When Cap Gemini bought the consulting arm of Ernst & Young in early 2000, the new management consulting and IT services company had to bring both groups into a single enterprise communications network. Given this classic opportunity to upgrade (and a nudge from the US Securities and Exchange Commission, which required it to separate operations in the US from Ernst and Young by May 2003), Cap Gemini Ernst & Young (CGEY) made a far-from-classic move—to IP communications from Cisco.

The benefits were obvious. CGEY (cgey.com) could converge its voice and data networks and centralize management—monitoring, troubleshooting, and upgrades. The Cisco IP telephony systems cost less to install and operate than PBXs. And, very important, IP communications provides the foundation for a future that includes boons such as unified messaging and other voice and data applications and services.

The timetable was short. Six months had to suffice for the initial phase, which involved 700 users at six major sites in a large triangle reaching from Pittsburgh, Pennsylvania, to Minneapolis, Minnesota, to Houston, Texas. That timetable had to stretch around design, procurement, installation, and user training.

The project roadmaps were nonexistent. This was a pioneering installation for CGEY. Despite the abbreviated schedule, CGEY planned carefully, spending six weeks, for example, on a pilot between offices in Cleveland, Ohio, and Chicago, Illinois, to test possible network components and configurations, work out problems, and assess user reaction.

The results were excellent. According to Rob Filby, CGEY's manager of voice operations in North America, users took readily to IP telephony, appreciating features such as call logs they didn't have with PBX service. Users also rated the sound clarity as excellent. The network, enabled by Cisco AVVID (Architecture for Voice, Video and Data), worked and integrated well with legacy systems, including third-party hoteling software, PBXs, and voice mail.

Equipment closets were less crowded, power requirements less, costs lower. CGEY's return on investment (ROI) looked good. At the time this issue of Packet® went to press, CGEY was finishing up the second phase, converting another 500 phones so one-third of the company's US staff will be on IP telephony; future phases will convert the rest. Planning is underway for outfitting CGEY's operations outside of the US as well, so in time, all 10,000 employees will use IP telephony.

The Crucial Pilot
“The single most important thing we did right was the pilot,” Filby says. During these six weeks, Filby and his staff, with advice from Cisco Technical Assistance Center (TAC) engineers, mixed and matched various AVVID-enabled components—including Cisco CallManager software, voice gateways, and Cisco IOS Software—to find the combination that accomplished what CGEY needed.

They created a hub-and-spoke architecture, with hubs in Chicago and Cleveland for voice and data and a data hub in Toronto, Ontario (see figure). When the team began rolling the technology out full scale, the fundamental decisions and fixes had been made, and the team could concentrate on network-level issues.

“One of the strengths of AVVID is that Cisco gives you lots of building blocks, and you can choose what works best for your environment and business goals,” says Mike Shintani, technical architect, CGEY. “There are lots of ways to skin the cat.”

After trying various combinations of CallManager, Cisco IOS Software, voice gateways, and other components, the team decided on a distributed network comprising a mix of Cisco CallManager clusters running on a Cisco Media Convergence Server 7835 (MCS-7835), Cisco VG248 analog phone gateways, Cisco VG200 H.323 voice gateways with an ISDN PRI interface, Cisco Catalyst® 4006 and 6500 switches, Cisco 3725 routers, Cisco IP phones, and ancillary systems.

Among the considerations that governed these choices was the need to separate local and long-distance calls, to separate voice and data at the main distributing frame, and to leverage the WAN that CGEY already had in place.

“We use different carriers for local and long-distance calls, so we wanted the granularity that
H.323 provides via dial peers,” Shintani says. “We also wanted to separate voice and data traffic so we could do maintenance on voice without taking data down. Isolating the PSTN gateway, the VG200 gives us the flexibility to do that."

One of the more important items the team worked through in the pilot, Filby points out, was integrating a third-party voice-mail system into Cisco AVVID. The solution rests on Simple Message Desk Interface (SMDI) and VG248 analog gateways. Smaller issues included occasional crosstalk during conference calls—solved by changing the digital signal processor (DSP) farm supporting local conferencing; some echoing—solved by changing the router and gateway combination; and some glitches in software compatibility—solved by using a different release of Cisco IOS Software.

Tailoring the login/logout extension mobility features was key. CGEY employees “hotel” offices. Rather than having a designated office, they use any available one. So, when people come in to work each day, they must login to Cisco CallManager by entering their numeric employee IDs. With the modification, they tap each key once to enter the number instead of the four times required in the usual coding (for example, A-B-C-2), thus minimizing aggravation.

Extension mobility is, currently, mostly limited to hoteling within the employee’s home city, but Filby expects that in the future users will be able to move throughout the area served by their hub and perhaps across the entire company. “The capability is there. We are working through the design now.”

Although the installation was designed and carried out by Filby’s group, he points out that “the Cisco TAC was a key component of our success. They suggested different configurations and created software patches for us. A lot of what we were doing was brand new, so there was no documentation on how to do it. TAC engineers set up parallel configurations in their labs, and we both worked on solutions while learning together.”

It was especially important to nail down the core equipment lineup and resolve basic operating issues during the pilot rather than during the full-scale rollout because, says Shintani, “if we had tried
to troubleshoot in a production environment, people might have received a bad impression of IP telephony."

User satisfaction was crucial, of course, and the group also tested how to introduce the new technology during the pilot. They settled on providing each user with paper documentation and giving receptionists and administrative assistants, who are responsible for covering multiple lines, hands-on training.

**Hub-and-Spoke Design**

Another right move was the hub-and-spoke design, with hubs initially in Chicago and Cleveland; an additional hub is planned in Texas.

Approximately 70 percent of the first 1200 Cisco IP phones are served through Chicago, about 10 percent through Cleveland, and the remainder through the Texas hub. An ATM WAN carries voice traffic as well as signaling and device management. While PSTN voice gateways are located at each branch office to give users local numbers, call processing is performed by Cisco CallManager clusters running on MCS-7835 servers in the hubs.

This design allows CGEY to centrally manage call processing, perform moves, adds, and changes, and install software upgrades and patches centrally, saving staff time and resources.

The hubs, which also house switches, voice gateways, routers, and the voice-mail systems, enable CGEY to serve up voice mail, monitor and troubleshoot network performance, and handle other administrative tasks centrally as well, adding to the savings. In addition, redundancy is built into the hub to improve network reliability and availability cost effectively.

The local sites contain routers employing Cisco IOS Survivable Remote Site Telephony (SRS Telephony) software that automatically reconfigures the router to handle call processing in the event of a failed link to the hub.

“Should the WAN link go down, users can still make and receive local calls,” Shintani says. Conference bridges, DSP farms, switches, voice gateways, and routers round out the local sites.

The switches deliver inline power to all phone jacks. “We tried powering only the voice jacks to save some up-front costs, but too many users needed more flexibility and had to repatch to get inline power to the data jacks, so it was actually more labor intensive,” according to Filby.

**Staging and Specializing**

Another step the team did right was staging some offices in Vienna before installing the equipment on site, something CGEY plans to do with all future sites.

“We had the equipment shipped to Vienna, where we configured the systems, loaded the selected release of IOS, configured the Cisco CallManager instances, and tested everything, and then shipped the complete office out to the site,” Filby says. “This saved time and travel, as all the necessary people could be in Vienna at the same time, rather than having to travel to the different locations.” Staging does require early ordering, though, to have time to relay the equipment through the staging area, he adds.

Team members specialized in certain aspects of the installation, such as the voice gateways, Cisco CallManager, and LAN switching—a much more efficient approach, Filby notes, “than everybody developing expertise on everything.”

Having successfully deployed IP telephony for internal use, CGEY is showcasing the network to demonstrate the technology to its consulting clients. But that’s far from CGEY’s main goal.

As Filby points out, “IP telephony satisfies extremely important business needs for us. The facilities people love IP telephony because it requires less floor space than a PBX—sometimes just one-fifth of a rack, rather than a big floor unit—and consumes less power. It’s more flexible to manage. It delivers at least the functionality of a PBX, and it gives us an open, scalable platform for delivering future voice applications.”

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**“IP telephony satisfies extremely important business needs for us. . . . It delivers at least the functionality of a PBX, and it gives us an open, scalable platform for delivering future voice applications.”**

---ROB FILBY, MANAGER OF VOICE OPERATIONS, NORTH AMERICA, CGEY

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**FURTHER READING**

- Cisco AVVID IP telephony solution overview:

- Cisco IP communications: