Contra Costa Community College District

District-Wide Strategic Infrastructure/Telecommunications Plan

Final Report

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Executive Summary

Purpose of the Engagement

Contra Costa Community College District (District) engaged WTC Consulting, Inc. (WTC) to assist the District with identifying communications needs and developing a District-Wide Strategic Infrastructure / Telecommunications Plan for data, voice, and video communications.

Engagement Approach

WTC completed the following steps:

Step 1: Worked with the two teams, Working / Steering Group and Policy Group, to identify four major strategic business issues:

- What to do with the technology infrastructure?
- What level of redundancy and survivability is needed by the District?
- What should be the rate of adoption for Voice over IP?
- What to do with the current outdated telephone system?

Step 2: Worked with the Working Group to define 10 configuration alternatives for voice, data, wireless, and Wide Area Network (WAN) architectures.

Step 3: Prepared a Port Model™ to represent sizing requirements and growth through the year 2015.

Step 4: Conducted a physical survey of all 174 telecommunication rooms (TRs).

Step 5: Analyzed the existing voice, data, wireless, and WAN environments.

Steps 6 and 7: Prepared capital and life-cycle budget estimates.

Steps 8 and 9: Developed a recommendation and held meetings with District Cabinet to gain their guidance.

Step 10: Created a Strategic Plan and a 7-year Timing of Funds model.

Key Findings and Conclusions

Following are key findings and conclusions:

- For voice and data architecture, capital budget estimates ranged from $8.87 - $13.04 million and life-cycle budget estimates ranged from $16.97 - $25.86 million.
- Migrating to a common cable plant, a VoIP-equipped voice system, and upgrading the existing LAN is the most practical next step. This allows for migration to VoIP and is the most appropriate strategic direction for the voice and data architecture. The capital cost estimate is $12.82 million and the life-cycle cost over seven years is $25.84 million.
- Increasing the redundancy and survivability of the voice, data, and WAN architecture will benefit the District with more resiliency, unified management, smooth deployment of new services, and the addition of high bandwidth applications.

Recommendations and Next Steps

Following are recommendations and next steps:

- Determine the changes needed for unified management of the voice, data, and WAN services.
- Determine the procedures needed to manage the ongoing support of the networks.
- Develop District-wide policies and standards for wired and wireless LAN Ethernet infrastructure management and WAN access.
- Conduct an RFP process for a voice system using Configuration X and include purchasing agreements for LAN and WAN systems.
- Prioritize upgrades of the physical infrastructure and develop a four-year upgrade plan.
- Conduct an analysis of the District's cost and funding processes in light of the District's strategic technology directions.

1 Purpose of the Engagement

Contra Costa Community College District (District) engaged WTC Consulting, Inc. (WTC) to assist the District with identifying future communications requirements based on business needs and developing a District-wide Strategic Infrastructure / Telecommunications Plan for providing data, voice, and video communications to support future business needs.

2 Engagement Approach

The following sections outline the key steps in the approach taken to complete this engagement.

2.1 Step 1: Established Engagement Teams

The following two teams were established to provide guidance and assistance throughout the strategic planning process.

- *Working / Steering Group:* The role of this Group was to develop a working understanding of the scope and intent of the engagement and to provide necessary input at key points during the strategic planning process. The Steering group members also provided consistency regarding policy decisions and operational preferences, tested the impact of new policy directions, and assessed risk.

- *Policy Group:* The role of this Group was to provide leadership and direction on business objectives and priorities during the engagement.

The list of members for each of these teams appears in the Planning Assumptions document located in Attachment I.

2.2 Step 2: Developed Planning Assumptions

WTC worked with the engagement teams to develop a Planning Assumptions document. This document formalized the understanding of the engagement scope, provided consensus regarding the specific issues pertaining to the engagement, and served as a guide during the engagement process. A final version of the Planning Assumptions document accompanies this report in Attachment I.

In the following sections, we detail the key assumptions and constructs

developed during the planning assumptions process.

2.2.1 *Basic Assumptions:* The following are basic assumptions underlying the strategic planning alternatives considered during the engagement:

- The planning horizon is now through the year 2015.
- The strategic plan developed would be practical.
- Alternatives would address both choices and the consequences of these choices.
- Examination of alternatives would include all significant District facilities, both existing and planned.
- Communications infrastructure would encompass the telephone system, the local area wired and wireless networks, the District wide-area network, and include both physical infrastructure and systems.

2.2.2 *Strategic Business Issues:* The following strategic issues were identified by the engagement teams as key drivers for the alternatives to be modeled.

- *Convergence:* Should the District migrate to a common cable plant for its voice and data networks or continue to maintain separate networks?
- *Rate of Technology Adoption:* How quickly should the District move toward adopting Voice over Internet Protocol (VoIP) technology?
- *Strategies for the Survivability:* Should the District develop a more survivable voice and data network or continue with the current survivability level?

2.2.3 *Configuration Alternatives:* The configuration alternatives developed addressed three physical infrastructure treatments and five voice system alternatives. Table I illustrates the voice and data configuration alternatives that were modeled in this strategic planning effort.

Table I Configuration Alternatives					
Infrastructure	Combined Infrastructure: Prepare Common Cable Plant However, Do Not Deploy VoIP	Combined Infrastructure: Common Cable Plant for the Voice and Data Networks Using Partial Converged VoIP		Combined Infrastructure: Common Cable Plant for the Voice and Data Networks Using Converged VoIP	
Description	Upgrade LAN (No POE) Existing Mitel 100% Digital Phones 0% VoIP phones Convenience Wireless Video = IPTV	Upgrade LAN (100% POE) Upgraded Mitel 50% Digital Phones 50% VoIP phones Convenience Wireless Video = IPTV	Upgrade LAN (100% POE) New Hybrid IPPBX 50% Digital Phones 50% VoIP phones Convenience Wireless Video = IPTV	Upgrade LAN (100% POE) Upgraded Mitel 0% Digital Phones 100% VoIP phones Convenience Wireless Video = IPTV	Upgrade LAN (100% POE) New IPPBX or Network-Based VoIP 0% Digital Phones 100% VoIP phones Convenience Wireless Video = IPTV
Current Survivability	I	II	III	IV	V
More Survivability	VI	VII	VIII	IX	X

2.3 Step 3: Developed the Strategic Sizing Forecast

2.3.1 WTC prepared a sizing document referred to as a Port Model™. This model represents the sizing and general interface requirements of the District's physical infrastructure and its voice, data, and wireless networks. This model also identifies potential growth through the year 2015.

2.3.2 The Port Model reflected the different ways in which voice and data ports and devices are handled in each of the ten configuration alternatives. Three separate Port Models were developed to accommodate these variances.

2.3.3 The Port Model reflected the anticipated growth in voice and data ports during the planning horizon. The Working Group assigned voice and data growth treatments to each District building of low, medium, or high. Tables II and III show the treatment for each of

these growth types. Growth percentages are not cumulative; all percentages are applied to the 2008 data received from the District.

Table II
Growth Treatment for Data Network

		Working @ Cut	*Equipped*	*Wired*	*Capacity*
Growth Type	*2008*	*At Year 1 2009*	*At Year 2 2010*	*At Year 4 2012*	*At Year 7 2015*
Low	Data from District	1%	3%	10%	20%
Medium	Data from District	2%	10%	30%	60%
High	Data from District	4%	20%	50%	100%

Table III
Growth Treatment for Voice Network

		Working @ Cut	*Equipped*	*Wired*	*Capacity*
Growth Type	*2008*	*At Year 1 2009*	*At Year 2 2010*	*At Year 4 2012*	*At Year 7 2015*
Low	Data from District	0%	1%	2%	5%
Medium	Data from District	1%	2%	5%	10%
High	Data from District	1%	3%	10%	20%

2.3.4 The Port Model was generated on August 29, 2008, and delivered to the District on September 4, 2008.

2.4 Step 4: Conducted a Physical Infrastructure Survey

2.4.1 WTC conducted a physical survey of 174 telecommunication rooms (TRs) in 105 District buildings.

2.4.2 The survey process included examination of 120 TR survey elements including space, environmental, equipment, copper cable, fiber optic cable, and code and safety issues. The process also included taking photos of each TR surveyed to document the conditions of the TR.

2.4.3 The survey process examined each of the TRs for both maintaining separate cable plants for voice and data (non-combined) and migrating to a common cable plant for voice and data (combined).

2.4.4 The survey process included examination of typical cost factors such

as size and location of TR, recabling requirements, difficulty of horizontal recabling, air conditioning, electrical, and storage removal needed.

2.4.5 WTC generated a TR Profile Book detailing the conditions of the TRs surveyed as well as the budgets required for upgrades. The TR Profile Book was delivered to the District on September 4, 2008.

2.5 Step 5: Evaluated Existing Technology Environment

The Working Group reviewed the existing voice and data environments:

2.5.1 Data Networks

Reviewed the core data site at the District Office along with backup procedures and connectivity to each campus.

2.5.2 Wireless Networks

Prepared a wireless database including existing wireless access point information from each campus and matched the information with the TR survey analysis.

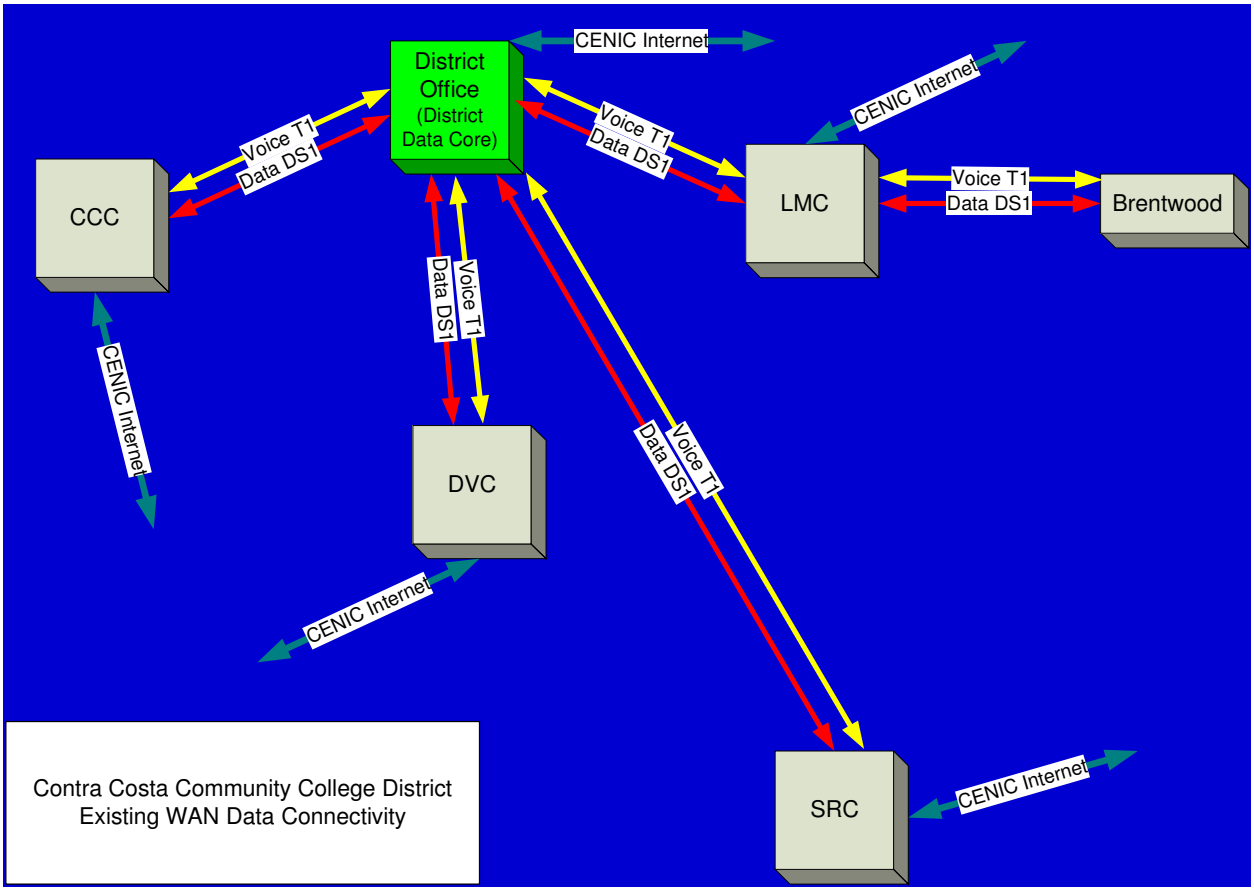
2.5.3 Voice Networks

Reviewed the Mitel system configurations for each of the 6 Mitel systems throughout the District. Conferred with the Mitel engineering staff at Mitel Direct regarding possible upgrades to the existing systems and the ability of the systems to support new technologies such as VoIP.

2.5.4 Wide Area Networks

Determined the existing wide area network (WAN) configuration throughout the District. Conferred with AT&T regarding the possible upgrades to the WAN that would allow for a more survivable infrastructure. The existing WAN connectivity is shown in Exhibit I.

Exhibit I
Existing WAN Connectivity



2.6 Step 6: Prepared Capital Budgets

2.6.1 WTC prepared capital budget estimates for the 1) infrastructure, 2) voice and data, 3) wireless LAN, and 4) WAN configuration alternatives.

2.6.2 The capital budgets for the voice and data configuration alternatives include the following elements:

2.6.2.1 *Inside Plant Infrastructure:* 1) TR upgrades, 2) remodeling and rebuilding TRs, 3) re-cabling and reinstalling cable, 4) HVAC and electrical, 5) removal of storage from TRs, 6) inside cable plant upgrades, 7) additional riser cable, 8) additional horizontal cable, and 9) design and implementation costs.

2.6.2.2 *Outside Plant Infrastructure:* 1) Additional single mode fiber and copper for campus buildings and 2) additional WAN connectivity to campuses for more survivability.

2.6.2.3 *Voice System:* 1) Base system, 2) hardware and software, 3) licensing, 4) design and engineering, 5) implementation and project management, 6) on-site training and implementation help desk, 7) removal of existing system, and 8) end-user telephone devices.

2.6.2.4 *Voice Adjunct Systems:* 1) Voice mail w/Unified Communications, 2) E-911 System, 3) ACD/Call Center, and 4) Tele-management System.

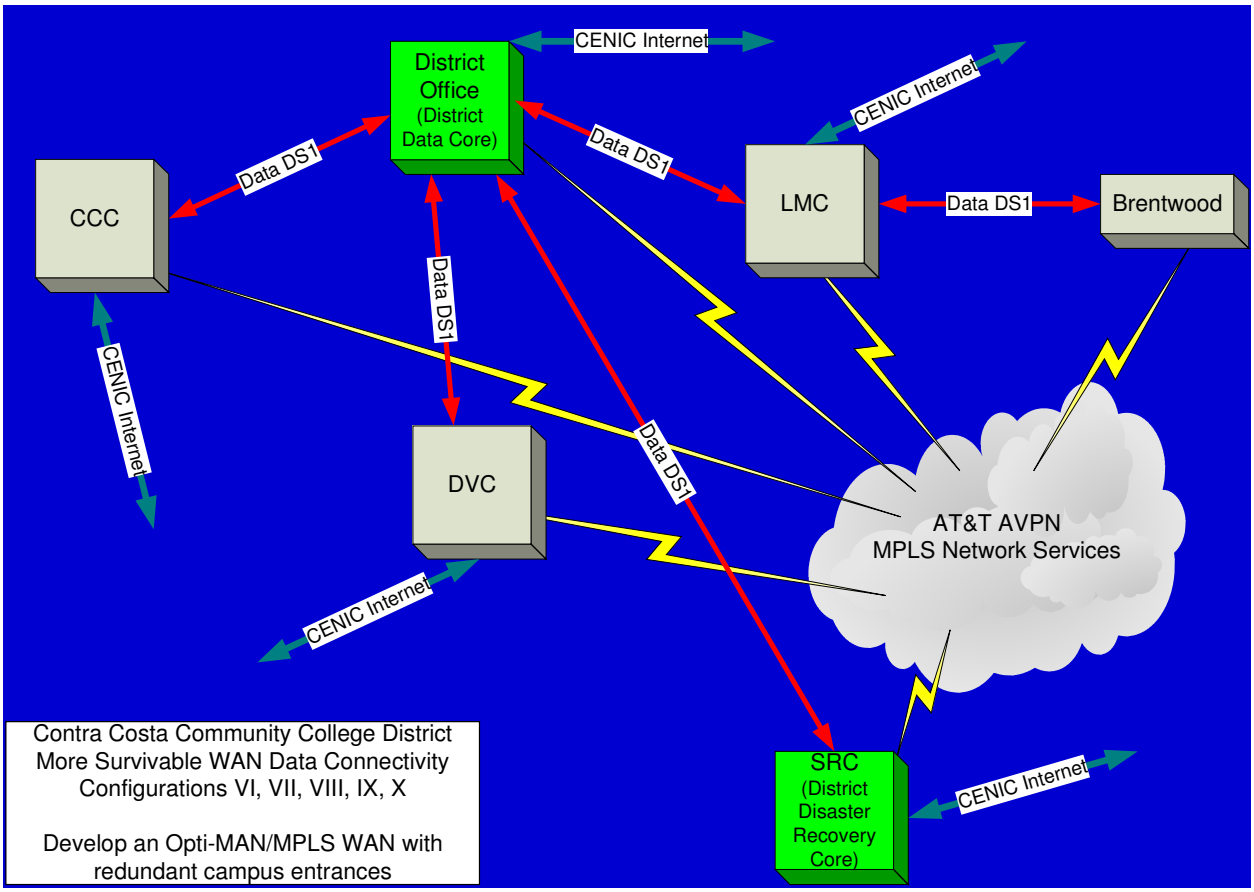
2.6.2.5 *Data Network:* 1) LAN electronics, 2) network design and engineering, 3) removal of existing electronics, and 4) switch configuration and installation.

2.6.2.6 *Data Network Adjunct Systems:* 1) Network management, 2) identity management system, 3) firewall and intrusion prevention/detection systems, and 4) Virtual Private Network (VPN) system.

2.6.2.7 *Wireless Data Network System:* 1) 802.11x wireless system survey for each campus and 2) inside and outside wireless access points, wireless management system.

2.6.2.8 *Wide Area Network System:* 1) AT&T AVPN MPLS Ethernet connectivity to each campus capable of 10Mbps transmission speeds, 2) redundant campus entrances for main campuses, 3) non-recurring connection charges, 4) non-recurring management charges, and 5) router equipment. The more survivable WAN connectivity used in Configurations VI through X is shown in Exhibit II.

Exhibit II
More Survivable WAN Connectivity



2.6.2.9 *Implementation for Voice, Data, and Wireless:* 1) Contingency (10.00%), 2) overhead (4.00%), 3) implementation oversight services (5.00%), 4) RFP or Bid process (5.00%), and 5) Final Design and Master Purchase Agreement Negotiations Process (3.00%).

2.6.2.10 *Implementation for Inside and Outside Plant Infrastructure:* 1) Contingency (10.00%), 2) overhead (4.00%), 3) engineering and drawings (6.00%), 4) implementation oversight services (5.00%), 5) RFP or Bid process (5.00%), and 6) Final Design and Master Purchase Agreement Negotiations Process (3.00%).

2.6.2.11 Capital cost model details are included in the following attachments:

- Attachment II, Infrastructure Capital Costs
- Attachment III, Voice Network Capital Costs
- Attachment IV, Data Network Capital Costs
- Attachment V, Wireless LAN Costs
- Attachment VI, Wide Area Network Costs
- Attachment VII, Summary of Capital Costs

2.7 Step 7: Prepared Life-Cycle Budgets

2.7.1 WTC prepared life-cycle budget estimates for the ten voice and data configuration alternatives.

2.7.2 The life-cycle budgets for the voice and data configuration alternatives include the following elements:

2.7.2.1 *Voice System:* 1) Capital costs including refresh costs, 2) growth including planned capital, and 3) recurring charges for operations and maintenance.

2.7.2.2 *Data Network*: 1) Capital costs including refresh costs, 2) growth including planned capital, and 3) recurring charges for operations and maintenance.

2.7.2.3 *Wireless Network:* 1) Capital costs including refresh costs, 2) growth including planned capital growth, and 3) recurring charges for maintenance.

2.7.2.4 *WAN Network:* 1) Capital costs including router equipment refresh costs, 2) growth including planned capital, 3) access charges, 4) bandwidth charges, 5) mileage rate, and 6) managed services.

2.7.2.5 Capital cost model details are included in Attachment VIII, 10-Year Life-Cycle Costs.

2.7.3 The hardware and software refreshment cycles shown in Table IV were used for the life-cycle budgets:

Table IV
Hardware and Software Refresh Cycles

Category	*Number of Years*
Voice System Hardware and Software	7
Voice Adjunct Systems	5
Data Network Core and Distribution Electronics	5
Data Network Edge Electronics	5
WAN Routers	5
Data Un-interruptible Power Supply Systems	4
Wireless Controllers	4

2.8 Step 8: Recommended a Strategy

Based on business considerations and the results of the analysis of capital and life-cycle costs, WTC made recommendations to the District on the voice and data architecture.

2.9 Step 9: Reviewed Final Results with the District Cabinet

Capital, life-cycle costs, and recommendations were reviewed with the District Cabinet. The Cabinet responded with directives for the Working Group to do more research in certain areas of technology and District finance issues.

2.10 Step 10: Created a Strategic Plan

Based on the engagement teams' endorsement of the recommended strategy, WTC developed a roadmap for the planning horizon together with a

timing of funds model.

Timing of Funds model details are included in Attachment IX, Timing of Funds Model.

3 Findings and Conclusions

In this section, we detail our findings and conclusions for the engagement. We have organized the findings and conclusions into the following strategic planning categories: 1) Physical Infrastructure, 2) Projected System Growth, 3) Voice and Data Architecture, 4) Capital Budget - Voice and Data, and 5) Life-Cycle Budget - Voice and Data.

3.1 Physical Infrastructure

3.1.1 Table V shows the classification of the 174 TRs examined during the physical surveys.

Table V
Classification of Telecommunication Rooms in the Physical Survey

Treatment	*Number of TRs*	*Average Cost*
None / Limited Cost: Simply needing maintenance	34	$2,000
Level A Remodel: Simple adjustments	50	$15,000
Level B Remodel: More aggressive adjustments	27	$21,000
Level C Remodel: Very aggressive adjustments	5	$29,000
Abandon: TR should not be used	46	$25,000
Rebuild: TR should be rebuilt	12	$83,000
Total	174	$21,227

3.1.2 Inside Copper Cable Plant

3.1.2.1 The majority of inside copper cable supporting the data network is Category 5 or better. The majority of the inside copper cable supporting voice services is Category 3 voice grade.

3.1.2.2 The District does not have a District-wide standard for all campuses to use. Therefore, there are different decisions made at each campus resulting in each campus managing its own stock, supplies, and technical support.

3.1.3 Outside Cable Plant

3.1.3.1 Most campus buildings are connected to the campus core voice and data systems with both copper and fiber optic cabling.

3.1.3.2 The existing outside copper cable will support growth to Capacity as forecasted in the Port Model. However, two of the campuses (CCC and DVC) report that portions of the outside plant copper cabling are affected by water damage. This has limited the available pair counts on several cables to the point that the copper cable does not support the number of telephones needed in certain areas of the campus.

3.1.3.3 Most fiber optic cabling is older 62.5 micron fiber that does not support speeds greater than 1 GB.

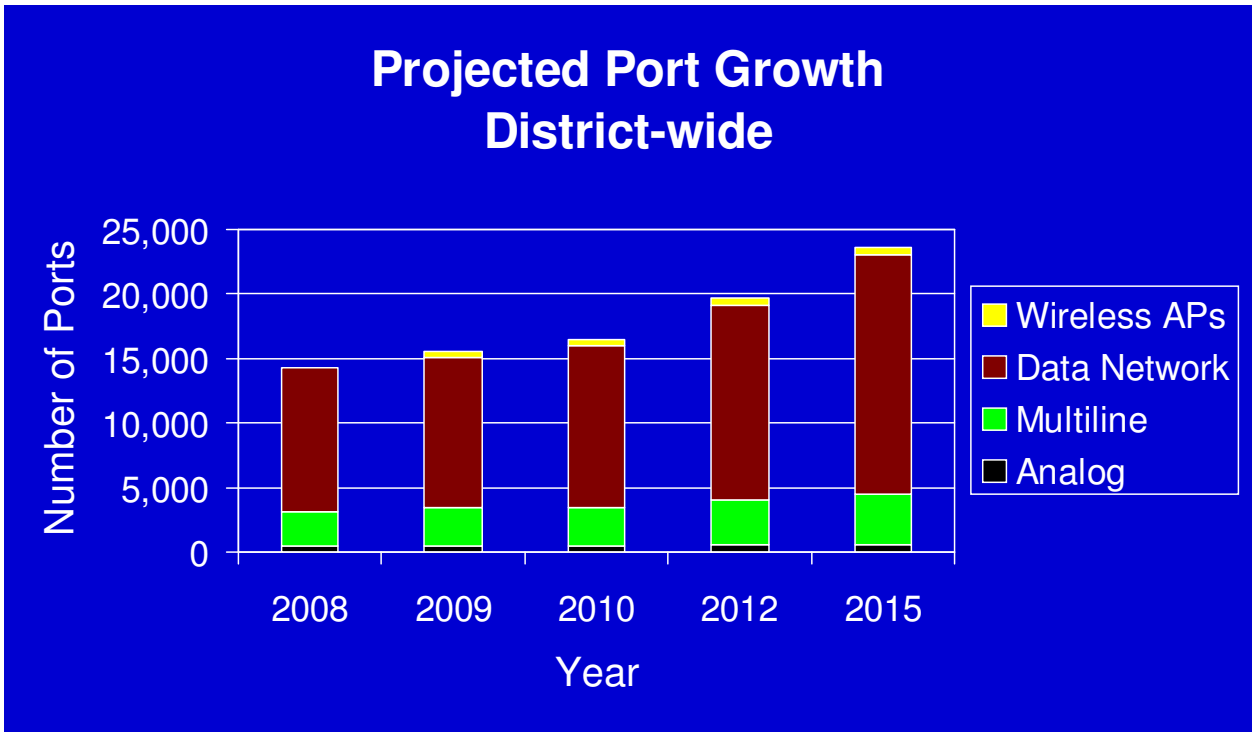
3.1.3.4 Most campuses have only one connection to the WAN for all campus buildings.

3.1.4 Migration to VoIP technology, whether partial or total, will be dependent upon completion of upgrades to the District TRs, fiber optic cable plant, and WAN connections to campuses.

3.2 Projected System Growth

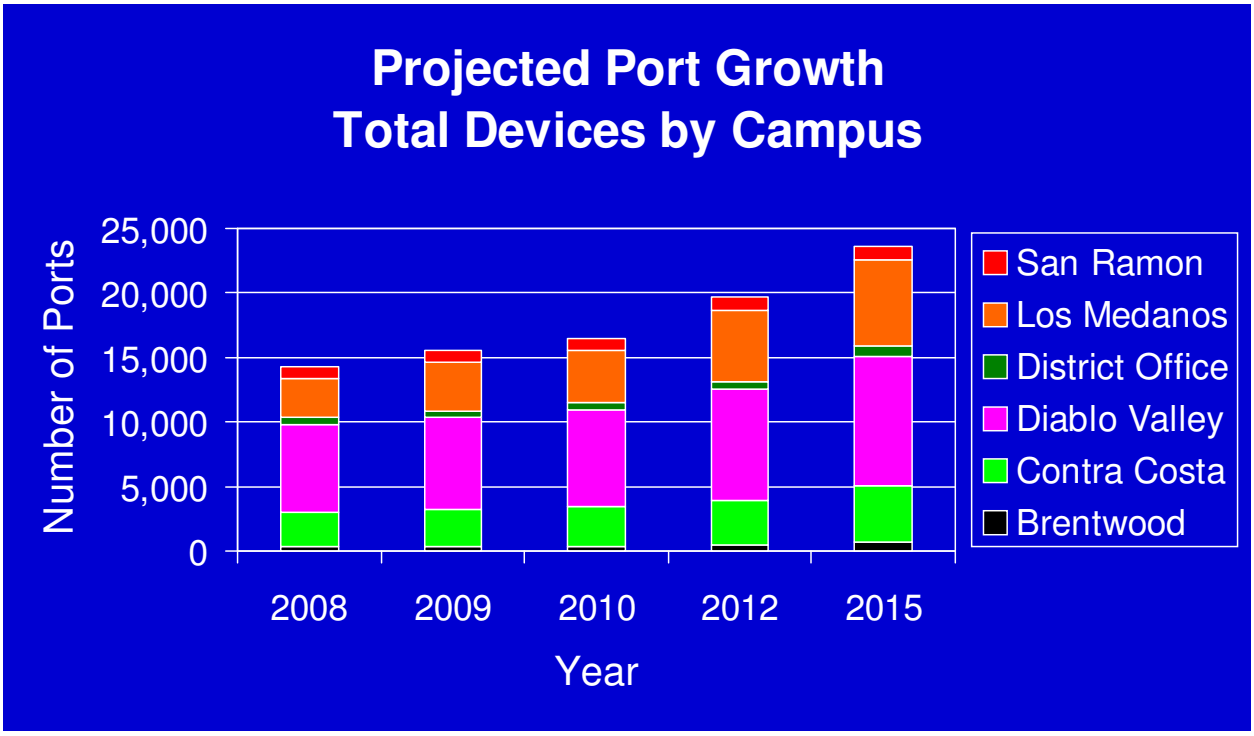
The graph in Exhibit III shows the projected growth of District analog voice, digital voice, data network, and wireless access ports based on the Port Model.

Exhibit III
Port Growth by Technology



The graph in Exhibit IV shows the projected growth of District ports by campus based on the Port Model.

Exhibit IV
Port Growth by Campus



3.3 Voice Architecture

3.3.1 The existing voice system, consisting of six separate Mitel systems, has been in operation for more than 10 years.

3.3.2 The existing Mitel systems would need major upgrades to either continue operation in Time Division Multiplexing (TDM) mode or upgrade to support new technologies such as VoIP. Mitel reported the following:

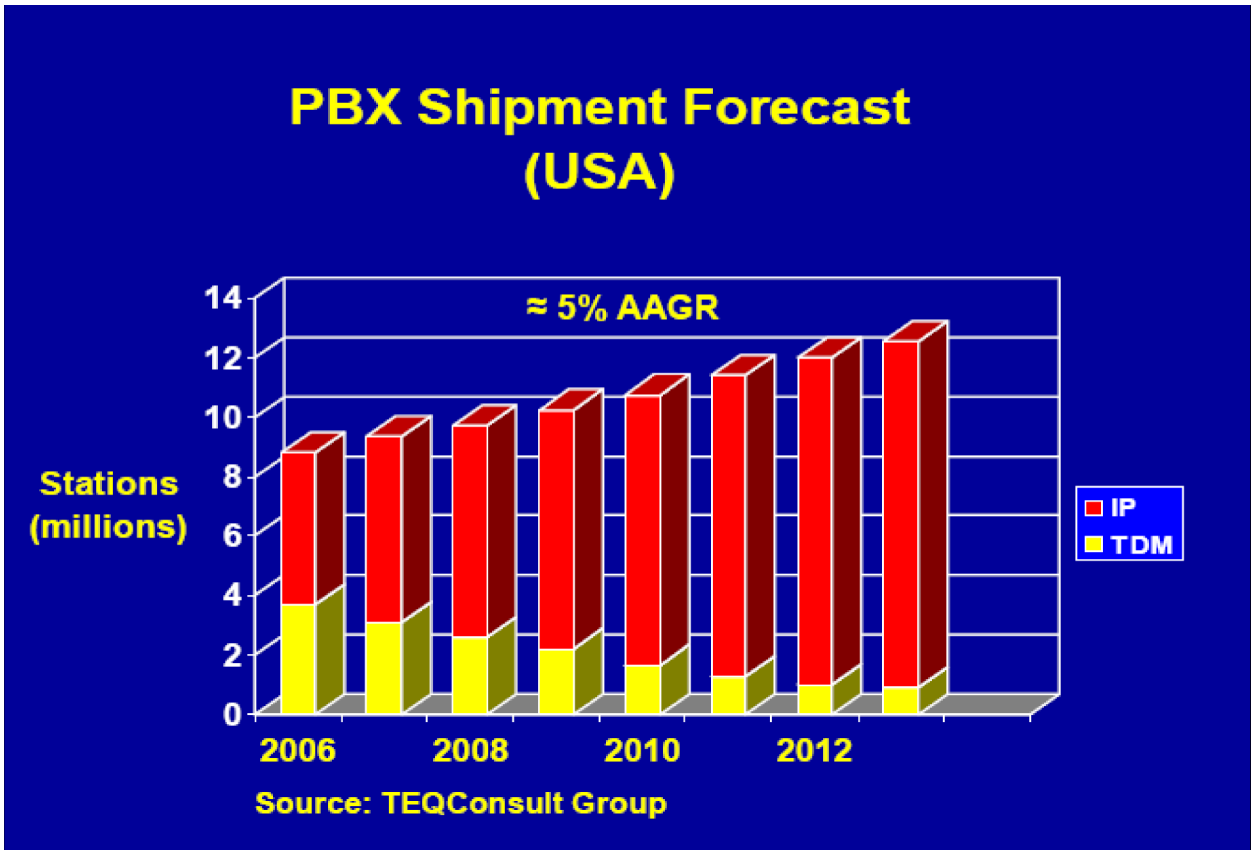
3.3.2.1 Mitel does not have a determined EOL (End of Life) at this time for the TDM product, nor any public release on when those will no longer be supported. We are certainly recommending IP to the majority of our customers.

3.3.2.2 Mitel has developed aggressive trade-in programs to encourage customers to migrate their voice systems from the TDM platform to the VoIP platform.

3.3.2.3 When asked "Is it safe to say that the client should upgrade to a VoIP capable system instead of putting all their upgrade money into the non-VoIP platform?" a Mitel direct engineer answered "It would be a smart choice, in my opinion."

3.3.3 Research of the telecommunications industry confirms the comments from Mitel. Exhibit V shows the industries increasing migration to VoIP platforms in lieu of TDM platforms.

Exhibit V
Telecommunication Industry's Shift to VoIP



3.4 Data Architecture

3.4.1 For the most part, campus LANs are managed by the individual campuses.

3.4.2 The existing non-unified approach to management of campus LAN Ethernet infrastructure would limit the District's strategic choices for its communications infrastructure and impede eventual migration to new voice technologies. Management of campus LAN Ethernet infrastructure refers to management of the distribution cable plant, the Ethernet horizontal and vertical riser cable plant, and the Ethernet LAN switches and routers. It does not include systems and applications connected to the LAN.

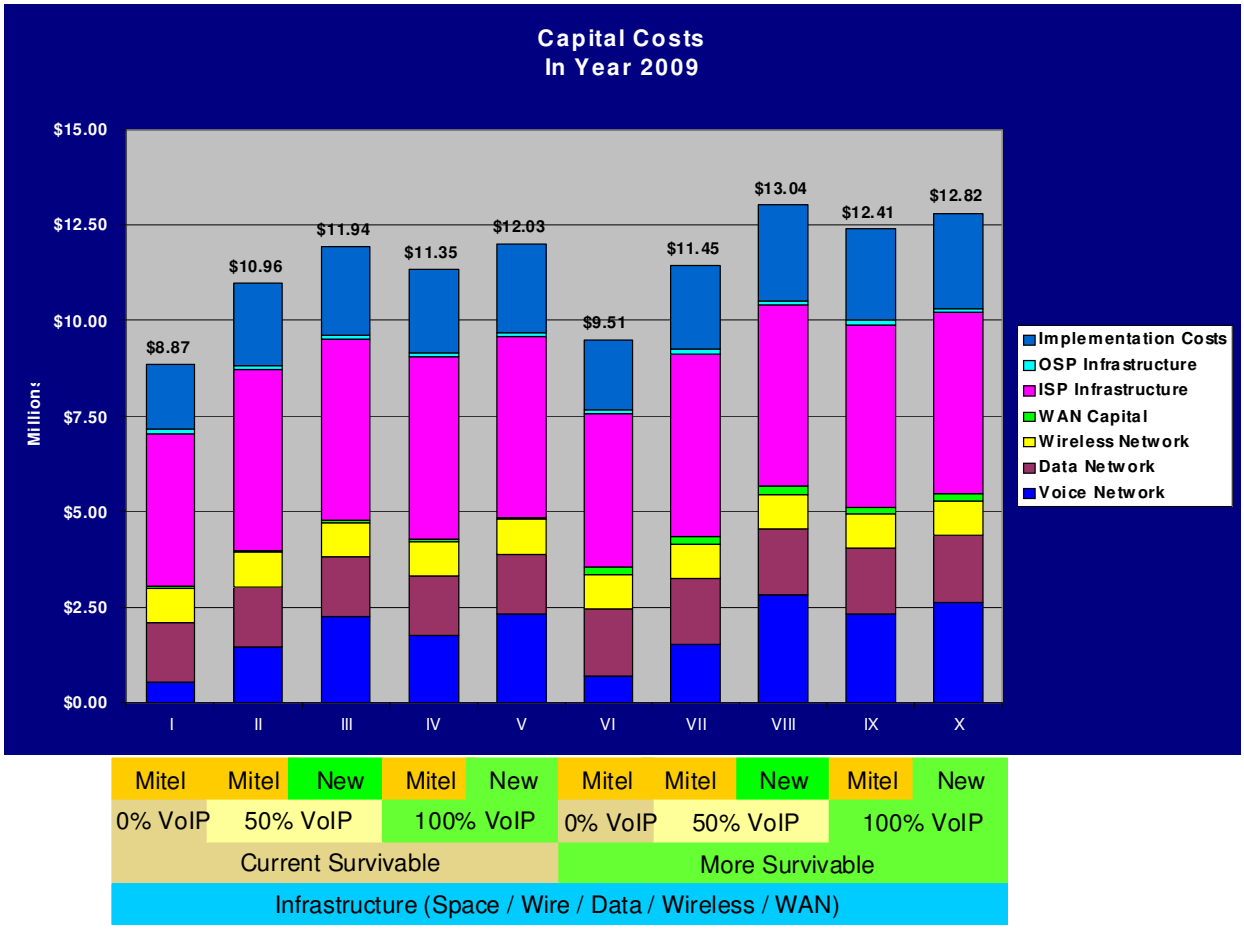
3.4.3 Establishing a common cable plant gives the District the most flexibility in choosing future technologies.

3.4.4 Migration to VoIP on a District-wide basis will require unified management of campus LANs.

3.5 Capital Budget - Voice and Data

3.5.1 Exhibit VI depicts the capital budget requirements for the ten voice and data configuration alternatives.

Exhibit VI
Capital Cost for all Configurations

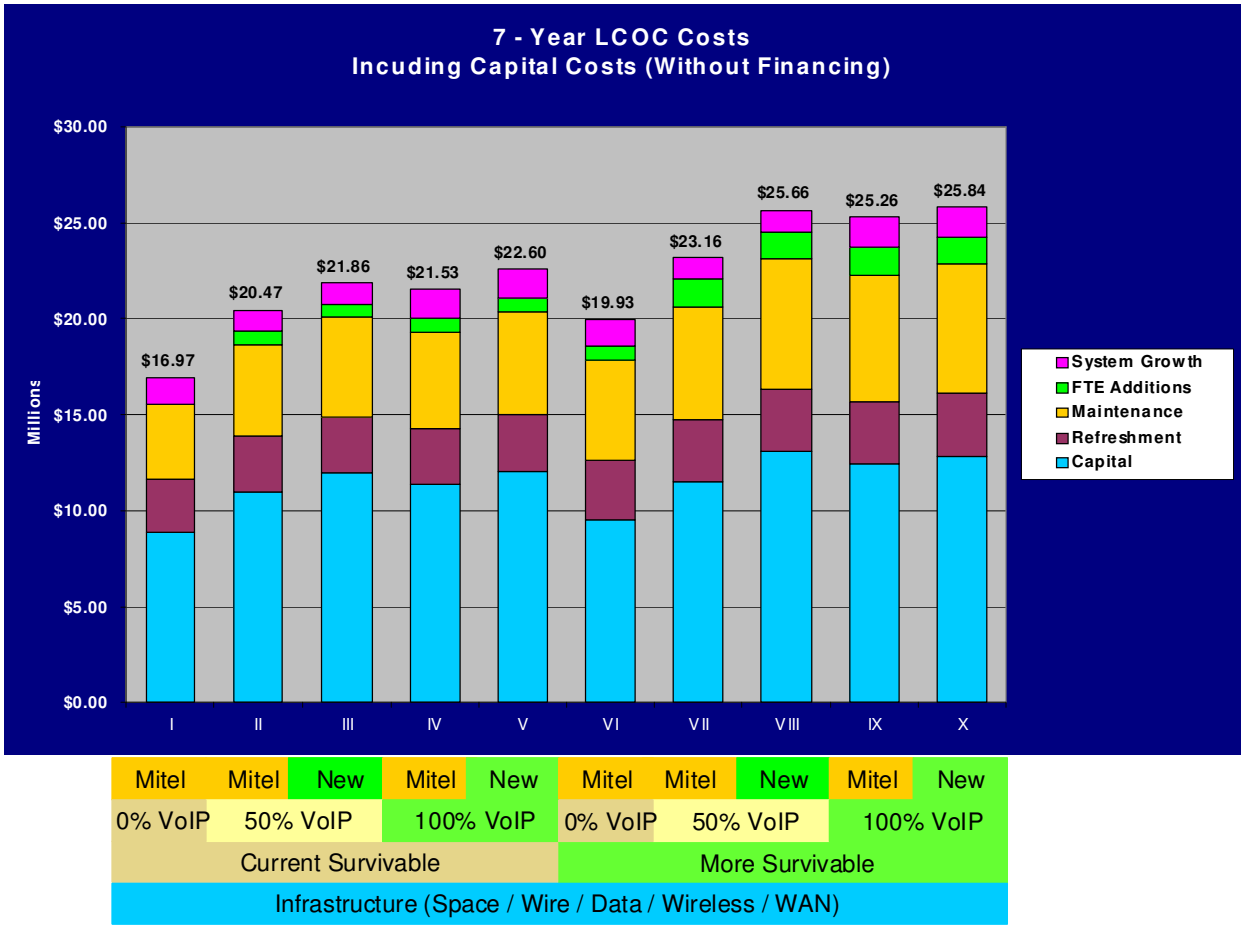


3.5.2 The capital budget details appear in Attachments II through VII.

3.6 Life-Cycle Budget - Voice and Data

3.6.1 Exhibit VII depicts the life-cycle budget requirements for the twelve voice and data configuration alternatives.

Exhibit VII
7-Year Life-Cycle Costs for all Configurations



3.6.2 The life-cycle budget detail appears in Attachment VIII.

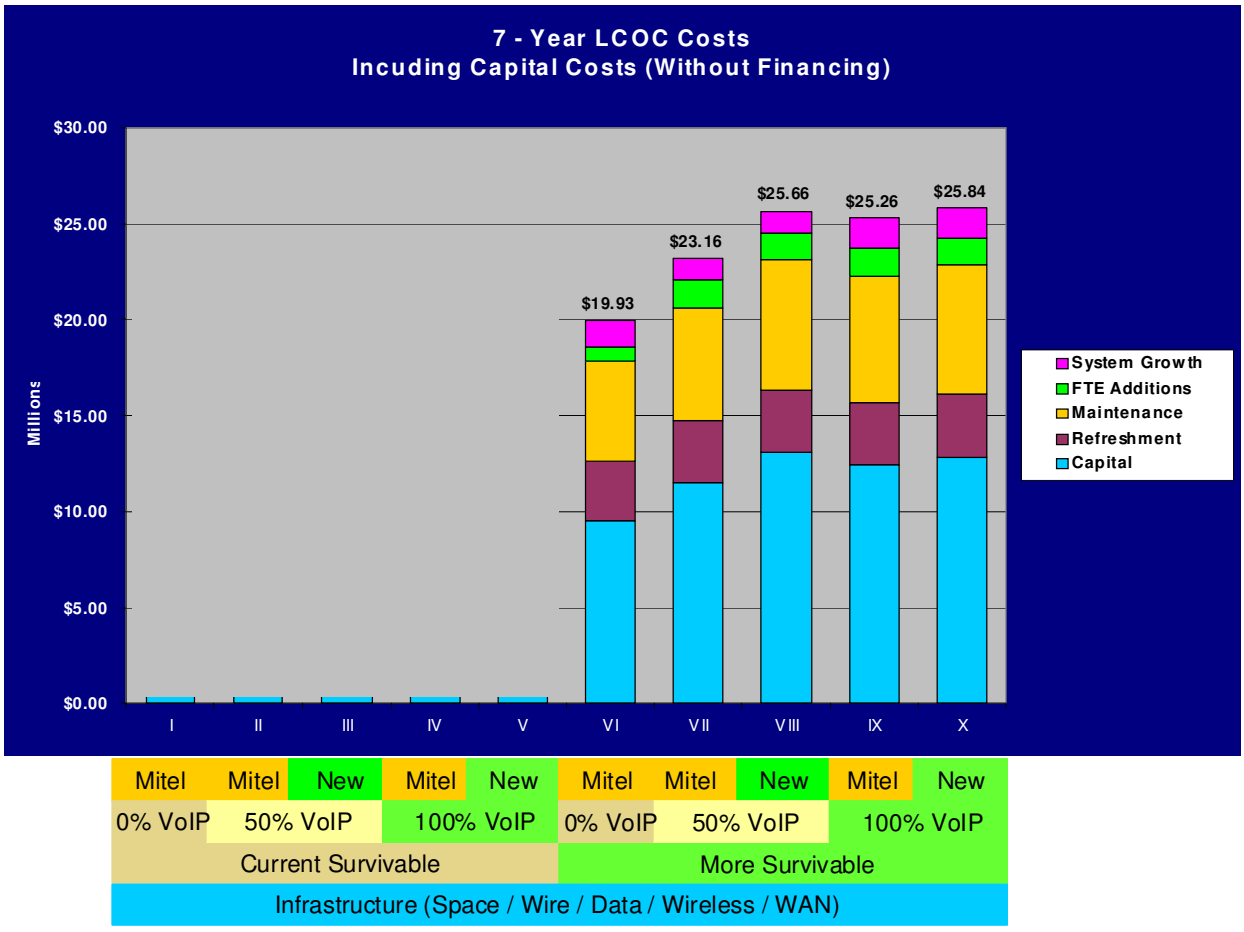
3.7 The Teams' Recommendation to the Cabinet

The Teams' findings and discussions determined the following conclusions:

3.7.1 Infrastructure changes throughout the District are required no matter what configuration is chosen.

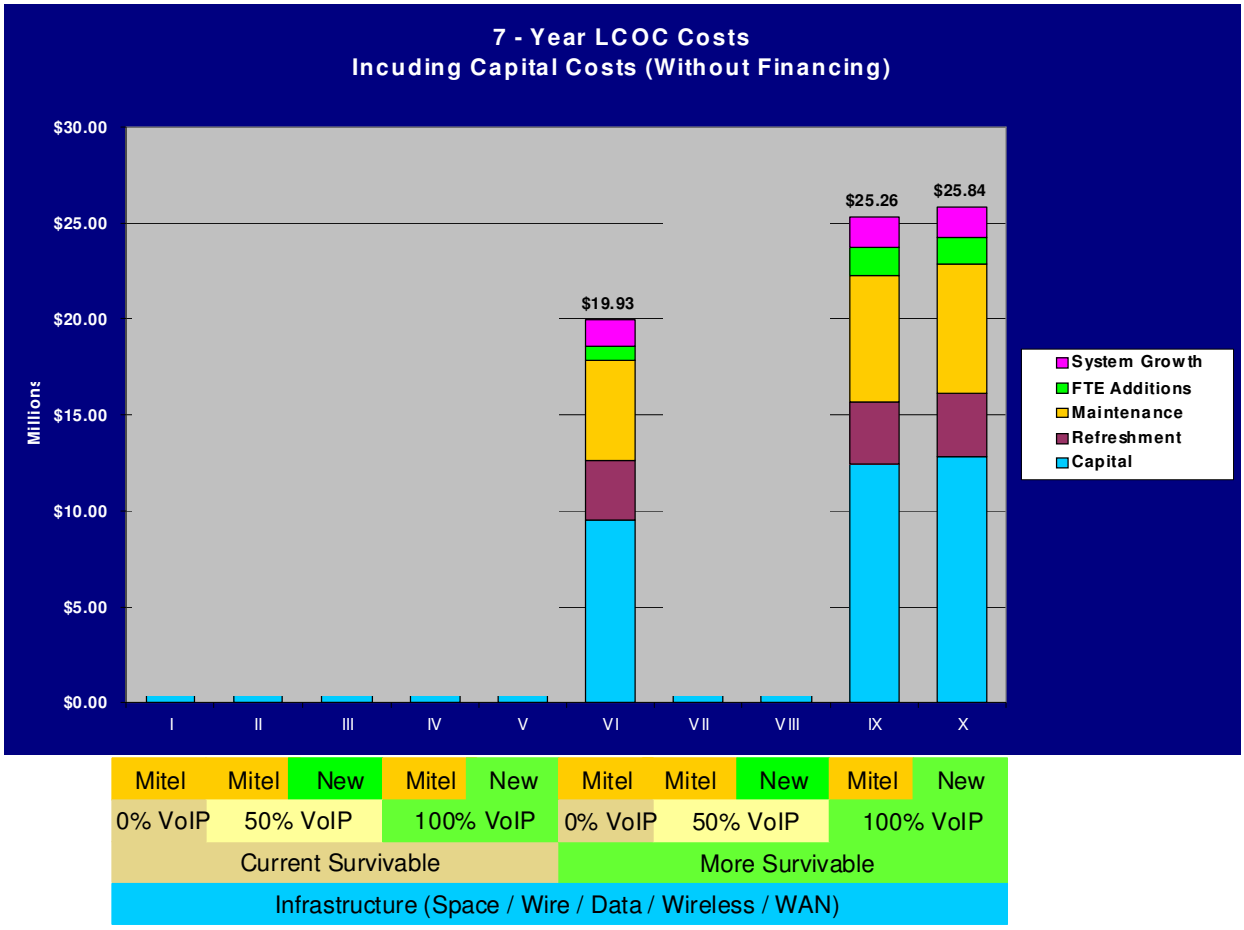
3.7.2 The cost delta to develop a more survivable solution is relatively low compared to the overall cost of the solutions. Therefore the Working Group eliminated Configurations I-V from consideration. Exhibit VIII shows this change in the Configuration choices.

Exhibit VIII
7-Year Life-Cycle Costs
Without Less Survivable Configurations I through V



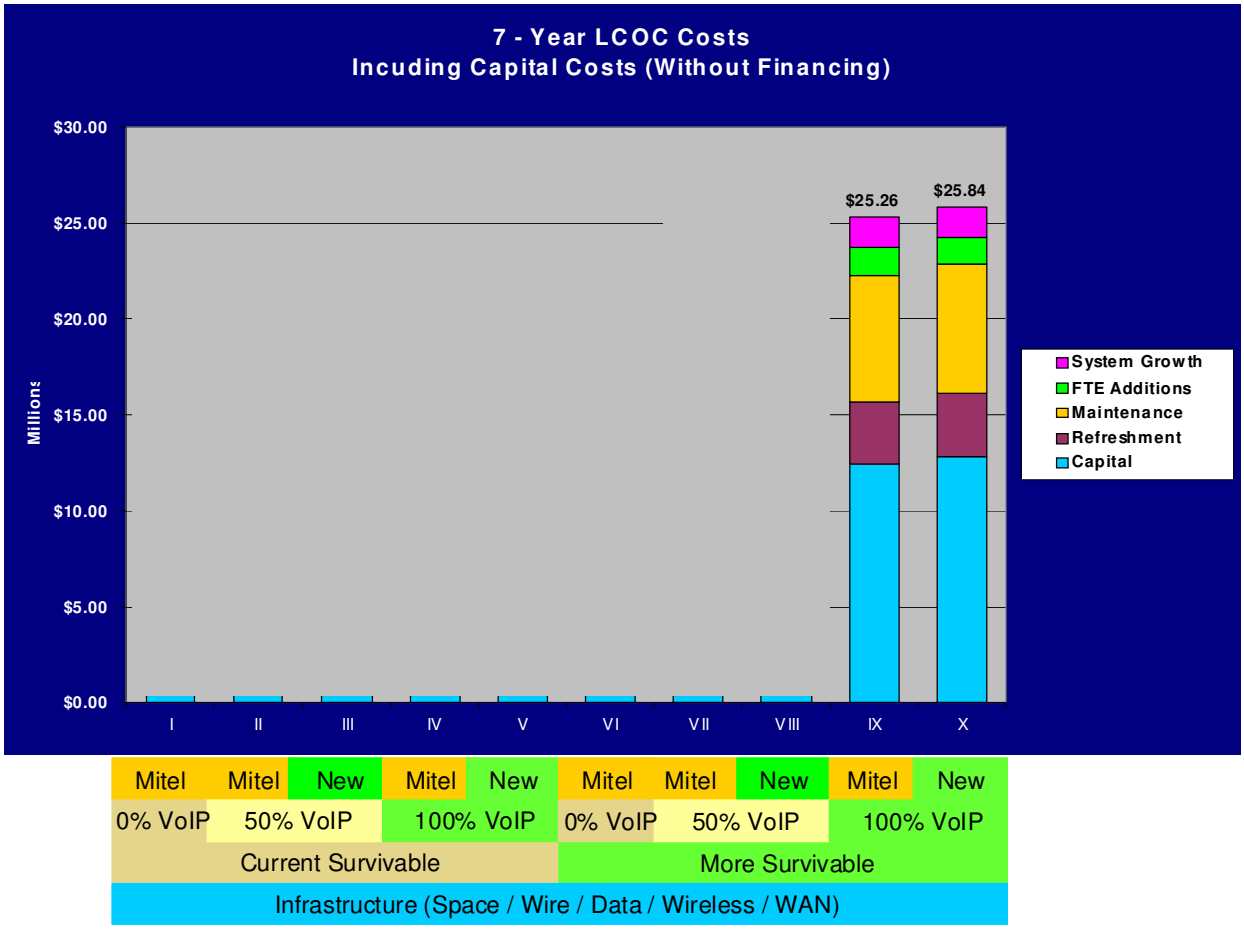
3.7.3 The cost savings of Configurations VII or VIII does not warrant the difficulty of managing the combination of TDM and VoIP technologies at the same time. Therefore, the Working Group eliminated Configurations VII and VIII. Exhibit IX shows this change in the Configuration choices.

Exhibit IX
7-Year Life-Cycle Costs
Without Multi-Technology Configurations VII and VIII



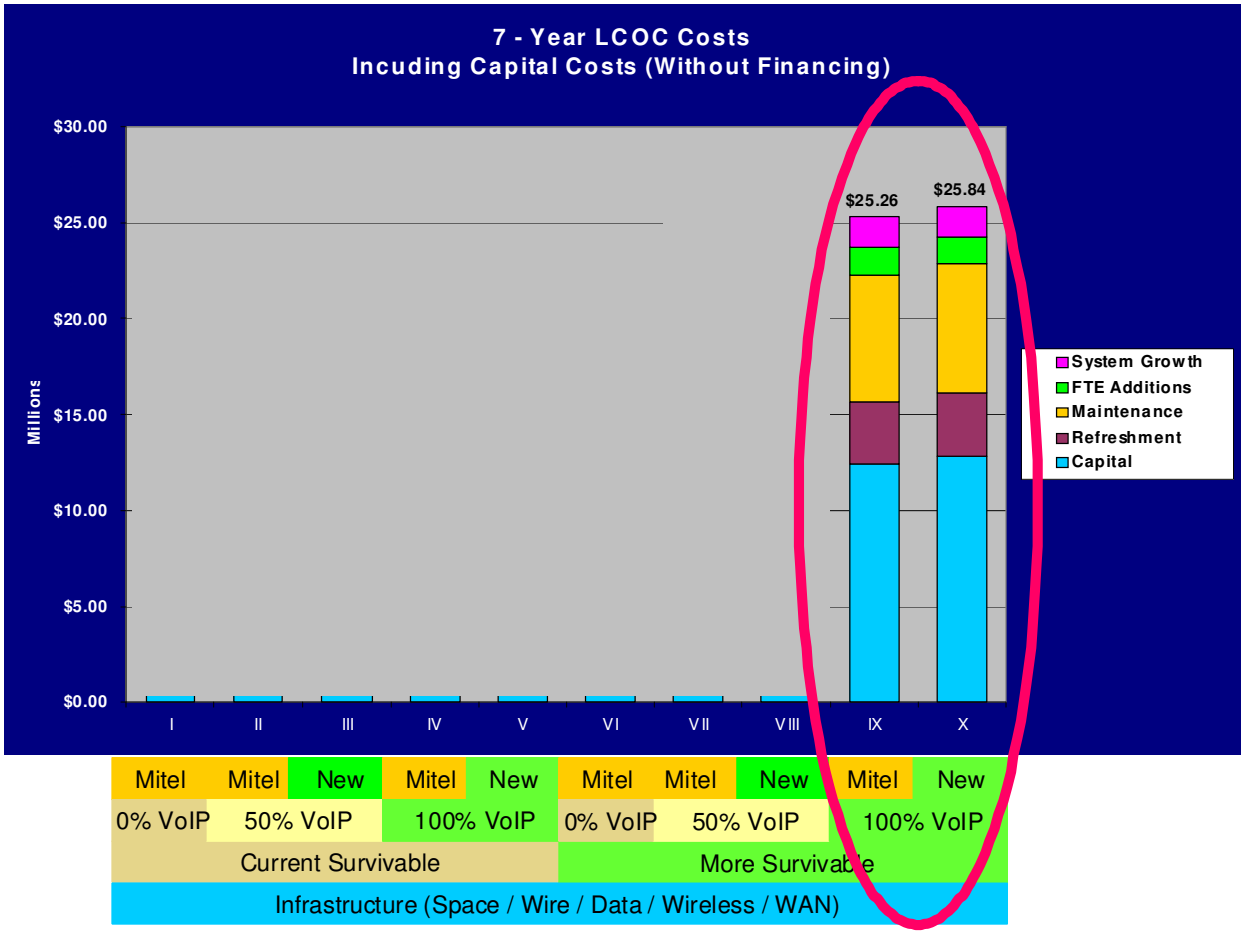
3.7.4 After reviewing the trends in the industry of manufacturers migrating telephony systems to VoIP and the desire for the District to move toward the use of technology to facilitate a more unified approach to technology, the Working Group removed Configuration VI. Exhibit X shows this change in the Configuration choices.

Exhibit X
7-Year Life-Cycle Costs
Without the Upgrade of Existing Voice Systems in Configuration VI



3.7.5 Configurations IX and X are actually the same. Configuration IX includes an upgrade of the existing Mitel systems to VoIP while Configuration X allows for the same configuration to any qualified manufacturer. The Working Group determined to recommend Configuration X as the solution that should be used for the upcoming request for proposal (RFP)process. Mitel suppliers would also be invited to respond to the RFP; therefore, the RFP process would actually include both Configurations IX and X.

Exhibit XI
7-Year Life-Cycle Costs
The Teams' Recommendation



3.8 Cabinet Review Meeting Results

After reviewing the capital costs, life-cycle costs, and recommendations from the Teams, the cabinet had the following comments and determined that the Working Group needed to do a few things before making a final decision to move forward:

3.8.1 Cabinet agrees with a more survivable solution.

3.8.2 Cabinet requested that the Working Group research:

3.8.2.1 What remodeling efforts are already underway?

3.8.2.2 What costs are already in District budgets?

3.8.2.3 What are the benefits of pursuing VoIP?

3.8.2.4 What are the ranges of costs when comparing Configurations VI and X?

3.8.3 Remodeling efforts already underway.

The Working Group compared the TR Profile Book information with the remodeling efforts already in progress throughout the district. Those TRs that are already slated to be remodeled or rebuilt through existing District efforts were removed from the capital cost models. This effort removed 23 TRs and $1,064,782 from the infrastructure capital costs. Table VI shows the remaining 151 TRs after removing those that are incorporated in the existing District remodeling efforts.

Table VI
Classification of TRs After Incorporating Existing Remodeling Efforts

Treatment	*Number of TRs*	*Average Cost*
None / Limited Cost: Simply needing maintenance	34	$2,000
Level A Remodel: Simple adjustments	47	$14,500
Level B Remodel: More aggressive adjustments	20	$20,500
Level C Remodel: Very aggressive adjustments	4	$25,000
Abandon: TR should not be used	35	$25,000
Rebuild: TR should be rebuilt	11	$80,000
Total	151	$20,052

3.8.4 Costs already in District budgets.

3.8.4.1 The Working Group reviewed existing budget cost reports to determine the costs that are already included in existing budgets. Those costs included:

- Maintenance costs
- Operational costs
- Upgrade costs

3.8.4.2 The results of this review identified $1,480,255 that could be taken out of the life-cycle cost models. The Working Group decided not to remove this cost from the models because the cost is intuitively too low. The Working Group reports that many purchases of networking components have been made through capital improvements. Many of those purchases have not been tracked in a way that allowed the Working Group to identify all of the costs.

3.8.5 The benefits of pursuing VoIP.

3.8.5.1 Redundant Capabilities

- Redundant programming.
- Automatic Core failover / Self-correction techniques.

3.8.5.2 Unified Messaging

- Collaboration between the telephone and the computer allowing for more computer enhancements.

3.8.5.3 Mobile Applications

- Wireless VoIP telephones.
- Auto reconfigure of phones that are moved.
- Automatic updates of the E-911 database.

3.8.5.4 Converged Applications

- Softphones – Using the computer as the telephone.
- Integrated voice and Web conferencing.

3.8.6 Comparing Configurations VI and X (to review a range of costs).

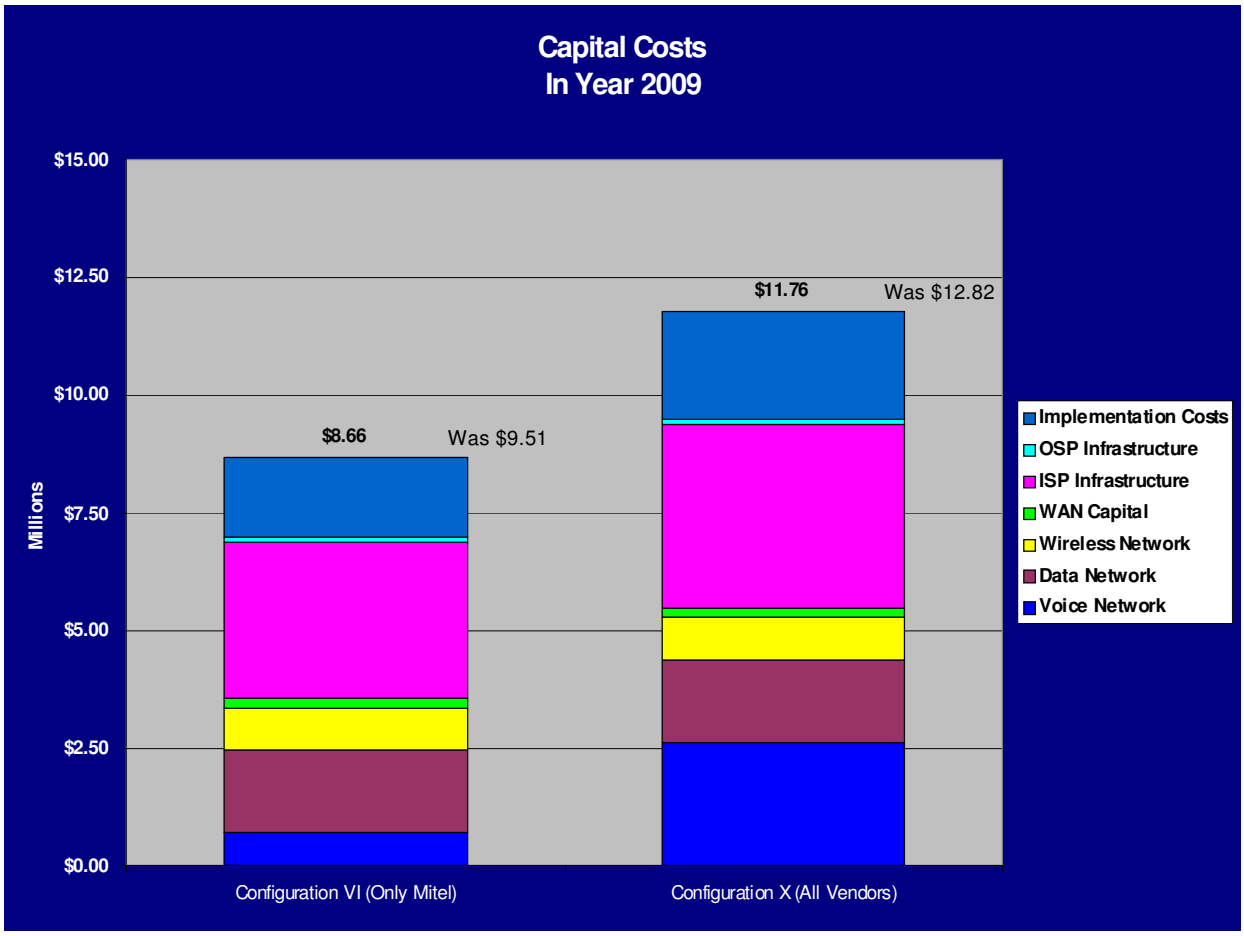
3.8.6.1 Exhibit XII shows a side-by-side comparison of Configurations VI and X. The text shown in gold shows the major items where Configuration X differs from Configuration VI.

Exhibit XII
Comparison of Configuration VI and X

	Configuration VI	Configuration X
Voice	Mitel Upgrade (software only)	New system or complete Mitel Upgrade
	New direct inward dial numbers	Same
	Single voice core	Redundant voice core
	No VoIP	All VoIP
Voice adjuncts	V.Mail, E911, ACD	V.Mail, E911, ACD, & Telemanagement
Data	No power over Ethernet	All power over Ethernet
	Redundant cores & Distribution	Same
Wireless	Full campus coverage	Same
WAN	AT&T MPLS redundant network	Same
Infrastructure	Remodel and rebuild rooms	Same
	Voice cable stays on old copper	Voice cabling replaced w/VoIP data
Staff	1 additional FTE for data/WAN	2 additional FTEs for data/WAN/VoIP

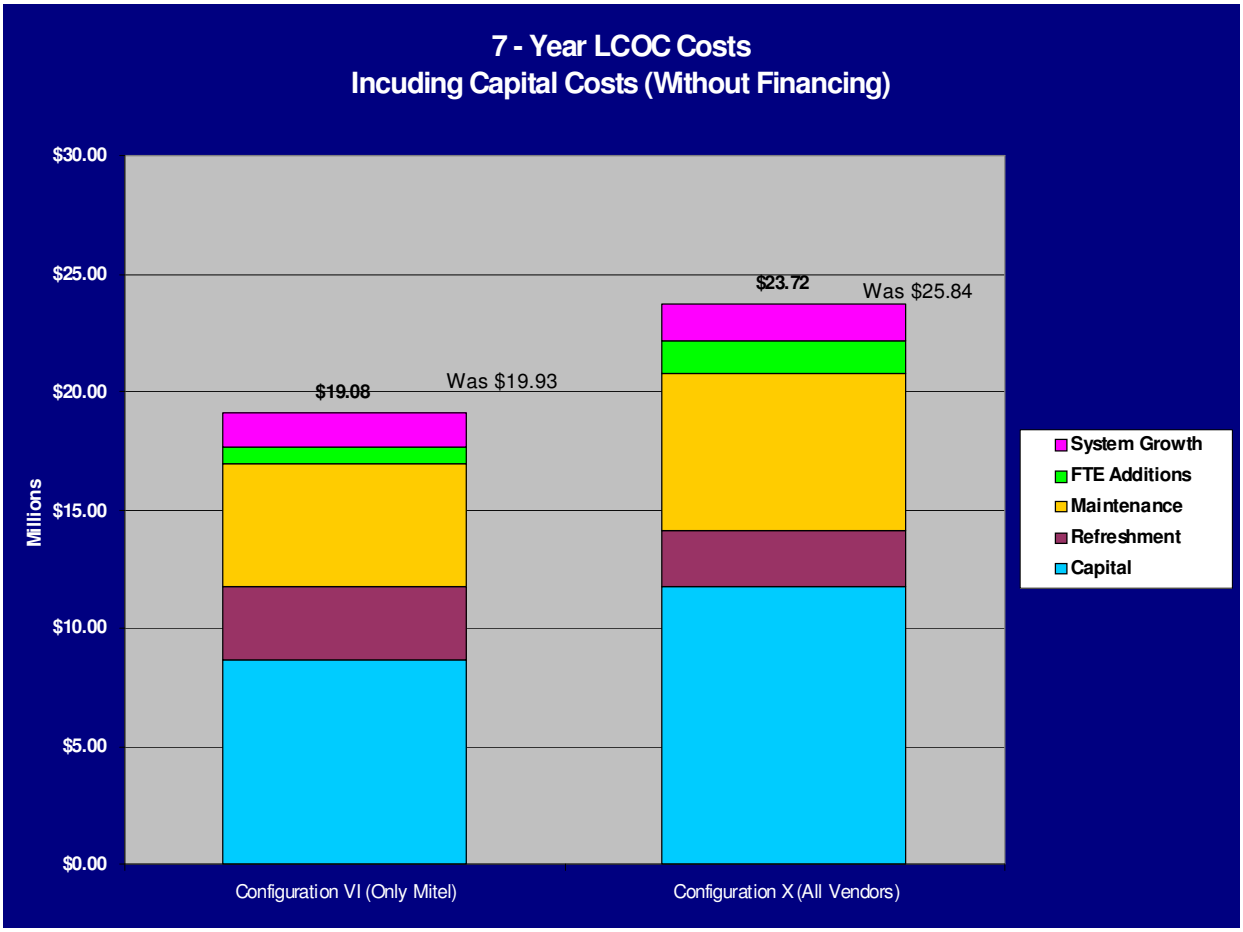
3.8.6.2 Exhibit XIII shows the new adjusted capital cost for Configuration VI and X after the reduction of existing infrastructure efforts that are already underway at the District.

Exhibit XIII
Revised Capital Costs for Configurations VI and X



3.8.6.3 Exhibit XIV shows the new adjusted life-cycle costs for Configuration VI and X after the reduction of existing infrastructure efforts that are already underway at the District.

Exhibit XIV
7-Year Life-Cycle Costs for Configurations VI and X



3.8.6.4 After reviewing the information with the Cabinet, the Teams and the Cabinet agree that Configuration X is the strategic direction that the District should move toward.

3.9 Timing of Funds Model

A Timing of Funds model was developed using Configuration X. The model calculates the annual cost of the systems over the 7-year planning horizon using the following assumptions:

3.9.1 Implementation will begin in the summer of 2009.

3.9.2 WAN implementation will span 6 months.

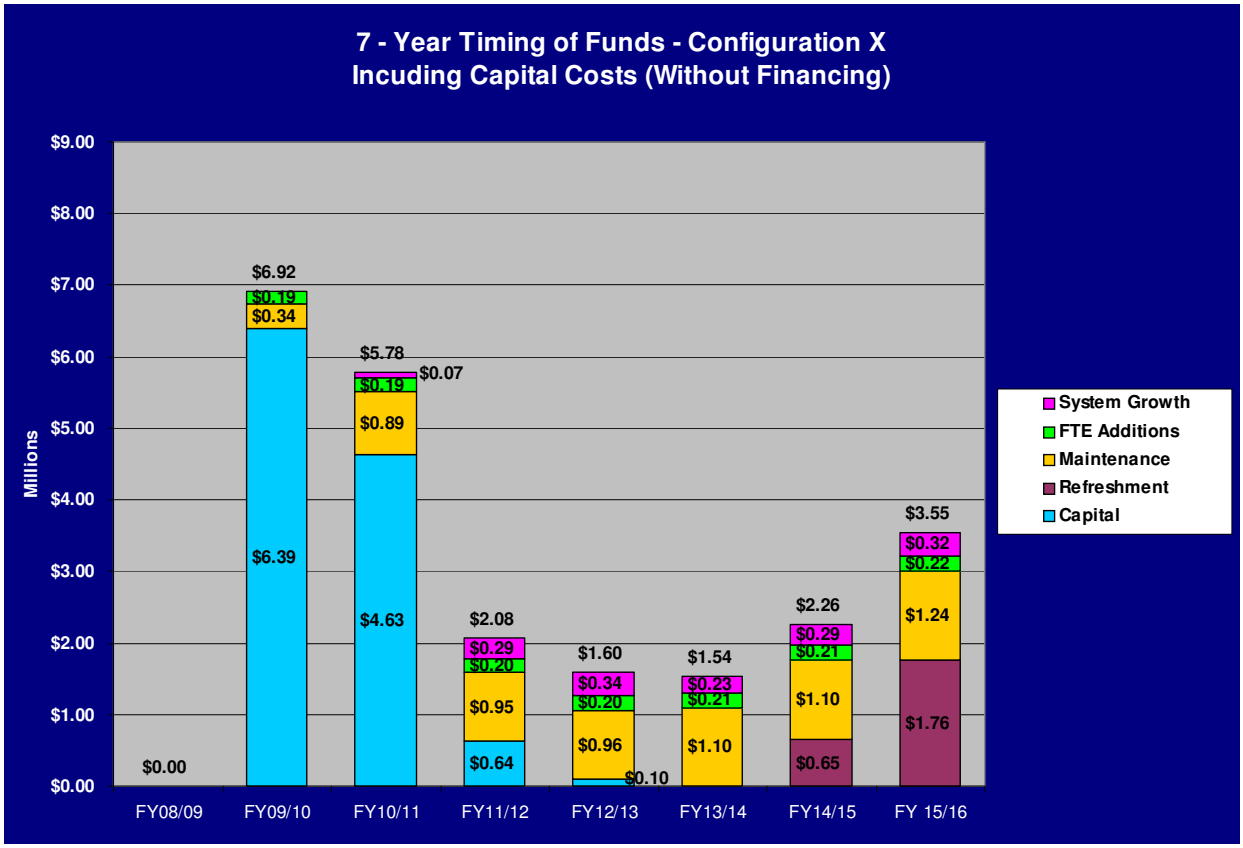
3.9.3 Telecommunication room modifications will span 4 years.

3.9.4 Voice and Data system implementation will span 2 years.

3.9.5 Wireless implementation: Do the wireless survey first, then phase in the coverage over 2 years.

Exhibit XV shows the timing of funds costs for Configuration X over the 7-year planning horizon. The details for the Timing of Funds model appear in Attachment IX.

Exhibit XV
7-Year Life Timing of Funds Model (Configuration X)



4 Recommendations

Based on the findings and conclusions detailed in the previous sections, we make the following recommendations regarding the strategic direction of the District's Strategic Infrastructure / Telecommunications Plan.

4.1 Overall

4.1.1 Develop a District standard for infrastructure installation and maintenance for all campuses to follow.

4.1.2 Develop policies and standards for centralized or coordinated management of District local area wired and wireless networks. These policies and standards should address the physical spaces housing network equipment (e.g., rooms with routers and switches), the network cable plant, management of network devices, performance monitoring, network authentication, security, and WAN access.

4.1.3 Examine District budgets to identify ways to confirm the existing budgets for infrastructure, voice, data, wireless, and WAN systems at each campus. Additionally, examine how budget policies promote or discourage using technology consistent with District-wide strategic directions and to provide District services in more cost-effective ways.

4.1.4 Plan on capital fund expenditures based on the Timing of Funds model.

4.2 Infrastructure

Determine the critical infrastructure work that needs to be completed before the implementation of a new converged voice and data environment and begin the proposal process to aggressively complete that infrastructure work.

4.3 Voice

Develop a Request for Proposal (RFP) that represents Configuration X to migrate to a VoIP based voice telephony platform.

4.4 Data

4.4.1 Include a new local area network (LAN) technology in the RFP process. Use Configuration X to configure the data RFP so that the LAN will be capable of the new technologies needed.

4.4.2 Define the Local Area Network (LAN) technology needed through a review of the vendor solutions in the Voice RFP process. Use either another RFP process or State-provided purchasing systems to acquire the appropriate LAN configuration that will allow for the most redundant, cost effective LAN solution. Those technologies include VoIP, Wireless LAN, Video Conferencing, and Streaming Video.

4.5 Wireless

Include a new wireless LAN technology in the RFP process. Use the wireless system as a complimentary technology platform for each District campus.

4.6 Wide Area Network

4.6.1 Define the Wide Area Network (WAN) technology needed through a review of the vendor solutions in the RFP process. Use either another RFP process or State-provided purchasing systems to acquire the appropriate WAN configuration that will allow for the most redundant, cost effective WAN solution.

4.6.2 Monitor the deployment of video and other bandwidth intensive applications and the impact of these deployments on the utilization of the WAN infrastructure.

Attachment I

Planning Assumptions

Attachment II

Infrastructure Capital Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment III

Voice Network Capital Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment IV

Data Network Capital Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment V

Wireless Local Area Network Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment VI

Wide Area Network Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment VII

Summary of Capital Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment VIII

10-Year Life-Cycle Costs

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.

Attachment IX

Timing of Funds Model

Summary pages are included in the written report. The detailed data files are included on the accompanying CD.