Build Better HMI/SCADA Solutions with Edge Computing

Running the finest PLCs and software on a conventional platform is no longer the best way to protect monitoring and control operations.

Introduction

Traditional human-machine interface (HMI) and supervisory control and data acquisition (SCADA) architectures for mission-critical automation control have served industry well, but there is always room for improvement. With digitalization comes an edge-computing-based approach that redefines what "good" looks like in a monitoring and control system architecture.

Modern Edge Computing platforms solve many common challenges faced by engineers when deploying or operating HMI and SCADA in their automation and control systems. This paper describes what an improved and fortified industrial control system architecture looks like; the inherent advantages of Edge Computing for resolving persistent challenges; and proof points from an oil & gas industrial organization, materials manufacturer, and specialty chemical company whose control systems are benefitting from the transition to a single edge platform.

You'll also see how three different organizations implemented an Edge Computing control and automation architecture along with a modern distributed control system (DCS) and historian software for process optimization.

Visualizing the opportunity

Edge Computing is a distributed computing framework that collects, processes, and stores crucial information close to the edge — where it is produced or consumed — rather than in a centralized server or data center. But what does that mean for an industrial control system infrastructure?

Figure 1 reflects how Gartner's representation of an Edge Computing topology is essentially the edge version of the Purdue Model for Industrial Control Systems. **Figure 2** combines the two models to illustrate a complete edge portfolio, from the device gateway to compute edge to the enterprise.

Adopting Edge Computing within your enterprise benefits automation control, specifically HMI and SCADA design, by improving your ability to protect mission-critical operations. A single edge platform can bolster operational excellence to deliver extensive engineering, operation, and maintenance efficiencies as well as critical reliability, safety, and security improvements.

The Gartner Topology vs. The Purdue Model

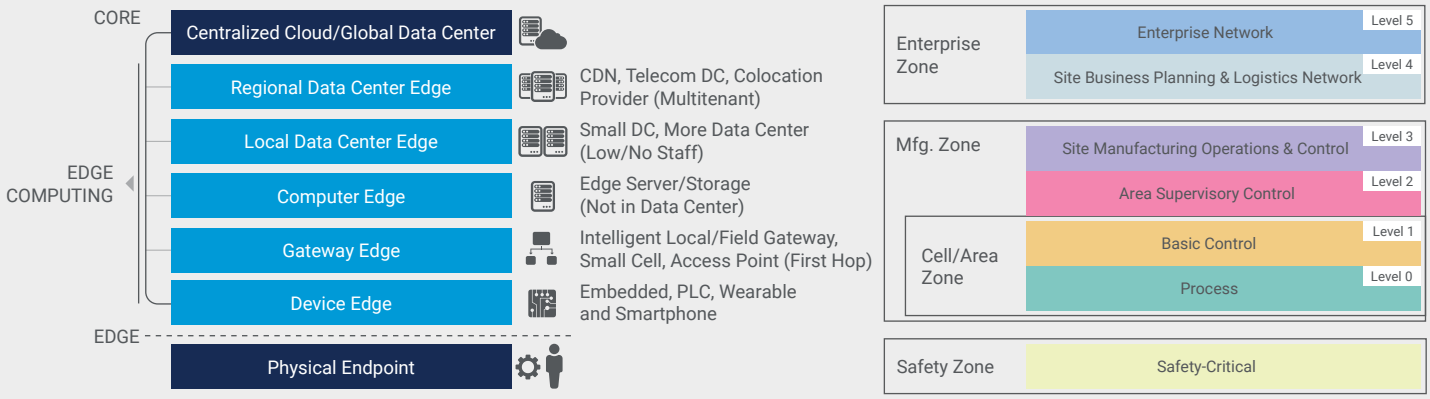

Figure 1. Gartner's Edge Computing topology is essentially the edge version of the Purdue Model for Industrial Control Systems.

Source: Gartner.

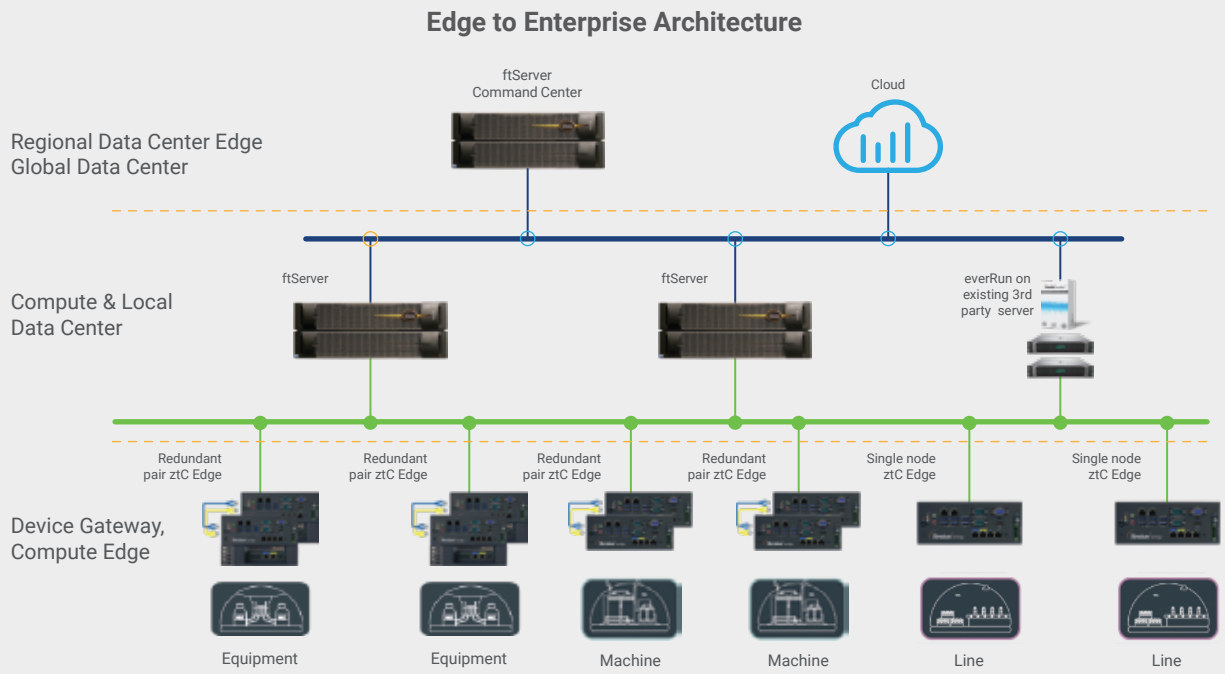

Figure 2. Combining the Gartner Edge Topology with the Purdue Model produces this diagram of an entire edge portfolio from device gateway and compute edge all the way up to the enterprise. It shows how it is possible to use Edge Computing platforms at various levels of the Gartner Edge Topology.

Solving core challenges

One of the most pressing challenges with typical automation and control architectures is turning the sheer volume of data generated by today's industrial automation systems into actionable information. Other significant challenges include modernizing legacy infrastructure, streamlining operations by reducing disparate islands of automation, and eliminating unplanned downtime. The Edge Computing approach tackles these challenges by design.

Edge Computing modernizes the infrastructure and streamlines operations by enabling the consolidation of multiple software solutions running on multiple individual computers into a single edge platform.

A typical installation has HMI/SCADA software and advanced applications such as historians, manufacturing execution systems (MESs), batch, asset performance, engineering, and programming software installed in multiple computers. Edge Computing platforms offering built-in virtualization avoid this complexity and cost.

In addition to embracing digitalization, decreasing islands of automation, and facilitating workload consolidation, edge platforms offer additional performance benefits such as mitigating delays from bandwidth and latency issues and simplifying maintenance complexities common with an expanding pool of hardware and software assets. Edge platforms that support remote and autonomous operations enable OT users to manage systems, removing the need to rely on IT resources.

As more critical applications reside in edge platforms, built-in redundancy to protect against unplanned downtime and enable operational resilience increases in importance. Downsizing to a single redundant device where all the valuable automation and control software are installed actually increases reliability and simplifies security management, thus minimizing the risk of costly operational disruptions. Built-in redundancy and preconfigured virtualization are especially important when the SCADA or HMI is installed in a remote or hazardous environment.

Delivering additional capabilities

Some modern Edge Computing platforms are industrial grade, such as those provided by Stratus. Ruggedized, Class I Division 2 (CID2) certified platforms, such as Stratus' **ztC™® Edge Computing platform** (see **Figure 3**), can be installed in hazardous locations, together with the programmable logic controllers (PLCs), in the same control panel without special accommodations for temperature, humidity, or vibration protection.

Many Edge Computing devices have built-in protection from cyberattacks, such as:

- Host-based firewalls for blacklisting or whitelisting IP addresses or domain names
- Restricted USB ports to help prevent the spread of malware
- Role-based access controls to authorize specific users and groups
- Secure communications protocols and Trusted Boot to thwart cyberattacks

Scalability, extensibility, and standardization also are associated with advanced edge platforms, such as the smaller-capacity Stratus ztC Edge and large-capacity **Stratus ftServer® platforms** (see **Figure 4**).

Figure 3. Some modern Edge Computing platforms are industrial grade, such as the ruggedized, Class I Division 2 (CID2) certified Stratus ztC Edge Computing platform, which can be installed in hazardous locations, with the PLCs, in the same control panel without special accommodations for temperature, humidity or vibration protection.

Figure 4. Advanced edge platforms, such as the Stratus ftServer platform, provide scalability, extensibility and standardization. The best Edge Computing platforms scale well as new nodes and locations are added.

The best Edge Computing platforms scale well as new nodes and locations are added. They are extendable to accommodate new operations and control capabilities without a significant investment, and flexible to extend monitoring and control of the plant to mobile devices.

Some of the most pressing challenges with typical automation and control architectures include demand for digitalization, disparate islands of automation, and downtime. The Edge Computing approach tackles these challenges by design.

They also support standardization of all control into a single architecture and can meet non-redundant, high availability, or fault-tolerant needs. And the best edge platform can be easily installed, operated, and maintained by non-IT personnel.

Optimization in action

The following three companies, each with unique needs, found their solution in an Edge Computing control and automation architecture. See how they optimized their operations.

1. Streamline Innovations

A Texas-based solution provider that focuses on eliminating hazardous emissions through technology, selected Stratus to bring AI-powered predictive maintenance, remote operation, and 99.5% uptime to remote oil field equipment. This included:

- Stratus ztC Edge to develop, host, and protect proprietary hydrogen sulfide gas treating process
- Inductive Automation Ignition HMI/SCADA Software
- PostgreSQL Database and Python
- Seeq AI Software

Streamline Innovations created solutions for their customers that enabled real-time analysis, HMI, and tracking of 50 KPIs from 350 miles away. The company also reduced onsite staffing requirements by 66% and surpassed 95% customer SLA by achieving 99.5% uptime.

> "Using Stratus, we have built smart plants that are managed remotely by Artificial Intelligence and visible from any location 24/7."
>
> **Dr. Peter Photos**
> Chief Technology Officer, Streamline Innovations

Read the full **case study** to learn how by using Stratus Edge Computing, the company brought intelligence and remote operations to complex process skids, enabled continuous operation, and surpassed customer expectations.

2. Rubberlite

A West Virginia-based materials manufacturer chose Stratus Edge Computing platforms to simplify and consolidate IT infrastructure, standardize data collection, and ensure continuous availability of applications and reliability of data. This included:

- Stratus ftServer to run application virtualization and fault tolerance eliminating downtime, centralizing data, and improving reliability
- AVEVA™ System Platform DCS and data historian

By improving data reliability and automation, Rubberlite drove significant improvement in efficiency and product quality, translating to business growth and customer satisfaction. The team reduced non-sellable material by 80% while increasing sales and production by 25%. Most dramatically, Rubberlite has experienced zero downtime since implementing a Stratus solution in 2016.

> "Our partnership with Stratus has helped Rubberlite evolve to where we are now, and it's put us in the position to continue to grow and improve."
>
> **Former Process Automation Engineer**
> Rubberlite

Read the full **case study** to learn how Stratus Edge Computing enabled Rubberlite to eliminate downtime, lower IT costs by 50%, and reduce non-sellable material by 80%.

3. Synthomer

A London-based specialty chemical company embraced a fault-tolerant Edge Computing platform to centralize and optimize operations at a production plant in Italy and protect against failures and downtime. Standardizing the entire facility on the same system eliminated islands of automation and improved operational safety, resilience, and analytics. This included:

- Stratus ftServer to protect the modernized operation and house all the software used to engineer, program, operate, and maintain the DCS
- Rockwell Automation PlantPAx DCS
- Rockwell Automation Allen-Bradley ControlLogix PACs
- System integration by Progecta

Upgrading the plant to run on a single Stratus edge platform and centralized PlantPAx DCS, in addition to replacing the plant's previous disparate, multi-branded PLCs with Allen-Bradley ControlLogix PACs resulted in a 30% increase in production and millions of Euros of additional revenue. Throughout the three-year digital transformation project, production never stopped.

Read the Synthomer **case study** to see how the company implemented a fault-tolerant Edge Computing platform to centralize and optimize operations.

Summary

The breadth and depth of proven Edge Computing advantages underscore the reasons it is time to turn the page on traditional automation control architectures. For mission-critical operations, leveraging benefits such as work consolidation, operational resilience, downtime protection, and standardization ensures a more powerful, efficient, and secure HMI/SCADA solution.

About Stratus Technologies

For leaders digitally transforming their operations in order to drive predictable, peak performance with minimal risk, Stratus ensures the continuous availability of business-critical applications by delivering zero-touch Edge Computing platforms that are simple to deploy and maintain, protected from interruptions and threats, and autonomous. For 40 years, we have provided reliable and redundant zero-touch computing, enabling global Fortune 500 companies and small-to-medium sized businesses to securely and remotely turn data into actionable intelligence at the Edge, cloud and data center – driving uptime and efficiency.

For more information, please visit **www.stratus.com** or follow Stratus on Twitter **@StratusAlwaysOn** and LinkedIn **@StratusTechnologies**.

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