

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 PASCC 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.

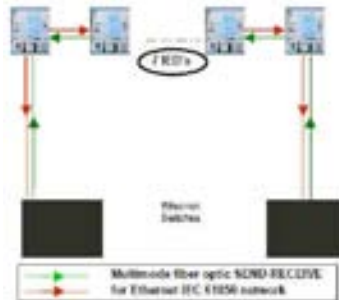
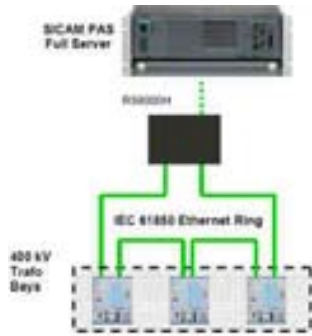


Fig.2 Example of the optical ring structure Fig.3 Example of connection of protection relays in ring structure

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].

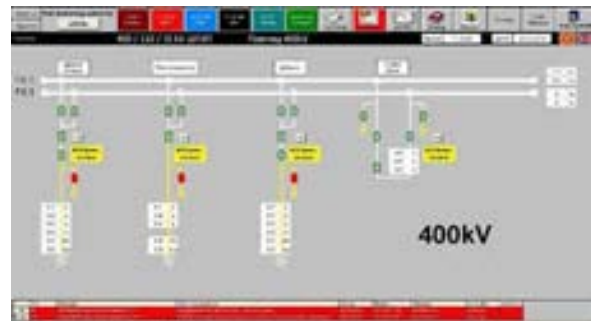


Fig.3 SICAM PASCC overview of complete substation Fig.4 SICAM PASCC detailed view of 400 kV level

3 REFERENCES

- [1] Siemens SA IS: Concept Description Substation Automation Systems.
- [2] Siskon : Operating Manuel Substation Automation Systems .