APPLICATION OF SICAP PAS SYSTEM IN AUTOMATION AND CONTROL OF T.S 400/110 KV STIP

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Annotation
T.S. 400/110 kV is located in eastern part of Macedonia and it is one of the most important substations in the transmission network of the country since it connects the both transmission systems Macedonian and Bulgarian via over-head transmission line Chervena Mogila. It was commissioned during the year 2010 as a part of Macedonia – Bulgaria Power Transmission Project which introduced construction of new 400 kV interconnection line between S/S Stip (Macedonia) and S/S Chervena Mogila (Bulgaria). Construction of new 400/110 kV S/S Stip ,near to the city Stip, was involved as part of this project. Substation is connected to National Dispatching Centre (NDC) through SICAP PAS program which enables data transmission to and from NDC placed in city of Skopje. SICAM PASCC program is used for complete control and monitoring of the substation i.e. SCADA system of the substation. Complete software and hardware solution is product of company Siemens. In this paper is presented the SCADA configuration in s.s. Stip its main function and advantages gained through implementation of this contemporary solution in substation automation.

Keywords
SICAM PAS, automation system design, optical network, transmission protocols

1 INTRODUCTION

The functions of Sicam PAS divided in 4 hierarchical levels: local bay unit controllers 400-110-35kV (6MD66-7SJ63), local protection relays 400-110-35kV transformer and busbar protection (7UT63-7SJ62-7SA617SS52-7SD52), central processing unit of Substation-Sicam Station Unit (Simatic Rack PC 647B), visualization system of substation (HMI) Sicam PASCC (Simatic Rack PC 547B)

The Sicam PAS system consists of the following components:

- Central Processing Unit of Substation, Sicam PAS Unit
- Communication with the National Dispensing Centre via protocol IEC104
- Communication with the protection and control panels and general signals of substation
- Sicam PASCC human-machine interface

System overview is presented on Fig.1

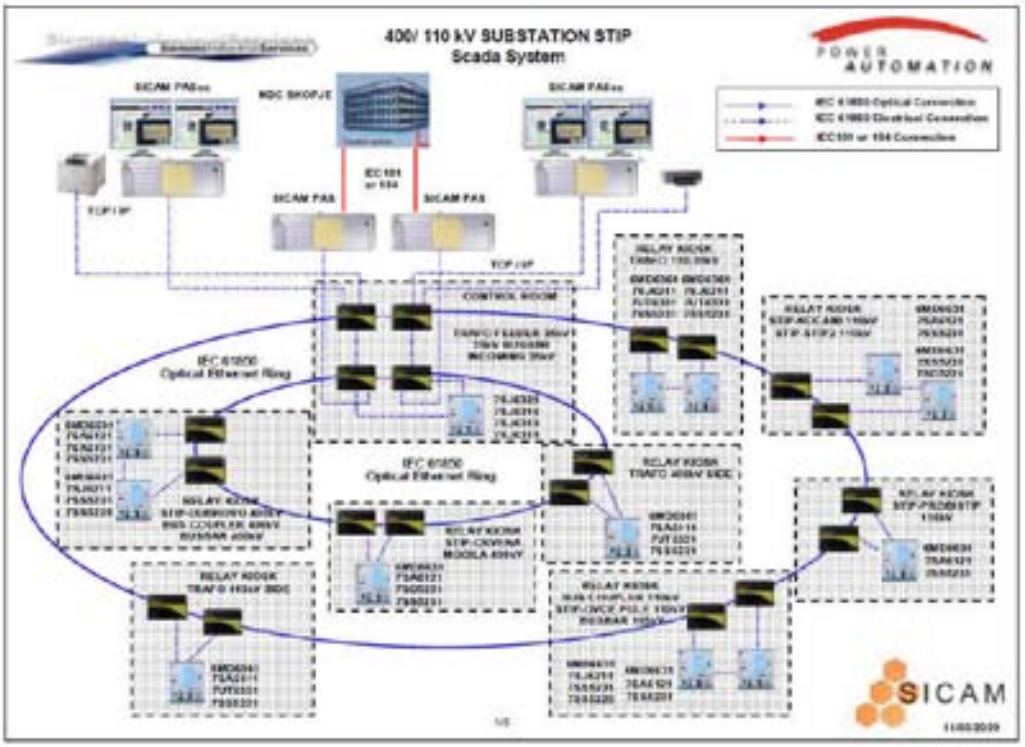

Fig.1 System configuration in s.s. Stip

Computer configuration of substation automation system is consisted of two SIMATIC RACK computers placed in the control room as well as of spare configuration of two computers PASS and PASCC. Each configuration is consisted of:
- SICAM PAS computer where SICAM PAS program is installed enables data transmission from/to protection relays and bay control units (SIPROTEC devices) as well as from/to NDC. Network in the substation has optical redundancy implemented with RUGGEDCOM switches. Protocol for communication to SIPROTEC devices is IEC 61850 client. This computer has also installed GPS for time synchronization.
- SICAM PASCC computer (SCADA) where SICAM PASSCC program is installed and serves for control and monitoring of complete system SCADA. All archives are on this computer. Substation menus are displayed on both computers [1].

2 SYSTEM DESCRIPTION

All information of process is scanned centrally and transmitted via the Ethernet protocol IEC61850 to Sicam PAS Station Unit. All the general indications of substation are scanning via I/O modules connected in profinet protocol (Ethernet). For the interconnection of the information of all protection/control panels IEC61850 protocol and optical connection with the control bay units and protection relays are used and IEC104 for the direct connection to National Dispensing Centre. For voltage level of 400-110-35kV the connection between Siprotec intelligent electronic devices (IED) and Sicam PAS system is established via the Ethernet Switches RS8000H of Ruggedcom company while time synchronization is achieved via IEC61850 protocol. For the network architecture is chosen network with fiber optics in closed loop (Ethernet ring) Fig. 2.

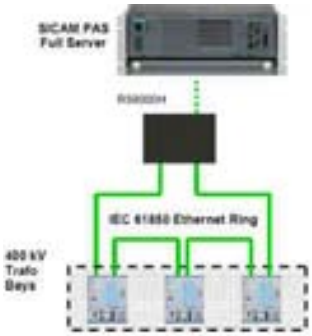

Fig.2 Example of the optical ring structure

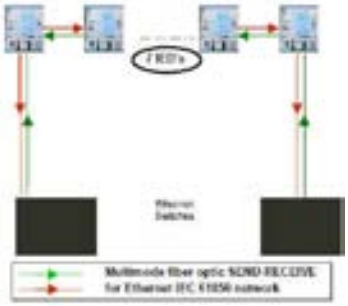

Fig.3 Example of connection of protection relays in ring structure

The ring structures of the relays in control/protection panels are established by the use of two Ethernet connections in the control room of substation. The specific solution, which is a redundant network solution, has a main advantage. If a fiber optic is damaged or an Ethernet switch is damaged/out of order, then the communication between the relays and the SCADA system can select an “alternative” way for driving the information from the protection relays (Siprotec 4) and the bay controller units (Siprotec 4). Due to the amount of the protection relays and the bay controllers, the use of fiber optics necessary. The fiber optic is a multimode type and follows the rules and codes for installation in High Voltages Substations and has protection against small animals. The SICAM PAS system is an open modular structured telecontrol and substation automation system for power energy automation. It handles the following tasks: telecommunication, monitoring, remote control / control with interlocking / switching sequences, archiving and logging of process events and fault indications with SICAM PAS CC [2].

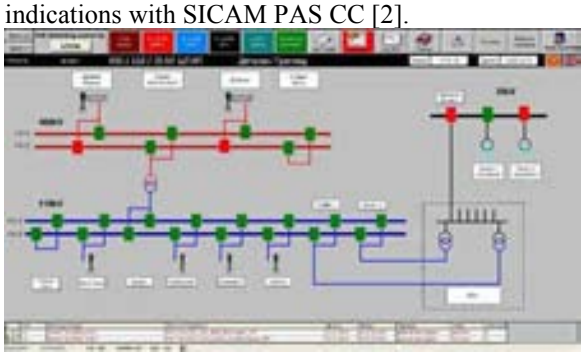

Fig.3 SICAM PASCC overview of complete substation

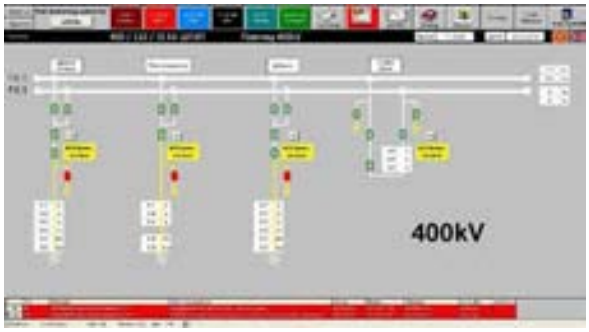

Fig.4 SICAM PASCC detailed view of 400 kV level

3 REFERENCES

[1] Siemens SA IS: Concept Description Substation Automation Systems.

[2] Siskon : Operating Manuel Substation Automation Systems .