Uniform Power Quality Recording via a Wide-Area Network (WAN)

Fault and power quality recording at Pfalzwerke AG

■ The company

Established on December 17, 1912 as a small utility, Pfalzwerke AG is nowadays the number one energy provider in the Pfalz and Saar-Pfalz regions. Pfalzwerke AG supplies power to about 280,000 private and 1500 commercial customers over an area of 6000 square kilometers that includes over 8000 kilometers of power lines and about 4000 substations.

To cope with the constantly growing demands on the power supply, strict environmental regulations and rising energy costs, new methods and technologies are needed. Pfalzwerke AG has recognized current trends and invests more and more in new technologies and solutions so that they are able to provide electrical energy in a proper way. Regenerative power sources such as wind power and photovoltaic systems, among others, are increasingly being employed to generate power. Nevertheless, the use of these technologies as well as deregulation have placed special demands on the overall power supply. Through area-wide monitoring of the power supply, it is possible to determine problems and their causes and to initiate the proper measures to clear them. Among other things, the recording and analysis of power quality according EN 50160 plays an important part.

■ The starting situation

In preparation for future challenges, a joint solution was developed for the area-wide monitoring of network quality. The goal of this project was to integrate the fault recorder system into Pfalzwerke's communication network in such a way that data should be transferred exclusively via the corporate WAN. This wide-area network has a special feature: All data transfer is performed in parallel, including the Internet, Intranet, MS Office applications, Voice over IP (phoning via TCP/IP), data communication by the fault recorder, PQ monitoring, etc. In the case of measuring points that cannot be connected to the WAN, data will primarily be transmitted via GSM modems.

Fig. 1   Web page of Pfalzwerke

Fig. 2   Service area of Pfalzwerke AG

■ The concept

A special implementation concept was developed based on the large volume of data (fault records and mean values). It is integrated in the communication network such that, on the one hand, time-critical fault records can be transmitted and analyzed as quickly as possible and, on the other hand, no interferences with any of the other services operating via the WAN can occure.

■ On-site tests

In order to guarantee the performance of the solution developed, operating scenarios were jointly designed with experts at Pfalzwerke AG and then tested on the customer system. The tested features included the transmission speed of fault records with simultaneous restriction of the communication bandwidth.

■ Time-optimized analysis

The SIMEAS fault recorder and the OSCOP P program for retrieving and processing records provide area-wide monitoring of power quality (PQ). Integration of the power quality recorder in the corporate WAN permits the time-optimized analysis of faults in the power supply and the implementation of countermeasures to clear them.

■ Fault record transmission

The SIMEAS R fault recorder and PQ monitoring system are set up so that one SIMEAS R 16/32 with the maximum configuration (4 VCDAUs) is installed in each substation and linked to the WAN.

Each SIMEAS R is connected to the communication network via the internal network card. SIMEAS R fault recorders are parameterized in callback mode. This means that after a fault is recorded, a call is placed to the appropriate server and the fault record is transmitted.

■ The special advantages
Data collection and server operation – centralized organization, decentralized execution

Data collection, i.e. the retrieval (gathering) and storage of data from the individual SIMEAS R fault recorders, is organized centrally. The data is retrieved by 8 servers that are installed in one station and connected to the WAN.

To ensure the highest degree of operational reliability, the server hardware is based on currently available technology. This means high computing power, a large RAM and, above all, a redundant storage system with backup functions.

Division of labor among eight servers

To make the transfer of fault records from a SIMEAS R recorder in the bay to the appropriate server in the station as fast as possible, the fault and mean value records are retrieved and distributed separately to the different servers. In concrete terms, this means that 4 servers are used exclusively for retrieving and storing fault records and 4 servers are used exclusively for retrieving mean value records. This ensures that the retrieval of a fault record will not be blocked by a simultaneous mean value record retrieval. In addition, sufficient storage space is available for the recorded values in the OSCOP P data base on the individual servers.

Automatic data retrieval and storage

The individual servers operate with OSCOP P in automatic mode. In other words, the servers automatically retrieve the fault and mean values from the individual SIMEAS R recorders and automatically store them in their data base.

Collection of mean values – easily implemented using PCs

PCs running OSCOP P in DAKON mode collect mean values from the individual SIMEAS Q mean-value recorders. They query the individual SIMEAS Q recorders via modems. At the other end (SIMEAS Q side), GSM modems are used.

Evaluation – when and where you want it

The fault records are evaluated by means of evaluation PCs connected to the server system via LAN. These PCs can be connected anywhere in the communication network, which also ensures that SIMEAS R can be parameterized from any point in the communication network. Whenever necessary, the evaluation PCs access the individual servers and retrieve the fault records for purposes of analysis.

Any number of OSCOP P clients can also be installed in the communication network. These clients have only read-access to the fault data stored in the servers. The system and devices cannot be parameterized from a client. This has the advantage that each user can access the data he or she needs.
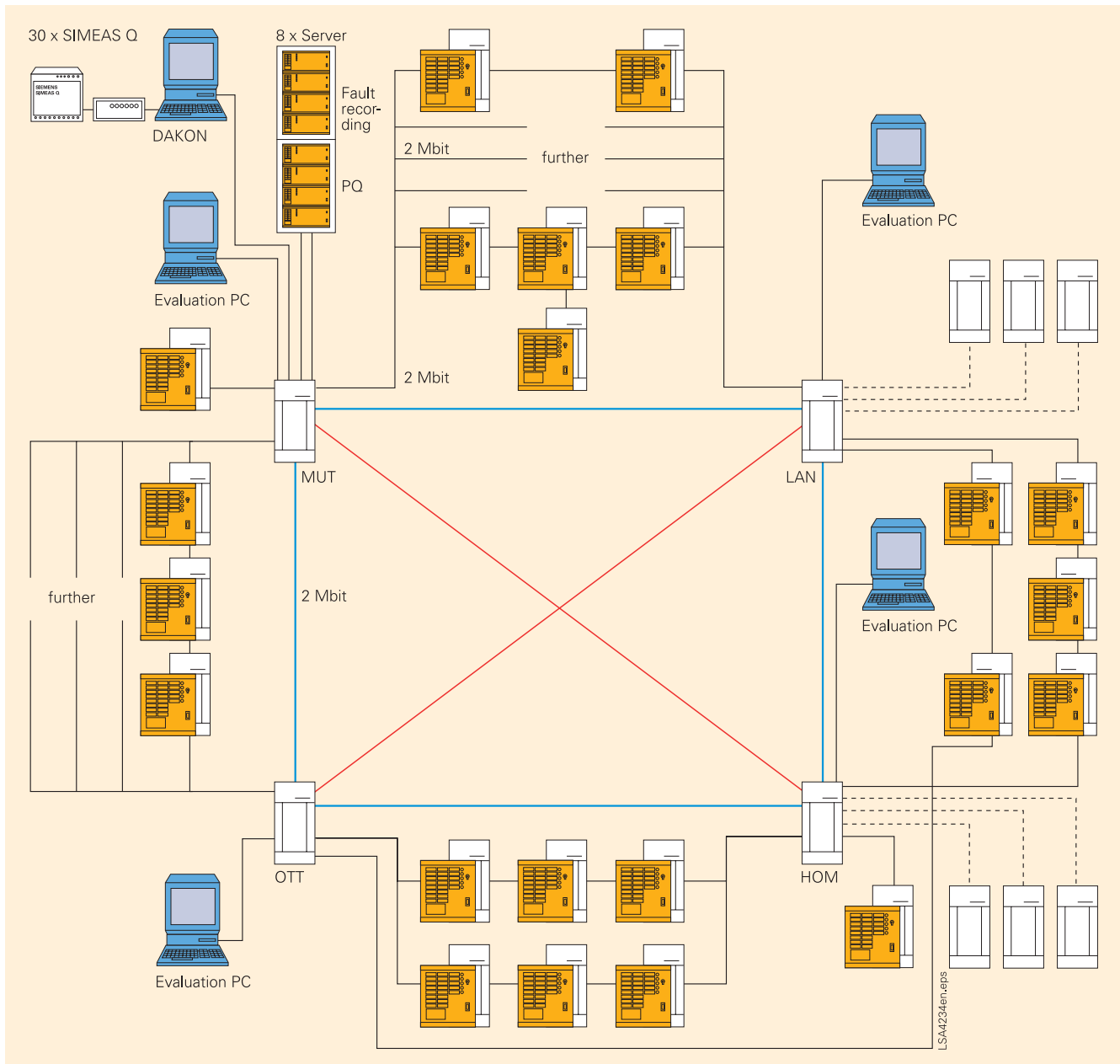
Fig. 3   System architecture of the SIMEAS R and OSCOP P fault recording system

■ *System overview*

- One SIMEAS R is installed in each substation and transfers its fault records and mean values to a central server via the WAN. In the maximum configuration, up to 60 SIMEAS R recorders can be connected to the system for monitoring the 110 kV and 20 kV level.

- Four servers (fault recording) are installed for handling SIMEAS R fault records and another four servers (PQ) for retrieving the mean values from the SIMEAS R and SIMEAS Q recorders.

- Most of the SIMEAS Q recorders are connected to a DAKON PC via a GSM modem. The PC transfers its mean values to the central mean-value servers. In the maximum configuration, up to 30 SIMEAS Q recorders can be connected to the system.

- Evaluation PCs are installed in the WAN for analyzing the fault and mean value records.

- SICARO PQ is operated in automatic mode for the purpose of analyzing power quality.

■ *Conclusion*

Competent support and consulting provided by the Siemens Power Transmission and Distribution staff – from the design phase to rollout – guaranteed Pfalzwerke an optimal solution based on the customer's requirements.

The particular challenge of this project was to integrate the fault recorders into an existing WAN. The most important consideration was the amount of time it took for a fault to occur, be recorded, be transmitted and, finally, for the fault record to appear on the screen. Based on the tests performed on the customer system, all parties came to have full confidence in the performance and reliability of the solution offered.

The SIMEAS R and OSCOP P fault recording system provides Pfalzwerke AG with a uniform system for monitoring and analyzing power quality. In addition, its modular design sets no limits on future expansions.

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