Jason Waxman
Corporate Vice President and General Manager of the Data Systems Group
Intel Corporation
2011 Founding Member of OCP

Contributions and Enablements

Products with Partners

*Other names and brands may be claimed as property of others.
Hyperscale Driving the Next $1B in OCP Hardware

50B CONNECTED DEVICES

GROWTH VECTORS

HYPER-CONNECTED WORLD

GROWTH

TRANSFORMATION OF
The Network

CHALLENGES

GROWTH OF
AI & Analytics

Efficiency
Less than 50% server utilization²

Growth
Data growth doubles every 18 months¹

Agility
New services can take a week or more to provision¹

2. IDC’s Digital Universe Study, sponsored by EMC, December 2012
Hyperscale Agility: Built on Industry Standards

Intel® Rack Scale Design

“an industry-aligned architecture for composable, disaggregated infrastructure built on modern, industry standards.”

Supporting Open Standards

Expanding Ecosystem

OEMs/ODMs/TEMs*

ISVs/OSVs/IVs/
IHVs*

Publicly Announced End Users*

*Other names and brands may be claimed as property of others.

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Intel® Rack Scale Design (RSD): Optimized for Hyperscale

RSD Architecture

- Compute Pool
- Accelerator pool
- Storage pool
- Optimized network and SiPh

Optimize for higher workload performance

Resource Pooling: greater utilization

Disaggregation: Late binding, different refresh rates
**Intel® Rack Scale Design Open APIs**

**Pooling Data Center Resources for Efficiency at Scale**

- More Pooled Resources
  - Intel® FPGA Accelerators
  - Memory Persistence Support
  - Smart NICs

- Optimized Interconnect
  - Storage Drawer
  - Accelerator Drawer

- Network Management
- Storage Management
- NVMe over Fabrics (Redfish)
- Network Management (Yang-to-Redfish)

- 2018
  - NVMe over Fabrics (Redfish)
- 2019
  - Storage Management (Swordfish)
- Future
  - Network Management (Yang-to-Redfish)

Greater Manageability

---

* Statements in this presentation that refer to Intel’s plans and expectations for the quarter, the year, and the future, are forward-looking statements that involve a number of risks and uncertainties. All information provided here is subject to change without notice.

**OPEN. FOR BUSINESS.**
Delivering Software, Compute, Network, and Storage Tech to Scale OCP*

Compute

Network

Storage

Common Management and Security

*Other names and brands may be claimed as property of others.
**Mount Olympus**

OCP 19” rack compliant 2S Intel® Xeon® Scalable Processor 1U server

Up to 16 M.2 NVMe SSDs

Provides 56 cores per system with 205W CPUs

---

**Tioga Pass**

OCP* Open Rack V2 compliant 2S Intel® Xeon® Scalable Processor server

Up to Eight M.2 NVMe SSDs

3 systems per 2U => 132 cores with 165W CPUs

*Other names and brands may be claimed as property of others.
<table>
<thead>
<tr>
<th>Chassis</th>
<th>Compute</th>
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<th>Configurations</th>
<th>Usage Models</th>
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<tr>
<td>Yosemite V2</td>
<td>Twin Lakes Xeon D® 2100 SOC</td>
<td>Glacier Point</td>
<td>Yosemite + 4 Twin Lakes</td>
<td>Usage is Web Tier / Edge Compute</td>
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<td></td>
<td>Yosemite + 2 Twin Lakes + 2 Glacier Point</td>
<td>72 cores in 1U</td>
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<td>Open Rack V2</td>
<td>Tioga Pass 2 Xeon® Scalable Processors</td>
<td>m.2 carrier</td>
<td>ORv2 + Tioga Pass</td>
<td>Storage / Data Caching</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>ORv2 + Tioga Pass + 2 Ava</td>
<td>32TB in 1U</td>
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<td>Memcached, database</td>
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<td></td>
<td>132 cores in 2U</td>
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<tr>
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<td>m.2 carrier</td>
<td></td>
<td>Storage / Data Caching</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48TB in 2U</td>
</tr>
</tbody>
</table>

**Usage Models**:
- Usage is Web Tier / Edge Compute: 72 cores in 1U
- Storage / Data Caching: 32TB in 1U
- Memcached, database: 132 cores in 2U
- Storage / Data Caching: 48TB in 2U
Intel® Silicon Photonics Innovation

100G CWDM4-OCP* optical module released and shipping in high volume.

400G CWDM8 targeted at 2 km and 10 km data center links

CWDM8 enables low-cost, low-power, volume-manufacturable 400G optics and the industry’s only data-center targeted 10 km solution

Open interface specs defined—join the MSA at cwdm8-msa.org

Samples in 2018

*Other names and brands may be claimed as property of others.
# OCP* Network Cards

**Now: OCP* Mezzanine cards 2.0**

| Intel® Ethernet Network Adapters for 10G 25G and 40G are available |

**2H 18/1H '19: OCP* NIC 3.0**

| Next generation of smart NIC, PCIe Gen 4 and Gen 5, larger power envelope (80 and 150W) |

Work with us on implementing your solution and give feedback on the specification

*Other names and brands may be claimed as property of others.*
Intel® Storage and Memory Innovations
a Range of Solutions for Today’s OCP* Platforms

**Product available at a later date. Check Intel roadmap for more details.**

*Other names and brands may be claimed as property of others.

Intel® Optane™

Yosemite/Twinlakes¹
Glacier Point Carrier
- Intel® Xeon® Processor Scalable Family
- m.2** Intel® Optane™ SSD
- m.2 Intel® SSD DC P4511

Tioga Pass¹
AVA Carrier
- Intel® Xeon® Processor Scalable Family
- AIC, m.2** Intel® Optane™ SSD

Lightning²
Intel® Xeon® Processor
- U.2 Intel® SSD DC P4510
- m.2 Intel® SSD DC P4511

¹Tioga Pass and Glacier Point – Based on OCP* Yosemite V.2 specification 0.4
http://files.opencompute.org/oc/public.php?service=files&t=837133e9167e70d79ba57450ecbb826

²Lightening – Based on OCP* Lightning v1.0 specification http://www.opencompute.org/wiki/Storage
Storage: Addressing the Storage Challenges for Hyper Scale Datacenters

Project Denali is a streamlined SSD architecture that standardizes SSD to host drive interface and media management.

In the future: combination of Intel® Optane™ Technology and floating gate (FG) 3D NAND to address hyperscale challenges.

*Other names and brands may be claimed as property of others.
OpenBMC Open Platform Manageability

Describe  | Prescribe  | Implement  | Test conformance
---|---|---|---
DMTF  | OCP  | OpenBMC  | Interop Validator

Management – OpenBMC

Open source Baseboard Management Controller firmware
Controls system management functions debug, monitoring, provisioning...
Lower cost to implement out-of-band manageability
OpenBMC will be available on platforms by end of year for use as a software development vehicle

*Other names and brands may be claimed as property of others.*
Security First Commitment

Released microcode updates for 100% of past 5 years of products that require mitigation

Redesigned parts of the processor to introduce new levels of protection through partitioning for next-generation Intel® Xeon® Scalable Processors (Cascade Lake) as well as 8th Generation Intel® Core™ processors

Platform Security - Cerberus

OCP project that supports secure firmware using device attestation of platform elements, including CPUs, FPGAs, NICs and SSDs

Mutual authentication delivered in Intel® Platform Firmware Resilience (Intel® PFR)

*Other names and brands may be claimed as property of others.
Software Momentum: Breaking Through Requires Focus and Clear Goals

- Compliance & Interoperability
- Data Center Facility
- Hardware Management
- Open System Firmware
- High Performance Computing (HPC)
- Networking
- Rack & Power
- Server
- Storage
- Telco
- Security

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Orchestration to Improve Datacenter Manageability, Deployability, and Ease of Use

- Manageability:
  - Service Function Chaining
  - Intelligent Workload Scheduling
- Deployability:
  - Multi-Networking Support
  - Virtual Memory Management
- Ease of Use:
  - CPU Pinning
  - Node Feature Discovery

* Other brands and names may be claimed as the property of others.
Intel + OCP*: Architecting for the Hyperscale Datacenter

Intel® Rack Scale Design Management
Intel Booth A12

OCP* Initiatives and Intel Implementations
Mohan Kumar session 3/20 16:20

New Workloads and the Evolving Network
Uri Cumming session 3/20 17:30

Democratizing AI
Carlos Morales session 3/20 17:30

Re-Imagining Data Center Storage and Memory
Greg Matson session 3/21 09:25

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