Chabot – Las Positas Community College District

Information Technology

Measure B Bond Activities

Accomplishments and Future Plans 2005-2017

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INTRODUCTION

Beginning in 2005, the CLPCCD Information Technology Computer Systems and Network Infrastructure have undergone significant expansion and improvement as a result of many projects funded by the Measure B Bond initiative. The Measure B Bond technology initiatives were completed as a combined effort of the staffs of CLPCCD District Information Technology Services (ITS), LPC Information Technology (IT) and Chabot Computer Support Services (CSS). The collaborative work of the District and College staff will be referred to as "CLPCCD ITS" for the purposes of this document.

The project areas outlined in this document are technology improvements in support of the Facilities Master Planning effort for renewal of the Chabot campus and expansion of the Las Positas campus. The technology improvements are addressed in two areas. The first area includes technology changes related to the facility structure required for the networking infrastructure such as fiber optic wiring, conduit between buildings, and cabling within the buildings. The second area includes classroom equipment, network devices, communication equipment to support data, voice and audio-visual, and all technology advancements that support the instructional environment.

With the successful passing of the Measure B bond, the magnitude of projects outlined in the Bond documentation clearly indicated the need for a methodical approach to the volume of work. The opportunity was now available for CLPCCD ITS to remedy the inadequacies in its existing 2004 computer technology and cabling infrastructure, which resulted in almost a complete replacement of the technology in place at the start of the Bond activity.

CLPCCD District ITS began its bond work with the documentation of a *Roadmap to Next Generation Networking*, which outlined the areas and steps to be executed for an efficient execution of the Measure B Bond projects. The Roadmap presented a step-by-step analysis of the key upgrade areas, and summarized a process with which upgrades could occur in an organized and methodical fashion. The Roadmap was the preliminary document issued in July 2004 to identify the key technology elements to establish the formal ITS Master Plan. Following the Roadmap, CLPCCD ITS developed a comprehensive *Information Technology Master Plan* (ITMP) in concert with the Facilities Master Plan for the Bond Measure B. This ITMP documented in detail the current state of technology at the colleges and the future plans for infrastructure and equipment installations and upgrades under Measure B. This entailed upgrade of 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. The initial ITMP issued in March 2005 has been updated annually with ITMP supplements to document the yearly accomplishments achieved in support of the ITMP objectives. Both the Roadmap and ITMP documents are posted on the District website under "Technology Services".

Following the Roadmap and the ITMP, specific recommendations called for the early development of standards to be applied to all projects at all sites, so that CLPCCD ITS could deploy a consistent functionality to all end-users. The development of the *CLPCCD Cabling*

Infrastructure Standards documented in detail the cable, outlet, room layout, telecom rooms and installation standards that provided design guidelines to the architect and engineering teams. Because of the industry merging of voice and data infrastructures, the standard addressed cabling standards for both aspects of telecommunications, both inside the building and for the building-to-building interconnection. With some supplemental documents issued as updates, the original standard has been used in all construction projects since 2006. Equipment standards were also established early on in the Bond project for networking equipment such as routers and switches, for servers, for desktops and laptops, and for printers.

With the thorough and organized approach defined in the Roadmap and the ITMP document, CLPCCD ITS was able to successfully migrate from the out-of-date computer and network infrastructure to the advanced technology and topologies required for current and future instructional application support. This has included server upgrades to state-of- the art computer platforms, desktop/printer/copier replacements, network equipment replacement and expansion, and cabling infrastructure installation. The sections of this document provide a detailed description of the projects and accomplishments of the Measure B Bond projects completed to date. The work has focused on the increase in availability, functionality, reliability and performance of information technology resources for use by CLPCCD staff and students. New building construction and modernization has increased network connectivity and usage substantially. Network connectivity, wired or wireless, is assumed to be as readily available as electrical power or lighting. Through careful design, standards and deployments, CLPCCD ITS can now provide and maintain a network and technology environment that is twice the size and hundred-fold the bandwidth compared to that of 2004, prior to the Bond.

As the current Measure B bond projects come to conclusion, CLPCCD ITS has identified the most important projects for completion with the remaining funds over the next four years which are identified in the **"Next Steps"** section within each of the major categories described in this document. These projects will manage the final deployments of technology to provide CLPCCD with the greatest longevity of technology resources and performance.

The work accomplished in the Measure B Bond has set a new standard for performance and functionality across CLPCCD campuses. As future bond measures are considered, the work accomplished with Measure B provides an excellent basis for the continued improvement and modernization of CLPCCD sites beyond 2017, which are identified in the **"Future Plans"** section within each of the major categories described in this document.

1.0 BUILDING CONSTRUCTION AND MODERNIZATION PROJECTS

At each campus, the selection of building construction and renovation was determined through user input and designed under the purview of the Facilities Modernization and Program Management Team. For each project, an architect and engineering team was selected, and CLPCCD ITS was been an integral part of the design process, providing input on the technology infrastructure that supports the communication of PCs, servers, wireless access points, electronic bulletin boards, AV equipment and telephones.

With increasing developments in building automation and energy management, the data network also supports the control and operation of controllers for HVAC systems, intelligent electrical panels, Solar Panel controllers, security panels and cameras, and an expanding list of Ethernet-enabled building automation devices. While CLPCCD ITS does not participate in the selection of these devices, the network design must include sufficient ports and connectivity for reliable service to these systems.

1.1 Conduit/Vault Pathway

In preparation for the building construction process, CLPCCD ITS began with a project to assess and document the low voltage conduit and vault system at each campus. New buildings would require space for new backbone cables to connect to the campus Main Telephone Room (MPOE) for voice connectivity and the Main Data Room (MDF) for data connectivity. It was important to assess the capacities, bottlenecks and expansion options of the existing infrastructure at each campus, so that CLPCCD ITS could appropriately provide input to the architect and engineering teams as new buildings were designed.

CLPCCD ITS initiated a "proofing" project to fully document the existing conduit and cabling infrastructure at both campuses. The result of this project was a set of maps and drawings that showed all the telecommunications conduits, vaults and cabling infrastructure in place. Analysis of the proofing results presented the following information:

> **Chabot College** – The low voltage infrastructure on campus was constructed around a series of fire alarm vaults from the original campus construction. Open, available conduits were minimal and most were full of cabling. Vaults were shallow and could not be expanded with additional conduits. Many of the conduits were full of old cables that were corroded and not in use, but could not be removed because the conduits were crushed in the ground. The existing conduit system could not be expanded to accommodate the planned building growth.
>
> **Las Positas College** – The Las Positas campus was fully equipped with large vaults and new conduits that were constructed in 1998. This system provided a good basis for connectivity of modernized and new buildings on campus.

The frailty and limited use of the Chabot conduit/vault system determined the need for a new Telecommunications Infrastructure Loop. As part of the Loop construction, each building on campus was provisioned with three (3) new four-inch conduits that fed into a conduit loop around the campus. At the Building 300 Main Data Room (MDF), twelve (12) new conduits were installed to support the fiber backbone cables for data connectivity to new and modernized buildings. At the Building 200 Main Telephone Room (MPOE), eight (8) new conduits were installed to support the copper backbone cables for voice connectivity to new and modernized buildings. The new Telecommunications Infrastructure Loop infrastructure was built in conjunction with the Chabot Campus Central Utility Plant (CUP) construction project. Points of connection for the CUP pipeline and the new telecom connections were through the mechanical rooms of each building. By using joint trenching, the two utility conduit systems leveraged work throughout the campus to minimize the disruption on the college constituents. At the conclusion of this project, the telecom infrastructure at the Chabot Campus was significantly expanded and prepared to support the infrastructure connectivity required for the Measure B Bond building modernization and new construction.

At the Las Positas campus, the cabling infrastructure was augmented with an extension of conduit from the north loop road to the interior vaults of the campus. This allowed for alternate routing to buildings fed from vaults in the center of the campus (Library, Science). This conduit extension was also constructed as part of the Central Utility Plant (CUP) construction on the Las Positas campus to leverage pipelines put in place for the CUP attachment to the future SSA building.

1.2 Building Construction

When building design commenced, CLPCCD ITS was an integral part of the design process for each project on campus. The contribution by CLPCCD ITS in Building Construction and Modernization projects included:

- Creation and documentation of CLPCCD Cabling Infrastructure standards, describing cabling, pathway, wall and floor termination styles, labeling and testing.
- Definition of Telecom Room (IDF) size and placement in new buildings to meet connectivity needs of spaces defined in Building Programming.
- Design of telecommunication outlets placement and quantity in offices, classrooms, meeting rooms, mechanical/electrical spaces, etc.
- Definition of Audio-Visual requirements for classroom, smart classroom, and meeting room spaces.
- Specification of telecommunication building backbone connectivity to campus data, voice and fire alarm (LPC) services.
- Review of architect/engineer design documents for cabling and pathway design changes, and Bid Documents acceptance.
- Where partial remodels of building occurred, integration plan for keeping voice/data services running during construction activities.
- Onsite review of cabling during construction projects.

- Approval of all Telecom Room layouts before final build.
- Commissioning of voice/data cabling and Audio-Visual systems after construction. Coordination of manufacturer's warranty walkthrough and certification.
- Support of connectivity for building automation and security devices as implemented.

In addition to the tasks outlined above, the projects presented unique telecom infrastructure issues, requiring that CLPCCD ITS provide specific infrastructure expertise during the design and/or construction phases. The highlights of each project include:

Chabot College

Chabot College	Project Specifics
B300	• Design of the Chabot Campus Server room for District ITS and Chabot CC servers. • Design of the Chabot Campus MDF room for campus data connectivity. • Provisioning of the 40KVA UPS for support of server room uptime during short duration power outages. • Selection and provisioning of a generator for 100% uptime of the server room and HVAC support. • Selection and provisioning of Inergen Fire Suppression System for protection of network/server room and ITS spaces.
B400 (IOB)	• Design of high density network connectivity for faculty offices. • Adjustment of Telecom room design to accommodate limited pathway and construction obstacles.
B500	• Design of Category 6A infrastructure for high performance lab building.
B700 (CSSC)	• Design of high density network connectivity for administrative offices and student spaces supported by four (4) telecom rooms. • Investigation of floorbox/pokethru devices for flush-mount voice/data connectivity in second floor spaces.

Chabot College	Project Specifics (continued)
B800/B900	• Assessment and approval of Category 6 cabling infrastructure, since these buildings were cabled early in the construction cycle. • Design of new standard for Wireless Access Point (WAP) connectivity in classroom spaces.
B1200	• Design of B1300 temporary backbone connectivity to ensure building uptime during construction of B1200. • Re-design of cabling infrastructure when pathway challenges extended cable lengths beyond specification. Design of supplemental Telecom room in theater catwalk.
B1400/B1600 (partial)	• Reconfiguration of the Chabot campus telephone system to allow the removal of the Fujitsu remote system from the B1400 Telecom room and replacement with new Avaya equipment. • Coordination of contractor qualifications to ensure proper skills, workmanship and ongoing support for technology items
B1700/B1800	• Inspection of floorbox piping for correct cabling terminations. Approval of revised product and construction mock-up for installation. • Pathway and routing revisions to address cable overfill issues. • Identification of cabling damaged by peer contractors. Direction for installation and termination of replacement cabling.
B1900	• Provisioning of specification template for project use. • Adjustment of cable routing for concealment in Planetarium.
B2200 (partial)	• Integration of newly remodeled first floor with non-remodeled areas. Reconfiguration of backbone cabling to maintain building connectivity during construction, and later enable connectivity through new fiber backbones.
B2500-2900	• Complex phasing of the building construction presented challenges in keeping sections of the building live on the network while other parts were under construction. • Specification of revisions to cabling infrastructure when pathway challenges extended cable lengths beyond specification.

Chabot College	Project Specifics (continued)
B4100	• Redesign of Outside Plant (OSP) conduits and vaults when site conditions prevented designed routing. • Modification of cabling infrastructure to accommodate building interior design. • Redesign of Telecom Room to provide more efficient use of room layout.
Security Phase 1	• Coordination of connectivity of new Talk-a-phone, camera and security devices to voice/data network. • Monitoring of performance and operational impacts of security devices on campus data network.
Parking Lot Solar/Security	• Design input for data connectivity to remote devices. Specification of cabling and devices.
B3400	• Provisioning of detailed specifications for use in project manual.

Las Positas College

Las Positas College	Project Specifics
B500 (partial)	• Seamless integration to existing infrastructure to minimize disruption to the unremodeled areas of the building.
B600	• Revision to cabling infrastructure to support new math lab equipment and furniture deployments.
B1600 (SSA)	• Design of high density network connectivity for administrative offices and student spaces supported by four (4) telecom rooms. • Review and modification of cabling pathway to Telecom Rooms. Revision of Telecom Room layouts for better operational functionality. • Revision to outlet placement and connectivity because of furniture changes. • Adjustment of cabling to support LCD display connectivity. • Design of cabling and network configurations for custom kitchen and building automation systems.
B1700 (Campus Safety)	• Seamless integration to existing infrastructure to minimize disruption to the unremodeled areas of the building. • Design of high density network connectivity for Campus Safety security monitoring and operations.

Las Positas College	Project Specifics (continued)
B1800 (Science)	• Field direction to contractor for revised Telecom Room layout and integration to current infrastructure to optimize cabling infrastructure in project scope.
B1850 (New Science)	• Detailed review and input of all construction documents. Approval of all submittal and changes in cabling infrastructure.
B1900 (District Data Center and LPC IT Building) and B1900A (MPOE/MDF)	• Design of new B1900, construction and commissioning. Redundant pathway and cabling to campus core. Detailed design of Administrative Systems Server Room, LPC Server room, and Network room. Specification of UPS and generator loads and operational parameters. • Modification of B1900A. Coordination of backbone and power modifications to optimize campus uptime.
B2300 (CDC)	• Assessment and approval of Category 6 cabling infrastructure, since these buildings were cabled early in the construction cycle. • Design and connectivity to three Telecom rooms, with revised cabling backbone for voice/data/fire alarm to B2200.
B3000/3100 (M&O)	• Assessment and approval of Category 6 cabling infrastructure, since these buildings were cabled early in the construction cycle.
B4000 (CCA)	• Design of the Amphitheatre placed it on top of the main Telecom conduit runs, thereby requiring the reroute and replacement of the conduits and fiber/copper cabling infrastructure to 19 of the buildings on campus. • New cabling necessitated the conversion of all working voice/data connectivity after the new infrastructure was installed. • Multiple Telecom room locations servicing high density cabling to labs, classrooms, offices and theatre spaces. • "Outside" Telecom Cabinet for provisioning of OSP cabling infrastructure to support voice and data connectivity in the Amphitheatre. • Cable and device concealment to accommodate the stage requirements.

Las Positas College	Project Specifics (continued)
LPC Soccer	• The new soccer field was designed on top of a key conduit pathway that contained existing backbone cables for the MD and PE buildings. CLPCCD ITS prepared a bid for the fiber/copper backbone cabling project that replaced this cabling so that the conduits and old cabling could be demolished in preparation for the construction of the soccer fields.
LPC Aquatics	• Redesign of Telecom Room closet for compact connectivity of data and voice. • Wireless connectivity to Aquatics vicinity.
Parking Lot Solar/PV	• Design input for data connectivity to remote devices. Specification of cabling and devices.
Security Phase 2	• Coordinate connectivity of new Talk-a-phone, camera and security devices to voice/data network. • Monitoring of performance and operational impacts of security devices.
LPC Fire Alarm backbone	• Design of multimode fiber backbone for Fire Alarm panel connectivity. Provide specifications for bid documents and review of loss measurements to meet manufacturer's specifications.
LPC PEIII	• Design of OSP infrastructure for provisioning of voice/data/AV connectivity to field locations.

Next Steps

As Bond projects are identified for each campus, District ITS and College Technology staff will continue to provide input and expertise for the voice, data and audio-visual infrastructure. This includes new OSP pathway to building, new fiber/copper backbones and new cabling infrastructure inside the building.

Key projects under review for inclusion in remaining bond funds are:

Site	Project
Chabot	B100 (limited scope remodel of first floor)
Chabot	B2100 (Biology)
Las Positas	B2000 (Library)

These projects are identified by campus user groups who prioritize the requirements based on all needs at the campus. As the user requirements are modified, CLPCCD ITS adjusts their planned technology upgrades accordingly.

There are several other high priority projects that are specific to upgrading old network cabling infrastructure. These projects involve the replacement of pathway and cabling in select buildings so that users in those buildings can take advantage of the new technology speeds and capabilities, including wireless access. Some of these projects may be included in additional Facilities upgrades. Others may be scheduled as Future Projects when additional funding sources become available. The project list includes:

Site	Project	Locations
Chabot	○ New pathway to all new and modernized buildings on campus, as needed by IDF relocations – minimum of (3) 4" conduits to the main IDF, and (1) 4" conduit to the Fire Alarm panel location. ○ Augment pathway to PE fields as needed by new low voltage infrastructure. ○ Additional pathway required to B200 MPOE from campus or for AT&T cabling. ○ Interconnection between new "Loop" and old pathway as needed for routing of FA backbone cabling.	New buildings as required. PE Fields B200 Specific Vault locations as designed.
Chabot	Upgrade of remaining multimode fiber backbones on campus to 48-strand single mode fiber backbones and new multi-pair copper.	B100, B1500, B1600, B2000, B2100, B2300, B2400, B3000, B3100, B3300, B3400, B3500, B3600, B3700, B3800, B3900, PE Athletic Fields (Press Boxes, Tennis, Track)
Chabot	Replacement of aged building cabling, or installation of new infrastructure with new Category 6A or better standards.	**B100**, B200, **PE Athletic Fields (Press Boxes, Tennis, Track)**, B1100, B1300, B1500, B1600 (remaining building), B2000, B2100, B2200 (second floor), B2300, B2400, B3000, B3100, B3300, B3400, B3500, B3600, B3700, B3800, B3900.
Las Positas	○ New pathway to all new and modernized buildings on campus, as needed by IDF relocations – minimum of (3) 4" conduits to the main IDF, and (1) 4" conduit to the fire alarm panel location. ○ Augmented pathway to B1900A for backbone cabling deployment – (8) 4" conduits allocated as (2) FA, (3) voice, (3) data.	New buildings as required. B1900A

Las Positas	Replacement of aged building cabling, or installation of new infrastructure with new Category 6A or better standards.	**B800, B1800**, **B2000, B2100, Fire Technology Portable**, B100, B200, B300, B400, B500, B700, B900, B1000, B1300, B2200, B2400, B2500, **Vineyard extension.**

Items shown in bold are of key importance to ensuring that the voice/data systems in those locations can meet the increasing connectivity and bandwidth demands of student and staff. At LPC, as a result of user relocations to the SSA building, there may be a need to rework cabling in the vacated buildings on campus. This will be scoped in conjunction with other remodels and maintenance projects coordinated by the Facilities planning.

Future Projects

Beyond the conclusion of the current Measure B Bond, CLPCCD ITS can forecast continued requirements to expand and improve the network infrastructure. Key areas for improvement include:

- **Video Backbone** – As video transmission increases on campus, with the distribution of lecture material or IP camera recordings, the bandwidth consumed by this traffic may impact current data traffic. As such, a discrete fiber backbone for AV, provisioned as 12-strand single mode fiber to each building, needs to be included in future cabling projects.

- **Redundant Fiber Backbones** – A redundant fiber would be routed to each building through an alternate path from the primary backbone. There would be common access into the building through the available conduit provisioning. This secondary fiber backbone would enable failover to a stand-by core switch, which would automatically enable if the primary switch were to sense a building connection fail. The secondary fiber backbone to each building would be provisioned as a 48-strand zero water peak single mode fiber data cable routed to a secondary MDF on each campus. The secondary MDF are currently identified to be Building 200 on the Chabot campus and the Building 1900 IT Building on the LPC campus.

These two projects, in conjunction with state-of-the-art cabling infrastructure inside the buildings will allow CLPCCD ITS to continue to provide a computer and network infrastructure that keeps pace with the future bandwidth and technology demands by staff and students

2.0 SUPPLEMENTAL CABLING PROJECTS

In addition to the building cabling tasks described above, there have been a number of locations where additional data cabling has been added to rooms or buildings not targeted for substantial modernization or construction. The cabling upgrades needs have arisen from:

- Office remodel, cubicle rearrangement, staff additions.
- Increased technology deployment, demanding more network connectivity.
- Deployment of technology devices requiring network connections.
- Site changes requiring rerouting or replacement of cabling infrastructure.

Where CLPCCD ITS has determined that the cabling upgrades are needed, projects have been initiated to address the deficiencies.

2.1 Project Summary

In these projects, CLPCCD ITS has taken ownership for complete processing including:

- Scoping and design – Development of drawings, specifications and scope narratives that describe the cabling to be performed.
- Bidding and contractor selection – Distribution of scope documents to certified contractors for pricing. Coordination with CLPCCD Bond purchasing for contract award.
- Construction supervision – Coordination of onsite work. Submittal review. Site walkthroughs and work clarifications.
- Inspection, punchlist/acceptance. – Review of completed work and test results. Documentation of items for correction and updating. Review of as-builts as provided by contractor. Testing and commissioning as required for job acceptance.

These CLPCCD ITS projects to add additional cabling to rooms and buildings have included:

Location	**Project Area**
Chabot College	
B100	Broadcasting
B200	Office areas, MPOE improvements
B1600	Voice Backbone cabling augmentation
B2300	Coax cable replacement
B2100	Wireless AP wiring
B2100	Smart Classroom wiring
Various buildings	Networked copier wiring
B900/1000, B1200	Fiber/copper backbones

Las Positas College	
B2500 (PE)	Supplemental cabling
B200, B300, B400, B500, B800, B2000, B2100, B2200, B2300.	Wireless AP wiring
Various buildings	Networked copier wiring
B200, B2000, B2200.	Smart Classroom wiring
B2400(MD), B2500(PE)	Voice and Data Backbones
B2000 (Library), B1800 (Science)	Voice and Data backbones
B2000 (Library)	Cabling for computer lab.
Dublin Center	
Continuing Education and District Office	Cabling Infrastructure

Next Steps

These types of limited scope projects will arise during the completion of the Measure B Bond funding because not all areas that need new or more cabling are included in building modernization projects. **As fewer modernizations projects are planned, CLPCCD ITS will need to use its budget, rather than Facilities budgets, to fund these critical infrastructure cabling upgrades.**

At present, the following projects have been identified and these projects are relatively small and defined in scope.

- **LPC Fire Technology Building** - The Fire Technology program is located in portable buildings adjacent to LPC buildings. Conduit pathway for telecom connectivity was put in place at the time of the portables installation. Cabling infrastructure to wire the instructional and office spaces for voice/data connectivity includes: 1) Category 6A wiring for classroom telephone, teacher's station, projector and wireless AP locations, 2) Category 6A cabling for instructor's office connectivity, 3) fiber and copper backbones extending to the B600 IDF.
- **LPC Vineyard connectivity** – The viticulture program needs remote connectivity as part of the monitoring of the vine growth. This will require a fiber backbone cabling to the PE Telecom room, and a small termination area in a waterproof cabinet by the vineyard on the south loop road. When those components are in place, a waterproof Category 6 cable can be extended to provide connectivity to the vineyard devices.
- **Chabot PE Athletic Fields** - Documentation from the PE department has indicated that network connections are required for input of athletic statistics during events. While the LPC Athletics fields are suitably equipped, the adjacent Chabot areas that will provide the necessary connectivity are not ready. To enable voice and data (wired and wireless) connectivity for the PE fields, the following cabling would be needed: 1) fiber and copper backbone to B4100, 2) Telecom room construction in Tennis, Softball, Concession and Track 3) limited Category 6A cabling for voice and data connections inside of those buildings.

Future Projects

There are some buildings on the campuses with computer labs that experience unreliable or poorly performing data connectivity. These locations are in critical need of cabling upgrades and should be considered for funding. If available, these projects may be moved up into a Next Step project, but otherwise, the projects listed below will need to wait for additional funds identified for future projects:

- **Chabot Library/B100** – A limited scope project for some improvement of the first floor office spaces is planned. However, the second floor Library labs are not included in this renovation. The cabling connectivity in the Library labs is very old and needs total replacement. Additional cabling for wireless access points can also be installed to expand the connectivity in the Library.
- **LPC B1800** – During the modernization of the LPC Science building, only certain areas were identified for cabling replacement. Many labs and offices were not upgraded. The old Category 5 cabling that services those locations cannot support the speeds and connectivity for current instructional requirements. Replacement pathway and cabling needs to be installed to bring the entire building up to current cabling standards. Telecom Rooms are already defined and built.
- **LPC B800** – The labs in the B800 building are cabled with old Category 5 cabling that were hand crimped and not professionally installed. There are many rooms with desks and carrels for high-density desktop lab connectivity, as well as connections needed in the Auto Shop. Wireless APs cannot be placed in the locations needed because of the lack of cabling. These rooms would be completely rewired, including the construction of a new Telecom Cabinet/Room for cabling terminations and network electronics. New single mode fiber backbones would also be installed for connectivity to the campus core.
- **Chabot Additional wireless connectivity** – Several buildings on the Chabot campus need additional wireless locations. Cabling to support additional access point connections is needed in B1100, B2000 and B1500.

Ideally, substantial cabling projects should be included in building modernization efforts. Other projects may arise with the repurposing of offices and classrooms on campus. CLPCCD ITS will evaluate the options to enhance connectivity in small-scale projects as the requests arise.

3.0 NETWORK EQUIPMENT

CLPCCD ITS is responsible for the provisioning and operation of TCP/IP network connectivity for all Ethernet connections on the campuses. As browser and Internet-based applications have increased in recent years, the continuous availability of the network has become a mission-critical operation. To meet these requirements, CLPCCD ITS has leveraged the Measure B Bond funds to install high performing networks at CLPCCD locations.

The network equipment consists of network switches that connect to the cabling in the walls that has been terminated in the Telecom Rooms (IDFs). The switches allow computers to connect to resources such as printers and servers. Network routers join the network switches to provide a connection outside of the local campus network, either to another CLPCCD campus or to Internet resources.

3.1 Campus Network Equipment

Beginning in 2005, CLPCCD's network consisted of limited Cisco routing equipment and an assortment of hubs from various manufacturers. This provided limited connections to the buildings on the campuses. One of the first projects undertaken was to procure state-of-the-art equipment, piggybacking on the CLPCCD Cisco standard, to bring the connectivity up to acceptable levels of performance. The first procurement for network equipment purchased the following gear:

Product	Quantity	Purpose
Cisco 6509 core switches	4 (Primary and failover for each campus)	These switch/routers became the high performance, redundant network core for connectivity of all buildings using single and multimode fiber. **CLPCCD was able to increase building connection speeds 100x**, and dramatically improve reliability since media converters were eliminated.
Cisco 4506 High Density switches	11	For buildings with 100 or more network connections, or where multiple Telecom Rooms (IDFs) were connected through a central Telecom Room (BDF), CLPCCD ITS procured high capacity, chassis-based switches. These switches were configured with redundant power supplies to improve robustness and uptime.
Cisco 48-port switches **Cisco 24-port switches**	46 26	For smaller buildings, stackable switches with fiber uplinks were installed, thereby enabling 100 Mbps connectivity speeds in a smaller footprint.

These switches provide copper and fiber connectivity to 5,500+ network ports. Performance was dramatically improved because of the speed increase and the topology change from hub (pooled

connectivity) to switched (private) connections. This bid was awarded through the public bidding process. The equipment was received and deployed rapidly by CLPCCD ITS staff, enabling a complete network upgrade by fall of 2005.

As new and modernized building construction progressed, CLPCCD ITS architected and deployed network expansion to extend the high-performance network connectivity to these buildings. With the first group of buildings completed in 2009, CLPCCD ITS procured a second round of network equipment:

Product	Quantity	Purpose
Cisco 6509 10Gb core supervisor blade	2	The 10GB supervisor engine was procured to provide improved network processing and failover. In addition, the first connections for 10Gb connectivity were acquired.
Cisco 4506 High Density switches	7	For buildings: LPC: CCA (2). Chabot: CSSC (2), IOB (2), B500.
Cisco 48-port switches **Cisco 24-port switches**	22 11	For buildings: LPC: CDC, M&O, CCA, PE, Aquatics. Chabot: IOB, CSSC, B4100, B500, B2700, B1900, B2200.

These switch purchases expanded the existing campus networks by an additional 2,664 ports, or 50% more connections. These connections were largely deployed to support new computer and printer equipment. This network equipment was awarded through the public bidding process and deployed by CLPCCD ITS.

The most recent switch procurement was executed in 2012, to support another round of building connectivity, as follows:

Product	Quantity	Purpose
Cisco 6509 10Gb core blade	2	For increased network backbone speeds, the 10Gb network blades were procured. **This allows CLPCCD to increase building connectivity speeds 10 times the current speed.**
Cisco 4506 High Density switches	9	For buildings: LPC: SSA (4). Chabot: B1200 (1), B1700 (2), B1800 (2).
Cisco 48-port switches **Cisco 24-port switches**	20 12	For buildings: LPC: Science, PEIII, other building expansions. Chabot: B300, B2500-2900, other building expansions.

These switches further expanded the campus by 3,000+ ports, effectively doubling the size of the networks at each campus, compared to 2005. These switches also expanded the 10 Gb fiber connections, such that buildings with high density connections could take advantage of increased uplink speeds to server and Internet resources.

In summary, CLPCCD ITS has been able to improve the network connectivity and performance by the following factors:

Item	Prior to 2005	2005	Current
Number of network ports	4,000	5,500	11,100+
Computer connection speeds	10Mbps, shared	10-100Mbps, switched	1Gbps, switched
Building Backbone connections	10-100 Mbps	1 Gbps	10Gbps

The effective performance increase is nearly three times the availability and over 1,000 times the performance compared to the 2005 network.

The performance growth of the network equipment is especially critical as desktop and laptop processors and their network cards also increase in power and speed. Network access will become saturated if the power and speed of the network equipment is not able to process the computer requests efficiently. Network equipment processing power must always exceed the desktop and server environment so that bottlenecks and contention for network bandwidth does not occur on the campuses.

Next Steps

As additional buildings on campus are renovated or built during the completion of the Measure B Bond, CLPCCD ITS will continue to provide the high capacity switching equipment needed to implement the high performing computer environment at the campuses. Connectivity and bandwidth demands continue to increase as faculty and students become more reliant on real-time access to Internet and server information. It is important that the upgrade projects for desktop and network switches are coordinated, so that the network switch speeds can match the connectivity requirements of the desktop. This allows the devices to work together in a complementary fashion to deliver additional speeds and bandwidth to the users. Laptops and desktop computers increase in speeds every 6 months and are equipped with network interface cards that support 1 Gbps connection speeds. Network switching equipment needs to provide ports with this same rate, and higher uplink speeds that can aggregate the connections from many computers simultaneously. Typically, the uplink speeds on building backbone connections are 10 times the speed of the ports for computers. This provides sufficient capacity for the activity of computers on the network.

In the next few years, CLPCCD will need to perform the following network equipment changes:

- Installation of network switches for remodeled or newly constructed buildings.
- Replacement of End-of-Life hardware with current technology.
- Provisioning of Power-over Ethernet (POE)+ connectivity for new equipment requiring 802.3at and future power-over-ethernet standards.
- Replacement of 10/100 Mbps ports with 10/100/1000 Mbps ports.
- Upgrade of 1000SX and 1000LX with 10G-LR fiber backbone connectivity.
- Replacement of fixed port-count stackable systems with higher performance chassis based systems as needed.

These next procurements and deployments will continue to provide CLPCCD with a high-performing network capable of supporting student and staff access to server and Internet resources for the next 3 years.

Future Projects

The campus building backbone connectivity and core switching capabilities will be upgraded in the future from 10G deployment which is in process now to 40G and 100G speeds. Technology development is underway for the release of 40G and 100G solutions. When those products are mainstream, CLPCCD will evaluate the cost/benefit and perform selected upgrades to enhance the network bandwidth and operation.

4.0 WIRELESS NETWORKING

Wireless network connectivity is provided on CLPCCD campuses for ad hoc access to Internet resources. It is provided on an "as-is" basis for the convenience of students, staff and visitors. Any CLPCCD sites that are publicly accessible from an Internet connection are also available from the wireless network. For security reasons, there is no access to the non-Internet web-based District or College servers from the wireless.

4.1 Wireless Deployments

In 2005, the wireless deployments at CLPCCD campuses were sparse. Since wireless access points need a network cable for connection and often a power outlet to power the wireless access point (WAP), the lack of network cabling severely impaired the locations where wireless equipment could be installed. Cisco Wireless Access Points (WAP), using 802.11 a/b/g technology were initially installed in student congregation places such as the cafeteria. However, buildings with old, low grade (category 3) network cabling were not able to support wireless connectivity until new wiring was installed. This limited the installation of wireless access points until building modernization was completed, or until additional CLPCCD ITS supplemental cabling projects were performed in the older buildings.

Following the initial deployments, CLPCCD ITS scoped a small number of cabling projects to provide cabling to locations in various buildings for access point connections. Access Points were installed inside of buildings at Chabot and LPC campuses. Each of these WAPs operated in standalone mode, providing an open, unencrypted connection for users to access Internet-only resources. At that same time, before wireless was prevalent on campus, hidden and encrypted wireless connections were configured to support Science or Machine shop applications in limited locations at Chabot campus.

Building modernization and new construction projects were designed with new cabling locations specifically for wireless access point installation. As new buildings came online, the number of WAPs on each campus grew, providing greater availability of wireless connectivity. Increased users on the wireless networks, with numerous wireless access point devices, made administration and monitoring of the devices more cumbersome and difficult. In 2009, CLPCCD ITS installed centralized wireless controllers at each campus for improved control and management of the wireless network. This provided a common interface so that all wireless access points could be simultaneously and consistently configured and monitored. One controller was installed at each campus for robustness, so that any site-to-site connectivity issues would not adversely affect the local campus wireless network. Standalone wireless access points were converted to work with the new centralized wireless controller. CLPCCD ITS was then able to better view wireless activity, and administer changes to improve uptime and availability.

With industry developments, the release of 802.11N wireless access points offered greater performance to wireless users. In 2010, CLPCCD ITS began the procurement and deployment

of the 802.11N access points. Compatible with the existing centralized wireless controller, these 802.11N APs increased speeds and performance while maintaining compatibility with the existing environment.

CLPCCD ITS has continued wireless deployments to new buildings and wired spaces. Today wireless services are available, servicing hundreds of users in most buildings on the campuses. The following wireless diagrams are posted on the District and College web sites.

Chabot Campus Wireless Service Areas

59 access points in 26 buildings

CC 100 Library 01	CC 700 CSSC – 712	CC 2000 Science&Math Faculty
CC 100 Library 02	CC 700 CSSC – 745B	CC 2124 Bio Science Classrooms
CC 126 TV Studio	CC 700 CSSC – 760	CC 2000 Bio Science Classrooms
CC 170	CC 700 CSSC – 767H	CC 2102 Biology Lab
CC 200 Administration	CC 800 Classroom	CC 2104 Bio Science Classrooms
CC 242 Administration	CC 900 School of the Arts CR	CC 2208 Health Sci/Dental Health
CC 304 Classrooms	CC 904 School of the Arts CR	CC 2251 Health Sci/Dental Health
CC IOB First Floor Conf Rm	CC 1100 School of the Arts Faculty	CC 2300 Cafeteria
CC IOB Second Floor Conf Rm	CC 1125 School of the Arts Faculty	CC 2300 Peer Academic Tutoring
CC 401 Instr Office Bldg.	CC 1300 Perf Arts STGLFT	CC 2345 Upstairs Conf Room
CC 402 Instr Offices Bldg.	CC 1300 Perf Arts Box Office	CC 2400 Disabled Students
CC 403 Instr Office Bldg.	CC 1400 Technology Center	CC 2500 Gymnasium
CC 404 Instr Office Bldg.	CC 1500 Applied Tech Faculty	CC 2607 PE Faculty Offices/CR
CC 451 Instr Office Bldg.	CC 1600 Applied Tech Classroom 1	CC 3100 Emergency Medical CR
CC 452 Instr Office Bldg.	CC 1611 Applied Tech Classroom 2	CC 3500 Children's Center
CC 453 Instr Office Bldg.	CC 1801 Classrooms	CC 3800 Bookstore
CC 454 Instr Office Bldg.	CC 1803 Classrooms	CC 3912 Chemistry and CompSci
CC 500 Soc Science CR	CC 1808 Classrooms	CC 4000 Fitness Upstairs
CC 700 CSSC – 700.3	CC 1813 Classrooms	CC 4000 Fitness Downstairs
	CC 1926 Science & Planetarium	

Building 1200, 1700, 2800 and 2900 will be enabled with wireless when modernization projects complete in those buildings. This will add another 8-10 WAPs, totaling to 69. As more buildings are modernized or cabled for WAP connectivity, the availability of wireless will increase.

Las Positas Campus: Wireless service areas
74 APs in 29 buildings

LPC 100 WAP 01	LPC 1600 WAP 07	LPC 1919 WAP 01	LPC 2401 WAP 03
LPC 200 WAP 01	LPC 1600 WAP 08	LPC 2022 WAP 01	LPC 2411 WAP 01
LPC 300 WAP 01	LPC 1600 WAP 09	LPC 2022 WAP 02	LPC 2411 WAP 02
LPC 400 WAP 01	LPC 1600 WAP 10	LPC 2022 WAP 03	LPC 2412 WAP 01
LPC 500 WAP 01	LPC 1600 WAP 11	LPC 2022 WAP 04	LPC 2416 WAP 01
LPC 600 WAP 01	LPC 1600 WAP 12	LPC 2100 WAP 01	LPC 2420 WAP 01
LPC 700 WAP 01	LPC 1600 WAP 13	LPC 2100 WAP 02	LPC 2420 WAP 02
LPC 800 WAP 02	LPC 1700 WAP 01	LPC 2100 WAP 03	LPC 2420 WAP 03
LPC 800 WAP 03	LPC 1805 WAP 01	LPC 2202 WAP 01	LPC 2500 WAP 01
LPC 900 WAP 01	LPC 1814 WAP 01	LPC 2205 WAP 01	LPC 2500 WAP 02
LPC 1000 WAP 01	LPC 1822 WAP 01	LPC 2300 WAP 01	LPC 2600 WAP 01
LPC 1300D WAP 01	LPC 1828 WAP 01	LPC 2306 WAP 01	LPC 3000 WAP 01
LPC 1600 WAP 01	LPC 1854 WAP 01	LPC 2345 WAP 01	LPC 3100 WAP 01
LPC 1600 WAP 02	LPC 1859 WAP 01	LPC 2348 WAP 01	LPC Amphitheater WAP 01
LPC 1600 WAP 03	LPC 1873 WAP 01	LPC 2362 WAP 01	LPC 4110B WAP 01
LPC 1600 WAP 04	LPC 1900 Hallway1	LPC 2366 WAP 01	LPC 4119 WAP 01
LPC 1600 WAP 05	LPC 1900 Training Room	LPC 2401 WAP 01	LPC 4119 WAP 02
LPC 1600 WAP 06	LPC 1900A WAP 01	LPC 2401 WAP 02	LPC 4210A WAP 01
			LPC 4210A WAP 02

As listed in the table above, a significant number of WAPs (13) were recently deployed in the LPC SSA building, commensurate with the building size and connectivity requirements, increasing the campus connectivity from 61 to 74 WAPs.

Next Steps

The expansion of the wireless networks will continue with modernization, new construction and supplemental wiring projects. The wireless network is not recommended for high activity/high bandwidth network connections such as Engineering/CAD systems. CLPCCD ITS will continue monitoring the wireless activity for suitable distribution and performance by addressing the following areas:

- **Inside building wireless** – As usage increases, CLPCCD ITS will continue to add and move wireless Access Points to provide robust services for student and staff access.
- **Outside building wireless** – CLPCCD ITS will examine the need for external wireless service so devices that are outside of the building can still access the network. Currently students near buildings will receive limited connectivity through "bleeding" of the wireless signal through the walls. SmartPhones can continue to access Internet services through their standard 3G/4G cell phone service providers. For laptops and tablets to receive strong wireless signals at further distances than the "bleeding" can accommodate, the installation of external APs/antennae are needed. This will require building roof/wall penetrations, grounding and mounting apparatus. Open congregation areas like the Chabot Grand Quad, Chabot Caesar Chavez Quad, Chabot PE Fields and LPC Campus Boulevard where high numbers of students gather outside, would benefit from the implementation of the outside wireless service.

Future Projects

Wireless technology continues to evolve and the release of new standards will be adopted by CLPCCD ITS.

- **802.11ac** – It is expected that the new 802.11ac wireless technology will be released as a mainstream technical solution in the coming years. This technology will continue to increase speeds of wireless network access in the 5GHz range, although the advances of its technology can only be realized with upgraded WAPs and wireless cards in laptops. Since the technology uses the 5GHz transmission, the distances served by these WAPs will be shorter, thereby requiring a review of WAP placement and density. As these new WAPs are made available, CLPCCD ITS will analyze the distribution of service to best augment or replace the existing wireless technologies.
- **Enhanced security** – As wireless usage continues to growth, enhanced security and protective measures are required. Wireless users all operate together on a common network for the campus. Wireless users are vulnerable to being hacked by a peer wireless computer, who may be using the network for disruptive purposes. Using authentication and monitoring tools described later in Section 7 that can track wireless activity in more detail, CLPCCD ITS will be able to ensure a high performing and secure wireless experience for users.

5.0 WIDE AREA NETWORK AND INTERNET CONNECTIVITY

As a multi-site entity, connectivity between CLPCCD campuses for server and Internet access is an essential network service. In 2005, data center services and Internet connectivity were centralized at the Chabot campus. LPC and District Office users were reliant on Wide Area Network (WAN) T-1 connections for access to Chabot for data center services supporting the district-wide enterprise systems. A T-1 connection offered speeds of 1.5 Mbps, or 1/10th of the speed of the campus network. Using the T-1s was the only option available for site-to-site connectivity in 2005.

Internet connectivity also initially consisted of a single access through the Chabot campus. Using Measure B Bond funds, CLPCCD ITS was able to steadily enhance the connection methods and speeds, to provide continued improvement to access of network resources.

5.1 CLPCCD Site-to-Site WAN Connectivity

CLPCCD ITS initially supported limited bandwidth site-to-site connectivity determined by the T-1 speed. As network activity increased at each site, CLPCCD ITS was able to incrementally add connections and redundancy to the WAN topology.

Connection	2005	2007
Chabot to LPC	3 x T-1 (4.5 Mbps)	
Chabot to District	1 x T-1 (1.5 Mbps)	2 x T-1 (3 Mbps) *
District to LPC (redundant link to Chabot)	1 x T-1 (1.5 Mbps)	

* This 2007 increase was needed because of the increased server usage between Chabot and other campuses related to the Facility Bond files and databases. This also facilitated the use of network IP cameras which were monitoring construction, and showing other sites real-time progress for the first project of the Chabot Pool renovation.

As server usage and file sharing between the campuses increased, it became apparent that more upgrades were needed. In 2008, CLPCCD ITS upgraded the WAN router infrastructure to be able to support the AT&T OPT-E-MAN Ethernet service. These connections far exceed the bandwidth offered by multiple T-1 connections, with a simplicity of operation and upgrade. CLPCCD ITS deployed and upgraded OPT-E-MAN from 2008 to 2010 as follows:

Connection	2008	2009	2010
Chabot	20 Mbps	20 Mbps	20 Mbps
District (Franklin)	10 Mbps	10 Mbps	10 Mbps *
Dublin (District)	-	10 Mbps	10 Mbps
LPC	10 Mbps	10 Mbps	50 Mbps (expanded due to the relocation of the District Data Center to LPC)

* The OPT-E-MAN connection from the previous District Office at Franklin will be discontinued when that location is vacated after One-Stop moves out.

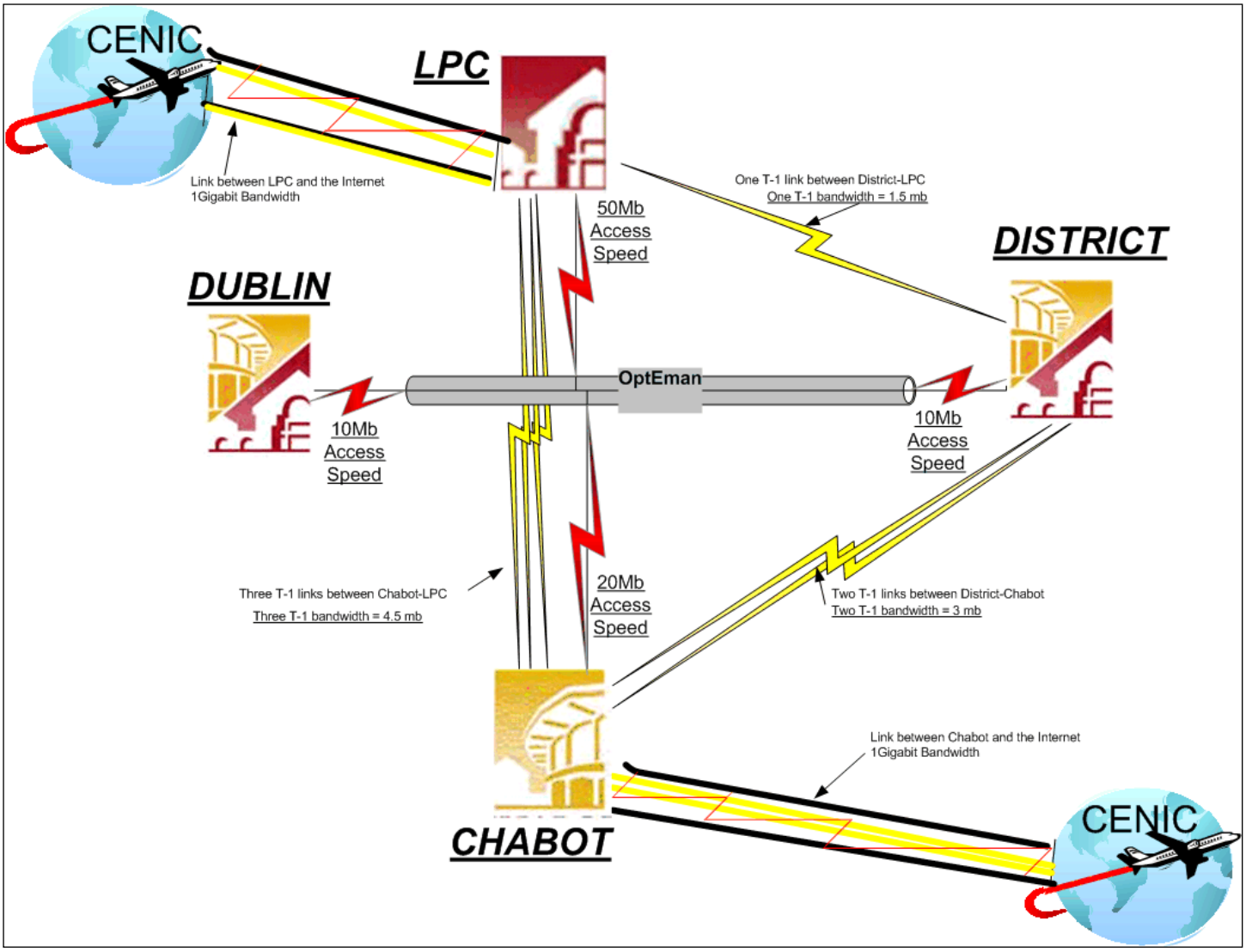
The migration to OPT-E-MAN from the T-1 services increased the connectivity speeds as follows:

- **Chabot** campus connection increased **four-fold**.
- **LPC** connectivity increased **five-fold** (due to the District Data Center at LPC).
- **District** Office site connection increased **three-fold**.

Obviously with the OPT-E-MAN installation, significant improvement in access speed was immediately observed at Chabot, LPC, and District sites.

Besides the increased access speed, OPT-E-MAN has other advantages and offers easier deployment and upgrades. T-1 orders typically would take 4-6 week lead times with costly installation rates and onsite technician time, whereas OPT-E-MAN upgrades could be executed in a matter of days as a software change in AT&T's network. Increasing OPT-E-MAN bandwidth does not require additional hardware for CLPCCD routers, unlike T-1 connections where ports had to be added for each incremental T-1. Because OPT-E-MAN connections are deployed on fiber connections to AT&T, OPT-E-MAN also offers a more stable and consistent bandwidth, leading to fewer outages and less maintenance time.

In 2010, the OPT-E-MAN bandwidth increase at LPC was implemented to support the move of the District ITS Data Center from Chabot to LPC. Chabot's bandwidth remained at 20 Mbps to facilitate the fast response to the Chabot campus from District Data Center servers. The current CLPCCD WAN topology is shown in the following diagram.



"CURRENT CLPCCD WAN TOPOLOGY"

In addition to the primary OPT-E-MAN connections, there are existing T-1s that are maintained as failover/backup to the OPT-E-MAN service. In the event of an OPT-E-MAN failure, traffic can be redirected to the T-1s. This would be a substantial decrease in bandwidth, but connectivity could be maintained until services were restored. The T-1s also provide a means of redirecting particular traffic, such as video streaming, so that network traffic does not impact production traffic over the OPT-E-MAN.

As network connectivity requirements expand, CLPCCD ITS will continue to monitor the OPT-E-MAN performance with average usage shown in the following chart.

Location	OPT-E-MAN Speed	Daily Average Usage
Chabot	20 Mbps	40% or 8 Mbps
Las Positas	50 Mbps	20% or 11.6 Mbps
Dublin (District)	10 Mbps	40% or 4 Mbps

It is evident that there is still capacity for growth as can be seen from the statistical averages that show the typical usage of the OPT-E-MAN connections.

Next Steps and Future Projects

As needed, OPT-E-MAN can be expanded incrementally to a maximum of 1Gbps, allowing substantial bandwidth between the CLPCCD sites. Compared to the 20Mb for Chabot or 50Mb for LPC bandwidth in use today, OPT-E-MAN can provide a 20-fold increase in performance, when needed by District and College applications.

CLPCCD ITS will continue to keep abreast of the technology advances for WAN connectivity. Where new offerings will provide improved performance and stability to the campuses, those will be deployed. This may include increases to the OPT-E-MAN bandwidth or future replacement technology offered by AT&T.

5.2 CENIC Internet Connectivity

A critical resource for CLPCCD students and staff is the connection to Internet servers and web sites. Provisioned through the direction of the State Chancellor's office, CENIC (*Corporation for Education Network Initiatives in California*) designs, implements, and operates CalREN, the California Research and Education Network, a high-bandwidth, high-capacity Internet network specially designed to meet the requirements of community colleges and universities. CENIC is CLPCCD's Internet Service Provider (ISP). The CENIC services is not funded by the Measure B Bond, but is funded by the State Chancellor's office for all California colleges. The CENIC services are included here in this document in order to provide a complete view of the CLPCCD WAN services.

Early in the provisioning of CENIC Internet connections, CLPCCD was allowed a single DS3 (45Mbps) connection to the Internet. This was hosted at Chabot campus. Because of the network growth at LPC, it became increasingly clear that LPC needed its own Internet connection. For a number of years, CLPCCD ITS funded the provisioning of an AT&T Internet connection at LPC. This consisted of two T-1s bonded together for a total of 3Mb access to the Internet.

Realizing that Internet needs would continue to grow at LPC, in 2005, CLPCCD ITS was able to work with the State Chancellor's office for the installation of a separate DS-3 (45Mb) for the LPC campus. This was a substantial milestone, since up to that point, the State Chancellor's office only allowed one point of CENIC connection for multi-campus college districts. The new

LPC Internet connection immediately provided performance improvements to the LPC students accessing Internet resources for their studies.

As Internet usage continued to escalate at all colleges and universities, the State Chancellor's office, in conjunction with CENIC, upgraded the Internet connectivity to Gigabit speeds in 2008. That represented a **twenty-fold increase in capacity** for each college. The average Internet usage is shown below:

Location	GIGAMAN Speed	Daily Average Usage
Chabot *	1 Gbps	20% or 200 Mbps
Las Positas	1 Gbps	30% or 300 Mbps

* The District Office Internet usage from the Dublin Site routes through Chabot's Internet connection.

While current usage does not reach the capacity available, CLPCCD closely monitors the Internet usage for planning purposes, and will take the appropriate action to expand the connectivity as increased usage warrants it.

Next Steps and Future Projects

For Internet connectivity, CLPCCD ITS will keep pace with any new offerings from CENIC. CENIC is currently planning for deployments of 100G backbone connectivity to early adopters in 2013. First deployed to large university campuses, CLPCCD can expect the general distribution of 100G Internet connections will be made available to community colleges in the coming few years. At that time, CLPCCD ITS will work with CENIC for necessary firewall and network equipment upgrades to be able to take advantage of the increased speeds to the Internet.

6.0 DESKTOP AND SERVER STANDARDIZATION

Prior to the bond, CLPCCD District ITS and College Technology groups operated autonomously for the selection and procurement of Desktops and Servers. This led to a mix of vendors, parts and suppliers. A substantial support effort was required to maintain desktops with a variety of CPU chips, disk drives, keyboards and interface cards. Because purchasing was performed separately for each location's equipment, CLPCCD could not take advantage of the discount rate that applies to bulk purchases of computer equipment.

6.1 Desktop Procurements

At the beginning of the Measure B Bond in 2005, the desktop platforms in place at Chabot College were distributed as follows:

Users	Quantity of Systems
Instructional	907
Administrative	241

At that time, the current industry standard for desktops was P4 systems. **Only 27% (that is 310 units out of 1,148 total units) of the desktops in use at the Chabot campus were considered "current" and the rest (73%) of the desktops were an old or obsolete model.**

A similar situation was present at Las Positas College in 2005.

Users	Quantity of Systems
Instructional	1117
Administrative	199

Only 18% (that is 237 units out of 1,316 total units) of the desktops in use at the Las Positas campus were considered "current" technology and the rest (82%) of the desktops were an old or obsolete model.

The Measure B Bond funding allowed the procurement and ongoing maintenance of new desktop systems, such that now **100% of all** systems are maintained at current technology. Bond budgetary estimates were based on a specific quantity of computers that would be replaced on a schedule. It became apparent early in the analysis, that the growth through building modernization and new construction would demand the installation of many more desktops than had been estimated in the initial bond planning. As a result, a four-year cycle for replacement of desktops was established.

CLPCCD District ITS spearheaded the effort to bring campus and district resources together to accomplish the following:

- Establish defined desktop standards that were accepted and deployed across all CLPCCD sites.
- Joint-bid for desktop procurement, thereby leveraging greater quantities of desktops purchased to gain larger discounts from the suppliers.
- Maximize the quantities of desktops that could be procured by embracing a four-year Life Cycle.
- Desktops may be replaced in a shorter timeframe, if the increased capabilities of the new systems were required by staff and students for the support of new or existing programs.

These efforts yielded positive results in allowing CLPCCD and the colleges to procure and support high-performing PC standards that satisfied all desktop requirements. Standards were established for Windows and Macintosh desktops and laptops.

Three Windows PC bids and one Apple PC bid have been conducted to-date. The vendor results of the bid awards were:

Timeframe	**Successful Bidder**	**Brand**
May 2005	Gateway	Gateway
May 2005	Apple	Apple
October 2006	Gateway	Gateway
April 2009	Atacom	H-P

Desktops were deployed on a four-year life cycle per the following schedule:

Campus	**Cycle**	**Quantity**	**Cycle**	**Quantity**
Chabot	2005-6	400	2009-10	420
	2006-7	400	2010-11	450
	2007-8	400	2011-12	495
	2008-9	400	2012-13	580
Total		**1600**		**1945**
LPC	2005-6	300	2009-10	450
	2006-7	325	2010-11	400
	2007-8	300	2011-12	325
	2008-9	250	2012-13	275
Total		**1175**		**1450**

As technology has progressed, the desktop/laptop standards have been updated and are posted on the college websites. The key standards for desktops and laptops include:

Standard 1: PC Desktop Baseline Standard (Mini-Tower)
Standard 2: PC Desktop Baseline Standard (Small Form Factor)
Standard 3: PC Desktop Baseline Standard (Ultra-Slim)
Standard 4: Performance PC Desktop Baseline Standard
Standard 5: Laptop Standard

Standards 1, 2 and 3 are composed of similar hardware, but are selected in different form factors based on whether they are deployed to labs, offices or other environments. Standard 4 selects a higher performing processor and video card, for enhanced processing of Engineering/CAD applications.

Next Steps

In the industry, models of desktop computers are enhanced and improved every 3-6 months. While the standards listed above represented the minimum standard as dictated by the bids, the more recent rollouts may have included desktops with higher capacities and capabilities, according to the college program needs. These standards are scheduled for review for the next bid, in particular to support Windows 7. Since 2013 begins the third full cycle of desktop deployments, CLPCCD District ITS and College Technology staff will prepare a fourth public bid in the Fall 2013, for the procurement of new computers that will address the four-year rollout for 2014/2015/2016/2017.

In addition, virtual desktop implementations are underway. Chabot College has implemented a computer lab, based on a Tangent VDI system that controls and downloads the operating system and application environment to the lab desktops. This allows a standardization of functionality and consistency of operation in the labs. The virtual desktop environment will be expanded to other labs as appropriate.

Laptops are still being utilized by faculty for instructional purposes and by staff for remote access. Therefore, laptops that provide a comprehensive suite of software will continue to be used where appropriate. The newer IPADs have been used effectively in some instructional areas such as Fitness that is integrated with the exercise equipment and the Chabot Nursing program that is adopted within the skills labs. Other disciplines are using the IPAD technology and many more disciplines are beginning to add this device to their programs. CLPCCD ITS coordinates with the various departments to provide security protection for these portable devices. Since the IPADs usage is increasing, CLPCCD ITS is implementing a wireless projection system for the IPADs and other vendor comparable tablet devices within selected classrooms in Fall 2013.

Future Projects

Since application software continues to require more memory, disk, CPU and video-demands on the desktop hardware, an ongoing cycle of desktop replacement is necessary. However, a parallel move to browser-based software applications is introducing the mobile, tablet and BYOD (Bring Your Own Device) computers for student use. The application usage of student BYOD devices need to be evaluated based on application performance and security. A smart-phone might be able to do a limited Internet search or email. Similarly, tablets and low-end laptops may be useful for viewing mail or taking notes in a class, but cannot support intensive science or programming applications. To ensure proper performance and availability of licensed

applications, the campuses will continue to deploy specialized computer labs which provide the software and hardware required by the instructional programs.

6.2 Servers

Like the Desktop environment, in 2005, the Windows and Novell server platforms were sourced from many manufacturers and suppliers. Servers were maintained in-house by CLPCCD District and College Technology staff, with little vendor support. Because of the variety of hardware, it was time-consuming and challenging to maintain the necessary uptime demanded by students and faculty. Servers hosted critical applications for instruction in specific departments and curriculum such as Linux, Oracle/IIS, Physics, and Library access (Sirsi). Servers also provided general applications for College websites, printing, email, file sharing, anti-virus distribution and SARS (appointments and attendance).

In 2005, the following server distribution was in place:

Location	**Number of Servers**	**Platforms**
Chabot	12	Windows 2003, Windows 2000, Mac OS
Las Positas	8	Linux, Windows 2000

In a process similar to the Desktop standardization, CLPCCD District and College Technology staff worked together to assess and select a common platform for server technology. Hewlett-Packard server platforms were selected as the platform standard in 2006. Two server standards currently being utilized include:

> Standard 1: Low-End server for standalone applications, 2 CPUs with 2GB memory per processor, RAID 1 disk.
> Standard 2: High-End server with 2 CPUs and 4 GB memory per processor, RAID 5 disk.

All servers are configured with redundant power supplies, 10/100/1000 Network Interface cards, and sufficient disk for the application that will be run on the server. The standards above are the minimum configurations. Dependent on the application system needs running on the servers, the memory and disk capacity are increased accordingly.

These standards are continually enhanced with hardware improvements by the manufacturer. Servers procured most recently included two processors, 16 Gb of memory and up to 8x450MB of disk space.

As servers were subsequently upgraded and/or removed from service, College Technology staff were able to move to a standard for performance and functionality. The current installation of servers is as follows:

Site	Server Function	Site	Server Function
Chabot	DDNS/DHCP/AD (2)	**LPC**	AD, Imaging
	Systems Control Center		DDNS/DHCP/AD, Pixie boot, AntiVirus
	Faculty File services		DDNS/DHCP/AD, Web JetAdmin, AntiVirus
	Print Services		AMAG (Security)
	SARS Track		Outside DNS services
	CCS File and Inventory Services		AD, Ricoh Print Services, file services
	IIS/Esars		Web server, FTP, outside DNS
	Dentrix		Esars and SARS CALL
	NAV12.1/AutoDesk		AD, file services
	Print Services		AD, file services
	GHT Images		AD, System Config Manager
	Mac Images		Elumen SLO software
	Tightrope		AD
	AMAG (Security)		AD, print services
	WEBS client		WEBS client (security)
	BlackBoard Archives		ATI, SARS
	XenServer, VDIManager, PxeServer		File servers for photo and video
	Web server (security)		MAC boot services and imaging
	Library Database Proxy Server		911
	Linux Server for CS		Imaging
	AVST		Imaging
	Avaya AMS		Various Test Servers
	Phone System		
	911		
	Various Test Servers		
Total	**30**	**Total**	**22**

Next Steps

Many of the servers listed above are ready for the next generation of upgrades. With the evolution of server technology, the architecture of dedicated servers for dedicated application has been replaced with multi-processor, storage area network (SAN) technologies and VMWare virtual hosting. This allows for pooling of the hardware resources to more fully utilize the capabilities of the systems as optimized between different applications that reside on the platform. Servers now reside in a "virtual" environment, rather than on an individual physical chassis. The server pooling allows for more efficient CPU, memory and hardware utilization.

This often results in lowered power and HVAC consumption, thereby allowing a more "green" and efficient operating environment within the District Data Center and server rooms.

CLPCCD District ITS has already deployed blade server hardware for its mass emailing application as described in Section 9. Projects to implement server virtualization are underway for College servers at both campuses.

Future Projects

The evolution of the SAN/Virtual server architecture will continue to demand the following enhancements:

- Additional acquisition of new multi-processor server hardware with large (multi-TB), fiber connected high-capacity storage area network systems (SAN).
- Integration with high-bandwidth (multi-10G) network connections to the District Data Center and campus core switches.
- Transition of servers from physical to virtual (P2V) environments.
- Validation and balancing of application performance across "virtual" servers.
- Provisioning of backup, failover and redundant systems for continuous uptime of the virtual environment.

While this new architecture provides advantages in server operation and deployment, CLPCCD ITS will need to employ sophisticated monitoring tools to ensure the efficient and high-performing operation of the server environment.

6.3 Peripheral Equipment

CLPCCD ITS has moved to an environment of networked print and multi-function devices. This allows the users to take advantage of the advanced functionality offered by larger and more sophisticated devices, while CLPCCD can standardize on hardware platforms, consumables, drivers and support. The standard for networked printers is Hewlett-Packard and the latest copiers also provide print capabilities district-wide.

The most recent copier bid was awarded to Ricoh. Currently buildings on campus are equipped with Ricoh copiers in workrooms and supply areas. Users are able to print to the copiers over the network and then retrieve their hardcopy. The Ricoh copiers also have scanning capabilities where images are directly stored to users' network drives.

Next Steps and Future Projects

By moving to centralized copiers and networked printers, CLPCCD ITS has been able to reduce the cost and variety of consumables, as well as printing and scanning hardware. As advances are made available with new models of copiers and printers, CLPCCD ITS will deploy the new technology to the campuses.

7.0 NETWORK FIREWALL, SECURITY AND MANAGEMENT

In addition to provisioning of the network connectivity, CLPCCD ITS is responsible for the daily monitoring of network access and network security. As Internet usage increases, so does the possibility of network attacks from viruses and outside hackers. CLPCCD ITS uses network firewall and monitoring tools which have been updated to current standards to keep pace with the ever changing activity on the campus networks through Measure B Bond funding.

7.1 Network Firewalls

A critical component of network security is the network firewall, which limits traffic access to and from different parts of the network. CLPCCD firewalls provide the following functions:

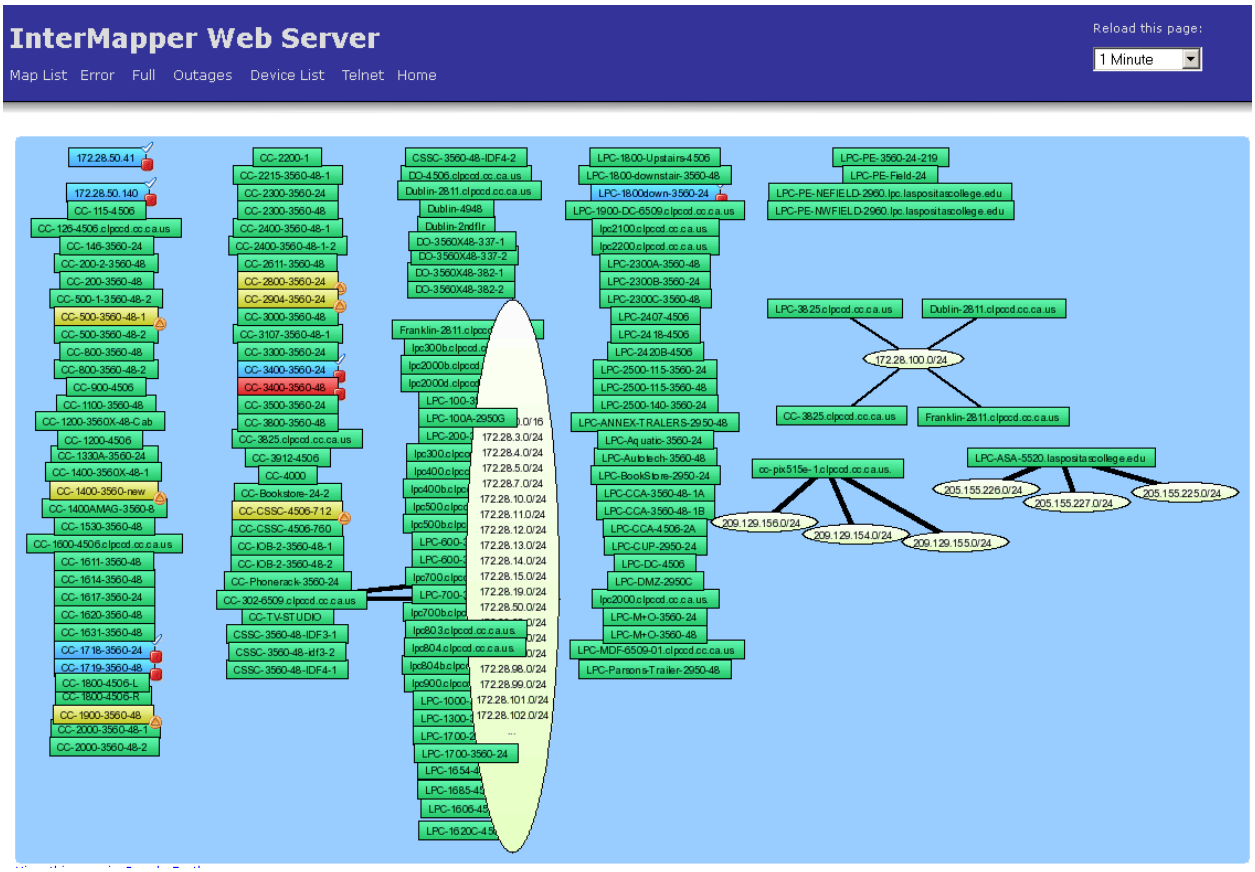
- Allow the inbound access from the Internet to servers that provide web or other functions accessed by the public. The level and type of access is determined in conjunction with the application software and security configurations on the server(s).
- Protect servers and desktops in CLPCCD campus networks from Internet sources which try to connect to the CLPCCD network.
- Provide VPN (Virtual Private Network) access from computers in home and other remote locations. These connections are provided for a limited number of staff for the purposes of monitoring and emergency response to critical services on campus.
- Log all inbound/outbound Internet traffic of the CLPCCD server and desktops, so that a complete profile of access to Internet resources is archived.

Like the network switches, CLPCCD ITS has standardized on Cisco-brand firewall equipment. In 2005, the network used one firewall at Chabot College where there was only one connection to the CENIC Internet. As one of the first Measure B Bond projects, CLPCCD ITS migrated its obsolete firewalls at Chabot and LPC Colleges to updated Cisco PIX technology. These were implemented in a failover pair, with one pair of firewalls at the Chabot CENIC Internet connection, and another pair of firewalls at the Las Positas Internet connection. Failover firewalls allow the immediate and non-disruptive transition from the primary firewall to the secondary firewall should a software or hardware error occur on the primary firewall. These firewalls improved the access speeds and security for Internet access. As network traffic and CENIC Internet speeds increased, CLPCCD ITS performed a second firewall upgrade in 2009 to Cisco ASA 5520 devices. The ASA firewalls were equipped with Gigabit interfaces to allow CLPCCD campuses to take advantage of the increased Internet connection speeds of 1 gigabit as provided by CENIC in 2008.

7.2 Log Management and Traffic Monitoring

An important element of ongoing network security is the monitoring and interpretation of traffic and event logs. CLPCCD ITS has deployed a number of different products for log management and traffic monitoring. For an overview of activity on the network, the Intermapper software

polls the network devices and maintains a view of connectivity. Simplistically, the graphics represent basic states of the network devices: green for "normal function", red for "down", and yellow for "potential problems". This software also alerts staff by email or pager when failures have occurred, so restorative action can be taken.



An additional function of Intermapper is the ability to graph bandwidth usage. It is extremely important that CLPCCD ITS monitors the "normal" network traffic and be aware of traffic bandwidth usage increases that occur as additional desktops and servers are added to the network. These bandwidth trends help CLPCCD ITS plan for network growth commensurate with usage.

An additional use of the bandwidth graphs is the quick identification of traffic abnormalities such as high peaks of usage. Abnormal peaks, particularly in the evening or weekend, that are not due to regular ITS server activity, could indicate a virus or intrusion to the network. By accruing the history of normal traffic usage, it is very easy to review current or historical traffic that might identify inappropriate computer use in and out of normal school hours.

For greater detail, firewall logs can be an important source of information to pinpoint unusual traffic patterns due to unacceptable use. CLPCCD ITS has used a variety of tools in the past to archive and report on the more detailed network statistics available from firewall logs. Measure

B funding has allowed the updating of these tools to current standards. CLPCCD ITS uses the ManageEngine Firewall Analyzer for real-time and archived reporting and analysis of traffic to the Internet.

These tools are customized to identify network attacks and unacceptable use. Common occurrences of unacceptable use can include email spam attacks, illegal upload/download of electronic media, Denial of Service attacks and virus attacks. Typically, this network activity originates from a computer on the campus network with destinations out on the Internet. Detailed reporting and alerting from these tools allow CLPCCD ITS to quickly identify the location of a network attack to mitigate the effects and stop the attack.

Next Steps

As Internet usage increases, the network firewalls will need to continue to perform at speeds demanded by the network traffic. Currently the firewalls can support the Internet usage. However, as the Internet access nears the CENIC maximum speed of 1 Gbps, the firewall will need to be upgraded to be able to operate at those higher speeds. With that hardware upgrade will come more sophisticated operating systems that better control and manage firewall traffic.

As hacker activity becomes more sophisticated, CLPCCD ITS needs to be equipped with comparable tools to monitor and detect intrusions. Intrusion Prevention tools consist of the appliances that monitor network traffic and identify malicious activities such as viruses, malware, and other network attacks. The system, not only identifies these attacks, but will also proactively log the activity, prevent, block, and stop any attacks, and safeguard the rest of the network. The Intrusion Prevention systems then alert CLPCCD ITS personnel of the intrusion for further investigation. CLPCCD ITS is evaluating tools available from different sources to see which system can offer the best performance for the campus network environment.

Future Projects

CLPCCD ITS rigorously maintains virus checking and provides frequent updates on its desktops and laptops to prevent the intrusion of malware and viruses into the campus networks. With the propensity of Bring Your Own Device (BYOD) on the campuses, the campus networks are now being used by devices that may not have been adequately maintained. Few users are knowledgeable enough to perform operating system and anti-virus updates and patches, and be aware if those updates have failed. CLPCCD's network and desktops can become susceptible to viruses and attacks from these BYOD devices that could come to campus with viruses or malware that the owners are not aware of.

A Network Access Control (NAC) solution operates on the network to interrogate and analyze BYOD devices as they log on to the network. A NAC server can look for acceptable levels of operating system and anti-virus updates and patches, so that CLPCCD can be confident that the device is not infected. If the device does not meet the appropriate standards, it is "quarantined" from the network until it is appropriately updated. NAC applies to any device that logs on to the CLPCCD networks. That typically includes laptops, tablets and IPads. Smart Phones usually

use the carriers 3G or 4G network, instead of the campus data network, although more recent models of smart phones can switch to an available wireless data network if it senses one nearby. NAC solutions work with any device attaching to the CLPCCD wired or wireless network.

NAC can also be integrated to CLPCCD authentication servers, so that users can log on with their existing passwords, be tracked and be granted access to the appropriate network VLAN for connectivity commensurate with their credentials. NAC solutions will provide CLPCCD with increased knowledge of what type of BYOD devices are using the campus networks, and confidence that those BYOD devices will not infect or otherwise harm the campus desktops and servers.

8.0 SMART CLASSROOM / TECHNOLOGY ENHANCED LEARNING

In early deployments before Bond Measure B, Instructional Technology Smart-Carts were commonly used in classrooms. This typically included a projector, computer and VHS player on a rolling cart. Instructors would have to schedule the cart to be brought to the classroom at the time of the class, a technician would then have to get it setup before class, and the instructor was still limited to whatever equipment was on the cart. This wasted valuable time and resources, and it was also not very versatile when it came to facilitating the use of new instructional content.

As classrooms began to be equipped with Audio Visual (AV) technology, it was not uncommon for instructors to find themselves on a campus that have classrooms stocked with many different looks, layouts, and equipment. It was very frustrating for an instructor to become familiar with the equipment in one classroom, and then move to another and have no idea how to operate the controls because everything is completely different.

As instructors began developing curriculum that made use of multi-media sources, the need for standardized, technology enhanced classrooms became more prevalent than ever before. Computer labs, lecture style classrooms and even hybrid lecture/computer labs all have requirements for technology enhanced learning. With the Measure B Bond, all classrooms labs, and other teaching spaces were targeted for upgrade to "smart classrooms" for technology enhanced learning. Currently, all "smart classrooms" are standardized throughout the campuses. Prior to the Bond Measure B, Chabot had limited "smart classroom" capability which has grown substantially over the past several years resulting in all classrooms containing the newer technology. For Las Positas, the "smart classrooms" were in place, but the AV equipment was upgraded in all classrooms to the newer technology standards.

8.1 Standardization for Smart Classroom and Technology Enhanced Learning Environments

CLPCCD ITS has customized standards to address different levels of technology to meet the needs of targeted areas. This allows College Technology staff to better manage the technology, and it creates a consistent learning environment for the students and instructors.

The current CLPCCD standard classrooms are equipped with computer, laptop connection, Internet and campus network access, wireless access points, document cameras, projectors, switching units, DVD/VHS player and a variety of other audio/video connections that provide faculty many options when it comes to delivering rich multimedia content to their students. These classrooms have also been equipped with consideration for disabled students with the availability of Assistive Listening devices, Closed Caption devices, amplification, speakers and microphones, where needed.

Classroom design requirements have led to multiple levels of standardization at the colleges:

- Standard 1 – Basic Audio/Visual Classrooms
- Standard 2 – Pro Audio/Visual Classroom
- Standard 3 – Lecture / Computer Labs
- Standard 4 – Theater / Auditorium
- Standard 5 – PolyCom Video Conferencing

The types of hardware provided for these standards include:

Standard 1 – Pixie + Basic System for Basic A/V Classroom.

This standard includes a Pixie + Controller, Screen, Projector, Document Camera, VCR/DVD Combo, and Speakers. A laptop or desktop computer may be provided.

Standard 2 – Pixie Pro System for Pro A/V Classroom

This standard includes the devices in Standard 1, but add a more sophisticated controller and switcher for enhanced video control and display. This equipment is typically housed in a custom rack in the instructor's desk.

Standard 3 – Lecture / Computer Labs

Computer labs and combination lecture/computer lab rooms are often customized according to purpose. Typically, computer labs include multiple screens that can each show different content with more sophisticated switchers to control multiple input sources and output destinations.

Standard 4 – Lecture / Auditorium

Lecture rooms and auditoriums are usually customized according to size and purpose. This may include multiple lecturn locations where presenters can control AV input/output as needed by the style of the lecture. Customized lighting to provide the best possible viewing experience is typical. Some rooms may be equipped with camera locations for recording and transmission of the lectures. Larger lecture halls typically have an associated control room where AV technical personnel can operate recording equipment. Each of these rooms is custom designed according to the defined requirements.

Campus deployments of these different AV standards include:

Location	Standard 1 Basic	Standard 2 Pro	Standard 3 Computer Lab	Standard 4 Auditorium
Chabot	0	125	15	4
Las Positas	35	30	28	1
District	2	-	-	1 (Board Room)

Standard 5 – PolyCom Video Conferencing

In addition to the standard audio visual configuration for smart classrooms, CLPCCD utilizes the standard PolyCom Video Conferencing equipment which is found in specific disciplines for the primary mode of instruction as well as in general areas for conferences and meetings district-wide. For the customized program at Chabot College, the Nursing program uses a specialized distance learning environment based on video conferencing equipment in their classrooms. Polycom video conferencing systems communicate to comparable Valley Care Medical systems in Livermore using a dedicated T-1 connection. This allows bi-directional instruction so that students at Chabot College can be instructed by Valley Care Medical staff, and Valley Care Medical staff can learn from Chabot College instructors. The video conferencing system transmits room views, Powerpoint presentations, documents, videos and demonstrations of techniques and procedures. This system is used daily for classes and is an essential technology tool for the execution of the successful nursing program.

Other AV deployments

In addition to the classroom and lecture environments, CLPCCD ITS has deployed AV technology in meeting rooms, which use the same components as the classroom technology, including projector, screens, and laptop connections. Depending on the room size, the screens may be replaced with large LCD Displays for an enhanced clarity of image for smaller group meetings.

Next Steps and Future Projects

An upgrade to the Polycom Video Conferencing equipment used to support the Chabot Nursing program is in progress and scheduled to be completed in Summer 2013. An additional classroom for the Skills Lab will be added to the Nursing program, bringing the total to three classrooms at Chabot and two classrooms at Valley Care Medical. For the Chabot Nursing program in partnership with the Valley Care Medical, the usage of T-1's for connectivity has been adequate for the amount of traffic currently utilized for this program. However, CLPCCD ITS will evaluate within the next year the benefits of transitioning these specialized T-1s to an additional Opt-E-Man connection in our WAN environment to take advantage of future increases in speed with minimal interruption to make that transition.

With the continued expansion of Distance Education courses at the colleges, the computerized facilities have become an integral part of the student experience. CLPCCD continues to utilize the Blackboard Learning Management System (LMS) at both colleges for both fully online and hybrid course models, of which the number of courses increases substantially with each new year. In coordination with college faculty, CLPCCD will evaluate other LMS options in the next couple of years and assess the benefits of functionality, the cost savings, and the conversion impacts in comparison to the existing Blackboard solution. In addition to Blackboard, the ability to broadcast on-going teaching sessions to the Web in "live" streaming mode would provide another forum to provide distance education to students. Technology improvements will be

implemented district-wide in the next 3 years to handle video on demand as well as streaming multi-way audio for faculty and students with connectivity through the Web. These streaming audio and video facilities will provide the forum for desktop videoconferencing in the future without needing to go to special facilities for such services.

As with computer technology, audio-visual technology is constantly changing and enhancing the standards for performance and resolution. The Computer Technology staff provides a standard set of capabilities in each classroom, and takes advantage of system and equipment enhancements as they come available.

Next-generation AV systems will be evaluated for incorporation into the campus classrooms and generation of new standards. Current AV systems installation has largely been funded through the Facilities Modernization program in conjunction with building remodels. However, the Facilities funding was limited only to the initial AV installs and did not address replacement upgrades of the AV equipment in accordance with the equipment life cycle. As with most technology items, equipment is continuously evolving. In the coming years, smart classroom technology will need to be upgraded to take advantage of new features and capabilities that improve the technology-enhanced learning experience. **These required AV equipment upgrades will need to be scoped and funded by the Bond Technology budget of CLPCCD ITS for the specific College classrooms rather than the Facilities budgets as was done for the original installations.**

9.0 INFORMATION TECHNOLOGY (IT) BUILDING AND SERVER ROOMS

For many years, the CLPCCD District Data Center was housed in a room in B300 at Chabot Campus. With the growth of application servers, this room became too small and underpowered to continue housing the District Data Center. In the Measure B Bond, a project was scoped to build a new B1900 IT Building at the Las Positas Campus.

In preparation for the building design, CLPCCD ITS worked with LPC Technology staff to scope the requirements of the building. This included:

- Number and type of offices, power and voice/data connectivity required in each office.
- Identification of supplementary spaces, i.e. training room and meeting space.
- Size, layout, power, HVAC and fire suppression requirements of District Administrative and LPC Instructional Computer rooms.
- Configuration of technical support spaces such as Test Labs and the Network room.
- Identification of improvements to the LPC Campus MPOE/MDF building (now called B1900A), including HVAC control, humidity control, power, fire suppression, control and monitoring.
- Definition of security requirements for the facility.
- Scoping of uptime requirements for correct provisioning of the UPS and generator support.
- Design of redundant building connectivity to maximize uptime in the event of a cabling failure.

These details were documented and provided to the design team for the Basis of Design, and subsequently enhanced during the building design process. The LPC IT Building (B1900) completed substantial construction in December of 2009, as a 10,200 square foot facility serving both CLPCCD District ITS and LPC Technology. The final Data Center relocation was completed in April of 2010 during spring break, to minimize service disruption to the District Enterprise Systems.

9.1 Server Room Facilities

The design of the District and LPC Instructional server rooms involved the careful analysis of existing servers, applications and services, and the forward-looking approach to new technologies and requirements of the college users. The server rooms were designed as follows:

District Administrative Computer room – This room was sized to house the Enterprise Banner servers and all District Linux, Novell and Windows servers supporting the District applications. Designed in a hot-aisle/cold aisle configuration to maximize the effectiveness of the 24x7 HVAC, this room houses three rows of servers with a total of 18 server racks, with possible expansion to a fourth row and six more racks. Each rack is provisioned with cabling infrastructure to patch servers directly to the core switch in the

Network room. For power, each rack is provisioned with an intelligent power strip for server connections, power monitoring and staged turn-on. The room is configured with cable runway above each existing and future server cabinet row, to allow for each cable routing, or the provisioning of supplemental fiber/copper cords.

LPC Instructional Computer room – This room was designed to house the Linux and Windows servers that support the instructional technology on the LPC campus. There are six server racks, in two rows of three racks, arranged in a hot-aisle/cold aisle configuration, with 24x7 HVAC control. As in the Administrative Computer room, this room is provisioned with cabling infrastructure, an intelligent power strip and cable runway to each rack.

The Network and Server rooms are equipped with the Inergen fire suppression system. The Inergen is controlled in three zones: Administrative Computer room, Network room and LPC Server room. Building 1900A, which houses the campus MPOE and MDF, has its own separate Inergen system and zone.

9.2 Power and HVAC Systems Fail-Safe Operation

The IT Building 1900 and Building 1900A has been equipped with new Eaton Powerware UPS systems for power-protection. Three UPS units to power the Enterprise server, Administrative and LPC Servers and the B1900A telephone and data components are installed. These UPS systems are all powered by a 400 kVA Backup Generator. The Generator is housed in the lot immediately beside the IT building. A 400 gallon fuel tank feeds the generator. In the event of a power failure, an automatic transfer switch (ATS) initiates the generator to start. The generator is fully running to supply power to the UPS systems in less than 60 seconds. The fuel tank is sized to support the fully deployed Network and Computer rooms.

The Heating, Ventilating and Air Conditions (HVAC) systems for the network and server rooms in the IT building were designed for functionality and failover. The HVAC systems consist of primary and secondary air handler units (AHU) for redundancy/failover. In addition to the Primary and Secondary AHU systems, a ceiling mounted HVAC system is installed in the Administrative Computer room to provide additional cooling directed towards the IBM Enterprise Servers air intake vents. The Central Utility Plant (CUP) is equipped with a primary and secondary pump/chiller to provide water to the HVAC systems in the IT Building. If the CUP systems fail, the IT Building is equipped with a Backup Chiller which automatically initiates into service to feed the IT Building HVAC. Except for planned power outage needed for maintenance and/or construction, the Backup Chiller does not run regularly, although the Backup Chiller is capable of sustained operation to run the IT Building HVAC, if required.

In the MPOE/MDF room in Building 1900A, a series of new HVAC units are installed. This consists of a 10 ton unit and two five (5) ton units provide airflow directed at the MDF end of the building. In the event of a failure of one of the units, the remaining units can continue to provide cooling to building, while repairs are initiated. These systems operate independently of the CUP.

There are several levels of control and monitoring to provide detailed problem identification and quick resolution. The points of monitoring include the electrical panels, UPSes, Building Security, Server room heat, and general EMS monitoring using the campus Allerton system. CLPCCD M&O and CLPCCD District ITS are contacted for problem resolution. In the event that the problem cannot be corrected, District ITS then performs a rapid shut down of the servers and equipment. This allows for quick response and for service restoration to problem events.

9.3 IT Building Security

The IT Building is provisioned with multiple levels of security to ensure a well-protected environment suitable to the critical nature of equipment and resources in the building. Since the exterior doors are always locked, staff who work in the building are issued personalized access cards to use with card readers on the exterior doors. Access into the server and network rooms requires two-factor authentication using an authorized card and a matching pin. Video cameras are installed at the outside entrances and the interior hallways. The security is based on the AMAG ACAMS system that is monitored by Campus Police. During off-hours, alerts are real-time monitored for intrusive activity, and also coupled to the temperature sensors in the server rooms in the event of HVAC issues.

9.4 IT Building District Administrative Servers

CLPCCD District ITS maintains servers that include all the enterprise servers that support the common district-wide application systems, including Banner System services, other third party systems that support Academic and Student Services, Email, File Sharing, DNS, DHCP, and Web applications. Beginning in 2005, the District maintained 29 servers, and now the number of current servers is 64 servers, including primary and secondary servers.

The list of current District Administrative servers which support access to the Banner Enterprise system and other common district-wide applications has expanded to include:

Function	**Servers**
Banner Administrative System	IBM (2), INB (5), BW (2)
Email	GroupWise (4), Calendaring, Mail Gateway (2), Spam filtering, Blackberry, Email Relay (15)
File Services	LPC (3), ITS
Backup and Distribution	Backup (4), Distribution (2)
Web and FTP	Web (2), FTP
Admin Applications	Degreeworks, CPS, MAPS, CollegeNet, BDMS
Network Services	Monitoring (4), HelpDesk, DNS/DHCP
Test and Redundancy/Failover	Various (7)
Total	**64 servers**

These servers are housed in the Administrative Computer room at the IT Building 1900. The Administrative Computer room has the ability to support redundant servers so that when hardware upgrades are being staged, both new and old hardware can be supported online, thereby enabling a smooth migration.

9.5 Chabot Server Room

The District Administrative Computer systems were formerly housed in a small server room on the Chabot campus. The room was limited in the space and power available for servers. With the relocation of the District servers to the LPC IT Building, it was possible to renovate the Chabot server room to better support campus server resources.

During the modernization project for Chabot B300, the existing server and network rooms were redesigned and upgraded to include the following:

- Installation of six (6) new server racks/cabinets to house Chabot College and District site-specific servers. Provisioning of cable runway and patch panels to each server rack.
- Installation of new, larger HVAC for server room temperature control.
- Installation of new power distribution to each server rack.
- Installation of new racking and cable runway for the adjacent MDF/network room.
- Provisioning of new 40KVA UPS for server and network room equipment.
- Provisioning of new generator for server and network room equipment, lighting and HVAC.
- Provisioning of new Inergen system for fire suppression of server room and adjacent ITS offices.

At the conclusion of the modernization project, these rooms were capable of sustaining the Chabot campus servers and data connectivity, with capacity for growth.

CLPCCD District ITS supports several remote servers at the Chabot campus to provide services specific for that location, as shown below.

Function	**Servers**
Email	GroupWise (2)
File Services	Chabot (2)
Backup Servers	Backup
Network Services	DNS (2)
Total	**7 servers**

In addition to the B300 server/network room improvements described above, CLPCCD ITS was able to remove and repurpose the smaller 30KVA UPS previously used for the server room, by installing it to support the electrical requirements in the B200 MPOE room. This provided improved uptime to the PBX telephone system and Internet connectivity equipment housed in that room.

9.6 Dublin Server Room

For the District office users, a number of servers are maintained at the District Office location. In February 2013, the CLPCCD District office relocated to new facilities in Dublin. This included a new server room which was built to include:

- Installation of three (3) new server racks/cabinets to house District site-specific servers. Provisioning of cable runway and patch panels to each server rack. Design allows the installation of one (1) additional server rack for future applications.
- Provisioning of HVAC for server room temperature control.
- Provisioning of power distribution to each server rack. UPSes are installed at the base of each rack, and provisioned with an intelligent power distribution strip for server connectivity.
- As a multi-tenant building, this server room was not able to be provisioned with generator capability.

CLPCCD District ITS supports several remote servers at the District office location to provide services specific for that site, as shown below.

Function	**Servers**
Email	GroupWise
File Services	District (2)
Application Server	Facilities, Development
Total	**5 servers**

Next Steps and Future Projects

The construction and modernization projects that have been described have vastly improved the Server and Network facilities at the CLPCCD Sites. The majority of critical systems now run in state-of-the-art facilities, with UPS and generator backup. CLPCCD ITS plans within the next year to install additional blade server systems and new SAN devices for storage of images for the Banner Document Management System and other new applications.

An area targeted for future improvement is the Chabot B200 Main Telephone room (MPOE). While the new UPS system improved the uptime of the B200 MPOE, telephone systems and Internet connectivity, it does not provide for continuous uptime during long-duration power outages. In addition, the MPOE in this building provides connectivity to the copper voice backbones for all buildings on campus. Space is limited for future expansion, and legacy, unused terminations which could free up wall space would be extremely costly to remove. In addition to growing the size of this room, the B200 MPOE room will require improvements in the electrical/HVAC system to support additional planned connectivity, and automatic transition to a stand-by generator for uptime during prolonged outages. These requirements need to be considered in detail, along with other renovations of the B200 building, such that telephone and Internet connectivity is continuously maintained to the Chabot campus in the event of a long outage.

10.0 DISASTER PREVENTION AND RECOVERY

CLPCCD District ITS provides the resources to ensure that all students within the District have access to Information Technology Services (ITS) computing resources on a 24x7 basis. with as close to 99.99% uptime as possible. In October of 2010, CLPCCD District ITS in coordination with College Technology staff, created the *"Information Technology Services Disaster Recovery Plan"* document to protect and safeguard the District's Information Technology resources to include the network infrastructure, servers, applications, and data. A brief summary of some of the major steps taken for the recovery and restoration of mission critical services is provided below. The Disaster Recovery items described in this section pertain to Information Technology resources hosted at Chabot College, Las Positas College and the Dublin site where the CLPCCD District Office and Contract Education reside.

10.1 Disaster Prevention and Recovery of the Banner Enterprise Server

CLPCCD utilizes Ellucian (formerly Sungard SCT) Banner as the core administrative Enterprise Resource Planning (ERP) system. Banner supports applications for Student Services, Academic Services, Financial Aid, Finance, Human Resources, and Payroll functions within the district. Banner utilizes Oracle as the database engine. As part of the 2010 move to the new Data Center in the LPC IT Building, two new IBM servers were purchased and installed in the Administrative Server room. Hardware and software configurations are replicated so either server can operate as the primary Enterprise server, with the other server functioning as a failover server. Vision Solutions software, Echo Cluster and Echo Stream, was installed to provide software replication of the ERP production software.

Oracle database and user data that is stored on the primary server's mirrored disk drives is duplicated on the second server. Redundant disk controllers, disk power supplies, I/O channels, and Ethernet interfaces have been implemented. Dataguard has been installed to provide automatic database shadowing and replication between the two IBM servers. In the event of a failure on the primary server, CLPCCD ITS can switch over to the backup server with a minimum of data loss. Further, the IBM includes a self-diagnosis and monitoring feature that warns of impending hardware problems, thereby averting a disaster and allowing for scheduled, non-disruptive maintenance.

In addition to the primary IBM Enterprise servers, the Banner System includes other supplemental servers for self-service CLASS-Web services, "the ZONE" Portal access and Internet Native Banner (INB) form access. The servers hosting the CLASS-Web and INB applications are architected with hardware redundancy including dual network cards, dual power supplies and disk mirror/RAID. For application redundancy, multiple servers are built and running each application. In the event of an unexpected failure, backup servers can be swapped out as needed to fully restore these specific Banner services. In times of high application usage, these backup servers can also be brought into service for load sharing.

10.2 Additional Administrative Servers

Additional Administrative servers provide distributed file, print, World Wide Web, Intranet, extranet, e-mail, collaboration, data archival, virus protection, and business and student administrative services for the staff and faculty. Similar to the INB/CLASS-Web servers, the other administrative servers are architected with hardware redundancy including dual network cards, dual power supplies and multiple disk drives using a minimum of RAID 5. If one hard disk fails, it can be replaced without bringing the server down.

10.3 Backup Systems

A comprehensive backup solution is essential in ensuring timely recovery of critical user information in the event of accidental deletion, hard drive crashes and corruption, security breaches, and natural disasters. The CLPCCD backup strategy uses a multi-tiered approach including disk-to-disk, disk-to-tape and offsite storage of backups. This enhances backup performance and optimizes recoverability when restoration is required.

10.4 Network Redundancy and Recovery

Chabot and LPC campus LANs use Cisco routing and switching products to serve as the respective core campus network backbones. This offers best-in-class capability and exceptional manufacturer's support. The standardization of command access for configuration and maintenance allows for consistency of operation.

For the firewalls, core campus LAN routers and switches, Cisco SMARTNET maintenance agreement has been purchased to provide 24x7, 4 hour response time to replace failed hardware components. For the smaller building closet switches, ample spare parts are available and ready to be deployed as necessary.

Next Steps and Future Projects

As new server and network technology is selected and deployed, a prioritization on architecture choices that support redundancy and failover will be maintained. This will allow CLPCCD ITS to select solutions that can be deployed and operated with as close to 100% uptime as possible.

CLPCCD ITS will institute additional advanced switching features to further protect the network security and to further improve the network performance. Advanced features such as Quality of Service (QoS) and security parameters are important design requirements to support high quality video conferencing, responsive administrative and educational application access, and reduce the impact of worms and viruses.

11.0 TELEPHONE CONNECTIVITY

The new construction and building growth at Chabot and Las Positas Colleges expanded the number of classrooms, conference rooms and offices. An increase in the connectivity requirements to the current telephone systems had to parallel this growth, requiring the addition of telephone extensions, voicemail boxes and cabling. CLPCCD District ITS has been very instrumental in working with College Technology staff for the expansion of telephone connectivity at each campus.

11.1 Cabling Infrastructure

As part of the CLPCCD Cabling Infrastructure standard, CLPCCD ITS defined the design and construction of voice station outlets and backbone cabling. Similar to the data cabling standard, CLPCCD ITS also documented the standards for the copper cabling topology and pair counts for new and modernized buildings. In the new cabling standard, all copper backbone cabling routes back to the Main Telephone room (MPOE) at each site, thereby providing high quality dedicated pairs to the site telephone switch. In keeping with industry standards, all cables are fuse-protected at each end to reduce and eliminate electrical failures that could damage the telephone switch or handsets. With standardized installation, the deployment of telephone connectivity has now become routine and consistent, thereby reducing time and effort for adds, moves and changes.

CLPCCD ITS has also worked with College Technology staff to upgrade the design of the site Main Telephone rooms (MPOEs). This has included additional racking, cable runway, grounding, wire management, and improved power/UPS and air conditioning. The rooms are now redesigned to allow for more efficient use of space, more connectivity and easier access to equipment.

11.2 Chabot College Telephone Equipment

In 2005, Chabot College had a Fujitsu telephone system for telephone connectivity to the campus, with a remote Fujitsu system in B1400 to support that quadrant of the campus. At that time, the Fujitsu system was considered an old system with limited features and functions. Performance was poor and telephone availability was compromised with frequent outages. While locally supported, the Fujitsu system was limited in its expandability, and could not support the additional growth required by the Measure B planned construction.

With the failing hardware, Chabot College needed to move towards a current technology telephone system. A technology solution that allowed new Avaya telephone systems to integrate to the old Fujitsu hardware was selected. This integration allowed the gradual migration of the telephones off the old Fujitsu system, as the new Avaya system expanded. Installed in the B200 MPOE, the new Avaya S8300 system was initially configured for support of the IOB and CSSC

building connections. Subsequent piecemeal additions allowed the connectivity to other modernized buildings, including B1900, B2200, B300, B500, B800 and B900.

With the construction of the B1400 building in 2011, another major change occurred. The remote Fujitsu system was removed from service and the Avaya system was upgraded to an S8800 to support the new connectivity requirements. This was the second phase of migration off the old Fujitsu hardware to the new Avaya system. This substantially decreased the number of users remaining on the old Fujitsu hardware. Telephone connectivity was centralized to the main Avaya system in B200.

The last phase in the telephone system upgrade was accomplished in April 2013. The remaining 135 telephones were moved over to the Avaya system. Chabot College was able to decommission the Fujitsu system and be fully supported on the Avaya system across the entire campus. The gradual migration in this three-phase approach executed in parallel with different construction projects proved to be an excellent path to modernize Chabot's telephone system as funding became available.

11.3 Las Positas Telephone Equipment

Las Positas purchased a Siemens HiCom 300 system many years ago. At that time, the system supported the existing campus telephones, with another 50% expansion capability. As Measure B construction projects have added new buildings to the campus, additional telephones have been installed in the new classrooms and offices. The telephone system is now currently configured at nearly 100% of its capacity.

The HiCom system is a discontinued product for Siemens, and support and parts are becoming increasingly more difficult each year. Las Positas is able to support the current connectivity requirements on this system up to the completion of the SSA building, but very little expansion is available for additional connectivity after that. Since the system cannot be expanded significantly, the next step is to consider a complete replacement of the telephone system, as was done at Chabot.

11.4 District Office Telephone Equipment

The District Office Telephone system was a smaller model Fujitsu system, that piggy-backed onto the Chabot College System for voicemail access. This system suffered similar performance and uptime issues as Chabot's system.

With the move to the new Dublin District Office site in February 2013, a new Avaya system was deployed for District Office voice connectivity. This new Avaya system was based on the same hardware and vendor support as the Chabot system. The District office Avaya system is reliant on the Chabot system for voicemail and campus telephone connectivity. Because the same model of Avaya is used at both the District office and Chabot, this allowed seamless integration in the same manner as the previous Fujitsu systems. The old Fujitsu system remains in place at

the previous Franklin location, providing limited dial-tone to the OneStop users, until that location is fully closed.

Next Steps

Chabot College and the District office are suitably equipped for telephone and voicemail service in the years to come. Since the LPC telephone system is at critical capacity, the following activity is planned for 2014:

1) Research technology alternatives for a replacement telephone system.
2) Structure a phased implementation that can be managed as a successful rollout.
3) Bid and select a technology solution for the next generation telephones on the LPC campus.

Future Projects

In the industry, the technology development and telephone system growth paths are towards Voice over IP phone systems (VoIP). In current telephone system at each campus, the telephones connect using dedicated wires, or twisted pair cables, with one pair of cables used for each telephone. Power and voice signals are sent over those cables. This connection is completely independent of the data network. With IP telephony, the telephones plug into the data network over the Ethernet cabling, just like the computer.

The new Avaya telephone equipment purchased for the Chabot and District sites are VoIP ready, in the event that CLPCCD goes in this direction in the future. Implementing VoIP telephones has a substantial impact on the network and campus operation that must be carefully considered.

- Currently, the telephones are powered by the centralized telephone system in the campus MPOEs. In the event of a power failure, the telephones will continue to work for 4 to 8 hours, depending on the number of telephones being used. With VoIP, the telephones are connected through the network switches. The network switches are not equipped with UPSes and turn off when the power goes out, thereby powering down the VoIP telephones. The cost of purchasing UPSes and installing them with the network switches must be considered.
- VoIP telephones are powered by Power-over-Ethernet (PoE) ports on the network switches. These are special ports, not required for computer connectivity. CLPCCD would need to purchase new switches for the network to provide sufficient PoE ports for the number of telephones needed in each building.
- Since VoIP telephones use a data connection, many existing buildings that have old, limited data cabling would need to be rewired for VoIP telephones.

CLPCCD needs to carefully consider the design and implementation of any telephone upgrades that would introduce VoIP telephone connections. The current Measure B bond funding did not include budget for any telephone system upgrades since the phone responsibility back in 2004 did not belong to the Information Technology groups, but rather this function was part of the

Maintenance & Operations group. Therefore, the funding was not adequate to embark on the transition to VOIP for the telephone systems, nor was there any functional need at the colleges that warrants this type of change. In addition, nor was funding of POE devices and UPSes for all network switches across all buildings on the campuses considered part of the upgrade or funding for the Data Network switch upgrades. Implementing VoIP technology requires joint maintenance by data and telephony staff. Transitioning to VOIP must be done district-wide at all sites due to the complexity of the centralized infrastructure changes and the impact on the technical staff support. Therefore, all discussions concerning VoIP telephone system upgrades and its potential impact on the budget, data network and staffing must include careful planning at the District and College level.

12.0 CAMPUS SECURITY - ACCESS CONTROL AND MONITORING

Measure B building construction and modernization has allowed CLPCCD to equip the campuses with new and sophisticated security systems and capabilities. Initial planning for these security enhancements was performed in 2005 with the assistance of the security consultant, Catalyst Consulting Group. Catalyst authored the Security Master Plans (SMP) for each college, which covered campus risks, mitigation and security goals and technology/operational recommendations to address these items. The District ITS and the College IT groups supported the technology aspects of the security project, as related to the data network and server infrastructure.

CLPCCD ITS participated in the discussions of the Security Master Planning (SMP), to provide input on the technology solutions which were being recommended as part of the overall security solution. The SMP called for a technology solution that consisted of network connected security panels in each building that talk to the building devices (door locks, card readers, motion detectors, cameras, etc.) and communicate over the data network to a centralized server where the logs of activity, video and the security database would be housed. AMAG was selected as the manufacturer of choice and standard for CLPCCD campuses.

12.1 Access Control and Video Surveillance - AMAG

For the AMAG solution deployment, CLPCCD ITS has participated in two design elements:
1) the network configuration required to support the connectivity of the security devices and
2) the performance impact of the additional security traffic to the existing campus data networks.

The AMAG solution was deployed to the LPC campus in 2007 for initial installation in the Pool building. Chabot College installed their AMAG system in 2008, with a separate server on their campus to control devices on the Chabot Campus. As each new building project occurred on each campus, the local AMAG server for the campus was expanded to control the new building devices. A comprehensive campus upgrade project occurred at each campus to equip the buildings that were not being modernized or replaced. Currently all buildings are connected with AMAG security panels in the buildings for access control, with a distribution of cameras for limited surveillance. The CLPCCD District office is also equipped with access control managed by the LPC AMAG server across the data network.

For the network configuration, CLPCCD ITS has configured a separate part of the network, or VLAN for the security devices. This communicates over the same wires and network equipment as all the other traffic on campus, but the separate security VLAN isolates the security equipment from general traffic on the rest of the network. This allows for better protection of the traffic from the security server to the security control panels in each building.

To ensure appropriate performance, CLPCCD ITS has examined the traffic volume and frequency on the network. The AMAG security control panels provided small communication

packets to the centralized server at each campus that transmit information about to whom and when access is permitted. During the business day, the messages of users accessing buildings are displayed on Campus Safety desktops which are also logged to the AMAG server.

A different type of security traffic is sent across the data network from the cameras and surveillance system. Video streaming from numerous cameras had the potential to contend for network bandwidth and slow down access to mission-critical servers. Recent AMAG technology changes now require the use of IP cameras which real-time stream to the AMAG server and its storage devices. With over 150 cameras deployed at Chabot, and 88 cameras at LPC, the volume of streaming video traffic can have a significant impact and cause bottlenecks and slow-downs for the security monitoring. Each campus uses a large screen monitoring console to display small video frames from assorted campus cameras.

On the campuses, the ongoing maintenance (patches, backups, etc.) of the AMAG servers is the responsibility of the respective College Technology departments. As needed, third party contractors have been engaged to assist with upgrades and configuration changes on the AMAG application server.

Next Steps and Future Projects

As the campus continues with renovations and new construction, additional connections for cameras and security panels will be added to the AMAG server. The evolution of camera technology to higher resolution-lower bandwidth video will continue to improve surveillance technology. Access control and alerting will largely be defined by future enhancements of the AMAG software.

College Technology staff will continue in its role to support the security server hardware and operation. District ITS' monitoring of the network traffic generated by security devices will ensure that proper prioritization of traffic maintains appropriate response times and bandwidth usage.

13.0 SOFTWARE APPLICATION SYSTEMS

Although much of the Measure B Bond funding was utilized for a variety of hardware devices with device specific software, there were specific software Application Systems that were planned and purchased under Measure B funding to improve the instructional environment for faculty and students as well as to benefit the administrative resources. These software systems were installed as part of facilities construction activity and/or as part of the network infrastructure innovations. A brief description of these software implementations with the current status follows.

13.1 Banner Document Management System (BDMS)

A centralized Banner Document Management System (BDMS) was installed for storage and retrieval of electronic documents for all departments throughout the colleges and district in order to migrate to a paperless environment where appropriate. This type of Document Imaging system will reduce facility space for file storage and archives and will automate the manual processes in all the business areas of the college and district. Some of the areas that will benefit most from the Document Imaging software are those that handle transcripts, admissions materials and checklist items, financial aid documents and tracking, finance invoices, purchase orders, human resource applications, and employee files.

The Banner Document Management System was selected due to the extensive functionality and flexibility as well as its integration with our existing Banner Student Information System. The BDMS System replaces the outdated and limited ATIFiler System that was utilized previously for many years by Admissions & Records at both colleges for the scanning of the transcripts received from other institutions. This BDMS system is not a standalone system like ATIFiler, but the BDMS module is an integral part of the Banner system and contains automatic links within the Banner System to view or modify the documents directly. BDMS has automatic links established within Banner for Admissions &Records, Financial Aid, Finance, Purchasing, Human Resources, and Payroll. However, the software requirement is not limited to the Banner system functions only, but has the capability to be extended to any area of the college or district where storage of digital media is required.

As of May 2013, Chabot College Admissions & Records has completed their conversion from the ATIFiler System to the new BDMS, which included 1.8M images, and they are now live on the System. In addition, Las Positas Financial Aid has been live on the BDMS System over the past year for their electronic documents for the new aid-year. Las Positas Admissions & Records is in the process of completing their conversion from the older ATIFiler System, which is scheduled to be live as of July 2013. Business Services that includes both Purchasing and Accounting are in the process of training to use the BDMS System during the Summer 2013 as they proceed to archive their paper documents. Other departments will be added to the BDMS System by the end of this calendar year, starting with Chabot Financial Aid and followed by Human Resources.

13.2 Banner Mobile Applications

A recent addition to the Banner Enterprise Suite of products, which migrates CLPCCD to the new mobile infrastructure capabilities, is the Mobile Applications module which provides inquiry features for primary CLASS-Web functions such as Courses and Grades. The Banner vendor has provided these base Mobile functions through a "cloud" technology, which facilitates the implementation of any new upgrades to the module for more inquiry features or future update functions. District ITS was able to negotiate with the vendor to waive the license fee for this Mobile product and be charged only for the standard maintenance fee similar to other Banner products.

The Mobile Applications will be released to students, faculty, and staff in the upcoming Fall 2013 term. End users simply select the Ellucian Mobile app from the app store of their choice, confirm the institution they want, and download a solution that is personalized to that institution. The initial release of the Mobile Applications will include the following menu options on the Smart phones, both for Iphones and Androids: Contact Us, Class Schedules, Grades, Holds, Zonemail, Faculty Directory, Blackboard, Campus Map, Event Calendar, Facebook, News, Twitter, Bart, and Wheels. As the Ellucian vendor expands the available functions on the Mobile Applications, District ITS will roll out these new changes.

13.3 College Net Room Scheduling System (R25)

An automated Room Scheduling System was installed at CLPCCD that also interfaces with our Banner Student Information System to provide class schedules and room assignments along with events activities. The CollegeNet R25 System is an automated academic and events scheduling software that provides online real-time management of the facility utilization throughout the campuses. In addition to the facility benefits, the Room Scheduling will enable the colleges to increase enrollments by maximizing the space on campus. The inventory capabilities for the rooms will also ensure that the right equipment is available for all the disciplines. The automated system optimizes campus facility use by comparing section/classroom scenarios, assigning classes to rooms, producing detail reports of the results, and providing "what if" simulations for planning purposes.

The Academic Services staffs at both colleges have used the class schedules for the instructional courses with automatic interface to the Banner System for the past several years. In order to have a comprehensive view of the entire campus room utilization, Academic Services is waiting for the college groups who schedule events at both colleges to fully utilize the system for events as well as courses. The colleges are in the process of working with the various groups that handle events for the campus to transition within the next year from their paper based system to the automated events features provided by the College Net System. With both Academics and Events online, users can fully utilize the R25 module for Resource changes and the S25 module for recommended Schedule changes.

13.4 Luminis Web Portal – The Zone

As part of the infrastructure improvements, a Luminis portal that is a part of the Banner Enterprise System was implemented several years ago to provide centralized access to the district-wide enterprise systems with single sign-on capabilities for Banner and other systems such as Blackboard. The Luminis portal product contains the automatic links to all the Banner modules as well as provides the tools to setup links to any other Web based applications, thus creating a unified digital campus. In general, portals make information, services, communication, and collaboration easily accessible to constituents anytime and anywhere, which in turn improves the institution's efficiency and staff productivity.

For CLPCCD, the Luminis portal is called "The Zone" and provides custom views for students, faculty, and staff to view information that is pertinent to their roles within the colleges. The system provides student email to all students using Gmail as the backend, which is called Zonemail at CLPCCD. The Zonemail is utilized to send electronic correspondence to students in place of hard copy mailers. Students use Zonemail for their online Waitlist for courses that they want to register for. The College Admissions & Records and Financial Aid departments use Zonemail to notify students of important deadlines or information requiring their action. The Zone portal has other features available such as targeted announcements and Group Studio that provides shared communication for clubs and committees.

13.5 Banner Enrollment Management Suite and Advancement Module (for Alumni)

For the instructional and student services improvements, the Banner Enrollment Management Suite was selected to give better visibility on the enrollment trends, student course needs, and alumni tracking. These integrated Banner modules provide a comprehensive web-based Enrollment management solution for prospective students, admitted/matriculated students, and alumni. These software modules will track marketing contacts, recruitment efforts, enrollment projections, and retention with the objective to support outreach, advertising, and marketing efforts district-wide. This software suite contains Argos reporting and analytic tools that include data views, data warehouse, and analytic capabilities for usage with the Enrollment management modules. The Argos reporting tool is also used for the other standard Banner modules already installed at CLPCCD such as Student, Finance, Financial Aid, Human Resources, and Payroll.

An Advancement module was also purchased with this suite and addresses the Foundation business used by the colleges in coordination with the alumni information. This Banner Advancement module will address the alumni association, parent, trustee, and friends to procure funding for programs and projects. It records contacts, fund raising goals, information on the foundation and organizational donors, campaigns, and gifts.

The Enrollment Management suite of products is not installed as of yet due to the magnitude of the college resources required across both campuses to implement the system since it impacts all departments across the district. The colleges are currently involved with other higher priority projects for new automation in their environment such as the Document Management System,

Degree Works, and Electronic Transcripts. It is anticipated that activity will begin on this Enrollment Management suite in late 2014 following the live implementation of these projects and the critical Student Success Task Force initiative.

13.6 Web for Faculty Self Service (Class-Web)

For more on-line features for students and faculty, the Web for Faculty Self Service system was installed which allowed faculty to use the Web for key functions on the Banner System. These included student grade rosters, student grades, and grade posting. The Web for Faculty module provides online services to faculty for entering grades, viewing course rosters, managing course enrollments, viewing course loads and schedules, customized "drop" sheets, and Mid-term Progress report. Query functions and Web for Employee features were also included when the Web for Faculty was implemented several years ago.

13.7 Hardware and Software Multi-Year Maintenance Agreements

The District Data Center resides in the Information Technology (IT) Building at Las Positas College which was Measure B funded and all hardware and software supporting the District Enterprise Systems is an integral part of that IT Building. All the Enterprise servers used to support the enterprise software is maintained under a centralized network infrastructure within the IT Building, all of which was Bond funded.

As the District researched new alternatives for cost savings in light of the current State budget situation, all software and hardware maintenance contracts that were funded by the District were evaluated and vendors were contacted to determine what multi-year options were available. Hardware and software products that meet the Bond criteria were purchased with Measure B funds. Included with the initial hardware and software purchases is maintenance for a specified period which varies depending on the vendor. With the current economic situation, vendors were more open to extending longer term maintenance agreements to their customers, which lock in the maintenance costs at pricing that provides significant savings to the customer by avoiding the yearly increases which can vary year to year. Therefore, all equipment within the District Data Center and software residing on that equipment was reviewed for multi-year maintenance contracts.

As part of the facility project for the Information Technology (IT) Building at the Las Positas campus that houses the District Data Center, hardware and software upgrades for the district-wide enterprise systems were done and extended maintenance contracts were negotiated with vendors for 4 to 5 years. These extended contracts provided significant discounts to the district as well as transferred costs from the operational budgets to the Bond budgets, which was critical during our restricted budget situations.

As of May 2013, the savings to-date for these extended vendor agreements were $720K per year or $3.5M total for the five year period, which ends in fiscal year 2015-2016. An additional savings of $655K will be realized for the Blackboard, Library System, and the Ricoh Copier Software, which will bring the final savings total to $4.2M for the period from 2010 through

2015. All these Bond expenditures were reviewed by the Audit team and by legal and they were deemed as valid expenses for Bond funding. These extended maintenance agreements are included in the Bond Technology Cost Summary charts in Section 14 under two funds for 551010 for the District IT Hardware/Software and 551017 for the specific college enterprise systems like Blackboard and the Library Systems.

13.8 Other Software Application Systems (Not Bond Funded)

There are numerous other software application systems that have been implemented at CLPCCD district-wide for the colleges and district which are not part of the Measure B Bond. The application systems mentioned above are just the short list of products that qualified for Bond funding. The District ITS Strategic Plan, which is posted on the district website under "Technology Services", contains the comprehensive list with descriptions of the CLPCCD Application Systems implemented during the period since 2007 that were being done concurrent with the Bond Measure B activity. In spite of the state budget situation over the past few years, CLPCCD is strategically in a very good position since we already purchased new software needed for the current priority development projects so that implementations can proceed as planned. A brief list of all the Banner and Third Party System projects that the District ITS staff has completed or is currently implementing is provided in "Appendix A".

14.0 BOND TECHNOLOGY COST SUMMARY

The Measure B Bond projects contain new construction projects or facility renovations that require technology improvements in the data network and computer equipment. The new technology improvements required to support this facility activity are addressed in two parts. The first part includes technology changes related to the facility structure such as fiber optic wiring and conduit between buildings required for the District networking infrastructure. These types of costs have been incorporated in the facility costs for all the college buildings for both renovations as well as new structures since these improvements are an integral part of the building structure or are in the ground surrounding the building. The second part includes classroom equipment, network devices, communication equipment to support data, video, or voice, and all technology advancements that support the instructional environment. These types of costs are either segregated to the specific college under the category "Computers & Equipment" or aggregated for shared network and communication equipment under the "Technology Upgrades" category for both colleges. This second part are the types of innovations that are included in the Bond Technology funds for Measure B and are centrally managed by the District's Chief Technology Officer.

The following charts provide the Bond Measure B budgets and expenses for all the Technology improvements made throughout the colleges and district from 2005 to the present as of May 2013. The Technology Bond budgets include several Bond funds which separate the costs for district infrastructure and enterprise expenses, Chabot campus specific technology expenses, Las Positas campus specific technology expenses, and other funds for extended hardware/software maintenance agreements or other unique hardware/software expenses. These costs relate to all the Information Technology projects as described in Sections 1 through 13 which identify the scope of the technology improvements. The remaining funds balance is being utilized to execute the **"Next Steps"** projects within the next 3-4 years. In addition, these remaining funds may be able to address some portion of the **"Future Projects"** that are identified as still critical to the colleges' operation and have not been addressed through a facility renovation or construction project, which is how the major cabling and building connectivity deficiencies have been done previously due to the cost efficiencies.

The two types of cost charts provided on pages 65-66 include:

(1) **"Bond Technology Budgets and Expenses by Funds for All Sites"**
(2) **"Bond Technology Costs by Category for All Funds and Sites"**

There is a need to clarify some of the cost categories that may have had low volume in the earlier years of the Bond activity, but will now increase in volume to provide technology enhancements to areas of the two college campuses that have not as of yet been renovated with more modern facilities where the new technology standards are built in as part of the new construction. For example, all the desktop costs for the 4-year life cycle replacements are included in the Bond Technology costs, both for initial new computers and for replacement computers. However, the

audio visual equipment costs for new buildings or renovated buildings were initially part of the FFE Facility funding as planned. As the Smart Classroom configurations require upgrades and replacements as part of the standard life cycle improvements, all these subsequent audio visual costs will need to be funded by the CLPCCD ITS funds as is appropriate. Besides the Audio Visual, the cabling costs have been covered by the Facilities funding as new or renovated facilities are completed. However, as the facility activity decreases, there will be deficiencies in cabling still left in the older buildings and these will need to be remedied in order to take advantage of the expanded bandwidth and increased wireless capability. Therefore, the costs to-date within the Technology funding for these "Audio Visual" and "Cabling" categories have been low volume, but these costs will increase significantly over the next 3-4 years to address the critical needs of the colleges for instruction in these technology enhanced learning environments. Besides these two categories of costs, Audio Visual and Cabling, there will be a focus on implementing Video-Streaming capabilities for both colleges to be utilized for the instructional programs where appropriate and this will require continued upgrades to the network infrastructure as bandwidth gets saturated and access speeds get impacted. In addition, expansion of the wireless, both inside classrooms and extensions to the outside areas, will also continue to be a major emphasis to provide more comprehensive service for the mobile and BYOD devices.

It should be noted that most of the technology upgrades and additions to the college campuses over the past several years have been funded by the Bond Measure B. Due to state budget issues, the operational funds for technology at both the colleges and district have been reduced substantially. Only those few products that were not eligible for bond funding remained in the operational budgets. Therefore, it is imperative to continue to utilize the balance of the Bond Technology funding prudently and strategically as the District ITS and College IT staffs have been doing in order to achieve the most technology advancements possible with these limited remaining funds. CLPCCD ITS has successfully utilized the Bond Technology dollars in order to perform the necessary replacements and upgrades of equipment to modernize our instructional environment campus-wide. Once the Bond Technology funding is all spent, then the college and district operational funds for technology will need to be increased to cover these technology costs in the future.

CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT

BOND TECHNOLOGY (IT) BUDGETS AND EXPENSES
BY FUNDS FOR ALL SITES

AS OF MAY 31, 2013

Fund	Fund Title	Current Budget	Total Expenses to Date	Available Balance	Percent Expended
551010	Information Technology & Tech Upgrades, District & Both Colleges	11,860,677.37	7,790,782.77	4,069,894.60	66%
551011	Classroom, Lab Equipment, Chabot College	11,738,117.63	5,624,622.10	6,113,495.53	48%
551012	Classroom, Lab Equipment, Las Positas College	8,315,719.96	4,979,261.65	3,336,458.31	60%
551013	District ITS Data Center Upgrade	17,269.28	17,269.28	0.00	100%
551015	Sungard Enrollment Management Suite	675,728.00	675,728.00	0.00	100%
551016	IBM Enterprise Server-Sungard Banner System	472,724.22	472,724.22	0.00	100%
551017	Enterprise Hardware/Software - Blackboard, Library, Copiers	1,309,808.00	655,113.01	654,694.99	50%
	TOTAL COSTS FOR ALL BOND "TECHNOLOGY" FUNDS	34,390,044.46	20,215,501.03	14,174,543.43	59%
	OTHER BOND FUNDS FOR IT BUILDING AND COPIERS				
	CONSTRUCTION FOR NEW DISTRICT DATA CENTER - APRIL 2010				
	(Funding part of Facilities not Technology Equipment Fund)				
553850	District- wide Information Technology Building at LPC	7,138,685.37	6,869,220.08	269,465.29	96%
	RICOH COPIER EQUIPMENT WITH COPY, PRINT, SCAN FEATURES				
551055	District- wide Multi-Function Copier Equipment	803,468.00	803,468.00	0.00	100%

CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT

BOND TECHNOLOGY (IT) COSTS
BY CATEGORY FOR ALL FUNDS AND SITES

AS OF MAY 31, 2013

Item No.	Category Title	Chabot	Las Positas	District	Total All Sites	Percent
1	Network Equipment - Routers/Switches/Connectivity	620,000.00	475,158.00	1,453,376.61	2,548,534.61	13%
2	Other Network Devices - Firewalls, Wireless, Network Monitoring Tools	53,870.80	82,405.00	436,503.31	572,779.11	3%
3	Cabling (Supplemental to Facilities)	110,078.00	67,031.00	53,580.00	230,689.00	1%
4	Installation/Implementation/Integration Services	81,951.40	7,600.00	1,245,543.40	1,335,094.80	7%
5	Desktops (PCs,MACs) and Laptops/Tablets	3,768,137.00	3,629,818.00	77,975.00	7,475,930.00	37%
6	Software (Facility or Infrastructure Related)	19,692.00	10,561.00	1,484,601.74	1,514,854.74	7%
7	Audio Visual (Supplemental to Facilities FFE)	172,411.90	201,072.65	69,721.00	443,205.55	2%
8	Servers (Enterprise and College Specific)	196,221.00	277,285.00	943,261.68	1,416,767.68	7%
9	Printers	152,284.00	92,363.00	12,374.00	257,021.00	1%
10	Telecommunications (Telephone)	304,622.00	83,165.00	3,371.54	391,158.54	2%
11	Multi-Year Maintenance Agreements (5 years) and Enterprise Systems	-	-	3,597,991.00	3,597,991.00	18%
12	Other Peripheral Equipment (UPS, GoPrint, Equipment Components/Racks)	145,354.00	52,803.00	233,318.00	431,475.00	2%
	TOTAL COSTS FOR ALL BOND "TECHNOLOGY" CATEGORIES	5,624,622.10	4,979,261.65	9,611,617.28	20,215,501.03	

15.0 "APPENDIX A" – BANNER AND THIRD PARTY PROJECTS

SUMMARY OF PROJECTS FROM "DISTRICT ITS STRATEGIC PLAN" (06/01/2013)

The District Strategic Plan for ITS Projects was approved by the Chancellor's Cabinet members who reviewed new college and district requirements for enhanced or improved system features. The District Strategic Plan for ITS Projects is developed in collaboration with the Chancellor's Cabinet, College Deans, Directors of Banner User Groups, and College Technology Committees. The ITS Plan includes only major development projects, not routine operational tasks, system maintenance, and service requests for minor changes. Additions for new critical projects are made as the need arises and includes state and regulatory mandates as well as changes to accommodate contract negotiations. Besides consideration of the state and regulatory directives, the Cabinet prioritization of Banner projects considers 3 factors: the impact to students, improved productivity, and reduction of costs. All Technology Plans including the Bond are posted on the District Website under "Technology Services". The Bond projects are described in the "Measure B Bond Activities – Accomplishments and Future Plans 2005-2017". The Banner and other Third Party projects are described in the "District ITS Strategic Plan". Status of the ITS Projects is provided below in three categories - "**Completed" Category A1**, "**In Progress" Category A2**, and "**To Be Scheduled" Category A3.**

A1. "Completed" Projects (Completion Dates provided by Year)

1. Faculty Contract modification to implement new "load sheet" (2013)
2. Faculty Contract modification to create consistent tracking system for "workload banking" (2013)
3. Student Credit Card Payments – convert from Official Payments to Heartland Payment System for annual savings (2013)
4. Banner Infrastructure Upgrade to all Banner modules and addition of Fusion Middleware component required as a follow on to Oracle 11G Database upgrade (2013)
5. Changes for new State Mandated Course Repeatability Policy for course repeats, equivalencies, and new "family" course concept still being defined. (2013)
6. New Financial Aid features in Banner and enhanced automation for routine processes – Transfer Monitoring and process for new year setup and roll (2013)
7. Evaluation of new Banner CALB Financial Aid module as separate install for BOGW – Evaluation completed and no need to do CALB at this time. (2013)
8. Banner Upgrade for HR/Payroll for new STRS/PERS reporting (2012, 2013)
9. Finance & Human Resources Regulatory release with Position Control and CALB HR (2012,2013)
10. Priority Registration changes based on units (2012)
11. Faculty Contract modification for "Pay by CAH" (2012)
12. Faculty Contract change to provide online forms routed to A&R for "Add" and "Drop" actions after census dates (2012)

13. Faculty Contract modification for handling of Summer 2012 Autopay (2012)
14. Oracle 11G Database Upgrade - Phase 1 prior to Fusion Phase 2 (2012)
15. Updates to Banner Financial Aid to handle the future Dream Act requirements (2012)
16. Banner Automatic Email ROREmail for Financial Aid Award Letters (2012)
17. New Financial Aid features in Banner and enhanced automation for routine processes – Email Correspondence, ISIR Load (2012)
18. Student Eligibility Form for Athletics initially for Chabot and then LPC (2012)
19. Online Technology Request Form for Chabot Technology Committee to satisfy Accreditation (2012)
20. Chabot Online Nursing Application Phase 2 for automating the selection process (2012)
21. Priority Registration for Veterans, Foster Care, and other changes (2012)
22. Regulatory Finance, HR, and Accounts Receivables release upgrades for calendar year end (2012)
23. Addition of summary statistics for student majors on the CLASS-Web faculty Roster screen to show the count of students by major for a specific course (2012)
24. SARS-TRAK for LPC for Financial Aid tracking of students (future replacement for STARS) (2012)
25. "Hayward Promise Neighborhood" reporting to identify Chabot population (2012)
26. Additions to Institutional Research data repository for Veterans data back to 2004 (2012)
27. Audit for Hybrid Courses included new reporting and calculation modifications (2012)
28. Evisions Update to Form Fusion for BDMS, AP, Payroll, PO, and Mailers (2012)
29. Online Submission of Help Desk Ticket in addition to phone and email for Chabot (2012)
30. New Accounts Payable & Payroll Checks (2012)
31. ASCC/ASLPC checks at college sites (2012)
32. Change to online Payroll data to allow access to prior periods during Payroll processing (2012)
33. Online Payroll Paycheck stub using BDMS to replace mailed copies of auto deposits (2012)
34. Title V changes – various changes with the latest being Repeat Checking changes (2010,2011,2012)
35. State MIS Reporting changes from State Chancellor's Office (2010,2011,2012)
36. Banner Waitlist for students and faculty (2010,2011)
37. Expansion for Waitlist of Banner (Ellucian) Luminis Web Portal The ZONE and Student Gmail (2011)
38. CurricUNET Course Curriculum Phase 1 (2010,2011)
39. SMTP Blade Server for SARS-CALL to handle large volume of student emails for all systems SARS-CALL and Banner emails (2011)
40. Faculty Contract modification for additional "load factor" for selected classes (2011)
41. Online Nursing Application Phase 1 for online application (2011)
42. Surplus System for purchase by students and staff (2011)
43. Inventory Bar Code Scanning System (2011)
44. ePAF Personnel Action Form Phase 1 for Recurring hires (2011)
45. Banner (Ellucian) SAAS Cloud Technology for Financial Aid (2011)
46. "Gainful Employment" reporting for State Chancellor's office Phase 1 (2011)
47. Evisions upgrade for Higher One automation of file transfer for Financial Aid (2011)

48. New tracking system for FTES state reporting requirements to support audit findings (2011)
49. Additional phases for new "Gainful Employment" reporting for State Chancellor's office (2011)
50. State Reporting for BOGW students included modifications based on withdrawal date (2011)
51. New MIS Reporting data elements for special projects and EOPS (2011)
52. Tutoring addition for Chabot using SARS-GRID (2010)
53. Faculty Obligation Reporting new features for release time and tracking of regular and overload assignments (2010)
54. Oracle Dataguard Installation for Database recovery (2010)
55. Vision Solutions Installation for Operating System recovery (2010)
56. Banner (Ellucian) Upgrade from release 7 to 8 (2009)
57. Oracle 10G Database Upgrade (2009)
58. PeopleAdmin Applicant Tracking for Hiring (2009)
59. Banner (Ellucian) Luminis Web Portal The ZONE (2008,2009)
60. Fixed Assets Depreciation (2008,2009)
61. Higher One Debit Card for Financial Aid (2008)
62. Student Email with Gmail through The ZONE (2008)
63. Dedicated Help Line for student ZONE and GMAIL calls (2008)
64. Single Sign On for Blackboard and Gmail through The ZONE (2008)
65. Crystal Reports (WebI) Ad hoc Reporting (2007,2008)
66. CollegeNet Room Scheduling for Academics (2007,2008)
67. Third Party Products - SARS-Trak, SARS-Grid & SARS-CALL, eSARS, PC-Trak, STARS LPC only,PE Chabot only (2007,2008)
68. Web for Faculty for Online Grades and Drops (2007)
69. BossCars Parking Permits (2007)
70. Web for Finance for Expenses and Budgets (2006,2007)
71. Elumens Student Learning Outcome (2006,2007)
72. Credit Card Payments & Installments – Official Payments & FACTS (2006)

A2. "In Progress" Projects (Partially "Completed" or Assigned/Scheduled – Target Dates provided by Term)

73. Banner (Ellucian) Degree Works for Student Degree Audit and Student Ed Plan (Fall 2013/Spring 2014 Counseling, Summer 2014 Students)
74. Banner Document Management System (BDMS) to replace ATIFiler System – Phase 1 A&R and Financial Aid (Fall 2013 A&R, Spring/Summer 2014 Other Groups)
75. Consolidated Next Generation Storage SANS for Document Imaging storage (Spring/Summer 2014)
76. "Student Success Task Force" requirements as specifications are finalized (Spring 2013/Spring 2014)

77. Changes for new State Mandated Course Repeatability Policy for handling of new "family" course groups (new rules for course repeats and equivalencies already completed Spring 2013, Families for Fall 2013).
78. eTranscipts (through CCCApply) for Automatic Transcripts to Send and Receive (Summer 2013)
79. ARGOS Report Tool for Degree Works and Finance Expenses /Budgets followed by other areas (Fall 2012 Finance, Fall 2013 Degree Works, Spring/Summer 2014 Other groups)
80. CCCApply BOGW for Chabot (Summer/Fall 2013)
81. Replacement of Video Conferencing Equipment for Chabot Nursing & Valley Care (Summer 2013)
82. Replacement of Grade mailers and other notifications through post office with electronic correspondence with option to request hard copy by exception – working with college A&R (Summer 2013)
83. Expansion of Online submission of Help Desk Tickets to District & LPC like did for Chabot (Fall 2013)
84. Banner Mobile Applications – New Cloud offering (Fall 2013)
85. Software Review for Electronic Signature – Docusign or Adobe – New Adobe Agreement through State Chancellor's office will satisfy requirement (Fall 2013)
86. CollegeNet Room Scheduling – Phase 2 for Events in addition to existing Academics portion (Spring/Summer 2014)
87. Online Chat capabilities e-Advising for Counseling using new feature in SARS products (Fall 2013/Spring 2014)
88. CurricUNET Phase 2 for Program Review & Assessment modules to follow after the October accreditation review (Spring 2014/Fall 2014)
89. Conversion of new Library System "Worldshare" vs. current "Sirsi" System for functionality, funding and conversion (Fall 2013/Spring 2014)
90. Web for Finance for online Requisitions using BDMS for storage PO attachments (Spring/Summer 2014)
91. Review of modifications to multi-campus handling to replace customizations with Banner baseline for Financial Aid module (Fall 2013)
92. Convert to OpenCCCApply System through State Chancellor's office to replace XAP CCCApply System (Summer 2014)
93. Automation of Faculty Office Hours as follow on to Pay by CAH (Fall 2014)
94. Personnel Action Form ePAF Phase 2 for new jobs for existing employees (Summer/Fall 2014)
95. Rewrite budgets processing for furloughs and reduced workload (Fall 2013)
96. New system for tracking the Chabot "Hayward Promise Neighborhood" program with CSUEB (Fall 2012/Ongoing)
97. Review of ZONE with Technology Committee and Students for improvements to webpage (Fall 2013/Spring 2014)
98. Sharing of Documents using Luminis Group Studio feature through The ZONE (Available/Procedural)
99. Release of Gmail for faculty using Zonemail like students do to share Google Docs (Available/Procedural)

100. Conversion Novell Operating System to Active Directory with college integration (Summer 2013/Fall 2013)
101. Email Archive DataCove System with conversion of Groupwise archives to be followed by Email migration to Outlook (Summer 2013 Email Archive, Fall 2013/Spring 2014 Email)
102. Windows 7 migration following testing of mission critical systems for compatibility (Fall 2013/Spring 2014) – Colleges have installed Win 7 in instructional areas
103. Chabot Online Nursing Application Phase3 Student provides points for selection process (Fall 2013/Spring 2014)
104. Regulatory Upgrades for Financial Aid 3-4 times annually (Ongoing)
105. Regulatory Title V Changes – ongoing as new features are finalized (Ongoing)
106. Evaluation and implementation of new SARS product offering for "text" capability in addition to current email features (Spring/Summer 2014)

A3. "To Be Scheduled" Projects (Dependent on other projects or available resources or On hold)

107. Banner (Ellucian) Enrollment Management & Contact System for Marketing
108. New Banner Tool for Data Views (ODS) to support Argos Report Tool
109. New Banner module for Data Warehouse (EDW) capabilities for trend analysis
110. Banner (Ellucian) Advancement module for Alumni
111. Automate Timesheets online using Banner
112. Implementation of WebEx type Video tool to allow faculty ability to login and participate in classes remotely via Web requested by College Technology Committees
113. Evaluation of Blackboard vs. other products on market requested by College Technology Committees
114. Centralized Streaming Video Services for colleges and district
115. Lecture Capture capabilities for faculty and students
116. Expand Video Conferencing capabilities at all locations where appropriate
117. Evaluation of the vendor offerings for the new industry trend of MOOCs for possible use at the colleges for Basic Skills classes, preparation for Assessment tests, or new higher level classes that are not currently offered at the colleges.
118. Automatic Student Billing
119. Additional COTOP process for student fees owed (currently have COTOP Financial Aid loans)
120. Spreadsheet Upload of Journals for Business Services
121. CALB (California Banner version – On Hold) of Banner baseline software (On Hold due to major scope and impact on all user modules) – provides no new features for CLPCCD
122. Common Matching for all Banner Modules – (On Hold) not required by CLPCCD
123. Luminis 5.0 Upgrade – (On Hold) Vendor delays on conversion
124. Grant Accounting – (On Hold) Potential usage for Bond accounting