Smart Grid Solutions Using Industrially Hardened (Rugged) Routers From Encore Networks

The Smart Grid combines the existing electrical grid with a communications infrastructure.

The Grid

Over the last twenty years, cellular technology has changed from being used primarily for telephone service to being utilized for broadband data travelling over the Internet. Cellular data transfer started as basic M2M (Machine-To-Machine) file transfer or polled data. Initially this was based on analog technology, but as frequency spectrum became scarce due to increased demand, carriers incorporated digital technologies including EVDO and HSDPA. With the advent of these technologies, data transfer rates have increased from 56Kbps to over 1Mbps. These technologies have led to where data links are carrying more than raw M2M data but also carrying IP based applications such as VoIP.

The Smart Grid

Encore Networks addresses today's cellular data networking requirements and challenges with the BANDIT™ line of environmentally hardened (rugged) routers. The BANDIT™ includes the features required for secure business applications like firewall, VPN encryption, and DHCP server capabilities and provides fully featured routing which supports VoIP, Internet and Intranet access for remote and mobile offices. For cellular data networking, the BANDIT™ integrates a hardened modem which can withstand a wide range of temperatures found in many M2M applications such as utility service providers (electric, gas and water), construction sites, industrial environments, lottery terminals, ATM machines and point-of-sale locations.

- ▶ Self-healing from power disturbance events
- ▶ Enabling active participation by consumers in demand response
- ▶ Operating resiliency against physical and cyber attack
- ▶ Providing power quality for 21st century needs
- ▶ Accommodating all generation and storage options
- ▶ Enabling new products, services, and markets

Smart Grid Communications:

Although some communications systems are up-to-date, they may not be fully integrated because they have been developed in an incremental fashion. In most cases, data is being collected via modem rather than direct network connection. These data applications include:

Sensing and Measurement
Core duties are evaluating congestion and grid stability, monitoring equipment health, energy theft prevention, and control strategies support.

Smart Meters
A smart grid replaces analog mechanical meters with digital meters that record usage in real time. Smart meters provide a communication path extending from generation plants to electrical outlets (smart socket) and other smart grid-enabled devices.

Phasor Measurement Units
High speed sensors called Phasor Management Units (PMU's) are distributed throughout the network and are used to monitor power quality and respond automatically to power irregularities.

Wide-Area Measurement Systems (WAM's)
A Wide Area Measurement system (WAM) is a network of PMU's that perform real-time monitoring on a regional and national scale. Many in the power systems engineering community believe that the Northeast blackout of 2003 would have been contained to a much smaller area if a WAM network was in place.

Advanced Control
Power system automation enables rapid diagnosis of and precise solutions to specific grid disruptions or outages.

Areas for Smart Grid improvement include:
Substation automation, demand response, distribution automation, Supervisory Control And Data Acquisition (SCADA), energy management systems, wireless mesh networks and other technologies, power-line carrier communications, and fiber-optics. Integrated communications will allow for real-time control, information and data exchange to optimize system reliability, asset utilization, and security.

Encore Networks and the Smart Grid

One of the challenges facing many of today's utility companies is how to effectively monitor and control the critical functions of their SCADA networks over slow analog lines. To create an effective communications 'highway' capable of monitoring the status of the grid and, for example, take the quick actions required to prevent a localized problem from developing out of control, utilities must take advantage of today's faster and more reliable transmission services.

Encore's family of industrially hardened (rugged) routers, the BANDIT™, enables these utilities to seamlessly upgrade their legacy SCADA networks to these services including Frame Relay, Internet Protocol (IP), VSAT, cellular wireless, cable modem, DSL, fiber and microwave.

The BANDIT™ ensures secure system data and SCADA network connections directly to a Wide Area Network (WAN) and/or Local Area Network (LAN), or a commercial cellular data IP service. The BANDIT™ is a rugged security router with integrated firewall, terminal server, serial-to-IP conversion, legacy-protocol conversion, and VPN functionality. Its hardened construction allows for operation over the wide temperature ranges found at remote substations.

Encore's carrier class, host site solution, the VSR 1200™ provides high performance, end-to-end Virtual Private Network (VPN) solutions that include standard features such as IP routing via Encore's patented Selective Layer Encryption (SLE), advanced QoS capabilities, a stateful packet inspection firewall, compression and optimized bandwidth utilization, and embedded address management capabilities such as NAT and PrAT. In addition to its unique VPN features like SLE, the VSR 1200™ also interoperates with standards-based routers using well-known formats for IPsec and GRE.

A high-port-density Remote Data Unit (RDU) module makes the VSR 1200™ an ideal fit for the smooth migration of legacy data applications to broadband IP networks. By performing protocol conversion and spoofing, the VSR 1200™ optimizes the utilization of satellite bandwidth.

Each time we flick on a light switch or press a power button, we enjoy the benefits of the nation's electric grid. This complex network of technology and people, many of whom utilize Encore products, work around the clock to produce and deliver electricity to millions of homes and businesses across the nation.
*Source: U.S. Department of Energy

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