Telecommunications & Networking Services
2010 – 2014 Strategic Plan
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1. Introduction

As part of Penn State’s central Information Technology Services (ITS) organization, Telecommunications & Networking Service (TNS) provides a core set of networking and communication services to the university community, in support of the University's mission to be "a multi-campus public research university that improves the lives of the people of Pennsylvania, the nation, and the world, through integrated, high-quality programs in teaching, research, and service."

Formed through the creation of ITS almost a decade ago, both TNS and its parent organization are heavily based upon prior organizational legacies dating to the mid-1980’s. This strategic plan is the latest of a series of similar plans initiated prior to and since that time, which collectively have enabled the development and refinement of the services available today. These services are revised, updated, and replaced, as necessary, to reflect the current strategies of the University and of ITS, as well as to take advantage of current and future technologies and services. The focus of this document is primarily upon the upcoming 5-year period, into 2014.

TNS is comprised of approximately one hundred personnel, and serves Penn State’s colleges, departments, campuses, and other locations, save for the Penn College of Technology (PCT), to meet demands for videoconferencing, for a robust, resilient and secure high-capacity network, for internet connectivity, for voice services, and for a fiber optic/copper cabling system capable of supporting these and other service needs. In short, TNS has design and operational responsibility for the centralized services which enable the University community (well over 100,000 students, staff, and faculty) to digitally interconnect a variety of devices, enabling data, voice, and video communications with each other and with those outside the University. (Note that the citation of “all” campuses hereafter excludes the PCT campus, unless stated otherwise.)

To enhance communication, TNS has recently expressed the unit’s Vision, Mission, and Values:

**TNS's Vision is . . .**

- To be the most professional, expert organization in the application of leading edge communication technologies within higher education

**TNS's Mission is to . . .**

- Provide a highly available, secure, resilient, standards-based, networking and communications infrastructure
- Balance the goals of accessibility, reliability, security, and ease of use against resources and policies to provide the most cost-effective and efficient solutions
- Ensure the overall interoperability of Penn State's networking and communication systems
- Establish and communicate best practices for the use of networking and communication infrastructures at Penn State
- Understand and integrate the various unique needs of the University community to create a cohesive, holistic institutional networking and communications infrastructure
**TNS embraces the following Values . . .**

- We are a service oriented organization
- We serve by taking ownership and embracing teamwork
- We value integrity, ethics, collaboration, creativity, and open mindedness
- We are honest, caring, empathetic, attentive, respectful, trusting and compassionate

Looking toward the future, this TNS Strategic Plan establishes a direction to guide investment decisions and future service evolution that is consistent with the above, and with ITS’s strategies:

1. Enhance discipline-appropriate support for teaching and learning
2. Strengthen discipline-appropriate support for research
3. Secure University systems and information
4. Manage IT investments cost effectively
5. Foster improvements in communication and collaboration
6. Promote University-wide IT leadership, governance and professional development

**2. Environment**

The university environment within which TNS services are provided is not unusual insofar as that which higher education and research universities face. Funding and other resources are limited; expectations for variety, reliability and performance levels of available services are high; and challenges are many. That is particularly of consequence in terms of assuring that the systems and approaches which best meet localized needs are able to also efficiently and economically leverage that which is better provided on a centralized basis, all while respecting a high degree of autonomy of the numerous entities served. Penn State’s multi-campus model also adds dimensions and challenges beyond those of single-campus institutions, as does its rural location within the Commonwealth, compared to those in areas having richer sets of commercial services readily available. Success demands innovation and forward-thinking approaches.

One key example of that has been the business model that has been developed by executives of the University, and applied to these services. With support from the Office of the President, the Senior Vice President for Finance and Business, and the Executive Vice President and Provost, a committee comprised of Deans and other executives developed a financial approach which balances the use of centrally-provided funds for “common good” services affording benefit to all within the University, against the use of funds recovered directly from organizations which choose to utilize, on a discretionary basis, those services designated as providing “individual good” to the respective organizations.

Continuing guidance by this group of executives is provided through an annual review of a 5-year forward-looking budget projection, which is updated each year to reflect changes in service demand and the cost of associated equipment, maintenance and support, and of those elements outsourced to commercial providers. This direction, based upon a mix of centrally funded and cost-recovered services, reflects the University’s overall model of central/decentralized budget planning and accountability. Of particular note is that funding for “common good” services currently includes all proceeds stemming from an “Access Fee” which is based on annual academic and administrative employee population, plus a portion of those funds generated each
semester by student IT fee; these augment allocations made from established central budgets. “Individual good” services are essentially recovered “at cost”, covering vendor and service provider expenses along with provision for apportioned utility and other University fees, and minimal billing system and support staff and service overhead. While this philosophy is consistently applied among the services offered, there is a deliberate element of central funding and cost-recovery inherent with each, with staff, with rare exception, centrally funded in light of their overarching support. This results in rates applied to “individual goods” benefitting from a degree of central support, and being somewhat below their true and total cost. Likewise, investments driven by “individual good” services are leveraged through application and provide benefit to those of a “common good” nature. A recent example of that is application of business system software to measure use also of “common good” services. The flexibility thus gained affords overall benefit to the University, further magnifying the success of the overall approach.

In addition to the impact of that approach, to this plan, are considerations stemming from the recently developed University- and ITS-level Strategic Plans, and the continuing formal and informal interactions with senior and other IT staff and other personnel throughout the University who are either using or planning to use TNS services. Adding to these are overarching general objectives to nurture a welcoming climate, embrace diversity, promote collegiality, and enhance the overall academic experience Penn State affords its students, faculty and researchers.

The University Strategic Plan and the ITS Strategic Plan are summarized in Appendix A and B, respectively. The plans themselves are available on-line to those within the University, at https://www.work.psu.edu/dept/president/pia/strategicplan/StrategicPlan.pdf and at https://wikispaces.psu.edu/display/stratplan/Home.

3. General Trends

While the focus of this plan is upon a 5-year period, there are general elements or trends of a longer term or more general nature warranting identification, which may not otherwise be immediately apparent within the strategies presented.

Four themes developed by the Vice Provost for Information Technology, the University executive who leads ITS, have been instrumental in establishing focus of TNS and peer units:

- Leverage the strength of being ITS
- Recognize and affirm that IT at Penn State is larger than ITS, and strengthen our relationships with campuses and colleges
- Put the core business of Penn State in the center of service design and delivery
- Develop a culture of collaboration and teamwork

These remain instrumental in the overall direction, daily activities and climate within the unit.

In a financial context, other than minor changes to the business model and priorities resulting from annual review by executives, and from recycling and funding reallocations, no significant change to the current business model is envisioned, with annual reviews, general philosophy, and levels of support continuing. However, growth in overall demand and associated cost of services, coupled with current economic conditions, present several challenges. Most significant of those is recognition that the past degree of use of centrally funded staff to support “individual good” services has become unsustainable, as service levels of “common good” services themselves require additional resources—while individual units work to gain efficiency by continuing, or
even increasing, their demand for central support to assist in meeting their own individual organizational needs. While being able to accommodate such change would appear to offer potential benefit in terms of overall efficiency through increased economies of scale, the associated central resources necessary to enable such support appear unlikely to exist in the near term, forcing curtailment of that “individual good” support provided through centrally supported resources, particularly as needs for attention to, and growth of, “common good” services prevail. A number of alternatives (increasing the degree of outsourcing of field and technician activities, reallocating/retraining resources within the unit, identifying services warranting discontinuation, obtaining and applying new commercially available products and technologies, etc.) are being assessed, to minimize the inevitable commercially available products and technologies, etc.) are being assessed, to minimize the inevitable degree of impact, to those with ever-increasing expectations.

It also should be noted that, while there is currently a degree of comfort for recent trends in pricing of bandwidth and other resources continuing to change on an evolutionary, rather than on a revolutionary, basis, there is nonetheless some possibility that unanticipated social, technological, or economic changes could emerge, that necessitate extraordinary measures to be taken to meet new demands. Such was the case leading to the Commonwealth-funded infrastructure upgrade at University Park over a decade ago, when technological change then necessitated substantial upgrade of basic infrastructure. Effects of events such as truly explosive growth in demand for video-based services, wholesale changes in technologies expected for use in commercial products, and application of new teaching paradigms which could result in disruptive change, are not explicitly addressed within this 5-year timeframe.

Likewise, based upon the higher-level plans recently developed and cited, dramatic changes affecting delineation of services by common vs. individual good, assignment of central vs. decentralized accountability, or a change in the need to accommodate current forms of financial reallocation within the University, are viewed as scenarios reasonably likely to continue. It remains unlikely that TNS, unlike many Auxiliary Services, will derive funds from sources external to the University, without special endorsement to a particular objective. It does appear likely that past revenues derived from IT fee increases would decline, based upon the level of the IT fee itself, with that expectation factored into annual budget reviews.

Of a more general nature, trends of higher education include an increased dependency and utilization of all forms of IT services, an increasing emphasis upon distance education and global involvement, a growing dependency upon social networking and interactive forms of IT, particularly by students, and the need to do more, with less.

Miniaturization, increased mobility and security, and the convergence of services are trends that will continue to influence the nature of technological solutions and IT services throughout the foreseeable future, with the demand for pervasive connectivity and increased use of video imagery expected to be among the most significant. Those, in turn, will engender ever-increasing needs for higher bandwidth, better-performing services, with related economies of scale and competition expected to enable containment of costs at feasible per-unit pricing levels.

Open architectures capable of meeting University needs are expected to continue to emerge, and with the adoption of recognized standards, technological advances should enable some reduction in the time that proprietary solutions are employed before full interoperability with other products and capable of accommodating the scale the ease-of-use necessary, is possible. Adoption of standards-based solutions will assist in establishing resiliency and reducing down time, as expectations continue for economical, “always on, all the time, everywhere” capabilities.
4. Goals, strategies, and tactics/metrics

The environment and general trends establish the basis upon which appropriate goals, strategies and tactics/metrics can be built, to pro-actively and openly share the approaches envisioned as best able to meet emerging service needs, as they are currently perceived. The following is presented in the context of the TNS services offered, and of the TNS business enterprise itself, the former affording insight to evolution of services, and the latter focusing upon strategies to improve climate, increase efficiency, enhance openness, and to enable a business approach conducive to maintaining a position at the leading edge—and near the “bleeding edge”—in terms of the services offered, and uses of technology employed. It is based on the premise that action can be taken in a measured manner, particularly in terms of arranging services which require development and/or procurement times that could be problematic, were a pro-active stance not taken.

4.1 Services

TNS currently has seven services, summarized in Appendix C, which are categorized in a manner reflecting the broad aspects of the unit’s offerings, as well as reflecting how the services are generally perceived and understood by those who use them. A “service”, from a high-level perspective, “delivers value to customers by facilitating the outcomes customers want to achieve without the ownership of specific costs and risks”\(^1\).

While there are numerous interrelationships among the offerings, parsing the set into seven broad services aligned with concepts of version 3 of an Information Technology Infrastructure Library (ITIL v3), affords a structure that may be more readily understood and relevant in today’s environment. A more focused discussion of ITIL principles as applied by TNS is included within Business Enterprise strategies, presented in a subsequent section. The categorization also supports overall ITS efforts to develop a comprehensive Service Catalog, as well as structuring financial data necessary to enable the estimation of individual service costs.

4.1.1 Wide-Area Network (WAN) Service

The Wide-Area Network Service encompasses national network connectivity as well as that which serves the enterprise connectivity needs within and among geographically separated University locations.

Goal:

- At the national network level, provide a highly resilient, available, secure, high-capacity wide area network to meet the needs of the University in a cost effective, “just in time” manner, and be proactive in managing bandwidth to national networks such that available capacity to and from them, exceeds current and near-term demands.

- At the campus level, assure that there is sufficient capacity, particularly within the University Park (UP) core of the network, to securely carry the University's voice, video and data traffic as needed, without degradation; that there be sufficient network resiliency such that the Mission of the University is not impacted by any failure of any single piece

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\(^1\) Office of Government Commerce *Information Technology Infrastructure Library (ITIL), version 3* (Crown 2007)
of network hardware; and that all connectivity be arranged in a manner appropriate to avoid service interruption during routine maintenance periods.

- Relative to intercampus connectivity, balance allocated budgets with technical demands to provide sufficient bandwidth for the campus' wide-area network needs and provide cost-effective secure and resilient network connections between the campuses.

### 4.1.1.1 National Networks

TNS is charged with obtaining and managing connectivity between the University and external networks, balancing the related technical requirements, institutional relationships and expectations of those within the University who use the connections, and doing so in a fiscally responsible manner. As of this writing Penn State has connections to three national networks: Commodity Internet, Internet2, and National LambdaRail.

**Strategy:**

- *Place an emphasis on establishing connectivity to multiple national networks in multiple cities through multiple routes from multiple locations within the University.*

In concert with the overall University direction to entrust those using networked resources to abide by University policies and the law, the characteristics of overall traffic volume, geographic location, group attributes, and other non-personally-invasive aspects of system management will continue to be used to make tactical decisions of network capabilities.

As an example, in order to assure that the overall educational, research and business needs of the University can best be met, overall consumption of the relatively expensive bandwidth leading to the Commodity Internet from wired connections in residence halls will continue to be managed to the objective of assuring that adequate bandwidth resources remain available to meet the University’s overall needs, throughout the day. As characteristics of that demand undergo change from workday, to evening, and to weekend hours, allocation of such resources will continue to be adjusted, as appropriate to the overall strategy.

The needs of all who depend upon the services provided will be balanced with the overall allocation of the resources available. As needs evolve, or as policies or laws change, differentiated services may be provided by appropriate means through new architectures, or as additions to current Internet Protocol (IP)-based architectures.

**Tactic/Metric:**

- Obtain as much capacity to national networks as need and allocated budgets warrant, in a manner so that the impact to the teaching, learning and service mission of the University will be minimized by any single point of failure within any of those networks or of the University's WAN architecture.

- Establish a connection point separate from Pittsburgh, for Commodity Internet and Internet2 connections, for redundancy.

- Offload a portion of the Commodity Internet traffic from the present connection, to instead utilize this new connection.

- Establish Altoona as an alternate location to UP, for connections serving all other Penn State campuses.
Monitor and maintain service levels of Commodity Internet bandwidth such that utilization generally remains below 80%.

Implement network performance monitoring software to enable validation of applicable Service Level Agreement (SLA) levels.

### 4.1.1.2 Enterprise Network

The University, as an enterprise, utilizes centralized networking services of an on-campus and of an inter-campus nature.

Relative to the on-campus environments, the University follows a model in which organizations are responsible and individually pay for the “local area network (LAN)” hardware within their buildings, as well as for the connection of that hardware to the Integrated Backbone (IB). Conversely, multiple pieces of networking hardware and infrastructure, particularly of the IB’s “core” at UP, are centrally funded as elements of a “common good” service. The entire University presently depends on the operation of the various pieces of the IB “core” components at UP.

In terms of the inter-campus environments, since the connection between the three national networks and the University are generally seen by users as a single connection, so, too, are the connections between UP and the other campuses. The University depends on its connections to the national networks; the other campuses similarly depend upon their connections to UP.

Because campuses are depending upon services offered from UP and interacting among themselves to a greater degree, there is increasing dependency on the inter-campus aspects.

For both on-campus and inter-campus environments, a balance must be maintained between assuring adequate network performance and affording the ability to maintain sufficient security.

**Strategy:**

- **Assure that the network at University Park be sufficiently robust, secure and resilient, to not be a limiting factor to local network services at any connected campus or other University location, while meeting the on-campus needs of local networks and other needs at UP.**

- **Maintain sufficient bandwidth to each campus to stay ahead of demand, particularly as related to the “primary” path to a campus, in cases where that architecture exists.**

- **Afford adequate resiliency between campuses, by converting the dial-up ISDN-based “redundant” network between other campuses and UP, to “always-on” Ethernet circuits**

- **Insure adequate bandwidth exists in the event of disruption of inter-campus network services, to maintain connectivity to meet Business Continuity needs between campuses.**

**Tactic/Metric:**

- **Afford flexibility, by accommodating use of non-IP inter-building connectivity, to support the evolving mission requirements of the University**

- **Arrange for more economic use of “private” fiber, while maintaining consistency of University identity with outside connections.**

- **Enable use of virtual local area networks (VLANs).**
o Provide resilience, such that any piece of hardware in the IB “core” at UP can be removed from service, whether for planned maintenance or in the event of disaster, without impacting the University's mission.

o Develop a centralized “Integrated Address, DNS and DCHP” management service.

o Implement network performance monitoring software that will show the applicable SLA levels continue to be met during normal operation.

o Reconfigure the overall University statewide network to an “Active-Active” model, characterized by use of both high-capacity and high-reliability pathways together, during normal operations.

4.1.2 Local Area Network (LAN) Service

Local Area Networks are the networks which interconnect through the WAN, and afford connectivity within an administrative unit, college, or campus, as chosen by such entities. They can be viewed in terms of the media used to convey the information, either wireless, or connected via a physical connection over copper or fiber.

Goal:

- For wired LANs, continue to offer, to the degree possible, state-of-the-industry LAN design, development, installation and maintenance of transport technologies.
- For wireless LANs, provide networking expertise and wireless LAN systems needed to deploy high-performance, interoperable, highly available University-wide WiFi services.

4.1.2.1 802.11 ("Wi-Fi") Wireless LAN

Trends in the purchase of new hardware and surveys of incoming students indicate an ever-increasing presence of mobile computing platforms on campus. The LANs that TNS designs, supports and maintains need to focus on increased accessibility, performance and security, in order to support the associated emerging expectations for mobile access to all services, and the myriad of device types, services, and applications that are expected to be in use. Users will need increased access to voice, video and data applications, from University-controlled resources, as well as from public resources that may be available within University environs.

Strategy:

- **Design and deploy a network which will be adaptable to the evolving needs of the University.**
- **Creation of support processes and procedures utilized for delivering the current service will be refined to better meet current general expectations. Future standards and technologies, including the “802.11i” and “802.11n” standards of the Institute of Electrical and Electronics Engineers (IEEE), will be implemented as appropriate.**
- **Provide customer liaison/coordination expertise to influence the design and deployment of wireless technology and network, so that the deployments will not unduly negatively impact other wireless networks deployed by others.**
Tactic/Metric:
  o Develop wireless design and interoperability standards/guidelines suitable for University application.
  o Increase user satisfaction and facilitate the inherent development of new dependencies on the network, as its performance and reliability increase.
  o Decrease the number of trouble calls as measured over time, increase the number of IP addresses as used over time, support the number of additional unique users and the number of simultaneous users.
  o Develop and publish performance metrics to enable validation of applicable SLA levels.

4.1.2.2 Wired LAN

Even with the advent of increased availability and better performing “Wi-Fi” and other wireless networks, there will continue to be a need for wired connections to various computing platforms.

Strategy:
  ➢ Insure the wired LAN services sufficiently meet or exceed customer derived requirements and maintain a scalable support model.

The wired LAN design and support service model will be re-evaluated, and cost-recovery service rates established if/as needed, should demand for this “individual good” jeopardize adequate support of centrally supported “common good” services. Appropriate actions will be taken to endorse, facilitate, or perhaps even arrange outsourced services, to enable those needs to be met.

Tactic/Metric:
  o Avoid unacceptable level of diversion of additional resources from "Common Good" services
  o Reduce the percentage of labor spent on individual good services by 10% annually, to enable growth of common good support needs while resources remain constant.
  o Assess and determine the feasibility of offering a “port-level” wired LAN service.
  o Develop and publish performance metrics that will show the Service Level Agreement levels continue to be met during normal operation.

4.1.3 Communications Cable & Wiring Service

TNS designs, installs, maintains, and modifies inter-building and intra-building cable/wiring and associated hardware for all University-owned, and select University-affiliated, properties. Communications cable/wiring includes copper, single- and multi-mode fiber, and coaxial and other special wiring. Minimum standards based in turn on international standards, are established by TNS, for university communications wiring to support current and expected applications.

Inter-campus connections are provided almost exclusively through leased circuits. This is not expected to change dramatically in the near future, although TNS will continue to research other options, such as Indefeasible Right-of-Use (IRU) or other dark fiber agreements, or utilizing new technologies, as applicable.
Goal:

- In terms of inter-building connectivity, continue to manage the University fiber between buildings that the University owns, and arrange, as appropriate, stable, long-term lease arrangements. Provide, ahead of demand, primary interconnection of buildings, through fiber.
- For connectivity within buildings, provide infrastructure capable of supporting a minimum of 1Gigabyte capacity to the wall plate for each desktop computer or similar device, and a standardized infrastructure throughout all University buildings.
- Insure quality space for telecommunications infrastructure and equipment is to be acquired, managed, and maintained.
- Improve record-keeping and documentation.

Strategy:

➢ Maintain collaborative interactions with the entire University IT community and the Office of Physical Plant (OPP).

Tactic/Metric:

- Wire each University-owned building with “Category 5e”, or better, wiring.
- Assure that every telecommunications room has sufficient air conditioning.
- Provide card access for every telecommunications room at UP, including those located within housing facilities.
- Provide card access for every telecommunications room at all non-UP locations.
- Provide back-up generator power for telecommunications equipment and support systems (e.g., lights and AC) at all non-UP central telecommunications facilities which serve multiple buildings or which serve “downstream” campuses.
- Provide back-up generator power for air conditioning systems at all IB “hub” sites at UP.
- Make available TNS-maintained records, to OPP and to the University IT community.
- Integrate drawing-based documentation into text and other database records, including work processing, billing, cable records, wireless coverage, etc.

4.1.4 Voice Service

Personal and business use of telephones is changing. Users expect mobility, flexibility, and personalization of services with the use of their voice services. It is unlikely a "one-size-fits-all" model of traditional phone services will meet user expectations or business needs in the future.

Because of that, services need to accommodate and leverage changes in technology and standardization that are occurring. The growth of IP-based service delivery and evolving standards, along with convergence of “data” and “video” services with those of “voice”, have prompted a move to open-source, standards-based service environments, hinged largely upon the use of Voice-over-IP (VoIP) technology. Managing these changes will require ongoing focus, and further changes to be made, within the University.
It is expected that voice systems capable of providing the services demanded by faculty and staff will evolve from single, campus-specific platforms, to instead encompass multiple user options, with each of the various systems interconnected and able to interact with each other. Services from stand-alone University Park and campus Private Branch Exchange (PBX) systems, in particular, are expected to continue to evolve, to use standards-based platforms and protocols, with software-based "soft phones" allowing users to choose which options best suit their business needs and personal productivity habits.

The “soft phone” concept creates the capability for campus PBX systems to take advantage of a consolidated system-wide approach, by utilizing the University’s IB as an element in routing calls from participating campuses, to the public telephone network. This could greatly decrease the need for campuses to individually purchase connections to the public telephone network, and yield an overall reduction in cost. However, to assure that adequate alternate resources would be available to meet system-wide service expectations, financial and operational changes would have to first be completed. Aspects to review would include 9-1-1 calling, charges for domestic long distance service, improvements needed to on- and inter-campus networking, and the aggregation of public telephone network access at certain “core” locations.

Such evolving services and technologies continue to enable new connectivity options at a time when the ongoing costs of classic arrangements— as typified by individual on-campus PBX systems connecting locally to the public telephone network—are viewed by many as now approaching their minimum level. Innovative approaches and use of soft phones may afford overall savings, beyond what otherwise might be possible through those classic arrangements.

**Goal:**
- Provide a service option for management, in accumulating order, of voice system design, procurement, installation and maintenance, at University-owned or -leased properties.
- Be seen as the experts within the University, for voice services.
- Develop and deploy services through systems that are reliable and, as needed, redundant.
- Develop, publish and communicate best practices and interoperability requirements, for “voice” systems not directly managed by TNS to follow, in order to gain interoperability.
- Provide open, standards-based services, utilizing the use of University-provided identity, to which users may apply network-based communication tools of their choosing.

**Strategy:**
- Continue the current offering of a reliable and highly available VoIP-based service at UP, to meet the business needs of departments and colleges where a traditional PBX feature set is required, and where individual or group requirements may include specialized adjuncts such as Voice Mail, Automatic Call Distribution (ACD), hunt groups, shared line appearances, or other business-oriented features.
- Continue to offer reliable, highly available and cost-effective generalized voice services (e.g., direct dial long distance and toll free calling).
- Support legacy telephony to the extent resources allow, particularly for those locations which cannot take advantage of current VoIP-based offerings.
Identify opportunities for the development and deployment of voice services that require capabilities beyond those of traditional telephone system approaches and architecture.

**Tactic/Metric**

- Initiate changes to financial models as needed to enable goals to be met.
- Develop strategies to identify and address additional labor needed to meet potential demand, through outsourcing, resource reallocation, or changes in funding.
- Insure contracting activities with third-party service providers accurately reflect, in the most cost-effective manner, the availability and reliability requirements, as well as the business needs, of the University.
- Develop and publish performance metrics to enable validation of applicable SLA levels.
- Keep core hardware and application software at University Park upgraded to versions recommend by vendor, to enable their continued support.
- Create a University-level focus group of Voice Administrators, with representation from those University locations arranging local voice services, to enable development of web-based documentation of best practices of designing, procuring, installing and maintaining voice systems at University locations, to openly share with others contemplating such arrangements.
- Pursue a mixture of vendor-provided and open-source solutions for the business-oriented adjuncts of Voice Mail and Automatic Call Distribution, at UP, to reduce costs, and limit service disruptions and their announcements when routine maintenance is needed.

**4.1.5 Interactive Video Service**

The desire and competitive need to increase collaboration and to reduce travel costs are forcing further consideration of videoconferencing service, which has the ability to support both the objective of enhancing the ability of people to work together and to avoid travel expenses. The quality of a Penn State education may be enhanced through appropriate adoption of this service.

System capabilities will continue to evolve. The application of the technologies will require more focus from the University requiring collaboration of physical facilities, system engineering and end user support.

**Goal:**

- Enhance the overall quality and videoconferencing experience through the use of “high definition (HD)” and other technological improvements that may be employed, at both the videoconferencing room and the videoconferencing bridge, to better serve both academic and administrative needs, and accommodate advancements in technology which make the videoconferencing experience more immersive and life-like.
- Form a more collaborative approach to providing the Penn State user community with workable, interoperable systems, by working with others to develop and implement plans to improve the quality, application and user experience regarding all ITS-provided videoconferencing services.
- Increase user accessibility and leverage the growth of accepted industry standards such that full benefit is gained by users, as options are developed to participate in audio and...
video communication using the platform that best suits their personal needs, regardless of whether it is a room-based system, desktop system, or handheld device.

- Educate the user community regarding the applicability of various videoconferencing options, addressing factors such as the type of use, the number of expected audience members, the quality of transmission, the level of detail of graphics, whether the event is real-time, time-shifted, or both, as pertinent to a deliverer or as a consumer, of content.

**4.1.5.1 Room System Design, Installation & Maintenance**

TNS provides, for room environments accommodating up to 15 people, room-based videoconferencing design, installation and maintenance services in two functional areas – facilities and systems.

**Strategy:**

- **Offer reliable and affordable HD videoconferencing capability/equipment.**
- **Research and disseminate information on systems affording capabilities of an immersive, life-like nature, such as “virtual telepresence (VTP)”**
- **Emphasize the need for appropriate, adequate user training to be obtained by all users.**
- **Improve handling of customer support requests, problem resolution and service inquiries.**

**Tactic/Metric:**

- Target 3 years as the target by which all room-based systems designed by TNS will utilize high definition capabilities.
- Increase usage and user satisfaction, as measured by survey results.
- Work with other units of ITS to provide better on-line and telephone support for those using room-based videoconferencing systems.
- Develop and publish performance metrics to enable validation of applicable SLA levels.
- Acquire and provide tools to enable system administrators to effectively manage and monitor videoconferencing usage and assess the return on their investment.

**4.1.5.2 Video Bridging**

A videoconferencing bridge is required any time that three or more videoconferencing systems are involved in a single videoconference. A University-owned bridge is available for Penn State related videoconferences involving two or more sites, and the service is configured such that it can have multiple, multi-site conferences running concurrently and offers the capability to support HD videoconferencing transmissions.

During recent years, there has been a steady increase in the use of the service, and an increased need to view videoconferences by asynchronous and synchronous delivery methods at the desktop, for both scheduled videoconferences as well as on-demand videoconferences. In general, the on-demand capabilities of the service will continue to be provided and expanded, and streaming and recording capabilities integrated with the bridging technology to support both video-on-demand and live-video needs.
Strategy:

- Conduct an assessment of the current video bridging capabilities, capacity, issues, needs and trends, and use this information as a basis to determine what we will need to support the future.
- Research and implement methods to provide a uniform service interface across the two existing bridges.
- Implement an automated videoconferencing recording and streaming system. Work with other ITS units to address storage, indexing and referencing aspects of video content.
- Implement a central videoconferencing system monitoring system available for viewing by videoconferencing system administrators.

Tactic/Metric:

- Improve the overall availability of videoconferencing content, through digital recording, archival and retrieval methods, to enable viewing of a videoconference from a computer, at a time later than the actual event.
- Provide a uniform service interface to video bridge users.
- Maintain adequate bridging capacity to meet increasing demands, both HD and non-HD.
- Continue to provide the ability to conference a telephone in a bridged videoconference.
- Maintain state-of-the-art video bridging technology meeting the demands of an increasing number of high-performance videoconferencing systems.
- Reduce costs by eliminating expensive legacy capabilities that are not often used.
- Provide, through bridging, video-on-demand and live video.
- Continue to support the Polycom MGC-100 Bridge until funding is available to expand the Tandberg MCU-4220, or purchase a bridge providing advanced technology features and a uniform service interface to replace it.
- Increase usage and user satisfaction, as measured by survey results.
- Develop and publish performance metrics to enable validation of applicable SLA levels.

4.1.6 Video Transport Service

Video Transport is multi-faceted. It includes Cable Television (CATV) service, gateway service to enable linking of dissimilar forms of video, routing of video among different systems at University Park, and satellite downlink reception and uplink transmission capabilities.

Goal:

- Continue to provide a wide range of both traditional and specialty, entertainment and educational programming.
- Provide more digital and HD content on the distribution system as the industry continues to move away from analog content. It is anticipated that this will be a gradual shift towards digital and HD as television sets are replaced with more modern products.
• Provide most of the local specialty content, where distribution rights can be acceptably managed, through IP based delivery making it accessible on both the traditional TV system and via network based delivery.

• Provide IP based distribution over the University network of certain programming to non-UP campus locations. Integrate with local distribution systems to provide a more common University feel to the CATV programming regardless of campus location.

4.1.6.1 CATV

University Park provides Cable TV (CATV) service to approximately 7,300 outlets in on-campus residence hall rooms and common areas operated by housing and food services. The signal is also delivered to about another 1,000 outlets in academic classrooms and administrative offices. The channel spectrum is divided into two tiers, with channels 2-36 designated as the basic tier and 37-78 as the expanded tier. All housing operations receive both tiers, but in the non-housing outlets receive a combination basic only service and expanded service. Historically, the goals of the system were to provide a CATV service to the University that was competitive with what students, faculty and staff could receive in their homes or off-campus housing. In addition, more diverse specialty content was provided such as international programming, local “bulletin board” information, College of Communications programming, and other programs to create a system that delivered both educational and entertainment opportunities and catered to both broad traditional tastes as well as catering to a very diverse low consumption specialty University community. Until recently, the system has met those goals.

Strategy:

➢ Continue to enable content to be delivered in the format and quantity desired, through classic coaxial distribution, with adoption at appropriate time of the use of alternative or additional means of transport, such as IP-based video may represent.

Tactic/Metric:

○ Prepare an RFP and bid a new content package, possibly from several vendors at the same time, to offer a wider selection of programming that is more competitive with the local markets.

○ Explore various options for on-demand types of programming.

○ Continue to own and operate a stand-alone distribution system. Upgrade the system to a 1,000 MHZ system that is bi-directional.

○ Review of alternative technologies and changing requirements, through surveys, affording insight as to the need for improvement or use of alternative technologies.

○ Develop and publish performance metrics to enable validation of applicable SLA levels.

4.1.6.2 Video Gateway

The video gateway service was first offered in 2005 to transport local or satellite delivered programming to campus locations by H.323 videoconferencing technology. Downlink coordination and satellite downlink equipment are provided by TNS or WPSU-TV. With the use
of existing TNS central videoconferencing systems and the video bridge, programs are transported to multiple campuses.

WPSU-TV currently offers a streaming video service and can provide a satellite to streaming service. NTSC fiber transport links between WPSU-TV and Telecommunications building can be used to transport the video to the Telecommunications Building. The digital video router will be capable of switching NTSC signals at Telecommunications building.

There is currently no ongoing cost to provide this service as it uses existing TNS and WPSU-TV equipment which is required in the support of other services. There are no plans to replace the video gateway equipment when it reaches its end of life.

Since the gateway service was introduced, it has been requested less than 6 times. Increased interest in this service may be stimulated as the 47 down-link systems are decommissioned.

**Strategy:**

- Conduct an assessment of the current capabilities, needs and trends. Use this information as a basis to determine what we will need to support the future.

**Tactic/Metric:**

- Provide video gateway services to support University units that will be discontinuing their local satellite down-link system.
- Offer video gateway service as long as existing equipment is available to support it and a sufficient need exists.
- Maintain user satisfaction while promoting reduced University costs as a result of the discontinuation of the satellite down-link support.
- Develop and publish performance metrics to enable validation of applicable SLA levels.

### 4.1.6.3 Video Routing

TNS provides an audio and video routing service at University Park, which is used daily to route live programming from the Walker Building weather studio to WPSU-TV, and to other entities on an as-needed basis. It supports needs of athletic events, public information, seminars, and other activities. The system, based upon analog technology and with many components in operation since the early 1990’s, was upgraded in early 2009 to accommodate WPSU-TV needs and to follow general television industry trends to utilize digital technologies.

**Strategy:**

- Assure that the service continues to adequately meet overall needs.

**Tactic/Metric:**

- Assess current capabilities, capacity, trends, and needs, to identify what will be needed.
- Secure funding to upgrade the uplink for digital transmission, or decommission it.
- Provide analog video transport during the transition to digital video.
- Provide a highly reliable, standards-based digital video and data transport system at UP.
- Reduce setup time, maintain reliability, and increase service accessibility.
4.1.6.4 Satellite Downlink Design, Installation and Maintenance

Satellite downlink design, installation and maintenance has been provided since 1988, with 47 satellite downlink systems maintained by TNS, including 8 systems located at campuses other than UP, 1 owned by the Athletic Department at UP, and 38 owned by the College of Agricultural Sciences, of which 37 are at county extension offices, and 1 at UP. The average age of Penn State’s analog satellite receivers, some which were installed in 1993, is now 15 years.

With the use of downlinks being replaced by the use of streaming and videoconferencing technologies, and most satellite services having now switched to digital transmission methods, many of the analog systems TNS is asked to maintain are used only a few times a year, if at all.

Strategy:

- Contact current satellite downlink administrators to determine their system usage and explain alternate methods to receive broadcasts, and continue to use a Video Gateway service to provide satellite broadcasts to sites with videoconferencing systems.

Tactic/Metric:

- Review the system usage information to determine the date for the end of downlink design and maintenance service.

4.1.6.5 Satellite Uplink Transport

Use of the University’s satellite uplink, which uses analog technology, has declined in recent years. Contributing to the decline are the use of videoconferencing rather than satellite service for meetings and seminars, and the use of streaming technologies over the internet for distributing video and audio content when reduced picture quality is acceptable. Also of consequence are that many broadcasters have started to switch to digital technology to distribute both standard and high definition television signals, and prefer the familiarity of using their own portable uplink equipment to broadcast live sporting events.

While an estimated 90% of broadcasts from the University’s satellite uplink are received by commercial broadcast stations or networks, because the process of converting to digital technologies as the standard for satellite transmissions is now underway, a number have encountered technical difficulties in trying to continue to receive analog transmissions. This situation may worsen as more analog receivers are removed from service.

Strategy:

- Contact users of the uplink to determine their future need for the service.

Tactic/Metric:

- If sufficient need exists to justify the expenditure, request funding support for a digital upgrade from the individual areas of the University using the service. If there is no such need identified by Jan. 1, 2010, terminate the present service as of June 30.
- If the service is terminated, research alternate methods to broadcast HDTV signals to those sites desiring to receive them.
4.1.7 Telecommunications & Networking Consulting Service

Consulting service will be provided by TNS to other University entities for the items below:

- Telecommunication Room Facilities
- Large Room Videoconferencing
- WAN
- LAN/LAN Analysis
- Voice
- Interactive Video
- Video Transport
- Communication Cable & Wiring

These consulting services include provision of advice and recommendations regarding minimum standards, best practices, and regulatory requirements, along with requirements development and implementation guidance, for telecommunications and networking, and related support systems.

Goal:

Develop and place into production a value-added consulting service, such that TNS expertise is available to the University community, including those cases where TNS services are not used.

Strategy:

➢ Share TNS knowledge and experience openly within the University community.

Tactic/Metric:

- Define organizational processes necessary to deliver and track the services.
- Identify subject matter experts within TNS, train and educate staff on the provision of consulting services and associated responsibilities, related boundaries, methods to make recommendations, and communications skills.
- Create, document and publish recommended standards for telecommunications and networking, based upon the University’s requirements and environment (security, architecture, etc.) and upon industry best practices.
- Increase the level of visibility and availability for customers to request technical insight and assistance within the telecommunications and networking realm.
- Work with the ITS Marketing and Communications unit to develop various ways to promote availability of the consulting service.
- Develop and publish telecommunications and networking standards through the TNS website and the ITS Knowledge Base.
- Offer a videoconferencing advisory service on a limited basis, to help units implement integrated audio/video rooms, with videoconferencing capability.
4.2 Business Enterprise

IT services, in general, have evolved from a state of affording "competitive advantage" or "market differentiation", to one of "utility", with commensurate expectations of high availability, reliability, and security. As cast within "Defining IT Success Through the Service Catalog"\(^2\), IT services were largely developed around technologies in response to a specific technical or business challenge, and were oftentimes opportunistic. However, the use of IT services has grown and evolved during the last quarter century to the point where use of those services has become prevalent and critical within all aspects of organizations. In enabling and supporting that overall environment within the University, TNS fills a critical role in terms of assuring the infrastructure and systems affording interconnection meet expectations.

Perspectives of those using IT services have largely and predictably changed from grudging tolerance of service interruptions and variance of performance levels, to a firm expectation that all services will be always fully functional, available all of the time, accessible from virtually anywhere, relatively easy to use, and secure.

In order to respond to the ever-growing and dynamically changing needs of the University, particularly relative to such expectations, financial realities, and technological advances, TNS has engaged more deeply into the process of an overall organizational and service delivery transformation. This transformation reflects a change of perspective from having the primary mission of a traditional telecommunications service provider offering a well-defined, pre-determined set of services, to instead embracing increased flexibility and agility, in order to better enable and support the tailored, value-added forms of services and solutions that are now expected of progressive organizations. A degree of latitude now needs to be taken to offer the various types of expert networking guidance needed to meet particular requests, whether they be to meet departmental, campus, or college needs, academic or administrative needs, public service or research needs, or to those of any other subset of a community as complex as Penn State.

This part of the strategic plan reflects the feedback and input from the detailed insights gained through workday relationships with those using TNS services throughout the University and from contributions from TNS staff via the TNS Collaboration Teams.

Driven by the cultural and business environment highlighted above, and face the growing demands of availability, scalability, capacity, resiliency, and security of TNS's existing services, enterprise and service management strategies were developed to accommodate expanded delivery of unique or "customized" services, within a reasonable time-frame and financial framework. To that end, the following business transformation strategies have been identified.

4.2.1 Service Management

Given nature, number and complexity of TNS' services and associated features and requests, managing transformation with minimal disruption is a difficult and challenging endeavor. In order to mitigate the risk and impact necessary to attain the long-term benefits, the following business goals and strategies are seen a core to a multi-pronged, multi-year approach to accomplish such overall change:

Goal:

\(^2\) Troy DuMoulin, Rodrigo Flores, and Bill Fine, *Defining IT Success through the Service Catalog* (Groningen, Netherlands Van Haren Publishing, 2007)
• Enhance the customer's service request experience with TNS, by providing greater flexibility and on-line access to information. TNS customers currently are able to request TNS services through a number of avenues, such as calling the TNS “Service Line” or submitting a “Service Inquiry” through the TNS web site. While these approaches are operationally effective, opportunities exist for improved customer service and interaction. Today’s customers expect a certain level of independence related to the ordering or requesting a service, with experiences gained at web sites such as Amazon.com or other web-facing service providers now often seen as the "standard" means of conducting business.

• Improve how TNS delivers services and leverages industry best practices. ITIL v3 provides a framework of "best practices” for IT Service Management. The adoption of ITIL principles within TNS affords a roadmap to help accomplish this goal. The principles are from a business and service delivery perspective, based on internationally recognized best practices.

**Strategy:**

- *Formally assess requests on a customer-by-customer basis, considering scalability, security, capacity, and the required resources and feasibility of honoring them.*
- *Improve and streamline the service ordering process through a number of appropriate system applications, and the development of a web portal.*
- *Develop a TNS Service Catalog and Portfolio with supporting processes to insure accuracy of data.*
- *Establish Service Manager and Service Owner roles and responsibilities.*
- *Establish Process Manager and Process Owner roles and responsibilities.*

**Tactic/Metric:**

- Define and create a consulting service to afford an entry point for specialized requests.
- Create a web-based TSR by further leveraging external University resources, WebRAT, Workflow and PAWS, to allow customers to request approvals through their respective management chain and electronically submit a service request.
- Create a customer portal which will allow the customer to initiate service requests or status inquiries without requiring a TSR.
- Create a customer satisfaction survey to guage overall performance and to help identify service and process areas needing improvement, and use as a key performance indicator.
- Develop and publish a TNS Service Catalog and Portfolio.
- Define and document Service Manager and Service Owner roles and responsibilities for TNS Services and TNS Service Items, and clearly communicate this information throughout the organization.
- Assign appropriate staff as TNS Service Managers and Service Owners.
- Define and document Process Manager and Process Owner roles, responsibilities and authority, recognizing that the Process Managers and process Owners will need the
support and contribution from across the organization, and clearly communicate related information throughout the organization.

- Assign appropriate staff as TNS Process Managers and Process Owners.
- Invest in appropriate staff training to help clarify and frame the transformation, through application of ITIL.
- Create a baseline assessment of all TNS process, identify deficiencies and make recommendations for improvement.
- Develop revised TNS IT service management processes and documentation templates for the appropriate ITIL processes.

**4.2.2 Strategies for Business Transformation - TNS the Enterprise**

The first step of an organizational transformation is recognition that change is needed. Beyond clear staff support and recognition during recent months to effect transformation within TNS, is the continued facilitation of a clear message and vision from TNS leadership.

**Goal:**

- Develop and maintain an open environment and communications, addressing change and organizational transformation.
- Insure staff resources and functional directorates are aligned with TNS's Mission and Vision
- Improve and optimize the IT resources and infrastructure used to support the TNS enterprise and its mission.

**Strategy:**

- **Enhance current communication channels and develop new channels of communication.**
- **Review roles and functions within each directorate to identify activities and tasks which are consistent with overall Penn State, ITS, TNS, and, as applicable, ITIL strategies and goals, and to identify any activities or tasks which are no longer consistent with a particular directorate's role.**

The current staff alignment and organizational structure of TNS reflects an organization and operational environment which has had generally steady, evolutionary changes during its legacy, with less-pronounced changes during the years since the overall organizational changes occurred in 2001 creating TNS from the previous organization, OTC. As TNS services continue to evolve, service expectations increase, and resources change in terms of numbers of individual and skill sets, a more focused review of functional and organizational alignment is now warranted. For the affected activities and tasks, the activity/task and the appropriate staffing resources should be moved to a directorate where it is more appropriately aligned, or outsourced to another area of ITS or to a third-party provider.

- **Assess the IT infrastructure supporting TNS service delivery and operations, and identify opportunities for improvement and elimination of duplication.**
TNS has had to invest in and integrate a number of IT-related systems, particularly hardware and software applications, to support and improve the delivery of services and support ongoing operations of the enterprise. However, opportunities may exist to further optimize this underlying IT infrastructure, by capitalizing upon strengths of organizational expertise and appropriately reassigning resources to gain higher efficiency.

**Tactic/Metric:**
- Create the TNS Strategic Plan.
- Facilitate communication through TNS Collaboration Teams.
- Issue summaries of meetings of the TNS Directors
- Arrange TNS all-staff meetings
- Create an internal TNS intranet
- Create a central TNS project status function
- Encourage unit-level social events
- Assess and align organizational resources
- Assess TNS’ operational IT environment

### 4.2.3 Disaster Recovery/Business Continuity:

The critical nature of communications during crises underscores the key roles that TNS plays in preparing for and minimizing the impact of unexpected events. This includes design of services which are highly resilient and incorporate diversity to the extent feasible, operational preparedness to fulfill essential roles and in which alternate processes and procedures are defined beforehand, and planning to enable ongoing needs to be met during the event, with orderly recovery thereafter.

**Goal:**
- To minimize the degree to which services provided by TNS are able to be impacted by unexpected events, regardless of nature of the service, or of the type of event.
- To assist others to the extent possible by applying knowledge and expertise as situations warrant and resources allow

**Strategy:**
- Align experience, best practices, and system design criteria such that services provided are robust and highly reliable under all conditions, at all University locations, to the extent feasible.
- Work with other units in ITS and throughout the University to plan and test capabilities.
- Proactively prepare individuals and groups within TNS for roles they may be called upon to fill in unanticipated situations.
- Maintain documentation such that others can follow plans and directions, should occasion arise to do so.


**Tactic/Metric:**

- Annually test established evacuation procedures from each facility having offices used by TNS, to assure each individual understands and executes their role in case of facility evacuation.
- Perform “table top” exercises involving appropriate staff to refine actions taken during various scenarios.
- Maintain and share as appropriate, information about NIMS and other certifications required of individuals within TNS, and afford time to attain certifications as deemed necessary.
- Annually review, continuously update and share as needed, TNS' Continuity of Operations (COOP) plan.

### 5. Conclusion

The goals, strategies, and tactics/metrics reflected above set the stage for substantive transformational change to occur during the planning period and beyond, and provide a general basis for continued refinement and definition as progress is made, and as requirements and environments change. The role of TNS, along with that of ITS, as well as IT within the University at large, continues to comprise a key element in the teaching, research, and public service mission of the University.
Appendices
A. The Penn State Strategic Plan—Summary of Goals and Strategies

This plan builds on the theme of prioritization for excellence, offering strategies for each of seven goals. Achieving these goals will require collaboration among administrators, faculty, staff, and students from academic and administrative units across Penn State.

Enhance student success. Penn State’s commitment to students is at the core of the University’s mission. The University should work to expand faculty-driven and administratively supported assessments of teaching and learning, provide more opportunities for student participation in research, internships and other forms of active learning, improve key student transitions (such as from one campus to another), strengthen advising for undergraduate and graduate students, and promote the highest possible quality of graduate education.

Advance academic excellence and research prominence. Academic excellence is the essential attribute of a world-class research university. The attraction and development of outstanding faculty, staff, and students will continue to be a high priority. As we consider setting priorities that will drive decision-making, we need to build on the University’s strengths, investing in boundary-spanning fields of great societal importance. A rigorous and targeted review process for both academic and administrative programs can identify possible mergers and realignments to provide critical mass, greater focus, and operating efficiencies. Increasing private philanthropy must continue to be a priority for advancing academic excellence and research prominence.

Realize Penn State’s potential as a global university. We expect that over the next ten to twenty years, the top tier of research universities will be those able to work effectively in a global context. Penn State must maximize the return on its investment in international programs, encourage globally oriented partnerships within the University, focus on a more limited and selective set of overseas partnerships, and expand internationally focused opportunities, course offerings and experiences.

Maintain access and affordability and enhance diversity. With 24 campuses, Penn State plays an important role in providing higher education access to the Commonwealth’s diverse citizenry. The University should continue to re-emphasize its 2+2 enrollment model, allow the campus tuition differential to grow, and evaluate student housing options, critical facilities needs, and student services availability at our Commonwealth Campuses. The identification of new sources of need-based student financial aid is critically important to the mission of the University. And, we must build on the Framework to Foster Diversity.

Serve the people of the Commonwealth and beyond. The University should continue to selectively pursue advanced delivery technologies and strategic alliances among multiple units and programs—including Cooperative Extension, continuing education, the World Campus, conferences and institutes, public broadcasting, and the colleges and campuses—to position the University to serve Pennsylvania and the world. Strategies will include using the campuses as key delivery nodes, sharing faculty, staff, and programs, expanding programming for non-traditional students, re-missioning some campuses if necessary, consolidating specialized services, taking a more entrepreneurial approach to service delivery, and developing a more internationally oriented concept of service. We know that the trend toward globalization in all areas—economic, political, social and cultural—will continue; service will increasingly involve local, national, and international dimensions as more of life is influenced by global-scale events and interactions.
Use Technology to Expand Access and Opportunities. Penn State’s information technology (IT) infrastructure is now the foundation for almost every aspect of teaching, research, service, and outreach. As the University sets priorities for excellence, smart and effective decisions about (and investments in) technology will continue to be crucial. The University will grow the World Campus, invest in a robust and flexible IT infrastructure, support open educational resource initiatives, rebalance centralized/dispersed services, protect the integrity and security of the IT system, and continue to support the central role of University Libraries in the educational enterprise.

Control costs and generate additional efficiencies. Penn State is one of the most efficient universities in the nation and remains strongly committed to maintaining excellence in a time of limited resources. This commitment will involve innovative and flexible steps, such as requiring academic units to develop transparent workload policies, reducing the number of under-enrolled sections and highly specialized courses, better using Summer Sessions capacity, moving to an “investment model” for internal funding of new initiatives, expanding the base for central recycling and modifying the approach for 8 future recycling, addressing the rate of increase of health care costs, and embracing sustainability.
B. The ITS Strategic Plan—Summary of Strategies

**Enhance discipline-appropriate support for teaching and learning.** While most faculty are using ANGEL adequately, we know that many courses could be improved if faculty knew how to better exploit new pedagogical tools and multimedia. Most of our undergraduates are savvy participants in the Web 2.0 world of social networking, continuous communication (cell and IM), and multitasking. Visualization, simulations, gaming, and rich collaborative environments – all should become resources that faculty can deploy easily and effectively. We will find ways to help faculty share ideas, course materials, and best practices. We will leverage the insights of other practitioners, both inside Penn State and throughout higher education, for new pedagogical strategies to engage learners. Penn State will become far more student-centered as we use new tools more effectively.

**Strengthen discipline-appropriate support for research.** We will aid researchers through collaborative approaches to providing cyberinfrastructure and new tools for communicating discovery. These efforts will support the data management needs of e-science and e-research. Services will include building and operating large compute engines as well as preserving, archiving and storing data in the humanities, science, engineering, and the social sciences.

**Secure University systems and information.** We will develop a culture of security through communications programs, procedural and technical measures, and policy changes. This culture will become integrated into the core of our daily activities and will be supported through new technology tools and services. A balanced approach will support research and discovery while protecting and securing information that cannot be shared with all.

**Manage IT investments cost-effectively.** We will make both one-time and ongoing investments with complete life-cycle analysis so that we understand the actual costs to the University over time. We will develop and deliver cost-effective services to meet our users’ needs. We will incorporate ease of use into service design and deployment.

**Foster improvements in communication and collaboration.** We will develop and support services that assist in discovery, communication, and sharing across disciplines, campuses, and beyond campus borders. We will offer services, technologies, and memberships based on identity information. We will integrate identity management into the workflow of all university processes to improve efficiency and the security of transactions.

**Promote University-wide IT leadership, governance, and professional development.** We will facilitate University-wide IT planning, strategies, and results oriented implementation and deployment partnerships. We will anticipate evolving technology trends and respond to emerging user requirements. We will provide leadership and management of a University-wide training and certification program, and we will promote practices that foster the retention and development of IT staff.
C. TNS IT Services

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TNS provides traditional ISP services to the University’s entities by offering sufficient capacity, advanced protocols and network services to all campuses, the Internet and national Research and Education networks.

TNS provides Local Area Network (LAN) design, installation, and maintenance services for university colleges, departments and units. Firewalls are included in the LAN equipment that can be purchased through TNS.

TNS provides inter-building and intra-building cable/wiring for all University-owned and select University affiliated properties. Communications cable/wiring includes copper, single and multi-mode fiber, coaxial and other special wiring as may be required. TNS will establish minimum standards for university communications wiring to support current applications through collaborative interactions with the entire University IT community and the Office of Physical Plant.

TNS provides Voice Services which offers a wide array of features and functionality allowing faculty and staff to easily communicate with others. Voice service features include local and long distance calling, voice mail, single digit menus and automatic call distribution.

TNS provides room based (up to 15 people) videoconferencing design, installation and maintenance services in two functional areas – facilities and systems. A video bridge is available for Penn State related videoconferences involving two or more sites.

TNS provides design, installation, maintenance and administration of University video networks, and will work closely with the University community to distribute programming via that network. The video network includes satellite uplinks and downlinks and routing to University facilities via the University owned cable and wiring infrastructure and the University enterprise network.
### Telecommunications & Networking Consulting

TNS provides Telecommunications consulting services to university entities. Consulting services include advice and recommendations regarding minimum standards, best practice and regulatory requirements, needs and requirements development and implementation guidance for telecommunications and support systems.

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D. ITIL Definitions

**Service**
A “service”, from the ITIL perspective, is "a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks".

**IT Service**
An “IT service” is "a service provided to one or more customers by an IT Service Provider. An IT Service is based on the use of information technology and supports the customer's business processes.

**Service Catalog**
A database or structured Document with information about all live IT Services, including those available for Deployment. The Service Catalogue is the only part of the Service Portfolio published to Customers, and is used to support the sale and delivery of IT Services. The Service Catalogue includes information about deliverables, prices, contact points, ordering and request Processes. The completed Service Catalog will contain the following elements:

- Service description with linkage to business requirements
- Contacts (Service Owner, Trouble or Problem )
- Ordering process
- Policies/Limitations
- Customer Requirements/Eligibility
- Service Level Agreements, Metrics & Measurements
- Service Hours (Availability)
- Related Services
- Pricing/business model,
- Exceptions/change requests, etc

**Service Portfolio**
A Service Portfolio is the complete set of services that are managed by a Service Provider (e.g., TNS). The Service Portfolio is used to manage the entire lifecycle of all services and includes three categories: Service Pipeline (proposed or in development), Service Catalog (live or available for deployment - production services), and Retired Services.

**Service Manager**
The Service Manager manages the development, implementation, evaluation and on-going management of new and existing IT services. The responsibilities of a Service Manager includes the business strategy development, assessing customer demand, financial oversight, vendor interactions, and the full life-cycle management of the IT Service. The Service Manager should be recognized as the global IT Service expert. They drive decision making processes, manage IT Service objectives and strategies, provide leadership on the development of the business case and service line strategy and architecture, new service deployment and life-cycle management schedules. The Service Manager should perform cost management activities in close partnership

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3 Office of Government Commerce Information Technology Infrastructure Library, version 3 (Crown 2007)

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with other organizations such as operations and finance. Service Managers must manage various and sometimes conflicting objectives in order to achieve the organization's goal and financial commitment.

**Service Owner**

The Service Owner is accountable for a specific IT Service Item within an organization regardless of where the underpinning technology components, processes or professional capabilities resides. The Service Owner is recognized as subject matter expert for their service. The Service Owner Manager understands the underlying technologies, service functionality and limitations. The Service Owner understands the market trends, customer demands, regulations, vendors, technologies, and business/strategic needs of the enterprise. The Service Owner needs to be good in leadership, making sound business decisions, communication, negotiating, managing conflict, and achieving consensus.

- The Service Owner takes responsibility, and is accountable, for developing and managing an IT Service Item across the entire life-cycle, including having the responsibility for continual improvement. In this role, the Service Owner must be able to see how their service fits within the strategic framework of TNS, ITS and the University as well as have a clear understanding of the tactical and technical aspects of providing the service. In other words, the Service Owner must insure there is alignment between the functionality of the IT Service Item and the customer's business needs.

- The Service Owner is not responsible for the underlying processes or process development for service delivery. The intent is for the Service Owner to focus on ensuring the service is meeting the strategic and business objectives of the customers and trusts that the processes are being managed efficiently and effectively by the Process Manager(s) and Process Owner(s).

- From a service development perspective, the Service Owner is responsible for the overall coordination and deployment of quality solution service designs and improvement initiatives. Specific responsibilities would include proposing new or modified services and have the leadership role in service development and proposal effort. The Service Owner is responsible:
  - To insure functional and design aspects of the service, as well as the infrastructure, environment applications and data management are developed and documented.
  - For producing quality, secure and resilient services
  - For ensuring service documentation is complete and accurate
  - For the overall business/financial/risk management of the service
  - For understanding the customer's needs and maintaining good customer relationships
  - That the service is being delivered to meet service level agreement measures
  - To Maintain an oversight and understanding of service requests as the request moves through the organization and insure final billing/invoicing is correct and accurate
  - For Monitoring performance metrics for product issues or product enhancements (efficiency or effectiveness

- The Service Owner is not only responsible for managing the technical aspects of the service but is also responsible for managing the customer relationships and business aspects of the service. Specifically, the Service Owner is responsible for developing a service level
agreement (SLA), ensure the service is meeting SLA metrics, involved with sourcing decisions and vendor management, and continued customer interactions.

- Following is a list of sample documentation:
  - Service Package - This document is used to propose a new service or modify an existing service. The purpose of the Service Package is to ensure the service proposal is consistent and in alignment with the business and strategic needs of the customer and the University. The Service Package addresses:
    - The customer's needs and how the service fits within the strategic plan supported by a business case analysis
    - Service objectives with respect to availability, capacity, security and business continuity planning
    - Service performance and delivery expectations, including pricing/charge back models
    - Strengths, weaknesses, risks related to the service, along with overall prioritization given other service proposals and resource availability
  - Service Design Package - This document is a set of documents defining all aspects of an IT service and its requirements through each stage of its life cycle.
    - Requirements: Business requirements, service applicability, service contacts
    - Service Design: Service functional requirements, service level requirements (including SLA and performance metrics measurement plan), service and operational level requirements, service design/topology,
    - Organizational Readiness: financial assessment, resource assessment, suppliers, supporting services, contracts
    - Service Life cycle Plan: Service transition plan, service operational acceptance plan, service acceptance criteria.
  - Service Catalog - The Service Catalog is a database or structured document with information about the IT service. The service catalog is published to the customers and is used to support the sale and delivery of the service. The Service Catalog includes information about deliverables, prices, contact points, ordering and request process.

**Process Manager/Owner**

The Process Manager is a key role which is accountable for the overall quality of the process and oversees the management of and organizational compliance to, the process flows, procedures, data models, policies and technologies associated with the IT business process. The Process Manager performs the role of process champion, design lead, advocate, coach and protector. The Process Manager is responsible for ensuring a process is fit for purpose. The Process Manager needs to have the ability to influence and ensure compliance to the policies and procedures put in place across the cultural and departmental silos.

The roles and responsibilities of the Process Manager includes:

- Take responsibility to improving the effectiveness and efficiency of the all business processes
- Take a leadership role relative to reviewing any proposed enhancements to the process
- Provide input to the ongoing Service improvement

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• Addressing any issues with the running of a process
• Thoroughly documentation of all relevant business processes and ensure the information is discoverable
• Defining and reviewing process related Key Performance Indicators
• Assisting with, and being ultimately responsible for the process design
• Ensure all relevant staff have the required training in the process and are aware of their role in the process
• Ensure that the process, roles, responsibilities and documentation are regularly reviewed and audited