



# Benchmark Space Systems Cuts Simulation Time Over 85% with Rescale & AWS

## Case Study



**Headquarters:** Burlington, Vermont, United States  
**Industry:** Aerospace, Satellite Propulsion and Manufacturing  
**Founded:** 2017

### Company Overview

Benchmark Space Systems offers in-space mobility-as-a-service that gives satellite operators cost-effective options for maintenance, repairs, and refueling to keep their satellites safely in orbit. As the industry of on-orbit servicing, assembly, and manufacturing (OSAM) increases in complexity and demand, Benchmark Space Systems expects its computational capabilities will enable increasingly efficient options to fuel continued innovation. As compute needs grew, the team turned to Rescale and AWS to give them a competitive edge.

### Executive Summary

Benchmark Space Systems develops unique propulsion technology to economically move satellites into more advantageous orbits after being launched into space by larger rockets. The rapidly growing market for its products, known as on-orbit servicing, assembly, and manufacturing (OSAM), is already estimated in the billions. Maintaining a complex ecosystem of satellite infrastructure requires extensive R&D and compute-intensive simulation.

The engineering team uses high performance computing (HPC) resources to run computational fluid dynamics (CFD) simulations before they go to production. To avoid bottlenecks due to limited compute capacity that might lead to delayed launch dates, the company transitioned from running HPC on-premises to AWS. By using Rescale's HPC automation platform to manage AWS services, Benchmark engineers reduced simulation times from eight hours to one hour, freeing them up to find new ways to grow their offerings and the business. "With revenue growth over 400 percent last year, and five milestone missions set to launch in 2021, Benchmark Space Systems, a propulsion solution innovator, for the past two years has exceeded their fundraising and growth expectations," said Chris Carella, Executive Vice President of Business Development and Strategy for Benchmark Space Systems.

### Delivering in-space mobility requires astronomical compute power

Started in 2017, Benchmark Space Systems is regarded as the go-to for in-space mobility solutions, serving satellite and spacecraft operators in the Space 2.0 segment. It strives to deliver the most cost-effective propulsion solution for small satellite mission needs, from simple orbit adjustments to high-agility maneuvers. The company's in-space mobility products combine hardware, software, and services to address common operational needs, including last-mile orbit insertion from the rocket. Since its inception, Benchmark has grown 100 percent each year thanks to its ability to get new solutions into orbit in a rapidly developing and competitive market.



Benchmark engineers use computation fluid dynamics (CFD) to model many of its thermal and structural designs. It takes hundreds of thousands to millions of core hours per year to run CFD workloads within a reasonable time frame. In some cases, engineers may oversimplify the models so they can use computer power and speed up time to results, which can lead to errors or inaccuracies.

Because of the mission critical nature of Benchmark's designs, engineers needed to maintain the full integrity of their tests, but they also needed to deliver on extremely tight timelines. "We anticipated that computing capacity could easily become a bottleneck that prevented us from delivering best-in-class lead times, especially when we're asked to build first-time configurations for multiple customer programs in parallel," explained Chris Carella. The company went looking for on-demand access to high performance computing (HPC) resources to run CFD. Additionally, they wanted an automated solution that would manage and optimize the underlying HPC resources for the startup-size team.



## Rescale optimizes 700+ HPC applications on the latest AWS cloud architecture

### Rescale delivers a turnkey HPC solution using AWS services

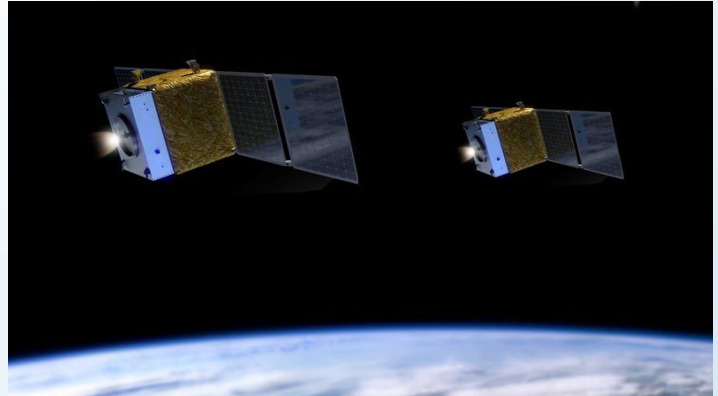
Traditionally, engineers use different systems for different activities like running simulations, storing data, building models, sharing ideas, or publishing results. Not only does each system require its own log-in, but engineers need to manually transfer data or information between them if they need to share it. With Rescale HPC automation platform, Benchmark engineers use a single cloud-based control plane which enables improved data sharing, workflow collaboration, and management control and visibility. By deploying the Rescale HPC automation platform using AWS services, Benchmark can ensure efficient iteration on its model simulations and eliminate islands of analysis, while simultaneously cutting simulation runtimes compared to on-premises HPC systems. Rescale delivers an intelligent computing platform that supports CFD simulations, and configures, manages, and optimizes of HPC resources automatically for engineers.

### Reducing time to a working design with CFD simulations

On average, it can take eight hours to run a simulation and optimizing it for each mission can sometimes take 20 iterations per system. “That means it takes 20 full days of development iterations to optimize on a complex or sophisticated system configuration,” explained Chris Carella. “And a single system can run up to 16 thrusters.” By using HPC resources on AWS instead of the on-premises system, the team reduced its 8-hour simulation to one hour. Similarly, the Rescale solution abstracts the technology management to free up engineers’ time to focus on mission critical tasks.

### Improving HPC resource management and cost

The Rescale HPC automation platform offers a turnkey solution that enables Benchmark’s team to get the best performance, cost, and configuration out of its AWS environment. Built for hybrid and cloud HPC and geared specifically for companies with heavy R&D and engineering computation needs, Rescale helps Benchmark Space Systems to further optimize the use of AWS services. “Rescale offers an end-to-end cloud HPC solution that maximizes simulation and modeling processes as well as business management, automation, budget management, and security compliance processes,” said Dylan Collie, Account Executive, Rescale.



### Intelligently automating the best cloud-HPC

Using AWS services with the Rescale solution offers customers like Benchmark better control and flexibility over how they run their simulations even though Rescale selects the server instances and auxiliary HPC resources for them behind the scenes. “Through AWS, we have access to the latest and greatest, infrastructure and core types available at this day and age,” said Dylan Collie.

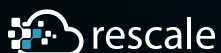
During the next 10 years, an estimated 50,000 satellites are projected to launch into space. They’re all going to need specific mobility solutions in order to successfully complete the mission. Running the Rescale platform with AWS services ensures Benchmark can perform quick, efficient model simulations to optimize complex system configurations—helping space customers take one small step for their satellites and one giant leap for their kind of business.

### Featured Partner: Amazon Web Services



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