
# VOICE OVER INTERNET PROTOCOL BUSINESS CASE

## SOFTWARE AND HARDWARE

## <VOIP>

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## EXECUTIVE SUMMARY

*Problems have been identified that are the impetus for changing CWU's Telephone System. First, though the existing system, an Avaya/Nortel CS1000M, is in good condition, well maintained and at current release, the system vendor Avaya has notified the industry that there will be no further feature or software development or upgrades for this platform. The building the system resides in has been identified as seismically unsound and a new Data Center is being planned as a part of the Samuelson Communications Technology Center Project. Once construction is complete data network and telephone system operations are planned to be migrated to this new Data Center. Moving the existing telephone system will be expensive, time consuming and require extensive and extended telephone service outages across campus. Costs to move and/or replace the system will have a major impact on the SCTC project budget.*

*A predesign study was performed by Summit Engineering to evaluate potential solutions. The recommended solution is to replace the existing phone system with a new VoIP communications system. Work will need to be completed prior to the completion of the SCTC project to mitigate the impact on that budget. New, proven, application and feature rich technology would be installed. Project disruption and downtime would be significantly reduced and much less service affecting.*

**Sponsoring Department(s):** *President's Office, Information Technology Services*

**Date of Business Case Preparation:** *September 27, 2013*

**Contact Person Name/Phone:** *Noah Rodriguez (ext. 2934)*

☑ New Product/Service
If there is a draft or sample contract, please provide a copy.

☐ Renewal of Existing Product/Service – if checked, include background information.
If there is a site license agreement, existing contract or new contract draft, please provide a copy.

1. **Problem Definition**

*The existing telephone system at Central Washington University campus is an Avaya/Nortel CS1000M. It is a conventional telephone system that is current in its maintenance and service. The existing telephone system is aging and will need to be replaced at some point in the future. For CWU, the Computer Center where the telecommunication system is located is an aging building that has been determined to be seismically unsound. The seismic instability of the existing Computer Center is a liability to the telephone system. A new Computer Center/Data Center is one of the features of the new Samuelson Communication and Technology Center. When construction is completed, network and telephone system operations will be migrated to Samuelson from the Computer Center. The existing telephone system uses many large copper cables which contain up to 2400 pairs of wires in each cable and are all terminated and connected in the Computer Center. It is estimated that conducting the moving process would require several weeks under best-case conditions, during which the campus would experience major telephone system outages ranging from several days to weeks.*

2. **Addressing Problem with CWU** existing tools and products (i.e. PeopleSoft)

*Central Washington University has a telephone system in good, working condition. It is well maintained and is expected to be capable of providing reliable service for the foreseeable future. It is also able and currently does provide a limited amount of Voice over IP telephone services to some buildings, offices and CWU Centers that would otherwise have no connectivity to CWU's phone services. However, Avaya has notified the industry that the CS1000 platform, which CWU has, will no longer receive new feature development or upgrades; however service packs with bug fixes will continue for the foreseeable future.*

*Two potential solutions were reviewed that included utilizing all or some of the existing phone system.*

*One was to move the existing phone system as it exists today. Under this scenario to move the existing telephone system to the new Samuelson Data Center, all of the existing cables, copper and fiber, would have to be disconnected from their existing termination in the Computer Center and spliced/extended to the Samuelson Data Center. This process will require significant telephone service outages across campus ranging from several days to weeks. The cost to move existing equipment and splicing has been estimated at between $500,000 and $750,000. There is a high risk for damage when moving existing equipment. Moving the existing switch is an "all in" commitment. It is not reversible without serious cost and disruption repercussions. A significant cost would be incurred to preserve older technology.*

*The second solution that utilizes the existing phone system is to do a phased migration to VoIP prior to the move to the new Data Center. This would require increasing IP licenses, gateway changes, replacing much of the existing hardware and adding some IP phones. The existing phone system can be migrated over time to a full VoIP system which can allow the continued use of many of the existing phones. The cost to implement this solution is ultimately comparable to a full system replacement and does not address the issue that the existing system is aging and will need to be replaced.*

3. **Organizational Impact**

*The organizational impact is campus wide. Replacing CWU's phone system affects Faculty, Staff, Students, and Customers, anyone contacting CWU by phone for any reason.*

*A study and pre-design has been conducted and provided by Summit Engineering, to evaluate options, identify the key considerations, and prepare budgetary pricing. Some information from that report has been included in this Business Case.*

*Replace the existing Phone System:*

*A. A new telephone system would be a Voice-over-IP (VOIP) system.*

- *Since its emergence, VOIP technology has steadily improved in quality and reliability while decreasing in cost. VOIP evolution has continued on this course, and today, virtually no new conventional telephone systems are being sold.*

*B. A new VOIP telephone system would be installed in parallel with the existing telephone system. The two systems would be interconnected, and operate cooperatively during the cutover process. Telephones would be transitioned one-at-a-time from the existing system to the new system, with users largely unaffected by the transition process.*

- *It is expected that this process would cause only minor disruptions in telephone service, and even then the disruptions would be localized to the building or portion of the building under transition.*

*C. A new VOIP telephone system would operate via the campus network using the existing fiber optic cables. Most of the copper cabling would no longer be used for the telephone system. Therefore, very little copper cabling would need to be spliced and extended to the Samuelson Communications Technology Center.*

*D. Uninterruptible power supply equipment would be used to keep VOIP telephones functioning for a limited period of time in the event of a power outage to serve E911 purposes.*

*In addition to the procurement, installation and commissioning of the telephone equipment, there are several other one-time costs associated with this initiative, including:*

- *CWU ITS technician training*
- *CWU Faculty and Staff user training*
- *CWU ITS technician involvement to guide and support the design and installation process*

*Changes that will be required to implement a VoIP System include:*

*Building infrastructure improvements*

1. *Cabling Upgrades*
2. *Additional Power*
3. *Additional Cooling*

*Telephone Equipment*

1. *Head end Equipment and Software*
2. *Telephone Devices*

*Added Network Electronics*

1. *PoE Network Switches*
2. *Uninterruptible Power Supplies*

- **All Stakeholders:** *All CWU Faculty, Staff, Students, Parents, Customers, Vendors; anyone using telephony based services to communicate with CWU.*

- **Potential Partners/Primary Users:** *All CWU Faculty, Staff, Students, Parents, Customers, Vendors; anyone using telephony based services to communicate with CWU.*

- **RFP Requirements Contributors** (add lines as necessary) – This section may or may not be required

| Department | Name |
|---|---|
| Information Technology Services | |
| Vendor Submissions | Summit Engineering |

4. **Benefits**
   1. *Replacing the existing system makes the requirement to move the existing system unnecessary.*
   2. *New (proven) technology would be installed, with a significant future lifespan.*
   3. *By comparison, very low disruption or downtime would be incurred.*
   4. *Avoids spending SCTC project budget to splice and extend large copper cables, preserving these project funds for other worthy features in the building.*
   5. *It is essential to the success of the Samuelson Communications and Technology Center project that the telephone system transition work be completed prior to SCTC occupancy.*

5. **Strategic Alignment**

   *This Business Case supports several of the goals of the CWU Strategic Plan. Some of the specific goals and outcomes supported by this proposal include:*

   *"**Facilities**: CWU believes that state-of-the-art, safe, and attractive facilities enhance the working and learning environments of faculty, staff, and students. CWU also believes that state-of-the-art technologies provide leverage for the efforts of faculty, staff, and students."*

   ***Objective 5.4:** Provide the facility and technology infrastructure and services appropriate to meet the university objectives, while maximizing sustainability and stewardship.*

   *http://www.cwu.edu/resources-reports/sites/cts.cwu.edu.resources-reports/files/documents/2012%20CWU%20Strategic%20Plan.pdf*

6. **Cost**

   - **Source of Funding (Project ID) or Description of the Source of Funding.** *The source of the funding to pay for this service has not yet been identified. If this is determined to be an acceptable proposal, and is approved for implementation, funding will need to be identified at that time.*

- **Cost Breakdown.** *The table below summarizes the major costs for network electronics, infrastructure improvements and the VOIP telephone system hardware and software:*
- **First Cost Range**

| Item | | Avaya | Cisco | MS Lync |
|---|---|---|---|---|
| First Cost Range | | $ 3,047,817 | $ 3,340,403 | $ 2,433,547 |
| Contingency | 15% | $ 457,173 | $ 501,061 | $ 365,032 |
| | | **$ 3,504,989** | **$ 3,841,464** | **$ 2,798,580** |
| Project Administration | 5% | $ 175,249 | $ 192,073 | $ 139,929 |
| | | **$ 3,680,239** | **$ 4,033,537** | **$ 2,938,509** |

- **Annual/Ongoing Cost Range**

| Item | | Avaya | Cisco | MS Lync |
|---|---|---|---|---|
| Annual/Ongoing Cost Range | | $ 276,068 | $ 297,913 | $ 369,668 |
| Contingency | 15% | $ 41,410 | $ 44,687 | $ 55,450 |
| | | **$ 317,478** | **$ 342,600** | **$ 425,118** |

*These costs include installation labor, sales tax and a 15% contingency.*

| Network Electronics Costs | Elec/Mech/Telecom Contractor Costs | Telephone Vendor Costs Avaya | Cisco | MS Lync | Total Costs Avaya | Cisco | MS Lync | |
|---|---|---|---|---|---|---|---|---|
| **$ 887,249** | **$ 112,543** | **$ 1,562,986** | **$ 1,855,572** | **$ 948,716** | **$ 2,562,777** | **$ 2,855,363** | **$ 1,948,507** | **Grand Totals** |
| $ 678,990 | $ 103,250 | $ 842,232 | $ 1,363,832 | $ 659,862 | $ 1,624,472 | $ 2,146,072 | $ 1,442,102 | **Building Totals** |
| $ 135,000 | | $ 591,700 | $ 338,528 | $ 210,520 | $ 726,700 | $ 473,528 | $ 345,520 | **Head end Totals** |
| **$ 813,990** | **$ 103,250** | **$ 1,433,932** | **$ 1,702,360** | **$ 870,382** | **$ 2,351,172** | **$ 2,619,600** | **$ 1,787,622** | **Sub Totals** |
| $ 73,259 | $ 9,293 | $ 129,054 | $ 153,212 | $ 78,334 | $ 211,605 | $ 235,764 | $ 160,886 | **Sales Tax 0.09** |

*The above Vendor costs obtained during the Pre-Design were derived from established WA State Master Contracts and K12 Contracts.*

*In addition to the above costs, the following tables detail Other One Time Costs and Other Annual/Ongoing Costs:*

| Item | Unit Cost | Qty | Cost |
|---|---|---|---|
| Technician Training | $ 15,000 | 6 | $ 90,000 |
| User Training | $ 10 | 2304 | $ 23,040 |
| Engineering | $ 300,000 | 1 | $ 300,000 |
| Support Staff during Installation | $ 72,000 | 1 | $ 72,000 |
| | | | **$ 485,040** |

| Item | Unit Cost | Qty | Cost |
|---|---|---|---|
| Staff to provide ongoing Support | $ 72,000 | 2 | $ 144,000 |
| Annual Maintenance Fee from Vendor | See below per vendor | | |
| UPS Battery Replacement (including Labor) | $ 84 | 115 | $ 9,668 |
| | | | **$ 153,668** |

*The probable Annual Maintenance Fees from the three telephone system vendors are:*

| Annual Maintenance Fee | | |
|---|---|---|
| Avaya | Cisco | MS Lync |
| $ 122,400 | $ 144,245 | $ 216,000 |

7. **Alternatives** (add lines as necessary)

| Alternative | Reasons For Not Selecting Alternative |
|---|---|
| Status Quo – Do Nothing | Potential financial and service impact to the CWU community through the extended service outages that will occur during the move to SCTC. |
| Phased Migration | Complete upgrade and replacement of many elements in the existing system will still be needed at the end of the SCTC project based on the industry timeline. This may create a scenario where the cost is duplicated. |

8. **Timing / Schedule** (add lines as necessary)

| Task | Target Date |
|---|---|
| Obtain funding for this project | FY 13-14 |
| Perform a full design: | FY 13-14 |
| Infrastructure improvements | FY 13-14 |
| Specify additional network electronics for the head end and for each building | FY 13-14 |
| Prepare a staging and cutover plan | FY 13-14 |
| Prepare detailed Request for Proposal | FY 14-15 |
| Get competitive quotes from vendors | FY 14-15 |
| Perform the installation and cutover during advantageous periods of reduced university operations | FY 14-15 |
| | |
| | |

9. **Technology Migration/Resource Identification**

*Installation of a new campus wide VoIP Communication System would require selection of a vendor through the established bid process. This qualified vendor will be expected to provide all personnel and equipment required for the complete implementation of this project. This vendor will also address how data will be migrated, training, obstacles and other related technical requirements. CWU Networks and Telecommunications staff will be required to support the vendor and the project migration.*

*Resource Identification*

*At least one CWU Networks Engineer, two Telecom Engineers and two Telecom Analysts will be needed for planning and assisting Consultants and the successful Vendor over the projected two year project schedule. Initially their assistance will be minimal but as the project progresses to completion and based on specifically identified tasks more of their time will be required for support. Some of the required components of this project will involve CWU Facilities Management for cabling, cooling and power additions to buildings. Additional PoE Network switches and UPS battery backups will be needed in some buildings.*

| Resource | Requirements | Timeframe |
|---|---|---|
| Personnel | | |
| Equipment | | |
| Facilities | | |

*Resource Loading Chart*

*This chart would be included as a requirement of the RFP responses.*

| Resource | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project Manager | | | | | | | | | | | | |
| Business Analyst | | | | | | | | | | | | |
| Snr. Programmer | | | | | | | | | | | | |
| Tester Manager | | | | | | | | | | | | |
| Database Admin | | | | | | | | | | | | |
| Test Manager | | | | | | | | | | | | |
| Technical Writer | | | | | | | | | | | | |
| Training Manager | | | | | | | | | | | | |
| Configuration Mgr | | | | | | | | | | | | |
| LAN Engineer | | | | | | | | | | | | |
| Total Hours | | | | | | | | | | | | |

## 10. **Product Life/Application Sunsetting or Decommissioning**

*Since its appearance in the technology market 15 years ago, VOIP technology has steadily improved in quality and reliability while decreasing in cost. VOIP is sufficiently robust to become a compelling alternative to conventional telephone systems. Today, virtually no new conventional telephone systems are being sold. Because VoIP utilizes data networks to carry voice traffic there is no expectation for sunsetting or decommissioning this technology. Expected life is indefinite.*

## 11. **References**

*Summit Engineering – Ron Carlson - CWU VoIP Pre-Design Report*

*Cerium Networks – Ed Weise*

## 12. **Recommendation**

*Based on the recommendations of Summit Engineering in the predesign study, "The requirement to keep the University operating during the telephone system transition makes it unfeasible to move the existing system. Factoring in the opportunity to adopt modern VOIP technology, we (Summit Engineering) strongly recommend that a new VOIP telephone system be procured……. It is essential to the success of the Samuelson Communications and Technology Center project that the telephone system transition work be completed prior to SCTC occupancy."*

## 13. **Approvals**

The following actions have been taken by the appropriate Sub-Council (ATAC or Non-Academic Sub-Council) and University Enterprise Team:

| Date | Action | By |
|---|---|---|
| 10/21/2013 | Presentation to EISC | Gene Shoda |
| 10/21/2013 | Approved for Review by Cabinet | EISC |
| | | |

***Upon approval by the Enterprise Team (ET) or one of the two Sub-Councils (Academic or Non-Academic), CWU procurement policies and procedures should be used to initiate a purchase. Please contact the Purchasing office at x1001 with any questions regarding the procurement process.***

***If you have any questions, please contact Sue Noce 963-2927 or Tina Short 963-2910.***

# VOIP Telephone System
# Pre-Design Report

**September 25, 2013**


**Prepared by:**

**Central Washington University**
**Information Technology Services**

**and**

SUMMIT
Engineering & Consulting P.S.
**www.summiteng.com**

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# 1 Preface

## 1.1 CWU's Existing Telephone System

A. The existing telephone system at Central Washington University campus is an Avaya/Nortel CS1000M. It is a conventional telephone system that is current in its maintenance and service.
   - Avaya has notified the industry that the CS1000 platform will no longer receive new feature development or upgrades, however service packs with bug fixes will continue for the foreseeable future.

B. The system also serves CWU's Centers in Wenatchee, Lynnwood, Seattle, Des Moines, Fort Steilacoom, Moses Lake and Yakima.

C. There are approximately 2,350 telephones in the system.

## 1.2 Impetus for Telephone System Change at CWU

CWU's telephone system is in good, working condition. It is well-maintained and is expected to be capable of providing reliable service for the foreseeable future. So why change it?

- The campus Computer Center (formerly called "Wildcat") is an aging building that has been determined to be seismically unsound. The existing telephone system resides in this building.

- The Samuelson Union Building is slated for demolition and remodel starting in 2015. A new Data Center is one of the features of the new building which will be called the Samuelson Communication and Technology Center (SCTC).

- When construction is completed for the SCTC, the network and telephone system operations will be migrated from the Computer Center to SCTC, leaving the Computer Center vacant and ready for demolition.

- A strategic opportunity now presents itself to CWU:

  - The University operations require a robust telephone system.
  - The existing telephone system is aging and will need to be replaced at some point in the future. Since it would be irresponsible to wait until the system fails, the system should be replaced at the right time under well-reasoned leadership while the system still has some usable life remaining.
  - The seismic instability of the existing Computer Center is a liability to the telephone system. CWU's operational risks can be reduced by moving the telephone system out of that building into a modern data center. If a significant seismic event were to cause the Computer Center to be condemned under the current situation, CWU would be required to procure a new telephone system under duress, greatly

increasing the cost and limiting the competitive bidding climate. Any resulting service outages might not be fixable in a condemned building and could potentially last months while a new system is procured and installed.

- Telephone system technologies have evolved presenting new ways of working that have not existed in the past. The sooner a transition occurs, the sooner these features can be placed into beneficial service.
- If the system can be replaced prior to the completion of the SCTC project, project funds can be better allocated to more worthwhile project uses, rather than being spent to accommodate older technology that would then be even closer to its end-of-life.

## 1.3 Options

Under the SCTC project the following two options were considered:

### 1.3.1 MOVE EXISTING TELEPHONE SYSTEM

A. The existing telephone system uses many large copper cables to route telephone calls between buildings on campus. These cables range in diameter between 2" and 4" and contain up to 2400 pairs of wires in each cable.

B. In order to move the existing telephone system to the SCTC, the existing cables would have to be disconnected from their existing termination in the Computer Center and spliced/extended to the SCTC.

- It is estimated that conducting the moving process would require several weeks under best-case conditions, during which the campus would experience major telephone system outages ranging from several days to weeks.

#### 1.3.1.1 PROS

- Continue to make use of an existing system.

#### 1.3.1.2 CONS

- Moving the existing system would present an expensive cost to the SCTC project, consuming funds that would be better spent on other building features. The cost of the copper cabling splicing and extension work is estimated to be more than $500,000. The move of the equipment could cost another $50,000.
- Significant, unacceptable disruption to University operations.
- Splicing would consume a large amount of space in the underground vaults.
- This would be a very high risk activity. The existing equipment, which fills a large room, is very heavy and could easily be damaged even under the most careful efforts.

- The cutover process would need to be done as quickly as possible to minimize the downtime. Duress from a time-pressured process tends to cause problems.
- Moving the existing switch is an "all in" commitment. It is not reversible without serious cost and disruption repercussions.
- A significant cost would be incurred to preserve older technology.

### 1.3.2 INSTALL NEW TELEPHONE SYSTEM

A. A new telephone system would be a Voice-over-IP (VOIP) system.
   - VOIP is an innovative method of carrying voice traffic via computer networks. VOIP technology entered the marketplace approximately 15 years ago.
   - Since its emergence, VOIP technology has steadily improved in quality and reliability while decreasing in cost.
   - During the early years of VOIP, conventional telephone systems were viewed as being a better value than VOIP:
     - More robust
     - Less expensive
     - Less difficult to install and commission
   - However, a cross-over point was reached roughly five years ago where VOIP became less expensive and sufficiently robust to become a compelling alternative to conventional telephone systems. VOIP evolution has continued on this course, and today, virtually no new conventional telephone systems are being sold.

B. A new VOIP telephone system would be installed in parallel with the existing telephone system. The two systems would be interconnected, and operate cooperatively during the cutover process. Telephones would be transitioned one-at-a-time from the existing system to the new system, with users largely unaffected by the transition process.
   - It is expected that this process would cause only minor disruptions in telephone service, and even then the disruptions would be localized to the building or portion of the building under transition.
   - Unexpected problems can and do occur. However, if something doesn't transition properly, it can be put back into the old system until the solution is discovered.

C. A new VOIP telephone system would operate via the campus network using the existing fiber optic cables. Most of the copper cabling would no longer be used for the telephone system. Therefore, very little copper cabling would need to be spliced and extended to the SCTC.

D. Uninterruptible power supply equipment would be used to keep VOIP telephones functioning for a limited period of time in the event of a power outage to serve E911 purposes.

#### 1.3.2.1 PROS

- New (proven) technology would be installed, with a significant future lifespan.
- By comparison, very low disruption or downtime would be incurred.

- Avoids spending SCTC project budget to splice and extend large copper cables, preserving these project funds for other worthy features in the building.
- The cutover process could be handled gracefully over a longer period of time. Each task could be done at times that would be cooperative with University operations.

#### 1.3.2.2 CONS

- Purchasing a new telephone system earlier is a lower net present value than one purchased sometime in the future. From a financial perspective, it would be desirable to defer a purchase of this magnitude for as long as possible, all other considerations held equal.
- University personnel would be required to adjust to a new telephone system and learn its new features.

## 1.4 Initial Recommendation

Based on the above considerations, it was clearly prudent to conduct a study and pre-design to investigate options from various vendors and also to prepare a budgetary cost model.

This document reports the findings of the study and pre-design efforts.

# 2 Study and Pre-Design

A study and pre-design has been conducted to evaluate options, identify the key considerations, and prepare budgetary pricing.

Each building on campus was visited to investigate whether any adjustments would be needed to the infrastructure and to verify the network and telephone equipment required.

Discussions were held with Cerium Networks, a vendor of major telephone systems. Cerium provided a preliminary design comparing telephone systems from Avaya, Cisco and Microsoft.

## 2.1 Required Infrastructure Improvements

In order to support a new VOIP telephone system, some buildings on campus were determined to require the following improvements to the technology infrastructure:

### 2.1.1 CABLING UPGRADE REQUIRED

A. Most buildings on campus have a minimum of Category 5 cabling, which is sufficient for this application.

B. Mitchell Hall currently uses Category 3 cabling for telephones. This cabling will need to be replaced before VOIP telephones can be used.

### 2.1.2 ADDITIONAL POWER REQUIRED

A. VOIP telephones are typically powered using Power-Over-Ethernet (POE), a method of delivering power via the communication cable.

B. Most buildings on campus have sufficient power available in the telecommunications rooms to support the POE network electronics that are required for a VOIP telephone system.

C. Bouillon Hall will require additional power outlets/circuits in its second floor telecommunications room.

### 2.1.3 ADDITIONAL COOLING REQUIRED

A. Network electronics that deliver Power-Over-Ethernet produce more heat in telecommunications rooms than non-POE switches.

B. Most buildings on campus have sufficient cooling available in the telecommunications rooms to handle the additional heat load produced by additional POE network electronics.

C. Some buildings on campus have long been too warm, requiring stop-gap measures to keep them operating (such as propping open the telecommunications room door). New split-system air conditioning equipment will be required for the following four buildings.

- Randall Hall (first floor telecommunications room)
- Peterson Hall (second floor telecommunications room)
- Wendell Hill Hall Building B (first floor telecommunications room)
- Naneum (first floor telecommunications room)

## 2.2 Required Network Electronics

### 2.2.1 POE Network Switches

During the field investigation process, a count was taken of the number of available POE ports in each building. Most buildings will require additional network switches, in one of three styles:

- Quantity 41 – 24-port stand-alone switches
- Quantity 21 – 48-port stand-alone switches
- Quantity 13 – 48-port blades for chassis switches

### 2.2.2 Uninterruptible Power Supplies

In order for telephones to remain in service during a power outage, Uninterruptible Power Supplies (UPS) containing backup batteries are required in each telecommunications room supporting VOIP telephones.

Some telecommunications rooms on campus have existing UPS equipment. However most of these are aging and will require replacement batteries or hardware soon.

Most of the telecommunications rooms on campus will require at least one new UPS, and some will need two.

## 2.3 Telephone System Vendors

The Pre-Design effort compared preliminary designs based on telephone systems from three leading enterprise telephone systems on the market: Avaya, Cisco and Microsoft (Linc).

Cost centers within the future vendor scope include the following:

### 2.3.1 Headend Equipment and Software

The “headend” of the telephone system, often called the “PBX” (private branch exchange), is comprised of equipment and software. Cost projections for the headend were derived from preliminary quotes from these vendors.

Some network equipment would be required in addition to the vendor-provided headend equipment and software. Since CWU ITS is able to procure this equipment at favorable educational discounts, the intent would be to remove this equipment from the vendor's scope.

- Please note that the Microsoft Linc solution requires that Microsoft Exchange be fully implemented. If Microsoft Linc were to be selected and Exchange had not been fully deployed, additional costs would be incurred to complete that task.
    - The cost for a Microsoft Exchange initiative is not covered in this estimate due to the fact that CWU is currently underway with a request for proposal to install Microsoft Exchange on campus.
    - It is unclear at this point whether or to what extent Microsoft Exchange will have been deployed by the time that a VOIP telephone system installation would begin.
    - Probable cost estimates for a full deployment of Microsoft Exchange suitable for this application range between $800 thousand and $1.1 million.

### 2.3.2 TELEPHONE DEVICES

Five types of telephone "profiles" were developed during the Pre-Design for the purpose of selecting similar phone equipment from the three vendors and correlating it to the existing telephones currently in use on campus. A total of 2,350 telephones were counted in the Pre-Design, distributed through the five profiles as follows:

| Profile | Quantity | % | Description |
|---|---|---|---|
| High-end Telephone | 563 | 24% | Desktop speakerphone, with LED screen |
| Mid-range Telephone | 387 | 16% | Desktop speakerphone, with LED screen |
| Low-end Telephone | 776 | 33% | Desktop speakerphone, with LED screen |
| Conference Telephone | 46 | 2% | Conference table speakerphones with remote microphones |
| Analog Telephone | 578 | 25% | Existing telephones to be reused |

Please note that the majority of the Analog Telephones that will be retained are serving student rooms in residence halls. In academic and administrative buildings, the typical use for analog telephones is as a Courtesy Telephone.

In addition to the above telephones, the new telephone system will also be required to support the many devices on campus that do not use a vendor-provided telephone device, such as fax machines, elevator telephones, area of refuge communication devices, and emergency blue phones.

## 2.4 Other One-time Costs

In addition to the procurement, installation and commissioning of the telephone equipment, there are several other one-time costs associated with this initiative, including:

- CWU ITS technician training
- CWU Faculty and Staff user training
- CWU ITS technician involvement to guide and support the design and installation process
- Engineering services during the design and installation process, and also services to address the required infrastructure improvements

## 2.5 Other Annual/Ongoing Costs

In addition to the one-time costs, there are three main areas where ongoing costs will occur:

- CWU ITS technicians providing moves, adds and changes
    - It should be noted that the existing ongoing/annual technician support costs approximately $72,000 per year. These existing expenses would offset a portion of the support costs of a new VOIP telephone system.
- UPS battery replacement (by CWU ITS technicians) – approximate 3-year cycle
- Vendor Maintenance Fees – all major vendors provide warranty services and technical support (including software updates) under a Maintenance Service Agreement.
    - It should be noted that the existing telephone system also incurs ongoing/annual Vendor Maintenance Fees (approximately $60,000). These existing expenses would offset a portion of the vendor maintenance fees of a new VOIP telephone system.

# 3 Cost Summary

## 3.1 Cost Components

The table below summarizes the major costs for network electronics, infrastructure improvements and the VOIP telephone system hardware and software:

| Network Electronics Costs | Elec/Mech/Telecom Contractor Costs | Telephone Vendor Costs Avaya | Cisco | MS Linc | Total Costs Avaya | Cisco | MS Linc | |
|---|---|---|---|---|---|---|---|---|
| $ 678,990 | $ 103,250 | $ 842,232 | $ 1,363,832 | $ 659,862 | $ 1,624,472 | $ 2,146,072 | $ 1,442,102 | **Building Totals** |
| $ 135,000 | | $ 591,700 | $ 338,528 | $ 210,520 | $ 726,700 | $ 473,528 | $ 345,520 | **Headend Totals** |
| **$ 813,990** | **$ 103,250** | **$ 1,433,932** | **$ 1,702,360** | **$ 870,382** | **$ 2,351,172** | **$ 2,619,600** | **$ 1,787,622** | **Sub Totals** |
| $ 73,259 | $ 9,293 | $ 129,054 | $ 153,212 | $ 78,334 | $ 211,605 | $ 235,764 | $ 160,886 | **Sales Tax 0.09** |
| **$ 887,249** | **$ 112,543** | **$ 1,562,986** | **$ 1,855,572** | **$ 948,716** | **$ 2,562,777** | **$ 2,855,363** | **$ 1,948,507** | **Grand Totals** |

The above Vendor costs obtained during the Pre-Design were derived from established WA State Master Contracts and K12 Contracts. Please note that after a full design is performed (see Recommendations, below) the costs will adjust to reflect detailed specifications and a competitive bidding environment. We fully expect the final costs to fall within the range given above.

In addition to the above costs, the following tables detail Other One Time Costs and Other Annual/Ongoing Costs:

**Other One Time Costs**

| Item | Unit Cost | Qty | Cost |
|---|---|---|---|
| Technician Training | $ 15,000 | 6 | $ 90,000 |
| User Training | $ 10 | 2304 | $ 23,040 |
| Engineering | $ 300,000 | 1 | $ 300,000 |
| Support Staff during Installation | $ 72,000 | 1 | $ 72,000 |
| | | | **$ 485,040** |

**Other Annual/Ongoing Costs**

| Item | Unit Cost | Qty | Cost |
|---|---|---|---|
| Staff to provide ongoing Support | $ 72,000 | 2 | $ 144,000 |
| Annual Maintenance Fee from Vendor | | see below per vendor | |
| UPS Battery Replacement (including labor) | $ 84 | 115 | $ 9,668 |
| | | | **$ 153,668** |

The probable Annual Maintenance Fees from the three telephone system vendors are:

**Annual Maintenance Fee**

| Avaya | Cisco | MS Linc |
|---|---|---|
| $ 122,400 | $ 144,245 | $ 216,000 |

## 3.2 Grand Total Probable Cost Ranges

CWU should budget for probable total First Costs ranging between $2.9 million and $4.0 million, as shown in the table below:

| First Cost Range | | | | |
|---|---|---|---|---|
| Item | | Avaya | Cisco | MS Linc |
| First Cost Range | | $ 3,047,817 | $ 3,340,403 | $ 2,433,547 |
| Contingency | 15% | $ 457,173 | $ 501,061 | $ 365,032 |
| | | **$ 3,504,989** | **$ 3,841,464** | **$ 2,798,580** |
| Project Administration | 5% | $ 175,249 | $ 192,073 | $ 139,929 |
| | | **$ 3,680,239** | **$ 4,033,537** | **$ 2,938,509** |

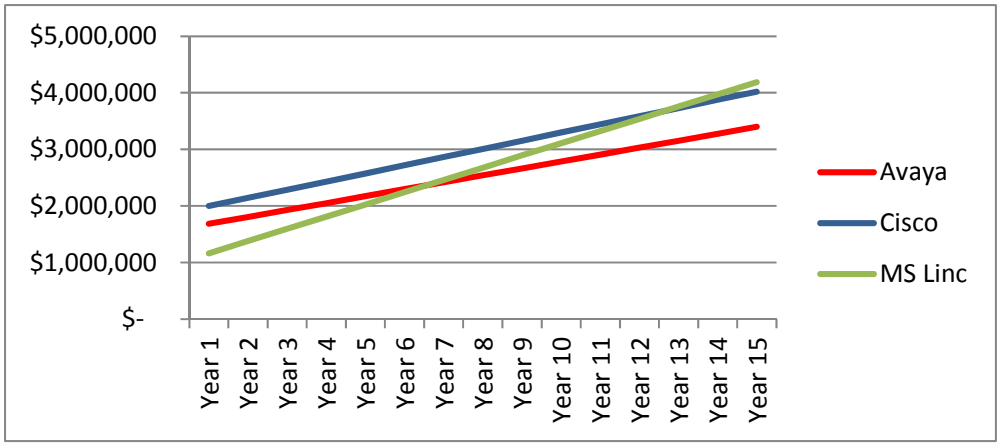
CWU should budget for probable total Annual/Ongoing Costs ranging between $317,000 and $425,000, as shown in the table below:

| Annual/Ongoing Cost Range | | | | |
|---|---|---|---|---|
| Item | | Avaya | Cisco | MS Linc |
| Annual/Ongoing Cost Range | | $ 276,068 | $ 297,913 | $ 369,668 |
| Contingency | 15% | $ 41,410 | $ 44,687 | $ 55,450 |
| | | **$ 317,478** | **$ 342,600** | **$ 425,118** |

These costs include installation labor, sales tax and a 15% contingency.

## 3.3 Noteworthy Observation

Considering only the vendor-specific costs projected during the Pre-Design, the **least expensive First Cost** solution comes from Microsoft Linc (if the cost for Microsoft Exchange is ignored). However, when the annual ongoing costs are factored in, Microsoft Linc becomes the most expensive solution in the 12th year, and the Avaya solution becomes the least expensive in the 7th year, as depicted in the chart below:




If the probable cost for Microsoft Exchange is included in the MS Linc pricing, then MS Linc would be the most expensive first cost, as well as the most expensive long-term cost.

Of course, this cost curve will probably change under competitive pricing, and the conclusions could also change.

# 4 Recommendations

## 4.1 CWU Action Items

The requirement to keep the University operating during the telephone system transition makes it unfeasible to move the existing system. Factoring in the opportunity to adopt modern VOIP technology, we strongly recommend that a new VOIP telephone system be procured.

We recommend that CWU take the following actions as soon as possible within normal budgeting cycles:

- Obtain funding for this project
- Perform a full design:
    - Infrastructure improvements
    - Specify additional network electronics for the head end and for each building
    - Prepare a staging and cutover plan
    - Prepare detailed Request for Proposal

It would be realistic to plan for a two-year project schedule once funding is procured, in order to make necessary adjustments to infrastructure, get competitive quotes from vendors, and perform the installation and cutover during advantageous periods of reduced university operations such as summer break.

It is essential to the success of the Samuelson Communications and Technology Center project that the telephone system transition work be completed prior to SCTC occupancy.