The Smart Connected Pipeline

Solution Highlights

■ An end-to-end smart connected solution based on industry best practices for pipeline infrastructures and network architectures
■ A flexible, modular approach from assessment, design, and test to deploy, install, and support
■ Collaborative expertise and service from the leaders in SCADA, network connectivity, and security, resulting in cost savings and optimized operations

Ensuring Secure, Efficient Pipeline Operations

Oil and gas pipeline operators and supervisory control and data acquisition (SCADA) engineers must ensure operational efficiency and cost-effective maintenance of pipeline assets while keeping operations running 24x7, 365 days a year.

Every day, they face challenges such as increased cyber security threats, outdated legacy infrastructures, and reduced budgets—all of which have the power to threaten optimal performance and disrupt operations.

For instance, because pipelines often span thousands of miles across regional and international borders, there is increased complexity when securing the infrastructure and operations. A threat as simple as a virus in one section could compromise the entire pipeline. Product theft and third-party interference are also concerns, particularly in emerging markets.

Many pipeline infrastructures are legacy brown-field structures that are inefficient to run, costly to maintain, and more susceptible to leakages that can go undetected and cause increased risk and damage.

Pipeline control systems, which often are as old as the pipelines, require more manpower and manual interventions when problems arise.

And because the underlying systems supporting these control centers are outdated too, they can’t take advantage of the latest SCADA and network technology for security, automation, asset management, and data analytics.

There are also challenges during the development of the new pipelines. Like the existing pipelines, today’s design practices are outdated, and do not properly address modern security, optimal infrastructure configurations, or innovative redundancy and high availability.

Solution Overview

To meet these challenges, Schneider Electric and Cisco joined forces to bring innovation to pipelines, oilfields, and processing facilities, from upstream production through to operations and transport. Together they ensure an architectural approach to mitigate deployment risk, accelerate deployment of the solution, improve operational efficiencies as well as total cost of ownership (TCO), and facilitate rapid resolution of critical network issues.

The Smart Connected Pipeline is an open, end-to-end solution for pipeline management that provides future-ready communication architectures for integrated, automated pipeline operations through the use of modern IT technologies.
Tested and validated by Schneider Electric and Cisco, this solution features a standards-based design and industrial cyber security that helps:

- Reduce integration costs
- Minimize project delivery risks
- Ensure predictable performance during pipeline upgrades and installation
- Enable high reliability and minimal downtime with fewer disruptions
- Increase business continuity

Schneider Electric and Cisco have teamed together to build a comprehensive reference architecture for this smart connected solution (see Figure 1). This architecture provides an end-to-end road map for how the key components of this solution work together.

Converged Telecommunications
The Smart Connected Pipeline automates operations end-to-end, from block valve to control rooms. It includes a validated and tested architecture and integrated industrial cyber-security systems that provide ease of management and support, improved reliability, and reduced engineering costs. The solution includes SCADA, advanced applications such as simulation, leak detection, process, and energy automation (see Table 1 below).

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The Smart Connected Pipeline includes two key components – converged telecommunications and the BLISS control center – which together form a complete pipeline management solution.

Figure 1: Smart Connected Pipeline

Table 1: The Smart Connected Pipeline Highlights

<table>
<thead>
<tr>
<th>Solution Overview</th>
<th>Description</th>
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<tbody>
<tr>
<td>Supervision and control</td>
<td>Real-time control and supervision of operations along the pipeline through a SCADA system based in one or more control centers</td>
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<tr>
<td>Measurement</td>
<td>Accurate measurement of flow, volume and levels to ensure correct product accounting</td>
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<tr>
<td>Leak detection</td>
<td>The detection and location of pipeline leakage including time, volumes and location distances</td>
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<td>Physical safety and security</td>
<td>Integrated security systems for personnel, the environment, and infrastructure using video surveillance, access control, and intrusion detection systems</td>
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<td>Process safety systems</td>
<td>Ensure safe operations through instrumentation and safety systems</td>
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<td>Energy management</td>
<td>Visualize, manage and optimize energy consumption</td>
</tr>
<tr>
<td>Block valve station</td>
<td>Isolate a segment of the line for leaks or maintenance</td>
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**BLISS Control Room**
This virtualized base-line integrated SCADA system (BLISS) control room portion of the solution provides fast, secure, and efficient deployment. It reduces design and engineering costs while increasing operational efficiency and lowering TCO. The control room solution includes IP networking, wireless, and optical communications as well as industrial cyber security (ISA SP99) high availability designs, and virtualization and convergence architectures (see Table 2 below).

Pipeline companies can start with a control center or the converged network telecommunications based on needs and requirements – or with the complete solution.

**Solution Benefits**
The Smart Connected Pipeline can benefit oil and gas companies in each phase of the process: design, operations, and maintenance. This results in:
- Lower total cost of ownership and reduced downtime due to faster build cycles and proactive, remote maintenance
- Increased revenue opportunities through optimized 24x7x365 run times
- Reduced risk with better safety, health, and environmental compliance and faster problem resolution and incident management

**The Smart Connected Pipeline Use Cases**
Oil and gas companies are reaping these benefits as they work with Schneider Electric and Cisco to build and implement innovative pipeline management solutions. Here is a quick overview of how customers benefit from this powerful solution.

**Smart Connected Pipeline—An End-to-End Solution**
This implementation focused on interconnecting the company’s gas pipeline with its storage facilities.

**Customer Challenges**
- Tight project schedule
- Highly critical infrastructure
- Strict environmental and harsh climate conditions
- Requirement for a data-center type solution that conformed with IT standards

**Solution Value Proposition**
- BLISS architecture with Cisco FlexPod appliance and Schneider Electric OASyS SCADA

**Scope**
- Electrical: UPS, electrical systems, shelters
- Control: SCADA, control center, simulation, programmable logic controller (redundant), and electrostatic discharge
- Security: Video system and intrusion detection
- Telco: Fiber optic ring and switches and VoIP
- Instrumentation: RT, L gas quality, and motorized valves (with PROFIBUS)

**Benefits**
- Single-source solution
- Reduced project implementation risk through end-to-end integration
- Virtualized architecture with reduced footprint and lower TCO
- Higher bandwidth for meeting OASyS SCADA requirements and scalability needs

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| **High availability and reliability** | - Backup WAN services to ensure operational services continuation  
- Options for primary and failover infrastructure connectivity (Ethernet, multiprotocol label switching (MPLS), dense wavelength division multiplexing, optical transport network, cellular, or wireless) depending on project requirements |
| **Transport multiple traffic types across common infrastructure** | - Differentiated quality of service (QoS) between traffic types, ensuring performance requirements of all operational traffic, and multiservice traffic  
- Segregation capabilities (physical or logical) between services, ensuring one traffic type does not impact another where designed |
| **Open standards-based security** | - Multi-level security to protect against cyber attacks and non-intentional security threats  
- Centralized configurable policy-based services |
| **Multiservice applications** | Optional services to support pipeline operations including VoIP, local Wi-Fi access, mobility, collaboration tools, and Internet access |
| **Management** | End-to-end communications network, security, and administration management, from instrumentation and sensors to the control center applications |
| **Ruggedization** | Ruggedized equipment available for harsh conditions, local legislation requirements, or industry certifications |

Table 2: Converged Telecommunications
Smart Connected Transport Pipelines

This customer has a 1000-mile (1,600 kilometer) crude oil pipeline in Eastern Europe that spans from the mountains to a marine terminal. This implementation of the Smart Connected Pipeline focused on the company's export pipelines and gathering system.

Customer Challenges

- Safe operation and modern leak detection
- Requirement of a major upgrade of trunk line with minimal disruption in operations

Solution Value Proposition

- Complete end-to-end solution with modern pipeline SCADA, leak detection, and telecommunications system

Scope

- Infrastructure: IP MPLS, optical, and Ethernet
- Control Center: SCADA and leak detection systems

Benefits

- Single source solution
- Complete modern solution from the control room, operational software, and communications infrastructure
- Upgraded without disruption to operation

Conclusion

The combined industry-leading expertise and technologies of Schneider Electric and Cisco provide a smart, innovative, and connected solution for upgrading and building oil and gas pipelines.

The Smart Connected Pipeline solution provides an efficient way to modernize pipeline systems utilizing the latest, most secure technology available today in a modular approach that can easily be adapted to each customer's needs.

In doing so, this solution helps oil and gas companies prepare for the future while optimizing performance and delivery today.