INTEL/CISCO Product Updates

Oct 2019

Jay Yankeloff
Intel
SP Sales Development - Americas
• Intel/Cisco Product Alignment
• New Announcements –
  • Cascade Lake (CPU)
  • Optane (Memory and SSD)
  • New NIC coming soon
• Wrap Up
# THE INTEL INGREDIENTS

<table>
<thead>
<tr>
<th>MOVE Faster</th>
<th>STORE More</th>
<th>PROCESS Everything</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTEL® ETHERNET 800 SERIES 100G</td>
<td>INTEL® OPTANE™ DC Persistent Memory</td>
<td>2nd Generation INTEL® Xeon® Scalable</td>
</tr>
<tr>
<td>INTEL® dc SSDs</td>
<td></td>
<td>INTEL® Xeon® D</td>
</tr>
</tbody>
</table>

NICS | MEMORY/SSD | CPU/SOC/FPGA |

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CISCO PLATFORMS.... with INTEL INSIDE

A broad product partnership – beyond UCS

INTEL PRODUCTS IN CISCO PLATFORMS

CPU – Xeon XP Skylake (31xx, 41xx, 51xx, 61xx, 81xx),
          Cascade Lake (32xx, 42xx, 52xx, 62xx, 82xx)
SSD – SATA 3D NAND (45xx, 46xx) ; PCIe NVME (45xx, 46xx)
Optane – Memory (DDR4 RDIMM) and SSD (4800x)
NICS – i350, X520, X540, X550, X710, XL710, XXV710,
          E810 (coming) ; (options of 1GBe-100GBe)
SOCs – - Denvertion, Broadwell-DE-NS, Skylake-D,
          Rangeley, Xeon-D, Atom
Chipsets – Lewisburg C6xx Series
FPGA – Altera Cyclone 4/5

Servers | Routing | Switching | Security | Collaboration | FOG/IoT

Where does Intel fit ---→ CPUs, SSDs, FPGAs, NICs, Chipsets, and SoCs
SECOND GENERATION (CASCADE LAKE)

INTEL® XEON® SCALABLE PROCESSORS

>50 Dozens 8 to 56 >4.5TB 1 to 8

STANDARD SKUS CUSTOM SKUS CORES PER SOCKET MEMORY PER SOCKET SOCKETS

Intel® Optane™ DC Persistent Memory
Intel® Deep Learning Boost
intel® Speed Select Technology
network-optimized SKUs
Cloud-optimized SKUs
Security Mitigations

BUILDING ON 20 YEARS OF DATA CENTER PROCESSOR INNOVATION
2-socket + Intel® Xeon® Roadmap

Platform code-named “Romley”

- Intel® Microarchitecture code-named Sandy Bridge
  - Intel® Xeon® E5
    -- code-named “Sandy Bridge”
    32nm
  - Intel® Xeon® E5 v3
    -- code-named “Ivy Bridge”
    22nm

Platform code-named “Grantley”

- Intel® Microarchitecture code-named Haswell
  - Intel® Xeon® E5
    -- code-named “Haswell”
    22nm
  - Intel® Xeon® E5 v4
    -- code-named “Broadwell”
    14nm

Platform code-named “Purley”

- Intel® Microarchitecture code-named Skylake
  - Intel® Xeon® Scalable
    -- code-named “Skylake”
    14nm

Not shown: Platform code-named “Brickland” includes Intel® Xeon® E7 v2, Intel® Xeon® E7 v3, and Intel® Xeon® E7 v4 processor models


PURLEY WITH CASCADE LAKE BRINGS NEW FEATURES, SKUs AND HIGHEST PERFORMANCE
Generational Platform Evolution

Grantley with Intel® Xeon® E5 v4 CPU
- 22C Per Socket
- Up to 2 Sockets per Server
- 40 Lanes PCIe* 3.0

Purley with Cascade Lake SP CPU
- 28C Per Socket +6
- Up to 8 Sockets per Server +6
- 48 Lanes PCIe* 3.0 +8
- Intel® Optane® DC Persistent Memory NEW
- Intel® Deep Learning Boost NEW
- Integrated Intel® QuickAssist™ Technology NEW
- Hardware Side Channel Mitigation NEW

Providing more of what you need:
- Scalability
- Performance
- Efficiency
- Throughput
- Resilience
- Programmability
- Security

30%-80% higher performance versus Intel® Xeon® E5 v4 based platforms

Minor validation impact potential for Intel® Xeon® Scalable-based implementations
Why Transition to Cascade Lake......

Process More ....for the same price !
More cores, more PCIe* lanes, more CPUs per server

Remove Storage Bottlenecks
New Intel® NVMe SSDs

Introduce New Classes of Storage
Intel® Optane® Memory Technology

Enhance A/I
Intel® Deep Learning Boost

Integrate More
Optional Built-in Intel® QuickAssist Technology (QAT) and Ethernet

Security Enhancement in HW (for Side Channel/Spectre Meltdown)
WHAT IS Intel® Optane™ Technology

- **Evolutionary material**
- **Write in place**
- **Bit addressable**
- **Ultra-low latency**

Most significant memory and storage advancement in the last 20 years

Set or reset data as needed, no need to erase media

Every memory cell can be individually addressed

...together delivering extremely fast media

Intel® Optane™ Technology is not NAND.....and better performance/endurance
Intel® Optane™ Technology.....comes in 2 options

Intel® Optane® SSD

Intel® Optane® Datacenter Persistent Memory

Intel® Xeon® Scalable Processor Family

DDR

DRAM

PCle*

Intel® Optane™ SSD

Intel® Xeon® Scalable Processor Family

DDR

Memory Pool

4GB

128 GB

128 GB

128 GB

128 GB

Seamless pool of system memory or Application Direct Persistent mode

Intel® 3D NAND SSDs for DC

NOTE – Optane SSDs are used in the Cisco Hyperflex solution (Cache and Storage options)
INTEL OPTANE AND QLC 3D NAND......Re-architecting the Memory / Storage Hierarchy

Memory

- DRAM HOT TIER
  - 10s GB, < 0.1 usec
- Persistent Memory
  - HOT TIER
  - 100s GB, < 1 usec
- Storage
  - WARM TIER
  - 1s TB, < 10 usec
- SSD
  - 10s TB, < 100 usec
- HDD / TAPE COLD TIER
  - 10s TB, < 10,000 usec

Improving memory capacity

Delivering efficient storage

Intel® 3D Nand SSD

Nano-seconds

Micro-seconds

Milli-seconds

Improving SSD performance

HIGHER COST SMALLER FASTER CAPACITY PERFORMANCE

LOWER COST LARGER SLOWER CAPACITY PERFORMANCE

Efficient storage

10s GB, < 0.1 usec

< 0.1 usec

< 1 usec

< 10 usec

< 100 usec

< 10,000 usec

10s TB

100s GB

1s TB

10s GB

10s TB
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Rapid Recovery for Apps with High Speed Memory/Storage

Direct Memory Access for Apps and Workloads

Data Persistence/Retainment/ Less Downtime

Transparent Volatile memory for more capacity (block) for more VMs

128, 256, 512GB (DDR4)

Add-on Capacity for In-Memory Databases (SAP HANA)

Storing data lowers latency

Memory/App Direct Modes

With Cascade Lake CPU only
Per socket memory savings in Memory mode with Optane

<table>
<thead>
<tr>
<th>GB</th>
<th>DRAM</th>
<th>Optane Persistent Memory</th>
<th>~ Memory Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>384</td>
<td>12x32GB</td>
<td>Recommend 512GB DC PMEM Config below</td>
<td>33% &gt; capacity</td>
</tr>
<tr>
<td>512</td>
<td>8x64GB</td>
<td>4x128GB Optane + 6x16GB DRAM, in a 2-2-1, 5.3:1 Ratio</td>
<td>26%</td>
</tr>
<tr>
<td>768</td>
<td>12x64GB</td>
<td>6x128GB Optane + 6x16GB DRAM, in a 2-2-2, 8:1 Ratio</td>
<td>32%</td>
</tr>
<tr>
<td>1024</td>
<td>8x128GB</td>
<td>6x128GB Optane + 6x32GB DRAM, in a 2-2-2, 4:1 Ratio</td>
<td>20%</td>
</tr>
<tr>
<td>1536</td>
<td>12x128GB</td>
<td>4x256GB Optane + 6x32GB DRAM, in a 2-2-1, 5.3:1 Ratio</td>
<td>44%</td>
</tr>
<tr>
<td>2048</td>
<td>8x256GB</td>
<td>6x256GB Optane + 6x32GB DRAM, in a 2-2-2, 4:1 Ratio</td>
<td>47%</td>
</tr>
<tr>
<td>3072</td>
<td>12x256GB</td>
<td>6x256GB Optane + 6x64GB DRAM, in a 2-2-2, 4:1 Ratio</td>
<td>40%</td>
</tr>
</tbody>
</table>

Significant memory savings in Memory mode
In App Direct, same memory savings, additional capacity & persistence
Optane Memory......2 Operating Modes

**Memory Mode**

- **Platform/OS/App Access to High Speed, High Capacity Memory**

  **High Capacity**
  - Targeting >1.2X More VMs

  **Affordable Capacity**
  - 128GB, 256GB and 512GB DIMMs
  - Up to 7.68TB per 2S system

  **Ease of Adoption**
  - No code changes required

**Intel Persistent Memory**

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**App Direct Mode**

- **App/Workload Direct Access to High Speed, High Capacity Storage**

  **Persistent Data**
  - Up to 15TB per 4S system

  **High Availability/Less Downtime**

  **Significantly Faster Storage**

**Built-In Flexibility to Use Both Modes Simultaneously**
Why OPTANE MEMORY....Solving customer problems

Identify and Address your customer Pain points

- DRAM is too expensive
- Scale Up is expensive
- Not enough capacity
- Operational Inefficiencies
- Poor workload performance
- Storage is too slow

Use Intel® Optane™ DC Persistent memory to...

$ Save more do more

- Displace DRAM
- Improve TCO
- Increase memory size
- Consolidate Workloads

- Workloads that need large &/or persistent memory
- Large memory or SW license fees per core
- High VMs, with low CPU utilization

- Break the IO bottlenecks
- Add high speed storage

= Go faster

- High Disk I/O Traffic
- Tiered storage subsystem

Systems >512GB

Save more do more

Go faster

Add high speed storage

Tiered storage subsystem
Storage Enhancements for 2\textsuperscript{nd} Gen Intel® Xeon® SP cascade Lake CPU Family

**New SSDs**

- M.2 (SATA and PCIe) support – recommend for all server boot drives
- U.2 2.5 inch PCIe SSD for scalable high performance 3DNAND and Intel® Optane™ storage options

**Processor-based PCIe storage enhancements**

Intel® Volume Management Device (Intel® VMD) provides support for PCIe Solid State Drives (SSD):
- Hot-plug, enclosure management and error containment functions

**RAID and Storage Performance Enhancements**

- PCIe based RAID using Intel® Virtual RAID on CPU (Intel® VROC) technology
- Updates to Intel® Cache Acceleration Software (Intel® CAS)

NOTE – Optane SSDs are used in the Cisco Hyperflex 4.0 solution (Cache and Storage options)
## Intel® enterprise ssd Roadmap

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1’19</th>
<th>Q2’19</th>
<th>Q3’19</th>
<th>Q4’19</th>
<th>Q1’20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTEL® Optane™</strong></td>
<td><img src="image" alt="INTEL® Optane™ SSD DC P4800X Series" /></td>
<td><img src="image" alt="Intel® SSD DC P4510/P4610 Series" /></td>
<td><img src="image" alt="Intel® SSD DC P4511/P4611 Series, M.2 110mm" /></td>
<td><img src="image" alt="Intel® SSD DC P4501/P4601 Series, M.2 110mm" /></td>
<td><img src="image" alt="Intel® SSD DC P4500/P4600 Series, U.2 15mm, 1TB – 16TB" /></td>
</tr>
<tr>
<td><strong>PCIe</strong> / <strong>NVM</strong> e*</td>
<td><img src="image" alt="Intel® SSD DC P4500/P4600 Series" /></td>
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**Bring Data closer to the Processor for Fast Caching/Fast Storage**
Where do Intel Optane SSDs fit Today?

- **Optane SSD in Storage** (High Endurance/QoS)
  - Cisco HyperFlex* (Cache/Storage)
  - VMWare VSAN*
  - Microsoft S2D* / Azure Stack*
  - CEPH*

- **Database / AI** (Low Latency/High-Speed Caching)
  - MS SQL* Memory w/ IMDT
  - FSI (STAC): McObject*, AMPs*, Kx*
  - HTAP: Esgyn*

- **HPC** (Random Read/Write Intensive)
  - Memory pool expansion / fast cache

*Other names and brands may be claimed as the property of others.
Intel® optane™ USE

CASES

- storage
  - Write Buffers
  - Vaulting
  - PMoF
  - Caching Layers
  - Meta-Data
  - Hi-Perf Direct Attached Storage

- VMs
  - VM and Container Density
  - Extended VM Memory Capacity
  - Application Density
  - Large Memory Java
  - Compute-side Storage and Cache

- database
  - DB Memory Buffer Pool
  - In-Memory DB
  - Mixed Logging and memory
  - User-Density
  - Direct-attached DB Storage
  - Dedicated Logging

- AI / analytics
  - Real Time Analytics
  - Machine Learning Analytics
  - In-Memory Analytics
  - Off-Heap Memory

- hpc
  - Larger Memory
  - Scratch & IO Nodes

- COMMS
  - NFVi
  - Cognitive Networking
  - Content Delivery Network (CDN) – Live Linear Streaming
  - Content Delivery Network (CDN) – Cloud DVR

Where use Intel® Optane™ DC technology:
- DC Persistent memory (DDR4 RDIMM)
- DC P4800X SSD

1 Workloads under investigation, subject to change

NFVi – Network Functions Virtualization
PMoF - Persistent Memory over Fabric
### COMING SOON - Intel® Ethernet Controller E810

*Speed and agility to deliver network flexibility using a programmable pipeline*

| Benefits | Speeds of up to 100 Gigabit to a general purpose Ethernet Controller with a Programmable Pipeline for a broad range of deployments |
| Interfaces for PCI Express v4.0 x16 Server and OCP adapters, backplanes and LAN on Motherboard (LOM) |

| Features | • Software configurable speeds of 2x100/50/25/10GbE or up to 4x25/10GbE |
|         | • Broad offering of physical interfaces |
|         | • RDMA ideal for routable and scalable storage solutions |
|         | • Network Virtualization Overlay accelerators and offloads |
|         | • Improved Virtualization support with VMQoS, VMDq and Intel® Ethernet Flow Director for overlay traffic |
Why refresh your Cisco UCS servers?

Jonathan Carmel
Data Center PSS
October 3rd, 2019
3 Challenges
IT organizations are being asked to solve

- Faster delivery of Applications
- Deploy and optimize in new Multicloud and Edge Environments
- Bridge across the old and new
Why should you care about refresh?

- **Reduce Total Cost of Ownership**
  Tangible financial benefits derived from higher performance, lower support costs, significant server consolidation, and reduced system downtime

- **Introduce New Capability**
  Unlock new features made available through enhancements in hardware and software that can fundamentally change operations

- **Consistency and Compliance**
  Stay secure, reliable, and compliant, ensuring ongoing access to Cisco support, bug fixes and security patches.
Refresh to Lower TCO

UCS and HyperFlex M5: Do more with less

- Better Performance
- Power, Cooling, Cabling
- More Dense
- Software Licensees
- More Reliable
- Warranty
- Easy to Manage
- Administrative Overhead

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Refresh to Lower TCO – What Customers Have Seen?

**Cisco HyperFlex**

- 50% Lower Cost of Operations
- 51% Savings vs. Public Cloud Over 3 years
- 452% 5-year ROI
- 8 Month Payback

**Cisco UCS**

- 45% Lower Cost of Operations
- 79% Reduction in energy costs
- 227% 5-year ROI
- 92% Reduced time to launch new lines of business

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1: 2019, IDC Business Value of Improved Performance and Agility with Cisco HyperFlex
Refresh for Simplification and Consolidation

M5 servers offer consolidation

10:7 Over M4 Servers

10:1 Over M3 Servers

And fewer servers means fewer switches and software licenses!

Fewer devices to track, support, and maintain

Reduces administrative overhead

Shortens maintenance windows

Reduces OpEx

Reduces security footprint

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Refresh for Performance

Processor architecture improvements (cores, frequency, instruction set) 579%

Newer memory architectures improves app performance 2933 MHz

M5 servers support the latest generation of adapters

32Gb Fiber Channel 10/25/40/100Gb Ethernet 100Gb InfiniBand

*Based on Intel® Xeon® Processor Transition Guide as of 2019/06/10
*Based on data provided by AMD
Refresh for Performance: ESG Validated

### Cisco HyperFlex

<table>
<thead>
<tr>
<th>Workload</th>
<th>Higher IOPS</th>
<th>Lower Total Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Database</td>
<td>77%</td>
<td>54%</td>
</tr>
<tr>
<td>SQL Server</td>
<td>143%</td>
<td>109%</td>
</tr>
<tr>
<td>Complex Mixed Workload</td>
<td>49%</td>
<td>96%</td>
</tr>
</tbody>
</table>

- Higher IOPS: 77% for Oracle Database, 143% for SQL Server, 49% for Complex Mixed Workload
- Lower Total Latency: 54% for Oracle Database, 109% for SQL Server, 96% for Complex Mixed Workload

### Cisco UCS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Power Consumption</td>
<td>60%</td>
</tr>
<tr>
<td>Reduction in Cabling</td>
<td>80%</td>
</tr>
<tr>
<td>Reduction in Provisioning</td>
<td>80%</td>
</tr>
<tr>
<td>Efficiency Increase</td>
<td>75%</td>
</tr>
</tbody>
</table>

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Introduce New Capability

Modernize your architecture

Simple to provision, secure and tune
Connect, scale, and configure wherever and whenever.
Reliability
Failure rates jump dramatically after 3 years
Can you afford to be down?

Avoid the outage costs with UCS or HyperFlex M5
Save money
Avoid negative perception

$140K to $540K Per Hour
$5,600 Per Minute

Refresh for Consistency and Compliance
Refresh for your Newest & Future Workloads

Enterprise App & Database Migrations

Big Data & Analytics

AI/ML
Nexus 9000
It doesn’t need to be complex.
Scale without sacrificing performance and security.
Nexus 9000 Switches

- Scale and Flexibility
- Programmability and Automation
- Intent Based
Delivering fabric wide cloud scale and services
Nexus 9000 powered by Cisco Cloud Scale ASIC

Nexus 9000 with 16nm Cisco Cloud Scale ASIC

Superior Performance
Visibility & Security Pervasive
Reduced Power
Optimized Price
Investment Protection

ACI/NX-OS: From Hypervisor to Core
A Generation Ahead

Cisco distances themselves from the competition in the latest DC Networking Magic Quadrant - Learn more
Cisco Data Center Switching Competitive advantage

Best of breed switching—Cloud-scale ASIC

Industry leading programmability – Open NX-OS capabilities.
Industry leading DC network automation – ACI with policy based automation

Industry leading Analytics – Built in Tetration sensors for data plane analytics and streaming telemetry for control plane analytics

The confidence that the infrastructure is doing exactly what you intended it to do

Future ready: 400G, innovations, ASIC etc
Why would you want to refresh?

- **Reduced TCO**: Tangible financial benefits derived from higher performance, lower power and cooling costs.
- **New Capability**: Unlock new features made available through enhancements in hardware and software that can fundamentally change operations.
- **Compliance**: Stay secure and compliant, ensuring ongoing access to Cisco support, bug fixes and security patches.
See how Nexus with Cloudscale helped a large photo sharing website to scale and reduce cost

- Millions of customers
- Free, unlimited photo storage
- Photo-based products and services

Mobile and Web apps
200+ Petabyte of Data
What does it mean to their network?

Requirements

- Provides compelling user experience with traffic growth
- Automates switch provisioning to save time
- Simplifies management
Upgrade network with Cisco Nexus 9000 Switch across multiple data centers
During the holidays—our busiest season—we were able to sustain a 40% increase in traffic with no performance degradation whatsoever.

Director of Cloud Engineering

Provisioning tasks that used to take 3 to 4 person hours are now automated, saving approximately $400 each time.

Director of Network Operations
Your Data center is unique
But one thing all of them have in common is
Automation can make it easier and faster
Choice for programmability and automation

- Start with NXOS out of the box automation
- POAP and XMPP out of the box are great options to bring up individual switches in an automated fashion
Choice for programmability and automation

Then use DCNM for VXLAN overlay provisioning

OR

Take advantage of open NXOS-APIs:

• Leverage DevOPs support including Puppet, Chef, Ansible etc ...
• Bash Shell access and Linux container support
• Utilize Python scripting
• Leverage Open stack integration with Neutron
Choice for programmability and automation

SDN with ACI for automation of overlay, and underlay networking, policy models, multi-hypervisor support, service chaining, L4-7 integration, WAN interconnect and deployment, and more

ACI Anywhere – ready for the multi-cloud workloads
Automated policy, greater visibility into network fabric, robust application development architecture

Results

Flipped this model

80% maintenance

20% innovation

80% innovation

20% maintenance
Invest for the future

Traditional data center

Virtualization

Policy Driven Automation

Cloud ready data center

Multi Cloud

Hybrid Cloud

Flexible consumption models (on premise, cloud, licensing)

CAPEX: optics, backward compatibility etc.

2018

ITaaS

PaaS

SaaS

XaaS

Traditional data center

Flexible consumption models (on premise, cloud, licensing)
Key takeaways

- **Speed**
  - Best of Breed Switching - Cloud
  - Scale ASIC

- **Simplicity**
  - Industry leading programmability - Open NX-OS capabilities. Industry leading DC network automation – ACI with policy based automation

- **Visibility**
  - Industry leading Analytics – Built in Tetration sensors for data plane analytics and streaming telemetry for control plane analytics

- **Assurance and compliance**
  - the confidence that the infrastructure is doing exactly what you intended it to do

- **Investment protection**
  - Future ready: 400G, innovations, ASIC etc