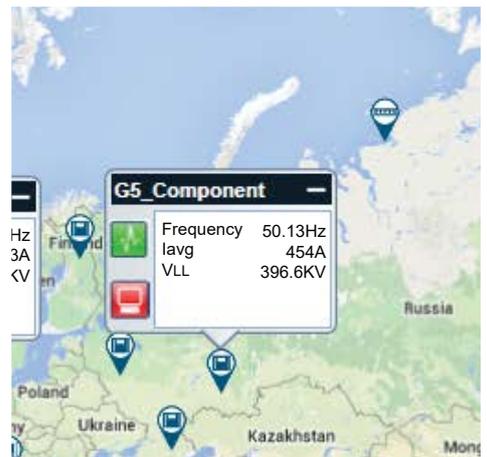


# Sapphire

Power Management  
Software



# System Overview

Espec PQSCADA Sapphire allows all Fault Recorders, Power Quality Analyzers, Revenue Meters and all other IED to be analyzed in one system



Alarm & Control



Real Time Overview



Advanced PQ Analysis



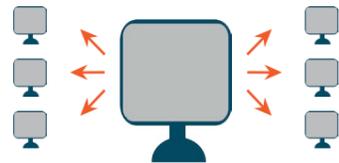
Report Customization



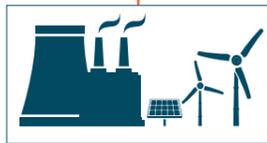
Historical Data Investigation



Fault Location



Local & Remote Work Stations



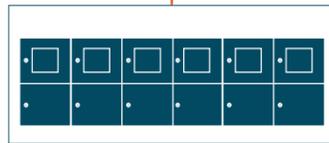
Generation



Transmission & Distribution



T&D Substation



Switching & Control Equipment



Power Distribution



Loads & Process

# 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 and bring into the future.

PQSCADA Sapphire's multi-vendor support sets new standards for power monitoring management software. This unique feature enables the gathering 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 later with add-ons, or developed independently through the use of API to meet your custom needs and applications.

# Accurate Data Anywhere, Anytime

## Benefits

### 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 simplifies your IT environment by eliminating the need to purchase, install, 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.

### Access Information From Any Location

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

### Get Notifications

PQSCADA Sapphire can be configured to send emails, SMS and pop-up notifications to users according to pre-configured scenarios.

### Easily Fix Misconfigurations

PQSCADA Sapphire allows you 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 for both past and future measurements.

### Reporting & Compliance Are Easy and Flexible

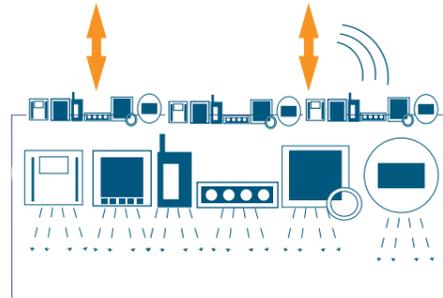
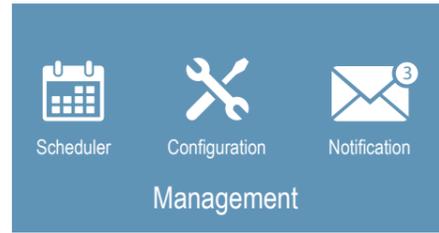
PQSCADA Sapphire has a flexible reporting and compliance engine allowing the design of report templates and compliance policies according to various standards or custom requirements. Reports can be generated manually or scheduled on a daily, weekly, monthly or yearly basis. Reports can also be triggered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

### See the Whole Picture

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



# System Architecture



## Data Acquisition & Process

**Download:** Vendor free Integration of Power Quality meters, fault recorders, protection devices, revenue meters and other IED's via standard protocols such as IEC 61850 and Modbus, or by importing COMTRADE/PQDIF files.

**Process:** A wide range of electrical parameters is calculated based on raw data. Processed data is stored efficiently for quick access, while keeping database size low.

PQSCADA Sapphire is capable of calculating 10,000 different power parameters, including statistics and harmonic amplitude/angle based on waveform raw data.

**Storage:** PQSCADA Sapphire supports a variety of DB engines such as MS SQL server 2008 and newer. Synchronized logged data, system data and events are securely stored at 1nsec precision. PQSCADA Sapphire supports distributed databases and servers for load balancing.

## Developer

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

**Gateway:** A comprehensive API is available for users who wish to extend PQSCADA Sapphire's communication options. The Gateway add-on can be designed to communicate through any industrial and proprietary communication protocol or file structure.

**Report:** The report add-on enables the user to design a tailor - made report template. Based on the stored data, the add-on also supports the option to calculate additional parameters and statistics, and to present them in the report.

## Management

**Scheduler:** PQSCADA Sapphire supports a variety of automated tasks such as reporting, maintenance, upgrade and notification. The scheduler module allows the user to schedule the task to run automatically on hourly, weekly, monthly, or annually basis or to be triggered in the event of limit value violations.

**Configuration:** PQSCADA Sapphire configuration module allows the user to configure any parameter on the system including remote devices and servers.

**Notification:** emails or SMS notifications will be automatically sent in case of violation of thresholds of a predefined grid code, limit value violation, system error or any predefined event.

## Overview

PQSCADA Sapphire enables you to view all measurement points on a live geographical map with real time data and general statuses. Each measurement point has two statuses:

- **Electrical:** Green as long as the electrical conditions at this specific measurement point are according to predefined grid code.
- **System:** Green as long as the measuring device is at operation condition.

In addition to the live map, 3 widgets are available to display the status of the electrical network:

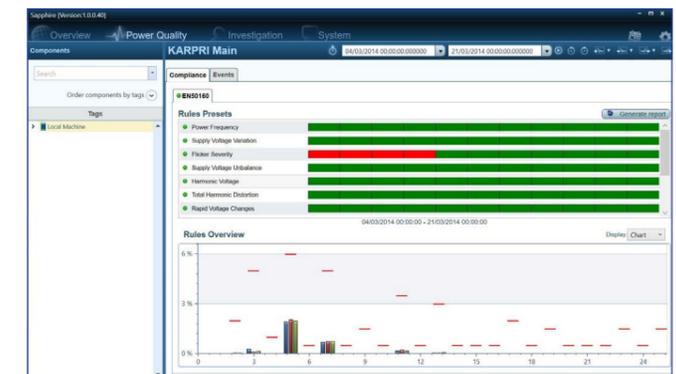
- **Power quality:** the power quality widget displays a list of measurement points that are in violation of predefined grid code. A link to map or investigation is available for quick access.
- **Disturbances:** the disturbances widget displays a list of short predefined events that have occurred during the last hour/day/week/month. A link to map or investigation is available for quick access.
- **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.



## Power Quality

The power Quality module shows at a glance the status of the entire network or individual measurement points 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 or any other local or international grid code. Identifying the root cause and type of violation is therefore quick and easy. Multiple compliance conditions can apply to single measurement point for comparison.

A comprehensive report, based on the power quality compliance conditions, can be easily generated from the power quality module.

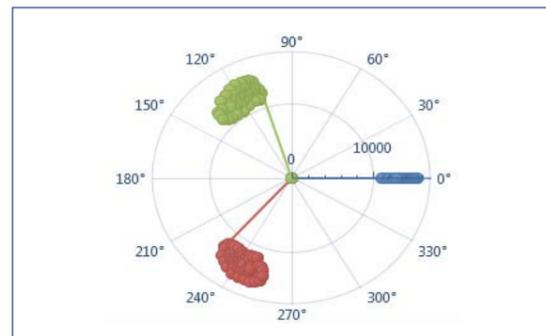
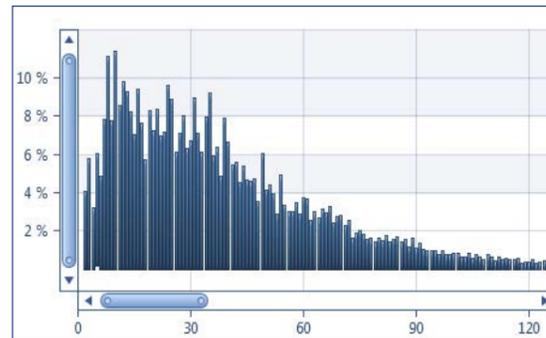
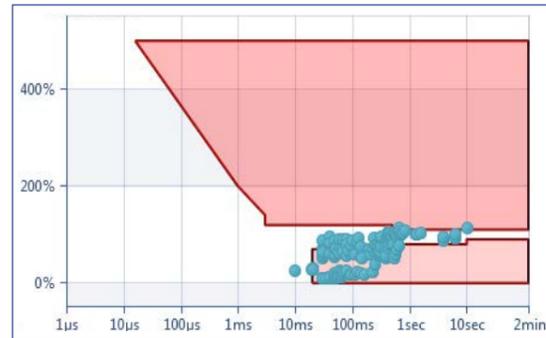
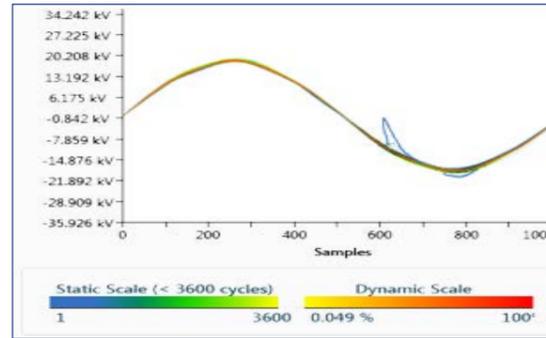
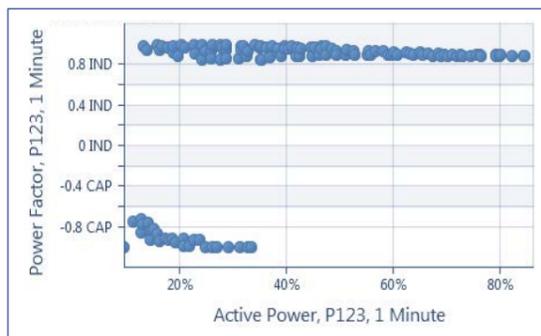


## Investigation

The Investigation module graphically presents trends, histograms, events lists, summary tables, and statistical summaries of any stored parameters. It allows the user to analyze voltage sags/dips, swells, interruptions or any other incident. Each investigation includes multiple views and charts that can be easily exported to MS word with predefined template, a PDF file or to be stored as an image on your computer. Sharing an investigation between users of the system can be done with a single mouse click. PQSCADA Sapphire Multi-site investigation allows you to simultaneously view data from many different sites or instruments, to compare data from various locations or times in the same chart. PQSCADA Sapphire unique capability to store continuous waveform recording from PQZIP enabled devices or temporary events recording from standard meters using COMTRADE and or PQDIF file formats makes Event Analysis comprehensive yet easy to achieve.

Sophisticated event detection capabilities enable the user to configure events of any measured parameters and/or IO ports. The event mechanism supports out-of-limit events as well as rates of changed limits. Events can be configured with multiple thresholds and conditions with multiple parameters. Another feature of the event mechanism is the ability to aggregate multiple events with logic operation between them. The PQSCADA Sapphire will find events according to user defined thresholds during post-processing.

| Parameter                   | Min         | Max         | Average      |
|-----------------------------|-------------|-------------|--------------|
| RMS V1N (Half Cycle)        | 4833.875 V  | 27862.38 V  | 12902.02 V   |
| RMS V2N (Half Cycle)        | 219.7576 V  | 26134.37 V  | 13014.89 V   |
| RMS V3N (Half Cycle)        | 48.39349 V  | 24405.08 V  | 12848.02 V   |
| RMS I1 (Half Cycle)         | 2.637337 A  | 76.16993 A  | 26.58886 A   |
| RMS I2 (Half Cycle)         | 3.15611 A   | 84.70454 A  | 27.08033 A   |
| RMS I3 (Half Cycle)         | 3.779934 A  | 71.51199 A  | 26.70231 A   |
| Active Power P123 (Cycle)   | 35991.68 W  | 2161166 W   | 889508.9 W   |
| Reactive Power P123 (Cycle) | -689753 VAR | 1982784 VAR | 331267.4 VAR |
| Apparent Power P123 (Cycle) | 67506.08 VA | 2755238 VA  | 963859.8 VA  |



## Product Selection Guide

| Features                   | Express       | Professional  | Enterprise    |
|----------------------------|---------------|---------------|---------------|
| Supported Parameters       |               |               |               |
| PQZIP                      | Import/Export | Import/Export | Import/Export |
| PQZ File                   | Import/Export | Import/Export | Import/Export |
| COMTRADE                   | Import/Export | Import/Export | Import/Export |
| PQDIP                      | Import/Export | Import/Export | Import/Export |
| Excel                      | Export        | Export        | Export        |
| CSV                        | Export        | Export        | Export        |
| PQZ HTTP/S                 |               | ●             | ●             |
| MODBUS                     |               | ●             | ●             |
| IEC 61850                  |               | ●             | ●             |
| Investigation              |               |               |               |
| Multi-site investigation   | 2             | Unlimited     | Unlimited     |
| Trend Chart                | ●             | ●             | ●             |
| Grid Chart                 | ●             | ●             | ●             |
| Summary Chart              | ●             | ●             | ●             |
| Spectrum Chart             | ●             | ●             | ●             |
| Statistics Chart           | ●             | ●             | ●             |
| Event Chart                | ●             | ●             | ●             |
| Scatter Event Chart        | ●             | ●             | ●             |
| Scatter parameters chart   |               | ●             | ●             |
| Cyclic Histogram           |               | ●             | ●             |
| Phasors                    |               | ●             | ●             |
| Tasks                      |               |               |               |
| Schedule task              |               |               | ●             |
| Triggered by event         |               |               | ●             |
| Reports                    |               |               |               |
| Fault location             |               | ●             | ●             |
| Server                     |               |               |               |
| Security                   |               |               | ●             |
| Run as System Service      |               |               | ●             |
| Client/Server Architecture |               |               | ●             |
| Servers Hierarchy          |               |               | ●             |
| Client Module & Features   |               |               |               |
| Overview                   |               | ●             | ●             |
| Tags                       |               | ●             | ●             |
| Notifications              |               |               |               |
| Emails                     |               |               | ●             |
| SMS                        |               |               | ●             |

# Worldwide Innovator in Power Quality

Since 1988 Elspec has developed, manufactured and marketed proven power quality solutions far exceeding our clients' needs and expectations. Our innovations not only simplify the understanding of the quality of power itself, but are also highly compatible, making it suitable for any business and/or application. Elspec's international team of professionals with extensive experience in electrical engineering, are ready to provide a tailor-made strategy that will enable a sustainable and efficient use of your electrical energy.



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