

HIGH-PERFORMANCE COMPUTING

HIGH THROUGHPUT COMPUTING

STORAGE

RESEARCH COMPUTING SERVICES

ENABLING RESEARCH THROUGH COMPUTING

VISUALIZATION

SUPPORT FOR RESEARCHERS

RESEARCH COMPUTING SERVICES

Research Computing Services (RCS)

aids you in maximizing your productivity and effectiveness in the use of research-focused computing, storage, and networking resources. To guide you, we will:

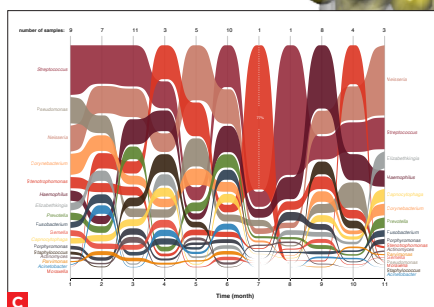
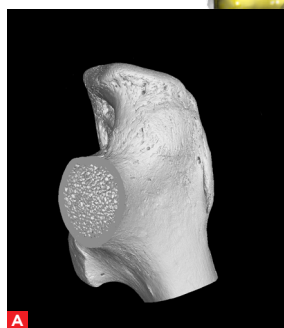
- **Discuss and understand** your research goals and how RCS can help you attain them Introduce
- **Introduce** your team and you to our research computing resources, including the Shared Computing Cluster (SCC), and train you to use them effectively
- **Develop and optimize** your workflows, programming codes, and visualizations to support your research
- **Install and support** your software applications and tools utilized in your field of research
- **Partner** with you to propose, purchase, and support your dedicated, research-er-funded computing and storage resources through the SCC Buy-in Program
- **Coordinate** resources available for your research through collaboration with local, regional, and national research and high-performance computing partners

- **Advocate** for you and your peers on BU's current and future research computing needs

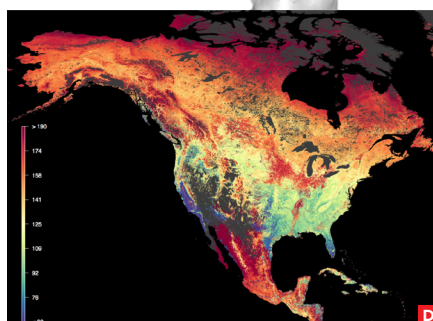
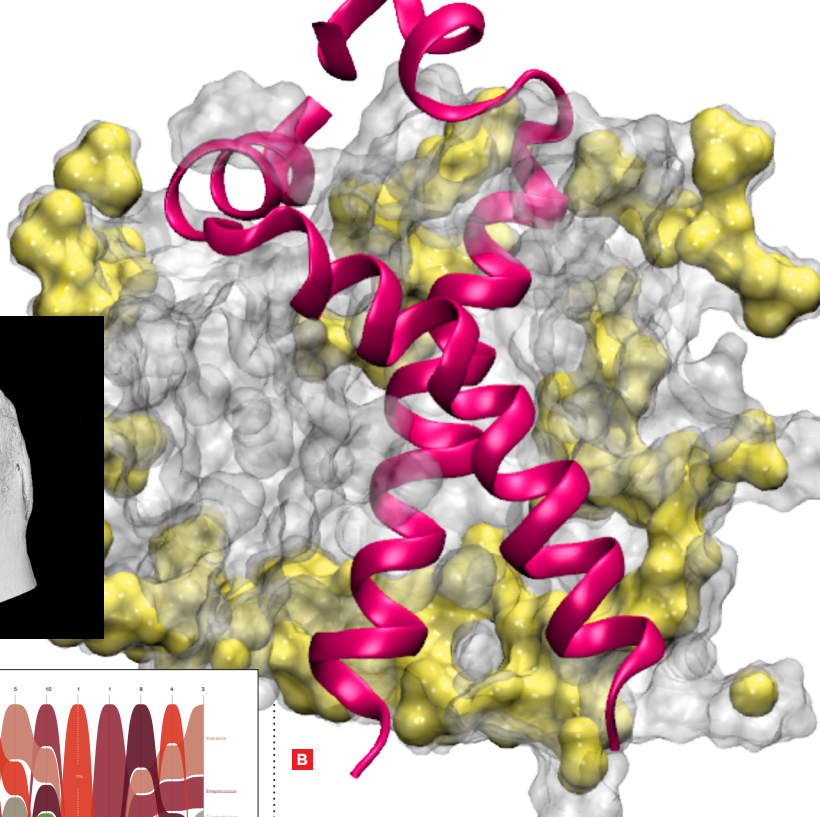
WHO WE SERVE AND WHAT WE DO

For over 45 years, RCS has supported thousands of researchers on the Charles River and Medical Campuses. Our group supports a wide range of disciplines, from the physical sciences and engineering to emerging computational communities such as biostatistics, bioinformatics, genomics, neuroscience, machine learning, public and global health, economics, finance, the social sciences, microbiology, and infectious diseases.

CONSULTING RCS' staff provides you with individualized support, leveraging our experience in advanced computing and domain-specific areas of science. We assist with all levels of resource usage; the porting, optimization, and parallelization of code; workflow design; visualization; and data and accounts management. Throughout our support process, we respect the tools and workflows customary in your field. We can also help you craft effective proposals that include research computing services and infrastructure.



TRAINING RCS provides live and online tutorials tailored for BU's research computing resources. Each semester, we offer hands-on tutorials covering various topics, including introduction to RCS resources, mathematics and data analysis, statistical computing, programming, high-performance computing, and visualization. On request, we customize training for research groups and classes. We also host workshops, user groups, symposia, and vendor training sessions.



A: Cross section of a reconstructed chimp femur (Alex Claxton)
B: Atomistic simulations of membrane protein association in lipid bilayers and surfactant micelles (Straub Group)
C: Changes in relative abundance of tracheal bacteria in tracheostomy patients over time (Johnson Lab)
D: The day of spring arrival in 2010 across North America—analysis of daily satellite imagery (Friedl Group)

SYSTEMS ADMINISTRATION RCS' dedicated staff supports BU's state-of-the-art research computing infrastructure, including the SCC. We possess expert knowledge in many advanced high-performance computing, storage, and networking technologies. In addition to hardware and systems administration, the systems group works in close concert with the RCS consulting group to provide researchers with a comprehensive support experience.

THE SCC: ADVANCED RESOURCES FOR RESEARCHERS

Need processing power, storage space, or software for your research? The Shared Computing Cluster may be an excellent solution for you. Available to all University faculty, their students, and their collaborators for research and educational use, the SCC includes shared resources supported by University investment. In addition, researchers have the opportunity to partner with us and purchase dedicated SCC resources through the highly successful RCS-managed Buy-in Program.

The SCC supports a variety of researcher workloads and includes resources for:

- Single-processor, multi-processor, and multi-node jobs
- Computation time, from hours to weeks
- Memory for large datasets
- Highly accessible fast storage for both small and large datasets
- High-speed networking for accessing computing and storage
- Over 900 research software applications and numerous programming languages
- Advanced computing technologies, including parallelization and GPU accelerators
- Advanced data analytics technologies
- Fast, interactive visualization
- The web-based interface, SCC OnDemand

DATA STORAGE The SCC offers high-speed, large-scale storage to support research data, including some types of confidential data. This storage system offers substantial protection from both hardware failures and accidental deletions. A limited amount of storage is automatically backed up and stored off-site for disaster recovery. We also support other methods for preserving research data, including SCC STASH and access to other institutional storage services.

SOFTWARE RESOURCES There are over 900 software packages on the SCC, and we frequently add more as requested



BY THE NUMBERS

The RCS-managed Shared Computing Cluster supports **3,800 researchers** in **1,200 projects** from **over 90 departments and centers** at BU.

In addition, it supports **over 70 academic courses** from **over 20 departments**.

The SCC comprises **over 29,000 CPU cores**, **over 470 GPUs**, and **14 PB of storage** for research data.

Over the past year, researchers have computed a total of **over 110 million core hours** on the SCC.

by researchers. Multiple versions are maintained and easily accessible to researchers. Our extensive software library includes many domain-specific application packages as well as numerous languages and libraries for conventional and parallel programming.

PARTNERSHIP & PARTICIPATION

SCC BUY-IN PROGRAM This highly successful program gives you the opportunity to acquire additional, cost-effective storage and compute resources to directly support your research goals.

Buy-in resources comprise two-thirds of the cluster—since 2012, 240 researchers, labs, centers, and departments have invested over \$9 million to become SCC partners. By integrating your purchases into the SCC, you'll receive additional support and benefits, including:

- IT infrastructure and administration of purchases at no extra cost
- Researcher-controlled allocation of storage purchases to your lab members and collaborators
- Researcher-driven priority access and usage policies for compute purchases
- Seamless scaling and bursting of work-

loads beyond your purchase to other SCC resources

- Compute credits when other researchers use excess compute cycles on your node
- Full hardware maintenance on your purchase during its five-year lifetime

OTHER SERVICE MODELS Two other service models, in addition to shared and buy-in resources, are available for those with very specific requirements.

The *dedicated service model* provides fee-based management of specialized research computing systems that do not align with the SCC.

The *co-location model* offers no-cost, stand-alone service providing rack space, power, cooling, and basic network access

in the data center for use by faculty wishing to have complete control of their own resources.

THE MGHPPC: HOME TO WORLD-CLASS RESEARCH COMPUTING

The SCC is housed at the LEED platinum-certified Massachusetts Green High Performance Computing Center (MGHPCC) in Holyoke, Massachusetts. This facility accommodates SCC's growth and supports unique collaborations and initiatives with our university peers.

Boston University is a founding member of the MGHPCC, along with Harvard, MIT, Northeastern, and the University of

The Massachusetts Green High Performance Computing Center (MGHPCC) in Holyoke, Mass., is home to BU's research computing infrastructure.

MGHPCC



Massachusetts. Other founding partners include Cisco, Dell EMC, and the Commonwealth of Massachusetts.

The MGHPCCC's location near Holyoke Gas & Electric's hydroelectric dam on the Connecticut River provides access to abundant clean, renewable energy to power the center's massive 33,000 square-foot computer room.

NETWORKING Charles River and Medical Campus researchers seamlessly utilize the SCC at the MGHPCCC via the campuses' and region's high-performance networking infrastructure. The SCC itself utilizes a combination of Gigabit, 10, 25, 40, and 100 Gigabit Ethernet, and InfiniBand for its computing systems. Connections from SCC back to BU are supported through two pairs of 10 Gigabit connections, providing an aggregate capacity of 40 Gbps to campus and 20 Gbps to Internet2's 100 Gigabit Ethernet national network.



OTHER RESOURCES

COLLABORATIVE ENGAGEMENTS

For researchers who need resources beyond what the SCC affords, RCS actively collaborates with several high-performance computing service providers. Very large-scale computing needs can be met through the NSF-funded Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support (ACCESS) program. The Massachusetts Open Cloud Alliance (MOC-A), of which BU is a lead partner, is a collaboration of industry, the open-source community, research IT staff, and systems researchers whose goal is to create a production cloud for researchers. RCS participates in two projects that are closely aligned with MOC-A, the Northeast Storage Exchange (NESE) and the New England Research Cloud (NERC) which provide scalable object and tape storage as well as on-premise cloud computing resources.

THE BU LINUX VIRTUAL LAB

The Linux Virtual Lab provides limited access to the SCC to members of the BU Community. The SCC OnDemand web-based interface provides access to most SCC software packages and to interactive desktops. Accounts are managed through the IT Help Center.

For details and help on our facilities and services, visit

rcs.bu.edu

Our Locations

Charles River Campus:

Information Services
& Technology,

2 Cummington Mall

Medical Campus:

BUMC IT,

Crosstown Center,

801 Massachusetts Avenue

Contact Us

Support: help@scs.bu.edu

General: rcs@bu.edu

Governance

Research Computing
Services is a group within
Information Services
& Technology. RCS

resources are managed
in close consultation with
the Research Computing
Governance Committee,
the SCC Faculty Advisory
Committee, and the Rafik
B. Hariri Institute for
Computing and
Computational Science &
Engineering.

Boston University's policies
provide for equal
opportunity and affirma-
tive action in employment
and admission to all pro-
grams of the University.