Virginia Tech Computing Facilities, Equipment, and Operations
Prepared by
Advanced Research Computing, Virginia Tech

July 2026

1 Introduction

Advanced Research Computing (ARC) advances the use of computing and visualization in Virginia Tech (VT) research by providing a centralized organization that identifies, acquires, maintains, and upgrades/extends compute systems; and educates, supports, problem-solves, and collaborates with the VT community. As one example, ARC offers generous levels of no-cost resources to students and faculty, which supports the great majority of user needs. The ARC website is https://arc.vt.edu/. ARC resides in the Division of Information Technology (DoIT). Cybersecurity is implemented through the Information Technology Security Office (ITSO).

2 Compute Systems

2.1 Cluster Systems

VT's main compute clusters are listed in Table 1. All clusters serve the entire VT community. TinkerCliffs is the flagship cluster, consisting of CPU and GPU (A100 and H200) nodes. Owl is a water-cooled CPU and GPU cluster that includes 12 large memory nodes with up to 8 TB of memory each and 4 nodes with 8 B200 GPUs each. Falcon is a GPU cluster comprising L40s, A40, V100, and T4 GPUs. The CUI (Controlled Unclassified Information) cluster is restricted for using ITAR or Export Controlled software/data. The biomed cluster is restricted for biomedical research in need of NIST 800-171 compliance. The five clusters serving all of VT provide 632 nodes, 64,736 CPU cores, 514 GPUs, and 360 TB of memory. The unrestricted clusters share the same GPFS mount so that codes and data can be accessed from any cluster. All clusters use InfiniBand (IB) interconnect.

Table 1: Summary of ARC compute clusters.

Cluster	**TinkerCliffs**	**Owl**	**Falcon**	**CUI**	**Biomed**
Node type	CPU / GPU	CPU / GPU	GPU	CPU/GPU	CPU / GPU
Nodes	288 / 16 / 8 / 14 / 6	160 / 4 / 12 /4	32 / 20 / 36 / 18	10 / 2	2 / 1
Cores per node	128 / 96 / 128 / 128 / 64	96 / 64 / 128 /128	64 / 64 / 24 / 32	64 / 64	64 / 64
GPUs per node	– / – / – / 8x A100 / 8x H200	– / – / – / 8x B200	4x A30 / 4x L40s / 2x V100 / 1x T4	– / 8x A100	– / 8x A100
Memory (GB) per node	256 / 384 / 1024 / 2048 / 2048	768 / 512 / 8192 / 2048	512 / 512 / 384 / 196	512 / 2048	512 / 2048

2.2 Visionarium

ARC's Visionarium Lab provides an array of visualization resources, including the ImmersaDeck, an immersive three-dimensional visualization room, with head and device tracking. The ImmersaDeck is a 14.7-foot by 14.7-foot by 9.2-foot three-dimensional visualization environment, with 47.9 million pixels and 700 ft2 of display surface. It is a world-class immersive visualization facility that has 15,000 lumens per projector (6) and Dual-Eyepoint Projection for two stereo views. The facility is unique in that it has 3 walls, a floor, and a partial ceiling. The Visionarium Lab is available to faculty, graduates, and undergraduates to work with their data and visualization solutions in a cutting-edge hardware and software environment including interactive 3D graphics locally, as well as remote High-Performance Visualization (HPV) with the ARC HPC clusters over the dedicated 10 Gig VT-RNET. From the Web to Headsets and CAVEs, the Visionarium Lab provides expertise and consulting in creating effective analytic, design, and collaborative environments.

2.3 Access To Resources Beyond VT

ARC resources are able to leverage Virginia Tech's excellent network connectivity, and network. Virginia offers access to advanced national networks, including ESnet, Internet2, and Mid Atlantic Crossroads.

3 Upgrades and Maintenance

Approximately every four months, the clusters are taken offline for two-to-four days for major upgrades. To the extent possible, hardware and software maintenance and expansion—which are continual efforts—are completed while the systems are offline to minimize disruptions to users.

4 Leadership and Technical Support

4.1 ARC Leadership

Alberto Cano, AVP for Research Computing, leads ARC. Other leadership team members are: Matthew Brown, Director of Research Computing Services; Jeremy Johnson, Director of Operations; Ben Sandbrook, Director of Research Software Engineering, and Mark Gardner, Network Research Manager.

4.2 Technical Systems Support

The Systems Engineering Team architects, installs, maintains, and upgrades research system network, storage, and compute resources, and workload management. They maintain and implement system security practices, and respond to alerts from monitoring/logging systems. These efforts include implementing and maintaining supporting infrastructure systems (e.g., cooling and power systems) and services. The team researches new/emerging technologies, including research on compute hardware and networks, and interacts with vendors to integrate hardware into ARC systems. They maintain user accounts and operate user-facing systems such as ColdFront and Open OnDemand, respectively.

4.3 Technical User Support

Technical user support occurs on two fronts. First, support is provided for general use of the clusters, user and system problems, and individual user or group needs, including proposal preparation (e.g., consultations). Second, system software and applications are maintained and new software is added based on user requirements. Both fronts are served by five Computational Scientists and three Graduate Research Assistants, who also conduct workshops for users. The group also hosts a bimonthly meeting for all VT students and faculty to describe new developments, bring up new issues for input from the user base, and answer questions. These meetings, among other outlets, guide ARC's future equipment purchases, operations, and services.

5 Cybersecurity

The Information Technology Security Office (ITSO) oversees the security of the cyber infrastructure on campus under the direction of the Chief Information Security Officer.

5.1 InCommon Federation

Virginia Tech participates in the InCommon Federation as an Identity Provider, allowing individuals to use their Virginia Tech credentials to securely authenticate to services provided by InCommon Service Providers. Since InCommon is a federal Trust Framework Provider, Virginia Tech is an approved Credential Service Provider under the FICAM TFS Program.

5.2 Intrusion Detection

The ITSO deploys freeware and commercial intrusion detection sensors to monitor attacks against University computers. The data collected by these sensors is analyzed to identify and respond to cyber-attacks and to analyze malware. Virginia Tech takes a Continuous Monitoring security strategy that allows

"hunting" for compromised machines and facilitates remediating events. Continuous Monitoring is a component of the Center for Internet Security's (CIS) Controls architecture. The CIS Controls are a subset of the NIST 800-53 Priority 1 controls, NIST CSF, and NIST 800-171. One very useful capability is the ability to merge IDS data with GIS maps and building floor plans on campus to facilitate a quick and timely way to determine the scope of cyber-attacks against University computers.

5.3 Cyber Security Operations Center

Virginia Tech has implemented a Cyber Security Operations Center (SOC). This convergence of tools, data, and personnel into the SOC allows IT Security personnel to unite data from network sensors, provide analysis, and coordinate needed responses to further protect assets.

5.4 Centralized Logging

The Division of Information Technology provides a Central Log Service (CLS) to university departments for storing and analyzing logs, both for security and operational purposes.