

Cornell University Center for Advanced Computing (CAC)

Research Computing | Consulting | Training & Education

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Accelerate Your Next Discovery

Changing circumstances demand new insights and plans for the future. Do you want to achieve your research and outreach goals faster and more efficiently?

Research Computing & Consulting

CAC provides Cornell faculty and staff with research computing and consulting services that accelerate discovery. Our PhD scientists, computational, and data analysis experts offer a wide range of services from HPC cluster hosting and data storage to database design, programming, and visualization. Our goal is to help you get your results faster and broaden your engagement with research colleagues, citizen scientists, the public and your supporters.

National Awards

| CAC Awards | Leadership Role |
|----------------------------------|---|
| NSF Aristotle Cloud Federation | Built Federated Cloud & Research Tools |
| Frontera Virtual Workshops | Training for one of the country's fastest supercomputers (launched in 2019) |
| NSF NANOGrav PFC & SCIMMA | Cyberinfrastructure Design, Software Design, and Data Management |
| NSF Physics at the Info Frontier | Optimizing Parallel Codes to Analyze CERN Detector Data |
| Indiana University Jetstream | Creating and Hosting Virtual Workshops |
| NSF XSEDE 2 | Campus Champion for Faculty Supercomputer Access and Training Lead |
| XSEDE 2 | Community Resource Infrastructure Lead, Software/Scripts, and Repository |

Cloud Platforms



- Instances with up to 28 cores and 240GB RAM
- Instances featuring up to 4 NVIDIA Tesla V100 GPUs or 4 T4 GPUs
- Persistent disk storage volumes backed by Ceph storage with >1 petabytes raw capacity
- CPU/cores not oversubscribed for superior performance
- Exploratory accounts available



- \$7.1M NSF-funded federated cloud: Cornell (PI), University at Buffalo, UC Santa Barbara
- New federated allocations, accounting, and cloud metrics
- OpenStack software platform
- Use cases include Cornell's J. Cordes, A. Douglas, S.C. Pryor, P.M. Reed, and UCSB's C. Krintz (SmartFarm: Improving Ag Sustainability Using Modern IT)

Sustainability Research Impacts



Weather simulation of wind farm turbine wakes and wind resource variability to maximize power production. 150TBs WRF simulation data modeled for 2001-16. S.C. Pryor, T.J. Shepherd, et al. (2019). Wind farm wakes simulated using WRF, *J. Physics*.

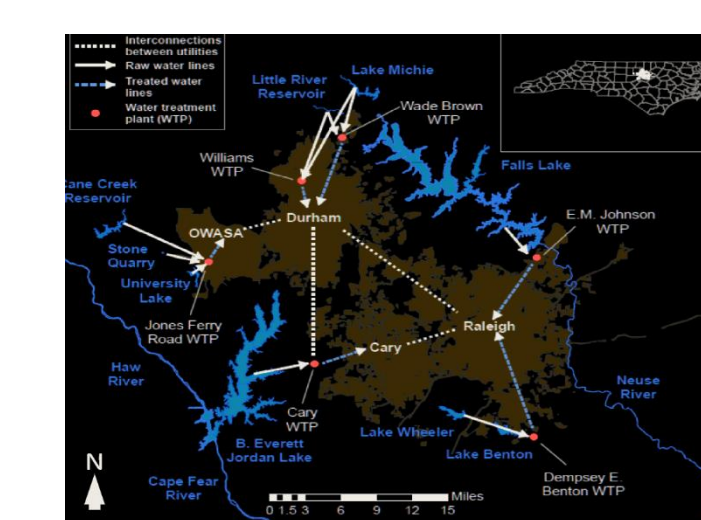
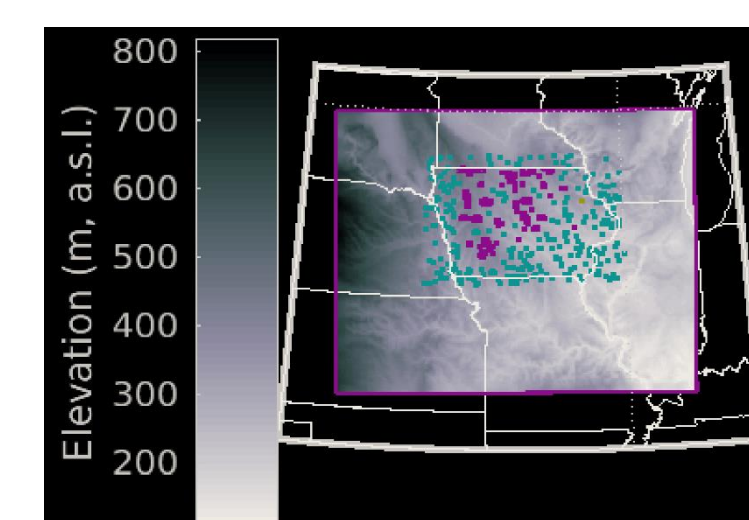


OpenMORDM water resource management framework optimizing water supplies for multi-actor usage. A 200+ CPU cluster was created to simulate water resource decision making. P.M. Reed, B.C. Trindade, et al. publication forthcoming.



All instrumentation for the USDA's Citrus Under Protective Screening (CUPS) project will be hosted by the Aristotle cloud. Cornell is the Aristotle PI; C. Krintz is the UCSB lead. The goal is to prevent the Asian citrus psyllid from damaging California citrus.

Wind and Water Simulation



Left: S.C. Pryor et al. (2019). Simulation of wind turbine wake effects around dense wind farms in Iowa. *Journal of Physics*.

Right: D.F. Gold, P.M. Reed, B.C. Trindade & G.W. Characklis (2019). Identifying actionable compromises: Navigating multi-city robustness conflicts to discover cooperative safe operating spaces for regional water supply portfolios. *Water Resources Research*.

Seeking Collaborators

- Server hosting for simulations or scientific research applications.
- MPI clusters for large simulations (WRF, MPAS, and more) over multiple server instances provisioned on demand or running at high scale on many thousand nodes of XSEDE computing resources.
- Private cluster hosting available including GPU hardware and support for setup and ongoing maintenance.
- Application code portability with Docker containers.
- Promoting best practices in cloud deployment. Less cycles used means less energy consumed by cloud resources.
- Studies of public cloud resource energy sourcing impacts.
- On campus hardware hosting services for energy efficient accelerators.

Services

| Service | Capability |
|-----------------------------------|--|
| High Performance Computing | Design/Maintain Clusters & Storage |
| Red Cloud Server Hosting | Cornell's on campus cloud hosting uses OpenStack managed virtual machines to support reliable and performant long running simulations |
| Cloud-Ready Research Applications | Build Docker Images Containerize Applications Deploy to Red Cloud or your choice - Amazon EC2, Google Cloud, Azure Scale on Kubernetes |
| Research Databases | Design, Optimize, Host, Manage |
| Programming & Code Improvement | Proficient in Many Languages |
| Web Sites/Science Gateways | Design/Host User Interfaces and HPC and Database Backends |
| Cornell Virtual Workshops | Design/develop online training workshops. You provide the Subject Matter Expert and we'll do the rest. A broader impact tool. |

Rates

- Professional computing and consulting services are fee-based. A Cornell account is required for charge back. Faculty can write our services into grant proposals. We can help with estimates, writing proposals, letters of support, and identifying potential collaborators.
- No fees required for initial requirements meeting, high-speed network access, up to 20 hours consulting to architect an HPC cluster or storage to be housed in our Rhodes Hall machine room and maintained by our staff, and educational events.
- Red Cloud exploratory accounts are free.
- Industry, colleges and universities, non-profits, and public agencies may access CAC services through our Partner Program. Red Cloud subscriptions are available to external entities on demand.

Contact

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