Edge Computing – quite literally, the Edge!

Lenovo Infrastructure Solutions
for The Data-Centered

Lenovo

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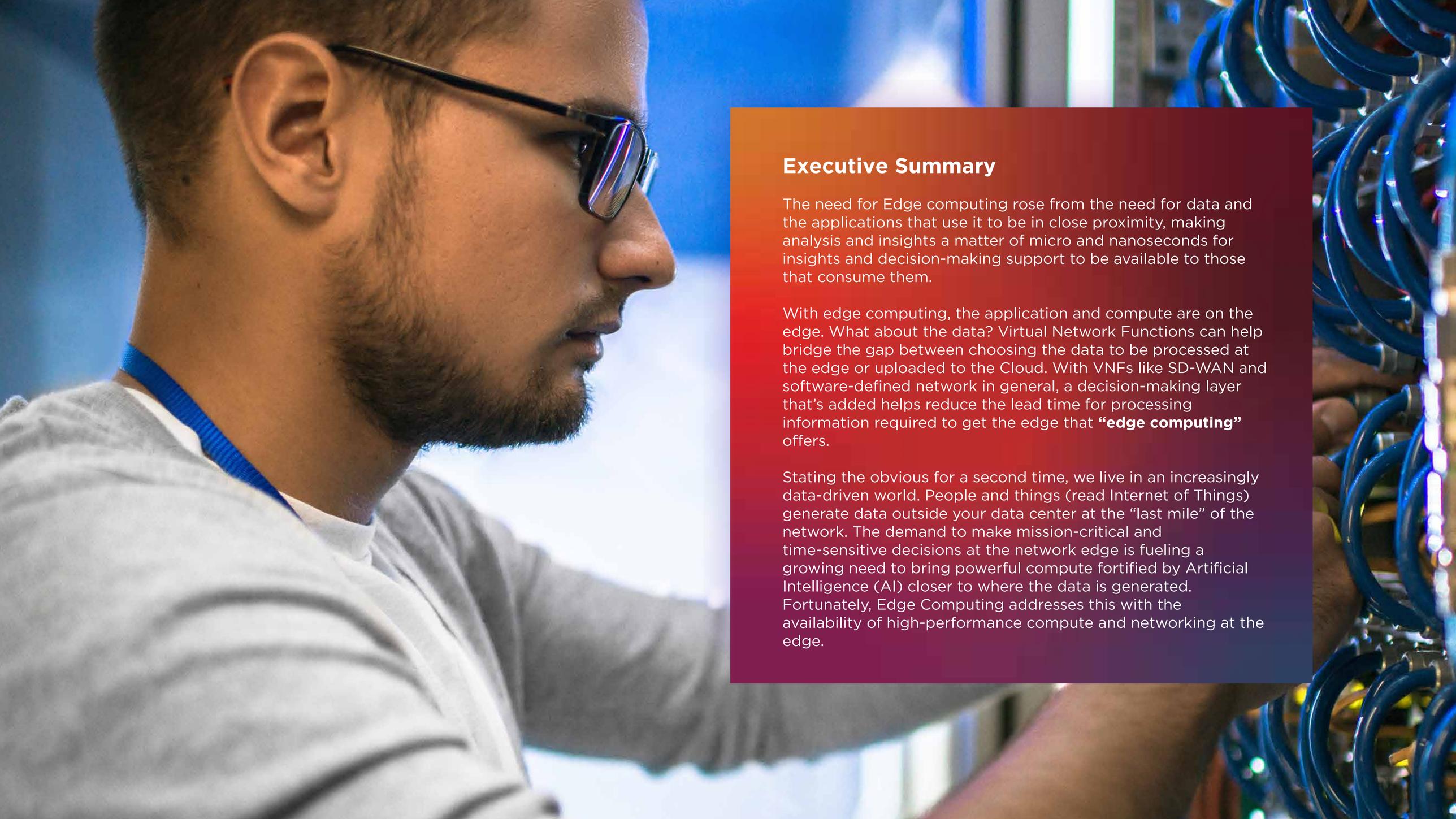
Introduction

With people around the world going mad over machines, we have found ourselves in quite some confusing terrain! First, we went from big applications to multiple small ones, big datacenters to smaller, “distributed computing.” Then the data explosion happened. From data modeling to data warehouses to big data, and now, technology seems to have driven us to the very Edge!

Today we take a closer look at what the edge is, what Edge is the edge to, and more importantly, what edge this Edge gives us.
As we would have it, earlier systems had centralized data repositories and localized processing of that data by applications. And this just wasn’t fast enough for situations where split-second decisions are of utmost priority. So! We had a new paradigm, which in normal words just means, new approach – to computing on the edge. Whether this edge is the

- Cliff-face an autonomous vehicle is trying to traverse
- Retail website trying to compute the best recommendations for a shopper, or
- Tsunami Early Warning Systems



Executive Summary

The need for Edge computing rose from the need for data and the applications that use it to be in close proximity, making analysis and insights a matter of micro and nanoseconds for insights and decision-making support to be available to those that consume them.

With edge computing, the application and compute are on the edge. What about the data? Virtual Network Functions can help bridge the gap between choosing the data to be processed at the edge or uploaded to the Cloud. With VNFs like SD-WAN and software-defined network in general, a decision-making layer that's added helps reduce the lead time for processing information required to get the edge that **"edge computing"** offers.

Stating the obvious for a second time, we live in an increasingly data-driven world. People and things (read Internet of Things) generate data outside your data center at the "last mile" of the network. The demand to make mission-critical and time-sensitive decisions at the network edge is fueling a growing need to bring powerful compute fortified by Artificial Intelligence (AI) closer to where the data is generated. Fortunately, Edge Computing addresses this with the availability of high-performance compute and networking at the edge.

The Challenge Edge Computing Addresses

When you need your insights in real-time, latency or delays caused by data traveling to data centers or the Cloud, and then back again to the device, can make things ludicrously slow. For example, self-driving cars cannot wait for the roundtrip of data when choosing to brake right now, or maybe a few seconds later; or for that matter, choosing the right speed for the given stretch of road. The growing need for real-time decision-making also increases the need for “intelligence” at the edge alongside complemented compute at the data center or Cloud for time-insensitive functions.

Other than the fact that Edge computing enables for ultra-low latency response times and reduced bandwidth need , there are also other compliance and cost benefits: for example, where data is required to remain within a certain location or must be processed n-site because of the prohibitive cost of transport or transport time. Similarly, for businesses with global operations, data protection regulations in certain geographies may make it imperative for data processing to happen on the edge.

Use cases that require processing at the edge may include , connected self-driving cars, video surveillance, IoT analytics, video encoding, video analytics, speech analytics, enhanced retail services, robots on a manufacturing floor, among others.

What makes Edge computing the cutting edge?

As we now know, edge computing offers computing capabilities at the location where the data is generated and utilized instead of the datacenter. Whether a branch office, a retail outlet, a manufacturing facility, or an oil rig in a remote location, edge servers need to be purpose-built to operate in harsh environments with a broad operating temperature range. They need resistance against shock and vibration, allow operations in dusty conditions, and have additional security features embedded, as in the case of devices outside the safety of the data center.

Lenovo Edge Servers are compact and ruggedized for use in harsh environments and limited power availability conditions. In addition, they are designed for ease of deployment, enhanced security, efficient manageability and are also supported by **Lenovo Open Cloud Automation (LOC-A).** LOC-A provides an automation platform that orchestrates the entire chain of events/tools from hardware configuration to operating systems installation to cloud, as well as the networking layer deployment.

Key attributes for successful Edge computing

1

Ease of Deployment

2

Enhanced Security

3

Ease of Maintenance

Ease of Deployment

Going from hundreds or thousands of servers concentrated in a few data centers to hundreds or thousands of devices in many different locations at the edge is a move away from the traditional data center-oriented IT architecture. This move also means a departure from traditional support models as your edge infrastructure will now be massively distributed and not easily accesabile by skilled resources. Hence, simplified and automated deployment will become the bare necessity – and Lenovo Edge solutions offer:

- Low-to-zero-touch deployment model to reduce installation time from hours to minutes
- LOC-A to orchestrate all the tasks needed to configure the hardware and deploy the operating system, network, and cloud layer
- Provisioning of systems within minutes, entirely automatically, without any human intervention, and all from a central location

Enhanced Security

To cater to the challenging environment edge systems are typically deployed in, to minimize the potential of theft of the data or device and protection of sensitive data, Lenovo Edge Systems feature:

- Tamper detection
- Lenovo ThinkShield Edge Mobile Management enables authentication of the server securely, via a mobile phone of an authorized technician only
- Self-encrypted storage drive—when tamper detection is triggered, the encryption keys of the hard drive are automatically deleted, rendering the device useless
- Unauthorized movement detection
- GPS tracking

Ease of Maintenance

As these devices are distributed in many different places (and sometimes countries!), deploying an IT technician at every site is not an option. Therefore, remote and more secure manageability are built into every Lenovo Edge Server to facilitate easy maintenance and operations , such as:

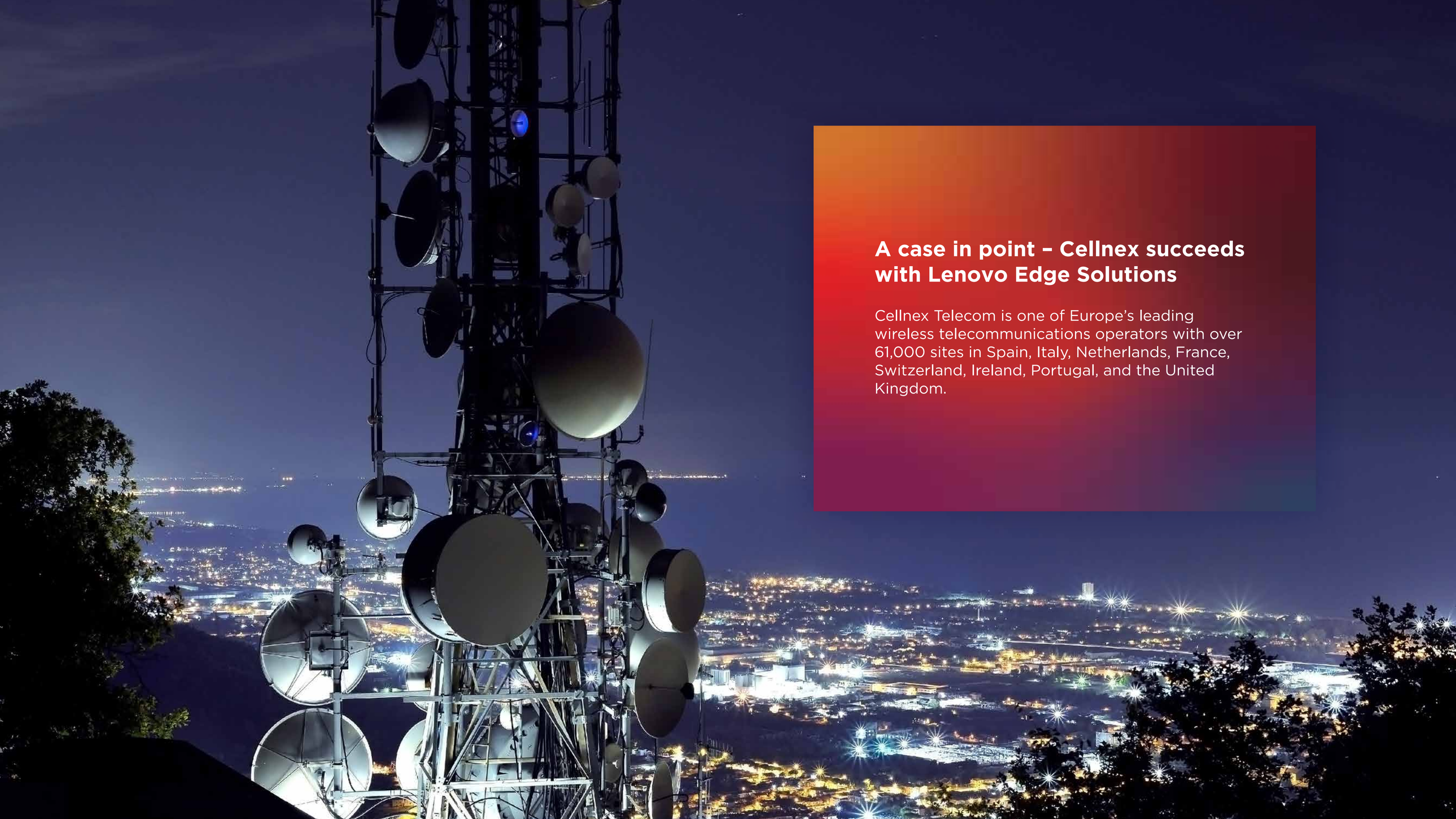
- Remote, automated hardware (such as firmware and BIOS) and software upgrades, and versatile remote access over 4G-LTE and 5G via LOC-A
- Local maintenance option over Wi-Fi using a mobile app

Real-world examples of Edge Computing

Edge for Telcos

5G communication presents a vast set of opportunities for the telecom sector, but not without added pressure on mobile network operators (MNOs). As IoT devices and smart grids generate a larger quantity of data, operators have a two-pronged challenge in improving bandwidth and latency as well as ways to use the infrastructure to reduce costs and generate new sources of revenue.
To answer these questions, operators are looking at edge solutions. By extending compute/ network capabilities from centralized data centers to a growing number of edge locations , MNOs can bring the network's speed and capacity closer to the end-user, reducing traffic load, improving performance, increasing scalability, and reducing operating costs.

The multi-access edge computing (MEC) network architecture aims to reduce bandwidth congestion and allow new applications and services to run at the network's edge, including IoT, RA, and local content delivery.



A case in point – Cellnex succeeds with Lenovo Edge Solutions

Cellnex Telecom is one of Europe’s leading wireless telecommunications operators with over 61,000 sites in Spain, Italy, Netherlands, France, Switzerland, Ireland, Portugal, and the United Kingdom.

Considering edge computing solutions decentralize the data center, spreading devices across hundreds of thousands of sites, device availability and reliability are critical! Thus, Cellnex required the Edge Infrastructure to be rugged, reliable, available, secure, and most importantly, powerful!

To reduce the risk in designing this new infrastructure and implementing it, Cellnex needed more than just a vendor. They needed a partner that could provide modular solutions for today and scalable for tomorrow as new and emerging technologies continue to arrive. Consequently, Lenovo and a local company Nearby Computing were chosen to bring this ambitious project to fruition. Together, Lenovo and Nearby built a converged edge solution that brought together operational and information technology workloads on a single, compact platform.

Lenovo deployed **Lenovo ThinkSystem SE350 Servers** and the prototype Lenovo ThinkSystem SE650 Servers running Intel® Xeon® Scalable processors.

The Lenovo ThinkSystem SE550 — currently a prototype — is a 2U-high modular system designed for applications that need significant processing power, such as vRAN, multi-access edge computing (MEC), and NFV infrastructure (NFVI). In addition, both servers offer physical and data security to protect against unauthorized data access with a dedicated management port and the ability to detect hardware tampering and unauthorized movement. And with Lenovo Open Cloud Automation (LOC-A) software, Cellnex can now allow MNOs to rapidly deploy, optimize, and manage cloud infrastructure on the ThinkSystem SE350 Edge Servers with support for Kubernetes, Red Hat OpenShift, and VMware Cloud Foundation.

Cellnex acts as a neutral host for the joint solution, offering the full end-to-end edge solution as a service to their MNO clients.

View the Case Study

This edge computing solution is designed to help mobile operators lower their TCO, while supporting exciting new visual use cases for different vertical segments. As a scalable and modular solution, it can cover many different scenarios, from dedicated on-premises deployments, to distributed Telco Edge Services for the customer market.

cellnex

Óscar Pallarols
Global Commercial Director,
Cellnex Telecom.

Edge for Smart Cities

Barcelona was one of the first European cities to implement data-driven smart city technologies to improve its services. Recognized telecommunications nexus, as well as an important venue for activities and events, such as the Mobile World Congress, Barcelona was an ideal setting to demonstrate how 5G solutions can support future lifestyles.

A consortium of leading telecommunications firms, IT service providers, and local government contributed to the roll-out of a large-scale 5G pilot program for the city, where edge computing played a key role.

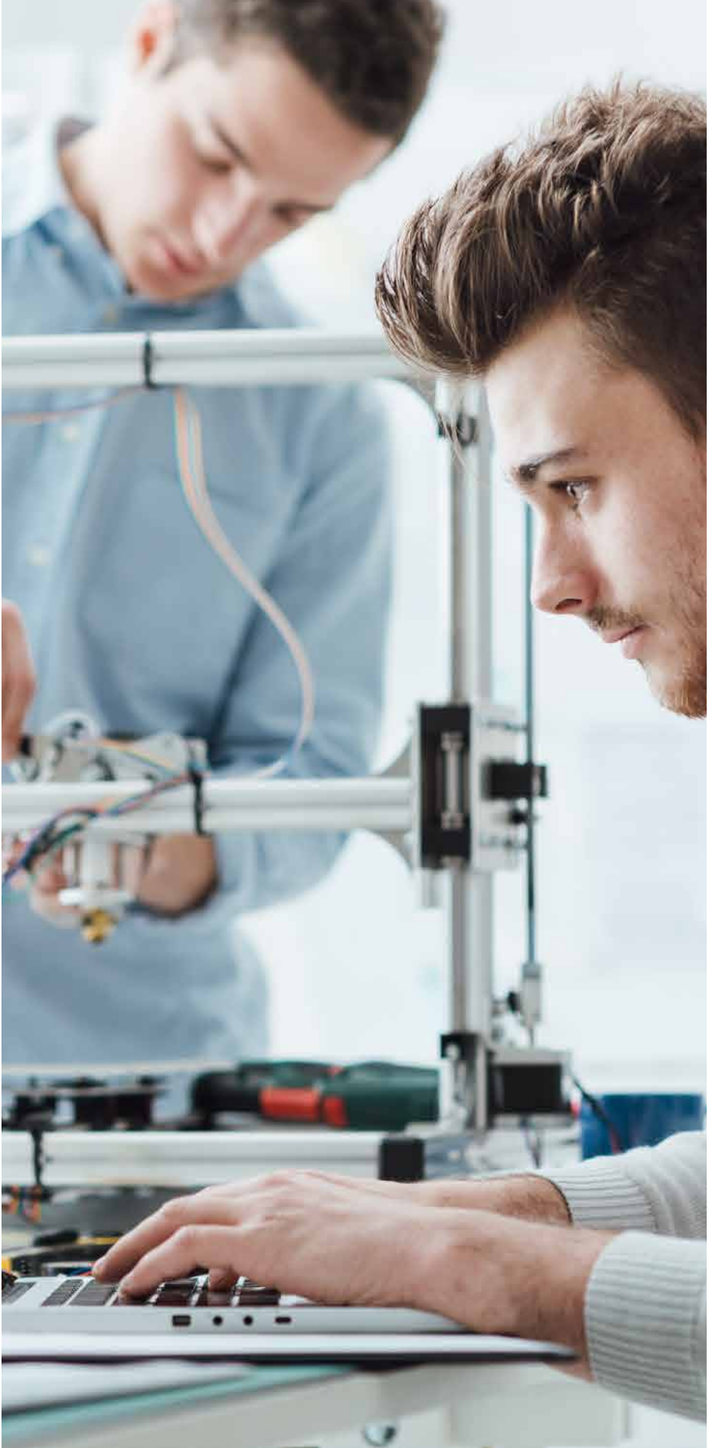
This consortium — which also involved Lenovo , the Catalan operator Parlem Telecom; Aumenta Solutions, a company specialized in augmented reality for the industry; Atos engineering; Nae consultants; and the startup Nearby Computing, a spin-off of the Barcelona Supercomputing Center — was one of the successful bidders in the second call for grants to develop 5G pilots.

The variety of solutions unleashed by by 5G technology was expected to transform businesses, consumers, and citizens alike. Specifically, the scenarios explored in the Barcelona smart city pilot, together with cloud-based computing infrastructure, included:

- **Emergency Response and Public Safety:** To deliver a smarter approach to public safety
- **Education:** A proof of concept of how holographic solutions can facilitate remote learning through immersive education
- **E-Commerce:** Facilitation of immersive remote shopping experiences through an augmented reality solution that allowed businesses to continue operating independently of what is happening in other parts of the world
- **Automotive:** A demonstration of how autonomous and connected vehicles can help people get around more easily
- **Manufacturing:** A means to help businesses move products throughout the supply chain in the most efficient way possible, based on real-time data
- **Connectivity:** in tourist zones through the implementation of a multi-operator neutral network
- **Broadcasting:** HD audiovisual signals in live events with remote performance
- **Design and Deployment:** of a fully 5G network, enabled to carry out the use cases in the project and which would remain in operation once the project is completed

Lenovo provided a single MEC platform and architecture that deployed, automated, and managed edge computing solutions for the Barcelona pilot, all from a central control point. Employing different products such as ThinkSystem SE350 Edge Server hardware and Lenovo Open Cloud Automation (LOC-A) software, the system was designed to be able to rapidly deploy, optimize, and manage the cloud infrastructure of communication service providers on edge servers, dedicated bare metal servers, containers, and virtual machines. LOC-A further combined the advantages of the public Cloud, including speed, scalability, flexibility, and low latency, with those of the private Cloud. LOC-A also offered a seamless integration needed to take advantage of the full potential that 5G communication had to offer by combining data protection and security. The system also included support for Kubernetes, Red Hat OpenShift, and VMware Cloud Foundation. This way, the ecosystem represented a solution that was smart, open, modular, future-proof, and that had the capacity for multiple use cases within the pilot.

The work of the Barcelona consortium was instrumental in demonstrating the potential of 5G to facilitate a new era of immense data speeds and bandwidth requirements. In addition, the smart city pilot helped reinforce the city’s reputation, not only as a leader in telecommunications but as a thriving business center in a truly digital economy.



Case in point - Edge for Manufacturing

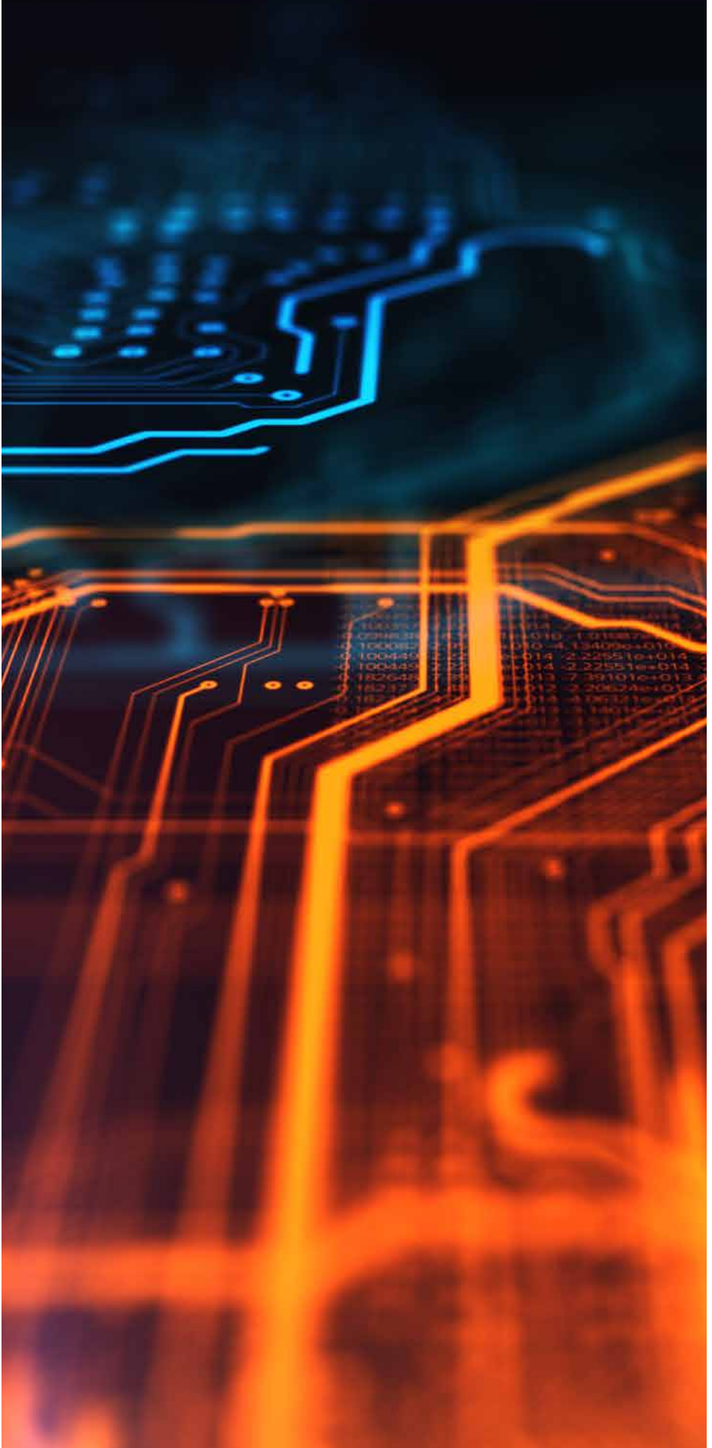
Strauss Coffee Romania is a subsidiary of Strauss Coffee—one of the top-ten coffee companies in the world. Part of Strauss Group, a major food and beverage multinational based in Israel, Strauss Coffee has been present in Romania for more than 25 years and employs around 250 people. Strauss Coffee used Lenovo ThinkSystem SE350 edge servers to enhance the resiliency and security of its factory-floor control system, helping to keep manufacturing operations on track.. To keep factory operations running smoothly, Strauss Coffee Romania relies on an extensive supervisory control and data acquisition (SCADA) system. This comprises supervisory systems connected to plant machinery and human-machine interfaces (HMI) through programmable logic controllers (PLCs) and other industrial automation sensors. The supervisory systems collect, aggregate, and visualize equipment data in graphical dashboards, enabling operators to monitor, control, and optimize production. In the past, Strauss Coffee Romania used Lenovo ThinkCentre M90n Nano PCs as the platform for its supervisory systems. However, factory conditions were pushing the machines to their limits. Temperatures on the factory floor can reach up to 50°C because of the roasting process, while the mills that grind the coffee beans produce a very fine dust that permeates the atmosphere.

Designed specifically for tough operating conditions outside of data centers, the Lenovo ThinkSystem SE350 edge server has a small hardware footprint with a 1U height, half width, and short depth case that can be installed flexibly almost anywhere. The rugged edge server can handle temperatures from 0° to 55°C, and tolerate locations with high levels of dust and vibration—making it the ideal fit for Strauss Coffee Romania's production site. They replaced multiple PCs with Lenovo ThinkSystem SE350 servers, reducing the total number of required hardware devices on the factory floor and improving ROI.

Today, the Lenovo ThinkSystem SE350 edge servers form an essential part of their SCADA system. Connected to as many as 8,000 equipment sensors, the edge servers control more than 42,000 digital input/output (I/O) devices, collecting data on machine state, error codes, temperature, humidity, pressure, and more

"The Lenovo ThinkSystem SE350 servers are rugged, powerful, and perfectly suited to the conditions in our factory. The advanced air flow and cooling system prevents the servers from overheating despite the 50°C ambient temperature, and specially designed dust filters prevent coffee grounds from entering the servers. Maintenance is much quicker and easier—rather than disconnecting and moving PCs around, all we need to do is remove, clean, and reattach the dust filter" **Aurelian Mester, IT Manager, Strauss Coffee Romania**

Read the case study



Lenovo’s edge server technologies power the Ducati team

Ducati first signed up Lenovo as a technology partner in 2018, in a deal focusing on equipping the MotoGP team with PCs, tablets, and edge computing devices to collect and analyze race data to help the team improve the design and configuration of its bikes.

To maximize driver performance on the track today, analyzing huge amounts of data had become essential. Therefore, Ducati built an edge infrastructure based on Lenovo servers, which followed the team on the track on all circuits.

Analytics and simulations now run during the MotoGP using Lenovo’s compact-sized and rugged ThinkSystem™ SE350 edge server to process and analyze data at the source. With this upgraded processing power, Ducati engineers are able to track simulations with AI and Machine Learning and develop even safer strategies on track, including better management of tire consumption.

The deepened technology partnership is proposed to continue to increase the team’s technological edge on the racetrack and enable even smarter remote collaboration focused on speed, flexibility, and mobility.

Lenovo Edge Computing Leadership

Lenovo solutions are designed to help customers easily deploy edge-compute services that use small cells and other private network topologies. Additionally, Lenovo's comprehensive server portfolio is also suitable for deployment at enterprises, street-side cabinets, remote base station buildings, retail outlets, warehouses, manufacturing, and mining sites, among others.

Explore Edge Computing Solutions