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The reliability of the PACS is associated with redundancy and monitoring of system conditions. Is this aspect being considered within the engineering process, including the application of tools?

Several network aspects must be analyzed to guarantee the security, reliability, speed and availability of the information being transmitted, warning potential communication failures or invasions. These network aspects are related to message integrity, configuration and data security, system's time synchronism and the message timing statistics, and others.

IEC 61850 network monitoring is important because it allows for early problem detection, monitoring of communication network operating conditions, reduced downtime by tracking faulty network elements, logging of all network events, and ensuring the security and stability of the power system. Achieving these requirements necessitates specialized tools.

The Protection, Automation, and Control Systems (PACS) are advancing due to the continuous innovations provided by the IEC 61850 standard. The implementation of fully digital substations based on IEC 61850 is increasingly growing worldwide, and the Process Bus further highlights the importance of Ethernet communication network performance in PACS.

The network monitoring system must achieve several important features, and for optimal functionality, it must be implemented using both specialized hardware and software. Key features include: comparison of running frames with .scl files; detection of unforeseen messages or absence of messages; identification of messages with divergent parameters or loss of integrity; monitoring for packet loss, duplicated or corrupted packets, and out-of-order packets; checking the condition of the synchronization clock (GrandMaster mode, BMCA, holdover); detecting failures in device synchronization; performing statistical functions such as time between frames, processing time, transfer time, jitter, and latency of messages. It also records logs and captures network traffic in .pcap format.

Below, in Figure 1, is a diagram illustrating how the monitoring system can operate in monitoring the IEC 61850 network.
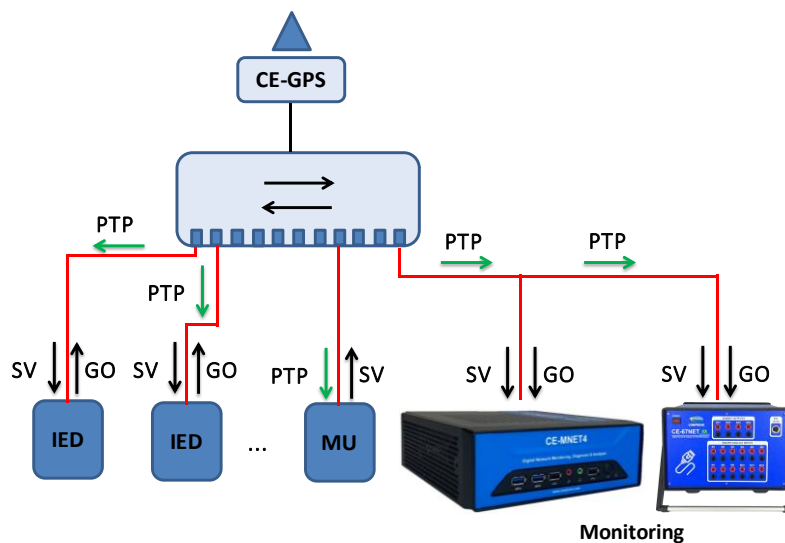

Figure 1 - Illustration of a monitoring system operating in the IEC 61850 network.

Below, in Figure 2, is an image of a monitoring system operating in a real-world scenario within the IEC 61850 network.

Figure 2 - Image of a monitoring system operating in a real-world scenario.