

*Sharing Resources in the
Cyberinfrastructure
Environment:
The Virginia Tech Perspective*

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About Virginia Tech

- Main campus:
 - Blacksburg, VA (rural southwest)
- Academics:
 - 110 bachelor's degrees
 - 170 master's and PhD degrees
 - 34,440 students
 - Selected research units
 - Biocomplexity Institute
 - Fralin Life Sciences Institute
 - Virginia Tech Transportation Institute
 - Institute for Creativity, Arts, and Technology
 - Hume Center (cybersecurity and intelligence)
 - Virginia-Maryland College of Veterinary Medicine
 - Institute for Critical Technology and Applied Science
 - Virginia Tech Carilion School of Medicine and Research Institute
- Ranked 43rd in university research in US
- Facilities:
 - 213 buildings
 - 2,600 acres (and an airport :-)



Virginia Tech Research Resources



■ Computing

- Cascades: general purpose; 236 nodes, 7312 cores, 63TB RAM, 100G IB; heterogeneous with large RAM and K80/V100 GPU nodes
- DragonsTooth: general purpose; 48 nodes, 1152 cores, 12TB RAM, 10 GbE; homogeneous with 1.9TB SSD per node
- NewRiver: general purpose; 173 nodes, 4380 cores, 53TB RAM, 100G IB; heterogeneous with large RAM, large disk, and K80/P100/K1200 GPU nodes
- BlueRidge: general purpose; Cray C300; 408 nodes, 6528 cores, 27TB RAM; heterogeneous with large RAM and Intel Xeon Phi nodes
- Huckleberry: deep learning; IBM S822LC; 14 nodes, 2240 cores, 3.5TB RAM; 10 GbE / 100 IB; homogeneous 4 P100 GPU per node with NVLink
- ARC Cloud: on-premises OpenStack; 48 nodes, 1152 cores, 12TB RAM, 2x10 GbE, 26TB Ceph SSD storage
- GENI rack: 12 HP Proliant DL360p nodes, 144 cores, 576 GB RAM, 24 TB disk, 1 GbE; InstaGENI software

■ Storage:

- /home: 281TB NFS
- /work: 2.1PB GPFS & Lustre
- /group: 1PB GPFS
- Archive: CXFS

■ Networking:

- 10 GbE research network (VT-Rnet) and ScienceDMZ
- 100 GbE data center network
- 100 GbE campus backbone
- 100 GbE to Internet2
- Mid Atlantic Research Infrastructure Alliance (MARIA) regional network managed by VT Operations Center (VTOC)

■ Visualization:

- The Cube: 4 story theater with 360 degree sonic field from 124 speakers, 4 subwoofers, and 9 “spot” speakers
- Visionarium: 10’x10’x10’ cube, three walls and floor

■ Awards

- NSF #1245827: ASCED (ScienceDMZ)
- NSF #1340875: MARIA100G (removed bottleneck for VA universities)
- NSF #1353831: FitGENI (GENI)
- NSF #1541338: VT-Rnet (research network)

URL: <https://www.arc.vt.edu/>

VT Opportunities and Challenges

- Opportunities
 - More collaboration with regional (e.g., MARIA) and national partners
 - Better federation and sharing of resources
 - Champion and support the use of national research resources
 - Better participate in national research resource acquisition initiatives and planning
- Challenges
 - Need to mentally make the transition to being major research institution
 - Ranked 43rd as research university but funding for research infrastructure is still ad hoc and limited
 - Need 5- and 10-year research infrastructure plans and budgeting
 - Insufficient skilled personnel for creating/maintaining/operating research infrastructure
 - Need to develop appropriate training specialized to needs of research and academia
 - (Then need to figure out how to retain after trained)
 - Expand user-base:
 - Some sciences well represented; expand to other sciences/liberal arts
 - Greater and earlier student involvement and use of research resources to better foster curiosity-driven learning