Study Committee D2
INFORMATION SYSTEMS AND TELECOMUNICATION

Paper 11136_2022

A SUBSTATION-FOCUSED COMMUNICATION NETWORK MANAGEMENT SYSTEM

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Motivation

- Communication network is becoming increasingly important as a worldwide adoption of IEC 61850 standard in Substation Automation Solution (SAS)

- For decades network engineers have used Network Management Systems (NMS) to monitor and manage communication equipment in substation. However, NMS was never addressing the unique needs of the industry

Method/Approach

- We need a solution that enables NMS to monitor critical substation protocols such as Generic Object-oriented Substation Event (GOOSE), Sampled Values (SV), Precision Time Protocol (PTP), Parallel Redundancy Protocol (PRP), and High-availability Seamless Redundancy (HSR).

- Network equipment to monitor critical protocol flow

- NMS to perform asset management using MMS and SNMP protocols

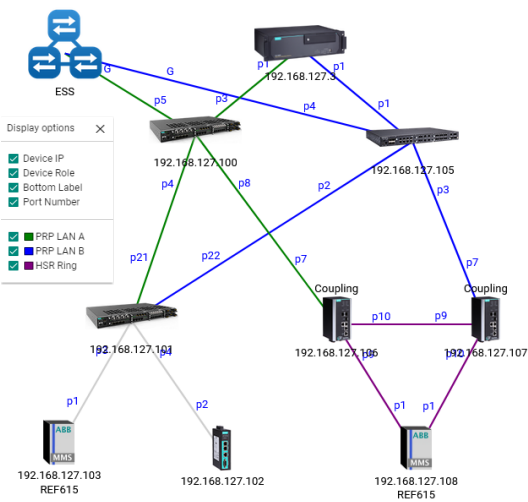- NMS to extract critical protocol baselines from SCD files

Objects of investigation

- The NMS solution that we propose has a two-tier architecture and consists of site-local NMS servers and a central server.
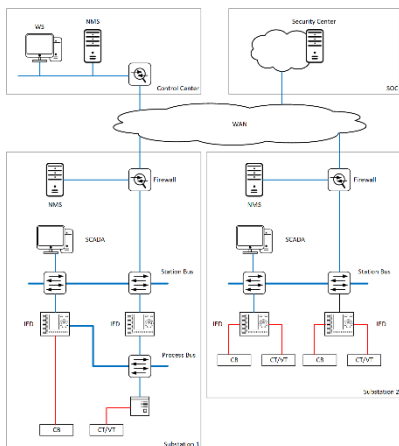
Experimental setup & test results

PRP/HSR based station bus with GOOSE-based interlocking.

Discussion

- IEC-62439-3-MIB can be used to correctly display PRP/HSR topologies on a link level

- Most IEDs do not support the traditional way of device management via SNMP. Therefore, it is necessary for NMS to utilize SAS protocols to detect and monitor critical substation assets, for example using Manufacturing Messaging Specification (MMS

- NMS can get information about all IEDs in the system and their communication patterns from an SCD file, populate a cybersecurity baseline and set restricting access policies for the networking equipment
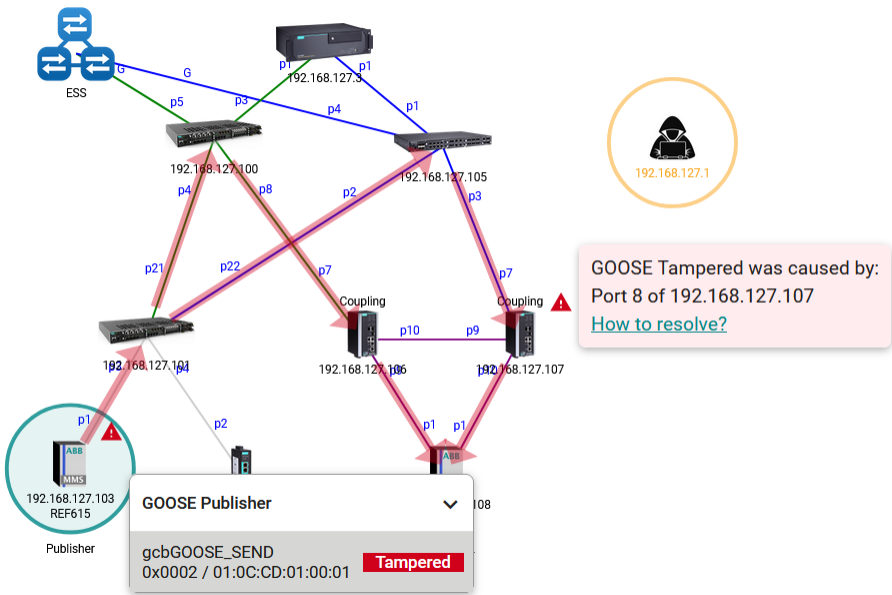
Conclusion

- Substation-focused NMS achieve better visibility and cybersecurity in SAS communication networks.

- The substation protocols GOOSE, SV, and PTP can benefit from being monitored by NMS. Traffic patterns can be associated with the topology to identify links and nodes where propagation fails and thus speed up troubleshooting.

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continued

Protocol Visualization

Security Posture Assesment