

Radiology Storage Transfer Analysis and Reporting (RSTAR) Server and Network-Center Located MGH-White/2-circa 1992

On February 4, 1985, Dr. Roger Bauman, hired Jaime Taaffe; together they started the RSTAR project (Radiology Storage Transfer Analysis and Reporting) a PACS research and development effort of the Massachusetts General Hospital Department of Radiology. During the ensuing years, the RSTAR staff grew; we all worked hard, and after a number of iterations, a sufficiently useful system was developed. Workstations/Scanners/Archives/Fiber-Optic-Networks/etc. were deployed in the department, in the hospital, at the film-library in Charlestown, and even at a Harvard Community Health Plan clinic in Burlington.

In support of these efforts and over time the RSTAR server, located on White/2, grew from a small Digital Equipment Corp. Vax/750 with only a few hundred megabytes of disk storage to, what was then - 1992, a sizable mid-range VAX 6000-430 computer system.

The following slide/pages describe the salient features of this system and the various local/wide/metropolitan networks that connected the RSTAR Server to its distal components.

Note: To put system cost in perspective, it is worth remembering that a 32-Megabyte memory board for a VAX 6000 system in 1992 retailed for approximately \$50,000. A full system often cost in the neighborhood of \$500,000.

MASSACHUSETTS GENERAL HOSPITAL AWARDED RESEARCH GRANT FOR MEDICAL IMAGING

Maynard, MA -- June 26, 1989 -- Digital Equipment Corporation today announced the award of a research grant to the Massachusetts General Hospital (MGH) Department of Radiology supporting the development of a Picture Archiving Communications System (PACS).

The advanced medical imaging research being conducted at MGH today will provide a cost-effective means of electronically distributing high-quality images to diagnostic workstations over fiber optic networks.

"The cooperation between MGH and Digital has been instrumental in our success so far, and Digital will continue to play a key role in our future achievements," said Jaime Taaffe, Co-Director of Image Research for the Department. "Our goal is to build a system that supports the primary diagnostic interpretation of radiological images at workstations throughout the hospital and beyond. The ability to store radiological images and other data in a computer archive and distribute them over high-speed fiber optic networks to diagnostic workstations will greatly improve patient care as well as reduce cost.

This research grant of a VAX 6220 will allow MGH to further develop its second generation PACS, featuring fiber optic image transmission, high-resolution displays, and greatly improved performance and functionality.

"The need to substantially reduce costs within hospitals is widespread. This contribution sends a powerful message of Digital's continued commitment to foster the development of cost-effective, image-handling systems within the healthcare industry," said Richard Corley, Digital's Group Manager of Health Care Industry Marketing.

Founded in 1811, the Massachusetts General Hospital is a leading patient care, teaching, and research center. The 1081-bed facility is the original

Joint DEC/MGH Press Announcement





System Upgraded to:

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SYSGEN> SHU /BUS  
Current Configuration  
Cpu Type: VAI 6000-430
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Hexus(hex) Connection Address  
IMI 00 01 IMI - 6000-400 processor 0010  
IMI 00 02 IMI - 6000-400 processor 0020  
IMI 00 03 IMI - 6000-400 processor 0030  
IMI 00 05 IMI - memory module 0050  
IMI 00 0A IMI - memory module 00A0  
  
IMI 00 0C IMI - BI Adapter (DWMB/A) Connects to BI 00 node 00  
BI 00 00 BI - IMI Adapter (DWMB/B) 00C0 Connects to IMI 00 node 0C  
BI 00 02 BI - Disk Adapter (KDB50) 00C2  
BI 00 07 BI - HI Adapter (DEB/A) 00C7  
  
IMI 00 0D IMI - BI Adapter (DWMB/A) Connects to BI 01 node 01  
BI 01 01 BI - IMI Adapter (DWMB/B) 00D1 Connects to IMI 00 node 0D  
BI 01 02 BI - LESI Adapter (KLESI-B) 00D2  
BI 01 03 BI - LESI Adapter (KLESI-B) 00D3  
BI 01 04 DRB32 00D4  
BI 01 05 BI - LESI Adapter (KLESI-B) 00D5  
BI 01 06 BI - HI Adapter (DEB/A) 00D6  
  
IMI 00 0E IMI - BI Adapter (DWMB/A) Connects to BI 02 node 01  
BI 02 01 BI - IMI Adapter (DWMB/B) 00E1 Connects to IMI 00 node 0E  
BI 02 02 BI - Disk Adapter (KDB50) 00E2  
BI 02 04 BI - Disk Adapter (KDB50) 00E4  
BI 02 06 BI - TK50 Adapter (TK50) 00E6
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Summary (1989 technology!):

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CPU : 3 X KA62B CPU module clocking @ 35.71 MHz  
RAM : 64 MB  
DISK : ~7GB  
NET : 2 x VAXBI ETHERNET (10mbit/sec)  
I/O : DRB-32 Multi-megabyte/sec 32-bit parallel
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NYNEX provides DS3 (44.736 Mbps) data services throughout the Boston metropolitan area to the RSTAR Group; in turn RSTAR develops full bandwidth interfaces to the DS3 High-Speed Serial Interface (HSSI) allowing high-resolution plane films to be transferred between sites in seconds.

'Charlestown doctors need immediate access to images in Boston, and vice versa. NYNEX's switching and network software make it work.'

Jaime Taaffe, Massachusetts General Hospital



User-friendly MBS (just move a pointer and click a button, and it delivers the right images at the highest clarity almost instantaneously) can be used anywhere there's a need to transfer large quantities of digital information, including graphics, but medicine offers a special challenge.

Explains Jim Robinson, NYNEX supervisor of Media Broadband Services, "There's no room for error in medical images. Drop one data bit and the image is skewed and useless as a diagnostic tool. This is the toughest application possible."

The most complex medical MBS project is a partnership with Massachusetts General

Hospital (MGH), Boston's largest medical center and one of the highest volume users of medical images in the world. MGH is a far-flung operation, with a main hospital in Boston, an imaging center in Charlestown, computing offices in Cambridge and a film and records library in a Somerville warehouse the size of a football field.

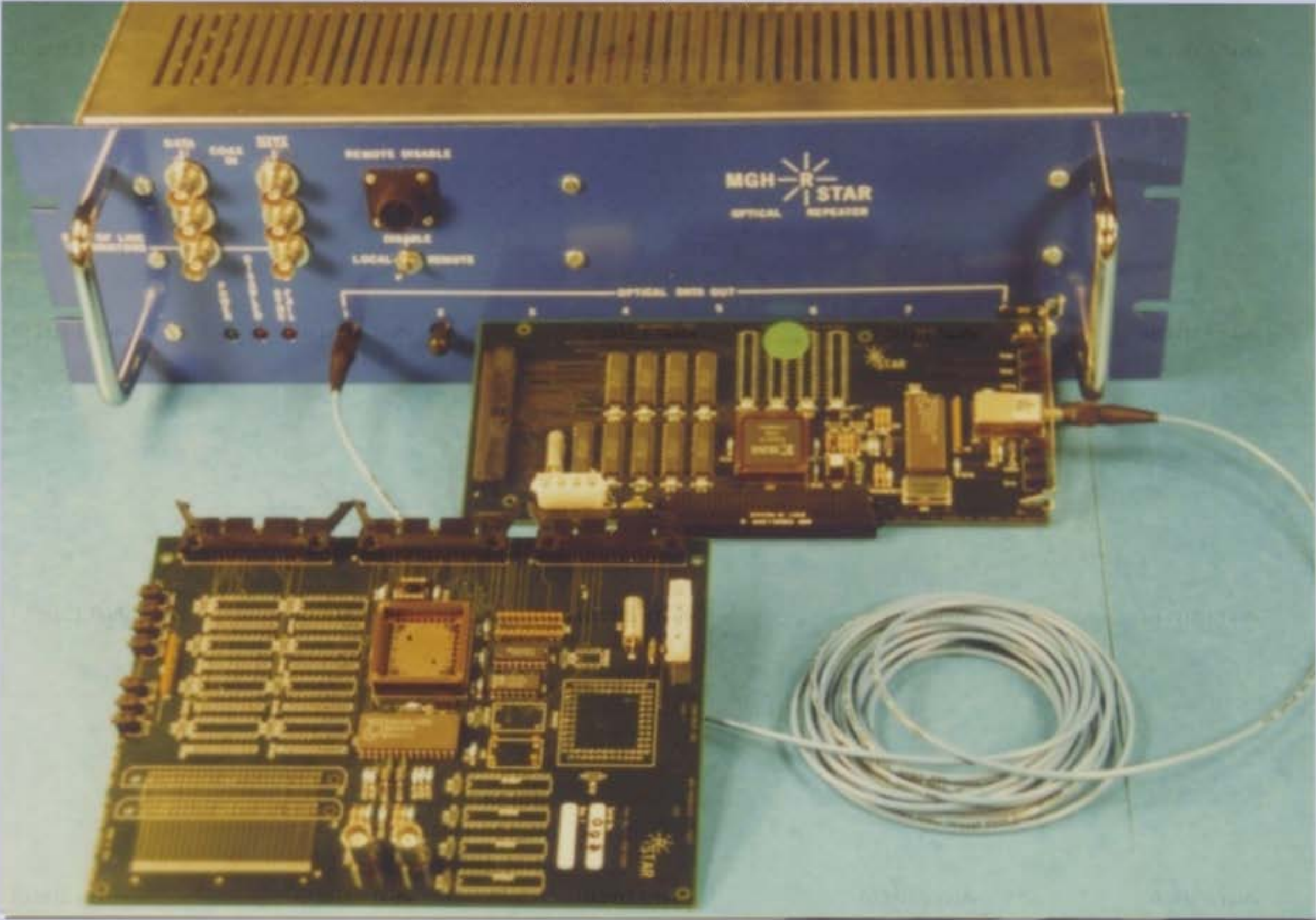
But MBS makes those distances virtually disappear, allowing doctors, in effect, to work in two places at once. The hospital's own storage and retrieval system, combined with MBS, allows physicians to review the same data from different locations.

In a routine use, both a radiologist in

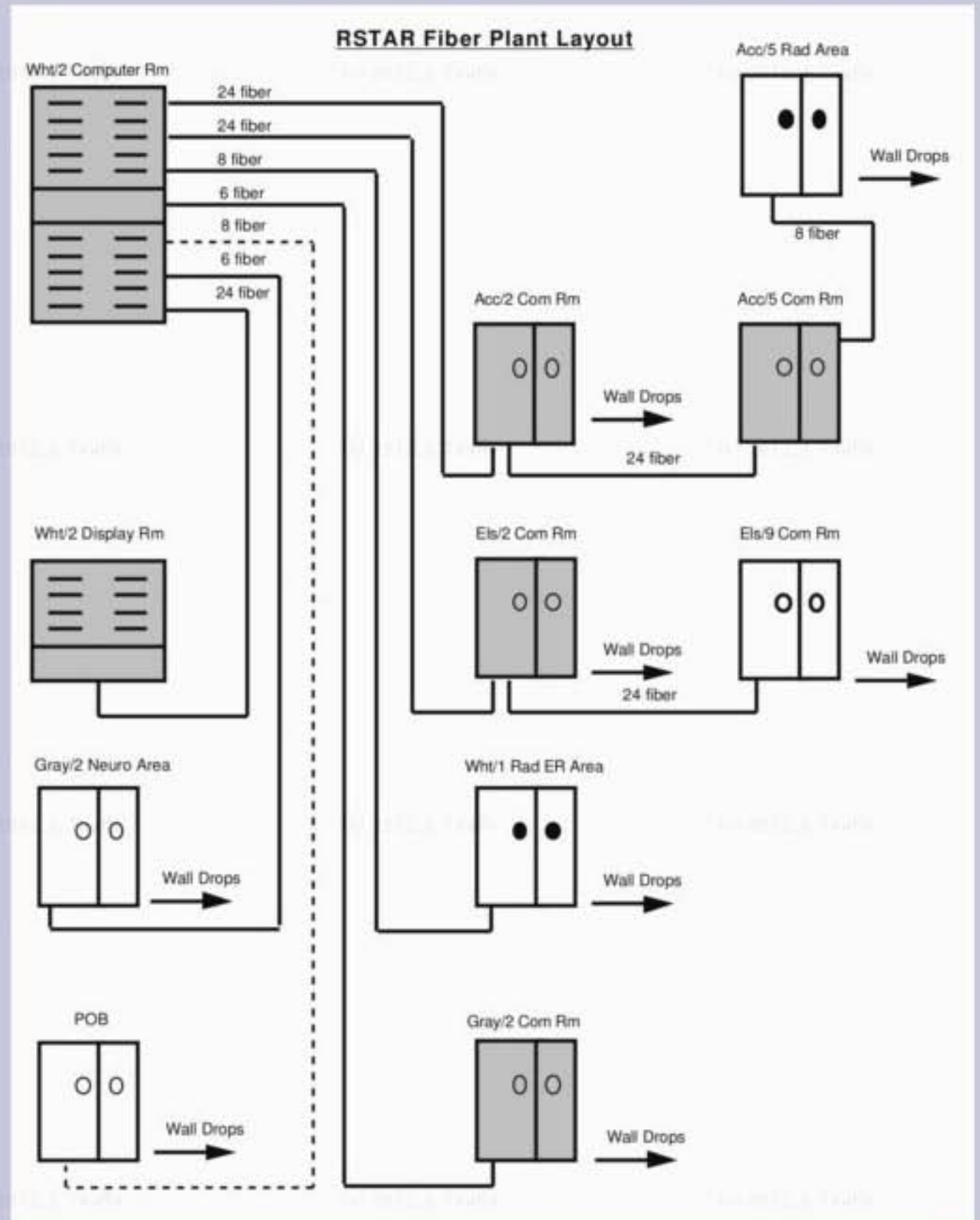
Charlestown and a treating physician in Boston display an image on their screens. Each has an electronic pointer that shows on both monitors, as well as access to the patient's file. After examining the X-ray, they switch to an MRI image, pointing to particular coordinates on the image and discussing the patient's problem. They are in different cities, but they might as well be standing shoulder to shoulder.

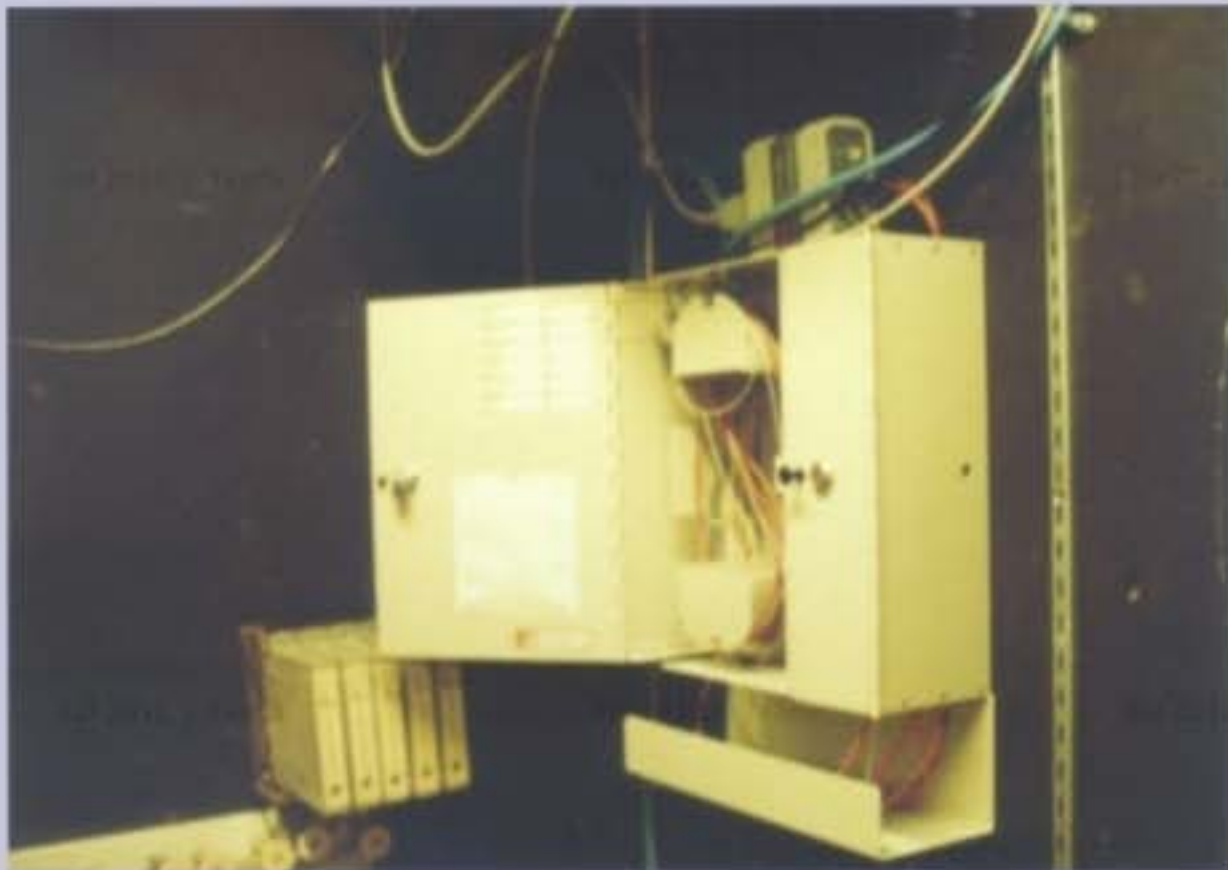
The radiologist isn't sure of the implications of one image, so he sends the records and images to a multimedia electronic mailbox for a specialist doc at the Boston hospital that evening. By morning, the treating

RSTAR optical-network components: 1) 125 Mbps 8-port optical repeater, 2) 125 Mbps optical-fiber to MIT/Apple/NuBus adapter, and 3) a configurable 125 Mbps serializer that accommodates either the VAX DRB32 high-speed parallel interface or the RSTAR Platform-Bord (PLB: a configurable, multi-use, direct-memory-access, MIT/Apple/NuBus to parallel-port interface).



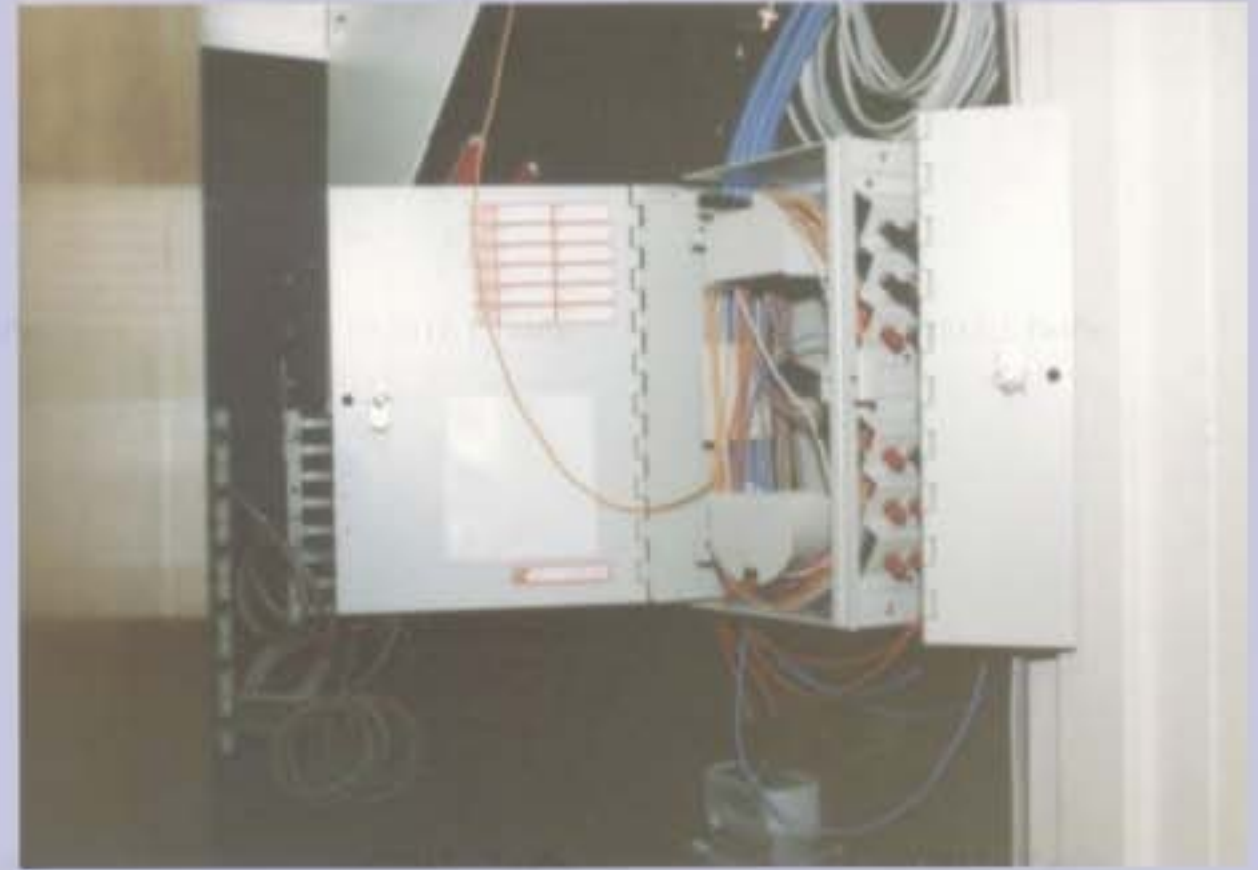
RSTAR FIBER OPTIC NETWORK: Head-end distribution on White/2 computer room and plant configuration circa 1993.





RSTAR FIBER OPTIC NETWORK

Head-end distribution in White/2 computer room and a few drop points within MGH, circa 1993.





Ethernet

-Repeaters

-Bridges

T1 DSU/CSU

X-25

Appletalk

Dial-In



1988 The RSTAR Group interfaces the Honeywell Very Large Data Store (VLDS), a 5.2 Giga-byte/VHS-Tape initially to a VME/UNIX system. Later to Digital Equipment VAX systems.



To allow patient radiology reports to be accessed and spoken using ordinary telephones RSTAR integrates Digital Equipment's text-to-speech system (DecTalk) to the RSTAR database and and the Radiology Department's DECrad radiology information system.