

## City of Houston Public Library— Checking Out IP Communications

As a public institution, the City of Houston Public Library must provide access to all its customers, including the disabled. The IP Telephony solution from Cisco Systems seamlessly connects to devices that assist hearing, sight, and mobility impaired customers and employees. Cisco IP Communications solutions including Cisco Unity and Cisco IP Contact Center deliver new capabilities while reducing operating expenses.

### Background

The City of Houston ranked fifth in the 2001 Digital Cities Survey for outstanding achievement in technology. The City's Web site (<http://www.cityofhouston.com>) was a 2001 "Best of the Web" finalist, ranking in the Sweet Sixteen of outstanding local government Web sites. The City of Houston gained this recognition through its emphasis on using technology to improve communication and employee productivity while reducing operating expenses. But like many local governments, it has to contend with legacy technologies installed over the last several decades, independently of any citywide master plan.

The Houston Public Library received a grant from the State of Texas in 1999/2000 to upgrade its Cisco data network. The team, headed by Robert Riley, Information Systems Administrator, City of Houston, envisioned an upgrade that would support multicast video and future IP Communications systems. From cost and capability standpoints, Riley recognized the value of network convergence over continuing to operate separate voice, video, and data networks.

The supercharged Cisco AVVID (Architecture for Voice, Video and Integrated Data)-enabled network throughout the Library locations has Cisco routers, Cisco Catalyst switches with inline power modules, and a T1 WAN between 39 sites. The new network is poised to leverage the emerging wave of integrated voice, video, and data applications, starting with Cisco IP/TV. The multicast network broadcasts the municipal television channel to all branches, where employees can access it through Cisco IP/TV client software on their PCs. It has also been used for employee training, on-demand video, emergency communications, and new employee orientation.

### Challenges

Like most City of Houston departments, employees at the 35 locations of the Houston Public Library (<http://www.houstonlibrary.org>) had difficulty talking to one another. The independent telephone systems were an assortment of private branch exchanges (PBX) or key systems from several vendors. Each had its own dial plan, voice-mail system, and trunk



lines to the Public Switched Telephone Network (PSTN). It was impossible to transfer calls between branches, and the reference call center at the main library often had to ask customers to hang up and dial another number to reach the expert they needed.

This hodgepodge of telephony systems was both expensive to maintain and becoming obsolete. Parts were unavailable for several of the PBX systems, and vendors were unwilling to renew expired contracts on older gear. Its age led to reliability issues, such as failures during Tropical Storm Allison. The many telephone “islands” also presented a public safety hazard. Some locations were connected to an offsite PBX; if someone were to dial 911 emergency services, the dispatcher would see the PBX location and send a response team to the wrong address. The City of Houston has similar issues in other departments.

Therefore, the City of Houston decided to implement an integrated telephone system that would eventually reach all City locations and departments. It decided against upgrading its PBX equipment because it is not customer-centric. It opted to explore an IP Communications solution, which could operate atop the existing Cisco data network and leased-line WAN and save money in maintenance and skill sets over the old solution.

The Houston Public Library was the natural choice to pilot Cisco IP Communications for the City of Houston “because the network was more ready for IP telephony than any other department,” says Toni Lambert, assistant director of Information Technology at the Houston Public Library.

The new telephones would have to support existing functionality such as music on hold and TTY access for the hearing impaired. The Library also hoped to add new capabilities. Aside from seamless five-digit extension dialing and transfers throughout all 39 locations, the Library staff wanted an online directory, voice mail for all employees, an improved call center, and redundancy in case of system failure.

Cisco was chosen to provide its Cisco IP Communications solution atop the existing Cisco AVVID network. Southwestern Bell used a new area code to provide 30,000 contiguous phone numbers for a larger project that will eventually convert the entire City of Houston to an integrated phone system with an estimated 25,000 users. As with the Library, the new system will provide five-digit dialing and unified communications access throughout all City of Houston offices and departments.

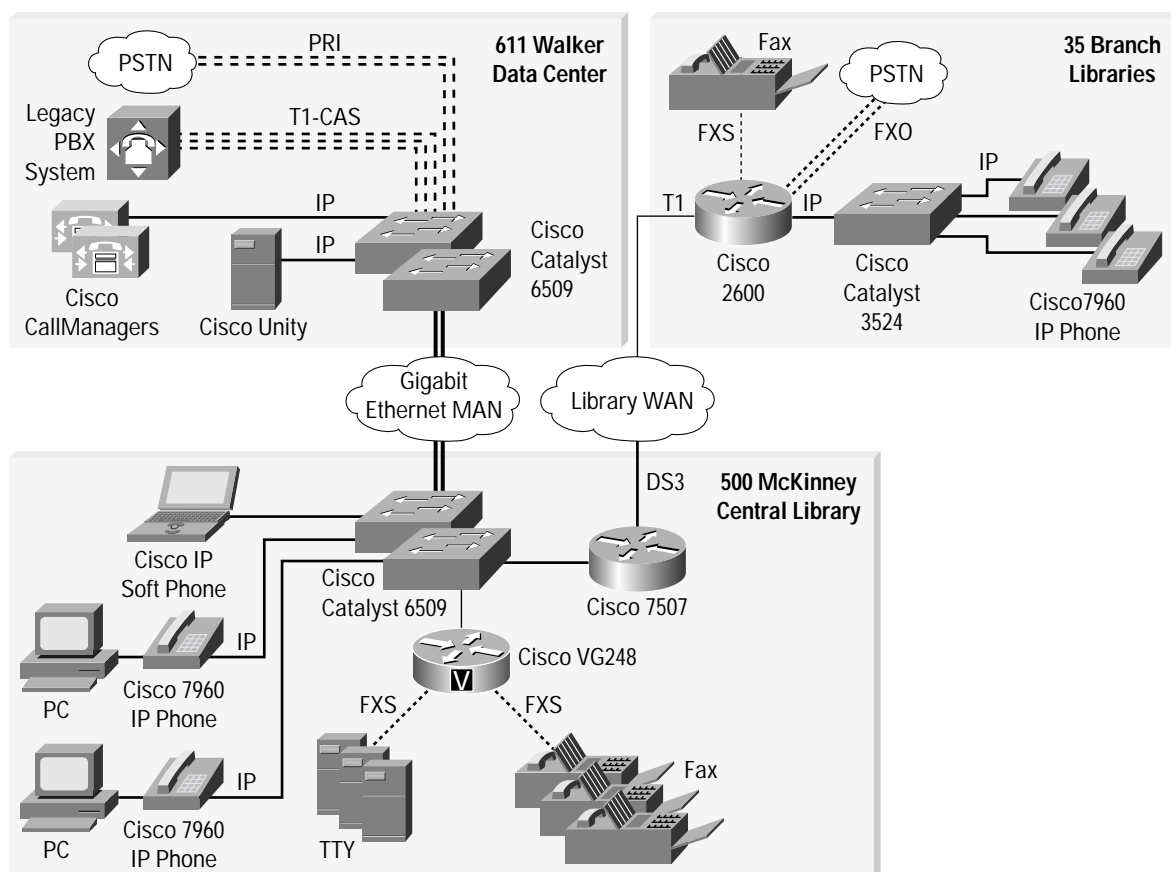
## Solution

With 39 locations and nearly 700 phones, the Houston Public Library network has dual Cisco Catalyst® 6500 switches forming a Gigabit Ethernet backbone in the Central Library IT data center, with Cisco Catalyst 4006 switches as a Layer-3 distribution layer. A dedicated Catalyst 6500 Switch in the distribution layer contains two Catalyst 6608 blades for Primary Rate Interface (PRI) connections to the PSTN, T1 Channel Associated Signaling (CAS) connections to conferencing and media termination point (MTP) resources.

Cisco CallManager software is clustered in three servers to provide redundancy. A Cisco Access Gateway Module with FXO ports resides in one Catalyst 4006 Switch to provide emergency 911 service with the Cisco Emergency Responder application. A Cisco Catalyst 3548 Switch connects a Cisco Unity server. A Cisco VG-248 gateway provides analog service to TTY devices and analog fax machines.



Figure 1  
Cisco IP Telephony Network at the City of Houston Public Library



Employees now enjoy five-digit extension dialing and transfers between branches. The Library's IT group has the simplicity of centralized moves, adds, and changes with Cisco CallManager, centralized voicemail with Cisco Unity™ unified communications, and contact center support with Cisco IP Contact Center (IPCC) Enterprise Edition.

The central Cisco CallManager cluster communicates with remote libraries via a hub-and-spoke WAN network, with channelized DS3 egress from a Cisco 7507 Internet Router in the data center diverging to T1 connections into a Cisco 2600 Router at each remote library. An easily replicated design at all satellite libraries makes it easier to design, deploy, and operate the entire network. Wiring closets house Cisco Catalyst 3524 PWR XL switches with inline power, which run to Cisco 7960 IP Phones on every desktop. Cisco IP Phones and desktop PCs are managed on separate virtual LANs.

Each Cisco 2600 Router has Cisco Survivable Remote Site Telephony (SRST) software to maintain telephone service in case of a WAN outage. Should someone in a branch location dial 911, Cisco CallManager routes the call through the local Cisco 2600 Router, allowing the 911-dispatch system to correctly locate the call. Each router also includes a two-port FXS module linking TTY devices, fax machines, and a two-port FXO module for direct 911 dialout.



## Access for the Disabled

As a public information resource, the Library has to provide access for all customers, including those with disabilities. The Library staff found that the Cisco IP Telephony system meets their requirements for accessibility. Says Lambert, “We’ve always had TTY devices in place so that our customers with hearing disabilities can communicate with the Library. They have the same communication needs as any other customer. Our customers who have any sort of hearing disability are able to communicate with us exactly as they could before we moved to Cisco IP Telephony.”

Riley reports that after the Cisco IP Telephony system was installed and running, he did a last audit of the Central Library building. “We had converted the whole library, and were looking for odd devices, when we stumbled upon those TTY machines. We went to the Cisco literature, found out which side of the house they operated on, and rather than test it, we plugged it right in. There were no special configuration parameters. The TTY devices on the IP Telephony network came right up. Everything works. It’s been up and operational on the network for over 18 months.”

The Cisco IP Communications system also accommodates other types of disabilities. A gentleman in the Central Library call center is vision-impaired. Special software linked with Cisco SoftPhone on his PC automatically enlarges onscreen text so he can read it easily. Another employee has use of only one hand. A headset plugged into her Cisco IP Phone allows her to dial the phone and type without negotiating the handset.

## Cisco Unity

Cisco Unity provides a voice mailbox to every Library employee for the first time. Employees that share IP phones use the Extension Mobility feature to program their phone at the start of a shift. Each employee now has a personal extension and voice mailbox—a capability that the legacy PBX could not provide. A limited number of employees use the unified communications functionality provided by Cisco Unity, which brings all contact channels together into a single inbox, enabling workers to listen to their e-mail over the phone or check voice messages from e-mail. “The people that have it love it,” says Riley.

## Online Directory

Paper-based employee directories are difficult to keep current. Lambert likes the new online Extensible Markup Language (XML)-based directory application accessible from each Cisco IP Phone. It’s easier to find someone because she doesn’t have to know which branch to call. The Cisco IP Phone also tracks placed calls, received calls, and missed calls. “It’s handy when someone calls you three times but doesn’t leave a message,” she says.

## Cisco IP Contact Center Enterprise Edition

During all hours that the library is open, customers can call a central reference hotline with questions. Says Lambert, “When people want a quick answer to a question, whether it’s business related, or school homework, or trying to settle a bet, calling the Public Library is one of the ways that people do that. Our telephone reference service is extremely busy, and we have to have a reliable telephone system.”

Cisco IPCC Enterprise Edition at the Central Library call center facilitates call transfers. The library has 19 agents using the Cisco Agent Desktop software on agent PCs with Cisco 7960 IP Phones or Cisco SoftPhone. Cisco IPCC Enterprise Edition is configured for one primary queue and seven transfer queues. Agents use Cisco Agent Desktop shortcut keys to transfer calls easily.

## Service and Support

"During the cutover, Cisco provided us with a tremendous amount of support to make sure that this network is 100 percent sound," says Riley. "One of the things that most service companies don't understand is that service is based on the relationship and the timely resolution of problems. Cisco provides that kind of service."

## Return on Investment

The Cisco IP Communications system enabled the Library to reduce the number of PSTN lines from 750 to 150, a substantial savings in monthly recurring costs. The monthly cost per phone has dropped

more than 50 percent. Lambert notes that maintaining the new Cisco IP Communications solution is much easier and less expensive than before, when she had to stockpile parts for numerous systems from different vendors. The number of staff required to maintain the system has dropped from two and a half to one person. Training is much simpler because staff only needs to learn Cisco CallManager software, not numerous PBX and key systems. "We've gotten features that we couldn't have with a PBX," says Riley, "and we will not go back." And best of all, "the voice quality is great."



Corporate Headquarters  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 526-4100

European Headquarters  
Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
www-europe.cisco.com  
Tel: 31 0 20 357 1000  
Fax: 31 0 20 357 1100

Americas Headquarters  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-7660  
Fax: 408 527-0883

Asia Pacific Headquarters  
Cisco Systems, Inc.  
Capital Tower  
168 Robinson Road  
#22-01 to #29-01  
Singapore 068912  
www.cisco.com  
Tel: +65 6317 7777  
Fax: +65 6317 7799

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