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Liberty University Engineering Invests in Cloud-Native HPC to Enable New R&D Capabilities

Case Study

LIBERTY UNIVERSITY

Location: Lynchburg, Va.
Focus: Engineering
Founded: 1971

2,500+ HPC R&D Experiments

Comprising 6+ million core hours across a wide variety of engineering research projects

"Rescale is part of our unique model of 'Creationeering' which brings together state-of-the art technology and processes to drive new innovation. This approach has enabled us to attract and educate students who will serve others and transform society."

— Dr. Mark Horstemeyer, Dean of Engineering, Liberty University

Building a Legacy of Engineering Impact

Liberty University is on a mission to educate values-driven students in an environment that encourages innovation and impacts tomorrow's society. In order to empower student and faculty researchers and continue to attract future leaders, the Liberty School of Engineering invests in curriculum and tools that enable cutting-edge research projects. Adapting to the demands of a quickly evolving industry landscape, the university has woven the practice of simulation-based design throughout its various disciplines. By applying simulation and other computational engineering approaches to its classes, competitions, and clubs, the school hopes to continue growing its reputation for producing high-quality research and top graduates.

Solving the Obstacles to Next-Gen R&D

As one of the fastest growing schools within Liberty, the engineering program soon required computation-intensive R&D and faced challenges providing adquate high performance computing (HPC) resources. Across a wide range of engineering programs, including civil, electrical, industrial, mechanical, and computer engineering, the HPC software and hardware required varies greatly. Combining that variation with the ongoing need for support posed a challenge for the IT team, so they began to search for a solution that could quickly scale to the needs of the school. Brian Wilkes, Director of IT at Liberty, said, "When we received the request for a robust HPC system, we had concerns around cost and our ability to deliver it quickly. When we explored their specific requirements we knew we were short on personnel to implement and maintain a solution on-premises, so we explored options for cloud HPC."

Evaluating the Best Path to Cloud HPC

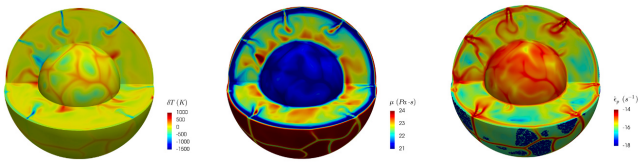
Liberty's IT and Engineering teams seached for a solution that could easily scale and support any number of students and an array of computational needs like batch HPC workoads and cloud desktops for visualization and pre/post processing. Once they decided that cloud was their preferred strategy, they began to assess the work required to build their own cloud services on top of a public cloud service provider. In this process, the team was working to enable a specialized HPC sofware whose vendor had experience working with Rescale and recommended it as a comprehensive and easy-to-deploy HPC solution for that software. It was determined that Rescale could also support all of Liberty's other HPC applications while providing prebuilt IT management tooling that would save the team significant implementation time.

From Resource Constrained to Compute-Empowered

Rescale helped the Liberty team overcome "limitiations around cost, IT bandwidth, and expertise," said IT Systems Operations Manager Dan Harmony. "Rescale provided an all-in-one HPC platform that was easy to implement, use, and control. IT allows us to manage the hardware and costs down to a project level, which is a huge benefit." Giving Liberty researchers an easy-to-learn user experience and flexible on-demand access to the latest cloud HPC tools through Rescale has opened up new possibilities. The Dean of the engineering school, Dr. Mark Horstemeyer, said, "Being able to efficiently leverage cloud HPC helps us use our staff and financial resources more efficiently and reach our goal of educating our students to go out and impact society by revamping the industrial world."

Today, the Engineering school empowers students to explore complex questions through geological, weather, finite element, fluid-dynamic, thermodynamic, electromagnetic, and other computation-intensive simulation types. Students enrolled in engineering programs are free to utilize custom HPC software codes such as 'Terra' (below), developed by Liberty professor and researcher Dr. John Baumgartner and widely used engineering applications like Simulia Abaqus (as seen on page 2).

Earth Mantle Temperature Variations & Fluid Dynamics Simulations Using Terra Run on Rescale



Rescale optimizes 800+ HPC applications on any Azure cloud architecture

"Rescale helped us get up and running quickly with HPC in the cloud. We now have access to a range of specific hardware types we need without having to wait for it. Where I used to wait 3 days for a single job to run, in the same time I can run several different jobs in parallel which saves me time. The Rescale user experience is very intuitive with preconfigured job templates — it even guides you through the steps from job submission to results analysis. With Rescale I don't have to worry about jobs running correctly — it's basically 'set-it-and-forget-it.'"

— Tate Fonville, Mechanical Engineering Ph.D. Researcher

Rescale Integrates Best-in-Class Tools for Streamlined HPC for Researchers

Define Engineering Research Goals

- Accelerate Research Results
- Reduce Overhead and IT Burden
- Maximize License Utilization
- Improve Research Collaboration

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Modern R&D Software
Computational Fluid Dynamics, Finite Element Analysis, Electromagnetics, and More...
ABAQUS

R&D Workflow Automation

IT / HPC Operations Automation

Policy-based Reporting & Controls

Latest Cloud Hardware
Scale, Global Coverage, and Broad Optionality Across Cloud Architectures
Azure

Software Lifecycle Automation & License Management

Full Stack Cost & Performance Optimization

Full Stack Security & Compliance

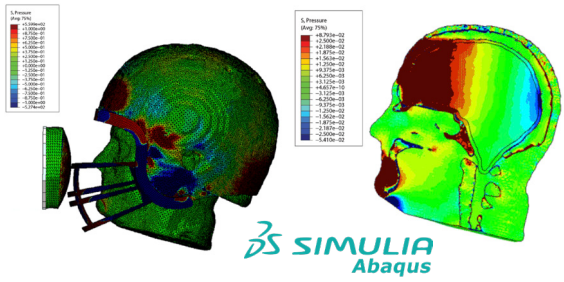
Strategic Academic Outcomes

- Faster, Easier Researcher Onboarding
- Improved Simulation Fidelity
- End-to-End Automation
- Decreased Capital Expenditures

LIBERTY UNIVERSITY + rescale

Innovative HPC-Driven Research Applications at the Liberty School of Engineering

Liberty Ph.D. student Tate Fonville conducts research to engineer a more effective football helmet, digitally simulating impact effects on materials and the brain. The discoveries made will also support the design of other protective devices.



By using Rescale, researchers can focus more on new R&D discoveries by automating and scaling up complex workflows for software like Abaqus, ultimately leading to testing more design iterations and never waiting for HPC resource availability.

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