INTERNATIONAL UNIVERSITY LIAISON INDONESIA

THESIS PROPOSAL

Comparison between Codesys and OpenPLC as a Modbus TCP Protocol Integrated Development Environment (IDE)

By

Andika Bramantio Wicaksono

11201902005

In Partial Fulfillment of the Requirements for the Degree of

Sarjana Teknik

In

MECHATRONICS ENGINEERING

FACULTY OF ENGINEERING

BSD City 15310

Indonesia

March 2023

1.   **General Statement of Problem Area**

The problem to be examined involves comparing two of the popular option for developing the automation system which is the Control Development System (Codesys) and OpenPLC which is an open-source IDE that can run through various devices from Raspberry Pi to Arduino.

2.   **Research Purpose**

The Primary Purpose of this research paper is to study and compares which software is the most suitable for developing a ladder logic diagram and later going to control automation system through the Modbus TCP protocol via the Ethernet connection.

3.   **Research Problem**

There are several facets of the research problems:

3.1) The increasing demand for automation systems shortly leads to the need for automation specialists to handle the automated machinery.

3.2) Learning automation can be very expensive, especially for students that couldn't afford to buy a physical programmable logic controller (PLC)

4. **Significance of Study**

The study is significant for several reasons:

4.1) First, the software is aimed at introducing automation to the newer generations that learning automation does not always means buying expensive industrial equipment.

4.2) Second, the Internet of Things can be applied since it substitutes industrial-grade machinery into a digital twinning counterpart and then it can be controlled over the network. This means it doesn't always have to be on-site when it comes to programming an Industrial Equipment

5. **Theoretical Perspective**

The Theoretical perspective for the proposed study is to integrate free-to-use software into the Industrial Standard Automation System using the Modbus TCP protocol. Which uses the Client/Server or Master/Slave protocol. Compared to the more popular choices for a large-scale industry that uses Open Platform Communications Unified Architecture (OPC) that can even self-sustain and communicate between devices independently.

Although it doesn't seem to make any sense to use the Modbus Protocol in large-scale industries. However, the Modbus TCP still have some advantages to use in small to medium-scale business such as:

1, Simplicity: Modbus TCP is a straightforward Client/Server based protocol for communication.

2. Easy to Integrate between Software and even Hardware: Whether it is using FactoryIO for Factory Simulation or using real PLC hardware, Modbus TCP protocol still and always be there as a choice for communication.

3. Availability: The Modbus TCP/IP protocol can be used with many devices, from different vendors, manufacturers, and many more differences can come and communicate using the Modbus Protocol making it one of the reliable options

6. Research Question and Hypothesis

6.1 Questions

Question #1: Which IDE offers the better option for creating and establishing the Modbus TCP protocol?

Question #2: What's the difference between Codesys and OpenPLC in terms of User Friendliness, Speed, and Reliability

6.2 Hypothesis

Hypothesis #1: Codesys offers more control and many industrial-grade features that can help debug and maintain the Modbus communication protocol

Hypothesis #2: OpenPLC offers multiple device capabilities that most other IDE couldn't do. For Example, in a Raspberry Pi

7. Research Methodology

The study will compare Codesys and OpenPLC as simple PLC machines. On top of that the list of software that is used for the investigation:

- OpenPLC Editor
- OpenPLC Runtime
- FactoryIO
- Control Development System (Codesys)

The Control Development System (Codesys) and the OpenPLC Editor are used to create an automation script that later is installed in PLC machines. In this case, the test would be conducted through Codesys Control WinV3 X64 for Codesys and a Raspberry Pi Running the OpenPLC Runtime Respectively. Both will be used to later control a FactoryIO scenario which is a modified Advanced Sort by Height.

8. Design Instrumentation

The research will use the Experimental Design Research type. All the tags required to make the Ladder Logic Diagram (LLD/LD) is already provided by the FactoryIO. Later on to be implemented to the same Ladder Logic Diagram to both software of Codesys IDE and

OpenPLC Runtime and then established a Modbus TCP protocol communication between each other software.

9. Data Analysis

The data analysis for this research is done by observing the connection between the Modbus TCP. Codesys IDE. OpenPLC Runtime and taking notes on what makes each software/IDE unique compared to one another.

10. Proposed Advisor

I propose Dr. Ir Tutuko Prajogo, M.S.Mfg.E, and Dipl.-Ing Maralo Sinaga as my advisor and co-advisors for my proposed thesis

References

1) Vadim, "What is PLC? programmable logic controller," *unitronics*, 07-Mar-2023. [Online]. Available: https://www.unitronicsplc.com/what-is-plc-programmable-logic-controller/. [Accessed: 28-Mar-2023].
2) "1.1 OpenPLC Overview," *Página inicial*. [Online]. Available: https://openplcproject.com/docs/openplc-overview/. [Accessed: 28-Mar-2023].
3) G. Magee, "What is Modbus?: Industrial IOT Data Platform," *Open Automation Software*, 01-Dec-2021. [Online]. Available: https://openautomationsoftware.com/blog/what-is-modbus/. [Accessed: 28-Mar-2023].
4) "What is Modbus TCP/IP description & white paper," *Acromag*, 09-Jan-2023. [Online]. Available: https://www.acromag.com/modbus-tcp-ip-for-ethernet-i-o/. [Accessed: 28-Mar-2023].
5) "Research guides: Organizing academic research papers: Types of research designs," *Typesof Research Designs - Organizing Academic Research Papers - Research Guides at Sacred Heart University*. [Online]. Available: https://library.sacredheart.edu/c.php?g=29803&p=185902#s-lg-box-wrapper-626730. [Accessed: 28-Mar-2023].
6) "IT Explained: Modbus," *Paessler*. [Online]. Available: https://www.paessler.com/it-explained/modbus. [Accessed: 28-Mar-2023].
7) "What is OPC Unified Architecture (OPC UA)?," *Software AG*. [Online]. Available: https://www.softwareag.com/en_corporate/resources/iot/article/opc-ua.html. [Accessed: 28-Mar-2023].
8) "Open Platform Communication Unified Architecture (OPC UA)," *OPC Foundation*, 26-Sep-2019. [Online]. Available: https://opcfoundation.org/about/opc-technologies/opc-ua/. [Accessed: 28-Mar-2023].
9) "The 3 benefits of the Modbus RTU/TCP protocol," *Webdyn*, 25-Nov-2021. [Online]. Available: https://www.webdyn.com/radio-articles/the-3-benefits-of-the-modbus-rtu-tcp-protocol/. [Accessed: 28-Mar-2023].