

THE COMPUTERWORLD HONORS PROGRAM

CASE STUDY



LOCATION:
*Los Angeles, California,
United States*

YEAR:
2006

STATUS:
Laureate

CATEGORY:
Science

NOMINATING COMPANY:
3Com

ORGANIZATION:

House Ear Institute

PROJECT NAME:

Advancing Hearing Science through Technology

Summary

When it comes to not-for-profit organizations and opportunities to step into cutting edge technology, I will echo the sentiment of last year's Computer World laureate winner, AidMatrix. It is not often a non profit organization is afforded the opportunity that was presented to the House Ear Institute in 2005. The winning combination of available funds, visible need, and eager individuals to make it happen has now transformed an antiquated data network and telephone system to a top notch, efficient, and converged telephone phone, fax, and email system. House Ear Institute (HEI) is celebrating its 60th anniversary this year (2006), and with that represents 60 years of advancing hearing science through research, clinical studies, and patient services. HEI is the recognized world leader in hearing research and replacement. In maintaining this distinguished title, the organization has always had the desire to be on the leading trail of technology. The unique location and relationship of the House Ear Clinic (for profit) and the House Ear Institute (non-profit) has allowed both clinicians and researchers the best of both worlds to help infants and adults hear for the first time or improve the hearing they have. In order for all of this to happen effectively, the organization needed an up-to-date network for data transfer of large microscopic images and a reliable feature-rich telephone communication system. Enter 3Com. With 3Com's converged voice, data, fax, and email solutions, HEI and HEC were not only able to improve doctor-patient support and research scientist's ability to collaborate across continents, but were also able to lay down the platform for Electronic Medical Records implementation over a wireless network for the future. Time is a valuable commodity of research scientists and practicing physicians. When one can free up more time, using technology, for them to work on the greater good then it's an achievement. In the beginning of 2005, the House Ear Institute (HEI) was faced with several business drivers that lead to the implementation of infrastructure upgrades.

The business drivers that drove the need for a comprehensive infrastructure upgrade at HEI include (1) the upcoming HIPAA Security Rule compliance requirement, (2), the upcoming addition of the Wallis Annenberg Research Center wing, and (3) the growing amount of Electronic Media.

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(HIPAA) of 1996 were effective starting April 21, 2003. This rule “adopts standards for the security of electronic protected health information to be implemented by health plans, health care clearinghouses, and certain health care providers.” Simply put, this rule requires that all systems containing Electronic Protected Health Information (EPHI) be secure from unauthorized access using accepted best practices in the Information Technology industry. In doing so, systems containing EPHI, along with all methods of electronic and physical access, must be accessed. In early 2005, HEI engaged PriceWaterhouseCoopers (PwC) to perform a HIPAA Security Rule compliance assessment. The assessment outlined recommendations addressing vulnerabilities in how data was secured in workstations, servers, and the network. Since all electronic access to systems is via the network, a large part of compliance must include addressing network security.

Over a decade ago, HEI’s Cellular and Molecular Biology (CMB) initiative was established. Since then, CMB has grown beyond the capacities and capabilities of the current building. To accommodate, plans for the Wallis Annenberg Research Center were initiated. Unfortunately, the capacity of the existing phone system had been reached, and the costs of upgrading the existing system were prohibitive. To handle the additional phones in the new wing, a new phone system would have to be purchased. Since HEI is a non-profit organization, the system must last well into the next decade, or longer, while having a low total cost of ownership.

As the digital age unfolded, the volume of electronic media has grown by gargantuan proportions. Storing, backing up, and administering such large amounts of data have always been a challenge for HEI. As images from such sources as electron microscopes have increased in resolution and quality, the rate of growth has spiraled out of control. In addition, HIPAA mandates required the consolidation of data to enable administration of security. HEI needed a network and systems that can transport, store, and maintain terabytes of data securely.

Introductory Overview

The project involved a delicate buy-in of the ten physicians, their support staff and executives in the Clinic, who are a separate entity from the House Ear Institute, combined with more than a dozen world renowned scientists, all the support staff, and executives of HEI. The simple telephone is often taken for granted, yet it is the number one channel of communication where most, if not all, business is taken care of. Entertaining the idea of swapping out the old telephone system for a cutting edge voice over IP converged telephone system brings some apprehension to say the least. In total, there are about 250 employees between the Clinic and Institute. To give some background the building is five stories tall and contains expansive lab areas. The Clinic also has five sister offices throughout Southern California. In order for HEI and HEC to maintain the level of dedication, fervor, and support for the greater goal of curing hearing loss, we must attract new intellect and nurture the scientists currently at HEI. One small way to accomplish this is to have an organization where communication, whether it is data, voice, fax, or email is seamless, effective, and user-friendly for all those involved. Another goal we wanted to accomplish was to make every square inch of HEI wireless accessible. The future goal of HEI and HEC is to implement Electronic Medical Records. Our scientists and doctors travel constantly. This new system improves their lives and the lives of ones who are counting on them. These were the goals of our endeavor. The method was simple: completely remove the existing voice, data, and network systems from the entire building. This includes all telephones, routers, switches, voicemail centers, some cabling and some old servers. Simultaneously with the cut-over we had to migrate from one telephone broad band provider to another,



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keep all existing phone numbers, replace it with 3Com's voice over IP telephony system, and do it all in one weekend!

Included in the scope of work was a full wireless survey of the site to evaluate how many and type of antennas to place above the ceilings. To accomplish our desired speed internally we ran fiber optic cables between each floor and back to the core router. This enabled true gigabit speeds to be obtained. Intrusion prevention and added security is assisted with a Tipping Point security server. HEI also installed what has been dubbed "Net Jacks". These Net Jacks are one of 3Com's most prized products. They essentially turn a single terminated network drop at the wall into a secure, power over Ethernet 4-port gigabit manageable switch. It was paramount to this cut over that the Clinic not miss a beat, and that patient care, surgeries, and visits run smoothly throughout the implementation. The Clinic sees more than thirty thousand patients a year. Obviously HEI counts heavily on their communication to the inside and outside world as well, but there aren't any ailing patients on the line since their focus is mainly research. HEI had many alternative options for replacing or upgrading the current hardware and software yet we chose the more challenging and riskier path. We knew that with the greater the risk the greater reward would be, and it was.

To address the business requirements of an infrastructure upgrade, HEI evaluated solutions that addressed the voice and data needs for now and the future. Since both voice and data solutions were being evaluated, it behooved HEI to consider Voice-over-IP (VoIP) solutions for a consolidated infrastructure. With VoIP, hardware and software components can be leveraged for voice and data.

After comparing VoIP solutions, we found that the 3Com solution and the 3Com team were the best fit for HEI. The 3Com solution combined the most comprehensive, technologically advanced voice and data solution. In addition, the 3Com team was the most professional and the most willing to work with us as partners to implement the best solution. Finally, 3Com provided this solution at a competitive price with a low total cost of ownership.

The 3Com team involved the HEI Information Technology Department in all aspects of the project. In the design phase, 3Com worked closely with IT to outline the current and future needs of HEI to determine the correct components to be purchased. IT performed the required infrastructure preparation with existing servers and network components in order to allow for such a pervasive upgrade to occur. IT ensured that all users were informed, trained, and prepared for the new voice and data systems to be implemented. Finally, IT acted as an additional technical resource working alongside 3Com resources.

The 3Com solution is based on the network. To address the business requirements of the upgraded infrastructure, the network will need address security, capacity, and voice capability for all types of users at all locations of HEI. For HIPAA requirements, access to the network will need to be controlled for HEI employees, visiting scientists and colleagues, patients, and the general public. The network not only will need to support all voice traffic, but also a high volume of data traffic. The central core of the network is a 3Com 8800 modular switch. Each of the five existing floors and the three new floors of the proposed wing have stackable 3Com 5500 Power-over-Ethernet (PoE) switches which are connected via redundant fiber to the central 3Com 8800 modular switch. The location across the street from the main location will be connected using a pair of 3Com Outdoor Wireless Bridges. Each of the remaining four remote locations utilizes a DSL connection and a 3Com 3030 Router to establish a VPN connection to



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a 3Com 5642 Router at the main location. Wireless connectivity at the main location consists of 3Com 2750 Wireless Access Points managed by a 3Com WX4400 Wireless Switch. Connectivity and security to the Internet at the main location is handled by the previously mentioned 3Com 5642 Router and a 3Com TippingPoint 400 Intrusion Prevention System (IPS). Finally, all the components of the network are managed by the 3Com Enterprise Management Software Suite.

With a secure and scalable network infrastructure, the 3Com VCX V7000 IP Telephony Solution can leverage the new network to provide an integrated voice platform. The core of the VCX solution is two redundant VCX servers handling call processing and Unified Messaging. A VCX Digital Gateway provides connection to the PSTN network for standard phone service while a VCX FXS Gateway supports analog devices such as fax machines. For IP phones, a combination of 3Com 3103, 3102, and 3101 phones using PoE for power is used at all locations. All calls between locations are handled as VoIP calls over the wide-area network, while calls at remote locations are routed through a FXO Gateway to traditional analog telephone lines.

What sets this complete voice and data solution apart is its ability to leverage existing voice and data technologies while allowing for upcoming technologies to be integrated as they become available. As voice technologies still rely on PSTN phone service for communication to other parties, the new infrastructure's use of VoIP for internal communication enables to use VoIP in the future to connect to the outside world when the phone companies transition from the PSTN network as the primary voice transport. As security needs become more advanced, the use of proven yet evolving security technologies such as IPS ensure that the network will remain protected. With future-proofed network components, higher speeds and capacities can be easily handled as new networking technologies become more ubiquitous and cost-effective, such as 10-Gigabit network connectivity.

Benefits

Some of the benefits include the least cost routing of telephone calls. Voice over IP calls travel over a broad band connection between sites. When someone at HEI in Los Angeles calls our Orange County office which is 40 miles south of LA, the call carries no charge. Additionally if someone at the Orange County office wants to call a patient in Pasadena which is North of HEI the system uses the internal VOIP network all the way through the most northern point and then hops off onto the public switched telephone network to complete the call. The shorter distance between the hop off point and the destination to the patient is what will be charged to HEI for a phone call. With the replacement of all the routers and switches and increased bandwidth from SBC, HEI has gone from a 1.5 MB per second internet speed to 6MB per second. HEI's once sporadic internal data rate was between 10 and 100 MB/per second and now has a true gigabit speed all the way to the desktop. The benefits of this speed ranges from clear and clean video conferencing and transfer of files in a fraction of a time to an extremely secure wired and wireless network.

From a manageability standpoint all the systems are configured using a web page. Everything is accessible from additions moves and changes to the phone system to changing the spectrum of a wireless antenna installed across the street at another office. The benefit with this is more time for the IT department to work on other projects. The benefit the new telephones provide is



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outstanding; they use the same connection that your computer uses to connect to the network. No more running of secondary phone lines everywhere. As long as there is a network connection in the room then the cable goes from the wall to the phone to the computer.

The speed, wireless capability, and security have laid the ground work for a complete Electronic Medical Records system. All the building blocks are in place for the doctors to be able to walk into a patient interaction holding a small tablet PC, instantly and securely pull up their chart, send a prescription to the pharmacy immediately and use many other features available with such software. To have this type of information and communication at the doctor's finger tips is invaluable.

The converged technology aspect of the project brings voice, email, and fax notification to the phone displays itself. Now the phone number you use to call someone is the same number you send a fax to. Using Xmedium's fax server and software all incoming faxes go straight to the client's email inbox. No paper involved. Outbound faxing works the same way. This brings HEI one step closer to a paperless office. Another feature of the 3Com system enables newly arrived voicemails to be converted to WAV files and sent to the client's email inbox automatically. Additionally, clients can call in from any telephone and have the system read the emails in their inbox. These features give our users tremendous flexibility for sending and receiving communications. Now when we walk into our office in the morning all we do is look on the phone display and it will read something like "5 Missed Calls" "3 New Messages" "6 New Emails" "2 New Faxes". What I have just described is called a converged system.

This newly implemented infrastructure will extend the current functions and capabilities that HEI offers to society. In the wake of HIPAA security requirements, new challenges have emerged in providing secure access to employees and visitors of HEI. Hundreds of researchers, scientists, and scholars visit HEI each year. Many of the programs and information are provided free of charge in the name of HEI's mantra, "Advancing Hearing Science". With the new 3Com infrastructure, HEI can offer the necessary access to the Internet and specific internal resources to these visitors while remaining in compliance with the HIPAA Security Rule. Also, other research organizations can take advantage technology that the new infrastructure enables, such as voice and video conferencing, video seminars, document collaboration, and secure VPN connectivity. In addition, the ability for the network to keep up with the increasing volume of electronic media such as electronic microscope videos, training videos, and experiment documentation further aids HEI to benefit society through advances in hearing research.

HEI also provides services to the general public through its partner House Ear Clinic (HEC). HEC resides at the same locations as HEI and utilizes the same infrastructure. HEC provides these services at the main office and at four other remote locations through the new network. The infrastructure not only provides a secure network for patient data, but also provides patients Internet access in waiting areas. In addition, the network is capable of supporting future medical applications, such as Electronic Medical Records (EMR), wireless script fulfillment, and patient appointment access through phones and wireless devices. These are only some of the additional benefits the new infrastructure provides to HEC patients and visitors.



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The Importance of Technology

The technology that was used to contribute to the success of this project has been in development for years but is only now being adopted on a wider range. It is one of the fastest growing industry in IT and the telecommunication world right now. 3Com's VCX servers and gateways make all of this possible. One important aspect of the hardware and software is the ability to have extremely clear and quick calls. Now that the calls are sharing the same network as the data and internet, the voice calls need priority for quality purposes. This is an important factor in any successful VOIP migration. A second vitally important aspect of the technology is the ability to have power run over the Ethernet. This enables the phones to operate with only a network cable connection. No extra power needed, as long as the network cable terminates at a 3Com switch.

Originality

By far the most exceptional aspect behind this project was the people. The small group of employees from HEI and 3Com were visibly dedicated to the success of this implementation. From day one all involved went above and beyond what was expected of them. They truly cared and had levels of patience for all sorts of issues that came along with this type of project. The camaraderie that had been built over the few short months when the implementation team was on site will not be forgotten. Every detail was checked and rechecked of the weekend of the cut over, working well into the early hours of the morning. The feeling of accomplishment the next day was astounding. This was an exceptional aspect of the project.

Granted projects like these are completed all the time all around the world. Its originality comes in the form of having the absolute newest hardware and software on the market.

Success

This type of project affects everyone within the organization simple because everyone uses the phone, fax, and email systems. It was a high visibility project. If the implementation went wrong all would know and see it, conversely if it went well it was just as visible. The weekend cut over was a success and everything was up and running Monday morning. Of course minor tweaks and changes had to be made that morning. The system is fully operational at this point and users are becoming more and more comfortable with the features that didn't exist with the old system.

. We scheduled round the clock training for all 200+ employees the week prior to the cut over. We needed them to be proficient with the phones prior to removing their old one. They had no choice if they didn't like the new telephones so they embraced the new technology quickly. Like most IT processes that operate today, you only hear from the users if it is not working. There are random compliments here and there. We'd like to say that if it is all quiet on that end then we've done our job and the project was a success.



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Difficulty

The largest hurdle we had to overcome was how to not re-program all the obsolescence back into the new phone system yet have it operate the same as the old telephones to the end user community. This is where the expertise of the 3com Global Services Team came into play. With their intimate knowledge of how to programmatically replicate an existing old phone system with all the phone numbers, hunt groups, and calling circles we were able to have a test lab in place prior to cut over. We would test and retest all connections, calls, and numbers. Much effort was given to bringing in key users and asking them if the changes we made would work in their environment. From a maintenance perspective it would have been a nightmare to reintroduce and maintain all the extra obsolescence that had been built into the system from the previous twenty years of adds, moves, and changes.

We had to first understand how all the scattered offices and departments operated. This was accomplished by countless interviews with users and clarification with managers. Documenting the entire process was a strategic necessity not only for the cut over but for future maintenance purposes. The last difficulty was dealing with a cut over between an old telecommunication provider and a new one. To time this switch within a few hours is a task that rarely occurs when desired. Even with all the planning, it took some after hours and emergency work to be done on the provider end in order for users to have the same phone numbers that following Monday morning.