

Virginia Tech – Facilities, Equipment and Other Resources

Virginia Tech's Advanced Research Computing (ARC) is a unit within the Division of Information Technology and provides centralized research computing resources which are available to any Virginia Tech researcher. ARC provides cutting-edge high-performance computing and operates 5 clusters with 603 compute nodes, 59,456 CPU cores, 271 TB RAM, 521 GPUs, and over 11 PB of storage. Currently available high performance computing (HPC) systems include:

1. **TinkerCliffs:** a general purpose CPU and high-end GPU cluster. This cluster has 308 nodes with 39,424 AMD Rome CPU cores, 16 nodes with 1,536 Intel Xeon CPUs, 8 high-memory nodes with 1 TB RAM each, and 14 nodes with 8 NVIDIA A100-80GB GPUs each. Nodes are connected via HDR InfiniBand offering 100 Gbps throughput.
2. **Owl:** high-speed, water-cooled CPU cluster. This cluster has 84 nodes each with 96 AMD Genoa CPU cores and 768 GB RAM, interconnected with HDR InfiniBand running at 200 Gbps. Additionally, it has 3 high-memory nodes each with either 4 TB or 8 TB RAM.
3. **Falcon:** GPU-based cluster made up of 52 compute nodes with a total of 128 NVIDIA A30 GPUs and 80 NVIDIA L40S GPUs. Nodes are connected via NDR InfiniBand offering 200 Gbps throughput.
4. **Infer:** GPU-based cluster made up of 98 compute nodes with a total of 80 NVIDIA Volta V100 GPUs, 19 NVIDIA Tesla T4 GPUs, and 80 NVIDIA Tesla P100 GPUs. Nodes are connected via EDR InfiniBand offering 100 Gbps throughput.
5. **CUI or Protected data:** This is a dedicated cluster and storage supporting some types of data which need elevated protections such as ITAR or Export Controlled software/data. This cluster has 12 CPU nodes each with 64 CPUs and 512 GB RAM, and 3 GPU nodes each with 64 CPUs, 2 TB RAM, and 8 NVIDIA A100-80GB GPUs.

Centralized storage provides over 11 PB of long-term bulk "project" storage and flash-based, as well as local "scratch" storage for workflows with demanding I/O needs.

ARC employs 15 FTEs and 4 GRAs to support the infrastructure and provide user support. ARC provides services to accelerate discovery and enhance the use of these systems. ARC has a staff of computational scientists who are available to consult with researchers to provide expert advice on the selection of systems for their workloads, optimizing workflows and code bases, and actively engaging in collaborative research. For extended engagements, they are also able to participate as named personnel on sponsored projects. Daily office hours are hosted by a team of graduate assistants who also provide most of the support for system usage via ARC Helpdesk tickets. Various workshops are conducted every term to provide orientation to new users and training to groups.

ARC's Visionarium Lab provides an array of visualization resources, including the VisCube, an immersive 10' x 10' three-dimensional visualization environment. The VT Visionarium provides nearly 86 million pixels, 4 billion triangles-per-second and 22 TB/s of GPU memory bandwidth.

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