Capital IT Funding Request  
CSU-Fort Collins  
Network Switch Upgrades

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Greg Redder, Manager of Network Operations  
Colorado State University
Summary of Revised Request: Upgrade Core and Edge Network Devices as a Bridge to Base Funding

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Original Request*</td>
<td>$3,573,000</td>
</tr>
<tr>
<td>2. Cost Sharing</td>
<td>($650,000)</td>
</tr>
<tr>
<td>3. Additional Discount</td>
<td>($44,820)</td>
</tr>
<tr>
<td>4. Net Revised Request</td>
<td>$2,878,180</td>
</tr>
</tbody>
</table>

* Graphic on next page.
Figure 1 Diagram of Switch Architecture

- Internet
- Border routers
- Core switches
- Segment 1
- Note complete Failover redundancy Supported by mesh Configurations
- Segment 2
- Edge switches In Buildings.
- Buildings (typ.) Behind ACL IT Security
- Firewalls
- Central IT Servers
Our Funding History – Have Tried Diligently to Keep Up, Unsuccessfully

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base, annual funding</td>
<td></td>
</tr>
<tr>
<td>- Building switches (Provost)</td>
<td>$130,000/yr.</td>
</tr>
<tr>
<td>- Wi-Fi Provost &amp; student fee funding</td>
<td>$500,000/yr.</td>
</tr>
<tr>
<td>One-time funding</td>
<td></td>
</tr>
<tr>
<td>- VoIP switch upgrades</td>
<td>$495,169</td>
</tr>
<tr>
<td>- New construction/remodels</td>
<td>$3,685,559</td>
</tr>
<tr>
<td>- Last NSF grant, core devices, 10 Gig</td>
<td>$454,000</td>
</tr>
</tbody>
</table>
Funding History and Funding Needs

**Needs**

- Core infrastructure – funded via NSF grants: NEED UPGRADE
  - 10 gig core (current)
  - Need 100 gig
- Building switches: DO NOT NEED
  - Funded by the Provost
- Edge switches: NEED UPGRADE
  - Departments’ responsibility

**Issues**

- Addt’l NSF funding unavailable to us
- Departments have been unable to keep up with needed upgrades to edge switches
- This request is to provide 1-X funding as a bridge to base
  - 3-year effort needed to put a new, base funding model into place
  - Get us over the hump
## Base Funding Need and Revenue Sources

<table>
<thead>
<tr>
<th>Item</th>
<th>Refresh Cycle</th>
<th>Annualized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Funding Needs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Core devices</td>
<td>5 years</td>
<td>$250,000</td>
</tr>
<tr>
<td>2. Edge switches</td>
<td>7 years</td>
<td>$415,800</td>
</tr>
<tr>
<td>3. Total</td>
<td></td>
<td>$665,800</td>
</tr>
<tr>
<td><strong>Revenue Sources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Student fees</td>
<td>Annually</td>
<td>$200,000</td>
</tr>
<tr>
<td>2. Departments</td>
<td>Annually</td>
<td>$265,800</td>
</tr>
<tr>
<td>3. Provost/Institutional</td>
<td>Annually</td>
<td>$200,000</td>
</tr>
<tr>
<td>4. Total</td>
<td></td>
<td>$665,800</td>
</tr>
</tbody>
</table>
Capital IT Request Needed to Catch Up: 10X in Capacity, IT Security, & POE

Core devices: border routers, core switches, and firewalls
New edge switches (from a comprehensive inventory)
Core Infrastructure Needs (~80k Devices)

- **10X Speed Increase** from 10 Gbps to 100 Gbps
- Fully redundant configuration
- Core networking trends, becoming “smart” – IT Security – evolving Software Defined Network (SDN)
  - Automatic configurations for real-time threat vectors
  - Will be needed to secure our networks from near real-time threats and zero-day exploits
The State Of Application Security, 2018
Application Security Is Worsening, But Automation Offers Hope
by Amy DeMartine
January 23, 2018
A Deeper Collaboration Stack (from I2)

Traditionally, a collaboration has wanted to share
• Email and listservs, calendars, wikis, polls, etc.
• Access to files and datasets and storage/curation

And now a collaboration shares
• Compute power, typically in a grid or in a commercial cloud
• Storage in motion and at rest
• Network bandwidth and scheduling
• Devices
• Ontologies and metadata
  • Decentralized data submission at scale
  • Long-tail data
• Visualization and analytic tools
• Security and Compliance
Network infrastructure problems at the "edge" - Edge Switches

331 of our ~1,100 edge switches that form the connection for all student/staff/faculty will be at or beyond End of Life (EOL) in FY 22

Lacking modern features, specifically:

- Speed
- Power Over Ethernet
- IT Security
Figure 2 No. of Edge Switches > 7 Yrs. Old, Needing Replacement (331 of ~1,100 total)
Edge Switches - Speed

Old edge switches are 100 Mbps for the users. Current standard is 1 Gbps, or 1,000 Mbps = 10X.

• Many have faster connections from their home than they do at their office at CSU!
• Unmet needs in entire buildings
• Files have grown huge, and much more numerous.
• Streaming media files require exceptional capacity.
Edge Switches – Power Needs ("Life and Safety")

Old switches don't provide Power over Ethernet or "PoE" to devices:

• Voice over IP (VoIP) phones.
• Internet of Things: alarms and sensors.
• Public Safety Team has requested installation of ~500 new security cameras.
• Current Wi-Fi can't run at top speeds without modern switches, and next gen Wi-Fi needs 10 gig.
IT Security: Huge Risk

• EOL switches no longer have security bugs fixed.
• Aged switches lack the firmware/OS needed to secure the infrastructure from attacks.
• Aged switches are easily compromised, and can be commandeered by attackers.
## Total Capital IT Request to Get to Base Funding

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount*</th>
</tr>
</thead>
<tbody>
<tr>
<td>331 Edge Switches/18,000 Ports at $83/port</td>
<td>$1,494,000</td>
</tr>
<tr>
<td>(2) Nexus Core Routers with 100G Cards</td>
<td>$573,000</td>
</tr>
<tr>
<td>(2) Border Routers with 100G Cards and Optics</td>
<td>$688,000</td>
</tr>
<tr>
<td>(2) Juniper Data Center Firewalls with 100G Cards and Optics</td>
<td>$708,000</td>
</tr>
<tr>
<td>(1) Juniper Space License and IDP License for IT Security</td>
<td>$110,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3,573,000</strong></td>
</tr>
</tbody>
</table>

* Amounts are discounted bid prices.
# CSU Funding to Get to Base (Steady State)

<table>
<thead>
<tr>
<th></th>
<th>FY 19-20</th>
<th>FY 20-21</th>
<th>FY 21-22</th>
<th>FY 22-23 (Base)</th>
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</thead>
<tbody>
<tr>
<td>Student Funding</td>
<td>$0</td>
<td>$66,666</td>
<td>$150,000</td>
<td>$200,000</td>
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<tr>
<td>Central Funding</td>
<td>$0</td>
<td>$66,666</td>
<td>$150,000</td>
<td>$200,000</td>
</tr>
<tr>
<td>Chargeback</td>
<td>$0</td>
<td>$66,667</td>
<td>$150,000</td>
<td>$265,800</td>
</tr>
<tr>
<td>Total Funding</td>
<td>$0</td>
<td>$200,000</td>
<td>$450,000</td>
<td>$665,800</td>
</tr>
</tbody>
</table>

Capital IT Funding Needed To Catch Up

Steady State (Caught Up)
Summary

• Need bridge funding over three years to allow us to budget up to steady state
  • 331 edge switches
  • Core routers, switches and firewalls

• Requirements
  • Capacity
  • IT Security, “smart” automatic adaptability
  • Power Over Ethernet to attach ITSec devices
Thank You

Questions Are Most Welcome!