Upcoming Meetings

- August 15 (Next Generation PennNet Strategy)
- September 19
- October 17
- November 7 (Final Rate Setting)

- All meetings in 337A from 1:30-3:00pm
Agenda

- N&T overall budget review
- How is the network funded today?
- Drivers for changing the funding model
- Potential options for a new funding model
- Tentative funding model team members
N&T Budget Overview

- For FY’12-’16 the N&T expense budget is projected at about $25M annually
- The funding comes from two general sources:
  - Direct charge revenue (97%)
  - General fee monies to support residential video (3%)
- We are projecting a balanced budget for FY’12-’16
- N&T charges for many optional services directly
- Many services are in a bundle and are not optional
  - The Central Service Fee (CSF) supports these infrastructure services
How is the network funded today?

- Expenses
- Revenue
- Optional services
- Bundled services
- Rate setting
- Current funding model for Central Infrastructure Bundle
N&T Expenses FY’12

- N&T annual expenses fall into 3 very general categories
  - Staff, contractors, overhead (46%)
  - Hardware, software, NAP operations (25%)
  - External providers (29%)
    - Telecommunications (Verizon/Internet/Internet 2)
    - Video content (Comcast, etc.)
    - Wiring contractors and materials including SM fiber
    - Telecomm hotel and associated fiber back to NAPs
N&T Revenue Sources  FY'12

- General Fee: 3%
- Telecom: 29%
- Central Service Fees: 10%
- Installations / SLAs: 4%
- Ports / VLANs: 13%
- Wireless: 6%
- MAGPI / MISC.: 29%
N&T Optional Services

- Ports & vLANs
- Wireless AP installation and operational support
- Web hosting
- Collaboration suites: Zimbra and Exchange
- Video conferencing, production, distribution, streaming
- Phones, sets, lines, voicemail, call centers
- Installations, activations, MACs
- Fiber circuits rentals
- Consulting, design, project management
- High-end research options: Internet 2 (ION, static and dynamic waves)
- See all at www.upenn.edu/computing/isc/networking/rates/
Central Infrastructure Bundle

- Campus Backbone
  - Stewardship/operation of about $75M of communications assets (NAPs, 500+ closets, conduit, fiber, electronics, etc.)
  - Building entrance equipment/subnets
  - Core routers and core switches
  - Building redundancy
  - Fiber to NAPs, buildings and closets
  - Fiber and cable management
  - R&D to evaluate next generation products
Central Infrastructure Bundle

- **Internet**
  - 3 Gig of diverse Internet Service Provider bandwidth
  - External routers to ISPs
  - Bandwidth management for ResNet
  - Arbor-netflow analysis for external connectivity and core routers
  - DWDM infrastructure to get back to campus from co-location space in Telecomm Hotel

- **Internet2**
  - 500 Meg-burstable to 1 Gig of Internet 2 bandwidth
  - ION/DYNES infrastructure/connectivity
  - DWDM infrastructure to get back to campus from co-location space in Telecomm Hotel
  - Campus application coordination support
  - R&D on next generation initiatives (Shibboleth, multicast, IPv6)
Central Infrastructure Bundle

- Network Operations Center (NOC), Network Management and Network Administration
  - Staffed NOC M-F 6am-11pm/rest on-call with proactive monitoring and beepers
  - Network management and test tools
- Main Web
  - Penn’s main web presence
  - Akamai for redundancy and peak loads
- Infrastructure Software Services
  - DNS
  - DHCP
  - Listserv
  - Directory LDAP
  - SMTP-relay
Central Infrastructure Bundle

- Network security
  - Port traces
  - PUMA
  - Network Ledger
  - SALT
  - Security tools, education & response
  - Vulnerability scanning
  - Logging lite
Central Infrastructure Bundle

- On-line directory
- Authentication
  - Kerberos and KITE
  - RADIUS
  - PennWebLogin
  - Net Reg
- Wireless
  - Authentication (802.1X)
  - Controllers
  - Secure W2
  - Xpress connect
- Authorization
- PennCommunity
- PennKey school support from TSS
Central Infrastructure Bundle

- Identity Management/Security (FY’12)
  - Two Factor Authentication tracking
  - Levels of Assurance
  - Shibboleth
  - InCommon
  - Intrusion Detection Systems evaluation
How do we set rates?

- Annually we do a full lines of business analysis on all of our services including the Central Infrastructure Bundle and set the rates in the fall, in time to be incorporated into the next year’s fiscal planning
- Rate setting goals:
  - Price services as low as possible
  - Plan for ongoing and future development of services
  - Plan for regular replacement cycles for equipment
  - Eliminate cross subsidies
  - Use a 5 year rolling average for expenses to minimize great variations in rates year to year
Current funding model

- Central Service Fee
  - Is the mechanism to collect for the use of the Central Infrastructure Bundle of services
  - Supports a bundle of over 50 separate, non-optional services delivered by ISC
  - 80% of the charge is paid for by taking a headcount “snapshot” in October in the schools/centers
  - 20% of the charge is based on registered IP addresses in assignments
Drivers For Changing the Current Funding Model

- Wireless
  - NPTF consensus that due to increasing mobile demands, a full campus wireless should be implemented in 2 years
    - Exponential growth of consumer devices on wireless networks
    - iPad use in instruction (High Density classrooms)
  - Who owns the mobile users as they consume AP bandwidth capacity and IP addresses?
  - Who owns outside and public spaces?
  - How best to prorate shared buildings?
Wireless AP Growth
Drivers For Changing the Current Funding Model

- External connectivity costs
  - Who should pay for the likely significant increases in Internet and Internet 2 when hundreds of servers shift to the cloud and applications are not housed on PennNet infrastructure?
    - In the last 11 years
      - Internet usage has grown from 100 Meg to 3000 Meg
      - Internet 2 usage has grown from 45 Meg to 500 Meg and frequently higher
  - Unit costs have gone down, but they are not free
    - Internet currently about $4/Meg month (Gig $48k)
    - Internet 2 currently about $20/Meg month (Gig $240k)
Internet Bandwidth Growth
Drivers For Changing the Current Funding Model

- IP billing for the non-headcount CSF charge (20%)
  - Is the current method too cumbersome?
    - Over 1000+ folks involved-tracking and thinking about fiscal aspect of registering an IP address
    - Some client behavior in managing down IP address costs, reflects historical rates ($11/month) rather than the current $1.46
  - If we keep the same funding model, we would need to do a significant programming effort to bill for IPv6 addresses
Potential funding model changes

- Make permanent the wireless IPs charges frozen at February 28, 2011 levels (Completed)
- Subsidize all wireless IP addresses for AirPennNet and Wireless Guest Network (Could do for FY’12 if NPTF agreed)
- Eliminate IP charges and just have a 100% headcount model for the Central Infrastructure Bundle of services
- Wireless access points in CSF
- Wireless access points and all support costs in CSF
- Several peers (Stanford, CMU) ahead of us in wireless have bundled infrastructure fees that include IPs, ports and APs
- We have begun analysis on all of these options
- We are establishing a small funding model team in late July
Funding Model Team

- Michael Palladino
- Gary Delson
- Naila Machado
- Janet Lind(SOM)
- Ira Winston(SAS, SEAS, DESIGN)
- *Matt Lane(SAS)
- Joe Shannon(FINANCE)
- Sue Kennedy(BUSINESS SERVICES)
- Donna Milici(NURSING)
- Mike Herzog(GSE)
- Margaret Troncelliti( WHARTON)
- *Would like another school Senior Business Administrator)