

# Competitive Response: HPE Servers based on Xeon Scalable Gen4 (Sapphire Rapids)

Updated March 2023

ISG Competitive - PowerEdge

*Please note: this deck is dynamic and subject to change*

# PowerEdge New Platforms for Targeted Focus Areas

## Core

### Acceleration-Optimized



### Mainstream

#### Mainstream 4 Socket



#### Storage Dense



### Modular



#### Mainstream Optimized



### C6620



## Edge



## Scale

### Cloud Service Providers



# Dell PowerEdge Xeon Scalable Gen4 (Sapphire Rapids) portfolio



- PowerEdge C6620
- PowerEdge R660
- PowerEdge R660xs
- PowerEdge HS5610 (CSP only)
- PowerEdge R760
- PowerEdge R760xs
- PowerEdge R760xa
- PowerEdge R760xd2
- PowerEdge HS5620 (CSP only)
- PowerEdge T560
- PowerEdge R860
- PowerEdge R960
- PowerEdge MX760c
- PowerEdge XE8640
- PowerEdge XE9640
- PowerEdge XE9680
- PowerEdge XR5610
- PowerEdge XR7610
- PowerEdge XR8000

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# Executive Summary

- HPE announced 8 new servers based on Xeon Scalable Gen4 (Sapphire Rapids) – with 5 coming...
  - No new Synergy Blade yet (Synergy 480 Gen11 – coming)
  - No 4-socket yet (ProLiant DL560 Gen11 is coming)
  - No comparable to PE R660xs/R760xs or HS5610/HS5620
  - One Edge system – that is not specifically Edge but is 1U/1S based on Sapphire Rapids: ProLiant DL320 Gen11; HPE did mention a ProLiant DL110 Gen11 Telco server is coming
  - One Accelerator system: Cray XD6500

*Note: Dell has 19 Sapphire Rapids-based system that will launch this year*
- HPE re-branded its Apollo systems:
  - Apollo 2000 is now Cray XD2000 (4-node/2U)
  - Apollo 4000 is now Alletra 4000 (storage dense 1U/2U)
  - Apollo 6500 is now Cray XD6500 (GPU dense)
- GreenLake
  - *GreenLake for Compute Ops Management* is available on all new ProLiant Gen11 and Alletra servers (not on Cray): a way to push customers to a GreenLake subscription

# HPE Xeon Scalable Gen4 (Sapphire Rapids) Announcement Review

# HPE Announcement

- On January 10, 2023, HPE announced new servers based on the Intel Xeon Scalable Gen4 (Sapphire Rapids) processors
  - The ProLiant announcement was via blog by Joseph George:
    - [HPE extends next-gen HPE ProLiant portfolio with world record-breaking energy efficiency](#)
    - HPE cited a SPECpower result published January 10 as substantiation for the claim. HPE's result was surpassed within one day...
- 
- ProLiant Gen11 positioning/servers announced:
    - Edge-optimized:  
[ProLiant DL320 Gen11](#) (1S/1U)
    - Enterprise-optimized dense compute:  
[ProLiant DL360 Gen11](#) (2S/1U)
    - Enterprise-optimized scalable compute:  
[ProLiant DL380 Gen11](#) (2S/2U)
    - Business-optimized tower compute:  
[ProLiant ML350 Gen11](#) server (Tower)
  - HPE also announced servers that were formerly Apollo:
    - [Cray XD2000](#) (2U/4-node)
    - [Alletra 4110/4210](#) (1U and 2U storage dense)
    - [Cray XD6500](#) (Accelerator optimized)

# HPE Announcement (continued)

- HPE also announced servers that are coming:
  - **ProLiant DL110 Gen11 (1S/1U)**  
Designed with high density optimized compute for Telco 5G Services and vRAN
  - **ProLiant ML110 Gen11 (small tower)**  
Engineered for small business and optimized for affordability
  - **Synergy 480 Gen11 (2S/blade)**  
For the software-defined datacenter, featuring enhanced Private Cloud for Enterprise
  - **ProLiant DL560 Gen11 (4S/2U)**  
To power big data workloads with quad socket performance and in-memory data acceleration
  - **New HPE ProLiant Gen11 (?)**  
Server with expanded GPU support for enterprise workloads

# HPE Gen11 launch messaging *Hybrid World*

## ***HPE ProLiant is engineered for your hybrid world***

*Supports distributed approaches, moving compute out of centralized datacenters and deploying it throughout your operations—across multiple clouds, multiple datacenters and at the edge. And they are simple to operate, with location-agnostic, cloud-based compute management ensuring visibility and consistency, unifying operations across the lifecycle and throughout the environment, while empowering security and automation.*

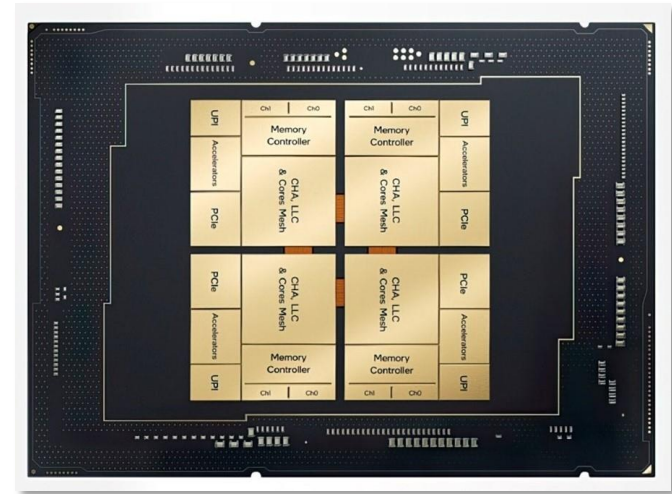
The entire second half of this paragraph is a plug for GreenLake for Compute Ops Management which is now standard with ProLiant Gen11 servers

# HPE Sapphire Rapids messaging

*With HPE ProLiant next-gen servers built with 4th Gen Intel Xeon Scalable processors, HPE and Intel bring you the next generation of compute for a hybrid world, engineered to drive your business forward.*

*You get next-level compute solutions to power your hybrid environment wherever it lives—from the edge to the cloud.*

*Whether you're looking for economical local storage capacity, cradle-to-grave security features, impressive energy efficiency, or flexible deployment options, you'll find it all with this latest family of HPE ProLiant servers.*



# HPE brand changes for Apollo servers

## HPC/AI:

- **Apollo 2000** ➡ **Cray XD2000**: 4-node (Genoa or Sapphire Rapids nodes) in 2U – competes with PowerEdge C6620
- **Apollo 6500** ➡ **Cray XD6500** – competes with PowerEdge XE product line (XE8640, XE9640, XE9680)

## Storage:

- **Apollo 4000** ➡ **Alletra 4000** – competes with PowerEdge R760xd (and PowerFlex)

HPE is moving away from the Apollo brand in favor of Cray and Alletra which have more brand equity in their respective focus: Cray for HPC/AI and Alletra for storage

# Impact to Dell

# HPE value propositions for ProLiant Gen11

Value Prop	Specifics	Response
<b>Everything as a service</b>	HPE GreenLake for Cloud Ops Management subscription is included with the purchase of these new servers: “simple, unified, automated”	HPE pushes GreenLake hard –including GreenLake for Compute Ops Management as a standard feature – but has had issues with operations like delivery delays – not so with <b>APEX</b> (see <a href="#">this document</a> on Klue for competing with GreenLake with APEX)
<b>Sustainability/ Power Efficiency</b>	Carbon footprint reports, emission metrics, energy usage – HPE claims top result on SPECpower as of January 10, 2023 – but it was surpassed the following day by other vendors	Dell already offers real-time usage carbon footprint reports (including emissions metrics) as well as energy usage and more with <b>Power Manager 3.0</b> See the <a href="#">Video</a> here
<b>Security</b>	Silicon Root of Trust with iLO6, SPDM (controllers & NICs), iDevID, TPM	iLO6 is brand new– but <b>iDRAC</b> has been ahead of iLO for generations
<b>Trusted supply chain</b>	Expanded to worldwide availability: Global Supply Chain Security Services	<b>Dell has rigorous supply chain security:</b> <a href="https://www.hsdf.org/wp-content/uploads/2021/06/Supply-Chain-Security-Dell-Technologies-White-Paper.pdf">https://www.hsdf.org/wp-content/uploads/2021/06/Supply-Chain-Security-Dell-Technologies-White-Paper.pdf</a>

# GreenLake for Compute Ops Management

- What HPE Says:

- *With the HPE ProLiant Gen11 next generation portfolio, the management experience is being transformed. It provides an intuitive cloud operating experience that's simple to use and can be managed via a single console using HPE GreenLake for Compute Ops Management:*
  - *Simplifies and unifies operations across the server lifecycle*
  - *Supports servers in varied locations*
  - *Scales elastically*
  - *Consistent, secure cloud experience for the whole environment*



- Challenges for customers

- Service issues with GreenLake:  
Time it takes to get a quote, time it takes to activate the solution, time it takes to troubleshoot the solution
- Commitment to an OpEx Model with annual licensing costs:  
The Compute Ops Management subscription model comes with two subscription tiers: a standard tier for lifecycle operations on a single device at a time at \$100 per year per device and an enhanced tier with all policy-driven features and functionality with automated group action and REST APIs for \$240 per year per device
- Vendor Lock-in
- Confusing choices of solutions/models

# From The Register

The logo for 'The Register' is displayed in white text on a red rectangular background. The word 'The' is in a smaller font, 'Register' is in a larger, bold font, and a registered trademark symbol (®) is at the end.

## Three years of GreenLake management whether you want it or not

In HPE's enduring quest to offer everything it can as-a-service, the company is launching these systems with the GreenLake for Compute Ops Management service as standard.

The service provides a dashboard for onboarding, management, and tracking of key metrics, like carbon footprint, on HPE's ProLiant systems.

Each server comes standard with a three-year license for the service's basic tier, which includes per-device management and metrics. However, HPE would prefer users upgrade to the premium version of the service, which enables bulk management for things like firmware deployments.

*Dell is about choice. What makes the most sense for our customers is what we will provide them.*

[https://www.theregister.com/2022/11/01/amd\\_epyc\\_intel\\_sapphire/](https://www.theregister.com/2022/11/01/amd_epyc_intel_sapphire/)

# HPE is leveraging the Cray acquisition for AI/HPC



- HPE has incorporated industry standard processors from AMD into its Cray Exascale supercomputing solutions – the XE2500 will have Xeon Scalable Gen4 and EPYC Gen4 – based systems

- Apollo servers for HPC and acceleration are now branded Cray, but still using the Apollo numerical nomenclature:
  - Cray XD2000 (follow on to Apollo 2000) with nodes incorporating EPYC or Xeon processors (looking at the photo HPE has released – this is a brand-new chassis – no specs available at press time)
  - Cray XD6500 (follow on to Apollo 6500)
- Cray branding suggests that these systems will be managed via the Cray management tools – including a Cray BMC (not iLO6)

# HPE tri-mode RAID controllers

A tri-mode controller supports SAS, SATA and NVMe drives

HPE SR Gen11 Controller(s):

- HPE SR932i-p Gen11



HPE MR Gen11 Controllers:

- HPE MR216i-o Gen11
- HPE MR216i-p Gen11
- HPE MR408i-o Gen11
- HPE MR416i-o Gen11
- HPE MR416i-p Gen11

Dell has chosen to provide a targeted solution for each workload rather than a one size fits all approach with tri-mode.

- BOSS which allows the customers to separate their boot devices from primary storage
- Few customers mix SAS and SATA VDs behind a controller and there are even fewer that will want to do it with SAS/SATA and NVME4
- A Tri-Mode or U.3 backplane creates limitations in drive architecture.: users are forced to allocate PCIe lanes to each drive slot which either limits the max number of SAS/SATA drives, or connect NVMe devices at x1.
- Our competitors chose to connect at x1 to NVMe and in comparison, PowerEdge connects at x2 behind PERC, and at x4 directly attached to the CPU.
- Challenge for this implementation: NVMe devices in a Tri-Mode config will be severely performance limited. Please see the DfD link below for more details <https://www.delltechnologies.com/asset/en-us/products/servers/industry-market/direct-from-development-u-2-still-the-industry-standard-in-2-5-nvme-ssds.pdf>

# PowerEdge 16G Sapphire Rapids Portfolio versus HPE

# PowerEdge Xeon Scalable Gen4 2-socket rack portfolio versus HPE

**DELL**Technologies

1U/1S (noted) & 2S

PowerEdge R660



PowerEdge R660xs



PowerEdge HS5610 (CSP only)



PowerEdge XR5610 - 1S



ProLiant DL360 Gen11



ProLiant DL320 Gen11 - 1S



2U/2S

PowerEdge R760



PowerEdge R760xs



PowerEdge HS5620 (CSP Only)



ProLiant DL380 Gen11



GPU Dense  
2U/2S

PowerEdge R760xa



ProLiant DL380a Gen11



2U/4 x 2S nodes

PowerEdge C6620



Cray XD2000 with XD220v node












**Hewlett Packard**  
Enterprise

**DELL**Technologies

# Accelerator, storage dense, blade and tower Xeon Scalable Gen4 vs. HPE



Accelerator	Storage Dense	Blade	Tower
<p data-bbox="69 277 305 314">PowerEdge XE8640</p>  <p data-bbox="370 408 606 445">PowerEdge XE9640</p>  <p data-bbox="69 489 305 526">PowerEdge XE9680</p> 	<p data-bbox="734 513 1066 598">PowerEdge R760xd2</p>	<p data-bbox="1170 314 1406 351">PowerEdge MX760c</p> 	<p data-bbox="1460 310 1696 347">PowerEdge T560</p> 
<p data-bbox="173 784 506 869">Cray XD6500</p>	<p data-bbox="768 720 1000 757">Alletra 4110</p>  <p data-bbox="765 847 996 884">Alletra 4120</p> 	<p data-bbox="1174 751 1406 788">Synergy 480 Gen11</p> 	<p data-bbox="1479 725 1731 762">ProLiant ML350 Gen11</p> 



# 4-Socket and Edge Xeon Scalable Gen4 Versus HPE

**DELL**Technologies

4-socket

PowerEdge R860



PowerEdge R960



Edge 1S/1U

PowerEdge XR5610



Edge 2S/2U

PowerEdge XR7620



Edge Multinode  
2U/1S-nodes (up to 4)

PowerEdge XR8000



ProLiant DL560 Gen11

*HPE has not said anything publicly on a ProLiant DL580 Gen11 4U/4S*

ProLiant DL320 Gen11



ProLiant DL110 Gen11

**Hewlett Packard**  
Enterprise

**DELL**Technologies

# PowerEdge 16G Sapphire Rapids Server Comparisons to HPE

Please note: this section is a WIP – it will be updated as HPE and Dell release detailed information on Sapphire Rapids-based systems (blank spaces in the side-by-sides means we don't currently have access to this information)

# ProLiant DL320 Gen11

*Enhanced performance with the right balance of expandability and density*

## What HPE says:

*The HPE ProLiant DL320 Gen11 server is a 1U 1P solution that delivers exceptional compute performance, upgraded high-speed data transfer rates, and increased maximum memory capacity and bandwidth, at 1P economics. The HPE ProLiant DL320 Gen11 server is an excellent choice for virtualized workloads such as software-defined compute, CDN, VDI and VDI, and secure edge apps that require balancing processor, memory, and network bandwidth.*



# Technical Specification comparison 1U/1S – PowerEdge versus HPE ProLiant DL320 Gen11

Features	PowerEdge	ProLiant DL320 Gen11	Comments
<b>CPU</b>		One 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 32 cores, 270W	
<b>Memory</b>		16 x DDR5 RDIMMs	
<b>Disk Drives/Storage</b>		Up to 4 x 3.5-inch Up to 8 + 2 x 2.5-inch SAS/SATA HDDs or SAS/SATA/NVMe	
<b>USB</b>		Front: 1 x USB 3.2 Rear: 2 x USB 3.2	
<b>Storage Controller</b>		MR416i-p Gen11; MR416i-o Gen11; MR216i-p; MR216i-o Gen11; MR408i-o Gen11; OCP SPDM P58335-B21; SR932i-p; PCI SPDM P47184-B21; Smart Array E208e-p SR Gen10	
<b>COMMs Expansion</b>		OCP 3.0 or PCIe slots only	
<b>Cooling</b>		Air	

\*See slide notes

# Technical Specification comparison 1U/2S – PowerEdge versus HPE ProLiant DL320 Gen11 (continued)

Features	PowerEdge	ProLiant DL320 Gen11	Comments
<b>PCIe slots</b>		2 x PCIe 5 x16 FHHL	
<b>GPU</b>		NA	
<b>Power Supplies</b>		Platinum: 500W, 800W, 1600W Titanium: 1000W	
<b>System Management</b>		iLO 6, OneView, GreenLake Compute Ops Management	
<b>OS Support</b>		Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, Oracle Linux, Ubuntu, Citrix	

# ProLiant DL360 Gen11

*Enterprise-optimized dense compute*

## What HPE says:

*The HPE ProLiant DL360 Gen11 delivers density-optimized enterprise infrastructure services whether it be VMs, containers or bare metal for business workloads with dual socket performance in only 1U of rack space. This makes the DL360 ideal for IT infrastructure and hyperconverged workloads.*



- 2 x Xeon Scalable Gen4 up to 56 cores, 350W TDP
- 32 x DDR5 RDIMMs
- 3 x PCIe 5.0 x16 slots
- 2 x OCP slots

# PowerEdge R660 versus ProLiant DL360 Gen11

## *Differentiation and challenges summary*



- PowerEdge R660 Differentiation

- 20% more 2.5-inch drives (12 versus 10)
- LOM riser option
- DLC Cooling option – with leak sense technology (HPE offers a liquid-based heat sink) for broader configuration support
- Power supply options for more efficient power use

- ProLiant DL360 Gen11 Challenges

- 3.5-inch drive chassis
- Support for 3 x versus 2 x GPUs (lots of restrictions for use... NVIDIA A2 only)
- More USB ports internal and in the rear of the system (2 versus 1 in each)

# Technical Specification comparison 1U/2S – PowerEdge R660 versus HPE ProLiant DL360 Gen11

Features	PowerEdge R660	ProLiant DL360 Gen11	Comments
<b>CPU</b>	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 56 cores, 350W	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 56 cores, 350W	
<b>Memory</b>	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: 4400/4800 MT/s (2 DPC/1DPC)	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: Up to 4800 MT/s	
<b>Disk Drives/Storage</b>	<b>Front:</b> Up to 10 x 2.5-inch SAS/SATA/NVMe <b>Rear:</b> Up to 2 x 2.5-inch SAS/SATA/NVMe Optional: BOSS-N1 (2 x NVMe)	<b>Front:</b> Up to 4 x 3.5-inch SAS/SATA or Up to 10 x 2.5-inch SAS/SATA/NVMe <b>Rear:</b> None Optional boot: NS204i-u NVMe	HPE offers 3.5-inch configuration and a universal drive option with 8 x 2.5-inch drives; Dell offers two extra 2.5-inch drives with rear drive option;
<b>USB</b>	<b>Front:</b> 1 x USB 2.0, 1 x micro-USB, iDRAC Direct <b>Rear:</b> 1 x USB 3.0, 1 x USB 2.0 <b>Internal:</b> 1 x USB 3.0 (optional)	<b>Front:</b> 1 x USB 3.2, 1 x iLO service port (optional 1 x USB 2.0) <b>Rear:</b> 2 x USB 3.2 <b>Internal:</b> 1 x USB 3.2 and 1 x USB 2.0	HPE offers more USB ports
<b>Storage Controller</b>	PERC H965i, PERC H755, PERC H755N, PERC H355, HBA355i Chipset SATA/SW RAID: S160	HPE SR932i-p Gen11 , MR416i-p Gen11 MR416i-o Gen11, MR216i-p Gen11, MR216i-o Gen11 , MR408i-o Gen11, Smart Array E208e-p SR Gen10	
<b>COMMs Expansion</b>	LOM Riser + 1 x OCP 3.0	2 x OCP 3.0	HPE has a second OCP slot that requires second processor
<b>Cooling</b>	Air or optional DLC*	Air or HPE ProLiant DL360 Gen11 Liquid Cooling Heat Sink Kit	Dell offers liquid cooling at a rack level, and includes Dell Leak Sense technology

\*See slide notes

# Technical Specification comparison 1U/2S – PowerEdge R660 versus HPE ProLiant DL360 Gen11 (continued)

Features	PowerEdge R660	HPE ProLiant DL360 Gen11	Comments
<b>PCIe slots</b>	Up to 3 x PCIe slots: 3 x PCIe x16 or x8 Gen4 or Gen5 (varied length/height)	Up to 3 x PCIe slots: 3 x PCIe x16 Gen 5 (1 FH, 1 LP, 1 on Proc 2 - either )	HPE slots are all Gen5
<b>GPU</b>	Up to 2 x 75W SW	Up to 3 x 75W NVIDIA A2	HPE gets a third GPU – but requires considerable configuration restrictions
<b>Power Supplies</b>	700W, 1100W, 1800W Titanium 800W, 1400W Platinum 1100W LVDC -48 — -60 VDC	1000W Titanium 800W, 1600W Platinum 800W, 1100W, 1600 VDC for China only	Dell offers a broader range of power supplies
<b>System Management</b>	<b>Embedded:</b> <ul style="list-style-type: none"> <li>• iDRAC9</li> <li>• iDRAC Direct</li> <li>• iDRAC RESTful API with Redfish</li> <li>• iDRAC Service Module</li> <li>• Quick Sync 2 wireless module</li> </ul> <b>OpenManage Software:</b> OME, integrations (including vCenter, Windows and MS System Center), and plug-ins (Power, Updates, Service), OpenManage Mobile	<b>Embedded:</b> <ul style="list-style-type: none"> <li>• iLO6</li> <li>• iLO6 Advanced</li> <li>• iLO6 RESTful API with Redfish</li> </ul> <b>Console:</b> <ul style="list-style-type: none"> <li>• OneView</li> <li>• OneView Advanced</li> </ul> InfoSight GreenLake for Compute Ops Management	HPE is pushing GreenLake for management of all Gen11 server platforms
<b>OS Support</b>	• Canonical Ubuntu Server LTS • Microsoft Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi	Windows Server • VMware ESXi • RHEL • SUSE • Ubuntu • Oracle Linux • Citrix	

# PowerEdge R660xs versus ProLiant DL360 Gen11

## *Differentiation and challenges summary*



- PowerEdge R660xs Differentiation
  - 20% more 2.5-inch drives
  - Embedded 2 x 1GbE ports
  - More power supply offerings to best support customer configurations
  - OpenBMC/Open Server Manager



- ProLiant DL360 Gen11 Challenges
  - Higher wattage, higher core processors
  - 2X memory slots
  - More USB ports
  - Support for up to 3 x NVIDIA A2 GPUs

# Technical Specification comparison 1U/2S – PowerEdge R660xs versus HPE ProLiant DL360 Gen11

Features	PowerEdge R660xs	ProLiant DL360 Gen11	Comments
<b>CPU</b>	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 32 cores; 250W	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 56 cores, 350W	The PowerEdge R660xs is targeting customers who don't require the level of performance or expandability that the R660 offers – saving users the expense of the system infrastructure to support high-end features
<b>Memory</b>	DDR5: Up to 16 x DDR5 RDIMM DIMM Speed: Up to 4800 MT/s	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: Up to 4800 MT/s	
<b>Disk Drives/Storage</b>	<b>Front:</b> (all HDD/SSD) Up to 4 x 3.5-inch SAS/SATA (HDD/SSD) Up to 8 x 2.5-inch SAS/SATA/NVMe Up to 10 x 2.5-inch SAS/SATA/NVMe <b>Rear:</b> Up to 2 x 2.5-inch SAS/SATA/NVMe (HDD/SSD)	<b>Front:</b> Up to 4 x 3.5-inch SAS/SATA or Up to 10 x 2.5-inch SAS/SATA/NVMe <b>Rear:</b> None Optional boot: NS204i-u NVMe	PowerEdge R660xs can support up to 12 x 2.5-inch drives – HPE supports 10
<b>USB</b>	Front: 1 x iDRAC Direct (Micro-AB USB) port, 1 x USB 2.0 Rear: 1 x USB 2.0 Internal: 1 x USB 3	<b>Front:</b> 1 x USB 3.2, 1 x iLO service port (optional 1 x USB 2.0) <b>Rear:</b> 2 x USB 3.2 <b>Internal:</b> 1 x USB 3.2 and 1 x USB 2.0	HPE has more USB ports
<b>Storage Controller</b>	Internal: PERC H355, PERC H755, PERC H755N, PERC H965i, HBA355i, HBA465i S160 Internal Boot:BOSS-N1 External PERC (RAID): HBA355e	HPE SR932i-p Gen11 , MR416i-p Gen11 MR416i-o Gen11, MR216i-p Gen11, MR216i-o Gen11 , MR408i-o Gen11, Smart Array E208e-p SR Gen10	
<b>COMMs Expansion</b>	Embedded NIC: 2 x 1Gb 1 x OCP 3.0	2 x OCP 3.0	HPE has an extra OCP slot – but R660xs has 2 x 1Gb embedded
<b>Cooling</b>	Air only	Air or HPE ProLiant DL360 Gen11 Liquid Cooling Heat Sink Kit	For higher performance configurations – choose the R660 which can support them with or without liquid cooling

\*See slide notes

# Technical Specification comparison 1U/2S – PowerEdge R660xs versus HPE ProLiant DL360 Gen11 (continued)

Features	PowerEdge R660xs	HPE ProLiant DL360 Gen11	Comments
<b>PCIe slots</b>	Up to 2 x PCIe Gen5 or Up to 3 x PCIe Gen4	Up to 3 x PCIe slots: 3 x PCIe x16 Gen 5 (1 FH, 1 LP, 1 on Proc 2 - either )	All HPE slots are Gen5
<b>GPU</b>	NA	Up to 3 x 75W NVIDIA A2	Choose the R660 if customer needs GPU support in 1U...
<b>Power Supplies</b>	600W, 800W, 1400W ,1800W Platinum 700W, 1100W Titanium 1100 W DC/-48-(-60) V 600W, 700W, 800W 1100W, 1400W, 1800W VDC	1000W Titanium 800W, 1600W Platinum 800W, 1100W, 1600 VDC for China only	Dell offers a wider variety of power supplies to appropriately support customer configurations
<b>System Management</b>	<b>Embedded:</b> <ul style="list-style-type: none"> <li>• iDRAC9</li> <li>• iDRAC Direct</li> <li>• iDRAC RESTful API with Redfish</li> <li>• iDRAC Service Module</li> <li>• Open Server Manager built on OpenBMC</li> <li>• Quick Sync 2 wireless module</li> </ul>	<b>Embedded:</b> <ul style="list-style-type: none"> <li>• iLO6</li> <li>• iLO6 Advanced</li> <li>• iLO6 RESTful API with Redfish</li> </ul> <b>Console:</b> <ul style="list-style-type: none"> <li>• OneView</li> <li>• OneView Advanced</li> </ul> InfoSight GreenLake for Compute Ops Management	HPE is pushing GreenLake for management of all Gen11 server platforms  Dell offers OpenBMC/Open Server Manager on the R660xs
<b>OS Support</b>	Red Hat Enterprise Linux, SUSE, Windows Server 2021 Ubuntu, CentOS	Windows Server • VMware ESXi • RHEL • SUSE • Ubuntu • Oracle Linux • Citrix	

# ProLiant DL380 Gen11

*Right balance of expandability and scalability*

## What HPE says:

*The HPE ProLiant DL380 Gen11 server features a dual socket, 2U form factor with advanced scalability for storage and accelerator so it is ideal for your most demanding workloads that require advanced DPUs and GPUs. The expandability provides a wide range of diverse workloads including virtualization and private cloud, as well as data management.*



- 2 x Xeon Scalable Gen4 up to 60 cores, 350W TDP
- 32 x DDR5 RDIMMs
- 7 x PCIe 5.0 x16 slots plus 1 x PCIe 4.0 slot
- 2 x OCP 3.0 slots

# PowerEdge R760 versus ProLiant DL380 Gen11

## *Differentiation and challenges summary*



- PowerEdge R760 Differentiation

- LOM riser option
- DLC Cooling option (HPE offers a liquid-based heat sink) for broader configuration support
- Support for SW GPUs and a broader range of GPU options (HPE supports NVIDIA A100 or A16 only)
- Power supply options for more efficient power use

- ProLiant DL380 Gen11 Challenges

- HPE supports the 60 core Platinum 8490H processor
- HPE supports more 2.5-inch rear drives: 6 x versus 4 x 2.5-inch
- HPE offers rear 3.5-inch drives
- More Gen5 PCIe slots (7 versus 5)

# Technical Specification comparison 2U/2S – PowerEdge R760 versus HPE ProLiant DL380 Gen11

Features	PowerEdge R760	ProLiant DL380 Gen11	Comments
<b>CPU</b>	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 56 cores, 350W	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 60 cores, 350W	HPE supports the Platinum 8490H Processor
<b>Memory</b>	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: 4400/4800 MT/s (2 DPC/1DPC)	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: 4400/4800 MT/s (2 DPC/1DPC)	
<b>Disk Drives/Storage</b>	<b>Front:</b> Up to 24 x 2.5-inch SAS/SATA/NVMe Up to 12 x 3.5-inch SAS/SATA <b>Rear:</b> Up to 4 x 2.5-inch SAS/SATA/NVMe  BOSS-N1 (2 x NVMe)	<b>Front:</b> Up to 24 x 2.5-inch SAS/SATA/NVMe Up to 12 x 3.5-inch SAS/SATA <b>Rear:</b> Up to 6 x 2.5-inch SAS/SATA/NVMe Up to 4 x 3.5-inch SAS/SATA	HPE supports more rear drives
<b>USB</b>	<b>Front:</b> 1 x USB 2.0, 1 x micro-USB, iDRAC Direct <b>Rear:</b> 1 x USB 3.0, 1 x USB 2.0 Internal: 1 x USB 3.0 (optional)	<b>Front:</b> 1 x USB 3.0, 1 x iLO service port <b>Rear:</b> 2 x USB 3.0 Internal: 2 x USB (1 x 3.0, 1 x 2.0)	
<b>Storage Controller</b>	PERC H965i, PERC H755, PERC H755N, PERC H355, HBA355i Chipset SATA/SW RAID: Yes	HPE Smart Array E208e-p Essential <b>Tri Mode:</b> MR416i-p Gen11, MR416i-o Gen11, MR216i-p Gen11, MR216i-o Gen11, MR408i-o Gen11, SR932i-p Gen11 Software RAID: Intel VROC	HPE offers tri-mode controllers- which support SAS/SATA/NVMe via a single controller
<b>COMMs</b>	1 x OCP 3.0; optional 2 x 1GbE LOM	2 x OCP 3.0	Dell offers an optional LOM – HPE NICs take a slot – although HPE has an extra OCP 3.0 slot
<b>Cooling</b>	Air or optional DLC* (see notes)	Air or HPE ProLiant DL380 Gen11 Max Performance Heat Sink Kit	HPE offers a heat sink as an alternative to DLC – not as effective

# Technical Specification comparison 2U/2S – PowerEdge R760 versus HPE ProLiant DL380 Gen11 (continued)

Features	PowerEdge R760	ProLiant DL380 Gen11	Comments
<b>PCIe slots</b>	Up to 8 x PCIe x16 slots: 5 x PCIe Gen5, 3 x PCIe Gen4 (note: 2 slots can be Gen4 or Gen5)	Up to 8 x PCIe slots: 7 x PCIe Gen5 x16, 1 x PCIe Gen4 x8	
<b>GPUs</b>	Up to 2 x 350W DW; up to 6 x 75W SW	Up to 2 x NVIDIA A100 or A16	Dell supports SW GPUs in addition to DW
<b>Power Supplies</b>	700W, 1100W, 1800W, 2800W Titanium 800W, 1400W, 2400W Platinum 1100W LVDC -48 — -60 VDC	1000W Titanium 800W, 1600W Platinum 800W (-48VDC) Power Supply: -40 Vdc to -72 Vdc	Dell offers a greater variety of power supplies
<b>System Management</b>	<b>Embedded:</b> <ul style="list-style-type: none"> <li>• iDRAC9</li> <li>• iDRAC Direct</li> <li>• iDRAC RESTful API with Redfish</li> <li>• iDRAC Service Module</li> <li>• Quick Sync 2 wireless module</li> </ul> <b>OpenManage Software:</b> OME, integrations (including vCenter, Windows and MS System Center), and plug-ins (Power, Updates, Service), OpenManage Mobile	<b>Embedded:</b> <ul style="list-style-type: none"> <li>• iLO6</li> <li>• iLO6 Advanced</li> <li>• iLO6 RESTful API with Redfish</li> </ul> <b>Console:</b> <ul style="list-style-type: none"> <li>• OneView</li> <li>• OneView Advanced</li> </ul> InfoSight GreenLake for Compute Ops Management	HPE is pushing GreenLake for management of all Gen11 server platforms
<b>OS Support</b>	Canonical Ubuntu Server LTS• Microsoft Windows Server with Hyper-V• Red Hat Enterprise Linux• SUSE Linux Enterprise Server• VMware ESXi	• Windows Server with Hyper-V Server: 2019 • Red Hat Enterprise Linux• SUSE Linux Enterprise Server• VMware ESXi • Ubuntu	

# PowerEdge R760xs versus ProLiant DL380 Gen11

## *Differentiation and challenges summary*



- PowerEdge R760xs Differentiation
  - Embedded 2 x 1GbE LOM
  - General purpose platform for customers who don't want to bear the price for capabilities they don't need
  - OpenBMC/Open Server Manager



- ProLiant DL380 Gen11 Challenges
  - Higher end processors
  - 2X memory
  - More PCIe expansion
  - More rear drive expansion
  - DW GPU support

# Technical Specification comparison 2U/2S – PowerEdge R760xs versus HPE ProLiant DL380 Gen11

Features	PowerEdge R760xs	ProLiant DL380 Gen11	Comments
<b>CPU</b>	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 32 cores, 250W	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 60 cores, 350W	The PowerEdge R760xs is targeting customers who don't require the level of performance or expandability that the R760 offers – saving users the expense of the system infrastructure to support high-end features
<b>Memory</b>	DDR5: Up to 16 x DDR5 RDIMM DIMM Speed: 4800 MT/s	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: 4400/4800 MT/s (2 DPC/1DPC)	
<b>Disk Drives/Storage</b>	<b>Front:</b> Up to 24 x 2.5-inch SAS/SATA/NVMe Up to 12 x 3.5-inch SAS/SATA <b>Rear:</b> Up to 2 x 2.5-inch SAS/SATA/NVMe	<b>Front:</b> Up to 24 x 2.5-inch SAS/SATA/NVMe Up to 12 x 3.5-inch SAS/SATA <b>Rear:</b> Up to 6 x 2.5-inch SAS/SATA/NVMe Up to 4 x 3.5-inch SAS/SATA	HPE has more disk storage expansion at the rear of the system – the same at the front
<b>USB</b>	<b>Front:</b> 1 x USB 2.0; 1 x Dedicated iDRAC micro-USB <b>Rear:</b> 1 x USB 2.0; 1 x USB 3.0 <b>Internal:</b> 1 x USB 3.0	<b>Front:</b> 1 x USB 3.0, 1 x iLO service port <b>Rear:</b> 2 x USB 3.0 Internal: 2 x USB (1 x 3.0, 1 x 2.0)	
<b>Storage Controller/ RAID</b>	Internal controllers: H965i, HBA465i ( post RTS), H755, H755N, H355, HBA355i BOSS N1) HWRAID 2x M.2 SSDs and Internal USB Software RAID: S160	HPE Smart Array E208e-p Essential <b>Tri Mode:</b> MR416i-p Gen11, MR416i-o Gen11, MR216i-p Gen11, MR216i-o Gen11, MR408i-o Gen11, SR932i-p Gen11 Software RAID: Intel VROC	HPE offers tri-mode controllers- which support SAS/SATA/NVMe via a single controller
<b>COMMs</b>	2 x 1GbE; 1 x OCP 3.0	2 x OCP 3.0	R760xs offers embedded LOM
<b>Cooling</b>	Air Cooled	Air or HPE ProLiant DL380 Gen11 Max Performance Heat Sink Kit	The R760 is customers who require a configuration that needs liquid cooling

# Technical Specification comparison 2U/2S – PowerEdge R760xs versus HPE ProLiant DL380 Gen11 (continued)

Features	PowerEdge R760xs	ProLiant DL380 Gen11	Comments
<b>PCIe slots</b>	Up to 6 x PCIe slots: 2 x Gen5, 4 x Gen4 Five x16	Up to 8 x PCIe slots: 7 x PCIe Gen5 x16, 1 x PCIe Gen4 x8	For customers that need extra expansion – there is the R760
<b>GPUs</b>	Up to 2 x NVIDIA A2	Up to 2 x NVIDIA A100 or A16	For more GPU/DW GPU options – customers can choose the R760 or R760xa
<b>Power Supplies</b>	700W, 1100W Titanium VDC 600W, 800W, 1400W, 1800W Platinum VDC 1100 W DC/-48–(-60) V	1000W Titanium 800W, 1600W Platinum 800W (-48VDC) Power Supply: -40 Vdc to -72 Vdc	Dell offers a greater variety of power supplies
<b>System Management</b>	<b>Embedded:</b> <ul style="list-style-type: none"> <li>iDRAC9 Express or Enterprise</li> <li>Lifecycle Controller 3.x</li> </ul> <b>Console:</b> <ul style="list-style-type: none"> <li>OpenManage</li> <li>OpenManage Power Manager</li> <li>Open Server Manager built on OpenBMC</li> <li>QuickSync 2.0/OpenManage Mobile CloudIQ</li> </ul>	<b>Embedded:</b> <ul style="list-style-type: none"> <li>iLO6</li> <li>iLO6 Advanced</li> <li>iLO6 RESTful API with Redfish</li> </ul> <b>Console:</b> <ul style="list-style-type: none"> <li>OneView</li> <li>OneView Advanced</li> </ul> InfoSight GreenLake for Compute Ops Management	HPE is pushing GreenLake for management of all Gen11 server platforms  Dell offers OpenBMC/Open Server Manager on the R660xs
<b>OS Support</b>	<ul style="list-style-type: none"> <li>Windows Server with Hyper-V Server: 2019</li> <li>Red Hat Enterprise Linux</li> <li>SUSE Linux Enterprise Server</li> <li>VMware ESXi</li> <li>Ubuntu</li> </ul>	<ul style="list-style-type: none"> <li>Windows Server with Hyper-V Server: 2019</li> <li>Red Hat Enterprise Linux</li> <li>SUSE Linux Enterprise Server</li> <li>VMware ESXi</li> <li>Ubuntu</li> </ul>	

# Cray XD2000 with XD220v node

*Density-optimized, scale-out compute system*

## What HPE says:

*HPE Cray XD2000 system offers a complete, scalable solution for HPC customers, with flexibility of power and cooling options, including direct liquid cooling, giving greater performance while lowering TCO. Built with exascale era-ready networking, integrated storage, extensive software portfolio, management tools, and proven expertise.*



*HPE Specs for the Sapphire Rapids node are not yet available*



Chassis Rear Panel Components - 4 x 1U nodes

Item	Description	Item	Description
1.	1U Node #4	4.	1U Node #1
2.	4 internal power passthrough jumper cords (rear end)	5.	1U Node #3
3.	1U Node #2		

# Technical Specification comparison 2U/4-node: PowerEdge C6620 versus HPE Cray XD2000 with XD220v node

Features	PowerEdge C6620	Cray XD2000/XD220v	Comments
<b>Chassis</b>	2U with 4 x 2S Nodes	2U – v2240 (240v power supply) or v2277 (277v power supply) 4 x XD220v nodes (also supports 4 x XD225v – EPYC Gen4 or 2 x XD295x EPYC Gen4)	
<b>Cooling</b>	Air or liquid	Air within nodes or Direct Liquid Cooling (DLC) option: CPU only or CPU plus memory cooling	
<b>Power</b>		HPE Cray v2240 supports 240 VAC, 2400W power supplies HPE Cray v2277 supports specific customer request in North America region – 277 VAC, 1600W power supplies	
<b>CPU</b>	Up to two 4 <sup>th</sup> Generation Intel Xeon Scalable; up to 56 cores, 350W		
<b>Memory</b>	DDR5: Up to 16 x DDR5 RDIMM (8TB) DIMM Speed 4800 MT/s		
<b>Disk Drives/Storage</b>	Up to 16 x 2.5-inch SAS/SATA/NVMe or Up to 8 x E3.s NVMe SSDs BOSS-N1		
<b>USB</b>	1 x USB 3.0 (per sled)		
<b>Storage Controller</b>	PERC H965i, PERC H755, HBA355, HBA355i, SW RAID with S160		

## Technical Specification comparison 2U/4-node: PowerEdge C6620 versus HPE Cray XD2000 with XD220v node (continued)

Features	PowerEdge C6620	Cray XD 2000/XD220v	Comments
<b>COMMs</b>	2 x 1GbE OCP x16 Mezz 3.0		
<b>PCIe slots</b>	2 x PCIe Gen5 slots		
<b>GPUs</b>	2 x 75W GPUs		
<b>Power Supplies</b>	1800W, 2800W Titanium 2400W Platinum 1800W, 2400W, 2800W DC/240 V 3200W AC/277 V 3200W DC336 V	4 x 2400W Common Redundant Power Supplies	
<b>System Management</b>	Embedded: <ul style="list-style-type: none"> <li>• iDRAC9</li> <li>• iDRAC Direct</li> <li>• iDRAC RESTful with Redfish</li> <li>• iDRAC Service Module</li> </ul> OpenManage Enterprise, Power Manager plug-in, Update Manager plug-in, SupportAssist plug-in, plus integrations	Cray BMC	
<b>OS Support</b>	Canonical Ubuntu • Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi		

# Alletra 4120

*Optimal balance of economic capacity and performance*

## What HPE says:

*The HPE Alletra 4120 data storage server is specifically designed to run the broadest range of data storage-centric work loads to power your data-driven initiatives to success. From deep archives and data protection to active analytics data lakes, file and object Software-Defined Storage, and so much more, it delivers the capabilities you need at ideal economics with trusted security and a cloud operating experience*



- 2 x Xeon Scalable Gen4 up to 48 cores, 350W TDP
- 24 x DDR5 RDIMMs
- 8 x PCIe 5.0 x16
- 2 x OCP 3.0 slots

# PowerEdge R760xd2 versus Alletra 4210

## *Differentiation and challenges summary*

No photo available at  
press time



- PowerEdge R760xd2 Differentiation

- NVIDIA GPU support: 2 x SW or 1 x DW; HPE can only support 1 x SW FH/HL
- Standard LOM 2 x 1GbE ports; only OCP for HPE
- HPE storage controllers\* on 3.5-inch option: 1 or 2 controllers (depending on configuration); 2.5-inch option: min of 2 controllers; PowerEdge 760xd2 doesn't mandate 2 x storage controllers for any config
- HPE doesn't offer any FHFL slots; Dell offers 2x FHFL slots in certain configs.

\*See Notes

- Alletra 4210 Challenges

- HPE supports higher core count and wattage processors
- HPE supports up to 24 DIMMs versus 16 for Dell
- HPE offers a 2.5-inch configuration

# Technical Specification comparison 2U storage dense PowerEdge R760xd2 versus HPE Alletra 4210

	PowerEdge R760xd2	Alletra 4210	Comments
<b>Chassis Dimensions H x W x D</b>	88.9 x 434 x 837mm 3.5 x 17.1 x 32 in	87.5 x 448.0 x 805.50 mm 3.44 x 17.63 x 31.71 in	
<b>CPU</b>	Up to two 4th Generation Intel Xeon Scalable; up to 32 cores, 185W	Up to two 4th Generation Intel Xeon Scalable; up to 48 cores, 350W	HPE offers higher cores/wattage
<b>Memory</b>	16 x DDR5 DIMMs	24 x DDR5 RDIMMs	HPE offers 50% more DIMMs
<b>Disk Drives/Storage</b>	Front: Up to 24 x 3.5-inch SAS/SATA Rear: Up to 4 x 3.5-inch Universal or Up to 2 x U.2 NVMe or 4 x E.3S NVMe BOSS N1 (2 x M.2)	Up to 28 x 3.5-inch SAS/SATA (24 front, 4 rear) Up to 54 x 2.5-inch SAS/SATA Up to 48 x 2.5-inch SAS/SATA plus 6 x 2.5-inch NVMe NS204i-u Gen11 NVMe Hot Plug Boot	HPE has a 2.5-inch chassis
<b>USB</b>	Front: 2 x USB 2.0, 1 managed (micro USB) Rear: 1 x Gen2 + 1 x Gen3 USB Internal: Optional 1 x USB	Front: 1 x USB 3.0 Rear: 2 x USB 3.0 Internal: 1 x USB	
<b>Storage Controllers</b>	PERC11 (H755) or PERC 12 (H965), HBA355i, H465e, H965e , HBA355e or HBA 355	Smart Array: Alletra 41X0 SR 32-port PCIe Alletra 41X0 MR 16-port PCIe (Also for field upgrade: HPE MR416i-p Gen11, HPE SR932i-p Gen11	
<b>COMMs</b>	2 x 1GbE LOM + 1 x OCP 3.0	2 x OCP 3.0 slots	Dell offers LOM standard
<b>Cooling</b>	Air	Air	

# Technical Specification comparison 2U storage dense PowerEdge R760xd2 versus HPE Alletra 4210

Features	PowerEdge R760xd2	Alletra 4210	Comments
<b>PCIe slots</b>	Up to 4 x PCIe Slots Gen4 (mix of LP, HL, FL)	Up to 8 x PCIe Gen5 x16 FH/HL	
<b>GPUs</b>	Support for NVIDIA GPUs: Up to 2 x16 FH 70W PCIe 4.0 Up to 1 x16 DWFL 180W GPU PCIe 4.0	1 x GPU FH/HL up to 75W	Dell can support GPUs – 2 x SW or 1 x DW – HPE can only 1x SW – none full length
<b>Power Supplies</b>	800W, 1400W, 1800W 1100W -48VDC	800W, 1600W Platinum 1000W Titanium 1600W -48VDC	
<b>System Management</b>	<b>Embedded:</b> • iDRAC9 Enterprise/Data Center  <b>OpenManage Software:</b> OME, integrations (including vCenter, Windows and MS System Center), and plugins (Power, Updates, Service), OpenManage Mobile	<b>Embedded:</b> • iLO6 • iLO6 Advanced • iLO6 RESTful API with Redfish <b>Console:</b> • OneView • OneView Advanced GreenLake for Compute Ops Management	
<b>OS Support</b>		Windows Server • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware	

# Cray XD6500

## What HPE says:

- 2 x

# PowerEdge XE9680 versus Cray XD6500

## *Differentiation and challenges summary*

- PowerEdge XE9680 Differentiation
  - Dell
- Cray XD6500 Challenges
  - HPE supports

\*See Notes

# Technical Specification comparison – high-end GPU systems

## PowerEdge XE9680 versus HPE Cray XD6500

	PowerEdge XE9680	Cray XD6500	Comments
<b>Chassis Dimensions</b> H x W x D			
<b>CPU</b>	Up to two 4th Generation Intel Xeon Scalable; up to 56 cores, 350W		
<b>Memory</b>	DDR5: Up to 32 x DDR5 RDIMM (8TB) DIMM Speed: 4400/4800 MT/s (2 DPC/1DPC)		
<b>Disk Drives/Storage</b>	Front bays: <ul style="list-style-type: none"> <li>• 16 x E3.S EDSFF direct from PSB (x4 Gen5) (post-RTS)</li> <li>• 8 x U.2 NVME direct from PSB</li> </ul> BOSS – N1 – 2 x M.2 NVMe		
<b>USB</b>			
<b>Storage Controllers</b>			
<b>COMMs</b>	2 x 1GbE LOM		
<b>Cooling</b>			

# Technical Specification comparison – high-end GPU systems

## PowerEdge XE9680 versus HPE Cray XD6500

Features	PowerEdge XE9680	Cray XD6500	Comments
PCIe slots			
GPUs			
Power Supplies			
System Management			
OS Support			





# Specification Comparison 2S blade: PowerEdge MX760c versus HPE Synergy 480 Gen11

Feature	PowerEdge MX760c	Synergy 480 Gen11	Comment
<b>Chassis</b>	MX7000	Synergy 12000 Frame	Synergy Frame is 10U with up to 12 x 2-socket nodes versus 7U with up to 8 x 2-socket nodes for Dell
<b>CPU</b>	Up to two 4th Generation Intel Xeon Scalable;	Up to two 4th Generation Intel Xeon Scalable; up to 56 cores, 350W	
<b>Memory</b>		32 x DDR5 up to 4800 MT/s	
<b>Storage</b>		Up to 4 x 2.5-inch SAS/SATA/NVMe 2 x M.2 Boot	
<b>Storage Backplane</b>		x 2 Universal Backplane x 4 Universal Backplane x 4 Direct Connect (to proc 1) NVMe No backplane	
<b>Storage Controller</b>		NS204i-d Boot controller Intel VROC (with Direct Connect only) SR416ie-m Tri-mode	

# Specification Comparison 2S : PowerEdge MX760c versus HPE Blade 480 Gen11 (continued)

Feature	PowerEdge MX760c	Synergy 480 Gen11	Comment
IO slots		3 x PCIe 5.0 x16 Mezzanine connectors	
GPU Support		NA to date	
System Management		Synergy Composer iLO6 UEFI	
Power Supplies (in chassis – shared by blades)		2650W Titanium 2900-3400W Platinum 2650W 277VAC 2650W HVDC 2650W -48VDC	
Form Factor	7U Chassis, single-width compute sled	10U chassis – single-width compute sled	
Operating temperature range		10°C to 35°C	
Operating System Support		MS Windows Server MS Hyper-V Server RHEL SLES VMware ESXi VMware vSphere	

# What to tell customers

# Top 5 Reasons our Customers Choose Dell Servers



1

## Need custom?

#1 OEM solutions provider with 20+ years experience, 500+ partners, 40+ verticals, 70+ countries

2

## Need security?

Encrypt & secure distributed server assets both on prem and in the cloud, protect against cyber threats & drift protection with single pane asset management (VMWare & 3<sup>rd</sup> party)

3

## Need automation?

Best systems management tools to seamlessly patch software, upgrade bios, optimize power & thermals, predict system breakdowns & avoid costly downtime

4

## Need actual shipments?

Most resilient world-class supply chain. Our market share proves it.

5

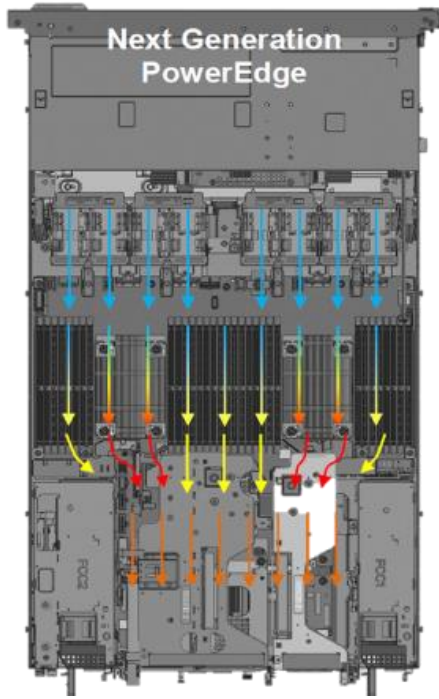
## Need services and financing?

Dell ProSupport-proactive & predictive services and Dell Financial Services facilitates technology acquisition (via OpEx or CapEx)

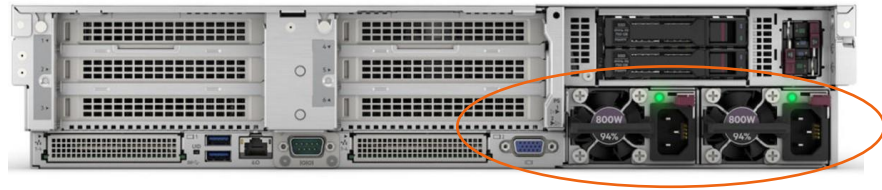
# Dell offers a broader Sapphire Rapids portfolio (to date) to better support customer requirements

Customer requirements	Dell PowerEdge	HPE ProLiant Gen11/ Synergy Gen 11, Cray, Alletra
Top performance accelerator platforms and dense platforms for AI/HPC workloads	<ul style="list-style-type: none"> <li>• XE8640</li> <li>• XE9640</li> <li>• XE9680</li> </ul>	<ul style="list-style-type: none"> <li>• R760xa</li> <li>• C6620</li> </ul>
Top performance in variety of platforms (2S: 1U, 2U, blades; 4S: 2U, 4U) for enterprise workloads	<ul style="list-style-type: none"> <li>• Cray XD6500</li> <li>• Cray XD2000</li> <li>• ProLiant DL380a Gen11</li> </ul>	<ul style="list-style-type: none"> <li>• R660</li> <li>• R760</li> <li>• MX760c</li> </ul>
Mid-range platforms for customers who don't need (and don't want to pay) for high-end systems	<ul style="list-style-type: none"> <li>• R860</li> <li>• R960</li> </ul>	<ul style="list-style-type: none"> <li>• ProLiant DL360</li> <li>• ProLiant DL380</li> <li>• Synergy 480</li> </ul>
Tower platform for customers who want a robust system in an office environment	<ul style="list-style-type: none"> <li>• R660xs</li> <li>• R760xs</li> </ul>	<ul style="list-style-type: none"> <li>• <i>ProLiant DL560</i></li> </ul>
Targeted systems for CSPs	<ul style="list-style-type: none"> <li>• T560</li> </ul>	<ul style="list-style-type: none"> <li>• ProLiant ML350</li> </ul>
Targeted systems for Telco and Edge	<ul style="list-style-type: none"> <li>• HS5610</li> <li>• HS5620</li> </ul>	<ul style="list-style-type: none"> <li>• ProLiant DL320 (competes with R660xd populated with 1 x processor)</li> </ul>
Targeted system for Dense Storage	<ul style="list-style-type: none"> <li>• XR5610</li> <li>• XR7610</li> <li>• XR8000</li> </ul>	<ul style="list-style-type: none"> <li>• R760xd2</li> </ul>
	<ul style="list-style-type: none"> <li>• Alletra 4110</li> <li>• Alletra 4210</li> </ul>	

# Server design to improve airflow to support higher wattage components



- Removing obstructions in the airflow pathway
- Forming airflow channels to target heat generating components
- Balancing airflow within the server by arranging the system layout in a symmetrical fashion



HPE still has the power supplies next to each other

# As a service (aaS) with Dell APEX

- HPE has been pushing customers to GreenLake for years – but at the expense of its offerings through a CapEx model... and as a result, market share
- Dell's aaS offerings through APEX may not have been first to market – but Dell has APEX has a broad vision and ability to execute that HPE sometimes lacks ([click here](#) for a brochure on Dell's vision with APEX)

See Klue for competitive content on GreenLake (sample below): <https://app.klue.com/search/greenlake>

**OFFERING SUMMARY**

## HPE GreenLake Offering Summary

**In Their Own Words**

*"The HPE GreenLake platform brings the cloud experience to your apps and data, wherever they reside, by providing a robust as-a-service portfolio that drives flexibility and speed to market. It helps you rapidly deploy a broad portfolio of cloud services such as machine learning operations (ML Ops), containers, storage, compute, virtual machines (VMs), data protection, and more—with no up-front cost."*

What It Is	What it Means
<p><b>HPE's portfolio of on-premises, ITaaS solutions</b> GreenLake consists of two primary offers:</p> <ul style="list-style-type: none"><li>• GreenLake Cloud Services</li><li>• GreenLake Flex Capacity</li></ul> <p>All GreenLake solutions are managed via the customer-facing GreenLake Central management portal</p> <p><b>GreenLake Cloud Services</b> are the highlighted offers of HPE GreenLake. GL Cloud Services are made up pre-bundled HPE and 3rd party ISV solutions.</p> <ul style="list-style-type: none"><li>• 17 use case-based Cloud Services categories with pre-architected solutions:<ul style="list-style-type: none"><li>• Containers, AI/ML/Analytics, Biz Applications, Edge, Containers, Virtual Machines, Hybrid/Private Cloud, Big Data, SAP HANA, Database, HPC, VDI, HCI, Managed Cloud Services, Migration, Data Protection, Networking, Storage, Compute, Security/Risk/Compliance</li></ul></li><li>• Total of 70 different pre-bundled or custom configuration options and offers across all Cloud Services</li></ul> <p><b>GreenLake Flex Capacity</b> is a "build your own" -aaS offering, with a committed term and capacity amount</p>	<ul style="list-style-type: none"><li>• Achieve a cloud-like experience on-premises</li><li>• Target customer:<ul style="list-style-type: none"><li>• Wants to preserve cash flow and pay only for capacity used</li><li>• Has a "cloud-first" strategy, but has concerns about risk/control/security of public cloud</li><li>• Needs to keep certain workloads/applications on-premises</li><li>• Looking to change to OPEX treatment for IT procurement</li><li>• HPE GL supports 5 major industries (Financial, Healthcare, Mfg., Public Sector and Telco)</li></ul></li><li>• Despite the "cloud services" name, all offers are on-premises solutions housed in the customer data center or a colocation facility</li><li>• Some Cloud Services offers are infrastructure configurations, and some are only professional services. It varies by offer.</li><li>• PointNext Services and Aruba are part of every HPE GL deal to upsell and cross-sell services.</li><li>• It's not a very intuitive process to know which category or configuration the customer should choose. It requires hands-on assistance from an HPE sales rep or partner to wade through all the available options.</li><li>• 100% OPEX (no customer asset ownership)</li><li>• Customer curates their own custom solution in a pay per use model</li><li>• A close comparison to APEX Flex On Demand</li></ul>

Content based on publicly available information, anecdotal reports, and/or observation and opinion of the content author. Dell does not represent or warrant that the information is accurate, complete or error-free. Use in breach of Partner or site terms is strictly prohibited. Dell Confidential. For Partner's internal education use only. Do not share or distribute.

**Dell Technologies**  
COMPETITIVE INTELLIGENCE | Battleground

# Dell is an innovator




**Top 300 Organizations Granted U.S. Patents in 2022**

40<sup>th</sup> Annual Listing

This list of organizations that received the most U.S. utility patents is being published by IPO for the 40<sup>th</sup> consecutive year, in collaboration with [Clarivate Analytics](#). It is based on data obtained from the U.S. Patent and Trademark Office.

For additional patent prosecution, technology, and low firm statistics related to the U.S. Patents issued in 2022, visit the [Patent 300<sup>®</sup> website](#) for an interactive dashboard.

January 6, 2023

**2022 Patent Owners**  
Numerical Listing

The total number of patents granted by the USPTO in 2022 was 323,058, down 1 ppm individual organization could be affected by merger, acquisitions, divestitures, inco 2021 and 2022, and many other factors. New organizations on the list are provided 0

Rank	Organization	2022 Patents	Change from 2021
1	SAMSUNG ELECTRONICS CO., LTD.	8513	0%
2	INTERNATIONAL BUSINESS MACHINES	4743	-44%
3	LG CORPORATION	4580	5%
4	TOYOTA JIDOSHA K.K.	3056	11%
5	CANON K.K.	3046	-10%
6	TAIWAN SEMICONDUCTOR MFG. CO.	3038	8%
7	HUAWEI TECHNOLOGIES CO., LTD.	3023	3%
8	BOE TECHNOLOGY GROUP CO.	2725	27%
9	RAYTHEON TECHNOLOGIES	2684	0%
10	QUALCOMM	2656	22%
11	SONY CORPORATION	2638	1%
12	INTEL CORPORATION	2501	-9%
13	DELL TECHNOLOGIES	2445	19%
14	APPLE INC.	2313	-11%
15	ALPHABET INC.	2077	2%

Dell innovates to improve technology use for current and future systems/workloads. And Dell's ongoing interactions with customers helps guide how we bring technology to market.

# Sustainability

# Electronic Product Environmental Assessment Tool (EPEAT)



## [From the US Environmental Protection Agency \(EPA\):](#)

EPEAT is a global ecolabel for the IT sector. EPEAT helps purchasers, manufacturers, resellers, and others buy and sell environmentally preferable electronic products.

EPEAT-registered products must meet environmental performance criteria: materials selection, supply chain greenhouse gas emissions reduction, design for circularity and product longevity, energy conservation, end-of-life management and corporate performance.



GLOBAL  
ELECTRONICS  
COUNCIL

*Sustainability for a Connected Future*

EPEAT is owned and managed by the GEC – developed via a grant from the EPA

# PowerEdge is the EPEAT Ecolabel leader for server sustainability

The EPEAT Program recognizes three tiers of sustainability performance:

1. EPEAT Bronze
2. EPEAT Silver
3. EPEAT Gold

The Bronze Tier is based on Required Criteria

Optional Criteria are designed to offer flexibility and allow Participating Manufacturers to select different Criteria to achieve the EPEAT Silver and EPEAT Gold tiers.

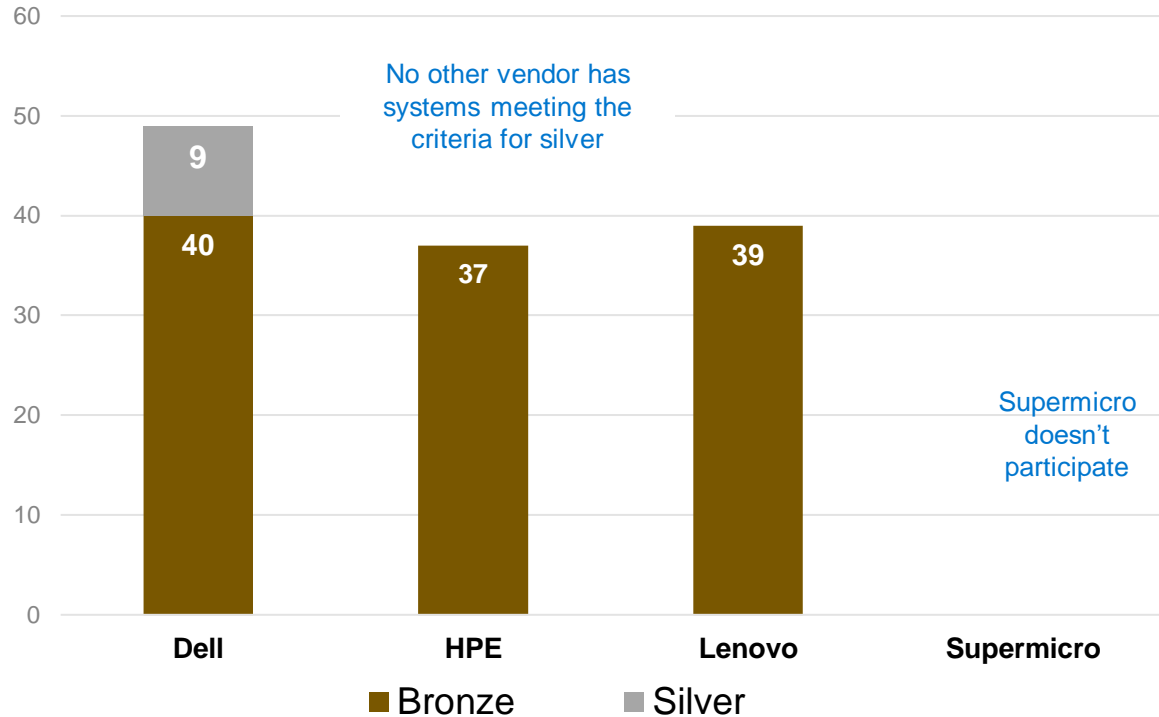
- EPEAT Bronze products meet all Required Criteria
- EPEAT Silver products meet all Required Criteria and a minimum of 50% of the available points for Optional Criteria
- EPEAT Gold products meet all Required Criteria and a minimum of 75% of the available points for Optional Criteria



# PowerEdge is the EPEAT Ecolabel leader for server sustainability



EPEAT is owned and managed by GEC – developed via an EPA grant



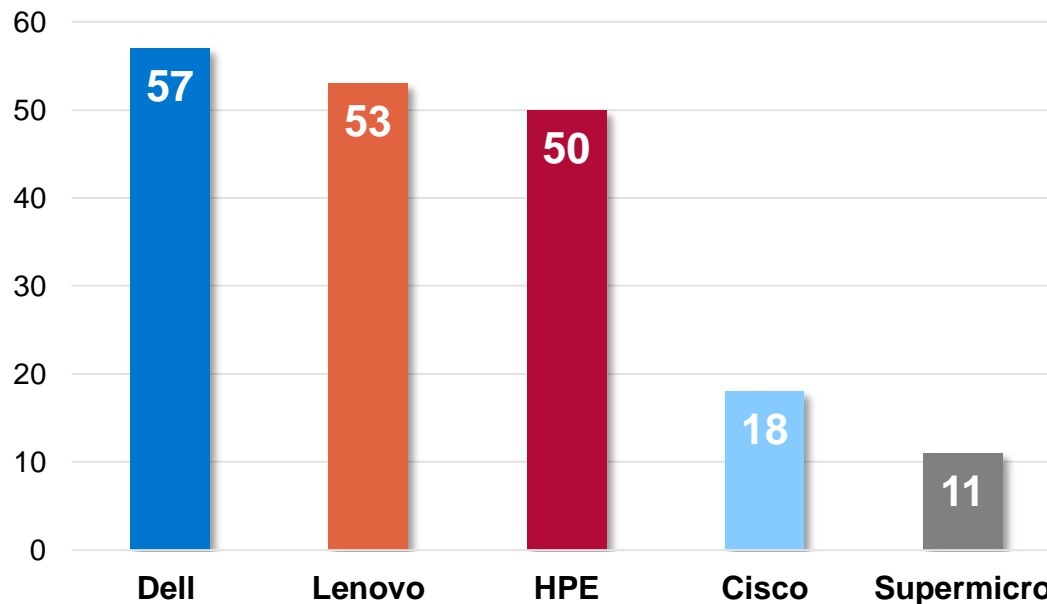
Retrieved from [EPEAT Registry](#) 3/15/23



PowerEdge  
is the  
Energy Star  
leader for  
servers



## Energy Star Enterprise Server Certifications



Information accurate as of March 24, 2023, from <https://www.energystar.gov/>

# OME Power Manger 3.0 Sustainability

- Carbon emissions usage calculator and capacity planning
  - **Use OME Power Manager to map actual CO2 emissions for PE servers:**
    - Individual servers or groups of servers
    - Measure one hour back to 365 days back (depending on how long Power Manager has been installed and collecting data)
  - **CO2 emissions reports can:**
    - Use the default CO2 emissions value as published by U.S. Dept of Energy
    - Use a customer's location specific value (if the customer does not know this value, they can easily search on country and city for specific CO2 emissions average using their favorite browser search engine – this data is widely published)
    - Be used to show actual CO2 emissions as related to usage in order to reduce power in off hours, reduce power all the time, and reduce the carbon emissions related to the excess power consumption
    - Run reports at a point in time (i.e., daily, weekly, monthly) to compare



## Customer Benefits

- Create reports for facilities or government entities to show CO2 emission reductions
- Use reports to lower emissions to meet “green data center” standards

**NOTE:** *CO2 emissions information coupled with data center's Power Usage Effectiveness (PUE) metric identifies emissions caused by a data center's facility (cooling, lighting, etc.) in comparison to PowerEdge devices*

- Create reports for under utilized servers (zombies, comatose, ghost):
  - Quickly identify PE servers that are not being utilized yet using power and emitting CO2
  - Repurpose, replace, remove the servers to reduce the CO2 emissions

**DELL**Technologies