Intel Architecture and the SD-WAN Disruption Opportunity

Executive Summary

Mid-market and large enterprise companies are rethinking their approach to wide area networking (WAN). Traditional deployment and management approaches will not scale with the ongoing proliferation of mobile and Internet of Things (IoT) devices, and the corresponding influx of data. Today, networking is more than simply a connectivity consideration. Through Software-Defined Networking (SDN), businesses can reap the rewards of improved agility and speed of application delivery—measured in hours and days, not weeks and months. SDN also brings with it a host of added functionality around automation, orchestration, and single instance management that script-based, device-by-device network provisioning of the past does not offer. The financial impacts of employing SDN are significant. The leverage of multi-vendor, standards-based networking equipment results in lower capital expenditures (CapEx), while the employment of fewer IT staff resources reduces operational expenditures (OpEx).

Software-Defined WAN (SD-WAN) is widely regarded as the optimal SDN deployment path for mid-market and large enterprise organizations given its cost-disruptive impact on branch connectivity. Service providers can capitalize on new monetization opportunities by offering associated solutions and managed services. Intel is well-positioned to help facilitate the transition from traditional WAN to SD-WAN by making networks faster, more secure, and agile. Intel accomplishes this via its significant intellectual property portfolio, massive supply chain, and end-to-end range of universal customer premises equipment (uCPE) and solutions. Additionally, it leverages a proven set of SD-WAN solutions designed for easy deployment by Communication Service Providers (CoSPs), Original Equipment Manufacturers (OEMs), Original Design Manufacturers (ODMs), and Independent Software Vendors (ISVs), among others, to achieve these benefits.

uCPE as a Market Disruptor

Proprietary, single-purpose infrastructure has long dominated the telecommunications and networking industries. Intel recently celebrated 50 years of technology innovation, a period in which it consistently demonstrated an ability to improve performance, reduce cost, and deliver exceptional value—all from a standards-based perspective that

supports multiple workloads. The beauty of uCPE is that it follows a similar trajectory. The uCPE workload-optimized platform performs multiple functions such as firewall, routing, Wi-Fi, and SD-WAN, and can be delivered on general purpose servers, which reduces costs and offers flexibility. Not only does uCPE streamline deployment through the consolidation of multiple devices (such as cable modems, cable access nodes, small cells, and remote radio heads) into a single platform, it also replaces aggregation points throughout the network. This consolidation is powerful from a serviceability, deployment, and management perspective as well. Furthermore, uCPE is not dependent on a centralized cloud for network function virtualization (NFV) and orchestration. Rather, it is entirely self-contained and harnesses its own integrated capabilities. The resulting flexibility in deployment, ongoing management, and compute power makes uCPE an ideal choice for SD-WAN implementations.

THE SD-WAN OPPORTUNITY

Many companies welcome improved networking agility. SD-WAN delivers that flexibility at the core and the edge, with virtualized functions that deliver automation, orchestration, and scalability. The resulting benefits include:

- Support for an ever-increasing number of new applications, devices, and users through improved scalability and automation;
- Robust, single-instance console management of network deployment, ongoing operations, and security threat mitigation, at the data center, branch, and edge;
- Continual optimization of network resources via real-time analytics and the application of machine learning and artificial intelligence;
- Realization of digital transformation and new monetization opportunities such as the current SD-Branch greenfield and brownfield deployments for small, medium, and large enterprises, and possible future SD-WAN consumer services.

The addressable market for SD-WAN is expected to reach $1B in revenue by the end of 2018 and $8B+ by 2021.[1] Over fifty companies, ranging from start-ups to established players such as Cisco, HPE, Aruba, and VMware, have entered the SD-WAN market and many are leveraging Intel architecture. The market holds significant opportunity for Intel's business partners—CoSPs, OEMs, ISVs and integrators—and Intel offers a number of tools and initiatives to enable these partners' success with SD-WAN services.

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[1] IDC Worldwide SD-WAN Forecast, 2017-2021

INTEL SELECT SOLUTIONS FOR uCPE, VERIFIED CONFIGURATIONS AND ACCELERATORS

Intel's Select Solutions (ISS) for uCPE are designed to enable CoSPs and enterprises to easily and quickly adapt to the dynamic nature of today's network services. Intel validates that these offerings accelerate the selection and deployment of the necessary hardware and software components for a given workload-optimized solution stack. In May 2018, Intel published a uCPE reference design, based on the Intel® Xeon® D-2100 system-on-a-chip (SoC) processor, to make it easier for service providers to provision new services, improve end customer agility, and decrease operational costs. A number of partners are using this reference design to build ISS for uCPE, including Advantech, Lanner, Caswell, Premier, Silicom, and Supermicro. Optimized ISS for uCPE is designed to take much of the guesswork out of designing or selecting the correct platform for specific business requirements. This should result in quicker and easier deployments, which in turn will lead to faster time to revenue and profitability.

Leveraging SD-WAN deployment learnings from the ISS for uCPE reference design, Intel and members of the Intel Network Builders ecosystem have identified verified uCPE configurations. Tested and delivered by a broad community, these building blocks purport to take the guesswork out of SD-WAN deployment. Together, ISS for uCPE and verified uCPE configurations provide the confidence of a fully tested, validated set of solutions. Some of the most recognizable companies in the technology industry contribute significantly toward uCPE deployments through a combination of ISS and verified configurations. Among them are Dell EMC, VeloCloud (VMware), Viptela (Cisco), Versa Networks, Silver Peak Systems, and Nuage (Nokia) Networks.

In one example, Nuage Networks and British Telecom Global Services teamed up to provide a next-generation, cloud-based SD-WAN service developed on Intel uCPE reference designs and architecture. This collaboration currently delivers a wide range of SDN services and benefits, such as virtual private network, integration with cloud management portals, flexible bandwidth, and other virtual services—all of which are cost-optimized and can be quickly provisioned.

Intel also offers a number of software accelerators that enhance SD-WAN deployments. The Data Plane Development Kit (DPDK), an effort initially led by Intel and now a part of the Linux Foundation, accelerates packet processing workloads running on a variety of CPU architectures. DPDK can improve overall network performance, deliver enhanced encryption, and lower latency. Intel QuickAssist Technology (QAT) seeks to enhance

security, authentication, and compression in order to optimize compute-intensive operations. Lastly, Hyperscan (Intel's open-source pattern-matching library) scans large volumes of data quickly for intrusion prevention, antivirus, unified threat management, and deep packet inspection applications.

INTEL ARCHITECTURE AND THE SD-WAN DISRUPTION OPPORTUNITY

Intel® Architecture (IA) encompasses multiple generations of microprocessors, hardware, and software that provide the building blocks for a number of computing systems. The company's comprehensive framework has a proven track record of supporting networking solutions spanning from the data center to the branch office. This includes high-performance Xeon® Scalable Processors that are workload-optimized for high demand, Atom® processors designed for lower cost and infrastructure optimization needs, interconnect and fabric offerings such as Intel's Omni-Path Architecture (OPA), and the aforementioned accelerators. With the depth, breadth, high performance, and scalability of these offerings, Intel is well-positioned to deliver an end-to-end networking solution that extends from the network core to the edge.

Enabled by its uCPE platform and IA, Intel facilitates a number of new cloud-based application and service delivery offerings over SD-WAN. These include cost-effective and robust virtual private networks (VPNs), video content distribution networks (CDNs), enterprise-grade unified communications (UC), over the top (OTT), and other managed services. Through the deployment of automation and virtualization, SD-WAN also reduces the OpEx associated with the overall management of networking infrastructure. Additionally, individual lines of business have the potential to benefit in terms of improved productivity, profitability, and agility.

CALL TO ACTION

Next-generation WAN deployments are complex and will tax networks beyond anything seen in the past. Enterprises are evaluating and deploying SDN solutions to support the explosion of mobile devices, applications, video consumption, and IoT devices expected in the coming years. Customers and service providers alike need guidance given the wide range of solutions available.

The Intel uCPE platform and IA deliver a number of benefits that warrant consideration:

- A single x86-based, end-to-end reference architecture that extends from the cloud to CPE;

- A unified networking topology and fabric that facilitates optimized performance, response, and scaling;
- Proven viability with a deep install base of SD-WAN and uCPE-driven use cases;
- A massive ecosystem of partners, including OEMs, ISVs, and ODMs, developing a wide variety of solutions and product offerings for mid-market and large enterprise customers.

Intel delivers an end-to-end, tested, and validated uCPE solution set ideally suited for mid-market and large enterprise deployment. It should be strongly considered by CoSPs, OEMs, ISVs, and integrators wishing to offer value-added SDN solutions like SD-WAN.

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