



One Phone System, Indivisible, with **Unified** Messaging and Extensions for All

The City of Houston is converging hundreds of standalone phone systems and its data network into a single converged voice-data infrastructure based on Cisco AVVID (Architecture for Voice, Video and Integrated Data). In so doing, they can implement city-wide five-digit extensions for the first time, solve a critical 911-dialing safety issue, and enable greater efficiency and productivity through centralized call processing, central Cisco Unity servers, and Cisco IP Contact Center (IPCC).

Background

Like most metropolitan areas, the City of Houston manages an incongruous set of public services in more than 400 locations. Examples of city services include police and fire departments, emergency services, parks and recreation, water and sewage treatment and disposal, healthcare clinics, convention and entertainment facilities, housing and community development, municipal courts and jails, and libraries, to name a few.

Houston ranked fifth in the 2001 Digital Cities Survey for outstanding achievement in technology. The city's Web site (www.cityofhouston.com) was a 2001 "Best of the Web" finalist, ranking in the "sweet sixteen" of outstanding local government Web sites. It has a Cisco data network but lacks a centralized telephone system. As the city grew over many decades, it built many standalone phone systems. Each private branch exchange (PBX) has its own dial plan, voice-mail servers, and trunk lines to the public switched telephone system (PSTN). The city now manages 27 PBXs, 43 voice-mail systems, and 175 key systems—from many vendors—dispersed citywide. "We have 175 mini-Bells running

around the City of Houston," observes J. Dennis Piper, Chief Information Officer for the City of Houston.

Challenge

Upgrading the telephony system was one component of the city's 2001 Information Technology Strategic Plan, which also includes IT organization structure renovation, communications infrastructure redesign, and formulating a life-cycle technology replacement policy. "We identified voice issues that we needed to address almost immediately," says Piper. "There was economic obsolescence on some of our PBX infrastructure. We lost maintenance because of age; there were no cannibalized parts available anywhere in the country to service that infrastructure."

The many telephone "islands" throughout the city require extensive management. Worse, they are also a public-safety hazard. Most locations are connected to an offsite PBX that could be miles away; if someone dials 911 emergency services, the dispatcher sees the PBX location and may send the response team to the wrong address. The city wants to resolve the 911 issue, provide

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



five-digit extension dialing among all city locations, integrate voice-mail services, and centralize call processing.

The city evaluated replacing its aging PBXs with up-to-date PBX equipment, but quickly decided against it in favor of a converged voice-data IP infrastructure. Explains Piper, “I carefully considered the converged network benefit. We’re going to take voice and data and run them on the same network. Over time we’re going to save a tremendous amount of money in maintenance and skill sets to manage that environment. We did look at maintaining the current environment, but it is not customer centric. It does not give clients what they need. If we were to replace the current PBX infrastructure, we’d be living the same scenario we were before.”

The city chose Cisco IP telephony solutions that it could deploy on its existing Cisco AVVID infrastructure with a few upgrades. Knowing how municipal governments work, Piper opted to develop the business case and launch a pilot installation simultaneously. The business case would prove the project to the administration, and the pilot would teach the IT team what they needed to know for a smooth rollout citywide. “One thing I’ve found is if you don’t do things in an expeditious way, you run a giant risk of not being successful with the implementation. We didn’t want to sit and study it to death. I don’t think that’s [unique to] Houston. Any change is difficult to accept. When you touch somebody’s phone and change somebody’s phone number, that’s a very personal thing. We had to show the benefits right away,” says Piper.

The city selected its library network for the pilot because it has one of Houston’s best-developed networks, and it’s a sophisticated organization in that the library uses its phones “like one big call center,” frequently transferring calls to another department or branch.

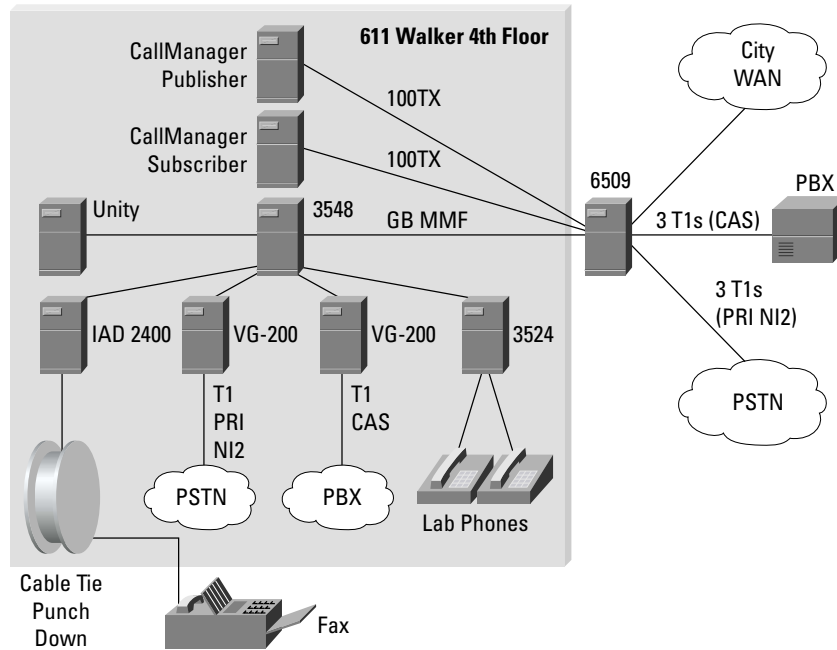
Solution

The pilot deployment required close cooperation between the city’s separate telecom and data network groups, anticipating the eventual union of the two teams into a single department, and allowing them to develop procedures for operating the new converged network. The IT group now enjoys the simplicity of centralized moves, adds, and changes with Cisco CallManager and centralized voice mail with Cisco Unity™ unified messaging.

With 35 branches and about 600 phones, the Houston library network offered a good training ground for IP telephony. During the transition, all IP phones must dial 10-digit numbers outside the voice-over-IP (VoIP) side of the network. The new network has dual Cisco Catalyst® 6500 switches forming a Gigabit Ethernet backbone in the IT data center, with Cisco Catalyst 4006 switches in the Layer 3 distribution layer at the Central Library. One core Cisco Catalyst 6500 Switch contains two Cisco Catalyst 6608 blades for Primary Rate Interface (PRI) connections to the PSTN, T1 Channel Associated Signaling (CAS) connections to legacy Avaya G3R PBX, conferencing and media termination point (MTP) resources. Two clustered Cisco CallManagers provide redundancy. A Cisco Catalyst 3548 Switch connects a Cisco Unity server. Cisco VG-200 gateways provide redundant connections to the PSTN and to legacy PBX systems. IAD 2400 systems provide service for analog fax machines. An Access Gateway Module with FXO ports resides in one Cisco Catalyst 4006 Switch to provide 911 services for users within the Central Library.



Figure 1
IP Telephony Network at the City of Houston Library System



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 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 switches with inline power, which run to Cisco 7960 IP phones on every desktop. IP phones and desktop PCs are managed on separate virtual LANs. Each Cisco 2600 Router has Cisco Survivable Remote Site (SRS) telephony software to maintain telephone service in case of a WAN outage.

Each router also includes a two-port FXS module linking fax machines, and a two-port FXO module for direct 911 dialout. When someone dials 911, Cisco CallManager routes the call through the local Cisco 2600 Router, allowing the 911-dispatch system to correctly locate the call.

Cisco Unity

The city deployed the voice-mail features on its Cisco Unity servers first, planning to implement the complete unified messaging service when IT was ready. However, Piper says, “We’re finding that it may be better to roll out the whole thing, turn it all on. We’ve taken a robust system that’s used to doing a lot of neat things, turned off the neat things, and doing that causes problems. We asked ourselves, why are we doing this? Why are we limiting ourselves? We need to turn this on for everybody. I love it and almost can’t live without it, and I’ve had it just a month. It’s a really nice tool.”



Cisco IP Contact Center

The next step is implementing Cisco IPCC at the libraries to facilitate the many call transfers, starting with the voice-only features. Piper views the contact center project as high risk, so he hired Cisco Professional Services to manage the installation. "I want a partner that owns the hardware, owns the software, and owns the implementation. There will be no finger-pointing going on if something happens, and Cisco will parachute anybody in necessary to make sure it's successful."

Dedicated Area Code

The city plans to deploy 25,000 Cisco IP phones in all. Every user gets a new phone number. Southwestern Bell used a new area code to provide 30,000 contiguous phone numbers for the project. Users will enjoy the ease of five-digit dialing and voice-mail access throughout the city offices. The telecommunications team, led by Simon Angelle, worked hard to ensure the smooth transition of library employees to new telephone numbers and voice-mail services.

Service and Support

When the City of Houston has network issues or questions, its primary resource is Tom Gonter, the Cisco sales engineer assigned to the account. "We think of Tom as one of us," says Piper. Kent Hudson, IP Telephony Project Manager for the City of Houston, echoes, "Tom's the main guy. He gets the tough questions. He's been an invaluable resource for our network upgrade project."

The City of Houston data networking team, headed by Leticia O'Connor, also uses the Cisco Technical Assistance Center (TAC) and the Cisco.com Web site to answer questions. O'Connor also finds that Cisco SMARTnet™ service hardware replacement works well.

Results

The City of Houston has learned a great deal during its pilot rollout at the library system and is already at work upgrading the rest of the network. Says Piper, "So far, we're very happy with what we've got and we've learned a lot. We've stubbed our toe here and there but we haven't made the same mistake twice. We're doing this very quickly. I have a goal to have this done by yearend 2002. I think it'll be the largest governmental deployment of IP phones in the country. We're going to take one step at a time. We want to offer it in some kind of controlled setting before we open it wide open for everything."

Another plus is an estimated return on investment (ROI) period of 12 to 14 months. In fact, says Piper, "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. We calculated that the monthly cost including voice mail, PBX, personnel, and network access is about \$44 per month per PBX phone, and \$21 per phone for the VoIP solution." The \$6.2 million is accounted as follows:

- \$4.3 million savings in voice circuit cost
- \$1.6 million savings in telephony equipment and maintenance
- \$427 thousand savings in network administration costs

Despite the speed and enthusiasm of Piper and his team, he insists upon strong process to maintain control and minimize risk. "You can mess up data all you want, but if you mess up phones, you got a problem. We have to be very careful. We want to keep dial tone. From there, the sky's the limit on what this system can give us from an application perspective. The real payback is that clients will get ten times the functionality they have today. The industry hasn't even begun to build applications that take advantage of all the things you can do with these phones. It's going to be incredible."



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