Center for Research Computing

RICE

The Center for Research Computing (CRC) provides research computing services for the Rice community and plays a crucial role in achieving the goals outlined in Momentous, the university's 10-year strategic plan. The CRC provides essential cyberinfrastructure, including high-performance computing (HPC) clusters, cloud computing options, research data storage and high-speed data transfer tools. Services include consultation, training, and application support to help researchers optimize their use of these resources and navigate cyberinfrastructure challenges. The CRC also assists with grant proposals, data management planning and secure research environments.

HIGH PERFORMANCE COMPUTING RESOURCES

The CRC operates several HPC clusters to meet a range of research needs and provides HPC resources for undergraduate and graduate coursework.

NOTS (Night Owls Time-Sharing Service)

is a general-purpose Intel-based cluster with both conventional and GPU processors. NOTS is designed for both HPC and high throughput computing (HTC), with 159 nodes interconnected with high-speed Ethernet and either Omni-Path or InfiniBand low-latency networking. An expansion in 2024 provided a significant boost in capacity and capability for CPU and GPU compute power, with a total of 88 million CPU core hours and 750 thousand GPU hours annually.

The **ARIES** cluster is a donation from AMD and intended for health research. It uses AMD GPUs providing 12 million CPU hours and 1.5 million GPU hours annually.

RAPID (Rice Analysis Platform for Interactive Data)

is a small GPU-only cluster with 80 Nvidia GPUs and is set up for interactive compute jobs and container-based execution.

RANGE

is a new state-of-the-art AI-focused system that will come online in fall 2025 with multiple Nvidia H100 and H200 GPUs, with NVLink GPU interconnect for high-speed internal data transfer.

Several hundred terabytes of VAST-based scratch space are available across the HPC clusters.

ADDITIONAL COMPUTING RESOURCES

The **ORION** (Owl Research Infrastructure Open-Nebula) system is an on-premises cloud service for users who need more interactive computing or virtual server infrastructure, including hosting web applications.

The **VRDE** system (Virtual Research Desktop Environment) is our secure on-premises multi-tenant, regulated enclave for storage and compute on confidential or restricted information. CRC collaborates with the OIT security and client services groups to provide ongoing support and consultation for VRDE, including security compliance, reporting, feature enhancements, process improvements and capacity planning.

RESEARCH DATA STORAGE RESOURCES

Research Data Facility

The CRC provides storage and data transfer services to support the needs across the research lifecycle. The Research Data Facility (RDF) is an on-premises, 2.9 petabyte (PB) networked service that is highly resilient. RDF allocations are available to faculty researchers — allocations of 500GB are subsidized and a cost recovery model in place for additional utilization beyond the 500GB limit.

Research High-Capacity Facility

In December 2024, we launched our new 5PB performant storage resource, the Research High-Capacity Facility (RHF), which is designed to support active research using large datasets. This resource is connected to our HPC systems and is accessible from most endpoints. Requests for allocations require a brief proposal, and the initial 10TB are subsidized by the University. Researchers may buy into this system if very large allocations are needed.

Open Storage Network

Rice is a member of the national Open Storage Network (OSN), which connects us to a national data fabric. The OSN supports research and education that require research storage, access and transfer at scale, with infrastructure that provides S3 compatible object storage for multi-terabyte data in active use. The CRC is committed to providing 20% of the available storage to the common OSN allocation pool, which is available through the NSF ACCESS program.

Cold Storage and Disaster Recovery

For disaster recovery, archiving and preservation, the CRC provides access to remote storage services, including AWS Glacier and the Granite (tape) service run at the National Center for Supercomputing Applications (NCSA) at UIUC.

Fast Data Transfer

The CRC manages an extensive network of GLOBUS data transfer nodes (DTNs), which allow researchers to move terabyte-scale datasets quickly between the CRC's HPC systems and other data endpoints; or to transfer large datasets to other participating academic institutions. Rice University's Science DMZ provides high speed connectivity to our GLOBUS DTN network via Internet2 and ESnet.

CRC SUPPORT SERVICES

The CRC provides several other advanced research computing services:

- Research Computing Facilitation and Training
- HPC Application Integration and Support
- Research Systems Management
- Cloud Computing Resources for Research
- Research Data Analytics, Visualization, and Mapping
- Research Proposal Consultation, Collaboration, or Support

Research Computing Facilitation and Training

Our facilitators consult with researchers to identify and ease access to the best services and solutions for their computational and data management and infrastructure needs, including account provisioning, on-boarding and user support. CRC facilitators hold regular workshops to introduce researchers to CRC systems and services, including data storage, virtualization and high-performance computing. Researchers can request custom workshops tailored to topics of interest to their group. In partnership with Fondren Library, the CRC also provides periodic Software Carpentries workshops — two-day, hands-on sessions focusing on critical tools for data analysis and software development such as Python, Git and R.

Application Integration and Support

The CRC's team of HPC application support specialists can assist with job optimization, code profiling, working with compilers, debugging software issues and integrating software packages into the cluster environment. The Application Support Team works directly with staff, graduate students and faculty to explain how to develop workflows, write job submission scripts and troubleshoot performance bottlenecks.

Research Systems Management

Research Client Services:

This team manages distributed, researcher-owned computing systems, and assists with optimizing the use of those resources.

System Procurement and Deployment:

RCS team can advise researchers on computer hardware purchases for their own research projects: evaluating specifications, providing quotes from vendors, data center installation and integration into the Rice network, and provisioning/configuring the operating system.

Systems Management and User Support:

RCS provides ongoing systems management services: user administration and access control, patch management, security monitoring, application installation, performance tuning, and troubleshooting and incident response.

Research Instrument Support:

Many scientific instruments utilize specialized computers or embedded systems for instrument control or data acquisition. The RCS team can help your lab deploy, manage and troubleshoot these systems to ensure stability, functionality and secure operation over the lifetime of the instrument.

Cloud Computing Resources for Research

The CRC can assist researchers with virtualized computing resources in the commercial cloud, or using the CRC's private, on-premises cloud service. CRC consultants can help researchers navigate commercial cloud offerings, manage project scope and design, and provide tools to set up boundaries to control costs and ensure authorized use of cloud resources.

The CRC operates **ORION**, a private, on-premises virtual computing platform. ORION is ideal for testing, development, interactive tasks, lightweight services or long-running compute workloads that don't parallelize well. Researchers can spin up resources on demand to expand their computing capacity and consult with our facilitators to develop workflows and applications using virtual machines.

Additionally, research projects may require a combination of on-premises and cloud-based computing resources. The CRC can act as a liaison between your research group, cloud service providers and OIT staff to facilitate cloud integration.

Research Data Analytics, Visualization and Mapping

The CRC offers support and project collaboration in the areas of data curation, visualization and analysis, custom web mapping application development, cloud-based analytics, training and consultation.

Geospatial Data Services:
The CRC offers support in geospatial data collection, geocoding, analysis and visualization, terrain and hydrology analysis, environmental monitoring and management, and 2D/3D web mapping application development.

Cloud Based Analytics:
The CRC can support scaling computational-intensive research from personal machines into the Cloud, with process design, data transformation and automated workflows.

Training and Consultation
Our team can provide training and consultation to students, faculty and staff involved in research projects on how to use tools and techniques for data collection, management, analysis and presentation.

Proposal Planning, Collaboration and Other Research Services

The CRC can help your research group plan for cyberinfrastructure, software and staffing needs related to your grant proposals.

Cyberinfrastructure and Staffing Costs

The CRC is available to consult with researchers to estimate the cost of computing systems, data storage, staff time and training for grant proposals, or collaborate directly with researchers on grants. We can provide facilities documentation to enumerate on-premises computing resources and assist with obtaining credit grants from commercial cloud providers.

Data Management Plans

The CRC can help your research group to develop data management plans, evaluate appropriate data storage technologies for different stages of the data life cycle, and ensure compliance with granting agency guidelines for data retention. The CRC also partners with Fondren Library's Research Data Services team to assist researchers with data repositories, research metadata, data accessibility and preservation.

ACCESS to National Resources

ACCESS is a program established and funded by the National Science Foundation to help researchers and educators, with or without supporting grants, to utilize the nation's advanced computing systems and services. The CRC team can work with researchers to write successful ACCESS proposals, design computational plans and introduce users to ACCESS cyberinfrastructure.

**For assistance,
scan the QR code:**

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