

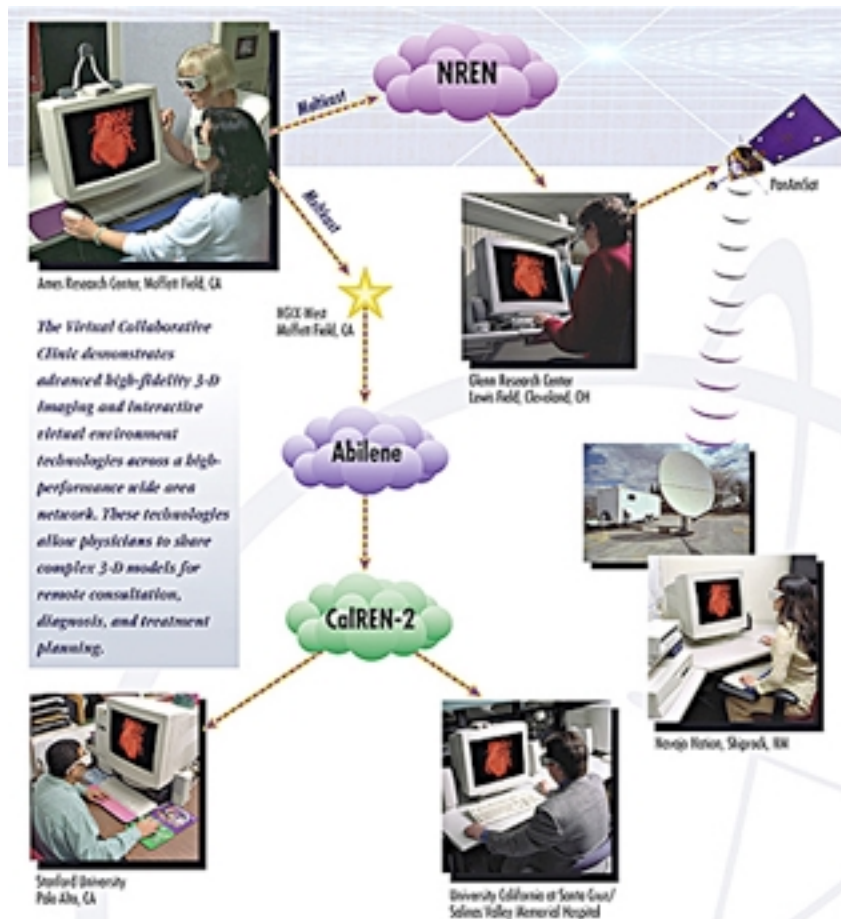
NASA Pioneers a Virtual Collaborative Clinic Using Cisco IP Multicast

FOR DECADES, NASA HAS PIONEERED THE EXPLORATION OF SPACE USING STATE-OF-THE-ART TECHNOLOGY. BUT RECENTLY NASA TOOK ANOTHER GIANT LEAP FOR MANKIND BY DEPLOYING THE CISCO SYSTEMS IOS® SOFTWARE'S MULTICAST SOLUTION FOR THE INTERNET TO ENABLE A VIRTUAL COLLABORATIVE CLINIC RIGHT HERE ON EARTH.

Tackling the Challenges of "Telemedicine"

Originally conceived as a "telemedicine" solution that would allow NASA to remotely monitor the health of astronauts on space stations or space vehicles, the Virtual Collaborative Clinic's larger mission is to bring high-quality health care to patients in remote areas and equalize health care delivery around the globe. In order to accomplish this, the clinic needed to implement a high-performance network that could handle the technological challenges of:

- Simultaneously transmitting medical data to multiple sites
- Minimizing transmission delays to deliver data in near-real time
- Synchronizing large, three-dimensional image displays at end sites
- Accommodating satellite/terrestrial networks on disparate platforms



An End-to-End Solution for Virtual Collaboration

Because bandwidth, scalability, reliability, and multicasting capabilities were all key to the success of the Virtual Collaborative Clinic, NASA selected Cisco to provide an end-to-end IP-based network solution. Cisco was the clear vendor of choice for two main reasons. First, Cisco has the only comprehensive Internet multicast solution available today. Second, Cisco offers a world-class development engineering and

support organization—one that has successfully delivered real-world solutions to NASA since the early 1990s.

NASA has pioneered multicast applications, most notably its space shuttle broadcasts. Although earlier applications used a tunneled multicast backbone infrastructure called the Mbone, NASA needed to deploy the Virtual Collaborative Clinic using a native multicast Internet solution for performance reasons.

For the satellite component of its very large bandwidth application, NASA implemented the Protocol Independent Multicast Internet Service Model, including software technology for interdomain routing, source discovery, and asymmetric communications links.

Using the advanced Cisco 12000 GSR series, Cisco 7500 and 7200 series routers, as well as Catalyst® 5500 and 2900 series switches, Cisco designed a robust, scalable network that provides high-speed backbone access to the Internet. This network solution enabled NASA to connect five major facilities—the NASA Ames Research Center, University of California at Santa Cruz and Stanford University in California; the Northern Navajo Medical Center in New Mexico; and the Glenn Research Center in Cleveland—with a high-performance WAN that stretched across the United States.

Real-Time Collaboration through Cisco IP Multicasting

Cisco worked with NASA to deploy its Cisco IOS Software's advanced IP multicasting technology to ensure that the Virtual Collaborative Clinic would be able to transmit large, three-dimensional medical images at speeds up to 38 Mbps to all five networked sites. IP multicasting saves network bandwidth and boosts Internet transmission speeds by delivering a single stream of information to thousands of recipients at the same time. Another important advantage of this technology is that it allows physicians at networked sites to view high-quality medical scans and procedures in near-real time, enabling them to collaborate easily with geographically remote colleagues.

Simulated Surgeries Save Time and Improve Procedures

The Virtual Collaborative Clinic also allows doctors to perform simulated surgical procedures using a "CyberScalpel." In this application, doctors "cut" into images taken from CT or MRI scans and then manipulate "bone" segments. The CyberScalpel gives surgeons a chance to practice procedures before entering the operating room, reducing the time needed for surgery and potentially improving surgical outcomes.

Making "Universal" Health Care a Reality

NASA's long-term goal for the Virtual Collaborative Clinic is still to ensure the health of astronauts as they probe deeper into space. But the clinic's advanced network technologies will also benefit patients and physicians all over the world. Someday soon, doctors and scientists may use the clinic to plan and practice delicate surgeries in virtual space. Digital libraries of patient records will enable doctors to share and leverage their medical knowledge—and provide an invaluable teaching tool for future physicians. Perhaps most importantly, even patients in remote, outlying areas will have access to the same quality health care that patients treated in large, well-known institutions enjoy. By bringing the Virtual Collaborative Clinic to patients around the globe and in outer space, Cisco IP multicast technology will help make "universal" health care a reality.



Corporate Headquarters

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

European Headquarters

Cisco Systems Europe s.a.r.l.
Parc Evolic, Batiment L1/L2
16 Avenue du Quebec
Villebon, BP 706
91961 Courtaboeuf Cedex
France
<http://www-europe.cisco.com>
Tel: 33 1 69 18 61 00
Fax: 33 1 69 28 83 26

Americas

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

Asia Headquarters

Nihon Cisco Systems K.K.
Fuji Building, 9th Floor
3-2-3 Marunouchi
Chiyoda-ku, Tokyo 100
Japan
<http://www.cisco.com>
Tel: 81 3 5219 6250
Fax: 81 3 5219 6001

Cisco Systems has more than 200 offices in the following countries. Addresses, phone numbers, and fax numbers are listed on the

Cisco Connection Online Web site at <http://www.cisco.com/offices>.

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