
TNS Telecommunications and Networking Services

A Unit of Information Technology Services

2007-2008

Annual Report

July 1, 2007 to June 30, 2008

Penn State's Telecommunications and Networking Services (TNS), a unit of Information Technology Services (ITS) is responsible for developing, designing, installing, and maintaining comprehensive telecommunications services within and among University locations and outside networks to accommodate the communications needs of the University's students, faculty, and staff.

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Acknowledgments:

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The Pennsylvania State University,
University Support Building 2, University Park, PA 16802

A copy is available at <http://tns.its.psu.edu>, under "About TNS"

Contributors:

Steve Updegrave: Senior Director
Emily Anselmi: Director, Transmission Facilities & Operations
Ron Dodson: Director, Special Projects
Jerry Krawczyk: Director, Enterprise & Computing Support
Jeff Reel: Director, Network Planning & Integration
Each of our co-workers in TNS
Compiled and Edited by: ITS Marketing and Communications

At a Glance
The Numbers

Integrated Backbone (IB)

Penn State has three National Network connections at Three Rivers Optical Exchange (3ROX) in Pittsburgh:

<i>Commodity Internet Bandwidth.....</i>	<i>1 Gbps</i>
<i>Internet2</i>	<i>1 Gbps</i>
<i>NLR</i>	<i>10 Gbps</i>

<i>Total IB connections to date.....</i>	<i>1075</i>
<i>Breakdown as follows:</i>	
<i>5 Gigabit</i>	<i>14</i>
<i>1 Gigabit</i>	<i>350</i>
<i>100 MB</i>	<i>708</i>
<i>10 MB.....</i>	<i>3</i>

Local Area Networks (LAN)

LANs Installed this period 54

<i>Total TNS-Installed & Supported</i>	
<i>LANs.....</i>	<i>556</i>
<i>Switches supported.....</i>	<i>1902</i>
<i>Firewalls supported</i>	<i>102</i>
<i>Access Points supported</i>	<i>669</i>
<i>UPS supported.....</i>	<i>289</i>
<i>Routers supported</i>	<i>85</i>
<i>VPN servers supported</i>	<i>26</i>

Residence Hall Ports Activated-Peak Period

Total..... 21,794

Voice over Internet Protocol (VoIP)

Total IP Phone Sets at University Park 12,731
In 188 buildings and/or departments

Voice Mail Subscribers

Voice over IP Unity Service at University Park 9,080

I. Summary

This report briefly describes the achievements and activities of the Telecommunications and Networking Services (TNS) unit of Information Technology Services (ITS) from July 1, 2007, through June 30, 2008.

Among notable events during the year were participation in the development of a new Strategic Plan for Information Technology Services for the period through 2012-2013, an associated focus upon internal organizational and process improvement initiatives identified through a unit-wide SWOT (strengths, weaknesses, opportunities, and threats) analysis, cultivation of more direct involvement with University-wide efforts for Continuity of Operations (COOP) and Disaster Recovery (DR) planning, and an increased level of activity with the governance model of the Three Rivers Optical Exchange (3ROX, our current provider of Commodity Internet, Internet2, and National LambdaRail (NLR) services).

Along with continued evolution and growth of TNS-enabled services, came an assessment of cost savings enabled through past initiatives and actions undertaken. Among the findings were that monthly recurring expenses alone—that were billed by TNS to budgets within the University—have declined since fiscal year (FY) 03/04 by roughly 30%. This equates to approximately \$2.0M no longer being expended for individual services. While this change is due to a number of internal and external factors, a significant portion is attributable to negotiations by TNS with providers of goods and services, technological innovation, and diligence in assuring bills and expenses are properly administered by providers. Continued efforts will be made to further these types of overall decreases in costs.

Continuing emphasis upon controlling costs also resulted in termination of certain TNS-led services and programs deemed have become of lower priority than others which have emerged. Among such changes was discontinuation of a 5-year-old program of matching the funds expended by organizations to add new wireless coverage areas to their local area networks (LANs). This program enticed colleges and administrative units to deploy wireless local area networking technology consistent in quality and security of that elsewhere in use within the University, likely in a more accelerated timeframe than otherwise may have occurred. The program was hailed in the press as being *“an example of a well-intentioned, well-thought out and well-implemented university endeavor”* and has helped to substantially increase the percentage of wireless coverage throughout Penn State campus locations and other areas. During its life, the program has matched roughly \$350,000 expended by individual University organizations to expand wireless local area network service areas.

The long-lived paging service developed by TNS was also terminated, since it is now able to be simulated through the use of commercially provided services, and outsourced directly by those organizations which require the use of paging.

A third change was an announcement that, during 2009, use of central funds to subsidize the purchase of VoIP telephone instruments will end, in order to further encourage remaining colleges and administrative units at UP (UP) who have not yet maximized their use of Voice over Internet Protocol (VoIP) technology, to do so during 2009.

As hard decisions were made in order to contain costs and advance services, emphasis was also placed upon changing from an organization well-versed in providing a well-defined set of services, to an organization more adept at providing service in the variety of forms that it is now often viewed and expected by those requesting it. This change, which modifies past years' approaches of emphasizing standardized processes in order to gain efficiency and establish a solid base upon which to grow, builds upon the resulting solid set of core services, but in an ever-more-flexible manner. It has already been noted and applauded by groups frequently requesting and using TNS services. It is anticipated that further progress along these lines will be made during the next year, and beyond.

Likewise, it is expected that further progress will also be made in continuing to improve internal and external communications, as well as the overall work climate within the unit, by addressing and leveraging feedback from internal and external meetings, and unit activities, and from the recent ITS-wide climate survey.

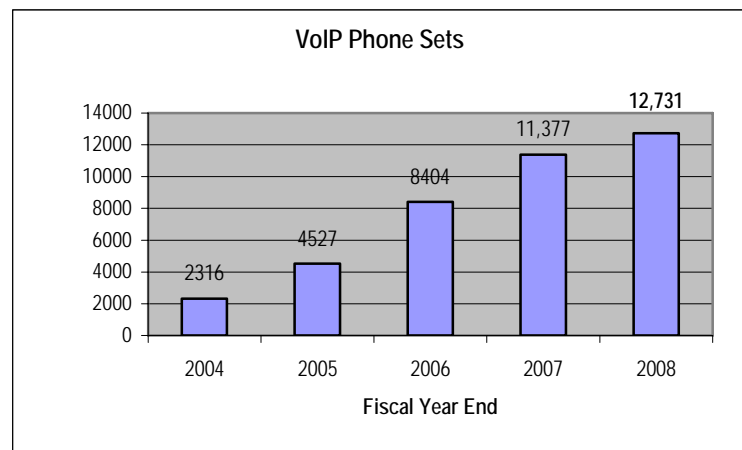
It is the Vision of TNS, to be the most professional, expert organization in the application of leading edge communication technologies within higher education.

II. Voice & Video Initiatives

Voice over IP (Internet Protocol)

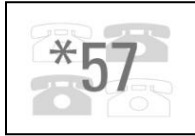
The University's use of VoIP technology—a technology that enables the university to reap significant long-term savings and benefits by converging voice and data features—passed the 5-year mark, and continues to grow in terms of the number of lines converted from legacy service, and of the new features that it adds.

During this report period, 1,354 VoIP phone instruments were activated, bringing the total number thus far to 12,731 of the approximately 15,000 telephones in use at UP having been converted to VoIP technology, among 188 buildings. In addition, over 70% of the total number of phones have also had voice mailbox services activated, far eclipsing past utilization rates of that capability.



The introduction of VoIP support during this year by the ITS Help Desk has further aided the use of and acceptance of VoIP, as has expansion of the features available through use of the technology, such as the “services” button function, which enhances user-friendliness by providing easy access to the device’s “MAC” address. This in turn facilitates prompt support when the Help Desk or Network Operations Center is called, by allowing the user to easily self-identify data needed to efficiently resolve the problem, as well as to identify information necessary for processing the movement, addition, or changes to existing service locations.

Of a similar nature, the information available through the use of the “services” button for “News and Alerts” continues to grow in utility, with News postings of both the University and of ITS, local Weather Reports, and Research News having been previously made available through this means.



Another feature added to VoIP phones during the year was Call Trace capability, accessed by dialing *57 from any VoIP phone at UP. To provide consistent instructions throughout UP, the access code for Call Trace on the legacy Centrex telephone system at UP was also changed to *57, allowing a person receiving an obscene, harassing or life-threatening call through a UP phone, to immediately activate a trace record of the telephone number used to place the call, by simply hanging up and immediately dialing *57. That action then captures information later accessible by University Police Services, should they be contacted by the victim about the event.

Automatic Call Distribution (ACD) also grew in use and acceptance, and is now used by several Penn State departments to answer and to queue incoming calls. This service also details reports of a set of parameters such as the total number of calls received, calls answered, the time a call is awaiting answer, and the duration of the call. To better support demand, the ACD core servers were replaced with devices having a greater growth capacity, to enable accommodation of a greater peak load before any reduction in the efficiency of handling incoming calls becomes measurable.

In order to ease the initial deployment cost of VoIP technology to individual colleges and departments, a \$100 one-time credit for initial connection of each new VoIP phone has been provided since the start of the transition to VoIP, over 5 years ago. Those credits now total over \$1M. However, in order to provide an incentive to those colleges and departments which have not yet chosen to convert to the new technology and adopt the long-term savings offered by it, a plan was developed to bring the transition period to a close by the end of 2009. That plan included an announcement during this reporting period that the \$100 one-time credit will end on June 30, 2009. Adoption of the new technology enables departmental savings of over 1/3 of the monthly legacy telephone dial-tone rate that would otherwise have been incurred for Centrex service.

By adding circuits for outbound local and long distance calls, the VoIP system also has enabled reduction of the University’s overall costs per minute. This was achieved by having local calls traverse a lower cost circuit than would otherwise have been the case for calls normally traversing legacy circuits. Long distance per-minute costs were similarly reduced by enabling direct connection to circuits from AT&T, our current long distance service provider. In addition to financial savings, this arrangement provides an added dividend in terms of resiliency, as the existing Verizon circuits provide back-up capability at times when local or long distance circuits are filled or are out of service.

Videoconferencing Services

As of the end of this reporting period, there are 194 rooms registered as having equipment installed for videoconferencing. Of those, 74 are located at the UP campus, 45 at Cooperative Extension offices, and 75 at other Penn State campus locations or offices. The videoconference support services provided include

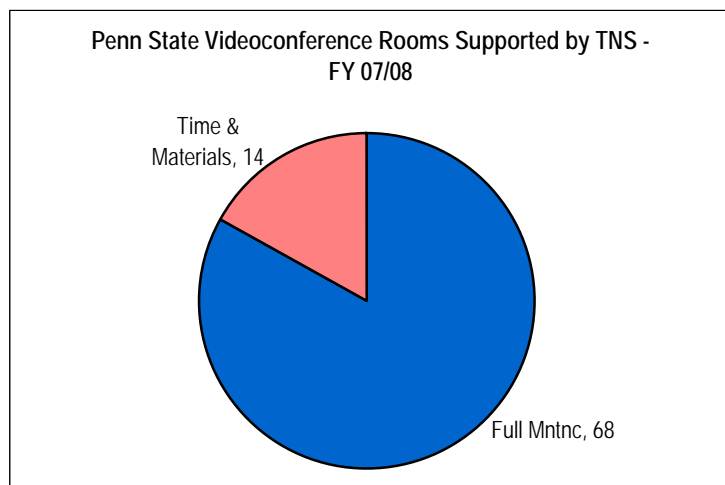
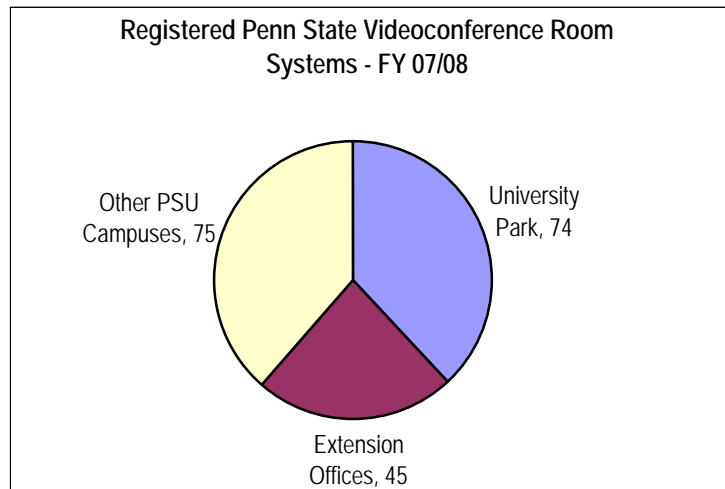
Videoconference-over-IP gatekeeper service, room system maintenance and installation services, video bridging service, and videoconference room design.

In order to enhance resiliency of the gatekeeper service, a second server and associated license will afford redundancy to the primary gatekeeper, with plans made to complete associated installations during FY 08/09.

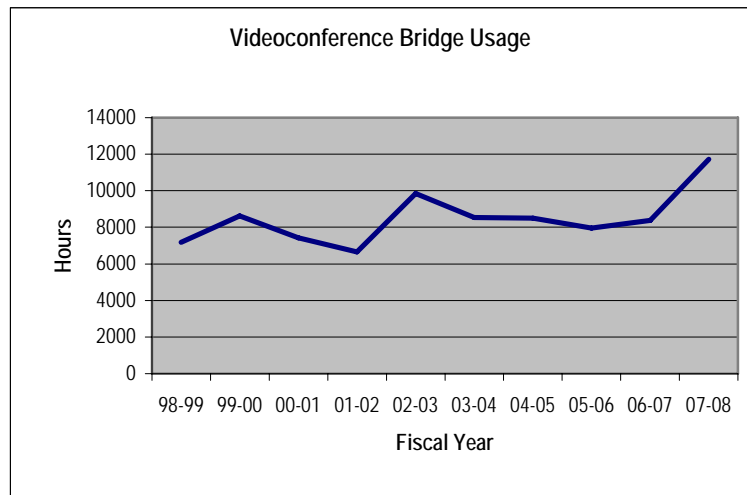
Participation continued with the ITS team experimenting with and evaluating videoconferencing streaming and recording systems. It is expected that a selection and purchase will be made after the system currently under trial is upgraded, to fulfill an essential compatibility requirement.

During fall semester, there was a 75% increase in the use of the videoconference bridge for which technical coordination, scheduling, and technical assistance is provided. At times, the full capacity of the bridge was called into use. To assist with scheduling, an automated video bridge scheduling system was implemented in January, which enables video bridge conference schedules to be entered directly by the ITS Call Center. The system automates the confirmation process, and directly enters the schedule onto the video bridge, which improves accuracy and enables those who otherwise would be required to operate the video bridge, to perform other necessary tasks. TNS is a team member of the ITS team responsible for the implementation of the scheduling system. Work continues with the vendor to enhance the features of the system in a new version of their software.

To learn more about current technology and improve ease-of-use of a typical room designed for use of both interactive video and classic meeting and classroom purposes, a substantial audio/video upgrade was accomplished in room 120 USB2, employing customized software and products from a well-known provider of such products and guided by a firm familiar with their application. It was completed in April, and has been offered as a model for others to consider following. Many of the improvements were made to facilitate the efficient use of presentation technology, reducing setup errors and employee time by automating controls for lighting, screens, window blinds, and projector.



Videoconference Bridge Usage substantially increased from the previous year's level. Exclusive of the data presented is that associated with On-Demand Video Bridge conferencing. On-Demand video bridge conferencing offers freedom of scheduling for impromptu meetings, by providing conferee-initiated access to the Penn State Video Bridge, for which hourly usage statistics are not gathered due to the nature of the service. In short, it offers the freedom to connect three or more videoconference rooms or desktop videoconference systems on an as-needed basis without the need for making formal reservations. During this reporting year, there were 104 different events of that nature, totaling an indeterminate additional number of hours of use.



To meet the overall growing demand for bridged interactive video, a second video bridge, from Codian, was purchased and plans were made to put it into operation in September 2008. The new video bridge will support 40 additional ports, to accommodate the expected demands of fall semester.

Also as of September 2008, the standard transmission rate for campus-based conferences using the video bridge will be increased to 768 Kbps. The increased transmission rate will improve the quality both of the static screen displays afforded by recent adoption of a standard (H.239) which enables that, as well as the quality of motion-intensive video, by reducing the time involved in sending both forms of content.

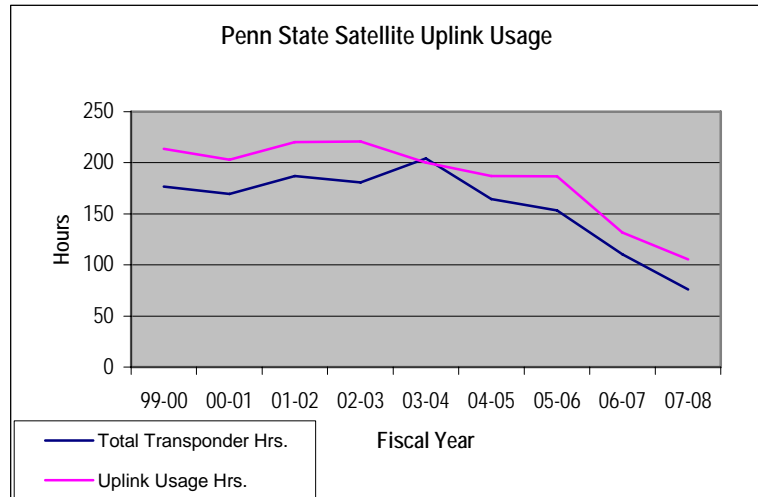
Beyond the established forms of videoconferencing, a new form of videoconferencing was investigated, often referenced to as Virtual Telepresence (VTP). This advanced, "life sized" form of videoconferencing has recently received much attention, and has substantial dependency upon high-quality networking, room configuration, and other attributes important to any broadcast-quality facility.

To afford a general assessment of the feasibility or desire for its use, a multi-site demonstration among facilities in Research Triangle Park, N.C; Herndon, Va.; and Pittsburgh, Pa., was arranged with a major manufacturer of a VTP product. Systems offered by ten vendors were later reviewed and demonstrations of various vendors including Cisco, Tandberg, Polycom/Nortel, LifeSize, Teliris, Telanetix, and Telepresence Tech, have been attended by a subset of those participants from TNS. Evaluation and assessment activities are ongoing, in conjunction with those underway at other institutions, and involving a subset of the manufacturers. A wiki was established to share information among the group participating in the earlier demonstration.

Satellite Uplink Service

Use of the Satellite Uplink continues to decline. This largely is expected to stem from changes in the types of current technology best used to meet particular needs, and the growing popularity of streaming video services through the Internet being used for distributing video and audio content. Of particular note is that the College of

Agricultural Sciences is switching to the use of videoconference rather than satellite technology for meetings and seminars. In addition, broadcasters prefer to use digital and HDTV technology to distribute sporting events over satellite. It has been cost-prohibitive to change the University's uplink from analog NTSC to those later technologies, given the downward trend in demand for this once-popular form of service.



Campus Cable TV System

The Big Ten Network was added to the UP cable TV system, and some channel assignments changed. The UP Cable TV system has almost 8,800 active jacks, located among 166 buildings at UP.

Discontinuation of ITS Radio Paging Services

In order to manage costs and apply available resources in the most beneficial manner, services are continually being assessed in terms of the value they bring and the degree of support they require. Those for which commercial equivalents have become available garner particular scrutiny, as outsourcing remains a key strategy. During this year, it was determined that the one-way Radio Paging Service warranted discontinuation. The discontinuation of the Radio Paging Service reflects rising operational costs and the availability of similar commercial service, and the dwindling need and use of the internal service.

III. Telecommunications Infrastructure Upgrade

Among the many facets of cyberinfrastructure, is the need for appropriate cabling upon which to build the associated network and information processing capabilities. During this year, several buildings have been rewired and/or have had single mode fiber extended to them, as part of the ongoing plan to appropriately upgrade this basic telecommunications infrastructure. The plan encompasses UP as well as most other campus locations, and continues to be centrally funded as part of the University's funding model for telecommunications services.

This year, 13 buildings were rewired, 7 of which were at campuses other than UP. In addition, single-mode fiber was extended to 66 buildings, including 21 of which were divided among 5 campuses other than UP.

Projects at Campuses other than UP:

In total, 7 buildings were rewired and fiber was extended to 21 buildings:

Dubois – Completed rewire of the Multi-Purpose Building and added single mode fiber to 9 buildings.

Fayette – Rewired the Ostermyer Lab.

Harrisburg – Rewired the Swatara Building.

Mont Alto – Rewired Weistling Hall and General Studies Building, added single mode fiber to 11 buildings.

Schuykill – Rewired the Administration and the Classroom Building and added single mode fiber to 1 building.

Projects at UP:

In total, 6 buildings were rewired and fiber was extended to 45 buildings:

New Fiber Installations (45) - Airport Facility (6), Hospital Facility (1), all residence halls in East Halls (17), West Halls (7) and Pollock Halls (9), and D&E Co-location Facility, Coal Utilization Lab, Academic Projects, Polestar Building, and Library Depository (5).

Buildings Re-wired (6) West Campus Power Plant, Fischer Hall, Ferguson Building, Recreation Hall, Engineering Services, and Pesticide Research Center.

Network Reliability

As part of the on-going effort to maintain or improve network reliability, aging Uninterruptible Power Supplies (UPS) systems were replaced at the Telecommunications Building. In addition, a replacement adjunct device that is critical to automatic switching among power sources upon main power system failure was installed there by the Office of Physical Plant (OPP). Similar action is now underway at USB2.

Air Conditioning, Electrical and UPS Upgrades

As network use and equipment continue to grow and expand, the heat and electrical loads in existing Telecommunications Rooms has become more problematic. In concert with TNS, OPP has begun to address these issues and provided upgraded air conditioning and electrical services in 7 existing Telecommunications Rooms at UP, and 4 Telecommunications Rooms at non-UP locations. UPS upgrades were also completed such that campus core routers now exceed 45 minutes of system backup protection to withstand power related events.

In addition to the work above, new construction projects consume a significant amount of time and effort from TNS staff as part of the planning, design and construction process. Each new building requires significant planning and design

to coordinate the fiber and copper services to the building, to arrange the building wiring and to ultimately activate data, voice and video services to each office, classroom, lab and other specialty spaces. Major projects completed this past year include those at Health Services Building, Borland Lab, Wagner Building, Whitmore Lab and Chandlee Lab.

Although not completed, construction of the new Katz Building for the Dickinson School of Law is well underway. This also involved significant utility upgrades and relocations to accommodate the new building site.

An addition to the Computer Building is also underway and building work is in the design phase for Materials/Life Sciences II, renovations to Health and Human Development South and East, North Frear Building, Bio-Safety Level 3 Facility, Agriculture Training Facility, Moore Building renovations, and a number of other, smaller renovations. A number of other major utility upgrades were performed, including moving facilities along Park Avenue to underground routes, and upgrades along Bigler, Curtin and Pollock roads.

IV. Network Enhancements

3ROX Governance

Internet2 provides the U.S. research and education community with a dynamic, innovative and cost-effective hybrid optical and packet network. The network was designed to provide next-generation production services as well as a platform for the development of new networking ideas and protocols. With community control of the fundamental networking infrastructure, the Internet2 Network provides the necessary scalability for Penn State and other member institutions to efficiently provision resources to address bandwidth-intensive requirements of their campuses, such as collaborative applications, distributed research experiments, grid-based data analysis, and social networking.

Penn State's fiber connection to the 3ROX in Pittsburgh is utilized to make the connection to NLR's PacketNet Service, connecting the University to an ever increasing number of universities throughout the country. The NLR is a research and higher education network offering robust bandwidth and resources for unprecedented access to networking and research technologies. Penn State's connection to the NLR enables researchers at the University to have the ability to use virtually unlimited bandwidth for data acquisition and collaboration by simply connecting to the University's Integrated Backbone (IB).

An effort was undertaken, led by the Vice Provost for Information Technology, to work with other institutions which use the services of 3ROX, and with the 3ROX leaders, to enable a higher degree of openness and transparency into the internal processes and method of decision-making of the collective endeavor. Some progress was made, particularly important in light of other national network-related factors involving NLR and Internet2, with more progress expected in the immediate future.

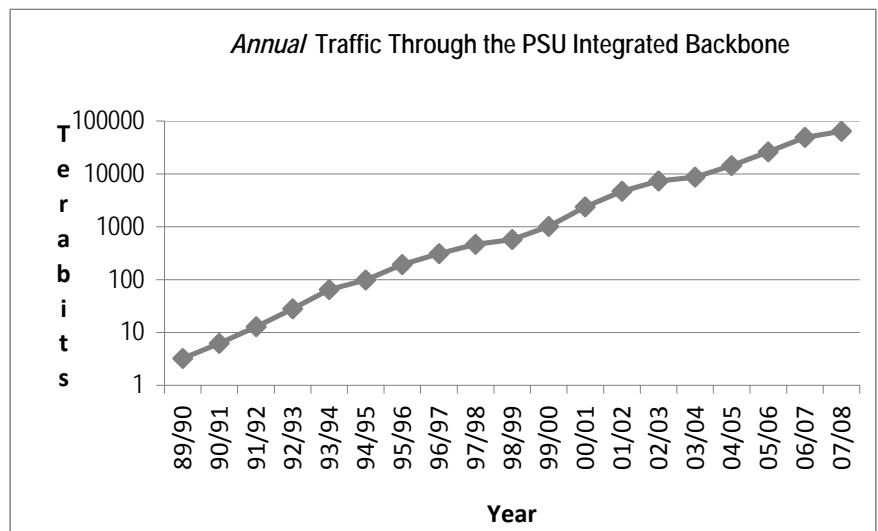
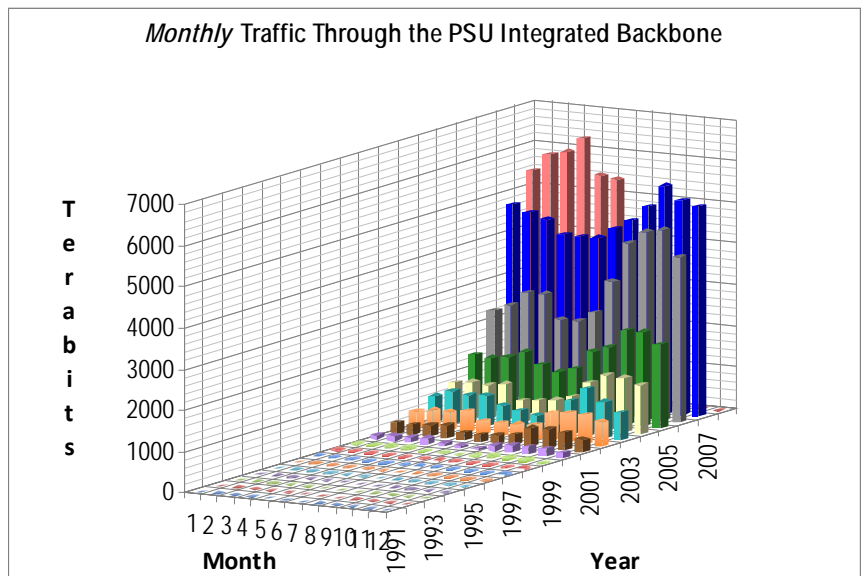
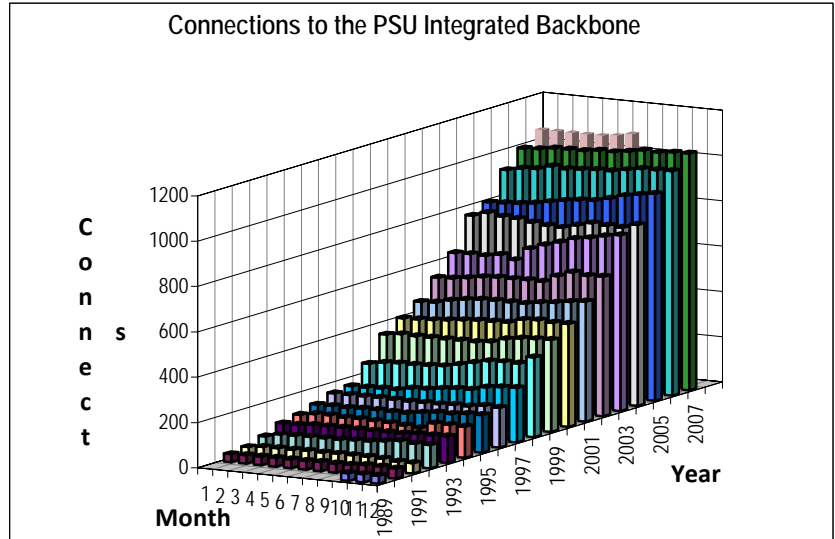
Integrated Backbone (IB) Services

The IB is the IP-based network that enables the efficient transmission of voice, video and data among students, faculty and staff—not only within UP—but with 22 other Penn State campus locations across the state, and to the Internet. The IB supports interconnectivity of over 1,000 LANs, as well as providing access to computing resources and information available at Penn State and via the Internet. During this reporting year, 205 IB designs were requested and implemented. As a result of these designs, there was a net increase of 57 IB connections, bringing the total number of IB connections to 1,075.

Wide Area Networks

Penn State maintains connections to three national Wide-Area Networks through Three Rivers Optical Exchange (3ROX) in Pittsburgh; the Commodity Internet, Internet2, and National LambdaRail (NLR).

TNS significantly managed the cost of the University's bandwidth to the Commodity Internet in FY 07/08 by participating with the National LambdaRail carried TransitRail (www.transitrail.net/) and the Internet2 Commercial Peering



Service (CPS) (www.internet2.edu/network/cp/). Bandwidth to the Commodity Internet is charged on a per megabit (Mbps) usage. In FY 07/08 the University consumption increased from 400Mbps to 610Mbps with the associated cost increases. However, the cost of traffic exchanged with NLR TransitRail and Internet2 CPS is inherent in the participation fees with those institutions. Over 300Mbps of commercial traffic was sent to those networks that in the past would have been routed at a much higher cost, to the usage-based Commodity Internet.

State-wide Networks

Twenty-three of Penn State's campuses are interconnected at UP. During this year, a multi-year plan was developed to address increasing needs for bandwidth, improving resiliency, leveraging use of newly available services and changes in service pricing, and other considerations of on-campus and system-wide network architecture and technology. Results were factored into budget models, shared with personnel from non-UP campuses, colleges, and other organizations as appropriate.

Capacity demands are continually monitored by TNS so that provisioning may stay ahead of demand. Initial steps were taken in the form of increasing bandwidth of both primary and secondary paths to several campuses. Campuses that received bandwidth upgrades in FY 07/08 were Abington, New Kensington, Greater Allegheny, Harrisburg, and Hazleton. Interaction increased with those at campuses for which near term changes are anticipated, inclusive of special efforts to strengthen communications with those at Hershey and at Carlisle.

The routers at each of the following campuses were converted from Juniper M10 series routers to Cisco 6500 routers--the same type installed at UP: Beaver, Brandywine, Dubois, Fayette, Great Valley, Lehigh Valley, Mont Alto, New Kensington, Schuylkill, Shenango Valley, Wilkes-Barre, and Worthington-Scranton. This prepares each for greater port density, throughput capacity and resiliency with redundant processors and power supplies. The remainder of the 23 campuses were upgraded in previous fiscal years.

The inter-campus transport fee (associated with all networking services delivered through Integrated Backbone (IB) Extensions) was eliminated as of January. An IB Extension allows University locations (that are not served by fiber) to connect directly to Penn State's Network - enabling these areas to retain their specific Internet address space and avoid the need to use a virtual private network (VPN). IB Extension users can also obtain larger bandwidth capacity than available through a commercial ISP, depending on their individual location requirements.

PSU.EDU Domain Name Service

In an effort to enhance Domain Name Server (DNS) security and improve resource usage on the Penn State Network, a function called "Recursive DNS lookups" in the University's domain name service was restricted as of July 9, 2007. As a result, University community members who use off-campus computers on a non-Penn State network will need to use the DNS server settings of their off-campus Internet service provider, in order to be able to access Internet sites outside of the psu.edu domain. Under the new scheme, computer users who connect via Comcast, Verizon DSL, or hotel, conference and meeting networks should ensure that their computers are configured to use the off-campus DNS IP settings, rather than the University's DNS settings. To verify whether or not a particular computer

is currently configured to use the Penn State DNS servers, users were directed to go to <http://tns.its.psu.edu/hotlinks/recursivedns.html>, or to ask their network administrator.

IPv6 at Penn State

The Penn State IPv6 Working Group was created in April and consists of members from various ITS units. The Group, which is chaired by a TNS staff member, acts as a central resource for people who are capable of influencing policy either directly or by communicating an implementation plan. Working Group members are in the process of identifying action items to enable IPv6 related projects within their specific areas of responsibility. The Working Group itself guides these planning activities, functions as a central resource, and partners with other groups as required.

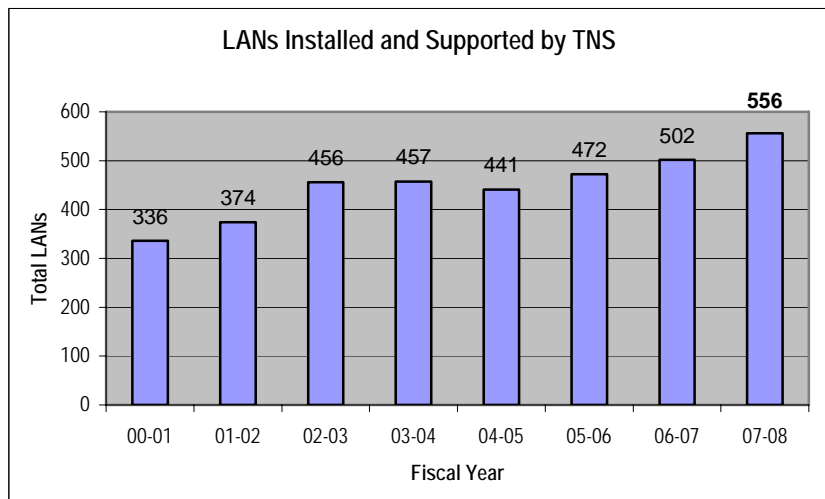
Local Area Network (LAN) Services

Currently, The University utilizes 1,075 installed backbone connections on 85 different routers. On 509 of these backbone connections, TNS supports 1,902 Ethernet switches and 102 firewalls. Both "Full" and "Hub-Only" forms of installation and maintenance continued to be offered by TNS. Of the 1,075 backbone connections:

- 200 are Full Maintenance
- 215 are Hub-only Maintenance
- 94 are Time and Materials.

During this reporting period, 54 new LANs were installed bringing the total number of LANs installed and supported by TNS to 556. Each TNS-

supported LAN is serviced through an IB connection. In addition, 12 LANs were upgraded, and 38 LANs were expanded.

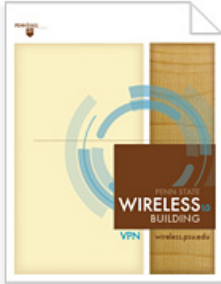


ITS Firewall Service

A newly negotiated contract at Penn State enabled price reductions of the ITS Firewall Service on newer models of firewall devices and their respective monthly service costs. ITS- and vendor-support for legacy firewalls continued under the terms of the new contract, with only a modest rate increase. In addition, an enhancement that enables multiple interface connections on new and existing firewall hardware devices was made available to the ITS "Custom" Firewall Service. These additional interfaces may be used on any firewall device that has multiple interface connections available to serve those requiring separate rule sets for their LANs, providing more cost-effective options for these areas. TNS remains a key ITS unit involved in providing the ITS Firewall Service.

Penn State Wireless Networking

Since FY 02/03, ITS has overseen a program to match funds on a 50/50 basis with units wishing to expand the wireless coverage area of their LANs. In cases requiring a new connection to the IB, the associated \$1,000 connection fee was



also waived. The success of this program has been instrumental in substantially increasing the extent of wireless coverage areas throughout the University, with many campuses now citing full coverage of high-speed wireless service. Roughly \$350,000 has been expended thus far; with additional funds earmarked for support of Penn State Wireless deployments that are currently in the design and/or installation phase.

Many colleges on the UP campus have taken advantage of the funding, including those of Agricultural Sciences, Liberal Arts, and Health and Human Development. University Libraries also leveraged the funding program to install wireless coverage in the Libraries.

Other Penn State locations took advantage of the matching funds to help jump start wireless access on their campuses. They include Abington, Brandywine, Fayette, Schuylkill, Wilkes-Barre, and Worthington-Scranton.

The University's student-run newspaper, The Daily Collegian, heralded the program's success by printing the following editorial opinion on April 14:

"In order to use the program's services, an organization had to apply for the aid and funding, which cut down on possible fiscal waste from installing wireless in places where it may go underused. The need- and request-based funding was an economically smart way to promote wireless growth for educational purposes."

"The Wireless Expansion Funding program is an example of a well-intentioned, well-thought out and well-implemented university endeavor. Internet access is incredibly important across such a large, research based campus, and this program yielded excellent results."

The program was a great success. However, the degree of success attained through several prior extensions to the initial program period, and need to reallocate funds, warranted discontinuation.

TNS administers and maintains the VPN for the ITS Wireless Service, affording connectivity of those members of the University who possess Penn State AccessIDs. TNS significantly enhanced the VPN during spring semester 2007, for greater throughput, resiliency and capacity.

An initiative was begun under charter of the Vice Provost for Information Technology in late 2007 to make wireless network connectivity available to individuals without AccessIDs who might be visiting the University. A means of providing this connectivity while still protecting the University from liability was needed. TNS personnel took leadership roles in the technical investigation, RFP creation and evaluation of possible alternatives. It is hoped that the announcement of a partnership award is possible early in the next fiscal year.

Next Generation ITS Wireless Service

A TNS staff member is chairing a committee of ITS staff who has been tasked with investigating and proposing changes to enhance the existing ITS wireless service and oversee the implementation of those changes. The committee is also in the process of establishing requirements for the next generation of ITS wireless service, which entails selecting components for the new service and developing a plan for transitioning from the existing system to the next generation ITS Wireless system. The committee implemented an operational trial of "Penn State Wireless 2.0" next generation wireless services in a controlled sampling of buildings on the UP campus in May. Specific buildings and areas included in the operational trial are located in the Central campus, Shortledge Mall, and East Sub-Campus areas of UP. The "Penn State Wireless 2.0" operational trial incorporates recent IEEE 802.1X wireless authentication and encryption methods that are aimed at enabling an improved level of security and improved performance. The trial is slated to run until September. Additional information about the trial is available at <http://wireless.psu.edu/trial.html>.



Wired External Networking Service Provision

A TNS chaired committee, composed of University representatives from ITS, Housing & Food Service, College of Agriculture, and Penn State Harrisburg, with participation from Procurement Services and Risk Management, reviewed the need to develop policies and guidelines for University entities who wish to procure internet service from a third party Internet Service Provider (ISP). The WENSP committee identified and documented the various drivers behind the various needs within the University for a third party ISP. The WENSP Committee developed a set of guidelines for the majority of the drivers, filling an information gap for University units and users. The guidelines describe the process a unit must follow in order to comply with University policies and security requirements. While mostly complete, the WENSP Committee is addressing one remaining driver which should be resolved and completed during the 2008/2009 timeframe.

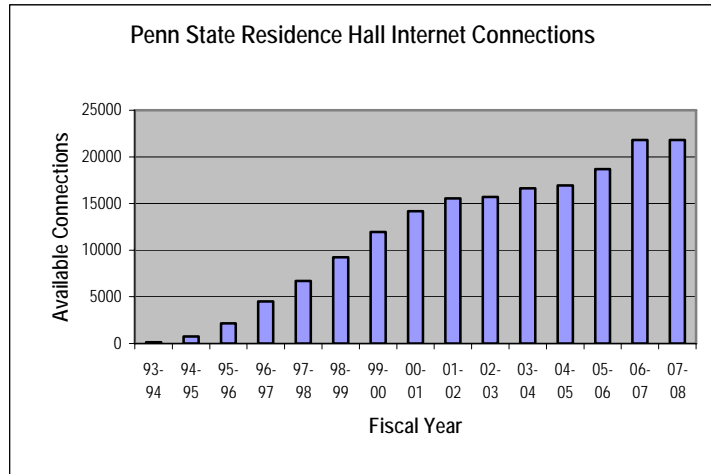
V. Student-Focused Issues

Residence Hall Internet Services

As has become an ongoing condition, virtually all of the University's residence halls students activated their individual residence hall Internet connection. However, even with that being par with prior years, demand for bandwidth through these connections continues to increase, triggered by the Web2.0 environment, social networking sites, broad availability of video content, and other education and recreational needs.

A successful test previously undertaken with those in Housing to implement a "static DHCP" approach to expedite network registration of computers used by students in residence halls, was moved to a production state, with the result that calls for help to Housing and to TNS' Network Operations Center decreased by 50% and 40% respectively, during the first week of fall semester 2007.

The bandwidth obtained by the University continues to be shared among students, faculty and staff, with special treatment afforded to that which is provided through wired connections within residence halls. In an effort to determine if the service level afforded by those connections warranted additional change, ITS—on a trial basis in conjunction with Housing and Food Services—doubled the associated 2-year-old, 2 gigabyte weekly network traffic allowance, to afford each residence hall student the ability to transfer, via the wired in-room connection, a weekly total of 4 gigabytes. The trial, along with commensurate forgiveness to those Residence Hall Students who had accumulated "violations" of excessive use to that point in time took effect in March. The trial continued through spring semester, and plans were made to further extend it.



During fall semester, the overall amount of bandwidth available for Commodity Internet access by the University was increased. Upholding past principles of affording commensurate increases in bandwidth to residence halls, the entire amount was allocated to residence hall use, in light of other changes made in the manner such bandwidth is treated, through "peering" services afforded through NLR and 3ROX.

Voices Services for the Residence Halls

TNS is actively collaborating with Housing & Food Services to assess the on-going value and the cost effectiveness of providing dial-tone phone service to students living in the UP residence halls. The analysis is driven by two facts. First, surveys show that over 90% of the students have and use cellular phones. Second, an analysis of residence hall telephone usage during FY 07/08 demonstrated that less than 35% of the phones in the residence halls were used at least once, with approximately 66% of those lines being used less than twice a month.

The assessment is investigating the feasibility of providing dial-tone service to a student's room only on an "as requested" basis – as opposed to the current approach to activate all 8,000+ lines – while still adequately addressing the requirement for providing emergency phone service on each floor.

Technological Support

In conjunction with Internet2, Student Affairs, and others, informal support was provided to enable a technologically leading-edge reception of programming through Internet2 using extremely high quality video and audio capability for a special class delivery held in the Hetzel Union Building.

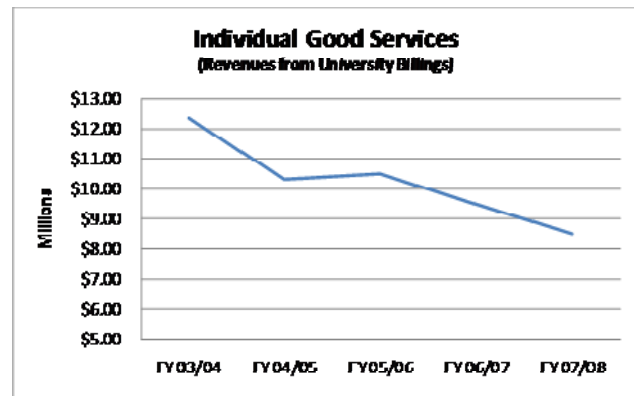
VI. Continuous Quality Improvement

Financial Measures

One of the TNS' mission statements has been that TNS will "Balance the goals of accessibility, reliability, security, and ease of use against resources and policies to provide the most cost-effective and efficient solutions." With pressures for rising costs concurrent with declining budgets, TNS has been closely monitoring the costs of services provided to the University community.

With respect to TNS' centrally funded services (e.g., the Penn State core network, cable/fiber upgrades, Internet connectivity, Intercampus Network, secure Wireless service, and others), TNS has been able to provide enhanced services within the budget allocation. TNS' 5-year business model projects, that even with continued recycling pressures, the budget allocations will be sufficient to meet the growing 5-year telecommunications needs of the University.

With respect to cost recovered services (e.g., voice, video conferencing, customer LANs, etc.), TNS has been able to make great strides in reducing the costs of providing these services, and is passing the savings along to the University community at large. For example, the total costs/revenues for cost recovered services have declined by approximately 31% since FY 03/04. This translates into an additional estimated \$3.8 million which University colleges and administrative units have had the opportunity to apply to their primary mission.



There are three components of cost recovered services: one-time expenses, recurring monthly expenses, and usage driven expenses. While part of the decline in these billable expenses is partially attributed to a decrease in demand for one-time equipment purchases, the primary driver for the 31% decline is the reduction of delivering operational services (e.g., monthly recurring expenses) and telecommunication usage expenses. For example, monthly recurring expenses billed to University colleges and administrative units have declined approximately 30% or \$2.0 million since FY 03/04. This reduction is largely driven by the conversion of voice services to VoIP and diligent contract negotiations with vendors. In addition, as a result of rate reductions stemming from contract negotiations, usage expenses (e.g., direct dial long distance calls) have declined by approximately 42% (~\$377,000) since FY 03/04.

While this recent rate of cost reductions is likely not sustainable, TNS continues to investigate ways to provide reliable and secure services, cost effectively.

Disaster Preparedness

Continuing the arrangement established in 2006, TNS continued to work with others in ITS and elsewhere to address issues related to the continuity of operations and recovery in event of a disaster. TNS was instrumental in terms of assisting in the University's identification of those services deemed critical, several of which are ITS-centric, and some which involve TNS. Exclusive of that work, TNS also conceived and is working towards a plan to further leverage the "dark fiber" path between UP, Altoona, and Pittsburgh, along with Altoona-based ITS disaster recovery initiatives, to increase overall University resiliency to a network-centered problem (such as could occur at UP), with no growth in centrally funded dollars. In addition, along with an annual update to TNS' Continuity Of Operations Plan (COOP) in November, the existing evacuation plan for TNS personnel in both USB2 and the Telecommunications Building was revisited, and attributes shared with the other ITS units having personnel located in USB2, should those units wish to mimic them.

Brainstorming sessions, focused on preparedness within TNS, yielded a number of initiatives, several which are currently in various stages of progress, to assist in alarm notification, communication, and other University-level processes which may be employed in event of a disaster. Among those are the use of the campus cable TV system to enable video information to be displayed on all channels of that system, use of VoIP technology to provide alert sounds or information to be distributed to those using VoIP phones, and the future use of Session Initiation Protocol (SIP)-based connections with others, to afford additional communication capacity. Suggestions were also offered during discussions led by ITS Consulting and Support Services (CSS) with companies providing wireless (cellular) services.

In order to support the utilization of the University's communications dispatch center located in the Eisenhower parking deck, an emergency circuit was installed to handle the increased volume of emergency communications to that facility, which could result from an unexpected event.

Upon invitation to ITS by the College of IST, TNS was afforded the opportunity to be among University personnel who were provided an introductory tour of Cisco's "Network Emergency Response Vehicle". While the visit was oriented toward use of the vehicle for academic pursuits, advantage was taken of the opportunity to begin to explore preparatory arrangements that might be made to enable its use by the University or by the community, in an emergency situation. Those remain pending, although agreement in concept has been reached with representatives from Cisco, and preliminary contact information exchanged, with particular interest afforded to the possible use of this unique vehicle to potential needs at non-UP locations, where limited local resources and expertise may make needs more dire than at UP in such a situation.

Continued Process Improvement

TNS is continually leveraging technology and service evolution to improve the processes and efficiency by which services are delivered. Over the past year TNS has implemented the ITS "TrackITS" on-line purchase ordering system, which is intended to streamline the ordering process. Additionally TNS is an active user of the University's travel P-Card service, Employee Reimbursement System (ERS), and e-Buy.

Internal and external "Service Management" processes were refined. Communication arrangements were streamlined. Key personnel from other units were transferred to TNS and associated "workflows" were altered to accommodate increasing expectations for rapid response and assistance. Informal feedback, particularly from those outside the unit, has reflected appreciation and accolades for the progress made and leadership taken in this area, by those managing service requests.

TNS is assessing the needs and requirements for the next generation of a Telecommunications Management System. While the existing system has supported TNS for over 5 years, an assessment is underway to identify if another application might offer improved capabilities as well as improve the efficiency of TNS service delivery.

TNS actively participated in the ITS Budget Advisory Group (BAG). The ITS BAG is focusing on improving the visibility and transparency into ITS's budget and services. Heading into FY 08/09, TNS costs and services will be captured into Voice, Video, Data, Technology Classroom and Administrative categories, which should provide additional insight into costs associated with these services.

Audit

University auditors reviewed aspects of VoIP-based voice services, and wireless network services, both of which entail significant involvement and leadership by ITS and TNS, with generally favorable results. Follow up actions stemming from the various findings are underway. Among those of note is development of an internal TNS security policy, as required by the University's AD-20 policy. The effort to develop that was leveraged to develop a template for possible adoption by others needing to develop such a work, and offered for appropriate publicity and possible posting. All TNS personnel and any organizations utilizing the TNS administrative LAN will be expected to acknowledge they have read and understand the new policy. Actions for resolution of other audit findings continue.

Strategic Alliances

Professional relationships with key commercial partners and providers of goods and services continued to be developed and sustained, with firms such as 3Com, ATT, Checkpoint, Cisco, D&E, Nokia, Nortel, Polycom, Tandberg, Verizon, Versatile and others having a variety of types of interaction during the year. Relationships are strengthened by the opportunity to assess capabilities in the University's atypical, highly heterogeneous, demanding environment, vendor flexibility in realizing resource constraints inherent to public institutions. Multi-year support contracts were established with PennNet and with Verizon for operational support.

Support and Collaboration Efforts

Various personnel provided support to overarching ITS initiatives. These included "ITANA", illegal use of intellectual property by those in residence halls and elsewhere, external provision of network services, and wireless provision of internet access to guests.

Efforts were renewed to assist the Penn Stater and Nittany Lion Inn in affording expected levels of access to internet resources by conference attendees and others utilizing their facilities, without compromising necessary security measures.

Various options and refinements of current arrangements with commercial providers and internal organizations were developed, with a plan reportedly under consideration for retention of TNS services for local LAN maintenance.

Timely Notification of Telecommunications Work and Deadlines

As in previous years, notices of deadlines were distributed well in advance, for work to be billed during the remainder of the fiscal year, and for work to be completed during the summer months. Timely notifications provide a tremendous overall benefit for the University community by enabling contacts to complete the required Telecommunications Service Requisition form prior to the deadlines, so that work can be scheduled and completed in an orderly fashion. This eliminates many of the disruptions stemming from high-priority, last-minute requests. The practice also minimizes the amount of extra-cost overtime needed to accommodate these efforts, leading to overall savings to the University, as well as to individual Colleges and departments.

Presentations:

VoIP at National ACUTA Conference

In January 2008, a presentation was given at the Association for Information Communications Technology Professionals in Higher Education (ACUTA) national conference in California. The theme of the presentation focused on the business strategy and financial model developed by Penn State to cost effectively design, develop and deploy VoIP voice services. Additionally, the briefing highlighted how VoIP has reduced the long term costs of providing voice services at the UP campus as well as lay out a road map for future cost reduction strategies and initiatives.



IPv6 at Internet2 Joint Techs

A TNS staff member and a panel of network engineers from Stanford University discussed options for campus IPv6 addressing plans (advantages and disadvantages of the options) at the Summer 2008 ESCC/Internet2 Joint Techs Workshop, hosted by the University of Nebraska-Lincoln. The workshop is part of an international conference of networking engineers. The Internet2 IPv6 Working Group is beginning a broad outreach program to help promote the adoption of the IPv6 protocol among the research and education community and beyond. As a first step, the working group has created an IPv6 accessibility challenge for Internet2 members to IPv6-enable several aspects of their networks. IPv6 is the next version of the IP, the data packaging and routing standard on which the Internet is based. IPv6 offers several improvements over IPv4. Most importantly, IPv6 vastly increases the number of addresses available from about 4 billion to approximately 340 trillion trillion trillion. According to the American Registry for Internet Numbers (ARIN), which manages the distribution of Internet number resources (IPv4 and IPv6 address space and Autonomous System Numbers) in Canada, many Caribbean and North Atlantic islands, and the United States, only 19% of IPv4 address space remains available and is depleting quickly.

Educause

In October, a presentation was given at Educause. This presentation was one of four components of a session arranged by members of a working group chartered by Net@Edu, focused upon integrated communications. Two steering committee members of that group are from TNS. One of those members also was asked and agreed to fill a 3-year role as a member of the overall Net@Edu national steering committee.

Committee on Institutional Cooperation (CIC)

In addition to ongoing participation within the committee of CIC peers responsible for networking at their respective institutions, and associated sub-committees focusing upon wireless and upon VoIP technology, interaction was increased with those overseeing the Chicago-based "OmniPOP" collection of internet services, to further leverage mutual interests.

Take Our Daughters & Sons to Work Day

TNS participated in Take Our Daughters & Sons to work day by offering two sessions. Twenty "Daughters & Sons" participated in sessions including a discussion about data communications using the Post Office analogy and a tour of the Network Operations Center and the Video Operations Center.

SWOT Team Analysis

TNS Staff members undertook a SWOT analysis of TNS strengths, weaknesses, opportunities and threats. This work continues as some common themes from the four SWOT teams were identified for focus work and action.

TNS Staff Meetings

A May meeting was held for all TNS Staff to review proposed TNS Vision and Mission statements, as well as outcomes from the SWOT analysis. Other initiatives underway were also reviewed. The next meeting is scheduled for August.

VII. Closing

As exemplified by the particular achievements and activities cited above, TNS continues its mission to develop, design, install, and maintain comprehensive telecommunications and networking services, within and among University locations and outside networks, to accommodate University communication needs. To that end, we look forward to embarking upon another year of continued accomplishments and advances of the services offered, as well as developing new services and embracing the ever-increasing need for positive change.