Intel/Cisco Product Alignment
New Announcements –
  - Cascade Lake (CPU)
  - Optane (Memory and SSD)
  - New NIC coming soon
Wrap Up
THE INTEL INGREDIENTS......

MOVE Faster
INTEL® ETHERNET 800 SERIES 100G

STORE More
INTEL® OPTANE™ DC Persistent Memory
INTEL® dc SSDs

PROCESS Everything
2nd Generation INTEL® Xeon® Scalable
INTEL® Xeon® D
INTEL® AGILEX™ FPGA

| 3D XPoint™ |
| MEMORY/SSD |

NICS
CPU/SOC/FPGA
CISCO PLATFORMS.... with INTEL INSIDE

A broad product partnership – beyond UCS

Also:
Nexus 3K, 5K, 6K, 7K

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 – - Denverton, Broadwell-DE-NS, Skylake-D, Rangeley, Xeon-D, Atom
Chipsets – Lewisburg C6xx Series
FPGA – Altera Cyclone 4/5

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

Where does Intel fit ---→ CPUs, SSDs, FPGAs, NICs, Chipsets, and SoCs
Intel® Xeon® Scalable Processors

Second Generation (Cascade Lake)

- >50 Standard SKUs
- Dozens Custom SKUs
- 8 to 56 Cores per socket
- >4.5TB Memory per socket
- 1 to 8 Socket(s)
- 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
    - New Micro-architecture
  - Intel® Xeon® E5 v2
    - code-named “Ivy Bridge”
    - 22nm
  - Intel® Xeon® E5 v3
    - code-named “Haswell”
    - 22nm
    - New Micro-architecture
  - Intel® Xeon® E5 v4
    - code-named “Broadwell”
    - 14nm

Platform code-named “Grantley”
- Intel® Microarchitecture code-named Haswell
  - Intel® Xeon® E5 v3
    - code-named “Haswell”
    - 22nm
    - New Micro-architecture
  - Intel® Xeon® E5 v4
    - code-named “Broadwell”
    - 14nm

Platform code-named “Purley”
- Intel® Microarchitecture code-named Skylake
  - Intel® Xeon® Scalable
    - code-named “Skylake”
    - 14nm
    - New Micro-architecture
  - Processor code-named “Cascade Lake”
    - 14nm

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


Today’s Focus

PURLEY WITH CASCADE LAKE BRINGS NEW FEATURES, SKU s 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
- Intel® Deep Learning Boost
- Integrated Intel® QuickAssist™ Technology
- Hardware Side Channel Mitigation

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

- revolutionary 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**

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

Persistent Memory

Storage

SSD

Delivering efficient storage

SSD performance

Improving memory capacity

Higher cost

Lower cost

Smaller capacity

Lower latency

HIGHER COST SMALLER CAPACITY PERFORMANCE

SSD

WARM TIER

Intel® 3D Nand SSD

HDD / TAPE

COLD TIER

DRAM

HOT TIER

10s GB, < 0.1 usec

100s GB, < 1 usec

1s TB, < 10 usec

10s TB, < 100 usec

10s TB, < 10,000 usec

Nano-seconds

Micro-seconds

Milli-seconds

Improved memory capacity

Improved SSD performance

Higher cost, smaller capacity, lower performance

Lower cost, larger capacity, higher performance

10s GB, < 0.1 usec

100s GB, < 1 usec

1s TB, < 10 usec

10s TB, < 100 usec

10s TB, < 10,000 usec

Improved memory capacity

Improved SSD performance

10s GB, < 0.1 usec

100s GB, < 1 usec

1s TB, < 10 usec

10s TB, < 100 usec

10s TB, < 10,000 usec

Nano-seconds

Micro-seconds

Milli-seconds

Delivering efficient storage

Improved SSD performance
Intel Confidential | Sales and Marketing Group

Optane DC Persistent Memory

- Transparent Volatile memory for more capacity (block) for more VMs
- Rapid Recovery for Apps with High Speed Memory/Storage
- Direct Memory Access for Apps and Workloads
- Data Persistence/Retainment/Less Downtime

- 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, 8:1 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>
<tr>
<td></td>
<td></td>
<td>4x512GB Optane + 6x64GB DRAM, in a 2-2-1, 5.3:1 Ratio</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6x512GB Optane + 6x64GB DRAM, in a 2-2-2, 8:1 Ratio</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6x512GB Optane + 6x128GB DRAM, in a 2-2-2, 4:1 Ratio</td>
<td>N/A</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

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
- Displace DRAM
  Systems >512GB

- Improve TCO
  Workloads that need large &/or persistent memory

- Increase memory size
  Large memory or SW license fees per core

- Consolidate Workloads
  High VMs, with low CPU utilization

- Break the IO bottlenecks
  High Disk I/O Traffic

- Go faster
  Add high speed storage
  Tiered storage subsystem

Save more do more Go faster

Workloads that need large &/or persistent memory

Intel Confidential | Sales and Marketing Group
Storage Enhancements for 2nd 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

**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)

**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

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

<table>
<thead>
<tr>
<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™ SSD DC P4800X Series</strong>&lt;br&gt;U.2 15mm 375GB, 750GB, AIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intel® SSD DC P4500/P4600 Series&lt;br&gt;U.2 15mm, 1TB – 16TB</td>
<td>Intel® SSD DC P4510/P4610 Series&lt;br&gt;U.2 15mm, 1TB – 16TB</td>
<td>Intel® SSD DC P4511/P4611 Series, M.2 110mm, 1TB / 2TB</td>
<td>Intel® SSD DC S4510/S4610&lt;br&gt;2.5” 240GB - 7.68TB,&lt;br&gt;M.2 2280 240GB – 960GB</td>
<td></td>
</tr>
</tbody>
</table>

### 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

Best fit applications......both products are viable options.

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

Cloud & 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

NFVi - Network Functions Virtualization
PMoF - Persistent Memory over Fabric

1 Workloads under investigation, subject to change
**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 | **Intel® Ethernet Controller E810**  
• 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 |

Samples: LATE 201__  
Production: 1H 201__
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
- More Dense
- More Reliable
- Easy to Manage
- Power, Cooling, Cabling
- Software Licensees
- Warranty
- Administrative Overhead

© 2019 Cisco and/or its affiliates. All rights reserved. Cisco Partner Confidential
### Refresh to Lower TCO – What Customers Have Seen?

<table>
<thead>
<tr>
<th><strong>Cisco HyperFlex</strong></th>
<th><strong>Cisco UCS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>50% Lower Cost of Operations(^1)</td>
<td>45% Lower Cost of Operations</td>
</tr>
<tr>
<td>51% Savings vs. Public Cloud Over 3 years(^1)</td>
<td>79% Reduction in energy costs</td>
</tr>
<tr>
<td>452% 5-year ROI</td>
<td>227% 5-year ROI</td>
</tr>
<tr>
<td>8 Month Payback</td>
<td>92% Reduced time to launch new lines of business</td>
</tr>
</tbody>
</table>

\(^1\): 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
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 Type</th>
<th>Performance Metric</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex Mixed</td>
<td>Higher IOPS</td>
<td>143%</td>
</tr>
<tr>
<td></td>
<td>Higher IOPS</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Lower Total Latency</td>
<td>109%</td>
</tr>
<tr>
<td></td>
<td>Higher VM Level Performance Consistency</td>
<td>96%</td>
</tr>
</tbody>
</table>

Cisco UCS

<table>
<thead>
<tr>
<th>Performance Metric</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>
Introduce New Capability

Modernize your architecture

Simple to provision, secure and tune
Connect, scale, and configure wherever and whenever.
Refresh for Consistency and Compliance

Reliability
Failure rates jump dramatically after 3 years

Can you afford to be down?

$140K to $540K Per Hour
Avoid the outage costs with UCS or HyperFlex M5
Save money

$5,600 Per Minute
Avoid negative perception

Avoid the outage costs with UCS or HyperFlex M5
Save money
Avoid negative perception
Refresh for your Newest & Future Workloads

- SAP HANA
- Microsoft SQL Server
- Oracle Database
- SAS
- IBM
- Cloudera
- NVIDIA
- Splunk

Enterprise App & Database Migrations

Big Data & Analytics

AI/ML
Nexus 9000 Switches

Ed Parkinson & Don Zaino
Data Center Networking PSS & TSA
October 2019
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

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

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.

© 2019 Cisco and/or its affiliates. All rights reserved. Cisco Partner Confidential
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 percent increase in traffic with no performance degradation whatsoever.

Nexus Powered by Cloudscale ASIC

Director of Cloud Engineering

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

NX-OS/Open API

Director of Network Operations
Simplicity
Choices for programmability and automation
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
Invest for the future
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**
  - Future ready: 400G, innovations, ASIC etc
  - the confidence that the infrastructure is doing exactly what you intended it to do

- **Investment protection**
  - Industry leading programmatic capabilities. Industry leading DC network automation - ACI with policy based automation

© 2019 Cisco and/or its affiliates. All rights reserved. Cisco Partner Confidential