The University of Vermont

<u>Annual Update on Information Technology at the University of Vermont</u>
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Board of Trustees
Educational Policy and Institutional Resources Committee

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University of Vermont
Information Technology Strategic Plan
Framing the 2020 Vision for the Use of Information Technology to Advance the Mission of
UVM 2019-2022
Report 2018- 2019 Cycle

Executive Summary

This report highlights UVM's progress on the use of Information Technology to advance the institution's overall mission. At its core, the report celebrates recent technological successes while subtly acknowledging the myriad of operational challenges that are addressed behind the scenes on a daily basis. On one hand, the content of the report endeavors to describe some of the major technological accomplishments of fiscal year 2018-2019 in detail. On the other hand, this report serves as a preview of the opportunities that lay on the horizon for UVM. The successes described throughout this document are a direct reflection of the University's highly talented and dedicated Information Technology professionals who deserve our utmost appreciation. Ultimately, this report underscores the outcome of the various partnerships that are being forged or being renewed in order to implement technologies, systems and services that have a transformative impact on the University and its constituents. Later in this report, the narrative provides a rich account of some the technological accomplishments that are highlighted in the section of the executive summary.

Summary of Some Major IT Accomplishments

1. **Help Create Teaching and Learning Environment of the Future**
   - Increased capacity of virtual desktop infrastructure (VDI) to support academic software needs and virtual computer labs
   - Introduced STEM digital notebooks and lowered barriers for academic use of high-performance computing
2. **Support Research and Scholarship**
   - Enhanced Vermont Advanced Computing Core (VACC) computing systems, including the design and launch of DeepGreen
   - Expanded data storage for researchers, both for high performance computational needs, and general research storage and archiving
3. **Support and Improve Administrative Processes**
   - Implemented software to improve student financial aid processing
   - Implemented student advising and retention platform
   - Deployed unified communication system to enhance collaboration, file sharing, video conferencing, and telephony
4. **Information Security**
   - Engaged in ongoing identification and mitigation of cyber threats
   - Created Information Security Council and Cyber Incident Response Team
   - Enhanced UVM's technology vendor and contract review processes
   - Established a student internship program in the information security office
   - Deployed a new email security system to reduce risk of incoming email threats

- Launched a new vulnerability management platform to gain greater insight into the security of UVM's servers and networks
- Expanded multi-factor authentication to additional services

5. **Improve Operational Efficiencies**
- Published UVM's first information technology service catalog to enhance understanding of IT services
- Migrated Grossman School of Business IT infrastructure into central environment
- Enhanced UVM's disaster recovery capabilities with a new enterprise data protection and backup solution
6. **Oneness of Information Technology at the University**
- Launched IT Governance to improve IT decision making across the campus
- Increased IT knowledge sharing among IT professionals across campus through Collaborative IT

Introduction

To a large degree, the accomplishments described below are, in fact, a significant step forward for IT services at UVM. To that end, the following narrative celebrates UVM's IT successes in a way that acknowledges institutional commitments and the dedication of the University's IT professionals. However, the ability to sustain such an ambitious technological agenda is likely to put additional pressure on UVM's financial and highly distributed IT staffing resources.

Informed by the priorities of the IT Strategic Plan that was unveiled in October 2018, this report confirms the importance of Information Technology in support of the multifaceted nature of the University as illustrated below.

1. Help Create Teaching and Learning Environment of the Future

In partnership with the College of Engineering and Mathematical Sciences, Enterprise Technology Services (ETS) has expanded the capacity of our virtual desktop infrastructure (VDI), which supports several virtual computer labs on campus. Over the course of this past year, we have doubled the capacity of the VDI environment and can now accommodate 600 concurrent students using the system.

Leveraging our extensive knowledge in virtual lab technologies, ETS has also partnered with Rubenstein School of Environment and Natural Resources to create virtual Geographic Information System (GIS) labs. This partnership complements largely the institutional response to the significant growth in the geospatial analysis field of study. The expansion of VDI technology in the GIS lab is expected to evolve to accommodate another 200 concurrent users in the near future.

These intentional expansions of institutional capacity significantly increase students' access to instructional software applications to enable their academic pursuits. Additionally, these technological initiatives would undoubtedly add a high degree of flexibility to the University's approach to making resources available to students and faculty. In more practical terms, these partnerships lead to increased flexible access to instructional software applications that would otherwise be tethered to physical spaces. Such expansions also bring greater flexibility in the use of physical spaces that would have otherwise been restricted to serving the sole purpose of a computer lab.

Finally, our partnership with the Physics Department in the College of Arts and Sciences to deploy a digital notebook known as Jupyter Notebook serves as further evidence of our commitment to directing institutional technological efforts to create the teaching and learning environment of the 21st century. A Jupyter Notebook environment enables the creation and sharing of documents that contain live code, equations, visualizations and narrative text. At the present time, UVM's Jupyter notebook environment can accommodate 50 concurrent users, since it is only targeted to two initial pilot classes. However, the environment can be scaled quickly to support hundreds of students, especially as soon as other faculty members are able to appreciate how this transformative technology can complement their pedagogical practices. Jupyter Notebooks and Open OnDemand are new technology service offerings that lower the barriers to students' exposure to High Performance Computing (HPC). These new service offerings introduce UVM undergraduate students to an HPC environment. At the same time, these new technologies broaden UVM students' exposure to the use of sophisticated computational capacity to solve complex academic and research problems.

2. Support Research and Scholarship

ETS' partnership with the Vice President for Research to support research and scholarship remains strongly anchored in our ability to provide technical oversight to the Vermont Advanced Computing Core (VACC). The VACC at UVM is the primary institutional High Performance Computing (HPC) facility similar to the ones available at national research facilities.

Over the course of this past year, the highlight of ETS' support for research and scholarship has revolved around the design and build of UVM's second supercomputer dubbed DeepGreen. This complex supercomputing system is precisely dedicated to supporting interdisciplinary research across many fields, including artificial intelligence and machine learning. Although frequently stated, it is still worth mentioning that the ability to architect and administer such a complex interdisciplinary research facility remains a point of pride for ETS. The ability to manage and administer such a complex research computing infrastructure is clear evidence of the high caliber of talents and skills currently present among the University's IT professionals.

Funded in part through an NSF grant, ETS built DeepGreen over the course of the spring 2019 semester. By the time of its completion in summer 2019, DeepGreen was ranked as one of the top 100 fastest academic supercomputers of its kind in the country. At present, DeepGreen is supporting 10 Principal Investigators and 28 other researchers at UVM whose research interests include machine learning, safer human-robot interactions, impact of substance abuse in human brains, genome sequencing, biological physics, and theoretical physics and quantum mechanics.

ETS's partnership with the UVM research community this past year is one that has gone well beyond the implementation of DeepGreen. In response to our researchers' need for generating and storing more data, we have expanded the high performance storage capacity of the VACC supercomputers by approximately 50%. We also have increased our traditional storage for researchers by another 400TB, a 33% growth in capacity.

3. Support and Improve Administrative Processes

Each of the applications in the Enterprise Application Portfolio, including both of the institution's Enterprise Resource Planning (ERP) systems, has also undergone upgrades to either improve administrative processes, bring about some efficiencies or to mitigate risks. Concrete examples of these efforts include our partnership with Student Financial Services to implement a software solution to streamline a critical and cumbersome segment of the student financial aid process. Over the course of 2018-19, a total of 3513 students supplied financial aid documents through the system, including prospective students. Of those 3513 files, 2853 were verified by Student Financials Services (SFS) staff. Previously, all the documents would have been mailed, emailed or faxed to SFS, which presented significant effort to review, image, index and manually review all elements of all documents to identify discrepancies and resolve them. With the newly implemented software solution, the documents were securely uploaded by the students. Through the use of smart forms and Original Character Recognition (OCR) discrepant data points were identified electronically. The SFS staff subsequently focused their review on the necessary discrepant items. Overall, such targeted effort significantly reduced errors and improved turnaround time. Many other software implementations, upgrades or purchases, big or small, can be described as exemplifying ETS's commitment to employing technological means to infuse efficiencies in institutional processes, especially for the benefit of our students. The partnership with the Office of Enrollment Management to implement an early alert system (EAB) might very well be one of our greatest contributions to institutional student success initiatives in general. We estimate that 86% of first time, first year and sophomore students have downloaded and are using the early alert Navigate mobile application.

Another support for administrative processes involved improvements to the institutional telecommunications and collaboration platform. Following a multi-year study of how to modernize the telecommunications platform and infrastructure, ETS has landed on a hybrid approach, which is being defined as the adoption and the implementation of Voice-Over-Internet as our telephony platform on one hand, and the adoption and implementation of Microsoft collaboration tools as an institutional platform. Consequently, this past year has been a year of preparation for the new VoIP environment, which includes the deployment of an Enhanced-911 system to handle phone instruments that move around the campus.

As of summer 2019 ETS has also rolled out Microsoft collaboration tools known as OneDrive for Business and Teams for all faculty and staff. OneDrive for Business has also been provisioned for all students. Provisioning of Teams for students will follow in October. Ultimately, the implementation and the use of these modern collaboration technologies will improve collaboration and efficiency in the areas of file sharing. Additionally, the use of these tools will promote a greater level of control over institutional data and records both for the purposes of retention and continuity of operation.

4. Information Security

The security of institutional digital assets along with the protection of any intellectual property generated at the University remains the top priority of UVM's cyber security efforts. Along that same vein, compliance with regulatory requirements and the mitigation of cyber threats in general have been our main areas of focus in the recent past. While ETS continues to look for ways to improve the overall institutional information security posture, cyber threats continue to evolve very rapidly, requiring constant prioritization.

Through the overarching Information Technology Governance, the University has now established both an Information Security Council and Cyber Incident Response Team. The purpose of these two groups is to help raise awareness to the real threats facing the University on one hand, and to help orchestrate an institutional approach to incident response and risk mitigation on the other. In this context of cyber security, the notion of risk mitigation goes beyond threats from bad actors only.

As we experience a proliferation of cloud services and 3rd party vendors, the institutional risk and exposure increases, consequently, requiring ETS to facilitate the management or the mitigation of these anticipated risks on most instances when the University enters into a relationship with an external entity. Over the course of 2019, ETS has reviewed over 331 contracts with additional vendor reviews on relationships involving University Protected Data.

In addition to raising awareness to institutional threats, the Information Security Office within ETS has established an internship program to expose UVM students to a true experiential learning opportunity in the field of information security and cyber defense. The first intern in this program is a female student from a non-STEM academic discipline. Although the selection criteria make the internship available to all UVM students, accepting a female student from a non-STEM discipline is consistent with the inclusive excellence goals of the ETS Division as we endeavor to promote various forms of diversity within the IT profession at UVM.

In addition to the information security governance work, there have been several projects this year with significant positive impact on UVM's security. In the spring of 2019, UVM implemented a new market leading email security system with enhanced capabilities to protect our environment. This new anti-threat solution for UVM email significantly reduces the amount of spam, malware, and phishing that is delivered to UVM faculty, staff, and students, reducing the overall risk to the University and our community. This year, we also deployed new vulnerability management software from a leading global security company. The new vulnerability management solution provides ETS with much better insight into the operational security of our servers and network, and provides better workflow for remediating any weaknesses identified. Among other security measures implemented this year is the expansion of multi-factor authentication for more services, including UVM's Student Information System, Banner, and our virtual desktop infrastructure.

5. Improve Operational Efficiencies

ETS unveiled the first UVM Information Technology Service Catalog in summer 2019 to bring about efficiencies on many levels. The Catalog helps promote and advertise the comprehensive suite of systems and technologies that are in the University's portfolio of services. Largely designed to serve as a hub of information to empower technology users, the Catalog also provides instructions on how to seek technical assistance when necessary. Between July and September 2019, the service catalog has had 768 visits, and to a degree, these numbers indicate the growing awareness of the productivity tools and technologies that are available to members of the UVM community.

Another operational efficiency initiative that has occurred in the recent past involved the consolidation of some technology infrastructure across the University. Until summer 2019, the Grossman School of Business (GSB) managed their own servers, Active Directory, services, and desktops as part of their standalone server infrastructure. Over the course of 2019, ETS worked with the Grossman School of Business to migrate this once standalone infrastructure into the University's overall infrastructure. On an order of magnitude, the transition included the migration of all of the faculty and staff in the School along with their desktops, and major IT services into the central UVM environment. ETS worked closely with GSB to migrate all of these services to central systems, with minimal impact to their faculty and staff. This kind of partnership allowed UVM to reduce unnecessary redundancies across units and provide improved technology services to GSB faculty and staff.

Over the course of 2019, ETS made several significant improvements to our disaster recovery readiness. We have expanded our deployment of data replication solution to protect more mission critical servers across UVM's multiple datacenters. UVM also has completed a very comprehensive Enterprise Data Protection and Backup RFP to select new software to backup and protect UVM's data, both on-premises and in the cloud. This RFP was just completed in September after a very thorough review of the market and evaluations of leading solutions. Implementation will begin in November. This new backup solution will improve the protection of UVM's data, ensuring much faster recovery in the event of a failure. Additionally, the tool provides both a much more redundant backup environment and more frequent backups.

6. Oneness of Information Technology at the University

FY 2019 also saw the launch of IT Governance. A structure was identified that includes representation from all levels of the University. The Executive IT Committee, with its focus on strategic IT direction, had its inaugural meeting this year, engaging senior leaders in discussion and decision-making on institutional level technology. The Operational IT Committee met several times to discuss and launch a process for reviewing, approving and shepherding specific IT projects. Collaborative IT, a group of IT professionals from across the institution, met regularly to discuss initiatives and share information. Moreover, the Information Security Council met multiple times to prioritize and discuss security initiatives. Formal governance groups such as the Student Government Association, the Faculty Senate, the Graduate Student

Senate and Staff Council all have liaisons to these groups, as do existing organizations such as the Center for Teaching & Learning and the VACC.

Although still evolving, IT Governance is gradually raising awareness to the true capacity of UVM's resources. So far, there are indications that ongoing partnerships with the campus community would continue to support the much-needed disciplined approach to managing UVM's scarce IT resources.

Conclusion

The numerous partnerships that are highlighted in this report crystalize UVM's commitment to using IT as an enabler of change through collaboration. Overall, this report gives a strong indication of how ETS values a service mindset to the same degree that we cherish our technical acumen. The breadth of accomplishments celebrated in the sections above gives meaning to our aspirational vision *to be a national leader among small research universities by orchestrating innovative technology solutions that have transformative impacts on teaching, learning and scholarship.*

On the Horizon

Looking ahead, the IT Strategic Plan will continue to guide institutional investments to allow resources to be directed toward some of the priorities that were far less celebrated in this report. One example of such priorities include the refinement of the data and analytics infrastructure to support the reinvigorated data-informed culture at the University. Over the course of the coming year, ETS is expected to deepen our partnership with the Office of Institutional Research as we mature our collective knowledge in the areas of data governance, data dictionary and data warehouse.

Students' strong penchant for mobile computing is also likely to have an impact on how we orchestrate UVM's IT environment in the future with the right balance of security and efficiency that supports teaching, learning and research. Essentially, the rapid evolution of the field of Information Technology in general is likely to test the limits of UVM's innovative spirit and our resources. To that end, the University's ability to maintain such an ambitious IT agenda creates an opportunity to explore new service and resource models. With our strong desire to continue to improve the technology user experience, the infusion of a more organized project management methodology along with ongoing business process analyses would greatly complement our service offerings.