

CASE STUDY

Service Providers
Edge Data Center



China Telecom Verifies Edge Implementation of NFV-based Core Network Functions

Intel® Select Solution for NFVi and Intel® Visual Compute Accelerator help China Telecom launch vCDN testing on edge data center

Spotlight on China Telecom

China Telecom Corporation Limited (China Telecom) is a large-scale and leading integrated information service operator, providing wireline and mobile telecommunications services, Internet access services, information services, and other value-added telecommunications services primarily in the People's Republic of China. At the end of 2016, China Telecom had 215 million mobile subscribers, 123 million wireline broadband subscribers and 127 million access lines in services.

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To support emerging 5G and Internet of Things (IoT) use cases, Communications Service Providers (CoSPs) like China Telecom are gradually replacing their traditional fixed, closed Central Offices (COs) with more agile and flexible Next Generation Central Offices (NGCOs) based on Network Functions Virtualization (NFV) and Software-Defined Networking (SDN) technologies. A critical component of the NGCO, NFV-based core network functions running on an edge cloud will bring processing power much closer to the end user, reducing latency and improving the overall customer experience. To access the value in this theory, China Telecom Guangzhou Research Institute recently conducted an edge data center virtualized Content Distribution Network (vCDN) Proof of Concept (PoC) using an Intel® Select Solution for NFVi and Intel® Visual Compute Accelerator (Intel® VCA).

Challenge

- Verify the feasibility and value of using edge data centers to implement NFV-based core network functions to improve user experience
- Accumulate practical experience in the deployment of network elements in the cloud

Solution

- The China Telecom Guangzhou Research Institute conducted an edge data center vCDN PoC using an Intel Select Solution for NFVi and Intel VCA
- Its objectives were to: evaluate the support capacity of edge data centers for new service applications; verify whether the Intel Select Solution for NFVi-based server satisfies the requirements of edge data centers and NGCOs; and to evaluate the video encoding and transcoding acceleration performance of Intel VCA on a vCDN

Result

- The PoC proved that edge data centers can effectively drive the implementation of NFV-based core network functionalities to provide users with a better service and experience
- The Intel Select Solution for NFVi in an edge data center provides the necessary computing, storage, and network capabilities, and meets security, reliability, and high availability requirements
- Intel VCA provides outstanding performance in video acceleration and accommodates vCDN in edge data centers

Ensuring a great user experience for 5G/ IoT services

The IoT and 5G present huge opportunities for CoSPs like China Telecom, but also great challenges. Traditional vertical, closed and fixed function network infrastructures no longer provide sufficient agility and flexibility to support emerging IoT and 5G use cases.

NGCOs, supporting both fixed and mobile operations, will implement access functions in a more IT-centric way. They will function more like a highly automated data center, using NFV and SDN technologies to draw on a x86-based hardware resource pool, to process ever increasing volumes of data traffic and performance demands.

To better accommodate the high bandwidth, low latency and high-density requirements of 5G and the IoT, the NGCO will also use Multi-access Edge Computing (MEC) to implement basic network functions on the edge cloud for flexible processing and an enhanced user experience.

With this in mind, China Telecom Guangzhou Research Institute is working to implement multiple NFV-based core functionalities into edge nodes and use a series of edge data centers in the deployment of NGCOs to verify its ability to support emerging 5G and IoT workloads, as well as traditional services – see figure 1.

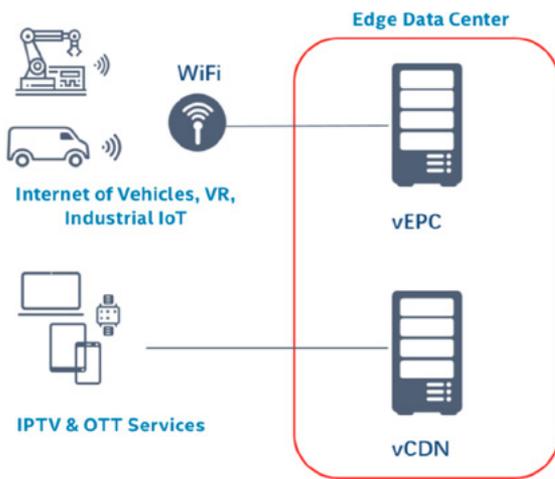


Figure 1: Structure of China Telecom edge data center Proof of Concept plan

Video services, including IPTV, are of particular interest. Currently CoSPs deploy CDN nodes to increase service efficiency, but these CDN server deployments are relatively fixed and inflexible. Using NFV and MEC to put CDN network elements into the cloud and embedding them into edge nodes that are close to end users, as well as deploying NGCOs on edge data centers, brings greater flexibility, improved resource utilization and a much better user experience.

However, the feasibility of vCDN node deployment on edge data centers will require a large amount of verification and assessment work. For example, do the power supply, heat dissipation, load bearing, and other aspects of the

edge data center fall within the specification scope? Do the server software and hardware performance, reliability, security and interoperability satisfy service requirements? And does the performance of the vCDN compatible video accelerator satisfy video encoding, decoding, and transcoding requirements? For help in answering these questions, China Telecom turned to Intel.

Edge data center vCDN proof of concept

Together with Intel, the China Telecom Guangzhou Research Institute, conducted an edge data center vCDN PoC using an Intel Select Solution for NFVi and Intel VCA. The PoC focused on three areas:

- The ability of an Intel Select Solution-based server to satisfy the computing, storage, and network capabilities, and the reliability and availability requirements, of China Telecom's edge data centers and NGCOs. The Intel Select Solution for NFVi enables software and hardware manufacturers to provide a workload-optimized server solution for edge data centers, helping CoSPs reduce the complexity involved in choosing infrastructure and accelerating deployment of network architectures based on NFV technology
- The video encoding, decoding and transcoding performance of Intel VCA deployed on vCDN nodes, and the improvements these bring to viewers of IPTV and other video services. Intel VCA uses the powerful performance of the Intel® Xeon® E3-1500 v5 processor with built-in Iris® Pro graphics to process high-end HVEC transcoding, intensive AVC transcoding and 3D remote rendering
- The suitability of MEC technology and an edge data center for network deployment, its performance in terms of load balancing, power supply, heat dissipation and whether it could be effectively integrated into China Telecom's existing fixed and mobile network resources

Proving the feasibility of edge data centers

China Telecom Guangzhou Research Institute found that the Intel Select Solution for NFVi's advanced motherboard design helps the system recognize network, storage, and other external devices and can improve the performance of these devices. Meanwhile, Intel® QuickAssist Technology enables powerful data encryption/decryption and compression performances, effectively improving the security of the entire edge data center. The Intel Select Solution for NFVi also provides a diverse choice of firmware, operating systems, drivers, hypervisors and other software components, as well as various optimization tools and sample demo applications to improve system efficiency.

Thanks to the deployment of Intel VCA, the video processing capability of the edge data center was greatly increased, and video services could be deployed on nearby edge nodes. Table 1 shows the results that were obtained in one of Intel's H.264 to H.265 video transcoding tests using Intel VCA and Intel Xeon processors.

		Real-time video stream (30fps)	Real-time video stream (60fps)
1080p to 1080p	H.264 to H.264	15	7
	H.265 to H.265	8	4
4k to 4k	H.264 to H.264	4	2
	H.265 to H.265	2	1

Table 1: Intel® Visual Computer Accelerator video transcoding performance

During the PoC, the vCDN 4K video service received good user feedback. Test results showed that the Mean Opinion Score (MOS) and image lag rate met expectations.

The edge data center vCDN PoC and solution environment created by China Telecom verifies that MEC technology and edge data centers can effectively drive the implementation of NFV-based core network functionalities. It also shows that the Intel Select Solution for NFVi provides the necessary computing, storage, and network capabilities, and meets the reliability and availability requirements, while Intel VCA provides outstanding video acceleration performance.

China Telecom plans to implement the edge data center vCDN in the near future. Following that, China Telecom will gradually verify the performance of implementing further NFV-based applications into the edge data center and further verify the integration of fixed and mobile networks.

“The Intel® Select Solution [for NFVi] creates a good foundational infrastructure for edge computing and delivers an entire set of computing, storage, and networking functionalities, while providing integrated capabilities for various VNF network elements, fixed and mobile network services; while Intel® VCA greatly accelerates the video encoding, decoding, and transcoding performance at vCDN nodes and effectively improves the user experience for IPTV and other video services.”

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Benchmark results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as “Spectre” and “Meltdown”. Implementation of these updates may make these results inapplicable to your device or system.

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