



TECHNICAL BRIEF

IT / OT Collaboration, Not Convergence, Must Drive Digitalization.

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Industry talk about the convergence of operational technology (OT) and information technology (IT) assumes both will soon merge into some common domain using IT methodologies, devices, tools, and team expertise - with it all being applicable to a plant floor as to front- and back-office operations. But that notion can be seriously misleading.

By itself, IT/OT convergence does little to actually move end-to-end digitalization forward. While it might provide short-term cost savings through more technology sharing and consolidated OT and IT teams, the performance gains will be incremental at best and not the quantum ones that digitalization can unleash. Even more fundamentally, shop-floor applications of IT-oriented hardware, software, connectivity, and services will always need to be far more robust, precise, and reliable than those needed in offices.

Instead of IT/OT convergence, industrial enterprises require a deep, cross-functional, and proactive collaborative approach that combines the respective intellectual power, know-how, and experience of both IT and OT teams to make today's industrial operations fully digital enterprises. The goal would be to collectively understand the unique terminology and design requirements for all network environments, especially in context of the network as the strategic backbone of a fully digital industrial enterprise.

Roots of the IT/OT convergence myth

The idea of IT/OT convergence is understandable. After all, IT and telephony were once separate functions and networks in most large companies, but converged years ago, aided by packetized voice-over-IP technology. What's more, OT engineers have successfully adapted many enterprise IT technologies to address the needs of a diverse industrial landscape that spans factories, warehouses, logistics facilities, plus power, marine, mining, and oil and gas industries.

Among those technologies are Ethernet-enabled wired and wireless LANs as well as industrial PCs, switches, and routers. Even today, industrial operators are continuing to adapt emergent enterprise IT technologies, such as cloud, big data, and advanced analytics, compelled by the economic advantages and competitive imperatives of the industrial Internet of Things (IIoT).

The benefits of these IT adaptations have included big reductions in costs, latencies, cycle times, and data collection errors, industrial communications – the digital thread – has also helped interconnect what were once islands of activities and data, while also helping to break down operational silos. Greater transparency and operational visibility also enables far better decision support for optimizing asset utilization as well as production quality, flexibility, and costs.

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Adapting Enterprise IT for Complex OT Applications

But adapting IT solutions for complex OT applications goes far beyond putting a veneer of ruggedization on devices.

For example, OT automation systems consisting of hundreds or even thousands of field level devices — sensors, actuators, valves, and instrumentation — need precise, millisecond synchronizations of their activities. Supporting networks must be deterministic. That means data commands arrive when they are supposed to, not on a best-effort basis. A network hiccup that might delay an outbound email by a half-second might not be

noticed by a user, but a similar delay in a controller command arriving at its destination could disrupt an entire production line.

The consequences could be missed customer commitments, costly restarts, or, worst of all, injuries. In fact, the world's leading industrial enterprises are not converging their OT and IT technologies because they know doing that is beside the point.

So, what's the real point of IT/OT collaboration? It's this: To establish vibrant digital threads of data running transparently, seamlessly, and securely through their businesses, from the factory floor to the boardroom and everywhere in between, even remotely.

Facilitating IT/OT collaboration for end-to-end digital enterprises

Rather than pushing their OT and IT teams to force even a blending of two necessarily distinct technology environments, these companies prefer them collaborating to make an end-to-end digital enterprise a reality for their companies. To do so, each team needs to understand the other's expertise and points of view, including respectively their chief concerns. Consider these examples:

New Concerns for IT with Factory Digitalization

- **Environmental, health, and safety impacts.** While technology failures or security incidents can certainly disrupt enterprise operations, similar incidents in an industrial environment can cause disruptions and consequences on a completely different scale, even threatening lives and the environment.
- **Asset availability and utilization.** Networked industrial systems can create business risks that most IT teams may not yet had to consider, such as the damage or loss of expensive equipment or the production of faulty goods. Production disruptions can also cause industrial enterprises to miss customer commitments. And poor asset availability and utilization can lower investment returns.
- **Outdated or custom systems.** IT is used to applying frequent and consistent software patches and upgrades, while industrial environments tend to be more systemic: one small change in one component or subsystem can trigger changes or disruptions elsewhere. As a result, many legacy plant/factory control systems may be running outdated operating systems that cannot easily be swapped out or a custom configuration that isn't compatible with the standard security packages of enterprise IT.

New Concerns for OT with Enterprise Connectivity

- **Physical risks and safety.** Threats to life safety are still a concern, but OT teams now face threats that are potentially outside of their control. Connecting machines, equipment and control systems to more open enterprise networks can leave them vulnerable to hacking. Hacks can override valve controls and emergency shut-offs, exposing employees to danger and production to costly disruptions.
- **Productivity and quality control.** Losing control of the manufacturing process or any related devices is an OT team's worst nightmare. What if some malicious party was able to reprogram an assembly process to in a faulty product that could potentially injure a customer user?
- **Data leaks.** While data breaches have long been a top concern for traditional IT teams, they are somewhat new to OT teams used to working with closed systems. But given the types of industrial systems coming online, securing transmitted data is critical.
- **Industrial security.** While OT teams can see the benefits of moving from closed systems to more open networks, they worry about a seeming lack of IT experience and potential solutions for rigorous OT needs, including real-time communications and cyber-security that traditional office solutions can't provide.

Common IT / OT objectives for securing a fully digitalized industrial enterprise

- Identifying and authenticating all devices and machines within a system, manufacturing plant and in the field, to ensure only approved devices and systems are communicating with each other.
- Encrypting all communications between the devices to ensure privacy of the transmitted data.
- Ensuring the integrity of the data generated from these systems.

How to develop industrial digitalization network strategies together that support greater performance, visibility, flexibility, and security

Full end-to-end digitalization of industrial enterprises requires a comprehensive networking strategy developed by OT and IT teams working together. The industrial network must be designed as the strategic backbone of production systems, not as a component. It involves deployment industrial-grade networking technologies based on proven standards. Here are three ways that Siemens can facilitate the needed collaborative process.

1

Bring all stakeholders to the table

All relevant stakeholders to the digitalization of a company's industrial and enterprise operations must have a voice in building a consensus about which metrics are most critical to their organization and which ones need improvement. They should focus on the unique requirements of production operations while managing risks of downtime and security. Together, they should consider these questions to identify key goals for success:

- What critical assets are likely to fail, when and why?
- How could an asset's failure impact personnel, operations, or production costs and downtime?
- How can data-driven decisions be integrated within the constraints of existing practices?
- Which production operations are performing below standard in terms of quality output or in-process defect rates?
- Where are large amounts of human intervention occurring to control quality that could be otherwise automated?
- Where could data be used to monitor real-time performance to reduce variability in output quality?

2

Provide education on industrial networks

IT teams may need education in the real-time requirements of industrial OT networks and the issues with traditional IT security solutions. That's why OT teams must share the principles, protocols, and architectural details about how to operate, maintain, and troubleshoot both existing and planned industrial networks, including:

- Switching and routing
- Wireless communications
- Security requirements

3

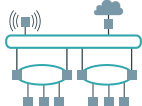
Find an experienced partner to facilitate first steps

As one of the world's largest organizations and manufacturers, Siemens has experienced and bridged the IT/OT divide in its own global operations. We learned that only through an active IT/OT collaboration — with a mutual understanding of each other's respective roles and backgrounds — can data flows be optimized over a company's core network, the backbone of a fully digitalized industrial enterprise. And we can help our customers do the same, through a consortium of Siemens experts and trusted Solution Partners around the globe.

Ultimately, by understanding the full potential of modern industrial communications, OT and IT can work together to ensure more operational efficiency, visibility, flexibility and security in production. This can help companies fully realize the promise of digitalization to gain greater competitiveness and profitability both in the short-term today and for the long-term tomorrow.

The Right Partner for Digitalization and Industrial Communication Networks

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