VIRGINIA TECH™

IT Division of Information Technology

Annual Report
Fiscal Year **2020**

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LETTER FROM VICE PRESIDENT & CIO

Scott F. Midkiff, Vice President for Information Technology & CIO

I am again pleased and honored to introduce the Division of Information Technology annual report for the 2019-2020 fiscal year (FY 2020)! FY 2020 started much like previous years, with anticipation of the upcoming semester and continuing to support the teaching and learning, research and discovery, and outreach and engagement missions of Virginia Tech. We had recently launched the IT Strategic Plan for 2018-2024 and we focused on new efforts as outlined in the IT Operational Plan for 2018-2020. The early part of the Spring 2020 semester was particularly productive and, in particular, we developed plans for important process improvements as part of the "Process" foundational element of our IT Strategic and Operational Plans.

But, the 2019-2020 fiscal year finished in a very different way than it began. Our world – everyone's world – changed dramatically in the early part of 2020 as nations, organizations, and individuals responded to the global COVID-19 pandemic. On March 11, 2020, Virginia Tech President Tim Sands announced that Virginia Tech would extend spring break by one week and resume the Spring 2020 semester on March 23 with all remote teaching. In addition to the shift in teaching, most university employees began to work from home in the middle of March. The Division of IT almost immediately focused on four goals: (1) to enable nearly 2,400 instructors to convert about 4,500 course sections to a remote teaching format; (2) to support the transition to work-from-home for the majority of employees across the university; (3) to continue the Division of IT's operations with close to 90 percent of our employees working all or mostly from home; and (4) to encourage and enable every IT employee to care for themselves, their family and friends, and their coworkers.

Division of IT employees stepped up and did amazing work to let the Division of IT and, indeed, the entire university continue to be successful in the "great pivot" of the pandemic. In addition to our employees, our success was due to a solid foundation of technology, training programs, and relationships. We had invested in technology especially with our Next-Generation Learning Management System project and Video for Instruction project. We had solid network infrastructure with virtual private network capability and a strong security program in place. We leveraged a 25-year

history of professional development programs for instructional faculty. We also utilized our strong relationships with faculty and business partners to get their help and to support others in the switch to remote teaching and work from home. The Division of IT continued to support the university's research mission during the pandemic. For example, in early summer 2020, in the midst of the pandemic, we deployed a new high-performance computing system called TinkerCliffs which greatly expanded access to state-of-the art computing for hundreds of university researchers. We also adjusted our administrative enterprise systems to support new requirements for supporting students and employees.

While we had to set aside some of our long-term, forward-looking work, we did not stop looking forward. As we ended FY 2020, we were still in the midst of the pandemic with much uncertainty, but with a certainty that FY 2021, from July 2020 through June 2021, would continue to be challenging. We also moved beyond FY 2020 with a certainty that we would learn and emerge from the pandemic at some future time with greater knowledge, expertise and experience, new strength and resilience, and a renewed sense of purpose and service. We knew that much would return to normal, but that we would return to a "next normal" in our services and how we work.

I am proud of the achievements of the employees of the Division of IT, before and during the pandemic and summarized in this report in the context of the five pillars (Innovation in Teaching and Learning, Advancing Research and Discovery, Leveraging Technology for Outreach, Enhancing Organizational Excellence, and Differentiating the VT Experience and the two foundational elements (People and Processes) of our IT Strategic Plan. Our employees were "heroes" in allowing Virginia Tech to continue its mission and for serving the university's students, faculty and staff throughout the pandemic. I look forward to the journey beside them to our next normal.

Scott F. Midkiff, Ph.D.
Vice President for Information Technology & Chief Information Officer

Fiscal Year 2020 Financial Summary

The financial summary below provides an overview of the total budgeted funds and expenditures of the Division of IT during FY 2020 (July 1, 2019 - June 30, 2020).

Vice President for Information Technology Financial Summary, Fiscal Year 2019-20

	Total Budget	Total Expenditures
Education and General Funds	$53,813,995.74	$44,014,505.63
Equipment Trust Funds	$ 4,609,488.79	$ 5,483,571.48
Auxiliary Operations	$22,682,651.00	$20,442,879.86
Sponsored Grants and Contracts	$ 1,968,238.97	$ 477,717.05
Continuing Education / IDDL Funds	$ 238,073.28	$ 3,303.13
Overhead Funds	$ 1,670,175.11	$ -
Other Sources	$ 248,596.35	$ 243,322.22
Total	$85,231,219.24	$70,665,299.37

When Virginia Tech abruptly transitioned to essential operations in March 2020 in response to the impending COVID-19 pandemic, TLOS immediately sprung into action, offering training sessions, consultation, and ongoing support for instructors moving courses online.

How to move a university online in 12 days

On Wednesday, March 11, 2020, President Tim Sands announced that, following an extended spring break the remainder of the spring 2020 semester would be conducted entirely online, in an effort to slow the spread of COVID-19. By March 23, nearly 2,400 instructors were teaching approximately 4,500 sections remotely, and all students were attending class online.

While many groups across the university made invaluable contributions to this swift transition, it would have been impossible without the leadership, support, and expertise of the Technology-enhanced Online Learning & Strategies (TLOS) team.

In many ways, TLOS had been preparing for a moment like this for a long time. Providing technology support for **continuity of instruction** and helping instructors move their courses online is part of what they do every day — and sound decisions made by TLOS, IT Procurement and Licensing Solutions (ITPALS), and other Division of IT groups laid the groundwork for Virginia Tech to successfully operate in an online academic arena. “With our adoption of Canvas, Zoom, and Kaltura in recent years, Virginia Tech had established a strong technical foundation for instructional continuity,” stated Quinn Warnick, TLOS interim deputy executive director **in VT News**. “Similarly, faculty have been deepening their digital fluency and building their confidence in online environments through TLOS’ professional

development offerings. When COVID-19 arrived, we immediately began to see the fruits of those efforts."

TLOS sprung into action to ensure that instructors would be able to teach as effectively as possible once courses resumed, offering twice-daily workshops for instructors to gain necessary skills in Zoom, Kaltura, and Canvas, and sharing out resources and best practices for everything from pre-recording lectures to preventing cheating to providing accessible course materials for students with varying needs.

> *"The work we have done would have been impossible without the tremendous contributions and support from individuals and units across campus." - Dale Pike, executive director and associate provost for TLOS*

To rapidly scale up support services, TLOS reached out to the Virginia Tech community, recruiting those who were already experienced with online teaching to serve as Continuity Partners, consulting with their peers throughout the transition period and beyond. In true Hokie style, nearly 150 departmental faculty, administrators, and IT personnel volunteered to help.

"The Continuity Partners gave freely of their time and resources to help in this crisis," said Marc Zaldivar, director of professional development curriculum and assessment for TLOS, who helped coordinate the Continuity Partners program. "They provided TLOS with the information we needed to respond quickly and effectively on issues that would have been overwhelming without their support. What this represents to me, personally, is Virginia Tech's *Ut Prosim* spirit: this community comes together — strongly — when called."

The full story, **How to move a university online in 12 days**, is available on the VT News.

Learning technologies outreach and engagement

TLOS supports faculty in using tools and techniques to innovate their classrooms and enhance teaching and learning. The Learning Technologies Outreach & Engagement initiative works to establish substantive connections with campus partners in order to further align TLOS' support efforts with academic program priorities. Using the current stakeholders committee model as a guide, TLOS realigned and redefined its engagement to establish a liaison network to support specific colleges and departments. Early COVID-19 support strengthened relationships between TLOS and departments across the university. Alongside the Continuity Partners, TLOS supported the rapid move to emergency remote teaching with both virtual consultations and through a **collection of online resources**. In order to continue the support model as the university moved towards summer sessions and the fall semester, TLOS initiated a process to allow campus members to **schedule a consultation** with a learning technologies specialist or instructional designer.

Computer lab of the future

TLOS maintains eight on-campus computer labs serving a variety of programs. The software provided ranges from basic text and business management programs like Office365 to the more processor-intensive programs in Adobe Creative Cloud. The Computer Lab of the Future project is reviewing the current state of computer labs, evaluating their effectiveness, providing insight into the future use of the spaces, and reimagining how to offer the same software services in innovative ways. After several virtual software solutions were analyzed, the **Apporto cloud virtual desktop solution** was selected. COVID-19 further encouraged TLOS to come up with a **touchless computer lab solution** for fall semester 2020. While the testing, funding, contracts, and deployment for Apporto are in negotiation, TLOS is providing a remote desktop solution for their labs.

IT training across the division

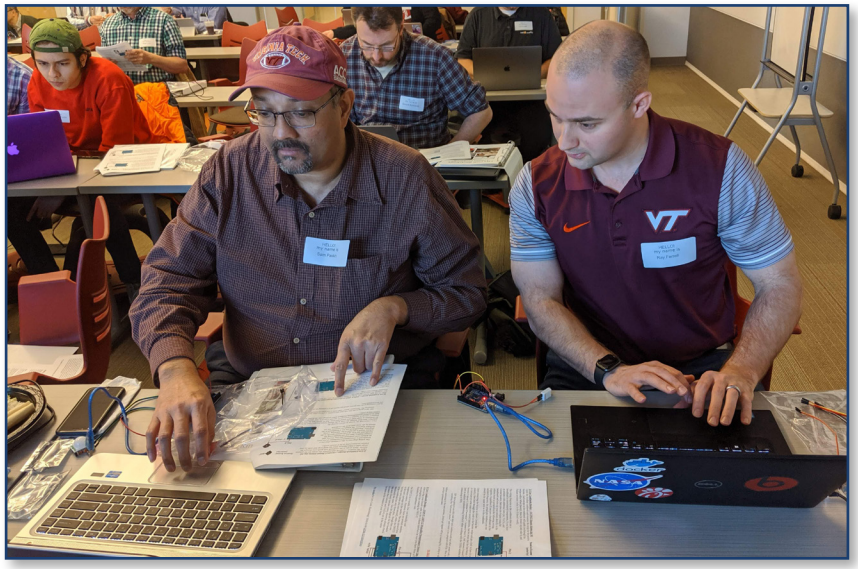
One of the greatest assets of the Division of IT is the level of expertise and experience of our employees. Every year, faculty across the division serve as instructors or guest lecturers to the Virginia Tech community and beyond. Several IT units host and facilitate workshops and seminars to help Virginia Tech students and employees, as well as educators and IT professionals, develop their information technology skills. These efforts support our commitment to facilitate innovation in research and promote the adoption of emerging technologies.

Highlights of training provided or supported by the Division of IT in FY 2020 include:

- **VACR/CCI Cybersecurity Workshop.** The Virginia Cyber Range (VACR), in partnership with the Commonwealth Cyber Initiative (CCI), hosted a multi-day online workshop for educators From Virginia's public high schools and community colleges. Sessions covered cybersecurity basics including networking, cryptography, the Linux operating system, web application vulnerability analysis, and password audits. Course instructors included Division of IT faculty, including David Raymond of the Virginia Cyber Range and Randy Marchany of the IT Security Office (ITSO).

- **Guest lectures for the Colleges of Science and Engineering.** Advanced Research Computing (ARC) computational scientists gave 14 guest lectures in various course sections of mathematics, physics, statistics, and computational modeling and data analytics over the course of the 2019-20 academic year. Topics included ARC basics, parallel computing, and Justin Krometis lecture "how my VT physics degree keeps me one step ahead of disaster." Division of IT project manager Greg Kroll shared his perspective on project management processes as a guest lecturer for CS 4704: Software Engineering Capstone.

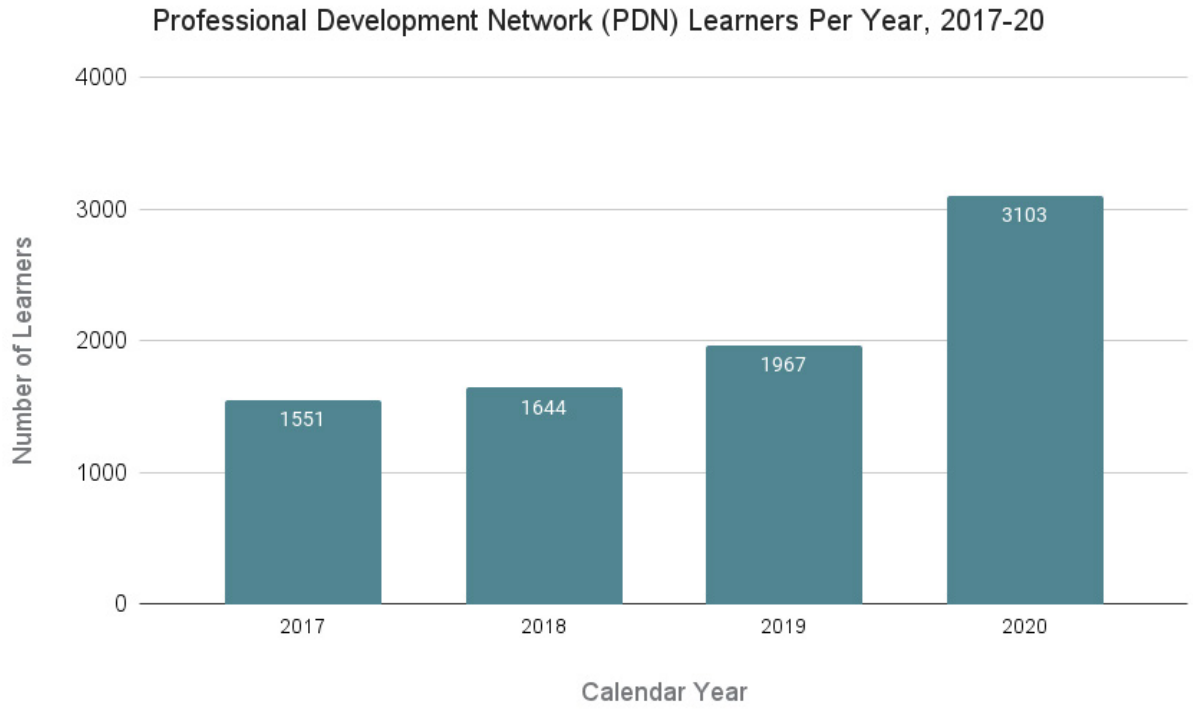
- **IoT Workshop.** During the Virginia Tech IT Symposium in January 2020, technology futures and community advocacy director Thomas Weeks conducted a hands-on course introducing faculty and staff to Internet of Things (IoT) system design. Participants created a computing environment monitor designed to monitor temperature, humidity, and motion in a small data center and report real-time readings to a web interface.

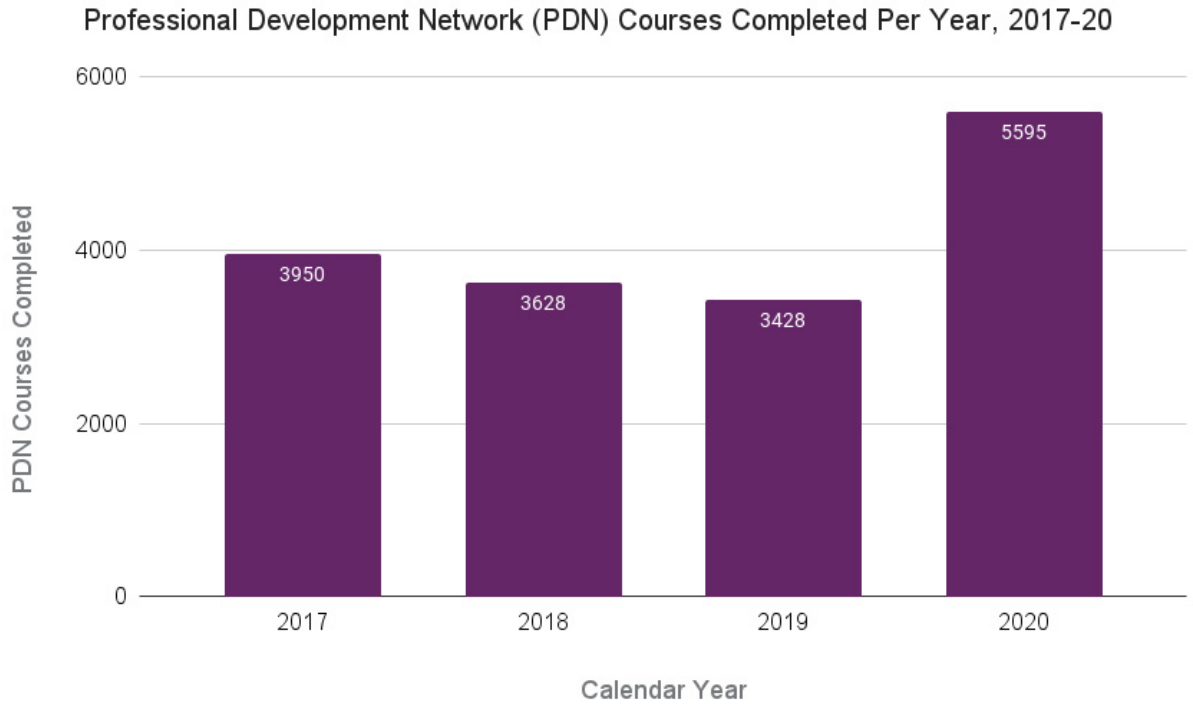


Sam Parikh and Ray Ferrell, both from Enterprise Systems, participate in the IoT Workshop on January 8, 2020.

- **SANS security training.** The (ITSO) regularly hosts courses for SANS Institute, a leading authority on cybersecurity training, certification, and awareness. In March 2020, the ITSO hosted SEC 530: Defensible Security Architecture and Engineering, which focused on effective design techniques to create a robust security architecture. The six-day course drew IT professionals from, Virginia Tech, state and local government agencies, and private sector firms across the U.S. and Canada.

- **TLOS Professional Development Network (PDN).** TLOS: Professional Development Network (PDN) delivered 548 high-quality professional development opportunities with 2,254 faculty, staff, and graduate students attending at least one workshop. PDN moved to all-virtual workshop offerings in early 2020 due to COVID-19 as well as providing on-demand tutorials.





The TLOS Professional Development Network (PDN) experienced a significant increase in usage in 2020, with a more than 60% increase in both the number of learned and number of completed courses compared to 2019.

- **LinkedIn Learning.** Virginia Tech upgraded from Lynda.com to LinkedIn Learning in August 2019, providing unlimited access to self-paced online learning. The LinkedIn Learning library covers everything from art history to software tutorials to math to technical writing with 26,510 hours of video viewed and 12,842 courses completed in the 2019-2020 fiscal year.

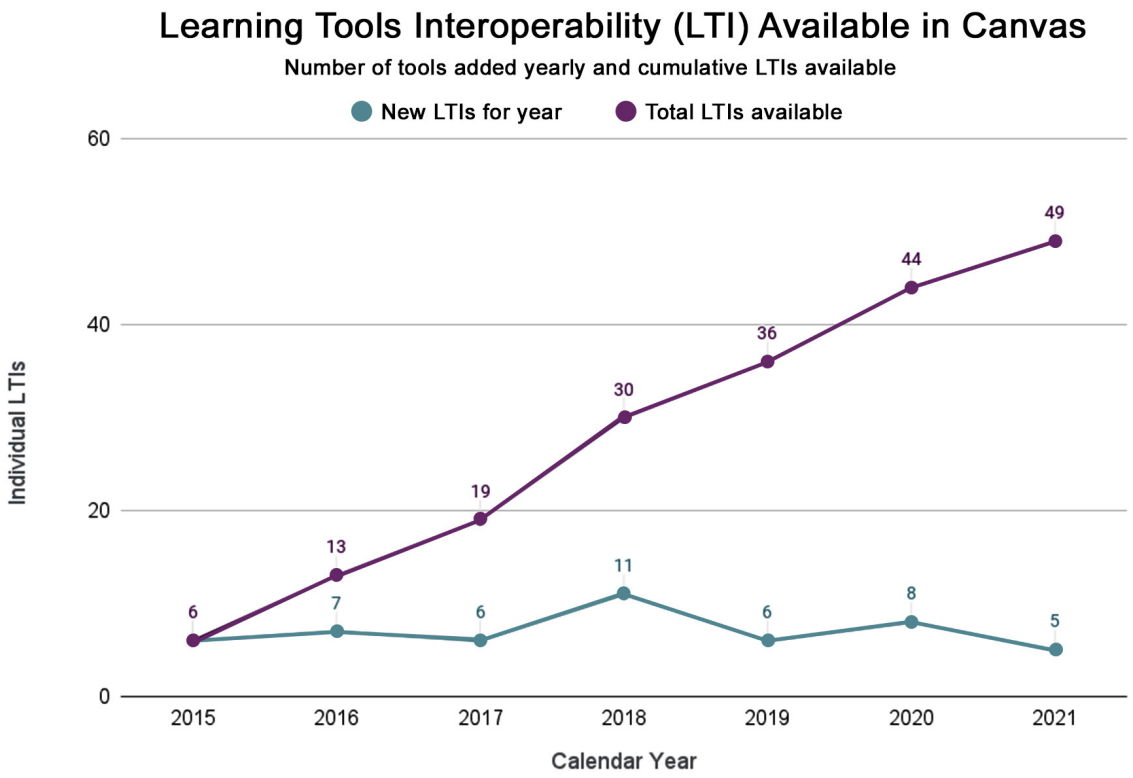
New tools for Canvas users

A collection of Canvas LTIs (learning tools interoperability) and feature updates were added to Canvas this year.

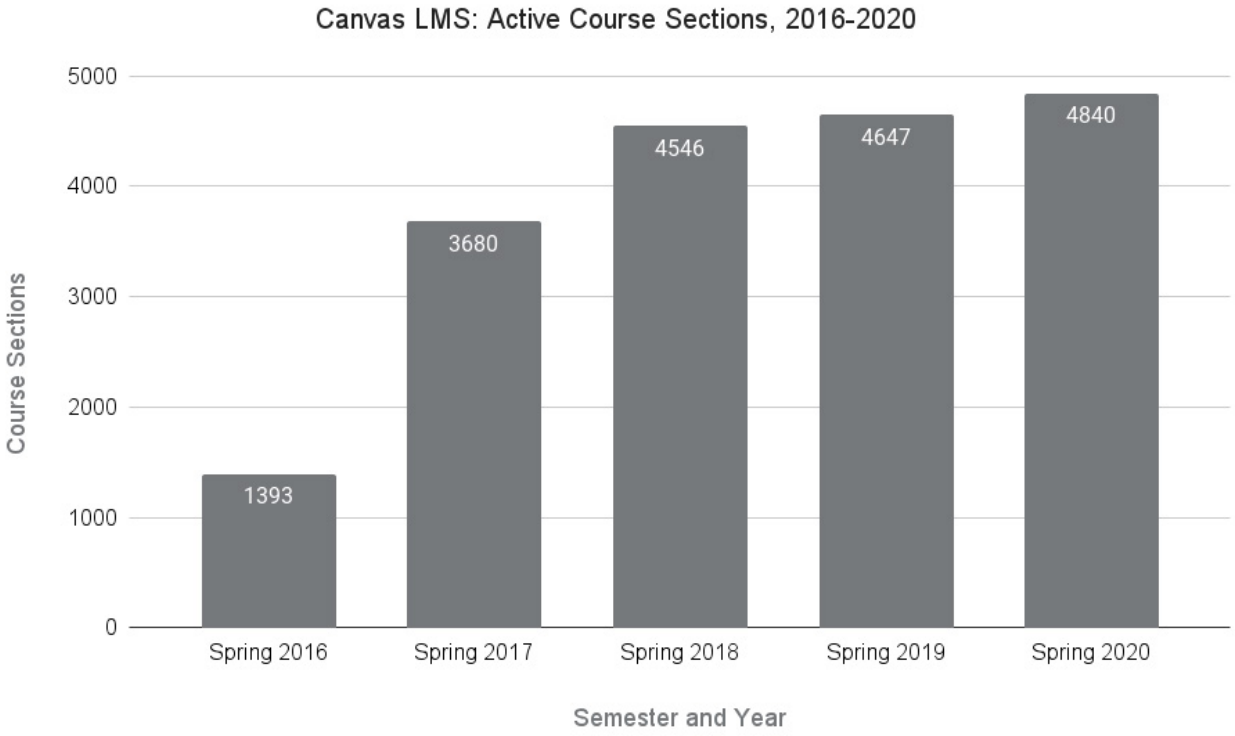
- The **Top Hat** active learning platform, similar to the **iClicker** system, allows students to engage both in and out of the classroom with interactive slides, graded questions, customized content, videos, discussions, and polls. Students access Top Hat content by purchasing a subscription to use with their web-enabled cell phone, tablet, or laptop.
- **Blackboard Ally** is an external tool integrated into Canvas to support accessibility and universal design. Ally scans uploaded instructor content within Canvas and gives suggestions to improve document accessibility. Students can use Ally to download alternate formats of documents.
- New features were added to Canvas's Gradebook in December 2019 including final grade override, anonymous grading, and moderated grading in assignments.

Instructors can use Blackboard Ally to improve accessibility of digital course materials.

- The **Reach 2.0 caption and transcript service**, which includes the option for free professional captions, was added to Kaltura for all uploaded videos.



The number of LTI tools available to Virginia Tech users has increased more than five-fold since 2015.



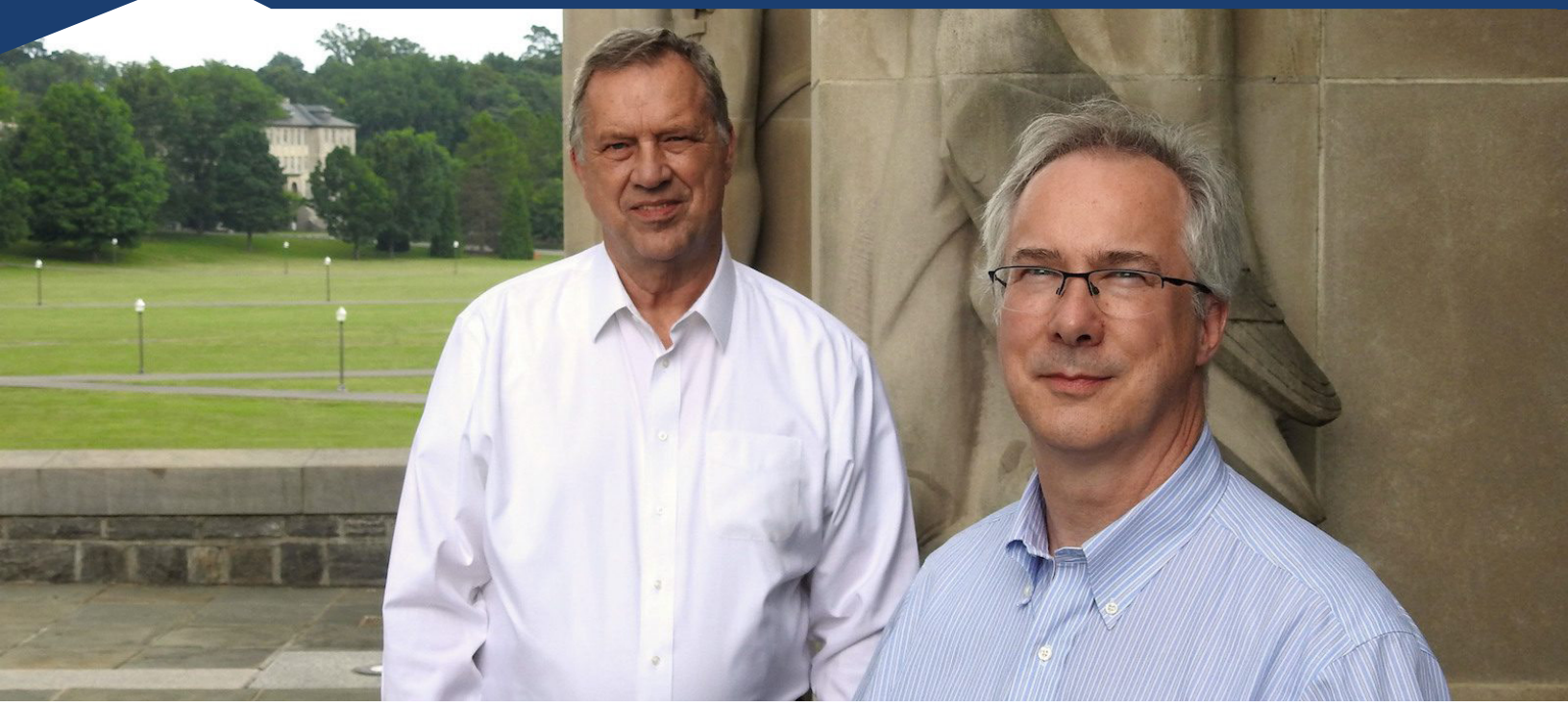
Since its adoption as Virginia Tech's primary learning management system (LMS) tool in 2015, Canvas has seen a steady increase in usage by instructors.

Grant opportunities support innovation in course design

Partnerships can lead to professional development, curricular redesign and research opportunities that may be eligible for funding through **4-VA** award programs, managed by TLOS under the 4-VA Campus Coordinator and Deputy Campus Coordinator. Sandbox projects can be established to support research and development of emerging learning technologies that may be eligible for **Innovation in Learning** grants. TLOS course design and content development teams supported a fall 2019 cohort of 24 faculty members earning credentials or developing courses through consultations, content development, and dedicated assistance from instructional designers and media specialists. Eighteen faculty members earned credentials to teach at a distance and six developed a distance learning course that adhered to Quality Matters standards. TLOS transitioned to a program-based working group in spring 2020 with a focus on supporting the College of Engineering in the development of courses and tools for the Master of Engineering (MEng) degree in Computer Science & Applications or Computer Engineering as part of the **Tech Talent Pipeline** initiative.

Stephanie “Nikki” Lewis was a 2019 recipient of the 4-VA Grant through Technology-enhanced Learning and Online Strategies (TLOS). 4-VA is a collaborative partnership between six Virginia universities that offers grants to advance collaborative research, course redesign, course sharing, and degree completion.

This VT News article **Honors College assistant professor receives grant to improve student access to computational research** highlights one example of a course that was redesigned through the support of a 4-VA grant.



Terry Herdman, associate vice president for research computing, and Kevin Shinpaugh, director of HPC operations, lead the computational research and systems administration teams in ARC, respectively.

Research computing growth

Virginia Tech's high performance computing facilities have distinguished the university as a leader in computational research. The Division of IT's Advanced Research Computing (ARC) unit serves to maximize the university's computational research productivity by providing centralized support and infrastructure for researchers' needs — and these needs are growing as high performance computing plays an increasingly prominent role in science, engineering, and technology research. In response, ARC underwent a significant expansion in both capabilities and facilities in FY 2020, when the research computing team from the Fralin Life Sciences Institute (FLSI) joined ARC.

Through this merger, ARC gained a highly capable and focused systems engineering team as well as access to the newly renovated high-performance computing data center located in the Fralin Life Sciences Institute's Steger Hall, which houses Virginia Tech's new flagship high-performance computing (HPC) cluster, TinkerCliffs, the largest and fastest cluster to date.

With the addition of the systems engineering team from FLSI and continued support for HPC operations from Network Infrastructure & Services (NI&S), ARC has been able to organize into two teams focused on computational science and systems engineering and operation, respectively. By doing so, ARC is equipped to support a higher volume of research, expand outreach and education efforts to help more Virginia Tech students and faculty utilize its HPC resources, and broaden its portfolio of services to include support of research involving controlled unclassified information and protected health information, thus advancing the research mission of Virginia Tech.

"The accelerated pace at which computing technologies and computing needs in research are developing and advancing has highlighted the need for more specialized facilities and personnel. Through this merger, Virginia Tech is gaining systems engineering expertise and capabilities that will enable us to respond to changes in the computing landscape and help Virginia Tech reach our goal of becoming a top-10 land-grant university." - Terry Herdman, associate vice president for research computing.

The full story, **Research computing growth: Fralin Life Sciences Institute computing group joins Advanced Research Computing**, is available on the VT News.

Improve security, accessibility, and connectivity for Mid-Atlantic Research Infrastructure Alliance, Inc. (MARIA) members

MARIA is a non-profit corporation created to enable research for Virginia universities through shared investment and collaboration for cyberinfrastructure. Virginia Tech's Division of IT contracts with MARIA to manage all IT and business management services needed to support this statewide research network infrastructure.

In FY 2020, Virginia Tech worked with **Internet2** to implement a new Distributed Denial of Service (DDoS) mitigation service through the MARIA gateways to the Internet2 network that enhances the security and reliability of internet access for all MARIA member institutions. The Technology-enhanced Learning and Online Strategies (TLOS) team adapted a new website design for MARIA to improve access for people with disabilities consistent with university objectives to promote equal access to electronic and information technology. The NI&S business support team successfully transitioned MARIA to a new accounting and tax services contract with Brown Edwards which has lowered costs and improved responsiveness for those services. MARIA launched a comprehensive statewide RFP process to update and extend wide area network connectivity for member universities and other Virginia research and education institutions. Consistent with objectives to improve collaboration, MARIA initiated a new Campus Network Architect meeting series that brought together experts from all seven member universities on a monthly basis to share best practices and address common challenges.

Developing a sustainable HPC business model

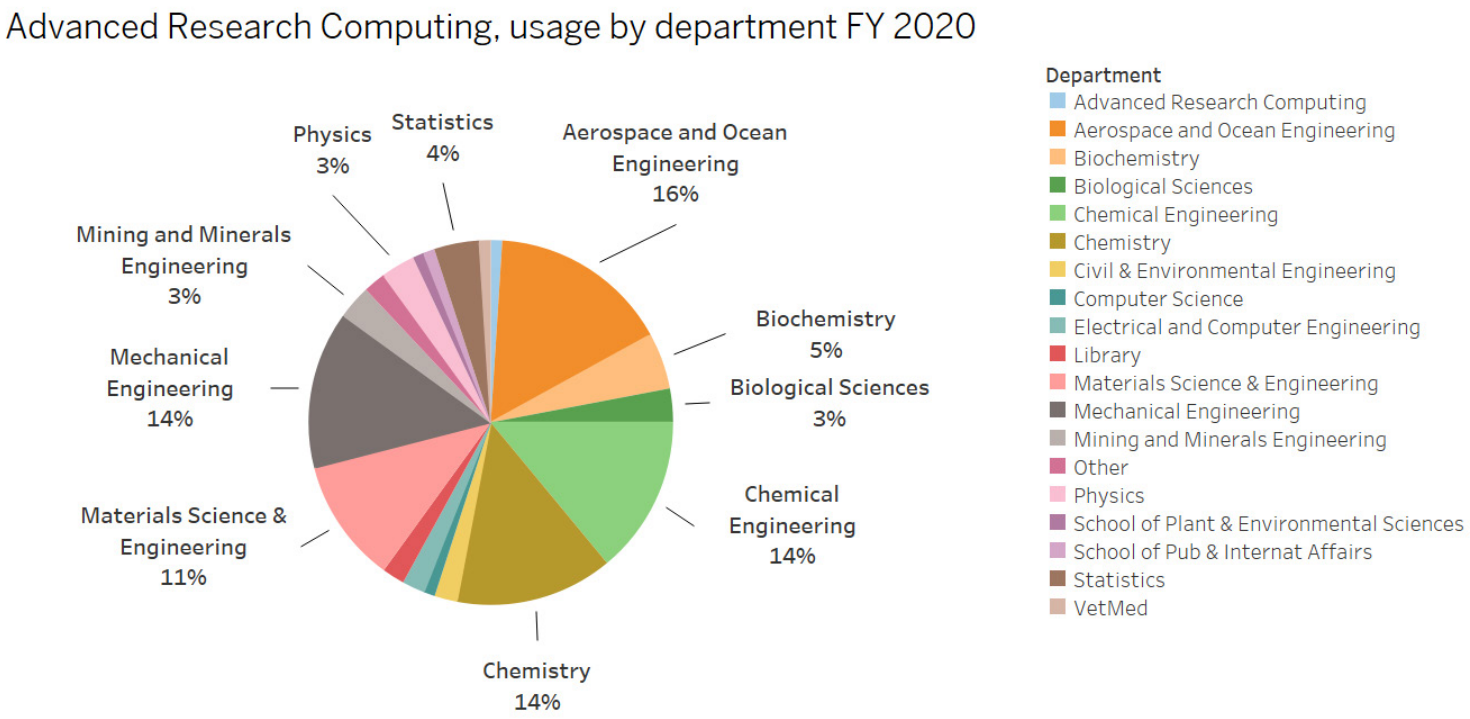
Over the last decade, the demand for high-performance computing (HPC) resources at Virginia Tech has grown substantially. To ensure that the university's HPC infrastructure can continue to meet the needs of researchers, Advanced Research Computing (ARC) identified a need to establish a sustainable model that would provide ARC with the resources necessary to continue to enable and support complex research projects.

ARC's Investment Computing Program will enable continued investment in high-performance computing (HPC) research at Virginia Tech, including installation of new HPC systems, such as the TinkerCliffs cluster, which will go online in October 2020.

In FY 2020, ARC worked with Division of IT finance and operations personnel to lay the groundwork for the Investment Computing Program, a new cost-center model intended to promote shared investment in HPC by faculty and departments while ensuring that ARC can continue to provide a base level of services to all Virginia Tech faculty.

The Investment Computing Program will allow faculty and departments to purchase priority access to ARC systems. The program will allow the division to better identify the full costs associated with each research computing service, develop clear metrics that demonstrate the return on investment associated with research computing services, and make appropriate comparisons among available technology to guide both researcher adoption and strategic investment. The Investment Computing Program is expected to launch in early FY 2021.

HPC system utilization by academic department



ARC's high-performance computing systems are utilized by faculty, students, and researchers in various disciplines who need to process large or complex data sets.

Successful outreach program becomes a nation-wide resource

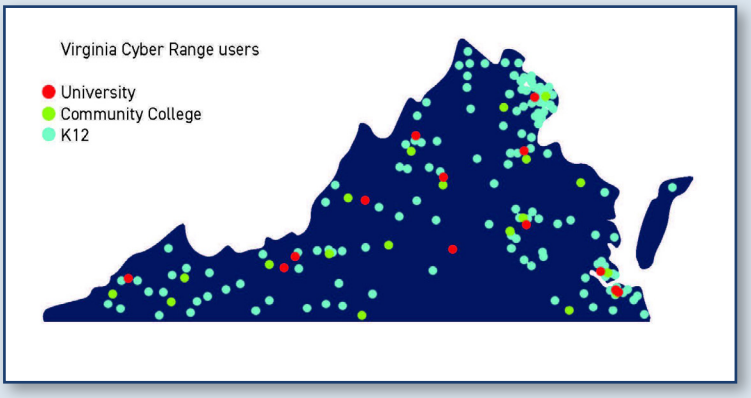
In response to a Commonwealth of Virginia imperative to improve the quality and variety of cybersecurity education available to students in Virginia, Virginia Tech and the Division of IT launched the Virginia Cyber Range in 2016. Funded by the Commonwealth of Virginia, this online resource connected students and educators across the commonwealth, and was a major success. Growing dramatically in its first three years of operation, the Virginia Cyber Range was reaching more than 5,000 students at over 200 schools, universities, and community colleges by the end of FY 2019.

People outside Virginia expressed an interest in being able to access these award-winning resources, and in response, the Virginia Cyber Range expanded the reach of its cybersecurity education services to a nation-wide platform, launching the U.S. Cyber Range of Virginia Tech in July 2019. This new platform enabled access to the cybersecurity education materials for educators in the other 49 states, as well as to interested small businesses and corporations.

> *"There is an increasing emphasis on cybersecurity education as the United States grapples with significant shortfalls in candidates to fill open cyber jobs," said David Raymond, director of the Virginia Cyber Range. "The U.S. Cyber Range comes just as many states are expanding cybersecurity offerings in high schools and colleges, and we are prepared to provide support to these classes."*

The U.S. Cyber Range provides a cost-effective service for schools and businesses that are looking to provide cybersecurity education and training. Unlike the Virginia Cyber Range, which is supported through a grant from the commonwealth and dedicated to offering free, high-quality courseware and real-time online laboratory space for students in Virginia, the U.S. Cyber Range operates on a fee-based model that still is aimed to be cost-effective

for educators, offering a low bar to access course content. Built primarily with academic users in mind, the U.S. Cyber Range supports courseware and hands-on environments for cybersecurity students. Small businesses and others are also able to take advantage of the cyber range for information security staff training and certification preparation.



Virginia Cyber Range courseware and cloud-hosted exercise environment for hands-on cybersecurity training are used in more than 200 high schools, community colleges, and universities across the state. The launch of the US Cyber Range provides access to these materials for educators and students across the nation.

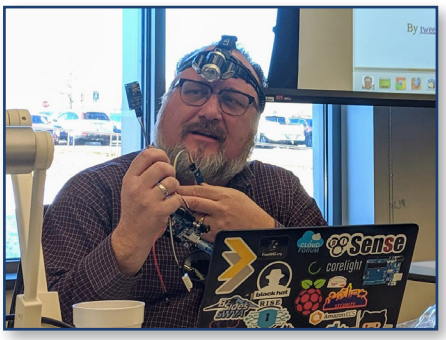
The uniqueness of this effort, one among many Virginia Tech forays into the area of cybersecurity, fills a niche that is critical to solving our national shortage of capable cybersecurity experts. As the threat of cyber attack continues to grow, both from domestic and international sponsors of hacking exploits, it is crucial that more high school and college students are exposed to this exciting and dynamic field. It is a path towards career success for the students, as well as a lifelong passion that can significantly assist the growth and viability of economies around the world. Conversely, if this area of education is neglected, and employment shortfalls continue to grow, economies around the world will suffer from vulnerabilities that continue to be exploited.

In addition to providing this valuable resource nationwide, the deployment of the U.S. Cyber Range has been a groundbreaking cloud deployment made possible through a partnership with **Amazon Web Services** (AWS). “The cloud has allowed the Virginia Cyber Range, and now the U.S. Cyber Range, to quickly and cost-effectively scale to meet the rapid growth in demand for its services,” said Scott Midkiff, vice president for information technology and chief information officer.

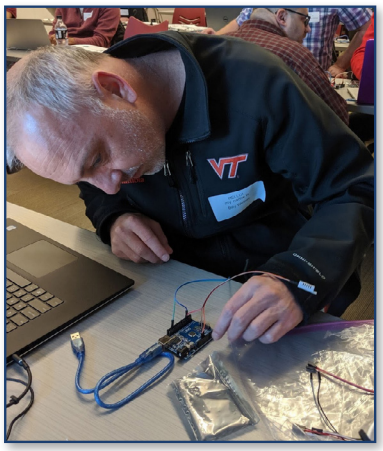
By the end of FY2020, the U.S. Cyber Range had initiated programs supporting 27 organizations across 20 states.

Launching the K-12 STEM outreach program

In 2019-2020, the Division of IT sought to formalize plans to offer regular support, staffing, and content for K-12 STEM education events at Virginia Tech. These events included participation in various university-wide efforts including KidsTech University, the VT Science Festival, CEED workshops (Center for the Enhancement of Engineering Diversity), and the Black College Institute programs offered through InclusiveVT. Our goal was two-fold: first, to help students (especially those in underserved communities) in our region to gain exposure to and develop an interest in STEM careers. Second, the plan sought to increase employee engagement by providing personnel with opportunities to volunteer in the community using their expertise. While the restrictions put in place in response to the COVID-19 pandemic resulted in the cancellation of several events, we were still able to participate in the VT Science Festival in November 2019, and in a train-the-trainers workshop in January 2020 as part of the IT Symposium.



Thomas Weeks is one of the Division of IT's coordinators of K-12 STEM education events at Virginia Tech.



Billy Wesley, from Finance Information Technology, builds an UNO as part of the 'train the trainers' session.

Virginia Cyber Range hosts annual cybersecurity education conference

The **Virginia Cyber Range hosted its 2nd annual Virginia Cybersecurity Education Conference** on August 13-14, 2019 at George Mason University in Fairfax, Virginia. The annual Virginia Cybersecurity Education Conference brings educators together to share ideas and resources they can use to better capture their students' interest in cybersecurity. Keynote speakers included Alan Paller, founder and director of research for the SANS Institute, and Karen Jackson, interim executive director of the New College Institute. The conference featured four tracks that addressed the

Virginia Cyber Range group photo from the 2nd Annual Virginia Cybersecurity Conference at George Mason University, August 13-14, 2019.

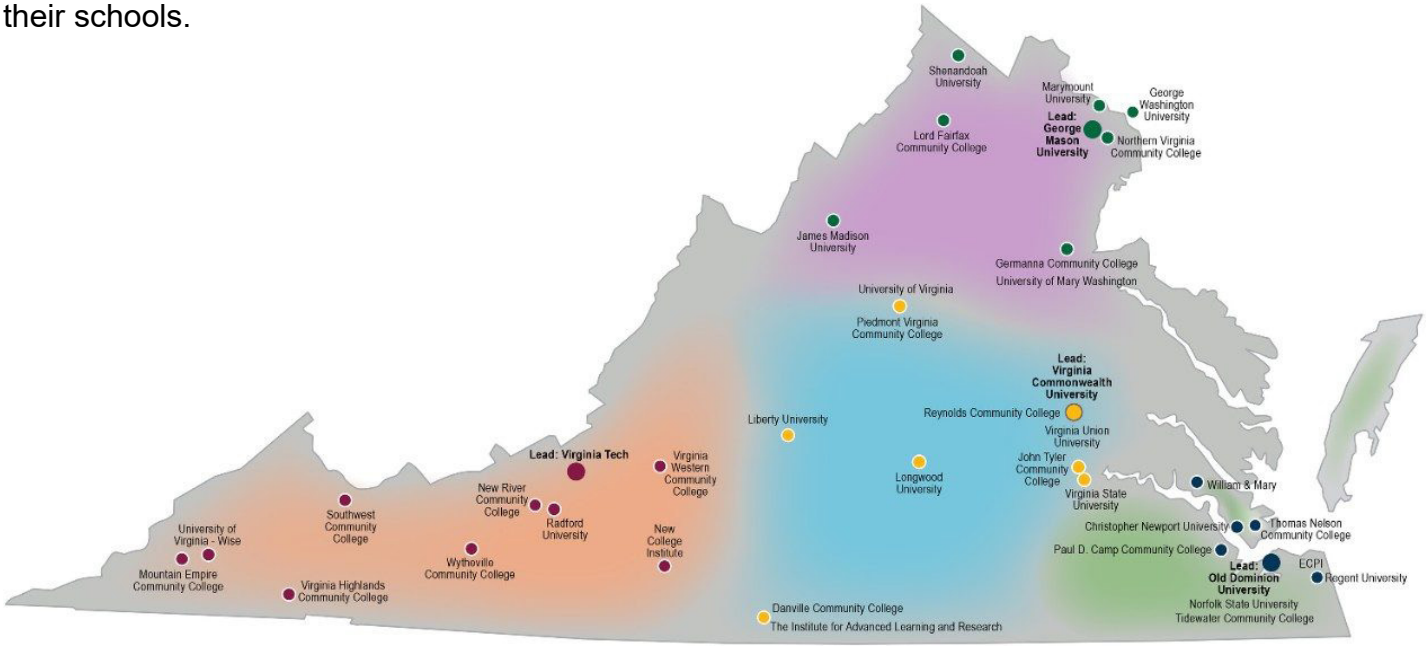
theme “Improving Cybersecurity Education at All Levels.” More than 200 attendees were able to discover new cybersecurity instruction tips, tackle hands-on cybersecurity activities, learn about innovative cybersecurity case studies, and explore cyber workforce development and credentialing efforts.

Attendees at the 2019 Virginia Cybersecurity Conference enjoy breakfast while listening to a morning speaker.

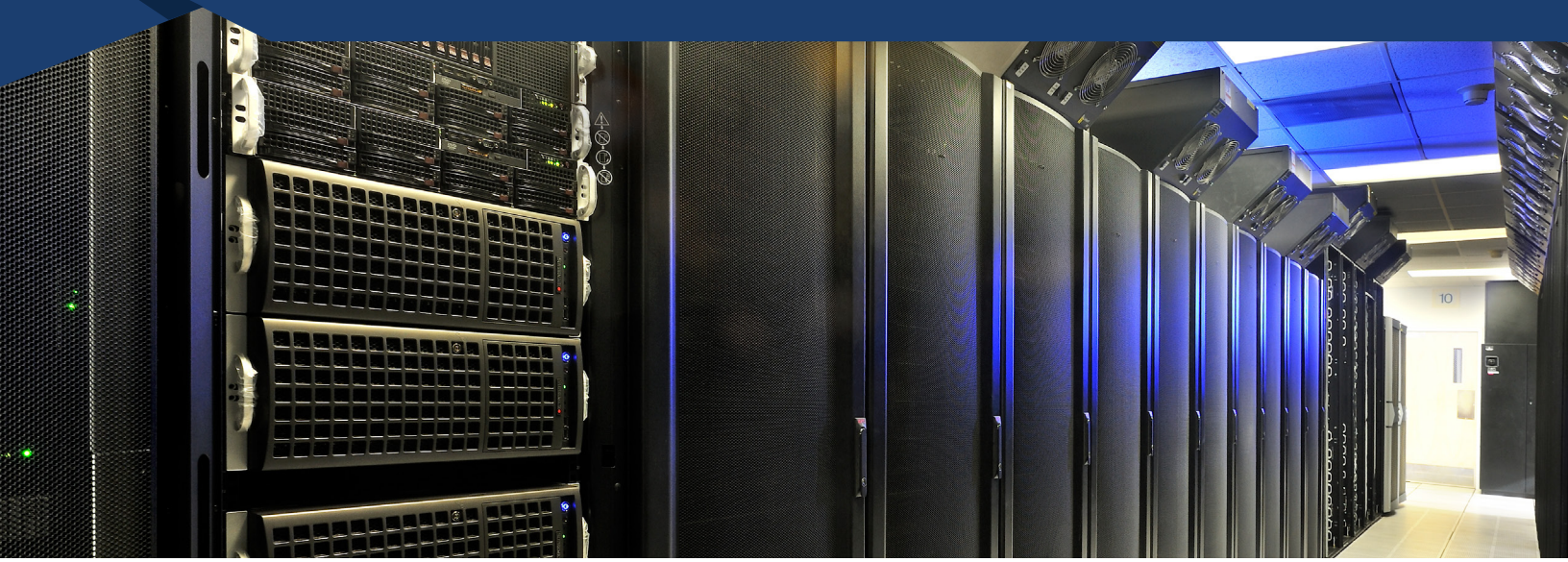
Hosting the Virginia cybersecurity workshop

Commonwealth Cyber Initiative

The Virginia Cyber Range teamed up with the Commonwealth Cyber Initiative (CCI) to host an online workshop to support Virginia secondary school teachers and Virginia Community College instructors who teach cybersecurity topics. Fifty Virginia educators were chosen to attend the workshop virtually from June 22 - July 2, 2020. Instruction focused on core cybersecurity topics such as cryptography, networking, and an introduction to the Linux command line, along with discussions of ethics, cybersecurity careers, and emerging topics such as 5G. Educators explored hands-on labs offered through the Virginia Cyber Range that demonstrated core cybersecurity topics and learned how these labs could be taught in their schools.



“The Commonwealth Cyber Initiative’s statewide network includes cybersecurity specialists in higher education, private industry, and federal agencies to strengthen education and develop talent in cybersecurity across Virginia.



Improving business intelligence and data analytics

Almost 20 years ago, the university established an enterprise data warehouse as a reporting and data analysis system. While this warehouse has served the university well, the growth of Software as a Service (SaaS) has significantly expanded university data sources. In recent years, Virginia Tech has increased efforts to modernize the data warehouse environment to meet quickly changing business requirements, provide support for new data sources, and rapidly iterate new solutions.

To meet these needs, the Division of IT initiated several multi-year projects in FY 2020 that are designed to improve the usability of data, leverage more meaningful analyses, and enable greater data integration in the shorter term, while laying the foundation to transform the data warehouse into a more flexible, dynamic “data lake.”

These projects will improve the data warehouse’s human resource and student areas with a goal to advance data-informed decision making. These projects include:

- Altering the structure of database tables in the warehouse to make them more compatible with university reporting and visualization tools like MicroStrategy.

- Incorporating data elements from third-party solutions such as PageUp and TimeClock Plus to expand human resource reporting capabilities.

- Adding student grade information and creating indicators for underrepresented, underserved, and first-generation students to improve the ability to report on progress toward university priorities.

- Implementing third-party software to verify and standardize domestic and international addresses for students and employees.

Additionally, the division began the process of enabling the Ellucian Analytics business intelligence platform. Ellucian Analytics is a role-based SaaS solution that integrates with Banner to enable the university to transform data into actionable insights that drive student success, institutional growth, and operational efficiency. Over the last year, the division spent many hours streamlining university data to enable it to be successfully loaded into Ellucian Analytics and to prepare for a pilot test within Enrollment Management. This pilot is scheduled to begin during the fall

Data Warehouses vs. Data Lakes: What is the difference?

	Data Warehouse	**Data Lake**
Key characteristic	Structured	Flexible
Data format	Processed, highly curated	Raw, processed and unprocessed, curated and uncurated
Schema	“On write” - data is defined prior to storage	“On read” - data is transformed and defined upon use
Cost / Performance	• Higher storage cost • Difficult to manipulate data • Quick and reliable analysis	• Lower storage cost • Easier to manipulate data • More work required for analysis
Purpose of data	Predetermined per data se	Undetermined until needed
Who uses it?	Business analysts	Data scientists, business analysts
How data is used:	Business analysis, reporting, data visualization	Machine learning, profiling, predictive analytics

Data warehouses and data lakes are both good options for big data storage. While the structured nature of a data warehouse is well-suited to many business operations, the flexibility offered by a data lake has become a better fit for meeting Virginia Tech’s research, administration, and business intelligence needs.

Transitioning Virginia Tech's data storage strategy to a "data lake" will allow the flexibility needed for both administrators and researchers to access, analyze, and utilize data generated by university activities.

2020 semester, and is expected to expand to Financial Aid, Finance, and Human Resources during the 2021 spring semester.

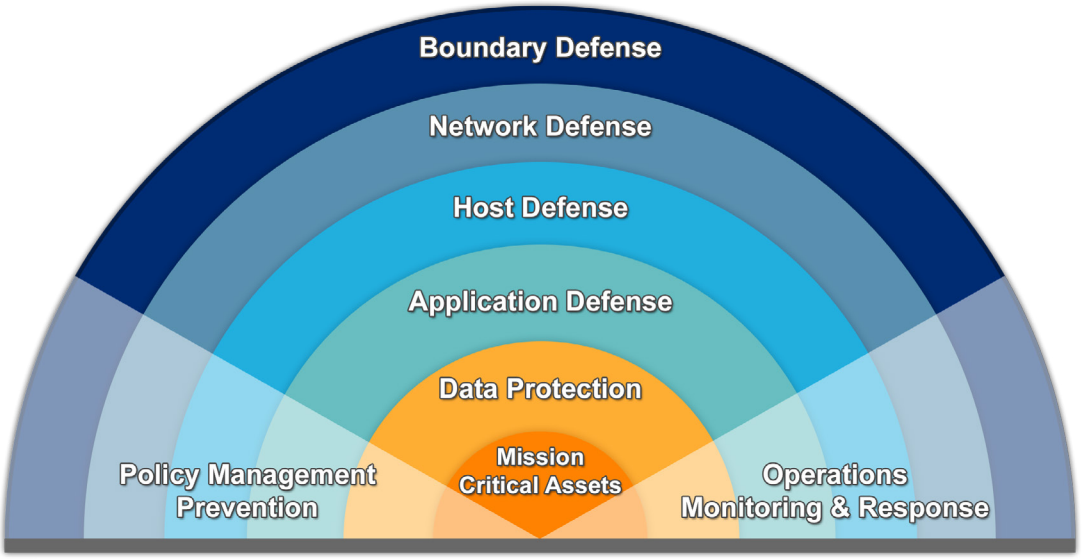
Creating a central repository for data establishes a foundation for making data more broadly available and establishes a basis for ensuring data quality.

Finally, Virginia Tech completed the first phase of a multi-year effort to establish the technical foundation for a university data lake hosted in Amazon Web Services (AWS). Given a proliferation of third party systems, creating a central repository for data establishes a foundation for making data more broadly available and establishes a basis for ensuring data quality. The second phase of this effort began in April 2020 and focused on technological improvements and integrations with crucial university systems.

During FY 2021, the data lake will become a primary data source for the University Data Commons application created by the **Office of Analytics & Institutional Effectiveness**. Additional deliverables in this upcoming phase include integrations with Technology-enhanced Learning and Online Strategies (TLOS) service offerings such as Zoom, Canvas, and LinkedIn Learning. Continuing the build-out of the data lake is a foundational element of the Virginia Tech data strategy.

Cybersecurity defense architecture

Protecting Virginia Tech's data networks and infrastructure against potential threats is a fundamental function of the IT Security Office (ITSO), as well as a critical service for Virginia Tech to protect the data security and privacy of our students, employees, researchers, and institutes. To ensure Virginia Tech continues to stay ahead of would-be attackers, and to safeguard our networks, the ITSO made several changes to upgrade its network detection capability in FY 2020. This include replacing the aging Snort Intrusion Detection System (IDS), Bro Network Traffic Analyzer, and commercial FireEye malware detection system with Security Onion sensors and Suricata IDS, a mature and robust open source solution that provides fast, thorough network threat detection at a lower cost than the previous system.



Cyber defense architecture involves many progressively intricate layers to keep networks and devices safe.

These upgrades also included an updated Zeek Network Traffic Analyzer and a number of other tools, which all feed into a customized Kibana interface, this change allows the ITSO Security Operations team to detect real-time threats while also quickly seeking out and identifying less obvious threats to the network. The new open source sensors allowed the ITSO to retire the FireEye system, providing significant cost savings to the Division of IT and to Virginia Tech.

Supporting administrative advances in finance

Two software implementation projects in Enterprise Systems have placed the university's Division of Finance on a path to automate time-consuming rote activities that have constricted the ability of analysts to focus on key decisions and analysis of financial trends and demands. The first, UiPath, is a Robotic Process Automation (RPA) tool that will allow the automation of tasks such as querying databases and verifying figures. The second, ABBYY FlexiCapture, is a smart scanning tool that allows finance workers to 'teach' the software how to recognize and enter data from invoices, vastly reducing the amount of time needed for manual scanning and data entry from the more than 150,000

paper invoices that come into Virginia Tech's finance division each year. Both of these solutions, implemented in tandem, will allow Virginia Tech's financial specialists to spend much less time on rote and repetitive tasks, and more time on the key actions and decisions that support strategic growth, investment, and the achievement of the university's missions.

During FY 2020, the Finance Administration team in Enterprise Systems worked with the Division of Finance to set up the servers that will host these specialized solutions and delved into defining the specific tasks that will be automated, a process that requires a great deal of testing and iteration to yield the right balance of accuracy, reliability, and flexibility. Implementation is continuing.

Improving the employee onboarding process by integrating PageUp and Banner

> *"Working in partnership with the Enterprise Systems team, the HR user community across campus and PageUp personnel combined to make the project successful, and the value it created is beyond our expectations," - Marie Bliss, Assistant Vice President of Human Resources Administration for Virginia Tech*

In 2019, the Division of IT partnered with the Division of Human Resources (HR) to help the university transition to a new hiring and onboarding system, PageUp. This move was part of a major project to create a "one-stop shop" for employee-related transactions. Enterprise Systems, IT Procurement and Licensing Solutions (ITPALS), and Division of IT HR personnel all contributed to the successful transition to PageUp, which went live on July 22, 2019 and, within six months, was implemented across the entire university. During that time, Enterprise Systems progressively expanded integration between PageUp and Banner, Virginia Tech's enterprise resource planning system, and our division's human resources team conducted training. This further streamlined key hiring, onboarding, and personnel management processes, eliminating several paper forms and creating a more seamless onboarding experience for new employees and hiring managers alike.

This modification of business processes to be more efficient and less reliant on paper processing, brought attention to the effort, which was highlighted as a success in the university's **Administrative Transformation Initiative**.

Rolling out a new and improved travel and expense system

Virginia Tech rolled out a replacement for the Banner Travel and Expense Management system beginning in August 2019. The new ChromeRiver Travel and Expense System provides new functionality to automate the purchasing card approval and reconciliation processes. The rollout continued through fall of 2019, with several groupings of senior management areas added at the beginning of each month until all areas had moved to the new system. During this process, training was offered to fiscal staff and simplified training was offered to other employees. The effort was complete by early 2020.

Enhancing the enrollment experience for applicants, student affairs, and admissions personnel

A new student is greeted by the Hokie Bird and friends with a Virginia Tech acceptance letter.

The application process is key to future Hokies' first impression of the Virginia Tech experience, and anything we can do to make this process less daunting — particularly for first-generation and under-resourced students — supports the university's core value of opportunity and affordability as well as the Beyond Boundaries initiatives set forth in the current strategic plan. Likewise, an efficient, effective admissions and enrollment process benefits both students and admissions personnel by ensuring applications are complete and accurate while also providing a forum for regular communication.

Throughout FY 2020, Enterprise Systems helped the Office of Undergraduate Admissions streamline the admissions process and enhance the application, enrollment, and orientation experience for new students by implementing new systems as well as supporting existing systems. These included:

- The **Coalition for Access, Affordability, and Success** application platform, a set of free, online college planning tools to help students prepare for and apply to college. Virginia Tech allows students to apply through the MyCoalition platform, which is integrated with Banner so that completed applications automatically reach admissions for review.
- The **self-reporting academic record (SRAR) tool**, which allows applicants to easily submit grades, courses, and test scores in one location, which is then received by Virginia Tech admissions.

- **Slate**, a Banner-integrated customer relationship management (CRM) tool that allows Virginia Tech to manage applicants and enrollment decisions in one area. Implemented in 2018, Slate was first used by Undergraduate Admissions to process decisions. In FY 2020, Enterprise Systems worked with the Graduate School on its project use Slate to accept applications and manage prospective students from the time they request information through enrollment.

- **VisualZen** orientation reservation system, which Enterprise Systems implemented in FY 2019, automates the orientation scheduling experience, allowing students to reserve their spot in orientation sessions through a secure online portal. VisualZen is also integrated with Banner and accessible through HokieSPA, so that the new student and family programs office can easily manage orientation attendance.

Supporting Advancement initiatives through smart system integrations

In FY 2020, Virginia Tech launched its most ambitious fundraising campaign to date, **Boundless Impact: the Campaign for Virginia Tech**. In support of this and other Advancement initiatives, such as **22 by 2022**, Enterprise Systems worked to bolster and maintain the university's Advancement Information Management System (AIMS), overseeing three major upgrades to the AIMS system. Enterprise Systems worked to develop an upgrade methodology that has allowed for some of the quickest and easiest upgrades the division has experienced.

Enterprise Systems implemented new payment methods in the online giving application, allowing supporters to easily make donations through PayPal and Venmo. Tightening integration of AIMS with other university systems enabled the Advancement Office to become immediately aware of donations made through various pathways and reduced the overhead cost per donation by minimizing manual intervention and data validation. As a result of this improved system integration, Enterprise Systems helped to improve the donor experience, which should translate to increased donations overall.

WiFi enhancements across campus

Classroom Project 2020 was 70 percent completed in the 2020 fiscal year.

The project installed WiFi6 technology in 196 classrooms to enhance instructional and learning experiences. It involved adding 542 WiFi6 access points across 32 buildings. This project is funded through the Life Cycle Management budget, which allows Network Infrastructure and Services (NI&S) to continuously assess and invest in important infrastructure upgrades. The move to online classes allowed the project to begin earlier than planned.

NI&S's work to expand WiFi access across campus enabled installation of outdoor workspaces starting in summer 2020.

To make this project happen, NI&S' Network Infrastructure Installation team installed switches, wireless access points, and new cable circuits. The Network Engineering Operations team did the necessary network design and configuration and worked with the Software Development team to accommodate the new software. Over the next seven years, all WiFi and new construction will transition to WiFi6 or newer systems.

Adding Advanced Threat Protection to Microsoft email service

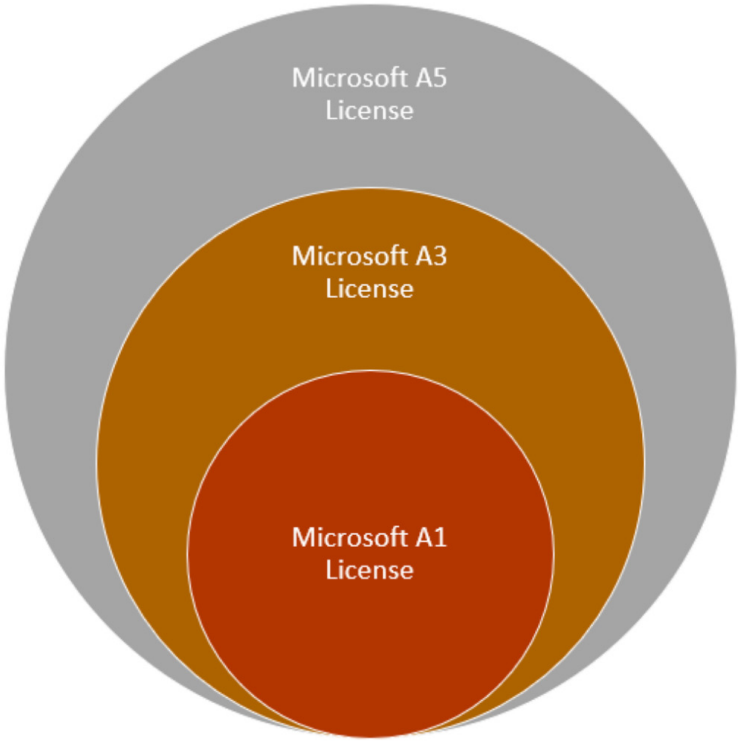
Microsoft 365

Collaborative Computing Solutions (CCS) expanded the security posture of university email by rolling out Microsoft's Advanced Threat Protection add-on service. This optional service enables greater protection from threats contained within malicious emails and links and provides the following benefits:

- Safe Attachments - Zero-day protection that checks email attachments for malicious content. If no suspicious activity is found, the message is forwarded to the mailbox.
- Safe Links - Time-of-click verification of URLs. Safe links remain accessible and malicious links are dynamically blocked.
- Anti-phishing protection - Detects attempts to impersonate users and custom domains.

Microsoft Office A3 and A5 bundles

CCS and ITPALS worked together to provide university customers with new capabilities in Office 365 based on Microsoft's new A3 and A5 licensing bundles. Account provisioning and licensing workflows were updated and streamlined to support this change. Through these changes, all faculty, staff, and students received access to new capabilities and security features including Microsoft Intune and Azure Information Protection.



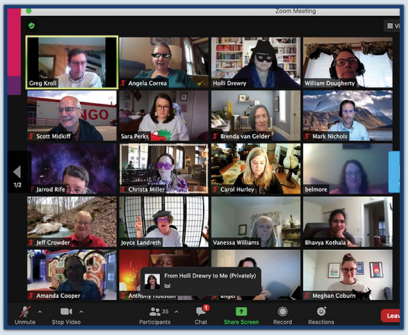
The vast majority of Virginia Tech users have Microsoft A3 or greater licenses, enabling access to a wide range of Microsoft applications for productivity and collaboration.

Google business associates agreement

Google Workspace for Education

CCS worked with ITPALS to improve the Google Workspace for Education service for the university by finalizing a Business Associates Agreement with Google. This agreement is necessary to support electronic protected health information (EPHI) in the Virginia Tech ecosystem. These efforts complemented work done last year to get a similar agreement in place for Microsoft Azure and Microsoft 365. CCS also expanded outreach efforts regarding compliance through a collaboration with Mary Potter, the new Director of the Privacy and Research Data Protection Program. Through this collaboration, a shared governance workflow for researchers working with EPHI data was created and communicated to the university.

A pandemic revolution in the ways we work and connect



The nature of information technology, especially in the higher-education space, is to continually evolve. It is incumbent on us to work to understand and prioritize the varied needs of our students, instructional faculty, researchers, and administrators within the constraints of available funding, the availability of new applications, and organizational priorities. Typically, those needs have some predictability. In recent years, we have followed trends towards flexible and ubiquitous access and collaborative capabilities, better process automation, and increased options for mobile connectivity. In addition, we have supported a shift towards cloud-hosted services that offer scalability. It turned out that moving towards those areas of priority and need placed us in a fortuitous position to respond to the impact of the global COVID-19 pandemic on our patterns of work and collaboration.

Beginning in mid-March of 2020, the university announced a shift to essential operations status. Most employees and students were required to work and learn remotely, and departments and faculty needed to move instruction, meetings, conferences, and business processes to an entirely online format. Suddenly, tens of thousands of students and employees needed to figure out how to continue their academic and professional efforts despite differences in connectivity, access to high-speed internet, and distance from campus.

Adaptability and resourcefulness became the name of the game. Many families that had been accustomed to blazing-fast connections at work or school were now grouped together at home, competing for limited bandwidth. Many others had few or no options for internet service in their homes. Within days following the shift

to essential operations, the IT communications group developed and published **detailed guides** to help our students and employees assess internet connection speeds, optimize and prioritize available bandwidth, find free or low-cost internet options, and access community WiFi resources. The division also met pressing needs to let the university know about campus locations where outdoor WiFi was available or expanding, maintain a strong defense against cyber crime, and to share information on how to establish VPN connections to ensure security as they continued the work of the university.

To many, the Division of IT's success in scaling up services [during the pandemic] felt seamless. In fact, it took massive and sustained efforts from our employees and was enabled by a multi-year move towards cloud-based applications that allowed employees to take meetings, collaboration, and teams online.

At the same time, while we all adapted to this new world, the division maintained 4Help IT Support and Faculty and Staff Technology Resources (FASTR) operations and developed protocols for safe, physically-distanced support consultations for hardware and software issues. We collaborated with Virginia Tech's communicators on the **Ready site**, expanded training and resources for the university's two productivity platforms (Office 365 and Google Workspace), renegotiated dozens of software license agreements to expand capabilities and access during the pandemic, and stayed closely connected to the efforts made and decisions reached by the university's Incident Management Team, which provided guidance and support throughout the pandemic response.

In parallel with the effort to move instruction to an online format, these adaptations helped the university shift to a vastly different workplace reality with speed and agility. To many, our success in scaling up services felt seamless. In fact, it took massive and sustained efforts from our employees and was enabled by a multi-year move towards cloud-based applications that allowed employees to take meetings, collaboration, and teams online. Imagine how this pandemic might have been more

difficult without university-wide access to Zoom, Google Drive, Microsoft Teams, Canvas, or even Slack.

It cannot be overstated that the technology decisions made by Virginia Tech over the previous five to ten years were directly tied to the university's ability to keep moving forward towards its missions when the COVID-19 response necessitated the cessation of in-person interaction. Indeed, for colleges and universities that had not made similar moves, the path forward was far more difficult, and in some cases impracticable. Virginia Tech succeeded in this effort where others failed, making it possible to do what was required to protect public health in our region while continuing to function as an institution. This is an achievement that has left many IT employees with a tangible sense of satisfaction, and that will help Virginia Tech emerge from pandemic restrictions into a stronger 'next normal.'

Unified endpoint management

The division continues its efforts to secure and consistently manage device endpoints (phones, laptops, desktops, etc.) through its Unified Endpoint Management project. This project is implementing device management services with input from a steering committee that included representatives from academic and administrative areas across the university. The steering committee worked with university IT personnel and with the project sponsor to evaluate and select amongst available vendors.

The solutions being implemented are:

- Jamf: for iMac, MacBook, iPad, iPhone, and Apple TV devices (macOS, iOS, iPadOS, tvOS)
- Intune: for Windows 10 desktops, laptops, tablets, and Android devices

Since the approval of the device management solutions, major FY 2020 accomplishments included:

- Completing Jamf software/security reviews
- Setting up and configuring Jamf, then conducting a pilot with partnering departments
- Collecting and analyzing pilot project data
- Initiating software license reviews in support of Android device management
- Research, investigation, and preliminary testing for Intune implementation

Advancing accessibility training and awareness

TLOS' Accessible Technologies group established the **Accessibility Professional Certification Grant Program** in the spring of 2019. Grant recipients gain the opportunity to develop expertise and earn the International Association of Accessibility Professionals (IAAP) Certified Professional in Accessibility Core Competencies (CPACC) certification or the Web Accessibility Specialist (WAS) certification. In both tracks, grant recipients receive membership in the IAAP, online exam prep training, and a waiver of exam fees, as well as weekly access to certified accessibility professionals who can answer questions and demonstrate assistive technologies. Since the program's pilot semester, four additional cohorts were selected with 38 cohort members earning the CPACC certification and 13 completing the WAS certification.

The TLOS Keep C.A.L.M campaign is designed to help instructors and others create accessible content through reminders such as this one to check contrast of fonts and other page elements.

The training program builds upon accessibility awareness efforts that began with the **Choose Accessible Learning Materials (C.A.L.M.)** campaign, which promotes early consideration of basic accessibility measures during course and web design. The campaign advised developers to request captions in collaboration with the Campus Accessibility Working Group.

Additionally, Blackboard Ally was enabled in Canvas to improve the accessibility of course materials. **Ally** scans uploaded content within Canvas and returns suggestions to improve file accessibility. Students can use Ally to download alternate formats of documents that best suit personalized learning. TLOS also added the **Reach 2.0 caption and transcript service**, which enables an option for free professional captions on eligible videos uploaded in Kaltura. Captioning video content is essential to creating high-quality educational resources that improve student outcomes and user engagement. Captions

These efforts move Virginia Tech towards a future where supporting all learners is an integral part of the process of course development, and website or content design.

improve comprehension by ameliorating variations in hearing ability, speaker accent, audio quality, listener's primary language, subject matter complexity, and missed audio content.

Together, all of these efforts move Virginia Tech towards a future where supporting all learners is an integral part of the process of course development, and website or content design.

VT Alerts increases safety and accessibility

Network Infrastructure & Services (NI&S) completed the third phase of the VT Alerts Annunciator system in May 2020. VT Alerts allows the university to communicate with students, employees, and others when immediate action is required during an emergency situation. This project involved adding 32 new annunciator devices to buildings on campus, bringing the total to 68.

The annunciators allow VT Alerts to be broadcast audibly through systems already in the buildings, such as fire alarm speakers. This new way of delivering messages allows people not in the view of message boards to receive alerts, increasing reach and accessibility. The annunciator program has been expanded. It almost doubled in size, with 32 new buildings being set for annunciator installation.

Another improvement to the VT Alerts service is the new ability to send notifications to departmental digital signage displays. These digital screens allow departments to showcase their services, activities, and other content, helping them to stand out and engage with members of the community.

The efforts we undertake within each of the five pillars are underpinned by foundational investments in our people and our processes.

People (Investing in and enabling our workforce)

During FY 2020, we worked to foster a culture of employee engagement and to maintain a commitment to attracting, retaining, and developing skilled IT talent in several ways, including through efforts in the four initiatives listed below. These initiatives are informed by data that we collect through a confidential biennial survey of employees. The survey helps us to identify the influence that different organizational practices have on employee engagement and overall employee satisfaction.

Career framework project

In early 2020, a team with representatives across the Division of IT began to develop a career reference guide, starting with a generic template for describing professional job types. The team identified levels of job progression, key competency areas, and the characteristics and scope of professional jobs within different levels of the organization. These descriptions incorporated different organizational unit practices within the Division of IT with the aim of giving the same types of jobs standard treatment across the division. The work continued into the spring, when the project focus was shifted and re-scoped to better align the project with anticipated changes that were coming from the Division of Human Resources, and to adjust the timeline, which was impacted by more immediate demands related to COVID-19. A revised project charter was signed in mid-June 2020.

IT Connect program

IT Connect is a protocol for supervisor/employee communication that defines a method that managers and employees can use to provide and receive ongoing feedback, clarify goals and organizational objectives, and discuss career development and advancement. Dr. Midkiff introduced IT Connect in a September 2019 email to the division. The Human Resources team developed training and communication plans to support division employees in implementing IT Connect. A plan for implementing training was outlined, but was somewhat delayed due to the pandemic. Training materials for both managers and employees were completed in May 2020, and training sessions began in June of 2020. Plans are to offer training to all division employees. Program assessments will include follow-up surveys to enable continuous improvement of this program.

Leadership development program

The Leadership Development Program, a year-long leadership and mentoring program for Division of IT employees, continued its evolution. In December 2019, the second cohort of participants graduated -- this group benefited from several changes in the program that were made based on evaluation data from year one.

The 2019 cohort of the Leadership Development Program was recognized at that year's holiday reception.

First, the nomination process was redesigned to incorporate an assessment of each applicant's development in the program's competency areas. The applicant and their supervisor complete the assessment individually first, then together. The senior leader of the applicant's department also provides a statement of support. This provides a clear understanding of the purpose and goals of the program, and enables the applicant and supervisor to discuss the applicant's development and any competencies of special interest for them.

Another change was a shift away from having most program content presented by outside subject matter experts. This resulted in greater consistency and the ability to make connections to earlier modules throughout the program so that the effect of building on previous learning was increased. The majority of content is now presented by the program team. This shift also expanded the program team's ability to focus on each individual's needs and enabled the addition of long-term activities that build as the modules progress, challenging cohort members to increase their self-awareness and integrate their learning.

Communication from the program team to participants' supervisors helped to increase support for specific activities in the program while keeping them informed. The program's Canvas course houses the course materials and provides additional resources for individual study. Continuous evaluation of the program occurs through participant evaluation at the end of each module as well as at the end of the program.

During the spring of 2020, the program pivoted to providing short, once-monthly meetings via Zoom rather than implementing the full curriculum during our transition to remote work.

Leading with values initiative: core values implementation project

Work continues on the core values implementation project, which seeks to help strengthen our organization by defining expectations for how we interact with one another in the Division of IT, as well as with others at the university and beyond. Activities have been implemented that are intended to establish a common language and behaviors for each value: Trust, Inclusion, Care, Service, and Striving for Excellence. In our all-hands Core Values Retreat in May 2019, we shared our thoughts about each of the core values by answering the questions: What does this core value look like? How do we achieve it? In spring 2020, summaries of comments from the retreat about the values of Care and Service were compiled and shared to spur renewed discussion.

Processes (Investing in Operational Excellence)

We embrace a culture of continuous improvement, striving for excellence in everything we do, and delivering services that are nimble and responsive to the university's needs. During FY 2020, we worked to clarify plans and roadmaps, eliminate barriers, streamline workflows, assess performance, and continuously improve our outputs through the six initiatives discussed below.

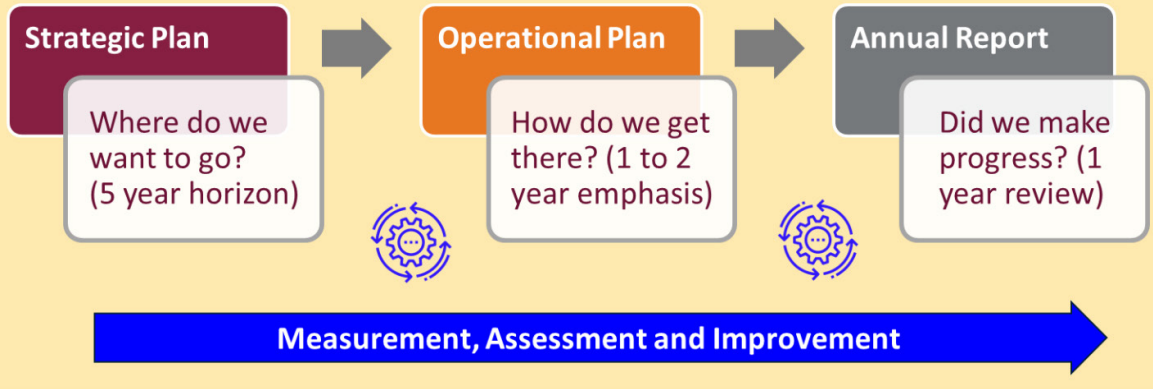
Implementation of strategic and operational plans

The strategic planning process at both the university and the Division of IT are based on developing and launching an adaptive, inclusive, and continuous process.

The Operational Plan is the mechanism that translates the multi-year, high-level strategic goals and objectives into specific initiatives over a one- to two-year time period. Initiatives are prioritized actions including, but not limited to, projects that the division will undertake to implement the university's and the Division of IT's strategic goals and objectives.

This process assists us in creating a detailed roadmap that aligns our work with the mandates of our strategy. It also provides assessment mechanisms for measuring outcomes and benefits, and forms the basis for the Information Technology Annual Report.

IT Strategic Planning Components



The Division of IT's strategic plan informs and guides the division's operational plans as they evolve year to year. The outcomes of implementing both plans are reflected in the annual report.

The IT Operational Plan 2019 – 2021 included 29 initiatives covering all aspects of the Information Technology Strategic Plan for 2018 – 2024.

Enabling Communities of Practice and Centers of Excellence

The Division of IT sought to elevate the capacity of creative individuals within the division through the establishment of Communities of Practice (CoP) and Centers of Excellence (CoE). A CoP is a group of people who share a common interest and seek to learn through regular interaction. A CoE is a concentration of knowledge, expertise, and resources intended to attain and sustain performance and value.

The UX Community, chaired in FY2020 by Division of IT employee Zeynep Ondin, brings together user design experts and enthusiasts from across Virginia Tech

Members of the division collaborated over the course of several months to develop a common definition of these terms that integrated the visions and goals of individuals, the division, and the university. From this, a white paper was prepared to present the concept to others, and to describe next steps required for implementation and utilization across the division.

New analytics tools and reporting practices provide insight into ITEE's impact on the user experience

IT Experience and Engagement (ITEE) continues to make progress in developing reporting practices that provide critical data and analysis to leadership, service owners, and stakeholders on IT service performance.

The ITEE team generates daily service center operations reports that highlight critical information regarding the types and volume of calls, service performance or degradation, and caller profiles. In addition, a monthly Incident Aging Report enables leadership to assess the volume of incidents in the team's queue, address customer experience issues, and ensure that customer needs are met in a timely manner.

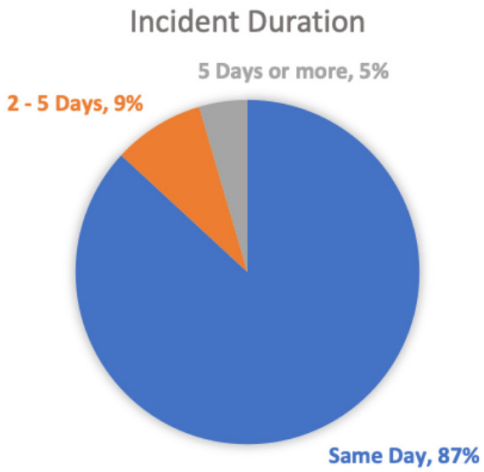
In FY 2020, ITEE added the Performance Analytics module in ServiceNow, which provides access to additional business metrics. Using these metrics, ITEE can now produce trending data that empower more informed leadership decisions based on key performance indicators using Analytics Hub, time charts, forecasts, breakdowns, and additional dashboards. This new tool also allows for better correlation of raw data to gain new insights. During the 2020 fiscal year, ITEE focused on gathering initial metrics to surface portions of the value ITEE adds to the division and university. These metrics will be used to provide longitudinal comparisons moving forward.

4Help launches user satisfaction survey

After the resolution of a 4Help incident, a user experience survey is offered to each user. The survey consists of four questions and also offers the opportunity to leave written feedback. These questions seek to gain the user's perspective on the customer service provided, the overall process (aside from customer service), and whether the issue was resolved. The process and individual results are averaged to generate an "overall" result.

FY 2020 Average results	
Was the incident resolved?	**96% (Yes)**
Were you satisfied with the care you received?	**4.82 (out of 5)**
Were you satisfied with the process for resolving your inquiry?	**4.67 (out of 5)**
Total satisfaction score	**4.74 (out of 5)**

4Help incident duration: When a 4Help incident is resolved, IT Experience and Engagement (ITEE) tracks the time elapsed since the incident was opened. FY 2020 results show that 87 percent of incidents assigned to 4Help were resolved within the same day, and 9% were resolved within 5 days. Tracking these metrics provides insight into the ability of 4Help agents and consultants to use their knowledge and the information resources at their disposal to resolve incidents.



Code.vt.edu moves to the cloud, increasing capacity for faculty, student, and researcher development projects

In 2015, Secure Identity Services (SIS) created an early instance of GitLab, git.it.vt.edu, as a place to store and version code for middleware projects. Over time, the number of projects grew, and new GitLab features such as continuous integration and continuous deployment became crucial to projects both inside and outside of SIS. The original GitLab instance was renamed code.vt.edu, and became a resource for developers, researchers, and faculty across the university, as well as for students who use GitLab for storage and gain experience in the skills that professional software engineers use to collaborate on projects.

Additional heavy use of GitLab by the **Summit project** and the Cyber Range placed added demands on storage and capabilities of the original community edition of GitLab. Within a few short years, it became clear that moving code.vt.edu to the cloud would be necessary to meet the needs of Virginia Tech's users.

On August 11, 2019 our local GitLab version of code.vt.edu was launched in Amazon Web Services (AWS), bringing it fully into the cloud. This move allowed anyone in the Virginia Tech community to create and manage up to 50 distinct projects as well as to collaborate on additional teams and projects up to a total of 305 gigabytes. Because code.vt.edu uses both Login.vt.edu and the InCommon Federation for authentication, Virginia Tech users are also able to collaborate with peers across higher education. As the Division of IT standardizes development on the Common Platform, which will provide an application technology infrastructure and shared services for all app development teams at Virginia Tech, the current group of 2697 users will continue to grow, making code.vt.edu part of the infrastructure of computing at Virginia Tech.

Improving data stewardship with the Data and System Access Automation Program initiative

SIS is working towards better access control, provisioning, and deprovisioning of university accounts with the initiation of the Data and System Access Automation Program (DSAAP). DSAAP, which replaced the Role Based Access Controls (RBAC) project, adds management of attribute-based access controls and policy-based enforcement to the original plan for role-based access controls. During FY 2020, SIS created a roadmap for the DSAAP initiative and selected technologies that will guide the years-long project.

As part of the DSAAP initiative, SIS continued to improve Group Manager, adding organizational groups to quickly provide access to specific university systems based on membership in teams, organizations, departments, or senior management divisions and colleges. Membership in the division's intranet site (intranet.it.vt.edu) and it-g Google group are now driven this way, eliminating the need to manually add and remove users of these services.

The DSAAP initiative also pursued Grouper as a tool to allow data stewards administrative control over group membership and policy. Grouper is a community-built, open-source educational product from the InCommon Federation, part of the Internet2 initiative. Grouper benefits from over 20 years of development at other higher education institutions and has recently adopted a data model consistent with that of Virginia Tech. In addition, Grouper offers a mechanism to provide Boolean math to groups, and allows data stewards to drive policy without using code — another benefit of using a tool common to academia.

CONCLUSION

This report covers many of the Division of Information Technology's most impactful efforts during the 2020 fiscal year. Given the atypical nature of this year, we understandably spent a significant portion of this report focusing on how we pivoted to meet the challenge presented by COVID-19. The interesting thing about this pivot was that while it did shift our focus away from several new initiatives that were about to commence, for the most part, the IT groundwork that allowed the university to meet many of these challenges was already in place. In a way, COVID-19 served as a checksum that validated our overall strategic direction.

There were many ongoing or routine activities that were not covered within this report, on which the university also depends. We hope you have found this document useful in building your understanding of what we are about and how we strive to be of service to Virginia Tech.

Edited by Angela Correa, Kit Hayes
Graphic design by Jarrod Rife

If you have questions, or would like more information on the topics covered within this report, please contact IT Communications via email (it.communications@vt.edu). Thank you.

Office of the Vice President for
Information Technology MC 0169
800 Drillfield Drive / Suite 314
Blacksburg, Virginia 24061
vpit@vt.edu | (540) 231-4227

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