The Dual Challenge of Converging Communications for Industrial Automation Networks

Transitioning from existing systems to next-generation networking presents the dual challenge of preserving essential legacy applications in harsh environments that are hostile to network equipment.

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The case for all-IP transport

Industrial automation systems have much to gain from the convergence of voice and data communications over a single packet-based network. The consolidated network offers long-term cost savings in terms of reduced hardware and streamlined operations, while offering powerful new features that provide greater ease of use for all the users—from field operators to executive management. Yet for manufacturing, heavy industry, control engineering, and similar operations transitioning from existing industrial communication systems to next-generation networks presents a dual challenge.

To transport industrial networks into the next generation, equipment and solutions providers must have the flexibility to respond quickly to changing application requirements.

Challenge One: Legacy Applications

Mission-critical SCADA applications must be preserved. Existing meters, EFMs, RTUs, PLCs and the like are typically based on narrowband synchronous and asynchronous technologies as V.35 and V.24/EIA-232. Replacing these legacy devices with Ethernet-ready alternatives can be cost-prohibitive, and in many cases such next-generation alternatives are not yet developed.

Challenge Two: Harsh Environments

Packet-based communications equipment is typically designed for installation in heated and air-conditioned office buildings or climate-controlled data-centers. For industrial operations, installation sites are often hostile to network equipment, with such harsh environments as offshore rigs, desert or arctic climates and many other hazards. In these deployment scenarios, network devices must be hardened against environmental extremes that include extremely hot or cold temperatures, high humidity, dust, dirt, oil and/or corrosive chemicals, splashing seawater, hose directed water, wind, rain, snow, and ice.

Addressing the challenges

To address the dual challenges of transporting industrial networks into the next generation, expertise in multiple domains is required. In-depth knowledge of legacy and state-of-the-art telecom technologies including experience with TDM and packet-based systems is needed. This domain knowledge must be combined with expertise in synchronous and asynchronous data communications protocols and practices. Manufacturing capability of hardened industrial enclosures is also needed, in addition to knowledge of and compliance with NEMA standards.

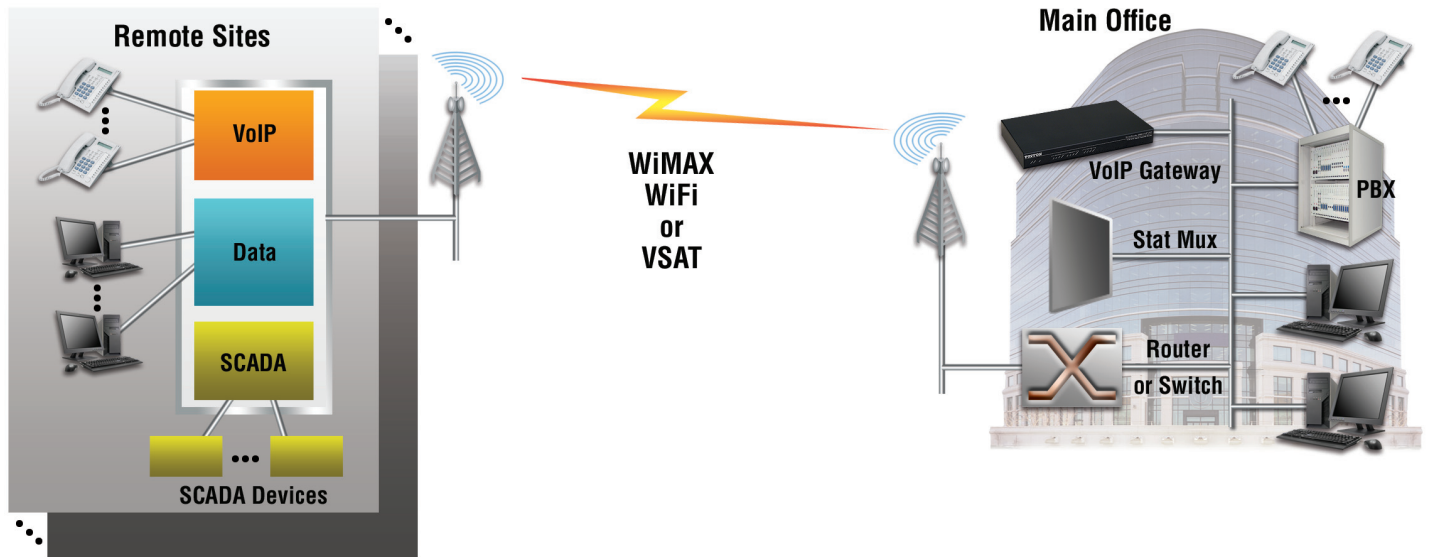# Case Study: Converged Communications for the Oil Industry

Remote Site Requirements

To modernize an offshore oil rig (as an example) for connection to an all-IP transport network, the following applications and equipment must be supported by a connection to a local Ethernet interface:

- Voice communications: Traditional plain old telephone service (POTS) handsets

- Data communications: Computer equipment (PCs, laptops, etc.)

- Device communications, including: RS-232 SCADA devices and V.35, X.21 or E1/T1 composite links

Unique Capabilities

Based on unique engineering and manufacturing capabilities, Patton Electronics is able to provide network equipment customized to the detailed requirements of specific industrial applications. In the case of the oil industry, Patton has developed a converged-IP transport

Example: Converged Communications Solution for Oil Industry

solution that supports voice, data, and SCADA/device applications—separately or simultaneously.

While offering a gradual transition path from existing synch-serial to next-generation Ethernet/IP composite links for asynchronous devices, Patton's customized multiservice CPE solution provides connection to a WiMAX, WiFi, or VSAT backhaul network for all remote-site devices.

Voice and data streams from all devices located at the remote oil-rig site are multiplexed and routed (or bridged) over Ethernet-IP and/or sync-serial connections.

Types of Equipment
Patton's solution for the oil industry delivers the functionality of the following types of networking equipment—separately or integrated within a single enclosure:

- **Multi Port Analog Voice-over-IP Gateway Routers**—Convert analog voice into digital signal, encapsulated into packets for transmission over a converged private IP network or the Internet. Provide FXS/FXO and Ethernet interfaces.

- **Ethernet Extension Devices**—Extend standard Ethernet segments up to five miles at full line rate over installed copper twisted-pair. Models are available with auto-rate adaptation that ensures reliable connections in the presence of electromagnetic interference, while achieving the highest possible speed across the maximum possible distances.

- **Managed Multiport RS-232 Async.-Over-IP Statistical Multiplexers**—Transmit the composite data-stream from multiple async devices over the Internet, a private IP network, and/or a low-cost PPP, Frame Relay, or T1/E1 service. Provides up to 8 RS-232 ports, a synchronous-serial V.35 or X.21 or T1/E1 port and dual Ethernet ports.

- **Power-over-Ethernet (PoE) Switches**—By delivering power and data simultaneously over the Ethernet cable, Power over Ethernet (PoE) technolo-

gy streamlines installation while reducing cost and cable clutter. The switch provides a common communication path for multiple Ethernet devices.

Patton can provide all the above functions as an integrated solution enclosed in a single environmentally-hardened cabinet. As an alternative, any of the above functions may be provided by separate off-the-shelf or customized products, for installation in existing environmentally hardened enclosures located on the oil rig.

Flexibility

In the real world of industrial networking, application scenarios run the gamut: from IP-enabling a single asynchronous meter, to converting analog handsets to VoIP, to multiplexing a range of PLCs over a V.35 composite link, to migrating an entire company network to next-generation Ethernet/IP. To meet the requirements of industrial operations, equipment and solutions providers must have the flexibility to respond quickly to changing application requirements and provide solutions that are:

- Customized for the required application.

- Adaptable based on feedback from the field and easily modified in the factory.

With engineering design, hardware and software development, and manufacturing teams all under one roof, Patton has the capability to quickly produce and adjust prototypes, as well as making design modifications to existing products. Virtually any combination of interfaces, software, and enclosures can be accommodated.

Environmental Requirements and the NEMA IV Standard

NEMA IV computer enclosures are constructed for indoor or outdoor use to provide protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; the external formation of ice on the enclosure. Going above and beyond the standard, Patton's NEMA IV equipment is capable of operating within the following environmental conditions:

- Temperature: -40 to +85°C

- Humidity: 5% to 95%

- Vibration: 2 to 11 degrees

Patton's EnviroNET™ Solutions

In order to address the challenges of transitioning industrial networks to the next-generation of all IP communications, Patton Electronics has developed the EnviroNET™ brand of ruggedized, environmentally-hardened communications equipment for telecom, datacom, enterprise and industrial networks. The product line includes WAN Routers, VoIP Gateways, Ethernet Extenders, Device Servers and DSL modems, all designed specifically for the rigors of heavy industry, mobile and/or outdoor networking applications.

EnviroNET equipment can deliver voice, video, and data communication services in arctic cold (down to -45° C), desert heat (up to 85° C), wind, rain, snow, hail, high humidity, dust, dirt, corrosive chemicals, and worse.

Safely housed in NEMA4-compliant, environmentally-sealed and thermally-controlled enclosures, EnviroNET

equipment lets you deliver voice, video and data in the toughest of industrial, enterprise, and telecom environments—indoors or out.

EnviroNET equipment is ideally suited for:

- Oil wells & refineries
- Mines & quarries
- Ships & seagoing vessels
- Railroad environments

Patton's EnviroNET solutions include POTS-over-Ethernet extension, T1/E1 extension, routed broadband-access, Voice-over-IP, xDSL, RS-232 device networking, and more.

For more information about Patton's networking solutions for next-generation industrial communications, or to discuss your custom requirements, contact sales@patton.com.