QNAP Adopts Converged Edge Reference Architecture for Retail

Company offers complete branch networking solution for retail stores combined with artificial intelligence (AI) to drive advanced smart checkout and facial recognition applications. Company's QuCPE servers are based on Intel® architecture processors.

Retail chains are increasingly leveraging cloud-native edge services in ways that improve customer service and experience, collect sales trends data, and provide product education videos, wireless network access, and other services. On the horizon are object description-based smart checkout systems that track the products in a shopping cart and automatically tally them and bill the customer.

These customer-facing applications are in addition to point of sale, networking, and other back-end systems that are moving from stand-alone appliances to be virtualized workloads on a universal customer premises equipment (uCPE) server. Cloud-native uCPE platforms based on Converged Edge Reference Architecture (CERA) offer a new value proposition to retail store chains by enabling new video and analytics use cases and delivering improvements in latency, data privacy, and reliability.

QNAP Systems Inc. has launched its QuCPE edge server that uses CERA on Intel® architecture servers to build platforms with an artificial intelligence (AI) framework to serve the needs of retail store operators.

How Edge Computing Is Evolving

uCPE servers provide a solution for low-latency cloud and networking services for retail, smart city, smart transportation, industrial, and other industries. In particular, retail chains now want to deploy advanced edge workloads such as smart checkout systems based on video analytics and AI inference, and private LTE systems based on virtualized radio access networks (vRAN) and evolved packet core (vEPC) virtual network functions (VNFs). They also demand advanced security, orchestration, and multi-platform connectivity with the same seamless scalability that has been prevalent in the cloud.

But advancements in edge computing come with some challenges. Building, testing, and onboarding new solutions on-premises and at outdoor locations is costly and complex. If customers use these platforms to build or evolve their networks beyond Wi-Fi and Ethernet to include 4G and 5G wireless, it requires an additional investment in wireless software and antenna equipment. CERA platforms provide the necessary software integration and functionality to overcome these challenges and deliver on the promise of cloud-native edge computing.

CERA unifies and converges all of these edge workloads into a single platform and also enables IoT with 4G and 5G wireless infrastructure technology. CERA helps communications service providers (CommSPs) to densify their wireless networks and enterprises to build private cellular networks using a cloud-native architecture. By abstracting the network complexity and streamlining the solution go-to-market process, CERA helps accelerate time to market (TTM) for service providers innovating on Intel® architecture.

Introducing the QuCPE Hardware Platform

QNAP's CERA-based QuCPE is based on Intel® Xeon® D processors. By adopting CERA, QNAP delivers a solution that can converge multiple workloads and functionalities into a single server (see Figure 1).

QNAP chose the Intel Xeon D processor because it is designed for applications that have space and power constraints. For heavy encryption and decryption needs, the edge servers also support Intel® QuickAssist Technology (Intel® QAT). Intel QAT is a hardware encryption and decryption engine that helps accelerate cryptography requests, providing additional performance and reducing the compute load on the CPU. QNAP plans to use a single QuCPE to offer the same functionality as QNAP's previous two-box solution.
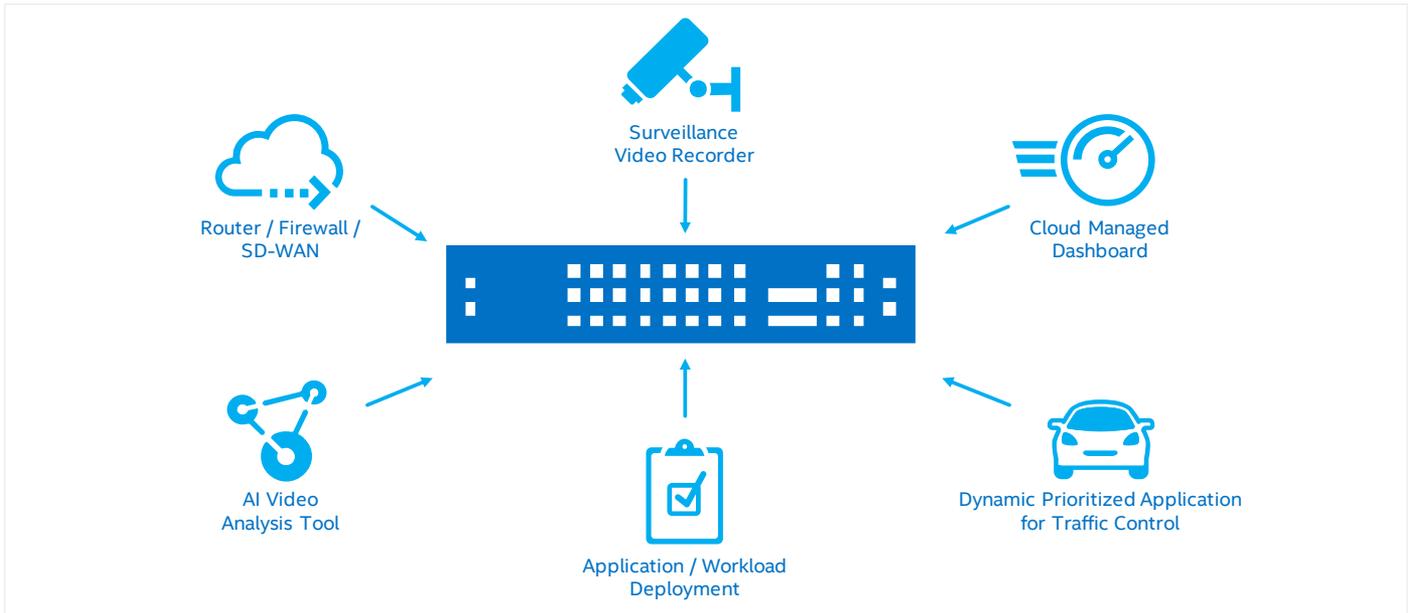

Figure 1. QNAP's CERA-based QuCPE converges multiple workloads into a single server.

While initially focused on retail customers, the QuCPE platform is flexible and can support additional use cases and applications for smart cities, transportation, industrial, and other enterprise segments.

When high-performance AI inference processing is needed, the QuCPE can support the Intel® Movidius™ Myriad™ X Vision Processing Unit (VPU) to provide a dedicated neural compute engine for accelerating deep learning inferencing. To take advantage of the performance of the neural compute engine, QNAP makes use of an Intel-developed high-density deep learning (HDDL) inference engine plugin.

QNAP Network Equipment Provides Software Foundation

The QuCPE is powered by QNAP's proprietary QNAP Network Equipment (QNE) operating system that features a complete network functions virtualization (NFV) environment and orchestration capabilities that simplify centralized application deployment across an entire network of retail stores. The QNE OS supports virtual machines (VMs) and containerized applications, greatly simplifying IT maintenance complexity.

QNE also provides centralized cloud management, which is a key element to achieving zero touch provisioning for complete remote service lifecycle management. Support for open source Data Plane Development Kit (DPDK) also helps boost packet processing performance and throughput.
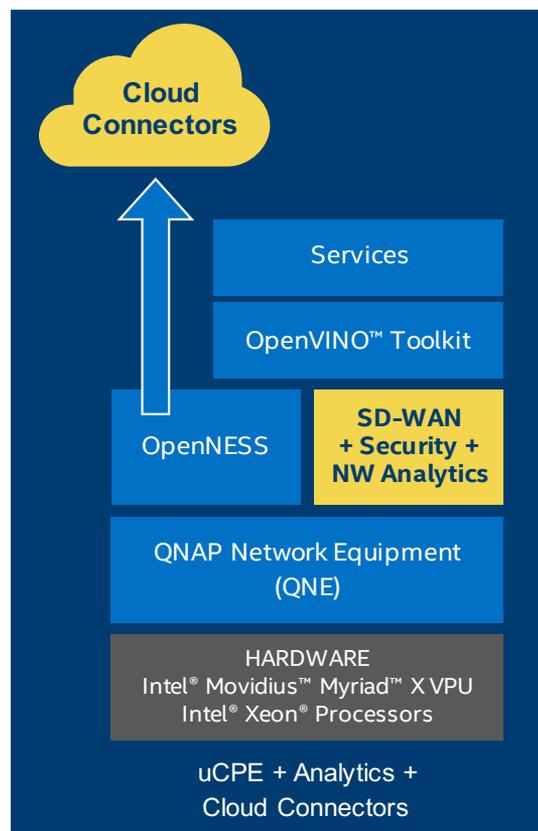

Figure 2. Block diagram of QNAP QuCPE hardware and software.

The QuCPE servers support a wide range of third-party VNFs and come with QNAP-developed VNFs including software defined WAN (SD-WAN), QVR Face video surveillance, and a firewall. QNAP has incorporated a quality of service (QoS) feature that gives point of sale (POS) highest priority in normal times, but switches the priority to the IP camera traffic whenever an event is detected. Other third-party VNFs can be obtained via the QNE Application Store, which provides a convenient way to manage licensing and payments.

Integrated Surveillance Video Features

QVR Pro is QNAP's surveillance storage and monitoring solution that features embedded monitoring channels for a complete surveillance environment. The system can support up to eight 1080p video streams, and its software features Smart Motion Detection that analyzes posture, motion, and movement in videos to provide more information for decision making.

QVR Center is centralized management software for QVR Pro that can manage multiple distributed QVR Pros instances. QVR Center provides customized event dashboards with charts that display event frequencies allowing users to plan for both busy and quiet periods. At the same time, users can view the health status of individual QVR Center servers at a glance through the QVR Pro Client application, allowing them to pre-plan for maintenance.

AI Enablement Framework

To enable facial recognition applications along with other deep learning and AI applications, QNE supports a full AI framework that supports select third-party AI-enabled VNFs. The framework is based on the Intel® Distribution of OpenVINO™ toolkit. The toolkit helps enable deep learning inference and easy heterogeneous execution across multiple Intel platforms, providing AI implementation at the network edge or across cloud architectures. The following two retail use cases will utilize AI:

- Object recognition is the foundation of smart checkout systems that automatically track a shopper's cart allowing for automated checkout. QuCPE supports these applications with QuMagie Core, which integrates facial recognition and object recognition AI engines.

- QNAP's QVR Face Recognition VNF can scan faces on a surveillance video, a camera, or uploaded video and quickly and accurately compare them to profile photos in a database in order to provide resources or security access to that person.

OpenNESS Software Tool Kit

QuCPE servers leverage Open Network Edge Services Software (OpenNESS), an open source software toolkit to enable easy onboarding, deployment, and management of edge services across diverse network platform and access technologies in multi-cloud environments.

Developed by Intel, OpenNESS uses standards-based APIs and a microservices architecture to provide comprehensive edge services lifecycle management, including onboarding, managing, and discontinuing applications at the network edge. OpenNESS features include more secure onboarding and management of applications with an intuitive web-based GUI.

Additional functionality includes private network access termination, traffic steering, multi-tenancy for services, service registry, service authentication, telemetry, application frameworks, appliance discovery, and control. This functionality makes it easy for cloud and IoT developers to engage with a worldwide ecosystem of hardware, software, and solutions integrators to develop new 5G and edge use cases and services.
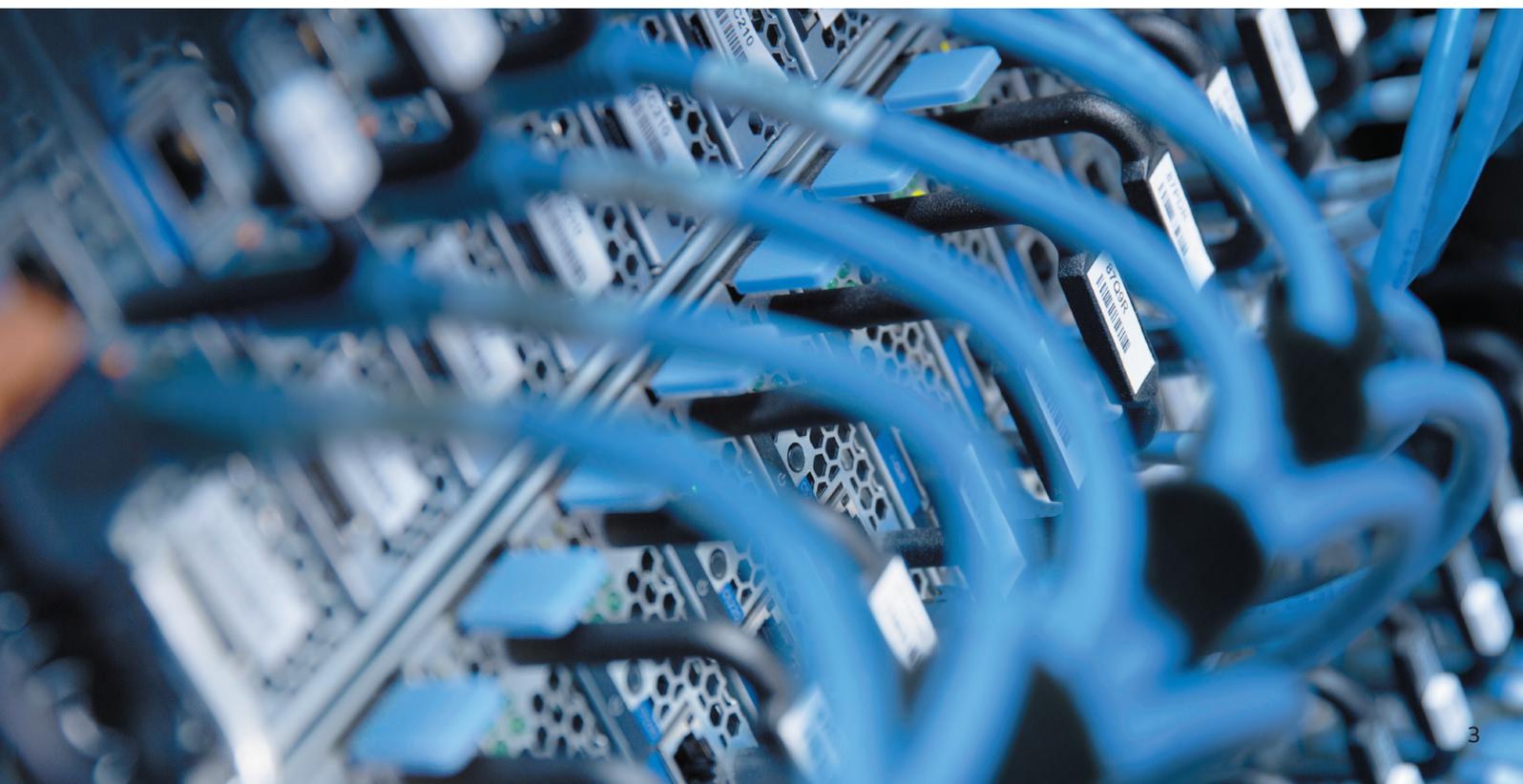
Conclusion

Retail computing is changing and advancing with the use of AI, promising great new ways to improve the customer experience. QNAP's QuCPE utilizes CERA on Intel Xeon D processor-based servers to provide the edge computing foundation that is essential for these applications.

QNAP is trialing the QuCPE through 2019 and will launch production in early 2020.

Learn More

QNAP is a member of the Intel® Network Builders Ecosystem: http://networkbuilders.intel.com

OpenVINO Toolkit: https://software.intel.com/en-us/openvino-toolkit