Edge Computing Bridges IT and OT to Accelerate Shared Digital Initiatives

IT leaders are achieving IT/OT convergence by deploying Edge Computing platforms to increase reliability, modernize operations, manage critical data from edge-to-cloud, and tackle cybersecurity.

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The worlds of information technology (IT) and operational technology (OT) are converging. Not just IT and OT technologies – which are undoubtedly transforming and advancing with Industry 4.0, the Industrial Internet of Things (IIoT), AI, and big data – but how teams are partnering across functions to align on IT infrastructure and system requirements to deliver business value and capability.

Integrating IT systems, such as data centers, digital networks, and help desks, with OT systems, including HMI/SCADA, PLCs, industrial equipment, and other manufacturing systems, is essential for the seamless sharing of critical data. This is becoming especially more prevalent as IT teams are being brought in to support the evolving demands of digital transformation in the OT space. Together, organizations are finding success converging IT and OT to solve operational problems and challenges with the use of IT tools combined with OT experience and knowledge.

In this environment, deploying compute infrastructure close to critical equipment and processes, including remote locations, is a requirement for success and innovation.

Reliable and scalable Edge Computing platforms are therefore central for accelerating these shared digital initiatives to modernize aging compute infrastructure while meeting OT needs for advanced digital operations. Changing OT environments and changing IT standards bring technical difficulties to the forefront when moving towards IT/OT convergence, which is especially true as organizations grapple with how to manage and integrate vast amounts of data and address cybersecurity risks.

In this white paper, learn how Edge Computing addresses these challenges, bridging the gap between IT and OT, improving uptime, modernizing legacy infrastructure, enhancing data management and integration, and more.

What is Edge Computing?

Edge Computing is a distributed computing model in which computing takes place at the edge of operations – where data is generated – aggregating, processing, and analyzing this data at the edge, rather than on a centralized server or in the cloud. An Edge Computing platform collects critical data from sensors and equipment in a manufacturing environment, for example, and processes it in near real-time, empowering organizations to maximize operational efficiency, improve performance, and automate business processes, ensuring "always on" availability.
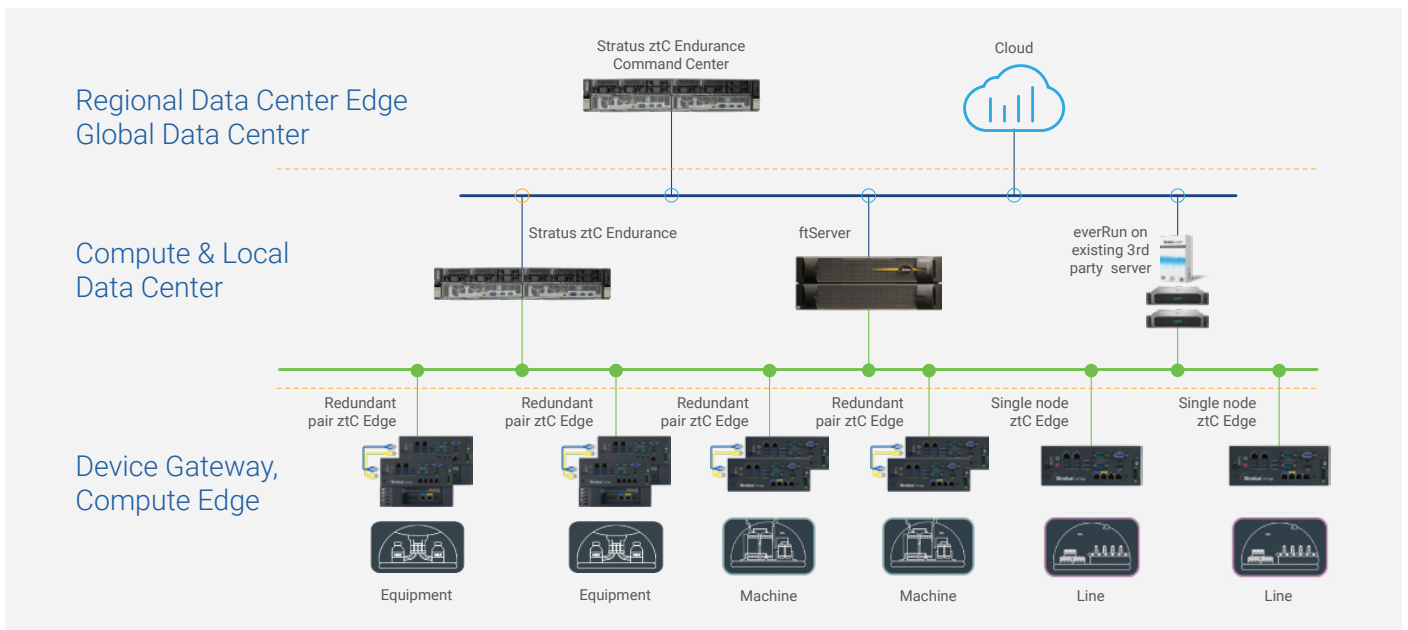
In the OT environment, industrial PCs (IPCs) lack the computing power and reliability necessary for the long term. If something breaks, IT teams must respond quickly to tickets, tech refresh needs, unplanned downtime, break-fix, and disruptions when supporting and managing these computers. While ruggedized, IPCs only run one application, each requiring individual maintenance, which could be in hard-to-reach or remote locations. Organizations require computing power to run industrial applications and IT teams need a familiar paradigm in the OT setting to support OT needs. Purpose-built Edge Computing platforms provide that landing spot and a foundation to build upon.

Conversely, the sophistication of modern compute infrastructure requires the oversight of IT teams. Because of this sophistication, OT teams have brought IT into the discussion in recent years. Edge Computing infrastructure must meet IT's requirements for interoperability, manageability, cost, and importantly, security. Combined, IT and OT teams are ultimately looking for one platform that can do it all – meet current and future needs with simple management and repeatability.

According to Gartner, "By year-end 2026, 70% of large enterprises will have a documented strategy for Edge Computing, compared to fewer than 10% in 2023." (Reference 1) Part of that strategy should include how to leverage Edge Computing for both IT and OT teams and embark on an IT/OT convergence journey.

Why Bring IT and OT Together

There is great value when converging IT/OT; from improved performance and efficiencies to increased resilience and adaptability, to name a few. Historically, companies have had dedicated IT and OT teams working independently from each other.

IT teams are primarily responsible for information processing as well as maintaining, configuring, and securing systems – both hardware and software. This includes the management and updates of software applications, servers, and IT infrastructure. IT infrastructure is crucial and required for data processing. These IT systems serve as repositories for corporate information, making data available to business applications as well as the users of those applications (Figure 1).

OT teams focus on the control and monitoring of physical devices and processes on the plant floor or other industrial locations, machinery, and manufacturing systems. The OT network of devices and software supports specialized gear that captures and relays data, enabling industrial and manufacturing equipment to perform specific tasks (Figure 1).

IT

Vital infrastructure required for data processing.

IT systems are repositories for a company's critical corporate information – digital networks, the cloud, data centers, and more. Data is available to different business applications as well as users of those applications.

IT/OT Convergence

Bringing IT and OT networks together and sharing the data that each network collects, analyzes, and distributes. An Edge Computing platform – that processes data in near real-time at the edge of operations – provides a landing spot for IT teams in the OT environment, making the sharing of critical data seamless.

With an Edge Computing platform, it's easier to merge the two teams that typically work independently, as they're able to pool their resources and technologies as well as share specialized knowledge and expertise.

OT

Network of operational devices and software leveraged in process and discrete manufacturing, industrial, and control systems.

OT systems collect operational data that enables industrial equipment to perform tasks, alert OT teams of potential failures, ensure operations continue running, and more.
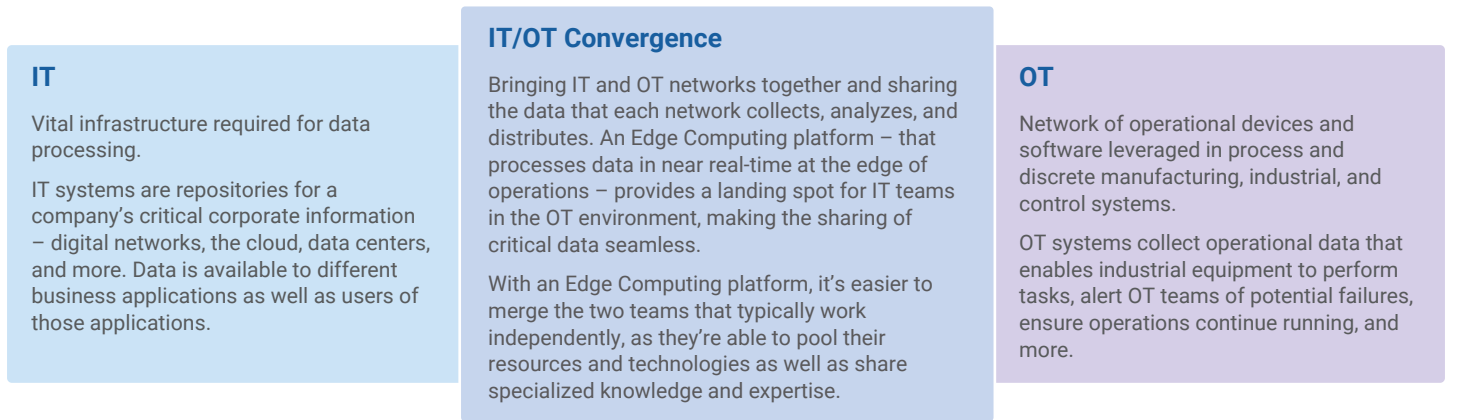
Figure 1. IT/OT convergence merges critical IT infrastructure with OT's network of devices and software leveraged in the manufacturing environment. By doing so, each distinct network shares the data collected and distributed from the IT and OT side, pooling crucial resources and expertise to enhance operational efficiencies.

Despite managing different environments, these teams have common goals, such as the need for modernization and continuous application and system availability, for example. IT and OT teams overlap in several instances, including maintenance and patching activities. IT must follow existing protocols but also coordinate with OT to avoid disruptions to the business.

Additionally, IT teams count on reliable systems with remote management and monitoring capabilities, whereas OT teams depend on reliable systems to ensure production continues without any unplanned downtime. Both IT and OT operations need to be secure, protected, and future proof, as well as simple to deploy and maintain – especially for organizations with limited skillsets and staff.

From an architecture standpoint, IT/OT convergence merges the two distinct networks – IT infrastructure and industrial, manufacturing, and process control systems – to share the data that each collects and distributes (Figure 1). With a simple, protected, and autonomous Edge Computing platform, IT/OT convergence processes can be reliably supported.

> Frost & Sullivan analyst, Sebastián Trolli, revealed 80% of organizations have begun, but have not yet finished, their IT/OT convergence journey. These findings matched polling from a 2023 Stratus and Frost & Sullivan webinar where 77% of live attendees reported that their organizations were only partially converged.

Challenges of IT/OT Convergence

Although it is clear that both IT and OT teams benefit from convergence, there are several challenges to overcome. Many different types of OT systems – including PLCs, HMI/SCADA, industrial equipment and machinery, supply chain management, manufacturing execution systems (MES), asset performance management (APM), and more – which have traditionally been under the domain of OT are increasingly under the purview of IT.

However, IT teams face the challenge of understanding these OT systems and their operational requirements.

From an IT standpoint, key challenges relate to system interoperability and technical complexity. Two areas where IT provides deep expertise and value are data management and integration, and cybersecurity. An Edge Computing platform can mitigate these challenges and play a crucial role for both categories.

Data Management and Integration

There are several variables to consider when managing and integrating data, including:

- **Data volume, velocity, and variety:** Converging IT and OT creates a huge volume, velocity, and variety of data. This data is produced from many different IT and OT sources, such as digital networks, production equipment sensors, devices, machines, and more. Managing the different data streams can pose challenges for any organization.

- **Data security and privacy:** IT/OT convergence can often expose sensitive and confidential data to potential security risks, especially as IT and OT have differing security protocols and requirements.

- **Data silos:** Disparate IT and OT systems lead to data silos, making it extremely difficult to easily access and analyze this data to better understand operations and make critical business decisions.

- **Data governance:** IT/OT convergence requires organizations to implement data governance strategies in order to ensure data consistency, data control, and importantly, data compliance internally and externally (e.g., SOX compliance).

An Edge Computing platform plays a crucial role in data management and integration. Because Edge Computing processes and analyzes data at the source, the volume of data that needs to be transmitted and stored in the cloud or on-premises data centers is reduced.

By processing data locally, Edge Computing also reduces the amount of sensitive data across networks, minimizing potential security risks. Additionally, Edge Computing can enforce data governance policies at the source, ensuring data consistency, control, and compliance with industry standards and regulations.

An Edge Computing platform also enhances data-driven decision-making. Not only is crucial data from IT and OT applications shared and analyzed, but with reduced data transmission latency, systems respond to changing conditions in near real-time, improving energy efficiency and minimizing waste – both essential in sustainability initiatives.

Cybersecurity

IT teams often rely on regular software updates to protect them from possible vulnerabilities, whereas OT teams run manufacturing operations on legacy hardware and software, opening them up to potential cyberattacks. According to CISA, there has been an effort from the U.S. Government and many software vendors, such as Rockwell Automation, AVEVA, Inductive Automation, and more, to improve cybersecurity monitoring for industrial control systems (ICS) to protect critical infrastructure. With this being said, there is always risk.

The interconnection of IT and OT systems increases the attack surface, which is one reason organizations are hesitant to converge. Because of this, there must be robust cybersecurity measures in place. Without these safeguards, organizations are susceptible to cyber threats and data breaches, which could be detrimental to a company's operations, reputation, and more. These measures include remote access, data encryption, intrusion detection, and the integration of IT security best practices into OT environments.

Process integrity is also fundamental in managing OT cybersecurity, especially when it comes to asset visibility and understanding changes to processes and equipment. With a large amount of data produced from both IT and OT systems, it is critical to carefully manage that data and any changes to configurations and permissions to identify potential risks.

For example, for an organization to meet and adhere to SOC 2 standards, processing integrity ensures that all elements within the audited system are complete, valid, accurate, timely, and authorized.

An Edge Computing platform serves as an additional security layer between IT and OT systems, providing a protected, local environment for securing data and applications, running cybersecurity protocols, and maintaining visibility across the OT infrastructure. This advantage coupled with an Edge Computing platform's ability to reduce the amount of data being transmitted between IT and OT networks, as well as the cloud, lowers the risks of exposure and cyberattacks.

How Edge Computing is a Common Ground for IT/OT Convergence

Foundational to spearheading efforts in converging IT and OT is a simple, protected, and autonomous Edge Computing platform. By leveraging Edge Computing, not only can manufacturers manage vast amounts of data and improve cybersecurity measures, but many organizations have found success with the following:

Providing an IT Landing Zone in the OT Environment

IT teams have crucial tools and technologies that help accelerate digital transformation in OT environments. A scalable and purpose-built Edge Computing solution provides a familiar platform for IT teams to have a solid landing zone in the OT environment. This allows IT managers to run their information technology standards on OT applications, providing critical insights and tools for both IT and OT teams.

IT teams also can further reduce the IT footprint with support from Edge Computing platforms. By consolidating applications and their workloads to single, fault-tolerant and virtualized Edge Computing platforms, IT teams can reliably and efficiently run a greater number of applications in support of OT operations, helping improve performance while reducing costs.

For example, with an Edge Computing platform, IT and OT teams are able to organize local data, feeding needed data into the advanced analysis of asset performance management (APM) solutions in the cloud, without the burdens of bandwidth and concerns of data management. The local compute power reduces the requirement for continuous communications with centralized servers and unburdens the network. As a result, organizations have the infrastructure to more easily apply equipment health monitoring to detect potential failures and run predictive maintenance. Through the virtualization and workload consolidation gained via Edge Computing, various IT-driven capabilities can be adopted locally, leading to enhanced operational efficiencies and streamlined operations.

IT/OT convergence gives organizations a competitive edge, as they can quickly respond to changing market conditions and meet customer demands. Bringing together both IT and OT technologies on a simple, protected, and autonomous Edge Computing platform bridges the traditional gap between IT and OT teams, empowering collaboration, improving productivity, enhancing decision-making, and allocating resources more effectively.

Improving Uptime and Reliability by Deploying Fault Tolerance Anywhere

In the OT environment, unplanned downtime is not an option – if production stops, cost goes up. IT teams look to ensure that downtime does not occur by using standardized systems that are both easy to manage and fail-safe. Implementing a fault tolerant Edge Computing platform protects both IT and OT data and applications from disruptions and downtime, ensuring operations continue and are always available.

A platform with built-in redundancy and failover replicates systems so that they can resume at a moment's notice. In the event of a failure, the application will failover to the secondary system and resume running without interruption or human intervention. Virtualization is being leveraged to combine physical systems, and failover applications running on virtual machines (VMs) are taking advantage of the portability VMs afford.

Advanced Edge Computing platforms utilize redundant hardware and intelligent, proactive failover capabilities to automatically take action to avoid a system outage if a hardware failure is identified or if a potential hardware failure is predicted. This advanced technology monitors system health to predict when a component failure is likely to occur or takes action to restore system health and prevent a failure without human intervention.

Modernizing Legacy Infrastructure and Becoming Future Proof

Although IT software and hardware solutions are continually updated, many OT systems are not. OT assets tend to last longer than IT assets and, as a result, they sometimes lack the latest technology. OT assets can also be proprietary, hard to update or modify. Today's manufacturing landscape is rapidly changing and it's essential for organizations to keep up with these changes, embrace IT/OT convergence, and replace aging platforms.

This is necessary in order to utilize the latest technologies – most of which are designed to improve flexibility, scalability, and, importantly, reliability. Edge Computing provides an essential platform for modernizing OT hardware and software, and it provides IT teams a standardized platform to integrate into their IT infrastructure.

For example, one system integrator modernized a leading global specialty chemicals manufacturers' compute infrastructure across its product lines. The integrator did this by consolidating 9 server workloads – running Rockwell Automation applications including 3 FactoryTalk batch servers, 2 FactoryTalk HMI servers, a Historian server, a SQL server, a domain controller, and an engineering workstation – into a single, fault tolerant Edge Computing platform. The specialty chemicals manufacturer has experienced no unplanned downtime since implementation.

By modernizing legacy infrastructure, organizations will also see improved cybersecurity measures. IT and OT teams that align their security protocols create a more robust, resilient, and secure infrastructure. With an Edge Computing platform, IT and OT teams have access to real-time monitoring and centralized control, enabling faster detection and mitigation of cyber threats.

Simplifying Manageability & Serviceability

A key benefit of IT/OT convergence is enhanced manageability and serviceability. With Edge Computing, manufacturers tie existing IT systems and technologies into the OT environment, which can all be managed remotely. Additionally, with virtualization, IT teams can easily consolidate workloads onto a single, fault tolerant edge platform, reducing IT footprint and costs.

IT teams can also leverage an Edge Computing platform to push and patch applications at the edge, manage those remotely and securely, and deliver future improvements by scaling these solutions in other production environments. Purpose-built Edge Computing offers an easy way to manage compute infrastructure for local operations without the requirement of IT skillsets or resources locally, which oftentimes is not available on the manufacturing floor.

Remote monitoring and diagnostics are one of the drivers in achieving an autonomous operations paradigm. IT monitoring tools can be run on an Edge Computing platform, providing crucial visibility and insights into the operational environment.

There is also improved visibility across functions with IT/OT convergence measures, supported by an edge solution. Critical data is aggregated, organized, and shared across systems – from the edge to the cloud – while minimizing latency, security, and cost concerns.

Choosing the Right Edge Computing Provider

Moving towards IT/OT convergence is no easy task. It's crucial to find the right Edge Computing provider to support the effort. Whether that's a system integrator or a technology partner, ensuring a smooth transition and receiving impeccable support services is key.

IT teams are often pressed to do more in less time with tight budgets and fewer resources and people. Because of this, it's crucial to have an Edge Computing provider that offers services including comprehensive development and support for end-to-end, multi-vendor environments, allowing organizations to supplement IT resources with customized solutions to address IT/OT convergence requirements.

Working with a true business partner gives IT teams the opportunity to offload platform support and health monitoring to professionals who are experts in OT deployments and Edge Computing platforms. This helps ease the IT workload and maintain those stringent uptime KPIs.

Organizations who have engaged OT and IT together report benefits such as:

- Massive reduction of IT infrastructure, for example, consolidation of 12 servers into one fault tolerant Edge Computing platform.

- Near elimination of unplanned downtime, data loss, and associated business impact.

- Increased capability and deployment of complex software while reducing total cost of ownership (TCO) by 15-20%.

- Edge Computing deployment and thorough infrastructure modernization in just 45 days.

- Reduced maintenance needs by 50% - issues, troubleshooting, and monitoring.

For organizations thinking of leveraging Edge Computing to support IT/OT convergence, choosing a provider that not only understands the importance of convergence but also provides around the clock, 24/7/365 support and services can make a huge difference, setting them apart from other vendors.

Simple, Protected, and Autonomous Edge Computing

Organizations looking to streamline operations, bridge barriers, manage and share data, and reduce cybersecurity threats are implementing Edge Computing platforms to support IT/OT convergence. End users need a comprehensive and user-friendly solution that is:

- **Simple:** Easy to deploy, install, manage, and scale up over time, and designed with a zero-touch approach.

- **Protected:** Robustly built for reliable operation in field environments, with native redundancy to reduce operational and financial risk.

- **Autonomous:** Deliver constant availability, both for the hardware itself and the applications it runs, with extensive remote management provisions.

It's crucial to bridge barriers between IT and OT with Edge Computing so that organizations can achieve all the benefits that come from IT/OT convergence. Stratus Edge Computing platforms meet this need and are purpose-built to drive reliable, efficient operations. Stratus ensures the continuous availability of operations-critical applications by delivering zero-touch Edge Computing platforms that are simple and easy to deploy, protected from interruptions and threats, and autonomous.

For more information about Stratus Edge Computing platforms, please contact us here today.

About Stratus

For more than forty years, Stratus has provided highly reliable and redundant computing systems and expert services to complex and constrained operational environments, enabling partners and customers to securely and remotely turn production data into actionable intelligence so they can run operations safely, reliably, and efficiently.

Reference 1: Gartner, *Building an Edge Computing Strategy*, 12 April 2023.