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Road to 5G · AI · Edge Computing

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Open Communities and Cross Pollination

▶ George Tchaparian, CEO

Edge-corE® NETWORKS

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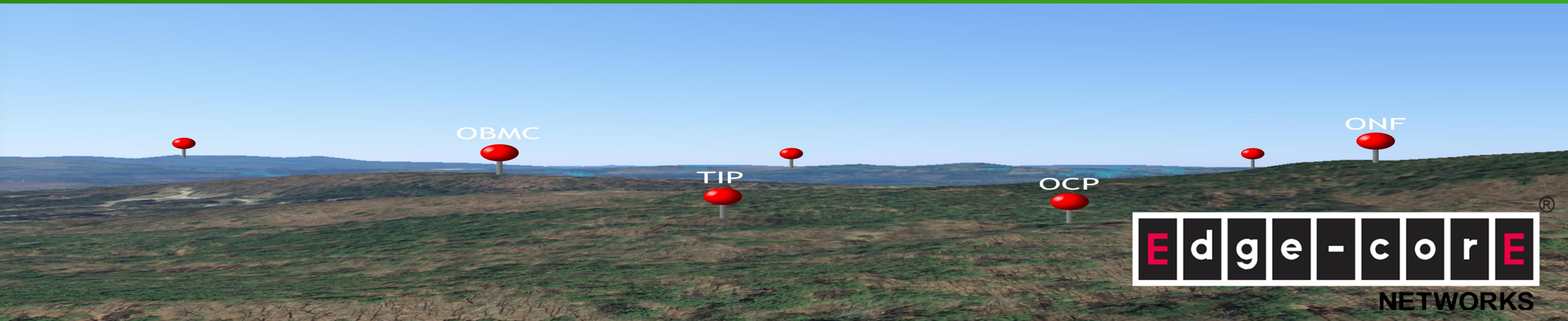
Open Communities and Cross Pollination



Edge-corE NETWORKS

Explosive Bandwidth Requirements Ahead !

- **AI & Edge Computing in 5G Era**
- The adoption of 5G, AI, and Edge Computing will drive new expectations for an:
  - always-on,
  - high quality network and,
  - services,
- Which will lead to operational efficiency (OPEX reduction) and boost ultra-low latency and intelligent applications.
- To honor the promise with the right CAPEX, it is vital to have the proper compute infrastructure in place, aligned to the right strategy, like, Openness, Whitebox, Disaggregation, Automation, etc.

Edge-corE®
NETWORKS

What upgrades are needed for 5G ?

OPEN PLATINUM

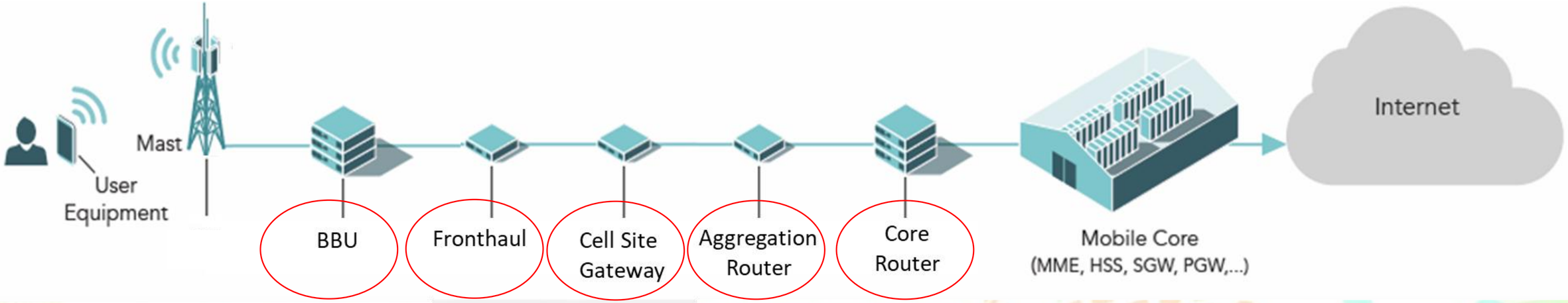
Core>>400G… +

Aggregation >>100/400G

Cell Site Gateway>>10/25G/100G

Fronthaul>>RoE

BBBU>>RU, CU, DU



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How will these product upgrades be delivered ?

- Openness
- Disaggregation
- Whitebox

Open Community

Active Community Members

OCP Community Work .... At Work !

OPEN PLATINUM

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Telco
HW

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Networking
Software

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Hardware Management
Redfish Profiles

DMTF Redfish

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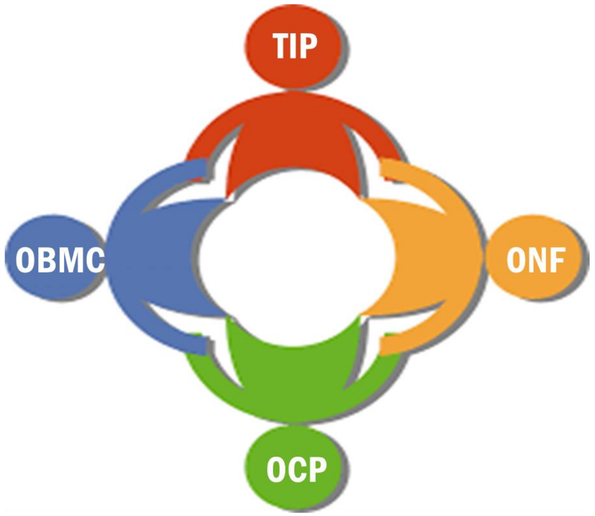
Hardware Management
RunBMC

Edge-corE NETWORKS

Open Communities

Open Communities and Cross Pollination



TELECOM INFRA PROJECT

Cassini

Edgecore AS7716-24SC

OpenBMC
Linux Foundation

ONOS Controller
ODTN

OPEN Compute Project
Hardware Management

DMTF Redfish

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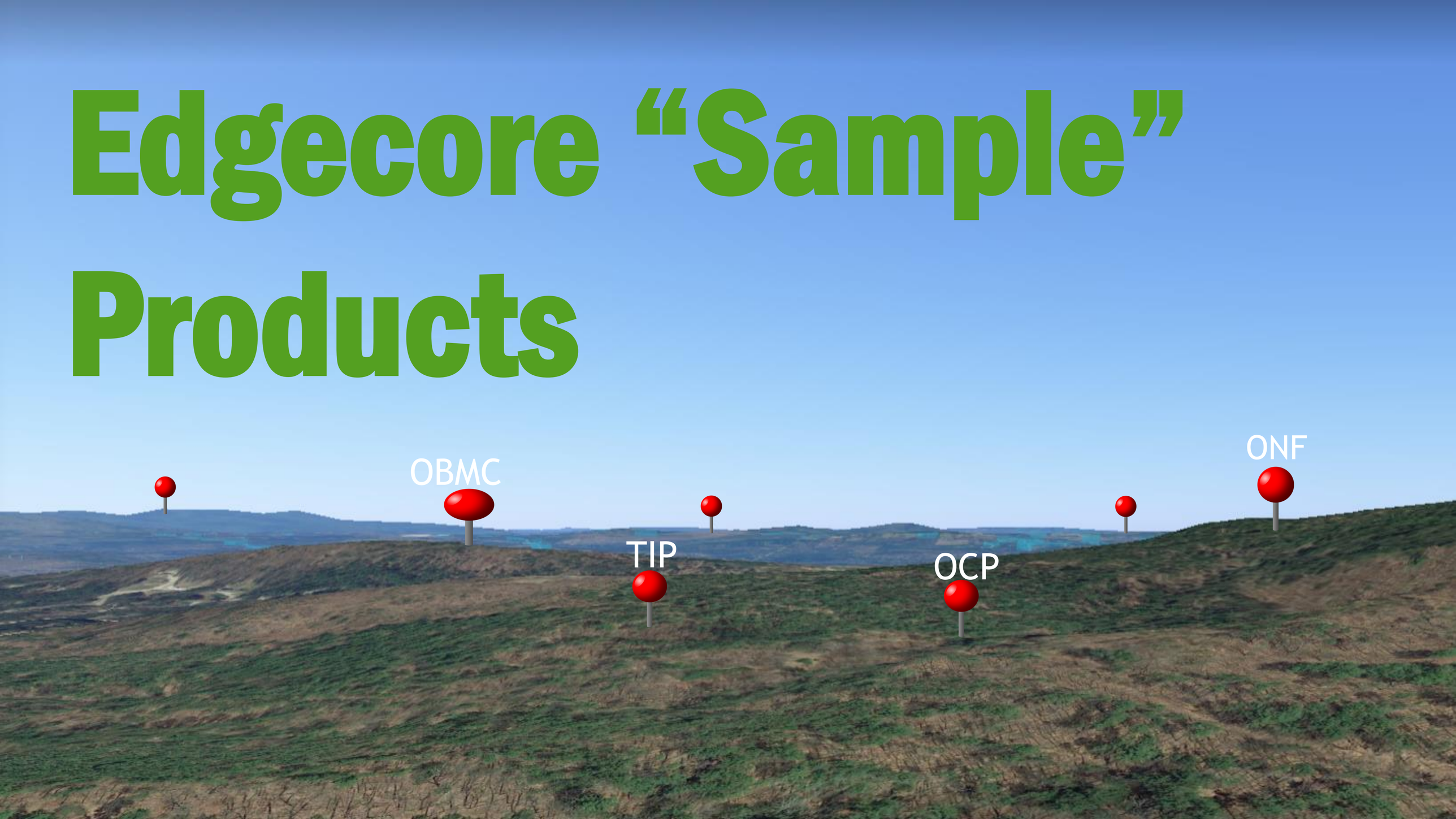
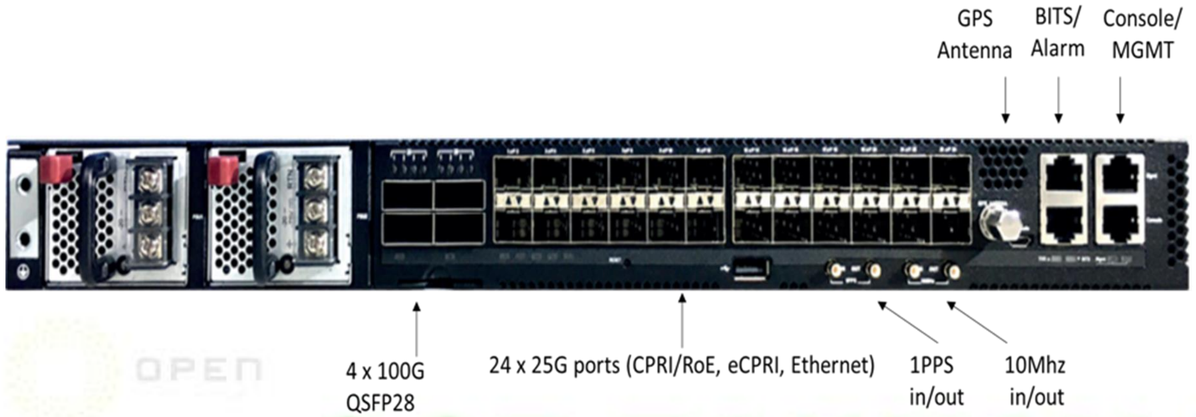
Cross Pollination = “A sharing or interchange of knowledge, ideas, etc., as for mutual enrichment;

Edgecore “Sample” Products



Edgecore Open Fronthaul Switches

- 24 x 25G SFP28 & 4 x 100G QSFP28
- Outdoor Plant Deployment
- NEBS3, -40 to 65C operating temp
- 1U, 300mm depth
- 350W max power
- Full 1588 and Synchronous Ethernet
- AC and 48VDC Power Options



- 8 x 25G SFP28 & 2 x 100G QSFP28
- Outdoor Plant Deployment
- NEBS3, -40 to 70C operating temp
- Pole, strand, and building mount options
- Fanless
- AC and 48VDC Options

Edgecore Open Cell Site Gateway

- **AS7316-26XB Cell Site Router Gateway**
  - 24 x 10G/25G SFP28, 2 x 100G QSFP28
  - Deep Buffer Switch
  - Outdoor Plant Deployment
  - 1U, 300mm depth

Edgecore Open Aggregation Routers

- AS7926-40/80XK 40 x 100G and 80 x 100G models
- Broadcom StrataDNX Jericho 2 (BCM88690)
- Deep Buffer Switch
- Expandable TCAM (BCM16K)
- IEEE1588 and Synchronous Ethernet
- AC and 48VDC Power Options
- “Building Block Design” for future offerings

Edgecore Open OLTs for PON Access

- **ASXvOLT-16**
  - 16 x 10G XGS PON Ports
  - 4 x 100G Uplinks
  - ONF SEBA Support
- **ASGvOLT 32/64**
  - 64/32 GPON Ports
  - 2x100G & 8 x 25G uplinks
  - ONF SEBA Support

We are at HALL 2, 1F, Stand #: P0208

OPEN PLATINUM

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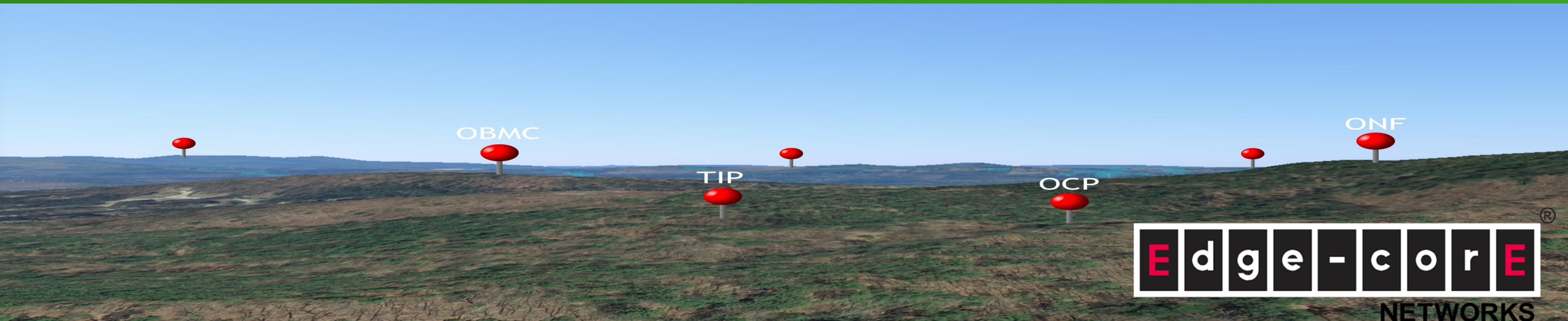
Thank You !



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CLOUD INNOVATIONS

- Murugasamy (Sammy) Nachimuthu
- Sr. Principal Engineer, Intel Corporation

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Agenda

- Cloud and OCP
- Intel® Platforms and Solution Innovations
- System Firmware Improvements
- Summary and Call to Action

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Cloud and OCP

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Public Cloud Growth Continues – Driving Greater Infrastructure demands

BY 2021

Digital Retail
$4.9T[1]

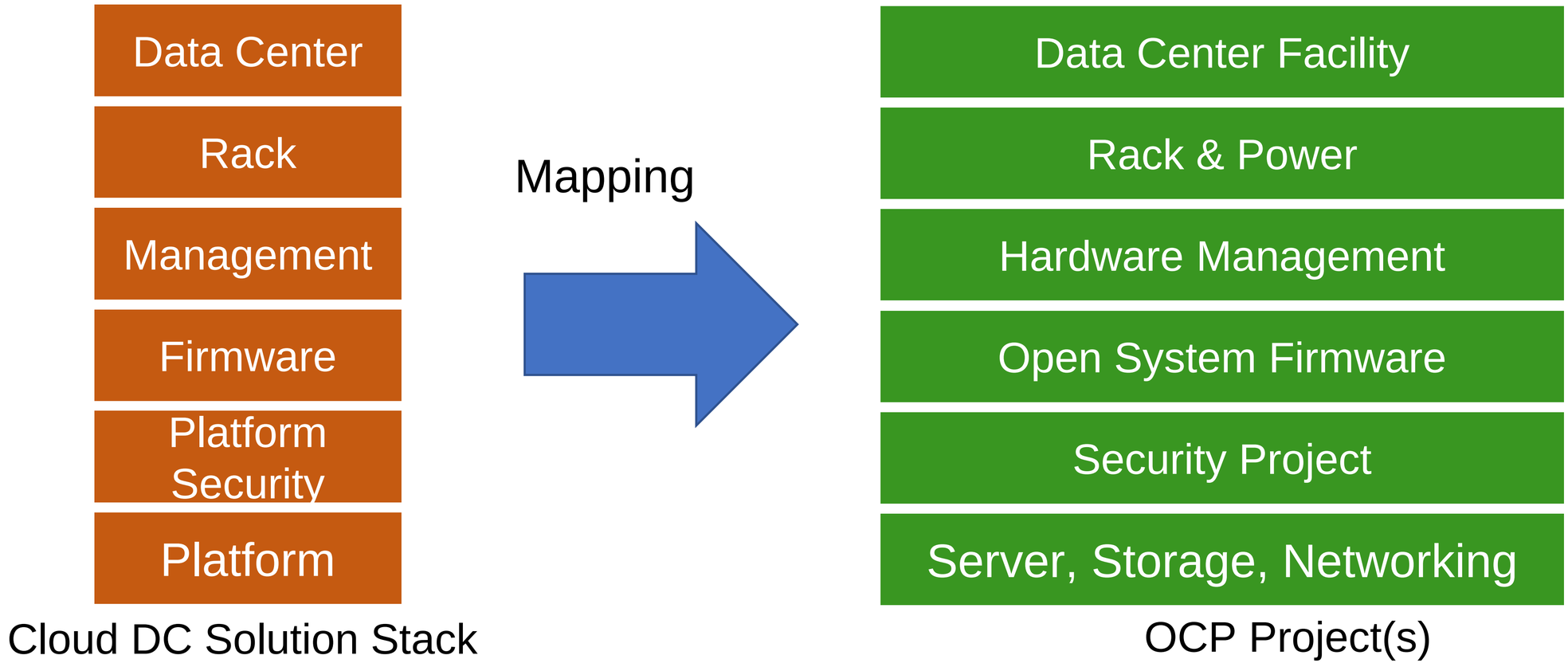
Digital Advertising
$400B[2]

Digital Video & Media
$120B[3]

Cloud Services
$300B[4]

1. Digital Retail – eMarketer Jan/March 2018
2. Digital Ads – eMarketer May 2018
3. Digital video/media – Juniper Research, Subscription Video on Demand, Dec 2017
4. Xaas (cloud services) – IDC Public Cloud Services Tracker Forecast 2017H2, May 2018

Cloud and OCP



OCP Project(s) well-positioned to satisfy Cloud Solution Requirements

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Intel® Platforms and Solution Innovations

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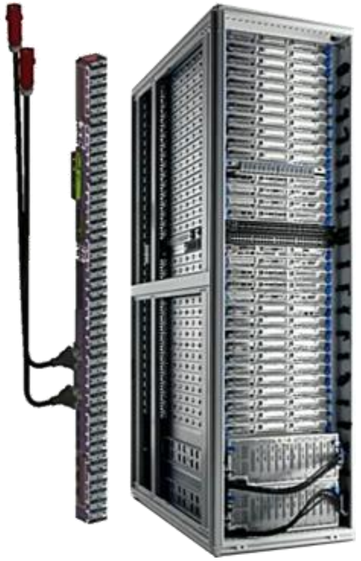
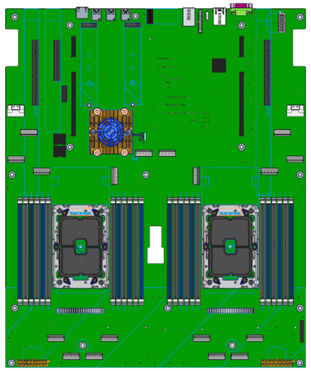
New OCP Compute Platforms This Year

Mount Olympus Next Gen Platform for Cascade Lake Processor

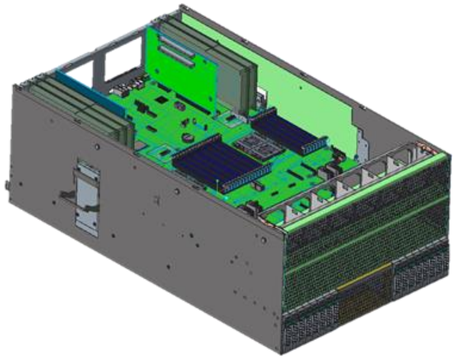


OPEN ACCEPTED

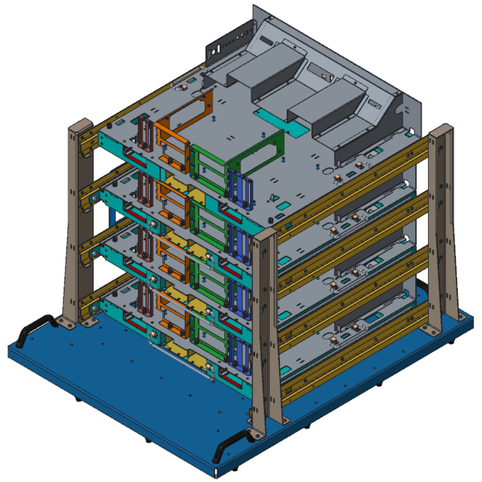
Cooper Lake Processor Platforms



2S



4S (2x 2S)



8S (4x 2S)

Microsoft

facebook

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Intel® High-Density, Cloud-Optimized Platform

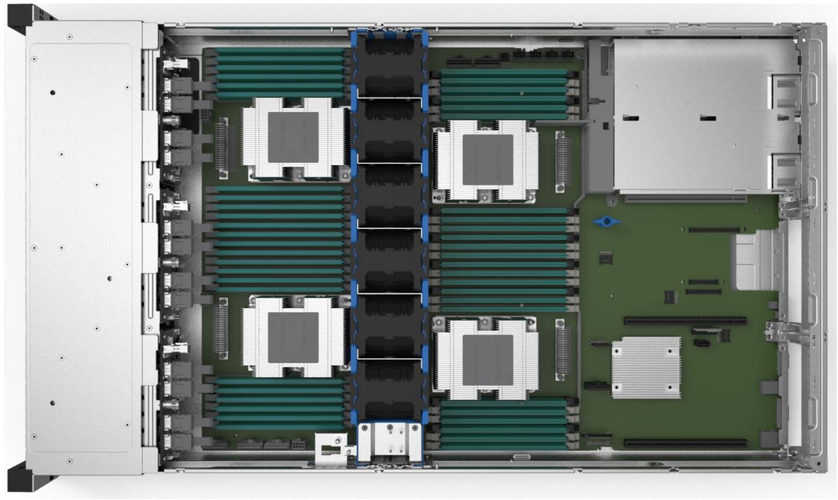
First Cloud-Optimized Platform

2U 450mm x 780mm 4S Intel ® Xeon®
6xxx VM optimized processors

48 DDR4 memory slots,
SATA/SAS/NVMe 2.5”
SSD drive bays

intel OPTANE™ DC PERSISTENT MEMORY

Available in second half 2019



inspur

DELL Hewlett Packard Enterprise hyve solutions wiwynn

Lenovo QCT SUPERMICRO

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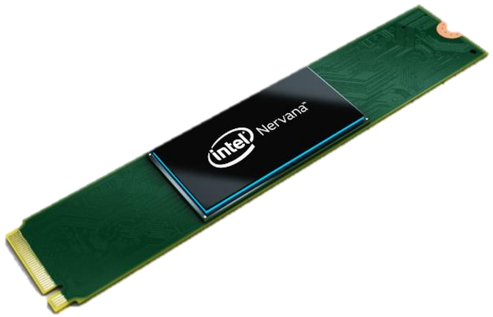
OCP Cards Support for AI Accelerators

Intel® NERVANA™ Neural Network Processor (NNP)

FOR TRAINING:

Dedicated deep learning training acceleration
Optimized memory and interconnects
In production in 2019

FOR INFERENCE:



Dedicated deep learning inference acceleration
10nm Intel® process node
In production in 2019

Intel is a proud partner of the GLOW community facebook

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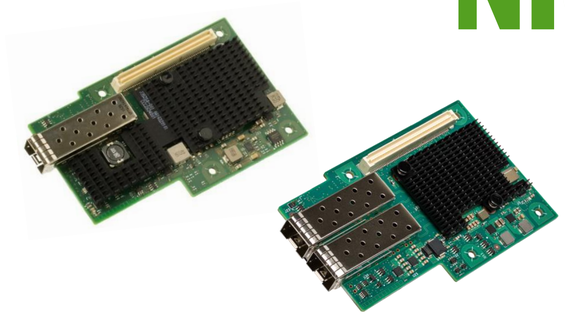
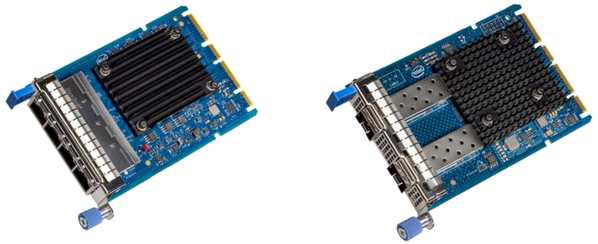
Advancing Network Performance with OCP NIC 3.0 Adapters



25GbE Intel® Ethernet Network Adapters for OCP 2.0



1GbE and 10GbE Intel® Ethernet Network Adapters for OCP NIC 3.0

Up to 100 GbE next gen Intel® Ethernet Network Adapter for OCP NIC 3.0

facebook

Now: OCP Mezzanine cards 2.0	Q3‘19: OCP NIC 3.0 Adapters
Intel® Ethernet Network Adapters for OCP - 10GbE, 25GbE and 40GbE are available	Complete OCP NIC 3.0 product family from 1GbE to 100GbE (1,10, 25, 50, 100) Flexible port configurations

Work with us on implementing and validating your solutions

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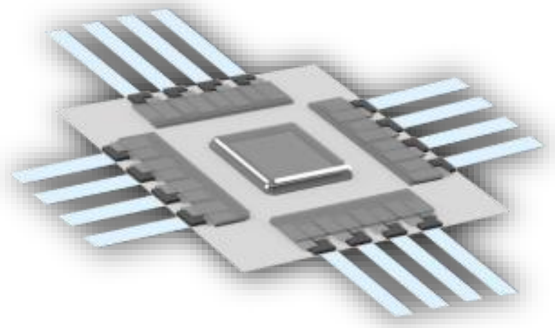
Advancing Common SIPH Connectivity Standards

Open standard optical hardware leveraging wafer scale manufacturing

100G CWDM4-OCP shipping in volume since 2017, 400G shipping in 2019

Working to standardize electrical interfaces (die-to-die and die-to-optical) for optical I/O and integrated networking/switch solutions

100G CWDM4-OCP



25T+ Integrated, Co-packaged Optical Switch IC Package

CLOUD - Managing at Scale Realities…

SW and FW Updates

Errors SW & HW

Service Outages

@Scale Magnification

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System Firmware Improvements

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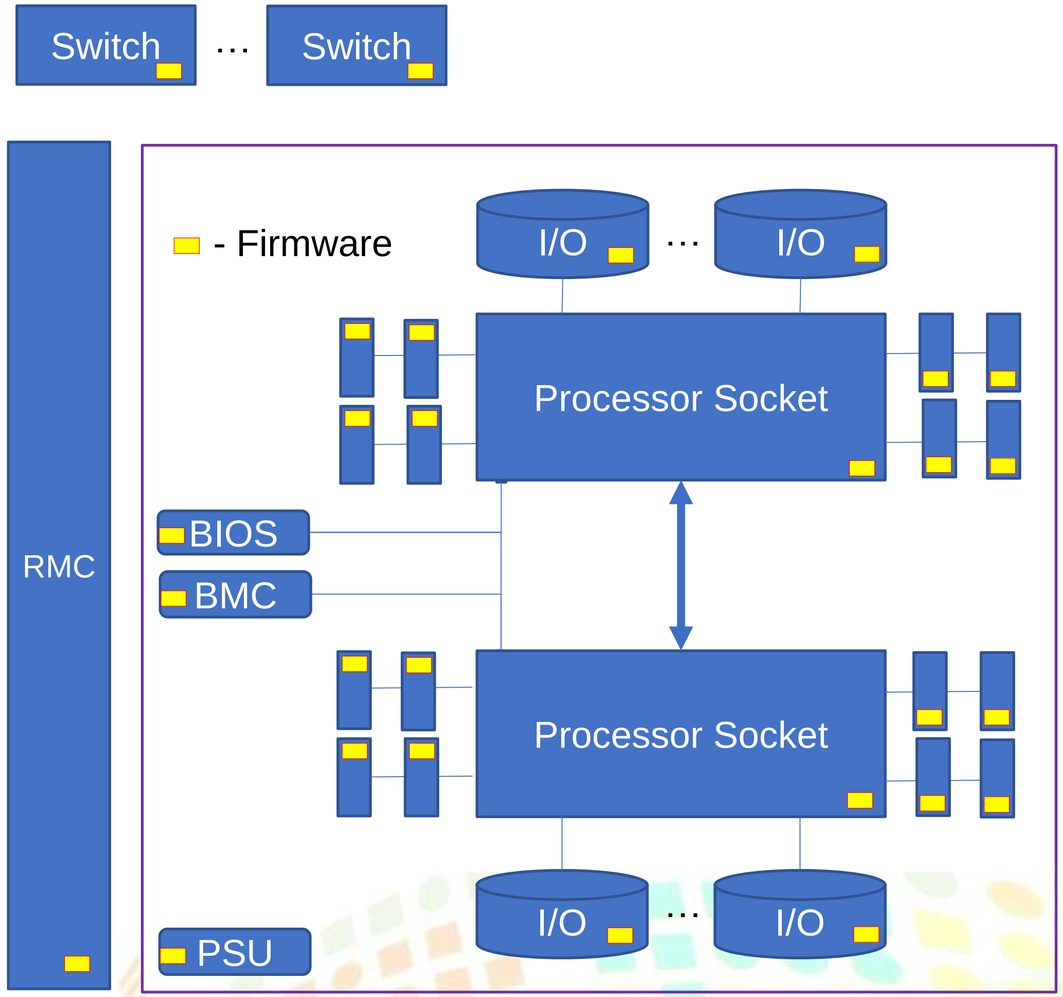
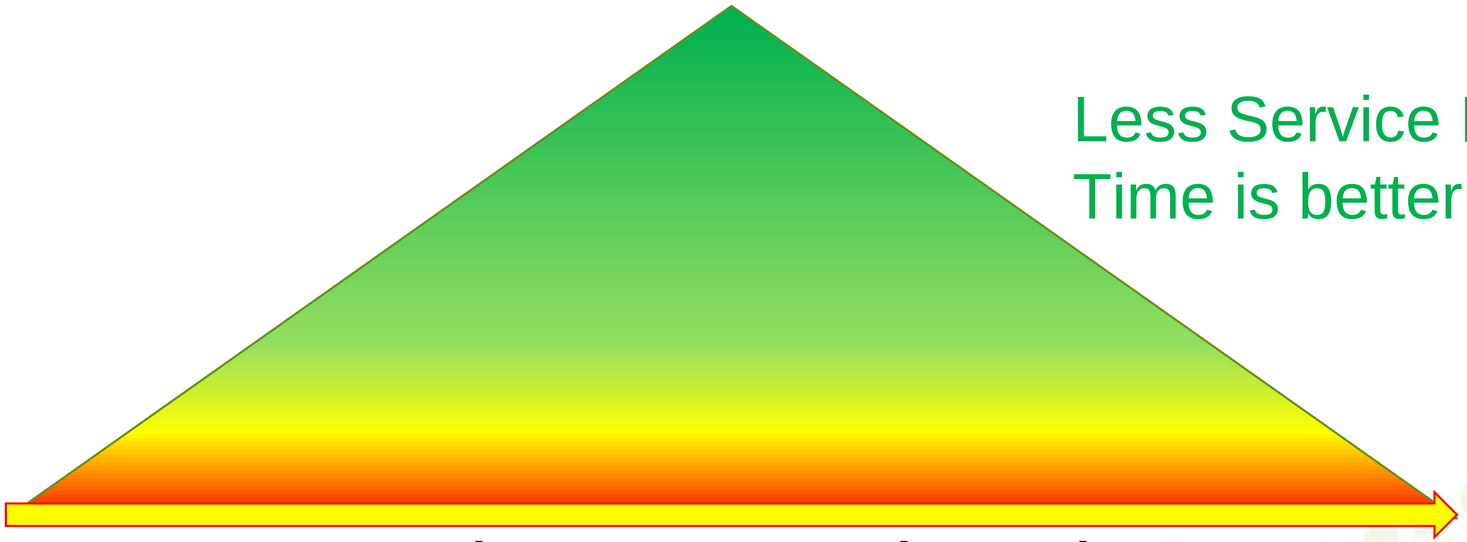
Cloud Firmware Update Challenges

- **Today's OCP system contains many hardware components with firmware**
  - System Firmware – BIOS, BMC, etc.
  - Device Firmware – Microcode, Network, Storage, PSU, etc.
- **Over life time of the system, the firmware components are upgraded to address:**
  - Security, power, performance, bug fixes, debug/telemetry, etc.
- **In most cases, system is rebooted to activate new firmware**



Cloud Demands High Service Availability

System reboot affects the service availability

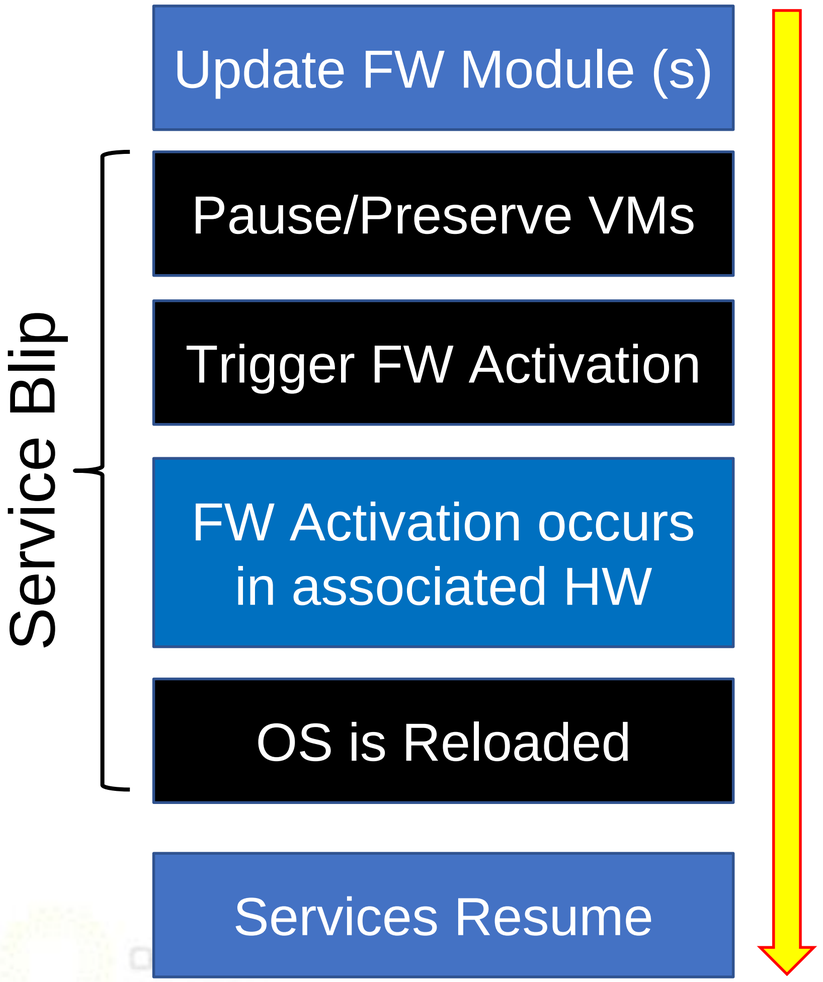


Less Service Interruption
Time is better

Service Interruption Time

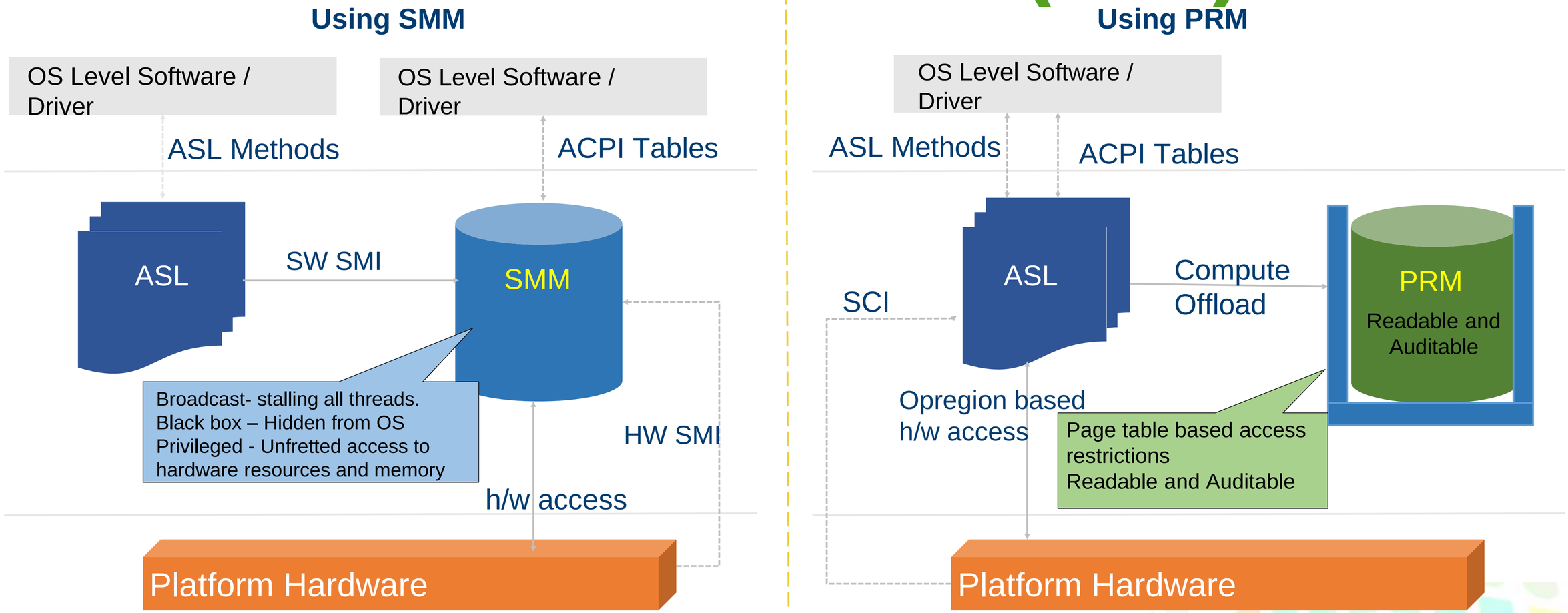
Intel® working with partners in OCP on improving FW Upgrades

Runtime Firmware Activation Flow



- **OS Constructs for Runtime Updates**
  - Unix/Linux – kexec
  - Windows – Memory Preserving Maintenance
- **Firmware Activation Mechanics**
  - Pause/Preserve VMs
  - Invoke Modified Reset flow
  - Activate new FW Modules
  - Load OS (memory contents still valid)
  - Resume services

Platform Runtime Mechanism (PRM)



PRM aims to reduce runtime SMMs

Advancing Cloud Innovations via OCP Projects…

- Intel® High-Density, Cloud-Optimized Platform – Joint OCP contribution from Intel and Inspur
- Data Center Cooling based on Predicting Power - Plan to contribute Whitepaper and Redfish profile to OCP DCF Project
- Open System Firmware (OSF)
  - Platform Runtime Mechanism (PRM)
  - Multi-socket Firmware Support Package (FSP) & Coreboot
- Storage Disaggregation using NVMe over Fabrics (TCP/IP or RDMA)

Call to Action

- Take advantage of Intel platform and solution contributions to OCP

- Participate and contribute to OCP Projects to enhance server & DC solutions

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Thank You

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