

## CASE STUDY:

# Rensselaer Polytechnic Institute Implements IBM POWER9™- Based Supercomputer that is Helping Scientists Conquer COVID-19

The Rensselaer Polytechnic Institute (RPI) Center for Computational Innovations is a world-class hub of computation-related research, innovation, and education. In the fall of 2019, RPI fired up the Artificial Intelligence Multiprocessing Optimized System, or AiMOS (which also tips its hat to Rensselaer's first senior professor, Amos Eaton.) Upon installation, AiMOS was the No. 1 ranked supercomputer at a private American academic institution. RPI, in partnership with IBM and New York State, deployed AiMOS to develop hardware and software that accelerates artificial intelligence (AI) and machine learning (ML).



# Rensselaer

*"Our primary mission is a collaboration between IBM and New York State to look at the next generation architectures of hardware for artificial intelligence and the algorithms that support that. Simulations and modeling will be done on the supercomputer at our AI Hardware Research Center."*

*John Kolb, CIO, Rensselaer Polytechnic Institute*

## THE BUSINESS CHALLENGE

The decision to build RPI's next-generation supercomputer on IBM POWER9™ servers was because their superior architecture, price, and performance make them ideal for modern research applications. IBM-built supercomputers running on IBM POWER9™ systems rank number 1 and 2 on the International Fall 2019 Top500 supercomputer list and hold three spots in the top 10. In order to get the system up and running, however, RPI needed an implementation partner that not only had deep expertise in IBM POWER9™ accelerated computing servers but, even more importantly, was an experienced systems integrator (SI) with the ability to design, package, and deploy all of the components for this massive high performance computing system — quickly.

*"Mainline was instrumental in helping RPI meet a tight timeline—and I do mean tight. From order to deployment, we had just over four weeks. Mainline helped us get the supply chain in place to ship, deliver, and install the system so we could finish the LINPACK benchmarking in time to be included in the Fall 2019 Top500 supercomputer listing."*

*John Kolb, CIO, Rensselaer Polytechnic Institute*

## THE SOLUTION

Mainline helped with the overall design of the network, systems, and storage, presenting a solution that checked all of RPI's boxes in record time. Mainline worked with IBM to locate the necessary components and expedite delivery so the implementation project could get underway as soon as possible.

*"Mainline helped RPI and its partners with the acquisition and installation of the system. That included the network, cabling, and data security design as well as the overall systems integration and deployment."*

*John Kolb, CIO, Rensselaer Polytechnic Institute*

**Industry:** Higher Education

**Client:** Rensselaer Polytechnic Institute

### Business Need:

A powerful supercomputer that could take artificial intelligence and machine learning to a new level in support of research.

### Business Value Provided:

The IBM POWER9™-based accelerated computing system fosters industrial research and has recently taken on a second mission: to assist scientists worldwide in conquering COVID-19.

## THE BUSINESS CHALLENGE

- Required deep expertise in IBM POWER9™ servers
- Needed a systems integrator that could work with multiple vendors
- Had to meet a short timeline; 4 weeks from order to deployment

## THE SOLUTION

- 252 IBM POWER9™ AC922 servers
- 40 cores
- 6 NVIDIA Tesla V100 GPUs
- IBM Spectrum MPI
- 2 IBM ESS GH24 Hybrid Storage Arrays
- Mellanox Infiniband Network

## THE RESULTS

- Met the deadline for Fall 2019 Top500 supercomputer ranking
- LINPACK performance 8,045 TFlop/s
- Theoretical peak 11,121 TFlop/s
- Ranked the most powerful supercomputer at a private university in the country
- Ranked #24 in the world
- Solicited to help scientists fight COVID-19

## THE RESULTS

AiMOS was delivered just in time for benchmarking and was deemed the most powerful supercomputer to debut on the November 2019 Top500 ranking of supercomputers, turning in an HPL result of 8.0 petaflops.

*"To put the power of AiMOS into perspective, there are about eight billion people in the world. Eight petaflops divided by eight billion gets you a million calculations per person in the world per second. That's what AiMOS is capable of doing."*

*John Kolb, CIO, Rensselaer Polytechnic Institute*

The main mission of AiMOS is to support industrial research, however the consortium has recently taken on a second mission: to make AiMOS available to researchers across the country and now the world to help fight COVID-19.

*"RPI joined a collaboration between the federal government, the Department of Energy, NASA, and the National Science Foundation as well as top industry participants including IBM, Amazon, Google, and Microsoft to be part of the COVID-19 high performance computing consortium."*

*John Kolb, CIO, Rensselaer Polytechnic Institute*

AiMOS creates modeling that helps scientists better understand the epidemiology of COVID-19, develop strategies to address it, and prepare for otherwise unforeseen scenarios, for example when the pandemic and hurricane season overlap.

More information can be found at <https://covid19-hpc-consortium.org>.

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*"Mainline was instrumental in helping RPI meet a tight timeline. AiMOS is the most powerful supercomputer at a private university in the country and it is the third most energy-efficient supercomputer in the world, which we're quite proud of. I really want to thank Mainline for making AiMOS a success. We could not have done this without their help."*

**John Kolb**

CIO, Rensselaer Polytechnic Institute

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