

COSET-- High Performance Computing Lab

The High Performance Computing Center (TSU-HPCC) at TSU was established in 2008 to promote research and training on campus through integrating leading edge high performance computing and visualization for the faculty, staff and students of TSU (<http://coset.tsu.edu/hpcc>). TSU-HPCC provides consulting and assistance to campus researchers with experimental software and/or hardware needs and training in parallel and grid computing.



Funding:

- Dept. of Education, Title III
- National Science Foundation
- Welch Foundation
- Army Research Laboratory
- Texas Southern University

Resources:

- Specially designed and equipped 672 sqft. double floor data room, with card reader security access
- Two 208Y/120V 42-pole panel with a total deliverable power of 88 kW and 112.5 kVA transformer
- 3 x 22-ton AC Liebert DS077DD chilled water units to provide downflow underfloor cooling
- Gas Ansul SAPPHIRE Clean Agent fire protection system
- Six racks with 64 nodes (blade computers), each with independent 10 kW UPS power backup
- 20 racks capacity each with 50 amps junction box power distribution
- A total of 1120 computing cores
- A total of 1998 GB of RAM memory
- Three 1GB/s Ethernet networks, two 10 GB/s Ethernet networks, one Infiniband fabric
- Eight "super-servers", with dual 6-core Xeon processors and 4 Xeon Phi coprocessors each
- Five GPU servers for Machine Learning and AI tasks with NVIDIA RTX 4000 accelerator cards
- A total of 35 TB disk storage

Selected ongoing Computational Projects:

- Classical Trajectory Monte Carlo simulation of proton and electron collisions with Rydberg atoms for cosmology and star genesis
- Quantum chemistry N-scaling large size system calculations
- Web hosting and web application scientific programming using dedicated Jupyterhub
- Scientific Machine Learning
- Electronic structure calculations of Nitrogen-Vacancy defects in diamond to be used as pressure and temperature gauge
- Quantum chemistry study of metallo-organic catalysis of C sequestration and hydrogen storage
- Atomistic simulations of shock wave propagation in high energy density systems
- Advanced digital signal processing for vibration analysis in early detection of machinery failure
- Modeling of stray neutron production in proton radiotherapy using Monte Carlo simulations
- Phylogenetic tree reconstruction in bioinformatics
- Parallel massive data reduction using Hadoop
- Research on performant computation fluid dynamics with co-moving, and mixed boundaries
- Research on eigenvalue calculation of extremely large systems in quantum mechanics
- Training workshop in parallel computing