

**INTERNATIONAL UNIVERSITY LIAISON INDONESIA**

BACHELOR’S THESIS

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

By

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**11201902005**

In Partial Fulfillment of the Requirements for the Degree of

Sarjana Teknik

In

MECHATRONICS ENGINEERING

FACULTY OF ENGINEERING

BSD City 15310

Indonesia

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**APPROVAL PAGE**

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgment is made in the thesis.

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**ABSTRACT**

Modbus TCP Protocol is one of the protocols which it is applicated in many industrial applications systems that are used to make a system communicate with one another. One of the uses of this Modbus TCP protocol is acting as the bridge of communication between a Programmable Logic Controller (PLC), Human Machine Interface (HMI), the controlled machine, and the integrated development environment (IDE).

The term of the PLC IDE that can work with the Industrial Standard is often associated with exclusive or expensive software/equipment. This can be a challenge for the first-time learner for the new generations of automation engineers learning the basics of automation programs.

This paper aims to compare two of the most popular, free-to-use programmable logic controller IDE that is popularly used to connect with the Modbus TCP Protocol. Codesys and OpenPLC are the two software that is popular in terms of making industrial automation programming system. Both are also capable of establishing a Modbus communication that let IDE, Human Machine Interface (HMI), PLC, and the automated machine communicate with each other by using an ethernet-based network.

This paper will provide a comprehensive analysis of the two IDEs, including their advantages and disadvantages, to help readers make an informed decision when selecting an IDE for their automation program and their integrated development through the Modbus protocol

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DEDICATION

I dedicate this thesis to my parents. Without their patience, understanding, support, and most of all love, the completion of this work would not have been possible.

ACKNOWLEDGMENTS

I wish to thank my committee members for their support, patience and good humor. Their gentle but firm direction has been most appreciated. Dr. xxxxxx was particularly helpful in guiding me toward a qualitative methodology. Dr.[[1]](#footnote-1) yyyyyyy interest in sense of competence was the impetus for my proposal.

Finally, I would like to thank my major professor, Dr. zzzzzzzz. From the beginning, he had confidence in my abilities to not only complete a degree but to complete it with excellence.

I have found my coursework throughout the Curriculum and Instruction program to be stimulating and thoughtful, providing me with the tools with which to explore both past and present ideas and issues.

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LIST OF SYMBOLS

CHAPTER 1

# INTRODUCTION

* 1. **Background**

The Manufacturing Industry in the 21st century relies on certain things. The combination of substantial human resources, computer-oriented integration, and automation. Making the manufacturing operation a sustainable and optimized operation in the company. The main backbone for the machine to be able to be working as it was intended to is the Automation Scripts that run in the background.

There are many varieties of software that can be used in order to make the automation scripts that were used in the industrial-grade standard. Such as the Totally Integrated Automation Portal (TIA Portal), Control Development System (Codesys), CX-Programmer (Omron), etc. However, not all of this software came in handy when it comes to being used by a first-time learner of the programmable logic controller (PLC). It is always for some reasons like it’s not open to the public, or it is way too expensive to be purchased in the first place which is not suitable for learning it the easier way. In this case, an alternative integrated development environment (IDE) is needed to compensate for such a requirement.

* 1. **Objective of this Thesis**

The objective of this thesis research is to find out which software is the better alternative IDE for making the automation program. In this case, is a comparison between two free-to-use software. The Control Development System (Codesys) developed by the Codesys Group and OpenPLC developed by the OpenPLC Development Group.

* 1. **Research Purpose of The Thesis**

The purpose of this thesis research is to make a clear difference between free-to-use software that is used in the development of making automation scripts which in this case is the Ladder Diagram/Ladder Logic Diagram (LD/LLD). Although it might be seeming that it has no difference between software usage. But it can be challenging when it is executed, especially when facing difficulties in certain software and its application when applied to real-world manufacturing machinery.

This also aims to help the new engineers/students that might be interested in the automation programming system but might find it challenging when it comes to choosing which is the first software that can be used for first-time learning. Counting from user-friendliness, easiness to use, documentation of the software, and community support.

* 1. **The Scope of the Thesis**

The following is the scope of comparing the Control Development System (Codesys) and the OpenPLC

Codesys and OpenPLC are both IDE for making Ladder Logic Diagrams. This thesis would include the overview perspective from the both IDE and the Modbus TCP protocol. Comparison between their feature

* 1. **The Limitations of The Thesis**
* All of the Factory Simulation would be done in the FactoryIO simulation software and using a custom scene based on the Advanced by Height Scenario.
* The Codesys PLC would be simulated by using the Codesys Control WinV3 x64 virtual PLC and the OpenPLC using the OpenPLC runtime virtual PLC.s
* Communications between the IDE and the FactoryIO would be strictly limited to the Modbus TCP Master/Slave (Server/Client) protocol.

CHAPTER 2

# LITERATURE REVIEW

1. [↑](#footnote-ref-1)