

HPC on demand - Overview

Jay Boisseau, PhD
HPC & AI Technology Strategist
Dell Technologies

for Hyperion HPC User Forum



We hear . . .



We can't respond fast enough to user demands for HPC



More users are asking for HPC resources requiring time and budget



We don't have the staff or budget to expand HPC quickly



Staff time and skillsets are stretched trying to respond



We need resources on demand without billing surprises

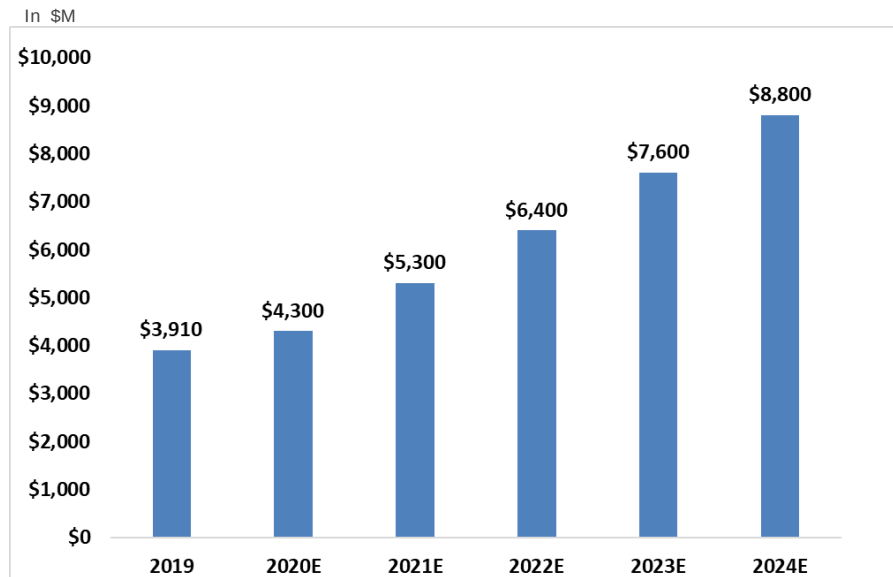


Large data transfer fees and other hidden costs can come as a surprise

WW HPC Cloud to grow +15.4% to \$8.8B by 2024

- HPC Cloud adoption drivers
 - Move from Capex to Opex (pay-per-usage or subscription model)
 - Access extra capacity quickly
 - Accelerating new projects
 - Access to new resource types for high throughput workloads
 - Shift operational complexity and risk to a cloud provider
 - Move from HW-centric approach to a SW-centric approach
 - And some Covid-accelerated cloud adoption
- HPC customers using public clouds now
 - Enterprise customers including HCLS, MFG
 - Divisional, Dept and Workgroup segments
- HPC cloud expected to grow faster than on-premises

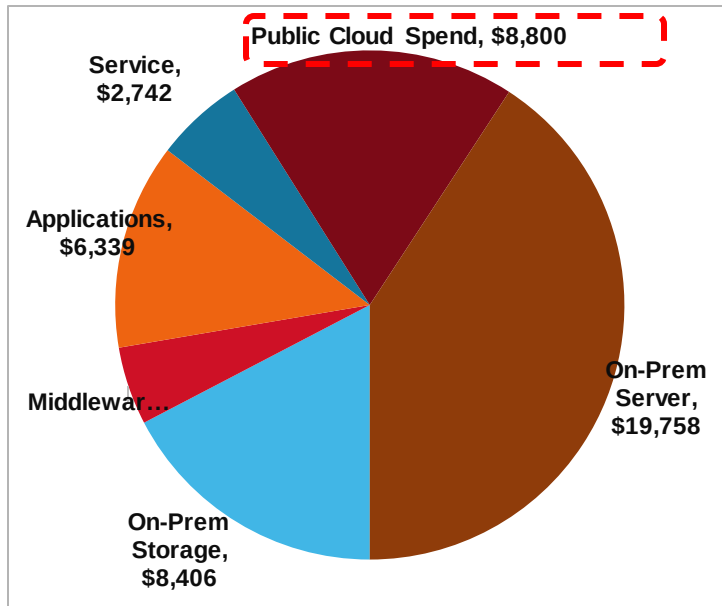
WW HPC Cloud Market Forecast



Source: Hyperion Research, January 2021

HPC Cloud market forecasted to be \$8.8B by 2024 with an overall CAGR of +15.4%

Total HPC Market 2024: \$48B



Source: Hyperion Research, January 2021

	2020	2021	2022	2023	2024	CAGR '20-'24
On-Prem Server	\$12,671	\$14,097	\$16,683	\$18,813	\$19,758	9.3%
On-Prem Storage	\$5,105	\$5,737	\$6,873	\$7,945	\$8,406	10.5%
Middleware	\$1,402	\$1,576	\$1,902	\$2,171	\$2,317	10.6%
Applications	\$4,062	\$4,455	\$5,258	\$5,862	\$6,111	8.5%
Service	\$1,899	\$2,040	\$2,366	\$2,587	\$2,643	6.8%
Public Cloud Spend	\$4,300	\$5,300	\$4,600	\$7,600	\$8,800	15.4%
Total HPC	\$29,439	\$33,205	\$37,682	\$44,978	\$48,035	10.3%

Source: Hyperion Research, January 2021

Cloud Market by Competitive Segment (\$M)

	2021	2022	2023	2024	CAGR '19-'24
Supercomputer	\$933	\$1,134	\$1,354	\$1,576	18.30%
Divisional	\$1,529	\$1,837	\$2,170	\$2,499	17.00%
Departmental	\$1,443	\$1,733	\$2,047	\$2,357	17.00%
Workgroup	\$1,394	\$1,696	\$2,030	\$2,368	18.50%
Total	\$5,300	\$6,400	\$7,600	\$8,800	17.60%

Source: Hyperion Research, April 2021

(\$M)	2018	2019	2024	2019-2024 CAGR
Bio-Sciences	\$778	\$1,230	\$2,453	14.8%
CAE	\$469	\$733	\$1,540	16.0%
Chemical Engineering	\$62	\$98	\$211	16.6%
DCC & Distribution	\$141	\$222	\$519	18.5%
Economics/Financial	\$123	\$195	\$430	17.2%
EDA	\$178	\$285	\$677	18.9%
Geosciences	\$148	\$240	\$660	22.4%
Mechanical Design	\$12	\$20	\$44	17.5%
Defense	\$185	\$296	\$705	18.9%
Government Lab	\$173	\$274	\$625	17.9%
University/Academic	\$123	\$197	\$528	21.8%
Weather	\$26	\$42	\$220	39.0%
Other	\$49	\$79	\$188	18.9%
Total	\$2,466	\$3,910	\$8,800	17.6%

DELL Technologies

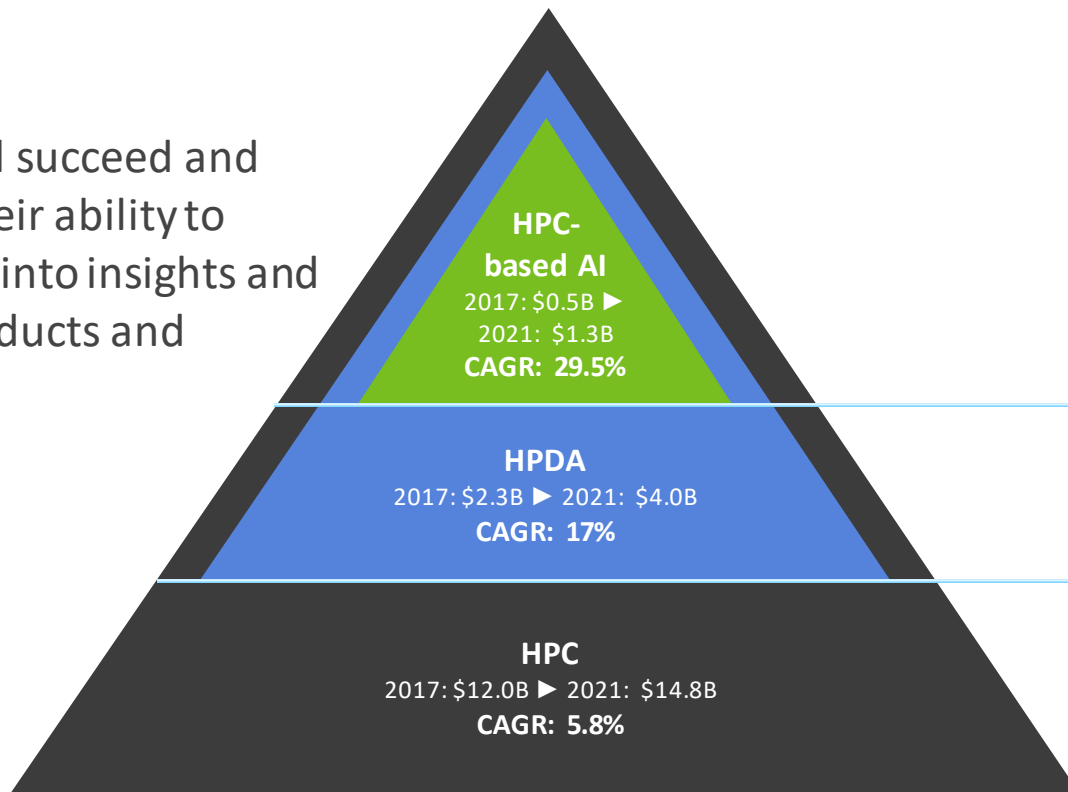
Source: Hyperion Research, June 2021

HPC provides the infrastructure for HPDA and AI

"Companies will succeed and fail based on their ability to translate data...into insights and actions and products and services."

- Michael Dell

Forbes



- Fraud / anomaly detection
- Predictive maintenance
- Personalized medicine

- Genomics
- Financial analytics
- Business intelligence

- Computer-aided engineering
- Weather forecasting
- Seismic analysis

HPC on demand – What is it?

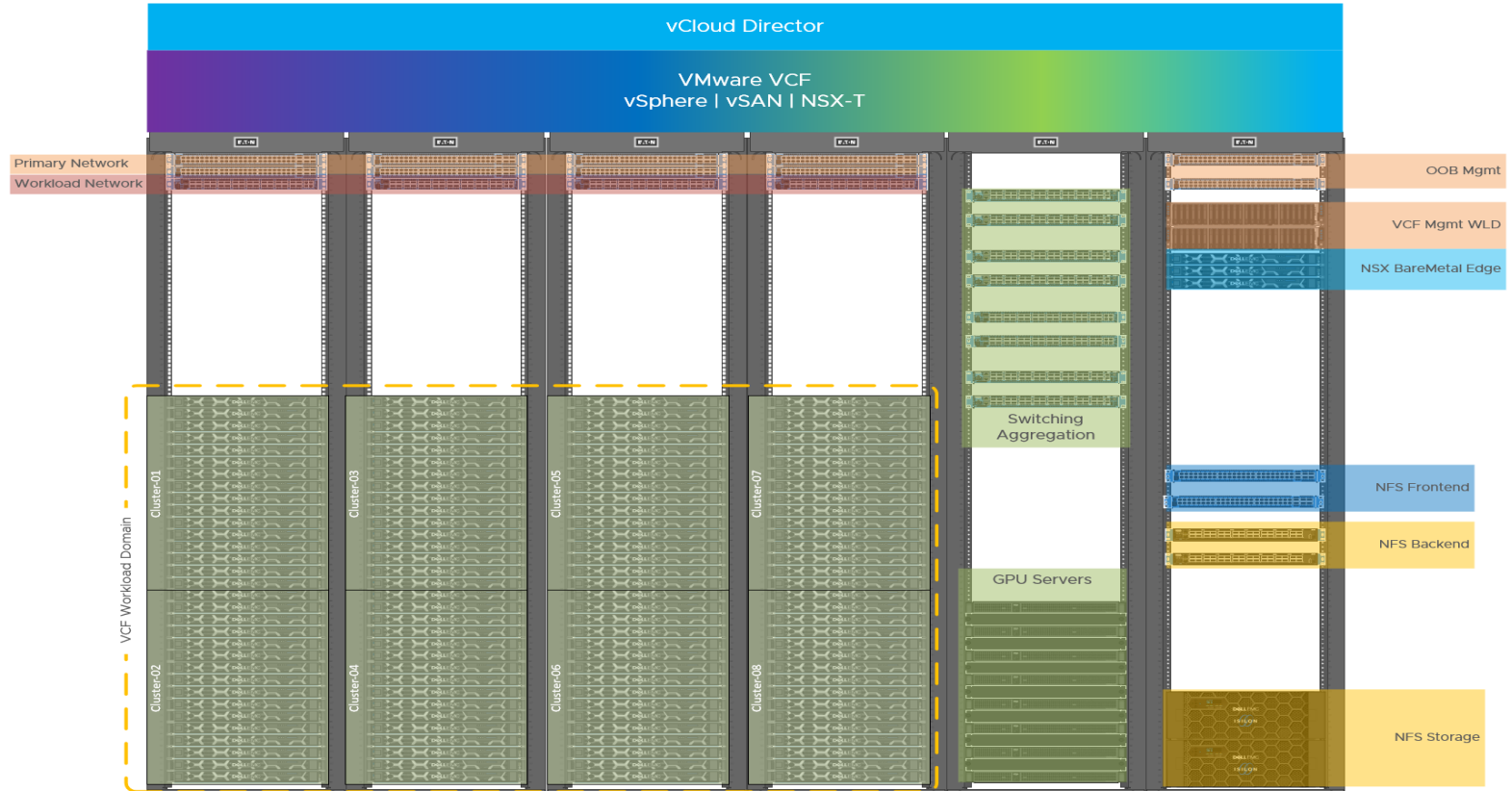
- A public cloud-style HPC offering
 - Secure, clean images for each customer, secure networking, etc. (VMware ESX, NSX, etc.)
 - “Bring your own images” etc. (VMware vCloud Director, etc)
 - Managed for multiple customers, on demand usage (R Systems)
- with HPC infrastructure
 - Dell servers with Intel Xeon processors, intel Optane, GPUs
 - 100Gbps Ethernet (Dell)
 - HPC software images (Omnia, Bright)
 - Optimized vHPC configuration (VMware)
- for HPC workloads (only)
 - Parallel simulation
 - HPDA
 - AI/DL
 - High throughput

***HPC on demand: pay-as-you-go access
to scalable HPC resources***



VMware is a key partner

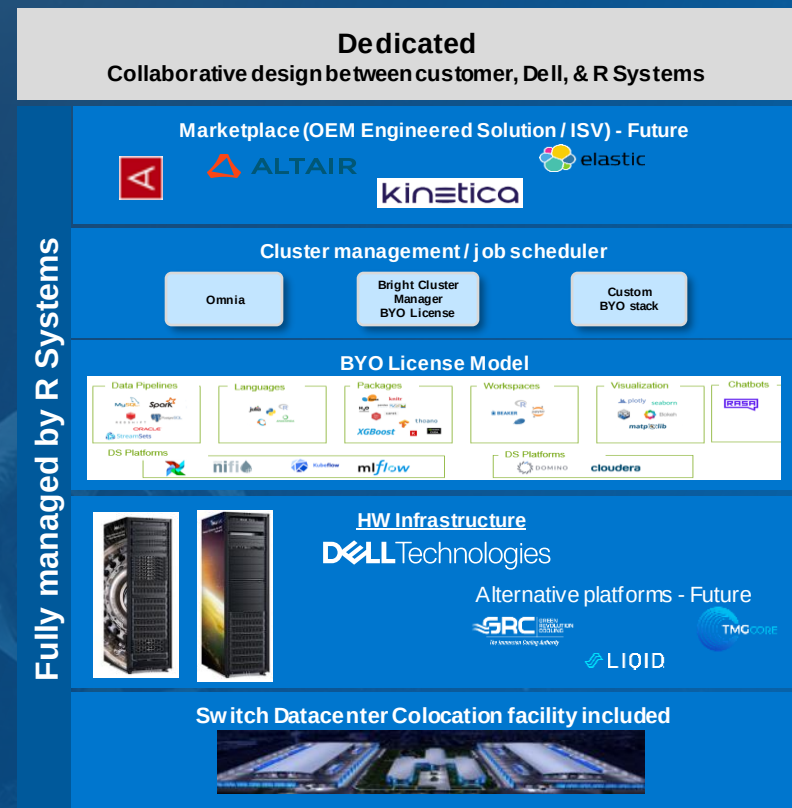
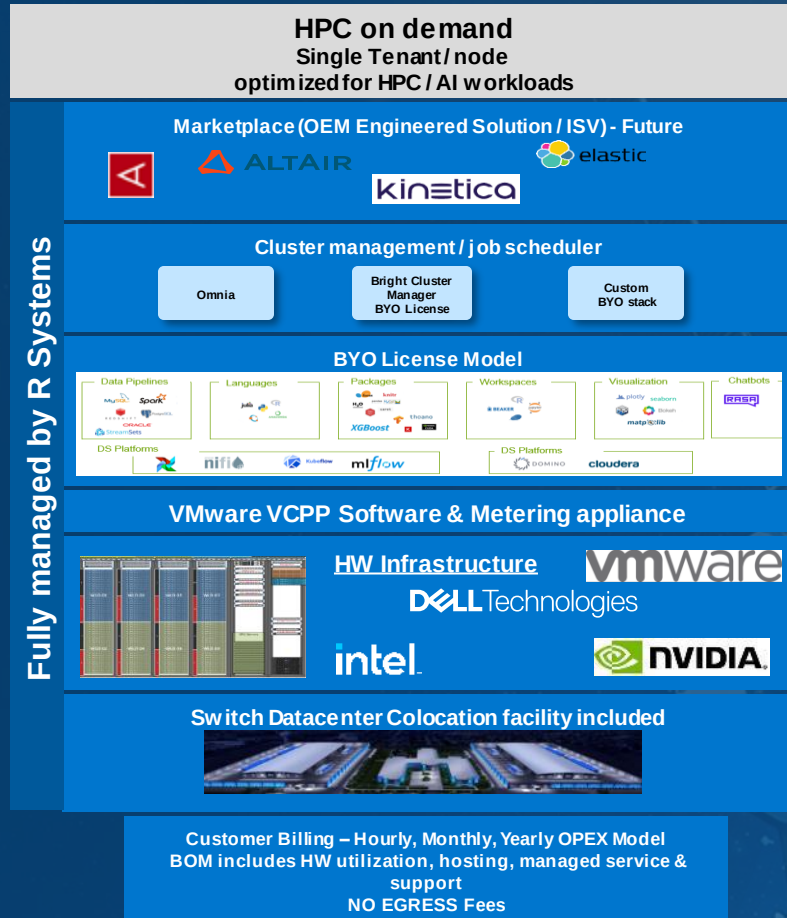
- ESXi Hypervisor: Industry standard, secure, and widely adopted
- NSX
 - Quickly create new isolated tenant networks
 - Self-service IPSEC VPN connectivity
 - Self-service firewall capabilities, including creating rules between VMs on the same network
- vSAN
 - High performance at lower cost
 - No interruption for a disk failure
 - Definable resilience through storage policies. (i.e., select RAID1 or RAID6 depending on the VM, and change it on the fly)
- VMware in use everywhere
 - Easy to migrate VMs in, or integrate into existing IT processes and workflows
 - Customers who are already familiar with VMware will have an easier time adopting a familiar platform
 - Easy to find support. Solutions are well documented by VMware, partners, and enthusiasts.
 - Compliance frameworks exist to help easily certify VMware environments for various regulatory needs
- Easy to scale
 - Easy to implement and federate across multiple sites, or on multiple clouds.



Access Modes

- GUI
 - vCloud Director – Basic Interface
 - All the knobs and levers to manage networking, VPN, instances and image catalogs. Highly flexible and customizable cloud infrastructure
 - Perfect for experienced VMware users and central IT administrators.
 - vCloud Director – Service Library
 - Pre-configured click-and-run clusters
 - Service provider populated depending on client needs
- API
 - vCloud Director/API are mature platforms. Point to your Dell HPC on Demand endpoint with your credentials and leverage familiar tools.
 - Reusable Templating systems
 - Re-use existing or build new templates to auto-deploy from CLI
 - E.g. Terraform, Omnia, Ansible, etc
 - Leverage any vCloud API integrated platform to extend into our cloud
 - vRealize Operations, Bright Cluster Manager, more coming soon

HPC on demand vs Dedicated



Customer Billing – 3 Year OPEX or CAPEX
BOM includes All HW, managed service & support
NO EGRESS Fees

HPC on demand announcement at ISC21

June 28, 2021 (with RTS in July)

Press release
June 28, 2021

Dell Technologies Drives Convergence of High Performance Computing, AI and Data Analytics with Omnia Open Source Software

Story Highlights

- Dell Technologies developed open source Omnia software speeds and simplifies AI and compute intensive workload management and deployment
- HPC on demand service now offers you a pay-as-you-go resource for hybrid clouds with Omnia infrastructure
- Dell EMC PowerEdge servers and Dell EMC VxRail hyperconverged infrastructure solutions support

ROUND ROCK, TEXAS – June 28, 2021 – Dell Technologies (NYSE:DELL) is introducing new solutions to help customers better manage the convergence of high performance computing (HPC), artificial intelligence (AI) and data analytics. To help organizations realize data-driven innovation, such as genomics sequencing to predict disease development, Dell is also expanding HPC on demand services and Dell EMC PowerEdge servers and Dell EMC VxRail hyperconverged infrastructure solutions support.

“As an AI/ML and data analytics coverage, storage and networking configurations have remained in silos, making it challenging for IT teams to provide required resources for shifting demands,” said Peter Marini, senior vice president of integrated solutions at Dell Technologies. “With Dell EMC open source software, customers can dramatically simplify the management of advanced computing workloads, helping them speed research and innovation.”

Simplifying and accelerating the convergence of workloads with Omnia

Omnia was developed at the Dell Technologies HPC AI Accelerator with Dell EMC open source software and Dell EMC support from the HPC community. The open source software is designed to automate the provisioning and management of HPC. AI and data analytics workloads to reduce a single point of failure, increase the speed of deployment and reduce costs. Dell EMC open source software is designed to reduce a single point of failure, increase the speed of deployment and reduce costs.

The Omnia software stack is an open source set of tools and libraries that speed the deployment of converged workloads onto Dell EMC servers and Dell EMC VxRail hyperconverged infrastructure. Omnia automatically ingests a software solution into each server based on the user's needs. The managed HPC solution is available for AI, machine learning, genomics and data analytics. It is a robust deployment layer that works to reduce:

- Complexity
- Cost
- Time to market
- Time to deployment

Community customers and contributors are supported for Omnia advancement. Omnia is currently Research Computing but will move into production with the Dell Technologies HPC AI Accelerator. Dell EMC open source software is designed to reduce a single point of failure, increase the speed of deployment and reduce costs.

HPC on demand with Omnia offers engine infrastructure access

Dell Technologies is expanding the HPC on demand offering to now support Omnia infrastructure. With HPC on demand open source software, customers can use advanced infrastructure to support their peak computing needs when they need it, with the addition of Omnia open source software. Omnia open source software and Dell EMC open source software are now a robust cloud computing solution.

Dell Technologies
Solutions brief

Get HPC on Demand
Extend your capabilities with on-demand access to HPC resources and technical expertise

HPC made easy
Every day, more organizations want to leverage the power of high performance computing (HPC) to fuel innovation. However, many don't have the resources to buy, build and tune HPC clusters. Dell Technologies can help you get the resources you need to compete, with scalable, flexible HPC on demand, delivered with zero down management overhead.

The opportunity to pay per use for HPC resources makes advanced computing more accessible, helping you:

- Access HPC on demand
- Pay for the HPC resources you need to compete, with scalable, flexible HPC on demand
- Reduce HPC on demand overhead of your hardware and a single point of contact. Dell EMC experts can help you build, manage and tune the systems for your workloads – no need to hire HPC staff
- Early access to new HPC resources by building on HPC in the cloud

Benefits to you include:

- Save the time and resources required to build and tune HPC systems
- Get fast, consistent performance of work with well-managed HPC systems that are optimized for your workloads
- Extend your staff with HPC resources when and where you need them

Pay per use as described:

- Pay for the resources you use
- Pay for the resources you use
- Pay for the resources you use

With HPC on demand from Dell Technologies, you can focus on using HPC to:

- Improve, tune, manage and tune the systems

Dell Technologies
Cloud bursting for engine speed

Customer profile
MERCURY
Manufacturing | United States

“We can digitally look at a hundred design iterations in the amount of time it might take to do one physical iteration.”
Arden Anderson
Engineering Director, Mercury Marine

Business needs
The engineering team at Mercury Marine needs on-demand access to high performance computing resources to run complex computer aided engineering simulations.

Business results

- Accelerating design and engineering cycles
- Reducing time to market for new innovations
- Cutting product development costs
- Creating more durable and robust products

Solutions at a glance

- HPC on demand with Dell EMC
- Dell EMC PowerEdge servers
- Dell EMC VxRail hyperconverged infrastructure
- Dell EMC PowerFlex software

- SC20: [Announced](#) HPC/AI on demand with partners
- [Spire case study](#) | [R Systems partner brief](#)
- [Announced](#) Maverick at [ISC21](#)
- [1x Dell Tech session](#) with > 100 registrants and [1x Intel session](#)
- Microsite: insidehpc.com/dell
- delltechnologies.com/hpc inclusion
- Social media promotion
- Upcoming VMworld session
- SC21 momentum

Press release

~60 press and analysts briefed

Solution Brief | Solution Overview

Team trained ~200

Training slides | Customer slides

Mercury Marine
Case study: [Written](#) | [Video](#)
> 100 views

Summary & Opportunities

- Our partnership is building an HPC-focused cloud capability
- Our advantages will be
 - Dell/Intel HPC optimized infrastructure
 - VMware features, scalability, reliability
 - R Systems HPC expertise
 - ***Performance and price/performance competitiveness/advantages***
 - ***HPC support!***
 - ***No data egress fees!***
- Opportunities
 - Making it as easy/easier to user than any other
 - Scaling fast/large
 - Adding new technologies quickly
 - Integrating with our other solutions
 - Hybrid cloud with our on-prem solutions

Questions & Discussion