NETWORK PLANNING TASK FORCE
2013 KICK OFF MEETING

Michael Palladino
April 1, 2013
Today’s Agenda

- Logistics (Meetings, Participants)
- NPTF Primer (101)
- Review of FY’13 progress
- Review of FY’14 NPTF funded initiatives
- Discussion of topics to explore for FY’15
Future Meetings

- April 29
- June 17
- July 15
- August 19
- September 16
- October 7
- October 21 (Final Rate Setting)
NPTF Participants 2013

- Michael Palladino, ISC (Chair)
- Mark Aseltine / Amy Phillips, ISC
- Gary Delson / Geoff Filinuk, ISC
- Jim Choate / Josh Beeman, ISC
- Deke Kassabian / Adam Preset, ISC
- Michel van der List, ISC
- Sue Kennedy / Parmenus Bowler, Business Services
- Daniel Alig / Joe Cruz, Wharton
- Cathy DiBonaventura, Design
- Helen Anderson, SEAS
- Brian Doherty, SAS
- Mike Herzog GSE
- Ira Winston, SEAS, SAS, Design
- Smith Ragsdale / Brian Sherman, VET
- Brian Wells / Michael Morris, PSOM
- Rich Cardona / Lena Buford, Annenberg
- Kayann McDonnell / Damien Leri, Law
- Donna Milici / John Singler, Nursing
- Jeff Fahnoe, Dental
- Grover McKenzie, Library
- Mary Spada, VPUL
- Marilyn Spicer, College Houses
- Joseph Shannon, Finance
- Dominic Pasqualino, OACP
- Marilyn Jost, FRES
- Michael Weaver, Budget Mgmt. Analysis
- David Kern, Public Safety
- John Eckman, Housing Services
NPTF PRIMER (101)

- What is NPTF?
- NPTF Funding Model Principles
- NPTF Annual Process
- FY’13 N&T BUDGET (PIE CHART)
- CSF BUNDLE FOR FY’14
- www.upenn.edu/computing/group/nptf/
Network Planning Task Force

- Participants include technology and business staff as well as leaders from the faculty, student body and administration.
- The NPTF meets each year to discuss and resolve issues surrounding the planning and funding of PennNet, gain broad agreement on the cost of communications services that ISC provides to Penn.
- Customers and ISC work as partners when making decisions, insuring flexibility to accommodate business needs and changing technologies.
Funding Model Principles

- ISC maintains close alignment with University academic, research and business strategies.
- Many Penn investments and operations are dependent upon the viability, accessibility and security of the network.
- The NPTF funding model is used to generate resources for all aspects of operation (business continuity, planning, support, security).
- Customers and ISC work as partners when making decisions, insuring flexibility to accommodate business needs and changing technologies. Using a continuous process improvement approach, we seek maximum cost-effectiveness and a high degree of customer satisfaction.
- Customers and ISC are proactive in identifying strategic directions and emerging technologies and encourage the retirement of obsolete services and systems to insure that we have the capacity to make investments for the future to remain competitive with our peers and industry.
- Costs are transparent for data, voice and video services and their associated components, showing a 5-year view of budgets and assumptions. Aggregate service rate (CSF, port and full phone service) increases are targeted at 0-3% yearly, determined in conjunction with the NPTF.
- The funding model encourages excellence and right kinds of behavior from both a customer and ISC perspective and is measurable in terms that are meaningful to the customer.
- The model is combination demand-based services and bundled services based on headcount.
- The model remains simple in order to minimize overhead costs and to allow for easy budgeting and discussion.
NPTF Annual Process

1. **Review Principles**
   - Update Assumptions
   - Identify Issues
   - Draft 1-5 Year Budgets

2. **Implement Changes**
3. **Communicate**
4. **Set Rates**
5. **Redo Budgets**

6. **Generate Challenges**
7. **Discuss**
8. **Prioritize**
   - Reach Consensus
   - Make Recommendations
FY’13 N&T Revenue Sources

- TELECOM: 28%
- CENTRAL SERVICE FEES: 30%
- NETWORK INSTALLATIONS: 7%
- WALLPLATE CONNECTIONS: 5%
- VIDEO, WEB HOSTING, SLAs: 13%
- EMAIL: 13%
- MAGPI SERVICES: 8%
- WIRELESS: 4%
- OTHER: 5%
FY’14 CSF Bundle of Services

- Campus Backbone Infrastructure
- Internet and Internet2 access
- Rate limits on ResNet
- IPv6, Multicast, and Advanced Networking
- Public Wireless Subsidy
- Cap on billable wireless IPs
- NAP Operations/Fiber and Cable Management
- NOC Services and Network Management
- Penn's Main Web and Central Pages
- Online Directory and LDAP access
- Classlists and SMTP Mail Relay
- University Calendar Service
- Infrastructure Software Services
  - DNS, DHCP, NTP
  - Penn+Box Storage & Collaboration (FY’14)
- Enterprise InCommon Certificate Service
- Enterprise Social Networking
- Security/ID Management
- Kerberos, KITE, RADIUS
- Penn WebLogin (CoSign and Shibboleth)
- The InCommon Federation
- Authorization (Penn Groups)
- PennNames and Penn Community Services
- Wireless Authentication & Support
- NetReg
- DNSSEC
- Vulnerability Scanning
- Security Tools, Education, and Response
- PennKey School Support
- PGP Whole Disk Encryption LSP Support
- XpressConnect
- Enhanced AirPennNet Guest Services
- Intrusion Detection System (FY’13)
- SafeDNS
$2.9M capital reserve at the end of FY’13

$3.5M of major purchases in FY’14
- MAGPI router $250k
- PennNet external routers $460k
- Wireless controllers $276k
- Wireless NG APs $976k
- Closet electronics upgrades $1.1M
- VoIP phones $502k

$3.9M cumulative deficit for FY’14-FY’19 budget on $159M expenses
Review of FY’13 Progress

- N&T Stats
- Next Generation PennNet (NGP)
- High Performance Research Networks
- Wireless
- PennNet Phone
- Security
N&T Stats

MARCH 2012
- 60,000 network ports
- 84,000 operating IP addresses
- 8,900 PennNet Phones
- 11,000 Centrex phones
- 10,000 Video outlets
- 17,000 Zimbra and Exchange accounts

MARCH 2013
- 66,834 network ports
- 93,947 operating IP addresses
  - 51,455 Wired addresses
  - 42,492 Wireless addresses
- 11,215 PennNet Phones
- 9,300 Centrex phones
- 10,000 Video outlets
- 17,661 Zimbra and Exchange accounts
N&T Stats

MARCH 2012
- 3,000 wireless access points
- 23,961 wireless users
- 38,222 wireless devices
- 3 Gb Internet
- 1 Gb Internet2
- 5 Gb ION/DYNES

MARCH 2013
- 3,305 wireless access points
- 29,254 wireless users
- 61,192 wireless devices
- 9 Gb Internet
- 1 Gb Internet2
- 10 Gb ION/DYNES
- 4,731 Penn+Box users
- 3.83 T Penn+Box storage
NGP Current Status

- We continue to significantly improve the capacity, reliability and security of PennNet
  - All closet electronics are Gigabit capable and being upgraded to enable 10 Gb building backbones
    - 420 (all) closets with single-mode fiber
    - 316 of 1850 switches completed
    - 22 of 176 10 Gb building backbones completed
    - 32 of 176 10 Gb building backbones in progress
    - Installing minimum 1 Power over Ethernet (POE) capable switch in each closet for wireless access points, clocks, phones, IP cameras, etc.
  - 205 buildings with Gigabit Ethernet
  - 85 critical buildings with dual 1 Gb links
  - 7 buildings with 10 Gb, no dual 10 Gb until new core
  - 155 buildings with single-mode fiber
NGP Current Status (Continued)

- 85 of 93 buildings with new building entrance electronics
  - 8 of 93 buildings requiring a larger port density BE will be completed by the end FY’13

- 10 Gb Internet2 ION and DYNES
  - Bandwidth on-demand for high-end research
  - Supports Software Defined Networking (SDN) and OpenFlow capability, an active area of current experimentation in networking
Core router evaluation completed
- Will enable 10 Gb building connections
- Will enable 100 Gb campus backbone
- Support Software Defined Networking (SDN) and OpenFlow
- Deployment in 1Q FY’14

External routers
- Will be upgraded in FY’14 and will enable 100 Gb
- Considering 100 Gb Internet 2 connection to put Penn at forefront of collaborative research (NSF grant)
- Considering Internet commercial peering through Internet 2 to enhance capacity and keep Internet costs level
PennNet Central and External Routing Core
NGP Current Status (Continued)

- Core server infrastructure upgrades in progress
  - Initiative called Project Portland
  - Upgrade of DNS and DHCP server hardware and software, including separation of services and advanced network techniques to provide very high availability and performance
  - Upgrade of central Kerberos authentication servers
NGP Value

- Making significant investments in NGP infrastructure to better prepare for high-end research needs, academic instruction, cloud services, etc.

- By FY’15, we will have implemented a 10-fold increase in network capacity across all major network component over today’s network capacity.

- Through combinations of strategic timing on upgrades and aggressive equipment price negotiations, we have been able to significantly lower higher-speed port fees and hold wireless support costs flat.
High-Performance Research Networks

- Provide high-performance networking services and collaboration tools designed to support a big data service model

- Meet the data transfer and collaboration needs of researchers and the requirements of grant-making agencies for Penn’s $1B annual research enterprise (High-Energy Physics, Genomics, Bioinformatics)

- Reliable, cost-effective network solutions that can be tailored to support specific research needs

- Provide high-speed off campus network access from campus labs and buildings though PennNet

- Through MAGPI, provide direct national and international connections with bandwidth that can be scaled as needed (Internet2 WaveCo’s service) or as lower-cost “on-demand” circuits through DYNES/ION
NGP Reliability/SLA

- Striving for 99.99% uptime for major network components
  - Goal <1 hours of unscheduled downtime/year/component

- Network infrastructure services (DHCP, DNS, etc.)
  - Goal <2 hours of unscheduled downtime/year/service

- Network user services (web, directory, streaming media, email, ACD, PennNet Phone, etc.)
  - Goal <5 hours of unscheduled downtime/year/service

- Most years, we beat these infrastructure and user services goals
Wireless Current Status

- Continue to increase coverage and enhance capacity for campus wireless coverage (over 3300 APs)
- Continue to design and install HD classrooms 96 and other spaces to support the incorporation of handheld devices into teaching
- Public spaces adding APs to increase capacity
  - Recently completed projects
    - Houston Hall 35 APs & Bookstore 8 APs
  - Pending projects
    - Van Pelt Library-95 APs & Irvine-20 APs
Wireless Current Status (Continued)

- Outdoor space: Penn and Shoemaker Parks
- Simplified Guest Access to AirPennNet-Guest
- AirPennNet User Device Network piloted in 4 residences; full production service in FY’14 1Q
- Distributed Antenna System (DAS) research and some implementations where necessary
PennNet Phone Current Status

- Multi-year initiative to enhance reliability of major infrastructure, enhance features and reduce costs
- At project completion, save Penn community over $2.5M annually from $8.8M expense
- 11,450 PennNet Phone Conversions Complete
  - Transitioning program to building-wide conversions
  - Enhanced features to support campus-wide rollout
  - Support for shared lines (BLA) up to size 12 now provided
  - Plan to trial support for cordless phones
- Finish project in FY’15 with about 17,000 phones
Security Current Status

- **Two-factor Authentication**
  - Piloting two-factor service using Google Authenticator and CoSign for individual users who opt in, including the infrastructure for provisioning and management of tokens
    - On track. The provisioning and verification piece has been developed by Chris Hyzer in ASTT and the CoSign hooks to use it are under development

- **LoA/InCommon**
  - Modifications to Kerberos, CoSign, and other systems necessary to calculate and store password entropy values
    - Slow progress, but still hopeful for meeting this one
  - Developing a project plan that identifies action items, owners/stakeholders, and timetables for satisfying non-entropy related InCommon Bronze/Silver requirements
    - Completed
  - Implementing one or more expanded pilots of LoA attributes for applications
    - On track. U@Penn apps: Direct Deposit, My Pay, My Tax, etc.
Network Segmentation
• Investigate alternative network topologies and segmentation approaches that may help to enable separable security policies and enforcement approaches.
  • White paper being developed in FY’13

Additional Projects/Initiatives
• Maturity of Security Liaisons program
  • NDSR
  • CSAT
• Revisiting SPIA process with Privacy
• Refinements to tools and processes (with an emphasis on automation)
• Successful new hire
NPTF-Funded Initiatives for FY’13

AirPennNet-Guest Enhancements

• There are now 5 models in use for getting a guest connected to AirPennNet-Guest:
  • Non-Persistent Guest PennKey (1,697)
  • Sponsored Hardware MAC Address (113)
  • Penn Affiliate Assisted Registration- NEW (100)
  • Guest Access Code Registration-NEW (133)
  • Guest Conference Code Registration- NEW (298)
A network IDS is the industry-standard tool for proactively identifying “bad” traffic.

A copy of campus traffic is passed through the device, and compared against pre-defined “rules”.

When a rule matches (“fires”) it sends an alert. Nothing is blocked (it’s just a copy).

Thousands of rules are included with the device. More can be purchased from commercial services (e.g., Emerging Threats).

Custom rules are defined as well.

Intrusion Detection System – Informing and Managing Risk
NPTF-Funded Initiatives for FY’13

IDS Q1
- Equipment delivery & installation
- Establish traffic delivery timetables (and some service)
- Communication plan
- Evaluation of IPv6 capabilities

IDS Q2
- Intake with schools/centers
- Training
- Establish core ruleset
- Automation and integration of feeds
- E-streamer capabilities
Implementation Plan

IDS Q3
- Notification and alerting
  - Determine if we can deliver additional data with the alert
- RNA evaluation
- Process and documentation (including rule creation)

IDS Q4
- RUA evaluation
- Complete communications
- Maintenance and support testing
- Project completion
NPTF approved all base increases and network infrastructure enhancements last fall.

NPTF also approved funding for four new initiatives:

- Penn+Box Storage & Collaboration
- SafeDNS
- Enterprise InCommon Certificate Service
- Enterprise Social Networking
Penn+Box

- A service for storing and collaborating with files
- Accessible from everywhere: mobile apps and web, with automatic sync from desktop
- Service—More integrated apps coming
- **50 GB** available to all faculty, students, and staff
- PennKey login and data encrypted in transit/at rest
- Contract protection for University data (FERPA)
- **4,731** Penn customers working with 700+ external collaborators
- BAA for HIPPA compliance coming 4Q; SecureSpace to remain until available
SafeDNS

- Enterprise solution provides real-time prevention of client computers browsing to known malicious domains
- Supplements your existing anti-virus/malware measures
- Clients only – no servers – can use this alternative DNS service provided by Penn today, but in limited numbers
- Transition planned from ISC Information Security pilot to N&T production service for higher resiliency, scalability
NPTF approved funding for InCommon Certificate Service starting in July 2013. Comodo (one of our current providers) is the CA

Information Systems and Computing and Business Services Division are working to bring the service online sooner

Penn’s Office of Software Licensing will continue to be the contact for your server certificates

Provides Penn with a campus license for cost-effective access to server certificates. Penn IT organizations had been paying roughly $150/year per server certificate. New cost would be $15

ISC will be providing guidance on certificate types and their appropriate use at Penn
ENTERPRISE SOCIAL NETWORKING

- **Benefits**
  - Enhanced collaboration and communication
  - Support social networking with contractual protections for Penn

- **FY14 Pilot - Volume Licensing to cover**
  - All IT staff
  - Other populations that Schools and Centers would like to license
FY’15 NPTF Idea Brainstorm

- What new strategic (or operational) things should we be thinking about?
- What should we do?
- What can we drop?
Some Possible Topics For FY’15

- 100% headcount funding model for CSF
- Changes to the list of activities in the Central Infrastructure Bundles of services
  - Cloud email “layer cake charge”
- New cloud solutions
- Central Active Directory
- NG WWW
- Central DAS infrastructure to lower individual building cost
- Emergency Phones (emergency phone service fee; infrastructure, maintenance, for all buildings, etc).
Some Possible Topics For FY’15

- **Wireless**
  - eduroam
  - NG assessment
  - 100% coverage including outside

- **Security**
  - Logging – facilitate a campus-wide logging service
  - Asset Management and Endpoint Protection – centralized asset management solutions (e.g., BigFix, Kace, Kaseya, etc.)
  - DMCA automation
  - Continued support of Identity and Access Management efforts, including LoA (e.g., Two Factor, InCommon Bronze/Silver, etc.)
  - Online computer security training & awareness resources
  - IPv6 tools and enhancements
Create working group to discuss moving to an all headcount funding model for FY’15

Working group to include:
- Chair
- Mike Palladino
- 1-2 senior BAs with one as chair (SAS and PSOM)
- Mary Spada (VPUL)
- Jeff Fahnoe (Dental)
- Cathy DiBonaventura (Design)
- Joe Shannon (Finance)
- Margaret T (Wharton)
- Budget Office (Mike Weaver?)
- Kay McDonnell (Law)