Cisco Systems

Cisco IP Communications

Read What Our Customers are Saying about IP Communications

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Cray Inc.
Convergence for Convenience

Background

Founded in 1972, Cray Research Inc. is synonymous with supercomputing, and remains the global market leader in high-end supercomputers, which address the world's most challenging computing requirements, solving problems of major economic and scientific importance. Cray systems have helped people design the cars and trucks we drive, creating new materials and life-saving drugs, predicting severe weather and climate change, analyzing complex data structures, safeguarding national security, and a host of other applications that advance the frontiers of science and engineering. The legendary Cray systems combine enormous capacity with enormous capability to provide exceptional bandwidth, communication, and synchronization.

Cray merged with Silicon Graphics, Inc. (SGI) in 1996. In 1999, SGI decided to spin off Cray Research, and in April 2000, finalized a deal to sell the division to Tera Computer Company. Tera changed its name to Cray Inc. and is combining Cray's supercomputing technologies with its own Multithreaded Architecture (MTA) system to create a new generation of supercomputing systems. The new company has major offices in Seattle, Washington, Eagan and Mendota Heights, Minnesota, and Chippewa Falls, Wisconsin.

Challenge

With the acquisition, Cray needed to build a new data, voice, and video networks in its Eagan, Mendota Heights, and Chippewa Falls offices. Cray started preliminary investigation in August 1999, and began intensive design in April 2000. The biggest challenge was choosing technologies that would allow an IT staff of one to maintain and operate the network with minimal resources. Cray wanted to offer its employees the advantages of the latest technologies, yet in a cost-conscious manner. The nature of its business calls for a network similar to its products, a network that delivers both high bandwidth and complex intelligence.

Tom Stephens, Network Group Leader at Cray, recommended a converged, all-IP network to Cray executive management. “Convergence has been the direction of networking since the early 1990s. At the time, I only knew IP, so using a single IP network to support data, voice, and video intrigued me,” he says. “We also discovered that we could install a converged network for the same price as a traditional PBX network by itself.”

Cray partnered with SBC, a division of Ameritech, to design and build its new network. Cisco Systems is the network equipment and IP telephony vendor. The Cisco AVVID (Architecture for Voice, Video, and Integrated Data) solution meets Cray’s need for a robust, standards-based infrastructure that can handle large amounts of data, support voice and video services, and grow over time with minimal disruption. “We care about adds, moves, and changes,” says Stephens. “We want to keep all management in-house. The Cisco solution is much faster and simpler than traditional PBX solutions. We have help now, but when this all started I was the entire networking staff for the three sites.”

“Convergence has been the direction of networking since the early 1990s. At the time, I only knew IP, so using a single IP network to support data, voice, and video intrigued me,” he says. “We also discovered that we could install a converged network for the same price as a traditional PBX network by itself.”

Tom Stephens
Network Group Leader, Cray, Inc.

Cray Inc. ROI Case Study

Deployment Details

- Global market leader in high-end supercomputers
- Multi-site deployment
- Replaced existing PBX with IP Telephony
- 650 phones
- Required data network upgrade to handle time-sensitive voice traffic

Return On Investment Findings

- Payback—7 months
- ROI Drivers:
  - Cost of Cisco IP Telephony and data gear cost the same as PBX
  - Improved productivity of network support staff by 33%
  - Reduced MAC's costs by $30K/year
  - Reduced inter-office calling charges by $25K/year

Solution

The Chippewa Falls facility houses the Cray data center and was already wired, as was the Eagan facility. "The Eagan site was vacated and all people relocated to Mendota Heights, but this created no issue as far as their calls were concerned," says Stephens. "That's a testimony to how easy it is to manage the IP telephony system." Cray had to install Category-5 cabling at the unwired Mendota Heights site.

The Layer-3 enabled Gigabit Ethernet network backbone at each facility uses Cisco Catalyst 6500 series switches with Multilayer Switch Feature Cards (MSFC). In the wiring closets, Cisco Catalyst 3524 switches with 10/100 Ethernet inline power modules connect a total of 650 Cisco 7960 IP Phones among the three sites. PRI Gateway cards within Catalyst 6500 switches at each facility route external and 800 calls to and from the PSTN and interoffice calls to Cisco 7200 routers, which connect to a T3 WAN (Figure 1).

Two Cisco CallManager clusters—one in Chippewa Falls, the other at Mendota Heights—handle call processing. "We were the first enterprise to deploy multiple CallManager clusters to provide resiliency," says Stephens. "It created some integration challenges. Cisco, and SBC all stepped up to the plate to resolve all the issues that came up. On several occasions we ran into roadblocks, both during design and deployment. People really adjusted to make sure the deployment date was not compromised."

Cray IP Telephony Network

Stephens followed the Cisco guidelines for enabling quality of service (QoS) in a Cisco AVVID network. Cray uses CiscoWorks 2000 to manage its network. "IP telephony technology actually improves the data network," he says. "People are intolerant of bad voice calls, so you have to clean up the data side to get IP telephony to work well. You must pay closer attention to management than you might in a data-only environment. As a result, we have a more efficient data network, and that was an added benefit we didn't look for."

Service and Support

Stephens also had a positive experience working with Cisco Service and Support teams. Cray hired SBC Professional Services to assist with design and managing the installation. "Our internal management knew the value of project management and professional services. It was the correct decision," says Stephens. "We just had too much other stuff to do. If we had relied only upon in-house resources, the project would have been a disaster, and we wouldn't have gotten it done in time. We were moving every office we had in the world, and we really had to trust that all the contractors on the deployment would come through. For the most part, they did."

"We're good customers of the Cisco TAC [Technical Assistance Center]," says Stephens. "They did a great job and solved most of our problems easily. However, there were a couple of nagging issues, and the TAC quickly escalated them to the design engineers."

Results

Prior to live deployment, the entire Cisco AVVID network was built and tested for three weeks in SBC's Memphis Tennessee laboratory. Cray met a very aggressive timeline for design, deployment, and turnup. The production network was installed over a weekend in October 2000. "Design never stopped. We were doing some design work during the weekend of the cutover. At first, users were incredibly skeptical about IP telephony," admits Stephens, "but we put it in and it worked. Users have been pretty quiet about it."

With the network running smoothly, Stephens wants to take advantage of new capabilities. With the TAPI interfaces available on CallManager version 3.09, he hopes to enable more features that deliver information directly to IP Phones. He also wants to use XML-based applications to IP Phones, starting with general-purpose services such as traffic and weather reports and corporate directory services. He is also exploring "push" applications to alert users with time-sensitive information that may impact their business. "Converged networking is the right thing to do for both economic and technical reasons," says Stephens. "And the coolness factor didn't hurt either."

Menlo College: Summer School for IP Telephony

Menlo College used the 2000 summer break to build a Cisco AVVID (Architecture for Voice, Video and Integrated Data) network from the ground up—literally. With all-new fiber and Category 5 cabling, the Gigabit Ethernet network supports data and IP telephony services campus wide, including the dormitories.

Background

As a four-year, private college for approximately 700 students from 40 nations, Menlo College prepares the managerial leaders of the 21st century by coupling an outstanding liberal arts curriculum with access to two of the world's most exciting professional communities—nearby Silicon Valley and San Francisco. The college's three core areas of instruction include management, liberal arts, and mass communications. Partnerships with sister colleges in England, China, and Chile support an interdisciplinary approach to education, blending philosophical, historical, and global perspectives in an increasingly diverse and dynamic world. Established in 1927, Menlo College is located in Atherton, California, and has gained the respect of the academic community for preparing its students to succeed in a competitive global marketplace.

Challenge

With an IT staff of four, Menlo College relied heavily upon outside contractors to help manage its separate data and telephone networks. Prior to 1984, Menlo College contracted AT&T to handle all its on-campus telephony services, and after the AT&T breakup, that task was transferred to the independent local exchange carrier (ILEC). Menlo College's first campus network was a shared, 10-megabit Ethernet Cabletron LAN in 4 of the 13 college buildings interconnected by a fiber ring.

> "Cisco has proven abilities in IP to the desktop and scalability…"
>
> Patrick Olson
> Director of Information Technology
> at Menlo College

More recently, the cost of maintaining this arrangement became quite significant. Students living in campus dormitories had to arrange their own Centrex-based telephone services directly with the ILEC. They had no direct access to the on-campus LAN facilities, and had to use telephone lines for Internet access. Faculty was limited in their ability to communicate electronically with staff and students, and was unable to make online course materials available to students. Between the telephone and data networks, the wiring was showing its age. "Pacific Bell handled all our wiring problems at a large premium," says Patrick Olson, Director of Information Technology at Menlo College.

In early 2000, Olson and his team decided to upgrade both the telephone and data services. In order to remain competitive in attracting students, the college needed to provide high-speed Internet access to the dormitories, and enable faculty to place course materials on line. It also needed to control administration costs by enabling a robust intranet and automating manual processes.

Olson decided to converge the two campus networks into one for several reasons. First, managing one network instead of two costs less in overhead expense and staff time. Secondly, Olson needed to reduce the amount of time his staff were spending on adds, moves, and changes to the telephone network, a common occurrence at the college. Third, a converged network would support emerging integrated applications to enhance the college faculty's ability to do their job.

To meet this goal, Menlo College would have to invest in a new intermediate distribution frame (IDF) and Category 5 wiring for each building and install fiber between the rest of its 13 buildings. After wiring, it needed a new IP data network and IP telephone system, and would then connect it all to the Internet and the Public Switched Telephone Network (PSTN).

Solution

Olson engaged several partners to design, build, and configure the network. VOICEPRO designed the IP telephone system atop a Cisco AVVID network designed and built by AMS.net. The two systems integrators worked hand-in-hand to ensure a tightly integrated voice/data solution. Delta Technology and Advanced Cable Technology (ACT) laid fiber between buildings and performed the in-building Category 5 wiring.

VOICEPRO, AMS.net, and Menlo College decided to build a Cisco AVVID network because it offers the only large-scale IP telephony system available, and also because Cisco AVVID leaves room for Olson to add future systems and third-party applications. "We should be able to put whatever we want into the network. We don't want to rebuild anything unless it's structural," says Olson. "Cisco has proven abilities in IP to the desktop and scalability. At this level of technology, the danger is when you say

that it'll last 15 years, you don't want to be stuck in five years with something expensive and stupid. Cisco is not going away, and I believe the Cisco AVVID solution will meet our needs for the foreseeable future."

The new network supports four discrete fiber rings throughout the campus, all connected to a Catalyst® 6509 switch in the data center. This Gigabit Ethernet backbone connects to Catalyst 6000, 4000, or 3500 series switches in every building, for a total of 1100 ports. Each switch is connected to a Cisco inline power patch panel to power Cisco IP telephones (Figure 1).

Menlo College Cisco AVVID Network

The data center houses all data servers, dual Cisco CallManager 3.0s on Cisco 7835 servers, a Cisco 550 Cache Engine, dual PIX™ Firewalls, a Domain Name System (DNS) server, the college's external Web site, and a Cisco 2621 router for Internet access. Dual T1 lines to separate providers assure full-time Internet access, and more will be added as traffic loads increase.

With a multilayer services feature card (MSFC) in the central Catalyst 6509 switch, Olson has divided the campus into several virtual LANs (VLANs) for management and security purposes using a private IP address scheme. All IP telephones reside in one VLAN, with other VLANs for management, student data, administrative systems, faculty, and so forth. Network Address Translation (NAT) provided by the Cisco PIX Firewall hides internal addresses from the Internet.

For the telephone system, VOICEPRO provided an Octel 300 voice-mail system connected to dormitory telephones via a 24-port foreign exchange station (FXS) card in the Catalyst 6509 switch, and connected to staff and administrative telephones and the PSTN via dual Cisco VG-200 gateways. Billing records are stored in the Cisco CallManager.

Dormitories have one switched 100-Mb Ethernet "port per pillow," so each student can connect an IP phone to the wall jack and a PC to the IP phone. Menlo College charges students a fee to use their telephones for local calls. Students can choose their own long-distance provider. The fee is less than what students paid Pacific Bell for Centrex services, yet helps Menlo College recover its capital investment expense.

Results

It was an exciting moment when the President of Menlo College placed the college's first outbound IP telephone call to its sister college in Oxford, England, in a special ceremony. The summer had been short, but successful. The wiring project went forward with few glitches, and the Cisco AVVID network was installed, configured, and tested by early August. All dormitory rooms had IP telephones by August 20, in time for the fall semester. When completed, the campus will have about 500 IP telephones. What's more, "We encountered none of the things you'd have in normal telephony migrations," says Olson. "The easiest piece was putting the phones in. We had no crosstalk, no echo, nothing. We programmed all the student phones in two days and distributed them with their registration materials. And all the partners worked together extremely well to make that happen."

Aside from e-mail, faculty and staff are already using the intranet to place facilities work orders, post and examine meeting and course information, and submit expense reports directly to Accounts Payable. The administration staff has identified eight other manual flows—such as purchase orders—that will soon be automated via the intranet.

Olson expects that the next steps will exploit the integrated Web interface on the Cisco IP Phone. One option on the table is a unified messaging system such as the Cisco Unified Open Network Exchange (uOne). The college may also deploy Web-based registration services, announcements, and other services directly to IP telephones, allowing students to register and obtain campus information without a PC.

Ministry of Social Policy

The Standard for Success

The New Zealand Ministry of Social Policy steps into the 21st century with the world's largest production deployment of Cisco 7960 IP Phones to date.

Background

With a mission of "helping people move from welfare to well-being with a hand up, not a handout," the New Zealand Ministry of Social Policy (MoSP) oversees the network infrastructure for three government organizations: the MoSP, the Department of Work and Income (DWI), and the Department of Child, Youth and Family (CYF). A single network supports all three organizations and 8000 employees across 210 offices delivering welfare services in New Zealand.

The New Zealand government has stated its intention to move quickly to e-government, using the Internet and other network-based tools and services to more effectively and rapidly deliver its services. "All departments involved are absolutely dependent on IT and telecommunications," says Margaret Bazley, Chief Executive Officer at MoSP. "We're further ahead with a common IT infrastructure and information platform than any other government agency [in New Zealand]."

Challenge

The MoSP started its Internet journey early. In 1994, Neil Miranda joined the then-Department of Social Welfare as Information Systems Coordinator. He found "a mish-mash of everything. We had about six different networks. Voice was not even there—everybody had a different PBX and didn't talk to each other." He set out to define a technology vision for the department, looking toward future convergence of all technology services through a single network infrastructure. "I decided that we needed to have a plan for the future," he says. "Underpinning that plan were policies and standards; otherwise, we wouldn't know where we were going. In the area of communications, IP was the de facto standard and we decided it would be the standard we would base all of our communications upon. By implementing standards, I'm getting a more predictable and manageable service that's cheaper and faster for everybody."

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>
> Neil Miranda
> Managing Director
> New Zealand, Ministry of Social Policy
> Information Systems Coordinator

As with any government organization, the MoSP has budget considerations. Says Bazley, "Whenever we do any upgrade, we always try to look as far into the future as we can. We don't have a lot of money at our disposal. We've done this several times in the past and it really pays off because it gives us a very good payback through the technology."

This philosophy led to the design and implementation of a Cisco AVVID (Architecture for Voice, Video and Integrated Data) infrastructure in 1998-2000. A reorganization during that time brought 2000 new people in 40 sites with Centrex telephone systems into the infrastructure for a total of 8000 users. Miranda was tasked with integrating IT infrastructures of new and existing agencies—without an increase in overall IT operations budget. He was already investigating ways to reduce operations costs through consolidating the voice and data networks. The sudden growth in user base became an impetus for an upgrade program to add telephony to the Cisco IP network.

A careful review and open bidding process in 1999 and 2000 among four vendors led to the selection of Cisco Systems as the telephony vendor. Cisco was chosen for several reasons. Because the MoSP already had a Cisco-based data network, it would be easier to deal with one vendor rather than many to resolve issues. While Miranda does not identify Cisco as a top voice-solutions vendor, he recognized Cisco's leadership in voice over IP (VoIP) and IP, his stated standard. "They had a viable solution to implement within the stated project timeframe, the cost was right, and we had their senior management commitment to achieve project outcomes." Miranda said. What clinched his decision was Cisco's outstanding customer service. "If I can't have a one-on-one relationship with the vendor, I don't want a relationship. It became apparent that Cisco had not only the better technology, but more commitment from its senior management."

To help with network design and implementation, MoSP contracted with Logical Networks New Zealand, a Cisco Gold Partner and systems integrator. Murray Jurgeleit, Managing Director at Logical Networks, understood the high standards set by Miranda for the job. "Being a Gold Partner means to our customer that they can rely on us to provide the absolutely best available levels of service to support their mission-critical networks." Clear Communications is the WAN network service provider.

Solution

The MoSP network has four core sites in Auckland, Hamilton, Wellington, and Christchurch. The four core sites are interconnected via OC3 ATM links. Each has dual Cisco 7200 VXR

distribution routers and dual Cisco 7200 VXR core routers interconnected via dual Catalyst 5500® Switches. All four sites are located within Clear Communications' carrier-exchange operation centers. Distribution routers connect to remote sites (approximately 210 of them) via Frame Relay or ATM.

Remote offices have a Cisco router and WAN link scaled to the number of users per site. The smallest sites have a Cisco 1720 Router; medium-sized sites have either a Cisco 2620 or Cisco 3640 Router, and the largest remote sites have a Cisco 7200 Router (Figure 1). The new network delivers switched 100-megabit switched Ethernet to every end device.

Ministry of Social Policy Cisco AVVID Network

With the exception of IP telephone handsets and remote router voice blades, all voice equipment is distributed among the four core sites. Each site has a single Cisco CallManager 3.0 cluster, with the exception of Wellington, which houses two clusters, one for Wellington and the other for Palmerston North. Each regional cluster has several Cisco uOne voicemail servers co-located and associated with it. A total of 30 servers deliver managed telephony from the four sites. Three of the four core sites have a Cisco 7200 VXR public switched telephone network (PSTN) gateway. Outgoing calls from a remote site are routed into the nearest core site, then to the PSTN.

All users in the network now have a Cisco 7960 IP Phone. Where a traditional private branch exchange (PBX) phone system would have required a technician to visit each site to hand-provision each phone at the cross-connect panel, the automatic configuration features of the IP phones saved a lot of time and money.

While the transition did require a new dial plan, "Rolling out the phones was a logistics exercise, but not a technically complex one. We never visited the remote sites," says Jurgeleit. "We just sent the phones out. We educated an individual at each site who would educate the users. I was surprised that it actually worked seamlessly and painlessly. Doing it all from one location let us concentrate our high-level skills. It just makes the whole thing a lot simpler."

Results

Says Jurgeleit, "We were very impressed with not only the commitment of all the partners involved in this project, but the response we received from Cisco in providing the expertise on-site in New Zealand—right down to the people from the labs who write the code."

After testing and approving the Cisco IP telephony solution, the production rollout took four weeks from start to finish. The new phone network handles between 130,000 and 160,000 calls per day. After proving the system's stability for one month, MoSP decommissioned its 164 traditional PBXs and 40 Centrex sites. And the Ministry was able to keep its operational costs the same despite adding extra sites and 33 percent more users.

What's next? Miranda and his team are investigating Lightweight Directory Access Protocol (LDAP) v3 directory services and other Web-based information delivery to each IP Phone. They're also discussing ways to Web-enable their call centers. Says Bazley about the Cisco AVVID network, "It's a system to build on for the future."

NASA

The First 90,000 Miles are Toll-Free

It's not E.T. phoning home—it's the shuttle astronauts of the National Aeronautics and Space Administration (NASA). And this call is private, two-way, and digital, more like the telephone call placed from a public phone booth on the Space Station of 2001: A Space Odyssey. Life imitates art via a Cisco SoftPhone loaded onto an IBM ThinkPad 760XD so that eventually, astronauts can keep in touch with their loved ones during long voyages aboard the International Space Station (ISS).

Background

Despite rigorous training and preparation, one of the hardships of space travel is long-term separation from families and friends. For several years, NASA astronauts aboard space shuttles have been able to talk to their families via a specially modified, pre-H.323 video conferencing application, but families had to come into the Mission Control Center (MCC), located in Houston, Texas. And due to an antiquated satellite communications system, NASA was unable to move IP packets between orbiting shuttles and ground stations during missions.

A new, digital satellite interface called the Orbital Communications Adapter (OCA) changed that. While the shuttle has always had digital communication, its proprietary data streams could not carry commercial IP packets. OCA enables IP transport and off-the-shelf Ethernet devices for high-speed data transfers, and can also accommodate voice and video traffic. "The OCA project is updating the low-criticality communications capability on the shuttle and the space station, and in some cases moving capability ahead by thirty years. We couldn't use the really cool desktop applications that people take for granted now," says Brett Parrish, Television and Signal Processing Project Engineer at the NASA Johnson Space Center in Houston, Texas. "Astronauts couldn't do Web browsing or email from space."

> "The first time I ever saw someone making a private phone call from space in a movie was in 2001: A Space Odyssey. And darned if we didn't meet that timeline. In the movie, that call cost $1.70. Our astronauts get the first 90,000 miles toll free."
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> Brett Parrish
> Television and Signal Processing Project Engineer at the NASA Johnson Space Center

Challenge

With bidirectional Ethernet communications in place, the astronauts could ask for a variety of new applications, including the ability to place private telephone calls to their families. "This is something a lot of astronauts have wanted for years, but it's never been a critical issue for space shuttle flights," says Parrish. "They train for years to go up there, but shuttle flights are anywhere from 7-14 days long. That's a camping trip. Every minute on a shuttle is timelined. They're trying to do the maximum amount of work in the least amount of time.

"But we're going into a whole new era now with the International Space Station, where astronauts spend three to six months on the station. They'll still have tight schedules, but they'll have time to sleep, watch the stars, and catch their breath. It changes from a two-week camping trip to really more of a sensory deprivation experiment when you go up there for a very, very long period of time. It's draining to be away from your kids for six months. But anything we can do to make life a little easier on them, we're looking into."

Parrish had been experimenting with Selsius and Cisco IP telephones for several years, and suggested using one aboard the shuttle and the ISS. However, adding hardware to a shuttle flight is a long process because NASA must consider the special environmental circumstances of space flight. Beyond simple weight-and-balance calculations, all approved equipment meets rigid standards for fire safety, electrical emissions, and so forth. Fortunately, Cisco has SoftPhone, which as a software product adds no weight and requires far less testing. Says Parrish, "There's a long process that engineering has to go through before we can fly something. Fortunately, in this case, the IBM ThinkPad 760XD laptops that carry SoftPhone have been flying for years. They're already certified."

The final challenge to getting IP telephones in flight is distance. Satellite signals travel between the orbiter and ground stations via two geosynchronous satellites and an intermediary ground hop for a total of 90,000 miles. "This may be the longest distance call that anyone's ever made," jokes Parrish. At the speed of light, that produces a minimum roundtrip delay of more than one second, which causes most interactive IP applications to time out.

Solution

Since the Cisco SoftPhone does not have hard coded timeouts, the Cisco engineering team modified it to meet the unique delay requirements of the OCA links. On board the shuttle or ISS, a 10BaseT Ethernet flight LAN includes the laptop with SoftPhone software and a Bose headset, and links to the satellite via an onboard OCA router. The signal travels across the private NASA Tracking and Data Relay Satellite System (TDRSS), which is fully shielded from any public network such as the Internet.

NASA Astronauts Phone Home from Orbit

On the ground, the Cisco Service and Support Solutions team assisted NASA technicians with building a separate LAN with a Cisco Call Manager, Cisco Voice Gateway 200 for PSTN access, a router, and Cisco 7960 IP telephones. Also, the Cisco Call Manager was modified to perform link recovery as the shuttle or ISS passes from one satellite link to another with blackout periods during their 90-minute orbit.

As of now, astronauts can direct-dial anybody in the world, but can only receive calls from NASA ground controllers on the Cisco 7960 IP Phones located in Mission Control. Long distance charges only apply to that portion of the call carried via the PSTN. Once the application is proven, NASA will link the system to the rest of its LAN. The system was tested and debugged from the ground before going into flight. Parrish and teammate Steve Schadelbauer orchestrated a series of rigorous tests, simulating delay, loss of signal, and bit error rates well above what is typical between MCC and an orbiting Shuttle.

Results

Astronaut Marsha S. Ivins placed the first-ever phone calls from space on February 10, 2001, just after 4 p.m. Central Standard Time. As a mission specialist aboard the orbiting Shuttle Atlantis, she placed the first call to the lead flight director, Bob Castle, in the MCC. The call was routed through the Cisco VG200 to the PBX to Castle's desk. The two had an animated conversation for several minutes. Soon after, Ivins' second call was placed to Parrish, who answered on a Cisco 7960 IP Phone. She asked him, "So how do you like getting the second-ever call from space?"

The first phone calls worked so well they were almost a non-event, according to witnesses. Ivins, Parrish, and Schadelbauer all commented on the clarity of call quality, pronouncing it better than audio quality of radio-based conversations with the Shuttle. With the successful trial, MCC can establish appropriate procedures for placing private phone calls from space.

"This is a pretty cool application, I've got to admit. There's a lot of excitement around here about it," says Parrish. The ability to make private telephone calls is very welcome to astronauts who will spend up to half a year at a time aboard the ISS. "After the first two weeks, you realize you're orbiting in a tin can and you're going to be there a long time. These guys have been trained for this, and they're psychologically ready, but they do have kids in school, and stockbrokers, and doctors, and people that they need to talk to. This will really help them do that.

"The first time I ever saw someone making a private phone call from space in a movie was in 2001: A Space Odyssey. And darned if we didn't meet that timeline. In the movie, that call cost $1.70. Our astronauts get the first 90,000 miles toll free."

Commonwealth of Massachusetts

Challenge

The network operations center of the Commonwealth of Massachusetts provides network access for statewide government agencies and nearly 60,000 end users. The network consists of two major core sites: one in Boston and one in Chelsea. These core sites connect approximately 400 remote sites and host-critical network components such as server farms and network management stations. Cisco hardware includes Cisco Catalyst® 6500 switches at the core and Cisco 7000 and 4000 Series routers at the wide-area network (WAN) edge. The Frame Relay (FR) WAN link includes a Cisco 2500 or 2600 Series router in each remote site.

Solution

Tasked with troubleshooting application response time and services, the Commonwealth of Massachusetts has deployed network analysis modules (NAMs) in many of its Cisco Catalyst 6500 Series switches. "We have recently rolled out many new network applications, and we are using the NAM to verify their performance," Commonwealth's lead network engineer says. For example, the Commonwealth spans ports connected from Web servers to the Cisco Catalyst 6500 switches. Using the NAMs, the Commonwealth's network team can gather and log information, such as port utilization, and link top talkers. The Commonwealth has also used the NAMs to isolate users that might be a network security risk. "The level of detail we get with regard to network traffic has really helped us out in many ways," adds the lead network engineer. Network administrators access this information and gather NAM statistics using the Web-based nGenius Real Time Monitor. "Having this information accessible on the Web has really made things easier around here," he states.

With an end goal of quality response time and meaningful network performance reports, the network administrators plan to leverage the information gathered with the NAM, along with statistics gathered by other management tools, to complete the network performance puzzle.

Results

Beyond the obvious time and resource savings for the Commonwealth's troubleshooting and capacity management, Cisco NAM technology has enabled a tremendous paradigm shift for its network engineering organization. Their lead network engineer sums it up: "For the first time, we have the ground-breaking capability to observe, analyze, and report on our customer's application activity with our enterprise network management tools. This has countless benefits to our customers and our organization as we support several large-scale application rollouts in a complex enterprise networking environment."

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Sports Soccer

British Sports Chain Centrally Manages Voice, Data, and Closed-Circuit TV over IP

Sports Soccer, a leading sports retail chain in the UK and Belgium, is saving money and boosting employee productivity by centralizing management of voice, data, and closed-circuit TV applications over IP. Learn about this retailer's cost-efficient voice-over-IP (VoIP) WAN solution based on Cisco Architecture for Voice, Video and Integrated Data (AVVID).

Challenge

In retail, time spent doing anything other than helping customers is time misspent. Installing and setting up new phones or watching over dialup transfers from the till (cash register) to the head office, for example, detracts from sales. Now Sports Soccer, a leading sports retailer in the UK and Belgium, has relieved its store employees of common administrative chores—and is saving money and boosting employee productivity in the process—by centralizing management of voice, data, and closed-circuit TV (CCTV) applications with a Cisco AVVID solution.

A few years ago, Sports Soccer began looking at ways to improve communications between its UK-based head office in Dunstable and 126 stores throughout the UK and Belgium. The retailer's information technology (IT) group identified numerous areas for improvement, such as reducing phone line rental costs; speeding credit card authorization at the point of sale; retrieving sales information from tills for timely stock replenishment; and remotely managing store alarms, access control, and the stores' CCTV systems. A key motivation was to reduce phone bills, which exceeded £250,000 annually. Line rental accounted for 55 percent of the bill because Sports Soccer rented three or four external lines for each of its stores in the UK and one line for each store in Belgium.

Evaluating alternatives, Sports Soccer quickly ruled out installing a mini private branch exchange (PBX) in each store because small PBX systems lacked voice-mail and remote management capabilities—two crucial features for the retailer. "We wanted the people in our stores to sell merchandise, not manage phones," says Sports Soccer IT Director John Ashley. "And sending IT personnel to stores whenever they had a phone problem would be horrendously expensive."

Solution

Sports Soccer found a WAN solution based on Cisco AVVID. "Cisco put together a solution that met the broad range of our business needs and allowed us to establish quality-of-service [QoS] priorities for our different voice, data, and video applications," explains Ashley. "And it cost less than half what we would have paid to install 100 remotely manageable PBX systems."

Redundancy for Reliability

Sports Soccer installed Cisco CallManager software in a redundant configuration on two Windows NT servers at its headquarters in the UK and Belgium. Cisco CallManager provides automated failover of gateways and phones to a secondary CallManager server located in another building. To ensure continued connectivity in the event of a WAN failure, the two Cisco CallManager servers are connected to separate phone lines from separate phone exchanges. Each Cisco CallManager connects to a Cisco Catalyst® 6000 Switch and Cisco 3600 Series routers, which route external calls to and from the Public Switched Telephone Network (PSTN). Each store has its own Cisco 2600 Series Router, a 128-kbps Frame Relay connection with a 32-kbps Committed Information Rate (CIR), and a backup ISDN line to handle voice, data, and video traffic between stores.

500 IP Phones Deployed in Eight Days

Sports Soccer purchased a total of 500 IP phones: Cisco IP Phone 7960 models for the head office and Cisco IP Phone 7910 models for its stores. “After we built the basic data infrastructure, adding voice required nothing more than plugging the IP phones into power and data sockets,” says Ashley. Once connected, the IP phones automatically registered with the Cisco CallManager at headquarters, downloaded the latest software, and assigned themselves a phone number. As new phone numbers appeared in the Cisco CallManager, IT staff dialed the numbers, asked for the store location, and changed the phone number to be appropriate to the area. Setting up each phone took only a minute. “Deploying 500 IP phones took eight days,” notes Ashley. “Without central management, we would have spent months installing and training around the country.”

Ongoing phone management involves little more than using PC-based network monitoring tools to make sure the phone is not unplugged. “One time we saw that a phone had removed itself from the network, and we called another phone at the same store,” Ashley recalls. “The employee went into the office and discovered it had been flooded by water.”

To conserve network bandwidth, Sports Soccer opted to compress all voice calls. Quality is so excellent that employees and other callers didn’t notice a difference when the store made the switch to IP.

Fast Credit Card Authorization

Cisco AVVID also solved the retailer’s data challenges, such as processing credit card transactions more quickly. Authorizing a credit card transaction over PSTN used to take around 24 seconds—a nuisance to customers purchasing small-ticket items such as T-shirts. Queues could grow very long very quickly. Now that Sports Soccer can send credit card information via Frame Relay with a 32-kbps CIR, approval time has plummeted to 8 seconds. “A permanent, low-bandwidth network was the perfect solution for time-critical, very small transactions,” says Ashley.

> “Cisco put together a solution that met the broad range of our business needs and allowed us to establish quality-of-service (QoS) priorities for our different voice, data, and video applications. And it cost less than half what we would have paid to install 100 remotely manageable PBX systems.”
>
> John Ashley
> Sports Soccer IT Director

Stock Replenishment

Sports Soccer also leverages its WAN for a variety of internal applications, such as monitoring alarm systems for break-ins and checking store opening times, monitoring and managing access control systems, and replenishing stock. The stock replenishment application alone has led to major productivity gains. Each day, a record of all merchandise sold is sent to the head office, where employees pick stock to replenish the store's inventory before opening the next morning. In the past, Sports Soccer transmitted till information via modem and had to wait until late afternoon when most sales had already occurred. But as more stores opened, it became difficult to squeeze all of the production work into such a short batch window. Now, with ample bandwidth and central management, Sports Soccer collects sales information in real time so that items can be picked throughout the day. The IT group can also remotely manage till information such as price changes. "With remote management capabilities, we can free store personnel from programming the till, so they can do what they're trained to do: sell the goods," says Ashley.

Convenient Store Video Retrieval

Monitoring CCTV video has traditionally challenged retail organizations. Transmitting the video from CCTV systems consumes a very high amount of bandwidth, and it's expensive to pay people to watch the video "just in case something happens," as Ashley puts it. Therefore, Sports Soccer decided to retrieve video from the stores only during high-risk events, such as a report of theft, major cash refund, and certain types of voids. Otherwise, the video is kept on in-store PCs with one-quarter terabyte of storage.

The QoS feature in the Cisco AVVID solution makes it practical to transmit bandwidth-hogging video over the WAN because it enables the retailer to assign priorities to different types of IP traffic. "We give our credit card transactions top priority, for example, because it keeps the queue length short at the point of sale," says Ashley. "On the other hand, what difference does it make if you have to wait a few seconds for CCTV video frames. Using QoS facilities in AVVID, we can give each application the appropriate level of priority on our line."

What's more, the recent addition of predefined voice templates available on CiscoWorks QoS Policy Manager will enable Sports Soccer to easily protect its voice traffic end to end as applications are added and the network expands.

Addition of New Applications, Devices

With a single pipe for consolidated voice, video, and data, Sports Soccer has positioned itself to capitalize on future applications and IP devices. For example, the retailer plans to leverage its network for unified messaging by taking advantage of the Cisco Unity™ Unified Communications Server. It also plans to allow traveling area managers to access IP voice and data applications, such as stock checking and sales reports, from Compaq iPAQ pocket PCs with Cisco IP Phone software.

Results

By enabling converged voice, data, and video on a single line, the Cisco AVVID solution is controlling overhead for Sports Soccer. More importantly, Ashley asserts that the company is increasing employee productivity and customer satisfaction by freeing up time for store personnel to assist customers.

"Centralized management relieves IT from administrative issues such as explaining to store managers how to set up alarms or change an item price in the till," says Ashley. "Both IT and the stores can focus on the far more interesting issues for retail, such as what we can do to make sure we've stocked what our customers want."

City of Dallas, Texas

The City of Dallas, Texas replaced six separate networks with a single, 8500-site converged IP network among its local agencies. The new network includes Cisco CallManager IP PBXs to handle all city voice calls, and promises to save the city US$21 million over the next ten years.

Challenge

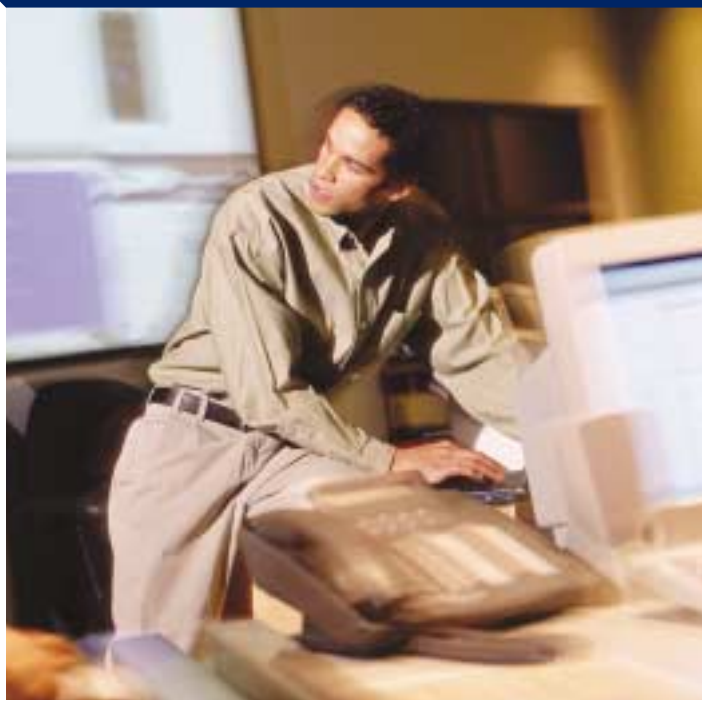
It could have been a networking staff's worst nightmare or a dream come true, depending on your perspective. The mission: to replace five incompatible data networks and a separate analog voice network with an infrastructure that would support new integrated applications across 280 government agency locations in the City of Dallas, Texas, US.

The city's information technology (IT) and networking staff quickly concluded that upgrading its sorely outdated networks to current releases was cost-prohibitive. A spaghetti bowl of low-speed data circuits running multiple Layer 3 protocols and different software releases had grown up, willy-nilly, over two decades. Similarly, the analog voice network included PBXs running outdated software releases, some elderly key systems, and a 20-year-old Centrex service, explains Dan McFarland, chief information officer (CIO) for the City of Dallas.

McFarland became the city's CIO in April 1999 and began evaluating network alternatives that would enable the sharing of common data among the city's many agencies. Another requirement was the support of business applications such as human resources/payroll and customer relationship management (CRM). McFarland and his team realized that the existing networks simply weren't up to these tasks because of their low speeds and lack of integration.

"We will continue to pay the same amount per year in telecommunications service costs—US$6 million—but we skipped the US$10 million upfront capital investment that would have been required to put more money into the old network,"

Dan McFarland
Chief Information Officer for the City of Dallas



No Short-Term Fix

But breathing more life into the existing networks with software and hardware upgrades—in addition to being an expensive proposition—would only leave the city in the same "legacy" predicament another five years down the road, McFarland determined. "I wanted a single converged IP network, where voice is nothing more than one IP application that runs on a data network," he says.

Solution

The city is now 100 sites into the construction of a converged data/voice network with the help of SBC as its systems integrator and its equipment supplier, Cisco Systems. The new network is based on Cisco Architecture for Voice, Video and Integrated Data (AVVID) components. The voice-over-IP (VoIP) building blocks include:

- Cisco CallManager IP PBXs for the processing and switching of IP telephone calls made from IP handsets or "softphones" (PC-based telephony applications).
- Cisco Unity unified messaging. Once the city has completed a desktop operating system conversion, it will activate Unity so that users can access e-mail, voice mail, and fax from a single IP mailbox. Researchers say that this integrated messaging capability improves user productivity by 25 minutes per day.
- Cisco Intelligent Contact Manager (ICM) Software, the IP-based counterpart to an automated call distributor (ACD) in the circuit-switched environment.
- Cisco IP Interactive Voice Response (IP IVR). This component is currently being used by the city as an auto-attendant for playing outgoing announcements to callers. Eventually, callers will be able to use it interactively, as computer-telephony integration combines the IP phone system with database information, to gain customized information and to perform transactions, such as paying water bills or fines.

Financial Justification

The integrated network promises to save the city US$21 million over the next 10 years, says Michael Jones, assistant director of communications and information services. The savings come in part by eliminating a significant number of circuits among city departments and agencies.

"Some locations will have greater bandwidth than they did previously, but overall we'll have fewer circuits for which we are paying monthly recurring fees," notes McFarland.

In addition, savings come from not having to shell out money to replace and upgrade existing equipment. Also, the city negotiated a five-year deal with SBC to lease the Cisco equipment and software. That deal precludes the city from having to make a large initial capital investment for new equipment and buys them upgrades to the Cisco AVVID infrastructure as technology evolves throughout the duration of the lease period. At the end of the five years, the city will own the equipment, and capital expenses will be limited to a maintenance contract.

Results

The integrated network promises to save the city US$21 million. "We will continue to pay the same amount per year in telecommunications service costs—US$6 million—but we skipped the US$10 million upfront capital investment that would have been required to put more money into the old network," says McFarland.

Hear What Other Customers are Saying About Cisco IP Communications Solutions

"The business case has gotten more attractive over time. We're going to save about US$6.2 million per year in run rate, mostly in line costs."

J. Dennis Piper
Chief Information Officer for the City of Houston

"The key word is resiliency."

John Roy
Merrill Lynch

"The network is extremely reliable and voice quality is clear."

Jan Wilson
DCI Services

"We've been hearing about data-voice convergence. So we went through an RFP process with a lot of traditional PBX vendors."... "We looked at Cisco Voice over IP (VoIP). The dollars made sense. The future growth potential and future capabilities made us go with a Cisco solution."

Rod Martin
Network Infrastructure Manager
Algonquin College

"...(Cisco IP Communications solutions) will grow our business and bring value to the company."

Dave Kepler
Dow Chemical Co.

"We can now complete telephone moves, adds, and changes using the Cisco CallManager software—rather than re-cabling and going out to a patch panel. And we no longer have to support two separate, totally independent networks. The converged network is much simpler to manage and support."

Adrian Shakeshaft
York Health's Desktop and Network Support Team Leader

"With help from Cisco, we are building a Village that addresses our customers' advanced communication needs."

Tom Jacobson
Intrawest Vice President of Development at The Village at Squaw Valley USA

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