Bureau of Technology Services
Capital Improvement Project Information
Fiscal Years 2012 - 2016

BTS Division: Infrastructure and Engineering
BTS Department: Network Engineering and Support

Package Title:

Enterprise Network Life Cycle Replacement (LCR)

SAP Cost Object:

BTS Divisional Ranking (1 is highest):

CIP status (new/existing)? New
Project Type: **(Paul will fill this in)**

Brief Description:
(Prepare one paragraph including a clear statement of the problem and proposed solution.)

The purpose of this CIP is to provide LCR funding for the City computer network infrastructure. Much of the equipment (3750 10/100 switches) that was originally installed for the Network Redesign project that began in 2005 has reached end of sale. Software updates, including security patches will no longer be available after July 2011. The network infrastructure that is included in the project consists of:

- The data network switches and routers at TPB including the data center
- The data network infrastructure at other major City locations including switches and routers at City Hall, 1900 Building, Water Interstate, BES facilities, etc.
- The data network infrastructure including switches and routers at smaller City locations including Parks and Fire Stations, etc.

Not included in this project are:

- Costs associated with equipment and support of the IRNE and INET networks.
- Costs associated with equipment and support of the city wireless (WiFi) network. The wireless network costs are detailed in a separate CIP
- Costs associated with equipment and support of the BOEC CAD data network.
- The city Police network is not included in this project.
- The Water Bureau and BES SCADA networks are not a part of this project.

In addition to detailing capital and labor costs associated with the next network life cycle replacement, a cost model is proposed to obtain bureau funding as a per PC network access charge.

Critical business need(s) or BTS Workplan project item(s) addressed:

The enterprise data network is a critical component of the city's computing infrastructure that provides the backbone IP communications for all of the city's computer applications. Some of the major components of the network infrastructure are approaching end of support from Cisco. This CIP provides for funding to replace portions of the network infrastructure on a yearly basis. It will ensure that network hardware and software are supportable from the vendor and also provide bandwidth and feature upgrades as required to ensure that there is adequate capacity

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and that the network continues to provide the functionality, security, and high availability required to support city business applications.

5 Year Financial Forecast:

FY 2011-12 (FY 2012)	FY 2012-13 (FY 2013)	FY 2013-14 (FY 2014)	2014-15 (FY 2015)	FY 2015-16 (FY 2016)	5 Year Total
$720000	$1300000	$850000	$593400	$575100	$4380500

Financial Estimate Confidence:
Select a Confidence Level (C, O, H, M, L) for each FY estimate. See end of document for Confidence Level definition.

Detail Description:
(Supply additional, relevant, detailed description or justification not included in the Brief Description and impact if the problem is not addressed.)

Computer Network Equipment Planned for Replacement

The equipment planned for replacement consists of the following:

a. Data Center – This equipment is planned to be upgraded in 2012-13 to provide 10Gig connectivity to VMWare servers and 10Gig uplink capability to server farms and access switches in TPB.
   - Core routers – Two core 6509 routers in the Portland Building Data Center that perform central routing services for the city network.
   - Server Farm switches – Ethernet switches in the Portland Building Data Center that provide connections to the servers.

b. Internet Edge – This equipment is planned to be upgraded starting in 2012.
   - Internet Edge routers – Two BGP routers that provide the interface between the city and ISP.
   - DMZ switches – Ethernet switches that provide network connectivity for external Internet facing servers.

c. Remote site T1 connectivity – This equipment is planned to be upgraded starting in 2012 and completing in 2016.
   - Core T3 router – The core router that interfaces with Qwest with multiple T3s and provides T1 WAN connectivity to ~100 remote sites. The majority of the sites are Fire Stations and Parks locations.
   - Remote T1 routers and switches – The smaller routers and Ethernet switches at the Fire Stations and Parks locations that provide the WAN interface and connections to local PCs and printers.

d. Network Access for PC and Printer connections – This equipment needs to be replaced as soon as possible because software updates and security patches will not be available after July 2011.
   - Wiring closet switches – 3750 stackable switches in wiring closets at major city locations including the Portland Building, 1900 Building, City Hall, Water Interstate, BES facilities, etc.

Requirements for Replacement Infrastructure

The network infrastructure must continue to provide adequate performance and reliability and meet the needs of future network devices and applications. In addition to supporting current functionality, the following additional requirement assumptions are made for the next generation of network infrastructure that will replace the current hardware:

1. Data Center
    a. Capable of 10 Gigabit connectivity from server farms to core
    b. Capable of 10 Gigabit connectivity to high end VMWare servers and other server farms with high bandwidth requirements.
    c. In Service Software Upgrades (no network downtime)
2. Internet Edge – no new requirements
3. Remote site T1 connectivity – no new requirements
4. Network Access
    a. Gigabit copper connections on access ports for desktop PCs
    b. Capable of 10 Gigabit connectivity from wiring closets to core
    c. Power over Ethernet (POE) on access ports to support VOIP phones and 802.11n wireless access points
    d. Routing protocol (layer 3) support

The cost assumptions for the replacement equipment in this CIP are based on the next generation Cisco products that would logically replace the equipment that is being phased out. The network architecture would remain the same. This differs from the original Network Redesign that required a significant redesign and configuration change.

There are other options that could be considered for equipment replacement from different vendors that would be lower in hardware cost but require additional labor to implement.

Life Cycle Replacement Costs

The current network infrastructure was installed starting in 2005 under the scope of the Network Redesign project. The majority of the infrastructure consists of Cisco Catalyst 3750(V1) 10/100MB Ethernet switches that provide desktop connectivity. This switch model can no longer be purchased. In July 2011 software updates including security patches will no longer be available

There are no funds currently allocated for network infrastructure life cycle replacement. With our current process, funding would have to be requested from the bureaus in a lump sum to replace funds being spent from reserves. This was the funding method that was used for the previous Network Redesign.

Going forward we would like to propose a cost model for including network life cycle replacement costs in BTS rates:

    a. Assume that network infrastructure needs to be replaced every 6 years and estimate the replacement cost. The next replacement cycle should start in the 2011-2012 budget year. The costs for that cycle are included in this CIP.
    b. Allocate the replacement cost to each bureau based on a yearly estimate of the count of PCs, printers, and other network connected devices in that bureau.
    c. Divide each bureaus cost allocation by 6, and have them budget and pay that amount every year into a network LCR fund.

The actual replacement of network equipment would be an ongoing effort carried out every year using funds from the network LCR.

Summary

Based on the assumptions and methodology described, the bureau allocations for the network LCR would be as follows:

- Total Cost of 6 year network equipment replacement: $4,380,500
- Cost per device based on a 5000 estimate of total number of city network devices (PCs and printers): $876.10
- Cost per year per device (Cost per device/6): $146.02
- Cost per month per device (Cost per device/12): $12.17

High Level Project Plans
(Outline high level project activity by Fiscal Year and associated costs. Ignore years that do not apply.)

Activity	BTS Labor Hours	Cost
FY 2012		
1. Replace 3750v1 switches in TPB (includes PCI switches)		$705000
2. Labor		$15000
FY2012 Total		$720000
FY 2013		
1. Data Center network upgrade including 10Gig		$530000
2. Replace DMZ switches at TPB		$100000
3. Begin replacement of remote site network equipment		$150000
4. Continue replacement of 3750v1 switches (1900 Bldg and City Hall)		$470000
5. Labor		$50000
FY2013 Total		$1300000
FY 2014		
1. Additional Data Center network upgrades for 10Gig		$150000
2. Replace Internet Edge routers		$50000
3. Continue replacement of remote site network equipment		$150000
4. Continue replacement of 3750v1 switches		$470000
5. Labor		$30000
FY2014 Total		$850000
FY 2015		
1. Finish DMZ switch replacement		$58400
2. Continue replacement of remote site network equipment		$150000
3. Continue replacement of 3750v1 switches		$370000
4. Labor		$15000
FY2015 Total		$593400
FY 2016		
1. Continue replacement of remote site network equipment		$164100
2. Continue replacement of 3750v1 switches		$396000
3. Labor		$15000

FY2015 Total		$575100

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Account	Description	2011-12 Total Budget	In this column, give concise descriptions on what your *Suggested Budget* dollars represent (ie. vendor, service, amount, etc.)
511100	Full-time Employees		
511300	Part-time Employees		
512000	Overtime		
513000	Premium Pay		
514000	Benefits		
Total	**Personnel Services**	**0**	
521000	Professional Services		
522000	Utilities		
523000	Equipment Rental		
524000	Repair & Maintenance Services		
529000	Miscellaneous Services		
531000	Office Supplies		
532000	Operating Supplies		
533000	Repair & Maintenance Supplies		
534000	Minor Equipment & Tools		
535000	Clothing & Uniforms		
539000	Other commodities (external)		
541000	Education		
542000	Travel (In-town/Out-of-town)		
544000	Space Rental		
548000	Operating Lease		
549000	Miscellaneous		
Total	**External Materials & Services**	**0**	
651100	Fleet Services		
651200	Printing & Distribution		
651300	Facilities Services		
651500	Technology Services		
651600	Insurance		
652000	Bureau to Bureau Interagencies		
Total	**Internal Materials & Services**	**0**	
563000 / 599630	Capital Equipment		
Total	**Capital Outlay**	**0**	
551000	Debt Retirement		
555000	Debt Interest		
557000	Debt Issuance		
571000	General Operating Contingency		
573000	Equipment Cash Transfers		
650010 / 589961	General Fund Overhead		
650020 / 589964	Other Cash Transfers		
Total	**Other**	**0**	
	Total Cost Center	**$0**	

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Performance measure(s) for measuring success:

Related Projects
(Document other projects that this is related to. Specifically note if this project is dependent on the completion or approval of another project, or if another project is dependent on this project being completed for approved.)

This CIP provides Gigabit POE ports on switches that are required by Enterprise WiFi Full Coverage LCR project for full functionality of the WiFi network.

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