merbon

SCADA

Functions overview

Contents

1 Introduction

This document, Merbon SCADA Functions overview, is intended to serve as a basic guide to system capabilities. It is a function description rather than a user manual, so that a customer can evaluate if Merbon SCADA meets his or her requirements.

1.1 What is Merbon SCADA

Merbon SCADA is a server application used for process visualisation. The package is designed for creating monitor networks of various technologies through telemetric networks and different types of local communication. The system takes advantage of the most modern software tools and communication standards but incorporates a great deal of verified "technically standard" solutions as well. The modularity of the system enables gradual construction of the dispatching sites from the simplest visualization of metering data to distributed integrated systems. Special focus is put on high reliability, fast application engineering and easy settings even for less experienced users.

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1.2 What is Merbon SCADA good for

The software communicates with technologies (building control systems, process controllers, and metering and readout systems, such as data collectors, communicative sensors etc.).

Merbon SCADA brings these data to technology schemas, where all instantaneous values of all peripherals and important variables are displayed, as well as to the historical data database. It shows the values, such as temperatures or energy consumptions, across a defined time range, which helps to diagnose problems and to optimize the system (fine tuning). This is important for setup of critical parameters to achieve maximum sensitivity to errors while maintaining the comfort level. It is also possible to enable and disable plants, change setpoints, time schedules etc., according to the design of the plant graphics. Last but not least, alarms are indicated as pop-ups or voice message.

2 About Merbon SCADA

2.1 Topology

Merbon SCADA is a server installation. It establishes communication with the data sources (PLC, control systems etc.) and it can be enhanced by a Merbon DB trend database running on the same or another machine – according to the computer performance and project size. It is recommended to use Merbon DB for projects of 10 000 data points and above. The database stores trend data. If it is not installed, Merbon SCADA saves historical data into proprietary local files. The trend functionality is not affected.
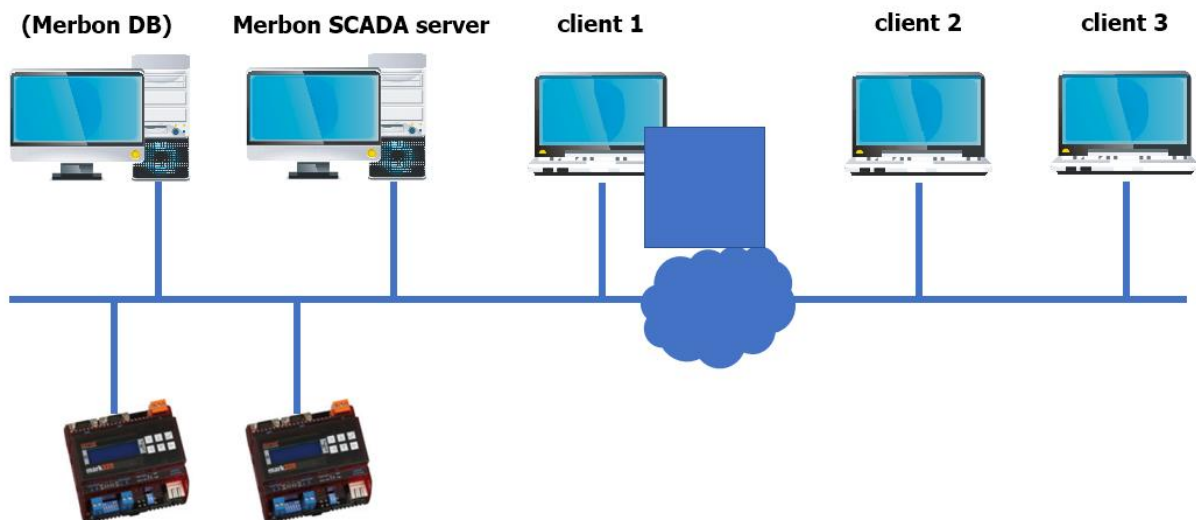
The server application provides a web interface, which is the entry point for client web browsers. The client computers thus do not need any special client software. Merbon SCADA uses Microsoft IIS as a web server, providing customizable security features, user policies, access and data volume limitation and other features.

2.2 Upgrade from RcWare Vision

RcWare Vision is an older SCADA system supplied and supported by Domat. The RcWare Vision projects can be in general exported to Merbon SCADA, so that the upgrade from RcWare Vision to Merbon SCADA requires no reengineering of plant graphics, creation of dat point database etc. However, as the function principles of Merbon SCADA are different from those of RcWare Vision, not all functionalities of RcWare Vision may be available in Merbon SCADA in the same way. This affects especially scripting and alarm messaging. When reengineering a RcWare Vision project, please contact Domat Control System technical support.

2.3   Licensing and data points

To consider the project size for licensing, its magnitude is measured using data points. A data point is basically a variable communicated from a subsystem to SCADA, be it a physical information – measured or set value (e.g. sensor temperature, valve position), or internal PLC variable (such as humidity setpoint or heating curve parameter). These data points in total are called software data points. A more complex data structure, such as a weekly time scheduler, is considered as a single data point.

Licences are issued in three sizes:

- Merbon SCADA for 5 000 data points
- Merbon SCADA for 50 000 data points
- Merbon SCADA for unlimited amount of data points.

If the total amount of data points in all installed projects exceeds the licensed data point amount, Merbon SCADA shows limited functionality. It is possible to enhance the licence at costs of the difference between the existing and the required licence. **There is no limitation of concurrently connected web clients.**

2.4   PC requirements

The minimum required operating system version is Windows 8.1, but Windows 10 are recommended as a standard. Should the project contain about 30 000+ data points, it is advised to deploy Windows Server 2012 R2, or better, Windows Server 2016. In a virtualised computer Windows 10 are OK.

The hardware requirements depend on the number and size of projects. The system needs about 4 GB RAM as minimum, 8 GB are recommended. Merbon SCADA runs without problems on PCs with CPU Core i3/5, it is good to have at least two threads. Remember to keep a reserve for future project extensions.

As for hard disks, SSD disks in a RAID are a good choice. The configuration depends on how data backup is executed. Faster disks may increase the speed of reading data from a Merbon DB or file history, which is what the user perceives strongly. Even editing of large projects is faster and

more comfortable with fast disks. However, the system runs reliably also with ordinary mechanical hard disks.

The Merbon SCADA web is typically installed at TCP port 80, however, the final configuration depends on the overall network setup and topology. This port is accessed by the users' web browsers. **There is no limitation of concurrently connected web clients**, the number of web clients accessing the server at the same time may be limited at the IIS server if necessary.

2.5   Project editing

To create and edit the project, the RcWare Vision, a free editor software available at www.domat.cz is used. The projects can also be run for 30 minutes in the editor including communication with the PLCs so that all functions can be checked before export and deployment of the project to the Merbon SCADA server.
The editor is used for:

- definition of communication channels from Merbon SCADA to the PLCs
- data point import from PLC application projects to Merbon SCADA
- data point table editing so that it fits the SCADA requirements
- plant graphics engineering with schemas, values, animated objects, etc.

The engineered projects are exported from RcWare Vision to the Merbon SCADA project folder either directly, or over a data carrier device (USB disk). There is a special dialogue for export in the RcWare Vision menu.

2.6   Project topology
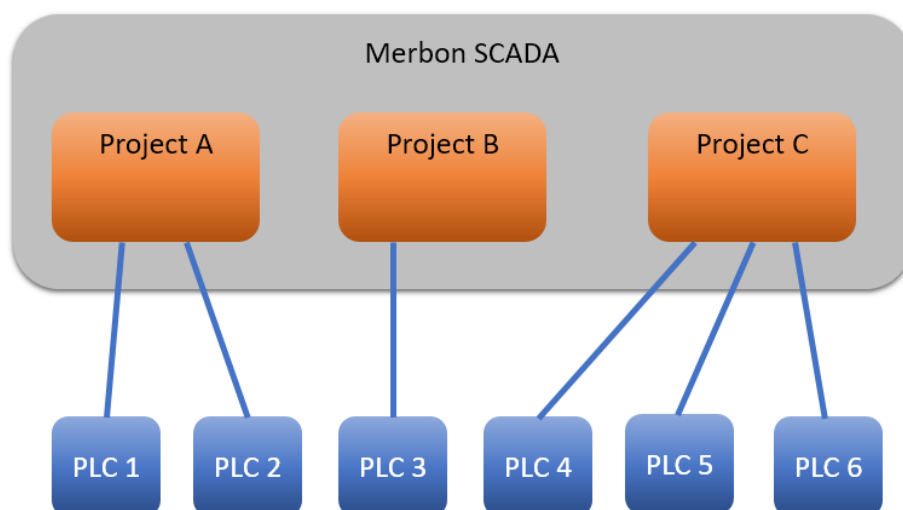
A Merbon SCADA server may process more projects concurrently, while every project contains one or more connection to PLC. Assigning PLCs into more projects makes sense if more engineers work on a large site at the same time, or if Merbon SCADA is a supervisory platform over more independent sites, every of which having a separate project with several PLCs.

3   Communication

Merbon SCADA establishes outgoing connections to the PLCs. The connection parameters are defined in the project database. This connection is open over the server operation time. If it is broken, Merbon SCADA attempts to renew it periodically. The connection status is visible e.g. at the total project statistics.

3.1   Communication drivers

The communication drivers are libraries of implemented communication protocols. There are following drivers available for Domat process stations:

- **SoftPLC Link** for IPLC..., IPCT..., SoftPLC Windows Runtime
- **SSCP** for mark... PLCs (the Merbon range)
- **Modbus TCP** (Merbon SCADA V1.8.1 and newer)

Other communication protocols can be integrated either over PLCs which provide physical communication interfaces (serial ports) at the same time, or using SoftPLC Windows Runtime, which may be run on the same as the Merbon SCADA or on another PC.
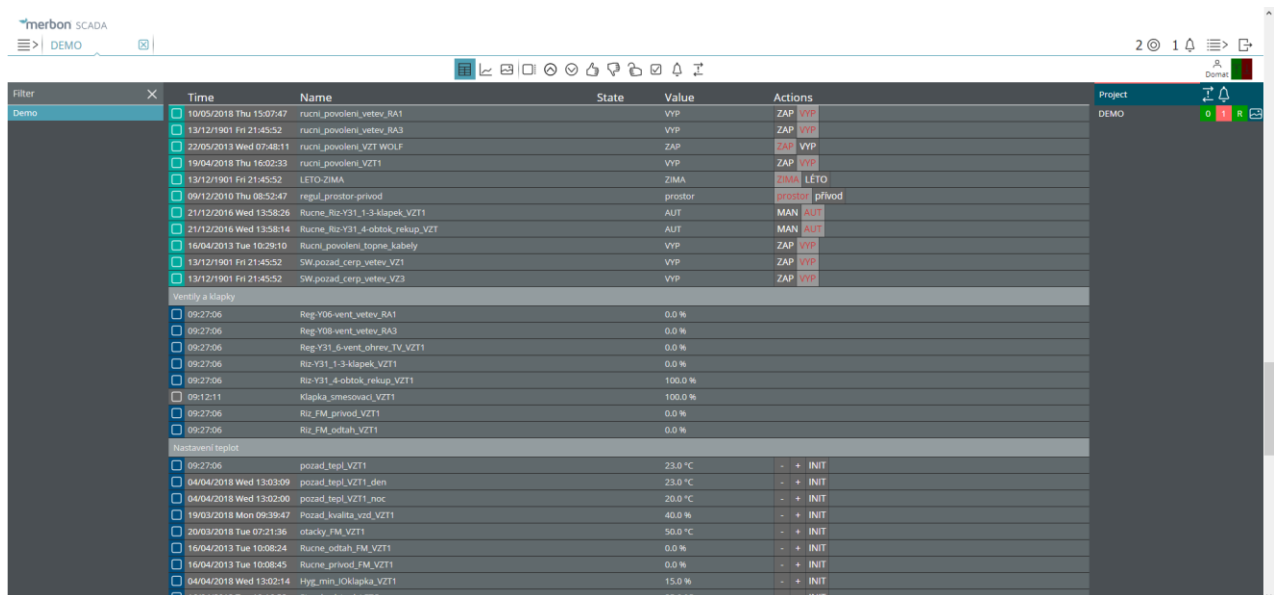
3.2   Transferred data volume

Sites connected over a mobile connection (GPRS, LTE) often require transferred data volume limitation to negotiate a suitable data tariff with the connectivity provider. Both SoftPLC Link and SSCP protocols derive their bandwidth from volatility of measured values, number of alarms and other factors, it is only possible to roughly estimate the transferred data volume over a time. For example, a boiler plant with 60 software data points (which means about 25 – 30 physical PLC inputs and outputs) refreshed every 5 s consumes monthly about 90 MB received and 125 MB sent. Data volumes can be reduced by up to 90 % by increasing the refreshing interval.

In a non-billed network, such as local intranet or municipal Wi-Fi infrastructure, a bandwidth of about 50 – 90 kbit/s is enough for a site. The bandwidth (communication throughput) may be

limited at the router, and Merbon SCADA then adapts automatically and increases the refreshing interval according to the available bandwidth.

4   Data point table

The data point table is a technical view on the PLC variables, scripts, and other data points. In the left column there is a tree structure for fast access to data point groups according to the technological group and location, and in the right pane there is a table with data points and their properties: a tick box, last update time, data point name, actual value. If the variable can be set, there are also buttons available to change value or state according to the user rights.

In the upper bar there are buttons to filter the view according to communication status, alarm status, tagging etc.

The utmost upper bar displays alarm indication summary, number of tagged data points, main menu button, and logout button.

5   Plant graphics

For fast and clear overview of values and controls, dynamic technology schemas are the right means. The schemas are of free-definable size and may contain following elements:
text – free definable text with complete Windows font formatting properties

bitmap – fixed size or stretchable, also possible as background picture

value indicator/control – various shapes and sizes, free definable colours etc.

button – jumps to another schema

shape – basic geometric shapes

line – connecting lines with pipe functionality

animation – symbol changing bitmaps according to the state of one or more data points

time program – weekly schedule

heating curve – graphic representation of a 4-point heating curve

graph – online trend with one or more values.

Merbon SCADA contains an original library of symbols for heating, ventilation, air conditioning, and energy management schemas. Customized images also can be used (.bmp, .jpg, .gif) according to customers' standards.
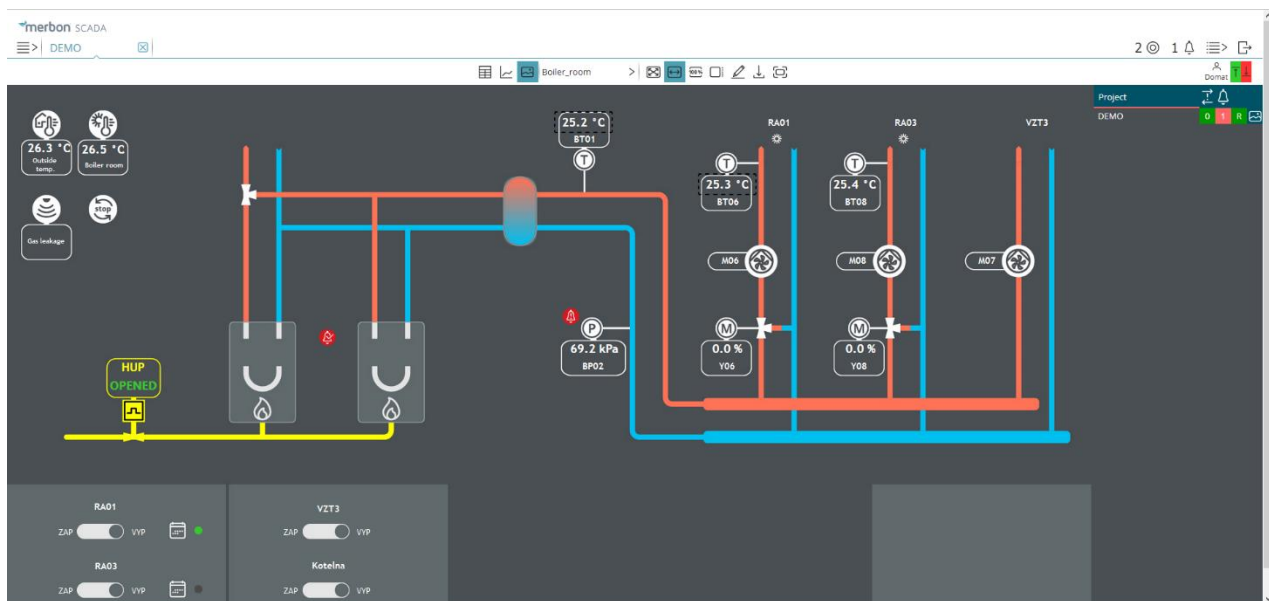
6   History data - trends

Selected data points store their values periodically. There are two types of history data:

-       **long term history**: saved permanently to text files or SQL database, for long-term analysis

-       **short term history**: several days back, faster sampling, for trending, tuning loops, and problem analysis.

6.1 History data definition

For each data point, the sampling type and frequency can be defined. The sampled values can be displayed as a graph and exported to .CSV or .XLS files.

The Merbon DB database is an optional part of installation. It is open for 3rd party programs so that the Merbon SCADA station can be used as a data concentrator from different systems, providing actual values e.g. over an OPC server, and history readouts over a Merbon DB API.

Graph configuration data can be defined and saved as a template, or a graph can be called over tagged data points. The data points are tagged in the technology view or directly in the plant graphics.

6.2 Graphs

The basic most commonly used graph is a line graph. It is capable of displaying more variables in a view:
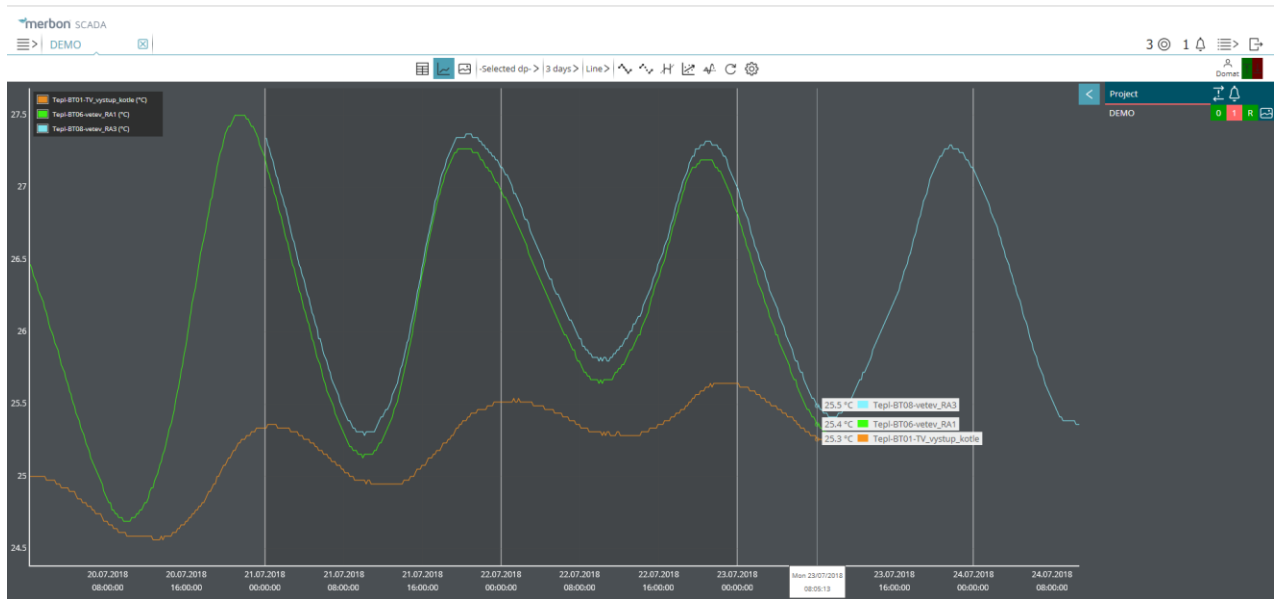
To examine periodically repeating trends, a carpet plot may be suitable. It has time on both X and Y axis, while the measured value is indicated by coloured spots:
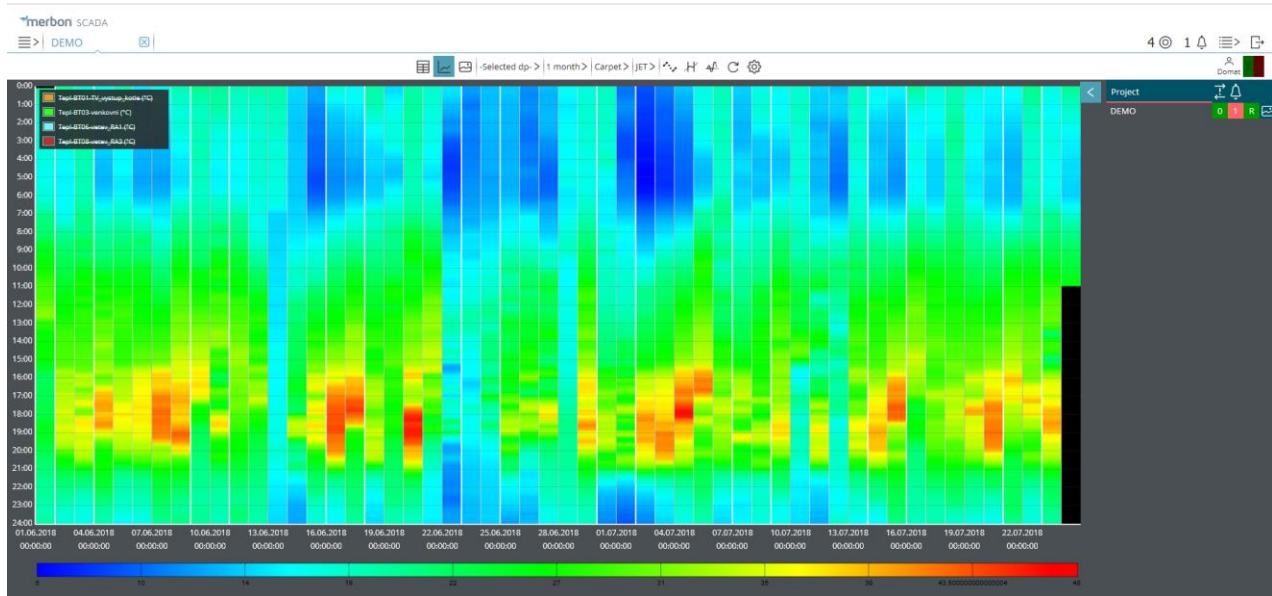
6.3   Data export

A graph may be exported as:

.png – image to be e.g. inserted into a report, data can not be edited

.xlsx – to open directly and process in MS Excel
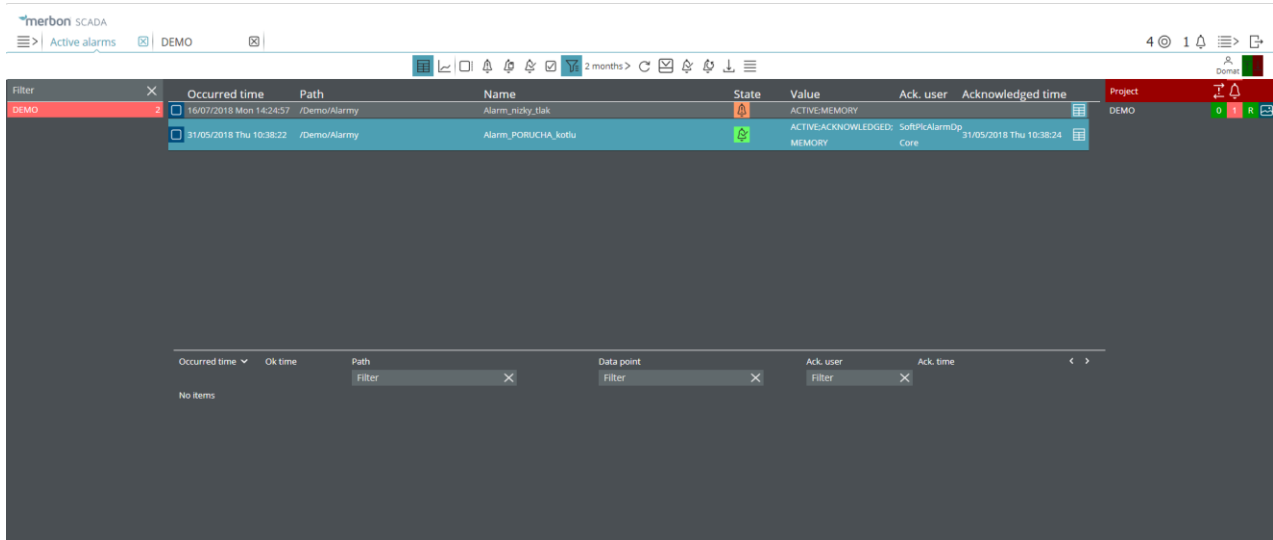
.csv – the most suitable format for import into 3rd party programs, values are separated by commas

.csv equidistant – values are resampled so as to align to a given interval (week, day, hour, 30 min., 15 min., 1 min. etc.) – suitable for data processing together with other 3rd party data, as all data rows possess the same timestamp, and values can be e.g. summed up.

7   Alarms

Any data point may be defined as alarm data point. At binary and discrete values, any state or value can be defined as alarm value; at analogue values, upper and lower limits are defined.

A summary information on number of active alarms is always displayed in the upper right corner; details are in the active alarms table and alarms history table.

In the table there are all active alarms and alarm history. Alarms may be sorted and filtered according to various criteria, there are functions *Find in schema* and *Find in data point table* for easy alarm localisation. These functions find and tag the alarm in plant graphics and in the data point table.

An incoming alarm is indicated by an alarm pop-up window and optional sound message. An alarm is a multistate object, and transition between its states are invoked by changes of data points values or user interventions (acknowledge, reset). In Merbon, the user intervention informations are sent back to the process (PLC), so it is possible to e.g. interlock a plant until the alarm has been reset by the remote operator.

A click to an alarm switches between data point list, plant graphics, or active alarms and alarm history list. An advanced add-on, Alarm Server, is used as an option for time schedule based alarm forwarding to e-mails or SMS messages, escalating alarms (if an alarm has not been acknowledged until a certain time from its appearance, it is automatically resent to another addressee in the list), and other functions.

8   Event logging

User activities and system events are recorded in a database. They can be listed as a table sorted and filtered. Both original and new values are recorded, so it is easy to learn which user changed which temperature setpoint, time scheduler, etc. Information on which panel was opened for viewing is also stored here.

9 Projects map

Merbon SCADA system contains optional function *Projects map*. If this function is active the map icon will appear in the right part of the screen. Clicking this icon causes the world map to open. In this map you can see all the projects in the map. Here it is possible to navigate to the projects schemas or control the active alarms and non-communicating datapoints.
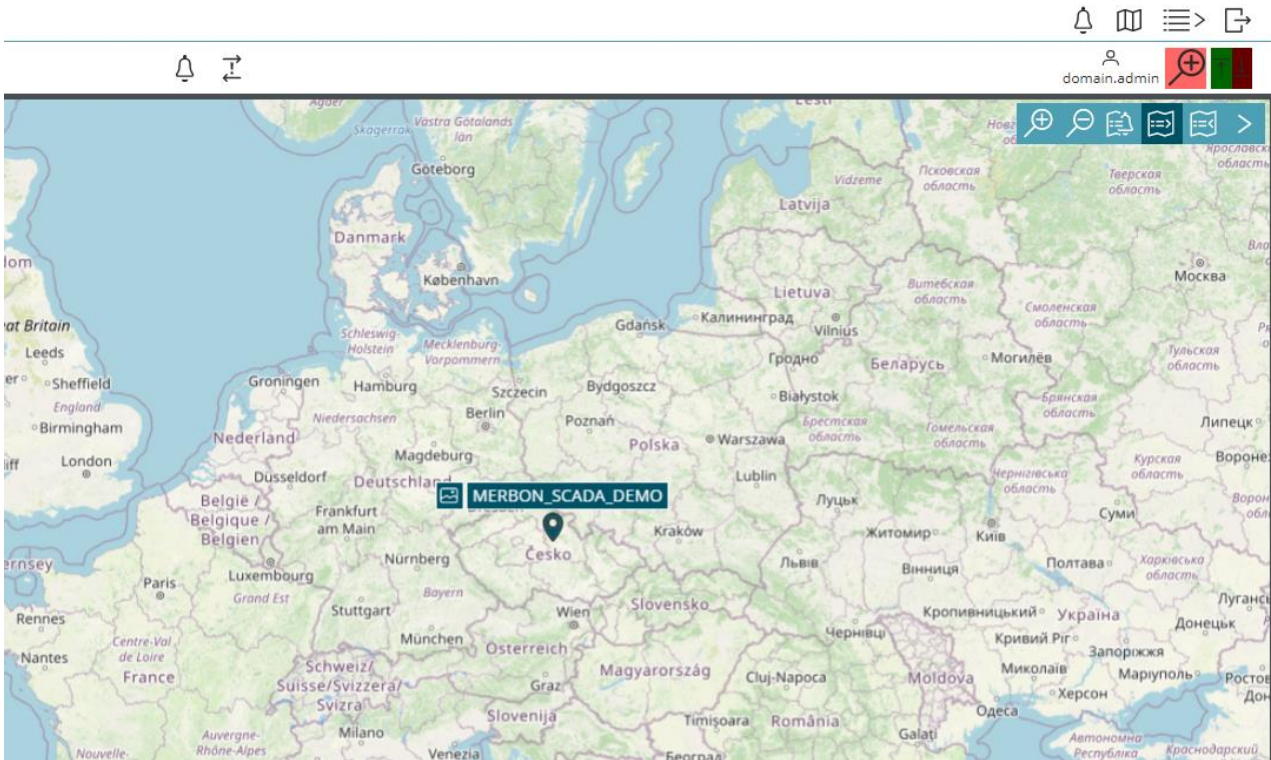
10 Scripting

For more complex data processing, calculations and conditional computing, script data points can be defined. The programming language is JScript.NET. There are many libraries available, including those with functions for access to data point values in Merbon SCADA. Script data points read values of one or more data points and provide the calculated values at their outputs. The data point values can be used in calculations, the script data points may provide sum values, react on exceeding of limits, etc.

The script data points have the same properties as technology data points: they can be displayed in schemas, sampled as history values, and communicated to PLCs.

While the older SCADA, RcWare Vision, evaluates the scripts within the GUI of the application, the Merbon SCADA components may only run in the server application. This means that any interactivity, integration of 3rd party code, etc. is not supported in scripts, because it may not affect the browser window. Some of the scripting functions then are not available in the client – server environment. Correct usage of scripts should be considered for each project separately. Details can be found in the *Merbon SCADA Implementation Manual*.

11 International support and services

11.1 Localisation

The Merbon SCADA software is currently distributed in English, German and Czech. More languages may be added on demand. Translation of system texts is easy and usually supplied by local distributor or system integrator.

11.2 Remote management

In today's environment, many sites do have remote access for easy and convenient service which saves costs and makes maintenance faster and more flexible.

If the user requires changes in schemas (adding new data points, changing of text or symbol in a schema, adding a new value into a schema etc.), all can be done on a remote basis. As a result, costs are saved and users are satisfied with the fast response of the service department.

11.3 Backups

To back up the complete project inclusive history data (in text form), it is enough to zip the whole project folder. It is not necessary to shut down the system, stop communication, etc. A zipped folder usually has 8 – 10 MB and can be sent by e-mail easily. It is quite easy then to create periodic automatic backups which increases system robustness. Of course, IT measures should be applied as a primary issue, such as mirrored disks, redundant connectivity to technologies, and the like. Merbon SCADA is able to use these technologies, and thus it is easy to integrate the SCADA system into the enterprise IT infrastructure and manage it within its framework.