Interoperability
for your devices
and software applications.

SAEAUT SCADA™
User's guide

by SAE - Automation, s.r.o., (Ltd.)

Product SAEAUT SCADA™ is part of the SAEAUT SCADA that consists of:

- SCADA server - for communication and data processing,
- SCADA clients - for visualisation and control,
- configuration application - for configuring of SAEAUT SCADA. functionality. debugging, desktop client

Table of Contents

1 Product overview

SAEAUT SCADA™ consists of:

- SCADA server - for communication and data processing
- SAEAUT SCADA Web Client- for visualisation and control
- Configuration application - for configuring of SAEAUT SCADA functionality. debugging, desktop client

As the SCADA Server, the runtime of the application OpcDbGateway is used. Configuring of SAEAUT SCADA is done by the configurator of the OpcDbGateway. Details please see in the documentation of the product OpcDbGateway. SAEAUT SCADA Web Client 31 is desribed in this document.

SAEAUT SCADA™ - MAIN FEATURES:

- communication with various devices, applications, databases through:
  - OPC and DDE servers
  - with exploitation of DLL, ActiveX
  - through database drivers
- data processing
  - configurable (rich functionality without programming)
  - programmable (with enhancing DLL's)
- logging in files and databases
- alarm systems:
  - according to OPC AE standard
  - proprietary - with alarms history
- alarm client applications:
  - desktop - in configuration application
  - Web client
- reports:
  - configured (report is defined using configuration application)
  - interactive (request to create report is defined in client application)
  - using MS Excel
- historical trends - created easily by software wizard.
- SMS and E-mail can be used for logging, alarms and for application control
- visualization using:
  - SAEAUT SCADA Web Client™ enabling:
    - structured view of the actual data in directory tree structure
    - view of tabular data from process databases using SQL commands either automatically generated or user-defined in the Web client
    - creating of interactive reports - it can export data from a database table view in the client application using formats csv, xls, pdf and doc.
    - log files viewer. Log files can contain messages about functionality of the SCADA server itself with defined level of details as well as parameterized user messages, in which the parameters are replaced at runtime by the current values of selected variables
    - Secure access to current data and data in process databases
  - connection to MS Excel over DDE (or OPC DA)
  - user's HMI over OPC DA
- security is provided by two level authentication

- configuring of big amounts of data points from external devices applications and data sources can be done fast and easily using software wizards built in the configurator.

Related links on the web

[OpcDbGateway on the web]
[OpcDbGateway blog]

,

1.1 Basic functionality

SAEAUT SCADA™

- communicates with external devices, process databases, and software applications,
- prvides processing of data from above mentioned external entities,
- enables read/write data using web client application,

according to the configuration created by SCADA Configurator.

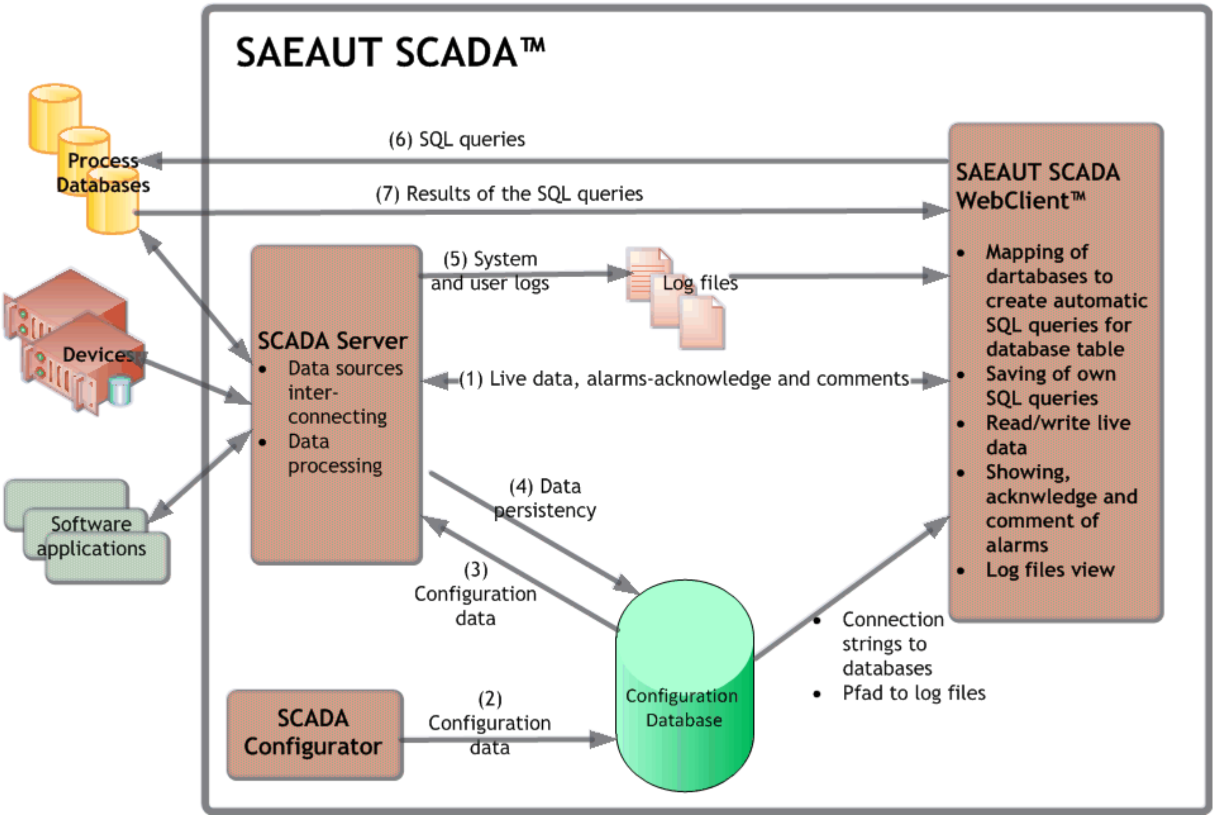


Figure 1. Data flows in SAEAUT SCADA™

SCADA Configurator enables to create *configuration data (2)* and to save them to the *configuration database*. **SCADA SERVER** reads *configuration data (3)* from configuration database and provides interconnecting of data sources – process databases, devices and software applications and also processing of data accordingly. *SCADA Server* offers processed *(1) live data* to ***SAEAUT SCADA Web Client.*** It provides also *(5) logging* of system data (enabling control and watch functionality of the *SCADA server*) as well as user messages to log files.

SAEAUT SCADA Web Client enables read / write of *(1) live data* from SCADA server (using OPC DA interface). It enables also reading of data from configuration database to find out connection strings to process databases and path to the log files. These information uses for displaying of related data. To display data from databases (6),(7), it uses **direct access to process databases** (not intermediated by SCADA Server).

SCADA Server provides evaluation of alarm sources and saving actual status of them to the alarms status table in one of process databases. It provides also saving of alarm states history to the alarm history table. SAEAUT SCADA Web Client enables to watch alarm status table and alarm history table directly in process database. It enables also to acknowledge and to comment activated alarm source.

In terms of direct access of the SAEAUT SCADA Web Client to process databases, it is supposed to be used read only. Writing to process databases is possible over SCADA server to that database tables are mapped.

SCADA Server provides easy data persistency (4). When stopped, internal status (memory operands) are saved to the configuration database. In case that none changes in configuration has been done the saved internal status is used by restart of the *SCADA Server.*

Details to the functionality please see in documentation of the product OpcDbGateway.

2 System Requirements

- Computer/Processor: Pentium II -compatible CPU
- Memory: at least 1 GB (recommended 4 GB)
- OS x86 or x64: MS Windows Vista, Windows 7, Windows 8, Windows Server 2003, 2008 R2, 2012
- Disk space: 20 MB for SCADA Web Client installation
- IIS must be installed to enable SCADA Web Client installation
- Disk space: 40 MB for SCADA Server installation
- Microsoft .NET Framework 4.0

3 Installation

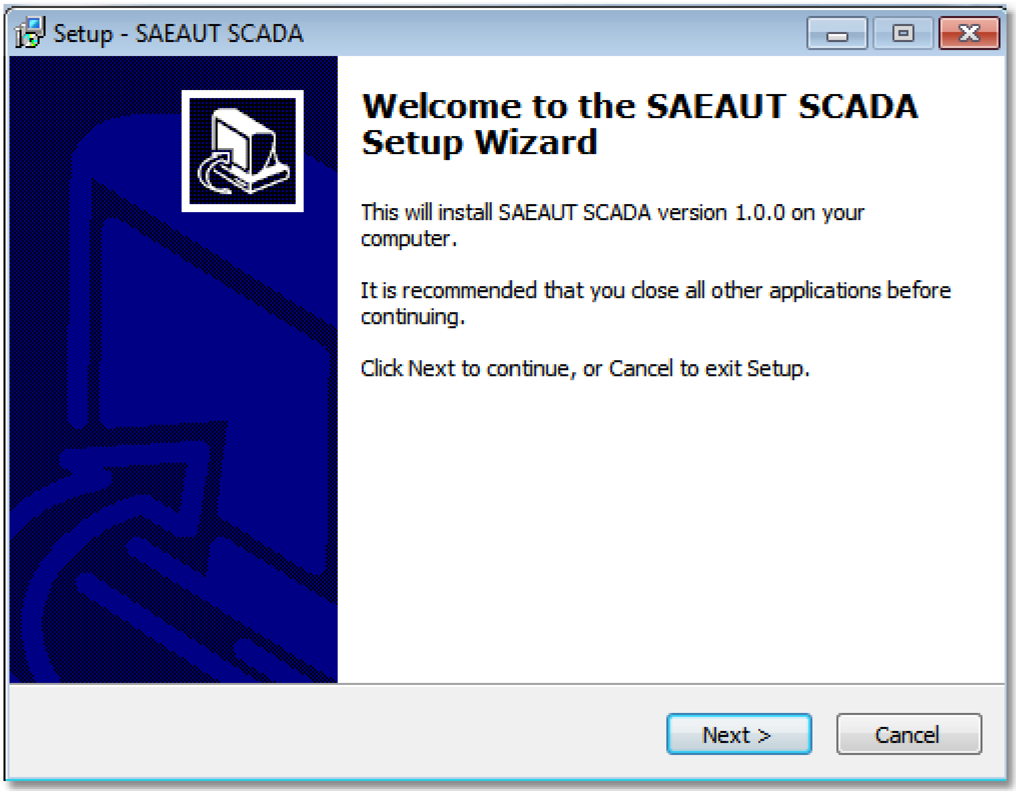
The SAEAUT SCADA™ is installed on a computer / server by administrator of the computer or Windows domain.

- The installation can be:Compact 6 – SCADA Server and SCADA Web Client are on the same computer
- Distributed 10 - SCADA Server and SCADA Web Client are on different computers

The term compact installation has nothing to do with placement of communication drivers (OPC servers), databases and external applications. They can be placed locally (on the same computer where SCADA server resides) or remotely – on other computers in the same Windows domain.

3.1 Compact

1. Lunch the installation application - the installation of SCADA (OpcDbGateway) Server and Configurator will be started



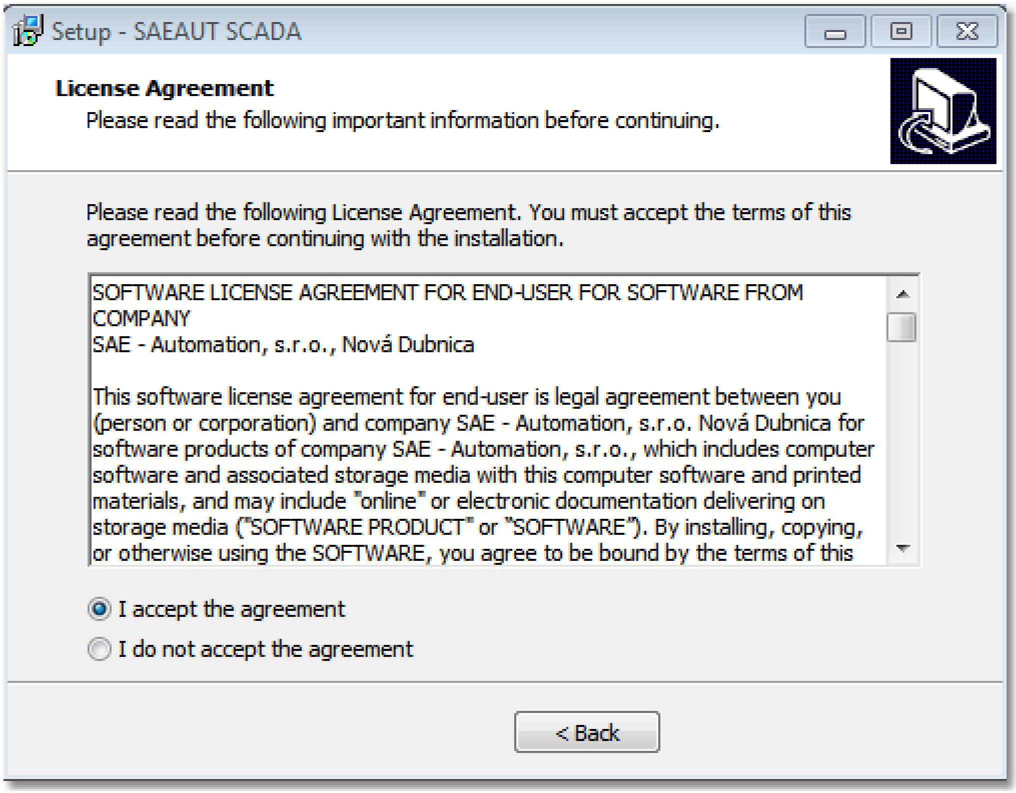
Welcome to the SAEAUT SCADA Setup Wizard

This will install SAEAUT SCADA version 1.0.0 on your computer.

It is recommended that you close all other applications before continuing.

Click Next to continue, or Cancel to exit Setup.

2. Confirm license agreement



License Agreement

Please read the following important information before continuing.

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

SOFTWARE LICENSE AGREEMENT FOR END-USER FOR SOFTWARE FROM COMPANY
SAE - Automation, s.r.o., Nová Dubnica

This software license agreement for end-user is legal agreement between you (person or corporation) and company SAE - Automation, s.r.o. Nová Dubnica for software products of company SAE - Automation, s.r.o., which includes computer software and associated storage media with this computer software and printed materials, and may include "online" or electronic documentation delivering on storage media ("SOFTWARE PRODUCT" or "SOFTWARE"). By installing, copying, or otherwise using the SOFTWARE, you agree to be bound by the terms of this

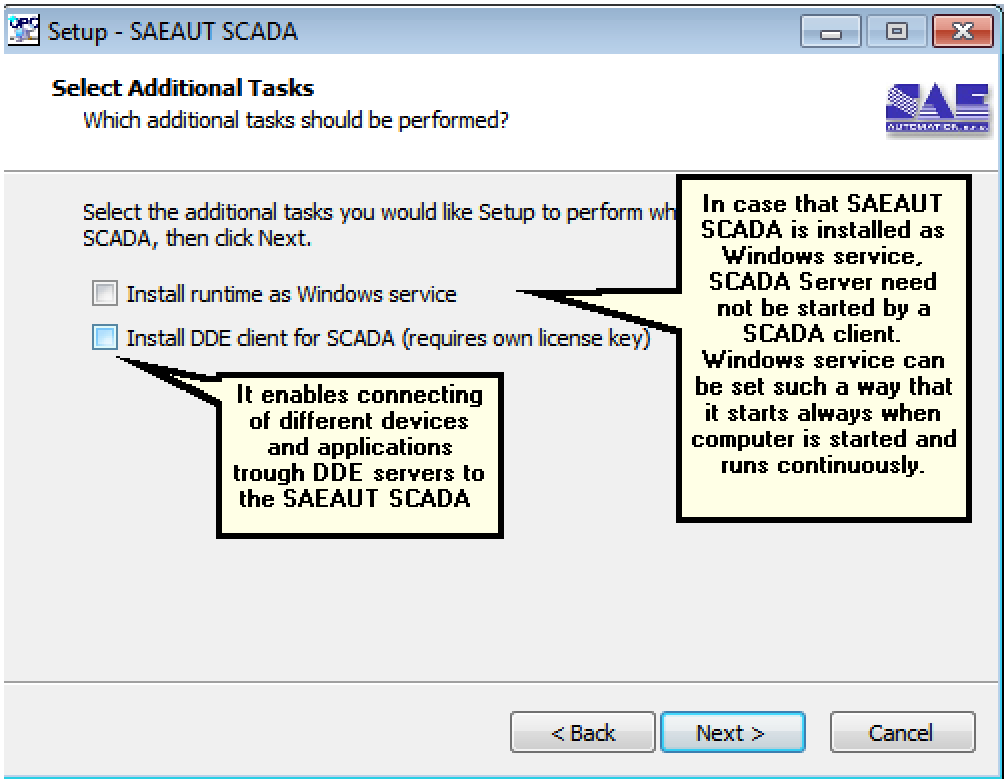
● I accept the agreement

○ I do not accept the agreement

3. Start installation by click on *Install*

4. Chose placement of SCADA Server - e.g. *C:\Program Files\SAEAUT SCADA*
5. Chose placement in START Menu - e.g. SAEAUT SCADA

6. Chose if SCADA Server has to run as Windows service and if the DDE client has to be installed as well.



Setup - SAEAUT SCADA

Select Additional Tasks

Which additional tasks should be performed?

Select the additional tasks you would like Setup to perform wh SCADA, then click Next.

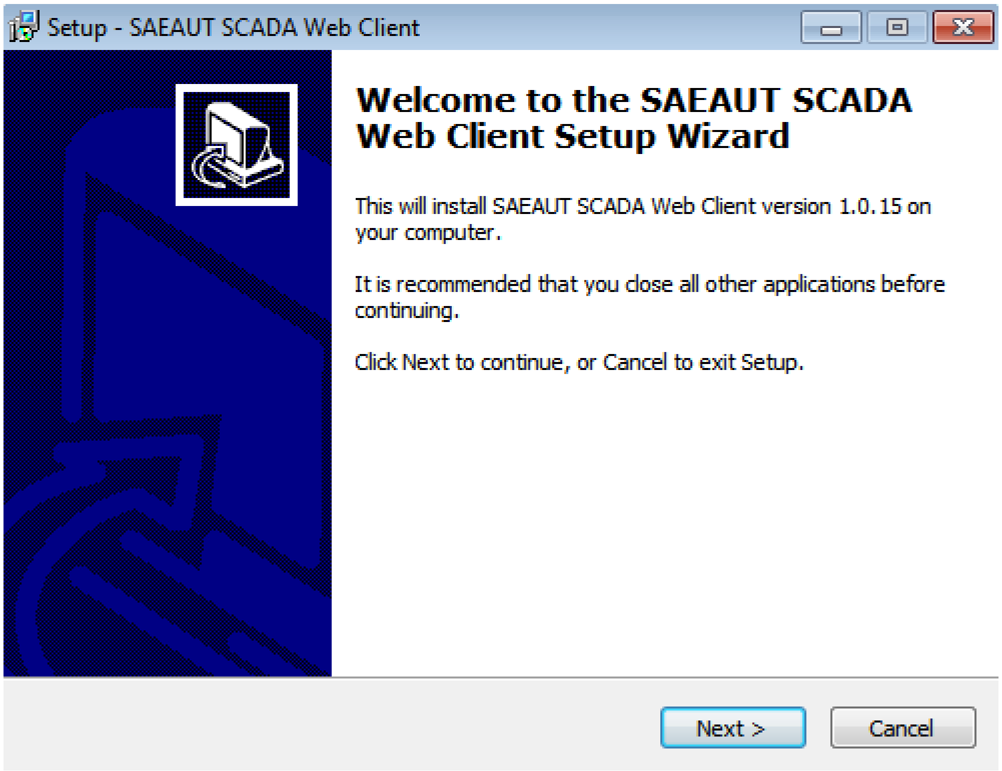
□ Install runtime as Windows service

□ Install DDE client for SCADA (requires own license key)

In case that SAEAUT SCADA is installed as Windows service, SCADA Server need not be started by a SCADA client. Windows service can be set such a way that it starts always when computer is started and runs continuously.

It enables connecting of different devices and applications trough DDE servers to the SAEAUT SCADA

7. Continue with SCADA Web Client Setup



Setup - SAEAUT SCADA Web Client

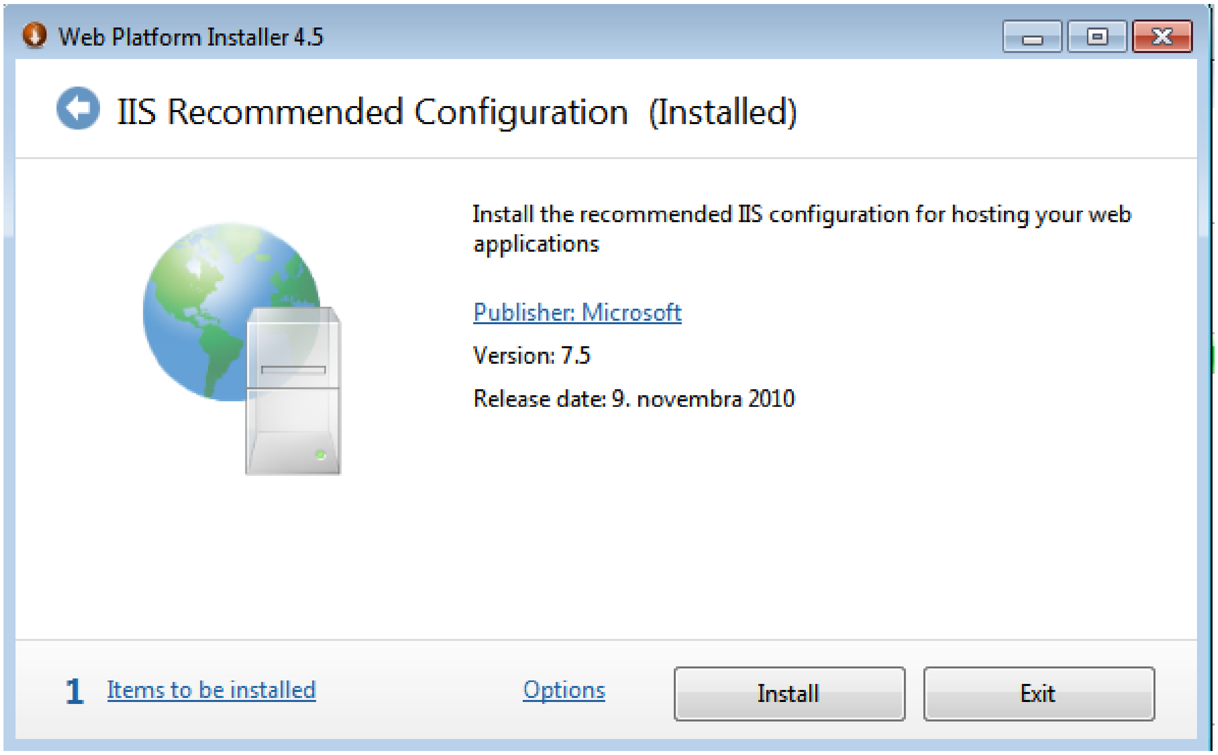
Welcome to the SAEAUT SCADA Web Client Setup Wizard

This will install SAEAUT SCADA Web Client version 1.0.15 on your computer.

It is recommended that you close all other applications before continuing.

Click Next to continue, or Cancel to exit Setup.

8. After that following view will be displayed. Continue by click *Exit* (There can be also more items in the dialog box, however you can click *EXIT*).



Web Platform Installer 4.5
IIS Recommended Configuration (Installed)

Install the recommended IIS configuration for hosting your web applications

Publisher: Microsoft

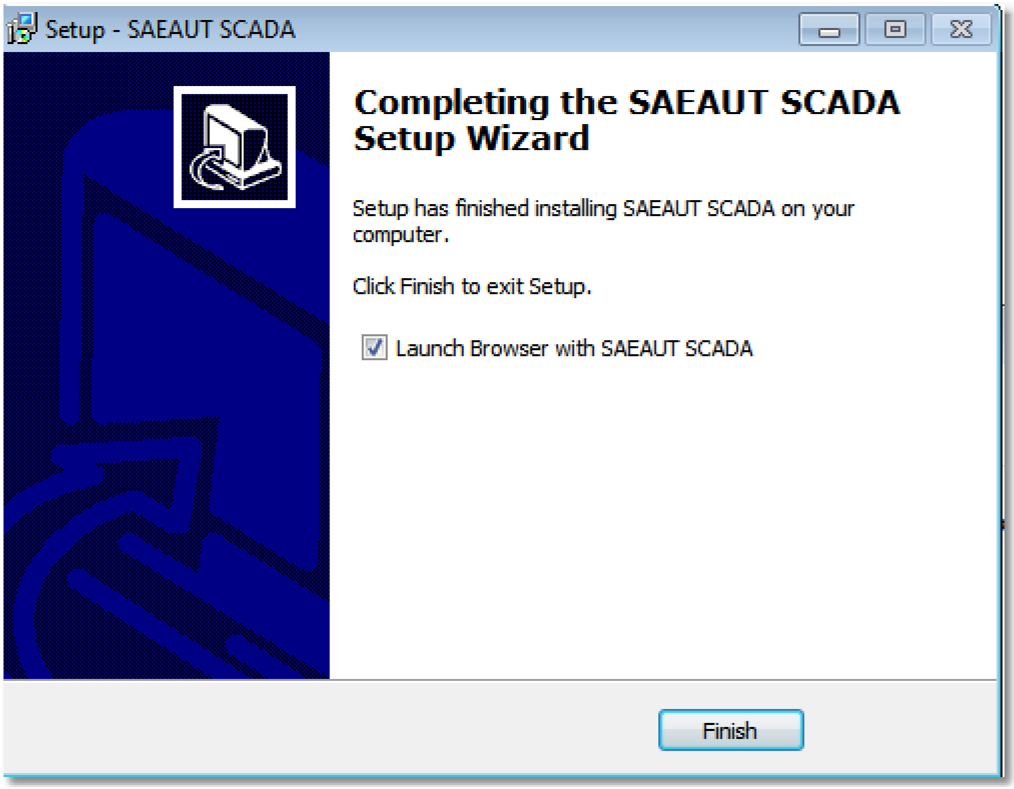
Version: 7.5

Release date: 9. novembra 2010

1 Items to be installed
Options
Install
Exit

9. After that, web client application files will be copied to virtual directory SAEAUT-SCADA on MS IIS

10.In case that you let checked the option „Launch Browser with SAEAUT SCADA" by completing the installation the SAEAUT SCADA will be started.



Setup - SAEAUT SCADA

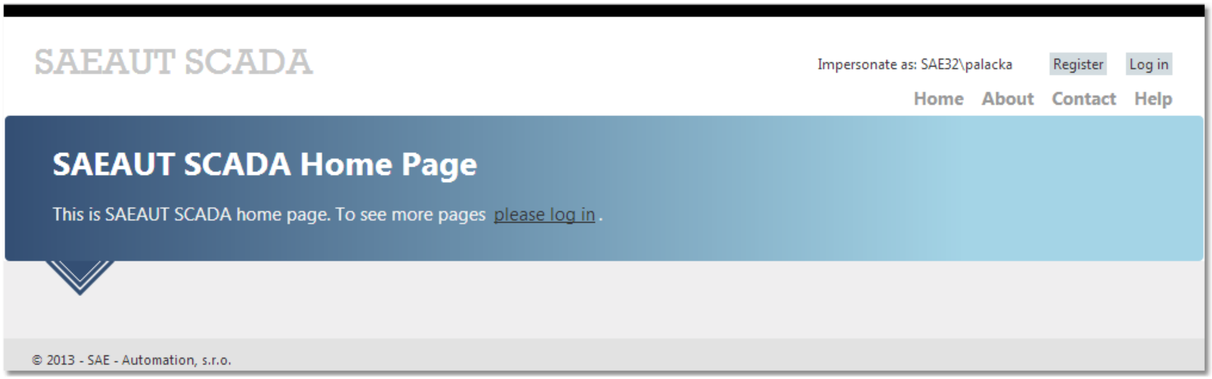
Completing the SAEAUT SCADA Setup Wizard

Setup has finished installing SAEAUT SCADA on your computer.

Click Finish to exit Setup.

☑ Launch Browser with SAEAUT SCADA

11. Following view will be shown in browser. You can proceed with user registering 32 or distributed deployment 10 (if you need it).



SAEAUT SCADA Home Page

This is SAEAUT SCADA home page. To see more pages please log in .

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3.2 Distributed

Distributed installation can be done using the same installation package on two different computers in the same Windows domain. But, on one computer only the SCADA Server and on the second only the SCADA Web Client will be used in runtime.

On the computer where SCADA Web Client has to be used, it is necessary to activate web client user access licenses. It will be done as described in Web client licenses activation 12. After that, SCADA server and configurator can be removed from the computer used for the SCADA Web Client.

Web client application variables have to be set such way to point to computer with running server. It can be done using IIS manager in Application settings for SAEAUT-SCADA virtual directory using following key - value pairs:

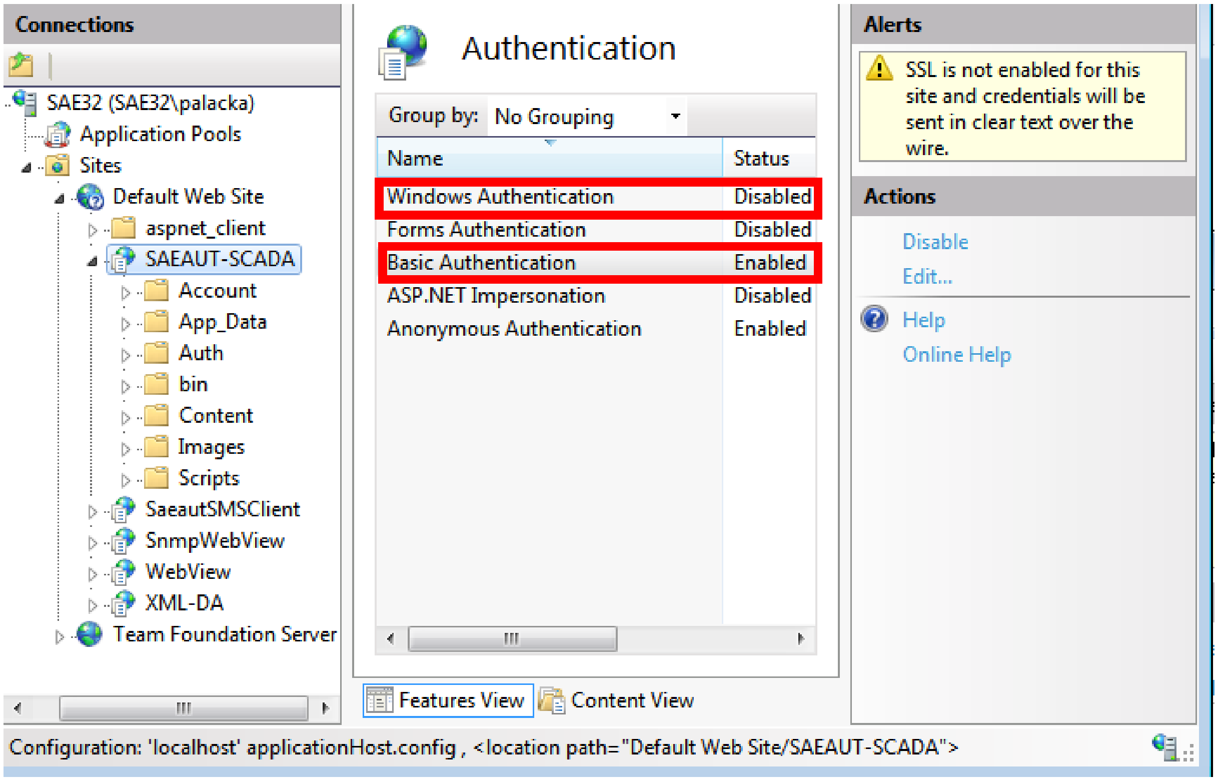
```
key="ConfigurationPath" value=""
key="AppRegistryPath" value="HKEY_LOCAL_MACHINE\SOFTWARE\SAE - Automation,
s.r.o.\OpcDbGateway\Configuration"
key="opc_server_address" value="opcda://localhost/SAEAutomation.OpcDbGatewayDA"
```

In case that the key "`ConfigurationPath`" is empty the path for configuration should be found in registry under "`HKEY_LOCAL_MACHINE\SOFTWARE\SAE - Automation, s.r.o.\OpcDbGateway\Configuration`"

The name of the host where SCADA Server - OPC server is installed has to be changed accordingly. E. g. value "`opcda://localhost/SAEAutomation.OpcDbGatewayDA`" has to be changed to "`opcda://s1/SAEAutomation.OpcDbGatewayDA`" if *s1* is the name of the host.

On both client and server has to be used the same configuration!

If it does not connect to the remote OPC DA Server correctly, make sure that you set the right DCOM settings for the OPC Server using DCOMCNFG.EXE
If it does not help, change the authentication type using Inetmgr.exe -> SAEAUT-SCADA -> Autenhentication -> Turn off Windows authentication, Turn on basic authentication.



Name	Status
Windows Authentication	Disabled
Forms Authentication	Disabled
Basic Authentication	Enabled
ASP.NET Impersonation	Disabled
Anonymous Authentication	Enabled

SSL is not enabled for this site and credentials will be sent in clear text over the wire.

Configuration: 'localhost' applicationHost.config , <location path="Default Web Site/SAEAUT-SCADA">

You can use OPC XML DA interface instead of OPC DA interface. It does not require such strict authentication rights. To do it, you can use OPC XML DA wrapper delivered with OpcDbGateway. Please ask SAE - Automation, s.r.o., (Ltd.). OPC server address has to be set following way then:

```
key="opc_server_address" value="http://PC-Name/XML-DA/SAEAutomation.OpcDbGatewayDA.3.asmx."
```

3.3 Web client licenses activation

To be able to access to the SCADA Server over Internet/intranet using a web browser you need to be registered for web access and logged in. By default, one web access license is activated after installation and can be used for registration.

To obtain additional web client access licenses, please ask vendor SAE - Automation, s.r.o., (Ltd.) to send link on installation with required nr. of licenses.

Additional client access licenses are activated only if the whole SAEAUT SCADA is activated. In demo mode, only one client has access.

Installation of the additional web client access licenses is provided by SCADA Server (OpcDbGateway) runtime. After installing of SAEAUT SCADA, only one user – administrator has activated access and can register. 32 Other users can be registered after start and stop SCADA Server runtime.

How to proceed:
1. Start browser – it can be done from START menu – SAEAUT SCADA -> SCADA Web Client or it will be done automatically at the end of installation if you let this option checked in.
2. Register an administrator in SCADA Web Client.
3. Log in to SCADA Web Client
4. Click in main menu on Live Data – after a few seconds SCADA server should be started.
5. Log out from SCADA Web Client
6. Other users (up to the nr. of bought licenses can be registered for access over SCADA Web Client)

Remark:
In case that you are accessing to SCADA server over Internet/intranet (not from a computer in the same domain where resides SCADA Server) you need to be registered in Windows domain first to be able register and log in.

4 First steps

After installation, the SAEAUT SCADA™ is either started automatically or can be started from START MENU.
Start of the SAEAUT SCADA™   means opening of introduction view of the SAEAUT SCADA Web Client application 31 in a default web browser. To proceed to functional views, it is necessary to register user(s) 32 first.

The first registered user is automatically logged in. He/she can start SCADA Server by choosing *Live Data* 33 in menu of the SAEAUT SCADA Web Client application.

SAEAUT SCADA™   is delivered with 2 demo configurations that can define its demo functionality 13.
In case that you have chosen installing DDE client , the easy configuration *SystemToExcel.ODG* is activated and so SCADA Server will run according to this configuration. If you have not chosen installing DDE client, a more comprehensive configuration *ExampleConfiguration.ODG* will be

activated. Of course, you can chose which configuration has to be activated using SCADA Configurator from START menu any time. You can create also own configurations.

We suggest to start with *ExampleConfiguration.ODG* and try to understand how it runs (*SystemToExcel.ODG* would not enable to test database fuctionaliy in the web client). **This is good starting point for creation of own configurations.**

4.1 Demo configuration

The demo configuration *ExampleConfiguration.ODG* enables learning and testing of following features:

1. Communication of the SCADA Server with external devices that use external OPC servers as communication drivers 14
2. Communication of the SCADA Server with external application using enhancing DLL's 15
3. Communication of the SCADA Server with databases 16
4. Mapping of data items from devices, external applications and cells from database tables to memory operands 17
5. Working with alarms - defining of memory operands alarm activation 23 and alarm acknowledgment
6. Mapping of memory operands to OPC items of the internal OPC server 18
7. Using of function blocks 20 to perform operations with memory operands
8. Using triggers 22 to initialize events
9. Defining of events 22 to call function blocks and start external programmes
10. Working with trends 24

To understand the example and to be able to create own configurations, it is necessary to learn basic principles of working with SAEAUT SCADA Server (OpcDbGateway) described in Integration of applications effectively. OpcDbGateway – configuring and programming, overview. Details to the working with OpcDbGateway can be found in the on line help of the OpcDbGateway.

The demo configurations *SystemToExcel.ODG and DDETestBook* enables learning and testing of connecting external devices and applications to the SCADA Server using DDE client enhancement. Details please see in the DDE client on line help.

To watch functionality of the SCADA Server running with the configuration *ExampleConfiguration.ODG* you can use the SCADA Web Client. Pictures used for describing of the work wih the SCADA Web Client 31 are matching the mentioned configuration. You can also use internal OPC client built in configurator for reading and writing OPC items to that memomory operands are mapped.

To start , please open SCADA Configurator from START Menu and chose *ExampleConfiguration.ODG* using *File->Open* from main application menu.

4.1.1 Using external OPC servers as communication drivers

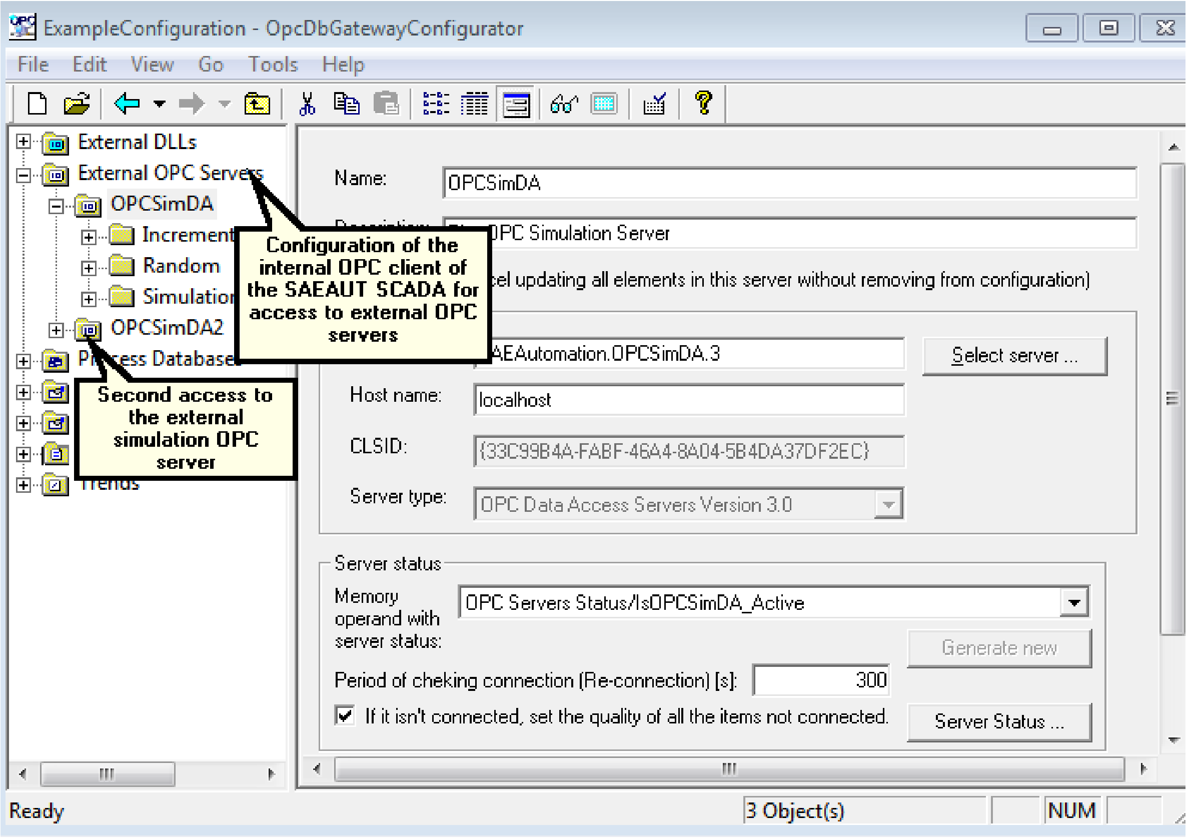
By installation of the SAEAUT SCADA™ OPC server SAEAutomation OPCSimDA is installed as well. It is supposed to be used only for demo and testing purposes. SAEAutomation OPCSimDA is used **to simulate connection to an external device over OPC server**. It offers changing data items on the simulated device as well as possibility to write to those data items.

Within Configurator, you can see configured connection to the simulation OPC server in the tree view under *External OPC Servers*. There are configured connections to the same SAEAutomation OPCSimDA OPC server - *OPCSimDA* and *OPCSimDA2.* You can try to configure also your own connection to this server. In runtime, connection to this sever is provided by internal OPC client built into SCADA server (see in Figure).

By configuring of connection to external OPC servers you can browse for available servers or write OPC server id directly. External OPC Servers can be placed on local host or whatever computer in workgroup or network domain.

As next step you can create OPC groups see e.g. the group *OPCSimDA->Increment* that can have defined e.g. way of communication with OPC server synchronous/asynchronous update rate...

For every OPC group you can choose OPC items by browsing of address space of the external OPC and provide automatic mapping to memory operands 17 and to OPC items of the internal OPC server 18.



Configuration of the internal OPC client of the SAEAUT SCADA for access to external OPC servers

Second access to the external simulation OPC server

Name: OPCSimDA

Description: ...OPC Simulation Server

...el updating all elements in this server without removing from configuration)

...AEAutomation.OPCSimDA.3

Host name: localhost

CLSID: {33C99B4A-FABF-46A4-8A04-5B4DA37DF2EC}

Server type: OPC Data Access Servers Version 3.0

Server status

Memory operand with server status: OPC Servers Status/IsOPCSimDA_Active

Period of cheking connection (Re-connection) [s]: 300

☑ If it isn't connected, set the quality of all the items not connected.

4.1.2 Using enhancing DLL's

Enhancing Dll's enable to enhance functionality of the SAEAUT SCADA with own programmed modules that can be used to implement own functionality, to encapsulate ActiveX and dll's from devices vendors to communicate with their devices and even to implement almost all project functionality using programming instead of pure configuring possibilities provided by SAEAUT SCADA configurator.

There is example with source codes – *Exampel1.dll* of very easy functionality implemented within projects for Visual Studio 2005 or 2012 that you can open from Start menu. They can be used as templates for your own projects. (Figure 1.)

Within configuration, the dll calling must be provided from a function block. The *Example1.dll* is called from the function block *Main* (Figure 2)

After creating your own enhancing dll, it is necessary to copy it to the directory where SAEAUT SCADA is installed - e.g. C:\Program Files\SAEAUT SCADA\ExternalDll.
Calling of the dll must be configured in your configuration

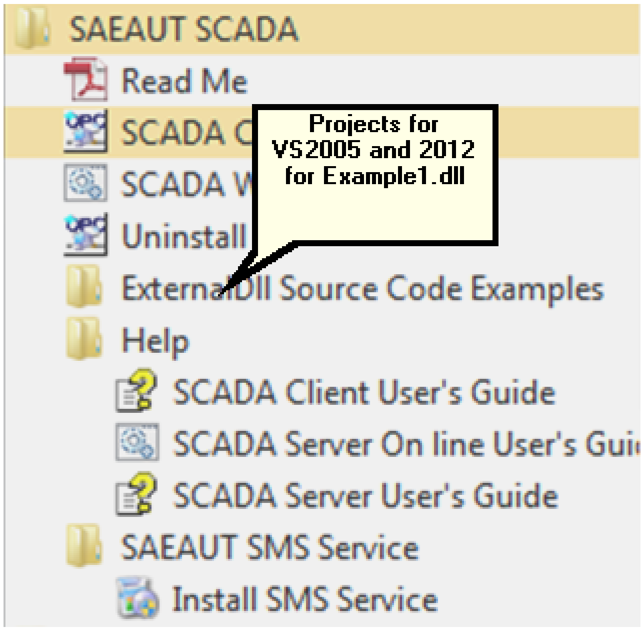
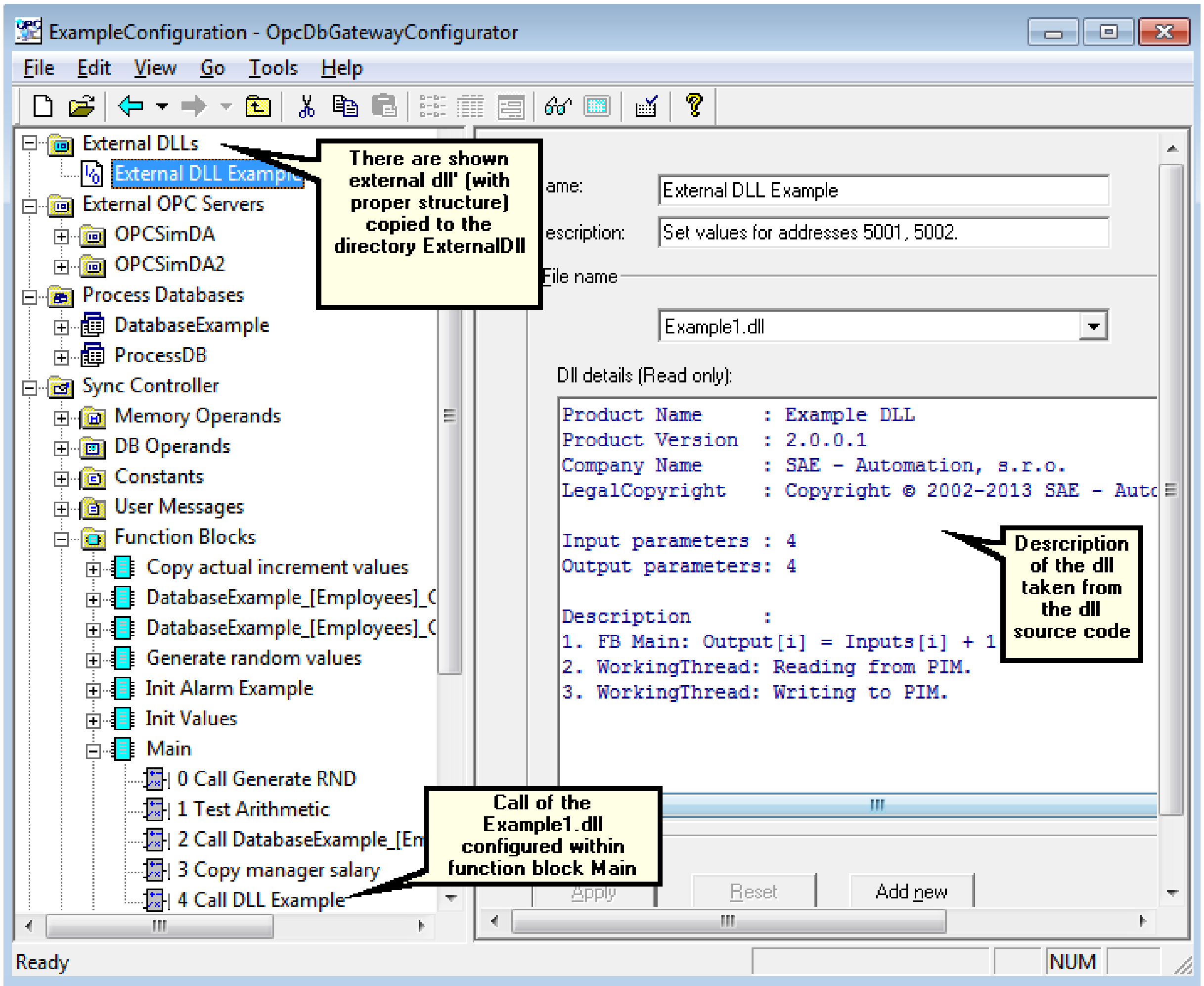

SAEAUT SCADA
Read Me
SCADA C
SCADA W
Uninstall
ExternalDll Source Code Examples
Help
SCADA Client User's Guide
SCADA Server On line User's Gui
SCADA Server User's Guide
SAEAUT SMS Service
Install SMS Service
Projects for VS2005 and 2012 for Example1.dll

Figure 1: Access to the projects for MS Visual Studio 2005 and 2012 from Start menu



ame: External DLL Example

escription: Set values for addresses 5001, 5002.

File name

Example1.dll

Dll details (Read only):

```
Product Name     : Example DLL
Product Version  : 2.0.0.1
Company Name     : SAE - Automation, s.r.o.
LegalCopyright   : Copyright © 2002-2013 SAE - Autc

Input parameters : 4
Output parameters: 4

Description      :
1. FB Main: Output[i] = Inputs[i] + 1
2. WorkingThread: Reading from PIM.
3. WorkingThread: Writing to PIM.
```

There are shown external dll' (with proper structure) copied to the directory ExternalDll

Desrcription of the dll taken from the dll source code

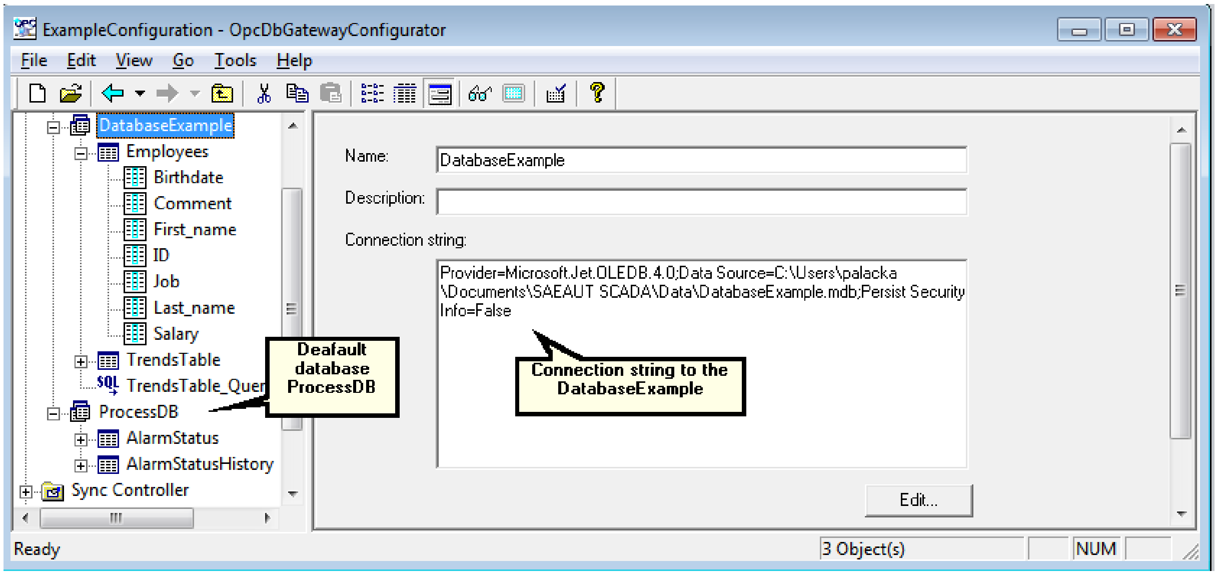
Call of the Example1.dll configured within function block Main

Figure 2. Configuration of Example1.dll - it is called from the function block Main

4.1.3 Communication with databases

SAEAUT SCADA™ can connect to many different databases using **configured connection strings.** When new configuration is created, default database with the name *ProcesDB* containing tables *AlarmStatus* and *AlarmStatusHistory* is created automatically. Within the demo configuration, also connection to another database on the local host – *DatabaseExample* with tables *Employees* and *TrendTable* is created.

Using configurator, you will be able to configure access to other databases on local or remote hosts, to create new tables on connected databases or map tables existing on connected databases to the configuration. You can also define queries for connected databases and use them in configuration e.g. using events.



Name: DatabaseExample

Description:

Connection string:

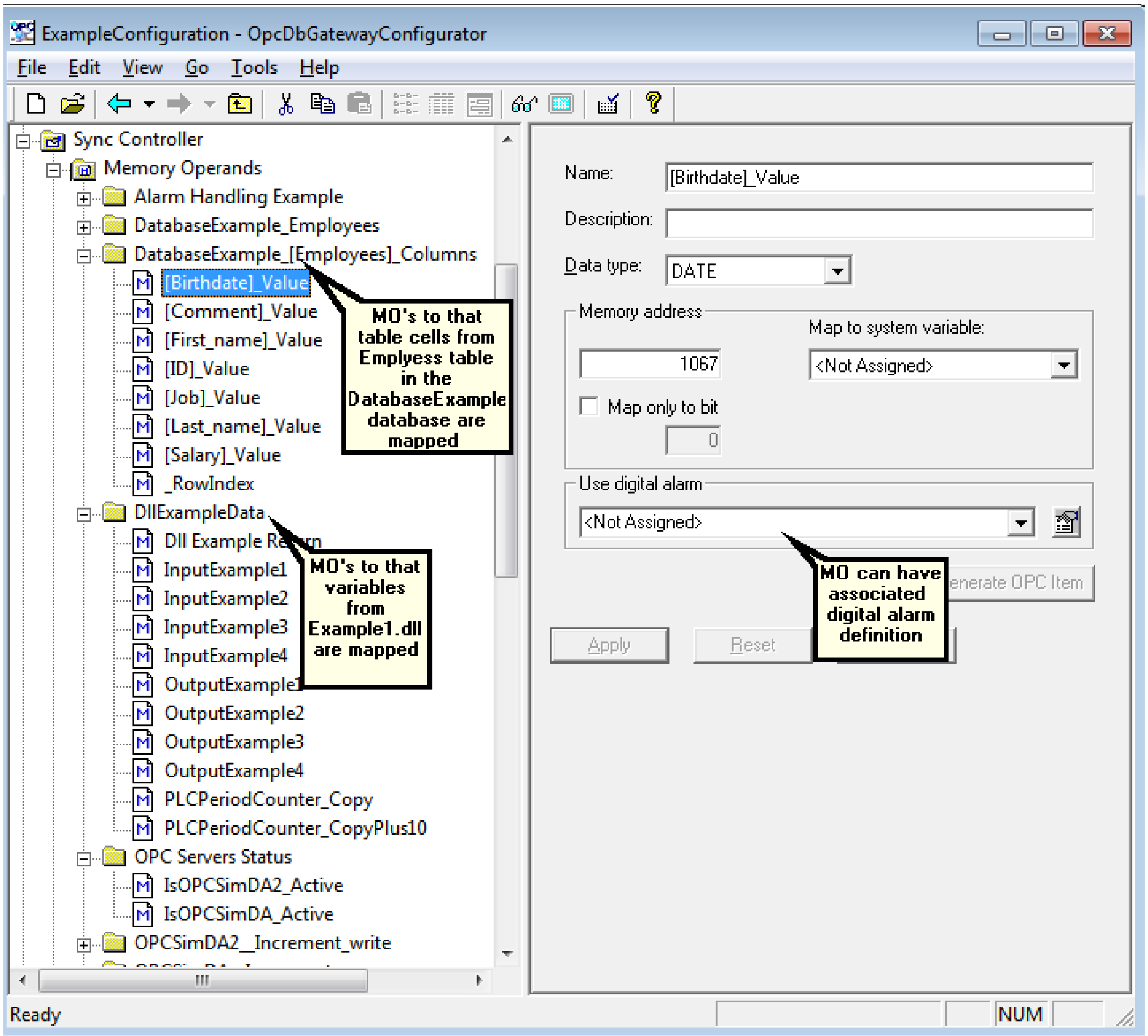
Provider=Microsoft.Jet.OLEDB.4.0;Data Source=C:\Users\palacka\Documents\SAEAUT SCADA\Data\DatabaseExample.mdb;Persist Security Info=False

Deafault database ProcessDB

Connection string to the DatabaseExample

4.1.4 Mapping to memory operands

The memory operands area is the place where an information exchange between different external devices, databases 16 and computation modules implemented as enhancing DLL's 15 is executed. By using of the SAEAUT SCADA™ configurable functionality 20, we work with memory operands and provide processing and data exchange between external devices, databases, program modules and the computing machine of the SAEAUT SCADA™ itself.



Name: [Birthdate]_Value

Description:

Data type: DATE

Memory address: 1067

Map to system variable: <Not Assigned>

☐ Map only to bit 0

Use digital alarm: <Not Assigned>

MO's to that table cells from Emplyess table in the DatabaseExample database are mapped

MO's to that variables from Example1.dll are mapped

MO can have associated digital alarm definition

4.1.5 Internal OPC server

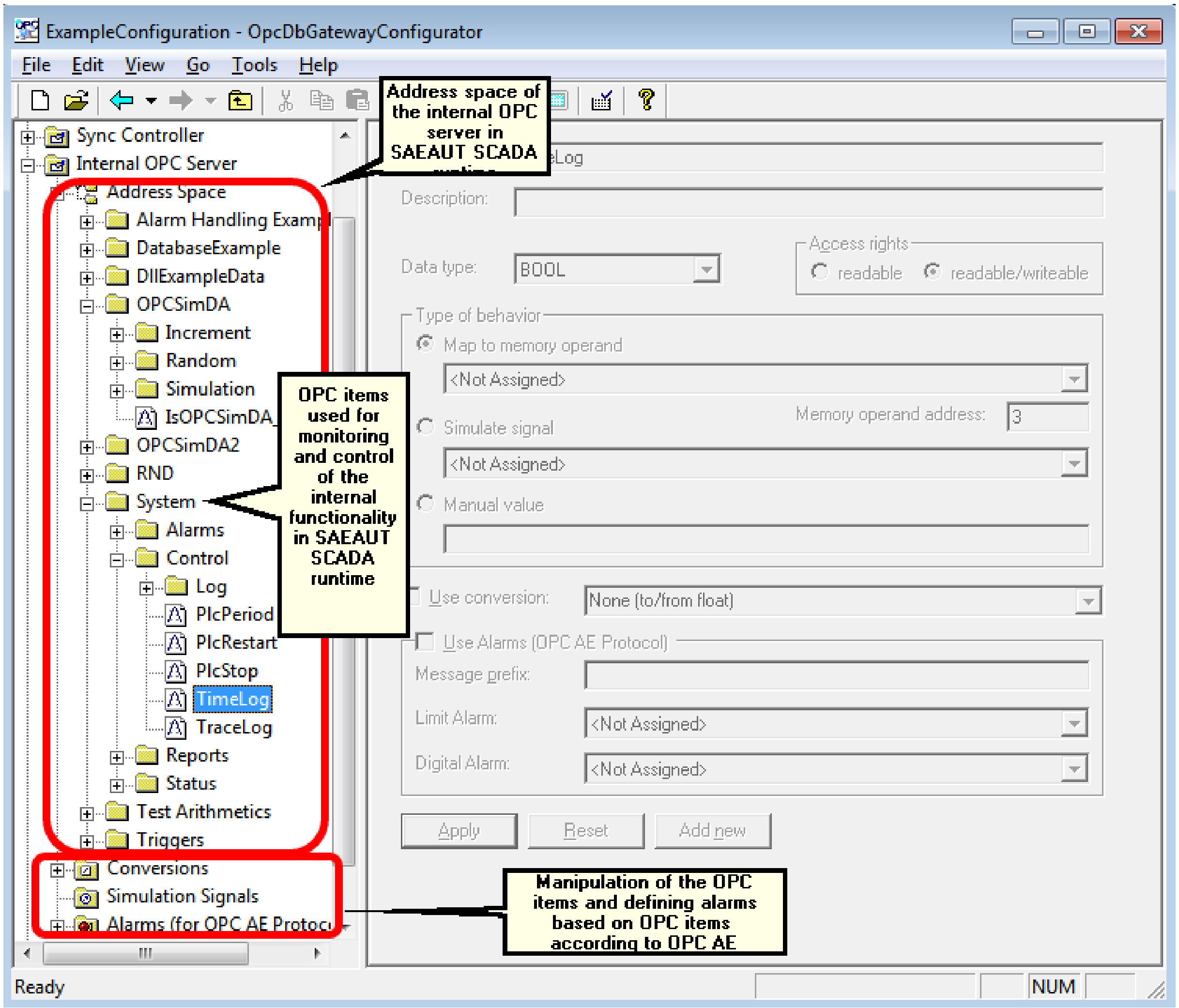
There is an OPC server providing access to memory operands within SAEAUT SCADA™ runtime. This OPC server is used by SAEAUT SCADA Web Client 31 and can be used by other OPC DA client applications as well.

There is possibility to define OPC items within *Address space* of the internal OPC server and chose to which memory operands they have to be mapped. Creating of OPC items can be done also automatically within configurator. E.g. by configuring of the access to external OPC servers it is possible to choose that related memory operands and OPC items of the internal OPC server will be created automatically.

Address space of the internal OPC server can be structured by folders. It enables to estimate which folders from memory operands configuration contain related OPC items.
E.g. memory operands from folder *OPCSimDA_Increment* are mapped to the folder *OPCSimDA ->Increment*. The same structuring of the address space is used also in the view Live Data 33 within SAEAUT SCADA Web Client.

On the level of internal OPC server, different value manipulations can be defined. E. g. OPC item can be simulated using simulation signals defined in the related folder or converted using one of conversions. To the OPC items alarms according to OPC AE specification can be defined. (These are different than alarms defined for memory operands.)

There is folder with the name ***System*** in the address space that is created automatically by default in every new configuration. Using variables from this folder, it is possible to monitor or control internal functionality of the runtime. (Memory operands to these variables are not explicitly created, but if you need a memory operand you can create it.)



Address space of the internal OPC server in SAEAUT SCADA runtime

OPC items used for monitoring and control of the internal functionality in SAEAUT SCADA runtime

Manipulation of the OPC items and defining alarms based on OPC items according to OPC AE

Log

Description:

Data type: BOOL

Access rights: ○ readable ● readable/writeable

Type of behavior

● Map to memory operand

<Not Assigned>

Memory operand address: 3

○ Simulate signal

<Not Assigned>

○ Manual value

□ Use conversion: None (to/from float)

□ Use Alarms (OPC AE Protocol)

Message prefix:

Limit Alarm: <Not Assigned>

Digital Alarm: <Not Assigned>

Ready NUM

4.1.6 Commands, function blocks

Data processing in SAEAUT SCADA™ - basics

Data processing in SAEAUT SCADA™ is:

- implicit that does not need configuring or programming, (e.g. transfer of unchanged data from mapped external OPC servers to internal OPC server.)
- explicit - executed by **commands** that are organised in **function blocks (FB)** and enabling processing of data from external devices applications and databases in SAEAUT SCADA™ runtime application.

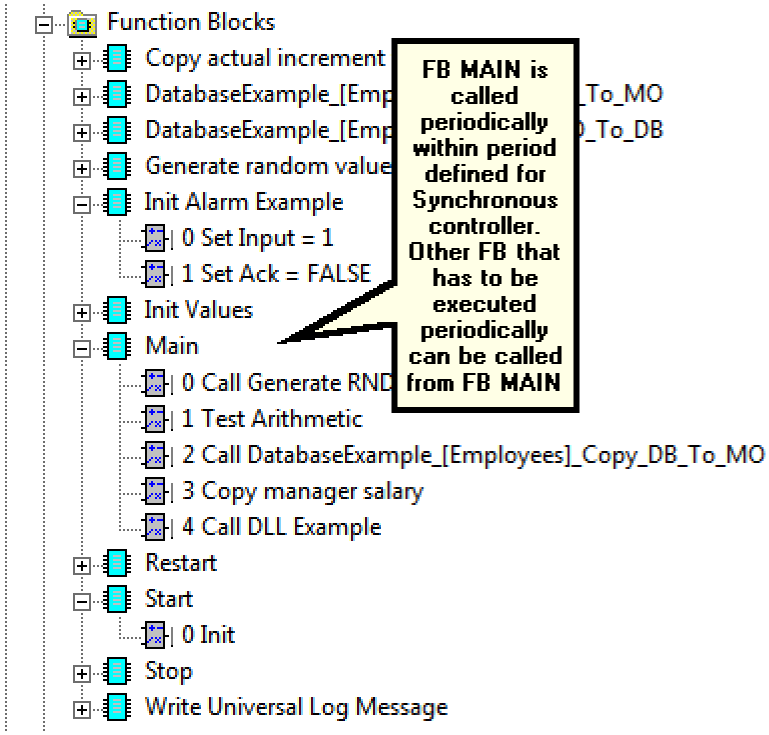
Data processing can be configured using **configurable commands** (see in *OpcDbGateway User's Guide->Sync Controller->Function blocks->Commands*) or programmed within enhancing DLL's 15.

There are **default function blocks** that are created in every new configuration - ***MAIN***, ***START, RESTART, STOP, Write Universal Log Message****.* (Some of them can be let dummy – without commands).

There are function blocks that are **executed always only one time** – by start (FB: *START*, *RESTART*) or stop (FB: *STOP)* of the SAEAUT SCADA runtime application. There is also FB ***MAIN*** *(Figure 1.)* that is executed **in every cycle** of the SAEAUT SCADA synchronous controller. Function blocks can be called from another FB using commands *CALL* or *CALLREV*. All FB called from FB *MAIN* are called cyclically (because of cyclic implicit functionality of the FB *MAIN)*.

There can be also FBs that are executed as events activated by a trigger 22. Within demo application following FBs are called this way: *Copy actual increment values*, *Write Universal Log Message.*

Functionality programmed within enhancing dll 15 is called using command *CALLDL*L that can be called from any FB. (In the demo configuration it is called from the FB *MAIN*).



Function Blocks
- Copy actual increment
- DatabaseExample_[Emp _To_MO
- DatabaseExample_[Emp)_To_DB
- Generate random value
- Init Alarm Example
  - 0 Set Input = 1
  - 1 Set Ack = FALSE
- Init Values
- Main
  - 0 Call Generate RND
  - 1 Test Arithmetic
  - 2 Call DatabaseExample_[Employees]_Copy_DB_To_MO
  - 3 Copy manager salary
  - 4 Call DLL Example
- Restart
- Start
  - 0 Init
- Stop
- Write Universal Log Message

FB MAIN is called periodically within period defined for Synchronous controller. Other FB that has to be executed periodically can be called from FB MAIN

Figure 1: Function blocks and commands in demo application

FB hierarchy in demo configuration

There is following hierarchy of the FB calls within demo application:

```
FB: Start
      FB: Init
              Commands: 1-8
              FB: Call Init Alarm Example
Stop
      Nothing
Restart
      FB: Init
Main
      FB: Generate random values
      Command: Test arithmetics
      FB: Call DatabaseExample_[Employees]_Copy_DB_To_MO
      Command: Copy manager salary
      Command: Call DLL Example
```

Function blocks called as events 24:

Copy actual increment values
Write Universal Log Message

Functionalities demonstrated by FBs in the demo application

Init – initialization of memory operands by start and restart and calling FB *Call Init Alarm Example* to initialise memory operands used by alarming example.

Generate random values – generates random values for memory operands *RND/Random1* – 4.

MAIN - command *Test arithmetic*: makes sum of values of memory operands *Test athmetics/Input 1* and *Input 2* and put result to memory operand *Test athmetics/Output*. As operands Input1 and 2 are writeable, this functionality can be tested using OPC or web client.

MAIN –Call DatabaseExample_[Employees]_Copy_DB_To_MO – values of records in database *Emplyees* are copied to memory operands and can be read over associated OPC items of the internal OPC server. There is one MO with special meaning *DatabaseExample_[Employees]_Columns/_RowIndex*. This MO is automatically (or per hand) created by mapping of database columns to DB operands and related MO operands. It is used to define row in database table from that are values copied to related MO's. Function block *Call DatabaseExample_[Employees]_Copy_DB_To_MO* together with *DatabaseExample_[Employees]_Copy_MO_To_DB* have been created automatically using wizard called from main menu in configurator – *Tools->Wizards->CreateMapping* to database table. The wizard created automatically also database operands, memory operands and OPC items related to columns of the table.

MAIN – command *Copy manager salary* is used to show the possibility of reading one cell from database table using related DB operand - *Manager salary* to memory operand *Manager salary.* DB operands can be created by software wizard for mapping of database tables to configuration.

MAIN – command *Call DLL Example* –provides cyclic calling of the functionality programmed within enhancing dll – Example1.dll. It is used to show how programmed and configured functionality can cooperate.

4.1.7 Triggers and events

Events in SAEAUT SCADA™ are initialised by triggers. Events can provide:

- Executing of function blocks,
- call an external program
- provide functionality related to configured logging
- provide activities related to configured reporting or different queries on databases
- easy testing functionality (beep).

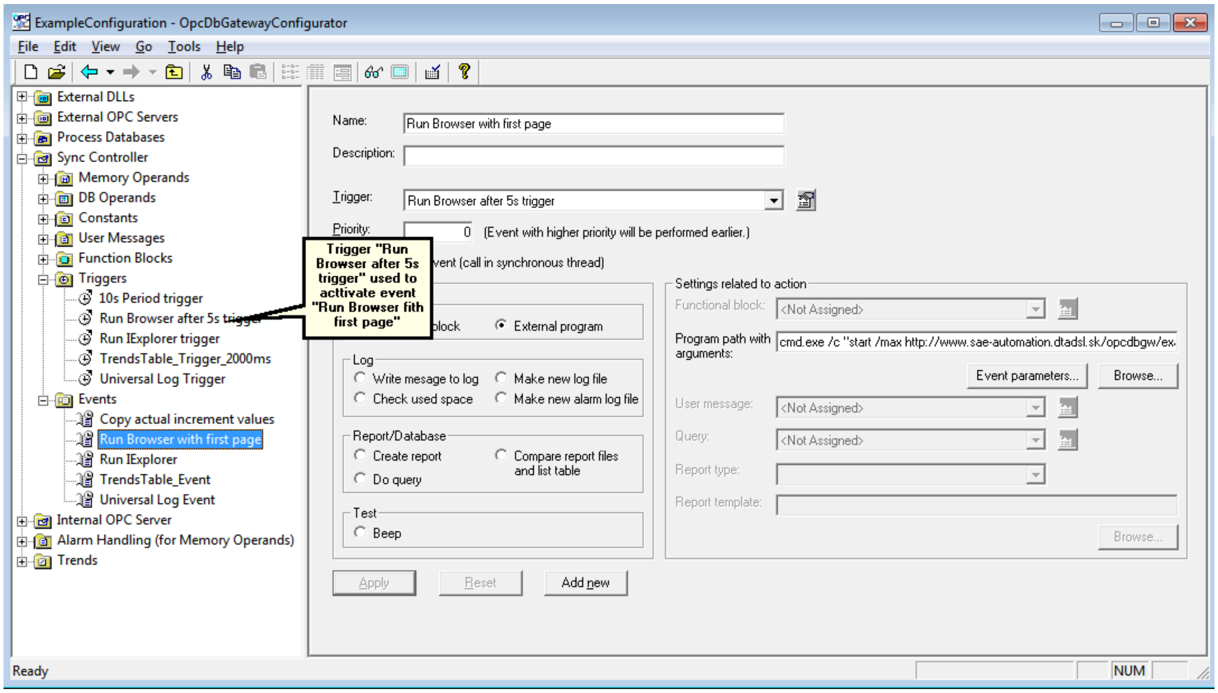
Events can run as **synchronous** – running in the same program thread as FB *MAIN*, or **asynchronous** – running in distinct asynchronous thread.

Triggers used to initialise events can be of following types:

- based on **value of a memory operand** – trigger is activated when configured MO has value TRUE,
- based **on time** - trigger is activated when defined time elapsed.

Triggers based on time can be periodic or one time valid. Periods of triggers can be either related to start of the synchronous controller (strict period keeping) or related to calendar – period need not be always the same – e.g. according to nr. of days in a month.

Triggers based on memory operands can provide reset of the memory operand after one period of the synchronous controller (related event will be activated only one time), or can be set all the time till reset from outside (related event will be activated in every period of the synchronous controller).



Name: Run Browser with first page

Description:

Trigger: Run Browser after 5s trigger

Priority: 0 (Event with higher priority will be performed earlier.)

vent (call in synchronous thread)

Trigger "Run Browser after 5s trigger" used to acttivate event "Run Browser fith first page"

block ● External program

Log
○ Write mesage to log ○ Make new log file
○ Check used space ○ Make new alarm log file

Report/Database
○ Create report ○ Compare report files and list table
○ Do query

Test
○ Beep

Settings related to action

Functional block: <Not Assigned>

Program path with arguments: cmd.exe /c "start /max http://www.sae-automation.dtadsl.sk/opcdbgw/ex

Event parameters... Browse...

User message: <Not Assigned>

Query: <Not Assigned>

Report type:

Report template:

Browse...

Apply Reset Add new

Figure 1. Configuring of event to start external application – default web browser.

Within demo following events are used:

Copy actual increment values - is used to show how to configure copying of data values from one external OPC server to other. It provides calling of FB with the same name in asynchronous thread when trigger - *10s Period trigger* is initiated -periodically every 10 s. Within this FB ,values from external OPC server *SimDA* - group *Increment* are written to external OPC server *SimDA2* group *Increment_write* using memory operands to that related OPC items are mapped.

Run Browser with first page - is used to show how to **start external applicatio**n from SAEAUT SCADA. The external application is started 5 s after start of the SAEAUT SCADA runtime by trigger *Run Browser after 5s.* Using application cmd.exe with file name with extension html as parameter, it is provided that the file will be opened in default web browser.

Run IExplorer - it provides start of the external application MS Internet Explorer when trigger of the type value is activated. It is alike functionality as by previous event, but at this time can be activated also from outside using memory operand Triggers/IExplorer and OPC item with the same name.

TrendsTable_Event - it is used to activate periodic writing to the trend 24

Universal Log Event - it is used to provide writing a message to log file. It is activated by memory operand, that can be set e.g. from enhancing dll. This way can enhancing dll use logging functionality of the runtime application.

4.1.8 Alarms

The **source of alarm** in the proprietary alarm system of SAEAUT SCADA is **memory operand (MO)**. There are 2 MO within demo application:

***Alarm Handling Example/Alarm Input* -** this memory operand is mapped to OPC item and so changing its value from outside, it is possible to experiment with alarming in the demo configuration. Alarm definition *Memory Operand Alarm Example* that is associated to this MO contains also definition of the memory operand *Alarm Handling Example/ AlarmAck* that is used to confirm (acknowledge) activated alarm from outside.

***DLLExampleData/Dll Example Return* -** this memory operand has associated alarm definition *DLL*

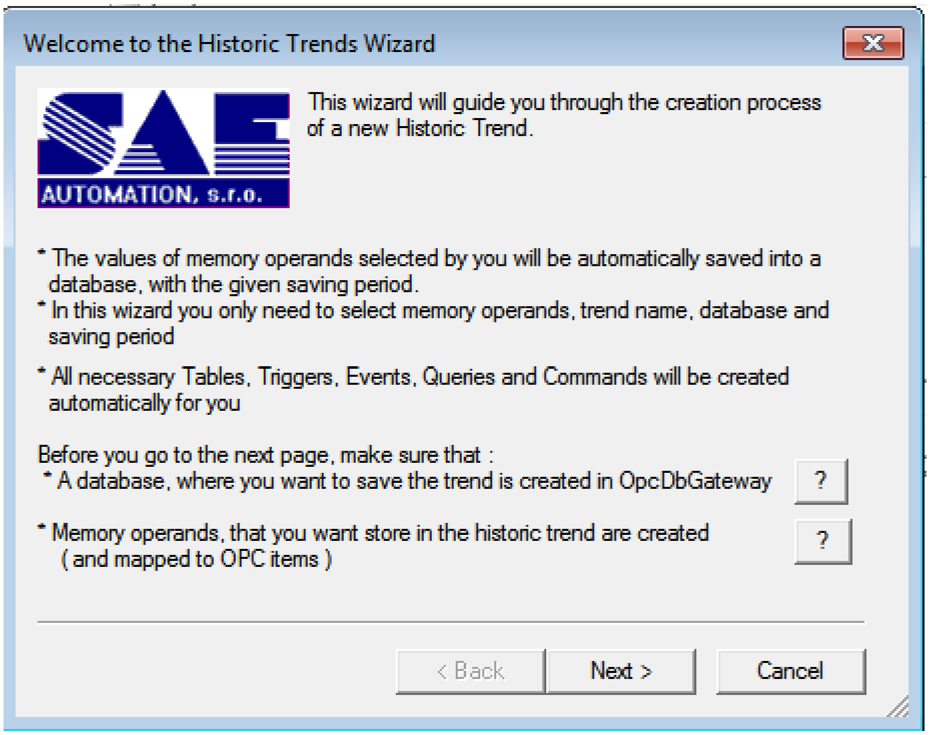
Call Unsuccessful. This alarm is not supposed to be acknowledged and so has not associated MO for that.

Please see more about alarming within this demo 38 in description of SAEAT SCADA Web Client.

4.1.9 Trends

Trend in SAEAUT SCADA stands for periodic writing of values of a chosen set of memory operands to a database table. As to the memory operands data from external devices applications and databases and even results of the internal computations can be mapped, it is efficient and universal way of logging structured data from all those sources to database.

This activity can be configured using standard configuration means – triggers, events, SQL queries. The whole configuring process would be relatively complicated. Because of this, within configurator a software wizard (started from main mane Tools->Wizards->Create Historic Trends) , that makes configuration of trends much easier, has been created. What is provided by the wizard is shown in Figure 1 where you can see the start view of the wizard.
A summary what has been created by wizard is shown in Figure 2.
After running the runtime you can see in configurator values of the trend written to the table created by wizard (see Figure 3).



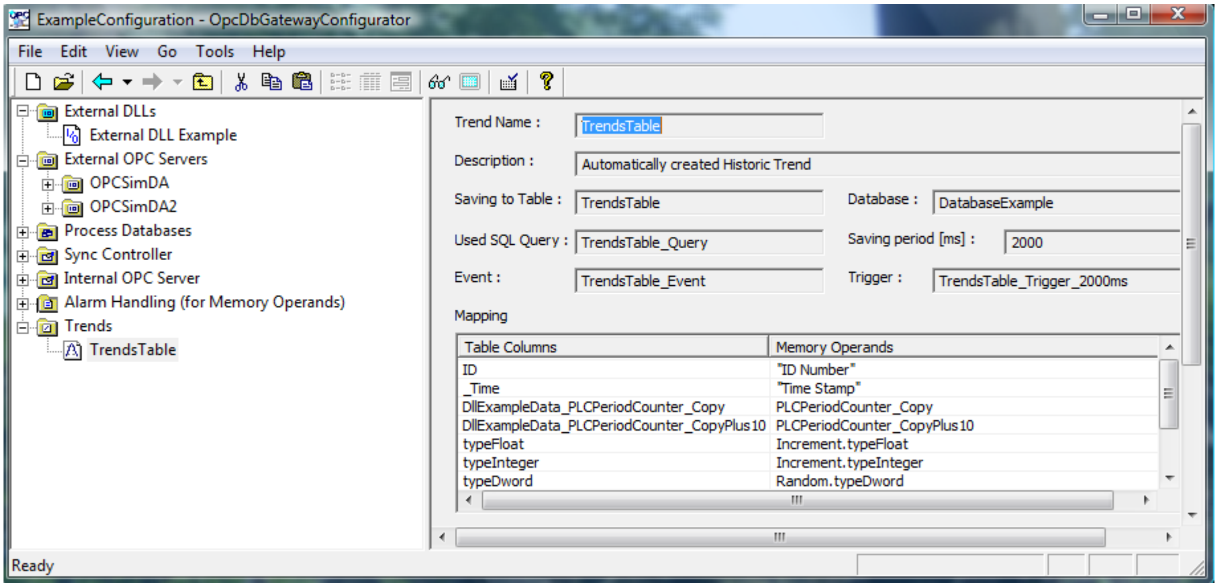
Welcome to the Historic Trends Wizard

This wizard will guide you through the creation process of a new Historic Trend.

- The values of memory operands selected by you will be automatically saved into a database, with the given saving period.
- In this wizard you only need to select memory operands, trend name, database and saving period
- All necessary Tables, Triggers, Events, Queries and Commands will be created automatically for you

Before you go to the next page, make sure that :
- A database, where you want to save the trend is created in OpcDbGateway
- Memory operands, that you want store in the historic trend are created (and mapped to OPC items)

Figure 1. Start view of the Historic Trends Wizard



Trend Name : TrendsTable

Description : Automatically created Historic Trend

Saving to Table : TrendsTable

Database : DatabaseExample

Used SQL Query : TrendsTable_Query

Saving period [ms] : 2000

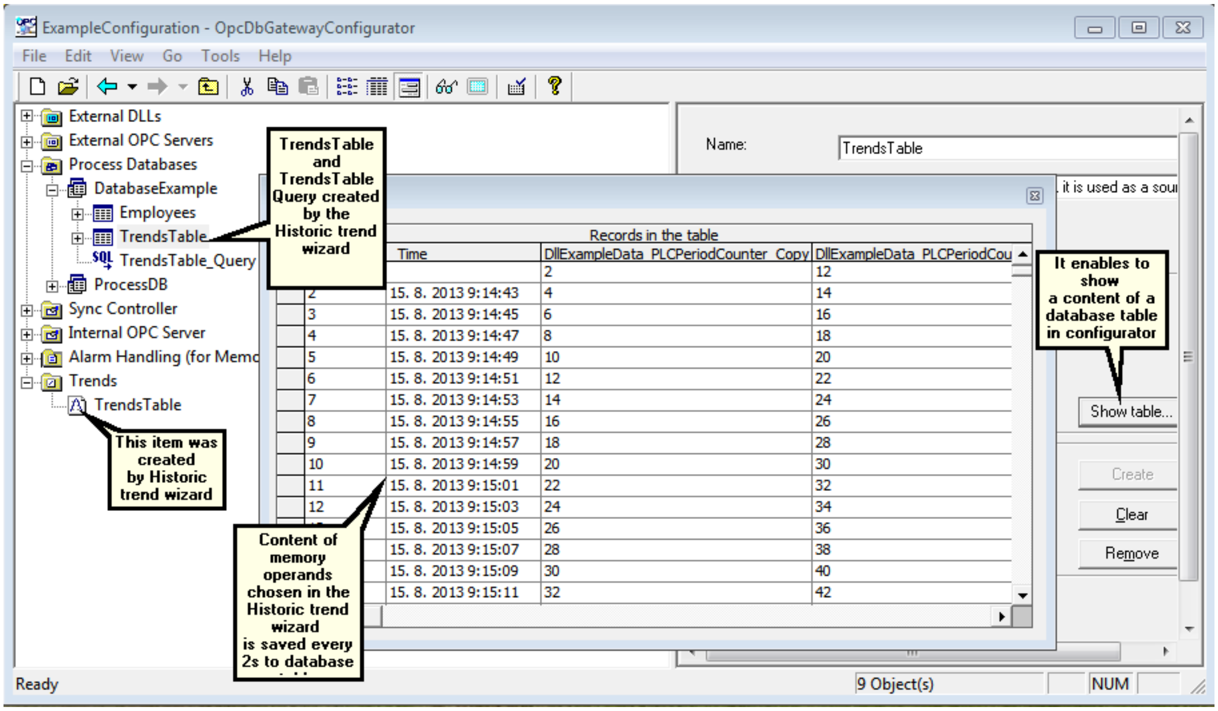
Event : TrendsTable_Event

Trigger : TrendsTable_Trigger_2000ms

Mapping

Table Columns	Memory Operands
ID	"ID Number"
_Time	"Time Stamp"
DllExampleData_PLCPeriodCounter_Copy	PLCPeriodCounter_Copy
DllExampleData_PLCPeriodCounter_CopyPlus10	PLCPeriodCounter_CopyPlus10
typeFloat	Increment.typeFloat
typeInteger	Increment.typeInteger
typeDword	Random.typeDword

Figure 2. Overview of the configuration of the historic trend with the name "TrendsTable".


ExampleConfiguration - OpcDbGatewayConfigurator
File Edit View Go Tools Help
External DLLs
External OPC Servers
Process Databases
DatabaseExample
Employees
TrendsTable
TrendsTable_Query
ProcessDB
Sync Controller
Internal OPC Server
Alarm Handling (for Memo
Trends
TrendsTable
TrendsTable and TrendsTable Query created by the Historic trend wizard
This item was created by Historic trend wizard
Content of memory operands chosen in the Historic trend wizard is saved every 2s to database
It enables to show a content of a database table in configurator
it is used as a sou
Show table...
Create
Clear
Remove
Ready
9 Object(s)
NUM

Name: TrendsTable

Records in the table

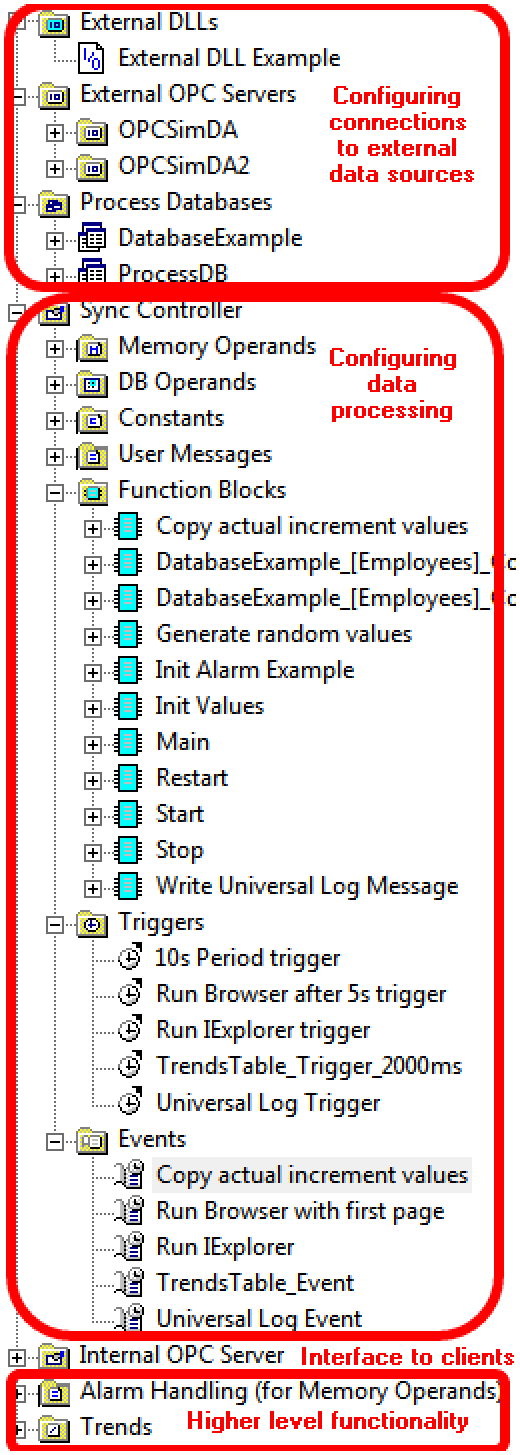
	Time	DllExampleData_PLCPeriodCounter_Copy	DllExampleData_PLCPeriodCou
		2	12
2	15. 8. 2013 9:14:43	4	14
3	15. 8. 2013 9:14:45	6	16
4	15. 8. 2013 9:14:47	8	18
5	15. 8. 2013 9:14:49	10	20
6	15. 8. 2013 9:14:51	12	22
7	15. 8. 2013 9:14:53	14	24
8	15. 8. 2013 9:14:55	16	26
9	15. 8. 2013 9:14:57	18	28
10	15. 8. 2013 9:14:59	20	30
11	15. 8. 2013 9:15:01	22	32
12	15. 8. 2013 9:15:03	24	34
	15. 8. 2013 9:15:05	26	36
	15. 8. 2013 9:15:07	28	38
	15. 8. 2013 9:15:09	30	40
	15. 8. 2013 9:15:11	32	42

Figure 3. Results of the trend configuring.

4.1.10 Demo summary

Demo configuration (and whatever other configuration of the SAEAUT SCADA™) has following parts (Figure 1):

- configuring of external data sources - external dll's - *External DLL Example*, external OPC servers - *OPCSimDA* and *OPCSIMDA2*, process databases - *ProcessDB* and *DatabaseExample*
- configuring of data processing - all items under Sync Controller
- configuring of connection to client applications as SAEAUT Web Client 31 - over *Internal OPC Server*
- configuring of higher level functionality as *Alarm handling for memory operands* and Trends



```
External DLLs
    External DLL Example
External OPC Servers
    OPCSimDA
    OPCSimDA2
Process Databases
    DatabaseExample
    ProcessDB
Sync Controller
    Memory Operands
    DB Operands
    Constants
    User Messages
    Function Blocks
        Copy actual increment values
        DatabaseExample_[Employees]_c
        DatabaseExample_[Employees]_c
        Generate random values
        Init Alarm Example
        Init Values
        Main
        Restart
        Start
        Stop
        Write Universal Log Message
    Triggers
        10s Period trigger
        Run Browser after 5s trigger
        Run IExplorer trigger
        TrendsTable_Trigger_2000ms
        Universal Log Trigger
    Events
        Copy actual increment values
        Run Browser with first page
        Run IExplorer
        TrendsTable_Event
        Universal Log Event
Internal OPC Server
Alarm Handling (for Memory Operands)
Trends
```

Configuring connections to external data sources
Configuring data processing
Interface to clients
Higher level functionality

Figure 1 Main parts of the SAEAUT SCADA™ configuration

Control flow by data processing

By configuring, the control flow picture (Figure 2) is created automatically (It can be displayed using main menu of the configurator *View->Graphic project viewer*). Triggers, events, function blocks are displayed as rectangles within the control flow. By click on the rectangle, it is possible to get fast to the related entity and edit its settings.

There are 2 parallel lines representing functionality executed cyclically (*PLC cycle*) during period of the synchronous controller in synchronous thread. There is only function block *MAIN* executed within synchronous thread in the demo application (FB called from FB *MAIN* are not shown in the control flow picture). In case that we want also another function blocks to be executed within synchronous thread (repeatedly or not) they can be called as synchronous events.

There are shown asynchronous events that run in different - asynchronous thread. In the control flow we can see that they are not displayed between horizontal lines of the synchronous cycle. Every from them is started by a trigger and provides executing of an internal activity – call FB, execute query on a database external activity (not represented by rectangle) or external activity – call an external program. There

We can see also on time executed FBs (*START, RESTART* and *STOP*) in the control flow picture.

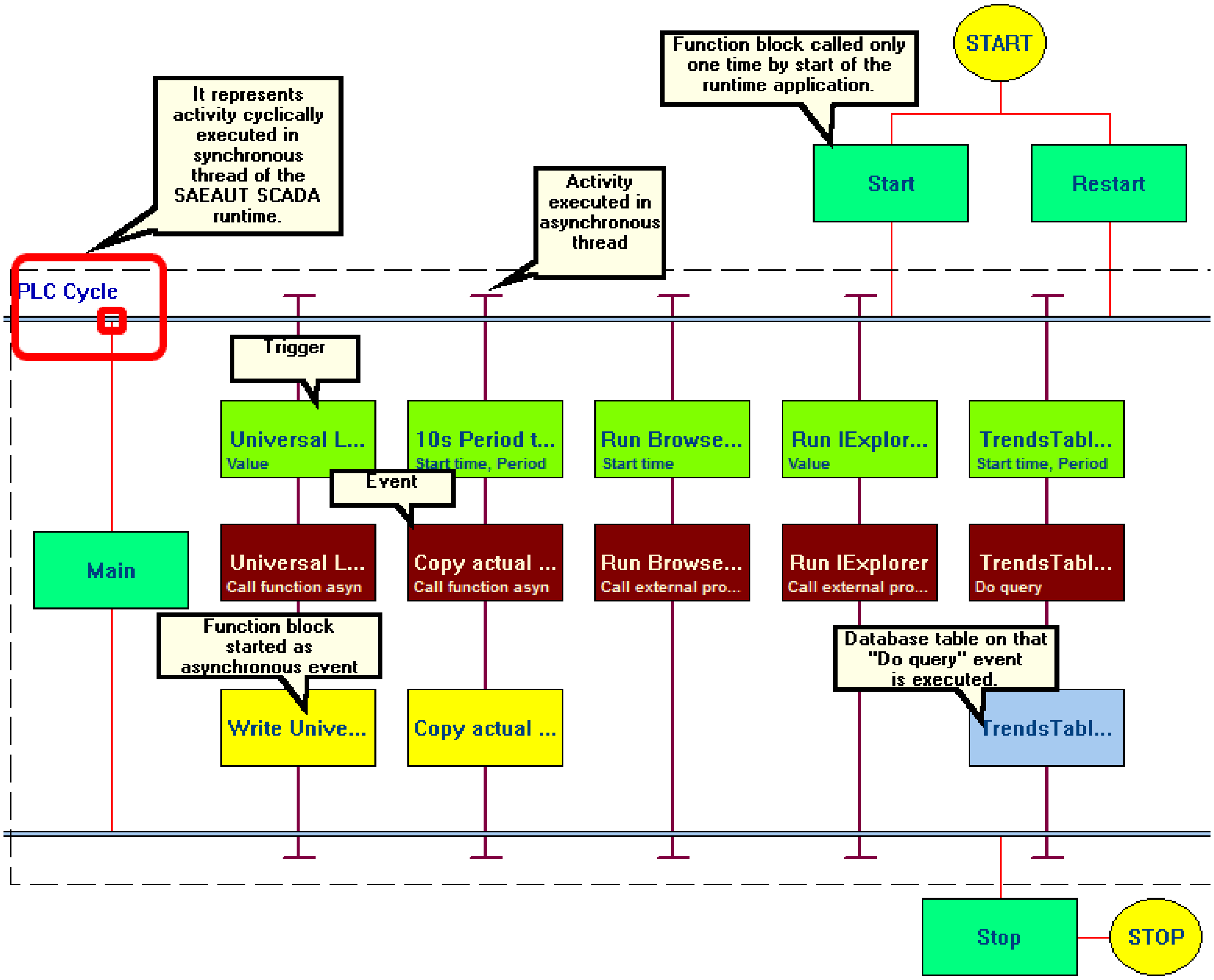

Function block called only one time by start of the runtime application.
START
It represents activity cyclically executed in synchronous thread of the SAEAUT SCADA runtime.
Activity executed in asynchronous thread
Start
Restart
PLC Cycle
Trigger
Universal L... Value
10s Period t... Start time, Period
Run Browse... Start time
Run IExplor... Value
TrendsTabl... Start time, Period
Event
Main
Universal L... Call function asyn
Copy actual ... Call function asyn
Run Browse... Call external pro...
Run IExplorer Call external pro...
TrendsTabl... Do query
Function block started as asynchronous event
Database table on that "Do query" event is executed.
Write Unive...
Copy actual ...
TrendsTabl...
Stop
STOP

Figure 2 Graphic project viewer.

Conclusion

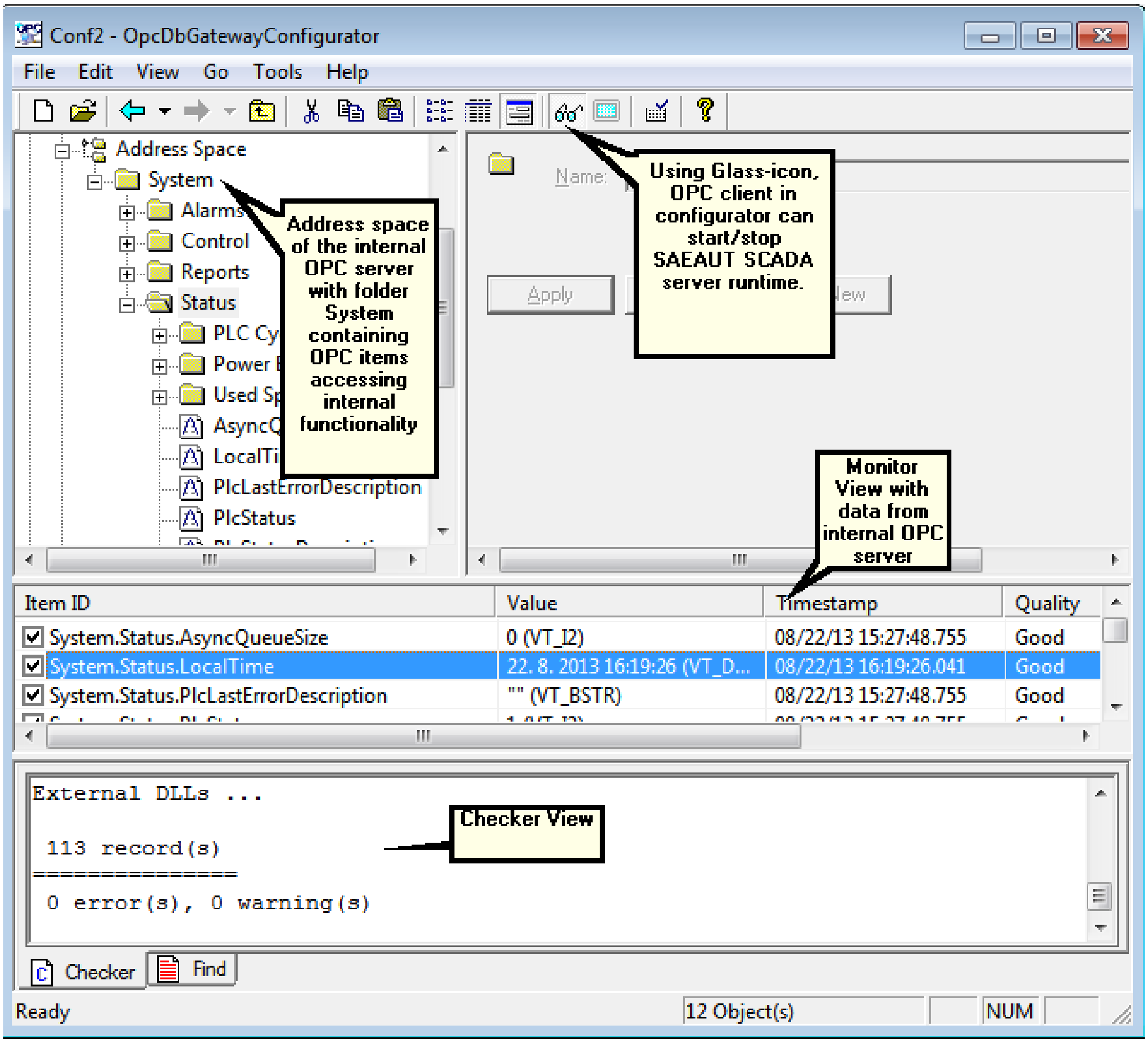
Demo application does not cover all aspects and possibilities offered by the SAEAUT SCADA™ . For example, as SCADA systems works often with big amounts of data points on external data sources it is necessary to understand the possibilities of mapping those data points to configuration. All details to that please see in online help of the product OpcDbGateway.

4.2 Your own first configuration

To create your first configuration (project) you need do very little. Open SAEAUT SCADA™ Configurator from Start menu and chose from main menu *File->New*, write the name of your configuration in the file dialog box and confirm with *Save*. After that, your first application is **created** and **checked**. Very probably, the result of the checking, that will be shown in the *Checker View* in configurator, will be *„0 error(s), 0 warning(s)"*. (When you will enhance the configuration, it is useful to repeat the checking from time to time again using *Tools -> Check configuration*. In case that you made an error, you can click on the line where error is announced and dialog box, where error can be removed, will be opened.)

Although you have not done very much till now, your first configuration is created and SAEAUT SCADA runtime using it can be **started**. It can be done directly in configurator from menu using *View->Monitor view* or by click on *Glasses – icon*. This way an OPC client built into the configurator (represented by *Monitor View*) will be started and connected to the internal OPC server of the SAEAUT SCADA™ . (Another possibility to start runtime is to open SCADA Web Client in browser and chose menu item Live Data 33 .)

Notwithstanding that you have configured none data points (OPC items of the internal OPC server) till now, there are some created by default for every new configuration. These data points enable to read and in some cases also to write to variables accessing   the internal functionality of the SAEAUT SCADA™ Runtime. Please go to the tree view and chose *Internal OPC Server->Address space->System->Status*. In the monitor View, you will see all OPC items from the folder Status. (To see values from other folders, you can click on a folder in tree view). There is e.g item *SystemStatus.LocalTime* with continually changing value.
Description of other system variables can be fond in *OpcDbGateway User's Guide->System variables.*



Address space of the internal OPC server with folder System containing OPC items accessing internal functionality

Using Glass-icon, OPC client in configurator can start/stop SAEAUT SCADA server runtime.

Monitor View with data from internal OPC server

Item ID	Value	Timestamp	Quality
☑ System.Status.AsyncQueueSize	0 (VT_I2)	08/22/13 15:27:48.755	Good
☑ System.Status.LocalTime	22. 8. 2013 16:19:26 (VT_D...	08/22/13 16:19:26.041	Good
☑ System.Status.PlcLastErrorDescription	"" (VT_BSTR)	08/22/13 15:27:48.755	Good

```
External DLLs ...

 113 record(s)
===============
 0 error(s), 0 warning(s)
```

Checker View

Important: To be able to continue in enhancing of your first application, SAEAUT SCADA™ runtime must be stopped first!

As the next step we try to connect an external device 30 to the SAEAUT SCADA™ .

4.2.1 Connecting external devices

Main purpose of the SCADA systems is communicating with external devices. To do it, we can use communication drivers implemented as own **enhancing dll's** or as **external OPC servers**.

Using of external OPC servers is preferred, for this way we can use **configuration wizards** built in the configurator. Another advantage is that we do not need explicitly configure data flows from external OPC servers trough internal OPC server to the SCADA Web client. All this is configured automatically. Details please see in *OpcDbGateway User's Guide-> Configuring and programming-> External OPC servers*.

To try it, we can use simulation OPC server as mentioned also in description of the demo configuration 13.
After configuring using mentioned wizards, we do not see in the configuration any function blocks created for that. However, because OPC items from external OPC servers can be automatically mapped to memory operands that can be seen in configuration, we can make different operations with them using configured commands. For results of the operations, we can configure own memory operands and every such operand can be also easily mapped to OPC item of the internal OPC server. The way how to do it please see in *OpcDbGateway User's Guide-> Configuring and programming->Sync Controller->Memory operands*.

In case that you communicate with external devices using enhancing dll's 15, it is not possible foreseen the functionality (for very universal approach) and so memory operands for communication with enhancing dll's have to be configured one by one. Details can be found in *OpcDbGateway User's Guide->External Dll usage*.

4.2.2 Saving data to databases

Data from external sources or gained as product of computation in SAEAUT SCADA™ runtime can be saved to different databases. It can be MS SQL Server, MySQL Oracle, MS Access or **whatever relational database to that we have installed database driver**. You can add database placed on local or remote host to the configuration as described in *OpcDbGateway User's Guide->Process Databases.*

To create **connection string to database** you can use connection string wizard described in *OpcDbGateway User's Guide->Process Databases->Connection wizard.*

To work with databases we can use either special set of **configurable database commands** or **SQL queries**. The advantage of queries is that individual features of different databases can be better taken into account.

For a small applications we can use MS Access database *ProcessDb.mdb* that is installed in the folder *x:\Users\xxx\Documents\SAEAUT SCADA\Data\*. This database is automatically configured for every new configuration that you create. If you do not need it, it can be removed from configuration. However, this database contains preconfigured tables for working with proprietary alarm system and so, if you want to use it, it is necessary to create table with the same structure in another database that you want to use.

There are two possibilities **to configure usage of databases in your configuration:**

1. To create database tables on the connected database and then to map them to the configuration. Details see please in *OpcDbGateway User's Guide->Process Databases->Database table mapping wizard,*
2. to connect to the database and to map it to the configuration of the SAEAUT SCADA as described in *OpcDbGateway User's Guide->Process Databases->Create table in configuration*.

Within configuration, fields and columns of the database tables are represented as database operands – see please in *OpcDbGateway User's Guide->Sync Controller->DB Operands*. DB operands can be used as arguments in configurable commands for working with databases. See please in *OpcDbGateway User's Guide->Sync Controller->Function blocks->Commands->Database operations*.

In case that you will work with queries only, it is not necessary to create DB operands,

The **periodical saving of variables to database** is the most typical database functionality in SCADA. After mapping of data points from external devices and applications to memory operands and configuring of connections to process databases, it is possible to configure this functionality very easy using **historic trend wizard** 24 described in *OpcDbGateway User's Guide->Historic Trends Wizard*. It is very useful to study results of the historic trend wizard activity to understand using of events queries and triggers for working with process databases. You can also modify it a little and this way implement different scenarios without complex configuring database activity from scratch,

Sometimes it can be useful for you, instead of writing raw values of memory operands to database, to write them within an explanation text. For that purpose user messages described in *OpcDbGateway User's Guide->Sync Controller->Function blocks->Commands->User Messages operations* are used.

5 How to work with SAEAUT Web Client

In this chapter you can find:

- how to register new users of the SAEAUT SCADA Web Client.
- how to log in
- how to watch end edit live data on SAEAUT SCADA server
- how to watch data saved in process databases and create interactively reports defined by SQL queries
- how to watch status and history of alarm sources and how to acknowledge and comment activated dynamic alarm.

5.1 Security

Access to the SAEAUT SCADA™ system is secured by two-level authentication:

1. User registration into the SAEAUT SCADA™ via form and then sign in with the name / password. If the user is not logged on, he does not have access to functional sites and can not even see links to functional sites.
2. Windows authentication, which is required for access to functional sites. To enable the user to access a given page, he / she must specify the domain name / password , which are recognized by the domain server on that SAEAUT SCADA™ is running. Possible authentication providers are NTLM, Negotiate, Kerberos. It can be set in IIS manager. If the user is using a browser that automatically sends his credentials in header (e.g. IE, Chrome), he does not need repeat sending of name / password and can automatically access the page. All the functionality that a user performs on functional sites is done under the Windows identity that entered.

How it works in practice:

The user logged on to the domain enters the username / password that was used for the registration into the SAEAUT SCADA™ . This gives automatic access to SAEAUT SCADA™ functional sites.

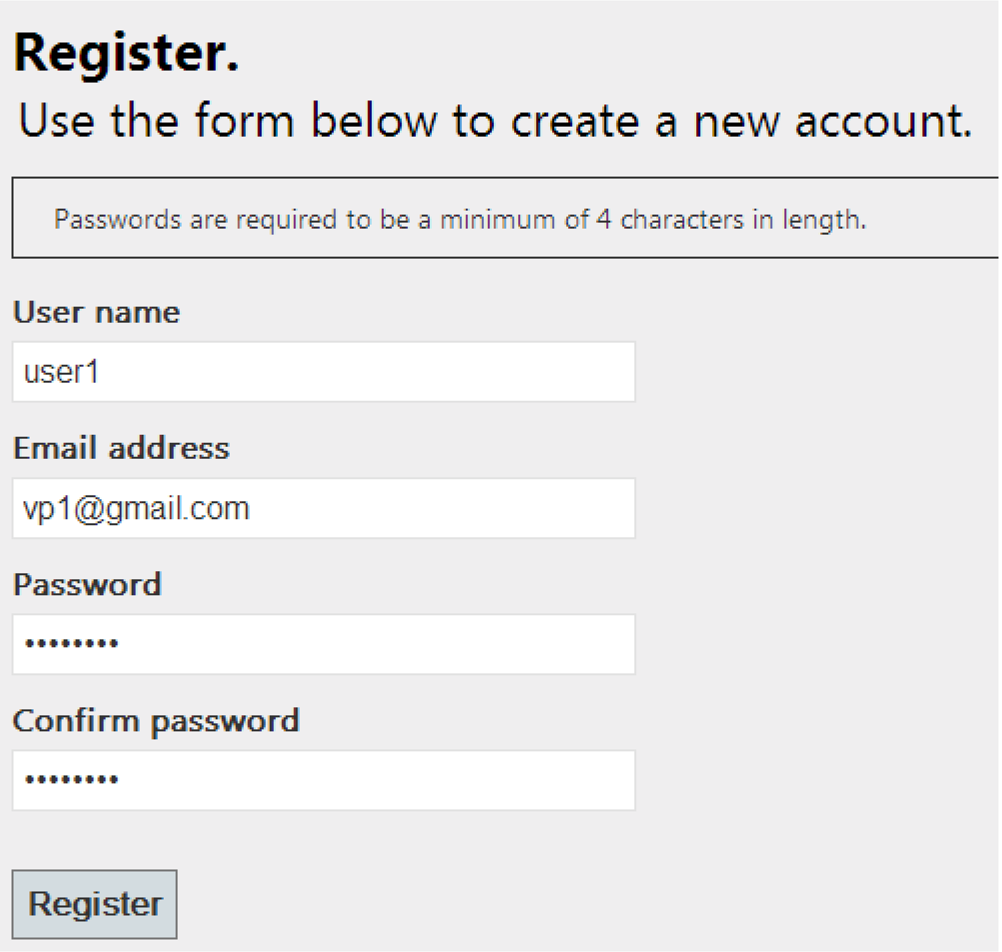
The user who is not logged on to the domain is asked to enter also the Windows domain name and password to access the functional sites of the SAEAUT SCADA™ .

Remark: In case the browser on a mobile device does not support NTLM or Kerberos authentication, you must configure basic authentication using IIS Manager.

5.1.1 Registration

Before registration none access to data from SAEAUT SCADA™ server is allowed. Also administrator of the server on that SAEAUT SCADA is installed must be registered.

Registration for a user can be done either by administrator of the computer or by user himself. Administrator can restrict possibility to register for SAEAUT SCADA Web Client usage for some domain users in MS IIS administration console. He can also disable possibility to register by users at all. Disabling of self registration by users can be provided by setting of application variable *AllowRegisterNewUser* in IIS Manager to „*False*",



Register.

Use the form below to create a new account.

Passwords are required to be a minimum of 4 characters in length.

User name: user1

Email address: vp1@gmail.com

Password: ••••••••

Confirm password: ••••••••

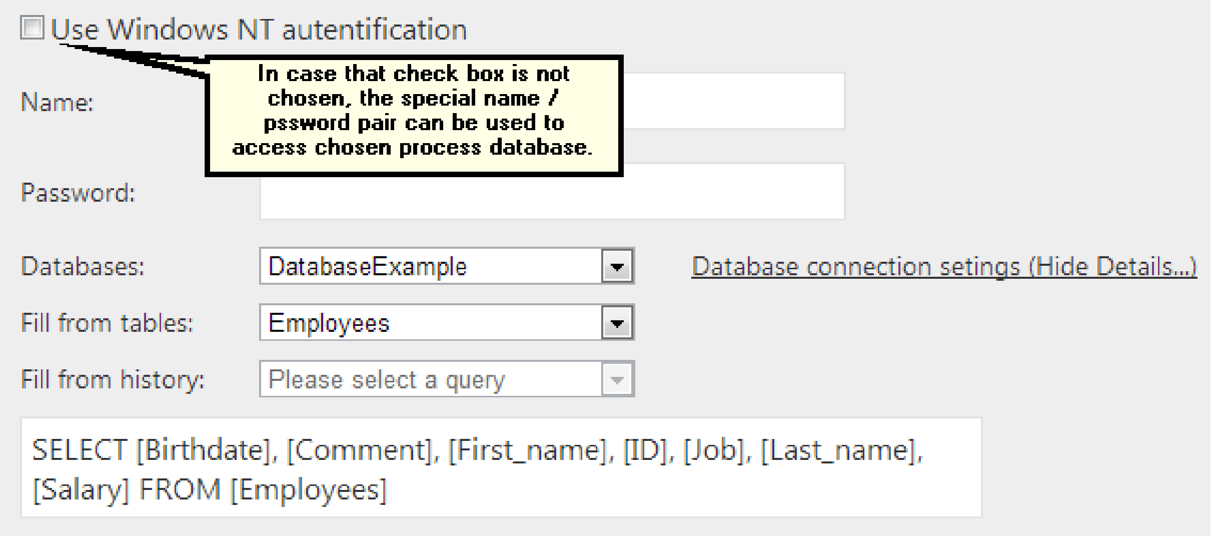
Figure 1 Registration dialog box.

After succesfull registration, login to the web application is done immediatelly.

5.1.2 Database access

There can be two or three level authentication:

- on the level of SCADA web client – it is applied always
- Windows authentication - it is applied always because only user registered in Windows domain of the SCADA server has access to web client functional pages (including page to access to databases)
- Name/password pair that can be set individually in web client for every process database



□ Use Windows NT autentification

In case that check box is not chosen, the special name / pssword pair can be used to access chosen process database.

Name:

Password:

Databases: DatabaseExample

Fill from tables: Employees

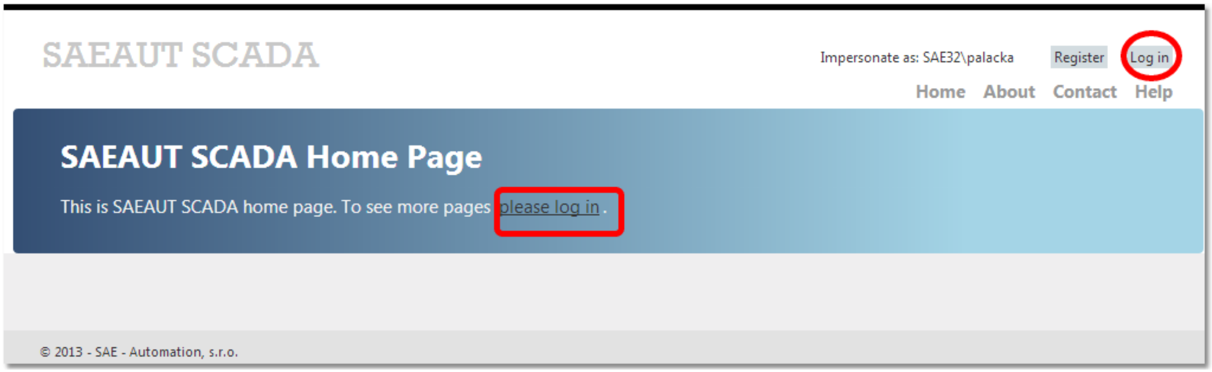
Fill from history: Please select a query

```
SELECT [Birthdate], [Comment], [First_name], [ID], [Job], [Last_name],
[Salary] FROM [Employees]
```

Figure 1. Using special name / password pair to access chosen process database.

5.2 Log in

Registered user can login after launch of the application in web browser. Maximal nr. of logged in users is limited by nr. of purchased licenses.



SAEAUT SCADA Home Page

This is SAEAUT SCADA home page. To see more pages please log in .

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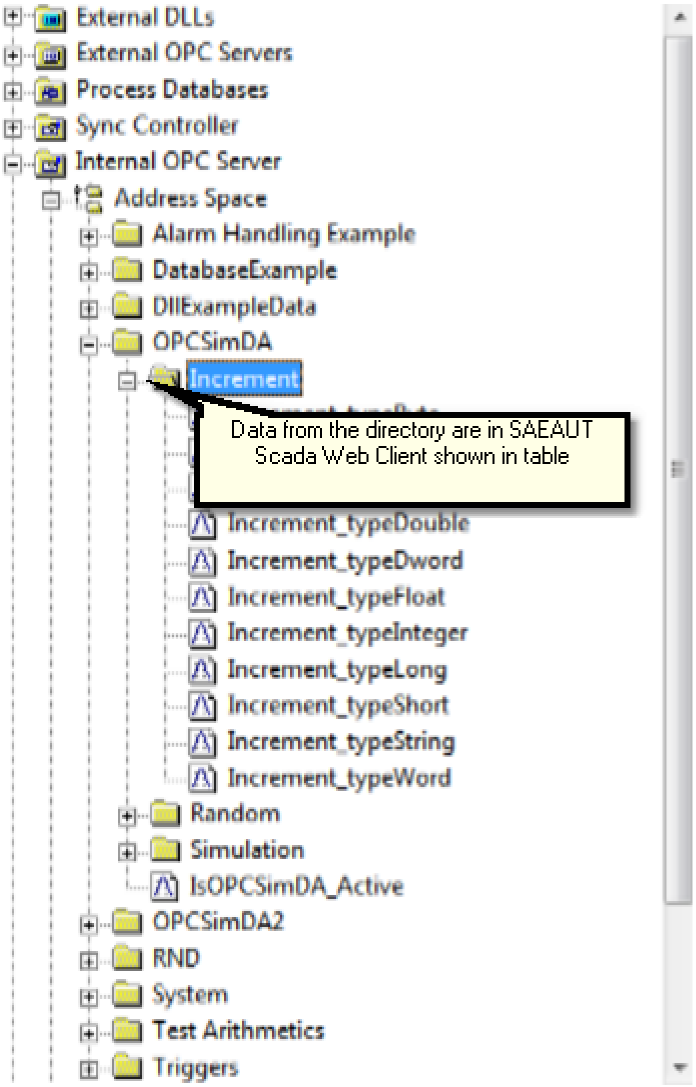
Figure 1: Some menu items are not shown before logging in.

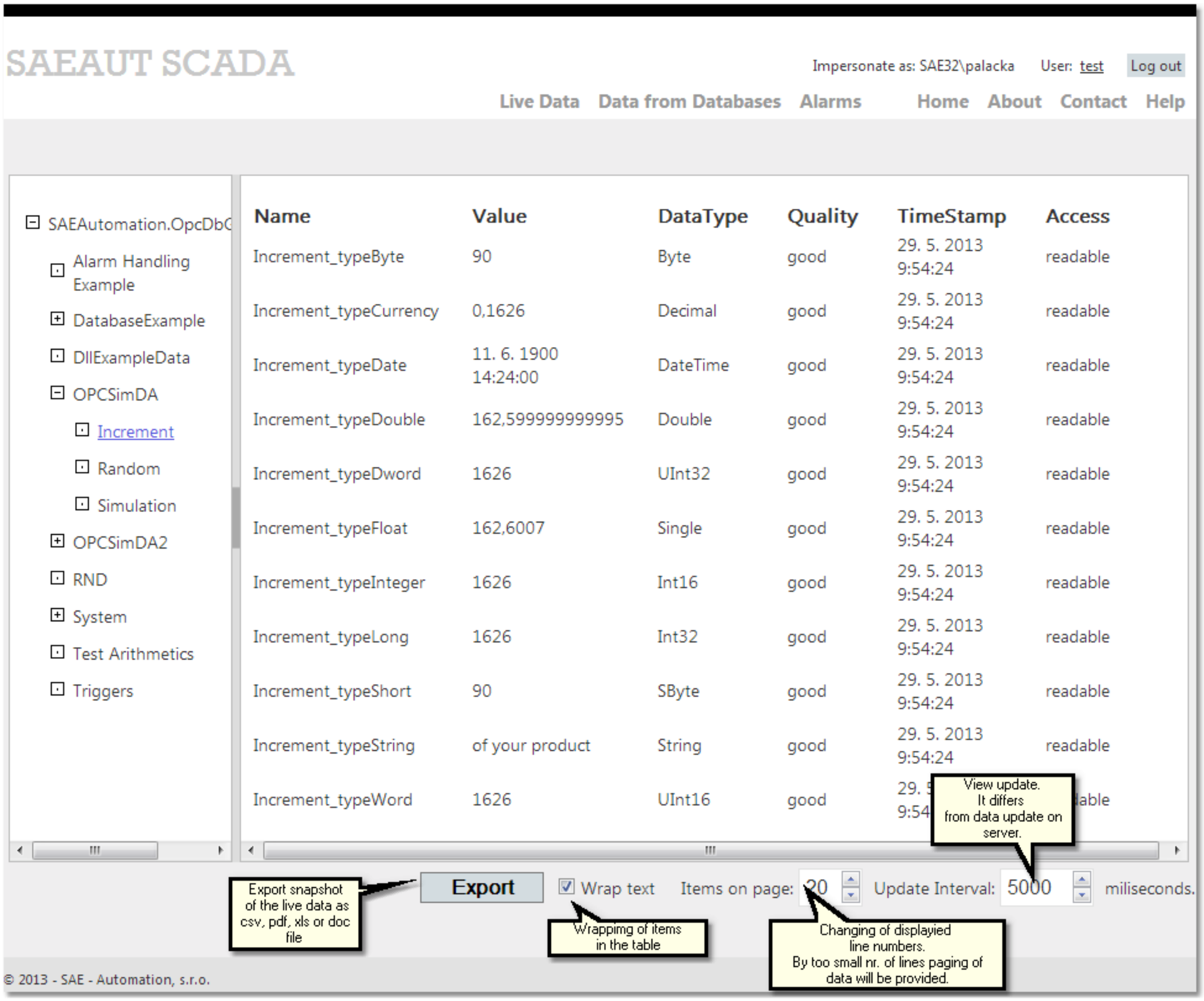
5.3 Live Data

Current data from the SAEAUT SCADA server are displayed in a tree structure as defined by the configurator (Figure 1.). It enables efficient structuring of data for visualisation by configuring. The content of each directory of the tree is displayed as the table (Figure 2). In addition to the variables values displaying, the information on data quality and timestamps are shown as well. Data of the type read/write can be edited in web client (Figure 3).



Data from the directory are in SAEAUT Scada Web Client shown in table

Figure 1: Tree structure of the data configured in SAEAUT SCADA (OpcDbGateway) configurator.



- ⊟ SAEAutomation.OpcDbC
  - ⊡ Alarm Handling Example
  - ⊞ DatabaseExample
  - ⊡ DllExampleData
  - ⊟ OPCSimDA
    - ⊡ Increment
    - ⊡ Random
    - ⊡ Simulation
  - ⊞ OPCSimDA2
  - ⊡ RND
  - ⊞ System
  - ⊡ Test Arithmetics
  - ⊡ Triggers

Name	Value	DataType	Quality	TimeStamp	Access
Increment_typeByte	90	Byte	good	29. 5. 2013 9:54:24	readable
Increment_typeCurrency	0,1626	Decimal	good	29. 5. 2013 9:54:24	readable
Increment_typeDate	11. 6. 1900 14:24:00	DateTime	good	29. 5. 2013 9:54:24	readable
Increment_typeDouble	162,599999999995	Double	good	29. 5. 2013 9:54:24	readable
Increment_typeDword	1626	UInt32	good	29. 5. 2013 9:54:24	readable
Increment_typeFloat	162,6007	Single	good	29. 5. 2013 9:54:24	readable
Increment_typeInteger	1626	Int16	good	29. 5. 2013 9:54:24	readable
Increment_typeLong	1626	Int32	good	29. 5. 2013 9:54:24	readable
Increment_typeShort	90	SByte	good	29. 5. 2013 9:54:24	readable
Increment_typeString	of your product	String	good	29. 5. 2013 9:54:24	readable
Increment_typeWord	1626	UInt16	good	29. 5 9:54	able

Export ☑ Wrap text Items on page: 20 Update Interval: 5000 miliseconds.

Export snapshot of the live data as csv, pdf, xls or doc file

Wrappimg of items in the table

Changing of displayied line numbers. By too small nr. of lines paging of data will be provided.

View update. It differs from data update on server.

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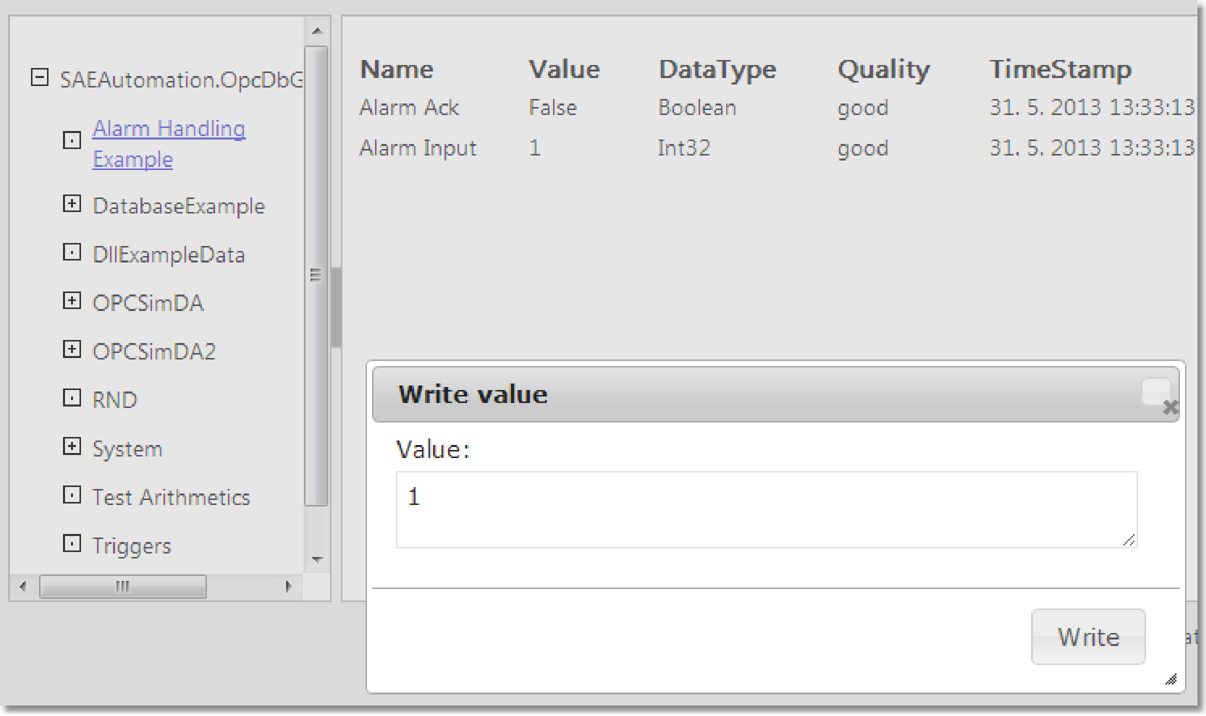
Figure 2: Tree view and data table of the live data in SAEAUT SCADA Web Client



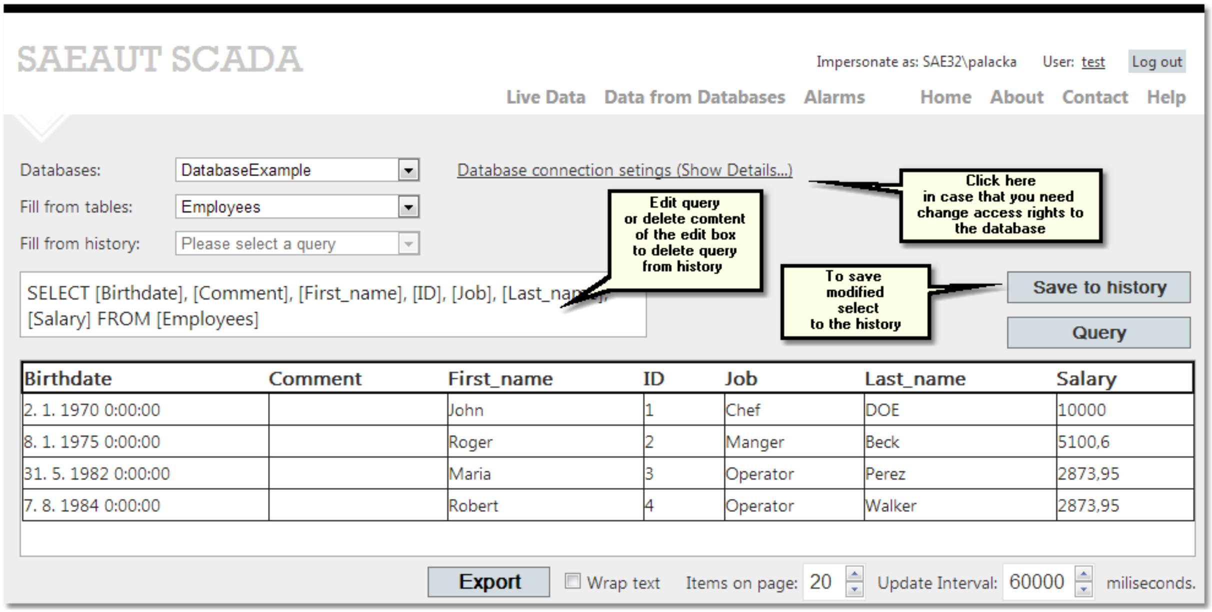
Name	Value	DataType	Quality	TimeStamp
Alarm Ack	False	Boolean	good	31. 5. 2013 13:33:13
Alarm Input	1	Int32	good	31. 5. 2013 13:33:13

Value: 1

Figure 3: Writing to live data item.

5.4 Data from Databases

The view enables creating of queries to all the tables from databases that are defined in the configuration of SAEAUT SCADA™ .



Impersonate as: SAE32\palacka User: test

Databases: DatabaseExample

Fill from tables: Employees

Fill from history: Please select a query

SELECT [Birthdate], [Comment], [First_name], [ID], [Job], [Last_name], [Salary] FROM [Employees]

Edit query or delete comtent of the edit box to delete query from history

Click here in case that you need change access rights to the database

To save modified select to the history

Birthdate	Comment	First_name	ID	Job	Last_name	Salary
2. 1. 1970 0:00:00		John	1	Chef	DOE	10000
8. 1. 1975 0:00:00		Roger	2	Manger	Beck	5100,6
31. 5. 1982 0:00:00		Maria	3	Operator	Perez	2873,95
7. 8. 1984 0:00:00		Robert	4	Operator	Walker	2873,95

☐ Wrap text Items on page: 20 Update Interval: 60000 miliseconds.

Figure 1. Showing of the table Employees from the database DatabaseExample.

Creating queries

After loading the page, loading of defined databases that are stored in the first combo box will be started. After selecting the database from the first combo box reading the information about the tables in the database, which are stored in the second combo box will begin. After choosing table from the chosen database in the second combo box, the *SELECT* that contains all the columns of that table will be automatically created. It can be freely adjusted by user and saved to the history of the created selects. After pressing the Query button the query result is placed in the grid. To delete query saved to history delete all text in the query edit box and confirm.

Changing access rights to the database

To change the access rights to the database defined in the configuration of SAEAUT SCADA, click on "Database connection settings (Show details ...)". You can use the username / password to access the database\ or Windows authentication (it is chosen by default using check box displayied if you click Show details).

Sorting of the table

Results in the grid can be sorted by every column by clicking on the text in the column header. For descending sorting, it is necessary to click on sorted column again.

Faster processing

For faster processing, we recommend to limit the size of the resulting table. It can be achieved eg. by adjusting query this way: "SELECT TOP 100 * FROM Table". Then only the first 100 records of the large table will be displayed.

Paging of the big table

You can move through the table that is automatically paged in case that all records can not be shown in one page. To choose page, click on the page number at the bottom of the table.

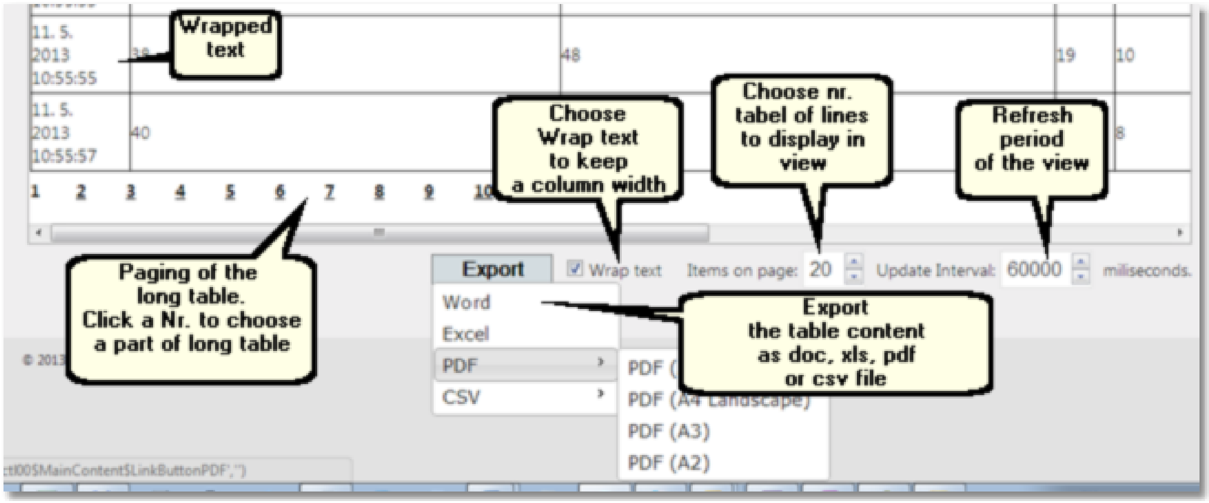
Table refresh

The information in the table is refreshed regularly as set using the edit box below the table.

.

Exporting of query results

Result of query can be exported into formats excel, word, pdf and csv. For the csv format delimiters of the items can be chosen and for the pdf format size of the page can be set. After chosing the file format, the report is dpwnloaded to the user's computer.


Wrapped text
Choose Wrap text to keep a column width
Choose nr. tabel of lines to display in view
Refresh period of the view
Paging of the long table. Click a Nr. to choose a part of long table
Export the table content as doc, xls, pdf or csv file
11. 5. 2013 10:55:55
38
48
19
10
11. 5. 2013 10:55:57
40
8
1 2 3 4 5 6 7 8 9 10
Export
Word
Excel
PDF
CSV
PDF (
PDF (A4 Landscape)
PDF (A3)
PDF (A2)
© 2013
ctl00$MainContent$LinkButtonPDF','')

☑ Wrap text Items on page: 20 Update Interval: 60000 miliseconds.

Figure 2. Showing the paged table and choosing of pdf report page size.

5.5 Alarms

Proprietary alarm system in SAEAUT SCADA™

SAEAUT SCADA™ allows to visualize the current state of alarm sources, which SAEAUT SCADA server writes to process database. It also lets you view the statuses history of alarm sources.

The source of alarm in the proprietary alarm system of SAEAUT SCADA™ is memory operand (MO). Variables (data points) of variety external data sources such as OPC servers, other communication drivers of different devices and cells of database tables can be mapped to MO's in SAEAUT SCADA™ . MO can contain results of various logical operations (functions) with variables saved in other MO's. Because of this, alarm generated by SAEAUT SCADA™ can depend on evaluation of different easy or complex conditions in external devices or connected software applications.

Whether MO is to be a source of alarm or not is defined by its configuring. MO to become a source of alarm, it must be assigned a preconfigured definition of alarm processing. If the definition is not assigned, then the MO cannot be the source of an alarm.

Static and dynamic alarming

Static alarming differs from dynamic that it does not / does validate (acknowledge) status of the alarm state by human operators. The acknowledgment source is again MO in SAEAUT SCADA™ . Therefore, similar to the alarm source, it can be the result of evaluating of a complex operation executed using several MO's.

States and transitions between states of alarms

For *static alarming*, each *alarm source* has 2 states:

- Activated (come) ...
- Inactivated (not active or gone)

It is due to the fact that the alarm is characterized only by a single variable - *alarm source*. In the *dynamic alarming*, the alarm entity is defined by two Boolean variables (MO's) - alarm source and *acknowledgment source* representing a total of four possible states:

- Not active
- Activated (Come)
- Inactivated (Gone)
- Acknowledged

The alarms entities are visible in the alarm status table in the SAEAUT SCADA™ with a constant number of rows equal to the number of configured alarm sources. Transitions between states are recorded as events in the table of alarm history. Here is recorded when there was a transition from one alarm state to another as well as one of two possible configurable messages:

- Message when the value of the alarm source is changed from false to true,
- Message when alarm source value changes from true to false.

As mentioned above, the source of the alarm is MO. The alarm source has a definition of alarm processing which includes:

- Alarming type - static / dynamic ,
- Alarm messages (in several languages) to be entered in the alarm history table at birth and at death alarm conditions,
- Whether the alarm is permitted to return from active to inactive status,
- Source acknowledgment alarm (MO) - must be configured in advance,
- Whether on alarm activation should be sent to SMS and / or e-mail.

Related links on the web

OpcDbGateway on line help
Alarms in OpcDbGateway
OpcDbGateway on the web
OpcDbGateway blog

Related articles

Configuring of Alarms 40

Alarm Status Table 42

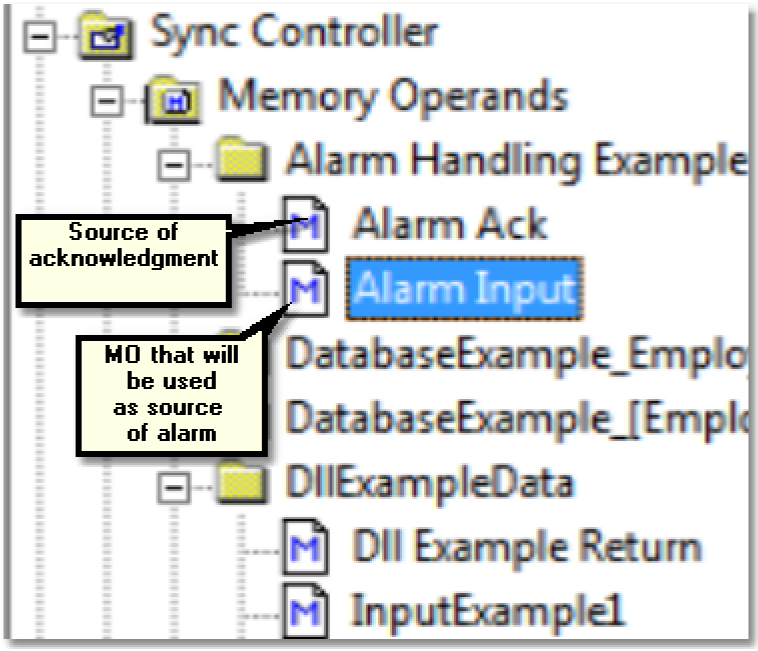
Alarm History Table 43

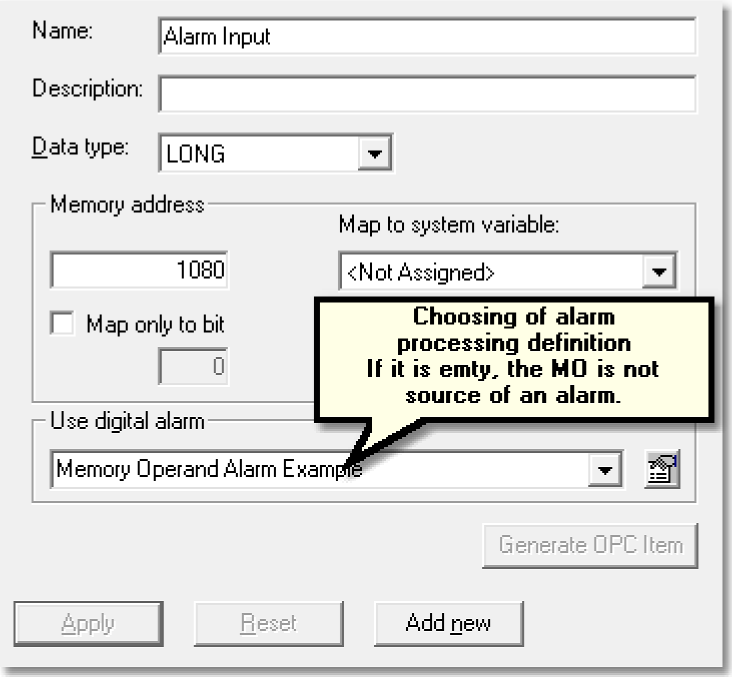
5.5.1 Configuring of Alarms

Alarms are configured using SAEAUT SCADA (OpcDbGateway) configurator.

Configuring of memory operands as alarm / acknowledgment source

There has to be configured memory operand that is used as source of alarm (Figure 1) and , in case that we want to create dynamic alarm (that requires acknowledgement), also the memory operand used as source of acknowledgement.
Every alarm source has to have defined way of alarm processing. Alarm processing definition (Figure 2) can have configured messages that are written by activation an deactivation of alarm. Dynamic Alarm processing definition has to have defined memory operand used as source of acknowledgement.





Name: Alarm Input

Description:

Data type: LONG

Memory address: 1080

Map to system variable: <Not Assigned>

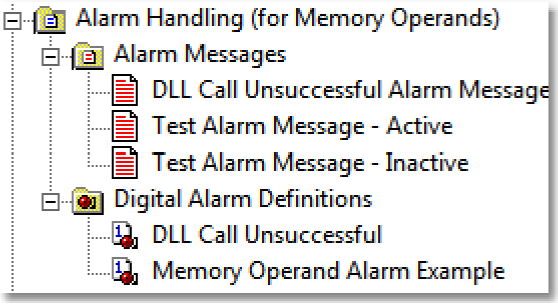
□ Map only to bit: 0

Use digital alarm: Memory Operand Alarm Example

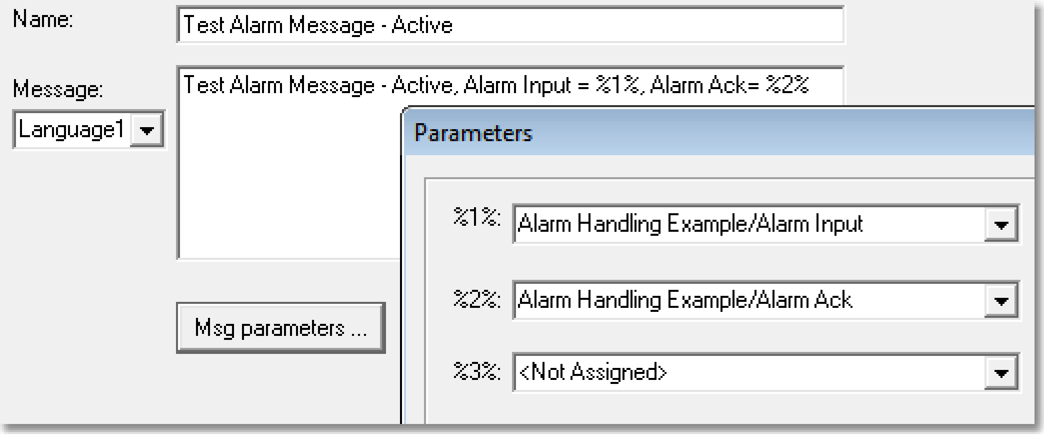
Choosing of alarm processing definition
If it is emty, the MO is not source of an alarm.

Figure 1. Configuring that memory operand "AlarmInput" has to be used as alarm source with the alarm processing definition "MemoryOperandfAlarmExample".

Configuring of alarm processing definition



- Alarm Handling (for Memory Operands)
  - Alarm Messages
    - DLL Call Unsuccessful Alarm Message
    - Test Alarm Message - Active
    - Test Alarm Message - Inactive
  - Digital Alarm Definitions
    - DLL Call Unsuccessful
    - Memory Operand Alarm Example



Name: Test Alarm Message - Active

Message: Language1

Test Alarm Message - Active, Alarm Input = %1%, Alarm Ack= %2%

Parameters

%1%: Alarm Handling Example/Alarm Input

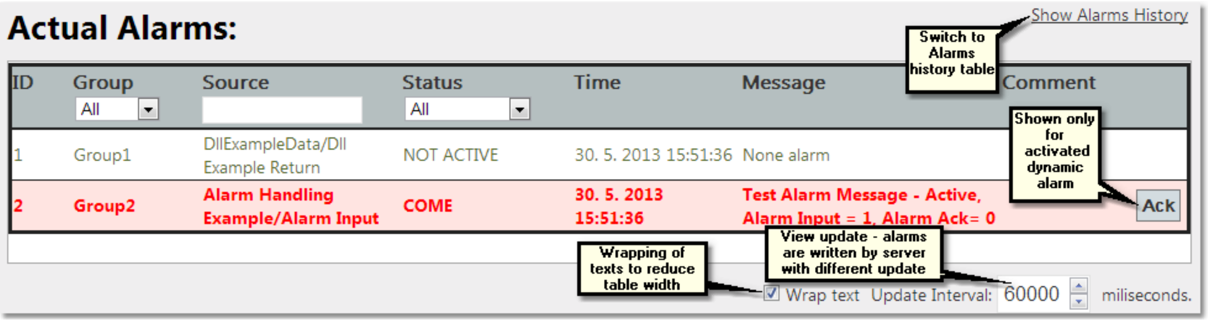
%2%: Alarm Handling Example/Alarm Ack

%3%: <Not Assigned>

Figure 2. Configuring of alarm processing definition "MemoryOperandfAlarmExample" that provides writing of message "'TestAlarmMessage-Active"   to the alarm history by activation of alarm. The message contains parameters - memory operands Alarm Input and Alarm Ack. Because of this, their values actual by writing of message will be written as well.

5.5.2 Alarm Status Table

Visualising of alarms statuses configured as described in "Configuring of Alarms" 40.



Actual Alarms:

Show Alarms History

ID	Group	Source	Status	Time	Message	Comment
	All		All			
1	Group1	DllExampleData/Dll Example Return	NOT ACTIVE	30. 5. 2013 15:51:36	None alarm	
2	Group2	Alarm Handling Example/Alarm Input	COME	30. 5. 2013 15:51:36	Test Alarm Message - Active, Alarm Input = 1, Alarm Ack= 0	Ack

☑ Wrap text Update Interval: 60000 miliseconds.

Switch to Alarms history table

Shown only for activated dynamic alarm

Wrapping of texts to reduce table width

View update - alarms are written by server with different update

Figure 1: Alarm status table with 2 alarm sources. The first one is in status "Not active", the second in status Activated (Come)

Columns in the alarm status table (Figure 1) have following meaning:

ID

Alarm identifier generated by SAEAUT SCADA server. It can be used in live data item 'System.Alarms.ActualAlarmIndex ".

Group

Group defined by the alarm configuring – can be used for filtering of alarms in SAEAUT SCADA™ .

Source

Path to the memory operand, which activates the alarm.

Status

Status of the alarm (NOT ACTIVE, COME, GONE, Acknowledged)

Time

Time of last change of alarm status

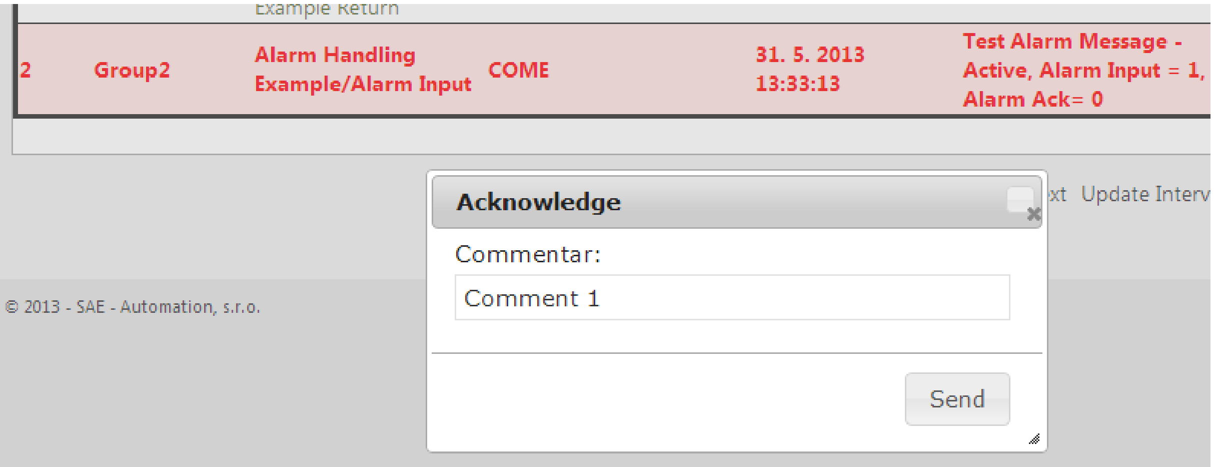
Message

The messages that can be configured to be written when alarm is activated or deactivated

Comment

Comment entered by user upon confirmation of alarm.

Columns Group, Source and Status can be used for filtering of alarm sources that has to be shown in the table. Ack is shown only by dynamic alarms that require acknowledgment.
Data in table can be sorted according every column upwardly/in descending order.



Example Return

2	Group2	Alarm Handling Example/Alarm Input	COME	31. 5. 2013 13:33:13	Test Alarm Message - Active, Alarm Input = 1, Alarm Ack= 0

Acknowledge

Commentar: Comment 1

Send

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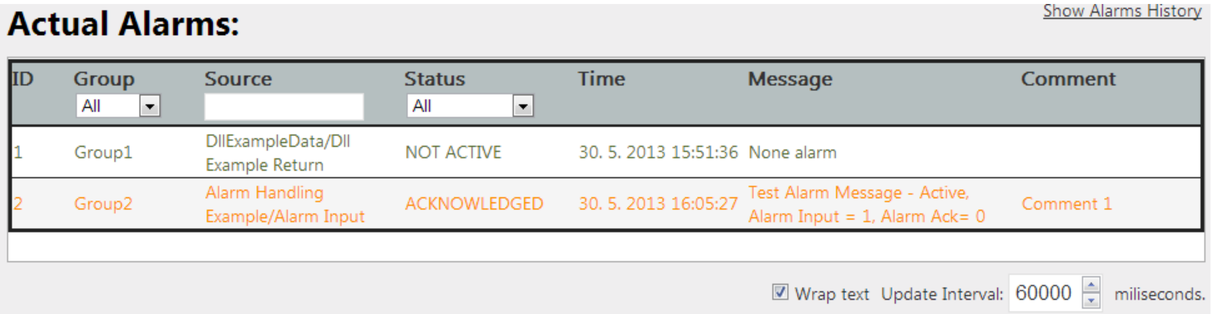
xt Update Interv

Figure 2: When acknowledging alarm comment which can be written to alarm history can be added. (To be written also Ack button is to be pushed)



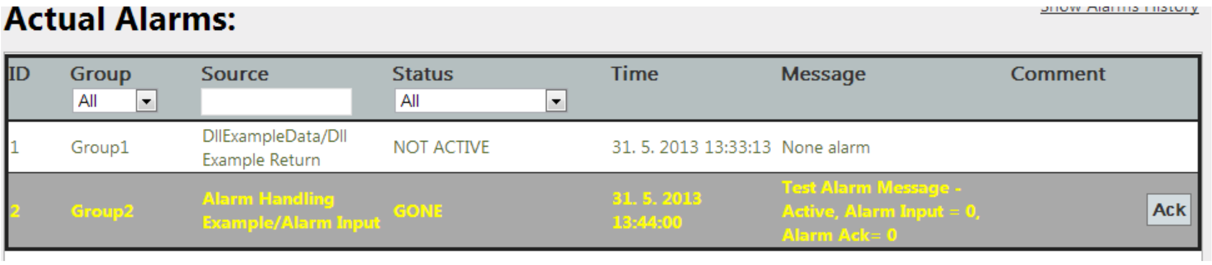
Actual Alarms:

Show Alarms History

ID	Group All	Source	Status All	Time	Message	Comment
1	Group1	DllExampleData/Dll Example Return	NOT ACTIVE	30. 5. 2013 15:51:36	None alarm	
2	Group2	Alarm Handling Example/Alarm Input	ACKNOWLEDGED	30. 5. 2013 16:05:27	Test Alarm Message - Active, Alarm Input = 1, Alarm Ack= 0	Comment 1

☑ Wrap text Update Interval: 60000 miliseconds.

Figure 3: Alarm status table with 2 alarm sources. The first one is in status "Not active", the second in status ACKNOWLEDGED.



Actual Alarms:

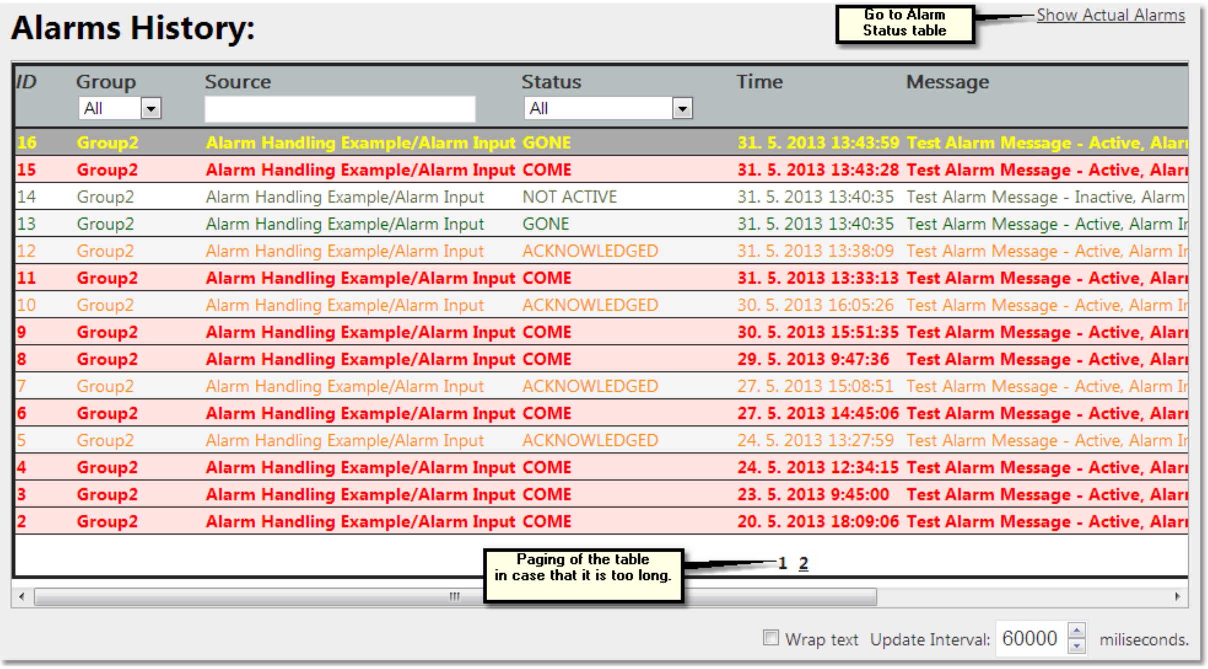
Show Alarms History

ID	Group All	Source	Status All	Time	Message	Comment
1	Group1	DllExampleData/Dll Example Return	NOT ACTIVE	31. 5. 2013 13:33:13	None alarm	
2	Group2	Alarm Handling Example/Alarm Input	GONE	31. 5. 2013 13:44:00	Test Alarm Message - Active, Alarm Input = 0, Alarm Ack= 0	Ack

Figure 4: Alarm status table - Alarm source ID = 2 was deactivated without being acknowledged and so it is in status GONE now.

5.5.3 Alarm History Table

Alarms History table contains log of every alarm status change for every alarm source. Meaning of table columns is the same as in Alarm Status table 42 ..



Alarms History:

Go to Alarm Status table

Show Actual Alarms

ID	Group	Source	Status	Time	Message
	All		All		
16	Group2	Alarm Handling Example/Alarm Input	GONE	31. 5. 2013 13:43:59	Test Alarm Message - Active, Alar
15	Group2	Alarm Handling Example/Alarm Input	COME	31. 5. 2013 13:43:28	Test Alarm Message - Active, Alar
14	Group2	Alarm Handling Example/Alarm Input	NOT ACTIVE	31. 5. 2013 13:40:35	Test Alarm Message - Inactive, Alarm
13	Group2	Alarm Handling Example/Alarm Input	GONE	31. 5. 2013 13:40:35	Test Alarm Message - Active, Alarm I
12	Group2	Alarm Handling Example/Alarm Input	ACKNOWLEDGED	31. 5. 2013 13:38:09	Test Alarm Message - Active, Alarm I
11	Group2	Alarm Handling Example/Alarm Input	COME	31. 5. 2013 13:33:13	Test Alarm Message - Active, Alar
10	Group2	Alarm Handling Example/Alarm Input	ACKNOWLEDGED	30. 5. 2013 16:05:26	Test Alarm Message - Active, Alarm I
9	Group2	Alarm Handling Example/Alarm Input	COME	30. 5. 2013 15:51:35	Test Alarm Message - Active, Alar
8	Group2	Alarm Handling Example/Alarm Input	COME	29. 5. 2013 9:47:36	Test Alarm Message - Active, Alar
7	Group2	Alarm Handling Example/Alarm Input	ACKNOWLEDGED	27. 5. 2013 15:08:51	Test Alarm Message - Active, Alarm I
6	Group2	Alarm Handling Example/Alarm Input	COME	27. 5. 2013 14:45:06	Test Alarm Message - Active, Alar
5	Group2	Alarm Handling Example/Alarm Input	ACKNOWLEDGED	24. 5. 2013 13:27:59	Test Alarm Message - Active, Alarm I
4	Group2	Alarm Handling Example/Alarm Input	COME	24. 5. 2013 12:34:15	Test Alarm Message - Active, Alar
3	Group2	Alarm Handling Example/Alarm Input	COME	23. 5. 2013 9:45:00	Test Alarm Message - Active, Alar
2	Group2	Alarm Handling Example/Alarm Input	COME	20. 5. 2013 18:09:06	Test Alarm Message - Active, Alar

Paging of the table in case that it is too long.

1 2

□ Wrap text Update Interval: 60000 miliseconds.

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