Actualités PowerEdge

Serveurs AMD EPYC Gen2 / Processeurs Cascade-Lake / SSD Optane

Comité X/STRA, le 17 Septembre 2019

Christophe Couty – Responsable commercial
Jean-Marie Petry - Solutions Consultant
A collective force of innovative capabilities

**Dell Technologies**

**Dell**
- Innovative devices, services and solutions designed for the way people work (and play)

**DELL EMC**
- Transforming the data center with industry-leading servers, storage and converged infrastructure

**Pivotal**
- Leading intersection of Big data, PaaS and agile development leveraging data on one cloud-independent platform

**RSA**
- Premier provider of security, risk and compliance solutions solving your most complex challenges

**SecureWorks**
- Elite and trusted intelligence that strengthens security and reduces risk in a dynamic landscape

**virtustream**
- Leading enterprise-class cloud software and solution provider

**VMware**
- Most trusted virtualization solution for desktop, data center and applications
AMD EPYC Gen2
New Dell EMC PowerEdge Servers / AMD
Lancement Sept-Oct 2019 / 2nd Generation AMD EPYC™

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Rack Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>R6515</td>
<td>Single-socket 1U rack server brings peak performance and excellent TCO</td>
<td>1S RACKS</td>
</tr>
<tr>
<td>R7515</td>
<td>Highly scalable 2U rack server delivers performance and outstanding TCO</td>
<td></td>
</tr>
<tr>
<td>R6525</td>
<td>Highly configurable 1U rack server delivers outstanding balanced performance for dense compute</td>
<td>2S RACKS</td>
</tr>
<tr>
<td>R7525</td>
<td>Highly adaptable 2U rack server brings powerful performance and flexible configuration</td>
<td></td>
</tr>
<tr>
<td>C6525</td>
<td>Compute-dense server sled accelerates data center performance to tackle diverse HPC applications</td>
<td>C-SERIES</td>
</tr>
</tbody>
</table>

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EMERGING WORKLOADS

MULTI-CLOUD
**2nd Generation AMD EPYC™**

**Naples:** I/O and memory spread across each Zen core creates lots of internal traffic

**Rome:** Single I/O/Mem die removes internal bottleneck for lower latency

- Up to 64 cores / 128 threads
- 2 x L3 cache per core (16MB per 4 cores)
- 2 x PCIe performance with Gen4 at 16GT/s
- 20% memory speed increase: 2666MHz to 3200MHz
- Double the speed per socket with xGMI-2 (~16GT/s)
- Secure Encrypted Virtualization SEV provides 509 unique hypervisor keys

**MULTI-CHIP DESIGN BENEFITS**

Separate I/O die from Zen2 chiplets allows:
- Flexible core configurations
- Higher chip yields

Dedicated I/O+mem die defaults to 1 NUMA domain
- Flexibility to also configure 2 or 4 NUMA domains
- 30ns improvement in latency for non NUMA aware apps (analytics, HPC – NamD, Linpack)

*Proj. based on AMD internal 20Jan2019. Subject to change.*
Evolution à venir > 14G
PowerEdge Dernières Innovations
Performance, Sécurité et Manageabilité

**Brand new Board Design**
Improved signal integrity for PCIe Gen4 and enables balanced airflow for better thermal design.

**Higher Performance**
2nd Gen AMD EPYC delivers higher performance with up to 64 Cores / 128 Threads, 2x L3 cache/core.

**Greater Bandwidth**
PCle Gen4 enables 2x PCIe performance at 16GT/s. Additionally, 20% higher memory speed increase to 3200MHz.

**iDRAC9**
4x faster user experience vs. previous generation including support for PCIe Gen4.

**Automated Cooling**
Multi-vector cooling that is automatically guided on to the hottest parts of the server.

**Intelligent Power Management**
Streamline power management with the latest OpenManage Enterprise plug-in architecture.

**Workload – Optimized Configurations**
Risers optimized for each specific workload including GPUs for ML/DL, maximizing slots for VDI or max PCIe B/W.

**Integrated Security**
- Protect each VM by isolating the guests and the hypervisor with AMD Secure Encrypted Virtualization (SEV).
- Protect data by using a single key to encrypt the system memory with AMD Secure Memory Encryption (SME).

**Drift Detection & System Lockdown**
Detect and remediate unauthorized or malicious change with drift detection and system lockdown with OpenManage Enterprise and iDRAC9.

**Protect data at rest**
Reduce the risks of securing data across their data center with OpenManage Secure Enterprise Key Manager.

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1. OpenManage Secure Enterprise Key Manager will be available on R6515 and R7515 in December 2019.
Balanced airflow provides better thermals for workloads requiring rich configurations

- CPU TDPs up to **240W**
- Multiple GPUs up to **300W**
- High mem capacities – up to **32 LRDIMMs**

Improved signal integrity for PCIe Gen4 at 2X the speed of Gen3 – 16GT/s
Dell EMC Defines Networking Industry Standards

*PowerEdge networking moves to new Open Compute Project (OCP) 3.0*

**Dell rNDC**
- Proprietary
- x8 Gen3
- Non-standard riser connector
- Shared LOM with iDRAC

**OCP 3.0**
- Industry Standard – wider variety of cards available
- x16 Gen4 – twice the speed, twice the bandwidth
- Standard Edge connector
- Shared LOM with iDRAC (standard PCIe cards do not support this function)

**Upcoming Changes**
- New speeds: 4x25G, 2x50G, 2x100G (PAM4)
- 10GbE adapters no longer come with 2x 1GbE ports (moved to LOM)
Problématiques des DSI: latences réseau

As VM count grows UPI bottle neck continues to get worse. 100s of containers are unmanageable.

Fix the bottle neck and affinity problem by adding 2nd NIC & HBA on 2nd CPU but increases 2x NIC cost, 2x power, 2x TOR port cost.
Solution: SNAP I/O avec PowerEdge

- Bandwidth steering from 1 port to both CPUs
- Multi Host NIC trains as 2 x8’s - Standard Mellanox NIC with new FW and Others heading this way
- No affinity mapping required
- NO NUMA link hops – greater bandwidth and lower latency leads to deterministic performance
- Reduced port IO to TOR switch – less cables
- **PowerEdge is helping you feed your cores!**

Source: Robert W Hormuth, Vice President/Fellow, CTO, Server and Infrastructure Solutions, Dell EMC, April 2019
Cascade Lake product numbering convention for Intel® Xeon® Processor scalable family

- **SKU Level**
  - 8 = Platinum
  - 6, 5 = Gold
  - 4 = Silver
  - 3 = Bronze

- **Processor Generation**
  - 1 = 1st Gen (Skylake)
  - 2 = 2nd Gen (Cascade Lake)

- **Processor SKU**
  - (ex. 20, 34…)

- **Integrations and Optimizations** (when applicable)
  - T = High Tcase
  - C = Speed Select
  - **Memory Capacity per socket**
    - No Suffix = 1TB/Socket memory tier
    - M = 2TB/Socket memory tier
    - L = 4.5TB/Socket memory tier

Note: All information provided here is subject to change without notice. Intel may make changes to specifications and product descriptions at any time, without notice. Contact your Intel representative to obtain the latest Intel product specifications and roadmaps.
# Intel® Xeon® processor scalable family – Cascade Lake processor levels and features

<table>
<thead>
<tr>
<th>82xx (Platinum)</th>
<th>62xx (Gold)</th>
<th>52xx (Gold)</th>
<th>42xx (Silver) (^1)</th>
<th>32xx (Bronze)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2S-2UPI, 2S-3UPI, 4S-2UPI, 4S-3UPI capability</td>
<td>2S-2UPI, 2S-3UPI, 4S-2UPI, and 4S-3UPI capability</td>
<td>2S-2UPI &amp; 4S-2UPI capability</td>
<td>2S-2UPI</td>
<td>6-ch DDR4 @ 2133</td>
</tr>
<tr>
<td><strong>6-ch DDR4 @ 2933 1DPC</strong></td>
<td><strong>6-ch DDR4 @ 2933 1DPCDIMM</strong></td>
<td><strong>6-ch DDR4 @ 2666</strong></td>
<td><strong>6-ch DDR4 @ 2400</strong></td>
<td><strong>6-ch DDR4 @ 2133</strong></td>
</tr>
<tr>
<td><strong>Intel® Optane™ DC Persistent Memory DIMM</strong></td>
<td><strong>Intel® Optane™ DC Persistent Memory DDR4 DIMM</strong></td>
<td><strong>Intel® Optane™ DC Persistent Memory DIMM</strong></td>
<td><strong>16Gb based DDR4 DIMM</strong></td>
<td><strong>16Gb based DDR4 DIMM</strong></td>
</tr>
<tr>
<td><strong>16Gb based DDR4 DIMM</strong></td>
<td><strong>16Gb based DDR4 DIMM</strong></td>
<td><strong>16Gb based DDR4 DIMM</strong></td>
<td><strong>Intel® Turbo Boost</strong></td>
<td><strong>Intel® Turbo Boost</strong></td>
</tr>
<tr>
<td>3 UPI links @ 10.4GT/s</td>
<td>3 UPI links @ 10.4GT/s</td>
<td>2 UPI links @ 10.4GT/s</td>
<td>Intel® Turbo Boost</td>
<td>Intel® Turbo Boost</td>
</tr>
<tr>
<td>Intel® Turbo Boost</td>
<td>Intel® Turbo Boost</td>
<td>Intel® Hyper-Threading</td>
<td>Intel® Hyper-Threading</td>
<td>Intel® AVX-512 (1 512-bit FMA)</td>
</tr>
<tr>
<td>Intel® AVX-512 (2 512-bit FMAs)</td>
<td>Intel® AVX-512 (2 512-bit FMAs)</td>
<td>Intel® AVX-512 (1 512-bit FMA)</td>
<td>Intel® AVX-512 (1 512-bit FMA)</td>
<td>Intel® Deep Learning Boost (VNNI)</td>
</tr>
<tr>
<td>48 lanes PCIe Gen3</td>
<td>48 lanes PCIe Gen3</td>
<td>48 lanes PCIe Gen3</td>
<td>48 lanes PCIe Gen3</td>
<td>48 lanes PCIe Gen3</td>
</tr>
<tr>
<td>Node Controller Support</td>
<td>Node Controller Support</td>
<td>Advanced RAS</td>
<td>Standard RAS</td>
<td>Standard RAS</td>
</tr>
</tbody>
</table>

*Note: One Silver 42xx Processor planned to support DDR-T/Intel® Optane™ DC Persistent Memory*

Changes in feature set from shelf to shelf highlighted in **green**

Changes in feature set from Skylake are **underlined and italicized**

Supported only on R940, R940xa and R840

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Cascade Lake - OS Minimum Requirements

- RedHat Enterprise Linux 7.6
- RedHat Enterprise Linux 8.0 (June block)
- SUSE Linux Enterprise Server (SLES) 15 (SLES12 SP4 will work but unsupported)
- Microsoft Windows Server 2016 (with Hyper-V)
- Microsoft Windows Server 2019 (with Hyper-V)
- Ubuntu 18.04.2 (16.04.5 w. latest HWE kernel will work but unsupported)
- VMware vSphere ESXi 6.5 U2
- VMWare vSphere ESXi 6.7 U1
- VMWare vSphere ESXi 6.7 U2 (June block)
- Citrix Xen Server 7.1 CU1
- Oracle Linux 6.10 (UEK4u7)/7.6 (UEK5u2); Oracle VM 3.4.6 (UEK4u7)

Note: Not supported on Cascade Lake
- Microsoft Windows Server 2012 R2
- RHEL6.x (virtualized or containerized only)
Optane DC
Persistent Memory Module
Intel® Optane™ DC Persistent Memory Features and Roadmap

Key Features:
- Increased capacity
- Affordability
- Performance
- Backwards compatibility
- Memory persistence

Q2
- R740/740XD
- R940

Q3
- MX840c
- MX740c
- R940xa
- R640
- R840
Memory Mode vs App Direct Mode

**Memory Mode**
- APPLICATION
- VOLATILE MEMORY POOL
- DRAM AS CACHE
- OPTANE PERSISTENT MEMORY

Getting to a large memory footprint, affordably and easily
- Any application as long as a supported OS is being used
- Only Intel® Optane™ DC persistent memory (DCPMM) appears as the available system memory
  - DRAM acts as a cache
- Not persistent

**App Direct Mode**
- APPLICATION
- OPTANE PERSISTENT MEMORY
- DRAM

Persistence and performance, for applications that natively utilize DCPMM
- Applications must support App Direct Mode
  - Opportunity for layers of storage protocols to be removed so data can be accessed directly from memory using load/store
- All memory is available as system memory
- Persistent
  - Storage class memory
  - Improved software startup times
Memory Mode TCO Example

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Approximate Relative Pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RDIMM &amp; LRDIMM</td>
</tr>
<tr>
<td>32GB</td>
<td>1X</td>
</tr>
<tr>
<td>64GB</td>
<td>2X</td>
</tr>
<tr>
<td>128GB</td>
<td>8X</td>
</tr>
<tr>
<td>256GB</td>
<td>-</td>
</tr>
<tr>
<td>512GB</td>
<td>-</td>
</tr>
</tbody>
</table>

Using 32GB as the baseline for relative pricing. The above rough pricing may change over time.
## Intel® Optane™ DC Persistent Memory Requirements

- Requires Gold or Platinum Cascade Lake CPUs
  - PowerEdge does not support the single Silver SKU that Intel enabled for Intel Optane DC persistent memory
- Runs at 2666 MT/s (which is the max speed when there are 2 DIMMs on a channel)
- Note that large memory configs require an M or L CPU SKU
  - No CPU SKU requirements: less than 1TB
  - M SKU required: between 1TB and 2TB
  - L SKU required: greater than 2TB
- For R940, the 2400W PSU is required

<table>
<thead>
<tr>
<th>CPU SKU</th>
<th>1 DIMM Per Channel</th>
<th>2 DIMMs Per Channel</th>
<th>Intel Optane DC Persistent Memory Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>(82xx) Platinum</td>
<td>2933 MT/s</td>
<td>2666 MT/s</td>
<td>Yes</td>
</tr>
<tr>
<td>(62xx) Gold</td>
<td>2933 MT/s</td>
<td>2666 MT/s</td>
<td>Yes</td>
</tr>
<tr>
<td>(52xx) Gold</td>
<td>2666 MT/s (one SKU 2933)</td>
<td>2666 MT/s</td>
<td>Yes</td>
</tr>
<tr>
<td>(42xx) Silver</td>
<td>2400 MT/s</td>
<td>2400 MT/s</td>
<td>No</td>
</tr>
<tr>
<td>(32xx) Bronze</td>
<td>2133 MT/s</td>
<td>2133 MT/s</td>
<td>No</td>
</tr>
</tbody>
</table>
Storage Over App Direct Mode

• Intel Optane DC persistent memory operates as a block storage device
  – Traditional read/write instructions
  – Works with existing file systems
  – Block sizes 4K or 512B
  – NVDIMM OS driver required

• Data is persistent

• Application does not have to be DCPMM aware
• 270% increase in the number of transactions with SQL 2019 using App Direct Mode
  - Linux version
  - DCPMM vs NVMe drives

• App Direct mode removes layers of protocols and software stacks

• DCPMM capacity allows the entire database to be kept in memory
Real results today: Improve SQL database performance

Up to **2.7x** Improvement

**PowerEdge R740xd**

Intel® Optane DC™ persistent memory

SQL Database Performance

(Transactions per Second)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Use NVMe</td>
<td>1</td>
</tr>
<tr>
<td>Intel Optane DC persistent memory</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Based on testing performed by internal Dell EMC with PowerEdge on Microsoft SQL Server 2019 preview on Linux and VMware ESXi 6.7
## Top Use Cases

<table>
<thead>
<tr>
<th>Value Proposition</th>
<th>Virtualization</th>
<th>SAP &amp; Other In-Memory Databases</th>
<th>MS SQL 2019 and other Databases</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Affordable large memory capacity</td>
<td>• Affordable large memory capacity</td>
<td>• Improved performance with App Direct Mode</td>
<td>• Improved performance with App Direct Mode</td>
</tr>
<tr>
<td></td>
<td>• Improved software startup times because of persistency</td>
<td>• DCPMM is much faster than NVMe and SSD drives</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Memory Mode</th>
<th>App Direct Mode</th>
<th>App Direct Mode</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Customer Profile</th>
<th>Virtualization</th>
<th>SAP &amp; Other In-Memory Databases</th>
<th>MS SQL 2019 and other Databases</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Customers looking to use 64GB DIMMs or higher.</td>
<td>• Anyone using SAP and other in-memory databases</td>
<td>• SQL 2019 customers where the database can fully reside in the DCPMM DIMMs</td>
<td></td>
</tr>
<tr>
<td>• Customers who have memory constrained servers</td>
<td>• More affordable than 64GB DIMMs and much more affordable than 128GB DIMMs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Customers concerned about updating systems because of software startup times.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Virtualization</th>
<th>SAP &amp; Other In-Memory Databases</th>
<th>MS SQL 2019 and other Databases</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Customers must evaluate the performance of memory mode with their workloads in their environment. Read heavy workloads will perform better</td>
<td>• DCPMM provides a large affordable capacity but will operate slightly slower than regular memory</td>
<td>• MS SQL2019 comes out in Q4 CY2019</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No performance information yet on of other databases</td>
<td></td>
</tr>
</tbody>
</table>
## Applications that Will Support App Direct Mode

<table>
<thead>
<tr>
<th>Type of Software</th>
<th>Operating Mode</th>
<th>Application</th>
<th>Description</th>
<th>Min Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISV</td>
<td>App Direct</td>
<td>Aerospike Enterprise Edition</td>
<td>In memory noSQL database</td>
<td>4.5</td>
</tr>
<tr>
<td>ISV</td>
<td>App Direct</td>
<td>SAP HANA</td>
<td>In memory database</td>
<td>2.0 SPS 03</td>
</tr>
<tr>
<td>ISV</td>
<td>App Direct</td>
<td>Gigaspaces</td>
<td>Distributed in-memory data-grid</td>
<td>V14.0</td>
</tr>
<tr>
<td>ISV</td>
<td>App Direct</td>
<td>Microsoft SQL Server 2019</td>
<td>Database</td>
<td>2019</td>
</tr>
<tr>
<td>Open Source</td>
<td>App Direct</td>
<td>Apache Cassandra</td>
<td>NoSQL database management system</td>
<td>4.X - Open source avail on github – not upstreamed Contact DataStax to help Intel accelerate code adoption</td>
</tr>
<tr>
<td>Open Source</td>
<td>App Direct</td>
<td>Apache Spark SQL with Optimized Analytics Package (OAP)</td>
<td>SQL database with a cluster-computing framework</td>
<td>Apache Spark version 2.3.2 with OAP 0.5.0 - Open source avail on github</td>
</tr>
<tr>
<td>Open Source</td>
<td>App Direct</td>
<td>Apache HBase Bucket Cache</td>
<td>Distributed non-relational database</td>
<td>Open source avail on github</td>
</tr>
<tr>
<td>Open Source</td>
<td>App Direct</td>
<td>Apache Hadoop HDFS Cache</td>
<td>Software framework for distributed storage</td>
<td>Hadoop 3.1 – Patch available, not upstreamed yet</td>
</tr>
</tbody>
</table>

Last updated 3/26/2019
# Applications that Intel has Evaluated using Storage over App Direct Mode

<table>
<thead>
<tr>
<th>Type of Software</th>
<th>Operating Mode</th>
<th>Application</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISV</td>
<td>Storage over App Direct</td>
<td>Asia-info</td>
<td>3.1.1</td>
</tr>
<tr>
<td>Open Source</td>
<td>Storage over App Direct</td>
<td>Apache Kafka</td>
<td></td>
</tr>
<tr>
<td>Open Source</td>
<td>Storage over App Direct</td>
<td>MongoDB/WiredTiger</td>
<td>4.0</td>
</tr>
<tr>
<td>Open Source</td>
<td>Storage over App Direct</td>
<td>PerconaDB(MySQL)/InnoDB</td>
<td></td>
</tr>
<tr>
<td>Open Source</td>
<td>Storage over App Direct</td>
<td>PerconaDB(MySQL)/MyRocks</td>
<td></td>
</tr>
<tr>
<td>Open Source</td>
<td>Storage over App Direct</td>
<td>RocksDB</td>
<td></td>
</tr>
</tbody>
</table>

Last updated 3/26/2019
Orders of magnitude lower latency than SSD
2X read/write bandwidth vs disk, with one module, more with multiple modules

1. 256B granularity (64B accesses). Note 4K granularity gives about same performance as 256B
OpenManage Enterprise: nouveau look!

1. **OBSESSIVE SIMPLICITY**
   - Modern HTML5 UI
   - Turn key deployment as a virtual appliance
   - Grounds up usability design

2. **END TO END AUTOMATION**
   - Comprehensive Redfish inspired API
   - Policy driven everything!

3. **UNIFICATION**
   - Centralized authentication
   - Similar management model regardless of server form factor
   - Solution aware management

Built for IT professionals who refuse to be limited by management complexity
Evolution OME vers OME!

OME 2.x

- OM Essentials v2.3
- OM Essentials v2.4
- OM Essentials v2.5
- No new features & Sustaining

OME 3.x

- OM Enterprise Tech Release
  - Dec CY17
- OM Enterprise v3.0
  - Sept 2018
- OM Enterprise v3.3
  - Sept 2018

Functional Parity
OpenMange Enterprise

OpenManage Enterprise has functional equivalent features to OpenManage Essentials

There is **NO** in-place upgrade from OM Essentials to Enterprise
There is **in-Place** upgrade from OM Enterprise Tech Release to 3.0

- Following customers can start using OM Enterprise:
  - **Linux Centric** customers
  - **New** Dell EMC customers
  - Essentials customers with >=12G systems and **no OMSA**

- Customers who will need to take a more measured approach:
  - <= 11G platforms and **OMSA** dependencies
  - **Complex** alert policies, CLI/API integrations, IO identity and vLAN management
  - Customer with No Virtualization Environment of any kind
  - Essentials Customers may run both OM consoles in parallel until everything migrated from Essentials and <=11G servers retired