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IEC 61850 기반 FRTU 개발에 관한 연구

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IEC61850 Based FRTU Development Scheme

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Abstract - When we implement the substation automation, the largest problem is that IEDs may come from different vendors, which will result in the reduction of the reliability of communication between IEDs. To solve the problem IEC61850 is investigated, which uniforms the communication interface. However, in order to communicate with an IEC61850 implanted IED, FRTU (Feeder Remote Terminal Unit) need to be compatible with IEC6185 consequentially. A new IEC61850 based FRTU development scheme is proposed. The performance shows his compatibility with other IEC61850 IED, which has already been tested in ARET (Agent-based Reliability Enhancement Technology) system.

1. Introduction

Until now, the electric power industry has made remarkable progress in both quantity and quality. But, as more and more companies and institutes set foot in this area, the social demand for a better compatibility is requested in the coming epoch, while connecting different manufactures

The research to the substation automation standard was started in US and in Europe at the beginning of 1990s. In US, EPRI created UCA2.0; and in Europe IEC made IEC61850. These two standards are merged into the IEC61850 that is based on the data model and service of UCA2.0 and include it. IEC61850 attracts so much attention because of his interchangeability and interoperability.

According to the actuality of the development of remote control and fault indication system for distribution line, the step of standardization also need be quickened comparing to substation automation standard. Many researchers engaged in this field. [1][2] summarized the functionalities of FRTU and propose a concept of logic system to standardize FRTU, [3] developed distributed network protocol RTU (DNP RTU) to obtain high reliability.

For distribution line, FRTU, considered as eye, ear and hand of supervisory system, is connected to switches by control cables. FRTU sends the order of CS to switch and monitor the status. When the CS orders to read the status or RMS value, FRTU sends status information to CS

2. Related work

2.1 Generally scheme

As we know, FRTU takes the task of supervising the system. The FRTU asks for all local data from different devices, processes it and transmits the alarm signal to CS, as well as it subscribes incoming control signal from CS and transmits operating signal to related device. With fault indicator (FI) located in FRTU, operators can easily locate the fault section between "yes" or "no" Fault indication.

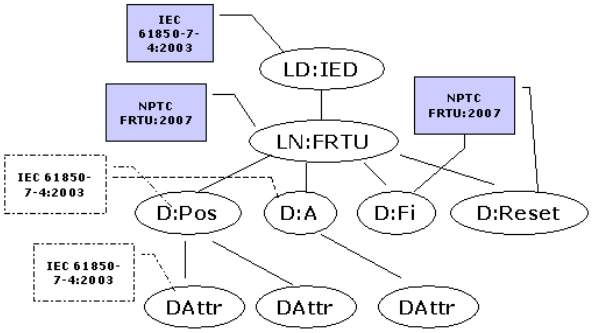
The new scheme is developed based on the following three aspects:

1. Standardization
2. Modularization
3. C/S Integration

2.2 Standardization

As a reference defined in IEC61850, the concept of the name space provides a means to uniquely identify the complete semantic of an instance of a Logic Device. It means that the implementation of name space allows the distinction of classes defined by different group, as long as the name have unique identifiers.

In our scheme, IEC61850 is used for reference[4]. We abstract FRTU as a Logic device, which is built up by instances derived from the classes of the repository of IEC61850 and other document, and its functions are encapsulated in a logic node named FRTU shown in figure 1, however, we can see that the definition of logic node FRTU is not original from document IEC61850, by configuring its name space to allow the unambiguous interpretation of the semantic of instance.



<Fig 1> The data architecture of FRTU

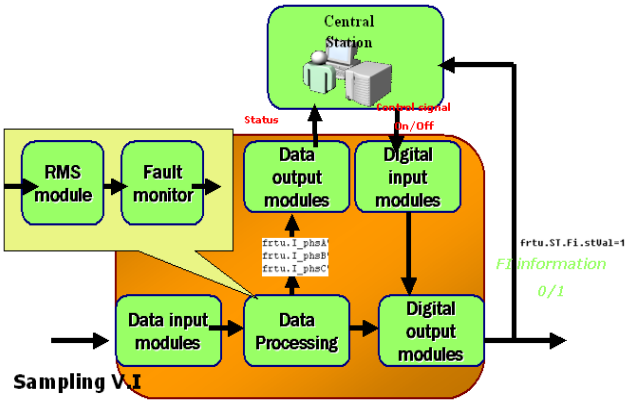
As a user-defined designation the instances that are parts of the logical device are coloured different because of different derivations.

The name space of the logic node and data are marked by **NPTC FRTU:2007** to differentiate from IEC61850 standard.

2.3 Modularization

A complete FRTU is composed of five parts. Fig 2 shows the inner construction of a server mode. It includes Data input modules, Data processing, Data output modules, Digital input modules, and Digital output modules.

1. Data input module takes control of receiving input sampling V. I value which will be soon send to the processing module to process.
2. Data processing module execute the evaluation of RMS and check if there is any abnormity from RMS value, the fault information, "yes" or "no", is stored in FI (Fault Indicator).
3. Data output module offers a interface to transmit RMS value to CS periodically.
4. Digital input module mange the commands from CS, Usually there are three kinds of commands, they are: "Circuit Breaker open", "Circuit Breaker close" and "Circuit Breaker reset".
5. Digital output module will generate a fault alarm to inform CS or other FRTU while FI is configured to "1" by data processing module

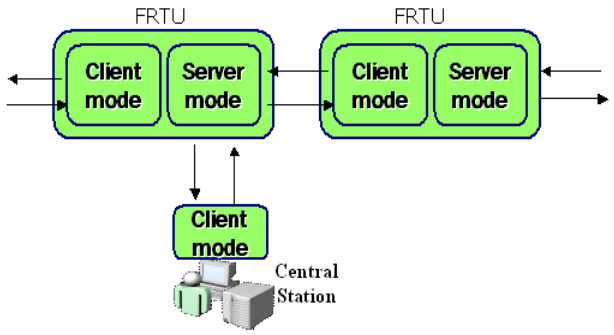


〈Fig 2〉 FRTU structure

2.4 C/S Integration

we implement the communication between FRTU and CS by inheriting a traditional C/S mode and extending it to a integrated mode.

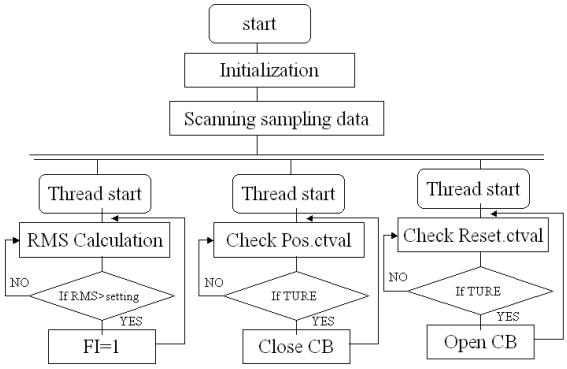
In our scheme, FRTU server is endow with a special interface so that the client can be bound together in figure 3, therefor the integrated FRTU has the ability to communicate with other FRTU, which means that the FRTU can be intelligentized and any protective algorithm can be embedded in.



〈Fig 3〉 System Overview

2.4.1 Server mode

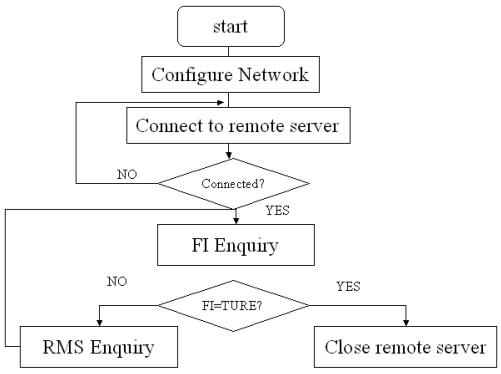
Server mode take charge of data calculation and FI monitoring and always get ready for a command from CS shown in Figure 4. if the incoming command is "close", FRTU will execute a CB close action then sleep. however sometimes we want to reactivate an sleeping FRTU, the FRTU will be waken by a reset command.



〈Fig 4〉 Server mode flowchart

2.4.2 Client mode

Client mode can be collocated on a Central Station or FRTU itself. it deals with command sending. Figure 5 shows its flowchart.



〈Fig 5〉 Client mode flowchart

3. conclusion

As we know, the epoch of electric power standardization is approaching. so to every product before it comes into use, that if it conforms to related standard, becomes the focus of attention. It directly determined if it is compatible with others. the proposed scheme to develop an IEC61850 based FRTU is an successful attempt. As well as it offers a method and platform to solve the protective problem of distributed line.

Acknowledge

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[References]

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