Configuration Tool for Commissioning of Automation Products

Submitted By Dhara Kakadiya 16MCEC07



DEPARTMENT OF COMPUTER ENGINEERING INSTITUTE OF TECHNOLOGY NIRMA UNIVERSITY

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Configuration Tool for Commissioning of Automation Products

Major Project

Submitted in fulfillment of the requirements

for the degree of

Master of Technology in Computer Science and Engineering

Submitted By Dhara Kakadiya (16MCEC07)

Guided By Prof. Jigna Patel



DEPARTMENT OF COMPUTER ENGINEERING INSTITUTE OF TECHNOLOGY NIRMA UNIVERSITY AHMEDABAD-382481

MAY 2018

Certificate

This is to certify that the major project entitled "Configuration Tool for Commissioning of Automation Products" submitted by Dhara Kakadiya (16MCEC07), towards the fulfillment of the requirements for the award of degree of Master of Technology in Computer Science and Engineering of Nirma University, Ahmedabad, is the record of work carried out by him under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination. The results embodied in this major project part-II, to the best of my knowledge, haven't been submitted to any other university or institution for award of any degree or diploma.

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Dr Alka Mahajan Director, Institute of Technology, Nirma University, Ahmedabad I, Dhara Kakadiya, 16MCEC07., give undertaking that the Major Project entitled "Configuration tool for Commissioning of Automation Products" submitted by me, towards the fulfillment of the requirements for the degree of Master of Technology in Computer Science & Engineering of Institute of Technology, Nirma University, Ahmedabad, contains no material that has been awarded for any degree or diploma in any university or school in any territory to the best of my knowledge. It is the original work carried out by me and I give assurance that no attempt of plagiarism has been made. I understand that in the event of any similarity found subsequently with any published work or any dissertation work elsewhere; it will result in severe disciplinary action.

Signature of Student Date: Place:

> Endorsed by Prof. Jigna Patel (Signature of Guide)

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> - Dhara Kakadiya 16MCEC07

Abstract

The actual goal of this tool is to configured the energy data from substation. This tool is connected with automation product RTU (Remote Terminal Unit). Basically, RTU is communication gateway between field and master location. RTU is connected with different sensors, meter and actuators. This configuration tool is provided customize menu as per user requirement. This tool is easy to handle, reliable and cost efficient. Using proprietary protocol to establish communication with Tool and RTU. This tool configured real time data and store log data in csv and xml file system. If any crisis and fault happened then easy to take care with stored file data.

Abbreviations

AI	Analog Input.
CPC	Central Processing Card.
\mathbf{CSV}	Comma Separated Values
CRC	Cyclic Redundant Checksums
DI	Digital Input
DO	Digital Output
IDE	Integrated Development Environment
PCB	Programmable Logic Control
RTU	Remote Terminal Unit.

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Introduction

In automation era, day by day technology increases and easy to catch up the goal. The basic purpose of this project is to design the tool that handle requirement easily with less effort. Tool is used for configuring the data of substation. This tool is based on hardware and software. This tool is connected with automation product RTU (Remote terminal Unit). This tool provides customized menu then this tool also can be used for nuclear power plant, water wastage, gas refining and transport system.

Basically, this tool communicates with RTU which configure required data. For this tool proprietary protocol has been designed for communication purpose. This tool provides facility to visualize entire communication with controlling, gathering and monitoring. This tool has been designed using Microsoft visual win form and implemented in C#. Device data is stored in DataTable. DataTable is in memory so this data is stored in csv and xml file system for future use. when any fault and damage occurs then it can easily retrieve that data from csv and xml file. Designed proprietary protocol for tool and device communication interface. Protocol designs set of rules for transmitting parameters data between tool and automated product RTU.

1.1 Remote Terminal Unit

This project is discussing about Automation product RTU (Remote Terminal Unit). RTU is located on field and take data from substation. The main function of RTU is to collect all data from substation digitized them and send to configuring Tool through the communication interface. RTU plays crucial role in substation automation. It consists different types of sections that can handle various types of field parameters. Actual goal of RTU is possessing to monitor electrical data such as voltage, current, temperature from the input line to transmit data to master tool. RTU is communication gateway. We can set logic as per requirement.

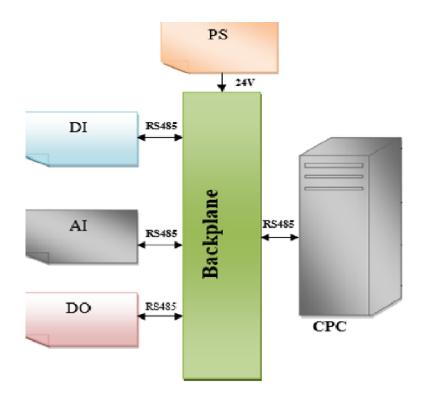


Figure 1.1: RTU

RTU has 9 slots. Each slot has different card i.e., AI (Analog Input), DI (Digital Input), DO (Digital Output), CPC (Central Processing Card) and power supply as shown in Figure 1.1. Power supply card is responsible to generate and provide require power to every card. CPC is the main processing board of this unit. It controls all the cards. It takes data from input cards and sends data to output card. CPC has great communication capability. It has one RS485 communication interface at the backplane connector to communicate with the different cards in the unit.

Master Station is handling data processing and user interface. The software package contains the all information and parameter of RTU. Software package should be designed to fulfil all types of user need and to achieve better functionality.

1.2 Problem Statement

This tool is needed for Configuration purpose. This tool is using direct collecting parameter of RTU and handle the request/response protocol. Configuration tool is made suitable for RTU substation. It is stored real time data in CSV and XML format if any time fails then easily catch the save data. CSV and XML file are storing all event logs. This tool is verifies and filters incoming data.

Literature Survey

In present state, world is using automated system. Everywhere needs automated system and aware of automation system. Automated System means to eliminate the need of human interference in order and complete a task. Remote Terminal Unit (RTU) is a vital part for getting distribution automation in system.

Remote Terminal Unit was black box(dumb) device that served as an extension of the central computer to the input/output. Traditional RTU had no intelligence but could only read the input and activate the control inputs. RTU developed and use with 8 bit, 16 bit and 32 bit microcontrollers, so now RTU dedicated microcomputer with perpetual capability. RTU managing database with the central computer, the central computer becomes an operator interface tool. The function of RTU is to collects all the data from the plant, digitize them and send to the master station through the communication network. RTU also receives command from control master station and executes it at the substation.

Chen Peijiang and Jiang Xuehua [1] designed and implemented a remote monitoring system based on GSM. The system divide in two parts: monitor Station and remote monitor station. The communication is established between two parts by TC35 communication device of GSM. MSP430F149 MCU is used for monitoring station. The result of demonstration showed that the system can monitor and control the remote communication between the monitoring Centre and the remote monitoring station.

Chang.et.al^[2] developed a DNP protocol for better performance RTU which was ap-

plied to the feeder automation system of Power Plant. The Harvard architecture advanced microcontroller using pipeline processing technology would be used as the control core, to improve the system efficiency. The RTU in this project could measure AI, DI, DO parameter of the voltage and current of the feeder, monitor the feeder line branch switch status, digital relay and utilize DNP and feeder automation host machine.

Aamir.et.al [3] has done a comparative study of two different selections of CPU for designing an RTU based on performance measurement in view of energy management applications. The two CPUs are programmable Logic (PLC) and Field Programmable Gate Array(FPGA). The study showed that FPGA based RTU possesses unique features like encryption support, radio support and large memory area while PLC based RTU exhibits limited features. An optimized RTU was proposed based on significant parameter that facilities the optimized design.

System Requirements

3.1 Non-Functional Requirement

1 Reliable

This tool is reliable and easy to use.

2 Manageability

This tool is manage the require phase of RTU.

3 Environment

This tool is suitable for energy power plant.

4 Recoverability

If any fault or damage occurs then data is easily recover. because data is store in file system.

5 Serviceability

One time tool commissioning after not need to worry. All the process handle by tool.

3.2 Functional Requirement

Functional requirement is specify behavior of the project. It contains information about how to proceed do with project.

3.2.1 System Requirement

• Connection with RTU

- Configuration of RTU
- Data Store in file
- Data Validation
- Protocol Design
- Serialize and Deserialize

3.2.2 Software Requirement

Tools Detail	Open Source/ Licensed	Information/Features	Limitations
IDE - MS Visual Studio 2017	Licensed	It is rich IDE. Provide Advance debugger. Write code accurately without losing current file. deliver best quality software. it is use version control. Source: https://msdn.microsoft.com/ en-us/library/ e2h7fzkw.aspx	More Space and Memory requires
.Net Frame- work 4.1	Open Source	It is rich framework. easily creating apps that run on number of platforms. deploying the software time minimize conflict. provides vast support program, compiler and code libraries. Features: Rich Toolbox Simplicity Automatic Monitioring easy maintenance Object Oriented Source: https://www.microsoft.com/ en-in/download/ details.aspx?id=8515	Object relational support limited Managed Code that you run with this framework can be slower than native code vendor lock-in migration is expensive
Windows Presentation Foundation	Licensed	WPF is a powerful framework for windows application. Features: Graphics charts(2D/3D) Themes Imaging Different Control:Tab Control, List Control Media Service(Audio,Video)	In-box control suite limited not run on old OS i.e. windows 2000 or lower
Serial Port Monitor	Licensed	Powerful system utility for RS232/422/485 port Monitor COM monitor displays, logs and analyzes all activity. Using track problem that occur during driver development, testing Source: https://www.eltima.com/products /serial-port-monitor	

Table 3.1: Software Tool

System Design

4.1 Master-Slave Model

The configuration tool and RTU works as a master- slave architecture. The configuration tool works as a master and RTU works as a slave. Master request for communication using serial port interface to RTU. RTU handle the request give the reply according required frame and set communication between Master and slave.

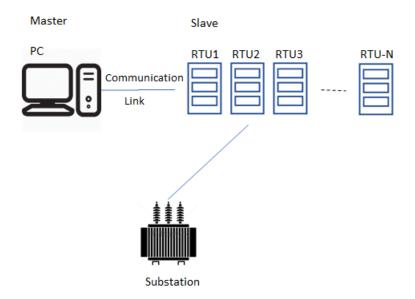


Figure 4.1: Master-Slave Architecture

As per given figure 4.1 Configuration tool is connected with RTU using communication interface such as communication link. Master configured the data and send to RTU. For

this communication some rules are needed. This rule sets by protocol. This system used as proprietary protocol. Implementation of proprietary protocol for the architecture of message/data request/response to /from master and RTU. RTU and Master with operation perform as per given figure 4.2.

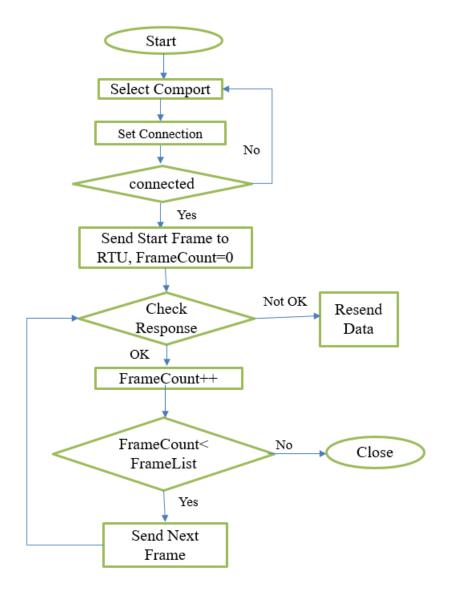


Figure 4.2: RTU Operation

For RTU, there is need of intelligent device such as computer, pc to handle all communication. Here master has the capability to manage all the communication of Slave. Information is transfer between master and slave.

Communication Model

The Request/ Response relation between master-slave is called Protocol. This protocol is a serial communication protocol. This proprietary protocol set data transfer rules between tool and RTU. This protocol is suitable for this project because ease of use and reliable. This protocol is design by some relevant parameter i.e. header, operation, GroupId and SubgroupID and CRCProtocol messages are a simple 2 byte CRC(Cyclic Redundant Checksum). Protocol structure can be used floating point and ASCII text. CRC is process of checking errors in data that has been transmitted on a communication link. CRC apply on 16 bit, 32 bit , 64 bit data and so on. Figure 5.1

5.1 Protocol Design

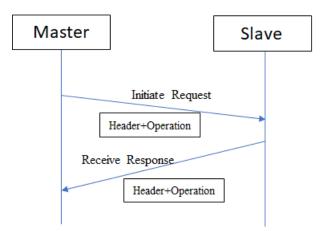


Figure 5.1: Initiate Protocol

For this protocol some parameter need to set. The parameter set as per below table

Field Name	Set Value
Baud Rate	9600 - 115200
Data Bit	8-10
Parity	Even/Odd/None
Stop Bit	One/Two

Table 5.1: Protocol Setting Field

Operation status set for communication start, stop, read and write. This data is stored in list. The list wise user selected parameter send to device. Given figure 5.2 is the frame structure of project. This frame using send and receive the data from tool to RTU.

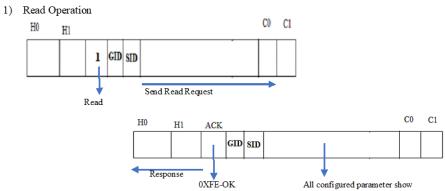
Frame has appropriate operation status. If communication initiate then Header(function code i.e. 2 byte 0xF0F0) with operation start(any hex number define for start i.e. 0x01) frame send to RTU. If frame Header, Operation and CRC match then RTU send the response frame with Operation OK(i.e. 0xa0) otherwise send operation Not OK(i.e. 0xb0).



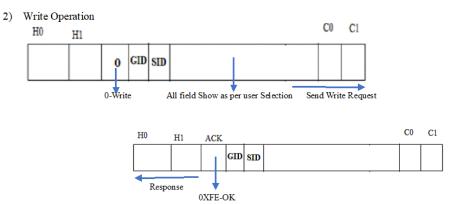
Figure 5.2: Frame structure

Below figure 5.3 give the information about the operation.

Here if frame wrong then number of operation status possible. For operation termination, tool send last frame with appropriate operation status STOP(i.e. 0xC0) to RTU and process terminate. Last frame structure show in below figure 5.4



At Read operation time all configured parameter show.



At Write operation time all fields show as per user selection and user can change and modify.

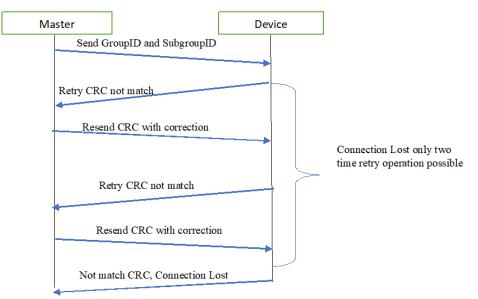


Figure 5.3: Protocol Structure

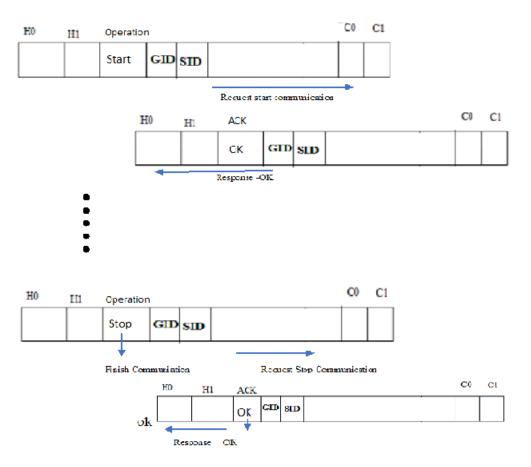


Figure 5.4: Terminate Frame

Implementation

6.1 Pseudo Code

This tool is designed in Microsoft win form and implemented in c[#]. RTU has different card and card has number of channel. These RTU, card AI, DI DO and Point AI, DI, DO implemented their class and structure as per parameter requirement and size of frame. Structure is marshal the size of parameter data, store in particular byte. One by one data marshaling and store in frame. In this project every data store in list. List is set the frame.

For Tool and RTU need to performed littel Endian and Big Endian operation. Send Parameter to RTU then perform Big Endian Operation and Receive data from RTU that time perform Little Endian. Big Endian is store most significant byte first where as Little Endian is store least significant byte first as shown in figure 6.1. This Operation is used Logical Operation. you have to convert all the parameter data type in this form.

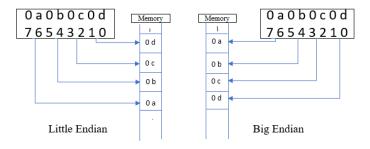


Figure 6.1: Little Endian and Big Endian

This frame is send or receive with correct data or not that test by CRC. The CRC is used to detect error at transmission on data frame. If frame size is 30 byte then 2 byte data append for CRC. Now, 32 byte reserved for every single frame. CRC is very popular because it is easy to implement for binary hardware.CRC is calculated by using logical operation shift and XOR.CRC can be calculated by using Big Endian and Little Endian.

- 1 Take two variable that define 1 byte for CRC1 and CRC2. CRC is 2 byte possible.
- 2 Perform XOR logical operation of total frame.
- 3 This XOR logical operation result is equal to last 2 byte of CRC then your frame is with correct data otherwise check data and recalculate the CRC.

```
function crc(bit list[1 to length], int polynomial) {
  shiftdata := initial data // basically one or zero possible
  for i from 1 to length {
    if MSB of shiftdata ^ (XOR) list[i] = 1 {
      shiftdata := (shiftdata left shift 1) XOR polynomial
    } else {
      shiftdata := (shiftdata left shift 1)
    }
}
```

```
if LSB of shiftdata ^ (XOR) list[i] = 1 {
shiftdata := (shiftdata right shift 1) XOR polynomial
} else {
shiftdata := (shiftdata right shift 1)
}
return shiftdata
}
```

6.2 Graphical User Interface

The GUI(graphical user interface) is follow the hierarchical structure Treeview and right hand side propertgrid.

6.2.1 Add Customer

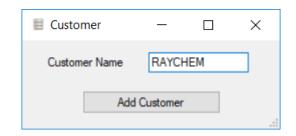


Figure 6.2: Add Customer Node

E RTUConfigutarion		-	
RAYCHEM			
	Configuration O SET		
	Edit Save		Send
	Jave		oona

Figure 6.3: Customer Node

6.2.2 Add RTU

Add RTU node in Treeview. When click on RTU node then property show in property-Grid.

6.2.3 Add Card

Click on RTU node and add Card Node in Treeview.

Click on Card and their property show in propertyGrid.

🗏 RTUConfig	utarion	-
RAYCHE	M	2 ↓ ■
	🗏 ADD RTU - 🗆	×
	No. Of RTU 1	
	Submit	
		Configuration O SET O GET
		Edit Save Send

Figure 6.4: Add RTU

6.2.4 Add Point

Click on Analog Card node and add Point of Analog node in Treeview. Click on Analog Point and their property show in propertyGrid

In this tool different card selection possible. Here AI, DI, and DO card require. Every Card has functionality different.

For this tool Serialized and Deserialized the given data. Serialization is the process of converting given object into a stream of byte in order to store the object into particular format i.e. database, file and memory. This application data is storing in .xml so Serialization and Deserialisation acquire.

E RTUConfigutarion		- 🗆 X
RAYCHEM	▲↓ IEC-104 Timeout T1TimeOut T2TimeOut T3TimeOut	15 10 60
	 IP Address DefaultGateway IPAddress Subnetmask Port 1 BaudRate Parity 	0.0.0.0 192.168.127.10 255.255.255.0 9600 Even
	T1TimeOut Set T1 Timeout form 1 to 255 S	Second
	Configuration O SET) GET Save Send

Figure 6.5: RTU Parameter

🗏 RTUConfig	gutarion		- 🗆	×
		Image: Second system Image: Second system Image: Second		

Figure 6.6: Add Card

ADD Card		neout				^
ADD Card	-	- [×	<		
Card Type No. of Card		rd_AI		127.		~
	guration Edit	⊖ set	Save	O GET	Send	
	Edit		Save		Send	

Figure 6.7: Add Card Window

RTUConfigutarion				—		×
E - ■ RAYCHEM TU_1 Card_Al_1 Card_Al_2	Y Ma If c	ConfiguredChannelM5 ConfiguredChannelM6 ConfiguredChannelM7 ModuleCount AI Card2 Module1 Module3 Module4 Module5 Module5 codule2 card inserted in slot 2 then s		4	se False	×
		Edit	Save	O GET	Send	

Figure 6.8: Card Information

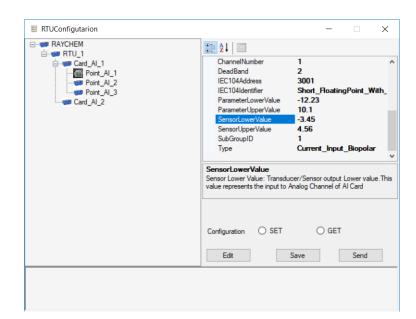


Figure 6.9: Point Information

RTUConfigutarion				- 🗆	\times					
RAYCHEM										
Card_Al_1	ADD Card	_			^					
Point_Al_2				laster						
Card_AI_2	Card Type									
	Card Type	Card_Al Card_Al Card_Dl Card_DO	~		1					
	No. of Card			v						
	Add Card									
				BET						
		Edit	Save	Send						

Figure 6.10: Different Card Selection

RTUConfigutation	-
RAYCHEM RAYCHEM Card_Al_1 Card_Al_1 Point_Al_2 Point_Al_3 Card_Al_2 Point_Al_2 Point_Al_2 Card_Dl_3 Point_Dl_1 Point_Dl_2 Point_Dl_3 Point_Dl_3 Point_Dl_3 Point_Dl_3 Point_Dl_3 Point_Dl_3 Point_Dl_3 Point_Dl_3 Point_Dl_2 Point_Dl_2 Point_Dl_2 Point_Dl_2 Point_Dl_2	Image: Solution of the system Image: Solution of the system </td
	Configuration O SET O GET
	Edit Save Send

Figure 6.11: Point DI Information

Tab	e view											
	Time	Function	Direc	Status	Data		Data (chars)	D.	Reg. le.	Port	Comments	
4383	25/04/2018 12:27:38	IRP MI READ	UP	STATUS_TIMEOUT	a0 b0 fe 0e 00	73 00 00 00 00 00 00 00 00 00 00 00 00 00	°b.s.			COMB		
	25/04/2018 12:27:38								1035552	COMB		
	25/04/2018 12:27:38			STATUS_TIMEOUT						COM3		
	25/04/2018 12:27:39				a0 b0 01 0e 00	74 00 00 00 00 00 00 00 00 00 00 00 00 00	*	32	32	COM3		
	25/04/2018 12:27:39			STATUS_SUCCESS		74 00 00 00 00 00 00 00 00 00 00 00 00 00	1.1			COMB		
	25/04/2018 12:27:39			5191105_50000055	80 00 01 00 00					COMB		
	25/04/2018 12:27:39			STATUS TIMEOUT	a0 b0 fe 0e 00	74 00 00 00 00 00 00 00 00 00 00 00 00 00	"b.t			COMB		
	25/04/2018 12:27:39			210102_11112001			Processing		1035520			
	25/04/2018 12:27:39			STATUS_TIMEOUT					107774	COMB		
	25/04/2018 12:27:40			2101102_11112001	a0 b0 01 0a 00	75 00 00 00 00 00 00 00 00 00 00 00 00 00	*	22	22	COMB		
	25/04/2018 12:27:40			STATUS SUCCESS		75 00 00 00 00 00 00 00 00 00 00 00 00 00	*U			COMB		
	25/04/2018 12:27:40			314103_3000033	80 00 01 00 00					COMB		
	25/04/2018 12:27:40			STATUS TIMEOUT	-0.50.6+.0+.00	75 00 00 00 00 00 00 00 00 00 00 00 00 00	"h-u			COMB		
	25/04/2018 12:27:40			STATUS_TIMEOUT	au du lie de du		p.u		1035488			
	25/04/2018 12:27:40			STATUS TIMEOUT					103,0400	COMS		
	25/04/2018 12:27:41			STATUS_TIMEOUT	+0.1-0.01.0+.00	76 00 00 00 00 00 00 00 00 00 00 00 00 00	*V	22	22	COMS		
	25/04/2018 12:27:41			STATUS_SUCCESS		76 00 00 00 00 00 00 00 00 00 00 00 00 00	•			COMS		
	25/04/2018 12:27:41			STATUS_SUCCESS	30 00 01 08 00			26		COMB		
	25/04/2018 12:27:41			STATUS_TIMEOUT	-01-05-0-00	76 00 00 00 00 00 00 00 00 00 00 00 00 00	"b.v.	32		COMB		
	25/04/2018 12:27:41			STATUS_TIMEOUT	au pu re de do		p.v	24		COM3		
				CTATUS TRACOUT					1055430	COM3		
	25/04/2018 12:27:41			STATUS_TIMEOUT			*			COMB		
	25/04/2018 12:27:42					77 00 00 00 00 00 00 00 00 00 00 00 00 0	*W			COM3		
	25/04/2018 12:27:42 25/04/2018 12:27:42			STATUS_SUCCESS	a0 60 01 0e 00	77 00 00 00 00 00 00 00 00 00 00 00 00 0	*W	52		COM3		
_								_	1035430	COMS		
dial	og (available in Profes	sional version or	shi									
ort	COM3			v	Baudrate:	853	 Databits: 	8				~
ity:	No parity			~	Flow control:	None	Stopbits:	1 stop bi	t			~
												¥ 5

Figure 6.12: Monitor Data

v1.17 © 2010-2010	6 Ricardo L. Olsen	Remote IP Address				Remote I	Link Add	ress				Local Link	k Address	Primary
Disconnect	GI	192.168.0.201				1						2		TCP CONNECTED!
	ASDU Addr.	Command Type							Comman	d Duration				
Send Command	3316	1				45: Sing	le - C_S	C_NA_1				• 0 = no a	dditional definition	▼ SBO
✓ Log Messages	AutoScroll	Copy Clip.Log												Copy Clip.Vals
T<-	SUPERVISORY 6c		^		Address	Value	Type	Cause	Flags	Count	TimeTag			^
R	-> 020: 68 12 6c 00 02 00 0d 01 14	00 01 00 7£ c4 00 00 00 00 00 c0			00101				-		1 1- 2010/04/22 4			
	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1			11	03101	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4:28:16.319		
R	-> 020: 68 12 6e 00 02 00 0d 01 14	00 01 00 80 c4 00 00 00 00 00 c0		2	03102	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4:28:16.363		
	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1 -> 020: 68 12 70 00 02 00 0d 01 14				03103	0.000		20	off iv nt	2	Local: 2018/04/23 1-	4-20-16 400		
R	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1	00 01 00 81 24 00 00 00 00 00 20		3	05105	0.000		20	on whi	4	LOCAI: 2016/04/25 14	4:20:10.400		
Dee	-> 020: 68 12 72 00 02 00 0d 01 14	00 01 00 83 #4 00 00 00 00 00 #0		4	03104	0.000	1	20	off iv nt	2	Local: 2018/04/23 14	4:28:16.453		
<u> </u>	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1	00 01 00 02 04 00 00 00 00 00 00			03105	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4.00.16 407		
B	-> 020; 68 12 74 00 02 00 0d 01 14	00 01 00 83 c4 00 00 00 00 00 c0		1										
	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1			6	03106	0.000	1	20	off iv nt	2	Local: 2018/04/23 14	4:28:16.543		
R	-> 020: 68 12 76 00 02 00 0d 01 14	00 01 00 84 c4 00 00 00 00 00 c0		7	03107	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4-28-16 588		
	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1			11										
R	-> 020: 68 12 78 00 02 00 0d 01 14	00 01 00 85 c4 00 00 00 00 00 c0		8	03108	0.000	1	20	off iv nt	2	Local: 2018/04/23 1	4:28:16.593		
	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1			9	03109	0.000	1	20	off iv nt	2	Local: 2018/04/23 14	4:28:16.648		
R	-> 020: 68 12 7a 00 02 00 0d 01 14	00 01 00 86 c4 00 00 00 00 00 c0								-				
	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1			10	03110	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4:28:16.692		
	SUPERVISORY 7c -> 020: 68 12 7c 00 02 00 0d 01 14 4			11	03111	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4:28:16.737		
R	CA 1 TYPE 13 CAUSE 20 SQ 0 NUM 1	00 01 00 87 24 00 00 00 00 00 20			03112	0.000		20	off iv nt		Local: 2018/04/23 1-			
8	-> 016: 68 0e 7e 00 02 00 64 01 0a	02 01 00 00 00 00 14		12	05112	0.000		20	on whi	4	LOCAI: 2016/04/25 14	4:20:10.702		
	CA 1 TYPE 100 CAUSE 10 SO 0 NUM			13	03113	0.000	1	20	off iv nt	2	Local: 2018/04/23 14	4:28:16.828		
	INTERROGATION ACT TERM			14	03114	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	1-20-16 072		
	Total objects in GI: 62			1.4										
<-	- BDTR: INTERROGATION END			15	03115	0.000	1	20	off iv nt	2	Local: 2018/04/23 14	4:28:16.918		
	SUPERVISORY 80			16	03116	0.000	1	20	off iv nt	2	Local: 2018/04/23 1-	4:28:16.965		
14:28:28 T<-							- 1							
R	-> 006: 68 04 83 00 00 00			17	03201	0.000	13	20	iv nt	2	Local: 2018/04/23 1	4:28:16.977		
14.00.02.0	TESTFRCON -> 006: 68 04 43 00 00 00			18	03202	0.000	13	20	iv nt	2	Local: 2018/04/23 1-	4:28:17.022		
14:25:03 R	-> 006: 68 04 43 00 00 00 TESTFRACT													
TC-	- TESTFRACT			19	03203	0.000	13	20	iv nt	2	Local: 2018/04/23 1-	4:28:17.069		

Figure 6.13: IEC104 Address Data

Conclusion

This tool is configuring all the data of RTU from substation using serial/Ethernet connection. This tool is suitable for remotely and locally configuring data. This provides customized menu. If user needs some additional parameters then in customized menu it is easy to develop. Using this application TreeView can be expand as per requirement. This tool can configured any behaviour of field structure i.e. Analog Input, Digital Input and Digital Output. This project is more efficient, flexible and reliable

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