

RELY-REC: a cost-effective solution for continuous monitoring in HSR/PRP PTP networks.

This win-case illustrates how the RELY-REC implements traffic recording with IEEE1588 timestamping in complex zero-packet-loss networks. This device allows to remotely configure the system and retrieve the traffic in real-time, using filtering and analytic standard tools and reducing significantly the cost of forensic and monitoring activities.

Customer Snapshot

- Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE).
- Provides power to more than 36.000 distribution substations with more than 4,000 MVA.

The Challenge

- Record and monitor the traffic of an HSR/PRP network, using standard tools. Based on a standalone system that can be accessed remotely, without affecting the performance of the network.

The Solution

- RELY-REC, a time-aware solution for continuous monitoring supporting high-availability Ethernet, smart recording and filtering. While any of this equipment is operating, the read and configuration access from a remote location through a dedicated communication link is allowed.

Key benefit

- Goose integrity or network performance are seamless
- Local industrial storage media. Remote access only to the required information.
- Advanced filtering for inspection activity.
- Allows data integration with third-party applications

The complexity of modern automation systems does not only require commissioning of the equipment before it is placed into service, but continuous monitoring as well. This approach allows effective forensic analysis if a contingency occurs and enables advanced preventive maintenance based on Big Data analysis.

The new horizontal technologies for high availability networking and sub-microsecond synchronization introduced in IEC 61850 Standards for Substation Automation, like HSR/PRP and PTP, enhance the quality of the service offered by the Utility. However, this advanced level of digitalization generates new technical challenges to provide comprehensive means for continuous and distributed monitoring.

Firstly, it must be taken into account that in a PTP (IEEE 1588) synchronized Electric System it is necessary correlate all the information under analysis within the same sub-microsecond time reference used in the whole system. This time reference is shared among the Merging Units, IEDs, remote Power Substations and even the Smart Grid in more advanced cases.

Secondly, in these digital environments, the real time control messages like GOOSE or SMV are digitally transmitted over Ethernet and more frequently, over zero-delay recovery time redundant Ethernet solutions.

In order to face these challenges, from a system point-of-view, it is necessary to design configuration proposals for continuous monitoring for simple Ethernet Networks, PRP and HSR ones based. These set-ups should allow network traffic analysis to enable system verification and network assessment. Figures a), b) and c) depict respectively time-aware monitoring set-ups for standard Ethernet, PRP and for HSR networks.

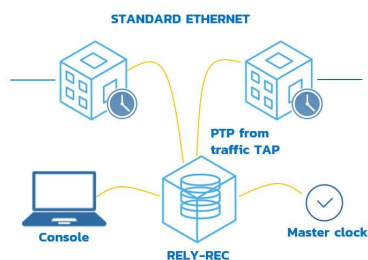


Figure a)

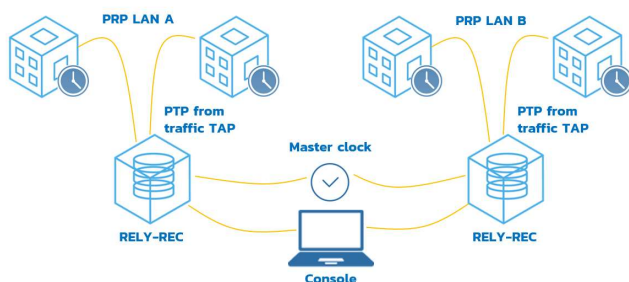


Figure b)

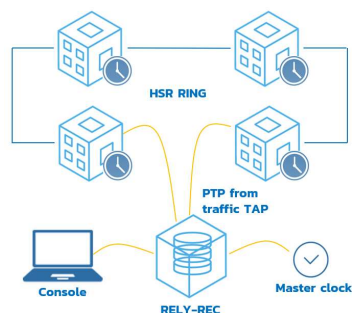


Figure c)

Each continuous monitoring unit (RELY-REC in the figures) is in charge of analysing, time stamping and recording the network traffic. Additionally, if the network topology requires that all the nodes acts like a switch, this monitoring equipment should be able to switch the frames according the expected behaviour of a ring node. Therefore, a proper correction of IEEE 1588 frames is expected combined with a low-latency introduction due to this node.

RELYUM time-aware recorders have been thought taking into account the requirements previously presented. They propose a time-aware solution for continuous monitoring supporting high-availability Ethernet, smart recording and filtering. While any of this equipment is operating, the read and configuration access from a remote location through a dedicated communication link is allowed. Each RELYUM recorder equipment can allocate one or more RELY-REC units depending in the complexity of the required set-up.

The configuration tools allow setting all network related functionalities, including the triggering and filtering options. Therefore the equipment is able to selecting specific traffic, like GOOSE or PTP to be recorded. Both, filters and data storage file format are PCAP compatible and can be easily defined.

The remote PC unit is able to access in real time to the traffic that it is being recorded in the equipment and event transfers simultaneously the selected files to the PC. For the basic traffic analysis, the well-know Wireshark tool can be used. The IEEE 1588 timestamping applied to the frames it is done in the way that Wireshark tool is able to manage and represent.

Additionally, advanced testing tools to analyse Goose integrity or network performance are seamless integrated within the functionality of the equipment.