SIEMENS

Case Study

Edition 09/2013

Rugged Network Components

EPRESA (Electricidad de Puerto Real S.A.U.)

EPRESA in Spain chooses RUGGEDCOM for Developing its Smart Grid

Objective

Provide a Highly Reliable Backbone Network that can be used for multiple applications including Smart Grid, Smart Metering, Distribution Automation, SCADA, Video Surveillance, Customer Internet Access and VoIP.

Solution

Advanced Multipurpose Network utilizing the RUGGEDCOM RS900G switch as the Ethernet communication fiber optic backbone to support mission-critical data and value added applications by connecting substations to the operation center.

Company Overview

EPRESA (Electricidad de Puerto Real S.A.U.) is a power distribution company with more than 75 years of history. EPRESA operates its own network with 100 distribution substations and 16,000 customers that represent a power consumption of more than 80GWh per year. The company also plays an important role in the telecommunications market; it serves as an Internet Service Provider for its electricity customers and provides modern services such as VoIP.

EPRESA is moving fast for ward towards distribution automation and as of the year 2009 it already has the ability to remotely control 25% of its distribution substations and transformation points. This system also manages power quality meters installed at connection points with the transmission system as well as power quality meters at Low Voltage outputs connecting end users.

EPRESA as a progressive utility focuses on distributed energy resources and is currently deploying solar panels in the city |council buildings. The interconnection of all the solar panels to the centralized SCADA system is done through the company's communication network. The utility is currently involved in a pilot project for remote metering and is planning to deploy smart meters to 15% of its total customers by the end of 2009. EPRESA's ambitious goal is to have 100% of the electricity users equipped with smart meters by the end of 2013.

Customer Requirements

EPRESA needed a reliable, broadband, multipurpose communications network capable of supporting various types of services that at the same time could integrate with its electrical distribution network. In other words they needed a redundant, robust, interactive and self-healing network to make its' Smart Grid a reality. The requirement for the communication equipment included immunity to electromagnetic interference as the devices had to be installed in electrical substations where the presence of high levels of EMI is common. The devices had to be designed to withstand harsh environmental conditions such as high levels of humidity, dust and temperature variations as EPRESA's distribution substations are located underground or outdoor at street level. Of special relevance was the operating temperature range that was required to permit the devices to work without failure in the extremely hot temperatures that are very common in South West Spain where EPRESA's area of service is located and where cooling fans in the devices are not an option.

The network was required to have redundant links, high-bandwidth, low-latency and very short recovery time in case of link failure. Redundancy and short recovery time were required because the network needed to transport critical protection and control information from electrical substations to the central SCADA system. Low latency and high bandwidth was crucial to ensure real time applications such as video surveillance and VoIP met the quality of service requirements to fulfill customer expectations. Another requirement was the small form factor for the network device as in many cases there would be very little space available to install the network devices.

Application and Implementation

EPRESA decided to take advantage of owning its electricity distribution infrastructure to build the Smart Grid. The first step in migration towards the intelligent infrastructure that would see the convergence of the electrical grid and communications infrastructure was the creation of a fiber optic Ethernet communications backbone connecting all of EPRESA's distribution substations. For this purpose EPRESA chose RUGGEDCOM RS900G Ethernet switches equipped with gigabit optical ports. The topology of the network consisted of multiple fiber rings interconnected to the control center. The communications backbone enabled access to one fourth of EPRESA's distribution assets, permitting remote access, monitoring and control using the company's SCADA system located in the control center. Another customer service that EPRESA was able to provide on the same backbone was internet access and voice over IP for home users. The last mile access was realized with different technologies, such as PLC (Power Line Carrier), ADSL and WiFi. All of these last mile technologies were then connected to RUGGEDCOM switches that formed the Ethernet communications backbone.

The infrastructure was able to provide further benefits with more innovative applications being implemented such as remote control and management of street lighting systems allowing intelligent management of each sector of light points that permitted energy savings as well a light pollution reduction. Additionally, EPRESA's solar panels that were installed on public buildings were connected to the Distributed Energy Generation Management system via the same Ethernet communications backbone. EPRESA also decided to fur ther capitalize on the communications network and implemented video surveillance for the local police department allowing real time cameras for traffic management and public safety. In 2009 EPRESA began replacing existing electric meters with smart meters and the RUGGEDCOM RS900G Gigabit Ethernet switches supported the transmission of electric utility meter data over the AMR (Automatic Meter Reading) network from consumers' homes and businesses to EPRESA's data center. The AMR will continue to be deployed during the next four years to all consumers within EPRESA's service area around Puerto Real in Cadiz, Spain.

RUGGEDCOM provided industrial grade Ethernet switches along with support for network design and support for commissioning to pave the way for EPRESA's Smart Grid infrastructure. The network interconnecting the utility's distribution substations was a gigabit Ethernet backbone in the topology of multiple rings connected to the control center. The switches used in this project were RS900G industrial grade devices with two fiber optic Gigabit Ethernet ports and 8 copper 100BaseTX ports. The optical ports were used for Gigabit connection to neighboring switches in the backbone rings. The copper ports were used in each node for connecting local devices such as protection and control relays, power quality meters, video surveillance cameras, street lighting system controllers, smart meter data concentrators, PLC gateways providing Internet access to end users, etc. Enhanced Rapid Spanning Tree Protocol, or eRSTP, was used to provide redundant links in the backbone network to provide fault tolerance and minimize disruption of service. eRSTP guarantees extremely fast network reconfiguration and recovery time in case of a link or device failure. To ensure proper segregation of different types of traffic and bandwidth optimization, multiple VLANs have been configured. The RS900G switches support up to 4096 VLAN identifiers and each switch is capable of handling up to 256 active VLANs. RUGGEDCOM provided the customer 5 years warranty with local support.

RUGGEDCOM RS900G Switch Key Features

- Gigabit Fiber Ports
- Exceeds IEC 61850-3 (EMI and heavy electrical surges)
- -40°C to +85°C operating temperature
- VLAN (802.1Q) to segregate and secure network traffic
- Small form factor

Benefits / Applications

- Smart Meters integration to Utility Data Center
- Distribution Automation
- Real Time access to Video Surveillance Cameras
- VoIP and Internet access for Home Users

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Case Study
Produced in Canada