Virginia Tech Information Technology

Strategic Plan for 2012-2018

Version 1.1

June 12, 2013

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History

4/1/2013   Version 1.0 of the IT Strategic Plan released. Comments are sought by May 1, 2013 for consideration for Version 1.1.

6/12/2013   Version 1.1 released.

Preface

It is my pleasure to present this strategic plan for the Information Technology organization for 2012-2018. This strategic plan for the IT organization provides a high-level framework for further strategic and tactical planning to realize this IT strategic plan and the university's long-range plan, "A Plan for a New Horizon – Envisioning Virginia Tech 2012-2018." The plan's focus is on services rather than on technology, although planning must consider the continually and rapidly changing technological landscape in which we operate. The plan's focus is, also, on activities at the scale of the university, although consideration is also given to interactions with information technology services at both smaller and greater scales. And, the plan's focus is on capabilities-driven innovative services that distinguish Virginia Tech and provide the university with competitive advantage, rather than on cost-driven commodity services that are important, but not differentiating. This IT strategic plan does not address resource needs, although it is recognized that new resources and reallocation of existing resources are required to realize many aspects of the plan.

It is noted that the IT organization provides many services that are critical to the successful operation of the university, most of which are not directly addressed in this strategic plan. We must continually strive to improve the effectiveness of these services to further the university's missions and goals. And, the IT organization must continue to grow into its role as consultant and broker, as well as infrastructure operator and service provider, given the changing landscape of information technology. This strategic plan highlights areas requiring particular focus and attention due to their importance to Virginia Tech's long-range plan and/or a need for change in what the IT organization does or how the IT organization functions.

Information technology and the associated requirements for information technology services change rapidly. Therefore, this IT strategic plan, like a "A Plan for a New Horizon," is a "living document that guides our efforts while it is continually tested and revised." The IT organization, in conjunction with others, will review, reassess and update this strategic plan, as needed and at least on a biennial basis. **This release of the strategic plan is Version 1.1 and is based on feedback received on Version 1.0 (released April 1, 2013) from within the IT organization and from other members of the university community.**

After becoming the Vice President for Information Technology and Chief Information Officer at Virginia Tech on October 1, 2012, I have learned much about the IT organization and its role in the university. I am continually impressed by the exceptional professionalism, technical and management expertise, innovativeness and work ethic of IT employees at all levels. And, I am continually amazed at how much this organization does today for Virginia Tech. But, as discussed in this strategic plan, there is much still to be done to fulfill the aspirations of "A Plan for a New Horizon," the university's long-range plan. And, the rapidly changing environment of information technology continues to provide new opportunities and new challenges. The IT organization looks forward to collaboration with others from across the university and beyond to realize "A Plan for a New Horizon" and this strategic plan for IT.

Scott F. Midkiff
Vice President for Information Technology and Chief Information Officer
June 12, 2013

Introduction

Virginia Tech's long-range plan, "A Plan for a New Horizon – Envisioning Virginia Tech 2012-2018,"[1] sets strategic directions for the university for the next six years and beyond. As described in the long-range plan, the university and our graduates face challenges in the coming years, but will also be presented with opportunities through which to respond to these challenges. Information technology is at the center of many of the challenges and opportunities that lie ahead. The rapid innovations in information and other technologies are creating challenges through structural shifts and are increasing the need for our graduates to be fully engaged in a data-driven, networked society. However, innovations in information technology also present opportunities for higher quality, more effective teaching and learning; new advances in research through computing, data analytics, visualization, and collaboration; and increases in organizational and operational efficiencies. In this context, the mission of Virginia Tech's Information Technology organization, called out below, has never been more important to the university in fulfilling its mission and achieving its aspirations.

Information Technology Mission Statement

The mission of Virginia Tech's Information Technology organization is to serve the university community and the citizens of the Commonwealth of Virginia by applying and integrating information resources to:

- Enhance and support instruction, teaching and learning;
- Participate in, support and enhance research;
- Foster outreach, develop partnerships with communities and promote the capabilities of advanced networking and communications; and
- Provide, secure and maintain systems allowing the university to accomplish its missions.

Simply following the *status quo* in pursuing the mission of the IT organization will not be sufficient to successfully meet the challenges and leverage the opportunities that are here today and that lie ahead. So, as the university plans for a new horizon and envisions itself for the next six years, the IT organization must also plan for its new horizon and envision itself so that it can fully support the vision of the university and respond to the challenges which it faces. Strategies for IT must recognize the need for initiating new services and increasing emphasis of selected existing services, but must also recognize the need to deemphasize or phase out some existing services that are no longer cost-effective or sufficiently aligned with university goals.

This strategic plan for Virginia Tech's Information Technology organization:

- Presents four focus areas for the IT organization that serve as pillars to directly support "A Plan for a New Horizon" (see "Information Technology: Supporting The Plan for a New Horizon");
- Presents three additional focus areas that serve as pillars to support the broader long-term success of the IT organization in addressing the university's long-range plan and in achieving success across IT's many functions (see "Information Technology: Positioning for the Future"); and

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[1] https://www.president.vt.edu/strategic-plan/2012-plan/2012-strategic-plan.pdf

- Describes more specific strategic themes and objectives for the IT organization that provide the foundation for these pillars (see "Information Technology Strategic Themes").

Information Technology: Supporting "A Plan for a New Horizon"

The fact that information technology has never been more important to the aspirations of Virginia Tech and to the long-term success of our graduates is evident in "A Plan for a New Horizon." Virginia Tech's Information Technology organization must be able to help lead the university in both meeting the challenges and taking full advantage of the opportunities presented by the "structural shifts caused by technological innovation." The IT strategic plan focuses on four pillars directly supporting "A Plan for a New Horizon."

- Pillar 1: Enabling networked learning in the networked university
- Pillar 2: Providing competitive advantage through sustainable advanced cyberinfrastructure and collaboration
- Pillar 3: Leveraging information technology to distinguish the Virginia Tech experience
- Pillar 4: Advancing information technology for enterprise effectiveness

These four focus areas are described below.

Pillar 1: Enabling Networked Learning in the Networked University

"A Plan for a New Horizon" makes the observation that "advances in technology are dramatically reshaping the educational landscape," in part by "creating unique opportunities to enhance classroom and online education." The university's long-range plan recognizes the role of online education in "expanding access to affordable and high-quality education to commonwealth residents," as well as the importance of providing faculty members with "the skills and conceptual frameworks necessary to use technology to provide meaningful student-to-student and student-to-faculty interaction, active learning opportunities, and timely and constructive feedback." As a specific goal, the university's long-range plan states that Virginia Tech will "continue to investigate, develop, and utilize current and emerging technologies to enhance traditional classrooms, provide mobile access, and expand high-quality distance-learning opportunities."

To support this goal, the Information Technology organization will focus on networked learning in the context of the networked university. Networked learning recognizes the interconnection of disciplinary expertise, pedagogy, and technology to improve the quality, effectiveness, and efficiency of teaching and learning. Networked learning also recognizes the interconnection of innovation, training and faculty development, and widespread practice in changing how faculty teach and students learn. Networked learning includes online learning's anytime, anywhere connectivity between students and course content and between students and a learning community, but clearly recognizes that this connectivity can benefit all of our students, both on campus and at a distance spanning geographic scales, and in traditional, hybrid, and fully-online classes. Networked learning also enhances the ability of faculty and students to collaborate to improve learning and pedagogy. And, networked learning recognizes both the "physical" and the "virtual" university in that it facilitates in-person and online interaction among faculty, supports teaching and learning in a variety of contexts, and connects faculty and students with both virtual spaces and physical spaces. Networked learning requires that we "develop an appropriate infrastructure for e-learning," stated as a goal in the university's long-range plan, but recognizes that the requirements for learning include much more than just infrastructure.

The Information Technology organization, in collaboration with partners across campus and beyond, proposes to lead the implementation of a team-driven Networked Learning Initiative. The Networked Learning Initiative is a set of intentional actions to:

- Put in place the services and supporting infrastructure to enable and encourage networked learning;
- Facilitate coordination of university units to create alignment with university-wide goals for networked learning; and
- Nurture a culture that recognizes the value of the networked university and rewards the collaboration and innovation necessary for networked learning.

To realize the Networked Learning Initiative, Learning Technologies within the IT organization will position itself to serve as a university hub for networked learning services, including consulting on instructional design; support for design, development, and creation of digital media content; support for universal design for accessibility; and access and support for in-house and cloud-based services for course management, content delivery, and collaboration. These services must support and recognize the importance of asynchronous online classes as the emerging primary model for teaching and learning at a distance; the ever growing importance of appropriately leveraging information technology for teaching and learning for local classes; and the rapid increase in technological capabilities. It should also be recognized that, to achieve these goals, reallocation of resources will be necessary that cause the IT organization to reduce its support for certain technologies, such as interactive videoconferencing for instruction. Our objective is to focus, at scale, on online web-based networked learning and to provide high quality, but limited, services for those technologies with more localized or niche impact. As an example, it is recognized that there is a need for a very limited number of highly-capable networked classrooms that connect Blacksburg and the National Capital Region.

The Networked Learning Initiative requires the careful definition of protocols between organizations in the networked university. In particular, Virginia Tech should ensure that program development and revision, course development and revision, grants to incentivize innovation and enable development and revision, and assessment are coordinated and consider the range of teaching modalities from the traditional classroom to asynchronous online distance learning.

Innovation and collaboration are essential to the Networked Learning Initiative. Learning Technologies will serve as a convener of a new Networked Learning Institute which is the evolution of the Faculty Development Institute (NLI) or "FDI 2.0." The Networked Learning Institute will be a collaborative effort with content provided by units across the university and will serve as the conduit for moving ideas, methods, and technologies into widespread practice in teaching and learning.

The Center for Innovation in Learning (CIL) will facilitate innovation in networked learning in collaboration with faculty and others across the university through its own educational research activities, and through convening collaborations that explore and pilot new approaches for networked learning. The university should coordinate grant programs to incentivize networked learning, possibly using the CIL as a hub for grants for innovative initiatives, program development, advancing 4-VA objectives, and other goals.

The university's long-range plan recognizes that "computational thinking and informatics/digital fluency are becoming basic skills needed in all disciplines" and presents a goal "to ensure competency in data analysis and computational methods as a component of general education for all students." In the context of this recognition and goal, the IT organization will give special attention to facilitating the

educational goals associated with computational thinking. The IT organization is committed to empowering students, and the faculty who guide and instruct them, with leading-edge skills and experiences in the data-rich participatory cultures enabled by the Internet. Through the Networked Learning Institute, the Center for Innovation in Learning, and InnovationSpace, the IT organization will support computational thinking and provide centralized services, infrastructure, innovation, and research necessary as part of general education across the university.

Pillar 2: Providing Competitive Advantage through Sustainable Advanced Cyberinfrastructure and Collaboration

"A Plan for a New Horizon" recognizes that advanced computing – data-intensive, high-performance, and highly networked – is "crucial to facilitating advanced research" in areas of priority for Virginia Tech. Indeed, as stated in the university's long-range plan, "the questions that can be asked and the methods and data sets that can be used to solve complex problems are being fundamentally altered by technology and the information sciences." The university's long-range plan further notes that "research and advanced graduate studies will require an increased capacity for data-intensive and high-performance computing."

To support the university's long-range plan, the Information Technology organization will strive for leadership in advanced cyberinfrastructure and provide new services to enhance collaboration within the university and beyond. Cyberinfrastructure encompasses high-performance computing (HPC), large-scale storage systems, visualization, HPC software and middleware, and advanced networking. Advanced cyberinfrastructure is important to recruit top researchers, grow and sustain computational- and data-intensive research programs, and enable graduate education involving data-intensive and high-performance computing. Enhanced collaboration is important to support research in the networked university and networked global research communities, especially in the multidisciplinary and interdisciplinary research areas which are often associated with advanced research computing.

The Information Technology organization, especially through the Advanced Research Computing and the Network and Infrastructure Services groups, in collaboration with others from across campus and beyond, will strive to provide Virginia Tech with a competitive advantage through advanced cyberinfrastructure. Our objectives are to:

- Provide cyberinfrastructure and services at a university scale that give Virginia Tech a competitive advantage through research computing and, in a coordinated manner, to appropriately facilitate HPC at other scales;
- Foster innovation in cyberinfrastructure and HPC applications through collaborative efforts across the university and beyond;
- Facilitate access to HPC across the university through both computing resource allocations and education and training; and
- Nurture a collaborative community of HPC scholars, practitioners, and educators at Virginia Tech.

The rapid advances in computing and storage technology, the growing demand for computational and storage resources, and budgetary constraints create a challenge to the IT organization and others in acquiring, installing, and supporting advanced cyberinfrastructure in a sustainable manner. Three key strategies will be pursued to meet this challenge.

1. If Virginia Tech is to be in a leadership position in HPC, the university must commit to sustained, predictable and strategic investments in personnel, operations, software licenses and maintenance, while also continuing to make opportunistic investments in HPC, storage, and networking infrastructure. This will allow the IT organization to maintain an appropriate balance between equipment acquisition and supporting personnel in both system administration and computational science.

2. The IT organization will partner with individual researchers and units to enable computational investments in exchange for HPC allocations. A goal is to leverage funds across the university from start-up packages, research infrastructure support, and sponsored programs to build university-scale HPC capacity. A second, equally important goal, is to increase effectiveness for the investors by guaranteeing allocations and reducing costs for system support, space, and building infrastructure compared to distributed operation of stand-alone systems.

3. Research computing is supported in different places and at different scales. Many research laboratories, centers, institutes, departments, and colleges support research computing to some extent and this is appropriate where resources are sufficiently utilized and/or meet specialized needs. While the IT organization will assist with this scale of research computing, our focus will be on cyberinfrastructure that is best provided at the scale of the university and that is shared by users with HPC needs across the university. We will prioritize allocations on university-scale HPC resources to enable research possible only through HPC. We will provide niche services only when those services are compatible with university-scale resources, yield high value to the university, and/or are appropriately supported by funds derived from efforts associated with the niche services.

While the IT organization's primary focus is on cyberinfrastructure and services at the scale of the university, we will also play a role at other scales. For example, the IT organization will seek to leverage opportunities for shared training, software licenses, and other resources across all scales. Further, the IT organization, through services, network infrastructure, consulting, and training, will facilitate access by Virginia Tech researchers to national-scale HPC resources, which are often the most appropriate for extremely large-scale computational problems.

A new University Data Center has been proposed and included in the university's six-year capital plan. The proposed University Data Center will play an important strategic role in advancing Virginia Tech's competitiveness in HPC and will be an important step in substantially growing our international reputation in advanced research computing. In particular, the University Data Center will ensure that Virginia Tech can be an innovative contributor to advancing high-performance computing and not just be a follower and a consumer of HPC. (More broadly, the University Data Center will allow the university to continue to be an international leader in leveraging information technology across its knowledge, discovery, and engagement missions.) The University Data Center will allow the university to achieve operational efficiencies by reducing energy costs and by centrally housing server and cluster computers that are owned and operated by the IT organization and by other units. Further, through the use of contemporary data center design techniques and by making the University Data Center a living laboratory for research and "hands on, minds on" learning in sustainable, resilient, and secure data center design, the facility and associated programs will contribute more broadly to research and instruction. The University Data Center can also be a significant part of efforts to "work toward campus sustainability by developing a campus-wide willingness and commitment to critically evaluate our

practices and embrace new technologies and innovative solutions," as stated in the university's long-range plan.

It is important for the IT organization to collaborate within the university and beyond to foster innovation. Partnerships within the university offer opportunities for new HPC investment mechanisms, as described above. Beyond Virginia Tech, the IT organization will accelerate its already strong efforts in initiation, leadership, and participation to create mutually beneficial regional partnerships, especially with other research universities. Such partnerships should focus on innovative and cost-effective high-end capabilities not generally available as commodity services and should be sufficiently broad in scope to consider network infrastructure, high-performance computing, and research collaboration.

The IT organization, through its Advanced Research Computing group and in collaboration with others, will facilitate access to HPC resources to researchers across the university that can effectively leverage university-scale cyberinfrastructure. The Advanced Research Computing group will continue and expand education and training opportunities to enable effective use of HPC. Training programs should leverage the proposed Network Learning Institute described above. And, resource allocation schemes will enable newer users to begin to explore and develop HPC expertise.

The Advanced Research Computing group will position itself as the hub for the networked university to convene and nurture an HPC community at Virginia Tech that supports operations and practice, scholarship and sponsored research, and education and training. Activities include, for example, an external speaker series, internal showcase events, recognition awards, and programs to highlight our accomplishments to an international audience.

Pillar 3: Leveraging Information Technology to Distinguish the Virginia Tech Experience

"A Plan for a New Horizon" calls for the university "to implement programs and policies that create the superior research, learning, and workplace environments essential to a vibrant academic institution" and that are needed "to attract the best students, post-doctoral scholars, faculty, and staff." In our data-driven, technology-enabled, and networked society, information technology must be a key component of the contemporary vibrant academic institution.

The Information Technology organization will partner and lead, as appropriate, with other units at Virginia Tech to distinguish the Virginia Tech experience in both its physical and virtual forms. An important principle is that information technology can and must be leveraged to distinguish the Virginia Tech experience. The specific forms of that experience and the enabling technologies will evolve over time as requirements and technologies change. Areas that are receiving attention and are expected to require continuing attention are:

- Providing innovative technology-drenched spaces, which will grow in importance in distinguishing the physical university experience from the virtual university experience;
- Leveraging and appropriately managing information technology to enhance the experience of students, faculty, and staff, including embracing the "consumerization" of information technology and the availability of highly-capable mobile devices; and
- Leveraging converged technologies for the physical safety, security, and resilience of the university community.

The Virginia Tech experience in virtual space will grow in importance due to online learning, web-based collaboration, and other information technologies. However, the Virginia Tech experience in physical space will also grow in importance as a way to distinguish and add value to the traditional residential

university experience and to our physical presence in Blacksburg, the National Capital Region, and other locations throughout the Commonwealth of Virginia and the world. Virginia Tech, through coordinated efforts by units across campus including the IT organization, should be innovative in how its students, faculty, and staff engage with the university's physical presence. In particular, the Center for the Arts presents opportunities for innovation in both how the IT organization engages with a campus unit and how information technology can differentiate a physical space. The IT organization will collaborate with the Center for the Arts and the Institute for Creativity, Arts and Technology (ICAT) to develop plans for sustainable engagement and services.

Information technology is, today, an important part of the Virginia Tech experience and it will become even more so. Many information technology services have become utilities, much like electricity and water, with regard to expectations of always available service. But, the underlying infrastructure of information technology changes far more rapidly than for other utilities. The ongoing Unified Communications project and core campus network upgrades will continue to be important as we bring our basic telecommunications and networking infrastructure into the 21st Century. The IT organization will continue to engage with cellular service providers to assist them in improving coverage and capacity using the Distributed Antenna System (DAS). There is particular emphasis with the DAS to improve coverage in residence halls for reasons of safety, security, and convenience. The planning of campus construction projects needs to consider information and communications technologies as a core part of a building to ensure cost-effective deployment of wired and wireless networks and access to cellular service through the DAS. We will also continue to improve our network connectivity to support demanding research and education requirements, to increase cost effectiveness, and to improve resiliency. We will continue to work in partnership with other universities at a regional scale in this area.

The consumerization of information technology and the wide adoption of mobile devices will present significant opportunities and challenges for the future. We will explore how to leverage smartphones, tablets and other mobile devices brought to campus by students, faculty, staff and visitors to improve the Virginia Tech experience. Example opportunities include incorporating mobile devices into a networked learning environment, connecting work groups and student groups through mobile collaborative applications, and enhancing campus visits for our guests. Challenges also come with the opportunities presented by the "bring your own device" (BYOD) or "bring your own everything" (BYOE) phenomena. While the university has had a BYOD environment since the first students brought personal computers to campus in the 1980's, the scale, heterogeneity and security risks of today's BYOE environment are at an unprecedented level and continue to grow. Network capacity and support for mobile services need to grow to meet the demands of a growing number of devices connected to the university's network and servers. Our approach will be to find ways to leverage the power of BYOE while ensuring connectivity and managing risks.

Virginia Tech, through the collaboration of the Information Technology organization, the Vice President for Administration and others, has been an innovator in leveraging information technology to enhance the safety, security, and resilience of the university community. We will continue to work toward sustaining and improving messaging and alert systems, geographic information systems, and other technologies for safety, security, and resilience through partnerships within and outside of the university. And, the IT organization will seek new opportunities for collaborative innovation and impact in this area.

Pillar 4: Advancing Information Technology for Enterprise Effectiveness

The university's long-range plan states that "as the university prepares to move into the next planning period, we will be challenged to continue to meet demands for increased productivity and efficiency without sacrificing quality." The long-range plan also states that "our goal is to ensure 'quality, innovation, and results' by reviewing and revising our current business practices for opportunities to optimize efficiency, flexibility, and accountability without sacrificing our ability to remain innovative and competitive." While not explicitly stated in "A Plan for a New Horizon," leveraging information technology through enterprise systems for automation and collaboration is important to achieving organizational effectiveness, much as it is for achieving operational effectiveness.

In addition to the Information Technology organization, there are many other units in the university that are critical to Virginia Tech's success in enterprise systems. These other units may develop their own software, contract with others for software development, and/or purchase software. These other units may, also, specify requirements, control resources, and develop or use business processes associated with enterprise-level software. The IT organization, through its Enterprise Systems group, will focus primarily on university-scale enterprise systems and related infrastructure and services, but should provide a leadership role for the university in the broad area of enterprise-level software.

The IT organization will strive to address challenges and leverage opportunities to utilize information technology for enterprise effectiveness, with particular focus on three areas:

- Improving enterprise systems prioritization and resource management;
- Evaluation of enterprise system and service delivery models, including in-house versus cloud-based models; and
- Positioning our enterprise systems for the future.

Resources for software acquisition and development will always be constrained, so the university must work toward meeting the highest priority needs and using central and unit resources as effectively as possible. While resource allocation decisions are typically not made by the IT organization, the IT organization will serve as a convener of a process to: (i) prioritize and oversee campus-wide enterprise systems development efforts; (ii) provide consultation on resource allocations and development standards; (iii) facilitate communication to ensure that project management duties have been delegated; and (iv) offer analysis of the effects of a project on the university and benefits across the university. In addition, the IT organization will provide a clearinghouse to encourage sharing of expertise and resources for software acquisition and development between different units on campus.

A variety of models exist today for how enterprise systems and services can be delivered and the diversity of models is likely to only increase with time. In collaboration with stakeholders, the IT organization will continually evaluate how to best provide enterprise systems and services to the university. As a general principle, the IT organization will focus on innovation for those systems and services that are distinguishing in that they offer competitive advantage in some way to the university. And, those services that are commodity in nature should be considered potential targets for provisioning through an external provider, i.e., moved to the cloud. Whether or not an enterprise system or service should be moved the cloud can be evaluated in terms of cost and efficiency. The IT organization has made such analyses and decisions in the past, for example the move of most Virginia Tech email accounts to Google. The IT organization will continue to look for appropriate opportunities to increase functionality, increase capacity, and/or decrease costs through moving commodity services to the cloud.

There are business and technological changes underway that may lead to more fundamental changes in how the IT organization and others at the university should acquire and structure enterprise systems and services. The IT organization in collaboration with others from across the university will take intentional actions to analyze options, make decisions about directions in enterprise systems, and position ourselves to be more agile and flexible with respect to enterprise systems. We have already embraced community-based open source software, for example, as part of the Sakai Project which is the basis for our Scholar learning management system. Virginia Tech, including the IT organization, should continue to seek and evaluate opportunities to participate and leverage community-based open source projects. For the long-term, Virginia Tech must position itself to be more flexible and agile in using the most effective enterprise systems in the most effective ways. New capabilities and costs for most current systems are under the control of the vendor, not the university. And, traditional monolithic, closed models of software are counter to contemporary software architectures and principles. In collaboration with other units, the IT organization will explore new directions for enterprise system architectures and options for transitions. Changing from the *status quo* takes time and, potentially, a significant investment of resources. We may choose to not deviate from our current approach to enterprise systems, but we need to understand and position ourselves to do what is best for the university.

Information Technology: Positioning for the Future

While not directly supporting "A Plan for a New Horizon," the Information Technology organization's strategic plan includes three additional focus areas that serve as pillars for the university's information technology capabilities and will strengthen the IT organization's ability to meet the university's information technology needs.

- Pillar 5: Ensuring the security and resilience of information technology resources
- Pillar 6: Improving communications with customers and partners
- Pillar 7: Strengthening the information technology organization

These three focus areas that position the IT organization for the future are described below.

Pillar 5: Ensuring the Security and Resilience of Information Technology Resources

Information technology has become critical to the operation of the university's teaching, research, and outreach missions. Thus, Virginia Tech's ability to operate and succeed is vulnerable to disruptions and failures in our information technology infrastructure and services that may be due to natural or human-made causes. The university must also ensure the privacy and integrity of sensitive data. Data privacy and integrity are likely to become even more important due to laws, policies and regulations, the growing requirements for data privacy associated with many sponsored research projects, and the growing number and sophistication of cyber attacks.

Addressing these issues requires participation by almost every unit on campus as almost every unit operates and/or uses a variety of information technology systems. The IT organization will continue to serve as a hub for the university to coordinate cybersecurity and efforts related to information technology risk assessment, disaster recovery, and continuation of operation. The IT organization will continue to focus on:

- Coordination of information technology risk assessment, disaster recovery, and continuation of operation;

- Facilitating and managing appropriate access to information technology resources through secure credentials and identity management;
- Assessment of cyber threats, cybersecurity for the university, and response to cyber attacks; and
- Research and innovation in cybersecurity that advances our cybersecurity capabilities and that is synergistic with related academic programs.

In coordination with administrative and academic units at the university, the IT organization, through its Converged Technologies for Security, Safety, and Resilience group, will regularly assess threats and risks to information technology infrastructure and services. The IT organization, in partnership with other units, will plan and implement measures to provide an acceptable level of risk. These functions include information technology risk assessment, disaster recovery, and continuation of operation. While the IT organization is already performing these functions, this will continue to be a focus area and efforts must adapt to new dependencies, new threats, and new laws, policies and regulations.

Ensuring appropriate access to information technology resources by students, faculty, staff and visitors relies on secure authentication strategies and sound management of identity and roles. The Secure Enterprise Technology Initiatives group within the IT organization will continue to advance the university's identity authentication capabilities including through national and international scale initiatives. Also, the IT organization will leverage identity management to ensure appropriate access to data and information technology services.

The IT organization's Information Technology Security Office will continue to monitor cyber threats to university information technology resources, provide effective defenses against these threats, and respond to cyber attacks that may have compromised data and/or other resources. These efforts must be innovative to achieve a balance between the openness and accessibility expected in an academic environment and growing risks and threats. Protection must be extended all critical Virginia Tech information technology resources, including those outside of Blacksburg. Education and training will continue to be an important function of the Information Technology Security Office targeted to both information technology specialists and, in recognition of the need to "secure the human," faculty, staff, and students.

Virginia Tech should continue to focus on innovation in cybersecurity. Research and innovation within the IT organization allows the university to be better prepared to defend itself against the continuous changes in cyber threats. Further, research and innovation in cybersecurity presents opportunities for research and education collaborations with academic units. It is noted in "A Plan for a New Horizon" that cyber security and "and the management and security of communication systems" are areas in which "Virginia Tech will contribute to national and local security through research programs."

Pillar 6: Improving Communications with Customers and Partners

As recognized in "A Plan for a New Horizon," Virginia Tech has become a "networked university" where "students, faculty, and staff operate in a world of increasingly permeable boundaries." While silos are rarely beneficial within an organization, they are particularly detrimental to the networked university.

The Information Technology organization must strive to reduce and eliminate silos that inhibit teamwork and coordination within the IT organization and that impede partnerships and collaboration with others at Virginia Tech and beyond. The IT organization will focus on communication as a strategic lever to bring down silos and enhance connectivity in the networked university.

The Information technology organization will develop and implement a comprehensive communication plan that considers communication with the university community and with internal and external partners and potential partners. The goals are to:

- Listen to and seek input from the university community regarding satisfaction and concerns with current information technology services, articulated needs and priorities, and congruence of the IT organization's plans with the plans and goals of colleges, departments, and other units;
- Better inform the university community of current services available from the IT organization and for future plans to lead to more effective use of information technology services and improved planning; and
- Build broad awareness of the activities and accomplishments of the IT organization and related activities at Virginia Tech to increase institutional reputation and build a foundation for mutually beneficial internal and external partnerships.

The communication plan will address two-way communication with multiple segments of the university, including administrators, information technology specialists, and faculty, staff and student users. The plan will, also, relate to the full range of services provided by the IT organization. And, the plan will consider a variety of communication mechanisms, possibly including in-person and online training, town hall meetings, advisory committees, and electronic communication through websites, webinars, and social media.

Pillar 7: Strengthening the Information Technology Organization

The Information Technology organization must become even stronger and more capable to meet the growing and changing nature of demands placed on it. Hiring and retaining highly qualified employees is a challenge and will likely become even more challenging as the demand for information technology professionals continues to grow both nationally and in the New River Valley. And, rapid changes in technology and the increasing importance of collaboration, teamwork and communication in the networked university make education, training, and professional development particularly important for employees at all levels in the IT organization and for information technology professionals across the university.

To strengthen the IT organization, we will place particular emphasis on:

- Recruiting and developing a workforce pipeline for the Information Technology organization; and
- Technical training and professional development for Information Technology organization employees and other information technology professionals at Virginia Tech.

The IT organization will examine its recruiting processes and consider new approaches to hiring a well-qualified and diverse workforce. We will consider ways to build larger pools of qualified applicants, for example through academic year and summer internship programs.

The IT organization will ensure that it is offering appropriate technical training and professional development opportunities for its employees by utilizing internal resources, university programs, and external programs. Particular emphasis will be place on preparing a cadre of professionals to be leaders within the IT organization and to be facilitators and integrators that make the Information Technology organization an effective part of the networked university.

Information Technology Strategic Themes

The Information Technology organization will focus on the seven pillars described above to support "A Plan for a New Horizon" and to ensure the future effectiveness of the IT organization. This section describes seven overarching information technology strategic themes that serve as the foundation for the seven pillars described above. For each IT strategic theme, there are a number of more specific actions and activities that will be pursued where possible. Priority will be given to those actions and activities that are aligned with the seven pillars described above and the University's long-range plan.

The association between the pillars described above and the IT strategic themes is indicated in the table at the end of this section (page 33). These seven strategic IT themes are also aligned with the three components of the university's long-range plan:

- Research and Innovation, with a focus on enhancing capabilities and outcomes
- The Life of the Mind of Virginia Tech's students, faculty and staff
- The Virginia Tech Experience, with a focus on positioning Virginia Tech as a dynamic and distinctive community

These components of "A Plan for a New Horizon" and the associated IT strategic themes are listed below.

Research and Innovation

- Strategic Theme 1: Establishing a level of security that continuously protects university data and research and collaborating with other university units in leveraging IT infrastructure to enhance physical security and safety
- Strategic Theme 2: Creating a resilient and robust computing and network infrastructure for research, teaching, and outreach
- Strategic Theme 3: Supporting university research through the development and support of high-performance computing and communications technologies, advancing competencies and capacity in computational science

The Life of the Mind

- Strategic Theme 4: Leveraging technology to advance teaching and learning

The Virginia Tech Experience

- Strategic Theme 5: Developing and reshaping the IT organization's efficiency and flexibility
- Strategic Theme 6: Providing leadership and service to apply new information technologies creating opportunities to improve quality of life and economic competitiveness for the citizens of the Commonwealth and all people
- Strategic Theme 7: Supporting the university's mission and activities with highly available and robustly functional enterprise systems

The IT strategic themes and associated actions, activities and objectives are described below.

Supporting Research and Innovation

Strategic Theme 1: Safety and Security

> *Establishing a level of security that continuously protects university data and research and collaborating with other university units in leveraging IT infrastructure to enhance physical security and safety*

The Information Technology organization is committed to the protection of university's information technology assets that reside at all university locations. These assets include the intellectual property, systems, and data used for teaching and learning, research and scholarship, outreach, and the conduct of university business. The IT organization will continue to take steps to help the university community identify and mitigate the internal and external threats to its critical assets.

In the context of this IT strategic plan, safety and security encompass the safekeeping of networked information and resources as well as the protection and control of physical facilities and spaces. The term "converged technology" is used to describe the technological interfaces between physical security and information security, and has been a focus within the IT organization since 2010, when the Converged Technologies for Security, Safety, and Resilience unit was created. Since that time, converged technology has become integral to Virginia Tech's information technology operations involving the collaboration of individuals and units in the IT organization with counterparts in the Vice President for Administration area to enhance aspects of physical and information technology safety and security, thus reducing threats on campus.

As information systems have evolved, they have come to provide more powerful tools and more rapid access to a wider variety of information needed to manage daily operations, provide instruction, and conduct research. Careful consideration of the ways in which physical safety and cyber security can be enhanced with each initiative is critical to the university. Every new or continued investment in information technology infrastructure should consider how the infrastructure could be leveraged in innovative ways to improve safety and security. New tools and techniques can be applied to enable greater situational awareness for first responders, emergency management and planning personnel, and members of the university community in the event of an incident on the Virginia Tech campus. By developing and conducting strategic pilot projects to understand these tools and techniques, Virginia Tech has the potential to be a model for best practices for adoption in other environments and communities.

Many campus security-related organizations require assistance and support to fully exploit the capabilities of enhanced information technology. There is great potential for tremendous gains in efficiency and effectiveness by carefully selecting and developing appropriate standards and solutions. These initiatives could also have implications at the national level, opening up new avenues for sponsored research and externally funded development. Several units and individuals in IT are actively engaged in conducting and supporting sponsored research in the area of converged technologies for enhanced security and safety. From a strategic perspective, these research activities should continue to be encouraged and supported to the extent possible.

The following activities and actions are planned in support of Strategic Theme 1, Safety and Security.

1. Maintain "best practices" level of standards, practices, and controls.

   a. Continue to provide an IT security review function for the university to ensure Virginia Tech's data confidentiality, integrity, and availability.

   b. Work with university stakeholders to improve documentation, resilience, and recoverability of critical IT systems.

   c. Continue to develop a secure university computing environment based on a defense-in-depth strategy.

   d. Ensure data and systems security compliance with Virginia Tech standards and policies.

   e. Periodically review Virginia Tech's information technology security policies and standards for applicability and effectiveness.

   f. Develop guidelines and/or policies for securing mobile devices and provide tools to assist.

2. Continue to expand capabilities in converged technologies.

   a. In collaboration with campus security and emergency management organizations – the Office of Emergency Management, the Virginia Tech Police Department, Information Technology, and others – provide support for the enhanced use of information technology and international standards in targeted application areas, including identity management, access, imagery, three-dimensional terrain and building data, sensor nets and services supporting situation awareness, and emergency routing.

   b. Work with local, state, and federal authorities to become a national participant in converged technologies and seek opportunities to create awareness of these initiatives and developments.

   c. Integrate geospatial data capabilities into processes and procedures that contribute to safety and security, as appropriate. Seek input from the Virginia Tech Police Department and the Office of Emergency Management to ensure the efficacy of proposed solutions.

   d. Involve students and student groups in developing applications, especially those that enable the use of ubiquitous mobile devices to enhance situational awareness and personal safety.

   e. Implement the relevant recommendations from the Identity Management Committee.

   f. Create more flexible identity management processes for enabling timely and appropriate access for non-core Virginia Tech individuals (e.g., program participants, emergency personnel, and research collaborators).

   g. Provide financial and technical support for selected police technology initiatives that go beyond the routine uses of technology and into more innovative developments, while maintaining the guideline of having the technology appropriately fit into operations.

   h. Convene an annual meeting in the spring, involving key personnel from the Vice President for Administration area and the IT organization, to assess progress on converged technology objectives and establish new objectives for the coming year.

3. Improve identification and mitigation of threats to Virginia Tech IT assets.

   a. Expand information technology security monitoring capabilities to sites beyond Blacksburg, such as the National Capital Region.

   b. Identify and review critical information technology assets and departments to ensure security levels meet industry best practices where appropriate.

   c. Build upon and improve network monitoring capabilities that assist in identifying real-time threats to Virginia Tech data and systems.

   d. Create a 24/7 information technology security strategy that convergences Virginia Tech's information technology security resources into a single operations center.

   e. Continue to develop and implement a program to assist units with desktop security.

   f. Continue to strengthen the level of assurance in personal digital identities.

   g. Expand support for technologies to encrypt sensitive university information at rest and in transit.

4. Work with university units to integrate cyber security practices into all university processes.

   a. Provide Virginia Tech data trustees and custodians with the tools and knowledge to fulfill their roles and responsibilities in protecting university data.

   b. Clarify and emphasize to colleges and departments their responsibilities in the areas of data and systems security, using IT risk assessments and security reviews as vehicles for maintaining awareness at the college and departmental level.

   c. Provide information technology security training and tools for the university community, with an emphasis on professional certification.

   d. Continue to investigate new and leading edge information technology security training for the university community.

   e. Expand and improve cyber awareness training opportunities for students, faculty and staff.

   f. Improve IT security metrics gathering and information sharing to assist university stakeholders in planning and decision making.

   g. Assist departments in identifying and implementing appropriate credentials for accessing online resources.

5. Maintain and build Virginia Tech's leadership position in emergency notification and other technologies for situational awareness in a university environment.

   a. Continue leadership in the development, enhancement, and deployment of emergency notification capabilities.

   b. Leverage Virginia Tech's leadership position in emergency notification technologies to develop new collaborations.

   c. Work with and advise university, state, and federal emergency management organizations to propose technology solutions to identified needs.

d. Develop additional notification mechanisms, such as the Commercial Mobile Alert System (CMAS) and other mechanisms focused on mobile devices.

e. Explore an open-source or privatized solution for sustaining and innovating emergency notification capabilities.

f. Lead efforts to standardize interfaces for applications that produce and consume emergency notifications.

6. Participate in strategic collaborative initiatives with the Vice President for Administration organization designed to leverage campus information technology infrastructure and resources for enhanced security and safety.

a. Enhance campus situational awareness during an incident by developing and utilizing communications channels with building coordinators to receive situation reports and increase information sharing and distribution.

b. Create a user-friendly interface to leverage available Geographic Information System (GIS) data for improved public safety and facility planning.

c. Enhance Emergency Action Plan (EAP) and Continuity Of OPerations (COOP) planning tools to improve departmental emergency preparedness.

d. Implement an identity management program to ensure a secure comprehensive strategy for managing the identities of people who access Virginia Tech facilities, services and online systems.

e. Explore the feasibility of an interactive on-line map that identifies vehicle parking locations and walking paths to destinations on campus based on time of day and availability of parking spaces.

Strategic Theme 2: Infrastructure

Creating a resilient and robust computing and network infrastructure for research, teaching, and outreach

A resilient and robust computing and network infrastructure for research, teaching, and outreach is critical to the success of the university. This is true not only for day-to-day operations, but also in the event of disaster-related interruptions to the environment. Increasingly this environment must also be capable of providing support to remote locations, both nationally and internationally, as Virginia Tech's operations expand to accommodate its global presence.

The following activities and actions are planned in support of Strategic Theme 2, Infrastructure.

1. Ensure there is an adequate computing environment, including data center capacity and capabilities.

a. Realize a new University Data Center to support growing computing resources.

b. Determine how to best meet computing resource needs using the existing and new data centers.

c. Identify novel funding sources to promote the implementation of hot site capabilities for a more robust data center environment.

d. Collaborate with other state institutions of higher education to determine if cooperative agreements for shared sites and/or resources can be created.

   e. Continue to seek "green" alternatives to mitigate electric power consumption.

2. Provide the university with ubiquitous high-performance optical and wireless network infrastructure.

   a. Provide leadership to the development of national and international research networks.

   b. Provide for future advances in information and communications technology by enhancing the campus network cable plant infrastructure.

   c. Continue upgrading the campus-wide wireless communication services and voice over Internet Protocol (VoIP) service. Provide any university work space with sufficient bandwidth to accommodate research activities.

   d. Explore options for restructuring of the funding model underpinning university-wide communications services.

3. Enhance information technology support to Virginia Tech locations outside of the Blacksburg campus.

   a. Ensure a robust virtual private network (VPN) service exists to accommodate secure access to data centrally stored for all Virginia Tech sites.

   b. Ensure, to the extent feasible, that data and voice capabilities at Virginia Tech sites outside of the Blacksburg campus are comparable to and compatible with those on the Blacksburg campus.

4. Enhance and expand identity management capabilities.

   a. Use the Standard for Personal Digital Identity Levels of Assurance and the Guidelines for Determining Level of Assurance of Personal Digital Identities to communicate to the university the importance of aligning access to electronic resources with levels of assurance in personal digital identities.

   b. Advertise the utility of InCommon Silver certification for federated services to the university community. Inform researchers and other stakeholders of the certification and how to obtain the proper credentials.

   c. Research and deploy a secure remote identity proofing and credentialing processes for distance learners such that appropriate levels of identity assurance are available as needed.

   d. Enhance identity management processes to enable expansion of appropriate access to services as the definition of the university community broadens.

Strategic Theme 3: Advancing Research with Advancements in Information Technology

Supporting university research through the development and support of high-performance computing and communications technologies, advancing competencies and capacity in computational science

The Information Technology organization supports Virginia Tech's research activities through high performance computing, high-speed networking, data management, and scientific visualization. The IT

organization will continue to deploy and support the cyberinfrastructure that Virginia Tech researchers need to be productive, competitive, and successful. Advanced computing infrastructure must be available to Virginia Tech researchers at all sites and, in particular, in the National Capital Region, as the university increases its presence outside of Blacksburg. In addition to its support of research across the university, the IT organization is an active participant in research, both in collaboration with academic faculty and independently in areas deemed of strategic importance.

The IT organization, in collaboration with researchers in academic units, has a significant opportunity to translate and transition academic research results into test beds and prototypes in a controlled environment and at scale. By building out the diverse research expertise of appropriate members of the IT organization, we will continue to lead, incubate and empower innovation. Through various collaborations with academic units across the campus, the IT organization will actively participate in sponsored research projects.

Computational and data-intensive research projects occupy an increasingly important role in scientific discovery. The Advanced Research Computing group supports research activities across the university by delivering high-performance computing and visualization resources to the Virginia Tech research community, providing state of the art training in computationally-based research methods, and engaging in interdisciplinary research collaborations with academic units. The IT organization will continue to lead efforts to expand research computing opportunities and ensure that advanced cyberinfrastructure is available to meet the evolving needs of the university's research community.

The following activities and actions are planned in support of Strategic Theme 3, Advancing Research with Advancements in Information Technology.

1. Develop best practices in HPC and visualization, advanced communications, faculty development in information technology, cybersecurity, and economic development.

    a. Continue to develop the HPC and visualization program within the Advanced Research Computing group to meet growing demand for advanced computing in a broad range of research disciplines.

    b. Provide and enhance user support to ensure that the university community is able to access competitive network capacity and computing resources.

    c. Enhance and deploy cyberinfrastructure that supports "big data" research.

    d. Expand education and training programs to engage researchers in HPC and visualization and to promulgate best practices.

    e. Increase participation of the IT organization in sponsored research projects through collaboration with academic units.

    f. Develop and implement a tracking system for documenting the contributions of the IT organization to research activities across the campus.

2. Lead new initiatives to provide significantly expanded support for university researchers.

    a. Aggressively expand HPC capabilities through acquisition of large-scale HPC systems, effective system and user support, and promoting use to researchers.

    b. Expand expertise in the IT organization to reflect changing needs in the Virginia Tech research community.

c. Plan, design and implement HPC facilities in the proposed University Data Center.

d. Develop a leadership HPC program for universities in Virginia and realize partnerships with national HPC centers through the NSF-XSEDE and/or other programs.

e. Explore opportunities for public-private collaborations to increase research funding and research capacity.

f. Enhance faculty development programs that promote interdisciplinary research activities through advanced research computing.

g. Continue to support and expand the Enterprise Geographic Information System and related systems underpinning the university's spatial data infrastructure.

h. Enhance and expand support to research activities for configuration, development and utilization of specialized, high performance network technologies to support large data flows. Leverage available funding to develop specialized network systems using the most advanced technologies in participation with and supporting research.

3. In collaboration with academic units, promote a culture of computational thinking across the university through comprehensive education and outreach programs that are integrated with research and innovation.

a. Develop a university-wide graduate HPC certificate or similar program that provides graduate students with knowledge of practical aspects and best practices of advanced research computing and enables them to leverage this knowledge for research.

b. Provide support and innovative technology approaches related to humanities, visual and performing arts.

4. Develop improved policies designed to streamline the research process and ensure efficient management of HPC resources.

a. Understand best practices in research computing organizational structure and policies and adapt as needed to enhance the organizational structure and polices for research computing at Virginia Tech.

b. Develop and implement a tracking system to effectively document computational research performed using cyberinfrastructure resources provided by the IT organization.

c. Design and implement an appropriate user environment and policies to ensure that systems are scalable, accessible, and useful for all computational researchers, from long-standing HPC users to new faculty and students, on a range of applications, including massively parallel, shared-memory, accelerator-assisted, and big data problems.

5. Develop new collaborations with an increased emphasis on open-source and open-standards development.

a. Actively participate in the Common Solutions Group to identify and assess potential open-source and open-standards solution and examine the evolving vendor support of open-source systems for support each unit's requirements.

b. Maintain an inventory of Virginia Tech's open-standards and open-source collaborations and developments. The IT organization is a stakeholder and contributor in many of these areas

from operating systems to high-performance computing libraries and web-based interactive 3D visualization. Such resources are expected to continue to improve quality of service and reduce costs.

    c. Communicate to the IT organization the opportunities for professional membership with the goal of expanding participation and collaboration.

6. Support university research in the National Capital Region and other locations outside of Blacksburg.

    a. Ensure the availability of a state-of-the-art optical network infrastructure to create a competitive advantage for research in and over high-capacity communication services between Virginia Tech in Blacksburg and the National Capital Region, in effect making Virginia Tech local to the National Capital Region.

    b. Adapt and deliver existing educational and user support programs to off-campus users, such as those at the National Capital Region and Virginia Tech Carilion Research Institute, to ensure familiarity with information technology assets and capabilities including for research computing.

    c. Expand and strengthen relationships with researchers in the National Capital Region, Virginia Tech Carilion Research Institute, and other locations outside of Blacksburg to engage in collaborative research.

7. Provide support and innovative technology approaches related to the visual and performing arts.

    a. Work toward enabling public access and participation to university arts initiatives, such as the "Virtual ICAT," through faculty collaborations and a supporting web-based infrastructure.

    b. Support the integration of new collaborations and telepresence technologies into research workflows, immersive exhibitions and design groups.

8. Enhance existing and develop new strategies and collaborations, especially with the University Libraries, that address research data preservation and repository development.

    a. Work toward creating a plan for migrating research storage into preservation storage as a seamless transfer.

    b. Establish metadata schemas for disciplines, with emphasis on collaborative working groups such as through the Southeastern Universities Research Association (SURA), and promote their integration with search and data acquisition.

    c. Establish tagging protocols offering batch options for data sets.

    d. Work with SURA standards to create consistency for preservation.

    e. Work with other Virginia institutions on projects that preserve and increase access to significant holdings.

    f. Advance sustainable repository project development and preservation policies and sustain activiites through appropriate cost recovery mechanisms.

    g. Work with the Universities Libraries to create unified repository storage solutions.

9. Increase the number of public-private collaborations to enhance increased research expenditures.

    a. Monitor opportunities for collaboration with the private sector and evaluate synergy and fit with the strengths of the IT organization.

    b. Create and leverage vehicles for industry-sponsored research, such as the National Science Foundation's Industry/University Cooperative Research Center (I/UCRC) program.

Supporting The Life of the Mind

Strategic Theme 4: Advancing Teaching and Learning

Leveraging technology to advance teaching and learning

Learning Technologies, in partnership with other units in the IT organization and outside of the IT organization, provides leadership for transforming higher education by increasing digital fluency in applied pedagogies for active learning, participatory culture, computational thinking, and network literacies. Learning Technologies is uniquely positioned within the IT organization to further the evolution of the university's strategic goals for teaching and learning, research and engagement in collaboration with the Virginia Tech community. Strategic visioning for cultivating the digital imagination of faculty, students, staff and administrators in learning, discovery and engagement is presented in more detail at an interactive website[2]. Through the strategies described below, Learning Technologies will continue to pursue and support innovation both in teaching and learning at Virginia Tech and in how IT supports teaching and learning.

The following activities and actions are planned in support of Strategic Theme 4, Advancing Teaching and Learning.

1. Transform teaching and learning through exploring, encouraging, and supporting Technology-Enhanced Active Learning (TEAL).

    a. Foster individual and systemic change through increased creative, technical and financial support of faculty and graduate teaching assistant projects that encourage innovative uses of instructional technologies across the networked university. By the 2013-14 academic year, identify and support campus leaders in TEAL through broad outreach efforts in the Virginia Tech community.

    b. Sustain economic, creative and research support to ensure more than 25 percent of the faculty has the opportunity to participate in meaningful, challenging, and intellectually stimulating development experiences in each academic year.

    c. Structure and program a variety of faculty, graduate teaching assistant, and graduate assistant development experiences in explicit support of strategic goals in this document as well as in the university's long-range plan. Identify content, format, and strategic goals that are addressed in each faculty development opportunity.

    d. Provide support for teaching, discovery, and outreach through bringing important voices from outside Virginia Tech into our conversations (speakers, publications and projects) and building a platform for Virginia Tech TEAL innovators to reach both intramural and

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[2] https://blogs.lt.vt.edu/inventthefuture2020/

extramural audiences (showcase events, conferences, virtual communities of practice, etc.). By the 2014-15 academic year, establish at least two major Learning Technologies showcase events in collaboration with key strategic partners across the university and around the world.

    e.   Develop an interactive knowledge base of faculty experiences in TEAL, development resources, conference opportunities, rich media showcases, etc. that will encourage user-created content, tagging, and RSS feeds that can be discovered and subscribed to easily. An initial goal is a redesigned directory of faculty development opportunities that would allow user tags and other discovery layers to encourage a creative, customizable, and agile environment for Virginia Tech faculty.

2. Foster widespread adoption of networked university pedagogies and technologies that improve learning and facilitate collaboration, reflection, sharing, curation, review, assessment and universal access.

    a.   Create individual and systemic opportunities for faculty, staff, and students to explore, implement, evaluate and champion new technologies that allow for a truly networked university and digitally-fluent faculty, staff and students.

    b.   Strategically explore enhancing networked remote access to provide all learners, regardless of location, with access to specialized software, technologies and services, particularly for assistive technologies.

    c.   Actively engage the university community in advancing web accessibility, universal design of course materials, and education about assistive technologies.

    d.   In partnership with other relevant university stakeholders and programs, support and help envision the merger and application of art and technology as a catalyst for educational excellence.

    e.   Increase support for digital media services and other appropriate instructional technologies that enable increased use of asynchronous online learning and collaboration in on-campus and distance learning classes.

    f.   Develop and implement an online testing center serving both on-campus and distant students, including provisions for remote proctoring.

    g.   Monitor, evaluate and promote the use of digital media and ePortfolio-related emerging technologies that enhance the creation and curation of personal learning environments and networks, and deepen teaching, learning, research, and outreach.

    h.   Develop an annual program inviting faculty and graduate teaching assistants to reflect on and grow their ePortfolio use within their curriculum, to engage and experience the ePortfolio use within academic contexts, and to share experiences with other academic programs engaging in ePortfolio use.

    i.   Create an annual student showcase for student ePortfolios where graduate and undergraduate students have the opportunity to share and demonstrate effective uses of their ePortfolios for use in research, learning, service, and professional growth.

    j.   Advance digital preservation efforts by amplifying strategic partnerships.

3. Provide an agile and responsive environment for discovering, evaluating and disseminating new applications of emerging technologies and pedagogies.

   a. Continually monitor and evaluate the technology landscape for emerging tools and practices through the InnovationSpace and model the phases of innovation, including pilot testing, assessing, communicating, and promoting successful use cases.

   b. Support collaboration and creativity through the Center for Innovation in Learning (CIL), including CIL staff and learning environments, grants for project planning and implementation, and opportunities for participation by faculty, graduate and undergraduate students, and staff in national and international TEAL consortia (EDUCAUSE Learning Initiative, National Institute for Technology in Liberal Education, New Media Consortium, etc.).

   c. Communicate through multiple channels the strategic mission, goals, values, services and activities of Learning Technologies, by creating and disseminating, on a regular basis, white papers, podcasts, videocasts, blog posts, Twitter microblogging, and other communications products.   By the 2014-15 academic year, each Learning Technologies hub or working group will publish at least one white paper, set up at least one ongoing blog site with diverse participation, and establish practices to increase visibility and outreach.

   d. Encourage sharing of Virginia Tech innovations in faculty development with other higher education institutions around the world by placing Creative Commons licenses on all appropriate development materials and curricula.

   e. Increase the visibility, prominence and potential for pedagogy and technology-transfer of the winning projects identified through the XCaliber awards program. By the 2013-14 academic year, develop and make accessible at least one exhibition of winning projects annually, through channels such as presentations, web pages, podcasts, videos, blogging, social mediation, etc.

   f. Promote and facilitate a culture of "eFolio Thinking"[3] that will encourage students to have "multiple opportunities to interact meaningfully with technology in order to sharpen analytical skills, foster abstract thinking, enable the effective synthesis and manipulation of data, and improve fluency with the computational methods and models that are necessary to solve otherwise intractable problems," as stated in "A Plan for a New Horizon."

4. Advance 21st-century learning environments by defining, advocating, and supporting transformation of both virtual and physical learning spaces and systems.

   a. Advocate for and model learning spaces, both physical and virtual, that stimulate multidisciplinary discovery and knowledge creation and that encourages and develops the digital imaginations of learners to be better equipped to invent and build the future.

   b. Pilot a "digital campus/digital citizenship" initiative in collaboration with strategic partners and stakeholders across Virginia Tech, including Undergraduate and Graduate Studies, Student Affairs, Academic Advising, and others.

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[3] http://www.educause.edu/library/resources/individual-and-institutional-folio-learning

c. Explore, test and deploy online virtual learning environments that enable an immersive learning experience.

d. Develop, deploy, and assess enterprise-level digital video and multimedia capabilities, integrated with the learning management system, so that classes, meetings, ad-hoc collaborations, and other events or content can be appropriately produced and accessed, either synchronous or asynchronous, by learners anytime, anywhere.

e. Develop, deploy, and assess an enterprise-level web-based synchronous learning, meeting and collaboration system, integrated with the learning management system, to enable live online interactive events (classes, group discussions outside the classroom, meetings, webinars, ad-hoc collaborations, etc.), including capabilities such as multiple cameras, screen sharing, document sharing, interactive communication, web tours, presentation of images and graphics, annotation, recording for later on-demand access, captioning, etc.

f. Continue to improve and transform our learning management system and student perception of teaching (SPOT) systems in terms of the quality of end-user experiences, flexibility, system performance, configuration management, and mobile accessibility.

Supporting The Virginia Tech Experience

Strategic Theme 5: Information Technology Organizational Development

Developing and reshaping the IT organization's efficiency and flexibility

As an organization, Information Technology must ensure that its culture, structure and communications meet the evolving requirements of the university and that the organization provides leadership to support university goals where information technology contributes to achieving those goals.

The following activities and actions are planned in support of Strategic Theme 5, Information Technology Organizational Development.

1. Develop a culture where professional development is valued and realized.

   a. Create a dedicated training fund designed to facilitate access to central funds in support of relevant and justifiable professional development opportunities.

   b. Implement a seminar series to educate managers and staff about the broader university environment and the IT organization's contribution and role.

   c. Use the annual performance review process to ensure that supervisors have communicated the importance of professional development to those they supervise and that every IT organization staff member has at least one training or development suggestion.

   d. Develop a strategy to enhance career planning within the IT organization.

   e. Enhance succession planning and leadership development through mentoring and through university and external professional development opportunities.

2. Periodically review the IT strategic plan and resource allocations to ensure alignment with university objectives and the university's long-range plan.

   a. Develop an inventory of services provided by the IT organization.

   b. Gather baseline data that relates to IT strategic themes.

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    c.   Evaluate alignment of support and service activities within the IT organization with the IT strategic plan.

3. Expand communications efforts by the IT organization.

    a.   Develop processes to enhance communications within the IT organization.

    b.   Develop processes to enhance communications between the IT organization and the rest of the university community.

    c.   Identify the multiple audiences for IT communications.

    d.   Raise awareness of what the IT organization provides to the university.

    e.   Establish new user groups focused, for example on research computing, security, and/or enterprise systems.

    f.   Establish on-going processes to ensure a comprehensive understanding of the needs of the university.

    g.   Develop a mechanism to solicit regular structured feedback from the University community.

    h.   Implement meetings, including town hall meetings, to facilitate and understand activities within the IT organization.

4. Build on the Restructuring Act to develop new organizational and business models to achieve university objectives for agility and effectiveness.

    a.   Participate in development of the VT Innovations Corporation and develop programs under it.

    b.   Provide effective management of VT Technology Assets LLC and expand the utility of that program.

    c.   Work toward the development of additional new corporations as appropriate, for example the Mid-Atlantic Research Infrastructure Alliance (MARIA), in partnership with third parties.

5. Significantly increase the number of students who work in or with the Information Technology organization in support of their academic goals.

    a.   Streamline the process for onboarding of student workers.

    b.   Develop relationships with departments for better recruitment opportunities.

    c.   Where appropriate, train and employ students in operational support.

    d.   Identify appropriate IT organization personnel to act as professional mentors to students and ensure that mentoring is recognized in annual performance reviews.

    e.   Continue to identify funding to support student employee wages.

    f.   Seek opportunities for collaborative undergraduate design projects and research experiences.

6. Foster a diverse and inclusive community that supports mutual respect.

    a.   Support programs that enhance campus and workplace climate, safety, and community.

b. Increase diversity training to improve cultural awareness and to foster a welcoming climate in the IT organization and at the university.

   c. Promote the use of assistive and other technology that enhances accessibility for the entire university community.

   d. Support work/life balance by improving the experience for teleworkers and their supervisors. Offer technology training for supervisors and workers that includes tools and techniques for engaging the teleworker in the on-campus office and meeting environment.

Strategic Theme 6: Outreach and Community Development

Providing leadership and service to apply new information technologies creating opportunities to improve quality of life and economic competitiveness for the citizens of the Commonwealth and all people

True to our land-grant mission, Virginia Tech serves the Commonwealth of Virginia, the nation, and the world. To enable computationally-intensive research and learning transformation, the Information Technology organization will, by necessity, operate at the cutting-edge of technology evolution. The IT organization will possess unique knowledge and capabilities of significant potential benefit to society.

Virginia Tech has a long tradition of providing leadership locally, regionally, and nationally to provide early access to advanced information technology to enhance economic competitiveness and to improve quality of life for citizens and communities throughout the Commonwealth, the nation, and the world.

As the advancement of information technology continues to disrupt legacy structures and create new opportunities, the IT organization will engage in projects and partnerships outside the university to increase the value to society of Virginia Tech in support of Strategic Theme 6, Outreach and Community Development.

The following activities and actions are planned in support of Strategic Theme 6, Outreach and Community Development.

1. Develop and improve mutually beneficial programs for economic and community development that leverage the expertise of the IT organization.

   a. Contribute to relevant local, regional and state information technology infrastructure development, especially as it promotes access for unserved and underserved populations and/or offers strategic advantage to Virginia Tech.

   b. Support the development of emergency management communications, especially as it offers strategic advantage to Virginia Tech.

   c. Pursue funding that enables partnerships with communities.

2. Provide leadership for regional and national programs that promote collaborative development of new information technology and infrastructure to benefit Virginia Tech and regional research, education, and economic development objectives.

   a. Develop and expand the NatCap regional aggregation facility in the National Capital Region to maximize value to Virginia Tech and the region.

   b. Provide leadership for the development of the Mid-Atlantic Research Infrastructure Alliance

(MARIA) in collaboration with other research institutions in the region to drive regional research competitiveness and outcomes.

    c. Provide leadership and participation to national programs including the Common Solutions Group, EDUCAUSE, Internet2, National Lambda Rail, the Quilt, gig-U, US Ignite, and others as they emerge to contribute to national development and to return knowledge from those activities for the benefit of the university and the Commonwealth of Virginia.

    d. Promote regional and national information technology infrastructure development to drive toward ubiquitous availability in support of universal access to networked learning and other services at all locations, on and off campus.

3. Provide consultation and services to public service entities where appropriate and strategic.

    a. Proactively inform collaborators and public service organizations of developments in information technology which have the potential to create significant opportunities.

    b. Respond to requests for assistance from public service organizations, Virginia businesses, and others, where appropriate, funding is available, and in the best interest of the university.

Strategic Theme 7: University Enterprise Systems

Supporting the university's mission and activities with highly available and robustly functional enterprise systems

The Information Technology organization develops, integrates, and manages enterprise-level applications that support teaching, learning, research and outreach. University enterprise systems are designed and administered to exemplify industry standards for enterprise-level availability, reliability, security, and sustainability. The IT organization collaborates with university constituents to encourage process transformation and to promote alignment of enterprise applications with university priorities.

The following activities and actions are planned in support of Strategic Theme 7, University Enterprise Systems.

1. Explore and implement innovative technologies and services that serve as catalysts and enablers for advancing the missions of the university.

    a. Provide technical services and direction for the implementation of a research administration system that addresses the goals and deliverables specified in the 2011 Research Administration Program (RAP) Charter.

    b. Identify and implement an enterprise-wide business intelligence solution that delivers data analytics across diverse information sources, thus providing insights to inform agile and responsive university decision making in our data-driven society.

    c. Advocate creative and transformative adaptation in the usage and configuration of enterprise academic administrative applications that will facilitate university changes in academics.

    d. Expand implementation of enterprise process engineering technologies such as document management, automated workflows, and integration architectures as enablers for business process optimization addressing efficiency, flexibility, and accountability.

e. Ensure that current, accurate, secure and relevant geospatial information resources are available to administrative personnel; provide training as needed to fully exploit these capabilities.

2. Enhance the use, user experience, and personalization of enterprise applications for the university community.

    a. Establish data governance and data modeling practices that provide appropriate and secure access while expanding information availability, value, and usage in existing and emerging applications.

    b. Advance the benefits of information technology consumerization and bring your own device trends, including developing mobile device interfaces and addressing user expectations for improved ease of use, while assessing security impacts and complexity of support.

3. Establish improved practices for collaborating with university constituents to prioritize and deliver enterprise services that are aligned with university strategic needs.

    a. Implement a governance process for prioritizing IT enterprise administrative initiatives from an overall university perspective. This group should evaluate and approve requests for enterprise administrative systems, align initiatives to university goals, and facilitate agile responsiveness to evolving needs and resources.

    b. Establish and support liaisons with academic colleges and departments to ensure ongoing effective collaborations and partnerships.

    c. Develop models and improved mechanisms for communication and collaboration across university information technology professionals to facilitate appropriate and sustainable deployment of enterprise systems and services.

4. Explore efficiencies, innovation, and effectiveness in the provisioning of computing and information systems.

    a. Advocate development of large-scale virtualization of applications and associated operating system platforms serving both centralized and distributed information technology systems and services.

    b. Promote competencies and active participation in open source and community source activities.

    c. Design an agile strategy for alternative sourcing of enterprise systems and services, cloud-based and on-premise, including administration, compliance, contract management, and integration of multi-sourced services.

    d. To the extent possible given laws, regulations and policies, complete implementation of hosted collaborative and email services by July 1, 2014.

Seven Strategic IT Themes Support the Seven Pillars

	Pillar 1: Enabling networked learning in the networked university	Pillar 2: Providing competitive advantage through sustainable advanced cyberinfrastructure and collaboration	Pillar 3: Leveraging information technology to distinguish the Virginia Tech experience	Pillar 4: Advancing information technology for enterprise effectiveness	Pillar 5: Ensuring the security and resilience of information technology resources	Pillar 6: Improving communications with customers and partners	Pillar 7: Strengthening the information technology organization
Strategic Theme 1: Establishing a level of security that continuously protects university data and research and collaborating with other university units in leveraging IT infrastructure to enhance physical security and safety			✔		✔		
Strategic Theme 2: Creating a resilient and robust computing and network infrastructure for research, teaching, and outreach	✔	✔			✔		
Strategic Theme 3: Supporting university research through the development and support of high-performance computing and communications technologies, advancing competencies and capacity in computational science		✔					
Strategic Theme 4: Leveraging technology to advance teaching and learning	✔		✔	✔			
Strategic Theme 5: Developing and reshaping the IT organization's efficiency and flexibility						✔	✔
Strategic Theme 6: Providing leadership and service to apply new information technologies creating opportunities to improve quality of life and economic competitiveness for the citizens of the Commonwealth and all people	✔	✔			✔	✔	
Strategic Theme 7: Supporting the university's mission and activities with highly available and robustly functional enterprise systems				✔			