

ATOZOF UCPE

A Guide to Universal Customer Premises Equipment



IN BRIEF

Communications service providers (CoSPs) and enterprises alike are now building out their infrastructures based on software-defined wide area network (SD-WAN) connectivity and network functions virtualization (NFV) on universal customer premises equipment (uCPE). But what exactly is uCPE and how can it benefit your organization? Find out the answers to these questions, and more, in this short A-Z of uCPE.

A IS FOR AS IT IS NOW

Enterprises continue to consume a variety of services, often through managed services offerings from CoSPs. These include firewall-based security; routing; virtual private networks (VPNs); multiprotocol label switching (MPLS)-based wide area network (WAN) traffic controls, acceleration, and traffic monitoring functionality; and more. These services and capabilities are typically offered through fixed-function proprietary boxes installed on customer premises.

D IS FOR BOXES

Using fixed-function proprietary boxes it takes weeks to deploy a new service. Once the service is ordered, the equipment has to be shipped, installed and provisioned – a time-consuming, manual process involving project managers, sales executives, and fulfilment and sales engineers. The CoSP then has to keep the service in operation for a minimum period to recoup the hardware and installation costs. Even if the utilization of the hardware is low, these boxes cannot be used for any other purpose in the meantime.

C IS FOR CLOUD

The alternative to fixed-function proprietary boxes is to use commercial-off-the-shelf (COTS) hardware to support NFV and software-defined networking (SDN) technologies to virtualize enterprise network services. Replacing traditional fixed-function CPE, uCPE extends the power of SDN and NFV from the data center/cloud to the customer premise, providing a general-purpose platform for hosting virtual network functions (VNFs), as well as non-virtualized, bare-metal services. SD-WAN on uCPE also allows direct and more secure connectivity from the edge to the cloud without the need to backhaul the traffic to the data center.

D IS FOR DYNAMIC OPERATIONS

uCPE running SD-WAN automates the control and provisioning of services making it easy to rapidly scale out services and automate post-deployment configuration changes. By reducing the time taken to launch and refine services, uCPE enables the CoSP or enterprise to respond quickly to changes in service profiles and update configurations via a software-defined interface (SDI), often referred to as zero-touch control and provisioning.



E IS FOR LESS EXPENSE

Intel and the Open Platform for NFV (OPNFV) found that CoSPs can deliver enterprise services at a low total cost of ownership (TCO) by virtualizing the CO and CPE. Transitioning fixed-function boxes to VNFs running on COTS hardware reduces new capital expenditures and ongoing management costs ranging from initial deployment, configuration, post-deployment changes, monitoring, troubleshooting, updates, and upgrades. On the service side, the delivery and installation of CPE, the commissioning and decommissioning of equipment, and resolving trouble tickets are all made more cost effective.

IS FOR FIREWALLS

Computationally-intensive firewalls are one example of an enterprise service well suited to implementation as VNFs in software. In terms of upselling additional managed services like integrated firewall, uCPE enables a much less costly "try before buy" approach by removing the need for expensive CPE upgrades and site visits.

G IS FOR GROWTH MARKET

uCPE is a growing market. IDC forecasts the virtual CPE software market to grow from USD 145.7 million in 2016 to USD 2 billion in 2021² at a compound annual growth rate (CAGR) of 68.3 percent.

Meanwhile, IHS Markit predicts the uCPE market will increase from USD 7.7 million in 2017 to USD 1.02 billion in 2022³ – a cumulative USD 1.9 billion market over the six years from 2017 to 2022.

IS FOR HARDWARE ACCELERATION

Hardware acceleration augments the capabilities of VNFs running on a telco cloud. For example, CoSPs can use plug-in PCIe module versions of the Intel® Movidius™ Neural Compute Stick or Intel® Field Programmable Gate Array (Intel® FPGA) cards to accelerate image analytics workloads.

IS FOR INTEL® SELECT SOLUTIONS FOR UCPE

Intel® Select Solutions for uCPE provide a foundation for the development of uCPE products with a solution reference design and performance verification. At the heart of the reference design is the Intel® Xeon® D processor, which offers the compute power, acceleration features, security features, and built-in Ethernet connectivity needed for cost-effective uCPE systems. Advantech, KGPco, Lanner, Premier, Silicom, and Supermicro are just some of the companies who have already launched a verified Intel Select Solution for uCPE, enabling CoSPs to get to market quickly with a differentiated product.

IS FOR JOIN THE COMMUNITY

Intel® Network Builders is an ecosystem of independent software and operating system vendors, original and telecom equipment manufacturers, system integrators, and CoSPs working together to accelerate the adoption of NFV and SDI solutions in CoSP networks. This community offers technical support, matchmaking and co-marketing opportunities to facilitate collaboration from the discovery phase to eventual trial and deployment. Meanwhile, Intel® Network Builders University offers comprehensive online training programs for enhancing organizations' NFV and SDI expertise.

IS FOR KAPSCH CARRIERCOM

Global systems integrator and Intel Network Builders' member Kapsch CarrierCom recently launched a complete uCPE solution composed of Advantech Intel-powered white box servers for uCPE and specialized software from a community of vendors. The Kapsch CarrierCom solution is designed to help CoSPs reduce networking costs, improve performance, and deliver new revenue-generating services optimized to each customer.

L IS FOR LOW POWER

The Intel Atom® system on a chip (SoC) processor C3000 series is a key Intel® technology for uCPE, offering very low power compute at the network edge. It can be used in a variety of light scale-out workloads that require high density and high I/O integration, as well as very low power. These include network routers, switches, storage, security appliances, dynamic web serving, and more.

IS FOR MANAGEMENT AND ORCHESTRATION

Integrating VNFs into the management and orchestration (MANO) framework is complex, with many high-level architectural options and a lack of standards at lower levels. The CoSP's priorities will be to ensure that the system optimizes the use of the infrastructure through orchestration, that it remains open so it can accommodate other VNFs and infrastructure vendors and enable business agility. A CoSP could undertake the integration of third-party MANO software itself, or it may instead seek to outsource this activity to a equipment vendor or systems integrator, who has specific skills in this area.

N IS FOR NETWORK EDGE

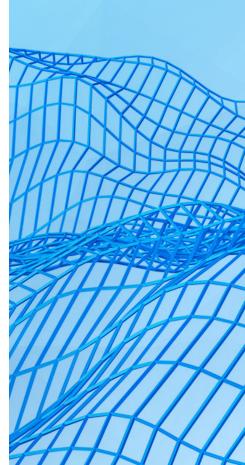
The network edge is transforming, with more compute being deployed in central offices (COs) and edge mile locations. uCPE is central to what Intel refers to as the next-generation central office NGCO - an SDN- and NFV-enabled location architected for delivering agile wireline or mobile network infrastructure and associated service delivery. Traditional COs don't offer the necessary compute power, agility and speed to support services like immersive media and streaming video at a cost that is sustainable. The advantages of putting these sorts of services at the edge, closer to the end user, include improved network resilience, lower latencies and jitter, and lower load on the CoSP's core networks.

O IS FOR INTEL® OPTANE™ TECHNOLOGY

For higher-end uCPE deployments the latest Intel® Xeon® Scalable processor with Intel® Optane™ DC persistent memory offers CoSPs an agile platform that distributes cloud and storage technologies across various locations in the network edge. Features like Intel Speed Select and Priority Based Frequency help CoSPs to reduce operational expenditure, while the larger memory footprint is designed with close proximity for localized processing and storage, lowering latency for the end user.

P IS FOR PLATFORM FOR THE VIRTUAL EDGE

The Dell EMC Virtual Edge Platform* 4600, powered by the Intel® Xeon® D-2100 processor, is a future-ready, high-performance uCPE platform, enabling CoSPs to easily build SD-WAN services for enterprise customers. The pre-validated solution, complete with designs, tested reference architectures and command lines, helps CoSPs achieve fast time to revenue with rapid production.



Q IS FOR INTEL® QUICKASSIST TECHNOLOGY

Intel® QuickAssist Technology (Intel® QAT) enhances security and compression performance in cloud, networking and storage applications. By offloading functions to a specialized logic engine, processor cycles are freed up for other workloads. This helps CoSPs to secure branch connectivity, for example through end-to-end encryption, without compromising VNF performance.

R IS FOR ROUTERS

With uCPE CoSPs can roll out virtual routers on universal hardware in addition to traditional networking services. The customer no longer needs a physical router on site, meaning they enjoy greater flexibility and reduced costs. Meanwhile, the CoSP generates more revenue through upselling of additional managed services on uCPE.

S IS FOR SD-WAN

It is the convergence of uCPE and SD-WAN that enables CoSPs to offer value-added services, like integrated firewall, without having to procure and deploy costly on-site hardware. CoSPs can also use uCPE and SD-WAN to provision virtual overlays onto existing physical networks to offer wholesale broadband into places where they do not currently have their own network presence, offsetting declining MPLS revenues and offering services into markets where they do not have physical assets. Meanwhile, enterprises benefit from more cost-effective WAN and services provision managed by a single point rather than multiple contacts.

I IS FOR THICK OR THIN?

CoSPs have two configuration options for uCPE deployments. The thin uCPE deployment model relies on hosting all VNFs and services in a remote data center, CO, cable headend or cloud, making the customer premises device less expensive. A thick uCPE deployment places highly programmable, commodity-based hardware at the customer site to host VNFs with ancillary VNFs remotely managed over WANs. It is this deployment model that truly eliminates multiple physical appliances with what amounts to a single server.

IS FOR UCPE BENEFITS FOR COLT

Colt has rolled out a uCPE platform for the delivery of virtualized services, allowing it to achieve faster product development, cost savings and operational efficiency, all while leveraging best-inclass technology from multiple suppliers. Capital and operating expenses are dramatically reduced with the use of shared COTS infrastructure and standardization enables processes and skill sets to be optimized and streamlined.

IS FOR VPNS

CoSPs can use uCPE to run virtual private networks (VPNs) as VNFs. The benefits of this are much the same as those realized through offering other additional managed services through uCPE. The CoSP is able to generate additional revenue through the cost-effective provision of networking services above and beyond core networking capabilities.



W IS FOR WAN OPTIMIZATION

As we've seen, by running a combination of virtualized services on a single CPE device, uCPE presents a terrific opportunity for CoSPs to cost-effectively deliver a range of additional managed services. One additional function which can benefit greatly from execution in software is WAN optimization. The software-defined approach provides greater visibility into data traffic, encryption states and application consumption making it quicker and easier for CoSPs to determine WAN optimization priorities.

X IS FOR INTEL® XEON® PROCESSORS

The Intel® Xeon® processor D-2100 family is developed specifically to help CoSPs bring intelligent services to the network edge by reducing the TCO for enterprises to establish next-generation branch office uCPE/SD-WAN applications, in power and space efficient COTS servers. Meanwhile, the latest Intel Xeon Scalable processor offers up to 1.5x network function speed up⁴. The wide range of options from Intel® Atom™ to Intel Xeon D and Intel Xeon Scalable processors provide CoSPs and enterprises with scalable solutions serving every need.

IS FOR YES TO UCPE

To conclude, uCPE brings the power of the cloud to the telco network. It provides a platform for innovation, facilitating the cost-effective and quick provisioning of revenue-generating services in addition to core networking capabilities. Intel supports CoSPs in rolling out uCPE with a range of edge-optimized Intel Xeon and Intel Atom SoC processor technologies and with Intel Optane DC persistent memory; hardware acceleration through Intel FPGAs; Intel Select Solutions validated reference designs; as well as community support through Intel Network Builders.

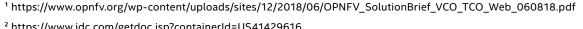
Z IS FOR DON'T ZZZ

The time to implement is now. If you sleep on uCPE, your competitors will leap ahead. IHS Markit global carrier surveys on SDN and NFV reveal that 82 percent of operators are deploying or plan to execute VNFs on uCPE⁵ located at customer sites. The time to act is now.



Get more information on how you can transform your edge network today in Intel's white paper **Creating the Next Generation Central Office with Intel® Architecture CPUs.**

Or find the solution that's right for your organization by contacting your Intel representative or visiting intel.com/networktransformation.



² https://www.idc.com/getdoc.jsp?containerId=US41429616

Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit http://www.intel.com/performance.

Configurations: Performance results are based on testing or projections as of 1st June 2017 to 3rd October 2018 (Stream Triad), 31st July 2018 to 3rd October 2018 (LINPACK) and 11th July 2017 to 7th October 2018 (DL Inference) and may not reflect all publicly available security updates. LINPACK: AMD EPYC 7601: Supermicro AS-2023US-TR4 with 2 AMD EPYC 7601 (2.2GHz, 32 core) processors, SMT OFF, Turbo ON, BIOS ver 1.1a, 4/26/2018, microcode: 0x8001227, 16x32GB DDR4-2666.

Performance results are based on testing as of the date set forth in the Configurations and may not reflect all publicly available security updates. See configuration disclosure for details. No product or component can be absolutely secure.

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³ https://technology.ihs.com/605919/universal-cpe-a-new-market-and-new-deployment-model-for-managed-services

⁴ Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.

⁵ https://technology.ihs.com/605919/universal-cpe-a-new-market-and-new-deployment-model-for-managed-services

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