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**Creating Laboratory Exercises for Telecommunications Course using VAMP
Relay Feeder Managers 257**

Faculty: Information Technology

**University of Applied Sciences, Vaasa
Finland**

I would like to dedicate this thesis to my dearest Dad

Syed Riaz Hussain (Baba Ji)

Foreword:

This thesis is written after the completion of my final project at the Technobothnia Research Centre Vaasa, Finland. This document can be used for the basic structure of IEC61850 standard and the VAMP Relay Feeder Managers 257.

During this whole project, there were many people who supported and helped me. First of all I would like to thank Almighty God, Who gave me strength to accomplish this task, my parents Syed Riaz Hussain (dad) and Shahida Riaz (mother) for their help, support and prayers all the way in finishing my studies at this institution. After that, I would like to thank Mr. Smail Menani who trusted in me and accepted me to take part in the completion of this task, Mr. Olavi Vahamaki (R&D Director VAMP), who was really helpful by all means, Mr. Antti Virtanen and Mr. Jukka Matila for always responding to any help required, my team members Wu Liang and Peng Xin, who were my support in completing this task.

Last but not the least, I'm thankful to my sisters Nadia, Aamna and Sana, my brother Ali, my friends Ali Yasser Khan, Waqas Butt, Hilal Butt, Rizwan Ahmad, Sanjeeb Karki, Ali Asghar and Khurram Shahzad for their love and support during my time of stay at Vaasa (Finland).

Riaz, Syed Ahmed

Abstract:

Author: Riaz, Syed Ahmed

Title: Creating Laboratory Exercises for Telecommunications Course using VAMP Relay Feeder Managers 257

Year: 2010

Language: English

Pages: 32

Name of Supervisor: Dr. Smail Menani

This document provides the information of creating pre-laboratory work for a telecommunications course using a VAMP Relay Feeder Manager 257. My part of the project is to study the complete standard IEC61850 and then use it to create pre-laboratory work, which includes instructions concerning the laboratory works and create questions out of those instructions. This will help the students to understand the devices and the practical work to be accomplished during the laboratory. In addition to that my part also includes the technical documentation i.e. creating the laboratory instructions which will be used while performing the practical work and pre-laboratory instructions which will be used by the students before performing the practical work.

Keywords: Telecommunications Laboratory, IEC61850, VAMP Relay Feeder Managers257, GOOSE

Abbreviations:

ACSI	Abstract communication service interface
ANS.1	Abstract Syntax Notation One
GoCB	GOOSE control block
GOOSE	Generic object oriented substation event
GSE	Generic substation event
GSSE	Generic substation state event
IED	Intelligent electronic device
LD	Logical device
LLN0	Logical node zero
LN	Logical node
LPHD	(Logical) Physical device
MMS	Manufacturing Message Specification
PhD	Physical device
SA	Substation automation
LED	Light Emitting Diode

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Chapter 1:

Thesis Overview:

1.1. Introduction:

Relay Feeder Managers are being used worldwide in order to facilitate the automation of a substation. The utilities offered by Substation Automation system are the reason of rapid increase in the SA. A product of embedded engineering, which involves different fields of Information Technology, is no doubt a very complex invention, providing enormous benefits to the concerned field. It has been enhanced further on the bases of Supervisory Control and Data Acquisition (SCADA) system, with appended capability of bringing more improvements in operations, efficiencies and maintenance within an SA system. Another important feature of an SA system is Intelligent Electronic Device (IED). SCADA monitoring functions, (prior to the advent of microprocessor-based-multi-function Intelligent Electronic devices) were limited. A single IED replaces the traditional panel of electro-mechanical relays with internal and external wiring by integrated relay logic.

The main scope of this research is to create laboratory exercises based

upon the use of VAMP Relay Feeder Managers. In those laboratories, the upcoming students will learn the use of these devices practically.

1.2. Aim of This Research:

The University of Applied Sciences, Vaasa, Finland, aims to enhance the capacity of its students beyond the theoretical knowledge by practically involving them into the laboratory works using real devices. The main aim of this research involves preparing a laboratory course work based upon IEC 61850 and the VAMP Relay Managers. The testing of IEC 61850 using the VAMP Relay Managers will provide a platform to document different tasks for the upcoming students of this institution, allowing them to get equipped with essential tools used in this technology. A team of three group members have been chosen to accomplish this task, all with different milestones. My area of the research emphasizes on the testing of Generic Object Oriented Substation Event along with the configuring the devices using VAMPSET. The documentation afterwards will be used as instructions to be applied during the lab work.

1.3. Structure of the Project:

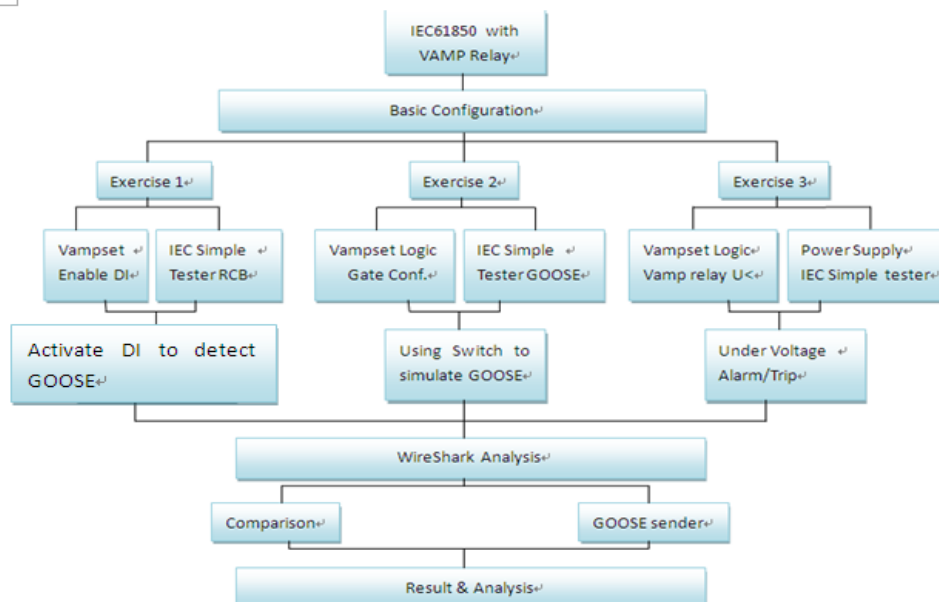


Figure1: Illustration of the project structure.

Figure 1 illustrates the whole research structure. From the top it starts with the name of the project which then leads it to the basic configuration of the VAMP Relays. These basic configurations include powering on the device, entering the password using front panel, giving the logical address to the device etc. Then it splits into three major portions named as Exercise 1, 2 and 3. In the first lab exercise we gave an idea of how to use this device locally and remotely. Further more, in this first exercise, we gave a detailed introduction to the soft wares that are used to control the devices. Later, the concept and procedure all three exercises is given in chapter 5.

1.4. Research Methodologies:

To start with, the most important and time consuming part of this research involves a complete and detailed study of IEC 61850 standard. The documentation of the standard is provided to us by the University in this regard. After the completion of this task, the VAMP Feeder Relay Managers are to be examined and to be get familiarized in every way, which includes different parameters of measurement within the device, the hardware description and finally the software used to configure and control different functions of the relay managers. The third and final step in this study will be the formation of different laboratory exercises for the students, along with pre-laboratory instructions and exercises.

1.5. Organization of Thesis:

Chapter one gives a brief introduction regarding the research. Chapter 2 will give details about the basics of IEC 61850 standard. Chapter 3 introduces the VAMP Relay Feeder managers and the software used to configure and control the devices. Chapter 4 gives a detailed view of Generic Object Oriented Substation Event (GOOSE). In Chapter 5, the accomplished lab works and the criteria used to integrate theory into practical is discussed in detail. Finally in Chapter 6 the conclusion and the future prospects regarding this study are discussed.

1.6. Conclusion:

This chapter gives a detailed vision of the whole project. It briefly explains the background of IEC61850 standard in the introduction and then gradually states the scope of this project. This chapter involves the overall organization of this whole thesis. The structure of the project defines graphically the goal of this study and then the aim of research states the need and background of this project. This chapter also includes the methods used to accomplish the task and finally explains the organization of thesis.

Chapter 2:

The IEC 61850 Standard:

2.1. Introduction:

The purpose of this chapter is to provide a detailed view about the concepts used in IEC 61850 standard. It is important to understand the basic mechanism of this standard before going deeper into the research. This chapter discusses the different features used in this standard and their interoperability. The understandings of this chapter have been conceived from the standard documentation itself and this chapter emphasizes on the communication parts only.

2.2. Background of IEC61850 Standard:

The SCADA functions were all centralized and were limited only to major operations such as; monitoring of circuit loads, control of circuit breakers etc. This means that the disturbance recording whenever available was limited and was local to the substation. At this moment such a system was required which could provide a platform of sharing information among the different devices of the whole substation not only limited to the local panel but also operable remotely.

After the advancement of IED's it became possible to add more functionalities into fewer devices which not only reduced the wiring of the whole system, but due to communicating capabilities of IED's more information could be available remotely. This whole process reduced the man power, in other words, less visits to the power station. To integrate these IED's into a single substation two protocols were emerged; Distributed Network Protocol 3.0 (DNP 3.0) and IEC 60870.

In the middle of 90's, the EPRI released a more advanced standard known as Utility Communications Architecture (UCA). This standard brought new horizons for the future substation automation. Less wiring and engineering were required, providing higher level integration schemes to the devices working within an SA system. This standard was actually a precursor of IEC61850. The need of more advancement in this standard triggered International Electrotechnical Commission to (IEC) to work on creating more advanced and higher level communication protocols. IEC61850 brought a higher level of integration between IED's, digital exchange of information, plug-and-play functionality and many more advantages. This standard was the next generation SCADA protocol.

2.3. IEC61850 Basic Structure:

The basic structure of IEC61850 is the most important aspect of this standard. The object model defines the mechanism of the organization of the data within a device working in an SA.

Following figure gives a basic idea about the defined data model structure in IEC61850:

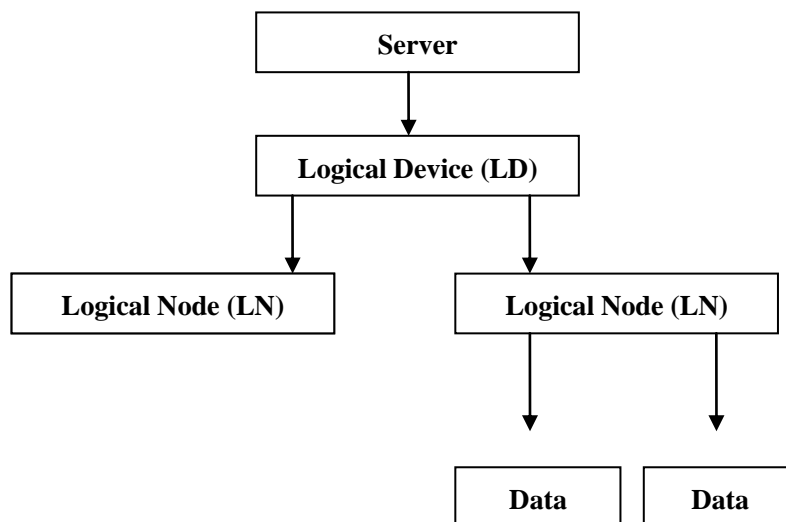


Fig.1 Basic Structure of IEC 61850 (Conceived from the documentation of the IEC61850 Standard)

2.3.1. Basic Components:

In the figure above, a *Server* which connects the network i.e. Ethernet or any system network and the devices along with their functions. A *Logical Device* presents functions that are to be performed by a Physical Device. One physical device may have multiple Logical Devices working in it. The *Logical Node (LN)* is one of the important objects within the IEC 61850 standard. LN's are a virtual representation of the basic functions within an SA system. Functions are devices which are attached to an IEC, e.g. a circuit breaker or phase angle measurement. The IEC 61850 standard defines standard LN classes for most of the basic devices within an SA system. The standard also defines rules to extend the available defined LNs. Finally the **Data** is the base of the IEC 61850 standard. Data is also modelled in an object oriented approach. Apart from the data the object represent they also hold information regarding the reliability of the data they contain.

2.3.2. Physical Device Illustration:

Before going deeper into different functions of the standard, at this point it is important to give a view of a Physical Device, which holds the Data Objects of a Logical Node. Figure 1.2 gives an idea about different data objects which operate within a Physical Device that consists of one Logical Device.

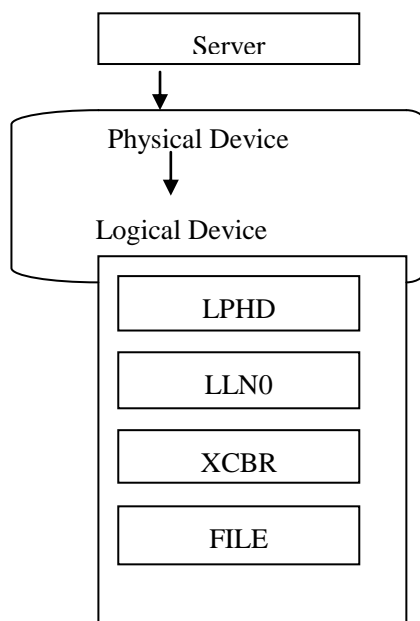


Figure2: Illustration of a Physical Device (Conceived from the documentation of the IEC61850 Standard)

In figure2 the Server is connected to a Physical Device. Within a physical device, a logical device is operating. Inside that logical device, there are different logical nodes.

LPHD refers to the Logical Physical Device, which is a logical node used to fetch information of the physical device from the IED.

LLN0 is another logical node which refers to different network operations. It includes Goose/GSSE Control Blocks, logs, setting group control block and Sampled Values Control Block.

XCBR refers to the Circuit Switch Breaker.

File is the data contained by a specific LN.

2.4. Communication in IEC61850:

The most important feature of IEC61850 is its communication stack. This stack is a set of different protocols working together. Part 8-1 of

IEC61850 explains the mapping technique of this standard onto MMS and the Ethernet. Following figure gives a view of protocol stack defined in IEC61850:

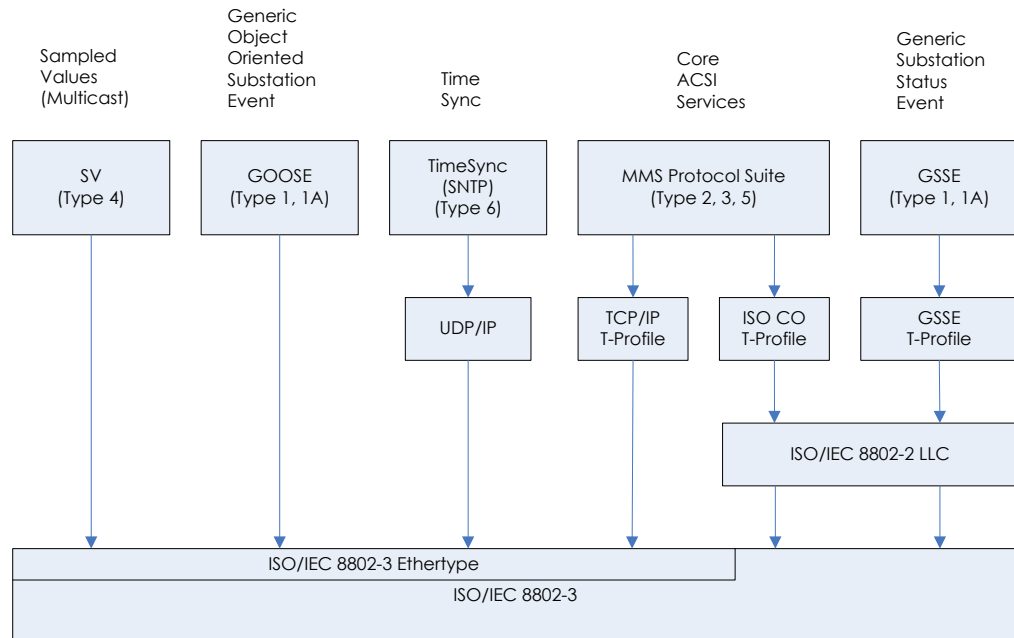


Figure3: Protocol Stack (Source: IEC-61850 Part 8-1)

Figure 3 explains the general structure of the communication stack of IEC 61850. The basic communication services are mapped to the MMS, which includes the configuring or monitoring of the devices. The term “Type” is used in the figure to elaborate different types of the messages. It is very clearly seen that the GOOSE messages are directly mapped onto the Ethernet, without involving any other protocol. This depicts that the type of GOOSE message is fast messages sent within a network, which includes “trip” as well. MMS on the other hand is mapped either on TCP/IP or ISO CO Protocol. The reason of choosing GOOSE in this standard is due to the slow nature of MMS protocol. The time synchronization is also a time critical message, which is why it is only mapped to UDP/IP and then to the Ethernet. The mapping of sampled values on Ethernet is explained in Part 9-1 and 9-2 of the standard IEC61850.

2.5. Conclusion:

This chapter introduces the basic structure of the IEC 61850 standard. All the information gathered from the documentation, regarding the structure of the

standard IEC6180 is explained using figures. It also discusses the protocol stack of this standard and gives the basic mapping techniques of the standard.

Chapter 3:

Introducing Equipments:

3.1. Introduction:

This chapter will give an introduction about the hardware and the software used to accomplish this research. It starts with an overview list of the equipment used and then states their functions.

3.2. List of Equipment:

- 1) Two VAMP Relay Feeder 257 Managers
- 2) CentreCOM MR820TR (Hub)
- 3) VAMPSET (Software to configure VAMP Relay Managers)
- 4) IEC 61850 Simple Tester (Software used to test the configurations of Relay Managers)
- 5) GOOSE sender (Software used to send/generate GOOSE messages across the network)

3.2.1. Vamp Relay Feeder Manager 257:

The core device used in this whole project Vamp Relay Feeder Manager 257 is a device that is being used already in different power stations. This device supports the IEC 61850 standard which is the reason of using it in our research. VAMP Feeder Manager 257 has a lot of features which are useful in substation automation. Some major features of this device are given below:

- 1) Comprehensive Measurements
- 2) Power Quality Assessment
- 3) Fault Location
- 4) Arc-Protection
- 5) Variety of Communication



Fig1. Vamp Relay257 Feeder Manager (<http://www.infotech.pl/files/VAMP257.gif>)

In our project, after understanding the idea of IEC61850, this device gave us a view of practical implementation of that standard. The feeder manager is used in the power substations to ensure the protection of the whole system. This device has enormous functions which can be used inside a substation system. For instance, if there is an over current detected inside a power station, this device has the ability to break the circuit at that specific point and alarm the administrative authorities about the failure. This device can be configured

locally, by using functions given at the front panel, as well as remotely. It uses two interfaces to connect to a SCADA system remotely; Ethernet and RSR232. These interfaces are used to configure and control the devices remotely within a network.

The rear panel of this device has different sorts of inputs, such as Digital Inputs. Actually this rear panel is used to connect the relay feeder to the different sources of the power substation.

3.2.2. CentreCOM MR820TR:

This device is known as an active hub. In our project, as we are using two relay feeder managers in a single network, therefore we need this device to connect the two relays and a laptop to it. This way we can analyze the traffic travelling not only between the laptop and the relay, but also the communication between the relays.

This device can connect eight IEEE 802.3 10 Base T network segments in one unit.

3.2.3. VAMPSET:

As previously mentioned the relay feeder managers are controlled and configured remotely, for which we need software, which will allow the applications from within the relays and the laptop to communicate. VAMPSET is the software chosen for this project. This software has is compatible to the device itself, as it has been invented by the same vendors as the Relay being used in this project. VAMPSET includes all the standard parameters and features that Relay Manager software must have. For instance, connecting to the device and then configuring it in real time, then observing the current status of the devices, including logics and harmonics of different measuring parameters. This software makes the relay to be used remotely. The figure below shows the publisher parameters of Goose Control Block 1 in VAMPSET. The red marked “enabled” refers to the change made by the user and the data has to written on the device.

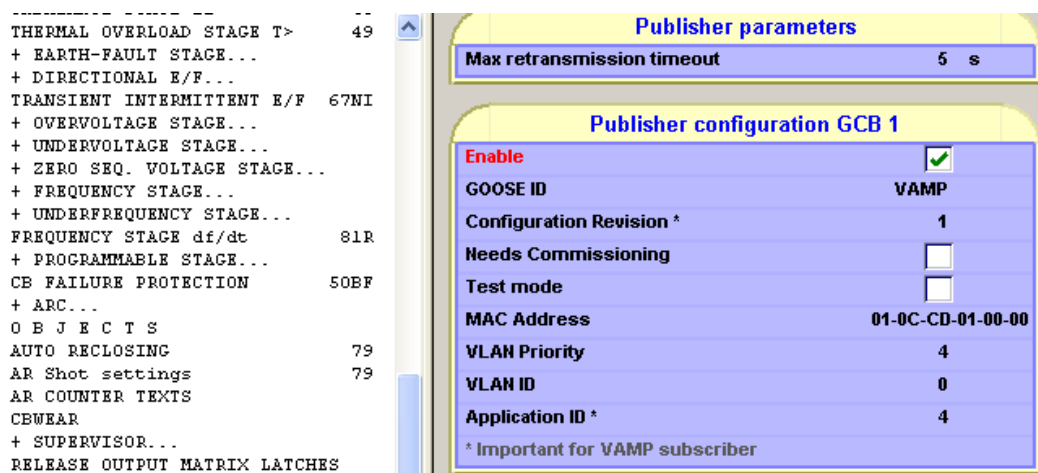


Figure 2: VAMPSET Demonstration (Source: Taken during the project)

The left hand side of the figure shows some the different features supported by VAMPSET.

3.2.4. IEC 61850 Simple Tester:

After configuring the relay using VAMPSET or the local panel, it is very important to check the configurations if they work properly or not. To test the configurations we have used IEC61850 Simple Tester. This tester takes the information from the connected device, read the enabled logical nodes and responds accordingly. This software takes the logical address of the device and connects to it. The following figure shows a demonstration of IEC Simple Tester, which is connected to the device with the logical address of 192.168.65.3. We see four major features in this software, the “read” block, “control” block, “report” block and the “GOOSE” block. This software fetches the information and shows the output in real time. We can choose different logical nodes in order to see their values in the device.

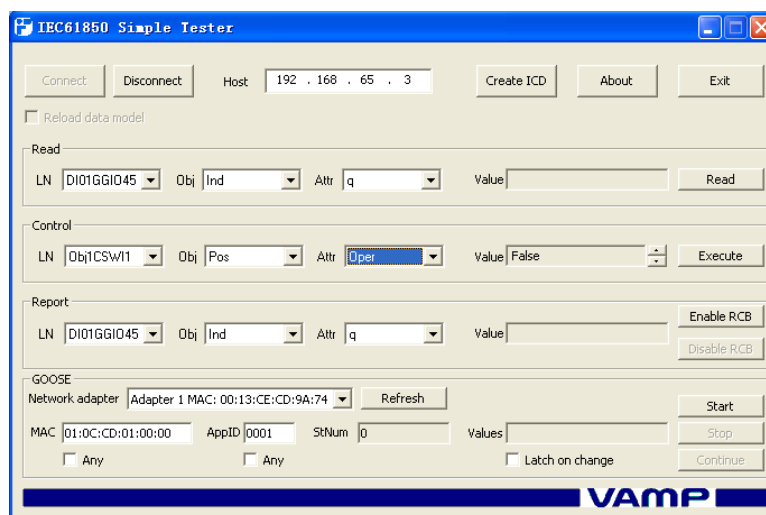


Figure3: Demo of Iec61850 (Source: Captured during the project)

This tool helps to observe the configurations made by the user and given a variety of many other functions.

3.2.5. GOOSE Sender:

To check if the devices are properly configured for a publishing and subscribing a GOOSE message, software called GOOSE Sender is used. This small software uses the MAC address of the SCADA system in order to get connected. Once this software is connected to the system, it generates a message which is responded by the GOOSE Control Block of the relay. This whole process can be analyzed by using Ethreal Network Analyzer. The following figure illustrated the idea of a connected GOOSE sender, which states the destination and the source MAC addresses, Logical Node, the enabled features of the device and the application identification number for GOOSE.

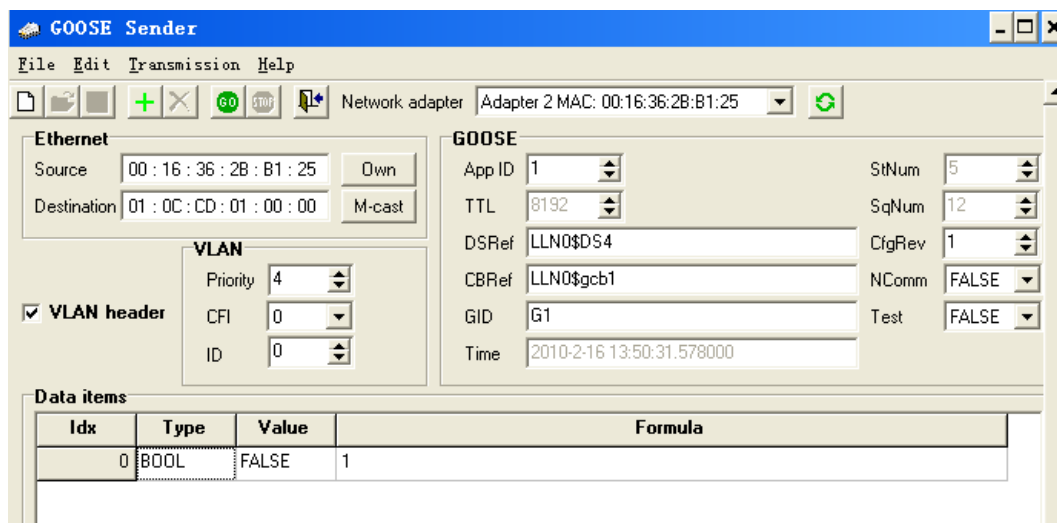


Figure 4: GOOSE Sender Demo (Source: Captured during the project)

Later on in this project, GOOSE sender is used to compare the results with originally generated GOOSE messages by the devices.

3.3. Conclusion:

This chapter gave a detailed introduction to the devices used during this project. It starts with an overview list of the devices and software finally explaining them later. It also includes the figures to demonstrate the main idea of the equipment.

Chapter 4

GOOSE (Generic Object-Oriented Substation Event)

4.1. Introduction:

The Generic Object-Oriented Substation Event is the most important feature of IEC61850 standard. This protocol is responsible to publish the time critical messages within the network. As discussed earlier in Chapter 2, the GOOSE is directly mapped onto the Ethernet, which makes it fast and efficient. GOOSE works on a publisher/subscriber model, which means that the devices, which have subscribed for this service can send and publish it. IEC6150 part 8-1 defines the mapping and the syntax of the GOOSE message. This protocol uses ASN.1 encoding scheme which is later in this chapter described and was a major part of this study.

In simple words, GOOSE acts as a rescue manager for the devices configured for this service. Whenever there is a fault, which may be an over voltage problem, current leaking situation or alarm trip fault, this device will act as a manager to a specific device facing such a fault. GOOSE actually has the ability to break a circuit switch, only if configured, if no GOOSE if configured, there will be no safety for any device in a specific network.

4.2. Managing GOOSE:

In order to manage a GOOSE message, the standard defines a separate block

named as GoCB (GOOSE Control Block). This block is a part of LLN0, of any logical device. This block holds different attributes which are defined in the standard and are given as follows:

Attribute name	Attribute type	FC	TrgOp	Value/value range/explanation
GoCBName	ObjectName	GO	-	Instance name of an instance of GoCB
GoCBRef	ObjectReference	GO	-	Path-name of an instance of GoCB
AppID	VISIBLE STRING65	GO		Attribute that allows a user to assign a system unique identification for the application that is issuing the GOOSE. Default GoCBRef
GoEna	BOOLEAN	GO	dchg	Enabled (TRUE) disabled (FALSE)
DatSet	ObjectReference	GO	dchg	
ConfRev	INT32U	GO	dchg	
NdsCom	BOOLEAN	GO	dchg	
Services SendGOOSEMessage GetGoReference GetGOOSEElementNumber GetGoCBValues SetGoCBValues				

Table1: Definition GoCB (Source: IEC61850 7-2)

The services defined in table1 can be modified as per requirements of the control block for a specific device/s. These services have to be configured properly in order to manage the GOOSE message.

4.3. GOOSE on Network:

Part 8-1 of IEC61850 standard states the mapping of GOOSE directly onto the Ethernet. MMS being slow in its nature which is why GOOSE has to be mapped directly on to the physical layer (Ethernet). There are however some services of GOOSE which use mapping to the MMS, which include the reading and writing the GOOSE settings to the device. The attributes of these services are “*GetGoCBValues and Set GoCB Values*”. The standard defines the application and the presentation of a GOOSE message within the standard. Table 2 defines the mapping scheme of a GOOSE message as defined in the standard:

OSI model layer	Specification		
	Name	Service specification	Protocol specification
Application	GSE/GOOSE protocol	As defined in IEC 61850-8-1	
Presentation	Abstract Syntax		
Session			
Transport			
Network			
DataLink	Priority Tagging/VLAN	IEEE 802.1Q	
	Carrier Sense Multiple Access with collision detection (CSMA/CD)	ISO/IEC 8802-3:2001	
Physical (option 1)	10Base-T/100Base-T	ISO/IEC 8802-3:2001	
	Interface connector and contact assignments for ISDN Basic Access Interface.	ISO/IEC 8877:1992	
Physical (option 2)	Fiber optic transmission system 100Base-FX	ISO/IEC 8802-3:2001	
	Basic Optical Fibre Connector	IEC 60874-10-1, IEC 60874-10-2 and IEC60874-10-3	

Table2: Mapping scheme of GOOSE message onto Ethernet (Source: IEC61850 Part 8-1)

As defined at the presentation layer, a GOOSE message uses Abstract Syntax Notation (ASN.1) format.

GOOSE frame as defined in the standard can be seen in Annex A. However the decoding of a GOOSE message is explained in Chapter 6 Exercise 3.

4.4. Conclusion:

This chapter starts with an overview of GOOSE protocol and gradually deepens the use of GOOSE in IEC61850. It describes the mapping of a GOOSE message and states the services provided within a GoCB. Annex A of this document states the frame of a GOOSE message.

Chapter 5

Integration of Theory into Practical Work

5.1. Introduction:

This chapter provides the information of how to use theory (described in the previous chapters of this document) in practice. In order to achieve the core objective of this research, such a practical work should be created which includes the basic theoretical structure of the VAMP Relay Feeder and utilizing that theory into practice. That is why; the laboratory instructions have two different parts;

- 1) Pre-Laboratory Works
- 2) Laboratory Works

Above mentioned instructions are explained in detail later in this chapter. In total, three laboratory exercises have been created using the documentation of the standard IEC61850, the software and the device itself. The first exercise introduces the very basic knowhow about the physical connections and some very basic configurations of the device using the front panel on VAMP Relay and using VAMPSET. The second exercise is designed in a complex way, which includes an enhanced level of configurations yet the same physical connections. In the third and final laboratory, the alarm/trip feature of the Relay is utilized including step by step configurations at a higher level as compared to the previously designed labs.

5.2. Preliminary Laboratory Works:

5.2.1. Preliminary Laboratory Exercise 1:

In the first laboratory exercise, the main aim is to give a very basic introduction to the device and the features used to configure and control the device locally and remotely. This means that in the preliminary exercise, students should be given such material which provides them the basic functionality and usage of the device. Furthermore, the introduction to the key software VAMPSET must be kept in mind as well. The chosen instructions for this exercise include the basic functionality of the VAMP Relays, which includes the arc-protection mechanism, the software used to configure and then test the configurations and most importantly the physical connection details.

The preliminary exercise involves some questions as well, which are to be answered by the students before coming to laboratory by reading the instructions provided to them before laboratory works. In the first exercise following questions have been chosen:

1. What is a relay and what is the different between a relay and a relay feeder manager?
2. Briefly describe the arc-protection mechanism.
3. Which software is used to configure the VAMP relays?
4. How can the configurations be tested?

As it can be seen from the questions above, the first exercise is made in a very simple way. In the coming laboratories, there will be more complex steps which will enhance the understanding level of the students.

5.2.2. Preliminary Laboratory Exercise 2:

This laboratory is designed to introduce an important feature of the IEC61850 standard, implemented in VAMP Relay. GOOSE, discussed earlier in this document is the main feature of lab exercise 2. In this laboratory the preliminary

exercise contains detailed information about GOOSE message, the IEC standard itself and the equipments to be used during the practical work. The Chapter 2 and Chapter 3 of this document are used as instructions in lab 2. This lab gives a general concept of a GOOSE message which includes usage of GOOSE, why is it important and how is it mapped onto the Ethernet level etc. Following questions were chosen for preliminary exercise:

1. What are differences between MMS and GOOSE protocols?
2. How is GOOSE message transmitted?
3. What encoding scheme is used by a GOOSE message?
4. Why GOOSE message is chosen for the protection Relay.

To answer above questions, students will have to get a general concept of the standard IEC61850, which is described in the instructions that they will use before performing the practical work.

5.2.3. Preliminary Laboratory Exercise 3:

The final laboratory is designed exactly for the protection mechanism used in protection relays. The measuring parameter used in this laboratory is under voltage ($U <<$). This factor triggers an alarm/trip in the relay when the current limit does not meet the minimum range of the current as configured in the relay. This step is met through a very careful frame of configurations described in the Lab instructions for Lab3.

5.3. Conclusion

This chapter gave an overview of the laboratory works created and the pre-laboratory works created for the students. This chapter also gives an overview of the theoretical part used in different laboratory exercises.

Chapter 6

Conclusion:

As proposed, the required objective of this project has been successfully achieved within the time frame. The created laboratories have been tested by all three different team members themselves and a fresh student as well. In addition to the laboratory instructions, the pre-laboratory instructions have also been created which will help the students to get more knowledge about their works before they perform the laboratory.

In the beginning, to determine the standard or the complexity of the exercises was a bit tricky as it was my first time to study and practically use the devices and the standard IEC61850, however as progress took place, the success became obvious. The three laboratories have been tested several times and demonstrated in front of different teachers as well, which can guarantee its reliability.

The pasture of created laboratories is maintained in such a way that it starts with the very basic configurations of the Relays and then gradually creates and solves relatively complex problems for the practical work made for the students.

. As in University of Applied Sciences Vaasa, it is the very first time that IEC61850 standard and the VAMP Relays are being introduced, which makes me and my team members the pioneers for introducing the devices in our institution.

Future Prospects:

The direct beneficiaries of this research are the upcoming students, who will use the created laboratory work to further their knowledge regarding the power automation features. In addition to that, this research is also beneficial to the concerned teachers who will use it in their subjects.

This research will also be a part of the future developments to be made regarding VAMP Relays or standard IEC61850. Already a fresh student has continued to further the scope of this research in our institution and is being directed by me and the team members. Furthermore this study can be used for many other upcoming students who are interested in the field of power automation systems.

References:

- 1) IEC Standard from Part 7-9
- 2) User Manual for VAMP Relay Feeder Manager257
(<http://www.vamp.fi/In%20English/Products/Protection%20relays/VAMP%20257%20Feeder%20and%20motor%20manager/Default.aspx>)
- 3) IEC6180Standard
(<http://www.scribd.com/doc/9404482/IEC-61850-a-Practical-Application-Primer-for-Protection-Engineers>)
- 4) <http://www.gedigitalenergy.com/multilin/journals/index.htm>