aws

The future of HPC is here: Virtually limitless HPC+ML. On-demand.

High performance computing (HPC) continues to develop at incredible pace, and the convergence of HPC and machine learning—and even quantum computing—is opening up new possibilities. Gain insights faster, and scale up your compute with AWS' virtually unlimited compute capacity.

What would you do with 172,692 cores?

Descartes Labs

9.95 petaflops (Rmax) of HPL performance

All-CPU cluster with 172,692 Intel cores (4,096 C5/M5 R5 instances)

19 minutes to shut down completely after the successful HPL run

A top 40 supercomputer took 11 days to plan, build, test, and deploy vs 12-18 months on-premises.

AWS enabled Descartes Labs to access incredible processing power with C/M/R Amazon EC2 instances.

"Descartes Labs has worked for decades to prove to the world that mass-produced, commodity hardware and software can be used to build a supercomputer, and the results more than speak for themselves."

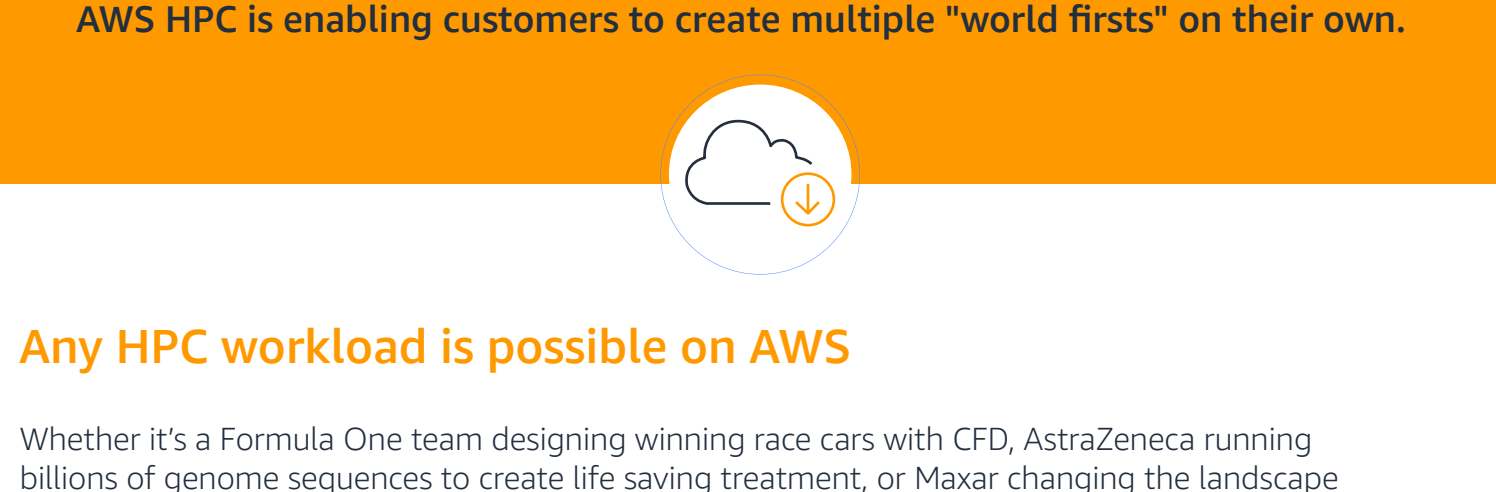
Jeff Barr, VP & Chief Evangelist, AWS

Get all the HPC capacity you need, when you need it

AWS HPC is enabling customers to create multiple "world firsts" on their own.

Any HPC workload is possible on AWS

Whether it's a Formula One team designing winning race cars with CFD, AstraZeneca running billions of genome sequences to create life saving treatment, or Maxar changing the landscape of weather forecasting... Whatever the HPC workload you can run it on AWS.



Computational fluid dynamics | Reservoir simulations | Weather forecasting

Elastic compute power on-demand

With HPC on AWS, you get rapid and secure access to thousands of cores when you need them. And only when you need them.

- Get what you need, when you need it
- Only pay for what you use
- Accelerate your time-to-results

Democratizing the ML revolution

ML is powering incredible advances across diverse fields—from genetics to geology, finance to Formula One.

ML used to be for niche players only. Not anymore. HPC on AWS puts the potential for cutting-edge ML-driven innovation in your hands.

92% of cloud-based deep learning runs on AWS models[1]

250+ new capabilities for machine learning and artificial intelligence in just the last 12 months

91% of cloud-based PyTorch runs on AWS[1]

100,000+ ML customers to date

More choice. More flexibility. More innovation.

AWS ML solutions are enabling organizations to:

- Reduce training time by 50%
- Deliver 3X faster network throughput
- Provide 90% scaling efficiency
- Improve price and performance by 25%

Key services that enable HPC + ML on AWS

AWS enables you to run tightly-coupled HPC and distributed ML in the cloud easily and securely, without compromising on price or performance.

Visualization
- AWS ParallelCluster
- NICE DCV

Networking
- Elastic Fabric Adapter (EFA) with up to 400 Gbps networking

Orchestration
- AWS Batch
- AWS ParallelCluster

Compute
- Amazon EC2 DL1
- Amazon EC2 C5n Instances
- Amazon EC2 P4d Instances
- Amazon EC2 G5 Instances
- Amazon EC2 Inf1 Instances
- Amazon EC2 Trn1

Storage
- Amazon FSx for Lustre

Broadest choice of processors and accelerators in the cloud

- intel: Intel Xeon Scalable (Ice Lake and Skylake) processors
- AMD: AMD EPYC (Milan and Rome) processors
- aws: AWS Graviton2 processor

Modular building blocks for rapid design and delivery of Amazon EC2 instances

- NVIDIA: NVIDIA A100 Tensor Core and T4 Tensor Core GPUs
- XILINX: Xilinx FPGAs for custom hardware acceleration
- aws: AWS Trainium for Training and AWS Inferentia for ML inference

Accelerators for every workload

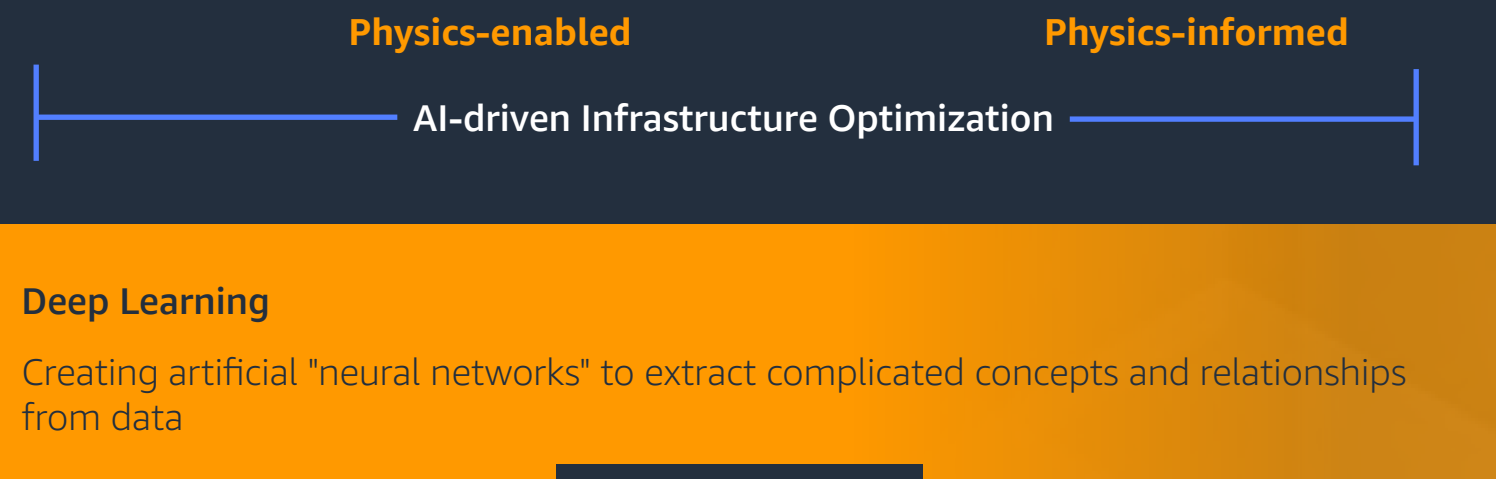
HPC accelerates...

Drug discovery | Cryo-EM process
- Increasing structural resolution with sub-cellular detail
- Optimizing price performance with nearly 500 instances types to choose from
- Turbo-charging drug discovery—from years to weeks

Autonomous vehicle navigation | Zoox
- Developing localization, perception, path planning, & control
- Petabytes of data processed per vehicle
- Millions of miles of simulations running continuously-massive HPC+ML at scale
- Spiky workloads requiring best-in-class infrastructure on-demand

Race car R&D | Formula One team
- Modeling turbulence with computational fluid dynamics
- Running 1,000s of designs to create the optimal car—beyond the capabilities of on-premises equipment
- AWS HPC+ML speeds up the process from months to hours

HPC & ML powers a broad set of new applications



Extract relationships from simulation data | Accelerate HPC simulations with embedded ML models | Learn solutions to governing equations directly

Physics-enabled | Physics-informed

AI-driven Infrastructure Optimization

Deep Learning

Creating artificial "neural networks" to extract complicated concepts and relationships from data

Applications

- Natural Language processing
- Image/video analysis
- Autonomous Vehicle systems
- Recommendation systems

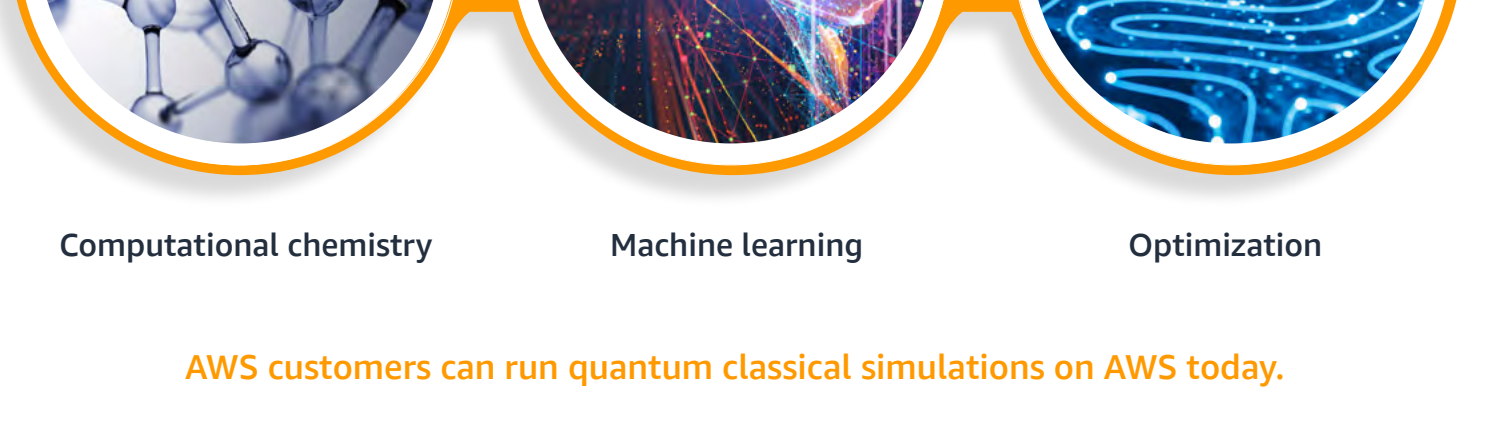
Digital Twins

A "living" digital representation of a physical system, process (or entity) that enables many business outcomes:

HPC + ML drives digital twins at scale

- What-if analysis
- Tuned model
- Sensitivity
- Uncertainty quantification
- Probabilistic forecasts
- Global optimization

Quantum Computing holds the promise to exponentially speed up solutions to hard problems



Computational chemistry | Machine learning | Optimization

AWS customers can run quantum classical simulations on AWS today.

Modern HPC + ML on AWS enables multiple paradigms simultaneously

- Tightly-coupled workloads
- Loosely-coupled workloads
- Accelerated computing
- Visualization
- AI/ML
- High volume data analytics

All the solutions you need. Limitless possibilities.

This is just a snapshot of what's possible now.

Don't wait for the future, make it happen today!

Learn more
https://aws.amazon.com/hpc

1. https://nucleusresearch.com/research/single/guidebook-deep-learning-on-aws-2/