GarrettCom IEC61850 compliant Ethernet Switches network fault and event monitors at substations throughout Italy

An Industrial Ethernet Application

TECHNOLOGY TODAY

The electricity industry has played a key role in Italy's economic and social growth. Over the last few years there has been a dramatic increase in electric utility automation, specifically substation automation. Consequently IEC 61850, a common communications architecture, has been conceived to define the communication between devices in the substation and the related system requirements. It has the goal of enforcing interoperability between a variety of Intelligent Electronic Devices (IEDs). Ethernet components in substation automation have to conform to the same criteria as protection IEDs if they are located in the same place and must be able to operate at the temperature extremes.

Power utilities are increasingly turning to industrial Ethernet because of its high reliability, and feature rich specifications. These include built-in fibre for high EMI noise immunity, 48 and 110 volt DC power operation, and extended temperature operating capabilities. These specifications allow Ethernet LANs to be designed into substations with control and instrumentation equipment to maintain high availability of electric power to the public.

About ENEL (the Ente Nazionale per l'Energia Elettrica – National Electricity Board)

After a long parliamentary debate, on 27 November 1962 the Italian Chamber of Deputies adopted legislation to nationalise the country's electricity system. The decision was taken with the objective of making optimal use of resources, catering to increasing demand for electricity, and ensuring equal conditions for all. On 6 December this legislation became law and ENEL (the Ente Nazionale per l'Energia Elettrica – National Electricity Board) came into being. After decades of monopoly, the nationalised energy market was opened up, but ENEL remains one of the leading energy producers and has seen the electricity industry play a key role in Italy's economic and social growth.

THE CHALLENGE

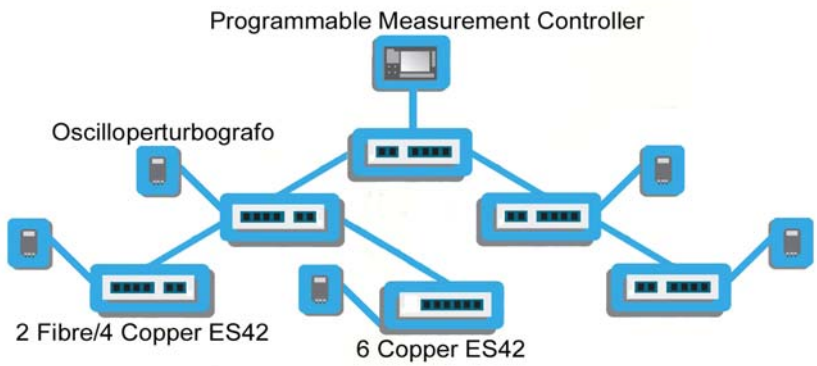
After a major blackout across Italy in 2003, the Italian National Agency for Country Power Management (GRTN) suggested using more sophisticated and automatic systems to manage high voltage electric charges. One of the results was the upgrade of 15 substations, with industrial instrumentation networked over Ethernet using hardened Ethernet switches from GarrettCom. In partnership with both Hi-TEC (producer and installer of Digital Fault Recorder devices) and Italian integrator FORT FIBRE OTTICHE, ENEL developed a strategy to monitor and record fault and events on electrical power lines backbone throughout Italy, in order to improve the service quality.

The project requires hardened Ethernet switches which are IEC 61850 compliant and offer high reliability. It also requires Ethernet media configuration flexibility that includes mixed 100Mb fibre and 10/100 copper. Another major requirement for the Power Utility is that the Ethernet devices need to be able to operate at 12/110VDC.

THE SOLUTION

FORT FIBRE OTTICHE chose GarrettCom's versatile ES42 range of compact, low cost, 6-port industrial Ethernet switches for their customer ENEL. The ES42 boasts high reliability as shown by the IEC 61850 and IEEE1613 standards compliance. The rigorous testing fulfils the criteria deemed necessary by the power utilities industry to support mission-critical applications that demand high reliability, electromagnetic radiation immunity, and sustained operation under temperature stress among other tough conditions.

Typical GarrettCom switch implementation in Italian Substation



IEC61850 Ethernet Switches in Italy

THE SOLUTION (cont.)

"GarrettCom's broad line of Ethernet products is perfect for anyone supplying networking solutions into Power Utility environments. Not only do they provide IEC61850 compliance, they also are industrial class construction for more extreme environments" says Luigi Campilii, Product Manager, FORT FIBRE OTTICHE, S.r.l.

THE RESULTS

FORT FIBRE OTTICHE selected combinations of the ES42 hardened Ethernet switches including the 6 copper port model and the 4 copper, 2 100Mb ST fibre model to create a network across the transmissions grid of 15 substations which allows ENEL to monitor, measure and analyse the faults and events on their Electrical power lines. Measurements are taken using industrial instrumentation equipment named "Digital Fault Recorder (DFR) and Sequence of Events Recorder". The DFR is essentially an Ethernet enabled data logger system dedicated to monitoring and measuring faults and events in power generation plants and high voltage substations. Measurement of data at each substation is taken by a computerised control unit. Each substation has a star topology with two arms and a sub-arm. A typical substation implementation is shown below:

ABOUT GARRETTCOM PRODUCTS

With device intelligence spreading to the very 'edge of the network', the ES42 range of industrial Ethernet switches have been designed to provide seamless connectivity from the most remote device right up to the IT department. The ES42 range is designed for use in challenging industrial environments – increasingly where small groups of PLCs or other industrial devices need to be connected upstream over a fibre cable, or where multiple devices need to be aggregated and connected over copper cable.

Incorporating the latest networking technology and innovative product packaging features to meet the needs of factory floor and utility substation applications, the ES42 switches include Link-Loss-Learn (LLL) functionality which enables them to be used in self-healing and redundant LAN structures. The LLL feature allows ES42 switches to sense Link Loss or standard STP/RSTP reconfiguration signals on designated ports. This, in turn, simplifies and speeds up recovery by changing the flow path of the LAN packets and passing the reconfiguration signal down the link to other products in the redundant network structure. Edge switches, combined with managed switches running STP or RSTP or S-Ring, can often provide high availability redundant LANs at a lower total cost than was previously possible.

The compact design provides 6 Ethernet ports, with base models having a choice of two 100Mb fibre and four 10/100 copper ports, one fibre and five copper ports, or six copper ports. The fibre port choices cover all multi-mode and single-mode fibre connector types.

ABOUT GARRETTCOM

GarrettCom is the leading manufacturer of industrial and carrier-class Ethernet LAN products. GarrettCom offers a comprehensive line of ETSI and NEBS-certified switches and hubs for use in telecommunications, industrial, and automated environments. Software applications, embedded in the company's MNS-6K Ethernet management software, support redundant rings and secure web-based access to local and remote networks. GarrettCom markets its products through a network of resellers, OEMs, system integrators, and distributors worldwide. For more information on GarrettCom and its products, visit www.garrettcom.com or www.garrettcom.co.uk.

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