# Generic SCADA System

User manual

Ovak Technologies

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## 1. List of abbreviations

*SCADA* – Supervisory Control and Data Acquisition;

GSS - Generic SCADA System;

*RTU* – Remote Terminal Unit (terminal, device, controller);

*GUI* – Graphical User Interface;

*TP* – Technological Process;

*DB* – Data Base;

*OPC* – OLE for Process Control family of software technologies, providing a single interface to manage objects and automation of technological processes;

*SQL* – Structured Query Language a formal non-procedural programming language used to create, modify and manage data in any relational database managed by the appropriate database management system.

## 2. Terms and Definitions

*Complex* - hierarchically organized set of geographically distributed software systems, the combined data transmission channels;

*Scanning* - cyclic sequential polling of group of Nodes with a certain time interval;

*Client PC* – computer on which the client software is running;

*Server* - part of a system that performs functions such as: customer service software, RTU poll, storage, processing, interaction with other systems, servers, operating in the complex;

*Client (client software)* - part of the system that runs on the user's computer, which provides a user interface and interaction with the server;

*Module* - program fragment that contains a set of software functions*;*

*Information life cycle* - time interval, after which the information is considered to be outdated and marked to overwrite;

*Status parameter* - parameter that is periodically polled by the server. The history for this type of parameter is recorded in the database;

*Directory* - virtual directory (folder) of the system.

## 3. Overview

The operator of Generic SCADA System(GSS) should familiarize with the following manuals that describe functionality and rules, be qualified as an experienced PC user, and have basic knowledge of working in Windows 7/10.

GSS is intended for the diagnosis, monitoring and changing settings of the work parameters of the Node in real-time, archiving data coming from the controllers, providing multi-user and multi-level access for technological and support staff to monitor and control Systems, including the automatic modes and setting changes of its work with controller.

Operator has access for the client part of GSS, which can be granted by connecting to the server. Connection is performed via web browser, by entering GSS IP address in address bar.

*NOTE: To access the client on a computer that is running* GSS *server, enter in the web browser address bar localhost.*

Regardless of where client interface is running, on server or on a separate computer, it performs the same function.

Before using the GSS for the understanding of its functionality, user should read the following terms and definitions:

- **Web GUI** – Web interface is used to access information from server database, control Nodes.
- **Scanning** – periodic data acquisition from Nodes. Administrator sets interval between periodic scanning. Default scan interval is 60 minutes, which means that after scanning a group of Nodes GSS waits for 60 minutes before starting a new scanning.
- **Session** –time during which the client interface is open and running. The session begins when user opens a Web browser and enters the IP address of the server, and ends when Web browser is closed or when the System exits at user command. Session also ends when user does not do anything for an hour. If user is using a workplace in parallel with other users, then, for safety reasons, it is recommended to end session after the work is finished.
- **Security** – GSS provides several levels of security and user access to the server functions. Administrator should set the security level for each client. Server security is based on the client's login and password. If menu items or the screen is not available, contact your system administrator to change the permissions.
- **Selected Node** – Node, that is selected from the tree of Nodes. When an object is selected, a web GUI uses the data obtained from it to fill in the information window.

# 4. Web GUI

The Web GUI is designed to display information from the controller, data recording, controller management and edit work settings of the Node, as well as graphically display various historical information.

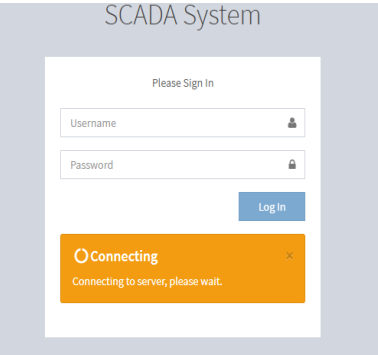



Figure 1 Authentication window (Connecting)

The Web GUI is accessible from browser window when its connected to the GSS server.

## 4.1. Authentication window

When user open a Web GUI it displays a user authentication window. To log in, user must enter the username and password. These are given by local system administrator with a certain level of access.

When connection to a server is established, connect animation disappears and the entry «Connected» is displayed. If waiting timer is expired, but connection to the server is not established, an error message is displayed. This error may also occur in the case of loss of communication with the server during operation, thus the GUI will switch back to the authentication window and will try to reconnect.

## 4.2. User main window

User main window provides a set of functions available to the user with specific access rights. Set of functions includes: browser of connected Nodes, a set of actions for the selected Node and Node data display area.

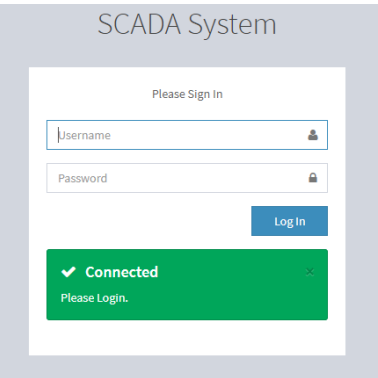



Figure 2 Authentication window (Connected)

User main window provides ability to navigate GSS toolkit trough menu items:

- **Objects tree** – is intended to show logical groups of Nodes. Node grouping visualized by means of a tree structure, similar to one which is used by Windows Explorer, and providing navigation to select a group of Nodes or single Nodes. Right-click opens menu with the following functions: create a new folder, delete the existing folder, rename the folder, add the Node into a specific folder, remove the Node.

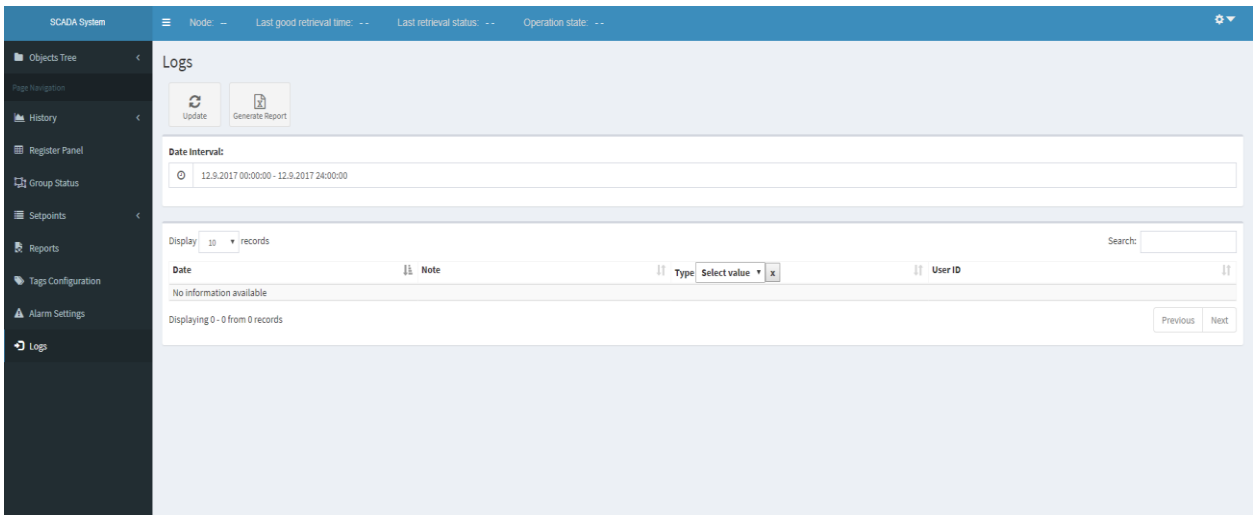



Figure 3 User main window

- **History** – opens window of parameter history browsing. Parameters displays in graphical and table forms.
- **Registers** – provides ability to read and write all parameters of Node.
- **Group browsing** – displays status of selected group of Nodes.
- **Setpoints** – displays and allows to change setpoints for working parameters of Nodes and groups of Nodes.
- **Tag configuration** – allows for user with certain permissions to link OPC tags with Modbus registers for selected Node.

*NOTE: The default username and password are the same. Enter "admin" in both fields to access WEB GUI.*

## 4.3. Objects tree

The object tree is a navigation tool for selection of single Node or a group of Nodes. This field is always available for browsing.

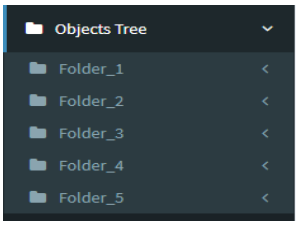


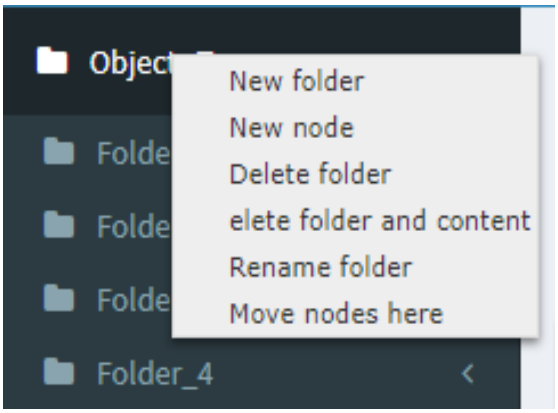

Figure 4 Objects tree

Object tree organizes Node in groups. The grouping of Nodes is based on user preferences. There are two types of object tree objects: folder and Node.

To display a list of Nodes or equipment listed in the group, click on button ‹ to the right of the group name.

By right-click on the object tree, following functions are available:

1. New folder
2. New Node
3. Delete folder
4. Delete folder and contents
5. Rename folder
6. Move Nodes here



**New folder** – to create a new folder, use right-mouse click on the selected folder, and in opened menu enter the name of the new folder.

Figure 5 Creating new folder

*NOTE: After creating a new folder, GSS server automatically provides full access rights to the folder for the user who created this folder. Other users are not able to see or work with this folder. Description of how to manage the rights to access folders provided in the document "Administrator's Manual."*

**Delete folder** – to delete an existing folder, use right-mouse click on the selected folder.

*NOTE: After deleting folder all Nodes and equipment located in that folder, will be placed in the main directory.*

**Delete folder and contents** – to delete an existing folder and all contents of this folder, use right-mouse click on the selected folder. In this case, after confirmation, all Nodes and equipment that located in this folder, and the folder itself will be permanently deleted.

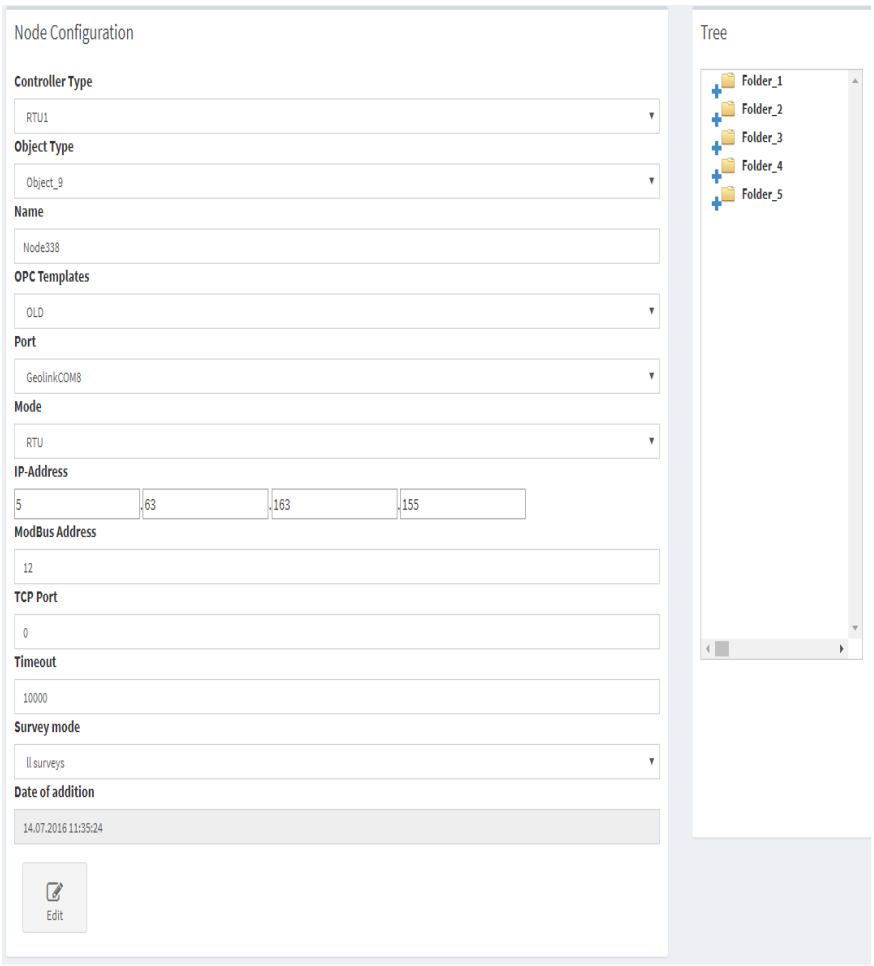



Figure 6 Add/modify Node

**Rename folder** – to rename an existing folder, use right-mouse click on the selected folder. Field with editable current folder name will appear.

**Place Node here** – to move one or more Nodes in the current folder, use right-mouse click on the selected folder. Click on the Node(s) to move them to a new directory. Selected Nodes are marked with blue color.

**New Node** – to add new Node following steps must be complete:

1. In the object tree, right-click on any folder in which you want to add new Node and select «New Node» from the dropdown menu.
2. Enter individual name in «Node name» field. Name cannot be blank, cannot be used on other Node and cannot include symbols “/”, “\”.
3. In «Controller» section pick controller type, communications port and device address.

4. In «Polling» section pick one of the following modes:
    - Disable – GSS will not poll this Node;
    - User only – only user can poll controller, all automated polls, initiated by GSS will be disabled;
    - All polls – all polls will be enabled on this Node.
5. After inputting all necessary parameters press button «Add» to add new Node.

*NOTE: «Polling» option by default set to «Disabled for current Node ».*
*NOTE: To not create Node that will function in «All Call» mode, do not use "0" in Node address. «All Call» Node will transmit messages via radio, that can be received by all objects.*

For existing Node available two following functions:

1. Modify Node
2. Delete Node

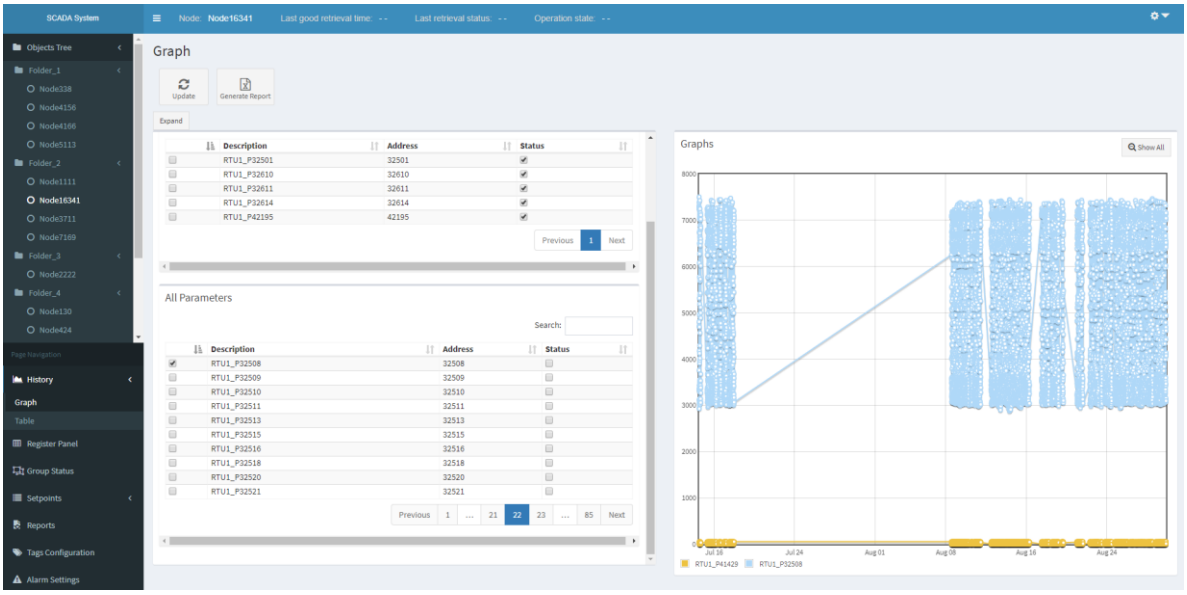
**Modify Node** – to edit the settings of an existing Node use right-mouse click on the selected Node and select «Modify Node» in drop-down menu. In opened window configuration parameters can be changed.

**Delete Node** – to delete an existing Node use right-mouse click on the selected Node and select «Delete Node», in that case all Node data, including configuration parameters and history will be lost.

## 4.4. History tab

History tab intended for browsing archive data for each parameter that was marked by user as «status». When changing Nodes in objects tree, the information is automatically updated for selected Node.

**Navigation:**




1. Click on «History» menu
2. Click on «Graph» menu

Figure 7 «History» tab. «Graph» subtab.

To receive schedule of parameter change, select Node from the object tree, select parameter from list «Status» set the time interval to display.

GSS allows to browse multiple graphs by overlaying them on top of each other to analyze. Graphs are marked with different colors, and the name of the graph is displayed at the bottom left of the chart.

To scale graph move cursor on the desired part of the graph while holding down the left mouse button.

Displaying the historical data is available in the form of graphs, as well as tables. To view the data in tabular form, use sub-tab "Table" in which to choose Node from the object tree, select Status from the list of options and set the time interval to display.

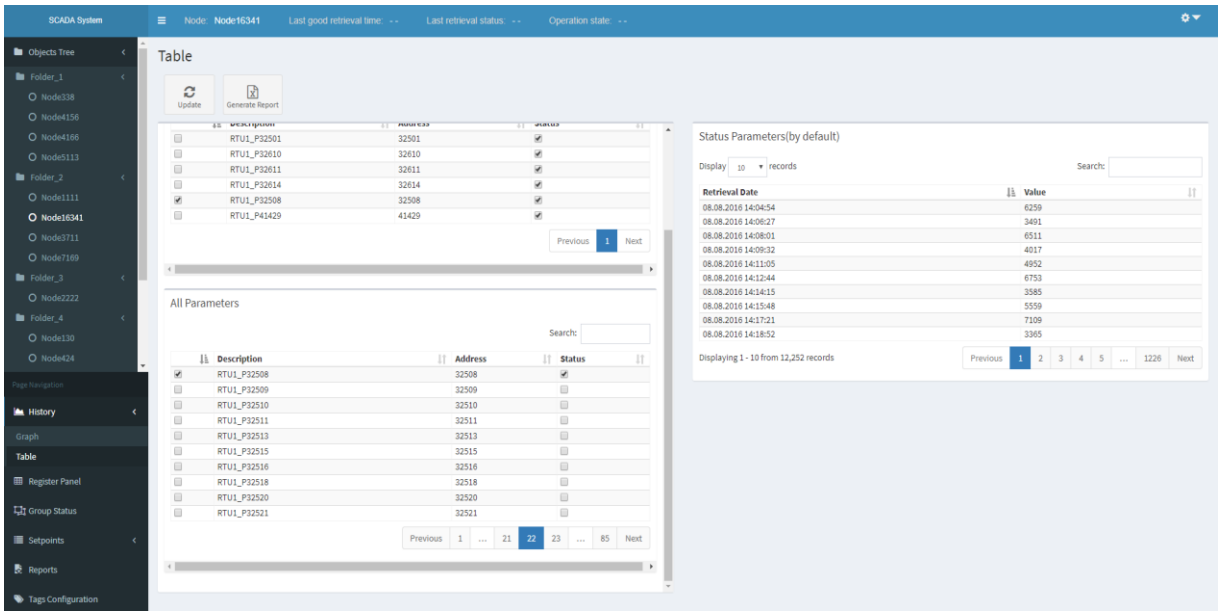



Figure 8 «History» tab. «Table» subtab.

To display or hide graph use right click on a parameter. If graph is displayed in the tab, then near this graph corresponding icon will be shown.

GSS user with certain access rights can edit the list of status parameters for selected Nodes. To do this user shall put or remove check mark for the corresponding parameter in the column "status". Selected parameter will be added or removed from the table "Status parameters".

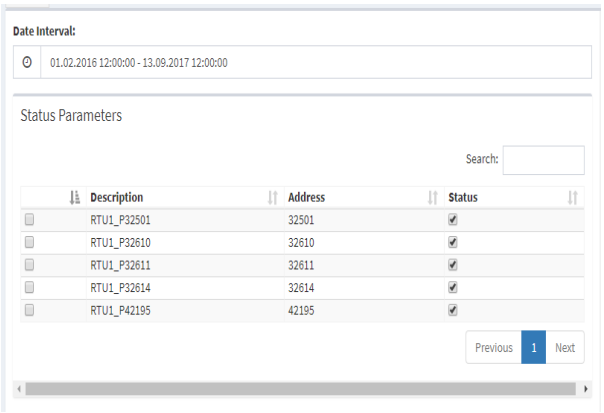



Figure 9 Selecting status parameters

## 4.5. Registers tab

Registers tab allows to mark for polling registers that not set in GSS by default

**Navigation:**

1. Click on «Registers» menu

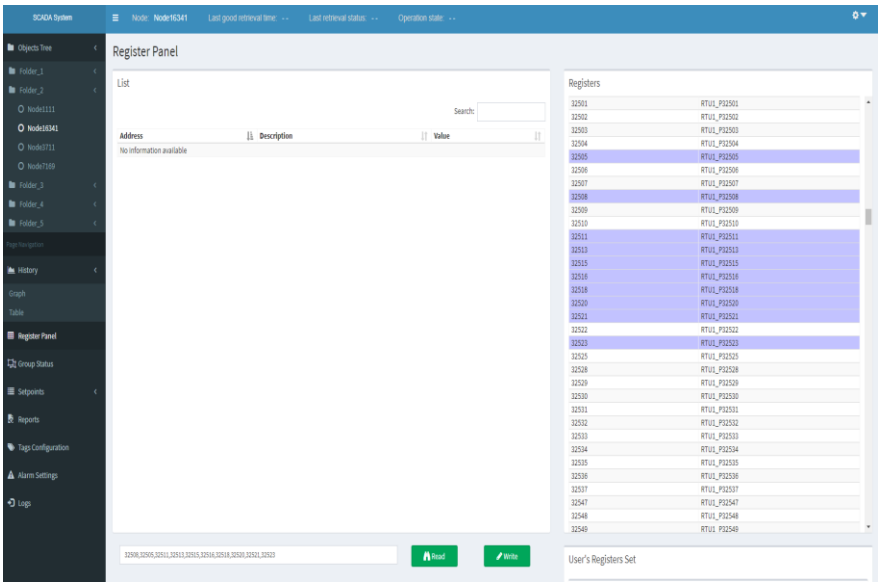



Figure 10 «Registers» tab

List of registers intended to select an address parameters. In the «Address» field user can enter or select registers addresses from list, that GSS must poll from Node. Nonadjacent registers must be separated by a comma, while adjacent registers must be separated by hyphens. To read entered or selected registers, press the button "Read", in this case will be displayed, addresses, descriptions and values of polled registers.

1. For single register the register number is entered in full (eg, 41425);
2. For a consecutive register numbers must be entered "first register" - "last register" (eg, 41425-41430);
3. For non-consecutive register numbers must be entered by comma followed by a space (for example, 41425, 41428, 41430).

To change the value specified in the register, click a cell in the column «Value» for parameter that needs to be changed. The cell is opened in edit mode and user can enter the desired value. After pressing the «Record» button, new value will be loaded into the Node.

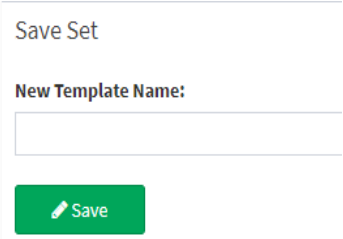



Figure 11 Saving registers set

For convenience of copying the register map from one client computer to another, available possibility to save a list of the registers as a group. After the address of the register(s) entered in the «Address field», enter the group name and click button "Save".

If necessary, user can remove already created group by selecting the appropriate drop-down list and press the "Delete" button.

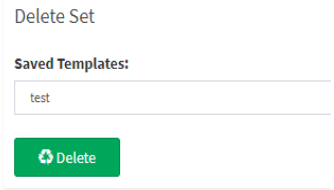



Figure 12 Deleting registers set

To download the appropriate registers group, select it from the drop-down list and click "Download" button. List of registers stored will be displayed in the field «Address», as shown in the figure 26.

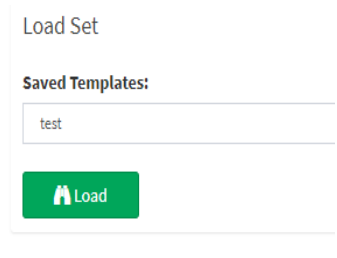



Figure 13 Loading registers set

## 4.6. Group Status tab

Group browsing tab is intended to display same parameters for multiple Nodes in tabular form.

**Navigation:**

1. Click on «Group Status» menu

To add a Node to the group view, select the Node and press «Add the selected Node» button. To add to the group view all Nodes in the selected folder press "Add all the Nodes in the current folder" button. To delete the selected Nodes from the group view press "Delete selected Node" button.

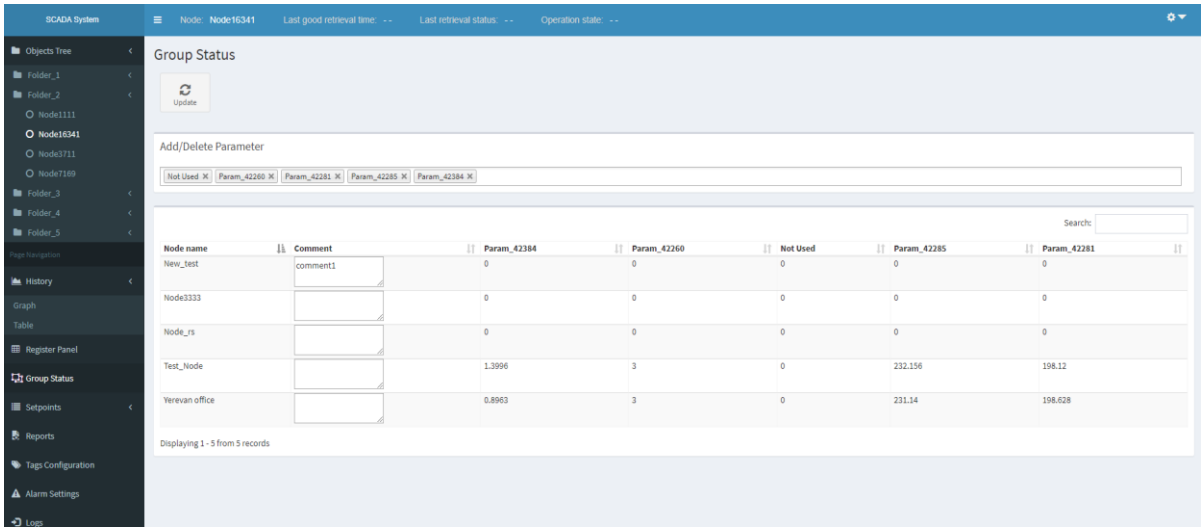



Figure 14 «Group Status» tab

After adding the Nodes to group view, user must define the parameters of group view. To do this user must select «options» from the dropdown list, and click on the "add selected item" button. For removing parameters of group view button "remove the selected item" is intended.

Parameters of the group view are displayed in a table. User can quickly search specific parameter by means of entering the Node name, parameter name or value.

After selecting periodic update parameters of the group view values Web GUI mode will periodically read the latest values and display them in the table.

## 4.7. Setpoints tab

Setpoints tab allows to read and write Nodes malfunction setpoints of single Nodes or groups, by selecting them in object tree. When changing Nodes in objects tree, the information is automatically updated for selected Node.

**Navigation:**

1. Click on «Setpoints» menu

This tab displays the Node controllers tuning registers grouped by criteria. After selecting controller or group GSS performs polling of Node controller and database, displaying values of the same parameters in the form of a table. User can update the databases values or Node values, in case of noticing values inequality.

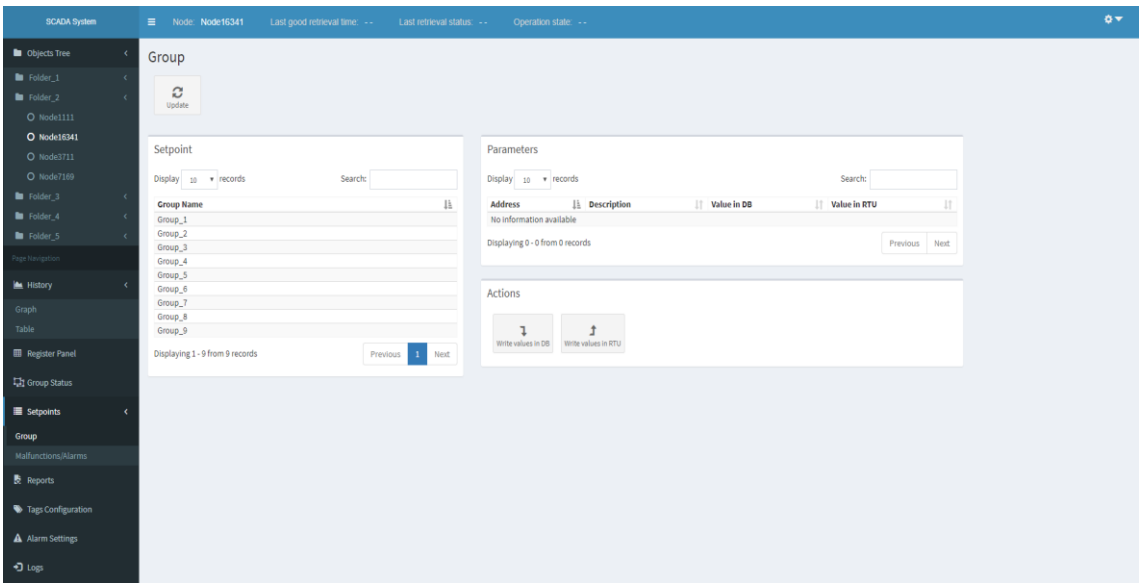



Figure 15 «Setpoints» tab

## 4.8. *Tag configuration tab*

Tag configuration tab intended to link Modbus registers with OPC tags. These tags serve as data source for the corresponding Node.
When changing Nodes in objects tree, the information is automatically updated for selected Node.

**Navigation:**

1. Click on «Tag configuration» menu

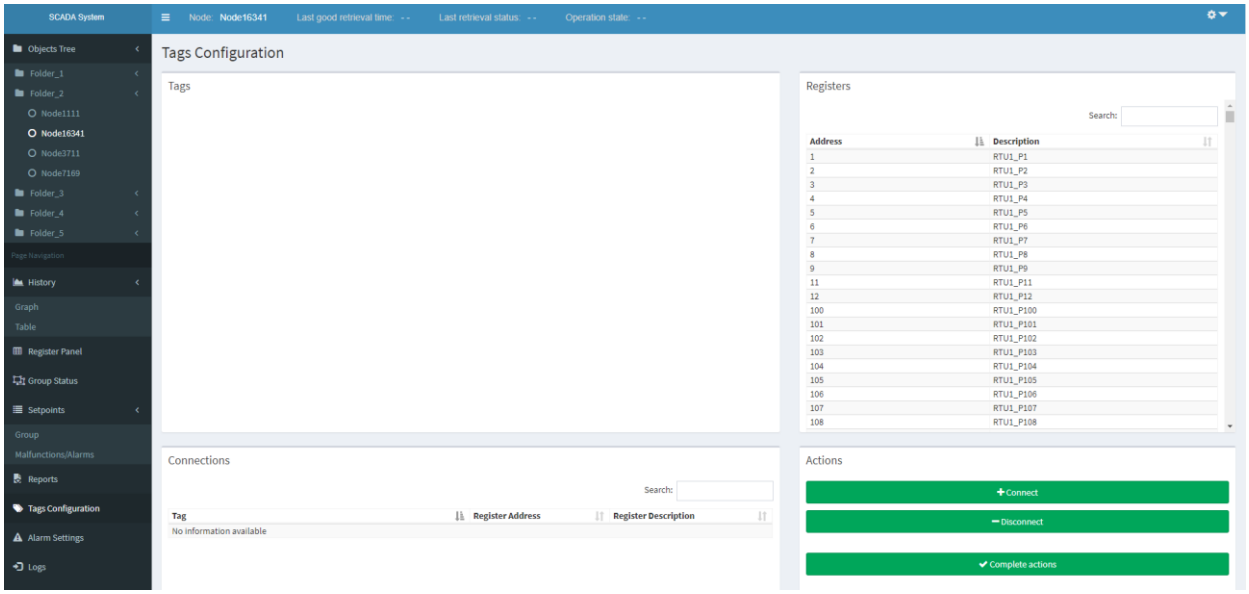



Figure 16 «Tag configuration» tab

When adding a new controller, GSS allows to use other OPC Server as a data source for this Node. To do this, user must configure controller registers by linking them with tags from available OPC servers in the network.

All of the available registers for the selected controller type are displayed together with all available tags in the network. In addition, user can view the available computers on the network, where OPC servers are running, and connect to an OPC client. All tags are displayed in a hierarchical form which allows user to connect them with the Node registers. After selecting a tag and register, press the button «Connect» to mark that the value of this register must be taken with a certain tag. All configured tags can be viewed at the bottom of the window. User can disconnect existing configuration by selecting the connection and pressing «Delete» button.

After configuration is complete, click on «Confirm» button to save all changes in GSS

*NOTE: After linking Node controller register to the OPC server tag, this tag is marked green in the hierarchy of tags. Not recommended to associate tag with more than one register.*

*After linking registers for one Node, user can save configuration as a template to be applied to other Nodes using same OPC client. To do this, after clicking «Confirm» button, click "Save Template" button.*

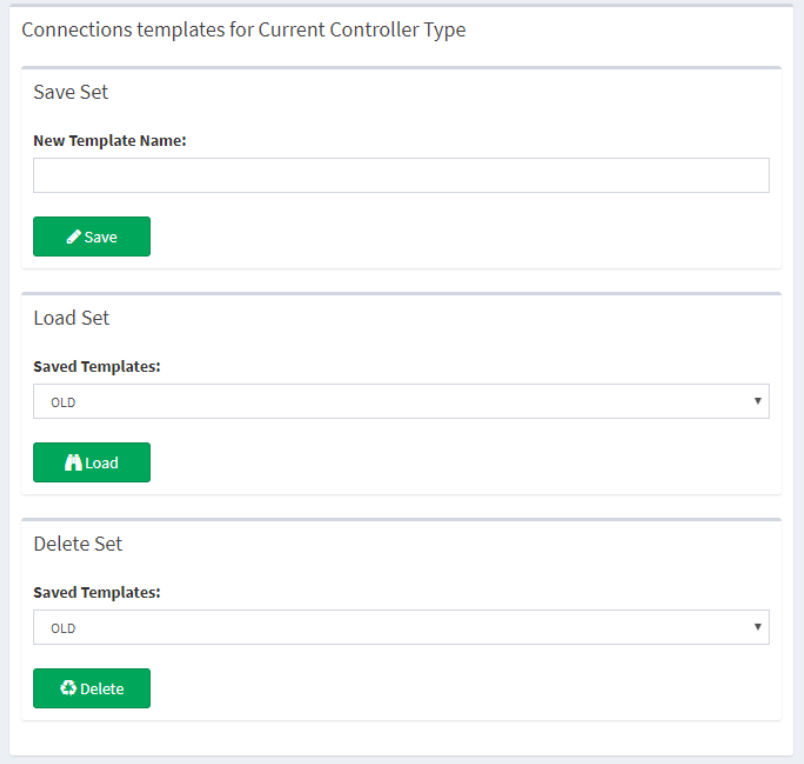



Figure 17 Connections

To apply template to Node user should do the following:

1. Select Node from object tree;
2. Open «Tag configuration» menu and click «Load template» button, in the «Connections» field will automatically appear new connections for the current Node, taken from the template;
3. Click «Confirm» button.

*NOTE: When clicking «Save Template» button, if connections not configured, GSS will ignore this command.*

*NOTE: User cannot use templates if controllers use different OPC servers.*

## 4.9. Malfunctions tab

Malfunction tab intended to set criteria of alarm triggers for all working parameters of Node. To do it select Node from object tree and click on «Malfunctions» tab.

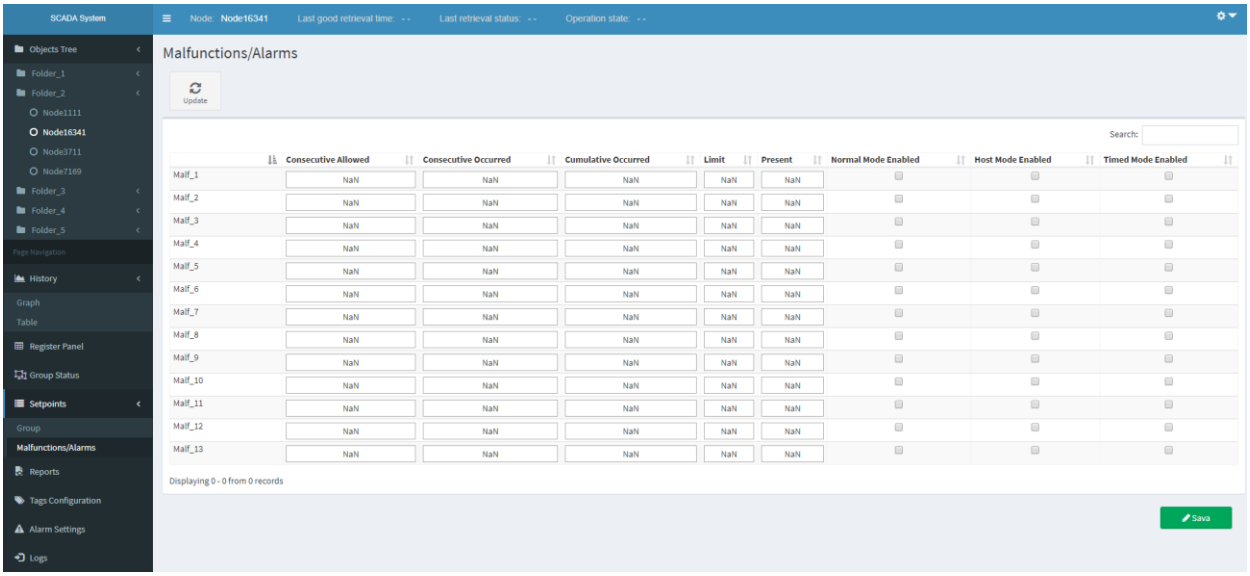



*Figure 18 «Malfunctions» tab*

1. Click on «Malfunctions» menu

To configure the criteria of malfunctions user should select parameter from the list and click on the "Add" button. Configuration window will appear with the following options:

- *Type* – is a selected parameter with the following values: ==, >, <, !=. The selected option is located in the left side of the above operations.
- *Priority – this parameter sets the level of importance of malfunction*. *GSS* using following types of priorities:
    1. Diagnostic;
    2. Low;
    3. Medium;
    4. High;
    5. Critical.
- *Value – when checking for the malfunctions this parameter located on the right side of the above operations.*
- *Description – short description/commentary of this malfunction*.

*NOTE: Multiple criteria of malfunctions can be configured for a single parameter. If simultaneously several criterias are met, result will be the one with higher priority.*

After setting malfunction criteria, to save results button «Save» is intended.

## 5. Support Information

For technical support, please, contact Ovak Technologies at:
Phone: +1.281.506.0020
Email: support@ovaktechnologies.com
Web: www.ovaktechnologies.com