CLPCCD ITS ROADMAP

TO

NEXT GENERATION NETWORKING

EXECUTIVE SUMMARY

This document was prepared in June/July 2004 as a preparation for the Facilities Bond Measure "B" Program Management phase of the project. Wendy Pinos from JasNET Consulting prepared the initial document for Chabot-Las Positas Community College District in coordination with the Information Technology staffs at all the locations and additional modifications were made by CLPCCD staff as needed to address our unique situation. This was a preliminary document to be used to identify the "talking points" for establishing the formal ITS Master Plan for the Bond Measure "B" projects. It is anticipated that revisions will be made as we proceed with the Program Management phase for the Information Technology portion as more information is gathered for the College priorities for the bond projects which may directly impact the ITS activities. In addition, any time estimates or costs estimates were provided to estimate the "rough order of magnitude" (ROM) for the individual tasks for comparison purposes, but were not necessarily derived from a detailed analysis or specific vendor quotes. Final timelines and costs will be refined and finalized as part of the Program Management phase of the ITS Bond project.

Participants from Chabot-Las Positas District included the District Information Technology Services (ITS) and each of the Colleges IT Computer Support staffs. This team was tasked to identify and to provide input on the ITS expectations and potential concerns that need to be reviewed and addressed on the proposed technology initiatives. The CLPCCD representatives include: Jeannine Methe, Mark Smythe, John McHugh, and Eric Stricklen from the District ITS; Ralph Kindred and Tom Trippe from Las Positas IT; Mike Seaton, Gordon Watt, and Steve Piatetsky from Chabot IT. The document inputs reflect the opinions of all the participants collaboratively and the participants were encouraged to freely provide their views on each of the aspects of the Bond project. However, the views presented do not necessarily reflect the Information Technology management direction or that of the District or College executive management. However, a consensus will be reached on all topics for an effective plan of action during the Program Management phase of the project after all views have been considered and evaluated.

With recent funding approval, ITS now has an opportunity to upgrade the network infrastructure to state-of-the-art technology, including copper and fiber cabling, voice/data network equipment, site-to-site connectivity, video functionality and desktop/server environment. These upgrades total to nearly a complete replacement of the technology in place today and as such, represent a huge undertaking with sizeable gains to be realized. Due to limited funding in the past, needed upgrades, expansion of bandwidth, and improvements to the reliability of the network were deferred, so now the opportunity is available to the District to remedy the situation.

This document presents a step-by-step analysis of the key upgrade areas, and summarizes a Roadmap with which the upgrades can occur in an organized and planful fashion. The goal of this document is to highlight the process steps, duration and resources for each technology change, and establish a 1-3 year timeline of the costs and effort required by

these upgrades. The Roadmap is meant to specifically address the projects owned by ITS and fits within the project organization by the Construction Project Management firm selected for the project management of the entire upgrade project.

In analyzing the scope of the infrastructure upgrades, some of the CLPCCD ITS project areas can proceed immediately and achieve some "early wins" for the College campus end-users. Due to current status of LPC, which is more modern than Chabot, several "early wins" can be pursued at LPC. Particularly in the areas of new core network equipment for the Las Positas campus and firewall enhancements, these upgrades can occur in the first year of the project schedule, allowing for immediate performance boosts at that campus. Specific recommendations call for the early development of standards to be applied across all sites, so that CLPCCD can deploy a consistent functionality to all end-users.

A key element in the upgrades is the assessment of the CLPCCD ITS skill sets and the positioning of those skill sets with respect to contractor/consultant supplementation and ongoing operational demands. It is impossible to take on a project of this magnitude without supplementing the current ITS staff. This project presents a significant learning and growth opportunity for the staff. As much as possible, existing staff should be made available for infrastructure deployment so as to gain expertise of the new technologies. While District ITS will spearhead the effort for these upgrades, the projects will be approached with collaborative inputs from College ITS. Standards will be leveraged across all campuses, to take advantage of bid discounts and simplified support. In the areas where specific expertise is required for the project rollout, but not for the continued operation, it is to CLPCCD's best advantage to engage consultants for the one time efforts vs. the on-going support.

This is an exciting time for CLPCCD and promises great benefits to the College community. With the thorough and organized approach defined in this Roadmap document, ITS will successfully migrate from the out-of-date network infrastructure to the advanced technology and topologies required for current and future instructional application support.

A.0 ESTABLISH THE ROLE OF ITS

A.1 Determine in-house competencies - The build-out of new topology, services and infrastructure introduces new demands on ITS operation teams. It is essential that ITS clearly identify its core competencies and capabilities in the areas of:

- Project Management
- Network Design (Cabling, LAN, WAN, WLAN)
- Construction Management
- Infrastructure testing and troubleshooting
- Installation/Implementation
- Documentation
- Operations

ITS may choose to use this opportunity to build new competencies that will provide job enrichment and enable new skill sets for future use.

Resources: ITS staff
Timeframe: 2 weeks
Key Owner: ITS Management

A.2 Determine staffing load - Few ITS departments have excess staff who can be relieved of their day-to-day duties to address new projects. In this step, ITS must balance staffing expertise with schedule availability.

Resources: ITS staff, College IT
Timeframe: 1 month
Key Owner: ITS Management

A.3 Define Construction Responsibilities - ITS will need to define its roles and responsibilities in the construction phases and how it wants to be included/excluded in the construction process. This can include:

- Project Overview
- Schematic Design
- Complete Design and production of construction documents
- Checkpoint meetings
- Document review
- Construction Management
- Approval of submittals, construction work
- Acceptance testing

Resources: ITS, Construction Program Managers
Timeframe: 2 months
Key Owner: ITS Management

A.4 Staff Supplementation - Once ITS has determined its expertise, staffing availability and responsibilities, it is necessary to determine where there are "gaps" that would require expertise and staffing augmentation. To hire contractors and consultants, ITS will need to define the scope of work, responsibilities and reporting structures, milestones and deliverables.

Resources:
Timeframe: 4 months
Key Owner: ITS Management

A.5 Integrate into Construction Process - As soon as the construction process initiates, ITS must integrate itself into the meetings, design sessions and reporting, to achieve the following:

- Communicate ITS' roles, responsibilities, ownership and staff members
- Establish ITS priorities and negotiate what it needs from the Construction Managers and architect/engineering teams
- Integrate ITS needs into the global schedule
- Communicate ITS' timelines for independent projects
- Accept other responsibilities as needed.

Resources: ITS, Consultant, Construction Program Managers
Timeframe: ongoing
Key Owner: Construction Program Managers

Recommendations:

ITS has defined expertise in specific technology areas. The expertise of the current staff could contribute to the following tasks:

Network/Server Manufacturer(s) Identification
Bid assessments
Network/Server equipment configuration and deployment
Selection and procurement of network operations tools
Coordination of contractors
Review of as-built documentation
Testing and acceptance

There are certain areas of expertise that will be needed by ITS during the infrastructure upgrades, but that may not be needed in subsequent day-to-day operations roles. CLPCCD should engage the services of consulting firms to fill in areas of specialty that they will need for the infrastructure upgrades. This includes:

Technology Focused Project Management
Network and Security Design and Engineering

Cabling Engineering and Design for new buildings
Bid creation and process management
Integration with architectural design teams,
Construction reviews, testing and acceptance

Once ITS has assembled its project team (staff and consultants), it must close align itself with the Construction Program Manager team. This includes attending all meetings that define project scope, control and timeline. ITS must communicate its ownership for the following items:

Equipment Procurement - ITS will be responsible for the entire process associated with equipment procurement, installation and deployment.
Standards Documents - ITS will be responsible for the establishment, documentation and periodic updating of all standards in use by CLPCCD. Standard documents will be distributed to other CLPCCD departments and architect/engineering teams as needed.
Construction Reviews - ITS will participate as reviewer and approver for designs contractor submittals, installations and acceptance testing of all network cabling installations.
Project Management - In cabling-only jobs (i.e. not associated with building construction), ITS will assume complete project management of all aspects of the contract.

ITS will rely on Construction Program Managers and associated Architect and Engineering (A&E) teams for:

Construction Schedule - The overall timeline of construction projects will be coordinated and scheduled by the Construction Program Managers firm, in conjunction with CLPCCD Management needs. ITS will provide input to the timeline for its critical path projects.
Construction Drawings and Specifications - A&E teams will be responsible for the creation of the construction drawings and specifications, adhering to the standards provided by ITS and input from ITS reviewers during the SD, DD and CD phases.
DSA approvals - A&E teams will be responsible for securing DSA approvals and permits for all construction projects requiring such.
Construction Project Management - Except for cabling-only projects, all management of contractors, contracts, certified payroll, change order management, etc. will be performed by the Construction Program Manager staff.

ITS will rely on the Construction Program Manager staff to inform ITS of meetings and review schedules.

B.0 FUNDING MODELS

B.1 Establish Funding Sources - This step identifies the funding sources and allowable purchases from those funding sources. Specifically, funds from bond sources may not be able to pay for maintenance contracts and ongoing monthly operational charges. Bond funds can pay for contractor/consultant labor, but not staff overtime fees. State-matching construction funds may be able to leverage matching bond funds to further extend purchasing power.

Resources: ITS, Purchasing, Bond Oversight
Timeframe: 2 months
Key Owner: ITS Management

B.2 Refine Budget - Once funding sources are identified, the budgets will be reworked to more clearly detail project costs and money sources. Budget may be leveraged by combining projects and readjusting timescales to provide more cost effective use purchases.

Resources: ITS, College IT, M&O, CPM
Timeframe: 2 months, then ongoing
Key Owner: ITS Management

B.3 Determine Procurement Process - It is critical that purchasing thresholds be defined to determine which costs need to be bid, which can be purchased with three competitive bids and which can be purchased through pre-negotiated agreements. Since the bid process is a resource-expensive process, any alternatives that can be leveraged will allow for more money put towards the project deliverables, rather than preparation. Purchase methods can include:

- Direct bid
- Joint bid
- State-approved contracts (CMAS)
- Ongoing CLPCCD contracts
- Contracts leveraged from other Educational institutions (SDSU)
- Consortiums (IBM E&I)

Resources: ITS, Purchasing, Bond Oversight
Timeframe: 6 months
Key Owner: ITS Management

B.4 Determine Funding Schedule - The release of funds may be tied to a fixed-release schedule, thereby limiting the project scheduling. This step identifies those critical paths and incorporates those limitations into the project schedule.

Resources: ITS, Purchasing, Bond Oversight

Timeframe: 6 months
Key Owner: ITS Management

B.5 Determine ITS Financial Process - ITS will need to establish its departmental financial model for tracking expenditures, including change order approval, overruns, under-expenditures, etc. This process needs to interface with Purchasing for proper invoice coding and payment.

Resources: ITS, Purchasing
Timeframe: 2 months
Key Owner: ITS Management

Recommendations

It is critical that the ITS staff be engaged in the upgrade process as much as possible, so they can fully "own" the infrastructure changes that will occur. To offload the day-to-day demands on existing staff, ITS management should investigate the use of temporary workers such as part-time staff. As an alternative, comp/overtime for existing staff can be funded. These choices are usually paid for by the operations budget and are typically not fundable by bond monies. ITS needs to closely examine its operations budget for the availability of funds that can pay for these type of staffing resources.

Another alternative is the use of contract labor. Bond funds are able to pay for installation assistance by contractors and consultants. As the schedule for the infrastructure deployment develops, ITS may consider engaging supplemental contractor labor on a regular basis for ½ or 1 day a week. By engaging the contractor on an ongoing basis, rather than for point deployments, the contractor staff would learn the existing network topology and be engaged in knowledge transfer that would streamline the upgrade process. This allows for more participation by the ITS staff during the infrastructure changes.

State guidelines are set with a limitation of ~$59K for informal bid selection. CLPCCD should continue to use these guidelines for smaller procurements in the following areas: servers, network tools, UPSes, etc. Procurement of network equipment should follow a bidding process to leverage as much discount as possible. If a single manufacturer is selected (i.e. Cisco), CLPCCD can leverage other pricing- attractive contracts used by colleges and universities across the state. These contract details can be received from consultants who worked for these college/universities or from the technical staff directly at these college/universities.

C.0 NEW DATA CENTER

CLPCCD will be building a new Data Center at the Las Positas campus. This data center will be 8500 square feet in size and house the District ITS and LPC IT departments, including computer equipment and staff. The new Data Center will be located in a separate building from the current MPOE (Building 1900), but in the same general vicinity on campus.

Assumptions and dependencies for the new Data Center are as follows:

- It will take about two years to design and build the new Data Center.
- No changes will occur in the Chabot Campus Data Center until the move to LPC. This includes renovation of the 100 and 300 building infrastructure.
- At LPC, it is recommended that Building 1900 will continue to exist as the data and telephone switching center for the LPC campus. Extending the existing fiber and copper infrastructure so it is housed in the Data Center building adds a sizable work effort and cost, particularly for fiber splicing, with limited gain in functionality. Leaving the core data switches in building 1900 provides a more optimal route path for Internet-destined traffic, and offloads that traffic from other traffic destined for the Administrative servers. The existing PBX will also stay in Building 1900.
- High bandwidth fiber connections will be installed between Building 1900 and the Data Center. This will provide a multi-Gbit backbone. The Data Center will be equipped with its own high-powered data switch/router.
- Redundant fiber runs from the campus buildings to the building 1900 and Data Center will be evaluated as part of the site network topology.
- When the Data Center moves to LPC, the existing UPS will be moved or upgraded/replaced. New generators will be purchased.

Building 1900 will undergo some enhancements to improve its interior environment. The enhancements will include:

- Installation of a more robust UPS
- Installation of a better HVAC control system
- Installation of a generator
- Installation of finished flooring
- Installation of an air purification system to remove dust and particulate matter from the air
- Modification of the doorways to limit/prevent dusty air from entering the building.

These enhancements will upgrade the Building 1900 working environment to one more suitable for data network and telephone equipment.

C.1 Building Requirements - The first step is to clearly identify the requirements for the offices and infrastructure. The following lists room types and high-level design requirements for the ITS portion of the building:

- **Offices:** Each office will be provisioned with two telecom outlet locations on different walls. Each outlet will have one voice jack, three data jacks and fiber jacks. Adjacent to the telecom outlets will be double gang power outlets (four plugs), each serviced with a dedicated 20amp circuit.
- **Conference Room:** The conference room will have six telecom outlet locations, distributed along the walls, and two floor boxes with outlets. Each outlet will contain one voice and one data jack. Single gang power outlets will be distributed beside the telecom outlets and in the floor boxes.
- **Training room:** A training room will be equipped with 40+ data jacks distributed in wall and floor outlets. This will support a minimum of 24 student computers and an instructor station, plus printers and other network devices. The room will have a ceiling-mounted projection system and Polycom video conferencing system. A raised floor will allow for easy cabling to computer locations, and reconfiguration as required. To facilitate growth and future connectivity, fiber backbone cabling will be run to this room.
- **Work Bench:** To facilitate equipment testing and troubleshooting, a workbench area is required. The ideal space would be a room 15'x30' with separate benches for networking and server. This space would need at least 6 dedicated 20-amp circuits and 24 or more data jacks.
- **Printer Room:** A 10'x20' space, comparable to the current space at Chabot, is needed for the printer room. Raised floors are not required. This space would need at least 6 dedicated 20-amp circuits and 12 or more data jacks. There is a possible need for 30 amp circuits, depending on the printer type.
- **Printer Production room:** Adjacent to the printer production room, a space to assemble printed reports is required. No special power or connectivity is required. Telecom and power outlets will be located on all walls.
- **Fire Suppression:** An 8'x8' space for Fire Suppression equipment is needed.
- **Fire Vault:** A 6'x6' (interior space) for fire vault storage is required.
- **Security System:** The building will need a security system to prevent unauthorized access. This can include card-key access to the building and individual rooms, glass break detectors, smoke detectors and possibly remote visual monitoring. The security system should separately secure and release the District ITS and LPC College IT portions of the building.
- **Telecom/Network room –** A separate 8'x10' room for the cabling and telecom terminations is required. This room requires raised floor. This room will house three self-standing relay racks, cable runway, and conduit access for building and outside plant cabling. A dedicated HVAC control system is required. Voice/data outlets around the periphery of the room are required. At least 12 dedicated 20 amp circuits and two 30-amp circuits are needed. This telecom/network room should be considered as a point of redundant backbone cabling/routing.
- **Computer room:** This room will house the Enterprise servers and PC servers. A separate electrical panel will power this room. The UPS in the room will be sized

to power all of the ITS, network and LPC IT equipment. A common security and generator support will also be provided. This room will have a raised floor, with distributed power and copper/fiber data drops. A more detailed investigation of power and room layout is required. A separate HVAC system is required. This room and the

- **Storage:** A storage room is required. Telecom and power outlets will be located on all walls.
- **Shipping/Receiving:** To facilitate the deliver of computer equipment, a shipping ramp and loading dock is required. This space will need to open to a wide corridor that accesses the computer/printer room to allow for delivery of pallets, or over-sized equipment.
- **Break room:** A break or lunch room, similar in size to that at Chabot, is highly desirable if space permits due to the distance of the ITS building from the other facilities. This room may be used for overflow meeting space. In addition to the electrical facilities needed by kitchen equipment (microwave, dishwasher, coffee pot, refrigerator, etc.), this room will need power and data outlets on the walls not servicing kitchen equipment. White boards on any available walls are also desired. ITS often has working lunches with staff and vendors, so the Break Room will be an alternate conference or work room as well.

Although the facilities described above pertain to the District ITS section of the building, the LPC College IT will need many of the same facilities in their section of the building. This includes a completely distinct computer/server room with separate HVAC/electrical panel/UPS, offices, storage, workbench, conference room, break room, etc. The Telecom/Network room could be shared. The HVAC/electrical can also be shared dependent on the facility structure and square footage covered by the HVAC. The Conference Room and Training Room can also be shared by District ITS and LPC College IT. The Break Room can also be shared for lunch meetings or conferences with vendors. Any additional room requirements will be defined in conjunction with the LPC IT staff. However, Security will be segregated for the District ITS areas vs. the LPC College IT for the Computer Room containing the District servers and related equipment. This high-level list of requirements for both District and LPC functions will need to be further refined as building design begins.

Resources: ITS, LPC IT, Architect/Engineers
Timeframe: 6 months
Key Owner: ITS Management

C.2 Building Design - During this stage, ITS will participate in the design reviews of the new Data Center Building, validating that the requirements. ITS Management will participate in design/cost decisions that will likely adjust or limit the requirements. Architectural and Engineering teams will be responsible for schematic and detailed design creation.

Resources: ITS
Timeframe: 12 months

Key Owner: Architectural firm TBD

C.3 Building Construction - During building construction, ITS will participate is submittals review for all voice/data cabling components. Additional input from ITS during construction reviews and acceptance will be required as directed and scheduled by the Construction Program Manager staff.

Resources: ITS, CPM
Timeframe: 12 months
Key Owner: CPM

C.4 UPS/Generator Procurement - The new Data Center and Building 1900 will each be supplied with generators and UPS systems to prolong uptime in the event of a power failure. These items will be sized according to the necessary power draw, with the intent that everything in each of these buildings remains functional as long as the generator operates. This step includes the procurement, installation and testing of the generators and UPS units for the Data Center and Building 1900. It is recommended that this procurement be separately bid and contracted, and not part of the construction project for the new Data Center Building. Installation will be coordinated with building acceptance of the new Data Center Building.

Resources: ITS
Timeframe: 6 months
Key Owner: ITS, CPM

C.5 Building Occupation - Following building acceptance, the staff will move in and occupy the new offices. It is recommended that there is at least a two month window and possibly as much as four months between building occupancy and the data center equipment move from Chabot. This allows for adequate testing of the building services (HVAC, UPS, networking), replacement of out-of-the-box or new installation failures, and configuration adjustments as required. Most of the ITS staff such as programmers can move separate from the Data Center. However, some of the Network and Operations staff who work with the Data Center equipment daily will need to move concurrent with the equipment.

Resources: ITS
Timeframe: 4 months
Key Owner: ITS, CPM

C.6 Data Center Move - The Data Center move from Chabot must occur the minimum disruption possible. The move will likely take 3 days, consisting of equipment transport, connection at the new site and testing. If scheduled on a summertime Friday/Saturday/Sunday, downtime and impact on the college community will be minimized.

Resources: ITS
Timeframe: 1 month
Key Owner: ITS

Related Work

- Chabot IT will move into the Building 300 space when the Data Center moves to LPC. Space re-allocation may occur to meet the requirements of Chabot IT.
- When Building 300 is renovated, the electrical power connectivity will be rerouted to provide a generator connection that only supports the first floor computer room, IDF, HVAC and Chabot IT offices. (The current generator connection supports the power needs for the entire building.)

- Depending on the design of the outside plant network at Chabot, the single mode fiber switching core may be moved to another building on campus such as the existing telephone are vs. the 300 building. This new location will require a separate UPS and generator to maintain access during a power outage. This generator will be required only for the IT servers, not for the full building. This will be determined during the work described in the subsequent Section M.0.

D.0 CABLING DESIGN STANDARDS

D.1 Standard workspace design - CLPCCD must define standards for quantity and type of cabling in the following areas:

- Classrooms
- Administrative Offices
- Teacher Offices
- Libraries
- Theatres, auditoriums
- Training Rooms
- Computer Labs
- Lobbies, cafeterias, circulation spaces
- Lounge areas
- External building

The current cabling implementation may vary due to the age of cabling and redefinition of workspaces. In coming up with the design standards, CLPCCD should take into account the redefinition of office/classroom spaces and usage and changing technology needs.

Resources: ITS staff, College IT, other departments as needed
Timeframe: 3 months
Key Owner: ITS

D.2 Network Cabling Topology - CLPCCD will define the standards for the following items:

- Basic topology to computer stations within buildings: Cat5E/6 star wired
- Fiber backbone riser - single mode or laser-optimized multimode
- Telephone cabling (Cat 5E/6)
- Video Cabling (CATV, IP Video, etc.)
- Security Cabling
- Specialty devices (sports scoreboards, message boards, etc.)
- Facilities services (HVAC, Fire Alarm, CCTV)
- Cabling redundancy

Resources: ITS, College IT
Timeframe: 2 months
Key Owner: ITS

D.3 Cable Products - In this step, the standards are chosen for the cabling products. This may include selection of a specific manufacturer's products to be the district/college standard. The selected products will include:

- Fiber backbone/riser type
- Fiber patch panels and terminations (wall/rack-mount, SC/LC)

- Copper station type (plenum, zero-smoke, PVC)
- Faceplate type (Dual, quad)
- Jack color coding (voice, data, ISDN)
- Patch panel type (modular, integrated cable management)
- Cable management type (horizontal, vertical)
- Rack type (wall-mount, self-standing)
- Cable pathways (cable runway, J-hook, cable tray, conduit)
- Labeling conventions
- Telecommunications closet requirements (size, HVAC, power requirements)

Cabling Infrastructure is scoped for a minimum of 30 years. A common trend in the data network industry is for the speed of the backbone to move down to the desktop connectivity every three to five years. As such, the cabling infrastructure may support speeds order of magnitudes faster that it was originally designed for. Conversely, desktop connectivity of the future may demand connectivity that surpasses the capability of the current copper station cabling. These trends as they apply to academic computing at CLPCCD, must be taken into account as cable product standards are set.

Resources: ITS, College IT
Timeframe: 2 months
Key Owner: ITS

D.4 Standard Documents - Once standards are identified, they need to be documented in a standards binder that can be distributed to all departments, contractors and other entities participating in the construction process. The binder will include:

- Description of Design Standards, purpose, decision process
- CAD drawings of standard workspaces (office, classroom, lab, etc.), Telecom symbol set, Telecom room layout
- Templates for construction specifications

The standards binders will be reviewed by a number of departments and consultants for clarity, accuracy and usability. On an annual basis, CLPCCD ITS will review the standards binders to update the content with relevant changes. These may include standards and code changes, new or enhanced services to be used at the campuses, etc.

Resources: College IT, M&O, ITS, CPM, EE
Timeframe: 3 months
Key Owner: ITS

Recommendations

CLPCCD can start on the standards definition immediately. The first step is to assemble all the existing documentation that has been used in construction projects in the past several years. A committee of IT and ITS staff and related consultants needs to review

the documentation and begin the discussion of what is missing and what needs to be changed.

Since CLPCCD ITS and College IT staff does not usually track construction, standards and code changes, it makes sense to bring in specialists in the following areas:

- Construction Standards Institute (CSI) specifications, including the MasterFormat 2004 modifications that include new sections for Division 27 Communications and Division 28 Electronic Security.
- TIA/EIA Standards, including 526, 568B, 569, 598, 606, 607 and 758.
- National Electric Code, sections pertaining to telecommunications cabling, grounding and bonding.

In addition to providing construction and design knowledge, the consultants will provide input on technology directions for next-generation cabling/network solutions and assessment of different manufacturer's products, disadvantages/advantages, warranties, selection criteria, etc. It is the consultant's responsibility for the accuracy and thoroughness of the standards book that they develop for CLPCCD.

E.0 DISTRICT PC SERVER REPLACEMENT

E.1 Define architecture - CLPCCD maintains a number of PC servers, which provide file sharing and support of the Banner environment. Most of these are Netware-based servers. The architecture of the server operating systems and platforms will change in the coming years, particularly with Novell's migration to open-source and the SUSE operating system. As well, CLPCCD is evaluating architecture changes in

- server location and placement,
- functionality (file/print sharing, web, database) and
- backup strategy (backup versus replication).
- Migration steps and timeline

In this step, a new architecture design is defined, documenting the server purposes and outlining the changes for the next several years. Note: Changes to the server functionality is dependent on the bandwidth between the two colleges. Increased speeds (nxT1 or DS-3) will allow for consolidation in functionality and enhanced capabilities.

Resources: ITS
Timeframe: 4 weeks
Key Owner: ITS

E.2 Assess/acquire Training - The new architecture will be based on the migration to the next generation of Novell operating system. This will introduce new functionality, new requirements for the server hardware platform, and other impacts. Prior to moving forward with server purchase, training for the ITS technical staff on the new operating system is required. Following the training, the architecture may be modified based on recommendations from Novell.

Resources: ITS
Timeframe: 2 months
Key Owner: ITS Management

E.3 Develop BOM - Since ITS staffing is limited, it is not feasible for all the servers to be migrated at once. It is more reasonable for four servers to be migrated each year. The oldest platforms which need to be migrated most urgently are the following servers:

- MIS_411
- Chabot_411
- NW5

In addition a new Span Filter server will be added. Future servers may be deployed in an architecture differing from today's servers. In particular, Banner forms servers will not be necessary with the move to the Banner web interface. CLPCCD has already begun the

migration to the Internet Native Banner (INB), which eliminates the forms server in a client server infrastructure and makes all of Banner web-based.

In this step, a bill of materials is developed for the server hardware and software. CLPCCD currently uses servers with Intel Motherboards/processors, dual processor, RAID 1 (mirroring) with 36 GB SCSI drives. This hardware architecture will be enhanced to support the new operating system and functionality, consistent with the requirements detailed in the architecture design.

Resources: ITS
Timeframe: 1 month
Key Owner: ITS

E.4 Procurement - Based on the estimated pricing, the server procurement will likely follow the process outlined for purchases under $59,000. Since it will take a number of months to prepare and ready a server for deployment, CLPCCD should space out the purchase of the servers. This will allow them to receive the most modern hardware platforms.

Resources: ITS
Timeframe: 1 month
Key Owner: ITS Management

E.5 Build/Deploy - Depending on the availability of the new operating environment, it may be necessary to build and deploy the new hardware in the same image and purpose of the existing servers. This allows CLPCCD to take immediate advantage of superior hardware and relieve any immediate issues with server reliability. However, this may require server reinstallation or upgrading at the time that the new architecture can be deployed.

Resources: ITS
Timeframe: 3 months
Key Owner: ITS Management

Recommendations

It is worthwhile to consider engaging the services of Novell's technical specialists, particularly in the architecture design phase. This will allow CLPCCD to gain the greatest vision into the directions and future functionality that Novell will be offering. It will also help CLPCCD scope the training needs of the ITS staff and any supplemental labor that will be required to ensure a smooth and trouble-free migration.

F.0 NETWORK EQUIPMENT STANDARDS

F.1 Next Generation Services - As TCP/IP connectivity becomes the standard for voice/data/video communication protocols, the complexity of managing network traffic and performance increases. In designing the next generation of network functionality, ITS will need to assess the communication requirements and match those requirements with network service functionality. This can include packet prioritization (QOS, TOS, DiffServ), multicasting, IPv6, Multi-Protocol Label Switching, EIGRP/RIP/OSPF/BGP, Spanning Tree, etc. This needs to be viewed with a forward-looking perspective so that the equipment can be provisioned with the functionality that will offer the most flexibility for future application support.

Resources: ITS, College IT
Timeframe: 1 month
Key Owner: ITS

F.2 Architecture Definition - In this step, ITS will define the architecture for the new equipment including:

- Backbone technology - Gigabit Ethernet, 10 Gb Ethernet, SX/LX/GX
- Routing – routing engine location and placement
- Redundancy - multi-path backbones or switch connectivity
- WAN connectivity - Multi-linked T1s, ATM, GB ZX, etc.

As a minimum, ITS must consider multi-Gbit backbones to the major buildings on each campus and Gbit in the building risers and to smaller buildings. A general rule of thumb is that the backbone connectivity is a minimum of 10-fold the speed of client connectivity. Switching gear should support migration to future 10Gbit multiple link connectivity without backplane over-subscription. Level three switching at key points in the network will be implemented to optimize traffic routing. Link redundancy, as fiber backbone cabling permits, will be designed.

The architecture will be documented and reviewed with College and District staffing as needed.

Resources: ITS, College IT
Timeframe: 2 months
Key Owner: ITS

F.3 Security Model - ITS must assess the security model to be used for network authentication. Currently the network uses VLAN assignment and access control lists for authentication. More sophisticated technologies need to be considered, such as:

- Port Authentication

- VPNs
- Radius authentication

The development or updating of a CLPCCD ITS Network Security Policy white paper will occur. This document will provide a detailed discussion of security levels, mitigation tactics, intrusion definitions, intrusion response tactics and roles/responsibilities of ITS and other CLPCCD departments in security detection and handling.

In addition, ITS should consider investing in intrusion detection tools such as Nessus, SNORT, RealSecure from ISS, etc. These tools, coupled with alerting mechanisms (email, paging, etc.) will allow ITS to be quickly advised of unusual network activity, and respond accordingly.

Resources: ITS, College IT
Timeframe: 1 month
Key Owner: ITS

F.4 Manufacturer/Vendor Selection - A substantial portion of network equipment will need to be replaced. As far back as 1999, the Chabot-Las Positas District selected Cisco to provide the manageable and standardized network equipment for routers and switches. Subsequent to that, Chabot-Las Positas utilized the consultant services of Campus Works Inc. (CWI) through April 2002. At that time, an analysis and evaluation was performed again on routers, switches, and hubs in relation to the District needs. At the conclusion of that evaluation, the Cisco equipment was re-ratified as the standard for the District and the College sites for the smart switches and routers. LPC has followed this standard consistently as has the District ITS, so all equipment bought for these locations over the past few years has been Cisco. Due to funding limitations, Chabot has done very few replacements of these switches and routers with the Cisco standard, so older equipment exists at this campus.

ITS needs to determine if they will close the bid selection to Cisco only equipment, or expand the bidding to include other manufacturers (H-P, Extreme, Intel, Foundry, etc.). Due to the changes in vendor offerings for this type of equipment since the Cisco standard was established in 2002, CLPCCD will complete a thorough analysis and evaluation before proceeding. The ITS staff expertise in the Cisco devices and the other support software for Cisco such as network monitoring tools are also important factors to consider since there is such a major investment made to-date in supporting the Cisco environment. Key requirements that need to be met for any new equipment will be compatibility with existing equipment, provisions for the same functionality, and proven demonstration of interoperability with existing equipment. These major factors may be significant enough in impact to the District to continue with and to maintain the Cisco standard. In evaluating this, ITS needs to consider the following key factors:

- Equipment price
- Support costs and services

- ITS technician skill set
- Investments in Monitoring Tools
- Compatibility and Interoperability
- Same or better Functionality

Once this is determined, ITS can begin the process of equipment acquisition and deployment.

Resources: ITS, College IT
Timeframe: 2 months
Key Owner: ITS Management

G.0 WIRELESS NETWORK STANDARDS

G.1 Architecture Definition - Oftentimes wireless solutions are viewed as the "panacea" of networking – easy to install, works every where, all the time, etc. In reality the openness of wireless networking will require more monitoring by ITS staff, since it is prone to hacker access. Also the performance of wireless networking is susceptible to interference effects and saturation, so performance monitoring and alerting is necessary.

Prior to the purchase and deployment of wireless access point at each campus, a thorough architecture and requirements assessment needs to be formulated. Some discussions have taken place with College IT, but no formal documentation has been assembled. Initial thoughts are that up to four wireless networks would be needed:

- Administrative - for admin users, in conference and meeting rooms, possibly for more flexible training environments
- Instructional - for lab expansion, in classrooms that offer limited data connections, but could be used for defined purposes
- Student/Open - for general student access, akin to a cyber-café access
- Utility – for mobile maintenance crews, who need to collect data from various locations on campus

When the needs are documented and agreement with College and District communities is gained, a defined architecture can be formulated. The architecture will include:

- Technology: 802.11 a, b, or g
- VLAN assignments
- Spectrum assignment
- SSID and AP naming convention

Resources: College IT, ITS
Timeframe: 2 months
Key Owner: ITS

G.2 Security Model - Hand-in-hand with the architecture development is the security model. The security model addresses several separate issues:

- Transmission encryption - a variety of encryption methods are available (40-bit WEP, 128-bit WEP, WPA, AES, 802.11x, etc.). One or more encryption method will be selected.
- Authentication - A variety of methods can be used to authenticate and validate end-users when they log onto the wireless network. This can include RADIUS, MAC address authentication, etc. One or more authentication models will be identified. VPN to the more secure wireless networks should also be considered.

- Firewall Design - The more "open" wireless segments should be considered "hostile" networks. The campus firewalls may need to be reconfigured with separate interfaces to manage these wireless subnets.
- Vandalism/Theft - Because of their versatility, access points tend to be targets for theft. ITS must decide on how to handle the security issues associated with placing access points in public, unmonitored areas.
- Incident Handling - College IT and ITS must clearly document their actions and authorized responses when a security intrusion occurs. This can include disabling the access point, disabling the end-user account, escalating the incidence through College management, etc.

The security model will also be publicized with College and District communities for global awareness and understanding.

Resources: College IT, ITS
Timeframe: 2 months
Key Owner: ITS

G.3 Revenue Model - The cyber-café model may be viewed as a service that could generate revenue for the Colleges. Even a nominal cost, added to student fees, or separately billed, could help generate funds that could be used by ITS for maintenance costs, service enhancements and upgrades to the wireless service in coming years. The security model would become more important to ensure that only authorized end-users can gain access to the wireless network resources.

Alternatively, wireless access may be provided as a no-cost service for the students. This decision would then have implications on the security model and maintenance funding.

Resources: College Management, ITS
Timeframe: 1 month
Key Owner: ITS Management

G.4 Support Model - Support of the wireless network environment is more complicated than wired network connections. It is essential that adequate monitoring and alerting tools be installed immediately upon turn-up of the wireless network. CLPCCD needs to assess tools and staffing to be able to monitoring the wireless environment and quickly respond to intrusion and performance issues. In order to fully support the wireless environment, ITS should consider the acquisition of the following tools:

WaveLink Mobile Manager
AirMagnet Laptop
Wild Packets

Resources: ITS
Timeframe: 1 month
Key Owner: ITS

Recommendations

The Colleges may already have deployed wireless in certain locations. It is essential that ITS move forward quickly with the architecture and security standards documents, and the procurement and deployment of monitoring tools.

H.0 MOBILE LAPTOP LAB DEPLOYMENT

An emerging solution for the flexible expansion and relocation of computer lab resources is the Mobile Cart. Equipped with up to 36 laptops and a wireless access point, this solution offers quick set-up of computer environments in a standard classroom, conference room or other work area. As part of the infrastructure upgrade, an allocation of five 36 portable carts has been allocated for each College.

H.1 Define Requirements - The first step is to assess the requirements of the Mobile cart solutions. This includes:

- Identify the classes/curriculum that can take advantage of the Mobile Cart solution.
- Identify the customized applications required by the classes/curriculum.
- Identify the training required by College IT so they can provide proper support.
- Identify the training required by faculty for the correct use of the Mobile Carts.
- Identify the operational issues associated with transporting the Mobile Carts across campus.
- Identify security issues associated with the use of wireless laptops.

Once these issues are clarified and documented, College IT will have clearly defined how they can best acquire, deploy and maintain the Mobile Cart environments.

Resources: IT
Timeframe: 2 months
Key Owner: College IT Management and College Departments

H.2 Laptop Standards - College IT will need to establish a standardized image for the Mobile Cart laptops. This includes the operating system, software applications, wireless configurations, security and logon parameters, etc. It is likely that College IT will need to re-image the laptops after repair or student modification, as a standard maintenance task. Damage/repair will occur more frequently than the equivalent desktop environment, due to laptop hardware fragility.

Resources: IT
Timeframe: 2 months
Key Owner: College IT Management

H.3 Procurement - The procurement process will involve a bid process. In addition to the base hardware/software, College IT should consider a complete turnkey bid, including the imaging of the new desktops with the College standard operating system/applications.

Resources: IT
Timeframe: 3 months
Key Owner: IT

H.4 Training - Since these carts will present a new computer environment to College faculty, it will be necessary to develop training materials and courses to educate instructors in the proper use of the Mobile Cart environment.

Resources: IT
Timeframe: 2 months
Key Owner: IT

H.5 Deployment - Deployment of the carts will involve 1) installing/configuring them for a standard desktop, Following training, the carts can be deployed, reserved through College IT as any other specialty resource.

Resources: IT
Timeframe: 3 months
Key Owner: IT

Recommendations

CLPCCD will do a thorough analysis of the benefits of these portable or mobile carts to determine if they really should proceed in this direction. The current viewpoint from some of the Chabot College IT is that these mobile cart environments will introduce a significant support burden. There is a reluctance to procure the quantity specified without testing the feasibility of carts at each campus. Initial thoughts are to order one Mobile Laptop Lab for each campus, assess the utility and supportability of this environment, and proceed in later years with the additional carts.

J.0 LAPTOP/DESKTOP/PRINTER ROLLOUT

Chabot and Las Positas Colleges will replace their entire desktop environment. This is a huge undertaking, given the large number of desktops installed at each of the campuses and limited IT staffing.

An allocation of laptops has been estimated for each campus. These laptops are designated as computer assets for instruction. Both Chabot and LPC IT departments are interested in planning the detailed rollout of these laptop resources. As such, the laptop deployment will be phased over several years during the infrastructure upgrade. Planning for the laptop deployment will follow the same process as outlined below for the Desktop rollout.

J.1 Desktop Standards - In this first step, a review of the existing desktop environment is required. This includes hardware (CPU, memory, disk), software applications and versions, tools, peripheral devices, LAN connectivity, remote support utilities, security, etc. An updated standard for the desktop environment will be documented and approved as needed by College committees and management. It is planned that Chabot and LPC will establish the same desktop standards, both configuration and vendors, unlike the current setup used where both colleges vary significantly. There may be some variances to meet the college's particular teaching environments, but the general baseline will be consistent.

Resources: IT, ITS
Timeframe: 2 months
Key Owner: College IT Management

J.2 Rollout Order - The College IT staff will need to establish an order and priority of the desktop rollouts. LPC has executed the TCO model for the past few years, so their rollout subset is clearly defined. For Chabot, users will be identified by category – low, mid, and high end users – and standards will be identified by these categories. In addition, users with high-end computer demands that exceed the standard baseline configuration will have procedures in place to request unplanned upgrades when required for new instructional requirements. Also, desktops that cannot support the required baseline software will be at the top of the list of upgrades for Chabot.

The rollout order may be prioritized in many other ways, such as:

- Faculty without desktops
- Faculty with the oldest desktops
- By Department
- By Building
- By Accessibility
- By College Calendar (to avoid conflicts during critical teaching times)

College IT will need to publish the rollout schedule and gain agreement from department and end-users.

Resources: IT
Timeframe: 2 months
Key Owner: College IT Management and College Departments

J.3 Procurement - In the first year (est. 2005), Chabot ITS staff believes they can manage the acquisition and deployment of 800 desktops at their campus. The acquisition will be phased over the year, with the rollout of approximately 200 desktops each quarter. LPC IT has estimated that they would be able to deploy 400 desktops per year (est.2005), again divided up to 100 desktops per quarter. The limitations of current IT staff resources may require assistance from temporary contractors to assist in the desktop installs over the first year. Following the initial phase, the College IT staffs should be able to handle the on-going upgrades in accordance with the Total Cost of Ownership (TCO) model supported by the State Chancellor's Office. However, under certain circumstances, temporary contractors can still be used when required to meet tight schedules.

The procurement process will likely involve a bid process. In addition to the hardware/software, College IT should consider including the following services with the computer procurement bid:

- Imaging of the new desktops with the College standard operating system/applications.
- Asset tagging, serial number documentation, inventory database creation.
- Placement of the new computers on the end-users' desks.
- Data migration from the old desktops.
- Removal and disposal of the old computers, if not needed. Credits for the old systems may apply.

Adding these services to the procurement bid will allow College IT to best leverage their staffing to achieve a smooth deployment.

Resources: IT
Timeframe: 3 months
Key Owner: IT

J.4 Training - The new desktop standard may be sufficiently advanced and different from the current standards, that a training curriculum may be necessary. This may take the form of classroom training, seminars, training manual, quick reference cards, FAQ documents, web-based training or CBT. College IT will need to evaluate the magnitude of the training needs and coordinate training as needed. Use of College Flex Training days may allow for large numbers of staff to be trained in a seminar/demonstration environment.

If a mandatory training class is established, it is worthwhile to schedule end-user attendance 2-3 days in advance of the new computer deployment.

Resources: IT.
Timeframe: 2 months
Key Owner: College IT Management

J.5 Deployment - The new desktop systems will be deployed as directed by College IT. The duration of the rollout will be dependent on the availability of staff, contractor labor, access to offices and other school scheduling. Chabot IT will deploy 800 desktops in 2005 and potentially 500 desktops in 2006. LPC IT will deploy 400 desktops in each of 2005, 2006 and 2007, since they have already adopted the TCO model. Both colleges will perform upgrades for desktops on a 3-year cycle and printers on a 5-year cycle in accordance with the TCO model recommendations.

During deployment, there will be significant issues in handling the logistics of receiving, storing, staging and deploying the volume of boxes/pallets required for the computer equipment. Las Positas College does not have a "Receiving" department. Delivery and inventory tagging of equipment may require Chabot College resources with subsequent transport to LPC. Before staging, the equipment will need to be stored in a secure and well-monitored location. Standard container structures that may hold furniture or construction materials are not secure enough for desktop computers. The storage facility for the computers must be well-lit, publicly viewable and alarmed, so that unauthorized access can be readily identified.

Recommendations

No large procurements of desktops will be performed for either Chabot or LPC until the new District standards are established for desktops. Small quantities of desktops (less than 40-50 units) may be bought before 2005 to service critical needs only. These exceptions will require approval by the District CTO. The current College IT standards, even though they are different by campus, will be used for these limited buys. Once the new standards are established, the desktop procurements, rollouts, and training can proceed in the calendar year 2005.

K.0 COLLEGE PC SERVER DEPLOYMENT

K.1 Review Architecture - Chabot and LPC IT each maintain a number of servers, which provide network services to the faculty and instructional computing labs. Before moving forward with the procurement of replacement hardware, each College IT team should separately assess their current server environment and determine any changes to:

- server location and placement,
- functionality (file/print sharing, web, database) and
- backup strategy (backup versus replication).
- Migration steps and timeline

In this step, a new architecture design may be defined. This design would document the new server purposes and outline the changes.

Resources: College IT, ITS
Timeframe: 2 weeks
Key Owner: College IT

K.2 Assess/Acquire Training - If a new architecture is defined, it may be based on the migration to the next generation of operating system. This could introduce new functionality, new requirements for the server hardware platform, and other impacts. Prior to moving forward with server purchase, training for the College IT technical staff on the new operating system is required. Following the training, the architecture may be refined.

Resources: College IT
Timeframe: 2 months
Key Owner: College IT Management

K.3 Develop BOM - Chabot IT would like to replace all seven servers as soon as possible in the Bond cylce. The current hardware platforms are old and inadequate. The current servers are Dell and H-P, but Chabot IT prefers not to use Dell equipment anymore based on their experiences over the last two years. An analysis will be performed to determine the server standard, both configuration and vendor. These standards will be developed district-wide similar to the desktop standards.

LPC IT has three enterprise servers that they would like to replace as soon as possible. The existing hardware used by these servers would be redeployed to other servers, which are currently running on workstation platforms.

In this step, a bill of materials is developed for the server hardware and software.

Resources: College IT
Timeframe: 1 month
Key Owner: College IT

K.4 Procurement - Based on the estimated pricing, the server procurement will likely follow the process outlined for purchases under $59,000. Since it will take a number of months to prepare and ready a server for deployment, College IT should space out the purchase of the servers. This will allow them to receive the most modern hardware platforms. Procurement for each college would be separate processes.

Resources: College IT
Timeframe: 1 month
Key Owner: College IT Management

K.5 Build/Deploy - Depending on the availability of the College IT staffing, it may take several months to build and deploy the new servers. Since server migration will be disruptive and time consuming, College IT should build and test the servers so that they can be deployed during the campus breaks.

Resources: ITS
Timeframe: 3 months
Key Owner: ITS Management

L.0 BUILDING CONSTRUCTION

L.1 Definition of ITS roles - ITS must clearly define and communicate the resources and expertise that it will provide during the building construction projects. This includes defining if ITS provides input or approval level authority in design and costing decisions. Construction Program Manager staff may view ITS as an "end-user" with regards to design input. ITS, or its consultant representative, must be regarded as part of the design team.

Resources: ITS, CPM
Timeframe: 1 month
Key Owner: CPM

L.2 Requirements Review - During the initial planning of the building, ITS should participate as an interviewer in any end-user discussions organizing by the A&E teams, concerning space utilization, facility resource requirements and telecommunications requirements. ITS may also schedule its own separate requirements discussion meetings with College and Department staff so ITS can document any unique requirements for the building end-users.

Resources: ITS
Timeframe: 6 months
Key Owner: A&E, CPM

L.3 Logical Design and Standards to A&E - ITS will meet with the A&E teams to present the standards binder. With information gathered from the end-user Requirements Review meetings, ITS will also formulate a logical design for the building that includes:

- Number, size and preferred location of telecommunications closets
- Backbone cable routing design
- Station cabling pathway design
- Other design specifics and choices which are different from the Standards binder.

Resources: ITS, A&E
Timeframe: 2 weeks
Key Owner: A&E

L.4 EE Design - The Architect will be responsible for the space layout and assignment of the telecom closet locations. The EE will be responsible for the telecom drawings that show pathways and data jack locations. The EE will use the CLPCCD standard symbol set. ITS will work with the EE for creation of the details drawings which include telecom closet layout. The EE will maintain all timelines, meet due dates and deliverables as required during the design process.

Resources: ITS, EE

Timeframe: 6 months
Key Owner: EE

L.5 ITS Review - ITS will review all documents prepared by the A&E team to ensure that it complies with the ITS Standards and any building-specific requirements. ITS will redline drawings and markup specifications as needed to provide direction to the A&E team in the proper design of the building. ITS will participate in all design review meetings as scheduled by the CPM.

Resources: ITS, A&E
Timeframe: 6 months
Key Owner: A&E

L.6 Construction - During the construction phase, ITS will participate in the following tasks:

- Submittals review
- RFI answers as pertaining to design
- Construction Project meetings with low voltage subcontractor
- Checkpoint walkthrough meetings
- Testing and Acceptance

Although all construction questions and approval will route through the A&E team, ITS will participate in the capacity of a low-voltage consultant, to provide clarifications as needed. Contractor management will be the responsibility of Construction Program Management.

Resources: ITS, A&E
Timeframe: 12 months
Key Owner: A&E, CPM

L.7 Acceptance/Approval - Building acceptance will be managed by the Construction Program Manager staff and the architect/engineering team. ITS will provide approval for:

- Station jacks - review of test results, testing of all jacks
- Fiber/Copper Backbone - review of test results, testing of all pairs
- Pathways - correct cabling routing, no overfills, correct bend radii, no sharp bends, proper bushings
- Labeling - all cables labeled per standards
- Telecom closet – built as designed, all components provided
- As-built documentation

The electrical engineering staff do not normally examine the voice/data/video installations to the level of detail that would ensure ITS of a system that meets its detailed

specifications. ITS will need to provide staffing to ensure that a punchlist items are properly identified and corrected.

Resources: ITS, A&E
Timeframe: 2 months
Key Owner: A&E

M.0 CONDUIT CONSTRUCTION AT CHABOT

M.1 Complete Conduit Replacement - Given the age and availability of the telecommunications conduit infrastructure at the Chabot campus, it may be wise to look at a complete redesign and build-out. This phase of the project is the decision point as to whether the conduits will be "augmented" in critical spots, or completely redesigned. This step will require 3-4 meetings with CPM and M&O to assess what was included in the bond. The budget for these expenses were covered in the Facilities portion of the Bond vs. the ITS equipment budget. There needs to be a validation that funding is ample to address these needs.

Resources: Construction, Program Managers, Electrical Engineers, M&O, ITS
Timeframe: could be many months, subject to proofing results.
Key Decision-Maker: M&O

M.2 Conduit Assessment - Assuming the decision is made to augment the current infrastructure, this step begins the process of pulling together the process and team for doing the assessment and construction work. The anticipated costs of this type of work activity is approximately $25,000

Resources: Construction, Program Managers, ITS
Timeframe: 2 weeks
Key Owner: ITS

M.2.1 As-built review - In this step, as-built documentation for the existing infrastructure is acquired from M&O archives and ITS documentation. As best as possible, the documents are reviewed, ordered and assembled for reproduction. This step will require 2-3 meetings with M&O and independent research in ITS

Resources: M&O, ITS
Timeframe: 1 week
Key Owner: ITS

M.2.2 RFP for Proofing Firm - This step includes the assembly of the RFP package for a conduit proofing company who will come to Chabot and perform the following:

- Locate all manholes on campus
- Trace all conduits routing on campus
- Identify conduit entry points to Chabot buildings
- Document conduit contents, damage and availability
- Provide CAD documentation with manhole butterfly drawings, conduit paths, content listing etc.
- Validate and augment Chabot provided as-built drawings
- Identify conduit bottlenecks, which should be augmented.

This RFP will be bid, assessed and awarded during this step. This step will require 4-6 meetings with the CPM staff.

Resources: Construction Program Managers, ITS
Timeframe: 2 months (bid creation), 2 months (bid and contract award)
Key Owner: CPM

M.2.3 Proofing Work - This step will include the proofing process on the Chabot campus.

- Identification of the contractor's work crew
- Scheduling of the crew
- Onsite coordination/access of the crew
- Resolving site issues as needed

Resources: M&O, ITS, Contractor
Timeframe: 2 months
Key Owner: ITS

M.2.4 Assess Results - This step includes review of the Contractor deliverables, including the CAD diagrams, spreadsheets and other materials specified in the RFP. Edits, clarifications, adjustments and corrections will be processed. The contract will be closed.

Resources: CPM, ITS, Contractor
Timeframe: 1 month
Key Owner: ITS

M.2.5 Schematic Design of new conduits - This step analyzes the bottlenecks and inadequacies discovered during the proofing work. A high level set of design requirements are documented. A decision as to whether the MDF and Multimode fiber should be relocated/rerouted is made. The rerouting decision will be evaluated based on:

- Constructability of adding conduit pathways to Building 100/300
- Cost of adding conduit pathways to Building 100/300
- Space issues which restrict the termination of the additional fiber backbone cables
- HVAC control and access in the Building 100/300 locations
- Power requirements in the Building 100/300 locations

Design ownership by ITS or Electrical Engineering staff is assigned. Budget is established. A schematic design is created.

Resources: M&O, ITS, CPM
Timeframe: 2 months
Key Owner: ITS

M.2.6 Design and Bid - The detailed design package is developed. ITS reviews and approves the design package. The Construction Manual is produced and the bid process occurs. The bid is awarded. See also M.3.2.

Resources: ITS, CPM, EE
Timeframe: 3 months
Key Owner: CPM

M.2.7 Construction - The conduits are constructed. Coordination of all construction is done by the CPM. Acceptance is the joint responsibility of ITS and M&O.

Resources: CPM, ITS, M&O
Timeframe: 3 months
Key Owner: CPM

M.3 New Conduits - This step is followed if the funding and need substantiates the requirement for a completely new conduit infrastructure. The telecommunications conduits would most likely "piggyback" on the pathway selected for an electrical conduit upgrade.

Resources: CPM, M&O
Timeframe: 1 week
Key Owner: M&O

M.3.1 ITS Requirements Definition - In this step, ITS identifies and documents the requirements for the new telecommunications conduit infrastructure. This includes the following:

- Number of conduits needed
- Size of conduits
- Building termination locations, including relocation as need be.
- Cabling contents and routing
- Expected growth

The design document is submitted to the EE for review. Clarifications and addendums are provided as needed.

Resources: ITS, EE
Timeframe: 2 weeks
Key Owner: ITS

M.3.2 EE Design - The Electrical Engineering firm takes responsibility for assembling the overall design of the new conduit infrastructure. This includes routing, trenching method, building penetration methods (with Architect, Structural Engineer as needed), manhole design, pavement/sidewalk/turf replacement, demolishment/reuse of old infrastructure as appropriate, etc. Coordination with design of replacement electrical plant as possible will occur.

Resources: EE, CPM

Timeframe: 2 months
Key Owner: CPM

M.3.3 ITS Review - ITS will review the Telecommunications conduit infrastructure design. This step and step M.3.2 will be iterative, as many times as necessary until the design documents are ready.

Resources: ITS, EE, CPM
Timeframe: 2 months
Key Owner: CPM

M.3.4 Bid Process - The EE firm will secure the necessary DSA approvals and assemble the bid package. The Construction Program Managers staff will facilitate the bid process, including circulation, walkthroughs, clarifications bid receipt and award.

Resources: EE, CPM
Timeframe: 4 months
Key Owner: CPM

M.3.5 Conduit Construction - The new conduit infrastructure is constructed. Coordination of all construction is done by the CPM. Acceptance is the joint responsibility of ITS and M&O.

Resources: CPM, ITS, M&O
Timeframe: 12 months
Key Owner: CPM

RECOMMENDATIONS

ITS can proceed immediately with the proofing projects at both campuses. Proofing firms include:

Precision Locating, 800 577 7324
C. Cruz Sub-Surface Locators Inc. 877-728-2789

Other firms are listed in the Construction Blue Book (www.thebluebook.com)

N.0 FIBER BACKBONE CABLING

N.1 Requirements Definition - This step establishes the high-level scope of work needed for the fiber backbone cabling, particular reviewing the standards set by ITS. A schematic design is created.

Resources: CPM, ITS
Timeframe: 2 weeks
Key Owner: ITS

N.2 Building Construction - During this step, the decision is made as to whether the fiber backbone will be bid as part of a building construction project, or as a discrete project.

Resources: CPM, ITS, M&O
Timeframe: 1 month
Key Owner: CPM

N.3.0 Independent Fiber Project - This step initiates a process for the design and build of a fiber backbone network that is not coordinated with a specific building contract. Note: ***This is recommended for the Chabot single-mode fiber installation.*** Roles and responsibilities are coordinated with Construction Program Managers.

Resources: CPM, ITS
Timeframe: 1 week
Key Owner: ITS

N.3.1 Detailed Design - Beginning with the standards established in the Fiber Topology Design Standards, the detailed physical design of the fiber network is created. The construction specification and drawings are customized from the templates provided in the standards binder. Design approval is coordinated with DSA as needed.

Resources: CPM, ITS
Timeframe: 2 months
Key Owner: ITS

N.3.2 Bid/Selection - The bid package is circulated and awarded. Site walkthroughs, clarifications and bid process requirements are facilitated by Construction Program Managers.

Resources: CPM, ITS, M&O
Timeframe: 2 months
Key Owner: CPM

N.3.3 Fiber Construction - The construction of the fiber backbone occurs. Onsite construction coordination is handled by the Construction Program Managers staff. ITS is involved in submittal review, RFI responses, design modifications, project checkpoint meetings, clarifications and approvals.

Resources: CPM, ITS
Timeframe: 6 months
Key Owner: CPM

N3.4 Acceptance - The backbone is completed per the specification and approved change orders. The project build-out and test results are reviewed and accepted. Contract close-out occurs.

Resources: CPM, ITS
Timeframe: 1 month
Key Owner: CPM

N.4.0 Building Project - This step occurs if the fiber backbone is included as part of a new building construction project. All design and construction activities are funneled through that construction process.

Resources: CPM
Timeframe: 1 month
Key Owner: CPM

N.4.1 Specify Design - In addition to the specification standards, ITS will provide a written document that details the cabling required for the fiber backbone to the building. These documents will provide the Architect and Electrical Engineering team with enough information to prepare the relevant drawings and sections of the Project Manual.

Resources: CPM, ITS
Timeframe: 1 month
Key Owner: ITS

N.4.2 EE Design - The electrical engineering team will be responsible for creating all the drawings and documents for the Project Package.

Resources: EE, CPM
Timeframe: 6-12 months
Key Owner: EE

N.4.3 ITS Review - ITS will review the design and bid documents before they are sent to DSA and for bidding. This will be an iterative step with N.4.2.

Resources: CPM, ITS

Timeframe: 6-12 months
Key Owner: CPM

N.4.4 Bid/Build/Accept - The Construction Program Managers staff will be responsible for the bid, award and construction process. ITS will participate in the acceptance process through certification of the backbone cabling.

Resources: CPM, A&E, ITS
Timeframe: 12 months
Key Owner: CPM

P.0 NETWORK EQUIPMENT DEPLOYMENT

P.1 New Building - In the first step, the dependency on existing building construction is assessed.

Resources: ITS
Timeframe: 2 weeks
Key Owner: ITS

P.1.1 Schedule Coordination with Building Construction - All activities that are dependant on new building construction must be coordinated with the schedule for building completion and occupancy. Network equipment must not be procured as part of the construction specification. Equipment procurement and delivery must be coordinated for arrival one month prior to building turn-up.

Resources: CPM, ITS
Timeframe: ongoing
Key Owner: ITS

P.2 Component Design - In this step, the equipment design is detailed, following the recommendations in the established standards. The specific equipment Bill of Materials (BOM) and support contracts is generated and reviewed. An assessment of installation resources is made to determine if available staff resources can handle the rollout, or if consultant/contractor implementation resources are needed for a smooth and timely rollout.

Resources: College IT, ITS
Timeframe: 1 month
Key Owner: ITS

P.3 Purchase Methodology - In this step a determination is made as to the appropriate purchase process. Choices can include new bid, existing CLPCCD purchase agreement, existing state purchase agreement, leveraged agreement from another educational institution, etc.

Resources: CPM, CLPCCD Purchasing, ITS, Bond Oversight
Timeframe: 1 month
Key Owner: ITS

P.3.1 Bid Process - This step involves the purchase of the network equipment using an open bid process. From the BOM, a detailed bid document is created, circulated and bids solicited. A contract is awarded to the most responsive bidder.

Resources: CPM, Purchasing, ITS
Timeframe: 2 months
Key Owner: ITS

P.4 Equipment Procurement - Using the appropriate purchase method, the equipment order is placed. Equipment delivery is estimated.

Resources: Purchasing, ITS
Timeframe: 3 months
Key Owner: ITS

P.5 Staff Skill Development - In this step, the ITS and College IT staff are trained in the advanced technology and capabilities provided with the new equipment. This may include any of the following methods:

- attendance at vendor training course(s) or seminars
- self-training on lab/test equipment
- Computer-based training (CBT)
- One-on-one training with consultant implementation technicians

P.6 Equipment Deployment - In this step, the installation team (contractor and CLPCCD staff) stage, burn-in and configure the network equipment. Equipment is racked in the telecom closets and tested.

Resources: College IT, ITS, Contractor/Consultant
Timeframe: 1 month
Key Owner: ITS

P.7 Acceptance - The functional network is accepted by the site. Support contracts are initiated. As-built documentation is generated.

Resources: College IT, ITS
Timeframe: 2 weeks
Key Owner: ITS

RECOMMENDATIONS FOR EQUIPMENT ROLLOUT PHASES:

Phase 1: Procure switch/router infrastructure for
a. LPC core
b. LPC edge (extras)
c. DO switch
d. LPC PIX firewall/VPN
e. Chabot PIX firewall/VPN
f. CacheFlow

Phase 2: Procure switch/router infrastructure for
a. Chabot core
b. Chabot edge

As the inter-campus connectivity alternatives are selected, additional procurements for the site-to-site interface components will be required.

Q.0 WIRELESS EQUIPMENT DEPLOYMENT

Q.1 Site Survey - In the first step, the dependency on the current building environment must be assessed for:

- Availability of power and data connections
- Interference effects from machinery
- Span of acceptable transmission from access points

During the survey process, it is also important to check for rogue access points, particularly those that are not secured. The site survey results will clearly identify the locations that are viable for the wireless transmission.

Resources: College IT, ITS
Timeframe: 2 months
Key Owner: ITS

Q.2 Design - Once the site survey is complete, ITS will work with College IT to design the access point locations and precise configuration details. It is relevant at this stage to also consider the standardization of hardware. A formal assessment of product offerings from different manufacturers should occur. It is also worthwhile to purchase or get loaners units of 3-4 access points so that prototype testing can be done in the areas of:

- Type of network (admin, instructional, cyber-café, services)
- VLAN assignment
- Roaming
- Management Interface
- Transmission spanning
- Performance saturation

Resources: College IT, ITS
Timeframe: 2 months
Key Owner: ITS

Q.3 Procurement - If procured as one large purchase for both colleges, a formal bid process will likely be required. This equipment should be procured separately from the network switching equipment, so that CLPCCD would be able to take advantage of any specialty pricing for the access points. If not acquired earlier, wireless network monitoring tools should also be acquired as part of the access point bid.

Resources: ITS
Timeframe: 2 months
Key Owner: ITS

Q.4 Deployment - The deployment of wireless access points should occur in a controlled fashion so that the security and performance issues can be closely monitored. Each college can choose a "pilot" location, which would provide the greatest degree of testing and vulnerability. Once the pilot testing is complete, a full-scale rollout would occur.

Monitoring of these pilot installations with the proper tools would also occur. If not already deployed, the tools suggested in Section G.0 are an absolute necessity so that rouge access points and intrusions are discovered and addressed in a timely manner.

Resources: College IT, ITS
Timeframe: 2 weeks testing, 4 months full deployment
Key Owner: ITS

Recommendation

While the deployment of wireless networking may be perceived as a very attractive networking solution, it should be approached cautiously to mitigate the potential threat to the rest of the wired network.

R.0 MULTI-MEDIA SOLUTIONS

CLPCCD will procure a number of hardware products to enable multi-media presentation and communication at the Colleges. These include:

- Video Conferencing Systems – These systems are already available at Chabot and LPC campuses. Additional units at each campus can provide greater capacity for video conferencing, particularly if the transmission is TCP/IP based.
- Intelligent Whiteboards - These are whiteboards that can connect to a computer and project prepared presentations. Annotations on the whiteboard during the course of the presentation and the presenter's spoken comments can be saved back to computer for subsequent distribution to class attendees.
- Video Projectors - These projectors can be ceiling mounted and connected to a control panel to offer presentation of VCR, DVD or computer video.
- Streaming Video Servers - Video servers will be enabled on campus to allow the streaming of video presentations across campus.

R.1 Requirements Analysis - In the first step, the requirements are identified. The following items are researched:

- In which classrooms/buildings are these items currently deployed?
- How frequently are they used? By which instructors? For which courses?
- Are there operational issues with the current technology?
- What specific version or model of these solutions is used?
- Are there any features that would enable greater utility of these products?
- Are staff/faculty trained on how to use these products?

Coordination with the faculty will be a critical factor in defining these future instructional requirements. After assembling this information, it is clearer to identify what issues currently exist and where future product selection and procurement should focus increase the benefits to the Colleges and District.

Resources: College IT, ITS
Timeframe: 1 month
Key Owner: ITS

R.2 Product Evaluation - Since these solutions come from rapidly evolving technology areas, it is worthwhile to perform an industry review prior to purchase. In particular, the video projectors and intelligent whiteboards have somewhat overlapping feature sets for PC projection, and should be evaluated within the context of their specific usage in the classroom/conference room. Manufacturers have likely released superior models than those currently in place at the Colleges. New features should be carefully cost justified for their applicability in the teaching environment.

There are a diverse set of solutions for the video server choices, and assessment prior to bid/purchase will aid in the composition of an RFP that precisely reflects the requirements.

Resources: College IT, ITS
Timeframe: 3-6 months
Key Owner: ITS

R.3 Bid/Procurement - The purchase process will vary depending on the cost of the equipment. Purchasing equipment for both colleges on the same bid may likely result in increased discounts. The bids should also be crafted to include installation/configuration and training.

Resources: College IT, ITS, Purchasing
Timeframe: 2 months
Key Owner: ITS

R.4 Training - Prior to deployment, the staff will need training. Training may take the form of quick reference cards, FAQs, videos, seminars or classroom training. The complexity of the product will dictate the level of training that needs to be created.

Resources: College IT, ITS
Timeframe: 1 month
Key Owner: ITS

R.5 Deployment - Deployment of projectors and intelligent whiteboards will likely need to be scheduled for break weeks to allow for installation efficiency. The video conferencing solutions can be tested and readied for usage during the regular teaching term, although distance learning requirements may drive deployment schedules.

Deployment of video servers is much more complicated and may take weeks of testing and configuration before completion. In addition, video servers may require additional scheduling, video reservation and other organizational processes that will ensure the effective use of the streaming video resource.

Resources: College IT, ITS
Timeframe: 1 month
Key Owner: ITS

S.0 VOICE SYSTEMS UPGRADE

S.1 Requirements Definition - The voice and voicemail systems at CLPCCD will be evaluated for functionality and expansion. Voice-over-IP systems are becoming more mainstream and robust. CLPCCD's new data wiring at Chabot and new network equipment switching infrastructure at both campuses will enable the integration of VOIP technology.

The initial step will entail a requirements definition and cost-benefit analysis to determine if the acquisition of a new VOIP telephone system should be pursued.

Resources: ITS
Timeframe: 1 month
Key Owner: ITS

RECOMMENDATIONS

It is anticipated that the Bond funding in the ITS equipment list may be inadequate to cover a complete VOIP implementation, so this will be a major factor in determining the feasibility and assessing the potential benefits of this technology enhancement. In the near term (1-3 years), there may not be significant justification to move to a VOIP platform. However, within the 10-year window associated with these upgrades, the voice system industry may naturally evolve to VOIP technology. As such, any upgrades to the network topology should readily support the prioritization and bandwidth management requirements of time-sensitive IP packets required by VOIP, digital video and other future applications.

T.0 INTER-CAMPUS CONNECTIVITY

T.1 Requirements Definition - The Chabot and Las Positas campuses are linked by WAN T-1 technology that provides inadequate bandwidth for Internet and administrative network access. With the move of the Data Center to the new facility at LPC, the need for high bandwidth access will become more acute. CLPCCD hopes to acquire a minimum of DS-3 bandwidth in a redundant topology between Chabot, Las Positas and the District Office sites. The first phase is to clearly identify what the requirements of the new connectivity are.

Resources: College IT, ITS
Timeframe: 1 month
Key Owner: ITS

T.2 Solution Investigation - There are multiple WAN solutions that can be examined as viable alternatives to the requirement for increased bandwidth. These include:

- Leased DS-3 from carriers or alternate access carriers
- Leased dark fiber from Metropolitan Area Network (MAN) providers
- Wireless solutions (5GHz broadband, Infrared, Microwave)

These solutions need to be assessed with respect to technical feasibility, functionality, build/lease/maintenance costs, maintainability and availability of solutions providers. This process will also entail vendor walkthrough of the sites, investigation of pathways to the MPOE room at each site from the street and assessment of the space/facilities requirements in each site.

Resources: ITS
Timeframe: 3 months
Key Owner: ITS

T.3 Bid/Procurement - Once the viable technical alternative is selected, a bid process for the solution selection will be processed. This includes the purchase of the equipment, the configuration and any construction associated with the solution. Construction elements may include:

- Installation of antennae, masts or towers (wireless)
- Installation of supplemental power, HVAC control, grounding
- Installation of racks and support apparatus
- Cabling.

The solution will be bid as “turn-key” with all elements required from crate to operation included in the bid documents. Specialty management, monitoring and configuration tools for ongoing operation will be included in the bid. Training on the equipment will also be included.

Resources: ITS, CPM
Timeframe: 3 months
Key Owner: ITS

T.4 Implementation - The implementation of the solution will be performed in stepwise fashion, beginning with pilot testing across one leg of the connection. When stability and sufficient operational experience are acquired by the ITS staff, additional legs of the topology will be implemented. The goal is to increase the bandwidth as quickly as possible, but not at the expense of reliability and stability. Depending on the complexity of the solution, the implementation may take as long as 6 months after the solution becomes available to each location. Some solutions may take longer than others depending on the construction elements, e.g. dark fiber provisioning may require a substantial construction effort, as opposed to DS-3 leasing.

Resources: ITS, CPM
Timeframe: 6 months
Key Owner: ITS

ESTIMATED PROJECT TIMELINES

Assumptions: One-year design time for building renovations, one-year build time for building construction. Funds available per acquisition schedule.

Year 1:

- Proceed with standards development for network infrastructure, equipment, wireless equipment, desktop PCs
- Begin design of new Data Center building at LPC
- Proceed with design development of next-generation Administrative servers.
- Bid and acquire network equipment for LPC campus, PIX firewalls and DO, and relevant network tools. (Estimate cost: $325,000.00)
- Initiate proofing and design for conduit infrastructure at Chabot, validate LPC conduit infrastructure (Estimated cost: $50,000.00) (NOT INCLUDED IN BOND ESTIMATE)
- Bid and acquire desktops/printers for LPC (400) and Chabot (800) (Estimated cost: $1,500,00.00)
- Bid and acquire PC Servers for LPC (3) and Chabot (7) (Estimated cost: $50,000.00)
- Bid and acquire 4 PC Servers for Administrative network (Estimated cost: $15,000.00)
- Bid and acquire additional video conference stations for each of Chabot and LPC campuses (Estimated cost: $50,000.00)
- Begin investigation of high-bandwidth inter-campus connectivity alternatives
- Begin acquisition/deployment of projector/whiteboards for LPC classrooms (Estimated cost: $50,000)
- Begin investigation of video server solutions
- Assess staffing needs and engage ITS consultant services to fill expertise or staffing inadequacies for above-listed projects (Estimated cost: $400,000.00) (PINOS GUESS)

*Estimated Cost Summary: $2,440,000.00

Year 2:

- Bid and acquire desktops/printers for LPC (400) and Chabot (500) (Estimated Cost: $1,100,000.00)
- Bid and acquire PC Servers for LPC (4) (Estimated cost: $32,000.00)
- Proceed with deployment of wireless infrastructure at LPC (Estimated cost: $25,000.00)
- Begin build of new Data Center building at LPC
- Begin installation of new fiber backbone at Chabot (Estimated cost: $500,000.00) (PINOS BASED ON CCSF EXPERIENCE)
- Begin renovation of Chabot buildings
- Bid and acquire 4 PC Servers for Administrative network (Estimated cost: $15,000.00)

- Bid and acquire one mobile cart for each of Chabot and LPC campuses (Estimated cost: $111,000.00)
- Evaluate and determine upgrades needed for voice/voicemail systems
- Begin deployment of high-bandwidth inter-campus connectivity (Estimated cost: $2,500,000.00) (PINOS GUESS)

*Estimated Cost Summary: $4,251,000.00

Year 3:

- Bid and acquire desktops/printers for LPC (400) (Estimated cost: $500,000.00)
- Proceed with deployment of new network equipment at Chabot [1] (Estimated cost: $325,000.00)
- Begin acquisition/deployment of projector/whiteboards for renovated Chabot classrooms (Estimated cost: $100,000.00)
- Begin turn-up of network connections to renovated Chabot buildings
- Move to new Data Center (Estimated cost: $200,000.00)
- Bid and acquire PC Servers for LPC (4) (Estimated cost: $32,000.00)
- Bid and acquire 4 PC Servers for Administrative network (Estimated cost: $16,000.00)
- Begin deployment of video servers (Estimated cost: $150,000.00)
- Begin deployment of additional mobile laptop carts and laptop PCs at each campus as needed. (Estimated cost: $250,000.00)

*Estimated Cost Summary: $1,573,000.00

* Further Cost refinement necessary

ADDITIONAL PROJECTS

Upon further consideration, a number of additional items have risen. These items have not been explicitly budgeted in the cost estimated submitted for the network upgrades. However, these items will impact the overall success of future network services and applications. It is important that the budget be revisited in more detail to see if these items can be covered by the funds available.

- **Cabling certification at District Office and existing LPC buildings:** While new data cabling will be provided as part of the Chabot building renovations and LPC new building construction, funds have not been allocated to test and certify existing installations that will not be upgraded. It is recommended that in areas that are not scheduled for cabling upgrades, a contracting firm be hired to certify cabling for Category 5e compliance. This action item was not specifically funded in the Bond estimate.

[1] Dependent on new fiber backbone cabling

- **Increased voice/data connectivity in room standards:** As standards for office, classroom and other workspaces are defined, there may be existing rooms not scheduled for renovation which need to be supplemented with additional, new cabling in order to comply with the new standards.

- **Wireless Tools:** Additional network monitoring and intrusion detection tools have been recommended.

- **Storage costs**: When large volume equipment procurement occurs, costs for the rental, monitoring or construction of storage facilities may be incurred.

- **Staffing costs**: Costs for consultant firms and CLPCCD staff supplementation need to be reviewed for impact on the budgeting estimates.