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Scada Configuration on 20kv Distribution Network in Central Java and Yogyakarta Special Region using ROPO, IDAS, and "Survalent"

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ABSTRACT
Like other SCADA systems in Central Java & DIY APD, there are three main SCADA implementation pillars: Master Station, Remote Terminal Unit, and Telecommunications. The Master Station functions to manage the SCADA software and its operational display. The remote Terminal Unit is an executor device to control and retrieve the status of Electric Power Distribution equipment. Meanwhile, Telecommunications is in charge of managing communication to connect the results of the Remote Terminal Unit with the Master Station.
To optimize all three and improve the reliability of electricity distribution PT. PLN (Persero) Distribution Control Area (APD in Indonesian) Central Java and DIY changed the current SCADA configuration (still separate in each region) into a centralized and well-organized future structure. The stages of realizing the plan include: setting up the SCADA master configuration, namely ROPO, IDAS, and "Survalent"; Building a backup server (Quad Redundant Server); and embodying the concept of 3 DCC.

Keywords
Configuration, SCADA, Distribution

1. INTRODUCTION
PT. PLN (Persero) Central Java and DIY Regional Distribution Control Areas were chosen as a research area. This district controls 20 KV voltage for Central Java and Yogyakarta Special Region (DIY) areas. Semarang PPE has controlled by SCADA, so it is a suitable place to explore the knowledge of electric power distribution control systems [1].
This research would explain the electric power distribution system, especially the use of SCADA at PT. PLN (Persero) Distribution Control Area of Central Java and DIY and introduce the field of work in PT. PLN (Persero). This research aims to know Indonesia's electricity system, especially the Electric Power Distribution System applied in Central Java and DIY. This research also explains the supervisory control and data acquisition system used in the electric power distribution system in Central Java and DIY [2].

2. DISCUSSION
2.1 SCADA system
SCADA stands for Supervisory Control and Data Acquisition. What is meant by SCADA is a system of monitoring, controlling, and processing data in real-time. SCADA components include master station, telecommunication media, and remote station or remote terminal unit. Fig.1 shows an example of SCADA system configuration [3].

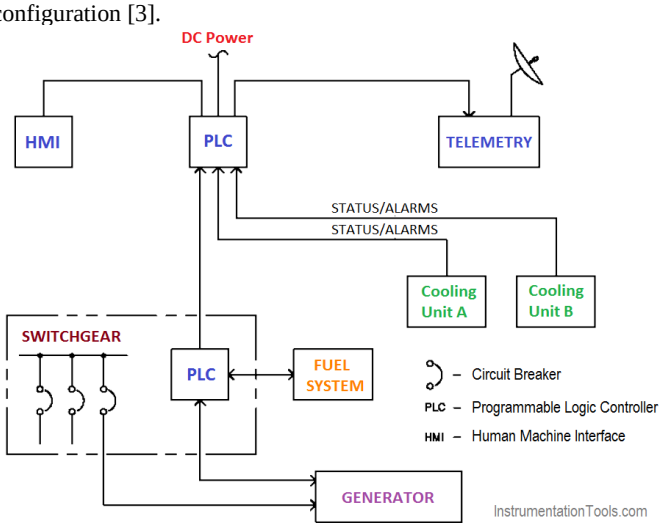

Figure 1: Scada Example System Configuration

2.2 SCADA Equipment
2.2.1 Master Station
The master station is a collection of hardware and software in the SCADA system's control center. The data obtained from the substation is sent to the master station. The orders from the operator at the control center are sent from the master station to the substation (RTU) [4].

2.2.2 Remote Terminal Unit
A Remote Terminal Unit (RTU) is one component of an electric power control system. RTU can be classified as an intelligent device, usually placed in substations, connecting substations, distribution substations, and generating centers as a device needed by the control center to acquire process chain data for remote control, remote indication, and remote metering.

2.2.3 Existing Condition of SCADA Central Java and DIY
Currently, all GIs in the Central Java & DIY APD areas have been installed with SCADA facilities. PLN APD Central Java and DIY have three master SCADA systems: "Survalent," ROPO, and IDAS [5].

Master "Survalent" was built in 2004 (in the Semarang Area) has one master and one redundant located in the Central Java and DIY APD office. The coverage area of Semarang Area (13 substations), Pekalongan Area (two substations), Yogyakarta Area, Network Service Area (APJ in Indonesian) Surakarta, and APJ Klaten (33 Substations), as well as several GIs in the Kudus, Salatiga, Magelang, Purwokerto, Cilacap and Tegal areas which are implemented with a dual master system, namely "Survalent" and ROPO.

Master ROPO was built in 2005 (in three areas Salatiga, Pekalongan and Cilacap) totaling seven units located in each area according to the coverage area, namely the Kudus Area, Salatiga, Magelang, Pekalongan, Tegal, Purwokerto and Cilacap (34 substations). The development background is the handover of the 20 KV feeder cubicle assets from P3B to the Distribution Office but with the human resources.

Master IDAS began to be built in 2007 (in the Semarang Area, only for critical points in the distribution network (Recloser and LBS) with the name DAS). IDAS has one master one redundant server located at the Central Java and DIY APD Office with a partial coverage area of the Semarang Area (five substations and network). The background for the development is a grant from the South Korean government through KEPCO.

2.2.4 SCADA ROPO

Remote Monitor and Control System for Outgoing Feeder Operator 20KV is a system that functions to monitor and control equipment at the Substation (Substation) of a Master Station as a control center. Fig. 2 shows the configuration of ROPO type SCADA [6].

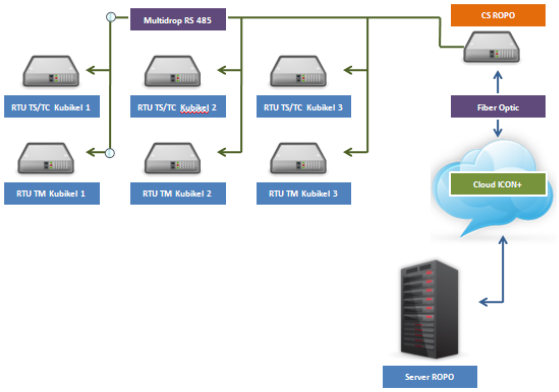

Figure 2: Scada ROPO Configuration

2.2.5 SCADA IDAS

Intelligent Distribution Automation System (IDAS) is one of the Supervisory Control and Data Acquisition (SCADA) applications produced by Korea and recently implemented in Indonesia, especially at PT PLN (Persero) APD Semarang

and was inaugurated on September 16th, 2010. IDAS is a software that can provide monitoring and control Load Break Switches (LBS) and reclosers on distribution networks remotely and Supervisory Control and Data Acquisition (SCADA). "Survalent" and Remote Operator Outgoing Feeders (ROPO). Fig. 3 shows the configuration of IDAS type SCADA [7].

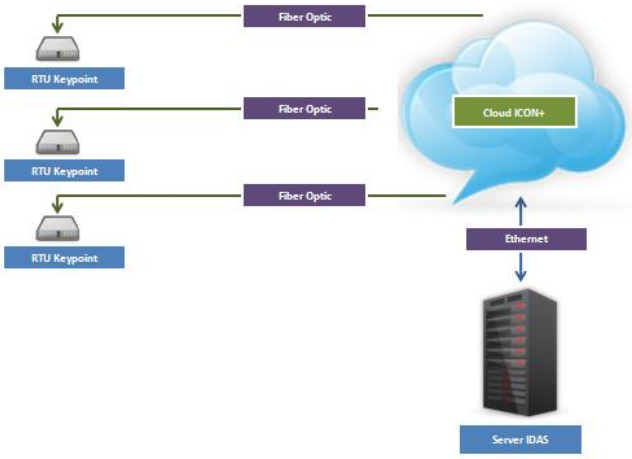

Figure 3: Scada IDAS Configuration

2.2.6 SCADA "Survalent"

"Survalent" is a SCADA technology originating from Canada which has several parts in its operation in Central Java and DIY PPE. In "Survalent" SCADA Software, the program provided for MMI (Man Machine Interface) is a complete view. Fig. 4 shows the configuration of "Survalent" type SCADA [8].

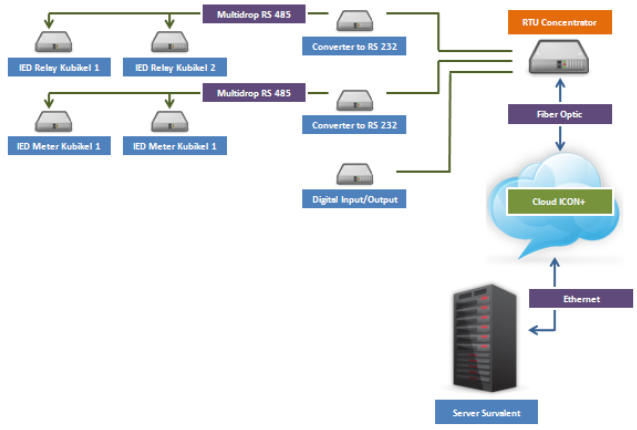

Figure 4: Scada "Survalent" Configuration

3. SCADA System Development

A reliable system can be improved in terms of data accuracy and settings. A real-time environment is needed to make the system responsive to adjust the condition [9]. Therefore, a mature development plan is needed to improve system performance.

3.1 Quad Redundant Server Plan

It is necessary to have a backup system that supports and covers the continuity of electricity distribution. As previously explained, currently, in Central Java and DIY, there is only one Distribution Management Area unit located in Semarang. There is a possibility that the Central Java and DIY PPE, the control center for the electricity system, face non-technical problems and cause disruption to the distribution system. Disruption can be due to external factors such as environmental factors, natural disasters, for example. The following is the current condition of the distribution system controlled by Central Java and DIY APD. Fig.

5 shows the configuration of a redundant quad server [10]. Fig. 5 shows a quad redundant server configuration.

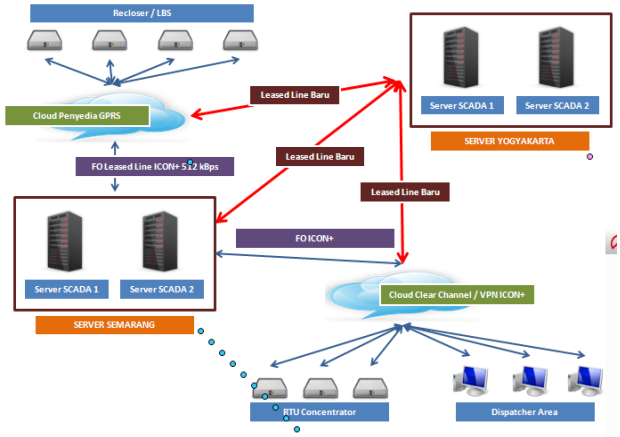

Figure 5: Scada Quad Redundant Server Configuration

The Quad Redundant Server plan is to build a backup Distribution Regulatory Area that can take over control of the electricity distribution system in the event of a disturbance that does not allow Semarang PPE to operate. The first step is to build a server in Yogyakarta, then lease a line and integrate it to be automated. Automation is so that when an interruption occurs, the Yogyakarta Server can directly take over the control so that there is no system blank out.

3.2 Distribution Control Center System

Masters that cannot meet future development plans would not be developed, and their control load would be gradually reduced without disrupting network operations. It is planned that the network equipment to be controlled would constantly increase in both volume and type. Network equipment includes data points that are processed to maintain the SCADA system's reliability and performance. It is necessary to build a new master server, which adjusts to the development of equipment on the network. The concept applied is DCC and sub DCC.

4. CONCLUSION

- The Central Java and DIY Distribution SCADA System development plan includes three main stages: changing the master configuration, building a ready-to-operate backup server, and realizing 3DCC
- The plan for the Quad Redundant server is to build a backup server in Yogyakarta. The configuration is precisely the same as the server in APD Semarang. The operating system is complete with the operation to back up data and control the SCADA Distribution System if there is an event of a severe disturbance to cause the APD Semarang server to fail to run.
- The concept of 3 DCC is to build three Distribution Arrangement Areas in three different places, namely Yogyakarta, Purwakarta, and Semarang. With three servers complete with their operating systems, the control and monitoring are divided according to their respective DCC areas to improve the operational performance of faster and more accurate electricity distribution.

ACKNOWLEDGMENTS

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