University of Maryland

Information Technology Ten Year Plan

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DRAFT

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1   Introduction

This plan serves as a roadmap for the development and renewal of the information technology infrastructure at the University of Maryland, College Park. To be effective, this plan must be updated on a yearly basis to incorporate the latest campus thinking on what the information technology environment should be and to ensure that the campus does not miss opportunities presented by newly emerging technologies. Capturing these new ideas early will enable the university to maximally capitalize on new enhancements to the information technology infrastructure.

This document focuses on what campus-wide services should be offered, in what timeframes they should be implemented, and what the estimated cost would be for each service. To be designated as a campus-wide service, there must be economies of scale gained from offering the service. Services that are not broadly applicable are best done at the unit level on campus and not by the central information technology (IT) organization.

The scope of this document includes both the College Park campus and the Shady Grove campus. The ability to provide a uniform set of information technology services to both campuses is critical to providing a supportable infrastructure that is of the most benefit to all stakeholders.

2   Mission

The Office of Information Technology (OIT) is a campus support organization that is driven by campus needs. This is reflected in the following OIT mission statement.

> OIT provides leadership and innovation in information technology planning, implements efficient technology infrastructures, develops and deploys effective information systems, and delivers responsive IT support services in support of campus needs and requirements.

3 Strategy for Excellence

The creation of a strong campus information technology program requires the enthusiastic participation, cooperation, and synergy of all constituents of the campus community. The following specific steps will be taken to ensure inclusion of the best ideas from across the campus.

3.1 *Build University Consensus on Goals and Initiatives*

University consensus can be achieved through a comprehensive information technology advisory structure. Three different types of committees are used to obtain consensus on campus IT direction: administrative committees, funding committees, and technical committees. These committees must work together to deliver a comprehensive campus IT strategy.

3.1.1 Administrative Committees

Campus administrative committees (listed in the table below) are primarily engaged in defining the strategic direction for IT and in providing feedback and approval for proposed campus-wide IT policies. Usually these committees are engaged in order from bottom to top, with the Dean's Council being first and the President's Cabinet last.

Administrative Committees	Membership	Relevance to Information Technology
President's Cabinet	President, Vice Presidents, President's staff	Recommends and implements campus policy
Administrative Council	Vice Presidents	Develops campus IT issues for discussion by the President's Cabinet
Information Technology Council	Vice Presidents, Representatives from Deans, Faculty, Students	Provides advice to the Vice President and CIO on campus IT policy, implementation, and issues. A formal connection to the University Senate is being created.
University Senate	Representatives from Faculty, Staff, Students	Provides advice to the President on any matter or concern, including, but not limited to, education, budget, personnel, campus-community, long range plans, facilities, and faculty, staff and student affairs.
Deans' Council	Provost, Deans, Provost staff	Manages discussions and gives feedback on campus IT policy and issues

3.1.2   Funding Committees

Funding for IT initiatives is either accomplished through the IT budget managed by the Office of Information Technology through use of the OIT fund balance or by shared funding among different campus units. For campus-wide funding plans, the funding committees below are engaged in the review, approval, and funding of initiatives.

Funding Committees	Membership	Relevance to Information Technology
Facilities Committee	Campus membership	Recommends facilities renewal funding to the Provost
Finance Committee	Campus membership	Recommends campus funding allocations to the Vice President for Administrative Affairs
Campus Student Technology Fee Advisory Committee	Student representatives from the colleges/schools	Serves advisory role on the use of the student technology fee and determines the allocation of the campus-wide portion of the student technology fee funds

3.1.3   Technical Committees

To provide a sound technical foundation for campus IT initiatives, campus technical committees are engaged in the discussion, review, and validation of campus IT architecture projects. Most of these committees are subcommittees of the IT Council. The University Technical Coordinating Committee is a campus-wide committee convened by OIT and has no formal reporting relationship to any other organization.

Technical Committees	Membership	Relevance to Information Technology
IT Council Best Practices Subcommittee	Campus representatives	Recommends the best practices that should be in place across campus, including instructional technology uses and customer services
IT Council Enterprise Administrative Applications Advisory Committee	Campus representatives	Provides information, advice, and recommendations to the ITC and to OIT regarding the design, development, procurement, implementation, maintenance, and operation of campus-wide software applications that support the business processes of the university
IT Council Finance Subcommittee	Campus representatives	Recommends an appropriate funding model for information technology projects and capabilities across campus and identifies opportunities that could yield economies of scale savings and campus-wide efficiencies in IT
IT Council Portal Technologies Subcommittee	Campus representatives	Recommends appropriate portal-related technologies for campus-wide deployment
IT Council Security Subcommittee	Campus representatives	Recommends campus-wide IT security enhancements and identifies information risks
IT Council Strategic Planning Subcommittee	Campus representatives	Creates a University IT Strategic Plan that supports the University Strategic Plan
University Technology Coordinating Committee	Campus representatives	Improves communication and coordination of IT activities on campus

3.2 *Leverage Campus Strengths*

No organization can be the best in all areas. The secret to success is to choose those areas that have existing strength on campus and leverage them to build nationally and internationally recognized programs. The university has several strengths that can be utilized to advance our information technology goals:

- Mid-Atlantic Crossroads (MAX) –MAX (www.maxgigapop.net) connects 40 partner institutions to the commodity Internet and Internet2. These include higher education, federal agencies and private non-profit institutions. MAX member institutions have a unique advantage over other institutions: the opportunity to create regional initiatives that utilize state-of-the-art networking and leverage the networking research efforts on optical networks and protocol development. In addition, high bandwidth networking connections are available to a host of academic and federal institutions to support research and education.
- Faculty research – The University of Maryland is expanding its presence in the list of top academic programs according to *U.S. News and World Report*. In the 2007 rankings, the

university ranks 18th among national public universities and has 31 programs in the Top 10 and 91 programs in the Top 25. Campus IT priorities should be aligned to enhance and support these strong programs and create new programs that build on these strengths.
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- Location – The university's strategic location in the Washington, D.C. Metro area provides easy access to federal agencies, corporate headquarters, advanced infrastructure, and the state legislature. This proximity enables the IT staff to interact frequently with the agencies and individuals who will define the next generation of regional, state, and federal programs. Proximity to the I-270 technology corridor and the high technology companies residing there also provides significant partnership opportunities for accessing and deploying advanced technology in support of the university's mission.

3.3   *Create Campus Test Beds*

Advancing new and productive technologies is an important role for IT on campus. At the University of Maryland, faculty members and partner companies are continuously researching a wide variety of topics. Rather than duplicating this research effort, campus IT staff should be familiar with faculty work so that technologies and capabilities that further the mission of the university can be moved from the research laboratory into production. The first step in participating in the creation and use of new technologies is to create a series of campus test beds to ensure that the technology can be deployed in a production setting. Those technologies and capabilities that show promise during faculty and partner research can then be moved into production.

The university also has a unique resource in its student body. Due to the high quality of admitted students and the high rate of IT literacy among them, a pool of talent exists that can be tapped into to not only test technologies, but also to develop new ones that can be incorporated into a test bed. Including students in a meaningful way in the management of the pipeline of campus technology is critically important.

3.4   *Implement a Strong, Inclusive Technology Selection Process*

The ability to make the correct technology selections to support the wide range of services deployed at the university is critical to a successful campus IT program. Inappropriate technology selections not only waste funding, but also waste time in their investigation, evaluation, and deployment. The best decisions are made when a diverse set of viewpoints are brought together in the decision-making process. For this reason, a 10-year IT roadmap, which provides guidance on services and technologies over an extended period of time, is crucial for success. Once the broad campus IT services are validated through the Ten Year Plan, procurement of these technologies should be pursued through a collaborative life cycle analysis and RFP process that involves the university community. No one organization should define the campus IT direction in a vacuum. Instead, the campus direction needs to be decided on a consensus basis with participation from the campus community.

3.5 *Facilitate Proposal Submissions for Major Awards*

University IT will never have enough resources from state funding or self support funding to achieve national prominence. To achieve distinction and to be seen as a national leader in the field, additional resources are required. To this end, OIT should leverage funding opportunities from federal agencies, state agencies, foundations, and industry groups to accelerate innovation and to create partnerships. With sufficient preparation, the university's IT should be able to achieve national recognition-- hence additional funding-- in its areas of strength. These include security, technology in the classroom, teaching and learning, networking, and technology integration. Opportunities exist at the National Science Foundation in the new Office of Cyberinfrastructure and in the Education and Human Resources Directorate. The National Institutes of Health, with its emphasis on knowledge management, and the Department of Education, focusing on teaching and learning with technology, are also possible sources of funding.

4   Information Technology Service Management (ITIL)

Excellent IT operations must be built on a firm foundation that provides a comprehensive strategy for success. The Information Technology Infrastructure Library (ITIL) has been chosen as that foundation. ITIL is the collection of best practices documented within one framework. It is the philosophy of managing IT services, through the use of industry best practices, for the improvement of business functions.

The goal of IT Service Management is to align services with current and future needs of the university to improve the quality of IT services and to reduce the long term cost of service provision.

Benefits of IT Service Management:
- Improved quality of business operations by ensuring that OIT processes align with campus goals
- Enhanced customer relations so that campus customers will know what to expect from OIT and what is required of them to ensure this can be delivered
- Cost-justified IT infrastructure and OIT services
- Increased campus awareness of OIT services and capabilities to allow better service utilization and creation of a Service Catalog
- Increased OIT understanding of the campus needs to facilitate innovative approaches to meeting those needs
- Improved ability to recognize changing trends and to adapt quickly to new requirements and market development (competitive edge)
- Improved metrics and management reporting facilitating informed decision making and improved IT governance

IT Service Management will be implemented in OIT beginning by instating the following processes:

Incident Management - Restore normal service operation as quickly as possible and minimize the adverse impact on business operations, ensuring that the best possible levels of service quality and availability are maintained.

Change Management - Ensure that standardized methods and procedures are used for efficient and prompt handling of all Changes, in order to minimize the impact of Change-related Incidents on service quality.

Configuration Management - Provide a logical model of the infrastructure or a service by identifying, controlling, maintaining, and verifying the versions of Configuration Items in existence.

Problem Management - Proactively minimize the adverse impact of Incidents and Problems on the business that is caused by errors within the IT Infrastructure, and to proactively prevent reoccurrence of Incidents related to these errors.

<u>Release Management</u> - Ensure that all aspects of a Release into production systems or services, both technical and non-technical, are considered as a whole.

5   Communications Plan

The University of Maryland, College Park is the flagship institution of the University System of Maryland and is a leading public research university in the metropolitan region. The university is committed to achieving excellence as the state's primary center of research and graduate education and the institution of choice for undergraduate students of exceptional ability and promise. The university has already attained national distinction and is ranked among the very best public research universities in the United States. To realize its aspirations and fulfill its mandates, the university advances knowledge, provides outstanding and innovative instruction, and nourishes a climate of intellectual growth in a broad range of academic disciplines and interdisciplinary fields. It also creates and applies knowledge for the benefit of the economy and culture of the state of Maryland, the region, the nation, and beyond.

The University of Maryland was among the first major educational institutions to understand the importance of integrating information technology into the teaching, learning, and research processes. Today, information technology is strategically important to the goals and aspirations of the university and is the backbone that enables the university's faculty, researchers, students, administrators, and staff to discover, learn, reach out, and serve communities.

While OIT works with other campus IT leaders and professionals on a routine basis, this part of the information technology 10 Year Plan describes the major components of a high level, strategic communications plan that would be carried out by the university's central information technology organization – the OIT unit. This section of the master plan is designed to provide a broad picture of the scope and priorities related to OIT's strategic communications efforts over the next ten years. It is best viewed as a work in progress and a thoughtful assessment of what needs to be done in strategic communications and how best to go about doing it. Like all strategies, it is subject to modification. In fact, this multi-year communications enhancement program as outlined will lack a certain level of specificity as more detailed plans to come will chart a course in areas of strategic communications including, but not limited to, crisis communications, external/media communications, employee communications, Web communications, and other areas as unforeseen challenges and emerging opportunities arise.

5.1   *Statement of Purpose*

OIT seeks to achieve a high level of local, regional, national, and international visibility in the information technology discipline that serves to establish the university as one of the leading research, education, and technology institutions in the nation.

5.2   *Key Audiences*

OIT defines its key audiences as the following: University of Maryland administrators, faculty, staff, OIT employees, current students, prospective students, researchers, business partners, stakeholders, peer institutions, associations, the media, state leadership, and the general public.

5.3   *Key Messages*

OIT will craft a variety of broad and specific messages designed to tell the OIT story about the scope and priorities related to the use of information technology on campus over the next ten years.

5.4   *Key Communication Vehicles/Tools*

- Targeted Promotional Publications/Collateral Materials: *TechKnow* for students, *ITforUM* for faculty and staff, and a wide range of informational and promotional brochures, pamphlets, and flyers. Opportunities exist for the development of additional and/or more carefully targeted informational and promotional publications and materials over the next ten years, such as an annual report/milestones publication. There is a reliance on printed material in the near future as OIT tests the viability and readership of e-pubs, the Web, and other electronic distributions.

- Web site: OIT's Web site is a key communication medium, and it will be frequently improved to enhance OIT's overall online presence. There will be a vigorous effort on the external sites in the areas of knowledge management and content management and a renewed focus on OIT's internal site. Opportunities exist for development of additional OIT-initiated electronic or Internet-enabled information, including blogs, chats, podcasts, Web-based surveys/questionnaires, and Web casts.

- University Publications/Outlets: *Outlook* for faculty and staff; *Terp* for alum; the *Diamondback*, the independent student newspaper; "FYI Digest" Listserv list; the front page and best secondary pages of www.umd.edu; and other campus and student publications, when appropriate, such as, *CMPS IT Newsletter*. Free advertising on UM Shuttle buses is also an option.

- University Events: Maryland Day, open houses, orientations, and other outreach activities.

- OIT-Sponsored Events/Meetings: Innovations in Teaching and Learning Conference and Speaker Series, seminars, issue-specific town hall meetings, face-to-face meetings, and other outreach and training activities.

- Original OIT Works: Opportunities exist to develop and convey OIT success stories or IT points of interest to the broader IT community via a number of original works, such as technical papers, white papers on best practices, speeches, presentations, opinion articles, feature articles, and general interest IT surveys/fact-finding exercises that would serve as news hooks/angles.

- External Communication Avenues: OIT participates in industry conferences, responds to surveys, and takes part in other activities. However, additional opportunities will exist over

the next few years to participate in more high visibility activities, at greater frequency, and in more depth, including, but not limited to the following:

- o The exploration of OIT's participation in future endeavors like the top IT/wired campuses national rankings and speaker bureau participation.

- o The submission of presentations in response to calls for participation, especially at gatherings such as EDUCAUSE.

- o EDUCAUSE opportunities for telling OIT's story and gaining prominence or increased visibility include contributing a resource document or an effective practice, publishing OIT work in *EDUCAUSE Quarterly*, participating in EDUCAUSE award programs that bring peer endorsement and public visibility to OIT accomplishments, participating in electronic discussion groups that involve finding connections and having focused communications with EDUCAUSE constituents, and taking part in EDUCAUSE's Community Blog Service, a pilot project designed to give members a hands-on opportunity to explore the use of blogs and to create a new, vibrant medium for professional information sharing.

- o OIT opportunities to engage more fully in Internet2 include, but are not limited to, participating in national member meetings, technical workshops, working groups, and member e-mail discussion lists, and demonstrating advanced applications developed on Maryland's campus.

- A comprehensive media relations program to include the following:

  - o Targeted media relations pitches to external media: local and regional general interest print, broadcast, and Web outlets; national media; regional and national business and technology publications; IT and higher education publications; and hometown media outlets of students and faculty.

  - o The media targets for the communications program would be extensive – from leading IT, technology, and business publications such as *Information Week*, *PC World*, *CIO*, and *Technology Review*, to relevant higher education trade publications such as *Campus Technology* and *Chronicle of Higher Education*, local news outlets such as the *Washington Post* and *Baltimore Sun*, and regional and national media outlets such as *News Channel 8* and *National Public Radio*, respectively.

  - o TV appearances by the CIO could vary in prominence from appearing locally on WUSA TV Channel 9 during the morning news segment or on specialized segments on Maryland Public Television to panelist coverage on C-SPAN at the other end of the spectrum.

  - o Communication Tools: Tailored media pitches, media/special events, media briefings, media interviews over the phone or in person, talking points, press tours, news releases, media advisories, various print/electronic communications, press statements,

media training, newsletters, press kits, speeches, position papers, videos, brochures, Web sites, meetings, conferences, fact sheets, bios, profiles, calendar alerts, paid advertisements, visual images, such as graphics and photography, B-roll, press lists, etc.

o Outreach Tool: The university's online experts database system used to connect university experts with media reporting on important issues and events occurring around the nation/world.

6 Campus Technology Goals

6.1 The Goals

The campus information technology roadmap will be focused on achieving four major goals. The intent of these goals is to provide the infrastructure needed for excellence in university-wide programs and to leverage campus strengths to achieve national prominence.

Goal 1: Achieve an innovative education and research environment

To achieve excellence, the university must excel in education and research. One of the best ways that IT can contribute to that excellence is to be a factor in attracting excellent faculty and recruiting the best students. New faculty and students prefer a university that can support innovation and state-of-the-art facilities. Information technology plays a large role in this perception. To attract the best, we must provide unique advantages over our peer institutions. For students, this is the ability to communicate effectively with students using the media they are familiar with (cell phones, Instant Messaging, podcasting) and to be involved in the technologies and processes that they will need to use to succeed after graduation. For faculty, this is the ability to utilize centrally provided, leading edge resources (computing facilities, high bandwidth networking) for their teaching and research. We cannot view ourselves as innovative if we are only providing state-of-the-market resources. Most universities provide online access to business functions – this is no longer innovative. We must provide state-of-the-art and beyond for our areas of focus.

The areas of focus for the next ten years that will provide an innovative environment for the university are as follows:

- Production computational grid for students, faculty, and staff that makes High-Performance Computing resources available for education and research
- High-performance computing facility for high-end computing that is available campus-wide
- Knowledge management for intuitive and quick access to campus information
- Data center strategy for the ability to house and maintain departmental servers and resources safely and securely
- Technology in the classroom to ensure that our students graduate with the tools they will need to pursue lifelong learning
- Secure and reliable campus infrastructure that is protected from attacks, redundant for critical operations, and resistant to failures
- Online access to campus services so students, faculty and staff can conduct their university business securely from any Internet location
- High bandwidth national and international networking connectivity that facilitates research and education with partner institutions, research centers, and national laboratories

Goal 2: Virtual presence and support for international programs

Virtual presence is becoming a requirement in conducting daily business and is facilitated by the development of distance learning and online business capability. Meetings, whether they are business meetings or student study sessions, are being held more frequently in distributed locations. For students seeking international experiences, virtual presence both for students abroad and those at home is important to maximize the learning experience. Educational programs can be created to take advantage of virtual presence and the availability of wireless networking abroad to have spur-of-the-moment conferencing. Business service delivery can also take advantage of virtual presence rather than requiring students, faculty, and staff to stand in line.

Videoconferencing services will be important for the campus community. There should be a centrally-located formal meeting space for videoconferencing, and there should be point-to-point distributed conferencing from desktops or laptops. This service is critical for participation in today's world.

Virtual presence does not only mean person-to-person contact, but also immersion in other environments. Increasing international programming on campus cable TV and providing multiple language documentation and all-language keyboards are important steps toward creating an international culture on campus.

Goal 3: National leadership in networking

In today's world, high bandwidth, high connectivity, and highly reliable networking to national and international locations is an absolute requirement. Networking is an enabling technology – without adequate networking, many objectives become unattainable. The university has the unique advantage of participating in the Mid-Atlantic Crossroads which provides access to the international networking infrastructure as well as leading edge networking research. The university also has one of the top computer science programs in the country that performs excellent research in networking. The university must capitalize on its networking strengths and become a national player in networking to enable a broad range of regional and national collaborations. The university must also get involved early in emerging networking technologies such as WiMAX and gigabit wireless networking, and create test beds to demonstrate the application of these technologies to higher education.

Goal 4: National leadership in computer security

Security will continue to be a major area of investment for the campus. A secure environment, properly deployed, can save time, resources, and money by minimizing wasted effort responding to security incidents. Given the increasing investment in security campus-wide, it makes sense to use this emphasis to create a security "center of excellence" that will be the best in the state and region. A campus-wide partnership between several campus departments investing in security research would produce the required collaboration to make this goal achievable and to

deploy a security infrastructure that is both supportable and extendable as new technology is developed.

6.2 *Design Principles for Implementation*

This Ten Year Plan will focus on campus-wide systems and services rather than special purpose applications so the economies of scale can be realized though centralization. Programs or capabilities that do not have sufficient critical mass to obtain economies of scale are better done in the colleges or schools. However these programs should leverage the investments made in campus-wide resources and capabilities to obtain the best "bang for the buck" in these cases.

In implementing campus-wide services, the following design principles will be followed.

- All services will conform to the established and documented campus-wide information architecture. Consistently following the published information architecture ensures maximum reliability and maintainability of our campus systems.
- All services have security designed into their structures from the beginning. All sensitive information must be protected. Administrative applications share sensitive information through encrypted channels rather than duplicate information in different applications to minimize risk.
- All campus-wide services that can gain economies of scale are to be implemented centrally, including, but not limited to, authentication, storage, e-mail, and file and print.
- All services utilize established standards where standards exist.
- All services are designed to have no single points of failure.
- All production services and capabilities are expected to work 100% of the time under all foreseeable circumstances.
- All services make use of best practices published by peer institutions and higher education professional organizations when applicable, particularly in customer service, change management, and version management control.
- All services employ simple information architectures to avoid complicated troubleshooting, to avoid prolonged problem resolution, and to facilitate maintenance.

7 Ten Year Plan Implementation Process

Even though this is a 10-year roadmap, specific projects must have more detailed planning. To this end, the following process will be used to ensure the correct level of detailed planning is done for each year.

Fall: September/October/November
- Identify status of ongoing projects/funding (expenditures year to date, additional operational expenses, and project funding needs for next fiscal year). These are the projects that will cross fiscal year boundaries, extending into next fiscal year.
- Identify short list of initiatives for each stem and review to make certain each supports the Master Plan.
- Discuss with unit managers short list of initiatives that provide project opportunities for next fiscal year.

Winter: December/January/February
- Create short descriptions for potential projects (tied to the short list of initiatives) for next fiscal year.
- Conduct *preliminary* investigation and identify resources needed, including preliminary budget.
- Submit an overview and justification for potential projects to OIT Senior Staff.

Spring: March/April
- Identify mandatory/critical (non discretionary) projects and resource/funding needs.
- Prioritize (discretionary) project and identify resource/funding needs.
- Determine final projects to be funded.

Summer: May
- Create final detailed project proposals and implementation plans.
- Award funding to *approved* implementation plans.
- Create master project management plan.

June
- Create final program plans for the new fiscal year.
  - Campus focus: Service and benefits oriented, non technical, general cost
  - OIT focus: Detailed, technical implementation plan and budget

July/August
- Project implementation begins.
- Quarterly milestone update to master project management plan.
- Create summary of accomplishments for previous fiscal year.

8 IT Funding Model

OIT strives to be the primary provider of information technology services to the University of Maryland, College Park campus. OIT is responsible for development and support of critical campus-wide services Funding for these services should be a combination of baseline campus funding when the entire university community benefits and self support funding when there are sufficient numbers of customers for cost effective service due to economies of scale.

Critical campus-wide services should be supported by baseline campus funding. These campus-wide services include the following:

- Administrative Systems – Developing and supporting critical business applications related to the budget, accounting, human resources, advancement, purchasing, portal, and payroll, to name a few.
- Communications – Keeping the campus well-informed of IT developments.
- Computer Laboratories – Providing hardware, software, and operational support for 40 computer labs across campus.
- Desktop Support – Offering operating system upgrades, antivirus protection, field support visits, and hardware repairs, as needed.
- Help Desk – Providing a one-stop shop for any computing help question, from e-mail accounts to viruses.
- Security – Ensuring the campus IT infrastructure and critical databases are well protected and used appropriately.
- Technical Services – Providing operational support for the mainframe computer and server facilities.
- Technology Classrooms – Providing technical support to the university's 191 technology classrooms and the faculty who use them.

Other critical services that are provided to specific clients are supported by funding provided by those clients. These self-support services include the following:

- Networking – Providing both wired and wireless networking, and enhanced protocols
- Server Housing – Providing secure locations and maintaining servers for other campus organizations.
- Storage – Providing online storage for students, faculty, and staff, archival storage, desktop/server backups, and data repository.
- Telecommunications – Providing services and support for telephone (local and long distance) and eventually Voice over IP.

In addition to the service side of IT, there are two other aspects of information technology that need to be addressed from a funding perspective.

- IT is a rapidly changing environment where new technologies, new protocols, and new systems are continually evolving. A funding source is needed for the university to be

proactive in that evolution as opposed to reactive. There are several steps the university should take to get on the leading edge:

- o Explore major research funding for innovative IT projects.
- o Formalize technology partnerships with leading IT companies.
- o Provide additional campus support for the development of test bed environments (High-Performance Computing and Knowledge Management) and conducting pilot studies.

- The movement, manipulation, and storage of data require a substantial infrastructure. That infrastructure is expensive to put into place and maintain. There needs to be a sustainable funding source for constructing and maintaining IT infrastructure.

- Creating an IT Infrastructure Refresh Program funded through the implementation of a new fee.

9   Technical Architecture

The top 20 research universities are characterized by the need to support a diverse information technology infrastructure with a variety of software and hardware platforms. This diversity is a strength that enables new ideas to be tried and explored. However, a central information technology organization does not have the luxury of supporting a wide variety of different information technology building blocks since each building block must have a coordinated support structure including support staff, help desk problem resolution, and funding for each item. The selection of appropriate information technology building blocks is critically important to providing a supportable, integrated, forward looking, and state-of-the-art environment for the university.

9.1   *Campus Requirements*

The campus technical architecture was defined by a campus-wide technical committee during FY06. This committee will take into account the following requirements for the architecture definition:

General Requirements

1. The production environment must be predictable and reliable. This requires that problems that arise must be able to be diagnosed and corrected through a deterministic process.
2. Develop solutions that fully meet all the requirements (100% solution).
3. Achieve an infrastructure with scheduled uptime at 99.99%.
4. A process for changing the Technical Architecture must be put in place and enforced. This process is to include a recommendation for change by the Technical Architecture Committee to the IT Council with a subsequent recommendation by the IT Council to the Vice President and CIO. The Vice President and CIO must approve the changes before they are implemented.
5. The technical architecture is to be as simple as possible with as few dependencies as possible. Complicated systems tend to have more problems and more dependencies, which can lead to instabilities. Simpler systems that meet the requirements are preferred over more complex systems.

Technical Requirements

1. Standards based – the technical architecture is to be based on existing standards. There must be a strong reason before proprietary solutions are incorporated. One such reason is that a leading edge capability is deemed necessary for the university community and the capability has not yet become a standard.
2. Standardize on Windows and Linux operating systems and services – the current campus architecture includes too many systems that in turn, complicate the procurement of compatible software applications like backup services and storage services. This requirement means that legacy systems such as Novell and the Andrew File System

should be phased out and replaced with more easily supportable and more standard services.
3. Strengthened security – security must be one of the primary requirements for the technical architecture and must be a paramount requirement.
4. Open source – the university should start incorporating open source solutions for enterprise applications where it makes sense. This will help to decrease the cost of enterprise systems and will enable the university to participate in mutually beneficial multi-university collaborations. Although the university does not have the staffing resources currently on board to participate heavily in open source initiatives, the staffing should be added incrementally over time to make more progress in this area.

9.2   Core Technologies

The first step in creating an information architecture is the selection of the core technologies that will serve as the underlying infrastructure for enterprise, research, and student applications. The second step is to migrate existing applications and processes to these technologies. The following are the technology choices that will compose the centrally supported technical architecture.

9.2.1   Computing Hardware

Standardization of computing hardware will make maintenance easier and offer economies of scale for purchasing new hardware.

Core Technology Hardware Systems	Hardware Systems to be Phased Out
PC-Compatible Blade Servers and/or Server Virtualization Tools– vendor TBD	Individual stand-alone systems
HPC Cluster Computing - Dell	Individual department clusters where it makes sense to consolidate clusters into one larger central cluster
SAN Storage - EMC	
IBM-Compatible Mainframe – IBM	
Macintosh (Apple) Workstations - Apple	
PC Platform - Dell	
UNIX/Linux Servers – Dell and Sun	
Windows – Dell and Sun	

9.2.2   Database

The standard database systems must be able to span a wide range of applications. Large applications will need a full featured system that supports many real-time users. Smaller applications that serve more limited needs and don't need as many features should be easier to use than the full-featured option. For this reason, two different database systems are standard.

Core Technology Database Systems	Database Systems to be Phased Out
Oracle (larger applications)	CA/Datacon not used for ongoing development
Microsoft SQLserver (smaller applications)	

9.2.3 File Sharing and Printing

File sharing is a common campus application that permits users to access files from across campus or from off-campus. Security and accessibility are key factors in these systems.

Core Technology File Sharing and Printing	File Sharing and Printing Systems to be Phased Out
Windows File and Print	Novell

9.2.4 Networking

Several standards are needed for networking. Building wiring choices must permit state-of-the-art applications to take full advantage of a high bandwidth physical infrastructure. To remain on the leading edge of wiring technology, we expect this standard to change, possibly on an annual basis.

Core Technology Building Wiring	Building Wiring Systems to be Phased Out
CAT-6 Augmented, CAT-5e	CAT-3

Another required standard is the wiring to each building. There is a standard for buildings not anticipated to require high networking utilization and one for network intensive users.

Core Technology Backbone-to-Building Wiring	Backbone-to-Building Wiring Systems to be Phased Out
Fiber	None – fiber is the current standard

The highest bandwidth requirement is for the backbone and off-campus connections to external networks, such as Internet2. These connections are fiber based as follows.

Core Technology Backbone Wiring	Backbone Wiring Systems to be Phased Out
Fiber	None – fiber is the current standard

Network protocol support is critical for not only campus applications but also for world-wide connectivity. Adoption and support of these standards are critical for continued participation in both research and production applications.

Core Technology Network Protocols	Network Protocols to be Phased Out
IPv6	IPv4
QoS	
WiMAX-compatible	
Wireless 802.11 a/g	Wireless 802.11b
Wireless 802.11n	
Security 802.11x	

9.2.5 Operating Systems

The number of supported operating systems should be selected to enable the most robust technical architecture without stretching the support resources too thin.

Core Technology Operating Systems	Operating Systems to be Phased Out
Linux (MacOS, Red Hat, Solaris, SUSE)	Novell Netware
Microsoft Windows	
IBM Z/OS	

9.2.6 Security

Authentication is a critical element for secure computing. There must be a campus-wide standard so that all enterprise applications can authenticate against a single user database that is fed and maintained from the campus administrative systems. OIT will maintain the campus authentication mechanism that can be used by other campus systems, such as the wireless network logon system.

Core Technology Security Systems	Security Systems to be Phased Out
Active Directory	Departmental authentication systems
Kerberos 5	
LDAP	

9.2.7 Storage

Access to centralized storage that is replicated and has different levels of access speed, bandwidth, and cost is critical for educational, research, and administrative applications. Having this resource will enable critical file access to be centrally monitored, logged, and backed up as needed. This resource will not replace local storage on specific machines but will provide an extension of local disk space for campus-wide usage.

Core Technology Storage Systems	Storage Systems to be Phased Out
Level 0 – Local system storage as presently implemented	Local large disk farms and tape systems that can benefit from economies of scale offered by the campus storage system
Level 1 – Very fast, highly redundant, fiber based, multi-channel storage	AFS
Level 2 – Fast, redundant, fiber based storage	
Level 3 – Medium speed, redundant, NAS based storage	
Level 4 – IBM Tivoli for backup and tape storage	

9.2.8   Web Hosting

The two primary requirements for a Web hosting system are scalability and vendor support. Due to the critical nature of Web services for disaster communication as well as public relations, the most robust systems must be employed.

Core Technology Web Hosting Systems	Web Hosting Systems to be Phased Out
Cold Fusion	None
PHP	

10 Campus Information Technology Plan

There are many significant demands for resources across campus. These include important health and safety projects such as sprinkler systems, building renewal for safety and maximal utilization, increasing costs for utilities and academic program enhancements. In light of these many competing demands, coordination among the major areas of central information technology responsibility is required to achieve the maximum impact for the investments made. To achieve this, long range planning is required to ensure that investments made each year are part of a larger, more comprehensive plan. This section provides details on needed areas of investment in information technology which come from campus expectations for each area.

Each section lists the campus requirements, the initiatives that will fulfill these requirements, the campus services that are provided as a result of investments in these initiatives, the technologies used, and the timelines for implementation. The resource requirements are listed in Appendix B.

10.1 *Academic Support*

The mission of the Academic Support unit of OIT is to support faculty and university initiatives that improve teaching and learning as well as student success. Academic Support carries out this mission by providing the technology expertise for campus groups working toward improvements in teaching and learning, for incorporating technology into classrooms, for training courses, and for managing the OIT student computer laboratories. Academic Support works with national teaching and learning organizations to bring the best practices of other campuses to the university and to make the best practices within the university known to the national community.

10.1.1 Campus Requirements

Campus requirements for this unit were determined through interactions with campus committees and through providing support to individual faculty. The campus requirements are as follows.

- o Provide an enterprise-wide learning management environment to support the integration of information technology into instructional programs.
- o Enhance and develop formal and informal integrated technology environments for teaching, learning, and research to increase access to technology in classrooms and around campus.
- o Create an environment to support exploration into innovative approaches to using technology in teaching and learning.
- o Create a virtual learning environment that integrates technology with content and support and is available throughout computer labs and library environments.
- o Support a technology environment to support institutional assessment activities including course evaluations and learning outcomes.
- o Develop a more student-centered focus for appropriate services.

10.1.2 Initiatives

The Academic Support initiatives are critical areas for the enhancement of teaching and learning at the university and will make a significant difference in how students will learn in the future. Expertise in online learning environments, physical learning environments, peer-to-peer file sharing, classroom technology design and implementation, and faculty support is critical for developing new methods for teaching and learning.

10.1.2.1 Online Learning Environments

Technology is an integral part of academic life at the university. Academic Support is striving to provide a variety of tools to support an online learning environment for faculty and students. Selecting tools that support managing an online course environment and support communication

and collaboration online will provide a consistent environment across campus for all faculty, students, and staff. In addition, providing a solution for delivery of digital images, storing of e-portfolios, and distributing media and academic materials will provide a central environment for storing and disseminating materials and will, again, provide a consistent environment across campus.

10.1.2.1.1 Enterprise Learning Management System (ELMS)

In the fall of 2006, the enterprise learning management system (ELMS) for campus was deployed, bringing together the user communities of the two major course management systems in use at Maryland into one enterprise environment. Engineering and Business School users on the Blackboard Learning System were migrated to the new Blackboard Academic Suite environment for the fall 2006 start. We are currently transitioning the remaining WebCT users to this new platform. This environment provides a single, consistent interface for students and faculty to online course materials and interactions. It is anticipated that in approximately five years, we will re-examine the technology infrastructure that supports ELMS to determine if a better technology solution is available. The growth and maturity occurring in the open source community may allow us to examine a potential solution that would not require licensing costs, but would require reallocation of existing staff to support the system. Hardware refresh would still be required to support whatever new system we transitioned to after a re-evaluation.

- FY08
    - Continue course conversions to be completed by Q2.
    - Decommission existing WebCT Campus Edition server and services.
    - Conduct cost comparison of hosted versus internally supported hardware and software.
    - Acquire hardware to bring ELMS services in-house.
- FY09
    - Continue support of enterprise learning management system.
    - Add extensions as required.
    - Transition from ASP to in-house services for ELMS.
- FY10-FY12
    - Continue support of enterprise learning management system.
    - Add extensions as required.
    - Refresh hardware supporting ELMS environment.
- FY13
    - Re-evaluate selection of course management strategy. Consider commercial and open source options.
- FY14
    - Deploy new course management system if applicable.
- FY15-FY17
    - Continue support of enterprise learning management system.
    - Add extensions as required.
    - Refresh hardware supporting ELMS environment.

10.1.2.1.2 Teaching and Learning Tools

Recent advancements in academic technologies now offer a myriad of possibilities for electronic communication and collaboration. For example, blog tools provide an individual space to publish writings and other resources and receive feedback from others; whereas, consensus building and facilitation tools aid in group processes such as brainstorming, decision-making, and document building. Still others provide capabilities such as live online communication and application sharing and automated peer review.

Collaboration and facilitation tools have been vital to the instructional goals of certain classes. Tools such as WebIQ and Calibrated Peer Review (CPR) are ones that we will continue to support, enhance, and/or replace.

- FY08
    - Complete the selection and implementation of a blog and/or wiki that will be integrated into the current OIT systems including LDAP authentication and UMEG to provide spaces for class only viewing.
    - Upgrade our facilitation tool to connect it into LDAP authentication and automate the addition of student rosters to the system.
    - Test the server version of CPR with our faculty to see how it will meet their needs.
    - Conduct an evaluative pilot of KEEP, a product for creating compact and engaging knowledge representations on the Web.
- FY09
    - Consider full implementation of KEEP based on the pilot results. If selected, this will include developing support staff expertise, and developing and providing training and technical support for users.
- FY10-17
    - Continue to update existing tool sets and add extensions as necessary.
    - Explore new collaboration technologies as they emerge in the marketspace.

10.1.2.1.3 Digital Image Archive and Retrieval Service

There is a need for a campus-wide digital image archive and retrieval system, in both the academic and administrative activities of the university. A digital asset management tool needs to be implemented that will include a powerful database that supports searching in many modes, an advanced level of digital rights management, and the ability to support all types of digital assets. This system will allow for the use, distribution, and sharing of the thousands of digital assets currently in use in the academic arena on campus. This environment will be integrated with the existing infrastructure and take advantage of the data storage initiative described in section 9.5.2.3.1.

- FY08
    - Implement a new digital asset management system selected by a campus committee.

- o Develop a consistent metadata scheme to provide for common search needs among campus users.
- o Import current digitized images from college, departmental, and individual collections into the new system.
- o Integrate system into project critical campus systems including LDAP and UMEG.
- o Offer training and support materials to campus users interested in this service.
- o Create advisory committee from campus community to provide information for implementation.
- FY09
  - o Continue importing current images from campus collections into the new system.
  - o Add new image, document, and specialized files into the new system.
  - o Review and revise metadata scheme to ensure viability for the campus community.
  - o Customize user interfaces as needed.
- FY10-17
  - o Continue to add new images and file types to the database.
  - o Explore the use of RSS feeds for file distribution and sharing

10.1.2.1.4 Multimedia Distance Learning System

To help support online collaborations, both among students and between students and instructors, we are looking to provide a multimedia distance learning system that could support synchronous activities. This would not only help support students who may be trying to get a group project completed and can't physically get together on campus, but would also help support AG/Extension activities. The system will allow real-time collaboration over the Internet via both text and voice and will capture the session for reviewing later. It will also have the ability to share documents. This system could also be used for supporting a virtual live classroom. The capabilities of this system are more robust and integrated. The identified system will be compatible with our enterprise learning management system.

- FY08
  - o Offer training and support materials to campus users interested in this service.
  - o Add extensions as required.
- FY09-17
  - o Add extensions as required.

10.1.2.1.5 Learning Outcomes System

The campus began an effort in the Fall of 2003 to work with all academic units in developing student learning outcomes and ongoing assessments. At this point in time, all learning outcomes have been defined and assessments are being developed. The university is currently undergoing the Middle States Accreditation process and this activity aligns with that. OIT is currently involved in discussions with Undergraduate Studies on how technology can best support these

efforts. A solution has not been identified yet, but there is a role for technology to enable collection, review, and dissemination of the materials that will result in this process.

- FY08
    - Participate in campus-wide Learning Outcomes committee to explore functional requirements for supporting assessment of defined learning outcomes across campus.
    - Attend relevant conferences to understand existing systems in place at other institutions.
- FY09
    - If necessary, conduct a formal RFP process to select an appropriate technology to support learning outcomes activities across campus.
    - Provide information and training about the use of the selected environment.
- FY10-17
    - Continue to promote and support the adoption of selected environment.
    - Add extensions as necessary.

10.1.2.1.6 <u>Mobile Learning</u>

Using portable computing devices (such as laptops, tablet PCs, PDAs, and smart phones) with wireless networks enables mobility and mobile learning, allowing teaching and learning to extend to spaces beyond the traditional classroom. Within the classroom, mobile learning gives instructors and learners increased flexibility and new opportunities for interaction. Mobile technologies support learning experiences that are collaborative, accessible, and integrated with the world beyond the classroom. We need to investigate and deploy technologies that will enable faculty to use these mobile devices in support of learning. Podcasting is one example that is starting to be used on campus. We need to explore other possibilities for including other types of mobile devices.

- FY08
    - Identify and deploy extensions to our learning infrastructure to support mobile devices such as PDAs, laptops, cell phones, etc.
    - Explore Blackboard Backpack solution for students to be able to interact with Blackboard in an offline mode with their laptops.
- FY09-17
    - Add extensions as necessary.
    - Continue to monitor the available services in this area for investigation to applicability to our environment.

10.1.2.2 Physical Learning Environments

Integrating technology into physical learning spaces will provide improved environments across campus where students can learn, both in and out of the classroom. General purpose classrooms are continually being upgraded and enhanced with technology. In addition, efforts need to be

focused at looking at how informal learning spaces can be designed and equipped to support student learning activities outside the classroom. We also need to continually look at how our computer labs are being utilized and how they can be reshaped to meet the changing needs of the students.

10.1.2.2.1 Classroom Technology Upgrades

The Teaching Facilities Committee allocates part of its funding both for supporting upgrades of existing technology and installing new technology in general purpose classrooms. Demand for classrooms with technology continues to grow as more faculty integrate technology into their teaching. To increase the number of classrooms available, we plan to aggressively equip all 360 general purpose classrooms in the next five years. In addition to equipping the classrooms, maintenance needs to be provided (replacing bulbs, batteries, etc.), as well as life cycle replacement of the equipment installed in the rooms to keep them functional. Staff support, specifically A/V technicians to provide level two support, is required to keep the rooms functional and, therefore, the number of technicians needs to increase over the next five years (at a ratio of 1:20) to keep up with the increase of rooms.

To provide better access to software for faculty, we will also be exploring the concept of putting thin clients into the classrooms. This will lower the overall hardware costs for providing technical functionality without having to buy a high-powered computer with a lot of disk space.

In addition to the Technology Classrooms, there continues to be demand for our high-end Teaching Theaters. These environments provide computers and collaborative software to provide support for active learning activities.

- FY08
    - Install equipment into 42 general purpose classrooms that do not have technology in them.
    - Provide maintenance for existing 191 Technology Classrooms.
    - Upgrade equipment that has reached end of life cycle.
    - Hire additional four A/V technicians to support additional Technology Classrooms.
    - Upgrade computers in OIT Teaching Theater.
- FY09
    - Install equipment into 42 general purpose classrooms that do not have technology in them.
    - Provide maintenance for existing 233 Technology Classrooms.
    - Upgrade equipment that has reached end of life cycle.
    - Hire additional two A/V technicians to support additional Technology Classrooms.
- FY10
    - Install equipment into 42 general purpose classrooms that do not have technology in them.
    - Provide maintenance for existing 275 Technology Classrooms.

- o Upgrade equipment that has reached end of life cycle.
  - o Hire additional two A/V technicians to support additional Technology Classrooms.
  - o Upgrade computers in AT&T Teaching Theater.
- FY11
  - o Install equipment into 42 general purpose classrooms that do not have technology in them.
  - o Provide maintenance for existing 317 Technology Classrooms.
  - o Upgrade equipment that has reached end of life cycle.
  - o Hire additional two A/V technicians to support additional Technology Classrooms.
- FY12
  - o Install equipment into 42 general purpose classrooms that do not have technology in them.
  - o Provide maintenance for existing 359 Technology Classrooms.
  - o Upgrade equipment that has reached end of life cycle.
  - o Hire additional two A/V technicians to support additional Technology Classrooms.
  - o Upgrade computers in OIT Teaching Theater.
- FY13-17
  - o Provide ongoing maintenance for 359 Technology Classrooms.
  - o Upgrade equipment that has reached end of life cycle.
  - o Upgrade computers in AT&T and OIT Teaching Theaters.

10.1.2.2.2 Terrapin Learning Commons

In the not-so-distant past, faculty and student researchers worked independently in quiet spaces; libraries promoted silence and solitude, and individual departments and other units created spaces that met their own needs. As a result, the spaces available for faculty and students to use for research, projects, papers, and support were separate entities found around campus. In today's multitasking and wireless world, students and faculty alike expect to work in robust, technology-rich environments where they can access hard copy, electronic, multimedia source materials, and support. In creating reports, articles, texts, class presentations, and other documents, many work collaboratively; thus, environments where they can meet, discuss, write, edit, and more are imperative to their academic success. To meet these faculty and student academic needs, the campus needs a coherent vision and integrated services that combine the abilities to access, create, and collaborate. OIT and the University Libraries bring these visions and services together in the Terrapin Learning Commons.

The Terrapin Learning Commons (TLC) offers access to technical and content resources, addresses information technology fluency and information literacy issues, supports collaborative work, and links faculty and students to both technical and content expertise through face-to-face and virtual resources—all in one physical place. But it also offers access to most of these resources from any location—at open computing facilities across campus and even through individual computers with Internet access both on and beyond campus. By combining central,

distributed, and virtual spaces; hardware, software, and an integrated infrastructure; and a robust academic, reference, and technical support structure (including an extension of the OIT Student Help Desk), the TLC not only provides the campus with the requisite tools needed to significantly enhance learning, teaching, and research, but also makes them readily available to all members of the campus community no matter where they are. The strength of the TLC comes from forging partnerships among various campus groups—OIT, the Libraries, and others, such as the Writing Center, Undergraduate Research Office, and the Maryland Institute for Technology in the Humanities (MITH)—each of which supports and enhances the campus community in different and important ways.

- FY08
    - Refine budget and staffing requests for the TLC.
    - Open Terrapin Learning Commons main facility in McKeldin Library.
        - Complete construction of facility.
        - Establish service desk for both technical and library assistance
    - Close current WAM Computer Labs in Worcester and McKeldin Library incorporating their computers into the new TLC.
    - Promote TLC with open houses, articles, fliers, brochures, giveaways and more.
    - Create an online support system of documentation, simulations, and synchronous and asynchronous communication tools.
    - Develop a robust Web presence for the TLC.
    - Establish the TLC Steering Committee from OIT, the Libraries, and the TLC partners to provide for the primary ongoing vision for the TLC.
    - Refresh Windows hardware in the TLC space in coordination with upgrades occurring in computer labs.
- FY09
    - Coordinate with current TLC partners to establish access to their services in the TLC.
    - Communicate with other potential campus partners to gauge their interest in participating in the TLC.
    - Establish the TLC Advisory Committee to offer direction from the faculty and student perspective.
    - Enhance virtual group study spaces.
    - Convert existing WAM Computer Labs to TLC sites.
- FY10
    - Explore systems to provide remote access to TLC software.
    - Examine the possibility of offering the TLC software environment on computers purchased through the computer purchasing agreements.
    - Integrate multimedia development center support into TLC activities.
    - Refresh Macintosh hardware in the TLC space in coordination with upgrades occurring in computer labs.
- FY11
    - Develop online tutoring channels.
    - Create informal TLC learning spaces around campus.
    - Offer opportunities to test and pilot new technologies for students and faculty.

- FY12-17
  - Continue refreshing hardware in coordination with upgrades occurring in computer labs.
  - Continue to monitor the multimedia development landscape and current student needs and add extensions as needed.

10.1.2.2.3 <u>Student Computer Labs</u>

OIT manages several student computer labs on campus. They are designed to meet students' the academic needs. OIT's eight computing labs support three operating systems (Windows, Macintosh, and, Linux). Computers in the labs provide students with general desktop productivity and development software. There are also tools for those students who need to work on programming projects. Printers supplied with toner and paper are also available. Computers continue to gain in compute power and decrease in size and, therefore, it is anticipated that the needs of a computer lab will change over time to require access to more high-end specialized software. The changing infrastructure that will provide access to centralized storage will enable us to look at providing access to computer lab applications from not only the desktops in a lab, but also from the desktops of the students' own computers via thin client technology. This will allow us to provide anytime/anywhere access to a 'virtual computer lab' environment for students so that they won't be restricted to having to physically go to a computer lab.

- FY08
  - Refresh Macintosh-based computer hardware.
  - Investigate thin client technology.
  - Continue to upgrade necessary software in the labs.
- FY09
  - Refresh Windows-based computer hardware.
  - Continue to upgrade necessary software in the labs.
  - Continue to examine usage of labs to determine if new configurations are required.
- FY10
  - Refresh Linux-based computer hardware.
  - Continue to upgrade necessary software in the labs.
  - Continue to examine usage of labs to determine if new configurations are required.
- FY11
  - Continue to upgrade necessary software in the labs.
  - Continue to examine usage of labs to determine if new configurations are required.
- FY12
  - Refresh Macintosh-based computer hardware.
  - Continue to upgrade necessary software in the labs.
  - Continue to examine usage of labs to determine if new configurations are required.

- FY13
    - Refresh Windows-based computer hardware.
    - Continue to upgrade necessary software in the labs.
    - Continue to examine usage of labs to determine if new configurations are required.
- FY14
    - Refresh Linux-based computer hardware.
    - Continue to upgrade necessary software in the labs.
    - Continue to examine usage of labs to determine if new configurations are required.
- FY15
    - Continue to upgrade necessary software in the labs
    - Continue to examine usage of labs to determine if new configurations are required.
- FY16
    - Refresh Macintosh-based computer hardware.
    - Continue to upgrade necessary software in the labs.
    - Continue to examine usage of labs to determine if new configurations are required.
- FY17
    - Refresh Windows-based computer hardware.
    - Continue to upgrade necessary software in the labs.
    - Continue to examine usage of labs to determine if new configurations are required.

10.1.2.2.4 Flexible Learning Space Sandbox

As technology is becoming smaller and more mobile, the "normal" configuration of classrooms begins to restrict the possibilities for faculty to experiment and to promote group learning. In order to experiment with new learning space configurations, we propose to equip an existing learning space with flexible furniture and the latest technology to allow faculty to try new configurations that can inform future designs of classrooms on campus.

- FY08
    - Equip an existing room with flexible furniture and the latest technology.
    - Create policies and procedures for how faculty will be able to access the room for experimentation.
- FY09-17
    - Continue to upgrade equipment and software in the room as necessary.
    - Keep abreast of new technology and keep staff trained on current technology.

10.1.2.2.5 Informal Learning Spaces

Physical spaces can have a significant impact on learning. This campus has focused mainly on classrooms when it comes to integration of technology in support of learning, but as students come more equipped with technology and more learning activities are technology-based, we need to explore ways that informal learning spaces (hallways, lounges, etc.) can be configured to support learning activities outside the classroom. Planning for these spaces should be included in new buildings, and we should work with Facilities to examine existing buildings and how these informal learning spaces can be transformed. Seeing students sitting on floors next to power outlets with their laptops should be an indication that there is a need to look at this area. OIT would like to work towards a more formal relationship with Facilities beyond the existing one with the Instructional Facilities group that focuses only on classrooms.

- FY08
    - Work with Facilities to formalize relationship in planning spaces across campus, both in new and existing buildings.
    - Develop a plan with Facilities for reviewing existing informal learning spaces across campus to identify potential areas for enhancements.
- FY09-17
    - Continue to work with Facilities for reviewing existing informal learning spaces across campus.

10.1.2.3 Faculty Support

Faculty support for the integration of technology into the teaching and learning process is being provided through the creation of a Center for Innovation in Teaching and Learning. Through this center, resources will be available to faculty (including equipment and staff), as well as support programs (including training and consulting services) and programs that help faculty connect, discuss, and celebrate accomplishments.

10.1.2.3.1 Center for Innovation in Teaching and Learning

The use of media-rich content is now part of the "norm" rather than a specialized "high end" extra in teaching and learning. The university needs a centralized location for faculty and/or students to work on innovative projects that require strong technology support. The center is designed to meet these needs by providing the necessary tools and support for multimedia development projects. As more of our students and faculty delve into the world of media-supported learning and social computing, they will need a place to learn, explore, create, and innovate. An OIT-supported multimedia development center ensures that university faculty and students will have the resources to meet and expand their academic goals. This center will provide our faculty and students a place to get direct multimedia support for their academic projects. Faculty will be able to meet with content experts and instructional designers to help them develop appropriate course materials, while students will have access to high-end multimedia equipment and staff expertise to help them in working on course projects.

- FY08
  - Establish Center for Innovation in Teaching and Learning.
  - Purchase initial equipment for the center.
  - Develop innovative media-based training materials for the new Course Management System (CMS).
  - Utilize Terrapin Learning Commons equipment to expand the accessibility of specialized software for development.
  - Establish a faculty, student, and staff committee to provide input on new directions in technology that can be tested in the center.
  - Promote the new center to the campus community through open houses, articles, fliers, and brochures.
- FY09
  - Create communities of practice around current, new, and emerging technologies.
  - Tap into Terrapin Learning Commons support system to provide technical support at-a-distance.
  - Develop innovative media-based training materials for the communication and collaboration tools supported by the center.
  - Explore thin client options to expand the accessibility of specialized software for development.
- FY10
  - Add high-end equipment to the center such as a 3-D scanner, portable IP-based conferencing tools, etc.
  - Develop innovative media-based training materials for any new services being offered to faculty.
  - Upgrade computers in Faculty Technology Center.
- FY11-17
  - Continue to monitor for emerging learning technologies to determine what equipment or software will be needed in the center.
  - Add extensions as necessary.
  - Refresh hardware in the center in FY12 and FY17.
  - Refresh hardware in the Faculty Technology Center in FY14.

10.1.2.3.2 Faculty Training and Consultation Services

Working through the Center for Innovation in Teaching and Learning, faculty training and consultation services provides consultation, design, and training services to faculty to help them make innovative and efficient use of technology in their courses. This support includes anticipating changes in instructional technology tools and strategies, as well as preparing faculty to understand and embrace those changes. In addition, faculty need to be exposed to the innovations and experiences of peers both internal and external to the university. These services promote collaborative opportunities between faculty, instructional technology support personnel, and students.

- FY08
  - Support faculty in more ambitious, learner-centered uses of not only the CMS tools, but also other technology-based tools available through the Center for Innovation in Teaching and Learning, like blogs, wikis, and podcasting.
  - Provide support through training, instructional design consultation, problem-solving, and troubleshooting.
  - Improve online resources so that a faculty support knowledge base may include
    - Step-by-step animations
    - Video snippets of best practices in the uses of new technologies
  - Continue to promote Maryland faculty achievement through the Innovations in Teaching and Learning (ITL) Conference and University of Maryland Innovation in Teaching with Technology (UMITT) award, as well as foster university collaborations to bring external instructional technology experts to campus.
    - Consider adding a USM-specific track to the ITL Conference to attract a broader audience and array of presentations to the conference.
  - Continue to collaborate with the Center for Teaching Excellence to offer the Innovations in Teaching and Learning Speaker Series, which will bring in nationally renowned speakers.
- FY09-FY17
  - Continue to monitor emerging learning technologies.
  - Continue to upgrade existing tools and add extensions as necessary.
  - Keep staff skills in existing and new tools current.
  - Continue to participate in relevant instructional technology conferences.
  - Continue to promote Maryland faculty achievement through the ITL conference and UMITT award, as well as foster university collaborations to bring external instructional technology experts to campus.
  - Continue to collaborate with the Center for Teaching Excellence to offer the Innovations in Teaching and Learning Speaker Series which will bring in nationally renowned speakers.
  - Upgrade equipment in Faculty Training Center in FY09 and FY14.

10.1.2.3.3 Enhanced Learning Fellowships

Faculty and students bring a variety of pedagogical and technological experiences to the teaching and learning process; however, to date, we have not harvested those experiences in a way that could be presented as lessons learned or best practices to University of Maryland educators. We believe that an Enhanced Learning Fellowship Program will improve our understanding of what faculty and students expect from technology in teaching and learning and how they have experienced it to date. Fellowships will pair a faculty member and a student of their choice in teams with the objective of exploring new, emerging, and innovative technologies and applying them to a pedagogical purpose.

- FY08
  - Create the first cohort of faculty and student teams. In this dynamic, students are perceived as partners in the development process.
    - Students are expected to have a requisite level of technical skill (attainable through participation in the Undergraduate Technology Apprentice Program).
    - Faculty training is provided through resources of the Faculty Support Services.
  - Fellowship teams will
    - Conduct research on the topic or technology they have chosen for their project
    - Coordinate brown bag discussions to share their research and the evolution of their project with university peers
    - Develop a final report of their project, including best practices
  - Publish Fellowship team findings and best practices on the Web for the benefit of the university teaching community.
- FY09-17
  - The goals of this program will remain essentially the same in FY08 and beyond; however, the objective is to support more teams and diversify the technologies and topics researched and developed.

10.1.2.4 Academic Infrastructure

Academic infrastructure is important to support the academic mission and to provide the best services to our students. Projects in this section will enhance the current environment.

10.1.2.4.1 Pay-for-Print Service

To gain efficiencies across campus and to provide a single interface for students, an evaluation of print solutions is currently underway. Once the solution is in place, it will provide students with the ability to print to any printer in a lab (both OIT and departmental) or in the libraries and be able to pay for that printing with their Terrapin Express account. The goal is to cover the cost of the equipment, supplies, and software license through the pricing structure set for printing.

- FY08
  - Deploy newly selected Pay-for-Print service in production across campus.
  - Offer support materials for users of Pay-for-Print services.
- FY09-10
  - Add extensions as necessary.
- FY11-17
  - Add extensions as necessary.
  - Continue to monitor the available services in this area and possibly reexamine vendor solution in FY12.

10.1.2.4.2 Legal Peer-to-Peer Sharing

University students here and elsewhere commonly share entertainment files through peer-to-peer (P2P) networks. This P2P sharing draws heavily on university computing resources. Additionally, files shared via P2P networks are frequently compromised with viruses. Furthermore, much P2P activity is presumed to be an infringement of the rights of copyright owners. Copyright infringement is a violation of federal law and, consequently, illegal file sharing is prohibited under the university's "Policy on the Acceptable Use of Information Technology Resources." For several years, the University of Maryland has controlled file sharing through educational outreach efforts and technological solutions.

The university needs to continue to offer a legal, safer alternative to P2P sharing. Current efforts have been on offering a digital music service through Cdigix. Plans for the future are to continue offering this type of service (not necessarily through Cdigix) and possibly to expand to include video for educational purposes.

- FY08
  - Continue offering music service to all students (graduates and undergraduates), faculty, staff, and alumni.
  - Evaluate current landscape for legal P2P sharing to determine if new service or change in service is required.
  - Pilot video sharing service to determine viability for support of teaching and learning.
- FY09-FY17
  - Continue offering music service to all students (graduates and undergraduates), faculty, staff, and alumni.
  - Evaluate current landscape for legal P2P sharing to determine if new service or change in service is required.

10.2 *Administrative Systems*

Administrative and Enterprise Applications (AEA) designs, develops, and implements databases, data warehouses, and enterprise application software in support of student and business administrative processes. AEA defines application data policy and standards, supports several University of Maryland system-wide applications, and maintains more than 30 university software applications including the Student Information System suite (which includes admissions, registration, scheduling, accounts receivable, and financial aid), the Financial Records System (FRS), the Payroll & Human Resources (PHR) System, and electronic forms (ELF). AEA is also responsible for the technical aspects of the university's portal implementation.

10.2.1 Campus Requirements

Requirements for administrative systems can be generated by the IT Council, the University Senate, other campus committees, and specific business departments. Routine, moderate to low effort requirements are negotiated directly with AEA, but high level, direction setting requirements with large resource implications are vetted through the Enterprise Administrative Applications Advisory Council, which reports to the IT Council. High level requirements are delineated below.

- o Application service delivery via portal technology that has a robust and redundant infrastructure, ability to utilize fail-over in the event of power outages, provides access services based on role or affinity, and provides single sign-on that spans administrative systems and enterprise technology services (including e-mail, and calendaring)
- o Elimination of paper processes
- o Decision on next generation student system and concrete steps toward implementation
- o Identity Management: Protect Social Security Numbers and implement a role based authorization system
- o Incorporation of central IT support to business processes that are common across colleges/divisions, yet are not currently supported by the existing enterprise application suite.
- o Central OIT support activity to develop and run local applications (for fee) for colleges/divisions in a robust and expandable architecture and common framework (LDAP authentication, standard development tools)
- o Resilient and redundant Web environment for the online aspects of the administrative applications

10.2.2 <u>Initiatives</u>

Specific initiatives identified for AEA include identifying and developing online solutions for remaining paper and resource intensive enterprise business processes, completing the final two phases (IIb and ARS rewrite) of PHR, maintaining and enhancing the university's financial systems, enhancing the current student system while developing a plan for and beginning a new student system, developing and maintaining an information architecture, and formulating additional data policies, especially related to data protection. Embracing and completing these initiatives will streamline business processes, save money, and free university employees to engage in more productive tasks.

10.2.2.1 Financial Systems

The current Financial Records System (FRS) supports the five "3A" institutions (UMCP, UMES, UMCES, UMBI, and USMO) in the areas of inventory/fixed assets, purchasing, accounts payable, and general accounting. In addition to FRS, the Interface Reconciliation System (IRS) is an important component of our financial systems. IRS provides the 3A institutions with the mechanism of interfacing FRS processing to the state. Also included among our financial systems are the Electronic Forms (ELF) and FRSWeb applications. ELF is the widely-used data collection and tracking tool for transactions fed to FRS. FRSWeb is the Web-based application that provides the university with a detailed look at what has been processed in FRS as of the most recent batch cycle.

Current system maintenance practices will continue to occur in each of the ten fiscal years and is a combination of Java-based programming and COBOL batch programming. This system maintenance includes vendor upgrades or Time of Solutions (TOS), enhancements, and modifications as well as daily operational support.

In the first five years (FY08-FY12), there are three major subprojects planned. The first subproject is a new Central Billing System (CBS). The current CBS resides on the Hewlett Packard mainframe, which is scheduled for decommission at the start of FY08; therefore, the CBS will be ported to a new environment (either mainframe or server based) and will become the External Department Billing (EBD) system. The second subproject is the reformatting and integration of FRSWeb and ProWeb. The third subproject is to modify the base FRS to allow for the extension of the Year-end Rollover process. This revised FRS application will then accept adjustments required by our published financial statements, which will affect the previous fiscal year while continuing to process transactions for the current fiscal year.

During the last five years (FY13-FY17), there is only one major subproject planned. This subproject is an RFP licensing cost or Open Source implementation of the next suite of financial systems.

- FY07
    - Develop replacement for HP based Central Billing System.
    - Streamline the library vendor maintenance process.

- FY08
    - Implement replacement for Central Billing System.
    - Determine specifications to modify base FRS for extension of year end.
    - Complete SDLC requirements and design of a new integrated FRSWeb and ProWeb.
    - Automate prorate/insertion process.
- FY09
    - Code and implement new FRS/ProWeb.
    - Implement modification of core FRS for extension of year end.
- FY10
    - Refine FRS/ProWeb rewrite and FRS base modification.
    - Design, develop, and implement an ELF requisition capability.
- FY11-17
    - Explore, select, and implement open source financial system.

10.2.2.2 Payroll and Human Resources Systems

The current Human Resource Systems support the five 3A institutions (UMCP, UMES, UMCES, UMBI, and USMO). The current Payroll System supports the five 3A institutions and the three non-3A institutions (UMB, UMUC, and UMBC). The Human Resource System provides capabilities for employee data, appointment data, and time entry data. The Payroll System provides capabilities for payroll data, payroll adjustment data, deduction data, and labor data.

Current system maintenance will continue during each of the ten fiscal years and is a combination of Web Sphere screen programming and COBOL batch programming. The system maintenance includes daily operational support, enhancements, and conversion upgrades. System maintenance also includes programming support for other initiatives such as Payroll Post Reporting System, Portal Implementation, and new Student Information System Interface.

During the first five years (FY08-FY12), there are three major subprojects planned. The first subproject is an RFP for or development of an online applicant and hiring system. The second subproject is the next generation Academic Resource System (ARS). The next generation ARS will be Web based and will more directly integrate (as opposed to interfacing) with the PHR system. The third subproject is a faculty time and attendance system. During the last five years (FY13-FY17), there is one major subproject planned. This subproject is an RFP licensing cost or Open Source implementation for the next generation human resources and payroll systems.

- FY07
    - Complete Payroll Post Reporting.
    - Investigate and select (vendor or in-house) applicant and hiring system.
- FY08
    - Begin SDLC methodology on next generation ARS rewrite.
    - Code (or implement package) applicant and hiring system.
    - Begin coding next generation ARS system.

- FY09
    - Define and design faculty time and attendance system.
    - Complete coding and implement next generation ARS system.
- FY10
    - Enhance applicant tracking and hiring system and next generation ARS system.
    - Code and implement faculty time and attendance system.
- FY11-17
    - Explore, select, and implement next generation open source human resources and payroll system.

10.2.2.3 Portal

This project implements an enterprise portal for the university community. Intended for use by the entire campus, the initial production release in January 2007 will be focused entirely on students, providing them with a single entry point to core online services required to function efficiently at the university. Using a semester driven staged release schedule, the portal will scale up with a goal of providing access to an increasing number of online services for students, faculty, and staff with each phase.

The focus for Phase 2, fall 2007, will also be primarily student based, with the inclusion of some "low hanging fruit" applications for faculty and staff that highlight the potential of the product. In order to accommodate mid-phase production and testing, initial budget monies included the purchase of 6 Servers costing ~5000 each for a Quality Assurance Environment. Hardware replacement in other areas of OIT allowed for a re-purposing of 6 dated servers to be used as a Development and Testing Environment.

An 11-year maintenance contract costing $165,000 per year represents a project life cycle that has the potential to allow for an eventual migration of all enterprise Web applications from their current environment to the portal. Additional budget money has also been added for consulting hours in the first five years of the project.

- FY07
    - Complete quality assurance testing and release student portal to limited population.
- FY08
    - Develop and release comprehensive student portal to entire population.
    - Begin initial faculty staff portal implementation.
- FY09
    - Continue to add functionality to student portal.
    - Complete coding and implementation of faculty/staff portal
- FY10
    - Explore and implement expanded user populations, e.g., alumni and prospective students.
    - Integrate the new (Kuali) student system with the portal functionality.

- FY11-17
  - Integrate the portal into emerging next generation financial and human resources/payroll systems.

10.2.2.4 Quality Assurance Group

This project creates a new Quality Assurance (QA) group composed initially of two personnel, growing to three in year two and beyond. Creation of a QA group within OIT will benefit the university and provide payback in excess of the cost of the group because problems identified early in a project/system life cycle are inevitably less expensive and less complex to resolve than those discovered during the later stages. Additionally, problems can be identified and fixed before they affect users on their job, but, more importantly, the QA group can anticipate and prevent problems new code may cause for related systems that were performing without incident. Lastly, implementing a QA program will offload and make objective a large part of the development process. Currently, developers are responsible for unit, system, integration, and user acceptance testing. This is a time-consuming and biased process (biased in that developers subconsciously make assumptions about their code and therefore do not test randomly or as thoroughly as an objective outsider). The money budgeted for this project is primarily for new personnel, but there is also a cost included for automated QA tools that can dramatically increase the group's effectiveness.

- FY07
  - Develop and obtain approval for QA group.
  - Fund QA group in FY08 budget.
- FY08
  - Complete hiring of QA group.
  - Develop and implement QA standard methodology for critical IT systems.
  - Begin using the QA group to enforce QA methodology.
  - Establish the QA group as an integral component of the student Kuali fielding.
- FY09
  - Expand use of QA group to all OIT systems.
  - Research, obtain, and implement automated QA tools to augment the group.
- FY10
  - Expand the QA group's scope such that it plays a key role in exploration of next generation financial and payroll/human resources systems.
- FY11-17
  - Continue to refine the QA role within OIT, especially as it applies to new student, financial, and payroll/human resources fieldings.

10.2.2.5 Student Information Systems

The Student System replacement project on the campus consists of implementing the software developed by the Kuali project and then incorporating functionality specific to our campus, such

as unique academic policies and procedures. It also includes integrating the Kuali developed software with other purchased modules and in-house developed systems. Although it is anticipated that campus implementation will begin approximately one year after the Kuali software development begins, it is expected that activities such as training, planning, and analysis of campus-specific functional specifications will begin to occur earlier (FY08). The implementation timeline has been set at five years, after which time the system enters the maintenance/enhancement mode. During those first five years, one additional technical position at a cost of $100,000 per year has been identified for the campus implementation. This additional FTE supplements 4.5 existing FTEs assigned to the project, while the remaining staff continues to maintain the existing systems during this time. The additional FTE is needed to ensure sufficient resources to implement the new system and maintain the old one, since 2 existing staff will have been contributed to the Kuali project. As each module is implemented on the campus, more of the maintenance staff will be reassigned to maintain the new modules. It must also be noted that some functions, such as those associated with dining services, parking, and campus residences, may not be included as part of the core Kuali and will need to be developed from scratch. At the conclusion of the five-year period, it is expected that the original staff will be sufficient to maintain the new system. The $25,000 for training for three years represents the estimated cost to train the entire staff in a phased fashion on the new technology, such as Java and Service Oriented Architecture. Some software, such as Financial Aid (packaging modules that incorporate government policies and regulations) will need to be budgeted for purchase. Some known tasks likely to be associated with the existing SIS system are:

- FY07
    - IT support for new academic progress monitoring policies
    - Reports and e-mail capabilities added to Advise system
    - Continuing to bring MEGS to OIT standards
- FY08
    - Anticipated policy changes for inclusion of +/- grades into GPA calculation
- FY09
    - All "old SIS" personnel assets shift to implementation of Kuali modules and integrating new Kuali modules with old SIS modules not yet developed
- FY13-17
    - All development directed toward Kuali new SIS.

10.2.2.6 Data Policy and Data Warehousing

Current system maintenance includes specification development, security administration, and functional maintenance of the PHR Affiliates module and the Academic Resource System (ARS); overall direction of the University of Maryland Data Warehouse including hardware/software upgrades, maintenance and updates to existing subsets, security administration, and Warehouse on the Web development and maintenance; functional maintenance for the UM Unit Bridge, metadata application; overall direction of the Digital Imaging Group including the addition of new customer projects, maintenance, security administration, backup and storage for the Digital Imaging Group; and functional maintenance of the data architecture including policy, stewardship, standards, quality, and data flows. In

particular, expansion is planned for the Data Warehouse to include additional data subsets, dashboard presentation for executives, non-browser dependent query tools, and single sign-on capabilities.

- FY07
    - Privacy Protection: Remove SID/PIN from Testudo, and complete SSN project with systems receiving SSN via data feeds.
    - Clean up/synchronize data in UPS/SIS/PHR.
- FY08
    - Research and document existing policies for provisioning of system access.
    - Develop policies for role based provisioning of system access.
    - Determine appropriate role for student warehouse in the context of the new Kuali student implementation.
- FY09
    - Implement role based access.
- FY10-17
    - Examine and implement data warehouse requirements for next generation financial and human resources systems.
    - Expand student data warehousing as necessary to support peripheral student module (housing, parking, etc.).

10.2.2.7 Information Architecture:

A global information architecture will be developed to provide the foundation for enterprise application development within the Office of Information Technology and to maximize the benefit to the university enterprise. The plan will contain the overarching principles that will be followed and the detailed rules and guidelines for components that make up the overall architecture – general principles, data architecture, database management, business rules and logic, technology independence, responsiveness to change, and application development. General principles will include the requirement for integration of data and systems across the enterprise to facilitate business continuity. Source person data will be held in one repository to facilitate data sharing and eliminate data redundancy. Data standards will be developed for all application development that include but are not limited to a common vocabulary and a repository for documentation – database names, schema names, table structures, and field names. Standards for database tables will include common utility tables, normalization, and test environments. This is a joint proposal with OIT Technical Services and Support (TSS).

- FY07
    - Define working group.
    - Working group establishes scope and content of information architecture.
- FY08
    - Global architecture guidelines are established.
    - Application groups analyze their systems for compliance with global information architecture guidelines.

- o Application groups develop specific architectures within context of global guidelines.
- o Information architecture is considered and made compatible with Kuali student system definition.
- FY09
  - o Specific application architectures are merged into a comprehensive global architecture.
- FY10-17
  - o Global information architecture underlies next generation financial and payroll/human resources systems.

10.3 *Enterprise Community Source Administrative Systems*

10.3.1 Campus Requirements

The Enterprise Community Source Administrative System is the next generation Student Information System (SIS) that will replace the current legacy SIS. Five institutions in the United States and Canada have formed a partnership to build this next generation SIS using a method termed "community source." Closely related to open source systems, a community source system is offered free to whoever wishes to use it. Unlike open source, community source projects are written by founding members that commit a significant number of resources and cash to the project and that have sole discretion in the project's direction.

The project's direction, or campus requirements, for the community source student administrative system are determined via two sources. The main source is the Kuali Student Foundation, the governing body for this five-year community source project. UM has two of the 10 seats on the Kuali Student Foundation Board and will use them to advance the interests of the Kuali Student project as a whole and the interests of the University of Maryland as one of the members of the foundation.

The second source of campus requirements is the members of the university community, who, as constituents of the UM Student Information System (SIS), will define functional requirements of the Kuali Student system from Maryland's perspective. These requirements will serve both the Kuali Student community as a whole and, where necessary, will serve to define customization points for the university where the community's requirements do not meet our needs.

The university community will become the ongoing source of campus requirements when Kuali Student is fully implemented at UM at the end of the five-year project. At that point, campus needs will help fill out Kuali Student from the core system as implemented into a system that integrates other related administrative systems and will provide enhancement requirements to the system. It's expected that this will be accomplished within the realm of an evolved Kuali Student community organization.

Known campus requirements are the following:
- o Delivery of a modern, flexible, and highly robust Student Information System that includes core SIS (Admissions, Financial Aid, Records and Registration, and Student Accounts) within a five-year timeframe.
- o Integration of non-core SIS systems (including existing systems, package systems, and systems newly written for Kuali Student), and enhancements to core Kuali Student over the life of Kuali Student.
- o Education and knowledge transfer to permanent University of Maryland staff, both functional and technical, in the production and implementation of complex, modern, Web-based systems for the purpose of leveraging the knowledge in other systems and projects.

10.3.2 Kuali Student Information System Initiative

10.3.2.1 Kuali Student Core Implementation

The University of Maryland's next generation SIS is a community source project named Kuali Student. The project has a five-year implementation plan that will deliver "core" SIS systems:

- Customer Contact (person identity, tracking, logging, relationships, roles, etc.)
- Admissions
- Curriculum Development
- Enrollment (Records and Registration)
- Financial Aid
- Student Financials (student accounts)
- Scheduling System (course, exam, event scheduling, room management)
- Interfaces to common systems:
    o Degree Audit
    o Student Life / Student Affairs systems
    o Libraries
    o Data Warehouse / Datamarts / Analytics and Reporting
    o HR / FRS
    o Document Imaging
    o Electronic Portfolios
    o Research

The Kuali Student community is composed of the following institutions (known as the Founding Institutions):

- Carnegie Mellon University
- San Joaquin Delta Community College
- University of British Columbia
- University of California, Berkeley
- University of Maryland, College Park

Each of the founding institutions contributes $1 million each year in cash and personnel resources towards the effort over the course of the five-year project. Personnel are 100% dedicated to the project and are directed by the Kuali Board. The Functional Steering Committee has one representative from each institution and is responsible for producing the project's functional requirements. The Technical Steering Committee also has one representative from each institution as is responsible for delivering the student system according to the functional requirements. These committees direct the dedicated project staff.

Kuali Student will be built in modular fashion. As modules are written, they will be implemented at each institution, with requisite connections to current legacy systems, until the entire Kuali Student system is implemented and the legacy system is transitioned out (retired). As each module that has been implemented becomes stable, it will be handed over to AEA and will enter its maintenance phase. Staff that supported the legacy module will take over the Kuali

module with the assistance of staff on the Kuali team responsible for developing the module. In the same fashion that Kuali Student transitions into the new SIS through the implementation of modules, AEA staff that support the legacy system will transition over to support Kuali Student as modules are implemented.

Milestones:

- FY07
    - Organize
        - Build Kuali Student Charter.
        - Founders sign MOU.
        - Functional and technical resources identified and allocated.
        - Steering committees formed.
- FY08
    - Functional teams build requirements for two-three major modules.
    - Technical teams build initial architecture.
- FY09
    - Functional teams build requirements for two-three major modules.
    - Technical teams solidify architecture.
    - Technical teams build initial major module, campus teams customize initial module.
    - Founders implement completed module.
- FY10
    - Functional teams build requirements for remainder of major modules and perform iterative requirements development for modules delivered and being developed.
    - Technical teams build two-three major modules; enhance architecture; re-factor code as needed; campus teams customize modules.
    - Founders implement modules.
- FY11
    - Implemented modules handed over to AEA for maintenance.
    - Functional teams perform iterative requirements development,
    - Technical teams build two-three major modules; enhance architecture; re-factor code as needed; campus teams customize modules.
    - Founders implement modules.
- FY12
    - Implemented modules handed over to AEA for maintenance.
    - Functional teams perform iterative requirements development.
    - Technical teams build remainder of modules; solidify completed system; re-factor code as needed; campus teams customize modules; deliver Kuali Student as a bundle.
    - Full system handed over to AEA for maintenance.

10.3.2.2 Kuali Student – Post-Core Implementation and Maintenance

After the core Kuali Student system is delivered in FY12, all Kuali Student core modules will be in their maintenance phase and the project will change to focus on 1) maintenance of the core system and 2) implementing non-core ("satellite") SIS systems (by building them at Maryland, by customizing modules written by the Kuali community, or by building interfaces to package systems or to existing systems).

The Kuali Foundation will evolve into another entity after delivery of Kuali Student in FY12. The primary needs fulfilled by the new entity from FY13 on will be system support and shared development. The Kuali community will likely satisfy both these needs through a network of contributing partners.

This new Kuali Student set of partnerships will have the same basic requirements of cash and resources from participating institutions, but with a reduced need for resources.

Milestones:

- FY13-17
    o Begin maintenance phase on core Kuali Student system.
    o Identify non-core systems for integration.
    o Integrate existing and package systems.
    o Build new systems within Kuali Student framework.
    o Shared maintenance and enhancements with Kuali community.

10.4 *Communications*

The University of Maryland's Office of Information Technology seeks to achieve a high level of campus, local, regional, national, and international visibility in the information technology discipline that serves to establish the university as one of the leading research, education, and technology institutions in the nation.

Communications is an integral part of this plan, as communications brings a voice to OIT's overall vision. Effective communications helps OIT increase public awareness, understanding, and satisfaction with the services provided by OIT and assists in enhancing and promoting OIT's reputation among its many constituents.

10.4.1 Campus Requirements

As the central office of information technology on campus, OIT leads and manages a significant technical infrastructure at this university. In furthering the vision of helping the university become one of the best public higher education institutions in research, education, and technology, OIT first strives to meet the immediate technological needs of university constituents. University constituents all have different technical and communication needs. OIT endeavors to communicate with different campus audiences who have varied technology needs and varied levels of awareness or interest in the individual and collective group of products and services offered by OIT.

10.4.2 Initiatives

Staff members of OIT think about the best way to reach different people, try to deliver effective communications that are suitable for specific and broad purposes, and involve numerous communication approaches, tools, and levels to reach, interact with, and/or inform university constituents. OIT has planned and implemented communications initiatives that have involved various activities from print publications to Web communications, online advertising, and special events. Over the next ten years, more communications initiatives will be created to promote more effective communication.

10.4.2.1 Campus Communications

Communications to the campus will target University of Maryland administrators, faculty, staff, researchers, OIT employees, current students, and prospective students and their parents, and will focus on keeping these important stakeholders informed about OIT's contributions and services to the university, enhancing constituent confidence in OIT operations, and better positioning OIT as a strategic leader in information technology on campus and beyond.

A mainstay for campus communications is distributing print publications which currently include *TechKnow* for students, *ITforUM* for faculty and staff, and a wide range of informational and promotional brochures, pamphlets, and flyers. Opportunities exist for the development of additional and/or more carefully targeted informational and promotional publications and materials over the next 10 years, such as an annual report/milestones publication. There is a reliance on printed material in the near future as OIT tests the viability and readership of e-pubs, the Web, and other electronic distributions. It is anticipated that more Internet communications will be viable options for message delivery over the next 10 years.

Another important communications outlet is in non-OIT communications. For example, contributions to other campus publications such as *Outlook* and *The Diamondback* are helpful in reaching faculty, staff, and students. In addition, OIT plans and implements awareness campaigns designed to offer information to target audiences about a variety of topics, from password change initiatives to the dangers of online piracy. In these and other communication efforts, OIT utilizes traditional and new media for delivering information to important publics such as online advertising on social networking sites, campus bus posters, Diamondback advertising, and signage in campus buildings, including, the Stamp Student Union, the libraries, and the dorms. New media technologies, such as RSS feeds and audio and video podcasting, will be further explored. All of this work is a part of the overall communications enhancement program, which supports and highlights OIT's data, voice, and video services that strategically enhance teaching, learning, and research at the university.

In short, OIT seeks to serve University of Maryland research, teaching, learning, and administrative communities through the provision of high-quality information technology services that help faculty, staff, and students excel. Valued data, voice, and video technologies are instrumental in connecting people to one another and linking people to the essential information needed to thrive in a knowledge-based environment. Therefore, it is a goal of OIT to remain on the forefront of these technologies and to make them accessible, and communicate that accessibility, to faculty, staff, and students.

- FY07
    - Refine, implement, and evaluate communications enhancement program and add innovative elements including online advertising on social networking sites to reach students.
- FY08
    - Refine, implement, and evaluate communications enhancement program and add more innovative elements including enhanced Web/new media.
- FY09
    - Refine, implement, and evaluate communications enhancement program and continue to broaden OIT's university media/press outreach activities.
- FY10
    - Refine, implement, and evaluate communications enhancement program and continue to look for new ways to spread OIT messages across a variety of media and with a variety of audiences.

- FY11-17
  - Refine, implement, and evaluate communications enhancement program so that OIT may be perceived as an innovative service organization that is clearly moving towards becoming the best central office of information technology among leading public research universities in the country.

10.4.2.2 External Communications

Off-campus communications will target University of Maryland stakeholders, such as business partners, peer institutions, associations, the media, state leadership, and the general public, and will focus on keeping these important stakeholders informed about OIT's contributions and services to the university and positioning OIT as a strategic leader in information technology on campus and beyond.

Media outreach plays a major role in our external communications efforts, as does Web communication. Both disciplines allow OIT to reach large numbers of university stakeholders efficiently and effectively.

OIT's Web site is a key communication medium, and it will be frequently improved throughout the next 10 years to enhance OIT's overall online presence. There will be a vigorous effort on the external sites in the areas of knowledge management and content management and a renewed focus on OIT's internal site. Opportunities exist for development of additional OIT-initiated electronic or Internet-enabled information, including RSS feeds, streaming video, video podcasts, Web-based surveys/questionnaires, Web casts, and other work.

Video production equipment will be secured for developing visual, streaming, downloadable, and mobile media. Video can enrich the overall communications enhancement program. The following are examples of possible OIT Communications video projects over the next 10 years: short, fast-paced "commercials" promoting OIT's mission and commitment to providing quality IT services to the university community to be shown as a back drop before VIP presentations by the CIO and other OIT staff members, via the OIT Web site, and through other avenues as they become available; "how to" training videos for the various OIT products and services available to university faculty, staff, and students to be created and posted on the OIT Web site; and video highlights, which could be created and distributed to broadcast media outlets during OIT media outreach efforts.

Frequent and effective communication with significant internal and external audiences is essential to OIT success. That is why the program elements described above are components of the overall communications enhancement program, with the aim of bringing university-wide, local, regional, national, and eventual international recognition and visibility to Maryland's communications technology solutions.

- FY07
  - Refine, implement, and evaluate communications enhancement program and increase the volume and effectiveness of OIT's media coverage and OIT visibility opportunities. We are working towards favorable communication outcomes that will enhance OIT's credibility and reputation among various internal and external constituencies.
- FY08
  - Refine, implement, and evaluate communications enhancement program and add more innovative elements including enhanced Web/new media.
- FY09
  - Refine, implement, and evaluate communications enhancement program and continue to broaden OIT's media/press outreach activities from primarily campus, local, and trade publications to national and international favorable exposure.
- FY10
  - Refine, implement, and evaluate communications enhancement program and continue to look for new ways to spread OIT messages across a variety of media and with a variety of audiences.
- FY11-17
  - Refine, implement, and evaluate communications enhancement program so that OIT may be perceived as an innovative service organization that is clearly moving towards becoming the best central office of information technology among leading public research universities in the country.

10.5 *Enterprise Technology Services*

Enterprise Technology Services are the core services for both hardware and software. They form the base infrastructure and a set of infrastructure and operational services upon which user services are built. They include server hardware and operating system support, data center housing services, storage services, backup services, directory services, e-mail and calendaring services, Web hosting, identity management, list services, and consulting support. The core services supported include online learning, administrative systems, and user services. These services must be both reliable and secure.

10.5.1 Campus Requirements

Many campus units manage "local" servers to support IT activities specific to the needs of their unit. This usually requires dedicated space to house the systems and dedicated staff to support them. The space is often not suitable to house the equipment. The staff is generally required to support the locally run applications and the operating system (O/S) level software and security. Significant economies of scale can be achieved for the institution in server support. OIT provides centralized support and facilities for servers to support departmental IT activities.

The University of Maryland's computing environment must be utilitarian and ubiquitous in form. It must move from having the ability to access data from many locations to delivering knowledge to any location. It must be utilitarian by enabling access to all appropriate data and necessary technology in simplified ways that don't require exceptional knowledge to use - much like we use a telephone or electrical service. Access to needed information should be readily and securely available through mediums such as a laptop plugged into a standard internet connection, a cell phone or hand-held device using wireless technology, or a desktop computer in a campus office. It must be ubiquitous by allowing access from anywhere in the world where access is available. Above all, it must be governed by policies and technologies that make data security and protection paramount.

The campus infrastructure that supports this environment must be easily scalable so that it can be expanded and contracted to meet demand. At the same time, it must be built so that it can be easily maintained and periodically refreshed in order to stay current with leading edge technologies that offer new or improved services to the university.

Our computing environment must be robust enough to connect and share resources with strategic partners, organizations and other Universities. The flow of information should not be constrained by time, distance, or local infrastructure. The University of Maryland should be a leader in the exchange of knowledge but we should also be a leader in the integration of appropriate methods and equipment to exchange that knowledge. Our infrastructure should be the reason that students, faculty, and researchers look to our institution.

Historically, there has been no formal mechanism in place to help establish IT requirements on campus. The result is that OIT often is not fully aware of the campus needs and priorities.

Several groups exist on campus which help to identify needs in certain areas. Expanding on this model will help to set IT priorities and improve communication on campus about IT needs.

Technical Architecture Committee (TAC)
The Technical Architecture Committee was formed in July, 2006 to advise the Director of Technical Services and Support on architectural direction to meet the diverse needs of the campus. It is composed of technical staff from within OIT as well as members from various departments on campus.

University Technology Coordinators Committee (UTCC)
The UTCC is an active and vibrant body of campus technologists that meets monthly and discusses technology related issues. Each of the following groups will provide input to the UTCC on related technology matters.

Lab Managers
This group exists to advise OIT on lab support and distributed computing matters with respect to UNIX systems. It will continue to exist and provide input in this area. The OIT Manager for UNIX systems will be technical advisor to this group and will report back to UTCC.

Windows Group
A group similar to the Lab Managers will exist to help set priorities related to Windows matters. The OIT Manager for Windows systems will be the technical advisor to this group and will report back to UTCC.

Enterprise Internet Systems Advisory Group
A group composed of UTCC members will advise OIT on enterprise systems and middleware initiatives to include the University Directory, Shibboleth, and e-mail. The OIT Manager for Enterprise Internet Systems will be the technical advisor to this group and will report back to UTCC.

University Technical Managers
OIT maintains a list of the university's technical managers. The OIT Director of Technical Services will form an advisory board from this group and will report back to UTCC.

Grid Executive Committee
The Grid Executive Committee was formed in the Fall of 2006 as a high level body to promote and build a centralized campus grid as well as to extend it beyond the campus. Its activities include meeting with groups on and off campus to promote adding resources to and using the resources of the campus grid.

10.5.2 Initiatives

The initiatives for Enterprise Technology Services are critical for the infrastructure upon which services and applications are used by both administration and the academic community.   The services offered by other units within the Office of Information Technology rest on the

infrastructure provided by Enterprise Technology. Thus, these initiatives are both critical and foundational, and any weaknesses in this area have broad affects on the entire campus community.

Centralization of common services provides a uniform set of services to the campus and is more economical than individual departments offering those services. These are called managed services and they are offered in an environmentally appropriate location with the appropriate security safeguards, appropriate backup of data, and proactive monitoring of the services by staff whose focus is on providing highly available computing services to the campus. Once the base infrastructure is in place, the cost of managed services is less than having individual units supply those services. The services are also delivered in a uniform manner to all segments of the campus. Policies related to identification to the system, ethical computing, defense against viruses and intrusion, meeting regulatory requirements, and uniform implementation of operating systems, software, hardware, and backup are features of a managed environment.

10.5.2.1 E-mail Services

E-mail services are critical to communication and collaboration within the campus community and with others outside of the university. As a central service, the advantage of a single e-mail system for faculty and staff and another one for students is in the support for features, common administration, and virus protection and spam filtering in a uniform manner. The ability to integrate e-mail with other services is also important to the university as computing becomes ubiquitous and the delivery of e-mail can be integrated with both telephone and wireless devices.

10.5.2.1.1 Alumni E-mail Forwarding for Life Service

It is beneficial to the university to maintain contact with its alumni. Alumni can provide both expertise and funds to the university. Thus, offering e-mail forwarding keeps alumni up to date on major events and milestones for the university and its departments.

- FY07
    - Define directory classes for alumni.
    - Maintain 2006 graduates in the University Directory.
- FY08
    - Work with Alumni Association to pull alumni data for graduates prior to 2006 in groups by year.
    - Develop processes in conjunction with the Alumni Association that permits alumni to change their forwarding address.
- FY09-17
    - Continue to add alumni for each graduating class.

10.5.2.1.2 E-mail Service for Faculty and Staff

Currently, there are multiple e-mail systems on campus. There are four supported by OIT for faculty and staff and numerous others at the department level. Two e-mail/messaging services will be offered to the campus by OIT. One service will be offered to faculty and staff only and will incorporate calendaring and other collaborative tools with messaging (e-mail). It will also incorporate Voice over IP (VoIP) to allow voice mail access through your computer. In order for faculty and staff to be as productive as possible, the integrated e-mail service will integrate e-mail, calendar, and tasks via a single product accessible via a client and/or a Web interface. This service will provide a larger mailbox size for faculty and staff. The second service will be limited to messaging and will be primarily a student service. Both systems will be easily accessible from desktop computers, via a standard Web browser interface and with wireless devices. Virus and junk mail protection with reject/accept lists will be in place for both systems. Adaptive site-blocking at the campus level for virus and junk mail will also be employed.

Extended e-mail forwarding for all alumni and members of the alumni association will be offered. Our alumni will be able to forward all of their e-mail to an e-mail system of their choosing while publishing a single University of Maryland address. This will help to maintain a relationship with our graduates while promoting the university's identity.

Enhanced mail distribution (SMTP) services will provide for broad mailings for admissions applicants, alumni, and other mass notifications. A system designed for large and enhanced mailings (Web pages, images, etc.) will be a part of the mail system offerings for approved units. Improved list management for mail reflectors, Listserv lists, and major-domo type lists will be offered to faculty, staff, and authorized university organizations. Lists will be self-managed through a simple Web page interface.

An integrated mail and collaboration system that can be utilized by all faculty and staff would raise productivity, provide consistent virus protection and spam detection, and offer the vital link between e-mail, calendar, and collaboration. Mirapoint's Mail@umd service is the current main service utilized by faculty, staff, and students. It will become the main student e-mail platform. Faculty/staff will migrate to an integrated e-mail service.

- FY07
    - ID consolidation completed. Faculty and staff have one identifier within the University Directory that offers authorization to university central services.
    - Eliminate WAM/Glue e-mail and migrate to Mirapoint to provide a common facility for spam containment and virus protection.
    - Evaluate and select collaborative integrated e-mail system for faculty and staff.
- FY08
    - Complete implementation of chosen integrated e-mail system for faculty and staff.
    - Integrate e-mail with VoIP to offer e-mail by phone or phone voice mail to e-mail as part of the ubiquitous computing initiative.
    - Migrate faculty/staff from Mirapoint.

- FY09
    - Implement integration of e-mail with wireless device support for e-mail, calendaring, and tasks as part of the ubiquitous computing initiative.
- FY10-FY17
    - Evaluate technology for collaboration and/or ubiquitous computing as it becomes available.
    - Maintenance mode.
    - AS VoIP expands, offer additional features.

10.5.2.1.3 E-mail Service for Students

This appliance based system offers basic e-mail services to students. Migration to a new generation of appliances over time will permit larger mailboxes for students as well as a faster backup mechanism. It is important to expand mailbox size as students work with larger files such as presentations, images, and video.

This system will provide virus and junk mail protection with reject/accept lists, as well as adaptive site-blocking at the campus level.

- FY07
    - Enhance ability to manage junk mail consistently.
    - Start migration to utilize a SAN storage based appliance.
- FY08
    - Expand mailbox size for students for their growing needs.
- FY09
    - Implementation of expansion of Mirapoint services or identification of a new e-mail system for students.
- FY10
    - Maintain system or implement hosted or OIT supported new e-mail system.
    - Integrate basic e-mail services with wireless technology.
- FY11-17
    - Maintenance mode

10.5.2.1.4 E-mail Archiving

The university is subject to a number of regulations including the newly adopted eDiscovery legislation. Currently, in response to a lawsuit, manual efforts are employed to preserve the environment. The Legal department expects the number of lawsuits to increase and for the discovery phase to include many of our electronic records. The primary request is for e-mail. E-mail archiving is a way to hold e-mail for a specified retention period even when it is deleted locally. It is done efficiently in that an attachment with twelve recipients is only stored once. The combination of certified hardware and software has been accepted by the courts as legitimate copies of e-mail. Moreover, the software permits electronic searching for specific keywords, recipients, senders, time periods, and attachments and then places the contents on a

removable device that can be directly accessed by the legal team. E-mail will be archived on Worm type storage as part of Storage Services.

- FY07
  - o Work with university lawyers on specifications for e-mail archiving.
- FY08
  - o Issue RFP and choose vendor.
- FY09
  - o Implement e-mail archiving.
- FY10
  - o Provide disk based replication to disaster recovery site of stored e-mail.
- FY11-17
  - o Work with Legal department on requirements as regulations change.

10.5.2.2 Ubiquitous Computing

The trend is toward ubiquitous computing, which is the ability to use services from many places and to use more than one medium to obtain those services. This initiative is to implement support for wireless devices such as Blackberry, Palm, and other smart devices that can deliver e-mail, content, and calendaring.

Integration of e-mail with Voice over IP telephone (VoIP) is also necessary as faculty, staff, and students need to be connected wherever they go. This integration would allow one to get voice mail by e-mail or obtain important messages via a smart phone.

- FY08
  - o Determine first set of devices to be supported and best integration methodology.
- FY09
  - o Fully support wireless devices identified in FY08 for faculty and staff.
  - o Integrate e-mail with VoIP.
  - o Design integration of e-mail with VoIP.
- FY10
  - o Support those same devices, where possible for students.
- FY11-17
  - o As e-mail, devices, and VoIP services expand, expand the integration set.

10.5.2.3 Technology Infrastructure

Technology infrastructure includes the foundational services offered by the Office of Information Technology and utilized by units of OIT to deliver new applications and services to the campus community. These services are the base upon which other services are built. Thus, they must be robust, redundant, and agile.

10.5.2.3.1 <u>Data Storage</u>

Data storage is the core to an information technology infrastructure. Industry analysts estimate that the typical environment will require ten times its existing storage capacity every five years. The University of Maryland must have a centralized storage environment that can provide dynamic growth to keep up with the ever-expanding needs of the university. To take advantage of economies of scale and to protect against data loss, this service must be centrally managed and a shared resource. To economize costs, the storage must be tiered so data in less demand can be placed on lower cost media, yet it must be flexible so that changes in demand for data can be accommodated - the data must be easily migrated between media. Finally, for archive and protection purposes, the data must be able to be stored in multiple and remote locations. Local Storage Area Networks (SANs) must be discouraged in favor of centralized storage.

Areas identified with large storage needs include archival storage for the library, preservation of university electronic records for our archives, e-mail, databases, e-mail archiving, litigation preservation, geospatial imaging, system monitoring, administrative systems, backup to disk for fast retrieval, common home space for students including accessibility from labs, and faculty research. Disk space must also be acquired for local and remote disaster recovery.

The cost of acquiring storage and its maintenance is high. However, the cost to individual departments to develop a robust storage environment that is appropriately maintained and redundant is even higher. In fact, most departments provide local storage without these protections, and there have been data losses as well as loss in productivity when these resources were not available to the departmental faculty.

- FY07
    o Review campus storage requirements.
- FY08
    o Acquire several tiers of storage and begin migration to tiers.
- FY09
    o Develop processes to migrate data among tiers as needed.
- FY12
    o Implement full ILM processes that targets data to tiers and moves data among tiers as needed.
- FY13-FY17
    o Refresh storage environment every four years as maintenance costs often exceed acquisition.
    o Virtualize environment with expected breakthroughs of switch based virtualization devices to be able to manage and assign storage from a common interface and through the use of campus policies for retention.

10.5.2.3.2 <u>Backup and Data Protection Service</u>

For long term data archive and protection, the university will expand its existing Tivoli Storage Management system (TSM) from IBM. This system is based on magnetic tape media where data

is first written to high speed disk and then copied to tape. The current system has dual tape subsystems in two campus locations. This provides a measure of protection against a disaster in a single location; however, it does not protect against a campus-wide or regional disaster. To provide this level of protection, the university must build a secondary TSM subsystem at a remote University of Maryland campus. Until this expansion is complete, OIT has contracted with a private, licensed and bonded vendor for a service that relocates our critical tape to a remote location.

Over the ten year period, the university must move to a backup to disk system to meet a shrinking backup window when use of services is low. After the disk backup, the data are moved to tape during the day and sent offsite. This provides both a fast method of recovering data from disk over a short term while meeting the commitment to have a copy of the data offsite.

- FY07
  - Add a TSM test server to test changes in backup schemes.
  - Offer archival back-up as a new campus service for one time copies of data for preservation.
- FY08
  - Add a TSM server for expanded service to additional campus departments utilizing funds from current backup service.
  - Start backup to disk for added protection and to meet backup window requirements.
  - Move to archive and time based backup service rather than number of copies based to meet regulatory requirements.
- FY09
  - Continue rollout of backup to disk for those environments needing this added protection.
- FY10
  - Review capabilities of chosen backup system with the needs of campus and regulatory requirements.
- FY11
  - Upgrade current environment utilizing existing backup technology or implement new technology including virtual backup.
- FY12-FY17
  - Expand services to all segments of campus.
  - Maintenance mode.

10.5.2.3.3 Server Hardware Refresh

The Office of Information Technology has servers in production that are between one and nine years old. Older servers are less reliable and are often the sources of service failures. The most cost effective refresh rate is four years. After four years, the failure rate of server components is more than 50%, and the maintenance costs are steep, making a refresh of servers attractive in terms of cost. The server refresh will be continuous as each server reaches the end of its useable

lifetime. Over time, the number of servers to be refreshed will be reduced by consolidating environments where possible to fully utilize the processing power of each server and through virtualization methodologies. The minimum percent reduction in servers is 10% and the timetable and budget reflect that percentage. Research shows that most companies can achieve a 35% reduction over five years.

These servers are integral to the support of campus applications including the University Directory, PHR, the Data Warehouse, FRS user applications, SIS, admissions, document imaging, Web hosting, and instructional applications.

- FY07
    - Replace servers that are more than eight years old.
- FY08
    - Replace servers that are more than five years old.
    - Start refresh cycle to four years.
    - Consolidate to reduce the number of servers that need to be refreshed over time.
- FY09
    - Refresh servers as necessary and align maintenance contracts to four years.
- FY10-FY17
    - Refresh cycle continues.

10.5.2.3.4 Hardware Consolidation – Virtual Machine Technology

Virtualization is a means to allow multiple environments to coexist on a single piece of hardware. Many applications require an environment with a set of base services on the server. The many versions of these base services have historically led to the configuration of one application per server. Thus, application servers are not utilized to their full potential in terms of both CPU and memory. Virtualization software permits these servers to be more fully utilized, providing a more cost effective computer infrastructure as well as the separation of the environments required by the base services. OIT is committed to using virtualization in the production, development, and quality assurance environments. Virtualization software also permits administrators to move and duplicate virtual environments from one physical asset to another in the event of failure of components or to quickly add capacity to a service. Hardware consolidation reduces physical space, power, and HVAC requirements, permitting growth in services without commensurate growth of physical infrastructure.

Virtualization also has the potential to be a major part of our disaster recovery plan by allowing us to place development and quality assurance environments at a disaster recovery site. Unusable or inaccessible hardware would be sacrificed in the event of a disaster, and the production virtual machines brought up until the disaster is over. Virtualization technology can lessen the costs of disaster recovery.

- FY07
    - Virtualize Windows development and quality assurance Windows based servers.
    - Choose technology for virtualization of UNIX/Linux servers.

- FY08
    - o Virtualize UNIX/Linux development and quality assurance UNIX/Linux based servers.
    - o Virtualize Windows production servers.
- FY09
    - o Virtualize UNIX/Linux production servers.
- FY10
    - o Implement VMotion technology where virtualized environments can be moved on the fly without disruption of services in cases of failure or high load events.
- FY11-17
    - o Maintenance mode.

10.5.2.3.5 <u>Virtualized Test Bed Facility</u>

Currently, there are insufficient servers for developers to thoroughly test their applications before release to the community. Moreover, the lack of environments means that projects must in some cases be developed serially due to the lack of environments. A true quality assurance environment must be able to simulate the load of the production environment so that adequate testing can be done, thus averting performance problems in production. It is not feasible to have a physical server for the multiple projects, and virtualization will be used to permit multiple independent environments for productivity and cost effectiveness. Moreover, environments can be brought up and taken down as needed.

- FY08-FY09
    - o Determine the best mix of environments and implement the virtualized test bed.
- FY10
    - o Modify the environments as needed for developers.
- FY11-17
    - o Refresh environments as needed.

10.5.2.3.6 <u>Mainframe Services</u>

Administrative systems will continue to be mainframe based over the next ten years, although some will move over that period to open systems. The mainframe has been partitioned with a Linux side and a mainframe MVS-type operating system. The Linux partition will expand to provide increased functionality. Web based front end machines currently running Windows and UNIX and supporting the administrative applications housed on the mainframe will be migrated "in-board" to the Linux partition. This will provide greater stability, increased security, and lower costs. Maintenance of software under Linux is more cost effective than that of MVS. Thus, stabilization of rates for MVS can be achieved while expanding the Linux partitions for large applications such as the new SIS system.

- FY07
  - Do a cost and functional comparison and establish a set of guidelines for inboarding vs. server clustering technologies for Linux environments.
- FY08
  - Evaluate existing and new services in light of guidelines.
  - Purchase additional IFLs as needed for Linux partitions.
- FY09
  - Evaluate MVS applications and their expected lifetime to plan for retirement or expansion of mainframe environment with associated costs for each option.
- FY10
  - Start retirement plans or plan for expansion of MVS.
- FY11-17
  - Maintenance mode.

10.5.2.3.7 <u>Next Generation WAM/Glue</u>

WAM/Glue is an environment that provides a single sign-on mechanism for services and a persistent file store, regardless of login origin and client platform. It also provides a public Web space for each user. The environment can be expanded very quickly and it offers centralized patch management. WAM/Glue has served the university well where there is a heterogeneous environment including Windows, Novell, Macintosh and UNIX clients. The WAM/Glue framework makes the services provided appear to be homogeneous.

- FY07
  - Combine WAM and Glue environments into one environment.
  - Eliminate WAM and Glue e-mail.
  - Investigate virtualization.
  - Evaluate file system basis for WAM/Glue.
- FY08
  - Implement a virtualized scheme for cost effectiveness and expansion of the environment.
  - Continue increased use of Linux where appropriate in terms of reliability, compute power, and cost.
  - Contain uses of AFS file system which is distinct from WAM/Glue but is an enabler of WAM/Glue as well as Web hosting.
  - Begin support for a distributed or network file system other than AFS for non-WAM/Glue environments.
- FY09
  - Evaluate need for SPARC-based systems after experience with Linux systems. Note that reliability of Linux is less than that of SPARC based systems for larger services as of FY07. Evaluate based on developments in the Linux environment which is more cost effective than the SPARC-based systems.
- FY10
  - Determine course and begin migration to chosen environment.
  - Continue to offer services in this environment.

- FY11
  - Replace file system for WAM/Glue in this time period as appropriate.
- FY12-FY17
  - Maintenance mode.

10.5.2.3.8 <u>System Monitoring</u>

Currently, systems are not consistently monitored in a proactive manner. Reactive monitoring that provides alerts for failures are in place. Nagios, an open system tool, is utilized in the UNIX environment and What's Up is utilized for Windows. Nagios is as feature rich as commercial monitoring tools and its use will be greatly expanded, especially in the UNIX environment. In order to provide a reliable set of services with a 99.9% up time, proactive monitoring warning of limits about to be exceeded, hardware that is experiencing intermittent problems, or high activity that could grind services to a halt are necessary.

The Ten Year Plan will add Microsoft's Operations Manager to the mix, and, in future years, it will add an application and database monitoring suite of tools. At that point, the entire stack will have proactive monitoring to achieve consistent reliable service to our client base.

- FY08
  - Acquire Operations Manager and determine which services will be monitored by which tool.
- FY09-10
  - Implement proactive monitoring over a period of two years using Operations Manager and Nagios, an open systems tool that is quite powerful.
- FY11
  - Evaluate tools for database and application monitoring.
  - Implement database and application monitoring.
- FY12-17
  - Evaluate new tools as the application environment expands to include commercial portal components. Utilize open source tools where possible to contain costs.

10.5.2.4 Identity Management

Identity management is a centrally managed service that provides authentication to systems and authorization to specific functions within services and applications based on the role of an individual within the university. A system will be developed that will establish identity, enable authentication, facilitate authorization, utilize an enterprise directory, facilitate single sign-on, and enable provisioning/de-provisioning based on the current role of the individual. A holistic approach will enable more seamless sharing and movement of person data across the enterprise. A core aspect will be defining of institutional roles, particularly addressing multiple roles across the spectrum of our constituents – students, faculty, staff, and affiliates. Components of the project will include hardware, software, development of roles, mapping of systems to

institutional roles, workflow, delegated processes, and policy compliance. It is usually implemented by means of a metadirectory. This will be a joint project with AEA and Security.

10.5.2.4.1 <u>Metadirectory</u>

Directories across campus will be integrated into an identity management system by means of a metadirectory that will provide a singular mechanism to identify campus affiliation. Changes to a person's attributes can be instantly processed across all campus systems. This will apply to everything from library use to building access.

The University Directory will continue to be expanded to provide authentication and authorization to the institution's computing resources. All campus faculty, staff, students, and affiliates will be defined to the directory and will have attributes which further define status. All campus IT systems will use the University Directory and it will be able to facilitate authorization and access to systems.

A final phase is access to particular portions of a service or an application which may be at the functional or role level. A person may fulfill multiple roles related to any one service.

- FY07
  - Convene multi-disciplinary group within and beyond OIT to discuss the various aspects of identity management. Systems of record must be identified and the components of the metadirectory must be specified.
- FY08
  - Determine which components will be purchased via RFP and which components will be developed by OIT.
  - Determine methodology for real-time synchronization of systems of record.
  - Determine the levels of authorization needed for centralized applications. This may be at the functional or screen level.
  - Implement Phase I of the metadirectory which will include synchronization.
- FY09
  - Implement Phase II - application authorization based on the role of an individual.
  - Set up identity management access controls for new hires, transfers, terminations.
  - Set up identity management provisioning and de-provisioning.
- FY10
  - Further refine and expand use of single identity management system across all OIT systems.
- FY11
  - Further refine and expand use of single identity management system across all non-OIT systems.
- FY12-FY17
  - Implement technologies to continue to meet regulatory requirements and based on technological advancements.

10.5.2.4.2 <u>Active Directory Service</u>

Active Directory is a mechanism to define campus populations into groups with specific rights to campus services. Users will authenticate to Active Directory when starting up their computers. Specific policies can be implemented for user groups based on information within the Active Directory forest. LDAP will continue to be supported and the two environments will be synchronized. Active Directory must be used for some services that are Windows based. Moreover, Active Directory will enhance the user experience via authentication and policies governing the use, security, and patching of user computers. It will be utilized to push out security and operating system patches to servers across the campus. It will replace Novell for all file and print services. Departmental Novell services will continue to be supported for a period of two years after implementation of Active Directory.

- FY07
    - Design Active Directory to meet the needs of both centralized and distributed computing.
- FY08
    - Implement Active Directory for central services such as file and print, and authentication. Synchronize with LDAP and Directory services.
    - Permit use of expanded forest to decentralized services via a set of MOUs. No unit may alter the central forest. They may use that forest for local authentication of services.
    - Set domain controllers in multiple locations for redundancy.
    - Phase out Novell support.
- FY09
    - Utilize Active Directory to push security updates to campus in an automated fashion.
    - Utilize Active Directory for patch management.
- FY10
    - Utilize Active Directory to set group policies for clients.
- FY11-FY17
    - Maintenance mode.

10.5.2.4.3 <u>Shibboleth Implementation</u>

Shibboleth permits Web-based services to be extended to members of other institutions that join the InCommon Federation. An individual could use their local credentials to gain access to services at other institutions. Work has already begun in a joint project with the library which will be using the OIT Shibboleth credentials.

- FY07
    - Obtain licensing and membership in InCommon.
    - Work with library to change Shibboleth authentication to use centralized credentials.

- FY08
  - Determine parameters for federated services.
  - Begin discussions with other USM institutions to include common services and High-Performance Computing.
- FY09
  - Continue with integration of services across Federation.
- FY10
  - Be opportunistic on services that may be enabled using Shibboleth.
- FY11-17
  - Maintenance mode.

10.5.2.5 Collaboration services for OIT

SharePoint Server 2007 will provide OIT with a Web-based centrally located, document management and collaboration suite. SharePoint enables OIT to create individual team sites and Web portals that can be customized to meet OIT specific needs. SharePoint document libraries allows for approval, review, signature collection, and tracking for multiple formats of documents. OIT can define customized document management policies to control item-level access rights, retention periods, expiration actions, and document-auditing settings. SharePoint provides Web based form templates which can be used for tracking change management, configurations, disaster recovery, vulnerability mitigation, etc. The enterprise search feature enables high relevance document, people, and URL searching across the enterprise from local workstations. SharePoint also provides support for e-mail integration, contacts, calendars, tasks, project task management, and Really Simple Syndication (RSS) support. This is all accomplished utilizing a single sign on with directory credentials utilizing SSL for security. In addition, there are applications developed by a community of users and Microsoft that are free. Finance and Administration is interested in an application that automates resume collection and management. There is also interest in a shopping cart application for OIT's Software Licensing program.

Once implemented within OIT, the technology should be evaluated for wider use across the campus.

- FY07
  - Test SharePoint using Beta version.
  - Implement GA version of SharePoint.
  - Develop a temporary Active Directory forest for use with SharePoint.
  - Begin migration of TSS documents to SharePoint.
  - Develop document versioning and approval rules.
  - Implement project management via SharePoint.
- FY08
  - Implement resume review system.
  - Implement credit card SLIC application.
  - Expand use beyond TSS and Administration.

- FY09
    - Determine whether collaborative tool should be expanded to the rest of campus based on review of portal and Blackboard capabilities.
- FY10
    - Implement SharePoint to campus based on review
- FY11-17
    - Maintenance mode.

10.5.2.6 High-Performance Computing and Grid Computing

High-Performance Computing is a method to solve complex problems that would require weeks, months, or years to solve if using a single server. Applications can be developed that can make use of parallel processing in order to solve problems in a number of areas including the life sciences, physics, astronomy, and engineering to name a few. For OIT, the HPC initiative will be implemented in the beginning through clusters in a partnership with Dell and EMC. Over time, additional head nodes that control the clusters work will be needed as well as Infiniband, which is a fast internal network to connect the nodes for fast processing. It is also anticipated that additional message passing switches will be needed over time.

OIT provides access to the HPC cluster for research and classroom activities on a peer reviewed basis at no charge. Departments that want to add to the cluster rather than manage their own are welcome to participate in this project and will receive a usage allocation on the cluster based on their contribution.

For grid computing, OIT seeks to expand the grid to the university community as well as to other USM institutions and others over time. Grids are used to solve complex problems that can be broken into smaller parts and the work distributed over both server and workstation assets. Collector servers are needed over time to allow for multiple pools to which jobs are submitted. Multiple collectors will permit the use of more assets on and off campus and place those assets into classes based on the characteristics of the problem. A campus grid exists with more than 1000 nodes and is being used for research. As the campus grid moves toward Globus as the underlying framework, it will be put into production with a similar peer review process as for HPC.

- FY07
    - Hire HPCC manager to provide focus.
    - Expand cluster through cooperative agreement with departments whereby joining the central cluster alleviates the need for local system administration.
    - Set up HPCC area in Primary Data Center.
    - Set up secure grid collector to utilize more resources in a responsible manner by reviewing each application that is permitted to run on this collector.
    - Set up Grid Executive Committee and reconstitute Grid Steering Committee.

- FY08
  - Integrate grid authentication with Directory authentication.
  - Add client computers to grid as an opt in option for students, faculty, and staff.
  - Look at federated resources to expand grid computing across campuses.
- FY09
  - Expand head nodes as needed.
  - Implement Infiniband network for faster processing.
- FY10-FY17
  - Continue expansion of High-Performance Computing Cluster.
  - Continue adding resources of campus grid.

10.5.2.7 Web Hosting

The Webhosting service serves Web pages for approximately 300 Web sites as well as the nascent Web portal, currently under development. The infrastructure to support these services, both planned and in development, is designed to be robust with fail-over capabilities and to be able to withstand a broad range of limited system failures.

Included with a Web site is administrative support (OS support, backups, monitoring, etc.) as well as a set of basic resources (disk space, ColdFusion, php, perl, media streaming, etc.). In addition, it is possible for Oracle table space to be established for the use of an application. The current environment uses a tiered architecture and runs on Sun hardware running the Solaris OS.

Expected annual growth of the service will be driven by increasing use of and dependency on the Web for delivery of services, increasing dependence on data driven Web sites (includes more databases on the back-end and more sophisticated applications on the front-end), more captured and stored data by researchers and their applications, and increasing use of audio and video repositories whose content will be delivered via the Web. While it is very difficult to anticipate the rate of growth of each of these components, it is reasonable to assume a minimum annual growth rate of 15%-20% overall.

The majority of software currently used by the Webhosting environment is free. Software that is not free includes ColdFusion (application environment), StarNet (SSH), RealNetworks (streaming support), Websphere/JRun/Weblogic (provides the Java environments), and the Oracle or SQL Server database software.

FY07
- Combine the existing WebSphere infrastructure, used by administrative applications, into the Webhosting environment. It is anticipated that this new, combined environment will be able to function as the primary Web page delivery service for the campus for years to come.

FY08
- Implement and begin to offer Web services in Microsoft IIS environment, including support for ASP/.Net.
- Begin offering support for SQLServer.
- Renegotiate Oracle site license contract

FY09
- Evaluate alternative hosting environment for personal pages. The existing systems (WAM/Glue) provide for publishing of Web pages, which require the ability to navigate a UNIX environment. Consideration should be given for the possibility of implementing a new service offering which supplants this with a Web based system for publishing personal Web pages.

FY10 – FY16
- There will likely be new methods for construction and publishing of Web content, including new and updated tools for managing media, and more data-driven application environments (like ColdFusion, Perl, PHP, ASP, .Net, etc.) that customer demand will require. There may also be additional document types that need specialized drivers to serve. As such, it is difficult to determine future needs in this fast changing environment.

10.6 *Facilities Services*

The central information technology organization can play a crucial role in obtaining economies of scale in facilities services. Instead of each department devoting space and maintenance to small computer facilities across campus, a centralized space will be much more cost effective. This section details projects in this area.

10.6.1 Campus Requirements

Leading edge technology can not be attained without the proper facilities to support it. The University of Maryland must have a state of the art primary computing facility and secondary facilities for replication, redundancy, and disaster recovery. These facilities will house research, instructional, and administrative systems.

The campus requirements for central information technology facilities are as follows.

- Data center facilities to provide a secure facility with options available for disaster recovery
- Quality research computing space that passes IT audit standards
- Achievement of economies of scale in housing computing facilities across campus
- Redundant facilities for emergency operations

10.6.2 Initiatives

10.6.2.1 Primary Data Center Administrative Housing Service

OIT will make space available in the Primary Data Center for any campus unit's hardware utilized for administrative applications that contain sensitive data (e.g., FERPA data). Costs for installing (e.g., power requirements) and locating the hardware in the data center are to be borne by the department. Maintenance, upgrading, and systems administration of the equipment is the responsibility of the owning unit. An up-to-date contact list for all equipment in the data center to include point OIT staff, point non-OIT staff, maintenance vendors, and facility contacts will be maintained. Access to the data centers will be afforded to appropriate personnel on an as needed basis through auditor approved mechanisms. This computer room space will provide UPS backup, generator power and environmental facilities that will remain operational during a power outage. This space is to be provided at no charge to the owning unit. It is preferable to build a new Primary Data Center that can provide services to the entire campus community.

Until a new Primary Data Center is identified, upgrades to the existing Primary Data Center must continue, including generators, power, HVAC, Power Distribution Unit replacements, fire detection and suppression systems, and networking. Lacking a generator and multiple power and

HVAC feeds has led to campus outages with the resulting loss of services to the campus community.

- FY07-FY09
    - Add generators to Primary Data Center.
    - Add redundancy to base infrastructure.
- FY10
    - Continue upgrades or populate new Primary Data Center.
- FY11-17
    - Begin implementation of partial lights out Data Center.

10.6.2.2 Secondary Data Center

A secondary campus data center facility must be available to run replicated systems and to provide the primary space for research computers. This facility must have redundancy in building systems for at least the portion of the data center dedicated to enterprise computing systems. It will also have 24x7x365 monitoring that includes on-site staff, video, emergency detection systems, and facility monitoring systems. Redundant networking paths will exist to the site.

This site will be constructed in three phases. Phase 1 is the construction of space in the Secondary Data Center to contain 80 racks of equipment. Twenty-five of the racks will contain enterprise equipment and have UPS and generator coverage. The remaining racks will be for research equipment that will not have UPS or generator coverage. Phase 1 has been completed. Phase 2 is expanding the research space by another 40 racks of equipment to bring the total research space to 95 racks. Phase 3 is the inclusion of UPS and generator coverage to the 95 racks of research equipment.

- FY07
    - Space to house 80 racks of non-OIT equipment is available to the campus (Phase 1 completed).
    - Space to house an additional 40 racks (for 120 racks total) will be under construction (Phase 2).
    - A formal request to upgrade this space to include UPS and generator power will be made to the Facilities Council (Phase 3).
    - Space to house 120 racks of non-OIT equipment is available to the campus (Phase 2 completed).
    - Move some critical assets to Secondary Data Center as a local failover until there is generator power in the Primary Data Center.
- FY08
    - An upgrade of the computer room space to include UPS and generator power for the equipment and environmental facilities is to be under construction (Phase 3).

- FY09
  - Space to house 120 racks of non-OIT equipment is available to the campus with UPS and generator power for both the equipment and the environmental facilities (Phase 3 completed).
- FY10
  - Upgrades based on schedule for new Primary Data Center.
- FY11-17
  - Maintain data center space.

10.6.2.2.1 <u>Secondary Data Center Research Housing Service</u>

OIT will make space available in the secondary data center for any campus unit's hardware. The facility is called the Research Data Center (RDC). Costs for installing (e.g., power requirements) and locating the hardware in the data center are to be borne by the department. Maintenance, upgrading and systems administration of the equipment is the responsibility of the owning unit. An up-to-date contact list for all equipment in the data center to include point OIT staff, point non-OIT staff, maintenance vendors, and facility contacts will be maintained. Access to the data centers will be afforded to appropriate personnel on an as needed basis through auditor approved mechanisms. Initially this computer room space expects UPS backup to be part of the hardware rack that is located in the facility. In Phases 1 and 2, environmentals will not be available in the event of a power outage, but on-site operations personnel will facilitate the orderly shutdown of the equipment. After Phase 3 construction is completed on the secondary data center, all research equipment will be covered by UPS and generator. This space is to be provided at no charge to the owning unit. Network design/procurement/implementation in secondary data center will be necessary to provide similar networking speed and capabilities (Layer 4, automated fail-over, etc.) for the secondary data center.

- FY07
  - Finish construction of Phase 1 in the Secondary Data Center.
  - Move first research equipment into the Secondary Data Center.
- FY08
  - Plan Phase 2 of the data center including generator power.
  - Continue to offer research equipment housing service.
- FY09
  - Implement Phase 2
  - Plan Phase 3 of data center to increase capacity for collocation.
  - Continue to offer research equipment housing service.
- FY10
  - Implement Phase 3
- FY11-17
  - Maintain housing space.

10.6.2.3 Remote Data Center for Disaster Recovery

A remote facility must be available for disaster recovery purposes and must be at least five miles from the College Park campus. This data center will be a contracted site provided by the winner of the hot site RFP for mainframe services. An additional site must be identified for non mainframe applications that can communicate with the chosen mainframe hot site, as many applications use both mainframe and non-mainframe services.

- FY07
    - Identify data and application needs and tiers for mainframe hot site.
    - Determine bandwidth requirements for non-mainframe systems.
    - Define RPO and RTO for non-mainframe systems.
    - First of yearly tests of the mainframe hot site performed.
- FY08 (non-mainframe systems)
    - In declared disaster, sacrifice test environments at hot site for tier 1 applications and operate at 70% efficiency.
    - Acquire storage frame and determine mechanism(s) for continuous movement of data from primary to secondary sites.
    - Relocate test servers to secondary site.
    - Implement virtualization at secondary site for sharing of test and DR environments.
    - Determine and implement patch management and syncing of environments.
- FY09-17
    - Test hot sites annually.

10.6.2.4 E-mail and Web Services for Disaster Recovery

To provide a lower cost disaster recovery option for e-mail and Web services, a partnership will be created with another USM campus to trade computer room floor space so OIT can house e-mail and Web services equipment at the other campus and vice versa.

- FY07
    - Create a partnership with a sister campus for exchanging floor space for disaster recovery purposes.
    - Sign a bilateral MOU that outlines how the reciprocal computer room space will be used and the obligations of each campus.
- FY08
    - Move equipment in support of e-mail and Web services disaster recovery to the sister campus.
    - Test the ability to provide e-mail and Web services in the event of a disaster.
- FY09-17
    - Test e-mail and Web services disaster recovery capability annually.

10.7 *Finance and Administration*

For OIT to fulfill its campus mission, the functions performed by the Finance and Administration group must be done with increasing efficiency. This requirement translates into needing increasing automation and increasing staff skills both within the group and across OIT as a whole. Over the time frame of this plan, Finance and Administration will be undertaking initiatives that will increase the efficiency of OIT's administrative functions.

10.7.1 Campus Requirements

The campus expects OIT to be managed in an exemplary manner with respect to the processes used to accomplish common campus administrative tasks such as recruitment, inventory, and financial tracking. The initiatives proposed in this plan will be field tested within OIT and then made available to the campus as an enterprise solution. These solutions will be created in conjunction with OIT's Administrative Enterprise Applications Group.

10.7.2 Initiatives

Finance and Administration's initiatives fall into three major areas to drive the efficiencies needed in day-to-day operation. One is process automation. Paper processes and manual handling of data does not scale well to encompass an entire university the size of UM. Finance and Administration will be OIT's internal advocate for adopting new processes and procedures to satisfy this requirement. The second initiative area is leveraging university purchasing power to provide university departments, faculty, staff, and students a better value for their dollar. The primary examples of this are the Terrapin Technology Store and the Software Licensing program. The third initiative area is in organizing professional development across OIT. By consolidating demand and making the best use of training resources, substantially more training can be done for the same price. Finance and Administration will organize professional development for OIT and make available to the campus training opportunities that benefit from economies of scale.

10.7.2.1 Process Automation

The initial priorities for automation include the processes for searching and hiring new employees, reporting on OIT's financial condition, and managing inventory. The searching and hiring process is extremely paper intensive. It wastes natural resources, employee time, and is cumbersome to manage. The university's financial management system does not provide useful information to program managers who are ultimately responsible for overseeing budgets. The inventory process is very decentralized and managed differently in every unit.

Staff has conducted initial discussions with the School of Engineering and with the Business Applications unit of AEA to explore the possibility of using Engineering's recruitment system.

Academic Affairs has a system that might prove useful, and TSS is preparing to rollout Microsoft SharePoint which has an HR component.

In FY07, OIT became a user of Priority, a project level financial tacking system. Further effort is required to get this system integrated within Finance and Administration.

Inventory efforts to date have been limited to developing new procedures. Nothing has been done with regard to automating this process.

- FY07
    - Meet with Engineering for a demonstration of its HR recruitment system.
    - Investigate possibility of using Engineering's system for OIT.
    - Participate in SharePoint rollout for assessment of potential use by OIT for recruitment.
    - Participate in AEA evaluation of a campus-wide recruitment tool developed on behalf of the university's HR office.
    - Initial integration of Priority into OIT.
    - New inventory procedures.
- FY08
    - Expand OIT access to Priority for the purpose of retrieving financial data.
    - Initiate exploration of automated process for managing OIT's inventory.
- FY09
    - Implement automated inventory management process.

10.7.2.2 Leverage University Purchasing Power

OIT currently offers limited types of software for purchase by faculty/staff and graduate students at a reduced educational rate. A broader range of this supported software is needed to enhance service in this area. It will be necessary for OIT to negotiate expanded site licenses for needed software and to increase the distribution of this software to the university community.

10.7.2.2.1 Computing Purchase Service

The Academic Computers for TERPS (ACT) Program provides a consistent and cost-effective method for university students to acquire quality workstations for research and study. The workstations purchased through this service are pre-loaded with a standard image that includes the operating system and application software necessary for the student to immediately begin using it productively and securely on the university campus network. Included with this service is availability on site for warranty service work on the workstation should problems arise, and personal one-on-one assistance by trained Help Desk technicians for software and application questions.

Related to the ACT Program, is the recently opened Terrapin Technology Store. Opened in early November 2006, the store focuses on Apple Computers and other Apple branded products, such

as iPods. Like Dell products through ACT, Apple products are available to students, faculty and staff for personal use. Unlike ACT, these products are also available to campus agencies for institutional purposes. By channeling institutional sales through the store, OIT can achieve higher commission rates. Hopefully, these higher rates will allow OIT to cover its costs to operate the store, provide funding for student Help Desk operations, and share some of the return with campus departments by leveraging volume to reduce costs to the purchaser. To maximize the commission, OIT will need to aggressively promote institutional sales through the store.

Other than first year startup, no state funding is to be allocated for this service.

- FY07
    - Open retail operation as an Apple reseller.
    - Develop a formal Marketing Plan with updates done every six months.
- FY08
    - Hire a permanent store manager with responsibilities that include aggressive campus outreach to promote sales.
- FY09-17
    - Continue operation of the store.

10.7.2.2.2 <u>Software Distribution and Purchasing Service</u>

OIT offers licensed software for sale to university faculty/staff and graduate assistant students. This software is available for purchase with a valid university ID card at the Help Desk. The availability of additional software in this manner will be of great benefit for faculty/staff and graduate students to assist with their research needs. Suggested software packages that could be added include the Adobe suite and the Macromedia suite.

OIT's Software Licensing operation benefits greatly by leveraging software demand from higher education institutions across the entire state. The economies of scale produce tremendous cost savings for individual purchasers. This model needs to be pushed to as many software products as possible.

- FY07
    - Work with Terrapin Technology Store to coordinate sales of software.
- FY08
    - Aggressively survey campus to determine what additional software is needed to support students, faculty, and staff.
    - Report on results of survey and develop a prioritized list of new items to explore either through the Maryland Education Enterprise Consortium or independently on our own.
- FY09
    - Develop plan and budget for acquisition of top software priorities.
    - Initiate purchasing arrangements.

10.7.2.3 Professional Development

OIT's Professional Development Program is designed to allow OIT employees to develop a specific training program that will ultimately provide them with the experience and knowledge to further their career within OIT. The program will promote a professional learning environment that supports recruitment and retention of staff. Training programs can be designed around different career enhancing activities and can include, but not be limited to

- Professional Development Conferences and Seminars
- Skill Training Classes
- University Curriculum
- Certification

The first year of the program will focus on hiring a Program Management Specialist to develop the specifics of the program and oversee its annual operation.

- FY07
  - Develop Position Description Form (PDF) for Program Management Specialist.
  - Request new position in FY08 budget.
- FY08
  - Conduct recruitment for Program Management Specialist.
  - Research into other university professional development programs.
  - Survey OIT employees to define training needs.
  - Develop budget request for FY09
- FY09
  - Begin implementation.
- FY10
  - Assessment of first year of program.

10.8 *Networking and Telecommunications*

Networking and Telecommunications Services (OIT-NTS) provides secure, reliable, cost effective, leading edge communications infrastructure and services in support of the university's mission of research, teaching, and outreach. New network technologies are creating a revolution in technology environments that are fueling a growth spurt in information access and communications. The Internet, as a global networking infrastructure, has made the world a smaller and more demanding place.   Wireless computing has paved the way for an "anytime-anywhere connected" networking environment. This has introduced an always-connected user community that has extreme demands of mobility computing. This always-connected community is replacing old paradigms of teaching, learning, and research with newer and bolder ones. Powerful, mobile and intelligent computing devices are transforming communications and the manner in which information is accessed. Recent advances in convergence technologies not only promote the convergence of a single physical IP infrastructure, but also introduce convergence of feature-rich services.   It is imperative that an obvious "Value over IP" proposition is designed into the network. A new networked environment must be created that meets the demands of the current and future communities in higher education.

10.8.1 Campus Requirements

Campus requirements for networking and telecommunications are complex and vary according to the campus function. However, there are a base set of functions that should be available across campus as described in this section.

10.8.1.1 Convergence Services for a Learning and Research Community

Efficient communications and information access are key to the success of any community. Convergence technologies are playing a pivotal role in bringing about a powerful and revolutionary change in this area which will render many devices, such as the traditional telephone handset, obsolete. Online convergence services are providing integrated services in a single environment. The converged network will provide the following tightly integrated services:

- Integrated Multi-Media Online Communications Services: A common interface will be available for communication services. Communications services will range from voice to data to video. This service will be provided by an online application environment. Integration with personal productivity tools such as calendaring and directory services will be tightly coupled with these services.
- Collaboration and Conferencing Services: An integrated solution will be available that provides voice, video, and Web collaboration services. This service will essentially create a campus-without-perimeter environment where conferencing, collaboration, and instruction can be provided via robust IP solutions.

- Multimedia Content and Information Services: The network will provide quick and efficient access services to media-rich and diverse content. This would mean accessing information from online knowledge/data repositories to cable IPTV content. Efficient and reliable access methodologies will be available for these services.
- Seamless Transition Communication Services: With mobility dominating the landscape, non-interruption of services is a must. In the course of using a service, such as voice services, a mobile user will transition from one environment to another. For example, while using the university's voice services, the mobile user may find him/herself in a cellular infrastructure. In such a situation, seamless transition of services will occur such that there is no interruption in service.

10.8.1.2 Accessing the Ubiquitous Information Environment

With the advent of wireless technologies, the information environment has indeed become ubiquitous. It is both pervasive and nomadic. This rich, ubiquitous computing environment has become very complex with the array of devices that can now connect to this environment. They range from desktop machines, to hand-held mobile devices, and even "network-enabled" consumer machines such as washing machines. End-users are putting extreme demands on access methodologies to the ubiquitous information environment.

- Media Agnostic Access: Networks are now connected in two ways – using wires and using the air. It is imperative that consistent and reliable access to the network be enabled regardless of whether the access is through a wired or wireless infrastructure. Access and services will be guaranteed regardless of the type of media being used as the conduit for access.
- Device Agnostic Access: There has been an explosion in the number of devices that are "network-enabled." There is now heterogeneity in the ability to access a networked environment. Access will be enabled from a wide range of machines and devices, including desktops, laptops, Blackberrys, PDAs, cell phones, cash registers, and wireless scanners, to mention but a few.
- Distance and Location Agnostic Access: In today's world, mobility is the norm. Users are everywhere and anywhere and expect access to the network at all times. Mobility ranges from being mobile on one's campus to being on international travel. It is imperative that distance and location from resources and services not be an impediment to access. Access will be available at all times and from anywhere.
- Secure and Trust Based Access: With access being ubiquitous, it is imperative that the access is secure. Furthermore, with access comes the offer of services and resources. It is imperative that the access is authorized, authenticated, and trusted. Also, once the access is authorized, a secure environment based on trust models should be established so that services and resources are not compromised.

10.8.1.3 A Robust and High-Capacity Network Architecture and Operations

With a single IP network supporting a suite of converged services with ubiquitous access, the network architecture must be robust, rock-solid, modern, and flexible. Such networks support online communications environments, enterprise applications, distributed resources, and collaboration. They are typically over-subscribed in services. The architecture has to be intelligent and scalable to accommodate the needs of such a complex computing and service environment. Similarly, the operations of the network must be robust, solid, and reliable. Some elements of the architecture and operations include the following:

- Rock-Solid Architecture: The network is the foundation upon which all IT services and solutions are built; therefore, the architecture must be robust, solid and modern. It will be resilient to network and power failures. Multiple levels of redundancy will be designed into it to support five 9s reliability. The network should support a framework for distance education and e-learning, the high-end and eclectic needs of researchers, and, in general, be the infrastructure for media-rich communications.
- A Network with a Security Framework: The ubiquitous network is host to very valuable and sensitive information assets. These assets either traverse the network while "traveling" or reside on network connected repositories. Therefore, it is imperative that the integrity of these information assets not be compromised. The network architecture will have a strong security component built into it, so that access is authenticated and authorized, communications are secure, and a model for trust is maintained.
- A Network with Quality of Service: The single converged network has an immense responsibility as it is the singular infrastructure upon which all services rely. The network will be designed such that there is an intelligent and cohesive model for packet delivery so that there is a guarantee of the delivery of mission critical services.
- A High-Capacity Network: The network will be designed to be a high-capacity and bandwidth abundant network. Bandwidth capacity should be guaranteed and adequate at all times. Services such as on-demand high bandwidth will be offered. The ability to assign dedicated "lambdas" (10 Gbits/second) will be an expected service of the network. Traffic engineering will be employed to shape campus traffic for an equitable distribution of bandwidth usage and provisioning.
- A Network Tightly Coupled with Middleware Services: Grid computing has emerged as a cost-effective approach to compute intensive analyses. This paradigm of computing is essentially a federation of computational services (CPU cycles, data storage, etc.) that can be scheduled to provide on-demand and utility services computing. Another phenomenon that is placing new demands on the network is the employment of intelligent IP-enabled sensor devices. These "sensor devices" are undergoing explosive growth with the advent of wireless technologies. They range from intelligent wireless access points with embedded location determination services using RFID technology to IP-enabled telescopes. Both grid computing and sensor device technology rely heavily on middleware services for security and resource scheduling and sharing. It is imperative that the network be tightly coupled with middleware services to be able to service the needs of future "sensor and grid-services networks."

- A Highly Connected Network: For the network to be effective in supporting the needs of a global community of students and researchers, it must be highly connected. The communications network shall be well-connected with regional, state, national, and international networks.
- A Network for Research: The network architecture shall be such that it can be segmented to support the main production network as well as a network on which network research can be conducted. The latter can tolerate breakdowns and on-demand configurations to aid research and will not in any manner affect the production network.
- A Network Operations Center (NOC): For the network to be rock-solid, robust, resilient, and highly reliable, it is imperative that it is proactively monitored and managed. Such monitoring must occur 24x7x365 to guarantee overall health and to provide five 9s reliability of service. The operations center will be equipped with modern tools and processes that will actively monitor all links, network components, and services. A highly skilled staff will operate the NOC and will respond to all warnings, alerts, and emergencies within a framework of best practices and procedures.

10.8.1.4 A Sustainable Funding Model for an Always-Modern Communications Infrastructure

The current network infrastructure is not modern. To deploy and maintain a refreshed modern IT infrastructure, the university must recognize the critical and strategic role of the network to the institution's research and education mission and, therefore, make it a priority for capital investment. Additionally, to keep a modern IT infrastructure always modern and current, a sustainable funding model must be defined. The following are some elements that would be fundamental in such a model:

- Institutional Recognition: There needs to be institutional recognition of the mission critical nature of the network infrastructure, which is, in essence, the foundation of all IT services.
- Consistent and Reliable Funding: Currently, the network infrastructure is funded on a charge-back model, which is fundamentally unreliable. Revenue generation varies from year-to-year. For a network to be well-maintained and kept modern, there needs to be consistent and reliable funding. Such consistency aids in good planning and guarantees a certain level of service at all times.
- Base Funding: The network infrastructure is a candidate for base funding. It is a university asset and investment that requires constant upgrades and regular maintenance. Funding spikes typically occur when an asset has fallen into disrepair and requires immediate attention. Such reactive responses to funding should be avoided when preserving and shaping strategic university assets like the network infrastructure.
- Funding for the Future: The network is the university's electronic technology nervous system. Like most of technology, its future is a moving target. To stay on the cutting edge, investments must be made in the infrastructure to embody tomorrow's vision.

Such investments require a stable and typically projected funding stream. It is recommended that such funding be reviewed annually to ensure adequacy.

- Annual Funding Reviews: The network infrastructure is an expensive investment. Expenses associated with maintaining and upgrading this infrastructure should be subjected to annual reviews so that the funding model remains current and modern.

10.8.1.5 The Sandbox of Tomorrow's Innovative and Emerging Technologies

Higher education has traditionally been an aggressive adopter of technology. It is important for the network to stay ahead of the technology curve. Indeed, the university should play a leadership role in defining and adopting emerging and innovative networking technologies. OIT should take an active role in partnering with the research community in exploring future technologies. The university's research community has ongoing research in the area of networking. This research should be leveraged to test the technology and its possible adoption for future production deployment. Partnering with campus researchers is imperative. For these same reasons, partnerships with entities such as Internet2, the Mid-Atlantic Crossroads, and National LambdaRail are equally important. Such partnerships provide leadership opportunities and visibility for the university.

Similar partnerships with vendors should be established to drive the development and testing of future technologies. The network will be in a state of continual expansion, in that the latest and emerging technologies are being researched, tested, and, ultimately, provisioned in the production network as enhanced services. The network shall be an early adopter of future technologies.

10.8.2 Initiatives

The following is a list of initiatives in support of the above requirements. Many of these will be enabled by the campus network refresh program.

10.8.2.1 Converged Network

Converged services aspire to deliver services in a unified model. Users should no longer have to use a traditional telephone handset to make/receive phone calls. They should not have to depend on a laptop or desktop computer to do e-mail. The goal is to bring all these services onto a single unified interface on any and all devices. End-user devices should be the choice of the end-user. Service delivery should be possible on any type of end-user device, whether it be a laptop, PDA, cell phone, or Blackberry, etc. Additionally, services should be content agnostic – they should be able to send and receive content in the form of voice, video, and data. Access methods of these services should also be diverse. It should not matter whether a user has wired, wireless, or cellular capability – the service should be accessible. Such convergence – of access methodologies, of content type, of end-user devices, of services – is creating a new breed of unified and integrated services that lend themselves to flexibility, efficiency, and service-

richness. Following are some initiatives in support of this higher-level strategic service delivery initiative:

- We must provide telephony services using Voice over IP technology solutions. This initiative leverages the converged communications infrastructure (indeed, it is the impetus for creating the converged network) by providing telephony services using the VoIP technology solution. This initiative will bring feature-rich telephony services to a multitude of end-point devices ranging from softphones on laptops to PDAs. Indeed, faculty, students, and staff could have access to a broad range of sophisticated applications and tools designed for communicating and collaborating with each other. These applications and tools will provide integrated support for video and data services. Indeed, they could render the traditional telephone handset obsolete.

- We must partner with cellular service providers so that the university's communications infrastructure and services can integrate with cellular services. This benefit ties directly into integrating our services with cellular service. For example, by integrating, we could have seamless transition from wireless (802.11 a/b/g) voice services to cellular services. This will also support service such as "follow-me" telephony services.

- We must implement video over IP services. This initiative offers a complete line of advanced services for videoconferencing, distance learning, e-learning, broadcast, video-on-demand, security surveillance, and cable-TV over IP network.

- We must partner with content providers to deliver IPTV services over the converged IP network. This initiative adds a rich functionality to the IP communications infrastructure. IPTV is gaining traction in providing television/cable services over IP networks. This will be realized in partnership with content providers, with content including international, educational, and entertainment television programs. This initiative is also a new avenue for generating revenue as a pay-for-service "value-add" service on the converged network. Currently the university's residential student population receives cable TV services from Comcast, giving Comcast a captive audience of 10,000+ viewers. In pursuing this initiative, there is revenue generation opportunity and better pricing for the university community. In offering this service, we would be offering services akin to "Tripleplay" - an expression used by service operators describing a consumer package including telephony, data, and video.

- We must provide unified and integrated messaging services. Personal productivity tools, such as one-stop message management, are becoming the norm. With this initiative, messages such as e-mail, voice mail, and faxes can be accessed from a common interface. This tool would be tightly integrated with other services such as calendaring. The desired state should be a unified interface to message and calendaring management.   The service would be tightly coupled with middleware services, which play a pivotal role in granting access and authorization rights and providing enterprise directory search capabilities.

10.8.2.1.1 Converged Multimedia Collaboration Services

Services in the area of teleconferencing and videoconferencing are currently limited. In teleconferencing, services are available for voice conferencing through traditional technology means. With the VoIP RFP being awarded, some limited IP-based conferencing solutions will be available. In videoconferencing, most conferences are ISDN and some IP-based. Plans are being developed to offer an enterprise-wide converged multimedia conferencing/collaboration service. This may entail acquiring a scalable solution that will ride upon the converged IP communications infrastructure.

By the end of FY10, an enterprise-level converged IP-based multimedia conferencing/collaboration service offering is to be available.

- FY06
    - Limited and traditional voice and video conferencing services available.
- FY07
    - The VoIP RFP issued in FY07 includes a module for an enterprise-level IP-based conferencing/collaboration technology solution.
- FY08
    - An enterprise-wide solution will be in place and production services will be available.
- FY09 – FY17
    - The solution will be continually enhanced to keep up with growth and demand. Technology refreshes will be applied regularly to maintain current solutions.

10.8.2.1.2 Internet Protocol Television (IPTV)/Cable TV Service

Currently, residential students are offered cable TV by service provider Comcast using traditional cable-TV technology. There is no IPTV service available at the enterprise level. Video content is offered in classrooms by services available on the coax video network.

IPTV is the next generation of technology that can provide video using the IP network. In partnership with content providers, we will provide IPTV content including international, educational, and entertainment programs. This service will be available on the converged IP network. It leverages the asset and brings in revenue. Consumers, in the form of residential students, now will have choices other than the commercial service provider Comcast.

- FY07
    - A plan is being developed to bring such a service to the university community.
- FY08
    - A pilot is in place to offer such a service.
    - An enterprise-wide solution will be in place and production services will be available. This service will be available in buildings where the network has been modernized.

- FY09
  - This service offering is fully leveraged and subscribed. Residential students are migrating over to this campus offering.

10.8.2.1.3 Multimedia Short Messaging Service

There is no campus service currently in place to offer enterprise-level multi-media short messaging services. Such services utilized by faculty, staff, and students are provided by external companies (such as text messaging on cell phones) with varying levels of security.

An enterprise-level converged IP-based multi-media short messaging service offering should be available by the end of FY08. This service would offer mobile multi-media instant messaging available via message notification applications. These applications are tightly integrated with middleware services and other enterprise applications such as course management systems, residential housing systems, etc. For these services to be effective they must be closely coupled with cellular service (or whatever the prevailing mobile communication technology is at the time)

- FY08
  - A plan is being developed to bring such a service to the university community.
- FY09
  - A pilot is in place to offer such a service.
  - An enterprise-wide solution will be in place and production services will be available.
- FY10 – FY17
  - The service is continually enhanced to keep up with demand and technology changes.

10.8.2.1.4 Telephone Service

VoIP service is currently offered in selected colleges/buildings including the School of Engineering and the School of Business. The rest of the campus is currently served by traditional telephone services delivered via our legacy TDM-based voice solution.

It is envisioned that by June 30, 2010, telephony services will be delivered primarily by employing VoIP technology solution. From July 1, 2007 – June 30, 2010 a phased approach will be implemented for the deployment of VoIP services. By the end of this timeframe, voice services will be available on multitude of devices like telephone sets, PDAs, and laptops. The service can be accessed by the wired and wireless networks.

- FY07
  - VoIP services available in select buildings, such as the Kim building. QoS will be enabled on the backbone and in all buildings that have VoIP services. A VoIP RFP award should be in place that dictates the technology solution.

- FY08
  - Enterprise-wide VoIP service implementation begins. Roll-out of the services is implemented in conjunction with a multi-year phased approach of building infrastructures and technology upgrades.
- FY10
  - VoIP services will be available to the community at large. QoS will be enabled on the entire IP network (wired and wireless).

10.8.2.1.5 Unified Messaging Service

At this time, an award for VoIP services should be made in FY07. This will put in place a technology solution for ongoing telephony services. At this time, a small pilot testing Unified Messaging services will be wrapping up. Plans for making such an offering campus-wide will begin.

The goal is that by June 30, 2009, all messaging services (e.g., e-mail, voice mail, fax, IM) will be accessible on a unified and integrated interface. Checking for voice mail by dialing into a telephone handset is not the primary means of voice message retrieval. Fax messages do not have to be retrieved as hardcopy fax messages sent to fax machines. The unified message access interface is available on any and all end-user data devices. This interface will be feature rich with a multitude of data services such as calendaring, multimedia messaging services, etc.

- FY07
  - Unified messaging pilot concluded. Planning for a campus-wide offering begins.
  - A unified messaging solution is identified and proposed for funding.
- FY08
  - Unified messaging services roll-out begins.
  - Unified messaging services will be available as an enterprise-level service.
- FY09
  - Unified message is kept current in its technology solution and scaled to serve campus needs.

10.8.2.2 Legislated Requirements

Legislated requirements are a common occurrence in the information technology space due to mandates for privacy and accountability. An example is the Family Educational Rights and Privacy Act (FERPA) that protects the privacy of student records. New requirements must be implemented as they become law.

10.8.2.2.1 Communications Assistance for Law Enforcement Act

On September 23, 2005, the Federal Communications Commission (FCC) released an Order and Further Notice of Proposed Rulemaking applying for the first time the Communications

Assistance for Law Enforcement Act (CALEA) to facilities-based broadband Internet access providers, including higher education institutions, K-12 schools, libraries, and interconnected VoIP service providers. The order requires these entities to facilitate lawful requests for surveillance of specific communications on their data networks through a combination of new equipment, trained personnel, policies, and procedures, to be in place within 18 months of the filing of the ruling in the Federal Register. This would impose substantial new costs on the institutions involved. (The old CALEA rules applied to telephone companies and focused on modifications in telephone equipment to assist with lawful surveillance of telephone calls.)

In addition to requiring compliance of all institutions within 18 months of publication in the Federal Register, this FCC order also seeks to identify procedures through which exemptions from some of the CALEA requirements might be granted to certain types of organizations in the future. The FCC also proposes to issue another order in the future to discuss the exact nature of the CALEA capabilities for Internet access, appropriate compliance extensions, the absence of cost recovery, and how enforcement will be addressed.

Notification of this requirement was published in the Federal Register on October 14, 2005 and starts the clock for the 18 month compliance requirement. (Source: http://listserv.educause.edu/cgi-bin/wa.exe?A2=ind0509&L=icpl&T=0&F=&S=&P=903)

- FY06
  - The University of Maryland files a response to the CALEA request for input and advocates that the university be exempt from the provisions of CALEA due to the financial hardship imposed for very little gain.
  - Clarification expected on the requirement for universities to comply with CALEA from the Federal Communication Commission.
- FY07
  - The University of Maryland, in consultation with its legal counsel, comes to the conclusion that its campus network is a private network and therefore claims exemption from CALEA compliance. Developments in this area are closely monitored should compliance definitions be changed which could affect Maryland's status.
- FY08
  - Compliance to CALEA is required by April, 2008 unless the FCC voids this requirement.

10.8.2.3 Network Access

As has been expressed, convergence is occurring at multiple levels. One level is the manner in which a network is accessed. In the traditional model, wirelines were primary in building networks. With convergence, wireless networks expand the footprint of networks and expand the manner in which services are accessed. In the old model, services were accessible when one was stationary. Wireless networks have added the capability of mobility to service access which adds a level of richness to the user service experience. Additionally, end-user computing devices

are getting smaller, more powerful and with attractive form factor functionality. Listed are initiatives in support of this effort:

Expand the wireless network footprint for anywhere and anytime service delivery. This initiative directly ties into anywhere and anytime service delivery that spans the campus footprint. This includes both Wi-Fi and WiMAX efforts.

Enable a heterogeneous group of devices to access the network. End-user devices are becoming very powerful computing devices with tremendous capabilities. Network access and access to converged services will be available via these devices.

10.8.2.3.1 <u>Dial-In Modem Service</u>

The usage of this service on campus has been declining over the past three years, but there are still approximately 400 simultaneous users using the modem pool at peak periods. However, the widespread presence of home broadband and DSL connections render this service obsolete.

This service will be phased out over an 18 month period (by June 30, 2007). At that time, only a small bank of modem pools will be kept for emergency use only by systems staff.

- FY07
    o The public modem dial-in service is discontinued.

10.8.2.3.2 <u>External Network Connectivity Service</u>

This service is our connection to the commercial Internet and to other networks such as the Abilene Network, National LambdaRail (NLR), Mid-Atlantic Crossroads (MAX), and USM's UMATS network. Currently our connection speeds are 1 Gbps to Internet2 via MAX, 155 Mbps to the commodity Internet (Quest via MAX) and 500 Mbps redundant commodity Internet (via Cogent).

As the bandwidth capacity of the network expands, so will our connection to the outside world. Also, with partnerships with entities such as NLR, we could potentially have point-to-point connections at 10 Gbps waves/lambdas.

- FY06
    o Evaluations will be made on the need for more bandwidth capacity to the commercial Internet and to other networks like Internet2.
- FY07
    o With campus network capacity growing, a recommendation will be made for additional funding to acquire increased bandwidth.

- FY08
    - Outside connection bandwidth will most likely increase. It is also projected that the MAX/MATP partnership will be solidified. This would entail that we will be in partnership with NLR and would leverage the bandwidth resources/services with this entity.
- FY09
    - It will not be unusual to have dedicated multiple point-to-point 10+ Gbps connections to many research units within the university (such as UMIACS, ISR, etc.). These point-to-point high capacity "pipes" can go from UMD to any other node in the international network. Indeed, high capacity links may also be used to facilitate on-demand utility grid computing needs.

10.8.2.3.3 Wireless Network Service

The wireless network footprint provides support for about 30% of in-building coverage via approximately 900 access points in early FY06. By June 30, 2009, wireless network services should be available in all academic and administrative buildings on campus. Some outdoor wireless network coverage will be attained via 802.11a/b/g from in-building service spill-over as well as with 802.16e WiMAX services when they become production-ready – possibly in FY09.

- FY06
    - 802.11 a/b/g wireless network services are available in all academic buildings including the McKeldin and Hornbake libraries.
- FY07
    - Plans are underway to expand wireless services to 45 student residence buildings (state supported buildings).
- FY08
    - State supported student residences have in-building wireless coverage.
    - 802.16e WiMAX test bed will be created.
    - 802.11 a/b/g wireless network services will be available in all major administrative buildings on campus. Outdoor coverage hotspots will be available via 802.16e.
- FY09
    - 802.11 a/b/g services will be available in all academic and administrative buildings residence halls. The network will be all pervasive. Extensive outdoor coverage will be available via 802.16e services or whatever the prevailing technology solution is to achieve outdoor coverage. Technology enhancements from 802.11 a/b/g to 802.11n and onwards are kept current.

10.8.2.4 Network Architecture and Operations

With networks converged onto one IP network infrastructure, so are services. Such converged networks are clearly multi-service networks. The challenge is mainly one of architecture and operations. The network needs to be designed such that multi-service delivery is assured,

scalability is embedded, flexibility is possible, and security is pervasive. A certain degree of physical currency should be maintained throughout the physical infrastructure (in terms of modern cabling, network equipment, etc.). Operating such a network is just as complex. Five 9s reliability must be the goal of the network uptime. Listed are some efforts in support of this initiative:

- Upgrade building wiring to the latest wiring standards in support of end-to-end very high bandwidth provisioning. ***Benefit*** -This initiative directly ties into creating a solid and robust converged network, which is the foundation of all IT services. In this effort, all networking closets shall be modernized with robust environmentals and power resiliency resources.

- Redesign and architect the network from backbone core design to distribution layer design. ***Benefit*** – This initiative is imperative for the support of a converged network that will invariably be over-provisioned and over-subscribed. Design elements will include and will not be limited to, redundancy, power resiliency, scalability, flexibility (the ability to segment the network by function), expansibility, and security. The design will also include the support of advanced protocols such as IPv6.

- Collapse the existing three disparate communications transport infrastructures into a single converged IP transport infrastructure. ***Benefit*** – This initiative relates directly to providing converged and integrated services over a single IP transport layer. It also has tremendous cost benefits in the support of a common and single infrastructure and support personnel. This initiative is being realized by the VoIP efforts currently underway.

- Design and build a network security framework. This initiative provides the security required for secure communications and includes authentication, authorization, encryption, intrusion prevention, and access prevention. It will be realized via an 802.11x framework, VPN services, IPS services, and firewall services, to list but a few.

- Shape campus traffic. The initiative ensures that campus network bandwidth capacity is adequate at all times. Currently traffic shaping occurs in the dorm network only. The service should be extended to the rest of the network.

Partner with organizations such as MAX, National LamdaRail (NLR) and Internet2 (I2). This initiative is imperative for being on the cutting-edge of technology services, for being early investigators of and adopters of technology solutions, and for provisioning high-end network services. By partnering with such organizations, we not only expand the level of our "connectedness" but also get an opportunity to collaborate in the investigation and research of new network technologies. Furthermore, by partnering with entities like the NLR, opportunities become available for subscribing to high-end and very high-bandwidth network services whose reach and scale is of the international level. If, say the department of Physics, required reliable and dedicated very high-bandwidth network connectivity from UMD to CERN in Switzerland, NLR could provision such services.

10.8.2.4.1 <u>Campus-Wide Traffic Shaping Service</u>

In FY06, traffic shaping was implemented in the dorm network due to the high bandwidth demands of the resident students. Enterprise-level traffic shaping needs to occur to ensure adequate capacity and equitable distribution of available bandwidth exists for routine university operations. This enhancement to the traffic shaping process is scheduled to be implemented in FY07.

- FY06
    - Traffic shapers are turned on for all of campus. Shaping does not occur, however, passive observation of traffic patterns is done and data is recorded.
- FY07
    - A plan is developed for enterprise-level shaping. The plan will propose traffic shaping policies.
- FY08
    - Enterprise-level traffic shaping is in place.

10.8.2.4.2 <u>Data Network Service</u>

Wired data network services are currently available in all campus buildings with minimum service levels at switched 10 Mbps to the desktop. The wireless network services are expanding and are addressed in the next section. At this timeframe, 80% of buildings on campus have Category 3 cable which limits data service to 10 Mbps to the desktop. The remaining 20% of buildings have service levels of 100Mbs to the desktop and above (with the Kim building at 1000 Mbps to the desktop capability). Backbone services are at gigabit speed. All large buildings have dual connected 1000 Mbps uplinks to the backbone. Smaller buildings have dual connected 100 Mbps uplinks to the backbone.

It is strongly recommended that, by June 30, 2009, all campus buildings have cable upgrades bringing them to Category 6-Augmented or better (or whatever is the latest standard in wiring that can achieve very high speeds). The minimum service level for all buildings should be at switched 100 Mbps with higher speeds (such as switched 1 gigabit/10 gig to the desktop) in many major buildings such as Kim, Physics, Martin Hall, Van Munching. A 10 gigabit backbone will be in place in this time frame. All large buildings have dual connected 10 gigabit uplinks to the backbone. Smaller buildings should have dual connected 1 gigabit uplinks to the backbone.

In addition to building wiring, the network closet equipment must be upgraded on a periodic basis to ensure we can implement current protocols (such as quality of service and IPv6). With approximately 1000 network closets on campus, this will add a significant cost to the baseline networking budget requirements.

- FY07
    - The Physics building will be the first building with a 10 Gbps dual uplink to the backbone. The backbone will be operating at 10 Gbps speeds

- FY08
    - The first phase of a 10-year network refesh cycle begins. Several campus buildings have upgraded cabling. Network gear in closets is refreshed and made current. Minimum service levels for buildings are increased and modernized for their building network classification.
- FY09 – FY17
    - The campus network refresh cycle is in operation. Buildings come up for refresh each fiscal year. Cabling is upgraded, network gear is made current, backbone uplinks are increased, and service options are made current.

10.8.2.4.3 Firewall Service

Enterprise-level firewall service is currently offered to a few select customers with critical security needs. This service has been piloted for about one year. The plan is to make it a full-blown scalable service on the network.

In FY07, enterprise-level firewall services should be offered. Policies are in place for firewall configuration and management. Administrative processes are to be established for the management of firewall services that could potentially scale across 1000+ VLANs.

- FY06
    - Firewall service is offered to select customers. Plans for enterprise-wide deployment have been developed.
- FY07
    - Firewalls are installed at the perimeter of the data center to comply with state audit requirements. Other campus requests are examined and brought online on a case-by-case basis.
- FY08
    - A campus-wide enterprise-level firewall service offering is in place with policies and administrative management procedures in place.

10.8.2.4.4 Intrusion Prevention Service

In FY06, services in the area of intrusion prevention exist in the form of intrusion detection and reactive responses to the detection. An RFP for an intrusion prevention system (IPS) solution will be awarded, which will dictate the technology solution.

Enterprise-level intrusion prevention services will be available starting in FY07. This service will act as a first-line-of-defense security mechanism that is required by the state auditors.

- FY06
    - An award for an IPS RFP was made, and the IPS was deployed. The situation is assessed accordingly and is scaled up on an annual basis, as appropriate.

- o Enterprise-level proactive intrusion prevention services are in place at the campus network border.
- FY07
  - o State audit requirements expect intrusion prevention services at the entry point into the data center. An IPS is installed and operated at this site.
- FY08
  - o Intrusion prevention services are expanded to points in the network where it makes sense. The services are nimble enough that they can be engineered to fit the needs and topology of the network.

10.8.2.4.5 Security Framework for 802.1x Network Service

The wireless network footprint will be continually expanded for the foreseeable future. In FY06, security in terms of end-user authentication, authorization, and encryption are offered via the Vernier wireless solution and VPN technology solution.

An 802.1x security framework must be designed, established, and fully integrated into the data network. The 802.1x IEEE standard is designed to augment the security of wireless network. The framework applies to not just WLANs but to wired LANs as well. It is a scalable, robust, and standards based solution for an enterprise network like the UMD network.

- FY06
  - o 802.11 a/b/g wireless network services will be authenticated using the Vernier technology solution. An 802.1x framework will be designed and tested.
- FY07
  - o A campus-wide 802.1x production framework is in place and operational servicing the wireless networks.
- FY08
  - o Plans are in place to offer enterprise 802.1x production services for both the wired and wireless networks.
- FY09
  - o Enterprise level 802.1x services are available to all hosts on the UMD network.

10.8.2.4.6 Network Operations Center (NOC)

NOC services are currently provided by student employees and also existing FTE staff (on a part-time basis) who have other primary duties. A fully functional enterprise-level network management system is not fully deployed.

A full-fledged NOC needs to be operational in FY07 for rapid network problem reporting and troubleshooting. The network and services must be proactively monitored to ensure reliable and secure network operation. The UMD OIT/NOC is taking on significant responsibility and assuming a role similar to the Indiana/Abilene NOC.

- FY07
  - A proposal is submitted for the creation of a 24/7/365 enterprise-level NOC.
- FY08
  - Phase I for the creation of a NOC begins. The NOC is well-defined with state-of-the-art tools, processes, and procedures. It operates at 8/5/365 with weekend coverage via on-call processes.
- FY09
  - Phase II of NOC begins. By the end of FY08 the NOC is fully created. It is now operational 24/7/365.
- FY10
  - The UMD OIT/NOC is now a regional operations center with clients the likes of MAX/MATP. In essence, it is operating as a "Washington Metropolitan Abilene/NOC."

10.8.2.4.7 <u>Network Quarantine Services</u>

It is imperative that hosts that connect to the network are "clean" and "virus/germ free." The network will provide services that check the health of a host that is requesting connection to the network. After initial authentication and authorization services are complete, the host will be subjected to a health check. If deemed "healthy," it is authorized to connect to the network at the appropriate level of connectivity. If it is deemed "infected or unhealthy," it will be put into a "quarantine segment" of the network. The host, at this time, will be "treated" for its "infection" by installing software patches if able or by making recommendations to the host owner on treatment options. After the treatment is administered, the host is checked for good health again and then removed from the quarantine network and allowed to connect to the campus network at its authorized level of connectivity and services.

- FY08
  - A proposed design for a quarantine network is under discussion with NTS engineers and operations in partnership with OIT security. The discussions will include technical design as well as processes and procedures.
  - A test quarantine network is piloted. Design and processes/procedures are further refined. A project plan with a request for funding is included at the end of the fiscal year for enterprise level implementation.
- FY09
  - An enterprise level service is available. NTS will train USS in managing the service from a user support perspective.
- FY09 – FY17
  - The service is continually expanded for scope, growing scale, and to keep the technology service current.

10.8.2.4.8 Enterprise Dynamic Host Configuration Protocol (DHCP) Services

The Dynamic Host Configuration Protocol (DHCP) is a set of rules used by a communications device such as a computer to allow the device to request and obtain an IP address without human or manual intervention. This allows rapid access to the network for authorized users. Currently DHCP services are available to dorm students and to some segments of of the campus network (e.g., wireless network). The goal is to offer enterprise DHCP services to hosts on the network. The current model of IP address dissemination and management is closely tied to the billing model of network services. This model will evolve to allow enterprise DHCP services as well as accounting of network hosts and related service fees.

- FY08
  - NTS engineers propose an enterprise design and process for offering DHCP services.
  - Pilot the service.
- FY09
  - Enterprise-wide DHCP services are offered.

10.8.2.4.9 Data Rate Increase and Dorm Phone Service Fees Increase

Data communication fees will increase by $1.00 per month from $4.00 per month to $5.00 per month. The increase will apply to faculty, staff, and students. This fee increase is necessary to support routine operations costs and to provide funds for the periodic network refresh. This fee increase has been approved by the Finance Committee.

- FY08
  - Start of 10 Year Plan. The Infrastructure Refresh Advisory Committee (IRAC) will make recommendations for which buildings should be refreshed each year.
- FY09 – FY17
  - Annual review and progress report.

10.8.2.4.10 Reduction in Dorm Phones

The millennial student is the mobile student requiring instantly available communications. This is resulting in less reliance on dormitory line-wired phones and an explosive growth in the use of cell phone technologies. In consultation with Resident Life, it is planned to reduce the prevalence of phones from one per pillow to one per room. This will result in a reduction of 4,000 phones and a savings to Resident Life of $500,000. To address the student requirement for mobile technology, Resident Life will redirect these savings into building a more pervasive and robust wireless network to service the dormitories.

- FY08
  - Dormitory phones reduced in number by 4,000.

- FY09 – FY17
  - o Develop a process for assessing the prevailing need for phones in dormitories. Annual review and analysis for possible further reduction or enhancement of the number of phones deployed.

10.8.2.4.11 E911 Services – Enhancement of Services and Associated Fees

The current E911 system will be replaced with a state of the art system providing many features not available in the current system, such as, a mass communications feature that provides the ability for a call to be directed to thousands of recipients simultaneously, and full location information displayed on the police call console. Also, this system will integrate both radio and line phone calls for enhanced emergency response. This emergency system will integrated into the VoIP replacement communications system. The specifications for this system were developed in consultation with the campus police. Procuring and implementing this system will require a $1.00 per line increase to faculty and staff phone fees.

- FY09
  - o Recommendation will be made to the Finance Committee.

10.8.2.4.12 Staying Ahead of Technology Obsolescence

Metcalfe's Law posits that "the value of a network grows as the square of the number of users." Historically, a prime example of this is the phone network: a telephone is of no use if you're the only person in the world who has one. But, as more and more people get telephones, the value of your device increases dramatically. In more recent times, Metcalfe's Law has been used to describe the growth of the Internet. In the telecommunications convergence scenario that is being planned for UM, the telephone network and the data network become one. Hence the one network takes on double significance and exponential criticality for the university community. It is imperative that this technology be refreshed to stay just ahead of the needs of the community. Such "just in time" deployment is the most cost effective approach to meeting the telephony, education, and research needs of the university. By doing incremental upgrades to the network, incremental costs will be minimized and capability will be maximized at any given time. To allow the network infrastructure to age far into its life cycle without periodic upgrades will present the university with a major cost that it may or may not be able to afford at the critical time the network upgrade is needed. To address this need, NTS will perform an annual review of all its technology solutions. To provide the best available network for research and education, NTS will propose technology upgrades during the annual project and budget planning cycles.

- FY08 – FY17
  - o An annual review process will be put in place to assess the obsolescence of pieces of the network infrastructure. Funding requests will be developed to keep the network ahead of the obsolescence curve.

10.8.2.4.13 Physical Diversity of Routes.

The disaster recovery and business continuity of a voice/data network hinges on having multiple connections to end points. To provide this protection, there will be dual uplinks from each building distribution frame (BDF) to the campus network backbone. The VoIP system will employ redundant call processors in multiple buildings to protect against the loss of voice connectivity. Thus, if a network link to a building were to be disabled, the voice and data traffic would flow to the backbone over the redundant link. Similarly, if one of the call processors was disabled, the voice traffic would flow to one of the redundant processors. Dual uplinks will be provided for all but "Class C" buildings. These buildings are identified in Section 11, Appendix B of this Ten Year Plan.

- FY08-FY17
  o To help ensure business continuity, proposals will be developed to implement as much physical diversity as funding allows.

10.8.2.4.14 Expansion of Services to M-Square

M-Square, the University of Maryland Research Park, has the potential to become one of the "crown jewels" in the University of Maryland campus complex. Tenants include the Center for the Advanced Study of Language (CASL), the U.S. Geological Survey's Earth Science Information Center (ESIC), the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS), and the Mid-Atlantic Crossroads (MAX), all serving and collaborating globally on research, teaching, and learning initiatives. This celebrity comes at a cost. To attract cutting edge research programs, the facilities must have a cutting edge data/voice network. OIT is in discussions with Administrative Affairs on infrastructure requirements that would give the residents of M-Square flexibility in obtaining the best level of high-end services and, in essence, "future proofing" the networking infrastructure. This requires addressing and funding initiatives such as a redundant data/voice network to each of the complex buildings and a very high bandwidth and flexibly or dynamically configurable data/voice network. The funding to realize the potential of M-Square is being sought. The funding for this initiative is currently being discussed at the campus level.

- FY08 – It is imperative to bring fiber to M-Square in this fiscal year if it has not already been accomplished. NTS will develop a proposal to fund fiber paths to M-Square.

10.8.2.4.15 Annual Review of Refresh Cycle, Expenditures, and Budget

In FY08, NTS will begin an annual review of the infrastructure to determine when the refresh cycles will occur and the extent of each refresh. NTS will develop budgets to fund these network refreshes and will recommend a funding model that will provide for sustaining an ongoing modern infrastructure required to provide reliable service.

Also in FY08, the Network Refresh Advisory Committee (NRAC) will be defined and approved by campus stakeholders. This will be the first committee of its type on campus. NTS will work with IRAC and its campus members from different constituencies on campus. Proposals will then be routed to the Facilities Advisory Committee to identify synergies to pool resources to facilitate a comprehensive infrastructure upgrade annually.

10.8.2.4.16 Participation in Regional Networks

To continue to provide an environment in which world class research and education takes place, OIT must ensure that the regional networks to which it connects have the network capability to provide the services needed by the university community. Two such regional networks are the Mid-Atlantic Crossroads (MAX) and the University Academic Telecommunications System (UMATS). The University of Maryland is a founding member of the Mid-Atlantic Crossroads and plays a major and critical role in ensuring that MAX continues to provide the advanced networking services that are demanded by the research and education agenda of UM. UMATS is similarly an important link in the external network connectivity of UM. Use of this network provides the shortest network routes to the other campuses of the University System of Maryland. UMATS has recently suffered the loss of its Executive Director, Richard Rose. The passing of Richard Rose leaves a vacuum in UMATS that must be filled with the energy, commitment to serving USM, political understanding, extensive contacts, and persuasiveness that resulted in building a first rate network dedicated to serving the needs of the USM institutions. The continued prominent participation of OIT in both MAX and UMATS is essential to ensuring that their vision and capabilities keep pace with the demands of the regional research and education community.

- FY08 – FY17
  - NTS will ensure that the campus connects to regional networks with sufficient bandwidth to provide excellent connectivity for campus research and education.

10.8.2.4.17 Staffing Increases

The network and telecommunications plan described in these pages requires an aggressive approach to resource acquisition and deployment, not the least of which is staffing. As the campus network grows in complexity and the services offered become both more numerous and more diverse, the needs for staffing this network's operations will also grow. NTS will do annual reviews of staffing levels and request within planning cycles any additional staffing that is needed.

- FY07-FY17
  - NTS will assess projected staffing needed to deploy and maintain the changes to be made to the infrastructure in the upcoming year. NTS will anticipate need and begin the hiring process in the year prior to the staffing need.

10.8.2.4.18 Requests for Proposals (RFPs)

The aggressive network and telecommunications plan described in this document demands that the best use be made of every dollar spent on this infrastructure. NTS plans to follow an open standards environment to avoid the sometimes vendor defined early obsolescence of technologies. Proposed equipment purchases will be guided by the rigorous specification of the needs of the infrastructure and that of the equipment to ensure full life cycle functionality of all purchases. This, coupled with open procurement processes including Requests for Information (RFI) and Requests for Proposals (RFPs), will ensure that vendors provide competitive and aggressively priced solutions to the university's needs.

10.8.2.5 Current Major Projects

VoIP Rollout
After RFP award, begin implementation of a multi-year rollout plan for VoIP and other converged services to campus.

Wireless Expansion
Continued wireless expansion. This is contingent upon various campus constituencies identifying funding (such as student affairs).

Network Redesign
This is contingent upon base NTS funding approval. This needs to be coordinated with the VoIP/converged services rollout.

There are additional projects which may not be campus-wide, but are nonetheless significant and require critical project management and coordination, for example, the recently completed Graduate Hills and Gardens project. The FY07 projects list identifies other projects as well.

10.9 *Policy and Planning*

The Office of Policy and Planning works in collaboration with other units in OIT and the university, to facilitate leadership in information technology management, service support and service delivery. We promote a collaborative environment in which to focus on IT best practices to provide a consistent approach to planning and service delivery. We facilitate the development of structures, standards, and processes through which sound IT strategic direction is set. We promote the continuous improvement of IT services and support and build awareness of the enhancement of the university's national IT prominence.

10.9.1 Campus Requirements

Delivering first-rate educational programs and providing state-of-the-art research facilities require advanced information systems.

Four areas for enhancement have been identified:

Services. Provide students with access to resources such as advanced computing, classroom information, music subscriptions, and online course systems.
Administration. Expand online services in order to "be always open for business" and to reduce the amount of paper.
Research. Make High-Performance Computing available.
Security. Increase computer and network security.

As the central provider of services that enable communication, collaboration, and computation, OIT must provide researchers, instructors, administrators, and students at all levels with the opportunity to work with the best tools in a stable environment. "Best" means a pervasive, stable environment of commodity services, but it also means and taking (controlled) risks with technologies that might evolve into the new commodities.

10.9.2 Initiatives

OIT will be a process oriented, best practice driven provider of quality IT services by employing IT Service Management. OIT will employ the philosophy of managing IT services through the use of industry best practices, for the improvement of business functions. Our goal is to align services with the current and future IT needs of the university. Increased OIT understanding of the the university community's needs will facilitate innovative approaches to meeting those needs. Increased university-wide awareness of OIT services and capabilities will allow the community to better utilize them. Through the creation of Service Level Agreements, campus customers will know what to expect from OIT and what is required of them to facilitate service delivery.

10.9.2.1 Business Continuity Management Program

The Office of Information Technology has developed a Business Continuity Management Program (BCMP) to manage risks for IT resources and enable continued operation of centralized services provided by OIT in the event of an emergency or a disaster.

The OIT-BCMP consists of four interdependent elements: The OIT Risk Management Program, Emergency Operations Plan, Business Continuity Procedures and the Disaster Recovery Plan.

The OIT Business Continuity Management Program starts with the priority services and processes established by the university, and links them to the information technology assets required to support them. This plan establishes the levels of staffing, skills, facilities, and services that would be necessary to provide immediate emergency support, as well as the levels needed to restore operations in a timely way. Each plan is reviewed and updated annually. The OIT Emergency Operations and Disaster Recovery Plans are tested on an annual basis.

10.9.2.1.1 <u>OIT Risk Management Program</u>

The principal goal of the OIT Risk Management Program is to protect the University of Maryland and its ability to carry out its mission in the face of potential threats to its IT assets.

Risk management is the process of identifying risk, assessing risk, and taking steps to reduce risk to an acceptable level. It is an essential task for the university and OIT.

- FY07 – 17
  - o Perform an annual Business Impact Analysis.
  - o Perform an annual risk management review of potential risks, probability of those risks occurring, and analysis of the impact those risks would have on the university and OIT should they come to pass. Where appropriate and practical, implementation of mitigating actions for those that can be mitigated.

10.9.2.1.2 <u>OIT Emergency Operations Plan</u>

OIT's Emergency Operations Plan (OIT_EOP) details OIT's emergency planning, organization, and response procedures to be used in the event of an emergency. An emergency is an unexpected change from the normal state of operations that may negatively affect OIT's ability to provide services to the university community. The scope ranges from a single, focused event, such as a mainframe being down for a day, to a large-scale physical disaster, like a tornado striking campus. The OIT-EOP complements the University Emergency Response Plan (UERP) and is used in conjunction with the UERP to define the information technology response to campus emergencies.

Following are the primary objectives of the OIT Emergency Operations Plan:

- Establish the management structure and process for responding to emergencies.
- Protect the health and safety of the university community.
- Provide a planned response to emergency situations.
- Protect the campus IT infrastructure.
- Bring the information technology infrastructure back to a production level of service after an emergency, with priority given to the university Web site, campus telecommunication services, and university enterprise e-mail.

- FY07-17
  - The OIT Emergency Operations Plan will be tested annually. It will be tested for procedural and organizational aspects as well as the technical ability to process at the contingency computer site.

10.9.2.1.3 <u>OIT Disaster Recovery Plan</u>

The OIT Disaster Recovery Plan details our longer term plan to rebuild and return to normal.

The primary objective of the OIT Disaster Recovery Plan is to help ensure the continued operation of our business by providing the ability to successfully recover computer services in the event of a disaster. The OIT Disaster Recovery Plan is a comprehensive document containing the necessary instruction, policies, organization, and information required for our university to be prepared for an emergency that would affect our computer services.

Disaster recovery is implemented through a hot site services contract to provide access to a mainframe equivalent to that used on campus. In the event of a disaster, university data processing would be moved to utilize the hot site. The hot site or an additional auxiliary site is also envisioned to contain sufficient front end machines to sustain degraded operation in the event of a disaster.

- FY07-17
  - Perform an annual test of the Disaster Recovery Plan and Procedures by informally walking through a hypothetical emergency. The goal is to identify and resolve problems and gaps in the Disaster Recovery Plan.
  - Perform an annual review and documentation of the Emergency Response Team members' desktop software and hardware to ensure that, if needed, they could perform their duties at a remote location. This is an ongoing activity and the only associated costs are staff time.
  - Ensure annual testing of disaster declaration and recovery of mission critical applications at the mainframe disaster recovery hot site. This will include testing of application servers, logistics, communications, tape retrieval, and restoration of data. Testing will begin in FY07 and the associated costs are for transportation, accommodations for the staff, and tape retrieval.

- FY10 and FY14
  - Solicit rebid of the disaster recovery hot site contract to ensure the university is receiving the best price for this service.

10.9.2.2 IT Service Management

IT Service Management is the philosophy of managing IT services, through the use of industry best practices, for the improvement of business functions. The goal of IT Service Management is to align services with current and future needs of the customer to improve the quality of IT services, in whatever way the customer expresses "quality," and to reduce the long term cost of service provision.

By implementing, IT Service Management, OIT has adopted the philosophy of providing IT services and support that underpin the business processes of the campus.   OIT will focus on providing high quality services with a particular focus on customer relationships. Our objective is to continually, cost effectively improve the quality of service, aligned to the business requirements of the university.

10.9.2.2.1 Change Management

OIT will ensure that standardized methods and procedures are used for efficient and prompt handling of all Changes, in order to minimize the impact of Change-related incidents on service quality. This will result in the following benefits both internally and at the campus level:

- Better alignment of IT services to university business requirements
- Increased visibility and communication of Changes to both business and service support staff
- Improved risk assessment
- Reduced adverse impact of Changes on the quality of services and on Service Level Agreements
- Better assessment of the cost of proposed Changes before they are incurred
- Increased productivity of Users – through less disruption and higher-quality services

- FY07
  - Implement the ITSM Change Management module.
- FY08 - 10
  - Audit the Change Management process annually.

10.9.2.2.2 <u>Configuration Management</u>

OIT will provide a logical model of the infrastructure or a service by identifying, controlling, maintaining and verifying the versions of Configuration Items (CIs) in existence. This will result in the following internal and campus customer benefits:

- Account for all the IT assets and configurations within OIT and its services.
- Provide accurate information on configurations and their documentation to support all the other Service Management processes.
- Provide a sound basis for Incident Management, Problem Management, Change Management, and Release Management.
- Facilitate adherence to legal obligations.
- Help with financial and expenditure planning.
- Contribute to contingency planning.
- Improve security by controlling the versions of CIs in use.
- Allow OIT to perform impact analysis and schedule Changes safely, efficiently and effectively.

- FY07
    o Implement the ITSM Configuration Management module.
- FY08
    o Integrate the TSS monitoring tools with the ITSM tool.
- FY09
    o Integrate the NTS monitoring tools with the ITSM tool.
- FY10-17
    o Continued maintenance and enhancements as needed

10.9.2.2.3 <u>Incident Management</u>

OIT will restore normal service operation after an incident as quickly as possible and minimize the adverse impact on business operations, ensuring that the best possible levels of service quality and availability are maintained. This will result in the following internal and campus customer benefits:

- Reduce business impact of Incidents by timely resolution, thereby increasing effectiveness.
- Proactive identification of beneficial system enhancements and amendments.
- Increased availability of business-focused management information related to Service Level Agreements.
- Improve monitoring to allow performance against Service Level Agreements to be accurately measured.
- Improve management information on aspects of service quality.
- Elimination of lost or incorrect Incidents and service requests.
- Improved user and customer satisfaction.

- FY07
    - Integrate the Incident Management with Change and Configuration Management modules.
- FY08 - 10
    - Review and audit processes.

10.9.2.2.4 Problem Management

OIT will minimize the adverse impact of Incidents and Problems on the business that are caused by errors within the IT Infrastructure, and to prevent reoccurrence of Incidents related to these errors. This will result in the following internal and campus customer benefits:

- Improved IT service quality
- Incident volume reduction
- Permanent solutions
- Improved organizational learning
- Better first-time fix rate at the OIT Service Desk

- FY07 - 09
    - Implement the ITSM Problem Management module.

10.9.2.2.5 Release Management

OIT will ensure that all aspects of a Release, both technical and non-technical, are considered as a whole. This will result in the following internal and campus customer benefits:

- Plan and oversee the successful rollout of software and related hardware.
- Design and implement efficient procedures for the distribution and installation of Changes to IT systems.
- Ensure that hardware and software being changed is traceable and secure and that only correct, authorized, and tested versions are installed.
- Communicate and manage expectations of the customer during the planning and rollout of new Releases.
- Agree on the exact content and rollout plan for the Release, through liaison with Change Management.
- Implement new software Releases or hardware into the operational environment using the controlling processes of Configuration Management and Change Management – a Release should be under Change Management and may consist of any combination of hardware, software, firmware, and document Configuration Item.

- FY07 - 09
    - Implement the ITSM Release Management module.

10.9.2.3 OIT Assessment Program

The Office of Information Technology will focus on evaluation and assessment of OIT projects, processes, and services. An OIT-wide assessment plan will provide guidelines for future customer surveys and other data-driven activities for the purpose of benchmarking, needs assessment, implementation, evaluation, and improvement of new and existing processes and services.

Ongoing performance monitoring will be an integral part of IT Service Management. New initiatives will benefit from implementation evaluation and formative feedback. Benchmarking and needs assessment contribute to the larger picture of OIT organizational planning. OIT assessments will also make use of other sources of information such as Campus Assessment Working Group surveys, legislative audits, and feedback from groups such as the Information Technology Council.

- FY07 - 09
    - Survey faculty, staff, and students regarding a range of OIT services and activities annually.
    - Develop plans for new and existing projects and programs.
    - Ensure that every OIT project includes an assessment plan that will involve the following elements:
        - Statement of program/project goals
        - Logic model describing how resources and activities are intended to result in objectives that advance these goals
        - Key observables that would indicate whether the objectives are achieved and criteria for comparison
        - Identification of assessment methods – survey, focus group, expert review, review of existing data, etc.
        - Data collection plan
        - Assessment milestones and timeline
        - Analysis and communication of findings to management and other stakeholders
        - Evaluation and refinement of assessment process
    - Actively participate in CAWG in order to make use of broader campus assessment activities.
    - Consult and assist with designing/implementing/analyzing special purpose surveys as needed, both within OIT and with partners across campus.
    - Tie assessment to the OIT Project Planning Cycle – an assessment plan should be part of every approved project.

10.10 *Security*

Security is one of the most important services provided by OIT. Without an effective security service, every member of the campus community using computing and networking resources will suffer loss of productivity and a potential disastrous loss of valuable data. Effective security is also important to the State of Maryland as evidenced by the periodic state audits of campus IT security from the Office of Legislative Audit.

As one of the focus areas for IT excellence on campus, security will continue to innovate to eventually achieve a level of security audit compliance that is better than peer institutions and state agencies.

10.10.1 Campus Requirements:

OIT's mandate is to ensure that the entire campus has the lowest possible security risk consistent with an effective production operation. This requires results in the following areas.

- Ensure that sensitive data (including the university's intellectual property and data protected by legal statute) stored on university computer systems and networks is protected from unauthorized access.
- Ensure that university computer systems are not compromised by hackers or viruses.
- Provide university researchers with access to the security assets within the Office of Information Technology in order to enhance their studies with *real world* data.
- Inform a university community (faculty, staff, and students) that is fully aware of their role in protecting the institutional data and systems at the university.
- Ensure that the burdens associated with enhancing security at the university are minimized as much as possible.
- Provide opportunities for students in the fields of Information Assurance and Security to obtain real-world experience.

10.10.2 Initiatives

The following initiatives address the basic campus security needs and will ensure that the campus has acceptable audit compliance in place. Future initiatives will need to be developed in conjunction with faculty doing research in security to push the campus to the next level.

10.10.2.1 Comprehensive OIT IT Security Assessment

While some universities have established assessment programs that catalog high risk systems and monitor progress towards eliminating those risks, no university has truly succeeded in developing a top to bottom program that encompasses every computer in a process that is easy to track, easy for non technical people to understand, and makes compliance easy to obtain.

OIT is developing a substantial security assessment program that ensures an ongoing process of evaluating systems, software, and IT related processes on all computers and networks at the university. OIT will be performing annual internal audits of its own processes, and of adherence to mandated state and USM audit practices. An annual report will be generated and submitted to the President's Cabinet for discussion and evaluation.

While several members of the OIT security team have elements of vulnerability, threat, and compliance assessment in their job descriptions, it is essential to enhance those capabilities by engaging outside consultants for periodic penetration testing. Such tests should focus on critical elements of the IT infrastructure, and different targets can be selected each year. It is likely that future federal security and privacy regulations will require an external certification in addition to internal assessment functions.

- FY08-17
    - OIT will compare its processes, policies, and procedures against the USM security guidelines on an annual basis and create plans to remedy any deficiencies found.
    - An annual external security assessment will be conducted to enhance the credibility of the internal security assessment.
    - An annual report will be generated by OIT Security that evaluates OIT's IT audit compliance that incorporates results from the internal assessment and the external assessment.
    - An annual OIT IT security risk assessment report will be created and shared with the President's Cabinet as appropriate.

10.10.2.2 Comprehensive Campus IT Security Assessment

To complement the intensive OIT security assessment, university units will be interviewed annually, on a rotating basis, to determine the vulnerability of sensitive data and mission critical systems. Well defined and easily understood roadmaps will be developed to assist departments with compliance. A report on each department will be created and shared with the Provost, the Vice President of Administrative Affairs, and the Vice President and Chief Information Officer. Follow-ups will be performed at regular intervals to check on the progress toward full compliance.

To encourage an increase in the number of security-aware staff and students on campus, internship opportunities will be available for Information Assurance students. The USM IT Audit Office will be invited to be a partner in this program. The worksheets and roadmaps developed in this program will be made available to other schools.

The university will benefit from this initiative through the reduction in the risk that sensitive data or systems will be compromised. A successful assessment program will ensure that the university is in compliance with data protection laws and will be prepared for periodic audits from USM and the Office of Legislative Audits.

To accomplish the OIT and campus security assessments, software, and hardware tools are required for automated evaluation and analysis.

- Vulnerability Assessment Software - OIT Security operates a cluster of systems utilizing a combination of commercial and open source software to scan computers on the network to identify known vulnerabilities. As funds permit, OIT Security is transitioning to the commercial software which has far greater detection and management capabilities. An initial investment was made in FY07 which provides coverage for OIT's enterprise services. Expansion to the point of covering all campus systems is desirable. Enhancement to handle IPv6 related vulnerabilities will be required once IPv6 becomes widely deployed.
- Incident Correlation Software - It is often the case that a security incident is foreshadowed by a series of seemingly unconnected events each of which may be detected by a separate element of the campus infrastructure. Incident Correlation Software connects the dots by synthesizing input from different sources to identify probes, intelligence gathering, and perhaps spot an intrusion more quickly than might be possible looking at the sources separately.

Milestones for this initiative are as follows:

- FY08-17
  - Departments will be selected for engagement on a rotating basis. Each department should participate in this review every three years.
  - Reports will be generated by OIT Security for each department engaged.
  - Follow-up is done on suggested security improvements.
  - An annual campus IT security risk assessment report will be created and shared with the President's Cabinet as appropriate.

10.10.2.3 Project NEThics

Now in its tenth year, Project NEThics is an OIT initiative that promotes the responsible use of information technology through user education and policy enforcement. Project NEThics is the university's designated contact for complaints filed under the Digital Millennium Copyright Act and ensures that the university's obligations under that law are fulfilled. Project NEThics counsels students who are in violation of the university's acceptable use policy and refers discipline cases to appropriate judicial boards.

In addition to a full time coordinator who handles delicate cases, Project NEThics employs two half-time graduate assistants who manage the student case load, perform one-on-one counseling, and provide DMCA confirmations. Students for this program are generally selected from disciplines related to either counseling or student management.

- FY08-17
    - Each summer, Project NEThics will identify a topic or topics of concern in the area of responsible student computing to be the primary focus for the coming year's awareness activities.
    - Original materials including articles, graphics, course and lecture materials, and multimedia presentations will be developed and distributed to the target population.
    - Develop an annual public service announcement to be professionally produced for use with outlets such as UMTV and Hoff Theatre.
    - At least once per year, a student forum will be held focusing on that year's theme.
    - At the end of each year, a report will be compiled documenting the year's efforts and assessing the effectiveness of the campaign.

10.10.2.4 Forensics Laboratory

Services provided by OIT Security include the analysis of compromised systems and the preservation of evidence for criminal and civil cases as well as internal university hearings. New guidelines on electronic discovery from the Supreme Court will dramatically increase the obligation for the university to preserve data under circumstances where a civil case may be filed.

The Forensics Laboratory will provide the facilities necessary to examine computers and storage media under conditions that will not taint its admissibility to court. Case management software will track investigations appropriately and disk images will be obtained and preserved using court sanctioned software tools. The laboratory will leverage secured networked technology to the extent possible (reducing space requirements) and will be made available to campus and local law enforcement to facilitate their own investigations. External funding will be pursued to help defray some of the costs.

Under appropriate supervision, opportunities will be created to provide hands-on experience for students in fields such as IT Security and Criminal Justice.

- FY08
    - Establish Networked Forensics Laboratory.
    - Expand storage capabilities to meet anticipated demand of electronic discovery guidelines.
    - Develop cooperative agreements with local law enforcement agencies.
- FY09
    - Establish forensic internship program.
    - Continue expanding storage capabilities.
- FY10-17
    - Continue expansion of capabilities based upon the current state of the art.

10.11 *User Support Services*

OIT's User Support Services (USS) serves as the first point of contact for the university community for technology and technical assistance. As such, USS is committed to providing excellence in service in this arena.

10.11.1 Campus Requirements

- User Support Services is the first point of contact for IT for faculty, staff, and students, ensuring that they receive appropriate technical assistance and information, training, and access to the IT Knowledge Base for campus.
- The User Support central Help Desk must work proactively with colleges and schools to provide excellent support services. Existing IT committees will be strengthened to work collaboratively for the empowerment of the campus clientele.
- User Support will work in collaboration with the campus community to identify a standard set of supported applications, operating systems, and tools. Once identified, these will be reviewed annually and updated as needed.
- User Support will meet with campus IT representatives to determine the base level of technical assistance and knowledge service needed by campus constituents and begin planning and implementation.
- New services, tools, applications, and relationships will be investigated, discussed, and implemented throughout each academic year to enhance user support for the campus community.
- User Support personnel will build upon existing professional knowledge and expertise to work effectively with campus entities, external partners, and colleagues for enhanced support services.

10.11.2 Initiatives

10.11.2.1 Consolidate Access to Multiple OIT Help Desks

Currently, OIT has several localized areas where clients may receive assistance for questions on telecommunications needs, networking issues, and general and technical assistance. Consolidation of these services into a centralized help desk will provide the campus community a more consistent and coherent approach for technical assistance. In keeping with the centralized approach to assistance, the Help Desk functions will be allocated to two phone numbers, one to serve the faculty and staff community and the second to serve the student community. Each of these communities will be provided with a high level of service with an emphasis on the technical assistance needed to efficiently solve the issue at hand.

- FY07
  - Provide a single customer help phone number for clients of the Network Operations Center and the Networking and Telecommunications departments in cooperation with OIT Networking and Telecommunications Services (NTS).
  - Work with USS' Knowledge Management (KM) team to incorporate ITSM into the merger of NOC and Telecommunications.
  - Using existing statistical software, determine additional staffing requirements.
  - Initiate discussion with other potential OIT/university units for consolidation of services.
- FY08
  - Work with KM to identify other OIT groups that would be appropriate additions to the centralized contact plan.
  - Using existing statistical software, determine additional staffing requirements.
  - Continue discussions with other OIT/university units.
- FY09
  - Fully implement project for OIT units.
  - Begin merge of university units phone services to a centralized number.
  - Implement ITSM ticketing for these units.
- FY10
  - Fully implement project for university units.

10.11.2.1.1   Student Help Desk Service

Currently, students do not have a satisfactory method of obtaining answers to technical questions or to receive assistance after 8 p.m. on weekdays. Increasing the hours of the central Help Desk, and targeting students' issues and concerns will allow them uninterrupted service while they are involved in research and study. The student Help Desk (SHD) can also be used to test new services and involve students directly in this testing process. The process will include opening an expanded set of service hours for the Student Help Desk, and will be accommodated by a separate phone number. The Student Help Desk will also have the expanded capability to provide equipment repairs for workstations under warranty and software application support. The SHD will foster technological training and advancement for student employees, provide quality, peer-level personnel and service to our student clients, and create a group of OIT and Help Desk ambassadors within the student population.

- FY07
  - Continue to hire and train students for SHD.
  - Expand SHD hours into the evening.
  - Coordinate student certification for warranty work to enhance service for ACT machines.
  - Hire and train students for the Learning Commons, in cooperation with ACS.
  - Explore new support opportunities through grants.
- FY08
  - Continue to hire and train students for SHD.
  - Expand SHD hours based on staffing availability and funds.

- o Continue to seek new support opportunities to enhance services.
  - o Begin investigating and developing plan to put mini-SHDs in the freshmen dorms.
- FY09
  - o Continue to hire and train students for SHD.
  - o Continue to seek new support opportunities to enhance services.
  - o Continue certification.
  - o Implement SHDs in the freshmen dorms.
  - o Continue support for Learning Commons SHD.
  - o Begin investigating and developing plan to expand SHD services to other areas on campus.
- FY10
  - o Continue to hire and train students for SHD.
  - o Continue to seek new support opportunities to enhance services.
  - o Continue certification.
  - o Implement SHDs in additional areas on campus.

10.11.2.1.2   University Help Desk Service

The establishment of a visually interactive Help Desk using current and emerging technologies such as VoIP, live chat, video conferencing, and co-browsing software will enhance service to the university community. The integration of these services into the existing ITSM software will streamline processes while taking advantage of the full features of the software. Clients will be able to speak with their Help Desk representative directly, including conferencing in technicians as appropriate. The use of the co-browsing software will enable Help Desk staff to demonstrate solutions "live" on the client's desktop. The implementation of customer service improvements, including a fully developed three-tiered service, will enhance Help Desk response time for problem resolution and create an increased number of completed calls, while maintaining high quality service.

Help Desk service will also include the provision of field support staff with tools such as wireless PDAs, telephones, scanners, and laptops. These tools will allow dynamic access to the Incident Management System and the technical Knowledge Base and will reduce time spent going back to the main office for information, thus allowing for more time spent in the field resolving issues and providing service for our clients. Also, the creation of a computer service center to address student computer issues with experienced technicians available will build better rapport with students while providing a valuable service to them.

- FY07
  - o Investigate available industry software that will integrate with ITSM ticketing system to empower the customer base, allowing them greater involvement in their problem solving issues.
  - o Create more effective metrics to allow USS a better understanding of the needs of the customer base.
  - o Identify and implement methods of using the existing ITSM software to meet the criteria for collecting the data for the metrics.

- o Investigate other support desks available on campus and begin planning for elimination of duplicate services.
- FY08
    - o Implement supportive tools for customer service, including live technical chat rooms, video desktop conferencing and individual chat sessions.
    - o Implement cooperative chat rooms and chat sessions with other campus HDs to further campus collaboration on problem solving.
    - o Work proactively with other campus Help Desks to eliminate duplication of service.
- FY09
    - o Work closely with KM staff to fully implement integration of the Knowledge Base, ITSM, and multilingual Web site.
    - o Perform metrics evaluation and revision as needed to improve customer service.
- FY10-FY17
    - o Continue self-evaluations, update processes, and implement new services as identified.

10.11.2.1.3 <u>Student Computer Support Service</u>

The creation of a computer service center with experienced technicians available to address student computer issues will build better rapport with students while providing a valuable service to them. In addition to the enhanced services provided under the Academic Computers for Terps (ACT) Program, all students benefit from having technician availability during the core service hours of the Help Desk. The services to be offered will include re-imaging of workstations as needed due to malware, viruses, or hardware errors; application support; and general self-help for technical issues for student workstations.

- FY07
    - o Coordinate support within USS for staffing of SHD Warranty desk.
    - o Begin the certification process for SHD Warranty desk staff and students.
    - o Continue hiring and training students.
- FY08
    - o Continue the certification process for SHD Warranty desk staff and students.
    - o Maintain the SHD Warranty desk and update tools as needed.
- FY09
    - o Review workload, level of service, and service statistics.
    - o Evaluate staffing and take appropriate steps to maintain and improve service.
- FY10-FY17
    - o Review workload, level of service, and service statistics.
    - o Evaluate staffing and take appropriate steps to maintain and improve service.
    - o Maintain the SHD Warranty desk and update tools as needed.

10.11.2.2 Knowledge Management Services

Knowledge management is a conscious, consistent strategy implemented to gather, store, and retrieve knowledge and then help distribute the information and knowledge to those who need it in a timely manner. KM staff will develop a plan for creation, capture, storage, cataloging, and sharing of organizational and technical knowledge to empower end users with tools that help them solve common and repetitive issues.

10.11.2.2.1   Knowledge Base Project

The creation of a multi-purpose/multi-tiered Knowledge Base (KB) will enable OIT to contribute to and access information about technical data, skill sets, archival and historical information, training materials, images, video, maps, interactive FAQ repository, and projects for use both within OIT and out in the campus community. It will be a common resource of answers and information accessible by multiple means. It will offer a body of technical reference information, plus will provide a mechanism to collect and connect varying forms of data (text, sound, video, graphics, etc.). It will at once be an information source for support representatives to reference for searches containing a unified set of answers as well as a method for users to obtain their own trusted solutions. The KB will also serve as a repository for user documentation applicable to the applications and systems supported by OIT.

- FY07
    - Educate new KM staff on concepts, plans, etc.
    - Work with Grants staff to identify potential funding opportunities.
    - Build sample KB for testing with internal USS staff.
    - Hold focus groups consisting of a mix of USS and other OIT staff to determine detailed methodology and tools necessary for success.
- FY08
    - Additional inclusive training for KM staff and research Web trends.
    - Determine tools, offerings, and campus needs based on prior experience and focus groups.
    - Evaluate KB and identify alternate methods and tools as necessary.
    - Convert KB for online student, faculty, and staff access on a limited basis.
- FY09
    - Identify, write, and transmit KB RFP for enhanced KB services.
    - Review RFP, choose vendor, install and customize software.
    - Prepare data for movement into revised KB.
    - Begin incorporation of KB into Web interface and HD site.
    - Make live demo available to focus groups.
- FY10
    - Join Web site, ITSM, and KM interface to enable online ticketing to be linked to KB for client service.
    - Investigate and analyze alternate access methods to KB for better client access.
    - Implement additional/alternate access methods to KB.
    - Research additional data that should go into the KB.
    - Prepare data for inclusion.

- FY11-FY17
    - Continue development of KB and access methods.
    - Hold focus groups for evaluation and update on a regular basis.

10.11.2.2.2   <u>Digitization Project/Audio Video Initiative</u>

The digitization project and audio-visual initiative is designed to assemble a consistent, accessible, and reliable library of information in easy-to-use formats. It will enable single source access to widely spread collections of information. It will contribute to creating a "virtual" help desk that is backed by the Knowledge Base and Web site content for the university community to quickly and efficiently access technical documents and solutions. The increased use of audio and video for in the KB will support the Help Desk and other content sources supported by Knowledge Services. Also, it will be a test-bed for new methods and mechanisms to provide technical documentation, instruction, and assistance through integration of new media with the Knowledge Base.

- FY07
    - Research, evaluate and implement new mechanisms and methods for data access for clients which provide training and educational services.
    - Research and purchase appropriate additional equipment and applications for audio and video technologies to be applied to the Web site.
- FY08
    - Research and identify external sources of relevant digital information.
    - Obtain rights to digitize and provide public access.
    - Determine topics for information areas not currently available.
    - Create resources as chosen above.
- FY09
    - Continue resource creation and integration.
    - Expand digitization services to OIT to assist in updating and revising topic specific Web pages to integrate audio/video for client access.
- FY10 –FY17
    - Expand services to campus to assist clients with audio/video integration into updated Web pages and providing training assistance on integration.

10.11.2.2.3   <u>Web Redesign/Disability and Access Enhancement</u>

Web site creation, maintenance, and content control is a vital part of the knowledge services provided by OIT in User Services. The Help Desk Web site, while advanced at its release four years ago, is in need of a re-examination and redesign. This effort will review the latest research in information access and user interfaces to rework our Web presence and take advantage of modern technologies and information gathering and searching needs. It will be integrally linked into the KB and will provide context sensitive help for the user community. We will also re-examine the site to see that it adheres to the Americans with Disabilities Act.

- FY07
  - Consult with campus groups dealing with disability information access issues (Office of Disability Support Services, Libraries' access specialists, etc.) to review current state of www.helpdesk.umd.edu.
  - Obtain approval for, search, and hire Information Architect (IA).
- FY08
  - IA will assess current state of helpdesk.umd.edu and begin redesign plan.
  - Assess redesign recommendations, analyze financial requirements, plan resources.
  - Create staff team to perform redesign, obtain necessary hardware/software.
- FY09
  - Release first version of redesigned Web site in test mode.
  - Perform beta test and collect comments.
  - Review and incorporate changes.
  - Release next version of redesigned Web site in test mode.
  - Beta test and collect comments.
  - Review and incorporate changes.
  - Release new site to production.
- FY10-FY17
  - Determine and provide appropriate training for Web staff.
  - Investigate and implement new features and technologies.
  - Research, evaluate, and implement new mechanisms and methods in Web design.

10.11.2.2.4   Multicultural Project

The OIT Help Desk Web site provides documentation, instruction, and guidance for IT resources used on UM's campus and beyond. It is designed to be a resource for students, faculty, and staff in general areas such as using e-mail, accessing the World Wide Web, and computer troubleshooting. Moreover, it supports the university's population in performing necessary online activities--completing timesheets, updating personnel records, locating specific campus buildings and offices, receiving grades, completing classroom assignments, etc. It is, however, of little use for those who need such information but do not understand English. We will address those people through the project by building our Web site in a language they understand.

- FY07
  - Reach agreement with Spanish unit in ARHU on cooperative venture to create mirror site of www.helpdesk.umd.edu in Spanish.
- FY08
  - Create Spanish mirror site.
  - Release Spanish pages by section to production as they are completed and verified.
  - Reach agreement with Chinese unit on cooperative venture to create mirror site of helpdesk.umd.edu in Chinese.

- FY09
  - Completed Spanish Web site will be in full production.
  - Create Chinese mirror site.
  - Move Chinese mirror site to production.
- FY10-FY14
  - Reach agreement with other foreign language departments, as identified by research and demographic needs of campus, on cooperative venture to create mirror site of helpdesk.umd.edu in those languages.

10.11.2.3 ITSM Project

ITSM was chosen in 2003 as the tool OIT will use to provide inquiry management, configuration management, problem management, and other organizational areas. Its initial rollout to the OIT Help Desk was a learning experience, which produced many ideas on how to best improve the tool and its effectiveness. As a result of the variety of opinions on the software, its planned expansion across OIT was postponed and its daily use limited to units within User Support Services. This project will incorporate the lessons learned to date and put ITSM development and expansion back on schedule to perform the tasks for which it was originally purchased. This process will include appropriate coordination with OIT Policy and Planning.

- FY07
  - Upgrade ITSM to version 10.
  - Train OIT staff on the use of the ITSM software client.
  - Coordinate integration plan with OIT units (TSS, NTS) to move staff to ITSM so client incidents that have been escalated will be handled through one mechanism, which will promote more efficiency and shorter resolutions for the client.
- FY08
  - Consult with other OIT units on ITSM integration.
  - Coordinate with OIT stakeholders and iET Solutions to incorporate configuration management component.
- FY09
  - Populate configuration management component to have interrelationships and dependencies for inquiry management.
  - Build and test ITSM Web interface.
  - Begin KB integration with ITSM.
  - Upgrade server and continue training.
  - Release beta of Web interface.
  - Explore expansion of ITSM use to non-OIT units.
- FY10-Y17
  - Move Web interface to production.
  - Complete KB integration.
  - Evaluate ITSM product and capabilities, upgrade as necessary.

10.11.2.4Training

Technical training for the university community will address skill deficiencies among university students, faculty, and staff and thus decrease the volume of Help Desk calls on targeted issues. The expanded services offered by the Help Desk, the Student Help Desk, and the KB will facilitate this type of training and enhance training materials and services. In addition, OIT will offer skills training for the campus community through more effective collaboration with the UTCC.

- FY07
  - o Research and identify training needs.
  - o Develop instructional materials.
- FY08
  - o Test instructional materials against focus groups.
  - o Develop next level instructional materials based on feedback from focus groups.
  - o Develop course material for training needs.
  - o Identify staff for training.
  - o Begin first sessions for staff.
  - o Evaluate and review sessions for efficacy.
- FY09
  - o Continue the development of instructional materials based on tiers of training assessed.
  - o Continue evaluation and assessment of classes.

10.11.2.5 Field Support

 The current Desktop Support and Imaging unit within USS provides services on a contractual and charge-back basis at a standard cost to those in the university community that request the service. As the university moves toward a recommended list of computer workstation specifications, the imaging team will provide a baseline set of images for these workstations that can be loaded onto any recommended workstation from the Help Desk.

10.11.2.5.1   Desktop Imaging Service

The software imaging service includes the design, creation, deployment, and support of software disk images for Windows, Macintosh, and Linux operating systems using application software such as Ghost and Netboot. This service will develop and provide baseline machine images for newly purchased student machines through the Student Computer Initiative that began in Fall 2006 with the introduction of the Academic Computers for Terps Program. This same image will be provided to the OIT Centralized Help Desk to allow staff to assist students, faculty, and staff to re-image workstations as needed. Examples of such need include workstations that have become corrupted due to malware, viruses or bots, or simple software failure where the amount of time and/or effort would make it more efficient to backup the existing data on the workstation and re-image the hard drive.

- FY07
  - Customize PC and MAC images for ACT computers and campus labs.
  - Provide updated images to HD for clients to access when needed, and to the Warranty Desk for re-imaging of ACT computers after repair.
  - Research Microsoft Vista OS and prepare for implementation.
- FY08
  - Continue the customization of PC and MAC images for ACT computers and campus labs.
  - Begin upgrade of WAM labs PC OS to Vista.
- FY09-FY11
  - Continue the customization of PC and MAC images for ACT computers and campus labs.
  - Complete upgrade of WAM labs PC OS to Vista.

10.11.2.5.2   Server Maintenance and Replacement

User Support initiatives necessitate the availability of file servers to accomplish their goals. Although the day-to-day technical support of these servers falls under the purview of the Technical Services and Support (TSS) Group, Field Support will take the lead for User Support to review and evaluate USS dedicated Apple and Dell server hardware with respect to life cycle re-fresh, hardware/software maintenance, and software licensing support from a budget planning perspective.

- FY07
  - Hardware Upgrades (server replacement, maintenance, licensing)
  - Staff Training
- FY08
  - Software Renewal (OS, applications, maintenance, licensing)
  - Staff Training
- FY09
  - Software Renewal (OS, applications, maintenance, licensing)
  - Staff Training
  - Staff Position
- FY10-FY17
  - Software Renewal (OS, applications, maintenance, licensing)
  - Staff Training
  - Hardware Budget (PC image, Development, maintenance, licensing)

10.11.2.5.3   Maintenance and Update for R/D Lab

Field Support will create a test infrastructure for both the Macintosh and PC environments to facilitate the efficient development and deployment of computer images. Machines which mirror those in WAM labs, at customer sites and models offered under the student computer purchasing

program will be used to create, test, and run images to be distributed to those respective clients. The lab will also be used for testing of other technologies supported by User Support and providing a routine location for new applications of technologies and services for clients.

- FY07
    - Hardware (MAC/PC test machines)
    - Software (OS renewals/maintenance, test new apps, utilities)
- FY08
    - Software Renewal (OS, applications, maintenance, licensing)
    - Peripherals (testing cell phones, PDA, scanners, cameras)
- FY09
    - Software Renewal (OS, applications, maintenance, licensing)
    - Peripherals (testing cell phones, PDA, scanners, cameras)
- FY10-FY17
    - Software Renewal (OS, applications, maintenance, licensing)
    - Peripherals (testing cell phones, PDA, scanners, cameras)
    - Hardware Replacement (PC Image, Development, maintenance, licensing)

10.11.2.6Grants and Special Projects

Projects that are both underway and being planned within User Support Services will require financial and coordinated resources beyond those available within the OIT budget. In response, a group tasked with identifying, seeking, and obtaining project support funds was formed in FY2007. Working across the User Support organization to determine project needs and requirements, this group assists in specifying the needs definitions and in obtaining the necessary resources to carry out the projects.

As projects are planned and implemented, the Special Projects staff coordinates and monitors all progress. They also act as intra-unit coordinators and facilitators, bringing the best efforts from all relevant teams to bear towards successful completion of User Support endeavors. This group also serves within User Support as an origination point of new plans for technology, services, and products for the benefit of university community members.

Training and travel is required for both the group coordinator plus additional staffers brought on as the group's mission and workload grows. The advantage of working with grants is that a portion of those awarded funds will be applied to expenses for training and travel. Therefore, the funding needs listed here are not the complete sums required, but rather only the projected OIT budgetary commitment.

With the expected results of successfully receiving grant awards, the administration of those programs will require additional trained and experienced staff. We project the need for a grants assistant in FY08. The first year salary of said grants assistant will come from OIT funds, but, as with training and travel, subsequent years' salaries will come primarily from award revenues as direct cost components. Increased staffing needs will arise within another three years, again with award revenues accounting for much of the salary and benefit costs incurred.

- FY06
  - Create Grants position through reassignment of staff.
  - Begin training for Grants staff.
- FY07
  - Continue training for Grants staff.
  - Research and identify projects.
  - Research and identify funding sources.
  - Create collaborations with university entities.
- FY08
  - Continue training for Grants staff.
  - Proposal of new staff for area.
  - Continue to identify collaborators for identified projects.
  - Submit proposal(s) for funding.
- FY09
  - Continue training for Grants staff.
  - Continue to identify collaborators for identified projects.
  - Submit proposal(s) for funding.
  - Upon successful award, begin project(s).
- FY10
  - Continue training for Grants staff.
  - Continue to identify collaborators for identified projects.
  - Submit proposal(s) for funding.
  - Administer existing grant(s).
  - Identify new funding sources.
- FY11-FY17
  - Continue training for Grants staff.
  - Continue to research, identify, and prepare proposals for funding.
  - Administer existing grants.

11 Appendix A – Office of Information Technology Organization

11.1 *OIT Organization Chart*

Office of Information Technology

Vice President and Chief Information Officer
Jeffrey C. Huskamp
1 FTE

Administrative Support
Coordinator
Lynn Mullineaux
1 FTE

Assistant Vice President
Dorothy Chrismer
1 FTE

Associate Director
Tony Conto
1 FTE

Academic Support
Director
Ellen Borkowski
23 FTE

Administrative Enterprise Applications
Director
Steve Edwards
56 FTE

Communications
Director
Phyllis Dickerson Johnson
3 FTE

Finance and Administration
Interim Director
Dorothy Chrismer
11 FTE

IT Security
Director
Gerry Sneeringer
6 FTE

Mid-Atlantic Crossroads (MAX)
Executive Director
Peter O'Neil
13 FTE

Networking and Telecommunications
Director
Tripti Sinha
37 FTE

New Applications Development
Director
David Alderson
1 FTE

Policy and Planning
Director
Willie Brown
4 FTE

Technical Services and Support
Director
Fran LoPresti
55 FTE

User Support Services
Director
Pam Burton
47 FTE

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11.2 *Roles and Responsibilities*

11.2.1 Office of the CIO

Jeffrey C. Huskamp

As Vice President and CIO, responsible for the campus-wide information technology strategic planning and management of the central information technology service organization with 265 staff. Components of the central information technology organization include policy and planning, networking, enterprise systems, telecommunications, administrative computing, academic computing, user support, and security. Responsible for information technology strategic planning, partnerships with external organizations and companies, and implementation of best practices in the day-to-day operation with a budget of $30M. Member of the Governing Board of the Mid-Atlantic Crossroads Gigapop, member of the Coalition for Networked Information, and institution executive representative for Internet2 and EDUCAUSE. On campus, member of President's Cabinet, and Chair of the campus-wide Information Technology Council.

David S. Alderson

As Director of New Applications Development in the Office of Information Technology, David is charged with defining policies, procedures, documentation, and communication practices for new applications developed within OIT. His primary responsibility is to provide the University of Maryland with a new generation Student Information System – a modern, integrated, Web-based system that will 1) fully support the university's mission in student-related administrative applications and 2) have the flexibility to continually meet the changing needs of the university. David also chairs the Functional Executive and the Functional Advisory committees for the university's Enterprise Portal, which will give all university constituents a single, seamless entry point into the university's vast array of academic and administrative systems.

Dorothy Chrismer

This role involves activities that serve to promote OIT in ways that benefit the entire university. The role involves both internal and external OIT activities. External information is brought into OIT for improvements as well as internal information is taken out from OIT for campus-wide improvements. The development of Internal Policies and Procedures for OIT results in improvements that will serve the entire campus. Outreach initiatives include the establishment of relationships for operational and research advancements. The areas of responsibility engage various entities of the university community ranging from departments to committees so that the best IT ideas are adopted campus-wide. Specific tasks include:

- Facilitating the Campus Student Technology Fee Advisory Committee and investigating the formation of a relationship with other organizations that also utilize student fees for technology.
- Representing OIT on the Facilities Advisory Committee providing OIT's perspective regarding campus facility projects as well as presenting OIT facility proposals for projects such as its new Remote Data Center as well as a new Data Center.
- Representing OIT in the University's Middle States Accreditation process.
- Formulating OIT's proposal for the formation of a Senate IT Council.
- Meeting with and forming partnerships with campus-wide units, researchers, committees, etc.

Tony Conto

- Responsible for initiative development and funding for OIT to address campus needs.
- Meets with federal agencies and other funding sources to determine possible funding streams for campus initiatives.
- Liaison with the Office of the CIO for campus proposals involving information technology.
- Manages campus-wide, regional, and national projects for the Office of the CIO.

Lynn Mullineaux

- Responsible for coordinating all the activities for the Office of Information Technology.
- Provide implementation assistance across OIT.
- Analyze and organize office operations and procedures.
- Coordinate calendars of the CIO and staff.
- Work collaboratively with Deans' and VPs' offices to foster relationships.
- Serve as liaison between the CIO and staff, the campus community, and the public.

11.2.2 <u>Academic Support</u>

Ellen Borkowski

- Provide leadership in the integration of technology with pedagogy and research to meet the academic mission of the university.

Outreach
- Foster relationships with key partners, both on and off campus, to further the academic mission of the institution by:
  - Building relationships with key partners and stakeholders.
  - Developing a closer linkage with the Center for Teaching Excellence.
  - Celebrating and promoting faculty accomplishments.
  - Providing leadership in academic technology efforts at the local, regional, and national levels.

- Taking an active role in setting the instructional technology agenda at the USM and local levels.

Environments
- Create, support, and enhance physical and virtual environments for teaching, learning, and research by:
    - Providing expanded course management and content management capabilities.
    - Increasing access to technology in classrooms.
    - Creating an environment for exploration into new tools and techniques.
    - Enhancing communication and collaboration tools and services for teaching, learning, and research.
    - Enhancing and developing formal and informal integrated technology environments for teaching, learning, and research.

Support
- To provide user-centered services to support the use, integration, and innovation of technology resources in teaching, learning, and research by:

    - Expanding level and expertise of support staff.
    - Implementing a faculty-centered team approach to design and development.
    - Developing a more student-centered focus for appropriate services.
    - Modeling and incorporating best practices in training, design, development, and support.

11.2.3 Administrative Enterprise Applications
Steve Edwards

- Provide software systems (purchased, in-house developed, or hybrid) that support the core business processes of the university. Maintain and enhance these systems.
- Act as the OIT focal point with the campus units responsible for the core business processes, such that systems requirements, specifications, enhancement requests, priority lists, etc. are developed in a partnership.
- In support of the first two responsibilities, achieve and maintain a professional capability in the areas of database administration, data policy, data warehouse, data administration, and software development methodology and environment.

11.2.4 Communications
Phyllis Dickerson Johnson

- Develop, direct, and implement communications strategies to promote OIT's role and services to University of Maryland administrators, faculty, staff, current students, prospective students, researchers, business partners, stakeholders, peer institutions, associations, the media, state leadership, and the general public.

- Define, implement, and assess the OIT communications plan, including strategies in crisis communications and employee communications.
- Define the content and structure of the OIT Web site, and create and maintain information on the OIT Web site.
- Assist OIT units with effectively communicating changes or new developments in campus IT infrastructure.
- Serve as a liaison with the university's marketing and communications professionals, and work with other campus stakeholders to achieve OIT objectives.
- Serve as the primary initial media contact with university publications and external media outlets.
- Manage other communications, including communications procedures and policy development, publications, special events, and media relations activities.

11.2.5 <u>Finance and Administration</u>

Dorothy Chrismer (interim)

The mission of Finance and Administration is to provide courteous, timely, responsive financial, payroll/personnel, software, and logistical services to OIT units and external customers. Finance and Administration acts as the conscience of OIT, ensuring that everything OIT does is done in compliance with regulations, rules, policies and procedures of the university. Our goal is to make OIT the shining example within the university of how to do things right. This unit also functions as the machine for OIT to get the people, money, equipment, contracts, and supplies that OIT needs to accomplish its mission.

<u>Personnel Services</u> - The Personnel Services group within Finance and Administration is responsible for the processing of all personnel/payroll actions, maintaining employee personnel records, leave, and benefits for OIT. This group coordinates employee reclassifications, candidate searches, employee orientation, the Performance Review and Development (PRD) Process, and requests for parking permits and staff ID cards. Personnel Services provides interpretation of personnel regulations, policies, and procedures for OIT.

<u>Financial Services</u> - The Financial Services group handles procurement functions, invoice payments, billings, travel, credit cards, financial transfers, and cash deposits. This group maintains accurate database files that reconcile with the university's accounting and budget systems, tracks expenditures on OIT special projects, and provides analyses on a variety of financial matters.

<u>Software Licensing</u> – The Software Licensing group negotiates with software vendors and purchases software and related products through educational site licensing and volume discount agreements. These products are offered to College Park faculty/staff and graduate students and to other University System of Maryland institutions at significantly reduced rates. A broader range of this supported software is needed to enhance service in this area.

11.2.6 Mid-Atlantic Crossroads

Peter O'Neil

- Directs the Mid-Atlantic Crossroads, the regional optical network in the mid-Atlantic region including Maryland, Virginia, and the District of Columbia.
- Oversees a research program for next generation optical networking.
- Provides connectivity and collaboration for more than 40 partner institutions.

11.2.7 Networking and Telecommunications
Tripti Sinha

Leadership/Strategic Role:

- Provide a leadership and visionary role in driving tomorrow's communications technologies.
- Position and poise the transport infrastructure to drive IT strategic initiatives.
- Actively participate in and drive IT strategic planning as the communications infrastructure is a key technology asset for technology solutions and services.
- Partner with researchers/faculty and entities such as the MAX, Internet2 and others to actively play a role in identifying/pushing emerging and future technologies.
- Partner with vendors in driving the development and deployment of future technologies by being a test-bed/beta-site for them.
- By active participation in the roles described above, bring national and international recognition/visibility to Maryland's communications technology solutions, be a key player and leader in the field, and establish an emulative technology model for others.

Operational Role:

- Responsible for the campus-wide communications infrastructure and services (voice, video, and data).
- Responsible for self-support unit/budget such that funds are used in meeting expenses for running operations and keeping infrastructure current.
- Partnering closely with OIT security to build all levels of security into the communications fabric.
- Responsible for the relentless execution of daily operational service delivery.

11.2.8 Policy and Planning
Willie Brown

- Facilitates the development of structures, standards, and processes through which sound IT strategic direction is set.
- Seeks to facilitate continuous improvement in IT service and support for the university community and promotes collaborative environments in which to implement IT best practices.
- Through the development of operational policy, promotes a consistent, effective approach to IT planning and service delivery.

11.2.9 Security
Gerry Sneeringer

- Lightning rod for IT Security related issues.
- Sounding board for IT staff and campus administrators.
- Drive development of IT security policy.
- Maintain leadership role in USM and national university security forums.
- Provide coordination between OIT and its auditors.
- Evangelist for better security inside OIT and across campus.
- Works closely with all OIT units, as security touches everything that OIT does.
- Collaborate with campus researchers by bringing real world experience to their academic pursuits.

11.2.10 Technical Services and Support
Fran LoPresti

- Provide the non-networking infrastructure for the IT services offered by OIT. This includes technical assistance in design, hardware implementation, and support, O/S level support and maintenance, and troubleshooting. Services would include administrative, academic, and research applications and for-fee local support of servers.
- Oversee the maintenance for all infrastructure hardware.
- Oversee the facility maintenance for the primary and remote data centers.
- Provide technical communication and act as liaison to the technical community across campus. Provide technical leadership for the campus community.
- Manage the production operation for OIT in a 24x7x365 manner. This includes scheduling of online and batch production, distribution of production output, and guiding production problems to resolution.
- Provide a limited courier service for the delivery of some campus output including media from the OIT Software Licensing office.
- Administer enterprise-wide services offered by OIT for IT and office productivity including electronic mail, calendaring, directory services, Web hosting services, list services, etc.
- Provide centralized storage, backup, and recovery services for the campus.
- Offer systems administration services in a distributed computing environment including a distributed file system.

11.2.11 User Support Services
Pam Burton

- Enhances the productivity of the university community and makes information technology accessible.

- Support faculty, students, and staff in effectively using information technology in academic, administrative, and research activities.

- *Help Desk Level 1 Support:* Our mission is to provide a single point of contact for the University of Maryland community for all OIT products and services. An important facet of the OIT Help Desk mission is to provide front line help desk support for the campus community. To insure success, the OIT Help Desk strives to empower our users with prompt, courteous, and accurate technical support as well as education and training.

- *Help Desk Level 2 Support:* The mission of Help Desk Level 2 Support is to partner with the OIT Help Desk and the Knowledge Management units in supporting and empowering our client base to effectively use information technology and to enhance the productivity of the university community. We also represent and support end-user interests in planning and implementing university technology initiatives.

- *Knowledge Management:* Our mission is to assemble, categorize, and process information and to respond to customers' needs for associating relevant items of data, regardless of location or format. In addition, we educate our community by offering formal classroom instruction, online training, and other traditional mechanisms for learning and growth.

- *Field Support:* The mission of Field Support is to enhance the productivity of the university community by maintaining operational excellence to all information technology resources. This is achieved through quality customer services that provide custom IT support solutions dedicated to any specific needs for academic, administrative, and research activities.

12 Appendix B - Communications Infrastructure Funding Model

12.1 *Introduction*

OIT is in the early stages of executing a 7-10 year plan to install a new converged campus network infrastructure capable of the simultaneous transmission of high-speed data, voice, and video. The converged network will allow OIT to offer new and integrated data/voice/video services, such as VoIP (which allows voice data to be sent over IP networks), and should result in reduced administrative and maintenance costs over the long term.

This initiative is heavily dependent upon the availability of infrastructure upgrade funds. A request for such financing is currently being addressed by the university's Finance Committee.

Presented below is a model that proposes a cyclical and tiered upgrade plan for the university's communications infrastructure (CI). The approach that has been taken is to classify the infrastructure into fixed cost categories with a well-defined technology lifespan. The recommendation is to upgrade the infrastructure component before its life cycle expires.

12.2 *Cost Categories and Associated Lifespan*
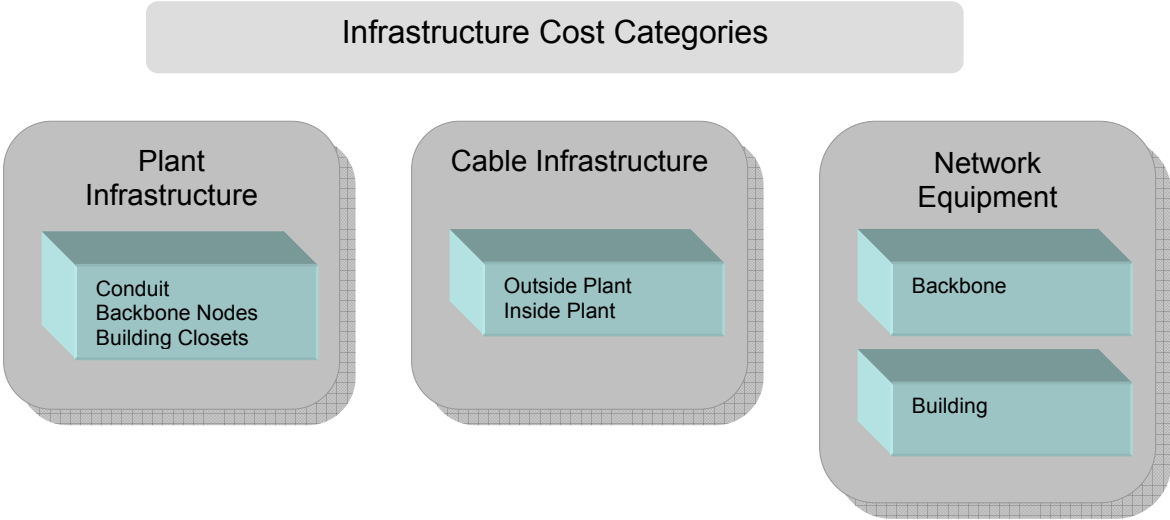
The CI has several distinct components with well-defined costs and lifespan.

1. **Plant Infrastructure**
   - Conduit system
   - Backbone nodes
   - Building closets (these closets house in-building network equipment). Some cost components of closets are power, HVAC, security, etc.

2. **Cable Infrastructure**
   - Intrabuilding horizontal cable: this wiring goes from network utility closets to wall jacks.
   - Outside Plant
     - Fiber
   - Inside Plant
     - Vertical riser (fiber)
     - Horizontal cable (Cat6A)

3. **Network Equipment**
   - Backbone
     - Core
     - Distribution
   - Building
     - Distribution
     - Access

Communications Infrastructure Upgrade Cycle

Plant Infrastructure	25 - 30 Years				...
Cable Infrastructure	10-12 Years		10-12 Years		...
Building Network Equipment	5-8 Years	5-8 Years	5-8 Years		...
Backbone Network Equipment	4-5 Years	4-5 Years	4-5 Years	4-5 Years	...

0   5   10   15   20 … N

Time in years where Year 0 = 2006
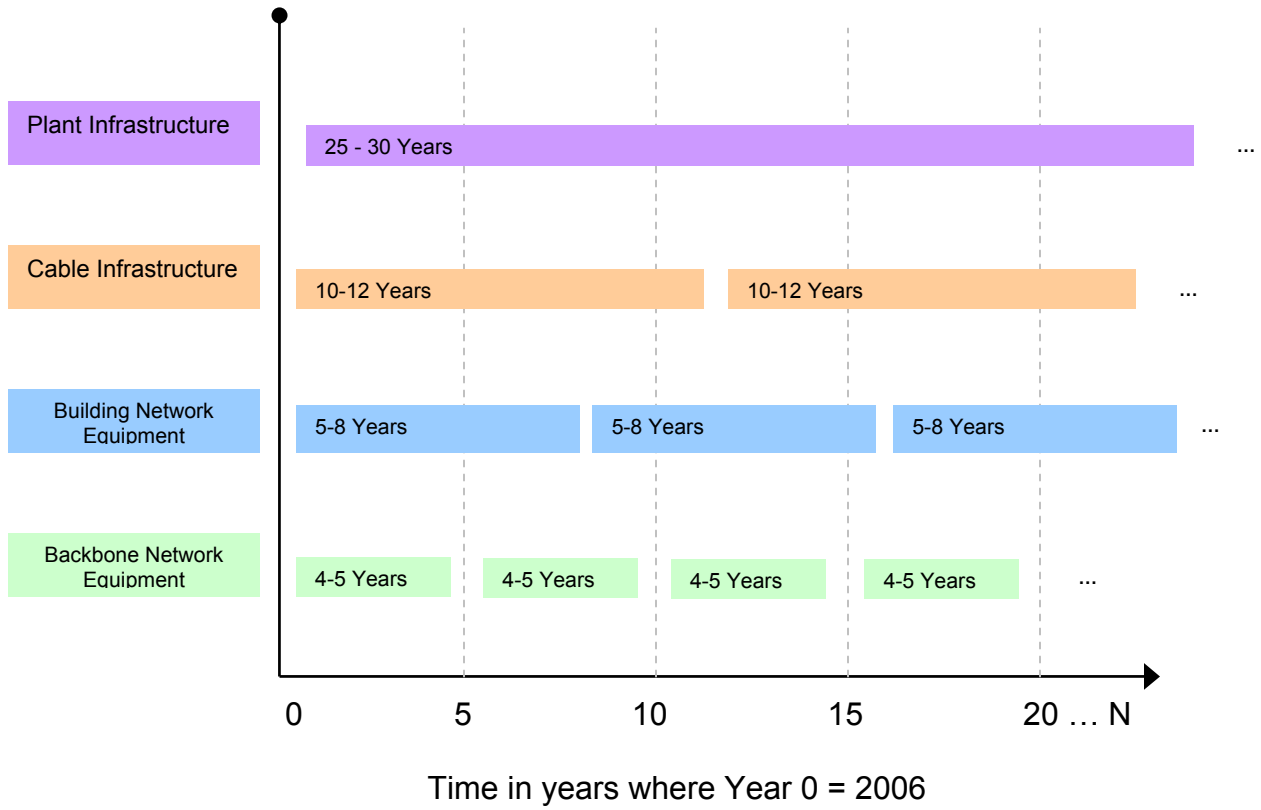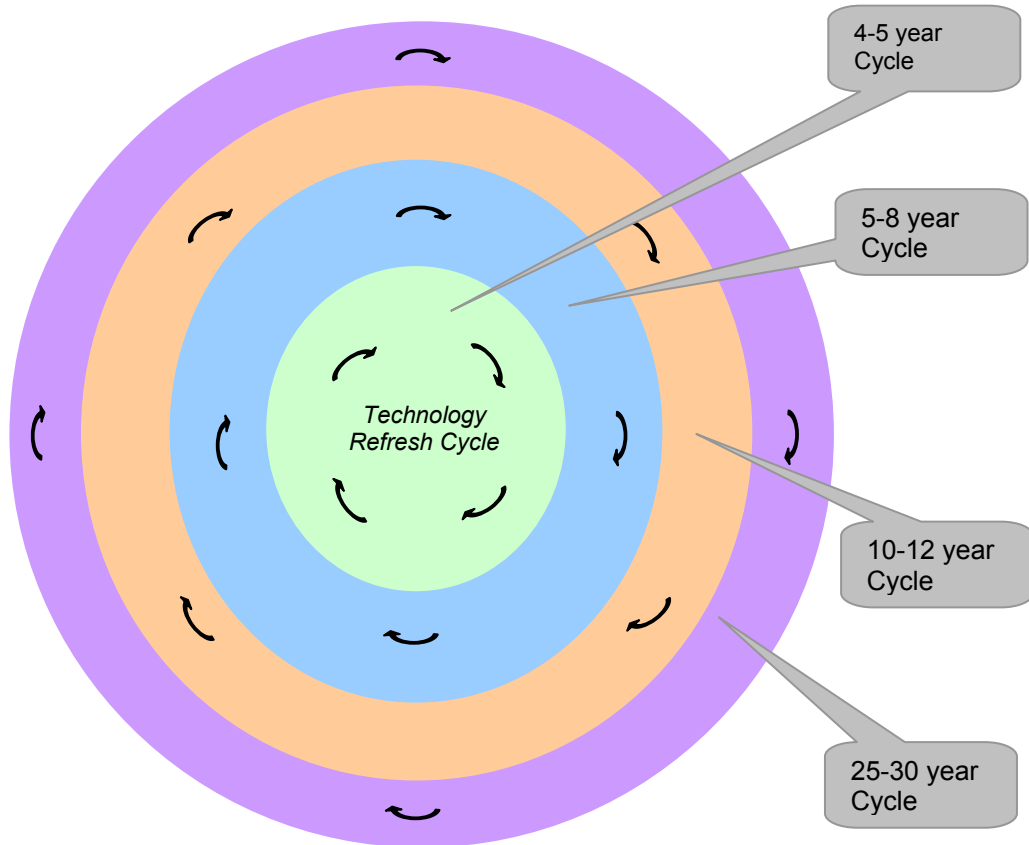
Backbone Network Equipment	Backbone equipment includes core and distribution site equipment. Upgrade Lifespan: 4-5 years	
Building Network Equipment	In-Building equipment includes distribution and access equipment. Upgrade Lifespan: 5-8 years	
Cable Infrastructure	Cable Infrastructure includes outside and inside plant. Upgrade Lifespan: 10-12 years	
Plant Infrastructure	Plant Infrastructure includes conduit, backbone nodes and building closets Upgrade Lifespan: 25-30 years	

The university network currently serves more than 250 buildings. These buildings come in different flavors with differing service needs and, therefore, different upgrade cycles. An attempt has been made to create classes of buildings that are defined by using a combination of the building functions as well as campus constituency. The classifications have resulted in the following definitions and representative buildings.

Class A Buildings

Class A buildings are generally academic in nature and have extremely high-end networking needs. These buildings typically house research facilities, technology centers, classrooms, and faculty offices. Buildings in this classification are required to be current and high-end at all times in their technology infrastructure and services.

Key service elements –
- o High Bandwidth – 10 Gig Uplinks / Gig to Desktop
- o Critical Reliability - Dual Gear / Dual Uplinks

Building Name	Building Number	Facility Type	Cat3 Cabling
1. A.V. Williams Building	115	Acad	100%
2. Animal Sciences/Agricultural Engineering Building	142	Acad	100%
3. Architecture Building	145	Acad	100%
4. Art-Sociology Building	146	Acad	100%
5. Biology-Psychology Building	144	Acad	100%
6. Biosciences Research Building	413	Acad	0%
7. Chemical and Nuclear Engineering Building	90	Acad	100%
8. Chemistry Building	91	Acad	87%
9. Computer and Space Sciences Building	224	Acad	68%
10. Computer Science Instructional Center	406	Acad	0%
11. Engineering Laboratory Building	89	Acad	100%
12. Institute for Physical Science & Tech	85	Acad	100%
13. Jeong H. Kim Engineering Building	225	Acad	0%
14. John S. Toll Physics Building	82	Acad	100%
15. LeFrak Hall	38	Acad	100%
16. Martin Hall	88	Acad	100%
17. Mathematics Building	84	Acad	100%
18. Physics Welding Shop	111	Acad	100%
19. Plant Sciences Building	36	Acad	0%
20. Tydings Hall	42	Acad	100%
21. Van Munching Hall	39	Acad	32%

Class B Buildings

Class B buildings are generally of an academic or administrative nature.
These buildings require sound and reliable technology services.
Key service elements –
- o Average Bandwidth – Multiple 1Gig Uplinks / Gig to Desktop
- o Critical Reliability – Dual Gear / Dual Uplinks

Building Name	Building Number	Facility Type	Cat3 Cabling
1. 4-H Headquarters	800	Facilities	0%
2. Annapolis Hall	8	SelfSupp	100%
3. Avrum Gudelsky Veterinary Center	795	Acad	0%
4. Benjamin Building	143	Acad	100%
5. Biomolecular Sciences Building	296	Acad	68%
6. Cambridge Community Center	97	SelfSupp	100%
7. Campus Recreation Center	68	SelfSupp	0%
8. Chesapeake Building	338	Admin	100%
9. Clarice Smith Performing Arts Center at Maryland	386	Acad	0%
10. Cole Student Activities Building	162	Acad	90%
11. College Park Fire Station	802	SelfSupp	100%
12. Comcast Center	360	SelfSupp	0%
13. Denton Area Dining Hall	251	SelfSupp	100%
14. Ellicott Area Dining Hall	257	SelfSupp	100%
15. Energy Research Facility	223	Acad	100%
16. Engineering Annex	93	Acad	100%
17. Francis Scott Key Hall	48	Acad	63%
18. Geology Building	237	Acad	100%
19. Golf Course Club House	166	SelfSupp	0%
20. Gossett Team House	379	SelfSupp	0%
21. H.J. Patterson Hall	73	Acad	100%
22. Hartwick Bldg. (College Park, MD)	912	Acad	94%
23. Health and Human Performance Bldg.	255	Acad	100%
24. Health Center	140	Facilities	0%
25. Holzapfel Hall	74	Acad	100%
26. Hornbake Library	147	Library	85%
27. Instructional Television Facility	45	Acad	100%
28. J.M. Patterson Building	83	Acad	100%
29. Jimenez Hall	34	Acad	100%
30. Journalism Building	59	Acad	100%

31. Jull Hall	227	Acad	100%
32. Leased Facility (8400 Baltimore Avenue, College Park, MD)	900	Acad	0%
33. Lee Building	71	Admin	100%
34. Leonardtown Community Center	250	SelfSupp	100%
35. Leonardtown Office Building	201	SelfSupp	100%
36. Main Administration Building	77	Admin	100%
37. Manufacturing Building	148	Acad	100%
38. Marie Mount Hall	46	Acad	100%
39. McKeldin Library	35	Library	94%
40. MFRI Office/Classroom Building	199	Facilities	36%
41. Microbiology Building	231	Acad	100%
42. Mitchell Building	52	Admin	100%
43. Morrill Hall	40	Acad	100%
44. Neutral Buoyancy Research Facility	382	Acad	100%
45. Nyumburu Cultural Center	232	SelfSupp	100%
46. Patapsco Building	805	SelfSupp	0%
47. Patuxent Building	10	SelfSupp	0%
48. Pocomoke Building	7	Facilities	100%
49. Police Substation (7505 Yale Avenue)	18	Facilities	100%
50. Potomac Building	92	Acad	100%
51. Preinkert Field House	54	Acad	0%
52. Reckord Armory	78	SelfSupp	100%
53. Regents Drive Parking Garage	202	SelfSupp	100%
54. Riggs Alumni Center	407	SelfSupp	0%
55. Rossborough Inn	80	SelfSupp	100%
56. Service Building	3	Facilities	100%
57. Service Building Annex	5	Facilities	100%
58. Shoemaker Building	37	Acad	100%
59. Shriver Building	75	Acad	100%
60. Skinner Building	44	Acad	100%
61. South Campus Dining Hall	26	SelfSupp	100%
62. Stamp Student Union	163	SelfSupp	0%
63. Susquehanna Hall	233	Acad	100%
64. Symons Hall	76	Acad	0%
65. Taliaferro Hall	43	Acad	67%
66. Tawes Fine Arts Building	141	Acad	100%
67. Technology Advancement Program Building	387	Acad	0%
68. Technology Ventures Building	806	Acad	0%
69. Turner Hall	79	Admin	100%
70. Varsity Sports Teamhouse	158	SelfSupp	100%
71. Wind Tunnel Building	81	Acad	100%
72. Woods Hall	47	Acad	100%

Class R Buildings

Class R buildings are buildings that are remote to main campus. These buildings would be classified as a class B building if they were located on campus. They are typically leased facilities that expect to have campus technology services.

Key service elements –
- o Remote Bandwidth – 1Meg (T1) to 10-100 Meg (TLS) links
- o Standard Reliability – Single Gear / Single Uplinks

Building Name	Building Number	Facility Type	Cat3 Cabling
1. Carlton Building (7309 Baltimore Avenue)	931	Acad	0%
2. Executive Bldg. (College Park)	906	Acad	0%
3. Leased Facility (6200 Baltimore Avenue, College Park, MD)	930	Acad	0%
4. Leased Facility (6303 Ivy Lane, Greenbelt, MD)	902	Acad	0%
5. Leased Facility (Ronald Reagan Bldg., Washington, D.C.)	936	Acad	0%

Class C Buildings

Class C buildings are small buildings with a small number of connections and lower end network needs.

Key service elements –
- o Average Bandwidth - Multiple 1Gig Uplinks / Gig to Desktop
- o High Reliability – Single Gear / Dual Uplinks

Building Name	Building Number	Facility Type	Cat3 Cabling
1. Adelphi Road Office Annex (8701 Adelphi Road)	803	Facilities	0%
2. Building Services Operations Building	215	Facilities	100%

3. Byrd Stadium Building (Upper Deck)	368	SelfSupp	100%
4. Byrd Stadium Concessions 1	362	SelfSupp	100%
5. Byrd Stadium Concessions 2	363	SelfSupp	100%
6. Byrd Stadium Concessions 4	365	SelfSupp	100%
7. Campus Mail Facility	343	Facilities	100%
8. Center For Young Children	381	SelfSupp	100%
9. Central Animal Resources Facility	87	Acad	100%
10. Crane Aquaculture Building	886	Acad	0%
11. Energy Plant	1	Facilities	100%
12. Environmental Service Facility	344	Facilities	100%
13. Field Hockey Building	414	SelfSupp	100%
14. Gate House	299	SelfSupp	100%
15. Grounds Office Building	50	Facilities	100%
16. Grounds Operations and Maintenance Building	124	Facilities	100%
17. Heavy Equipment Building	216	Facilities	100%
18. Litton 3 (5000 51st Avenue)	809	Facilities	0%
19. Memorial Chapel	9	Facilities	100%
20. Motor Transportation Facility	11	SelfSupp	100%
21. Mowatt Lane Parking Garage	404	SelfSupp	0%
22. Mowatt Lane Substation	400	Facilities	100%
23. North Gate (Campus Drive & Route 1)	295	SelfSupp	100%
24. Pest Control Trailer	385	Facilities	100%
25. Physical Distribution Center	383	Facilities	100%
26. Plant Operations and Maintenance Shop 3	212	Facilities	100%
27. Plant Operations and Maintenance Shops	6	Facilities	100%
28. Plant Operations and Maintenance Warehouse	12	Facilities	100%
29. President's Residence	164	Facilities	100%
30. Research Greenhouse	398	Acad	0%
31. Ritchie Coliseum	4	SelfSupp	0%
32. Satellite Central Utilities Building (SCUB 2)	67	Facilities	100%
33. Satellite Central Utilities Building (SCUB 3)	392	Facilities	100%
34. Satellite Central Utilities Building (SCUB 4)	405	Facilities	0%
35. Shuttle Bus Facility	13	SelfSupp	100%
36. Shuttle Bus Trailer	112	SelfSupp	100%
37. South Gate (Regents Dr. & Route 1)	401	SelfSupp	100%
38. Special Services Office Building	100	Facilities	100%
39. Stadium Drive Parking Garage	218	SelfSupp	100%

Building Name	Building Number	Facility Type	Cat3 Cabling
40. Temporary Building (South of Route 201)	116	Facilities	100%
41. Temporary Building 1 (West of Route 201)	207	SelfSupp	100%
42. Temporary Building 2 (West of Route 201)	204	SelfSupp	100%
43. Tyser Tower	361	SelfSupp	100%
44. Union Lane Parking Garage	179	SelfSupp	100%
45. University Courtyard Clubhouse	994	SelfSupp	0%
46. University Courtyard Equipment Shack	995	SelfSupp	0%
47. West Education Annex	66	Acad	100%
48. West Gate (Perf. Arts And Denton on Stadium Dr/193)	297	SelfSupp	100%
49. Womens Softball Stadium	409	SelfSupp	0%

Class M Buildings

Class M buildings have few connections and minimal network requirements. They are often buildings that are temporary in nature (such as construction trailers).

Key service elements –
- o Low Bandwidth – 1 Gig Uplink / Gig to Desktop
- o Standard Reliability - Single Gear / Single Uplink

Building Name	Building Number	Facility Type	Cat3 Cabling
1. Animal Science Service Building	103	Acad	100%
2. Apiary	156	Acad	100%
3. Arena Parking Garage	403	SelfSupp	100%
4. Byrd Stadium Maintenance Building	369	SelfSupp	100%
5. Horse Barn	108	Acad	100%
6. Ludwig Field/Kehoe Track	388	SelfSupp	100%
7. Plant Operations and Maintenance Storage Bldg. 2	213	Facilities	100%
8. Plant Operations and Maintenance Shop2	101	Facilities	100%
9. Plant Operations and Maintenance Storage Bldg. 4	217	Facilities	100%
10. Recycling Trailer	107	Facilities	100%
11. Satellite Central Utilities Building (SCUB 1)	19	Facilities	100%
12. Sheep Barn	109	Acad	100%

Building Name	Building Number	Facility Type	Cat3 Cabling
13. Shipley Field	159	SelfSupp	100%
14. Track and Soccer Field Ticket Booth	389	SelfSupp	100%

Class D Buildings

Class D buildings are all buildings that house on-campus residential students. These buildings require a modern and current technology infrastructure and services, although the density of users and their requirements are different than the other classes of buildings.

Key service elements –

- o Average Bandwidth - Multiple 1Gig Uplinks / Gig to Desktop
- o High or Standard Reliability - Single Gear / Single or Dual Uplinks

Building Name	Building Number	Facility Type	Cat3 Cabling
1. Allegany Hall	24	SelfSupp	100%
2. Alpha Epsilon Phi Sorority (11 Fraternity Row)	136	SelfSupp	100%
3. Alpha Epsilon Pi (4 Fraternity Row)	129	SelfSupp	100%
4. Alpha Sigma Phi Sorority (9 Fraternity Row)	134	SelfSupp	100%
5. Anne Arundel Hall	60	SelfSupp	100%
6. Baltimore Hall	16	SelfSupp	100%
7. Bel Air Hall	99	SelfSupp	100%
8. Beta Theta Pi Fraternity (6 Fraternity Row)	131	SelfSupp	100%
9. Calvert Hall	15	SelfSupp	100%
10. Cambridge Hall	96	SelfSupp	100%
11. Caroline Hall	70	SelfSupp	100%
12. Carroll Hall	65	SelfSupp	100%
13. Cecil Hall	17	SelfSupp	100%
14. Centreville Hall	98	SelfSupp	100%
15. Charles Hall	25	SelfSupp	100%
16. Chestertown Hall	121	SelfSupp	100%
17. Cumberland Hall	122	SelfSupp	100%
18. Delta Phi Epsilon Sorority (4514 Knox Road)	173	SelfSupp	100%
19. Delta Tau Delta Fraternity (3	128	SelfSupp	100%

Fraternity Row)

20. Denton Hall	252	SelfSupp	100%
21. Dorchester Hall	64	SelfSupp	100%
22. Easton Hall	253	SelfSupp	100%
23. Elkton Hall	254	SelfSupp	100%
24. Ellicott Hall	256	SelfSupp	100%
25. Frederick Hall	29	SelfSupp	100%
26. Garrett Hall	31	SelfSupp	100%
27. Graduate Garden Apartments (4301 Rowalt Drive, College Park)	260	SelfSupp	0%
28. Graduate Garden Apartments (4303 Rowalt Drive, College Park)	261	SelfSupp	0%
29. Graduate Garden Apartments (4305 Rowalt Drive, College Park)	262	SelfSupp	0%
30. Graduate Garden Apartments (4307 Rowalt Drive, College Park)	263	SelfSupp	0%
31. Graduate Garden Apartments (4309 Rowalt Drive, College Park)	264	SelfSupp	0%
32. Graduate Garden Apartments (4311 Rowalt Drive, College Park)	265	SelfSupp	0%
33. Graduate Garden Apartments (4312 Rowalt Drive, College Park)	266	SelfSupp	0%
34. Graduate Garden Apartments (4313 Rowalt Drive, College Park)	267	SelfSupp	0%
35. Graduate Garden Apartments (4314 Rowalt Drive, College Park)	268	SelfSupp	0%
36. Graduate Garden Apartments (4315 Rowalt Drive, College Park)	269	SelfSupp	0%
37. Graduate Garden Apartments (4316 Rowalt Drive, College Park)	270	SelfSupp	0%
38. Graduate Garden Apartments (4317 Rowalt Drive, College Park)	271	SelfSupp	0%
39. Graduate Garden Apartments (4318 Rowalt Drive, College Park)	272	SelfSupp	0%
40. Graduate Garden Apartments (4319 Rowalt Drive, College Park)	273	SelfSupp	0%
41. Graduate Garden Apartments (4320 Rowalt Drive, College Park)	274	SelfSupp	0%
42. Graduate Garden Apartments (4321 Rowalt Drive, College Park)	275	SelfSupp	0%
43. Graduate Garden Apartments (4322 Rowalt Drive, College Park)	276	SelfSupp	0%
44. Graduate Garden Apartments (4323 Rowalt Drive, College Park)	277	SelfSupp	0%
45. Graduate Garden Apartments (4324 Rowalt Drive, College Park)	278	SelfSupp	0%

46. Graduate Garden Apartments (4325 Rowalt Drive, College Park)	279	SelfSupp	0%
47. Graduate Garden Apartments (4326 Rowalt Drive, College Park)	280	SelfSupp	0%
48. Graduate Garden Apartments (4327 Rowalt Drive, College Park)	281	SelfSupp	0%
49. Graduate Garden Apartments (4329 Rowalt Drive, College Park)	282	SelfSupp	0%
50. Graduate Garden Apartments (4331 Rowalt Drive, College Park)	283	SelfSupp	0%
51. Graduate Garden Apartments (4333 Rowalt Drive, College Park)	284	SelfSupp	0%
52. Graduate Garden Apartments (4335 Rowalt Drive, College Park)	285	SelfSupp	0%
53. Graduate Hills Apartment (3400, 3402, 3404, 3406, 3408 Tulane Drive)	286	SelfSupp	0%
54. Graduate Hills Apartment (3401, 3405, 3407, 3409, 3411 Tulane Drive)	292	SelfSupp	0%
55. Graduate Hills Apartment (3410, 3412, 3414, 3416 Tulane Drive)	287	SelfSupp	0%
56. Graduate Hills Apartment (3413, 3415, 3417, 3419, 3421, 3423 Tulane Drive)	291	SelfSupp	0%
57. Graduate Hills Apartment (3420, 3422, 3424, 3426 Tulane Drive, 7710 Adelphi Road)	288	SelfSupp	0%
58. Graduate Hills Apartment (3425, 3427, 3429 Tulane Drive)	290	SelfSupp	0%
59. Graduate Hills Apartment (3431, 3434, 3436 Tulane Drive, 7700 7702, 7704 Adelphi Road)	289	SelfSupp	0%
60. Hagerstown Hall	258	SelfSupp	100%
61. Harford Hall	14	SelfSupp	100%
62. Howard Hall	28	SelfSupp	100%
63. Kappa Alpha Fraternity (1 Fraternity Row)	126	SelfSupp	100%
64. Kent Hall	22	SelfSupp	100%
65. La Plata Hall	259	SelfSupp	100%
66. Lamda Chi Alpha Fraternity (7 Fraternity Row)	132	SelfSupp	100%
67. Leonardtown Apartment	238	SelfSupp	100%
68. Leonardtown Apartment 1	248	SelfSupp	100%
69. Leonardtown Apartment 10	239	SelfSupp	100%
70. Leonardtown Apartment 12	244	SelfSupp	100%
71. Leonardtown Apartment 2	242	SelfSupp	100%
72. Leonardtown Apartment 3	249	SelfSupp	100%

73. Leonardtown Apartment 4	247	SelfSupp	100%
74. Leonardtown Apartment 5	246	SelfSupp	100%
75. Leonardtown Apartment 6	245	SelfSupp	100%
76. Leonardtown Apartment 7	243	SelfSupp	100%
77. Leonardtown Apartment 8	241	SelfSupp	100%
78. Leonardtown Apartment 9	240	SelfSupp	100%
79. Montgomery Hall	32	SelfSupp	100%
80. Phi Kappa Tau (5 Fraternity Row)	130	SelfSupp	100%
81. Pi Kappa Alpha Fraternity (2 Fraternity Row)	127	SelfSupp	100%
82. Prince George's Hall	21	SelfSupp	100%
83. Queen Anne's Hall	61	SelfSupp	0%
84. Sigma Kappa Sorority (10 Fraternity Row)	135	SelfSupp	100%
85. Sigma Phi Epsilon Fraternity (8 Fraternity Row)	133	SelfSupp	100%
86. Somerset Hall	63	SelfSupp	100%
87. South Campus Commons #1	996	SelfSupp	0%
88. South Campus Commons #2	997	SelfSupp	0%
89. South Campus Commons #3	998	SelfSupp	0%
90. South Campus Commons #4	999	SelfSupp	0%
91. South Campus Commons #5	974	SelfSupp	0%
92. South Campus Commons #6	975	SelfSupp	0%
93. St. Mary's Hall	62	SelfSupp	100%
94. Talbot Hall	30	SelfSupp	100%
95. University Courtyard #1	987	SelfSupp	0%
96. University Courtyard #2	988	SelfSupp	0%
97. University Courtyard #3	989	SelfSupp	0%
98. University Courtyard #4	990	SelfSupp	0%
99. University Courtyard #5	991	SelfSupp	0%
100. University Courtyard #6	992	SelfSupp	0%
101. University Courtyard #7	993	SelfSupp	0%
102. Washington Hall	23	SelfSupp	100%
103. Wicomico Hall	69	SelfSupp	100%
104. Worcester Hall	51	SelfSupp	100%
105. Zeta Beta Tau (14 Fraternity Row)	139	SelfSupp	100%
106. Zeta Psi Frat.(13 Fraternity Row)	138	SelfSupp	100%
107. Zeta Tau Alpha (12 Fraternity Row)	137	SelfSupp	100%

12.3 *Implementation Plan*

Phase I (First year)
Fiber
- Upgrade outside infrastructure – SM fiber

Core
- 10 Gig buildout
- Sup720 upgrades with CoPP (control plane policing)

Building
- Upgrade closets for buildings selected for VoIP deployment
- Cabling upgrade for first group of VoIP deployment
- Upgrade BDF, IDF switches in VoIP selected buildings

Phase II (2-3 years)
Core
- Upgrade power at backbone sites
- Upgrade HVAC at RCH

Distribution
- Begin to add new DR routers
- Upgrade links to buildings to 10 Gig (coord. With VoIP deploy)
- Upgrade MM fiber buildings to SM fiber (coord. With VoIP deploy)

Building
- Next phase of VoIP deployment
  - o Cable upgrades
  - o BDF/IDF upgrades

Server Farms
- Upgrade Core connections to 10 Gig
- Sup720 upgrades with CoPP (control plane policing)

Misc.
- Upgrade NTS server routers
- 10 Gig buildout
- Sup720 upgrades with CoPP (control plane policing)

Phase III (3-5 years)
ISP
- Upgrade Internet2 connection to 10 GIG
- Upgrade MAX router
- Additional ISP link at RCH

Core
- Migrate to MPLS design

Building
- Continue with VoIP deployment
  o Cable upgrades
  o BDF/IDF upgrades

13 Appendix C - Telecommunications Closet Renovation Cost Estimate

13.1 Overview

Currently about eighty percent (80%) of the telecommunications closets are shared spaces with electric, steam, janitor, and HVAC equipment. Typically, they are not suitable for today's network environments. Some of the major concerns are that most of the closets do not have security or backup power (UPS and generator), and that they are not environmentally protected (A/C, humidity, and dust). In order to understand what is needed for each closet, we have broken the buildings into three different categories, Poor, Adequate, and Excellent, depending on what we feel will be the amount of difficulty and expenditure to bring them up to our current standards.

13.2 Building Classification for Telecom Infrastructure

Poor – These are typically older buildings built or renovated before the 1990s. Adequately sized telecom closets were not included, nor did they have any emergency power or environmental equipment. In order to bring these buildings up to standards, space must be found, closets need to be built, and/or power and HVAC needs to be installed (usually difficult since the closets are spread throughout the building and the infrastructure is not set up to handle these additions).

Adequate – These buildings usually have little or no shared spaces, are typically air conditioned, and have several 20amp circuits available, as well as good pathways for cabling. This type of closet will require security upgrades (card access) and UPS power off of generator, if available.

Excellent– These buildings have closets requiring minimal upgrades, such as card access and central UPS for telecommunications.

13.3 Estimated Pricing for Closet Requirements

These estimates are based on prior work and consultation. Because of the nature of each building's blueprint, facilities, and age, a definitive number cannot be made to adequately cover any one building, thus, each estimate below is an average.

* Closet build, including four walls, ceiling, new door, normal power and lighting $5000
* Card access on door $2500
* Emergency power (if available) $2000
* Install central UPS to all closets of generator feed   (per closet) $2000
* HVAC including new duct work, return, and filtering $2000
* Distribution racks (typically two or more with cable management) $3000
                                                              TOTAL $16,500

It should be noted that the infrastructure supporting these closets has not been included in this estimate. Outside plant, as well as riser copper and fiber, are considered to be part of the wiring of a building. Typically, on an existing structure requiring the minimal amount of copper (100 pair) and fiber (12 strands), installed in reasonable increments, the costs would be approximately $6000.

Also, new construction costs are not included, mainly because those costs are built into the cost of the overall construction of the facility.

14 Appendix D – Resource Requirements

This section provides the resource requirements for each of the initiatives listed in this plan for the period from January 1, 2006 through June 30, 2009. If sufficient budget is not available for full implementation of this plan, prioritization will be done on a year-by-year basis with extensive campus input to ensure the most important initiatives are funded.