



Innovation Without Limits

Your Guide to High Performance
Computing in the Cloud

- 4 What Could You Accomplish with a Million Cores?
- 5 Access Resources Quickly
- 6 Leverage Latest Technology
- 7 Collaborate Securely
- 8 Innovate Economically
- 10 Explore the Possibilities
- 12 Start Experimenting



Is your on-premises infrastructure up to the task? You have the talent, the ideas, and the drive. Now you need to generate the type of actionable results that bring your ideas to life and fuel continued research and discovery.

There's just one problem:

Your on-premises infrastructure is holding you back. Your top engineers and researchers have to compete for access to run their high performance computing (HPC) workloads on the limited, on-premises capacity you have to help them make progress on their innovative ideas. Unable to test a full range of hypotheses, researchers become frustrated and

demotivated, and may even discount possible breakthrough-generating work for fear of taking up valuable resources, only to potentially fail. Hardware upgrades take months to stand up—meanwhile, your research lags behind your competitors' efforts.

It doesn't have to be that way.

AWS cloud empowers you to push your ideas ahead at full speed. AWS offers Intel Xeon-powered compute instances to enable your engineers and researchers to innovate without constraints by offering virtually unlimited infrastructure enabling scaling and agility not attainable on-premises. With easy access to numerous Intel optimized software libraries via the AWS Marketplace, your engineers can accelerate their development timelines even further.

What could you accomplish with a million cores?

Business leaders who oversee HPC efforts are no strangers to solving complex problems. In today's environment of increasingly large data sets and resource-intensive algorithmic processing, the challenge of HPC includes keeping pace with the demands of researchers, scientists, engineers, and creative professionals so they can rapidly produce high-value answers to complex questions.

In 2017, cloud HPC revenue represented only \$1.1B of the total market of \$35.6B*. The majority of HPC processing is conducted using on-premises systems. Because of the high cost of HPC infrastructure, many companies are reluctant to invest in new hardware to handle peak demands. This

approach ensures high utilization rates but constrains researchers who want to experiment with new ideas.

That's where AWS comes in. AWS HPC solutions with Intel® Xeon® processors deliver significant leaps in compute performance, memory capacity and bandwidth and I/O scalability. The highly customizable computing platform and robust partner ecosystem enable your staff to imagine new approaches so they can fail forward faster, delivering more answers to more questions without the need for costly, on-premises upgrades. In short, AWS frees you to rethink your approach to every HPC and big data analysis initiative and invites your team to ask questions and seek answers as often as possible.

Access Resources Quickly



Migrating your HPC application to AWS means you'll no longer have to make tradeoffs between experimentation and production. AWS and Intel bring you the most cost-effective, scalable solutions to run the most computationally-intensive applications on-demand. Now your research, development, and analytics teams can test every theory and process every data set without straining your on-premises systems or stalling other critical workstreams.



Flexible configuration and virtually unlimited scalability allow you to grow and shrink your infrastructure as your workloads dictate, not the other way around. Additionally, with access to a broad cloud ecosystem and trusted partner network, you can quickly adapt and use tested and verified HPC applications so that you can innovate faster without having to reinvent what already exists.

The AWS Advantage for Resource Access

Run your own HPC applications or choose from a range of commonly used and verified applications from our trusted AWS ecosystem partners.

Quickly reconfigure resources to match your workload's needs and launch your HPC clusters in minutes for faster time to results.

Eliminate the wait for on-premises resources to test multiple theories and data sets in parallel, including fringe cases and unconventional hypotheses.



BEFORE

Because of on-premises capacity constraints, our researchers can't freely experiment and innovate.

NOW

Our researchers, engineers, and scientists have immediate access to all the resources they need to move their research ahead at full speed.

The AWS Advantage for Technology

Break free from the inefficiency of the capital expenditure (capex) investment while making technology obsolescence a thing of the past.

Leverage the latest technology for your entire data processing pipeline, from data harvest to processing to long-term storage.

Never worry about downtime, migrations, data center refreshes, on-site maintenance, or any of the additional IT expenses that come with on-premises solutions.

BEFORE

We're only one year into our current on-premises infrastructure investment. Our teams will have to make do with what we have.

NOW

Our HPC research and compute teams have access to powerful, efficient systems that shorten the time for discovery and delivery.

Leverage Latest Technology



AWS HPC solutions remove the traditional challenges associated with on-premises clusters: fixed infrastructure capacity, technology obsolescence, and high capital expenditures. AWS gives you access to virtually unlimited HPC capacity, built from the latest technologies.



You can quickly migrate to newer, more powerful Intel® Xeon® based EC2 instances as soon as they are made available on AWS. This removes the risk of on-premises CPU clusters becoming obsolete or poorly utilized as your needs change over time. As a result, your teams can trust that their workloads are running optimally at every stage.

Collaborate Securely



Keeping your on-premise infrastructure compliant with an alphabet soup of regulations and legislation is challenging. Security concerns can hold back collaboration with colleagues and partners in other parts of the world.



The AWS cloud is compliant with the latest revisions of GDPR, HIPAA, FISMA, FedRAMP, PCI, and other regulations. Encryption and granular permission features guard sensitive data without interfering with your ability to share data across approved users. With our global presence and the wide availability of Intel powered Amazon EC2 Instances, you can share and collaborate efficiently with team members across the globe without compromising on security.

The AWS Advantage for Secure Global Collaboration

Share data across geographical regions while meeting data residency requirements.

Comply with industry regulations such as GDPR, HIPAA, FISMA, FedRAMP, and PCI.

Secure your critical business data in the same public cloud used by government and research agencies and financial institutions.

BEFORE

Data residency, compliance, and security concerns make it difficult to work with researchers in other parts of the world.

NOW

We can collaborate securely with team members anywhere and improve the quality of our results.

The AWS Advantage for Budget Management

Optimize your budget with flexible resource selection and pay-per-use options.

Move from inefficient capex investments to a flexible, pay-as-you-go operational expenditure model.

Save up to 90% off on-demand prices with spot pricing for workloads that can tolerate interruptions.

BEFORE

We don't have good visibility into our long-term needs, so we end up provisioning for peak capacity whether we need the resources or not.

NOW

We can choose the capacity we need and pay only for what we use, and we make use of flexible pricing models for significant cost savings when processing our time-flexible, stateless workloads.

Innovate Economically



With AWS, capacity planning worries become a thing of the past. AWS offers on-demand pricing for short-term projects, contract pricing for long-term, predictable needs, and spot pricing for experimental work or research groups with tight budgets.



AWS customers enjoy the flexibility to choose from any combination of pay-as-you-go options, procuring only the capacity they need, for the duration that it's needed. This simplified, flexible pricing structure allows research institutions to break free from the time- and budget-constraining, capex-intensive data center model. With AWS and Intel, your HPC solution parallels both the compute demands of the researchers and the financial team's budget. It's a win-win!



“By spinning up a few hundred nodes on AWS and getting results in less than a day, our scientific researchers have a lot more freedom to ask questions that weren’t even possible before. The speed is important, but equally important is the additional intellectual curiosity this enables for researchers.”

Associate Director of IT, Celgeneⁱ



Explore the Possibilities

Every industry tackles a different set of challenges. AWS HPC solutions, available with the power of the latest Intel® technologies, help companies from small to large in nearly every industry achieve their HPC results with flexible configuration options that simplify operations, save money, and get results to market faster. These workloads span the traditional HPC applications like genomics, life sciences research, financial risk analysis, computer-aided design, and seismic imaging, to the emerging applications like machine learning, deep learning, and autonomous vehicles.



Energy and Geo Sciences

By running on AWS, we can analyze a model with hundreds more outputs in a fraction of the time it used to take us to run a model with just one output. AWS helps us come up with more rigorous answers, subtract a lot of risk from our decision making, and capture much more value.

Business Integration Manager, Refining Technology Group at BP ⁱⁱ



Financial Services

In regular quarterly financial reporting, it would take you two weeks and a small army of people to complete your regulatory reporting process. AWS gives us the computing power to shorten that time to hours and minutes.

President and CEO, PathWise Solutions Group at ASI ⁱⁱⁱ



Life Sciences and Healthcare

We can reduce the number of subjects in a clinical trial from 60 to 40, the length of the study is reduced by almost a year, and the cost savings is [nearly \$500,000].

Senior Solutions Specialist, Bristol-Meyers Squibb ^{iv}



Design and Engineering

For engineering firms in highly competitive industries, the benefits of running on AWS are many. You can get products modeled, developed, and up and running faster, which allows you to be more competitive, and you can lower your R&D costs to get your products to market

CEO, OnScale ^v



Media and Entertainment

For our VFX team, our architecture on AWS acts as a safety net, so they can put more resources toward rendering as big deadlines approach. That means we improve overall artistic quality while keeping clients happy.

Operations Manager and VFX Supervisor, Fin Designs + Effects ^{vi}



"AWS provides on-demand access to high performance resources, which enables us to focus on science, rather than the heavy lifting of maintaining server infrastructure. AWS helps us lift the ceiling on the size and scope of our machine learning experiments."

Professor at San Francisco State University^{vii}



Start Experimenting

Sign up for free and launch a sample HPC workload within minutes.

1. Get your free AWS account for hands-on experience with the AWS platform and ecosystem.
2. Experiment and learn with sample projects and step-by-step tutorials.
3. Build your HPC solution and innovate without limits.

Ready to try it out?

Get started.

<https://aws.amazon.com/hpc>

* Intersect 360 Research: HPC Market Update presented at ISC 2018, June 2018

i <https://aws.amazon.com/solutions/case-studies/celgene/>

ii https://aws.amazon.com/solutions/case-studies/BP_Spiral_Suite/

iii <https://aws.amazon.com/solutions/case-studies/aon/>

iv <https://aws.amazon.com/solutions/case-studies/bristol-myers-squibb/>

v <https://aws.amazon.com/partners/success/on-scale/>

vi <https://aws.amazon.com/solutions/case-studies/fin-design-effects/>

vii <https://aws.amazon.com/solutions/case-studies/san-francisco-state-university/>