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New Lenovo ThinkEdge SE450 Edge server enables 5G RAN and MEC Applications

Built with 3rd Generation Intel® Xeon® scalable processors and tuned for commercial software built with Intel® Smart Edge Open technology, Lenovo Edge Servers help CoSPs and Enterprises with 5G network transformation.

intel. XEON PLATINUM

The growing rollout of both public and private 5G services is enabling a new edge computing paradigm. These high-bandwidth, low-latency, and more secure 5G networks provide access to cloud compute resources nearer to the devices that are delivering the data to the users consuming the information.

Lenovo Edge Servers deliver purpose-built and more secure platforms suitable for compute-intensive and latency-sensitive applications that need to be deployed outside of traditional data centers. For example:

Lenovo

- Compact edge servers to host O-RAN centralized unit (CU) and distributed unit (DU) containers that provide 5G edge infrastructure for both communications service providers (CoSPs) and enterprise.
- More secure private 5G networks that can be hosted on premises.
- Real-time analytics for public safety applications, internet of things (IoT), industrial internet of things (IIOT), artificial intelligence of things (AIoT), location aware services, and others.

NEARBY COMPUTING

- Machine learning inferencing for real-time intelligence from a sensor network.
- Highly responsive content delivery for latency-sensitive user experiences, such as augmented reality/virtual reality (AR/VR).

These platforms are ready for commercial software stacks, including virtual radio access network (vRAN) and multi-access edge computing (MEC), through a broad partner ecosystem.

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

The Lenovo ThinkEdge SE450 is the latest generation of Lenovo edge servers, based on the latest 3rd generation Intel® Xeon® Scalable processors. It was designed to meet the exacting requirements of the Intel Select Solution for vRAN. The ThinkEdge SE450 is designed and optimized to be NEBS-compliant and meet stringent technical and environmental requirements for O-RAN infrastructure, MEC hosting, and private 5G deployments. Working with Intel, the Lenovo ThinkEdge SE450 has been validated with containerized 5G baseband unit (BBU), 5G Core, and Nearby One MEC as illustrated in Figure 1.
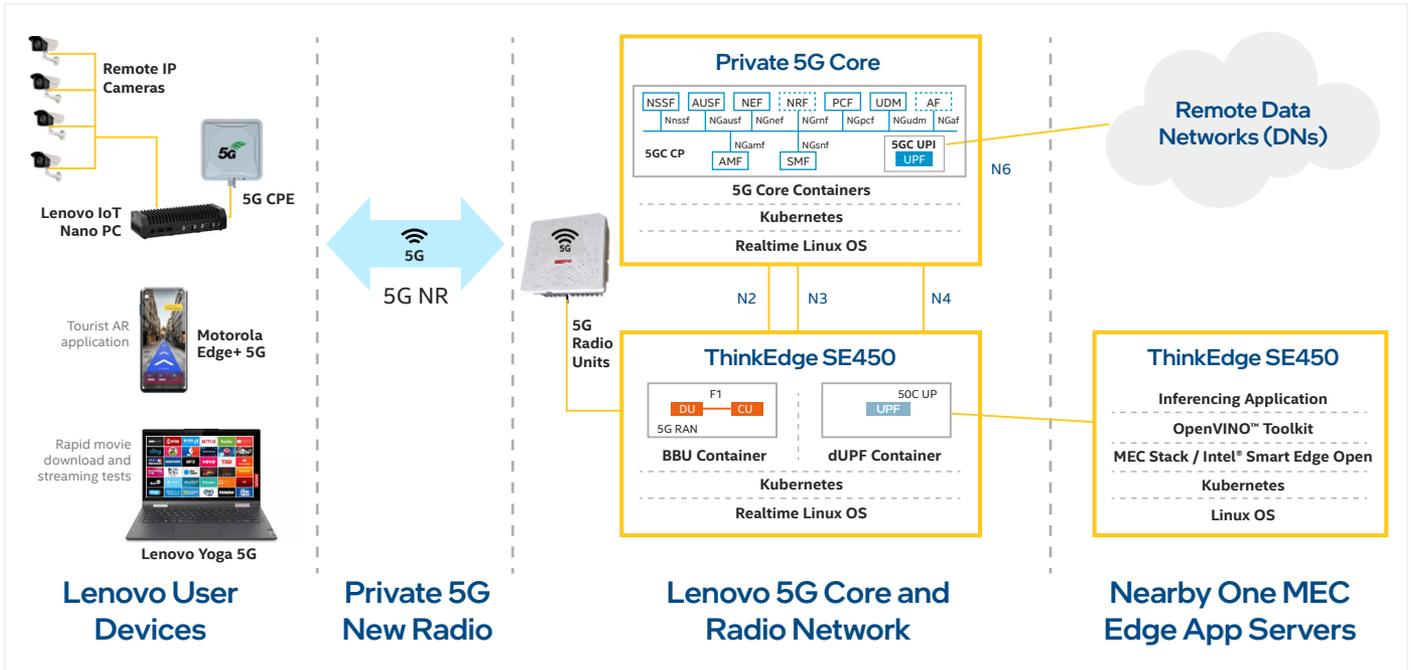
Figure 1. Sample deployment with containerized 5G BBU, 5G Core, and MEC converged at edge.

The newest 3rd generation Intel Xeon Scalable processors, with their high core count, provide an excellent base for deploying containerized workloads. The PCIe-Gen4 technology is ready to support the extra bandwidth and low latency of 5G and MEC workloads at the edge.

Lenovo 5G Infrastructure Key Attributes

Lenovo's 5G solution is fully aligned with O-RAN architecture. Aside from the general benefits of O-RAN, including reduced network CAPEX and OPEX, improved network efficiency, and increased agility, Lenovo's solution demonstrates customized design and optimization, including but not limited to in-house cloud-native

software platform and application specific hardware acceleration cards, with overall performance largely optimized on Lenovo edge servers.

Nearby One MEC Stack

The new Lenovo edge server designs together with Lenovo Open Cloud Automation (LOC-A) and the Nearby One MEC stack provide a future-ready, modular, open, and multi-tenanted solution. This system allows provisioning all tiers of the multi-access edge platform, providing a unified infrastructure and service orchestration logic.
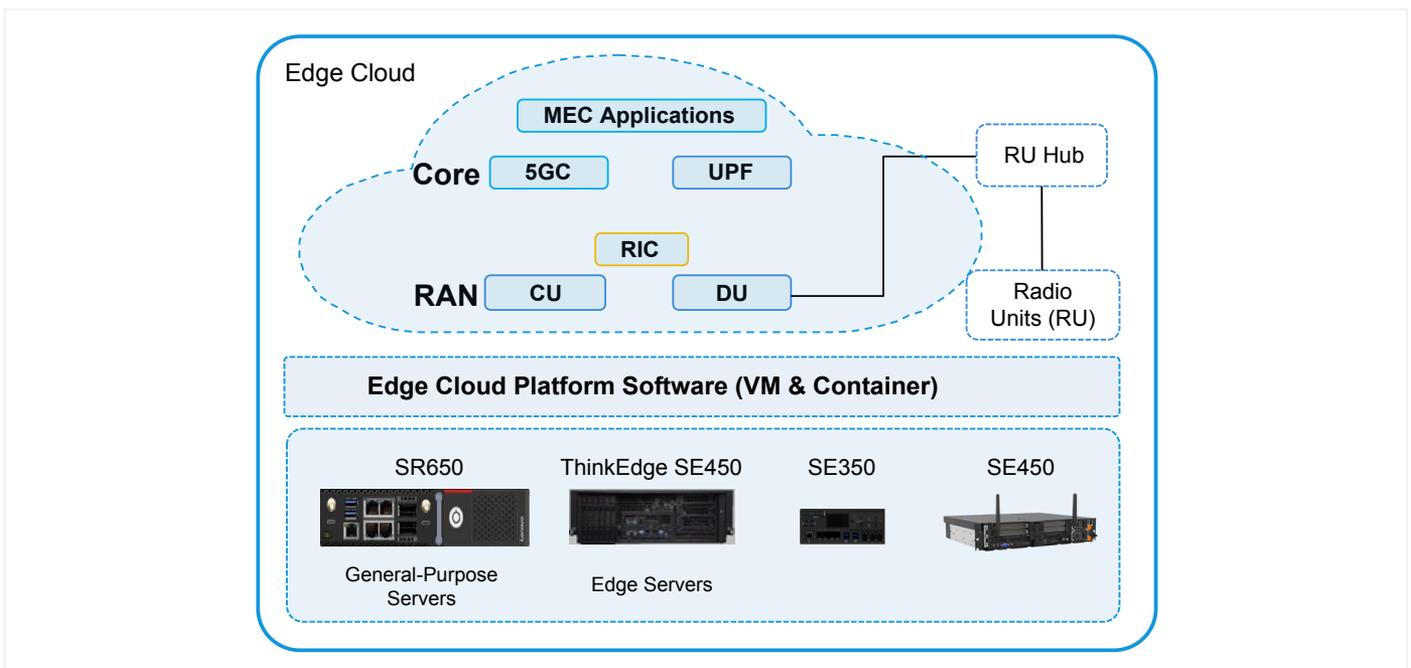

Figure 2. Lenovo 5G Solution Architecture.

Nearby One is a cloud-native solution for edge computing, from IoT to MEC. Nearby One enables a modular and multi-tenant platform to provision the infrastructure (near zero touch provisioning (nZTP) from the data center to the far edge), VNFs, and edge applications from a single pane of glass (Figure 3). The software solution is completely implemented as a set of containerized microservices.

Nearby One considers two aspects of end-to-end service orchestration:

- **Inter-node orchestration** – The selection and management of the nodes automatically decide how to place service in the infrastructure based on intent-based parameters, such as service level agreement (SLA) requirements.

- **Intra-node orchestration** – Management of the hardware platform components inside the node manages the life-cycle of services and applications, taking advantage of the hardware resources (cores, memory, accelerators) to optimize resource allocation.
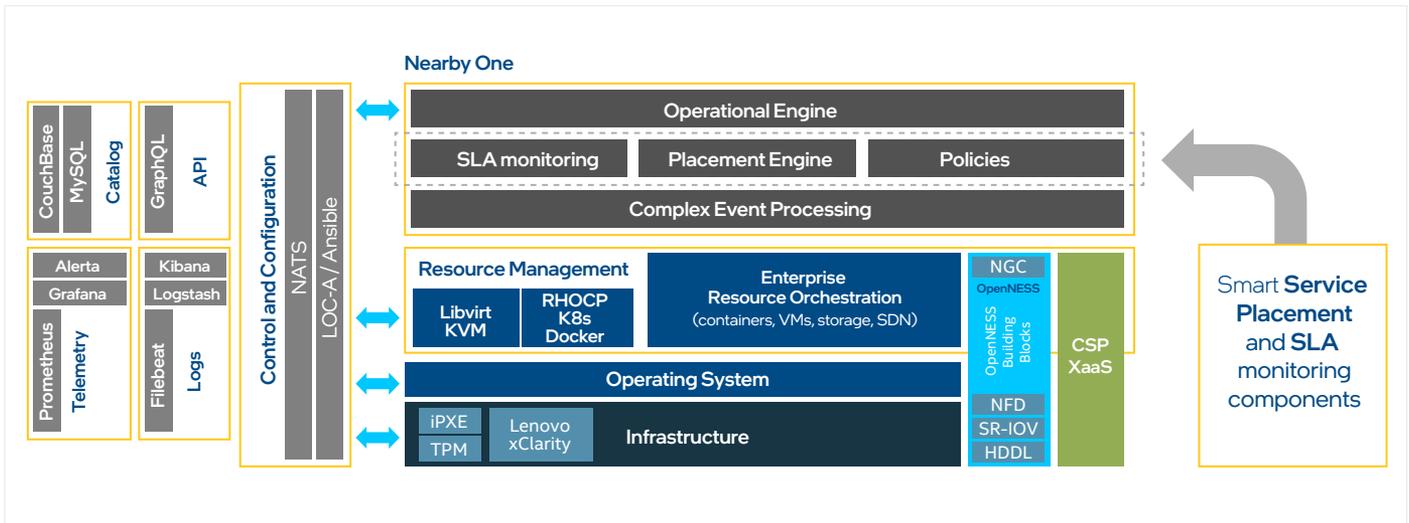

Figure 3. Nearby One architecture and technologies.

The Nearby One solution is composed of two main elements:

- The Nearby Orchestration Platform is the main component of the solution. It runs in a central location and oversees the performance of all tasks related to the orchestration of applications and infrastructure.

- The Nearby Blocks are distributed components that encapsulate logic and code for different application- and VNF-specific functionalities.

The Nearby One solution fully supports different resource orchestration platforms (e.g., Red Hat OpenShift or any other Kubernetes distributions) to provide end-to-end service assurance and infrastructure management. Nearby One fulfills the requirements of the "MEC Orchestrator" and "MEC Platform Manager" as described by the ETSI MEC reference documents.[1]

Nearby One comes with a marketplace of pre-integrated applications and virtual and containerized network functions (xNFs) to support a network functions virtualization infrastructure (NFVI) and containerized applications. These applications and containers are deployed and fully managed through the dynamic extraction and management based on key performance indicators. These indicators include CPU utilization, power consumption, network latency, and others, which are fed into Nearby One closed control loops.

As part of the Nearby One ecosystem, several from Intel® Smart Edge Open building blocks have been integrated into the solution, including for example, high-density deep learning (HDDL)-enabled acceleration of video analytics workloads powered by the OpenVINO™ toolkit.

New Lenovo ThinkEdge SE450 server

The Lenovo ThinkEdge SE450 edge server is a ruggedized, single-socket, short-depth, 2U server that is built with Intel® Smart Edge open technology and leverages the 3rd generation Intel Xeon Scalable processor. The ThinkEdge SE450 server is designed for a wide range of use cases, including 5G RAN, MEC, and smart city applications at far-edge sites.

ThinkEdge SE450 Edge server highlights:

- Optimized system design to meet performance and cost points for edge/telco workloads that include AI (AR/VR), vRAN, MEC, DU, and CU.

- Ruggedized design with short depth (300 mm and 360 mm options) to fit in street cabinets, small network racks in stores, and other compact installations.

- Supports high-core-count 3rd generation Intel Xeon Scalable processors.

- Supports two to four storage devices and hardware accelerators, including Intel® Movidius™ Myriad™ X Vision Processing Unit (VPU), Intel® FPGA Programmable Accelerator Card (Intel® FPGA PAC) N3000, Intel® QuickAssist Technology (Intel® QAT) accelerators, Intel® vRAN Dedicated Accelerator ACC100, smart NICs, and more.

• Front access for easy serviceability.

• NEBS 3 compliance: operating temp range -5 to 55°C (<96 hours)

• Dual-redundant AC or -48V DC power sources.

• Built-in enhanced security, tamper detection, and encryption.

• GPS location tracking.

• Zero-touch setup for simple rollout with remote management over LTE and Wi-Fi.

• Outstanding systems management tools that leverage industry standards, such as Redfish.

• No frills, vanity-free design, future-ready for emerging acceleration technologies (4x PCIe 4.0)

• Connectivity options include Wi-Fi, cellular LTE, optical, copper, and 5G.

Working closely with Intel, Lenovo architected the new ThinkEdge SE450 server to support 5G O-RAN infrastructure, MEC deployments, and private wireless networks. With a scalable, modular approach, Lenovo has developed solutions optimized for a wide range of near edge and far edge use cases. This modular edge server is designed to be future ready, so that once deployed they can support new use cases as they emerge.

Figure 4. Lenovo ThinkEdge SE450

Key Attributes

Edge computing provides computing capabilities outside of the data center, closer to where the data is being created and to the devices using it. These locations could include a branch office, a retail store, a manufacturing plant, or an oil rig in a remote location. Deploying to such locations means that edge servers need to be purpose-built to operate in harsh environments with broad temperature range. They need to resist shock and vibration, operate in dusty conditions, and have security features embedded for devices outside the safety of the data center.

The new ThinkEdge SE450 meets the compact, ruggedized requirements of harsh environments and power availability conditions. They are designed for ease of deployment, enhanced security, and efficient manageability,[2] and supported by 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 and networking layer deployment.

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 presents challenges to managing resources distributed all around the world.

Sending a technician to manage each edge server is not an option. Therefore, deployment needs to be automated as much as possible. The ThinkEdge SE450 edge server features easy deployment capabilities, including:

• New low-to-zero-touch deployment model to reduce installation time from hours to minutes.

• LOC-A automates all the tasks needed to configure the hardware and deploy the operating system, network, and cloud layer.

• The system can be provisioned within minutes, entirely automatically, without any human intervention and all from a central location.

Enhanced Security – Having the device outside the safety of the data center presents new challenges to security. The device can be stolen, or sensitive data can be compromised. Lenovo Edge Servers are equipped with security features that help address these challenges:

- Locking bezel

- Lenovo ThinkShield Edge Mobile Management app allows a technician to authenticate the server more securely from a mobile phone.

- 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 – Since the devices are distributed in different locations all around the world, operation and maintenance of the servers must be done remotely. Remote and more secure manageability is built into the ThinkEdge SE450 to facilitate easy maintenance and management, such as:

- Remote, automated hardware (firmware, BIOS, etc.) and software upgrades, and versatile remote access over 4G-LTE via LOC-A.

- Local maintenance option over Wi-Fi using a mobile app.

Intel® Technology Lets You Build a Resilient Edge

Intel has spent years working across the entire edge value chain to align use cases, address common integration challenges, and deliver edge-to-cloud blueprints. These are all supported by a mature commercial offering from ecosystem partners with hundreds of network functions virtualization (NFV) software and services providers. The company has helped enable the development of MEC, including offering the Intel Smart Edge platform, which helps further accelerate MEC development by unifying and converging multiple edge workloads into a single high-performance system. This platform abstracts network complexity and streamlines the get-to-market process, thereby accelerating time to market (TTM) for service providers that are innovating their services infrastructure on Intel® architecture.

Intel® Smart Edge Open is edge native software to enable highly optimized and performant edge platforms, across distributed edge locations, for management of diverse workloads with cloud-like agility. Intel Smart Edge Open uses standards-based APIs and a microservices-based architecture to enable easy onboarding, deployment, and management of edge services across diverse network platforms and access technologies in multi-cloud environments.

By combining Intel architecture with a strong software foundation, Intel Smart Edge Open advances next-generation edge computing solutions using cloud-native applications.

- The newest 3rd generation Intel Xeon Scalable processors offer the core count and other resources for hosting multiple compute-intensive and latency-sensitive applications, including:

  - vRAN, virtual evolved packet core (vEPC), and 5G new radio (NR) CU services.

  - Edge applications, such as visual analytics, a wide range of virtualized and containerized xNFs, encryption/decryption, and others.

- Intel Movidius Myriad X VPU provides visual computing and AI acceleration for fast processing and analysis of multiple video streams.

- Intel QAT accelerators speed encryption and decryption of data streams.

- Intel FPGA PAC N3000 accelerates the high physical layer forward error correction (FEC) functions, such as low-density parity check (LDPC) applications in 5G. The Intel FPGA PAC N3000 also provides two onboard Intel® Ethernet Controller X710 ports, enabling network fronthaul transmission and connectivity functions in addition to the FEC accelerator.

- Intel vRAN Dedicated Accelerator ACC100 rapidly performs Layer 1 FEC algorithms, making more processing power available for increased channel capacity on edge-based services and applications. The accelerator is a dedicated device that works with Intel Xeon processors to enable low-cost, power-efficient 4G and 5G vRAN solutions.

- To enable visual computing, along with other deep learning and artificial intelligence (AI), Intel Smart Edge-based systems support the Intel® Distribution of OpenVINO™ toolkit. Using the toolkit, customers can provide implementations across cloud architectures to edge devices without software changes.

- FlexRAN is a reference implementation for cloud-enabled wireless access xNFs. It shows how to efficiently implement wireless access loads. It does this through flexible software architecture, new Intel Xeon Scalable processors using the Intel® Advanced Vector Extensions 512 (Intel® AVX-512) instruction set, and optimized network functions virtualization infrastructure (NFVI) with the Data Plane Development Kit (DPDK).

Conclusion

Solutions that are designed for multiple workloads are accelerating service innovation at the edge of the network and proliferating new use cases. Building on Intel Smart Edge Open and utilizing Intel® technology, Lenovo ThinkEdge SE450 offers a modular platform for cloud-native applications. The Nearby One Solution delivers an edge computing platform that goes beyond MEC to manage all tiers of the edge—including low-footprint container and VM management for single node deployments—from a single pane of glass. These next-generation edge servers are optimized for 5G and can be utilized for a wide range of service deployments at different edge locations.

Learn More

Lenovo
https://www.lenovo.com/us/en/data-center/solutions/telco-nfv

Lenovo is a member of Intel® Network Builders ecosystem
http://networkbuilders.intel.com

Intel Distribution of OpenVINO toolkit
https://software.intel.com/en-us/openvino-toolkit

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