

Introduction

University of New Orleans (UNO) is an urban research university, that caters to a diverse student community. The university provides essential support for the educational and economic well being of the diverse New Orleans metropolitan area. The research investigator team from UNO belonged to the departments of Computer Sciences, Chemistry, Networking and Security, in addition to the Systems Administration Laboratory (NSSAL) and the Advanced Materials Research Institute (AMRI). The university's goal is to supply the greater New Orleans area with a wealth of qualified software engineers, computer security experts, bioinformaticians, chemists and game developers.



UNO faculty have received a number of grants from Federal and private agencies that have helped the university keep pace with its competition in the research arena. Sustaining such innovation, however, requires a continuous reinvestment in infrastructure that allows researchers to keep pace with technology advancements.



**5TH ANNUAL
RESEARCH CLUSTER GRANT
RECIPIENT**

"The cluster arrived, we plugged it in and it works beautifully. In all honesty, the integration of the cluster into our environment was easy. When we ran into questions, Silicon Mechanics was there with ready answers. It has provided the type of expertise we would look for in a computing partner."

Assistant Professor of Chemistry
University of New Orleans

Challenge

Prior to applying for the Research Cluster Grant (RCG), UNO's scientific computing department owned a nine-year-old cluster that was originally funded by the state of Louisiana that was considerably behind current high-performance computing (HPC) standards. The system ran on commodity spindle drives; its network connectivity was poor and there was no straight-forward cluster management system to manage the this aging infrastructure.

To add the list of challenges, UNO's network provided only two 10 gigabit lines connecting the university to the world. This challenge, combined with the university's limited computational power was disproportionately affecting the research impacts UNO could deliver. From the education side, course offerings and teaching curriculum were limited, the university's ability to recruit students and faculty was being impacted. In addition the deliverability and timeliness of high-impact research was being affected by UNO's limited technology foundation.

Solution

During the Fall of 2015, the research team at UNO applied for the annual Research Cluster Grant (RCG) award offered by Silicon Mechanics and its partners, Intel, NVIDIA, Mellanox, Supermicro, HGST, Micron, Seagate, Western Digital and Bright Computing. The RCG provides the awardee with an HPC cluster valued at over \$100,000, in order to meet the research needs of the institution.

In April of 2016, UNO and the University of California Merced were awarded HPC clusters by the RCG program. Both grants were largely based upon the deep and immediate needs expressed in each application, and decided upon by an established committee. The RCG grant provided researchers at UNO exactly what they needed, a brand new cluster cable of transforming their research.

Results

Since implementing and integrating its new cluster, UNO's Computer Science department has experienced the following benefits:

1. Stability & Speed – The new RCG high-performance computing cluster is a significant addition in terms of speed and stability. There have been no more crashes and an absence of 'flying by the seat of their pants.' Additionally, the cluster gave UNO researchers access to NVIDIA K80 GPUs, making it the fastest set of GPUs in Louisiana. The K80 GPUs provide a speed differentiator on the scale of 100x compared to the K20 GPUs on the Louisiana Optical Networking initiative's (LONI) supercomputer.

2. Connectivity – The problem with the network infrastructure at UNO – only having two 10 gig lines to connecting to the world, was not only frustrating to the scientific computing team at UNO because it hampered its ability to conduct research in a timely manner. As a result of the new cluster, the scientific computing team was able to curate a map of UNO's network plan, showing where the connectivity problems existed. This allowed the team to work with its IP to identify means to rectify over 80 gigs of network lag.

3. New Grant Proposals – Access to cutting-edge technology in the Silicon Mechanics RCG cluster has provided the scientific computing team with new opportunities for growth. The team at UNO continues to improve processes and best-practices for both faculty and students as to how best to utilize the cluster. Interestingly enough, this situation has led to a slew of new grant proposals from UNO that look into upgrading storage, compute, network connectivity and student training. These include:

- A network upgrade grant proposal submitted to the National Science Foundation (NSF). Now that UNO has a fast cluster in place it could run research at-scale model calculations and distribute them to regional and national sites. This process is, however, hampered by its antiquated network - the only way UNO can accomplish this specific mission is by owning a faster network and network switches.
- A mixed reality (augmented and virtual) and artificial intelligence grant proposal – both of which are now possible since the cluster has robust GPUs. The

cluster allows researchers at UNO to run GPU-based platforms like Unity. Mixed Reality gives UNO the ability to run visual simulations in chemistry class, for example, which for UNO represents the ultimate flex of its computing power.

- Cyber Security Grants – in order to teach people via eLearning workshops how to conduct super secure computing. How do you set up a super secure computing environment?
- A research instrumentation grant that submitted to the NSF in collaboration with SM to obtain a new storage server to add to the cluster, plus additional GPU nodes.

The RCG high-performance cluster awarded to University of New Orleans has fundamentally transformed Departments of Chemistry and Computer Science and the associated technology infrastructure. With additional computational power and GPU-enabled technology, UNO now has the tools to recruit leading student and faculty talent. Silicon Mechanics is honored to be involved with UNO as they to prepare students for careers in technology industry and deliver cutting edge research and instruction within the disciplines of drug-design, energy, cyber security and bioinformatics.

HPC Cluster Solution Components

Intel Xeon E5-2600 processors

Mellanox InfiniBand EDR networking

NVIDIA Tesla K80 GPUs

Supermicro SuperServer

Silicon Mechanics design, integration and support

Research Cluster Grant Contributions

