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On-Premise performances with the flexibility of the cloud

HPC Knowledge Meeting'20

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HPC is a late moving workload to the cloud

- Historically, companies have invested millions of $ in HPC infrastructure on-premise

- Initial cloud performance were not great due to virtualization of the OS, network,…

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The HPC market is growing

HPC cloud usage on the rise

Cloud is the fastest growing segment of the HPC market, projected to exceed $3B by 2023

– Intersect360

HPC cloud revenue is projected to reach $7.4 billion in 2023, reflecting a compounded annual growth rate (CAGR) of 24.6 percent

– Hyperion Research

HPC market $44 billion by 2023

– Hyperion Research

HPC investments are paying dividends

An investment in HPC results in an average increase in revenue of $463 per dollar invested in HPC, and an average increase of profits (or cost savings) of $44 dollars per dollar

- IDC

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On-premises HPC workload challenges

Capacity Planning

- Correctly balancing capacity across planned and unplanned demands
- Supply chain and procurement processes can result in delays of months
- Existing capacity doesn't run our jobs quickly enough

High Costs

- Over-provisioning to ensure burst capacity can lead to overspending
- Cost of lost performance on legacy hardware.
- Power, cooling, networking, storage, hw and sw add to on-premises costs

Hard to Optimize Operations

- HPC farms must run are near capacity to to maximize ROI
- Under-provisioning can lead to long queuing times for new jobs, productivity
- Staying on top of security and compliance requirements is demanding and missteps can be devastating

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How Customers Benefit From Moving HPC workloads to the Cloud

	Cost	Capacity	Flexibility	Performance
Engineering Outcome	Reduce on-premises infrastructure spend and predict costs based on usage	Solve models faster with access to more compute and storage	Run jobs at any time with on demand HPC compute capacity	Best price performance of any cloud vendor. Largest single node machines. Largest available on-node storage
IT Outcome	Eliminate the hardware refresh and capacity planning vicious cycle	Utilize cloud to respond to unplanned jobs and eliminate job queues	Focus on strategic priorities, not managing hardware and software	Next generation performance matches on-premises hpc clusters

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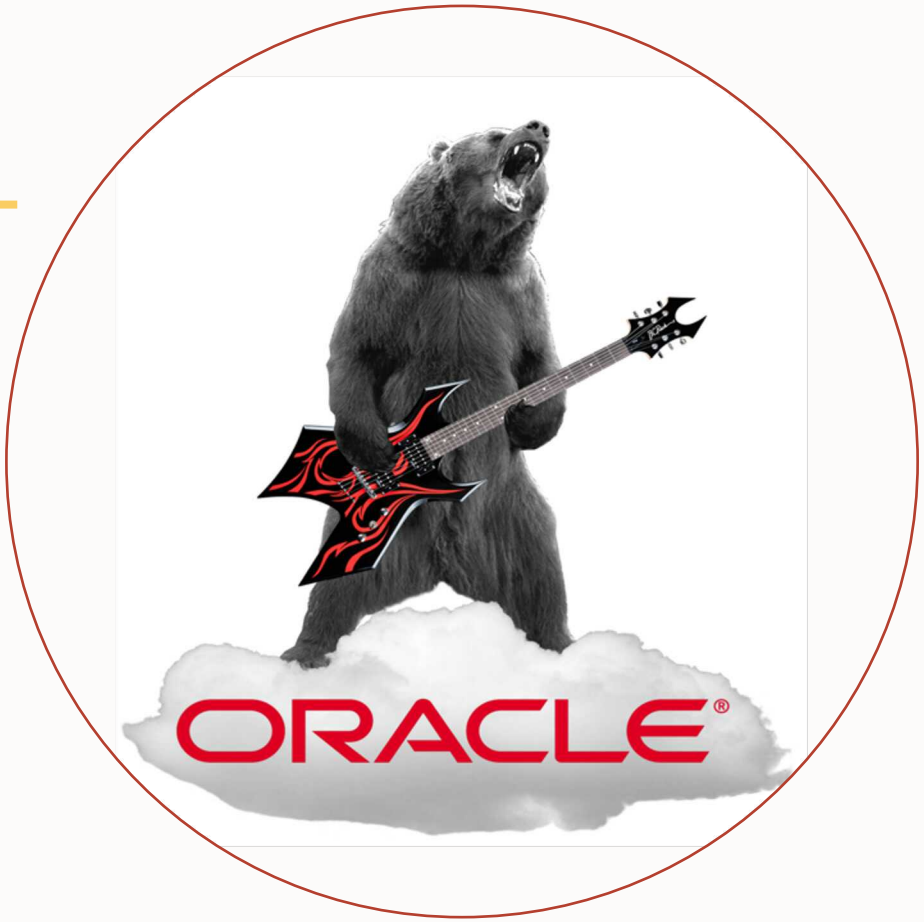

The Metal in Bare Metal

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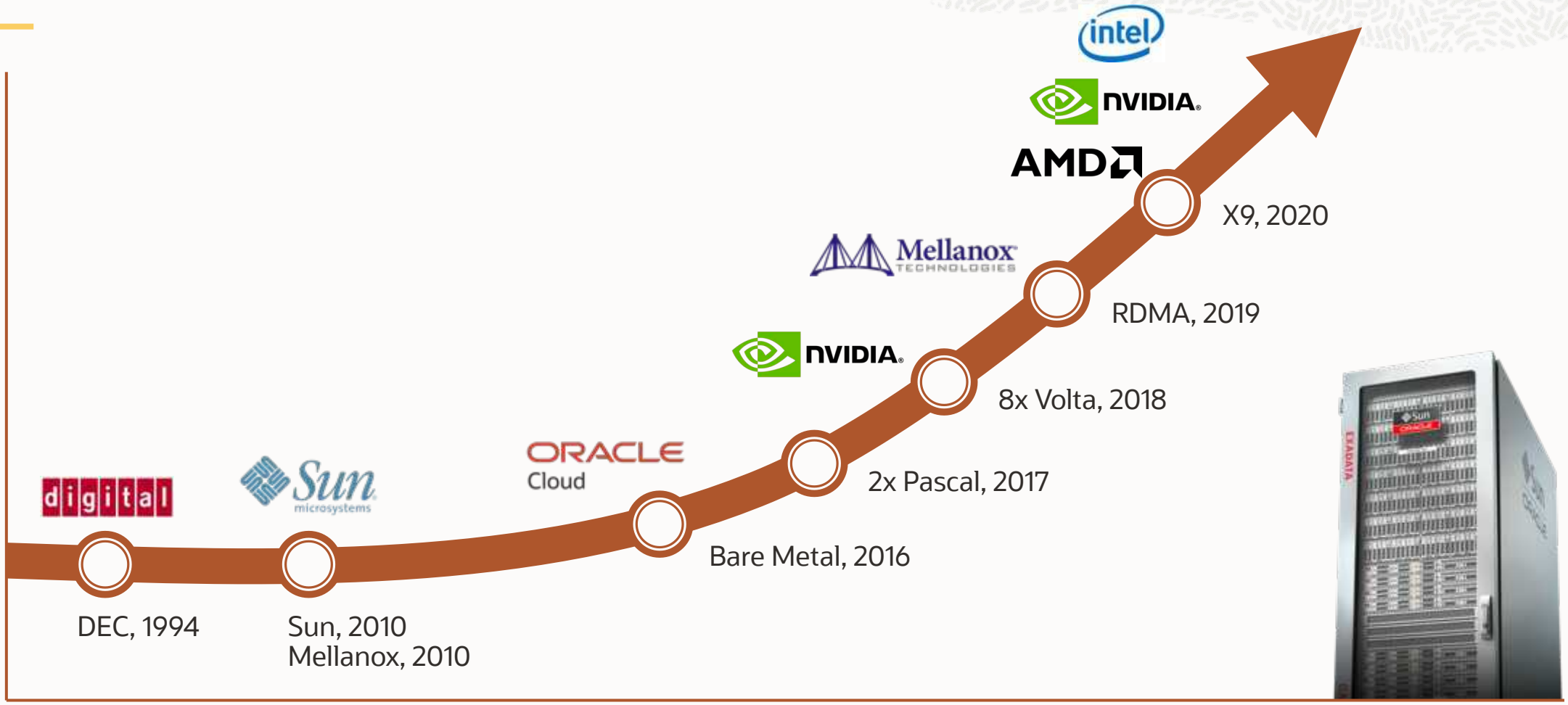
Oracle's HPC journey



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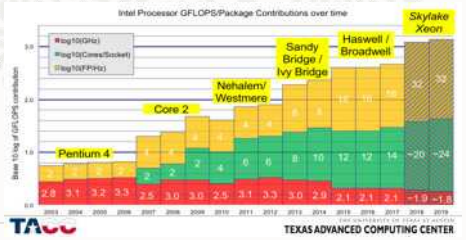
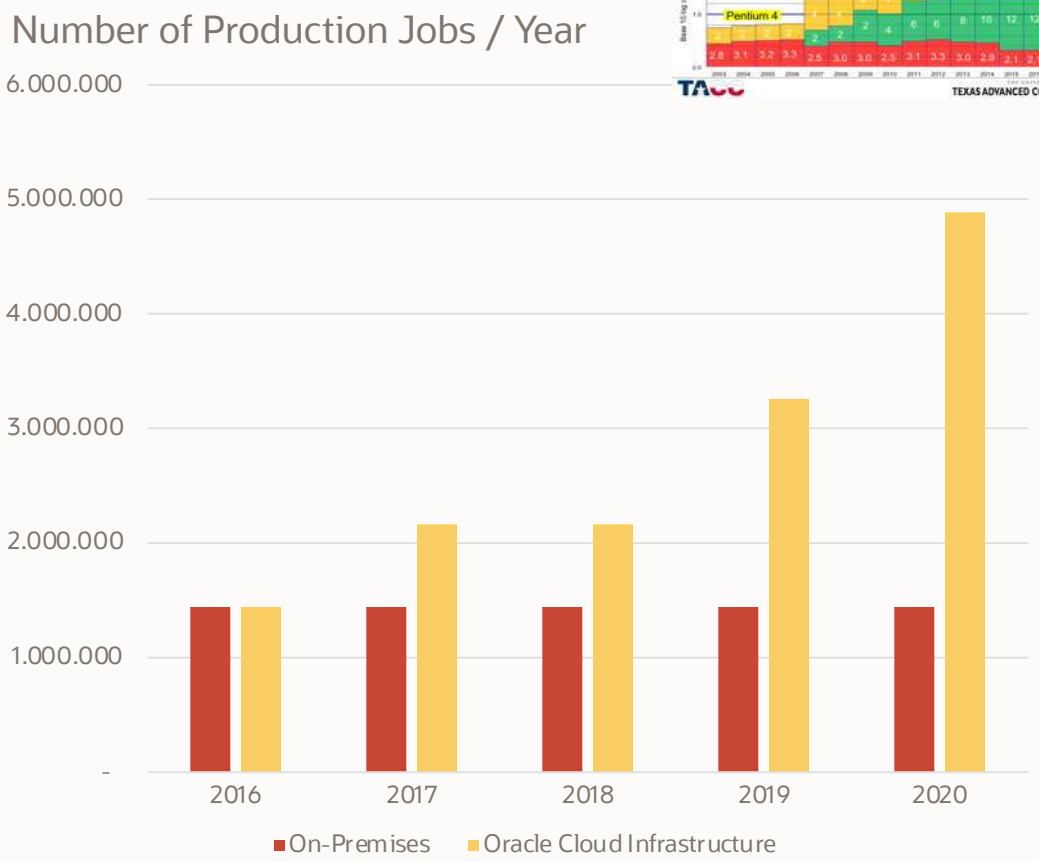
On-premises cost of lost performance

- As a cloud provider we launch new instances running on the latest hardware every year
  - 2016: Intel Broadwell
  - 2017: NVIDIA Pascal
  - 2018: Intel Skylake and NVIDIA Volta
  - 2019: AMD Naples
  - 2020: AMD Rome and upcoming NVIDIA and Intel hardware
- According to Texas Advanced Super Computing Center (TACC) and our own experience, performance in GFLOPS doubles every 5-7 years
- For HPC applications, that means potentially 7x performance in 5 years, on-premises deployments lose out in those gains





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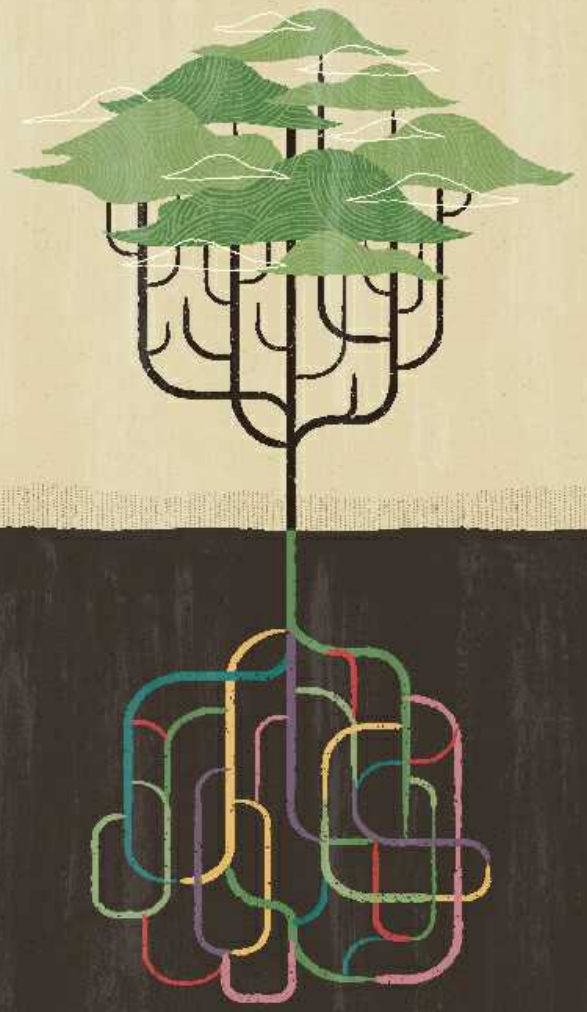
Oracle Cloud Infrastructure for HPC



Maximize your compute spend to deliver innovation fast

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CPU core Vs GPU core

- CPU core: relatively heavy-weight, designed for complex control logic, optimized for sequential programs.
  - Embarrassingly Parallel
  - Tightly-coupled
- GPU core: relatively light-weight, designed with simple control logic, optimized for data-parallel tasks, focusing on throughput of parallel programs.

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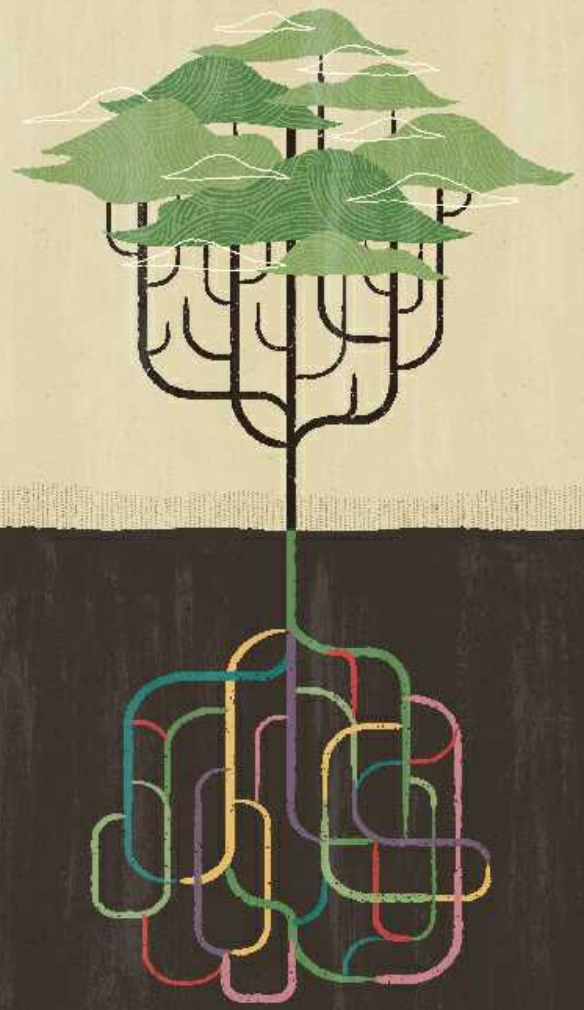
Oracle Cloud Infrastructure for HPC



Technical details

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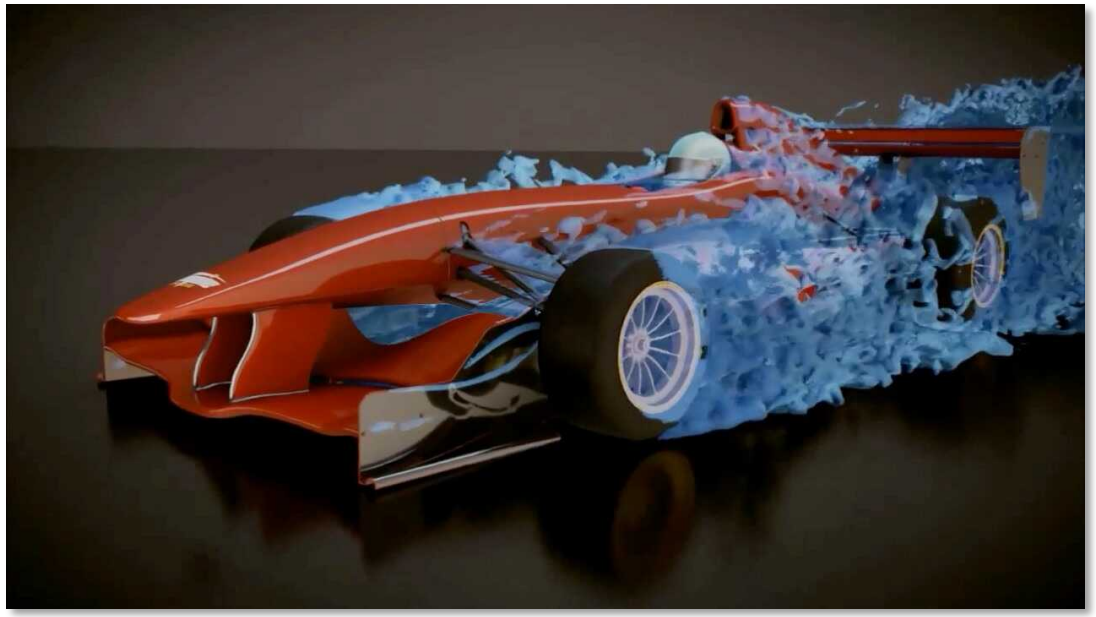
3.7 GHz, All Cores Turbo

36 Cores of Intel 6154 High Performance
384 GB of memory and **6.4 TB** of local storage

20k over 20,000 cores in a single RDMA cluster



intel HPC

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128 Physical Cores on a single machine
256 total threads

2 TB of memory along with 2x50Gbps network bandwidth

VMs available with choice of CPUs and (very soon) RAM

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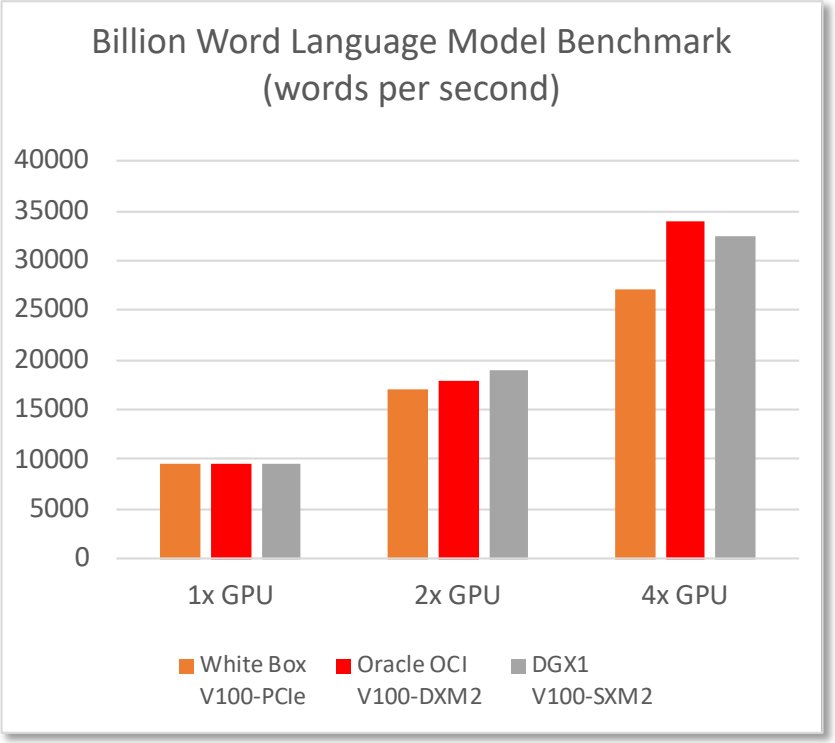
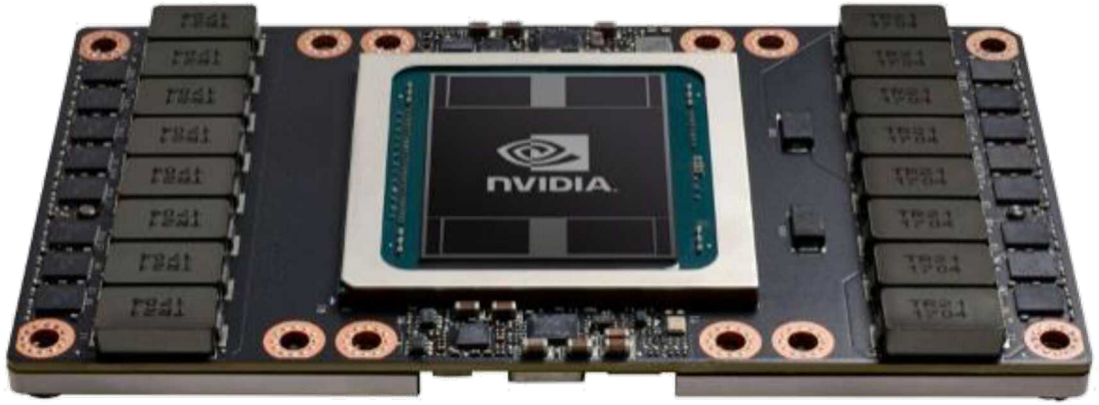
8 BM.GPU3.8 – 8 Way NVIDIA Volta SXM2, NVLINK, HGX-1 Open Compute 52 Skylake CPU cores, 50 Gbps

2 BM.GPU2.2 – 2 Way NVIDIA Pascal Perfect for Visualization or Inferencing

1 Attach up to 1 PB of NVME backed block storage to “Feed the Beast”





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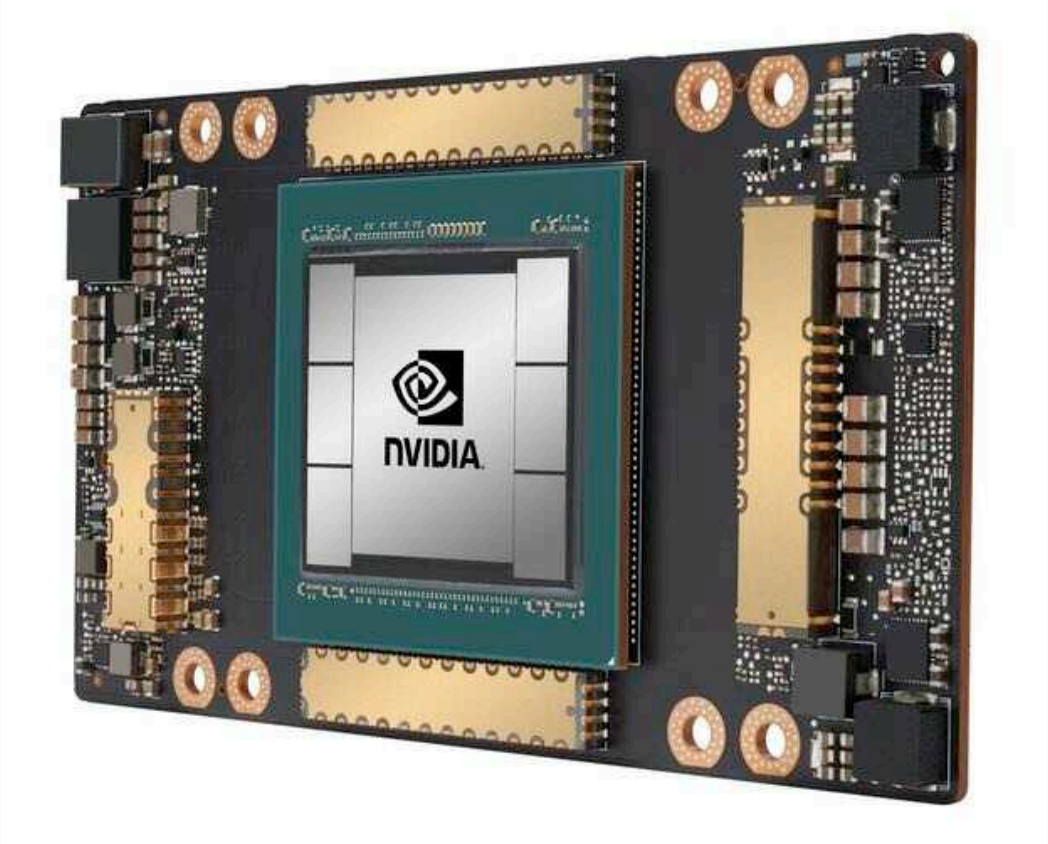
GPU 4.8 (Coming this summer)

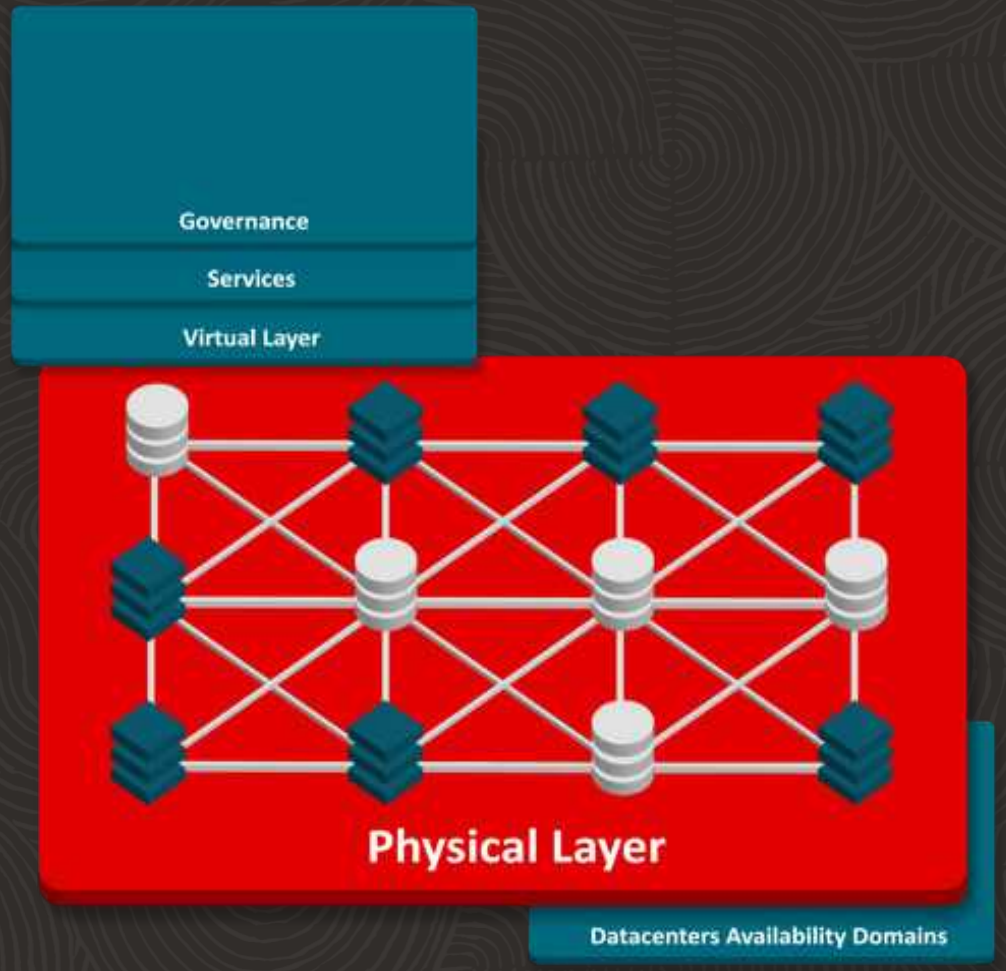


GPU 4.8 has product features that differentiate itself from GPU 3.8:

- 2x – 20x the performance of GPU 3.8's V100 Volta GPUs
- Contain local NVMe storage (27.2TB) to support checkpointing
- Offers double the onboard system memory of 2TB for large graph workloads
- Offered in both VMs with 1, 2 or 4 GPUs and Bare-Metal with 8 GPUs.
- GPU 4.8 bare-metal shapes will allow for RDMA using Clustered Networking for large scale workloads with up to 1600Gb of bandwidth.

Fast and Predictable Physical Network Infrastructure

- Non-oversubscribed flat, highly scalable network with ~1 million network ports in each AD
- High speed interconnects: 2 x 25Gbps bandwidth
- Predictable, low latency - < 100µs expected one-way latency between hosts in an AD, <500µs between ADs
- The only cloud network performance SLA



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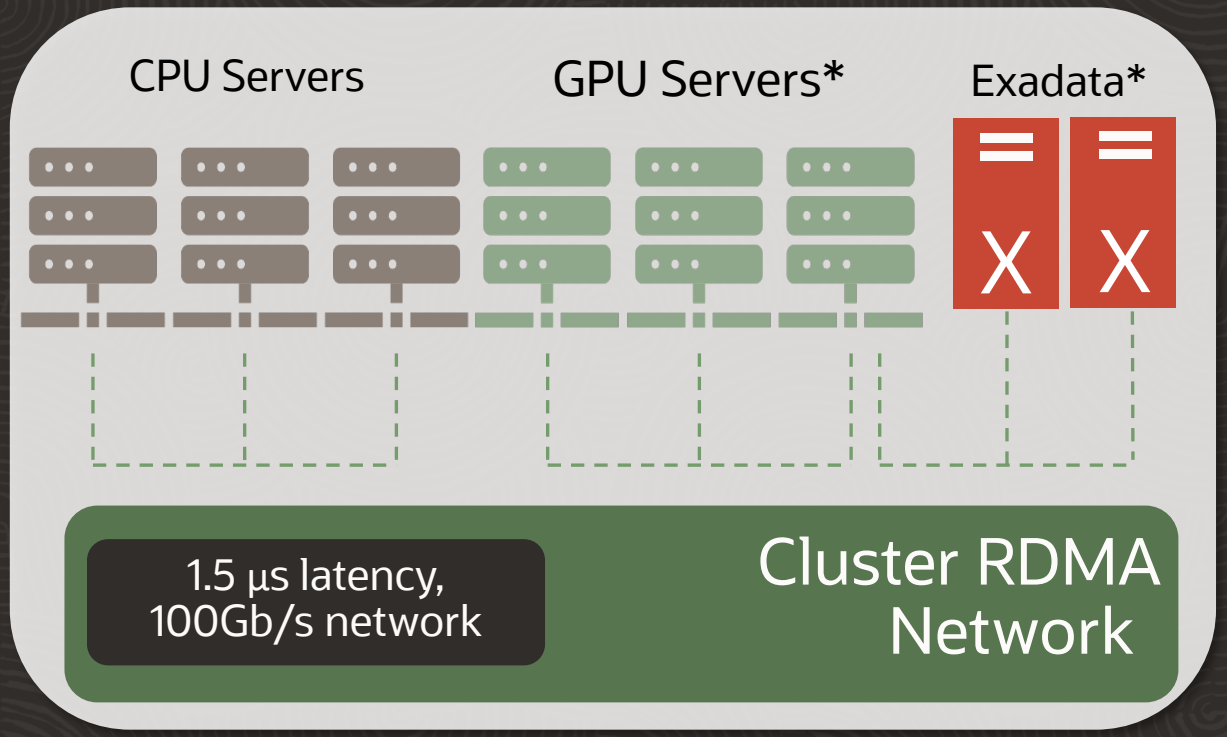
High Bandwidth, Low Latency RDMA Cluster Networking

- RoCE v2: RDMA over Converged Ethernet
- Oracle connects the servers directly to the RDMA switch
- Up to 20,000 cores in a single RDMA cluster
- No hypervisor, no virtualization, no jitter bare metal HPC
- 1.5 µs latency, 100Gb/s



*Planned for 2H 2020

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Easy to deploy file systems and high-performance storage

- Deploy HPC parallel file systems on OCI in just 3 clicks
- Choose from a wide set of parallel file systems: IBM Spectrum scale, BeeGFS, Lustre, Quobyte and more
- Achieve 60 -100 GB/sec throughput for HPC parallel file systems
- HPC instance includes 6.4 TB local NVMe

"Oracle Cloud is the only major cloud provider delivering Spectrum Scale in a shared-storage architecture on bare-metal hardware. The Oracle offering has been tuned for the demands of HPC and big-data analytics and offers 10X performance advantage over virtualized cloud offerings, improved flexibility, scalability, and manageability."

Michael Sedlmayer
President, Re-Store

Re-Store | A

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HPC Customers Cloud utilization

24/7	Burst	Variable Workloads
Turning cluster on 24/7. Using this as a hassle-free datacenter	Hybrid mode, base workload are running on prem and what is overflowing comes to the cloud.	Scheduler is turning machines on/off depending in the queue size.

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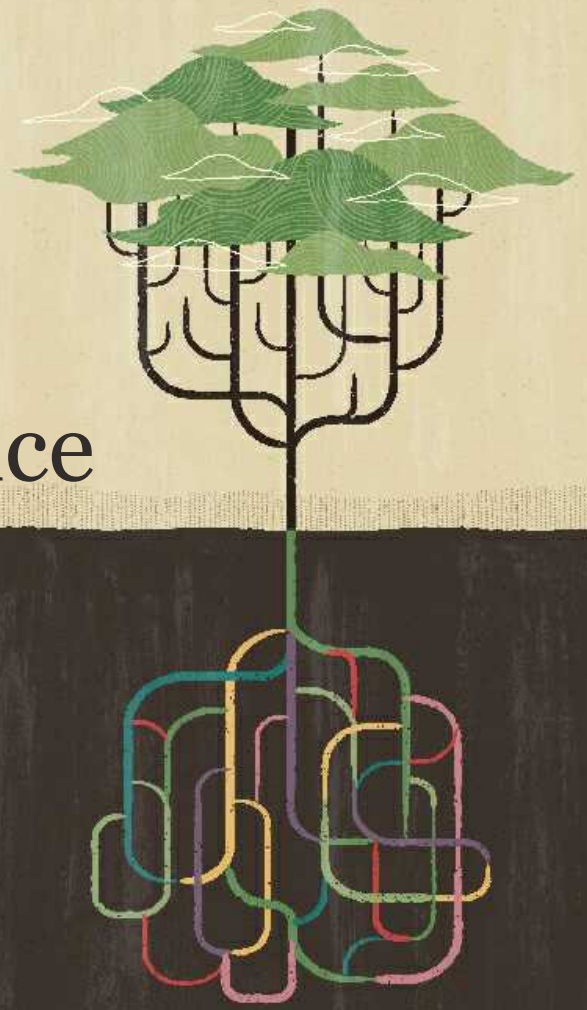
HPC outperforms competition and offers on-premises levels of performance



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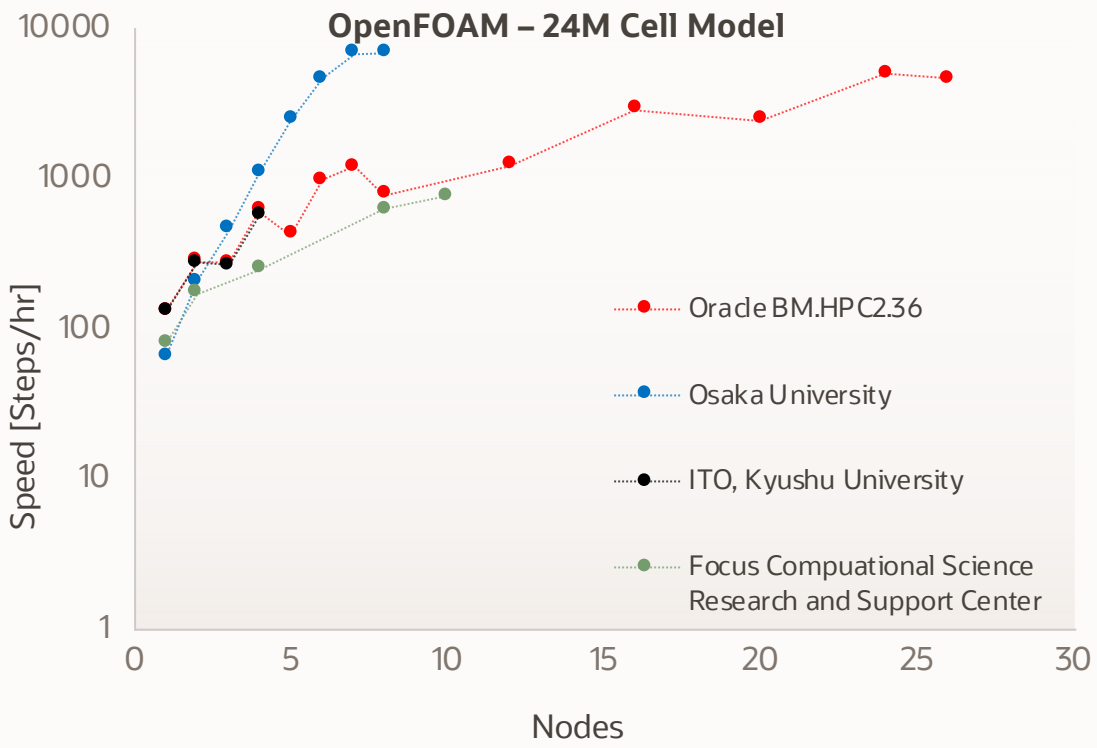
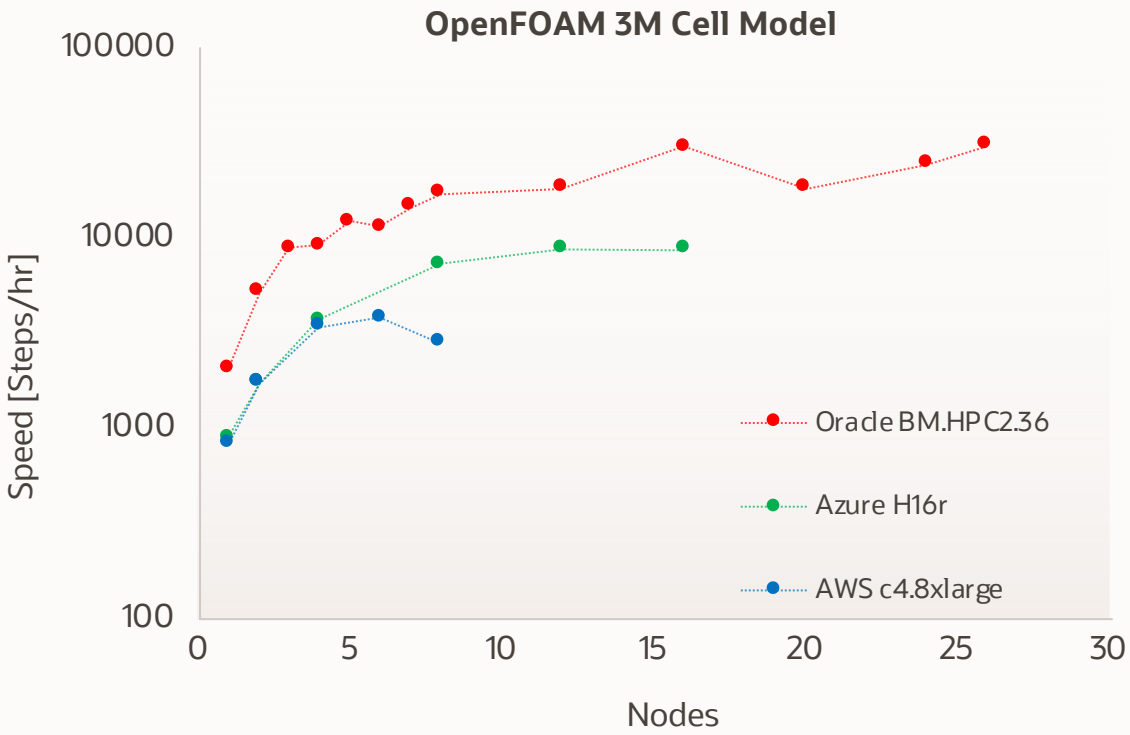
OCI offers supercomputer-level performance and tests higher than AWS and Azure

OCI provides on-premises levels of performance



OCI HPC vs On-premises Supercomputers

OCI outperforms AWS by 164% and Azure by 278%



OCI vs. competition

Evaluation performed by Open CAE

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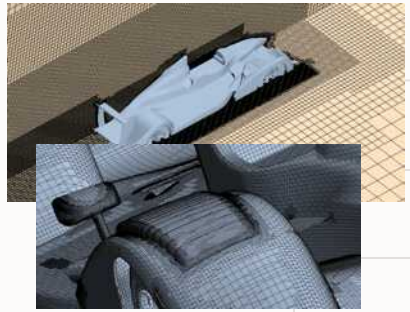
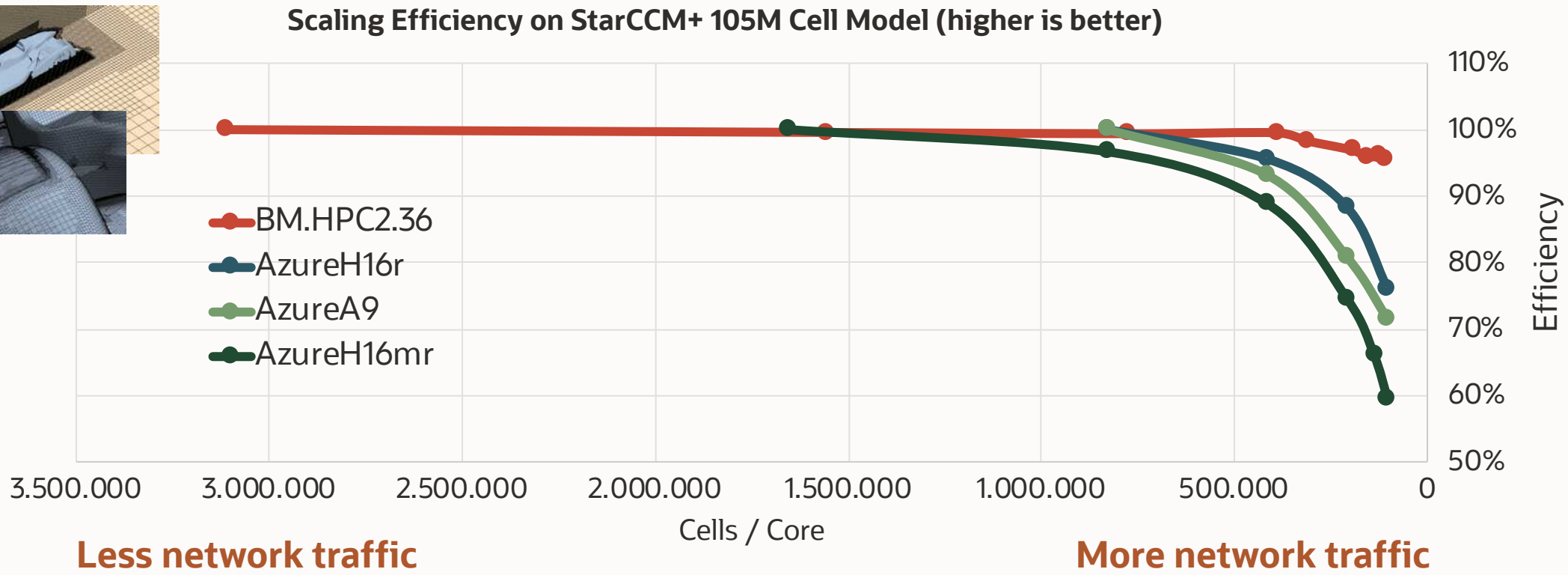
Network scaling Oracle vs. Azure

Comparing HPC BM shape and Azure's HPC shapes using StarCCM CFD S/W

As network traffic increases for a StarCCM CFD workload, Oracle scales best





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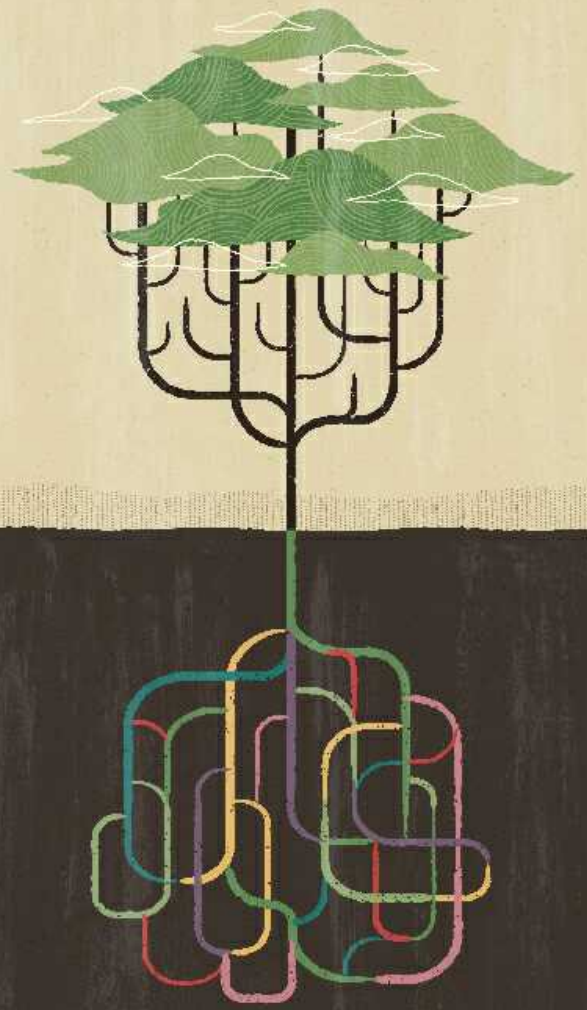
Demo Time !



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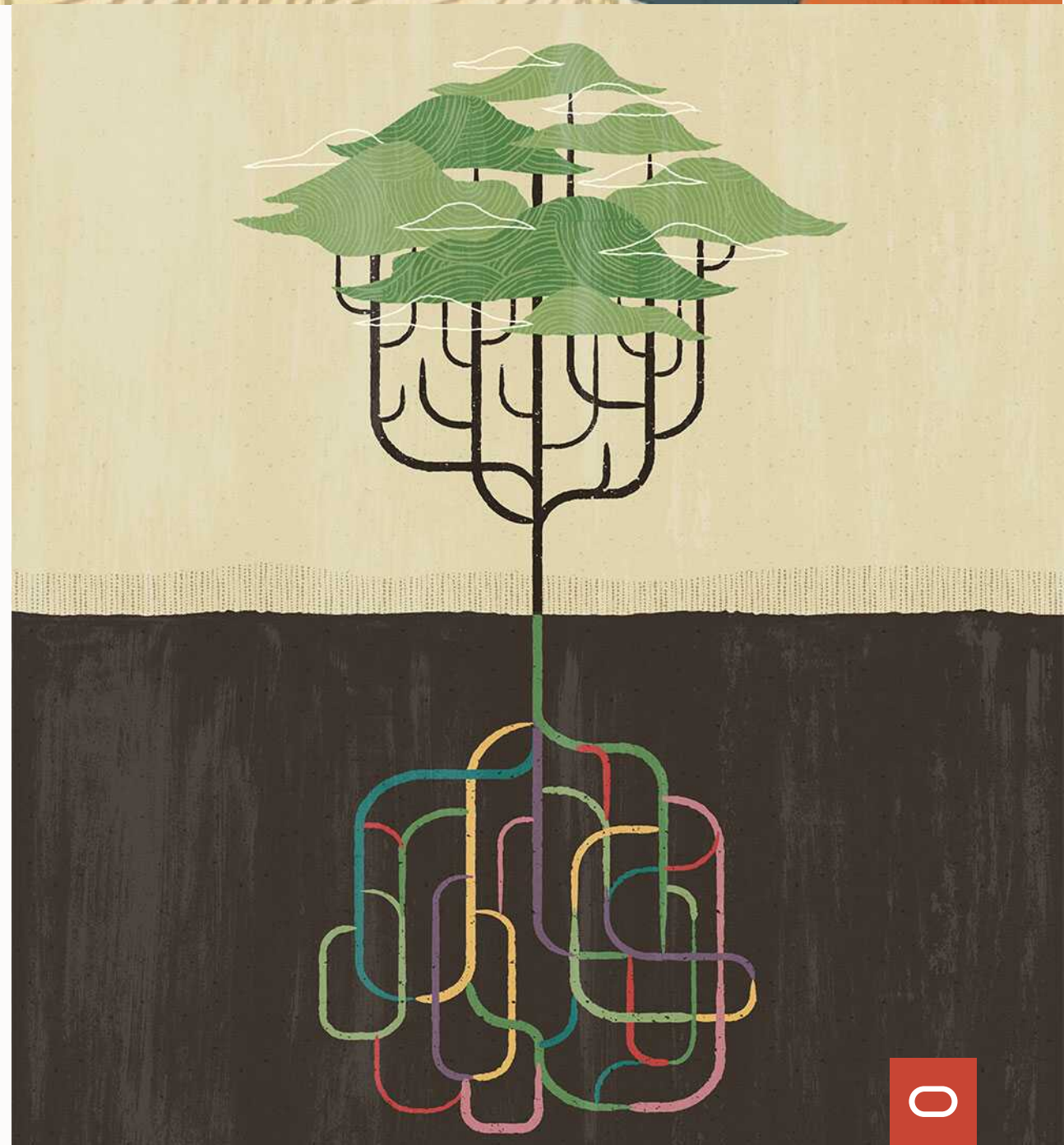
Call To Action

Spin up an HPC cluster today

https://cloudmarketplace.oracle.com/marketplace/en_US/listing/67628143

Deploy a GPU

https://cloudmarketplace.oracle.com/marketplace/en_US/listing/54854361



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