A New Leading-edge Cluster is a Win–Win for Louisiana and XSEDE Users

Source: XSEDE

Just a few months before the arrival of the new year, a powerful new computational resource went into full

production for XSEDE users—the SuperMIC (pronounced as Super Mick) cluster connects Louisiana State University (LSU) to the national cyberinfrastructure through XSEDE while serving as the next step in supercomputing for the state of Louisiana.

The National Science Foundation (NSF) provided $3.92 million in funding for SuperMIC in a Major Research Instrumentation (MRI) award to the Center for Computation & Technology (CCT) at LSU in 2013. CCT and the Office of Research and Economic Development at LSU provided an additional $1.68 million.

Principal investigator (PI) for SuperMIC is CCT Deputy Director Dr. Honggao Liu, who also was the PI for the NSF-funded LSU–LONI (Louisiana Optical Network Initiative) high-performance computing (HPC) operations project, which added LONI resources to the NSF TeraGrid in 2007; and he was the LONI PI for "Bridging to eXtreme Digital (XD)," a TeraGrid project to extend LONI's operations to XSEDE. LONI is a state-of-the-art fiber optics network that runs throughout Louisiana and connects Louisiana agencies, universities, and Mississippi research universities to one another as well as to Internet2.

"SuperMIC is a natural extension of LSU's past history of supporting the national cyberinfrastructure through the TeraGrid program," Liu says. "This is a unique opportunity for LSU to again become a significant player on the national scene, and this MRI award will be an exemplar for how the national community and the LSU infrastructures can interact for the benefit of both. SuperMIC will also play a key role in many research and education projects supported in Louisiana and continue Louisiana's leadership role in supercomputing."

He says that SuperMIC provides the resources needed to solve challenging research problems, ranging from personal medicine genomics, to the study of black holes, to accurately predicating environmental impact from storms and manmade disasters that threaten the coastal areas of the U.S.

"The rapid adoption of accelerators in industry makes SuperMIC the ideal platform for developing new programs and methods for making the best use of all the power they offer, giving U.S. industry a major competitive advantage," Liu says.

SuperMIC is one of America's fastest supercomputers—in the current Top500.org list (November 2014), it's ranked number 88. It is a 380-node cluster made up of Dell servers running Linux. In many ways it is similar to the XSEDE Stampede cluster, but on a much smaller scale—"only" 7600 cores. However, each node has two of the newer 10-core, 2.8 GHz Intel® Xeon® Ivy Bridge CPUs.

Three hundred and sixty of the compute nodes are equipped with two Intel® 7120P Xeon Phi™ accelerator cards, and 20 "hybrid" nodes have one Xeon Phi™ 7120P plus one NVIDIA® Tesla™ K20X GPU. This means SuperMIC's peak processing speed is 1 PetaFLOPS (or 1000 TeraFLOPS), which is equal to one quadrillion floating-point operations per second. It achieved 557 TeraFLOPS for its Top500 ranking using 323 of 380 nodes. For comparison, the fastest supercomputer in the U.S. (number 2 in the world), Titan at Oak Ridge National Laboratory, is capable of 27 PetaFLOPS.

Not only are hundreds of scientists throughout Louisiana able to use SuperMIC for research projects requiring processing of large amounts of data but also, through LSU's agreement with NSF, 40 percent of the resource's total compute cycles is available to researchers across the country via the XSEDE Resource Allocation Committee (XRAC) process.

As an XSEDE Level-2 service provider, LSU will inform the XRAC each quarter of the number of cycles available from SuperMIC at the national level—which is expected to be about 6.6 million service units (SUs) each quarter—and receive support from the XSEDE project in deploying and integrating the software and middleware tools developed by XSEDE. This symbiotic relationship between the award and XSEDE corresponds with the idea of campus bridging developing an integrated national cyberinfrastructure.

Through SuperMIC XSEDE allocations so far, researchers have started exploring areas of interest in physics and molecular biosciences. And, as of this writing in early January 2015, more than 700,000 XSEDE allocated CPU-hours have been used since full production started on Oct.1, 2014.

Publish Date:
01-27-2015

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