

Five reasons to run your CAE workloads on AWS.

Today, nearly all industries are using computer-aided engineering (CAE) in product development, including: automotive, aerospace, plant engineering, electronics, energy, and consumer goods. Engineers require simulation tools to quickly and cost-effectively ensure the effective functioning of a product in all environments and at different phases of a product's lifecycle.

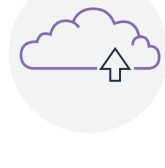
Modern simulation tools, software as a service (SaaS) solvers, and cloud computing have removed barriers to streamlining the difficult endeavor of CAE. Engineers can now leverage the power and speed of high performance computing (HPC) in the cloud to speed up the standard CAE workflow and significantly reduce the cost and time required for each design iteration cycle.

Here are five reasons why AWS is a good choice for running your CAE workloads.

1

Unleash unlimited and on-demand HPC

- Let your CAE simulation dictate the architecture, not the other way around.
- Access virtually unlimited cloud resources, available with the latest Intel® technologies, without the overhead of procuring, deploying, and managing infrastructure.
- Gain more insightful results by leveraging the latest technology tools.



Challenge:

Compute-intensive simulations can get constrained by limited on-premises HPC infrastructure capacity, high capital expenditures on hardware, and the persistent need for technology refreshes.

Solution:

HPC on the AWS Cloud unlocks essentially unlimited amounts of computing power and data storage when engineers need higher performance. Engineers can also leverage additional AWS services and the latest technology tools easily such as AWS Machine Learning (ML) with Amazon SageMaker, to aid in predicting the future performance of products and new features.

Results:

Hyperion Research reports that for every \$1 spent on HPC, businesses see

\$507 in incremental revenues¹ and **\$47** in incremental profit¹

72% of organizations using on-premises HPC reported delayed or cancelled HPC jobs due to lack of resources.²

See more about HPC on AWS [here](#)

2

Accelerate innovation



- Easily launch CFD simulation workloads and get results faster.
- Choose from a range of Intel powered Amazon EC2 instances and pay only for what you use.
- Create, operate, and tear down secure, well-optimized HPC clusters in minutes.

Challenge:

Formula 1® Motorsports wanted to increase excitement for fans by enabling closer, wheel-to-wheel, racing. For Formula 1 cars, the downforce generated by their aerodynamics is the single largest performance differentiator, helping a car travel faster through corners. The current generation of cars suffer a loss of downforce when they are running close to one another, reducing a drivers' ability to sustain close racing and increasing the difficulty of overtaking. Currently, a car running one car length behind another loses up to 50 percent of its downforce.

Solution:

To reduce this downforce loss, F1 used AWS ParallelCluster to set up HPC clusters using Amazon EC2 instances and simulated how the aerodynamics of cars interact when racing in close proximity. With the insights gained from these simulations, Formula 1 has been able to design a car with only 10 percent downforce loss at the same, one car length distance.

Results:

Insights gained from these simulations enabled F1 to design a car with only

10% downforce loss, at one car length distance, as opposed to 50 percent

F1 reduced simulation time by

70% from 60 hours down to 16



Using Amazon EC2 C5n instances

F1 was able to achieve performance equivalent to that of a supercomputer, for a small fraction of the cost

See the complete case study [here](#)

3

Gain competitive advantage



- Run Amazon EC2 Spot instances, and take advantage of spot pricing to further reduce cost for time-flexible workloads.
- Read and write simulation data from Amazon Simple Storage Service (Amazon S3), taking advantage of S3's ability to store vast amounts of data and to handle any conceivable request rate.
- Free engineers to launch compute-intensive simulations to speed new product development without worrying about compute time.

Challenge:

Western Digital's engineers needed quick results from computational electromagnetic simulations to rapidly decide how to increase the capacity of its hard disk drives and get better performing products to market faster than competitors.

Solution:

The company found the best solution was to run its simulations on a massively scalable HPC cluster built on AWS using Amazon EC2 Spot instances. In one case, Western Digital enabled its engineers to run 2.3 million simulation jobs on a single HPC cluster of 1 million vCPUs.

See the complete case study [here](#)

Results:



Reduced the time to results from

20 days to eight hours

The cluster grew to one million vCPUs in one hour and 32 minutes

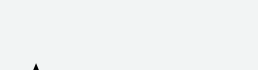
and ran full-bore for six hours at a cost that was approximately half the cost of making the simulation run on an in-house cluster

Achieved extreme scalability in terms of capacity and configurations—

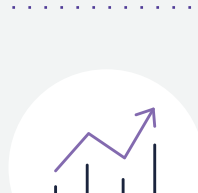
without a large upfront investment or lock-in to legacy infrastructure

4

Build confidence and grow



- Cut CAE simulation costs and still be able to accept projects that exceed your on-premises compute capacity limitations.
- Use Amazon CloudWatch monitoring service to track the progress of CAE simulations.
- Confidently take on projects of larger and larger scope.



Challenge:

TLG Aerospace conducts aerodynamics simulations on aircraft to predict the pressure and temperature surrounding airframes. The company wanted to reduce the costs associated with running simulations and also gain scalability to take on larger simulations.

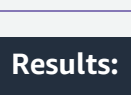
Solution:

TLG takes advantage of Amazon EC2 Spot instances, a way to use unused EC2 computing capacity at a discounted price. TLG also uses Amazon S3 buckets to store multiple terabytes of simulation data on the cloud and Amazon Elastic Block Store (Amazon EBS), which offers persistent block-level storage volumes that can be used with Amazon EC2 instances.

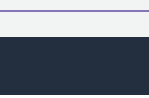
Results:



TLG saw a 75% reduction in the cost per CAE simulation using EC2 Spot instances and was able to pass those savings along to customers—becoming more competitive at winning business



Gained ability to check simulation status from anywhere to catch problems early



Removed capacity limitations and is now able to bid on projects that have a larger scope

See the complete case study [here](#)

5

Unleash productivity



- Scale a diverse range of the latest hardware and applications instantly.
- Access controls for administering simulation users, projects, software, hardware, and budgets.
- Avoid over-provisioning and wasting resources, while also getting the power to exceed your on-premises capacity.

Challenge:

"The challenges we faced at Nissan revolved around managing our in-house HPC system, alongside keeping up with the latest technology innovations to meet market demands."

- Seiji Kawachiya, General Manager of Engineering and Quality System Department, Nissan Motor Corporation

Solution:

Nissan Motor Corporation decided to shift its technical computing to AWS via the Rescale ScaleX platform to gain an agile, cloud-enabled, platform-based solution on a pay-per-use model to minimize overall cost per simulation and continuously adopt the latest technologies.

See the complete case study [here](#)

Results:

18% cost optimization of applications and productivity



50% cost reduction for HPC expenses



Reduced queue time from two to three days to zero days

"The ever-increasing interdisciplinary challenges of vehicle development require innovative, disruptive computational technologies to shorten development cycles to continue to satisfy customer needs."

- Dr. Henry Bensler, Head of CAE Methods at Volkswagen Group Research

¹ Hyperion Research, 2020.

² Economic Models for Financial ROI and Innovation from HPC Investments, Hyperion, 2018.

Getting started with CAE on AWS is easy. You can set up an account with just a few clicks without any upfront commitment. When you choose AWS, you gain instant access to HPC resources including Intel® Xeon® processor technologies and a full spectrum of storage, computing, and analytics.

Learn more

<https://aws.amazon.com/hpc/getting-started>