FY’13 NETWORK PLANNING TASK FORCE

Final Rate Setting Meeting

Michael Palladino
November 1, 2012
Agenda

- Financial process
- Operating efficiencies
- Service enhancements
- Review of FY’13 initiatives
- FY’14 Central Infrastructure (Service) Fee monies requested
- FY’14 proposed rates for other services
Annual Financial Process

• N&T does a lines of business analysis yearly
• We look at every service to determine the total projected cost and total projected revenue
• We project the number of customers for each service & divide by 12 to get the monthly unit cost
• We do this for 60+ services
• There are 100+ sub-services that feed into the 60+
Annual Financial Process

• For instance, DHCP and DNS are subservices of the LOB called Infrastructure Software Services, which is a component of the Central Infrastructure (Service) Fee

• Our end goal:
  • All services “on their own legs”
  • No or minimal cross-subsidies
    • Transparent ones can be good (NGP & telephony)
  • Slight margin on services to fuel R&D, innovation, and next generation services
FY’13 Operating Efficiencies

- Strategic efforts to keep rates low, despite greatly enhancing capacity
  - Continued server virtualization efforts
  - Continued strong negotiations with all vendors
    - WSCA cell provider contracts will save Penn community (individuals and corporate) $1M more annually on our total $10+M spend
  - Extending depreciation schedules on equipment
  - Selective use of cloud solutions (Akamai, Box) and blended workforce (ACD, analog telephony, Operators)
  - Continued efforts to keep headcount (staff and contractors) level-despite sizable increases in ports, IPs, APs, services, and new features over the years
Client Impact of Operating Efficiencies

• PennNet Phone/audits to save clients $2.5M annually (FY’09 charges versus FY’15)
  • Admin bills going from $8.3M annually to $6.3M
    • Still $800k savings to go from now to FY’15
    • Students bills went from $500k to almost $0
• PennNet Phone savings $400k for FY’14
• Port rate reductions nearly $300k in FY’14
  • 1000 Mbps $10 to $7 per month
    • 3000 ports X 12 months X $3/month =$108k
  • 10/100 Mbps $5.00 to $4.75 per month
    • 63,000 ports X 12 months X $.25/months =$189k
FY’13 Service Enhancements

- 10-fold increase in campus backbone
  - 10 Gbps buildings to routing core (6)
    - Remaining mostly for net infrastructure (IDS, wireless)
    - Many more after new routing core, Summer 2013
    - Positioning for 100 Gbps core
  - 10 Gbps building backbones
    - Only 2 of 176 completed
    - We need your help in coordinating these
  - 10 Gbps closet switches deployed (107 of 1817)
  - 93% of admin ports 100/1000 Mbps
FY’13 Service Enhancements

• Internet bandwidth increased from 3 Gbps to 9 Gbps on three 10 Gbps interfaces that are all scalable

• Services for researchers:
  • Internet2 basic connectivity increased to 1 Gbps
  • Internet2 10 Gbps waves worldwide for collaborations (NDDI, DYNES) upgraded from 5 Gbps
  • We continue to leverage MAGPI (RON) to benefit Penn
FY’13 Service Enhancements

- Wireless
  - 3115 wireless access points
  - About 100 HD classrooms
  - 18% coverage increase and increased capacity
  - Controller architecture modified for smaller fault zones and faster “hitless recovery”
  - XpressConnect continues to enhance onboarding experience, saving thousands of support hours annually
  - Piloting non-authenticating device use in College Houses
FY’13 Service Enhancements

• **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

• **LoA/InCommon**
  • Modifications to Kerberos, CoSign, and other systems necessary to calculate and store password entropy values
  • Developing a project plan that identifies action items, owners/stakeholders, and timetables for satisfying non-entropy related InCommon Bronze/Silver requirements
  • Implementing one or more expanded pilots of LoA attributes for applications
FY’13 Service Enhancements

• Central AD AuthN/AuthZ
  • Develop a strategy for central AD infrastructure
  • Leverage Penn Community for user information and allow Penn IT units to manage Org Units directly

• Network Segmentation
  • Investigate alternative network topologies and segmentation approaches that may help to enable separable security policies and enforcement approaches
NPTF-Funded Initiatives for FY’13

• AirPennNet-Guest Enhancements
  • There are now 4 models for getting a guest connected to AirPennNet-Guest:
    • Guest PennKey
    • Sponsored Hardware (MAC) Address
    • Penn Affiliate Assisted Registration- NEW
    • Guest Access Code Registration-NEW
  • We are actively working on the fifth and final enhancement (Guest Conference Code Registration- NEW)
    • We anticipate the completion of coding this in December
    • Implementation pending successful completion of testing
NPTF-Funded Initiatives for FY’13

• All the models are in use (October 1 - October 26)
  • Guest PennKey: 2,196 non-persistent guest PennKeys
  • Sponsored Hardware (MAC) Address: 91
  • Penn Affiliate Assisted Registration: 84
  • Guest Access Code Registration: 64

• Traditional non-persistent Guest PennKey is the preferred model
NPTF-Funded Initiatives for FY’13

- Intrusion Detection System – Improving Visibility

  - Better visibility means improved detection, fewer incidents, and lowering risk (and cost) by resolving incidents faster

  - IDS is already an important tool for large-scale security events and investigations
NPTF-Funded Initiatives for FY’13

• Intrusion Detection System
  • The IDS equipment is installed in the Levy NAP
    • It is receiving 100% of core traffic including all traffic to/from site external to Penn
    • We are currently using port mirroring to send core traffic from each core router to the IDS
    • The port mirrors will be replaced with fiber taps after the core upgrade
    • InfoSec is currently reviewing and refining rules to be applied to core traffic and tuning system for available coverage
    • IDS rules and alerts will be available to schools and centers. Use-cases and requirements being gathered from schools and centers next week
    • The project will be completed in 4Q
NPTF Initiatives for FY’14

• From FY’13, second installment of 50% one-time monies for Intrusion Detection Systems ($126k)
• Penn+Box storage & collaboration
• SafeDNS
• Enterprise InCommon certificate service
• Enterprise social networking
Penn+Box

- Cloud-based file management and file sharing service operational on 11/1/2012 (1500+ already in pilot)
- All faculty, students, and staff will have 20 GB of space
- Additional storage billed at vendor costs
- Penn+Box includes a robust set of tools to facilitate collaboration, easy access from a variety of devices, automatic synching of local files, and application integrations that allow seamless viewing and editing of a wide variety of content stored on the service
Penn+Box

• Service protects Penn intellectual property via a University contract, which is stronger than click-thru agreements for similar commercial services like Dropbox
• Will supplement Secure Share and may replace Secure Space over time
• Penn has contracted with Internet2 for the Box service as part of ISC’s ongoing strategy of partnering with preferred and trusted organizations as a way of providing flexible and secure cloud service options
Penn+Box

• Estimated total project costs
  • Internet2: $115,000
  • ISC Support: $50,000
    • LSP support, documentation, vendor and service management, new app review, etc.
• Total $165,000 annually
• FY’13 expenses funded out of FY’12 operational efficiencies
SafeDNS

• Benefit – Enterprise solution provides real-time prevention of client browsing to known malicious domains

• Cost
  • 5 Virtual Machines (up to 17,000 users)
    • Migration of existing pilot environment to modest production environment to start (2 nodes, ultimately 5 nodes)
    • Virtualized, Red Hat Linux on VMWare
    • New failover model, which entails resiliency via anycast DNS listening on both nodes (and cost to implement)
    • Small initial investment, suitable for uncertain adoption rate, scalable for wider adoption

• Yearly cost to operate $15,000
InCommon Certificate Service

• Benefits
  • Unlimited 1-year/3-year certificates for a fixed annual fee
  • Comodo (one of our current providers) is the CA
  • Includes all domains — .edu and non-.edu alike, such as athletics and professional societies
  • Savings of $15-$30k to Penn community in next 1-2 years, depending on speed of cert conversions

• Cost
  • $15,000 per year for unlimited certificates
  • Minimal processing fee ($15) paid to BSD per transaction
ENTERPRISE SOCIAL NETWORKING

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

• Costs
  • Pilot Only - $25K-$50K
    • Volume licensing for 1000-1500 accounts
    • One-time costs – implementation and integration
      • Penn – SSO, provisioning accounts and groups based on Penn data
      • Vendor – Consulting or engineering services?
    • Assumes SSO and basic integrations
  • Pilot and Rollout - $50K-$100K
    • Site license
    • One-time costs – implementation and integrations
    • Assumes SSO and integrations for an initial campus-wide rollout
FY’14 CSF Bundle of Services

- Campus Backbone Infrastructure
- Internet and Internet2 access
- Rate limits on ResNet external
- 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
- 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
- Enhanced AirPennNet Guest Services
- DNSSEC
- Vulnerability Scanning
- Security Tools, Education, and Response
- PennKey School Support
- PGP Whole Disk Encryption LSP Support
- XpressConnect
- Intrusion Detection System
- SafeDNS
- Enterprise InCommon Certificate Service
### Review of FY’14 Initiatives

<table>
<thead>
<tr>
<th>Initiatives within base CSF rate</th>
<th>Initiatives with cost increases in FY’14</th>
<th>Initiatives with potential incremental costs in FY’15 and beyond</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 10 Gbps in-building backbones &amp; new closet electronics</td>
<td>• IDS</td>
<td>• Security</td>
</tr>
<tr>
<td>• 10 Gbps building connections to core</td>
<td>• Penn+Box Storage &amp; Collaboration</td>
<td>• 2-Factor Authentication</td>
</tr>
<tr>
<td>• Next generation core router deployment</td>
<td>• SafeDNS</td>
<td>• More logging</td>
</tr>
<tr>
<td>• External router deployment</td>
<td>• Enterprise InCommon Certificate Service</td>
<td>• Mobile device security</td>
</tr>
<tr>
<td>• IPv6 continued deployments</td>
<td>• Enterprise Social Networking</td>
<td>• IPv6 tools and enhancements</td>
</tr>
<tr>
<td>• New DHCP &amp; DNS</td>
<td></td>
<td>• Central Active Directory</td>
</tr>
<tr>
<td>• Eduroam pilot?</td>
<td></td>
<td>• Wireless full campus deployment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NG wireless</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• UPS to closets and building entrance equipment</td>
</tr>
</tbody>
</table>
## FY'14 CSF BASE RATE

<table>
<thead>
<tr>
<th>Description</th>
<th>TOTAL FY'14</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMPUS BACKBONE (NAPs, FIBER MANAGEMENT, CORE ROUTERS, BUILDING ROUTERS)</td>
<td>$2,913,760</td>
</tr>
<tr>
<td>INTERNET (DWDM/FIBER TO TELECOM HOTEL/EXTERNAL ROUTERS, ISPs, N&amp;T SECURITY RESPONSES)</td>
<td>$722,790</td>
</tr>
<tr>
<td>INTERNET2</td>
<td>$437,502</td>
</tr>
<tr>
<td>NOC/NETWORK MANAGEMENT</td>
<td>$328,291</td>
</tr>
<tr>
<td>WWW (PENN'S MAIN WEB)</td>
<td>$159,487</td>
</tr>
<tr>
<td>WIRELESS CENTRAL INFRASTRUCTURE (CONTROLLERS, SECURE W2, GUEST ENHANCEMENTS), AUTHENTICATION (SHIBBOLETH, INCOMMON, LOA, LOGGING LITE, PENNWEB LOGIN, 2 FACTOR CONTINUED EVAL, PENNKEY, NETREG), AUTHORIZATION, INFRASTRUCTURE SOFTWARE SERVICES (DHCP, DNS), IDS ONGOING</td>
<td>$2,121,281</td>
</tr>
<tr>
<td>MAIL RELAY, LISTSERV, LDAP (NISC)</td>
<td>$116,291</td>
</tr>
<tr>
<td>SECURITY TOOLS, EDUCATION &amp; RESPONSE</td>
<td>$110,425</td>
</tr>
<tr>
<td>VULNERABILITY SCANNING (2X/YR)</td>
<td>$28,001</td>
</tr>
<tr>
<td>PENNKEY SCHOOL SUPPORT (SECURE SHARE, MISC.)</td>
<td>$81,323</td>
</tr>
<tr>
<td>AUTHORIZATION</td>
<td>$123,205</td>
</tr>
<tr>
<td>ON LINE DIRECTORY</td>
<td>$134,515</td>
</tr>
<tr>
<td>PENN COMMUNITY</td>
<td>$147,286</td>
</tr>
<tr>
<td>TSS WIRELESS SUPPORT &amp; EXPRESSCONNECT</td>
<td>$106,542</td>
</tr>
<tr>
<td>IDS (SECOND INSTALLMENT OF 50% ONE-TIME)</td>
<td>$126,746</td>
</tr>
<tr>
<td>SUBTOTAL INCLUDES IDS &amp; NEW WIRELESS GUEST ENHANCEMENTS FROM FY'13</td>
<td>$7,657,444</td>
</tr>
<tr>
<td>FY'13 REQUEST</td>
<td>$7,533,682</td>
</tr>
<tr>
<td>% INCREASE</td>
<td>1.64%</td>
</tr>
<tr>
<td>Service Description</td>
<td>TOTAL FY’14</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>CAMPUS BACKBONE (NAPs, FIBER MANAGEMENT, CORE ROUTERS, BUILDING ROUTERS)</strong></td>
<td>$ 2,913,760</td>
</tr>
<tr>
<td><strong>INTERNET (DWDM/FIBER TO TELECOM HOTEL/EXTERNAL ROUTERS, ISPs, N&amp;T SECURITY RESPONSES)</strong></td>
<td>$ 722,790</td>
</tr>
<tr>
<td><strong>INTERNET2/KINBER &amp; PENNREN</strong></td>
<td>$ 437,502</td>
</tr>
<tr>
<td><strong>NOC/NETWORK MANAGEMENT</strong></td>
<td>$ 328,291</td>
</tr>
<tr>
<td><strong>WWW (PENN’S MAIN WEB)</strong></td>
<td>$ 159,487</td>
</tr>
<tr>
<td><strong>WIRELESS CENTRAL INFRASTRUCTURE (CONTROLLERS, SECURE W2, GUEST ENHANCEMENTS), AUTHENTICATION (SHIBBOLETH, INCOMMON, LOA, LOGGING LITE, PENNWEB LOGIN, 2 FACTOR CONTINUED EVAL, PENNKEY, NETREG), AUTHORIZATION, INFRASTRUCTURE SOFTWARE SERVICES (DHCP, DNS), IDS</strong></td>
<td>$ 2,121,281</td>
</tr>
<tr>
<td><strong>MAIL RELAY, LISTSERV, LDAP (NISC)</strong></td>
<td>$ 116,291</td>
</tr>
<tr>
<td><strong>SECURITY TOOLS, EDUCATION &amp; RESPONSE</strong></td>
<td>$ 110,425</td>
</tr>
<tr>
<td><strong>VULNERABILITY SCANNING (2X/YR)</strong></td>
<td>$ 28,001</td>
</tr>
<tr>
<td><strong>PENNKEY SCHOOL SUPPORT (SECURE SHARE, MISC.)</strong></td>
<td>$ 81,323</td>
</tr>
<tr>
<td><strong>AUTHORIZATION</strong></td>
<td>$ 123,205</td>
</tr>
<tr>
<td><strong>ON LINE DIRECTORY</strong></td>
<td>$ 134,515</td>
</tr>
<tr>
<td><strong>PENN COMMUNITY</strong></td>
<td>$ 147,286</td>
</tr>
<tr>
<td><strong>TSS WIRELESS SUPPORT &amp; EXPRESSCONNECT</strong></td>
<td>$ 106,542</td>
</tr>
<tr>
<td><strong>IDS (50% TWO TIME AND ON-GOING)</strong></td>
<td>$ 126,746</td>
</tr>
<tr>
<td><strong>SUBTOTAL INCLUDES IDS &amp; NEW WIRELESS GUEST ENHANCEMENTS (FY’13)</strong></td>
<td>$ 7,657,444</td>
</tr>
<tr>
<td><strong>BOX</strong></td>
<td>$ 165,000</td>
</tr>
<tr>
<td><strong>INCOMMON CERT PROGRAM</strong></td>
<td>$ 15,000</td>
</tr>
<tr>
<td><strong>ENTERPRISE SOCIAL NETWORKING</strong></td>
<td>$ 25,000</td>
</tr>
<tr>
<td><strong>SAFEDNS</strong></td>
<td>$ 15,000</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td>$ 7,877,444</td>
</tr>
</tbody>
</table>
## FY’14 Proposed Monthly Rates

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>FY ’13 RATE</th>
<th>FY ’14 RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NETWORK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10baseT port charge</td>
<td>$5.00</td>
<td>$4.75</td>
</tr>
<tr>
<td>100baseT port charge</td>
<td>$5.00</td>
<td>$4.75</td>
</tr>
<tr>
<td>1000baseT port charge</td>
<td>$10.00</td>
<td>$7.00</td>
</tr>
<tr>
<td>Wireless Access Point (without port)</td>
<td>$25.75</td>
<td>$25.75</td>
</tr>
<tr>
<td><strong>PHONES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional services (lines, set, usage, long distance)</td>
<td>See next page</td>
<td>See next page</td>
</tr>
<tr>
<td>Phone (PennNet Phone)</td>
<td>See next page</td>
<td>See next page</td>
</tr>
<tr>
<td><strong>VIDEO</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penn Video Network</td>
<td>$19.50</td>
<td>$20.50</td>
</tr>
<tr>
<td>Video Production, Conferencing, Streaming</td>
<td>Slight increases</td>
<td>Slight increases</td>
</tr>
<tr>
<td><strong>HOURLY RATES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Project Managements /Consulting</td>
<td>Slight increases</td>
<td>Slight increases</td>
</tr>
</tbody>
</table>
## FY’14 Monthly Phone Rates

<table>
<thead>
<tr>
<th></th>
<th>Traditional Phone</th>
<th>PennNet Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrex line/VoIP line</td>
<td>$16.50</td>
<td>$16.50</td>
</tr>
<tr>
<td>Phone set maintenance</td>
<td>$3.90</td>
<td>$3.00</td>
</tr>
<tr>
<td>Voicemail</td>
<td>$11.75</td>
<td>$3.00</td>
</tr>
<tr>
<td>Port</td>
<td>$0</td>
<td>$4.75</td>
</tr>
<tr>
<td>SUBTOTAL</td>
<td>$30.15</td>
<td>$27.25</td>
</tr>
<tr>
<td>Usage (PNP 50%)</td>
<td>$6.00</td>
<td>$3.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$38.15</td>
<td>$30.25</td>
</tr>
</tbody>
</table>
Drivers For Accelerated PNP Rollout

- Penn’s contract with Verizon expires 11/1/2013
  - Analog is no longer a core business; 80% of Verizon’s revenue comes from wireless
  - Rates will increase.
  - Verizon may also announce an end-of-life on Centrex service
- Octel traditional voice mail support from vendor ends 6/30/2013 (over 20 years old)
- Issues with spare parts for traditional phones and KSUs
- Analog infrastructure issues with aging copper plant
  - Very costly to maintain
  - Experience weather-related outages when it rains
- The drivers are real, and we really need your help. The faster we can go, the more money we all can save
PennNet Phone Service Status

• PennNet Phone – 10,400 campus-wide
• ISC to retire traditional phone service by June 2014
• Traditional phone voice mail end-of-support starts 6/30/2013
• Traditional phone rates to increase significantly in FY’15
• ISC to coordinate building conversions starting FY’14
  • Advance notice will be provided
  • Floor by floor conversions (10-15) at a time, will be scheduled
  • ISC to contact clients Spring (March/April)
Other Necessary Rate Changes

• Email (Zimbra & Exchange)
  • Need to increase rates by about 6%
  • We will be leading a campus-wide email discussion in the near future
  • Contracts currently being negotiated with Google and Microsoft for faculty and staff

• ACD
  • Rate increasing 5%

• Lists
  • Rate increasing 5%
Other Necessary Rate Changes

• BES
  • The number of non-ActiveSync devices is dropping dramatically
  • The new BlackBerry handhelds will work with ActiveSync
  • We have three alternatives:
    • Run a BES service at Penn and increase costs (2-4X)
    • Phase out the BES service on 6/30/2013 and move all customers (< 200) to either new BB or other devices
    • Move BES service to cloud
Next Steps

- NPTF makes rate recommendations
- Bring recommendation to ISC VP
- ISC calculates and finalizes CSF headcount and IP rates and sends them to senior BAs
- Approved rates sent to ABA in December
- Rates published in *Almanac* on 12/11/2012
Next Steps

- Next meeting in Spring 2013
  - Two possible discussions
    - KINBER/PennREN
    - Internet2’s NET+ Services
  - Any ideas that you want us to research in the meantime?
Next Steps

- Is this process working?
- How can it be improved?