



**Hewlett Packard
Enterprise**

HPE UPDATE

ACCELERATE INNOVATION AND DISCOVERY

Gerald Kleyn
General Manager – HPC & AI Systems

May 2023

Q&A – PRE PROCESSING PROCEDURE

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Softball

Hardball

What leaders in science and business know

In order to stay ahead we need to
innovate faster

**Make precise predictions
about the future**

with Modeling & Simulation (MOD/SIM)

**Make fast and accurate
decisions**

with maximum AI-at-scale

**Unlock the value of your
data faster**

with High Performance Data Analytics (HPDA)

“Anyone can build a fast CPU.
The trick is to build a fast system.”

Seymour Cray, Founder, Cray Research, Inc.



SUPERCOMPUTING IN THE EXASCALE ERA

Enabling unprecedented **speed** in **computational science**



1

Supercomputer*
(more than 1 **exaflops**)

1

Storage System**
(nearly 1 **exabyte** raw capacity)

Clean Energy

Faster
path to clean fusion power



Material Science

More sustainable
materials and designs



Health Care

Accelerated
cancer research



Environmental

Better protection
of biodiversity



*[November 2022 top500.org list](https://www.top500.org/list/2022/november/)

**[OLCF announces storage specifications for Frontier exascale system](https://www.olcf.gov/news/olcf-announces-storage-specifications-for-frontier-exascale-system)

THERE'S FAST,
and there is
FRONTIER
fast.



At 1.1 exaflops of performance,
Frontier is faster than

the next **7** systems combined
on the Top500;

and the next **68** systems combined
after that;

and the next **393** systems combined
after that.

INDUSTRY RECOGNITION WITH NINE 2022 HPCWIRE EDITORS' AND READERS' CHOICE AWARDS

















HPE was presented nine 2022 HPCwire Editors' and Readers' Choice Awards for breakthrough achievements in supercomputing.

Top 5 Vendors to Watch	Top Supercomputing Achievement	Best Sustainability Innovation in HPC	Best Sustainability Innovation in HPC	Best Use of High Performance Data Analytics & Artificial Intelligence	Best Use of HPC in Industry (Automotive, Aerospace, Manufacturing, Chemical, etc.)	Best Use of HPC in Physical Sciences	Best HPC Collaboration (Academia / Government / Industry)
Editors' Choice Award	Readers' & Editors' Choice Awards	Readers' Choice Awards	Editors' Choice Award	Editors' Choice Award	Readers' Choice Awards	Editors' Choice Award	Editors' Choice Award

The HPCwire annual Readers' Choice Awards recognize the best and the brightest developments in HPC. These awards are nominated and voted on by the global HPC community and announced during the annual Supercomputing Conference in November.

DELIVERING THE FASTEST SYSTEMS ON THE PLANET

		WORLD'S FASTEST*			EU'S FASTEST*	
						
						
DELIVERED	IN FACTORY	DELIVERED	ANNOUNCED	IN FACTORY	DELIVERED	ANNOUNCED
AMD Milan EPYC CPU & NVIDIA GPU with Slingshot interconnect	Future Intel Xeon CPU & Intel Xe ^e architecture with Slingshot interconnect	AMD EPYC CPU & AMD Instinct GPU with Slingshot interconnect	Future AMD EPYC CPU & Radeon GPU with Slingshot interconnect	Intel Xeon Sapphire Rapids CPU with Slingshot interconnect	AMD EPYC CPU & AMD Instinct GPU with Slingshot interconnect	Future Arm CPU with Ampere Next GPU Slingshot interconnect
STORAGE 35 PB All Flash Cray ClusterStor E1000	STORAGE 200 PB Cray ClusterStor E1000	STORAGE 700 PB Cray ClusterStor E1000	STORAGE 400 PB Cray ClusterStor E1000	STORAGE Not Publicly disclosed	STORAGE 87 PB Cray ClusterStor E1000	STORAGE 10 PB** Cray ClusterStor E1000

* June 2022, Top500.org list ** 100 PB expansion in progress. Listed is the publicly disclosed won-to-date contracts.

HPE POSITIONED FOR THE AGE OF INSIGHT

Expertise in HPC / AI / MCS

Largest applications
and performance team
in the industry

HPE trusted
supply chain

Hewlett Packard
Labs

Differentiated IP & systems capabilities

High Performance
Networking

Photonics

Memory-Driven
Computing

High Performance
Storage & Data
Management

Cloud native & full developer ecosystem

HPE Cray Programming
Environment

Cloud native systems
management &
orchestration
(Kubernetes)

Converged workloads

Delivered at any size and any data center

On-premises
Colo
Public Cloud

CAPEX
as-a-Services

Enabling **Computational Competitiveness** for businesses of all sizes

Manufacturing

Faster
Time-to-market



FSI

More profitable
Trading



Commercial AI

Inclusive & ethical
AI models



Energy

Faster
Exploration & generation



Commercial Weather

More accurate
Weather forecasting



Health & Life Sciences

Faster
Drug discovery



Transportation

Safer
Autonomous vehicles

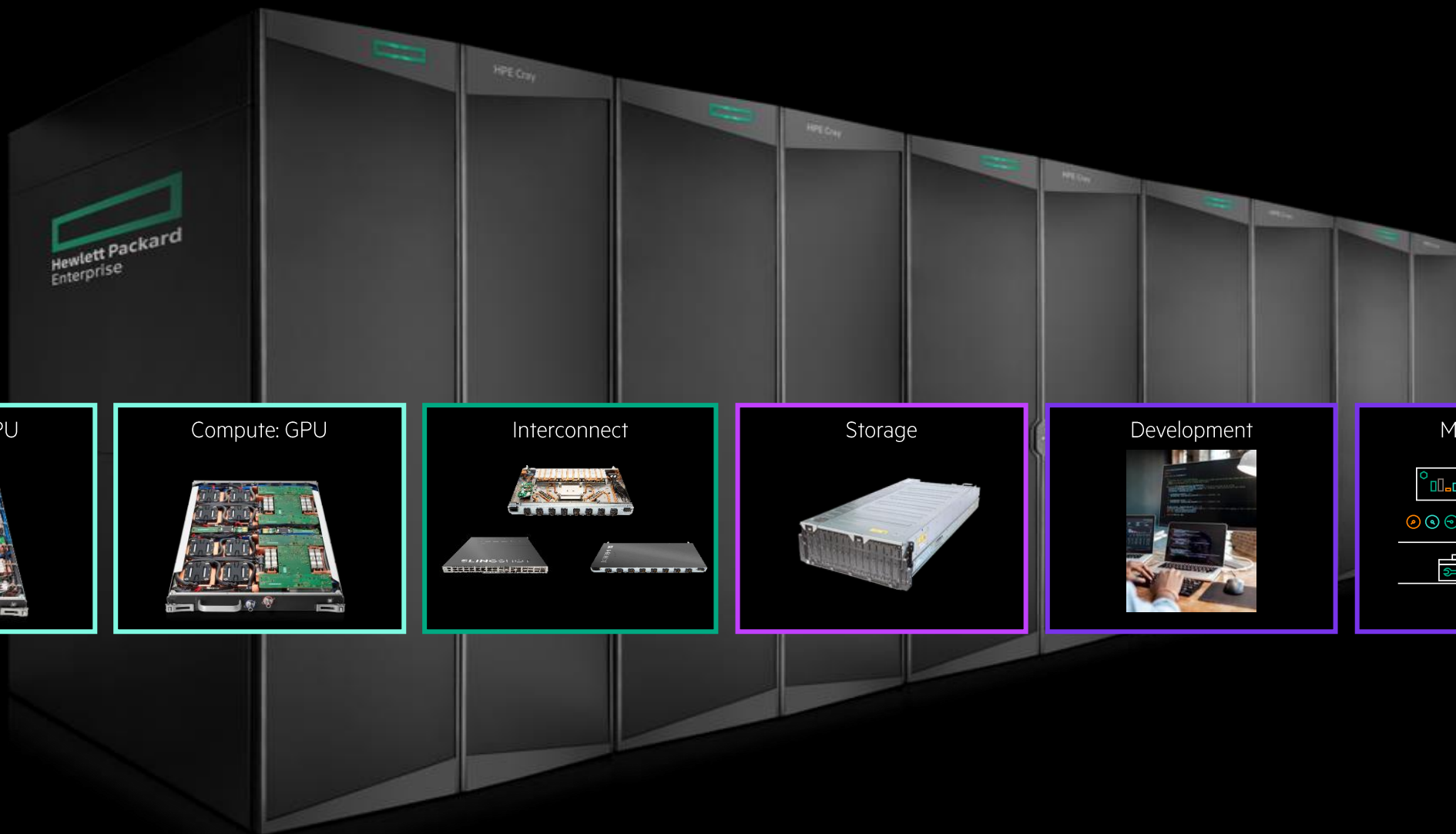


Retail

Better
Customer experience



HPE TECHNOLOGIES POWERING EXASCALE



Compute: CPU



Compute: GPU



Interconnect



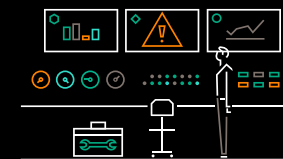
Storage



Development



Management



HPE Cray Supercomputing Portfolio EDGE to EXASCALE

Purpose Built Supercomputing

HPE Cray Supercomputers

HPE Cray EX4000



HPE Cray EX2500



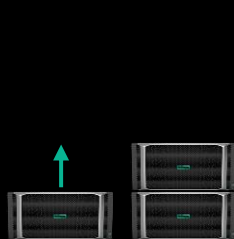
The next frontier of supercomputing systems redesigned for HPC, AI and converged workloads

HPE Superdome Flex Family

HPE Superdome Flex



HPE Superdome Flex 280



Scale-up, shared memory SMP systems to tackle HPC and AI workloads holistically

Accelerated HPC/AI

HPE Cray XD6500 (Q1 CY23)

HPE Apollo 6500 Gen10 Plus System



Accelerated compute platform for HPC and AI workloads

Mainstream HPC/AI

HPE Cray XD2000 System



HPE Apollo 2000 Gen10 Plus System



Density-optimised, scale out compute for HPC and AI workloads

HPE ProLiant DL38x Systems



Flexible, general purpose compute for HPC and AI workloads

Edgeline

HPE Edgeline EL8000



HPE Edgeline EL8000t



High-performance system for real-time AI/ML capable compute, engineered for harsh edge environment

NonStop

HPE NonStop



Fault-tolerant, always-on and always-adapting computing

Networking

HPE Slingshot



Unified HPC and AI Ethernet interconnect for application scalable performance

Cray ClusterStor E1000



Parallel storage systems purpose-engineered for HPC and AI

Integrated HPC & AI Software Portfolio for software development, cluster management, data management and system management

Everything available "as a Service" via HPE GreenLake

ENERGY EFFICIENCY COMES BUILT IN

Liquid to Air Cooling

Chilled water supply from the facility cools down the air-cooling system positioned close to the servers.



RDHx
Rear Door
Heat Exchanger



ARCS
Adaptive Rack
Cooling Solution

Hybrid Cooling

Combined direct liquid cooling and air cooling



Apollo 2000 DLC

Direct Liquid Cooling

Coolant flows through a network of tubes and coldplates to extract heat directly from all components on the server



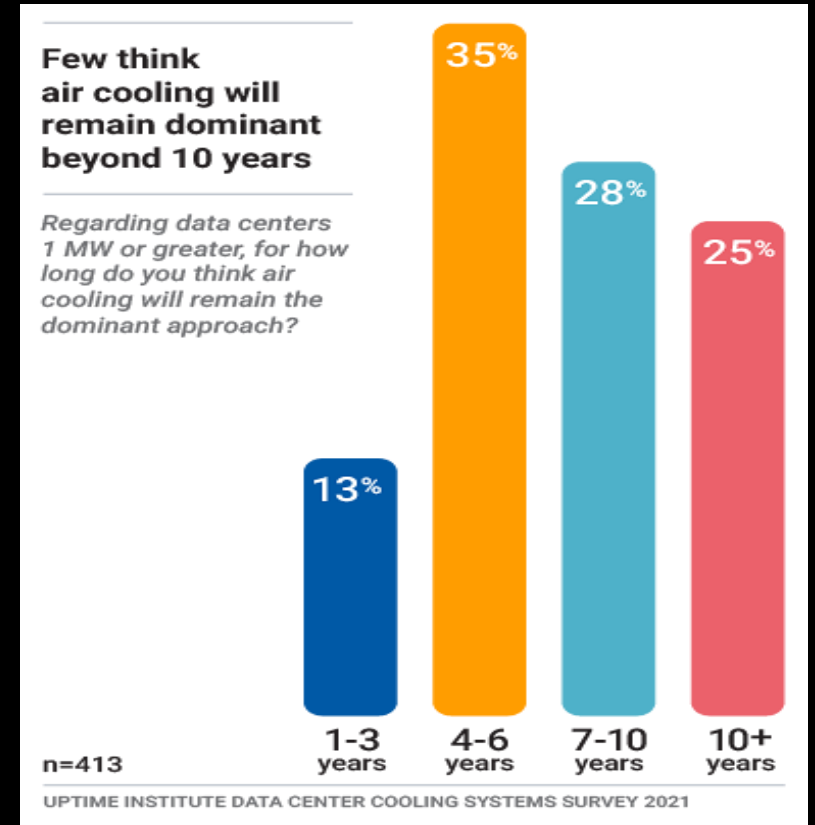
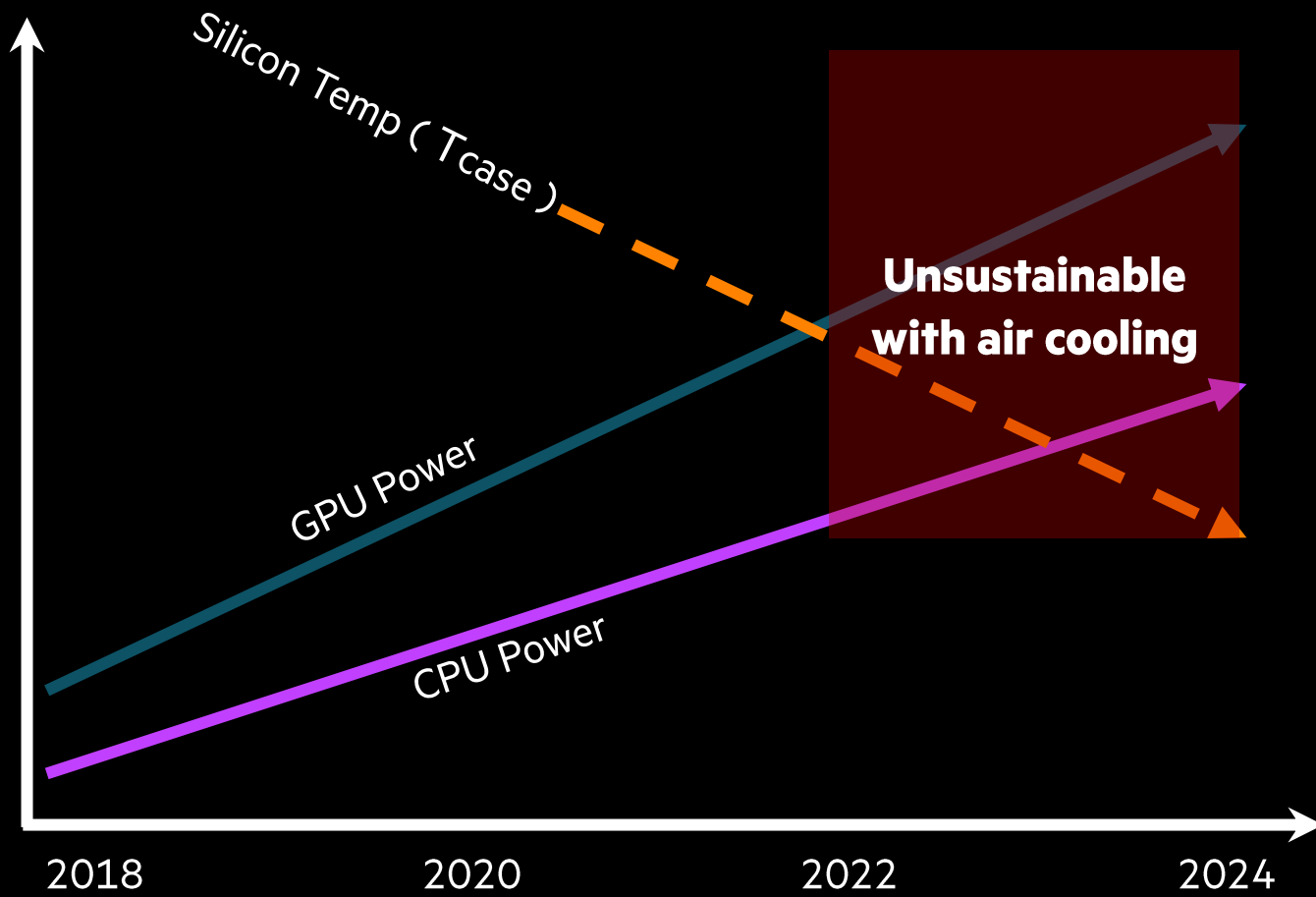
**Cray EX
2500**



Cray EX

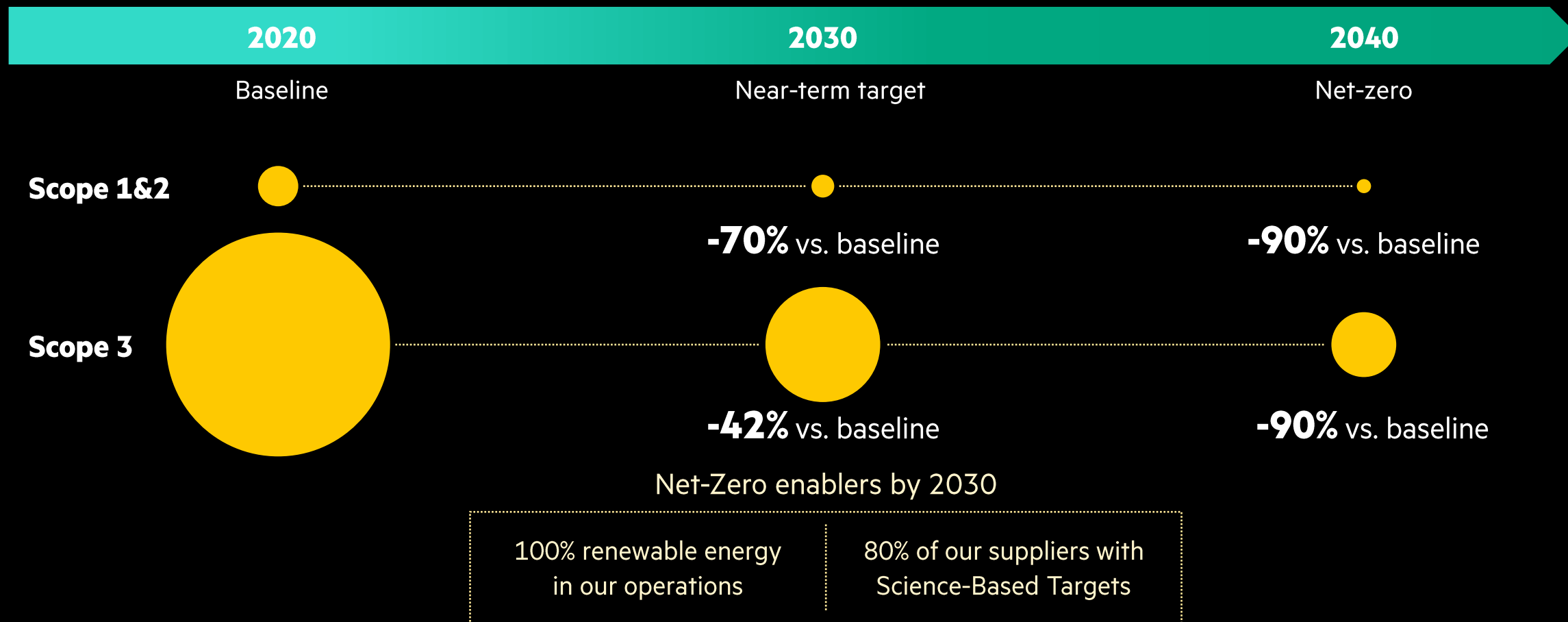
Cooling efficiency and capacity (kW/rack) increases from left to right

ENERGY DILEMMA ...AND ACOUSTIC, LIQUID COOLING EMERGING



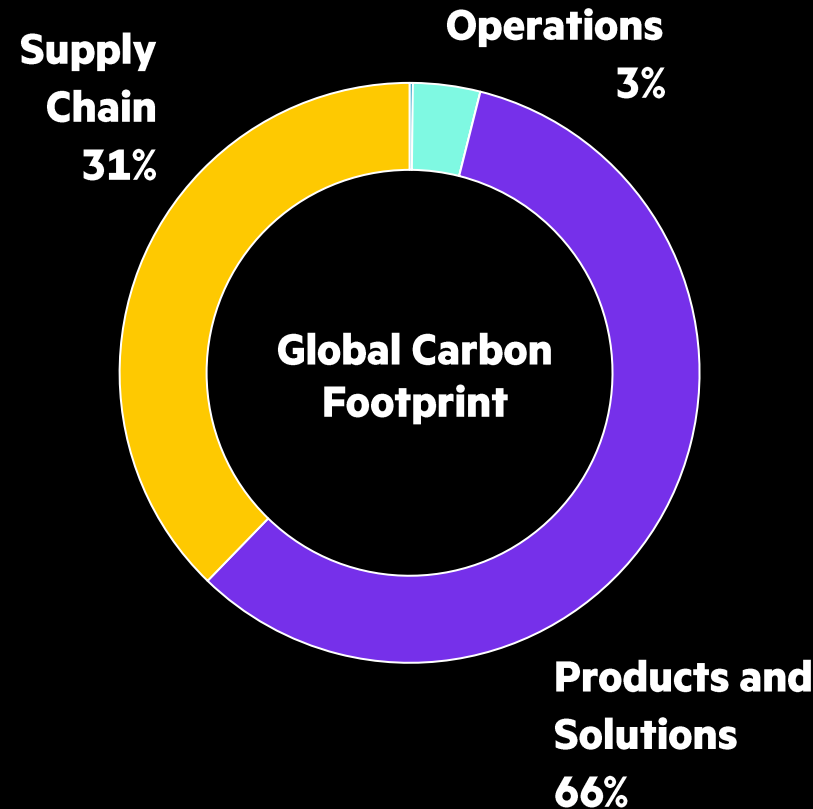
HPE is committed to becoming a net-zero enterprise by 2040

We continue to align our goals to the latest climate science with a new suite of science-based targets. Beginning in 2022, executive compensation was tied directly to climate metrics.



MANAGING THE ENVIRONMENTAL IMPACTS OF OUR PORTFOLIO

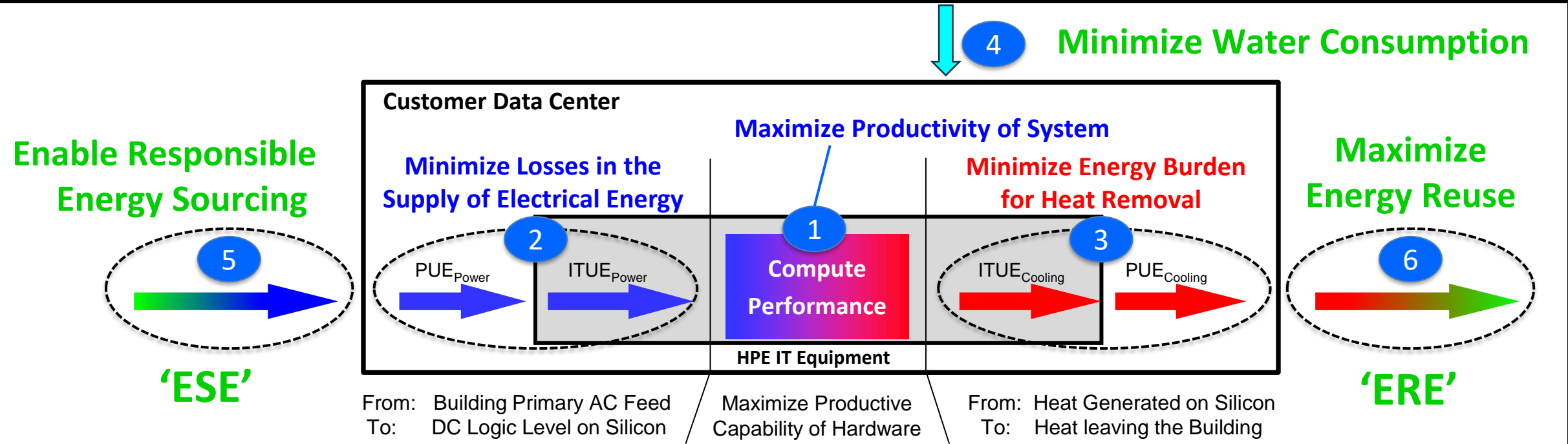
- **25%** of our production suppliers, by spend, have set Scope 1 and 2 science-based targets (toward goal of 80% by 2030)
- Emissions management platform **available to 80%** of suppliers, by spend



- ~**50%** of HPE's portfolio has sustainability and IT efficiency attributes
- HPE GreenLake offerings are configured to, on average, **reduce customer inefficiencies by 30%**
- HPE Technology Renewal Centers processed **>3 million retired IT assets**, refurbishing **approximately 85%**

Achieving net-zero will require contributions from across the value chain and across every business and function

Need to consider end to end environment when deploying supercomputers



HPE Focus on the Full System Deployment Level

- 1 • Maximize Productivity of the System
- 2 • Minimize Losses in the Power Delivery System.
- 3 • Minimize Total Energy Burden for Heat Capture & Removal.
- 4 • Minimize Water Consumption.
- 5 • Enable Responsible Energy Sourcing Strategies
- 6 • Enable Effective Heat Energy Reuse
 - Carbon footprint of material/components going into system
 - Recycling components



The way forward

#1

HPE Cray Supercomputer Frontier in Top 500 and #2 and # 6 in Green500 list

7

HPE supercomputers on Top 10 of the Green500 list

101

HPE supercomputers on the Green500 list of the world's most energy-efficient supercomputers

HPE has a **unique vantage point** rooted in our own sustainability journey

Commitment to be a net-zero enterprise across our entire value chain by 2040 with near-term goals by 2030

~50%

of renewable electricity sourced in our operations on our way to 100% by 2030¹

6000+

patents for transformational low-carbon technologies filed since 2000³

85%

of tech returned to HPE is upcycled and put back into active use²

>500

Social and Environmental Responsibility audits conducted with suppliers

¹HPE Living Progress Report, 2021

²HPE Financial Services Technology Renewal Center information

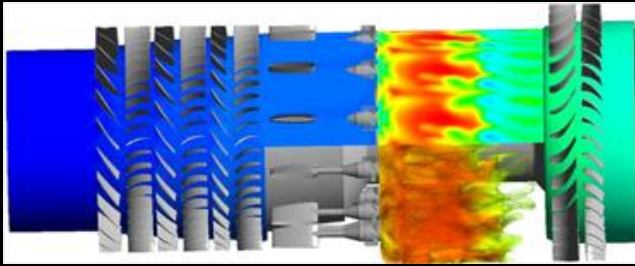
³Based on HPE internal records

⁴2021 Living Progress Data Summary, 2022

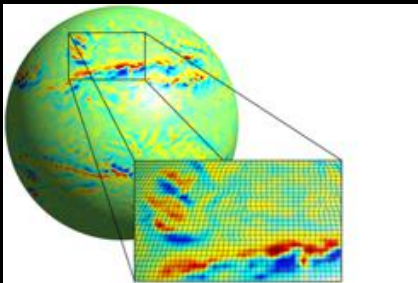
HPC AND AI WORKLOADS ARE CONVERGING..

SIMULATION

Combustion Modeling



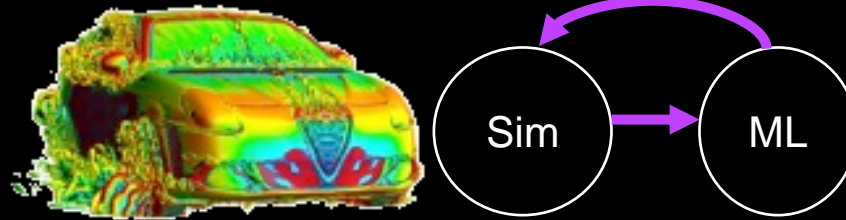
Numerical Weather Prediction



CONVERGED WORKLOADS

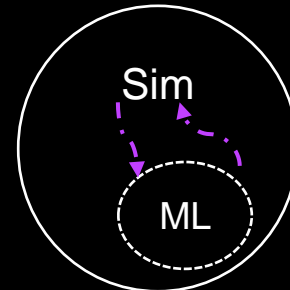
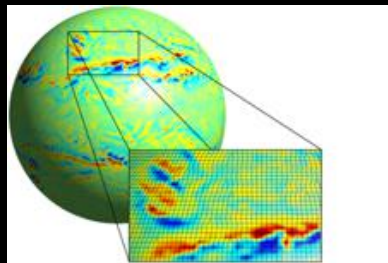
Deep CFD

"Learning on the outside"



Physics Emulators in Numerical Weather Prediction Models

"Learning on the inside"

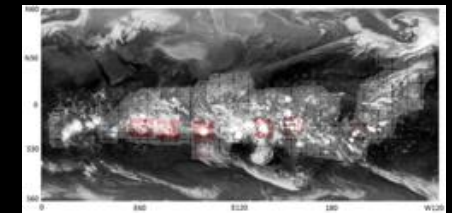


ARTIFICIAL INTELLIGENCE

Object Detection



Researching Precursors of Tropical Cyclones Using Deep Learning



We have built a leading AI-at-scale portfolio

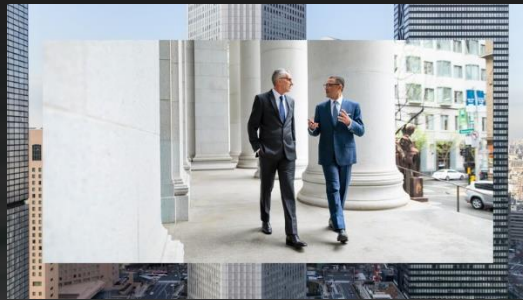
Sitting on top of our leading Supercomputing infrastructure

Industry-specific Workload Solutions

Curated solutions, training & inference-related platforms, and reference configurations for key industry workloads



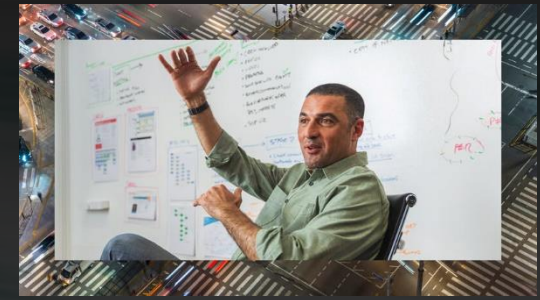
Manufacturing



Financial Services & Insurance



Health Care & Life Sciences



Government

AI Workflow

AI Data Management

AI Training

AI Inference

AI Foundation

MLDE IN ACTION - DISEASE DETECTION USING COMPUTER VISION

Train CV Models 3.5X Faster for Brain Bleeding Detection (BBD)



Outcomes

- Speed up model training time 3.5X
 - Logs and profiling features
 - Better GPU Utilisation at 80-100% on Apollo 6500 nodes
 - Increased throughput at ~700 images/s
- Cluster scalability due to inter-node model training

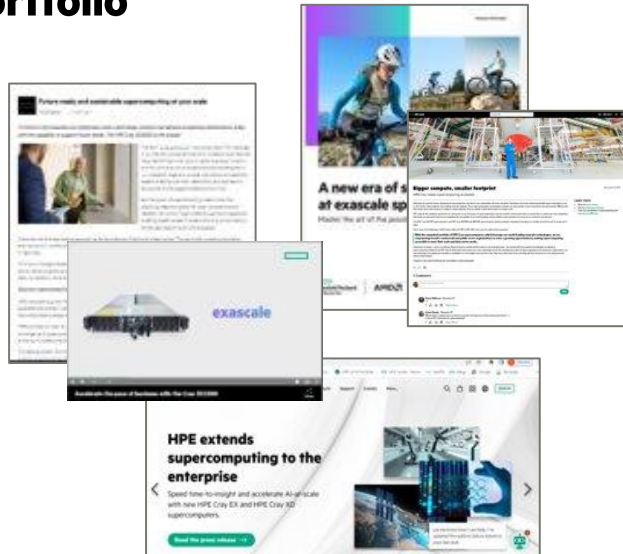
Model (S, M, L size)	# GPUs	Expected	Actual Speedup
BBD_S	4		
BBD_S	12	3	~3.6
On Determined AI			
BBD_M	4		
BBD_M	12	3	~2.8
On Determined AI			
BBD_L	8		
BBD_L	12	1.5	~3.5
On Determined AI			

MAJOR MOVES TO DELIVER AI-AT-SCALE

HPE Cray XD / HPE Cray EX Launch

Hewlett Packard Enterprise extends supercomputing to the enterprise with new HPE Cray portfolio

HPE Cray



Discover Frankfurt

Accelerate the possible: AI at scale in the exascale era

HPE Discover Frankfurt 2022

The edge-to-cloud conference

Trish Damkroger-led panel with 3 customers from Aleph Alpha, CSC/LUMI, and KAUST



HPE Acquires Pachyderm

Hewlett Packard Enterprise acquires Pachyderm to expand AI-at-scale capabilities with reproducible AI



Pachyderm



Hewlett Packard Enterprise

THE EDGE-TO-CLOUD COMPANY

POST-EXASCALE VISION



Today

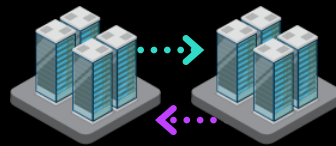
Exascale Supercomputer

World's fastest
Supercomputer



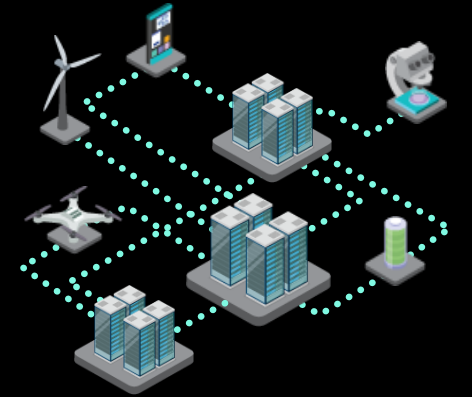
~10x Exascale

Productivity and agility for
HPC and AI applications



**Multi-faceted,
complex workflows**

For modeling, simulation, data
analytics, and artificial intelligence



**Federated Diverse
Systems**

Integrate, automate, and optimize
workflows that span multiple
organizations, locations, and vendors

World's fastest
Workflows

Why partner with us for HPC?

Undisputed Leadership

Global reach

Unique expertise

Full stack innovation

Sustainability track record

#1

partner to take Supercomputing into the Exascale era with the #1 machine on the Top500 list

1,000+

Supercomputing experts who can support your next-gen system

Design/Benchmark

Build/Deliver

Support

Run



9

HPCwire Editors' and Readers' Choice Awards 2022 for breakthrough achievements in supercomputing

Only

provider with Supercomputing IP on every layer of the stack:

Software

Compute

Interconnect

Storage

Q&A - POST PROCESSING PROCEDURE

Softball

Hardball

Q&A

Softball

BRING HARDBALL QUESTIONS TO “1-100 WITH TRISH DAMKROGER”

THANK YOU CUG!

Gerald Kleyn
gerald.Kleyn@hpe.com

