HMI Mini-FLUFFY Research

Version number	Date	Changes
1.0	12-4-2024	Made document, answered how to create dashboard, how to retrieve data, and how to control system questions.

Contents

Research questions

For this part of the project, the main research question is the following: “How can we create an HMI for the Mini-FLUFFY project that uses a Siemens PLC that can monitor and control the system remotely?” To answer this question, we have made the following subquestions:

- How to create a dashboard for a Siemens PLC?
    - What software do we use?
- How to retrieve the data from the system?
- What do we do with retrieved data?
- How to control the system from the HMI?
- How to make a connection between the HMI and the PLC?

The goal is to answer these smaller questions to get an idea of how we can make the HMI dashboard.

How to create a dashboard for a Siemens PLC?

To create an HMI solution for the S7-1200 the most used solution is WinCC. This is because WinCC is a mobile way to create a personalized dashboard, making visualizing the state of your system quick and simple. Advantages of WinCC are:

Seamless integration: WinCC is developed by Siemens, so as expected it seamlessly integrates with Siemens PLC’s, including the S7-1200.

Scalability: WinCC offers a lot of different versions, such as Basic, Comfort, Advanced and Professional. Each has his own use case that offers scalability as needed for your product.

Rich visualization options: WinCC offers a lot of visualization options for making your dashboard, also using a simple drag & drop system.

Data Logging: WinCC includes multiple features for logging data, trending and historical analysis, enabling to record, save and analyze data that you retrieve from the system. This can be valuable for troubleshooting, performance optimization, and compliance with regulatory requirements.

Remote Access and Monitoring: With WinCC, you can set up remote access and monitoring capabilities, allowing authorized users to view and interact with the HMI interface from remote locations. This can be useful for supervisory control, diagnostics, and maintenance purposes.

To start creating a dashboard in WinCC, you first need to setup a communication with the S7-1200 PLC. Important is to configure a communication protocol you are going to use (Profinet, Modbus TCP/IP) and the PLC’s Ip address.

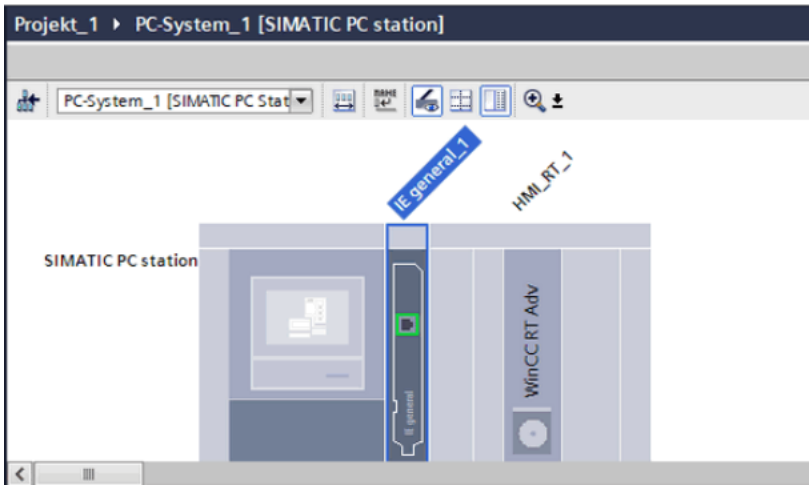
(Siemens, 2024)

How to retrieve the data from the system?

To make the HMI interact with the Mini-FLUFFY system, we need to be able to get data from it. This data needs to be displayed on the dashboard and we need to be able to send commands from the dashboard to the PLC.

How to make a connection between the HMI and the PLC?

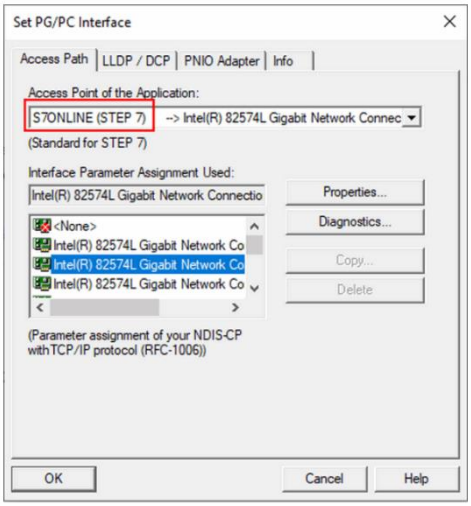
Because we are using WinCC RT Ad advanced HMI, we need to do some little configuring. To allow communication between the PLC and the HMI we need to add a communication module onto the PC (HMI) system. This can be done by dragging an IE general module onto the PC system in device overview.



After that we need to check the settings of the IE general module, but normally it is configured correctly.

To make the actual connection, we need to drag and drop a line between the two ethernet ports of the PLC and the PC station. When you press the connection button afterwards it becomes “HMI_Connection_1” with access point “S7ONLINE”.

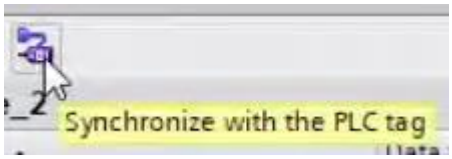
The last really important step is to set a configuration on your laptop. This can be done through the control panel of windows. Go to "Start > Control Panel > search for Set PG/PC interface” and make sure that your Access point is S7ONLINE and you choose the TCP/IP adapter you are using. (Siemens, 2022)



PLC tags to HMI tags

The system has a list of I/O components, and these are in the PLC as tags. These tags contain if a component is on or off via a Boolean, for example for digital inputs and outputs. Since these tags contain this information, we are going to share them with the HMI.

To do this, first find where these tags are in the PLC project. In our project, it is in the PLC tags folder, in both the "I/O list" and "Default tag table". Copy the tags you would like to have in your HMI. In your HMI project, add a tag table and paste your variables into this table. Once this is done, press the button you see below above the tag table. This will open a menu to select which variables you want to sync up. Since the tags were copied, they match in name. Select the "paths of the PLC paths match" option and press synchronize. (Romanov, 2021)



Now you have imported the tags into your HMI and can use them in the elements of the HMI.

What do we do with retrieved data?

Now that data has been retrieved from the Mini-FLUFFY PLC, we can use it. But what do we use this data for? We're going to log incoming data. For logging the data, we have a couple of options on how to save it.

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(Siemens, 2024)

How to control the system from the HMI?

Controlling a system from WinCC involves configuring your HMI project to send commands to the PLC based on user interactions with the graphical interface. This can be done by the following:

Design Control Elements: Start by adding control elements such as buttons, switches, sliders, and input fields to your HMI screens in WinCC

Define Tags for Control Variables: Define tags or variables in WinCC to represent the control parameters or commands that will be sent to the PLC. For example, you might define tags for start/stop commands, setpoints, mode selection, etc. These tags will be used to exchange data between WinCC and the PLC.

Assign Actions to Control Elements: For each control element added to the HMI screens, assign actions or scripts that will be triggered when the element is interacted with. This can typically be done through the properties or configuration settings of the control element in WinCC.

Write Scripts or Logic: Write scripts or logic in WinCC to define the behavior of the control elements and the actions to be taken when they are activated. For example, you might write scripts to send specific commands to the PLC when a button is pressed or a setpoint is adjusted.

Establish Communication with the PLC: Ensure that communication is properly set up between WinCC and the PLC. This involves configuring communication settings such as the communication protocol, PLC address, and data exchange parameters in WinCC.

References

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