Memorandum

Date: May 1, 2012

To: Honorable Doreen Farr, Chair, and
Members, Board of Supervisors

From: Bob Nisbet
General Services Director

Subject: Telecommunications Technical Plan – Deliverable from November 1, 2011 Board Meeting, Item D-2

Cc: Chandra L. Wallar, County Executive Officer
Renee Bahl, Assistant County Executive Officer
Tom Alvarez, Budget Director

During the presentation of the Telecommunications Technical Plan at the Board meeting of November 1, 2011 (Item D-2), the Board directed that the plan be delivered by May 1, 2012 so that the plan proposals and alternatives were available prior to budget hearings.

At the meeting of November 1, 2011, a report was presented that described the need to carefully evaluate the best options available to upgrade or replace the existing County telephone system, that is at the end of its vendor supported life. The opportunity is to replace the existing NEC telephone system with technology that will allow the County to improve its automated telephone work flow, reduce disaster response times and allow staff to collaborate more efficiently by better utilizing mobile communications and audio/video conferencing.

Attached is the report from Gartner, our telecommunications consultant. Phase one of the recommendation is to upgrade the NEC Private Branch Exchanges (PBX) to a hybrid system that supports the Voice over Internet Protocol (VoIP) and allows the continued use of the existing digital phones on most County desks. The VoIP upgrade will enable the rerouting of communications around failures caused by natural or man-made disasters resulting in substantial improvement to business continuity and disaster recovery responses. Phase one also includes replacing the 14 year old voicemail system. The upgraded voicemail system will improve telephone work flow through Interactive Voice Response (IVR) and also provides a single inbox for both voice and email messages.

The second phase of the project recommends installation of Microsoft Lync to improve collaborations and conferencing through enhanced audio conferencing, video conferencing and desktop sharing. The first two phases of the project will be initiated next fiscal year. The third phase of the project will be implemented in FY 2013/14.

The funding for the first two phases of the project is in the Telephone Services proposed budget for FY2012/2013 in the amount of $1,500,000. The project is funded through the Internal Service Fund's depreciation line item.

A Report for

County of Santa Barbara

Telecommunications Replacement Planning

Report

26 April 2012
Engagement: 330002448

Gartner.

Table of Contents

Executive Summary

Executive Summary

Gartner was engaged by the County of Santa Barbara to conduct a Telephone System Replacement study, the findings of which are summarized within this Executive Summary. From a methodology perspective Gartner undertook the Telephone System Replacement study within the framework of a comprehensive Unified Communications and Collaborations (UCC) strategic planning process so as to provide a systemic view by including all interdependent communications and collaborations technologies. This approach takes into account new technologies, technology substitutions for a telephone system, and alternative collaborative means of communications that include video, and data collaboration. Our UCC strategic planning process included a review of the County's UCC needs and requirements, an assessment of the capability of the current UCC infrastructure to meet these needs and requirements, the identification of alternatives for meeting determine its capability of supporting UCC requirements and the development of a recommendation for moving forward.

Our review of County needs and requirements revealed a strong end user perception that the current Communications infrastructure is performing well and meeting most needs of the Departments. However, portions of the communications infrastructure are reaching the end of serviceable life and require replacement. The County has been notified by NEC — the vendor who manufactured and maintains the Telephone System — that core portions of the system are reaching end of life at which time software updates will no longer be provided and maintenance will only be provided on a best effort basis. The lack of software and assured sources of hardware will create an operational risk that is unacceptable in a public safety, correctional institutions and in a first responder or disaster recovery situation. The County must either perform an upgrade of the current telephone system or a replacement of the system if the County is to be assured of continuing to meet operational and performance expectations.

Our interviews with Departments revealed a desire for the communications infrastructure to have an increased level of unification through the deployment of Unified Messaging (UM) and the deployment of County-wide call centers through call center virtualization. These Unification and Virtualization features would provide productivity, process and cost improvements for the County. The Departments also expressed a strong interest in the deployment of collaborations tools that can increase their productivity and their communications effectiveness through the deployment of desktop voice, data and video conferencing. We also observed a strong interest in the facilitating the current transition from a "wired" or "fixed location" communications environment to a mobile communications environment.

After an examination of the current UCC infrastructure we found the infrastructure to have strengths and some weaknesses. We found many strengths within the current UCC infrastructure; although not perfect, the cabling and building facilities are in good condition, the data Wide-Area Network (WAN) is robust and is capable of supporting the unification of communications. Chief among the weaknesses is the imminent end of serviceable life for the common control portion of the existing NEC telephone system — this portion of infrastructure will require replacement. Weaknesses were also found in the ability of the Local-Area Networking infrastructure to support Voice over Internet Protocol (VoIP) phones. A final material weakness was found in the County's current practice of allowing Departments to independently manage software images on personal computers. This independence has resulted in a lack of uniformity that inhibits the deployment of collaborations services on personal computers.

Based on the requirements and the strengths and weaknesses of the current UCC infrastructure; Gartner examined three alternatives for moving forward.

1. Continue the current course — defer upgrades in the telephone system and increase investments in alternative communications methods (i.e., mobile phones, Smartphones tablets and "free" consumer communications and collaborations services).
2. Upgrade the current NEC end-of-life components (the Common Control and Voice Mail) and leverage the capabilities of the new software and hardware to deploy Unified Communications. Leverage existing Microsoft application licenses to deploy Collaborations services on desktop computers.
3. Replace the current NEC communications network with a comprehensive VoIP infrastructure capable of deploying Unified Communications and deploying Collaborations with a single vendor approach.

A thorough analysis of the three alternatives revealed the NEC upgrade approach meets the needs and requirements of Departments at close to half the cost of a replacement approach while providing the enterprise features and operational guarantees that are not provided in the "continue the current course approach". The upgrade approach can be implemented with the least disruption and transition trauma. It also provides a seamless evolutionary path to future UCC technologies as they are deployed over the anticipated seven year life of the upgrade; including consumer communications technologies that are free. As a result, Gartner has prepared the following recommendation;

- Upgrade the end of life components of the NEC telephone system transforming the system to a VoIP communications server capable of transition to VoIP phones and networking that will lower operational costs
- Replace the end of life Voice Mail with a Unified Messaging system capable of providing voice mail and email integration
- Deploy Desktop Collaborations capabilities using the already-paid-for Microsoft Enterprise Client Access Licenses

The recommended approach addresses the end of life issue by extending the projected life of existing investments by an additional seven years. This recommendation provides the greatest leverage of existing investments in UCC infrastructure, desktop computer applications and the data networks. It also provides improved disaster recovery and business continuity benefits, along with the deployment of fixed to mobile convergence capabilities. It also includes enhancements to the Call Center capabilities to allow any Department to set up a call center and for agents to be added virtually at any location in the County.

These recommendations should be completed over the next twelve months using the "depreciation" funding already set aside for equipment replacement. Details of the recommendation are provided in the following report.

UCC Needs and Requirements

Gartner.

UCC Needs and Requirements

Interviews with Department representative, IT representative and infrastructure investigation by Gartner revealed that Departmental communication needs are generally currently being met. Most interest in new features and services relate to desires to either increase productivity of end users or lower the costs of communications.

During the course of the engagement Gartner met with, interviewed and conducted site visits with many of the largest Departments within the County in an effort to establish an understanding of Department needs and requirements. The major Departments that were interviewed included

- Social Services
- Sheriff
- General Services
- District Attorney
- Community Services - Parks
- Public Health
- Planning and Development

Although each of the Departments has some unique requirements, they also have several common requirements. The first and foremost requirement was to "do no harm." All Departments expressed high satisfaction with the operational performance and reliability of the existing Communications infrastructure. All Departments cited performance and reliability as very high on their list of requirements. Many of the Departments expressed skepticism regarding perceived potential risks to operational performance and reliability if the system were to be migrated to the County's comparatively less reliable data network.

Most Departments expressed a strong desire to increase the Disaster Recovery and Business Continuity capabilities of the existing communications system. Departments have concern that the inflexibility of the current telecommunications design does not provide the resiliency needed in the event of a disaster. As an example, Departments expressed concern about the "silo'ed" nature of the existing system — calls to a location are not easily rerouted, calls to a mobile phone are not capable of transferring to the County network, no work at home capability.

All Departments also expressed a fundamental satisfaction with the features provided by the existing telephone sets. In fact, not a single Department perceived the replacement of the existing telephone sets as adding value.

The Departments did uniformly express a desire to improve productivity by consolidating email and voice mail messages and making them accessible either by voice mail or email. The Departments also uniformly expressed an interest in having desktop based collaboration tools that would enable the quick and easy establishment of voice and video conferencing and desktop collaboration (i.e., screen sharing).

Many Departments also expressed an interest in using productivity improving features like Call Centers and Interactive Voice Response for efficiently handling high volume calls. These same Departments also expressed an interest in virtualizing their call centers so personnel can work from multiple offices within the County, or even at home.

Finally, we also found strong interest in the unification of the current wired communications infrastructure with mobile phones, tablets and Smartphones. Departments would like to have a find-me-follow-me feature that forward calls from an office phone to a mobile phone, or takes voice mail messages on the County voice mail system so users can avoid mobile phone

charges. Departments would also like to be able to use a voice communications application on Smartphones so they can avoid using mobile phone minutes to make a call on their mobile phone. Departments would also like increased access to Wi-Fi so they could minimize cellular data plans.

In aggregate, the Departments envision the telecommunications replacement as having the following strategic objectives;

1. Maintain the current high level of operational performance
2. Improve the disaster recovery and business continuity capabilities of the network
3. Lower costs of providing telecommunications services wherever a positive Return on Investment exists for capital investments
4. Lower the costs for Departments by providing productivity enhancing features
5. Extend and stretch the previous investments to the greatest extent possible.

Assessment of Current UCC Infrastructure

Gartner.

Assessment of Current UCC Infrastructure

Gartner undertook an in depth review of all major components of the County's existing UCC infrastructure. Overall, we found the infrastructure elements to have varying degrees of readiness for UCC deployment.

Physical Infrastructure

Most locations have a standardized wiring and facility infrastructure that can be adopted for the deployment of UCC services. The core network locations (typically those locations that currently have a PBX) generally have the appropriate environmental conditions (power, air conditioning, space, battery backup) to support VoIP. The cabling also appears to be adequate for the installation of VoIP. Those locations that do not currently have a PBX will require remediation in order to meet the environmental conditions at facilities that currently have a PBX.

Infrastructure Applications

The County currently operates and maintains two separate sets of infrastructure applications (trouble ticketing systems, network management systems, inventory management systems); one for the voice network and one for the data network. The two separate systems reflect the fact that the County has not yet undertaken a consolidation of the two historically independent platforms. Regardless of the strategic direction taken, the County can achieve operational efficiencies and improvement in effectiveness if the two independent systems are consolidated.

PBX

The County installed a comprehensive NEC telephone system eight years ago. The telephone system deployment included all new telephones sets. The common control portion (CPU and Memory) of the telephone system has now reached end of life and will no longer be manufactured or supported. But a substantial portion of the telephone system consisting of the line cards, trunk cards and telephones remains manufacture supported.

Discussions with NEC validated that an upgrade of the common control portion of the telephone system will extend the life of the system by an additional seven years — possibly more. This upgrade would include the deployment of the prevailing release of software; making currently available features available within the County. The capital costs to upgrade the current telephone network are $900,000.

The system is currently configured in a WAN hub and spoke architecture that makes it difficult to provide resiliency in the event of a disaster — if a hub losses communications then all of the tributary spoke locations also suffer a deterioration/loss of performance. The County's trunks interconnecting the telephone system with the Verizon also have single points of failure that can result in substantial losses of service with few options for remediation in the event of a disaster. An upgrade of the PBX should also include a deployment of VoIP on the WAN such that failures in the network can be dynamically rerouted around using secondary or tertiary links.

Voice Mail

The County currently has a 14 year old manufacture discontinued Octel voice mail system that has also reached the end of life. The system reached in maximum capacity over eight years ago and has not been capable of meeting the demand for certain services. The voice mail system also lacks features like Unified Messaging that can integrate the voice mail and email system to provide voice mail messages in Outlook or provide a text to speech reading of email messages in our voice mail. The Octel system also lacks advanced interactive voice recording, which can provide callers with a self help substitute to reaching a County employee. This results in higher

operational costs for the Departments. The capital costs to replace the voice mail system are estimated to be $400k.

Video Conferencing

The County currently has limited video conferencing equipment. Most of the equipment that has been deployed is expensive room based systems that use dedicated WAN bandwidth to provide a quality assurance. Desk based video conferencing has not been deployed due to the lack of Quality of Service and Class of Service support on the LAN and WAN. Without QoS and CoS, the County cannot prioritize video and voice traffic as required to provide a quality end user-experience.

Local-Area Network

The County LAN infrastructure is relatively old and not capable of supporting Voice over IP communications. The LAN equipment lacks the Power over Ethernet (PoE) that is required to provide centrally powered — and centrally Uninterruptible Power Supply (UPS) — for phones. The cost to upgrade portions of the LAN to support the telephone system upgrade and voice mail replacement is approximately $100,000.

The data network currently operates at a 99.9% level of availability. Although this level of availability may be adequate for the data networking needs of the County, the voice network currently performs at a 99.999% level of availability. The LAN will require an investment of more than $1M to increase the availability of the network to a 99.99% level of availability. Investments in facilities (i.e., UPS deployment) will be required to achieve the increase to 99.999%.

Wide-Area Network

Currently most locations have one dedicated WAN connection for voice networking and a separate dedicated WAN connection for data and video networking. These two WAN circuits were provided to the County as a result of a Comcast agreement that is now reaching end of term. Once the Comcast agreement expires the County will lose access to the WAN circuits currently used for voice communications. The County will be forced into either purchasing replacement circuits, or unifying the voice, data and video onto the remaining circuits. The additional cost for these circuits is estimated at about $10,000 per month.

Microwave Network

The County has a microwave network that provides limited bandwidth and therefore has limited bandwidth available for providing business continuity routing of voice networking. Even so, the telephone system is not capable of optimizing and fully utilizing the bandwidth that is available. The configuration restrictions result in only a limited number of calls being capable of going through the microwave network in the event of an emergency; and those calls that do go through will not be the result of an emergency response prioritization schema. No estimates have been prepared for the microwave network, the network is being considered as a constraint within the telecommunications replacement planning.

Client and Endpoint Devices

The County has NEC digital telephones deployed throughout the enterprise. Although these telephones meet the needs and requirements of the end users, these digital telephones are proprietary and they only operate on the NEC telephone system. If the County were to upgrade the telephone system common control these telephones would continue to operate as they do today. If the County were to replace the telephone system the telephones would also require replacement.

From a personal computing perspective, the County has allowed each Department to create unique images of operating systems in accordance with the needs and requirements of each Department. This approach results in a lack of an enterprise standard that severely limits the ability of the County to deploy desktop communications and collaboration features. This prohibits the ability of the County to use desktop communications and collaborations features — features that are already paid for within the Microsoft licenses. If the County were to create an enterprise standard for the basic operating system and collaborations software, the County could deploy a rich suite of desktop voice, video and data collaboration tools using Microsoft Lync features.

Overall assessment

The County's UCC infrastructure is robust and capable of being upgraded to support a hybrid VoIP architecture that uses VoIP on the WAN, Microwave network and portions of the LAN while supporting existing proprietary digital phones. The weakest portion of the County network is the LAN infrastructure. The LAN, and related data network equipment, would require replacement in order to support VoIP to the desktop using VoIP phones. Either strategic alternative will require investments in the data network and infrastructure applications.

UCC Strategic Alternatives

Gartner

UCC Strategic Alternatives

Based on Gartner's extensive research of product manufacturers, service providers, best practices, market price and service level benchmarks; we prepared three alternatives that will meet the strategic objectives of the County.

1. Continue the current course — defer upgrades in the telephone system and increase investments in alternative communications methods (i.e., mobile phones, Smartphones tablets and "free" consumer communications and collaborations services).
2. Upgrade the current NEC end-of-life components (the Common Control and Voice Mail) and leverage the capabilities of the new software and hardware to deploy Unified Communications. Leverage existing Microsoft application licenses to deploy Collaborations services on desktop computers.
3. Replace the current NEC communications network with a comprehensive VoIP infrastructure capable of deploying Unified Communications and deploying Collaborations with a desktop computer independent approach.

Strengths and weaknesses of the three alternatives follow;

Continue the current course

From an initial capital perspective, this alternative has the appearance of having the lowest cost. But from a risk adjusted total cost of ownership, this alternative is actually the most expensive option.

A decision not to upgrade the NEC telephone system will force the County to accept a best effort level of service as the system is no longer supported by the manufacturer. Maintenance will need to be performed using parts purchased on resale markets. We have seen several businesses pursue this path by purchasing second hand parts on E-Bay or other online sources. The risks of buying second hand parts can be mitigated by buying complete sets of spare parts and testing them during network maintenance windows prior to actual need. This approach can be successful if you have a low impact from a loss of service. Many manufacturing facilities find this approach attractive when they are winding down investment in a facility. If a telecommunications system fails in a manufacturing plant, managers can use alternative voice communications methods until replacement parts and technicians are sourced. But the County is not a manufacturing facility; it is expected to provide first responders and public services even in the event of a natural disaster. System failure tolerances are minimal and service restoration expectations are high.

This approach has been shown to accelerate the transition from the legacy telephone systems to alternative communications methods. For the County the alternative communications methods will include the public safety radio network, cellular services and consumer grade services.

Although the County's current public safety radio network is not capable of providing the needed amount of talk paths and bandwidth; many government agencies are investing in their public safety radio networks during the 700MHz re-banding so that the radio networks are capable of supporting increased level of mobile voice and data connectivity. This is an expensive option that cannot be cost justified on the basis of providing and alternative to a wired telecommunications system.

Over the past several years the Departments have been increasingly purchasing mobile phones and Smartphones that enable them to meet their communications needs but at a higher monthly cost (the average cost for a smartphone with a data plan ranges around $50 per month

compared to the average County cost of $25 per month for a wired connection). Mobile phones, Smartphones and tablets are an appropriate replacement for traditional wired services; but the demand for services needs to be managed against lower cost alternatives otherwise costs spiral out of control.

Many Departments are also trialing the use of free consumer communications applications like Skype that allow voice and video calls on the Internet using computers, tablets or Smartphones. Free may be a compelling price but the detriments to this approach are severe;

- Mobile phone and Internet users have no guarantee of service during a natural disaster.
- Consumer grade services do not provide the security and privacy required by governmental users
- Silo-ed communications create interoperability problems that hinder emergency response efforts
- The frequent upgrading of consumer applications creates compatibility issues
- Some consumer applications can introduce vulnerabilities into County network if the devices are used within the County network — aka, Trojan Horse.

Continuing on the same path will result in the degradation of operational reliability on the telecommunications network with many users transferring to equally unreliable higher-cost networks that provide improved features. Overall costs will increase with performance on both the telecommunications and cellular networks having a high risk of "crashing" during a natural disaster.

Upgrade the NEC telephone system

In this alternative the County would upgrade the current NEC end-of-life components and replace the Octel Voice Mail system. This alternative will convert the core NEC network to a VoIP server architecture that has LAN VoIP interfaces capable of supporting VoIP phones and WAN VoIP interfaces capable of routing calls over the voice network. The deployed feature set will be the equivalent of prevailing market features and will enable the deployment of productivity improving features.

The LAN VoIP interface will allow the County to replace expensive Digital Remote Units (DRU's) with VoIP phones eliminating 25 T1 circuits that cost the County a total of $7,500 every month. The VoIP interface will also allow the virtualization of the telephone network such that telephones and telephone extension numbers can be freely moved around the County.

The WAN VoIP interface will allow the County to unify voice, video and data traffic over a single WAN connection saving the County the potential cost of $10,000 per month. The savings on circuits alone provide just over a four year break-even on the $900k NEC upgrade cost.

Replacement of the Octel Voice Mail system with a unified messaging system will provide the County substantial productivity benefits. Gartner surveys of clients who have deployed UCC consistently site UM features as one of the top three benefits of deploying UCC. Among other features, UM provides users with a voice mail message in their Outlook email inbox.

In this alternative both communications and collaborations features will be deployed using the Microsoft Lync capabilities that are partially included in the current enterprise Microsoft licenses purchased for desktops. Lync will provide the ability to initiate voice calls from a personal computer or a smartphone/tablet using the data network. Lync will also provide the ability to initiate video calls from a personal computer or a smartphone/tablet using the data network. Lync enables the use of video calling as easily as voice calling. It also allows the user to conduct multiparty voice and video conferencing on their desktop or smartphone/tablet.

This approach does introduce a level of complexity associated with the integration of multiple product vendors. This approach may also exceed the capabilities of the County's existing vendors. If the recommendation for this alternative is accepted, Gartner recommends the County consider conducting an open procurement for the upgrade of the LAN and WAN, implementation of Lync and the integration of Lync with the NEC telephone system. The vendor selection should focus on qualifications associated with experience, certification, and integration expertise.

Replace the current NEC communications network

In this alternative the County will replace the NEC telephone system with an alternative VoIP system that is provided by a single provider. This approach provides the County with a comprehensive replacement of all telephone system components by a provider who can provide a comprehensive end-to-end portfolio of products and services. This approach provides the County with a single point of responsibility for the UCC network, but it comes with the highest cost.

In this approach a single vendor will deploy a telecommunications network replacement (new phones will be required), Voice Mail replacement, upgrade of the data network infrastructure to provide increased availability and the deployment of a collaborations suite of software that would operate in the place of Microsoft Lync.

The features available from this alternative will equal, and in some ways marginally exceed, the features available from the NEC upgrade alternative. The County should also find it easier to locate a service provider who specializes in the single vendor product portfolio, as opposed to finding a vendor that supports the unique mix of products deployed in the NEC upgrade scenario.

However, the cost for this alternative is substantially higher. Although the costs for the core communications network and UM investments are comparable with the NEC upgrade alternative; this alternative will have additional costs associated with the LAN and facilities upgrade (estimated at between $1.5M and $2M) and another $1M for the replacement of proprietary NEC phones. Finally, this alternative will also cost an additional $50k — $100k per month in licensing costs to provide an alternative to Lync.

In summary; this alternative has the benefit of a single vendor providing marginally improved features at an increased capital cost of between $2.5M — $3M and an additional operational cost of $50k — $100k per month. This alternative does not provide value commensurate with the additional cost.

Recommendation

Recommendation

When we assess the three alternatives against the strategic objectives identified in the Departmental interviews;

1. Maintain the current high level of operational performance
2. Improve the disaster recovery and business continuity capabilities of the network
3. Lower costs of providing telecommunications services wherever a positive Return on Investment exists for capital investments
4. Lower the costs for Departments by providing productivity enhancing features
5. Extend and stretch the previous investments to the greatest extent possible.

We find continuing down the same path does not meet the first and second objectives — actually the primary objectives — of Departments. Replacing the network does not meet the secondary Department objectives of lowering costs and extending the life of investments. The only option that meets all objectives is the upgrade of the existing NEC telecommunications network.

As such, Gartner recommends the County undertake the following initiatives

Initiative	Timing
Conduct procurement of NEC common control upgrade	Immediate
Conduct separate procurement of a Unified Messaging replacement	Immediate
Conduct procurement of Lync supporting infrastructure, LAN and WAN upgrades	90 days
Establish a County standard operating system and Lync image for desktops that can be adapted to the unique application portfolio requirements of Departments	90 days

Any questions regarding this Report should be addressed to:

Mark E Gilbert
Director
Gartner, Inc.
11845 W. Olympic Blvd, Ste 505
Los Angeles, CA 90064
Telephone: +1 818 497 8528
Email: mark.e.gilbert@gartner.com

This Report was prepared for County of Santa Barbara:

Jennifer Slayman
Assistant Director, General Services/IT
County of Santa Barbara
105 E. Anapamu St. Room 304
Santa Barbara, CA 93101
Telephone: +1 805 568 2606
Email: jslayman@countyofsb.org

Gartner.