire imports the channel mapping configuration from the physical device. This is the default state
- Unsynchronized with component – PQSCADA Sapphire ignores the channel mapping of the physical device. This state is mostly used to fix misconfigurations and/or wrong connections as a post process

To modify mapping configuration, follow the instruction below:

1. Uncheck the *Synchronize with component* box.
2. To modify the physical channels, follow the instruction below:

   The physical channels section includes a list of the device physical channels, their properties, and the system frequency.

   Channel – displays the name of the physical channel

   Signal type – displays the signal type of the physical channel (e.g. voltage, current).

   Primary – enter the new primary value here.

   Secondary column – enter the new secondary value here.

   Nominal Frequency (Hz) – enter the new nominal frequency here.

> **NOTE:**
>
> Physical channels store the waveform data as recorded by the physical device.

3. To modify the Auxiliary channels, follow the instruction below:

   The Auxiliary channels section includes a list of the device auxiliary channels and their properties. PQSCADA Sapphire supports 4 types of auxiliary channels: Analog input, analog output, digital input and Digital output.

- **Analog input channels**

  ID – displays the channel ID number

  Signal type – displays the signal type of the physical channel (e.g. voltage, current)

  Name – enter the new channel name here.

  Units– select the units to display the measurement. This combo box contains a list of optional units (e.g. Hz, ^{0}C, etc.). To add a custom unit, click on *add custom unit* and enter the new unit type.

  Analog min. – enter the minimum value of the analog input (e.g. 4mA)

  Analog max. – enter the maximum value of the analog input (e.g. 20mA)

  Converted min. – enter the value to display when the reading is equal to the analog min value

  Converted max. – enter the value to display when the reading is equal to the analog max value

- **Analog output channels**

  ID column – displays the channel ID number

  Signal type – displays the signal type of the physical channel (e.g. voltage, current)

  Name – enter the new channel name

  Units – select the units to display the measurement here. This combo box contains list of optional units (e.g. Hz, ^{0}C, etc.). To add custom unit, click on *add custom unit* and enter the new unit type.

  Analog min. – enter the minimum value of the analog input (e.g. 4mA)

  Analog max. – enter the maximum value of the analog input (e.g. 20mA)

  Converted min. – enter the value to display when the reading is equal to the analog min. value

  Converted max. – enter the value to display when the reading is equal to the analog max. value.

- **Digital input channels**

  ID column – displays the channel ID number.

  Signal type– displays the signal type of the physical channel.

  Name – enter the new channel name

- **Digital output channels**

  ID – displays the channel ID number

  Signal type – displays the signal type of the physical channel

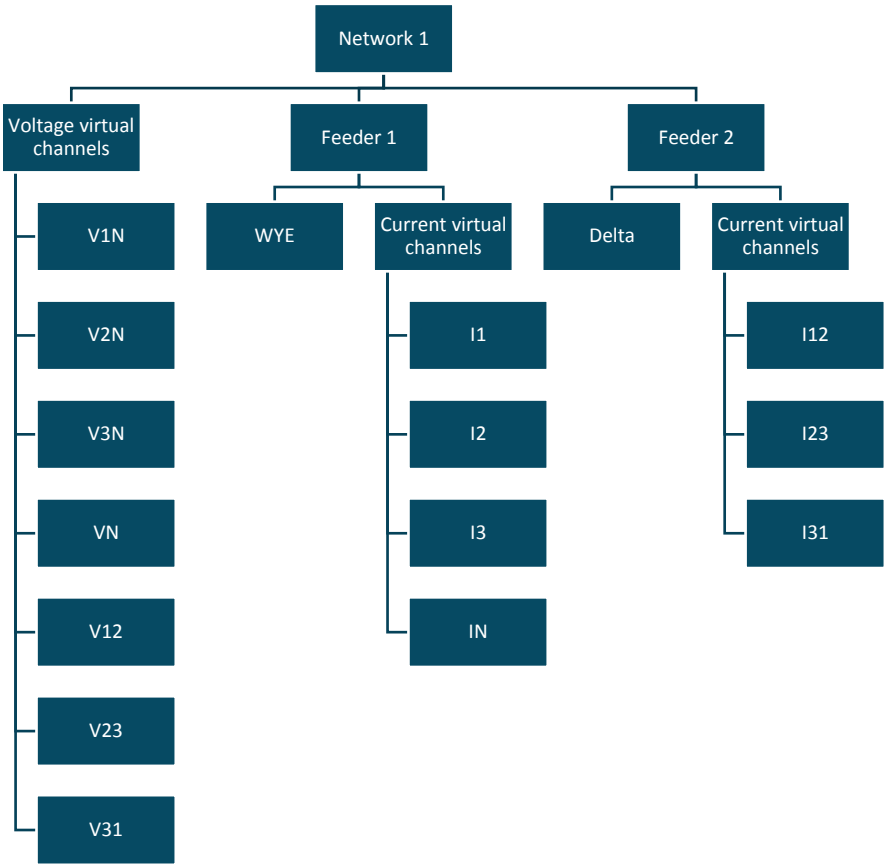
  Name – enter the new channel name

4. To modify the virtual channels, follow the instruction below:

   This section is used to map physical channels to power topologies. The power topology elements are:

   - **Network** – the network properties are: Voltage virtual channels and feeders.
   - **Feeder** – the feeder properties are: current virtual channels and power topology.
   - **Virtual channel** – the virtual channel properties are: Nominal and mathematical summation of physical channels with scaling factor.

Following is an example of single network with 2 feeders:



Add network

1. Under virtual channels, Click +. Network with one voltage channel and 1 feeder will be created by default
2. Add/Modify voltage virtual channels for the network:

   Click + to add a virtual channel, and configure the following:

   - *Tag* – Tag is used to classify the virtual channel to a specific phase. This combo box contains possible tagging options
   - *Name* – Enter the name of the virtual channel
   - *Nominal* – Enter the nominal value of the virtual channel
   - *Physical* – select a physical channel. These combo boxes contain list of physical channels
   - *Factor* – enter the factor to multiply the physical channel with. To reverse polarity of a channel enter (-1).

     $$Virtual\ Channel = \sum_{N=1}^{4} (Physical)_N X (Factor)_N.$$
3. Set the topology under the feeder.
4. Add/modify current virtual channels for the feeder
5. Click save, to apply changes
6. Under *save configuration*, do the following
   a. Check the *new time* box
   b. Enter time to apply the new configuration from
   c. Click *Save* to apply changes and start Recalculation

7.10.9 Query settings.

The *Query settings* tab enable you to change: scale factors, and clock settings and includes the following configurations:

- Time synchronization – this configuration is useful to correct the real time clock of the instrument in case it was incorrect while measuring
  - Check the Time shift box to enable time shifting
  - Select the time shift direction: Forward or Back
  - Enter the amount of time to shift in the time picker
- Primary PT – enter the new primary PT value here
- Secondary PT – enter the new secondary PT value here
- Primary CT – enter the new primary CT value here
- Secondary CT – enter the new secondary CT vale here
- Check the Change neutral setting box if Neutral channel requires different scaling factors
  - Primary CT for neutral channel – enter the new Primary CT for neutral channel here
  - Secondary CT for neutral channel – enter the new secondary CT for neutral channel here
- V to I ratio – enter the new V to I ratio of the clamps here
- Click *Save* to apply changes

Notes:

- The Query settings apply on the *Summary* data only. Therefore some parameters may not be recoverable in all situations.
- To apply scaling factors, swap phases and reverse polarity

7.10.10 Save as Default

8. Setup

8.1 Users/Groups

Click the *Setup* menu and select *Users/Groups*

The *Users/Groups* screen is divided into two main sections – the left hand side displays the Server object, and users/groups objects, and the right hand side displays the properties of each of those objects, while they are selected.

8.1.1 Authentication providers

PQSCADA Sapphire supports three types of authentication providers for users and groups:

- *PQSCADA Sapphire authentication* – users and groups are created and managed internally, on the application level.

  In a hierarchical structure of primary and secondary servers, authentication between the instances themselves is based on this type
- *Local machine authentication* – users and groups are created and managed locally on the operating system level, recognized by PQSCADA Sapphire and can be assigned with permissions and roles
- *Active Directory authentication* – users and groups are created and managed externally by an administrator on the Domain level, recognized by PQSCADA Sapphire and can be assigned with permissions and roles

  In order to utilize Active Directory authentication, the domain name needs to be configured, as well as a valid user name and password, which will be used for binding to Active Directory. This configuration is made on the server object.

8.1.2 Creating groups

Click *Actions* and select *Add group*. Select the appropriate Authentication Provider (See *Authentication Providers*) and click *Next*.

- If *PQSCADA Sapphire authentication* is selected, enter the name of the group, select Type (Admin/Non-Admin), and add users. If you do not wish to add users at that time, click *Finish*.
- If *Local machine authentication* or *Active Directory authentication* are selected, select a group from the drop-down menu, then select Type (Admin/Non-Admin) and click *Close*. The name of the group and member users are configured on the operating system level or on the domain level, respectively.

8.1.3 Creating users

Click *Actions* and select *Add user*. Select the appropriate Authentication Provider (See *Authentication Providers*) and click *Next*.

- If *PQSCADA Sapphire authentication* is selected, enter a user name and a password, select Type (Admin/Non-Admin), and add to groups. If you do not wish to add to groups at that time, click *Finish*.
- If *Local machine authentication* or *Active Directory authentication* are selected, choose a user from the drop-down menu, select Type (Admin/Non-Admin) and add to groups. If you do not wish to add to groups at that time, click *Finish*. User name and password are configured on the operating system level or on the domain level, respectively.

8.1.4 Assigning permissions to groups and users

PQSCADA Sapphire has a sophisticated security module, allowing the creation of a highly-granular access policy. This policy is configured on the *Permissions* tab.

8.1.4.1 Rules

For each group or user object - one or multiple rules can be created. The logical operator between multiple rules is 'OR'.

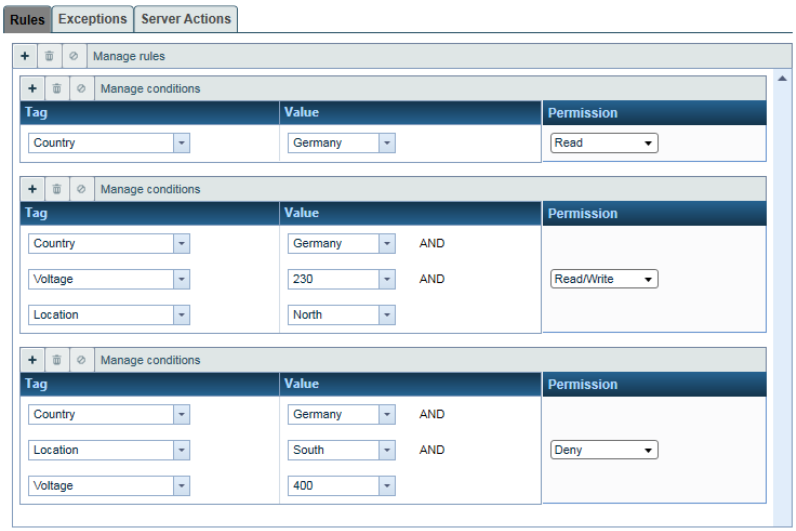
Within each rule, one or multiple conditions can be created. The logical operator between multiple conditions is 'AND'.

Conditions are Tag-oriented, which means that for every combination of Tag and value - you can assign a permission of Read, Read/Write or Deny.

For example – the user "David" has read permissions on all components that are associated with the Country tag Germany.

Furthermore, on components that are associated with voltage tag 230 and location tag North, this user has Read/Write permissions.

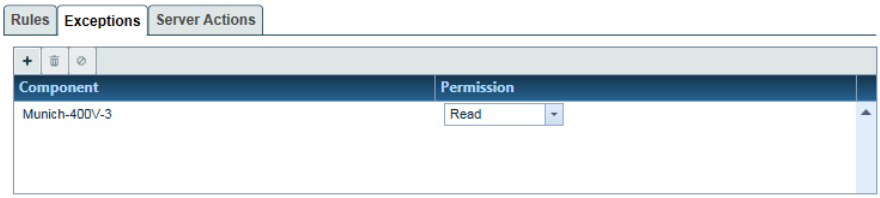
However, on components that are associated with voltage tag 400 and location tag South, this user has a Deny permission, which means he cannot see any data stored in them.



8.1.4.2 Exceptions

Unlike rules and conditions, exceptions are component-oriented, which means that for each component that exists on the system - you can directly assign a permission of *Read, Read/Write* or *Deny*. Exceptions take precedence over Rules, allowing for further fine-tuning of permissions.

For Example - the user “David” has a Read Exception permission on the component Munich-400v-3 that is associated with both Voltage Tag 400 and Location tag South. Normally, this user would have been denied access to this component (as per previous example), however since an Exception was created – he can now gain access.

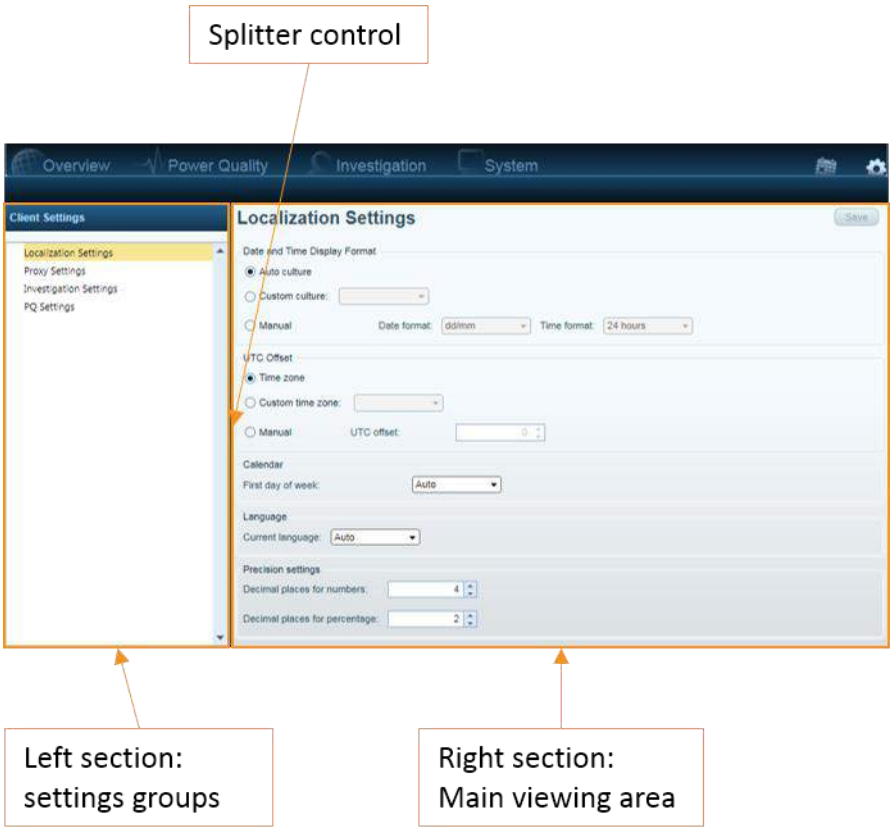


8.1.4.3 Server Actions

Non-administrative users can be delegated to perform certain actions that would otherwise require administrative permissions over the system, such as adding or removing a component, or creating a task.

8.2 Client setting

Click the *Setup* menu and select *Client setting*, to open the client setting window.



The *Client Setting* screen is divided into two main sections – the left section displays settings groups, and the right section displays the properties of each of those group, while selected. These sections are divided by the splitter control (a vertical line between the sections).

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

8.2.1 Localization Settings

- *Day and Time Display format* – select one of the options below:
  - *Auto culture* – select *Auto culture* to use windows configurations.
  - *Custom culture* – select *custom culture* and choose one of the options in the drop down menu to set the date and time format for a different country.
  - *Manual* – select *Manual* to set up your own date and time format.
- UTC Offset – select one of the options below as the client time zone:
  - *Time zone* – select Time zone to use your local computer time zone
  - *Custom time zone* – select Custom time zone and choose one of the options in the drop down menu to set the time zone for a different country
  - *Manual* – select Manual to set UTC offset manually
- *Calendar* – select the *first day of the week*. *Auto* will use windows configuration
- *Language* – select the language of the client. *Auto* will use windows configuration
- *Precision settings* – configure the options below:
  - *Decimal places for number* – select the number of figures to display after the decimal point for absolute numbers
  - *Decimal places for percentage* – select the number of figures to display after the decimal point for percentage numbers

8.2.2 Proxy Settings

Some organizations use proxy servers as intermediary between user's computers, and the Internet.

Proxy servers are used to control access to the Internet, to optimize bandwidth usage and enhance security.

PQSCADA Sapphire may require access to the Internet for the following reasons:

- Version update notifications.
- Map data retrieval in the Overview screen (Enterprise and Professional editions only).
- Connecting to remote PQSCADA Sapphire servers, as a client

The following options are available:

- *No Proxy*: connect directly to the Internet. No additional configuration is required
- *Use System Proxy Settings*: PQSCADA Sapphire uses the same proxy settings as configured in Windows' Internet Options, Connections tab, LAN Settings
- *Manual Proxy Configuration*: select this option if the use of a Proxy server is required for PQSCADA Sapphire, but this requirement is different than the one for the operating system (i.e. operating system connects directly to the internet, or by using another, different Proxy server)

  Additional configuration is required - Proxy server Hostname, and Port

  The *No Proxy For* is a bypass list, enabling to specify hostnames and IP addresses that will not be proxied.

  If *Bypass proxy server for local addresses* checkbox is selected, connections to other hosts on your local network will not be proxied
- *Network Credentials*: depending on the proxy server configuration and the requirement for authentication, the following authentication methods are available:
- *Windows Authentication* – PQSCADA Sapphire uses your Windows logon credentials for authentication. This method is mostly used in domain environments
- *Manual* –enter manually a valid user name and a password

8.2.3 Investigation Settings

- *Default Chart Display Mode* – select the default display mode when opening a new Chart
  - *Normalize* – voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage * Current nominals
  - *Regular* – displays absolute data
- *Default Power Factor Display mode* – select one of the options in the drop down menu:
  - *Load* – select load if the readings are conducted on a load.
  - *Source* – select Source if the readings are conducted on a generator
- *Default Charts Angle Mode* – select how angles will be

displayed in a chart

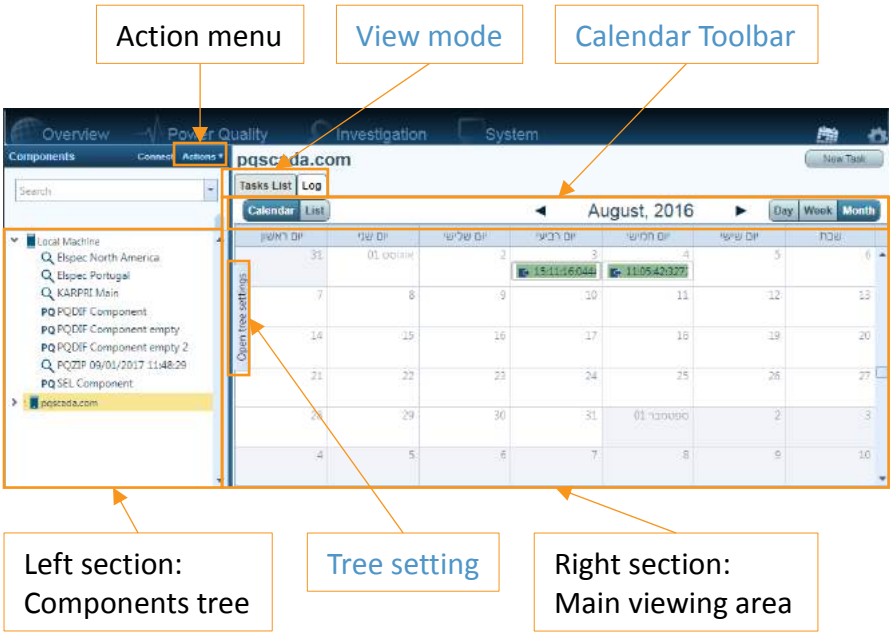
- *Default Calculation Base Mode* – Base resolution is the native time interval of a parameter. For example: RMS can be calculated every 1/2 cycle or 10/12 cycles. Therefore, 1 minute aggregated values can be calculated based on 1/2 cycle or 10/12 cycles. The results of these two aggregations can be different. For min/max values the based resolution is even more critical. PQSCADA Sapphire supports multiple base resolutions for a single parameter. The following options are available:
    1. *Auto* – PQSCADA will select the base resolution automatically according to a selected parameter. For min/max values PQSCADA will select the highest resolution available in the database. For average values PQSCADA Sapphire will select the closest resolution to the selected.
    2. *Manual* – based resolution will be selected by the user on the parameter selection page of the *add new chart wizard*.
- *Default Energy Chart Layout*
- *Export Settings* – enter size in pixel of the exported image of a chart.
- *Phase Color Definition* – select the displayed color of each one of the phases, frequency channel, auxiliary channels and total parameters.

8.2.4 PQ Settings

9. Scheduler

The Scheduler module enables you to monitor tasks that are currently running, scheduled to run or already ran. In addition you can use the scheduler module to add, modify, delete, stop and resume tasks.

Tasks are add-ons, such as a report, that runs on individual process. PQSCADA Sapphire supports three types of tasks: Reports, Exports, and control and maintenance.



The *Scheduler module* screen is divided into two main sections – the left section displays the connected *Instances* and their hosted *components*, and the right section displays the configured tasks of each of those objects, while selected.

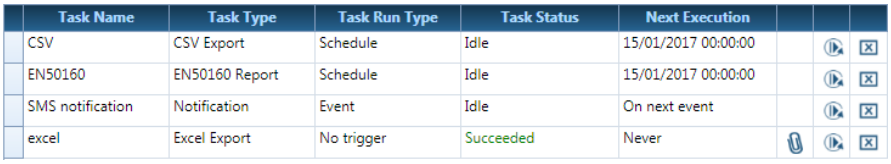
These sections are divided by the splitter control (a vertical line between the sections). The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

9.1 View mode

Use the View mode to toggle between: *Task List* and *Log* views.

9.1.1 Tasks List

Tasks List enables to monitor the status of currently configured tasks of the selected object/s.



Task Name	Task Type	Task Run Type	Task Status	Next Execution
CSV	CSV Export	Schedule	Idle	15/01/2017 00:00:00
EN50160	EN50160 Report	Schedule	Idle	15/01/2017 00:00:00
SMS notification	Notification	Event	Idle	On next event
excel	Excel Export	No trigger	Succeeded	Never

Task name – displays the name of the task

Task Type – displays the task type

Task Run Type – displays task's trigger:

- Schedule – reoccurring tasks
- Event – task is triggered by event
- No Trigger – single running task

Task Status – displays the status of the last operation:

- Idle – task was not triggered yet
- Succeeded – task operation was successful
- Failed – task operation/output failed

Next Execution – date and time for next operation

Attachment – click *attachment* to open the attachment window

Rerun – for single running tasks, click the *Rerun* icon to rerun the task

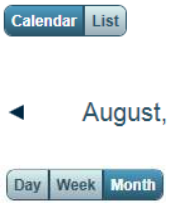
Delete – click the *Delete* icon to delete task from Instance

9.1.2 Log

The *Log* mode displays logs of executed and scheduled tasks in two ways: *Calendar* and *List*.

9.1.2.1 Calendar toolbar

It is possible to change the calendar settings from the *Calendar toolbar*.



Toggle view mode – Toggle between Calendar and List views.
Calendar Time – move left or right to change Calendar date.
Arrange – Toggle between Calendar arrangements

9.2 Add new Task

Launch the Add new task wizard by one of the following methods:

- Click *New Task* at the top right corner of the main viewing area
- Click the Action menu and select Add Task
- Right click on the Instance and select Add Task

The Add new task wizard has two stages:

1. Scheduler settings – the schedule is an Instance service that trigger the task add-on based on the scheduler settings
2. Add-on settings – the wizard imports the configuration required by the Task add-on. For example, in an export task, the exported parameters belong to the Add-on settings

9.2.1 Export Task

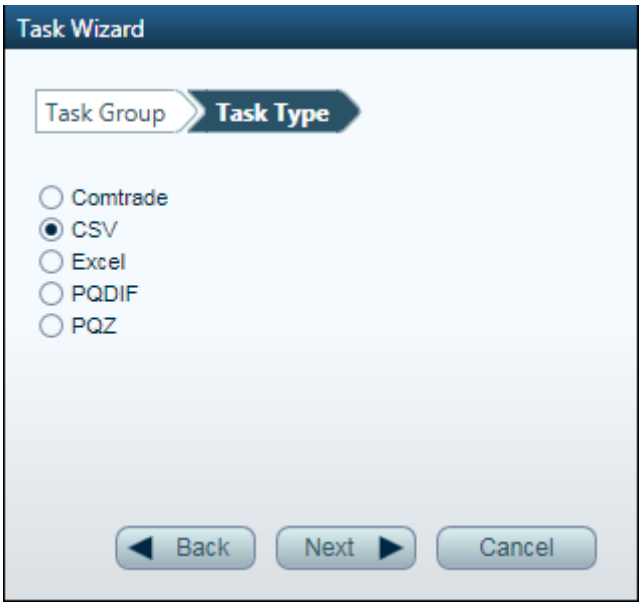
Step 1: Select the Task Group

On the *Task Group* page, select *Export*

Click *Next* to go to *Task Type* page.

Step 2: Select the Task Type

On the *Task Type* page, select one of the options. Available options depends on the *installed add-ons*.



Click *Next* to upload the Add-on configuration. And go to *Task Initial configuration* page.

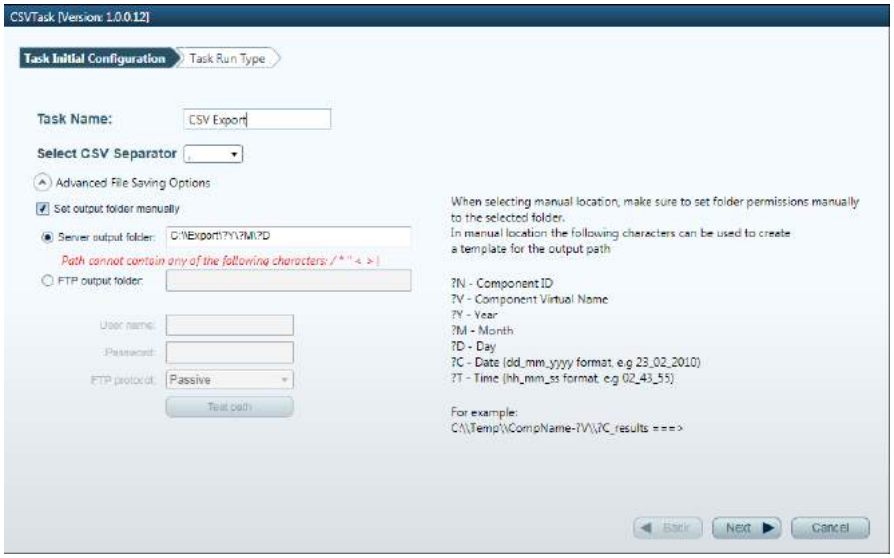
Notes:

- Uploading the Task add-on for first time can take a few minutes.
- Once the Task add-on is uploaded, going back to the Task Type page is no longer available.
- For the purposes of this description we assume that you select CSV Task. This will ensure that all of the steps in the wizard are fully explored.

Step 3: Initial Configuration

On the *Initial Configuration* page, configure the following options:

- *Task Name* – enter the Task Name
- *Select CSV Separator* – select the separator character from the drop down menu.
- *Advanced File Saving Options*
    a. Click the expend arrow to unhide advanced options.
    b. Check *Set output folder manually* to enable the following settings:
        - *Server output folder* – select this option to save task output on the instance machine. Make sure that PQSCADA Sapphire's Instance have permissions to store files in the configured path
        - *FTP output folder* – select this option to save task output of a remote FTP server.

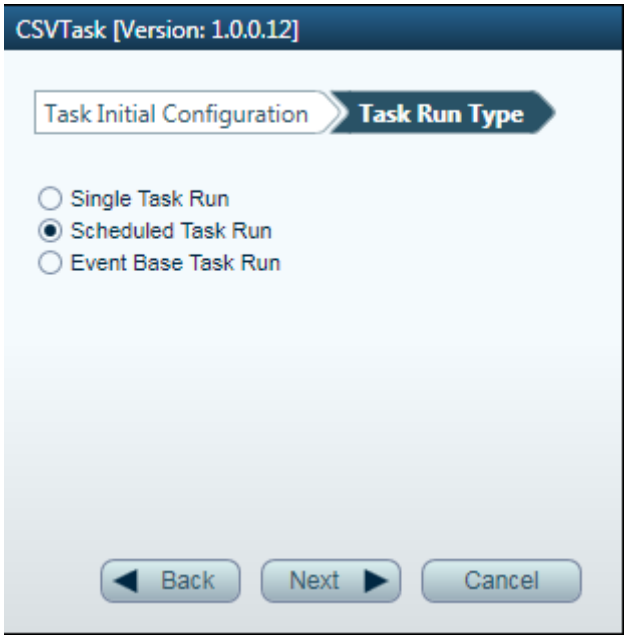


Click *Next* to go to *Task Run Type* page.

Step 4: select the Task Run Type

On the *Task Run Type* page, select one of the following options:

- *Single Task Run* – PQSCADA Sapphire will run the Task one time only.
- *Schedule Task Run* (enterprise edition only) – Allows to create a Task once, and then have it execute automatically after a designated time interval.
- *Event Base Task Run* (enterprise edition only) – allows to define events that, when met, start Task execution.



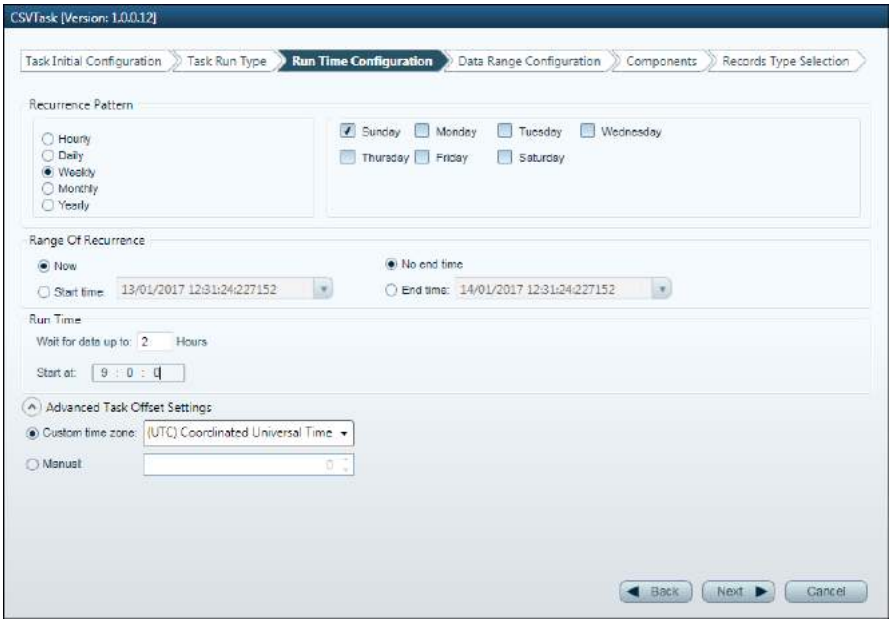
Click *Next* to go to *Run Time Configuration* page.

Step 5: Run Time Configuration

On the *Run Time Configuration* page, configure the following options:

- *Recurrence Pattern* – select how often Task will be executed: hourly, daily, weekly, monthly or yearly
- *Range Of Recurrence* – use *Range Of Recurrence* to specify when the recurring Task starts and ends. By Default, a recurrence is set to *Now* and *No end time* respectively
- *Run Time* – use *Run Time* to specify when to execute the Task
  - *Wait for data up to* – use this option to delay the execution time in case that part of the data is missing
  - *Start at* – the time to execute the Task
- *Advance Task Offset Settings* – use this option to set time offset different from the Instance machine.

In the example below, the Task will be executed every Sunday at 9:00AM UTC Coordinate Universal Time. Furthermore, if at 9:00AM data is not available, Task execution will be delayed by up to two hours. At the end of the two hours, Task will be executed regardless of data availability.



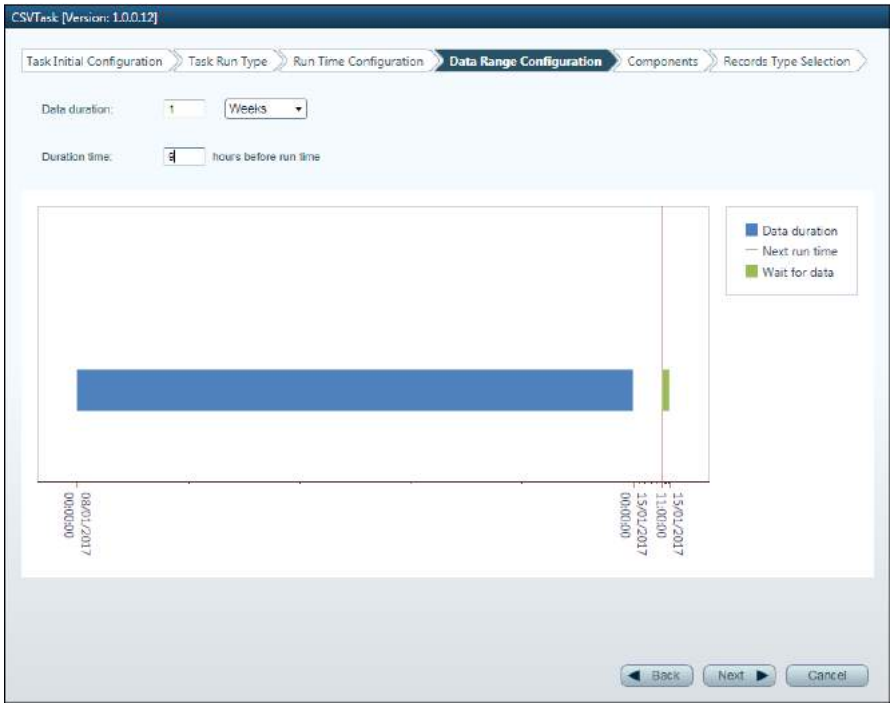
Click *Next* to go to *Data Range Configuration* page.

Step 6: Data Range Configuration

On the *Data Range Configuration* page, configure the following options:

- *Data Duration* – set the data duration to be exported.
- *Data end time* – set the end time relative to the *Run Time* (configured in the *Run Time Configuration* page).

In the example below, the *Data duration* is set to 1 week and *Data End Time* to 9 hours. Therefore, every Sunday at 9:00-11:00 (as per previous example), export task will be executed. The exported file will contain the data of the last week midnight to midnight.



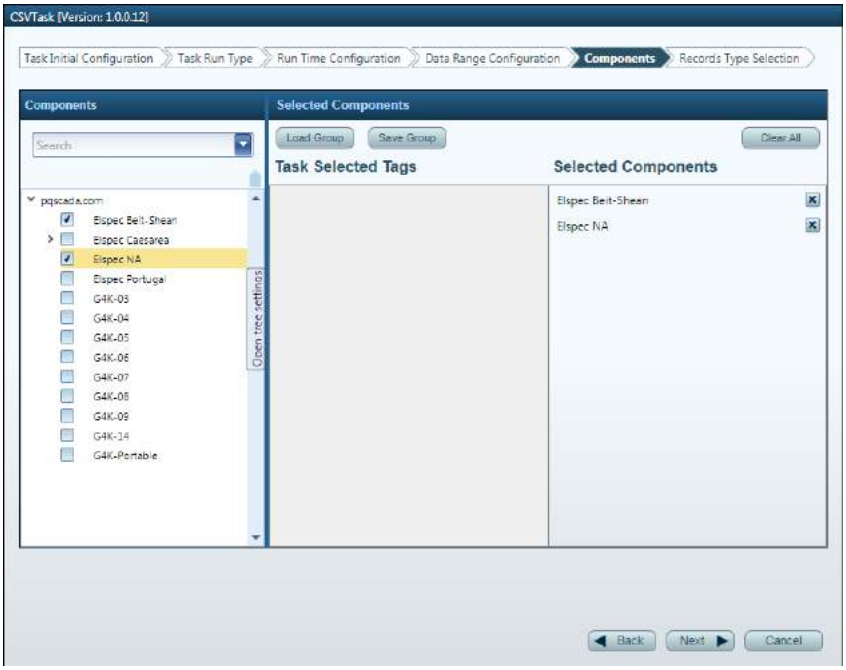
Click *Next* to go to *Components* page.

Step 7: select Components

On the *Component page*, select the components to execute the Task on in one of the following options:

- **Component selection** – Task will be executed on individual components. select a component with one of the following options:
  - Check the component boxes in the *Component section* on the left side of the *Component page*. Click the *Tag* button to sort component by tags. To reset tags click the Open tree settings.
  - Click the *Load Group* button in the Selected *Component section* on the right side of the *Component page*

  A list of the selected components will appear at the *Selected Components* column. To save the selected list, click *Save Group*

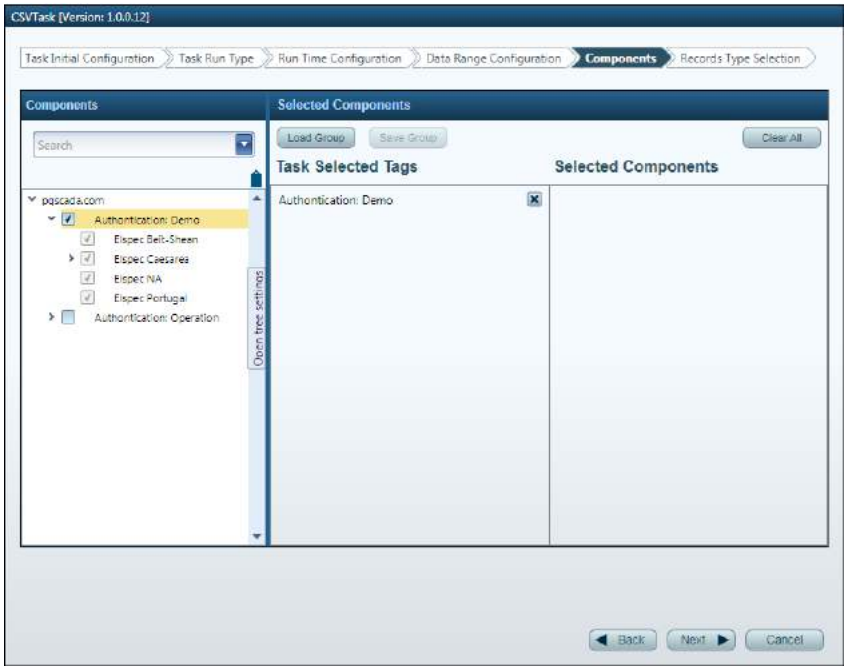


- **Tags selection** – Task will be assigned on all components configured to the selected tag. To select tags, do the following:

  a. Click the *Tag* icon to sort component by tags. To reset tags click the Open tree settings

  b. Check the Tags boxes in the *Component section* on the left side of the *Component page*

  A list of the selected tags will appear on the *Task Selected Tags* column.

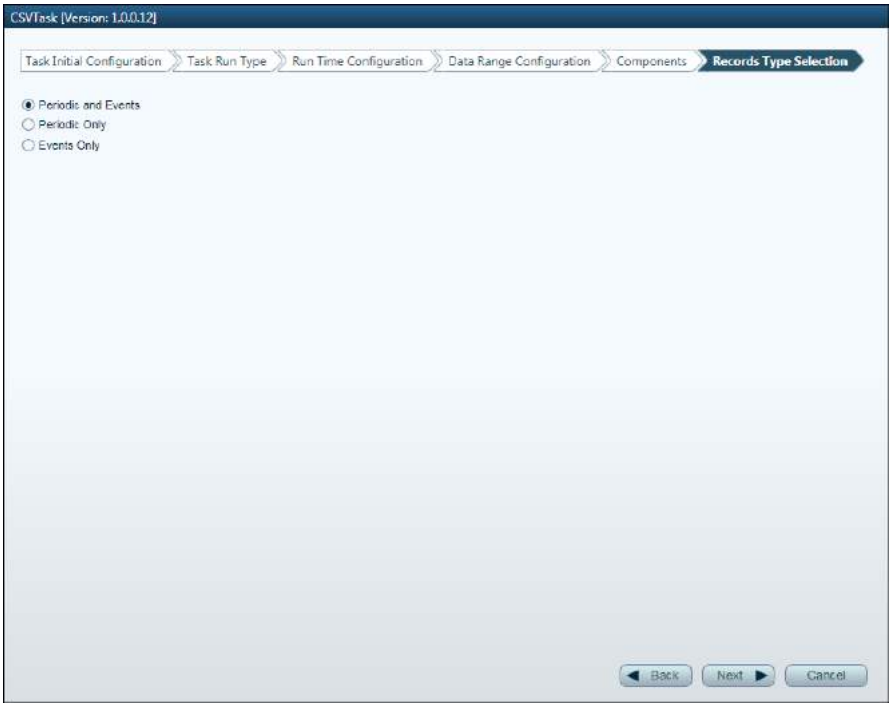


Click *Next* to go to *Records Type Selection* page.

Step 8: Records Type Selection

On the *Records Type Selection* page, select one of the following options:

- *Periodic Only* – used to export low resolution parameters continuously for the entire task data duration
- *Events Only* – use only to export high resolution parameters and waveform for events that occurred during the Task Data Duration. Each event is a data record with a duration equal to the event duration plus pre/post margins
- *Periodic and Events* – use to export both low resolution parameters for the entire task data duration, and high resolution parameters and waveform for events occurred during the task data duration



Click *Next* to go to *Low Resolution Parameters for periodic* page.

Notes:

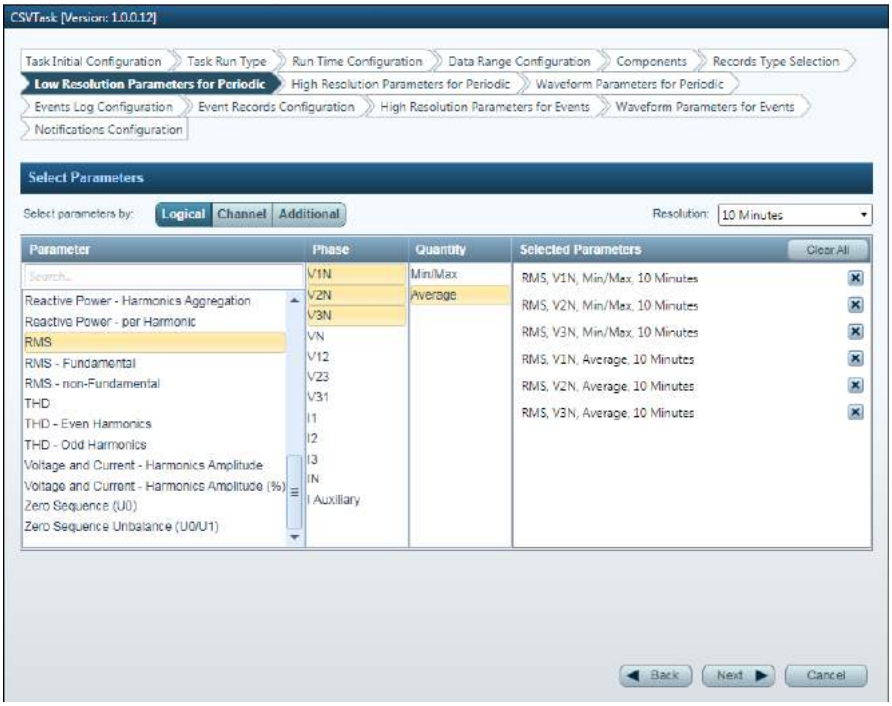
- For the purpose of this description we assume that you select *Periodic and Events*. This will ensure that all the steps in the wizard are fully explored.

Step 9: Low Resolution Parameters for periodic

On the *Low Resolution Parameters page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters are stored without any power topology and can be sorted by channel number
  - Additional – non-power needs verb parameters such as temperature.
- Select Resolution from the drop down menu - on the upper right corner
- Select the parameter in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval and task type
- Click on the phase to select. Second click cancels the selection Multiple phases can be selected.

A list of the selected parameters will appear on the left column.



Click *Next* to go to *High Resolution Parameters for Periodic* page.

Notes:

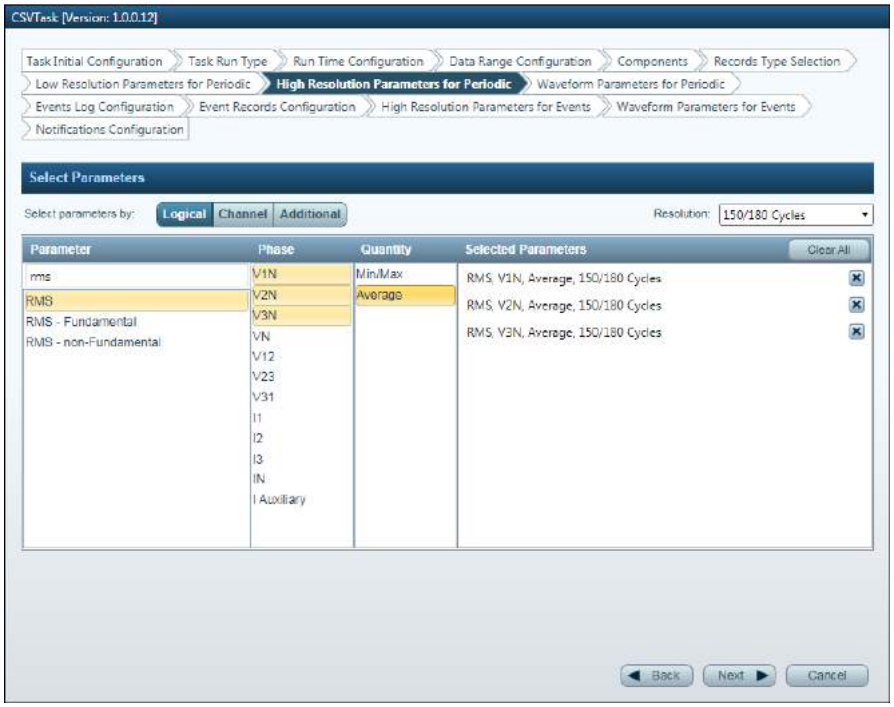
- For CSV export Task, low resolution will be exported as a single file.
- In Excel export Task, low resolution parameters will be exported to a dedicated sheet.

Step 10: High Resolution Parameters for Periodic

On the *High Resolution Parameters page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters are stored without any power topology and can be sorted by channel number
  - Additional – non-power parameters such as temperature.
- Select the resolution from the drop down menu on the upper right corner. The max. number of exported points per parameter is limited to 1,000,000
- Select the parameter in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval and task type.
- Click on the phase to select. Second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.



Click *Next* to go to *Waveform Parameters for Periodic* page.

Notes:

- For CSV export Task, high resolution are exported as a single file.
- In Excel export task, high resolution parameters are exported to a dedicated sheet.

Step 11: Waveform Parameters for Periodic

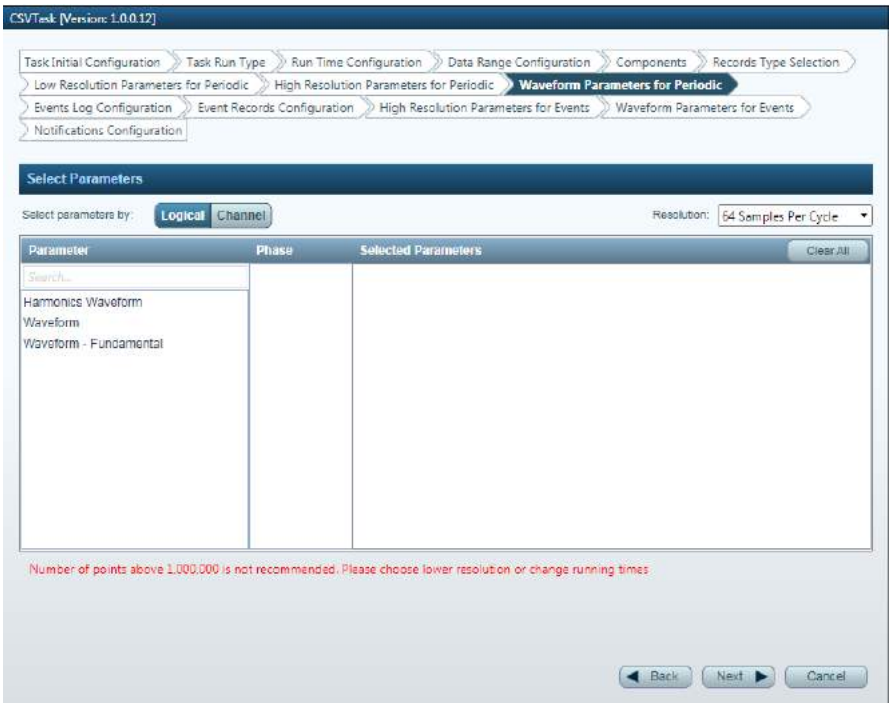
On the *Waveform Resolution Parameters page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters are stored without any power topology and can be sorted by channel number.
  - Additional – non-power parameters such as temperature
- Select the resolution from the drop down menu on the upper right corner. The max. number of exported points per parameter is limited to 1,000,000.
- Select the parameter in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval and task type.
- Click on the phase to select. Second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.

Notes:

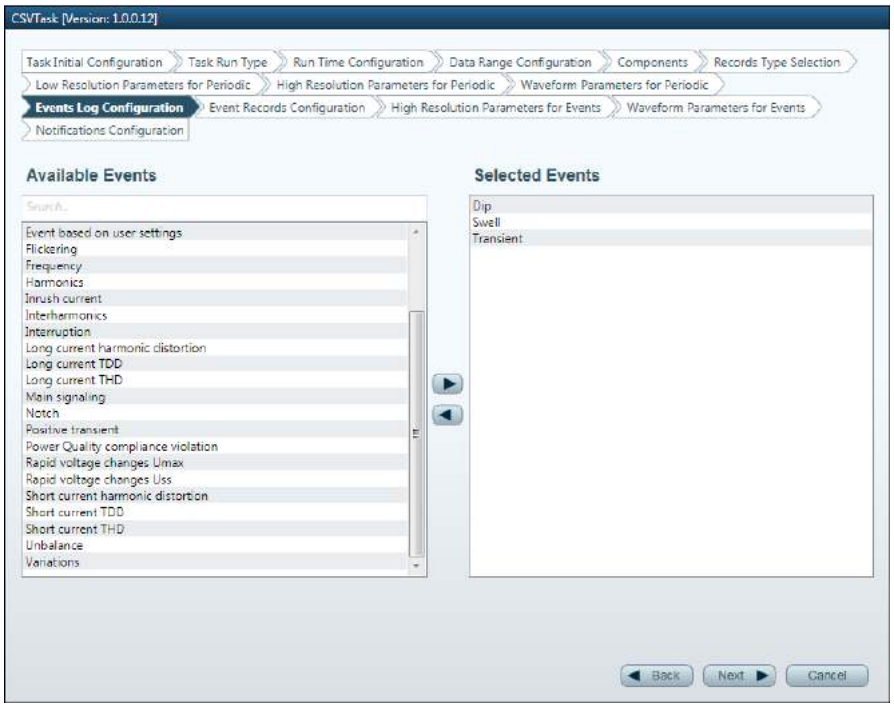
- For CSV export task, waveform data are exported as single file.
- In Excel export task, waveform data are exported to a dedicated sheet.



Click *Next* to go to *Events Log Configuration* page.

Step 12: Events Log Configuration

Select the events to include in the event log table by double clicking the event type on the left list.



Click *Next* to go to *Events Records Configuration* page.

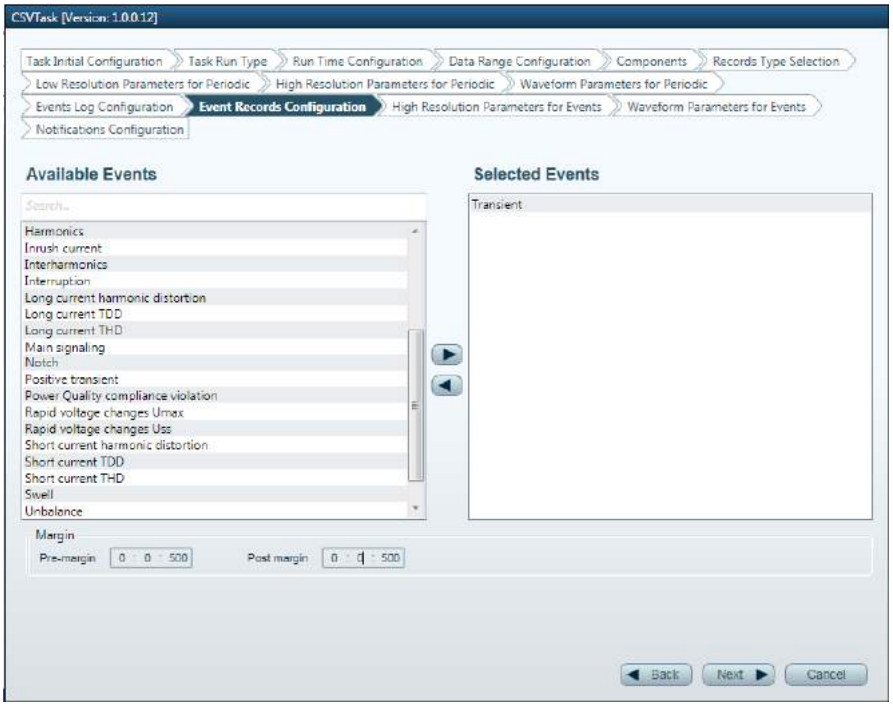
Notes:

- For CSV export task, events log list are exported as a single file.
- In Excel export task, events log list are exported to a dedicated sheet.

Step 13: Event Records Configuration

On the *Event Records Configuration page*, configure the following options:

- Select Events that will trigger events records by double clicking on the event type on the left list.
- Set pre/post margins in the bottom part of the page.



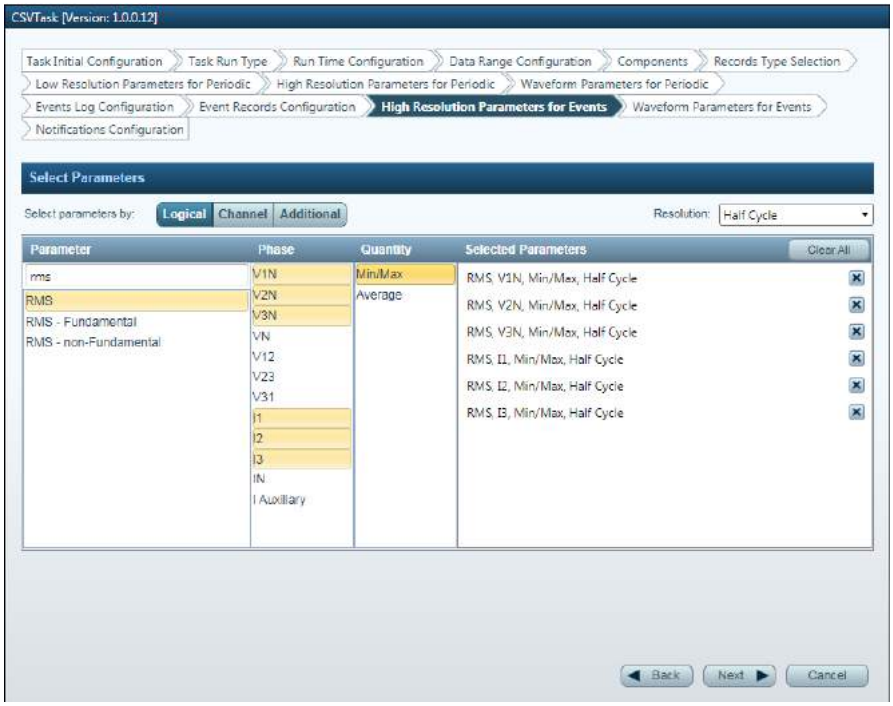
Click *Next* to go to *High Resolution Parameters for Events* page.

Step 14: High Resolution Parameters for Events.

On *High Resolution Parameters for Events page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters are stored without any power topology and can be sorted by channel number.
  - Additional – non-power parameters such as Temperature.
- Select the Resolution from the drop down menu on the upper right corner
- Select the parameter in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval and task type
- Click on the phase to select. Second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.



Click *Next* to go to *Waveform Parameters for Events* page.

Notes:

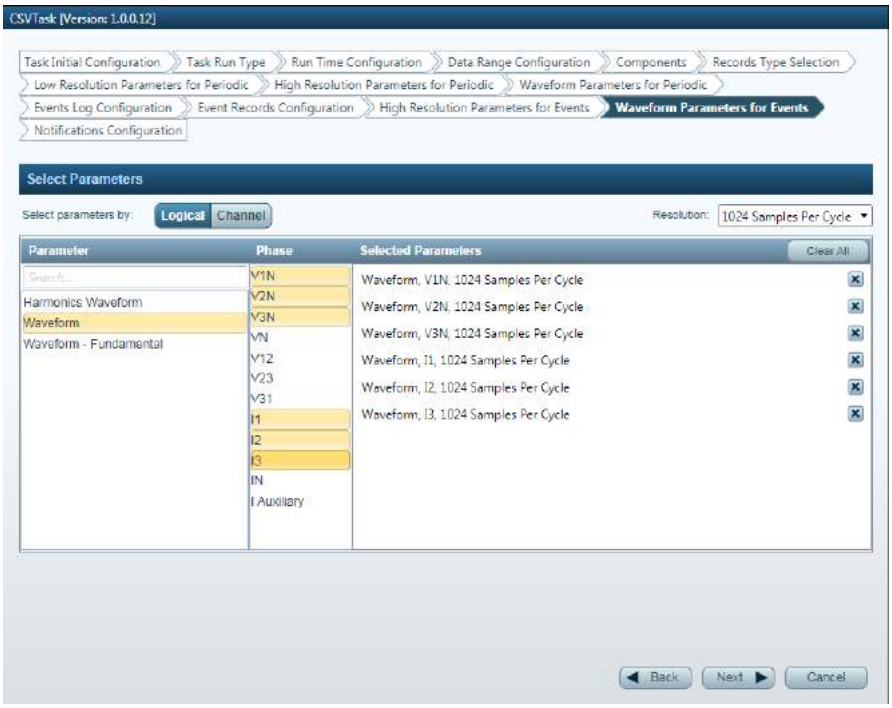
- In CSV export Task, each event record generates two files: high resolution and waveform.
- In Excel export Task, all events records generate a single file. The file includes two sheets for each event record: high resolution and waveform.
- The max. number of exported points per parameter is limited to 1,000,000. In case the event duration is too long, PQSCADA will export the first 1,000,000 points.

Step 15: Waveform Parameters for Events.

On the *Waveform Parameters for Events page*, configure the following options:

- Select how parameters are tagged:
  - Logical – parameters are logically tagged
  - Channels – parameters are stored without any power topology and can be sorted by channel number
  - Additional – non-power parameters such as Temperature
- Select Resolution from the drop down menu on the upper right corner.
- Select the parameter in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval and task type
- Click on the phase to select. Second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.



Click *Next* to go to *Notification Configuration* page.

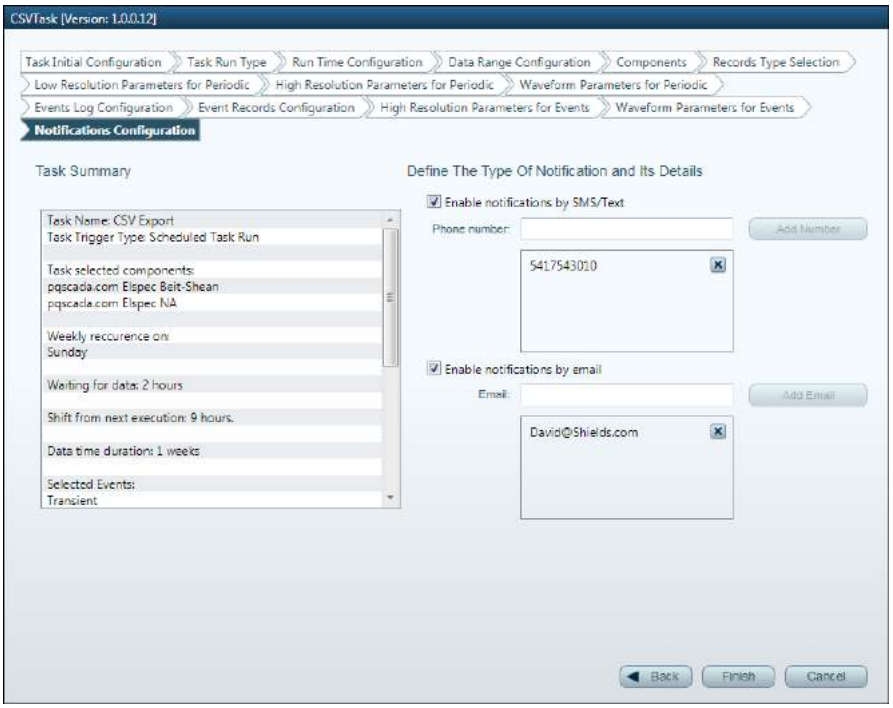
Notes:

- In CSV export Task, each event record generates two files: high resolution and waveform.
- In Excel export Task, all events records generate a single file. The file includes two sheets for each event record: high resolution and waveform.
- Max number of exported points per parameter is limited to 1,000,000. In case the event duration is too long, PQSCADA will export the first 1,000,000 points.

Step 16: Notification Configuration page

On the *Notification Configuration page*, configure the following options:

- Enable notification by SMS/Text – check *Enable notification by SMS/Text* box, and add cell phone numbers to send text message notification on task execution
- Enable notification by email – check *Enable notification by email* to send email notification and attachment (if *enabled*) on task execution



Click *Finish* to apply changes.

9.2.2 Report Task

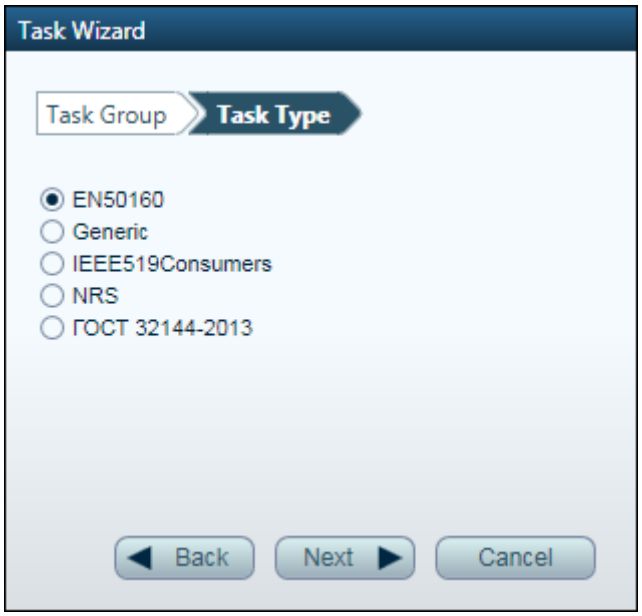
Step 1: Select the Task Group

On the *Task Group* page, select *Report*

Click Next to go to *Task Type* page.

Step 2: Select the Task Type

On the *Task Type* page, select one of the displayed options. Available options depends on the *installed add-ons*.



Click *Next* to upload the Add-on configuration. Go to *Task Initial configuration* page.

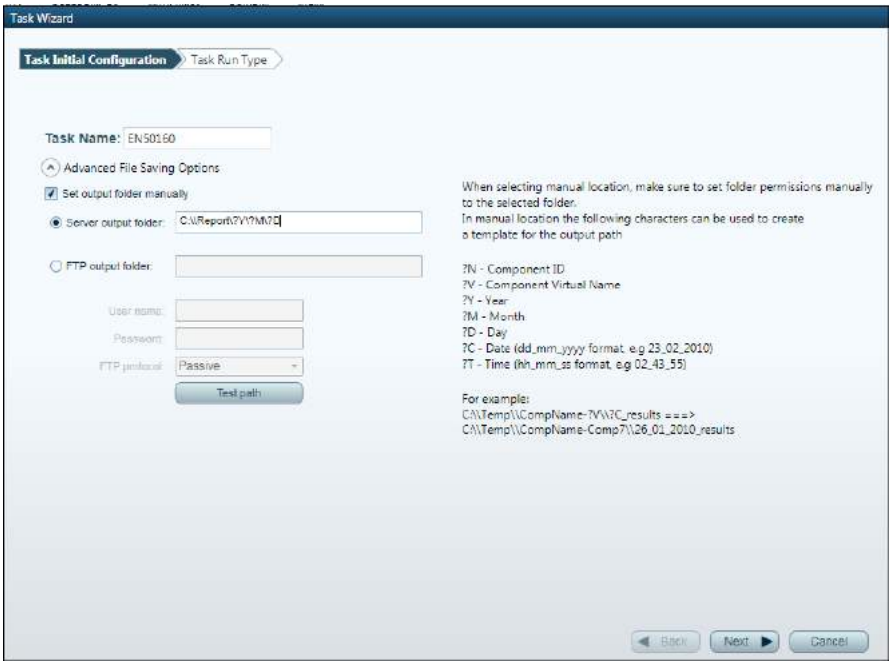
Notes:

- Uploading the Task add-on for first time can take a few minutes.
- Once the Task add-on is uploaded, going back to the Task Type page is no longer possible.
- For the purpose of this example, we assume that you select EN50160 Task. This will ensure that all steps in the wizard are fully explored.

Step 3: Initial Configuration

On the *Initial Configuration* page, configure the following options:

- *Task Name* – enter the Task Name
- *Advanced File Saving Options*
  a. Click the expend button to unhide the advanced options
  b. Check *Set output folder manually* to enable the following settings:
     - *Server output folder* – select this option to save task output on the instance machine. Make sure that PQSCADA Sapphire instance have permissions to store files in the configured path
     - *FTP output folder* – select this option to save task output of a remote FTP server.

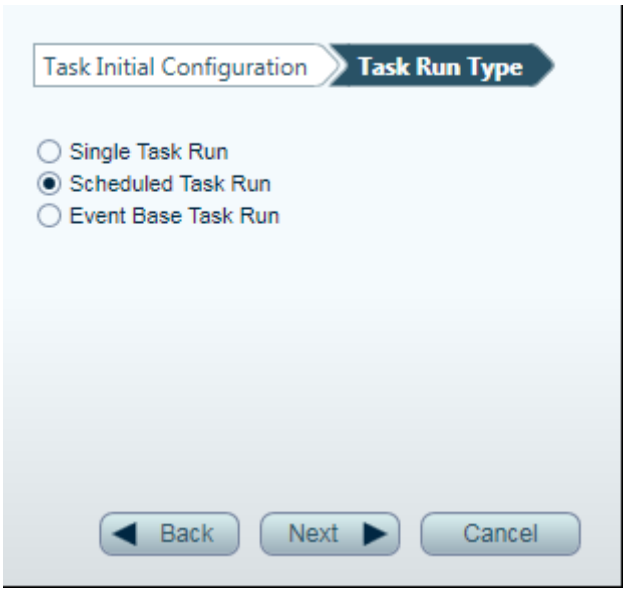


Click *Next* to go to *Task Run Type* page.

Step 4: select the Task Run Type

On the *Task Run Type* page, select one of the following options:

- *Single Task Run* – Runs the task one time only.
- *Schedule Task Run* (enterprise edition only) – Creates a task once, and then execute it automatically according to designated time interval.
- *Event Base Task Run* (enterprise edition only) –Defines events that when met, start the task execution.



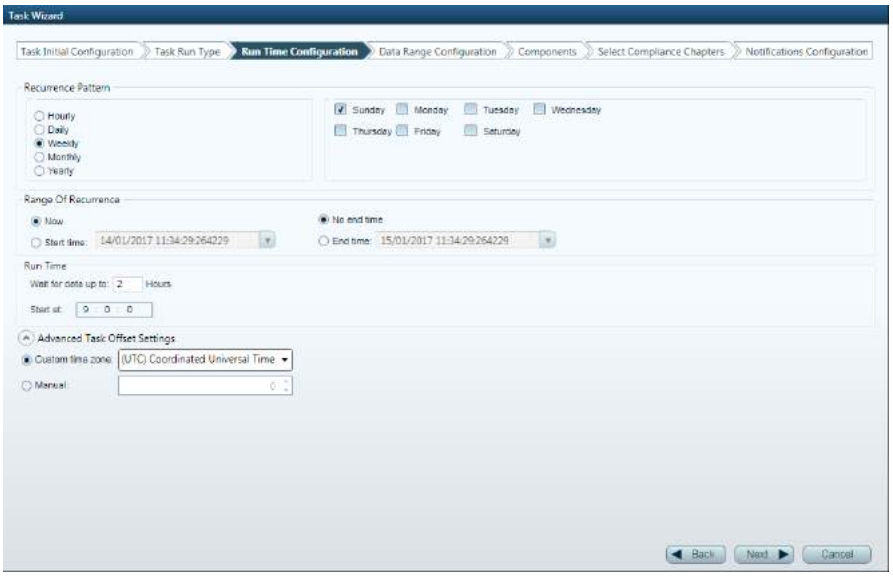
Click *Next* to go to *Run Time Configuration* page.

Step 5: Run Time Configuration

On the *Run Time Configuration* page, configure the following options:

- *Recurrence Pattern* – select the frequency of the task execution: hourly, daily, weekly, monthly or yearly
- *Range Of Recurrence* – use to specify start/end time of the recurring task. By Default, recurrence is set to *Now* and *No end time* respectively
- *Run Time* – use to specify when to execute the task
  - *Wait for data up to* – use to delay the execution time in case of missing data
  - *Start at* – use to set up the time to execute the t ask.
- *Advance Task Offset Settings* – use to set time offset from the Instance machine.

In the example below, the task will be executed every Sunday at 9:00AM UTC Coordinate Universal Time. If at 9:00AM data is not available, the task execution will be delayed by up to two hours. At the end of the two hours, the task will be executed regardless of data availability.



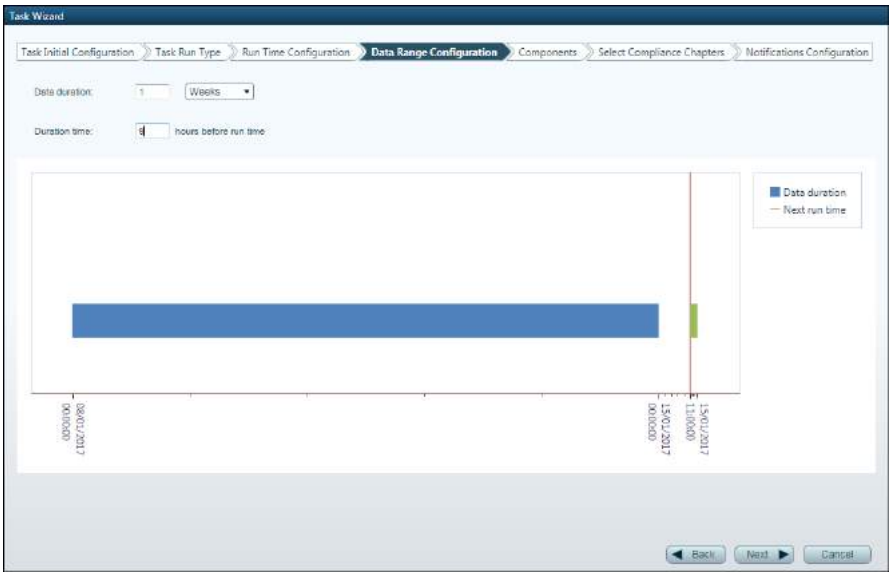
Click *Next* to go to *Data Range Configuration* page.

Step 6: Data Range Configuration

On the *Data Range Configuration* page, configure the following options:

- *Data Duration* – set the data duration for export
- *Data end time* – set the end time relative to the *Run Time* (configured in the *Run Time Configuration* page).

In the example below, *Data duration* is set to 1 week and *Data End Time* to 9 hours. Therefore, every Sunday at 9:00-11:00 (as per previous example), export task will be executed. The exported file will contain the data of the last week from midnight to midnight.



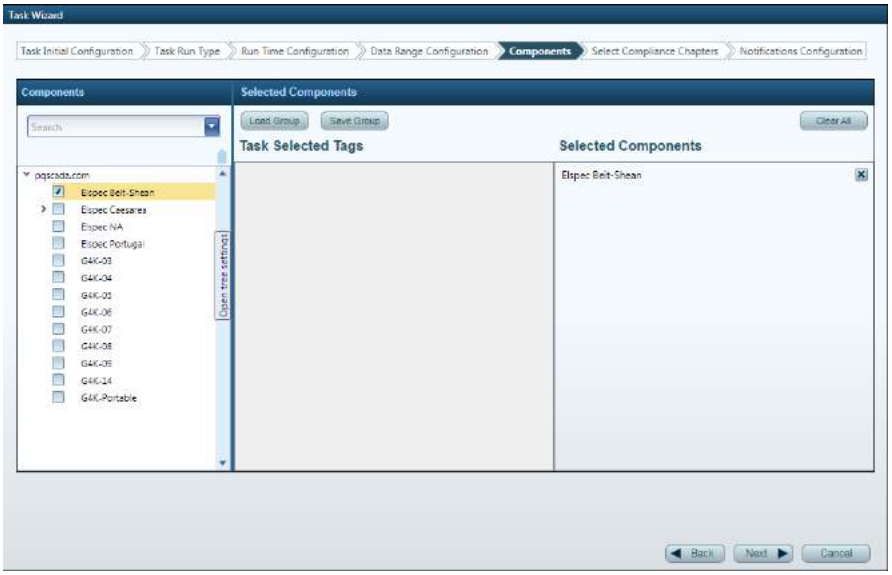
Click *Next* to go to *Components* page.

Step 7: select Components

On the *Component page*, select the components to execute the task with from one of the following options:

- **Component selection** – The task will be executed on individual Components. select Component in one of the following options:
  - Check the component boxes in the *Component section* on the left side of the *Component page*. Click *Tag* to sort components by tags. To reset tags click the Open tree settings
  - Click *Load Group* in the *Selected Component section* on the right side of the *Component page*

  A list of the selected components will appear on the *Selected Components* column. To save the selected list, click *Save Group*

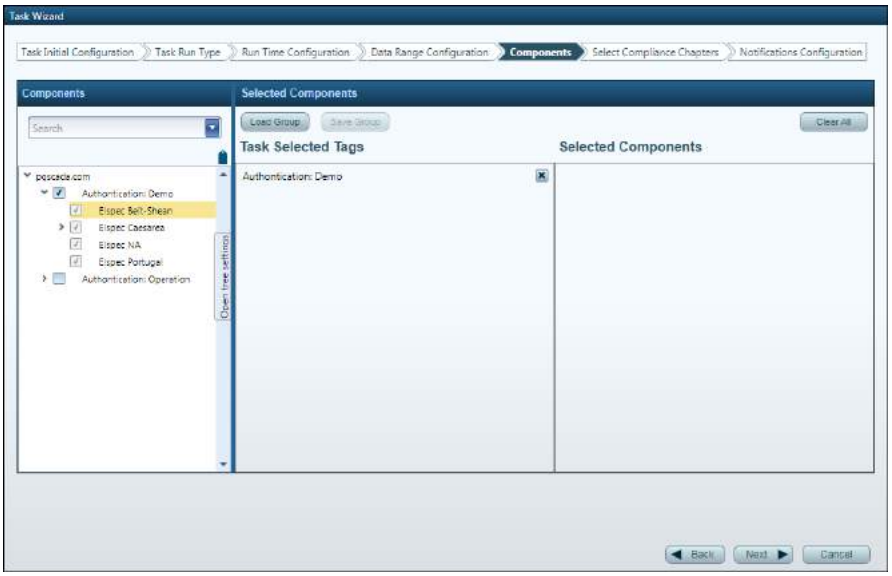


- **Tags selection** – Task will be assigned on all components configured to the selected tag. To select tags, do the following:

  c. Click the *Tag* icon to sort component by tags. To reset tags click the Open tree settings

  d. Check the tags boxes in the *Component section*

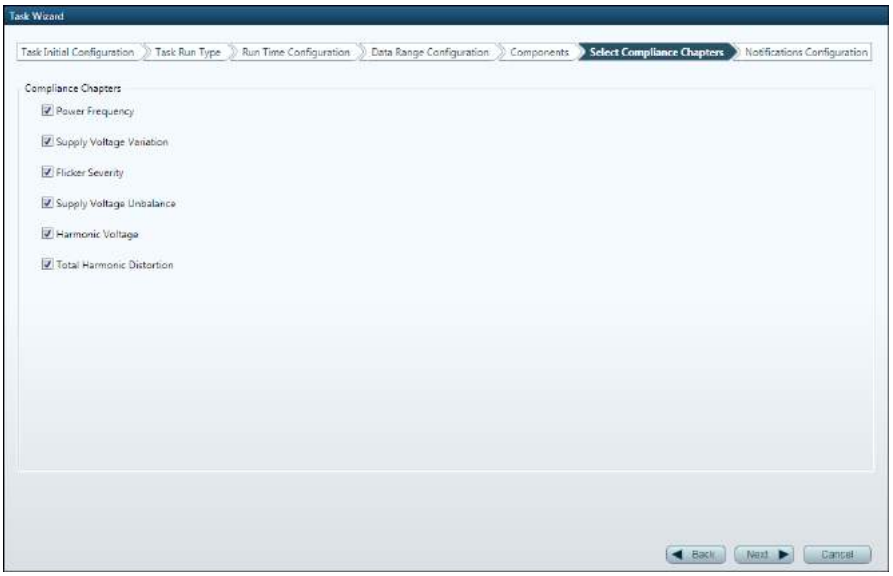
  A list of the selected tags will appear on the *Task Selected Tags* column.



  Click *Next* to go to *Select Compliance Chapters* page.

Step 8: Select Compliance Chapters

Select the compliance charts to include in the report.

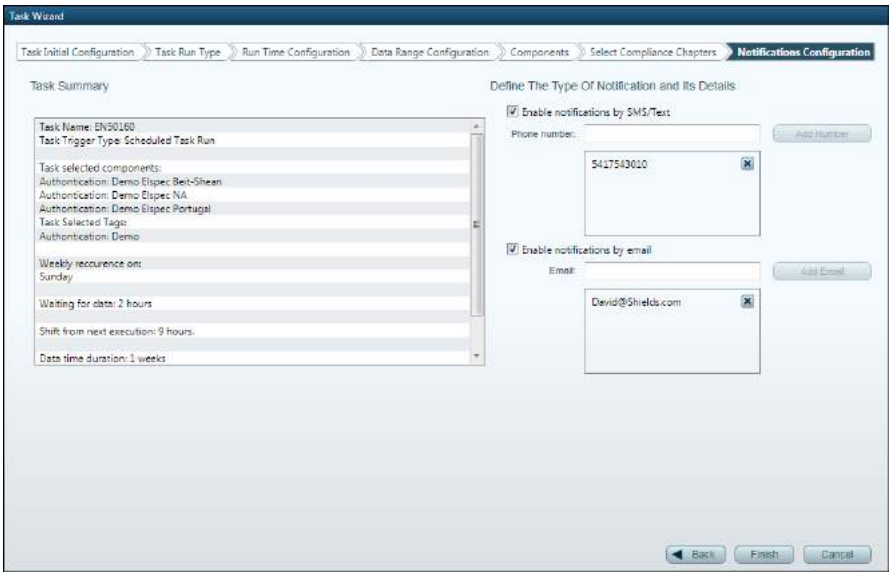


Click *Next* to go to *Notification Configuration* page.

Step 9: Notification Configuration page

On the *Notification Configuration page*, configure the following options:

- Enable notification by SMS/Text – check *Enable notification by SMS/Text* box, and add cell phone numbers to send text message notification on task execution
- Enable notification by email – check *Enable notification by email* to send email notification and attachment (if *enabled*) on task execution



Click *Finish* to apply changes.

9.2.3 Control and maintenance Task (Enterprise edition only)

Step 1: Select the Task Group

On the *Task Group* page, select *Control and Maintenance*

Click Next to go to *Task Type* page.

Step 2: Select the Task Type

On the *Task Type* page, select one of the displayed options. Available options depends on the *installed add-ons*.

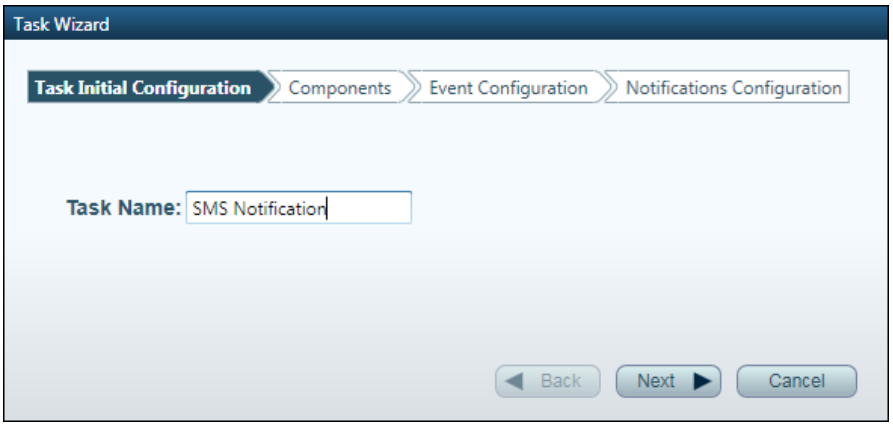
Click *Next* to upload the Add-on configuration. And go to *Task Initial configuration* page

Notes:

- Uploading the Task add-on for first time can take few minutes.
- Once the task add-on is uploaded, going back to the task Type page is no longer available.
- For the purpose of this description we assume that EN50160 task is selected. This will ensure that all of the steps in the wizard are fully explored.

Step 3: Initial Configuration

On the *Initial Configuration* page, enter the Task name



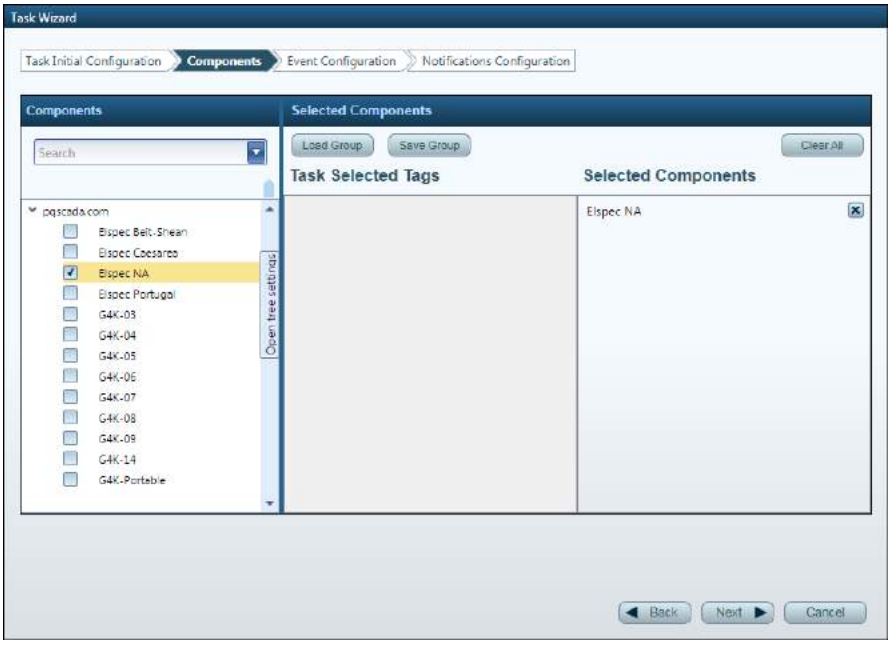
Click *Next* to go to *Task Run Type* page.

Step 4: select Components

On the *Component page*, select the components to execute the Task on, with one of the following options:

- **Component selection** – Task will be executed on individual components. select the component with one of the following options:
  - Check the component boxes in the *Component section* on the left of the *Component page*. Click *Tag* to sort component by tags. To reset tags, click the Open tree settings
  - Click *Load Group* in the Selected *Component section* on the right of the *Component page*

  A list of the selected components will appear on the *Selected Components* column. To save the selected list, click *Save Group*

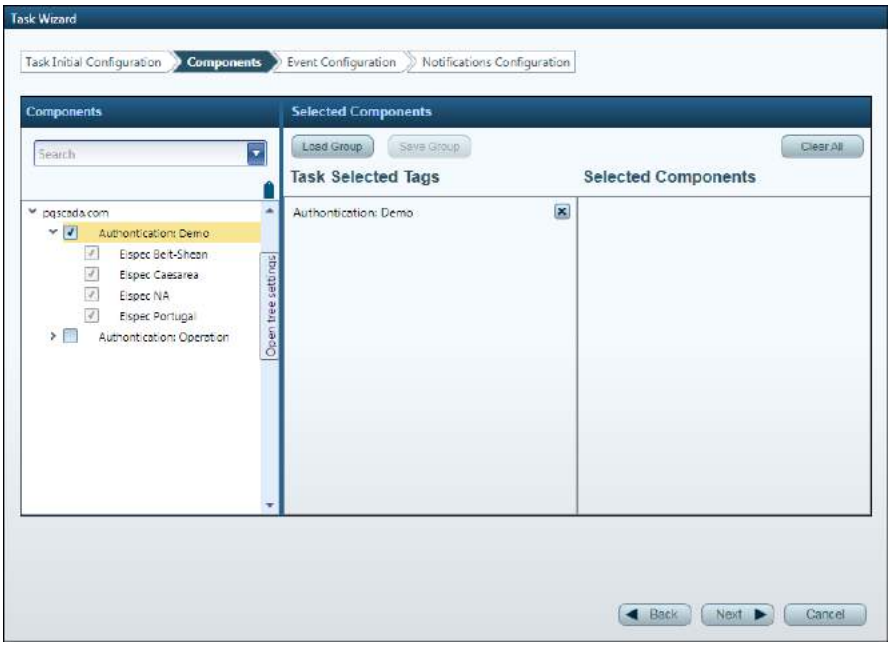


- **Tags selection** – Task will be assigned on all components configured to the selected Tag. To select tags, do the following:

  e. Click the *Tag* icon to sort component by tags. To reset tags click Open tree settings

  f. Check the Tags boxes in the *Component section* on the left of the *Component page*.

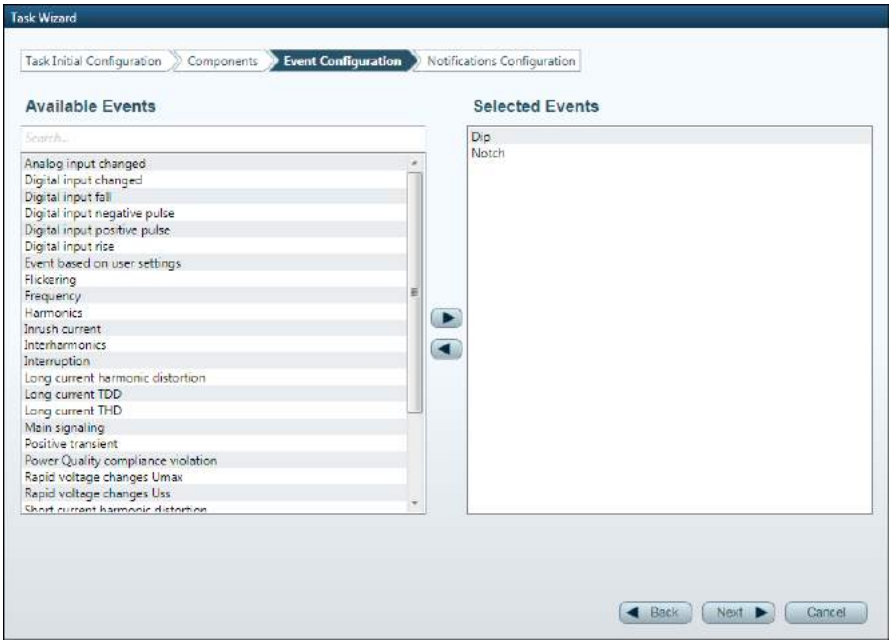
  A list of the selected tags will appear the *Task Selected Tags* column.



Click *Next* to go to *Select Compliance Chapters* page.

Step 5: Events Configuration

On the *Event Configuration page*, select Events to be triggered notifications. To select events, double click the event type from the left list

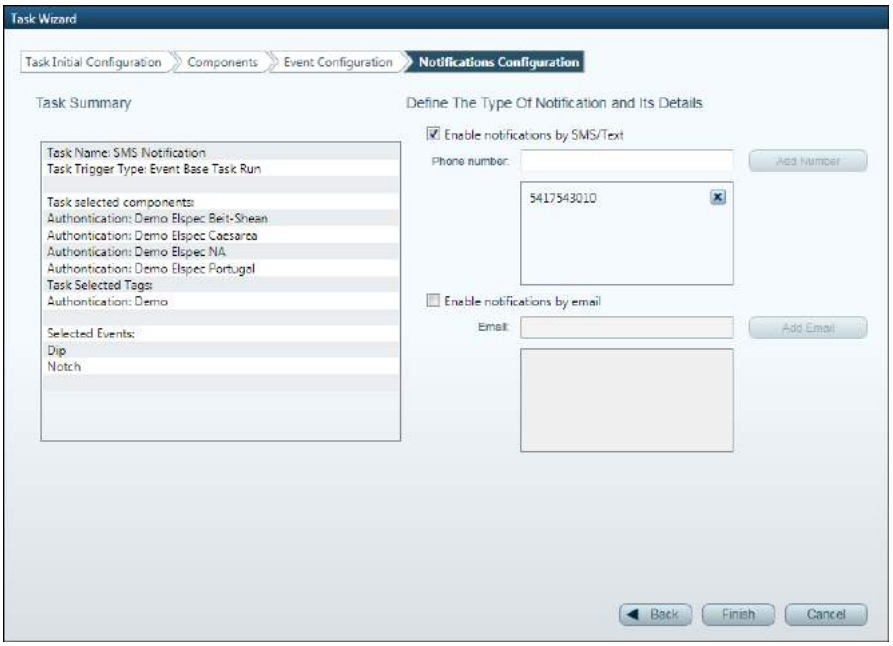


Click *Next* to go to *Events Records Configuration* page.

Step 6: Notification Configuration page

On the *Notification Configuration page*, configure with the following options:

- Enable notification by SMS/Text – check *Enable notification by SMS/Text* box, and add cell phone numbers to send text message notification on task execution.
- Enable notification by email – check *Enable notification by email* to send email notification and attachment (if *enabled*) on task execution.



Click *Finish* to apply changes.

9.3 Modify Task

1. Toggle to *Tasks List* view on the Scheduler main viewing area
2. Double click the Task to modify
3. Follow the wizard instructions

9.4 Delete Task

1. Toggle to *Tasks List* view on the Scheduler main viewing area
2. Delete task by one of the following options:
   a. Right click the Task and select Delete
   b. Click X on the delete column of the Task to delete

9.5 Open attachment

1. Toggle to log view on the Scheduler main viewing area.
2. Double click the task log.

10. Appendix 1 – Historical Data

10.1 Binary and Summary data

PQSCADA Sapphire contains two types of Data:

- *Binary* – waveform data stored in chunks of 1 minute
- *Summary* – Calculated parameters stored as min., max. and average values of different time intervals.
  The summary data may include thousands of parameters calculated from the binary data, fetched instance data, or directly acquired from a device.

10.2 Recalculation process

Recalculation process is used in one or more of the following options:

1. Adding/removing new power quality parameter to the summary data
2. Adding/modify/removing events from a component
3. Adding/modifying/removing compliance standard to a component
4. Changing the unit configuration due to misconfiguration or wrong installation

The recalculation process will recalculate the selected parameters/event/compliance from the waveform data. In case of unit configuration change, the recalculation will apply to all the historical data