

Rugged Network Components

MAESSA

MAESSA Chooses RuggedCom to be Part of its Standard Solution for High Voltage Substations

Objective

Provide a reliable, utility grade Ethernet network for interconnecting multiple remote telecontrol units distributed across a high voltage substation.

Solution

Utility grade fiber optic, resilient ring utilizing RUGGEDCOM RS900 switch, capable of working in the most extreme environmental conditions to guarantee proper operation of the most critical telecontrol operations.

Company Overview

MAESSA S.A. is a Spanish engineering company that provides solutions for multiple industries including power utility, oil & gas, mining, infrastructure, construction, pharmaceuticals, etc. MAESSA is part of the ACS Group, present on five continents, with more than 145,000 employees. MAESSA S.A. is the indisputable leader in the Spanish market and one of the most important engineering companies in Europe.

In March 2004, as a complement to its present activities, MAESSA incorporated a new Telecontrol Systems department. It is dedicated to the design, manufacturing and implementation of turnkey telecontrol solutions for conventional and renewable energy, water and waste water, gas and telecommunications installations.

MAESSA's offering for electrical utility markets is focused on complete telecontrol solutions. These solutions include hardware and software products, and are based on distributed RTU (Remote Telecontrol Unit) architecture. MAESSA's telecontrol solutions are being used in high voltage substations, medium voltage substations and medium voltage transformer centers,

as well as in hydro generation plants. An important fact is that MAESSA distributed RTU architecture has been certified by Spanish utility Endesa as a standard solution for its high voltage substations.

Customer Requirements

MAESSA's telecontrol solution for high voltage substation and hydro power plants is based on the concept of the distributed RTU architecture. The core elements in this architecture are two types of MAESSA's RTU modules, the Idacs and the Setis families of devices. Initially communication between all the system components including MAESSA's Control Suite SCADA software was based on proprietary serial protocols. The company has been progressively migrating to open serial protocols such as IEC 60870-5-101 to recently jump on the latest communications standard based on Ethernet like IEC 60870-5-104 and IEC 61850.

MAESSA needed a solution to interconnect its own and third party Ethernet-enabled devices to the common network in the substation. Because of the distributed nature of MAESSA architecture, it required that the Ethernet network should not be limited to the central control building in the substation but should instead span different locations in the substation, such as remote containers with RTUs, IOs and signal acquisition modules in the switch yard. This implied the requirement for Ethernet switches to have as a minimum two fiber optic ports for interconnecting links. The switches needed to be deployed in the high voltage switch yard in direct proximity to primary equipment like power transformers or circuit breakers. The Ethernet switches also had to withstand multiple phenomena present in high voltage substations. MAESSA specified that the

switches were required to comply with IEC 61850-3; a standard document that defines minimum levels of immunity against high levels of electromagnetic fields, electrostatic discharges, fast transient signals of high voltage, vibrations, etc. The company also wanted the communications solution to be applicable in medium voltage transformer centers. These types of installations are often located underground and exposed to extreme humidity and pollution levels. Another requirement was a small form factor for the network device, as in many cases there would be very little space available for installation.

Apart from very strict requirements for hardware design, MAESSA wanted communication devices to offer a high level of flexibility and software features. With the Ethernet network as the neuralgic point of communication in the distributed telecontrol RTU solution, the network topology and switch configuration had to guarantee self-healing operation and a high level of redundancy and security. MAESSA knew that the network should be immune to a single point of failure and be able to ensure critical messages were always delivered to the final destination. In utility applications it is not an option for the Ethernet network to lose a message that carries a command to open a circuit breaker under faulty conditions on a 66 kilo Volt line. Of special relevance, was the ability of Ethernet switches to segregate network traffic and permit security mechanisms, like port based network access control, to guarantee isolation of multiple applications and prevention of unauthorized users accessing the network.

Powering with Robust Ethernet the Distributed RTU Architecture

MAESSA chose the RUGGEDCOM RS900 Ethernet switch as part of their standard telecontrol solution. In this solution RS900 switches are interconnected in a redundant ring topology via 100Mbps multimode fiber optic links. The ring topology provides path redundancy and the switches implement the eRSTP protocol to ensure a quick convergence time in case of network failure. The solution is highly scalable as RUGGEDCOM eRSTP redundancy protocol creates large networks that can span up to 160 Ethernet switches. Each RUGGEDCOM RS900 switch was equipped with six 100BaseTX copper ports to connect MAESSA Idacs RTUs, and other devices such as IEDs, printers, video surveillance cameras, station computers or maintenance laptops. MAESSA architecture supported the migration path and permitted integration into its Idacs RTU a large number of serial based devices like MAESSA Setis acquisition modules. MAESSA distributed RTU telecontrol solution powered by RUGGEDCOM RuggedSwitch offered a comprehensive, scalable, open and secure solution that minimized costs.

RUGGEDCOM RS900 Switch Key Features

- Enhanced Rapid Spanning Tree Protocol for ultra fast network fault recovery (<5ms)
- -40°C to +85°C operating temperature range
- Robust design that exceeds IEC 61850-3 and IEEE 1613 requirements for EMI and heavy ESD
- Multi-level cyber security features

Benefits

- Guaranteed smooth operation of the most critical applications in electrical substations
- High level of redundancy
- Optimized for modern communications such as IEC 61850 Station Bus and Process Bus
- Seamless and secure integration of multiple types of network traffic