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Foreword

FWD: Notes from the Open Compute Summit

The annual Open Compute Project Summit, which is underway this week at the San Jose Convention Center, has attracted approximately 3,000 attendees to hear and discuss the latest innovations in hyperscale cloud engineering.

The overall impression of the Open Compute Project Summit 2018 in San Jose is that the hyperscale cloud operators have reached such size and power that they are able to throw their weight around without worrying too much about niceties such as industry standards and specifications. Although participants in the OCP talked about being part of a community, in reality it is clear that Facebook, Microsoft and Google use the forum as a way of communicating their interests and requirements to the industry without having to seek compromise and negotiated agreement as has been typical in the IETF or the IEEE. The intereaction is typically "here is our design for disaggregated flash storage arrays" - have a look if you wish, but it's done.

On the positive side, the OCP Summit does provide valuable insight into the engineering teams inside these three hyperscale clouds. Hot topics for this year are the imminent of arrival of 400G in data centre cores, software-defined data planes and greater network programability.

More interest in P4

P4, which is the open programming language for specifying packet forwarding behaviors, is gaining more attention thanks to Google, AT&T and a handful of vendors. Earlier this week, it was announced that P4 as a research project will now be part of the Linux Foundation portfolio. P4 actually got its start about four years ago out of the networking labs of Professor Nick McKeown at Stanford, along with collaborators at Princeton, Google, Intel, Microsoft and Barefoot. A basic design goal of the P4 language has been that it could be compiled, without modification, to run on a variety of targets, such as ASICs, FPGAs, CPUs, NPUs, and GPUs. Target applications include better telemetry in data centres, enterprise networks and service-provider backbones.

So far, two major service providers are on the record endorsing the idea: AT&T and DT.

"AT&T was an early supporter of P4, having been one of the first to use P4 to specify the behavior we want in our networks and using P4's programmable forwarding plane devices in our network," said Andre Fuetsch, Chief Technology Officer and President, AT&T Labs. "As one of the operator members at ONF, and as a member of P4.org., we look forward to using and contributing to the synergies created by P4.org joining ONF and Linux Foundation."

"At Deutsche Telekom we use P4 for prototyping key network functions as part of our Access 4.0 program," said Jochen Appel, Vice President of Access Network Engineering, Deutsche Telekom. "We are quite excited about the potential P4 holds for driving innovation in the networking space and its role in a growing ecosystem of open programmable hardware and associated programming models."

Announcing the Stratum open source project for software-defined data planes

The Open Networking Foundation, with support from Google, is a launching a new "Stratum" open source project for "a truly software-defined data plane. The idea here is to develop a new set of interfaces to enable full lifecycle control and automated network management of every aspect of the data plane. These new SDN interfaces are to include four major functional capabilities, exposing all aspects of data plane control and management, including:

Pipeline Definition

The P4 language is used to define/document the logical data plane pipeline. On fixed or partially-configurable data plane silicon, P4 is used to document the logical pipeline that is exposed by the switch. On P4 programmable devices, this same P4 pipeline definition can be used to dynamically (re) define and/or upgrade the switch pipeline.

Pipeline Control

P4Runtime is used to dynamically program the forwarding pipeline tables in the switch. This can be thought of as a newer dynamic version of OpenFlow, where the Network OS and data plane

can dynamically negotiate completely new pipeline configurations (unlike OpenFlow, which requires a revision of the specification).

Device Configuration

gNMI with OpenConfig data models is used to manage device configuration. Initial work in SDN did not address these requirements, and instead SNMP, Netconf and CLI were used in an ad-hoc manner (inhibiting interoperability).

Device Operations

gNOI is used for operations, for one-time events like device testing or reboots that do not required maintenance of state. This too was not specified in earlier SDN initiatives, resulting in inconsistent implementations and limiting interoperability.

Google has seeded initial software code for Project Stratum, which has since garnered support from a variety of players.

- **Cloud Providers:** Google, Tencent
- **Telecom Operators:** China Unicom, NTT, Turk Telekom/Netsia
- **Networking Vendors**: Big Switch Networks, Ruijie Networks, VMware
- **White Box ODM Vendors**: Delta, Edgecore Networks, QCT
- **Silicon Vendors**: Barefoot, Broadcom, Cavium, Mellanox, Xilinx
- **Other Open Source Projects**: CORD, ONL, ONOS, OpenSwitch, OVS, P4.org, SDKLT

Barefoot brings P4 and SoNIC support

Barefoot Networks, which is a Palo Alto, California start-up with a next-gen Ethernet switching ASIC, showed off Open Compute Project's (OCP) Software for Open Networking in the Cloud (SONiC)

Barefoot already offers two OCP-compliant Wedge 100B switch designs based on its Tofino 6.5 Tb/s Ethernet switch chip: Wedge100BF-32X, a 3.2Tb/s 1RU 32x100GE switch and Wedge100BF-65X, a 6.5Tb/s 2RU 65x100GE switch. Its Tofino chip also features a built-in packet monitoring and analytics system.

Barefoot enables a P4-programmable forwarding plane and a Switch Abstraction Interface (SAI) enables advanced SONiC capabilities such as data plane telemetry (DTel). The company said its Tofino running SONiC with DTel SAI APIs enables network operators to take advantage of the benefits of programmable forwarding planes and SPRINT, including increased scale, ability to add new features and per-packet visibility.

Wistron NeWeb Corporation (WNC) and Edgecore Networks are two vendors who are using the Barefoot silicon with SONiC support for bare-metal, whitebox switches.

One of the OCP demos showed advanced network performance monitoring, including path and latency tracking, microburst detection and congestion analysis. The demo ran on a P4-

programmable 6.5Tb/s Barefoot Tofino ASIC based bare metal switch and configured using SONiC DTel functionality.

Previously, Barefoot has announced trial deployments of its Tofino silicon with AT&T, Baidu and Tencent. Barefoot is backed by investors including Andreessen Horowitz, Lightspeed Venture Partners and Sequoia Capital. The company has raised approximately $155 million in five funding rounds, most recently raising $23 million in November 2016 in a round led by Alibaba and Tencent.

Modular NG-NOS architecture

At the OCP Summit in San Jose, Google, Facebook and Big Switch took to the stage to demo the disaggregation of hardware and software layers of the hyperscale switching stack.

All three NG-NOS demonstrations performed Layer-3 networking (routing):

- The Google demo showed L3 routing with SDN controller, Google NOS and P4 programming
- The Facebook demo showed this with FBOSS and the Thrift protocol
- The Big Switch demo showed this with an open-source BGP protocol (FRrouting) and networking CLI.

University College London carries 120 Terabit/s over a single repeatered fibre with Xtera

University College London (UCL), in collaboration with Xtera, has demonstrated the transmission of 120 Terabit/s over a single repeatered fibre.

The experiment used a hybrid distributed-Raman / EDFA amplifier with a bandwidth of 91 nm. This is an extension of the technology which Xtera currently deploys in its subsea repeaters, with 256QAM and adaptive FEC expertise coming from UCL and Z-PLUS Fiber 150 fibre from Sumitomo. These initial experiments were performed over 630 km with nine broadband amplifiers spaced at 70km. In the near future, these will be connected to form a loop to allow tests over much longer distances. The capacity and span achieved today exceeds the previous record of 115 Terabit/s over 100 km by more than six times.

Xtera said conventional approaches can yield bandwidths of approximately 70 nm when using the combination of a C-band and an L-band amplifier. Raman amplification used by Xtera can offer even greater bandwidth, in this case 91nm, while also offering very low noise.

Dr. Stuart Barnes, Chairman of Xtera, in expressing how pleased he has been with the Xtera / UCL collaboration, states, "This is the start of an exciting period of work where Xtera and UCL will push the limits of this technology even further, a possibility which doesn't exist for two discrete C+L amplifiers. I am confident that more bandwidth is not only possible but also practical, and more importantly, commercially viable. Xtera will continue to push transmission technology further in order to create products which meet the market demands of the future."

Professor Polina Bayvel, CBE FRS FREng, adds, "I am happy that our state-of-the-art, high-speed WDM transmission testbed, developed through the EPSRC UNLOC programme, could be used to achieve record transmission throughput. This accomplishment has been enabled by many ground-breaking research developments in digital signal processing and amplifier technology as well as dedicated effort of outstanding researchers from UCL's Optical Networks Group and Xtera."

http://www.convergedigest.com

Details of the experiment and findings are available at www.xtera.com/learning/ and www.arxiv.org

UK kicks off 5G spectrum auction

Ofcom, the official telecoms regulator in the U.K., has commenced an auction to release more airwaves to improve mobile broadband capacity, and help prepare for future 5G services.

A total of 190 MHz of spectrum is being sold across two frequency bands: 40 MHz in the 2.3 GHz band, which will be used to increase mobile broadband capacity for today's users; and 150 MHz in 3.4GHz, which has been earmarked for 5G.

Five companies have been approved to bid in the auction: Airspan Spectrum Holdings Ltd; EE Limited; Hutchison 3G UK Limited; Telefonica UK Limited and Vodafone Limited.

The length of the auction depends on the level of bidding activity. There is a £70m reserve price, with the value increasing round by round as bids are made.

NTT Com plans 4th data center campus in Frankfurt

NTT Communications' e-shelter business unit has acquired a new development site in Frankfurt, which will be its 4th location in the city.

The "Frankfurt 4 Data Center" campus is located in Hattersheim in the west of the city and will feature 5 DC buildings built out in phases, with the first building of 9.7MW IT load scheduled to open in early 2019. Once fully built out, the site is capable of housing up to 60MW IT load and 24,000 sqm of IT space, supporting an average power density of 2.5 kW/sqm.

e-shelter, which offers both wholesale and retail colocation services, along with hybrid IT enterprise solutions, currently operates across ten locations in the DACH region and a data center area of around 90,000 sqm. Outside of DACH e-shelter is also expanding to new markets with a new data center campus opening in Amsterdam in early 2019 and development sites secured in both Madrid and London.

Dell EMC launches Virtual Edge Platform

Dell EMC introduced its enterprise Virtual Edge Platform (VEP) family for SD-WAN.

The Dell EMC VEP4600, which is powered by the new Intel Xeon D-2100 processor, is a universal Customer Premise Equipment (uCPE) meant to displace expensive fixed-function access hardware.

It provides an open Intel architecture-based platform to support multiple simultaneous virtual network functions (VNF). Numerous proprietary physical devices can be consolidated into this single uCPE while maintaining the high-performance levels needed to host many. The modular design includes room to grow with front panel expandability so the platform can be easily upgraded or serviced in the field as needed.

"There is a real need among service providers and enterprises to update network operations to address distributed and cloud-based applications and capitalize on changing economics enabled by cloud models," said Tom Burns, senior vice president, Networking & Service Provider Solutions. "By infusing Open Networking into access networks to the cloud with the Virtual Edge Platform family, Dell EMC can help customers modernize infrastructure and transform operations while automating service delivery and processes."

"As network traffic continues to increase, optimized service delivery is required to meet the demands of a broad range of use cases at the network edge," said Sandra Rivera, senior vice president and general manager, Network Platforms Group, Intel. "A programmable and power efficient system-on-a-chip processor is needed to deliver the performance that users and devices require for edge applications. Using

the Intel Xeon D-2100 system-on-a-chip in the Dell EMC Virtual Edge Platform provides flexible and power-efficient network edge solutions with high-performance compute and intelligence."

- In February, Intel introduced a system-on-chip processor in its Xeon line that is architected to address the needs of edge applications and other data center or network applications. The new Intel Xeon D-2100 processors include up to 18 "Skylake-server" generation Intel Xeon processor cores and integrated Intel QuickAssist Technology with up to 100 Gbps of built-in cryptography, decryption and encryption acceleration. Intel said this processor will be supported by system software updates to protect against the Spectre and Meltdown security exploits.

Microsoft signs largest corporate solar deal in U.S. at 315 MW

In what is described as the single largest corporate purchase of solar energy ever in the United States, Microsoft agreed to purchase 315 MW of energy from Pleinmont I and II, two new solar projects in the Commonwealth of Virginia.

Microsoft is aiming to power 60% of its operations with renewable energy by 2020.

"Today, we're signing the largest corporate solar agreement in the United States, a 315 megawatt project in Virginia that will move us ahead of schedule in creating a cleaner cloud," said Brad Smith, president, Microsoft. "This project means more than just gigawatts, because our commitment is broader than transforming our own operations; it's also about helping others access more renewable energy."

The project is owned and will be operated by sPower, a leading independent renewable energy power producer based in Salt Lake City, Utah. Once operational, Pleinmont I and II will consist of more than 750,000 solar panels spread across more than 2,000 acres, and produce approximately 715,000 MWh a year. It is the largest solar project in Virginia and the fifth largest solar project in the country.

Averon raises $13.3 million for mobile identity

Averon, a start-up based in San Francisco, raised $13.3 million in series A funding for its work in mobile identity verification.

Averon's solution leverages mobile carrier data signaling and hardware already in every smartphone combined with Averon's proprietary blockchain technology to positively and instantly authenticate mobile users. The mobile authentication works seamlessly whether users are on Wi-Fi or LTE.

The company says its patented techniques are impervious to man-in-the-middle attacks, social engineering and other forms of digital hijacking.

The funding round was led by Avalon Ventures and Salesforce founder and CEO Marc Benioff.

"Averon provides the fastest, strongest mobile security in the world, and we're proud that our innovations are disrupting the status quo of cybersecurity," said Wendell Brown, Averon co-founder and CEO. "We completely relieve the burden from end users while providing enterprise customers far superior security. Our solutions heal the cyber battle wounds suffered by every sector, from banking and healthcare to e-commerce. Our customers enjoy freedom and peace of mind, because users' logins, purchases and entire digital life are always effortlessly protected while connected with Averon."

http://www.averon.com

CenturyLink overtakes AT&T on Vertical Systems Group Leaderboard

CenturyLink (including Level 3), AT&T, Verizon (including XO), Windstream and Frontier have gained a position on the 2017 U.S. Incumbent Carrier Ethernet LEADERBOARD, according to Vertical Systems Group's latest research.

The Incumbent Carrier LEADERBOARD, which ranks incumbents in order based on U.S. retail Ethernet port share for this segment, is an industry benchmark for measuring Ethernet market presence.

CenturyLink jumps to the first position on the 2017 Incumbent Carrier LEADERBOARD based on Ethernet ports from its Level 3 merger, up from the third position in the previous year. As a result, AT&T moves into the second position from first, where it had been perennially ranked in the incumbent segment. Verizon (including ports from its acquisition of XO) is in the third position, followed by Windstream at the fourth position. Frontier gains the fifth position for its initial entry to the Incumbent Carrier benchmark ranking.

Other companies in the Incumbent Carrier segment selling retail Ethernet services in the U.S. market include the following (in alphabetical order): Alaska Communications, Cincinnati Bell, Hawaiian Telecom, TDS Telecom and other incumbents.

To qualify for the 2017 U.S. Incumbent Carrier Ethernet LEADERBOARD, companies must achieve either a top rank or a Challenge Tier citation on the 2017 U.S. Carrier Ethernet LEADERBOARD. Incumbent Carrier is one of three U.S. provider segments, along with the Competitive Provider and Cable MSO segments.

ETSI and OPNFV announce co-located testing

ETSI and OPNFV announced plans to co-locate their next community testing events in Sophia Antipolis, France.

The third ETSI NFV PlugtestsTM event will be held between 29 May and 8 June 2018, and the OPNFV Fraser Plugfest will be held from 4 to 8 June.

"Effective interoperability is the goal of any standards activity, and ETSI NFV adopted an approach oriented towards actually exercising and demonstrating interoperability from its start in 2012, evolving from Proofs of Concepts to Plugtests activities," says Diego Lopez, chairman of ETSI ISG NFV. "This event is a new opportunity to strengthen the current cooperation with relevant open-source communities in the NFV landscape."

ZTE touts cloud native container platform for NFV

ZTE announced an end-to-end container networking solution for open-source NFV .

ZTE's unified ICT PaaS platform, TECS OpenPalette, is based on container and Kubernetes cluster management technologies.

The company said that in order to address telecom application requirements such as high concurrency, large throughput, and multiple network planes, its platform employs the Knitter container networking solution.

In addition to supporting the native Kubernetes network, it offers multiple network planes, static application IP addressing, IP address migration, configurable IP resources, and high-performance forwarding.

Samsung posts specs on its 10nm Exynos 7 Series 9610

http://www.convergedigest.com

Samsung Electronics Co. posted key specifications on its latest application processor (AP), the Exynos 7 Series 9610, for high-end smartphones.

The Exynos 9610 is built on Samsung's 10-nanometer (nm) FinFET process. The CPU is comprised of four Cortex-A73 cores running at 2.3 gigahertz (GHz), and four 1.6GHz Cortex-A53 cores to load apps quickly and run multiple tasks simultaneously.

The GPU is a second-generation Bifrost-based ARM Mali-G72.

There is an embedded Cortex-M4F-based low-power sensor hub, which efficiently manages the sensors in real-time without waking the main processor.

The embedded all-network LTE modem supports Cat.12 3CA (carrier aggregation) at 600 Mbps for downlink and Cat.13 2CA at 150Mbps for uplink.

The processor also features 802.11ac 2x2 MIMO Wi-Fi, faster and longer range Bluetooth 5.0, and FM for radio. In addition, for global location positioning coverage, it embeds a 4-mode Global Navigation Satellite System (GNSS) receiver that includes GPS (Global Positioning System), GLONASS, BeiDou and Galileo.

The Exynos 7 Series 9610 is expected to be mass produced in the second half of this year.

Seagate shows 14TB helium-based Exos HDD

Seagate Technology introduced its 14TB helium-based Exos X14 enterprise drive at the OCP U.S. Summit 2018 in San Jose, California.

The Seagate Exos X14, which is aimed at hyperscale data centers, boasts enhanced areal density for higher capacity storage in a smaller package. It offers built-in encryption with the United States government's Federal Information Processing Standard (FIPS) 140-2, Level 2 certification and the Common Criteria for Information Technology Security Evaluation (CC) - an international computer security certification standard (ISO/EIC 15408). Other key features include 40 percent more petabytes per rack versus Exos 10TB drives, a 10 percent weight reduction versus air nearline drives, and a flexible design that delivers wider integration options and support for a greater number of workloads.

The drive is currently sampling to select customers and will be followed by production availability this summer.

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