Time-Phased Implementation of a Large-Scale PACS at Samsung Medical Center

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Abstract

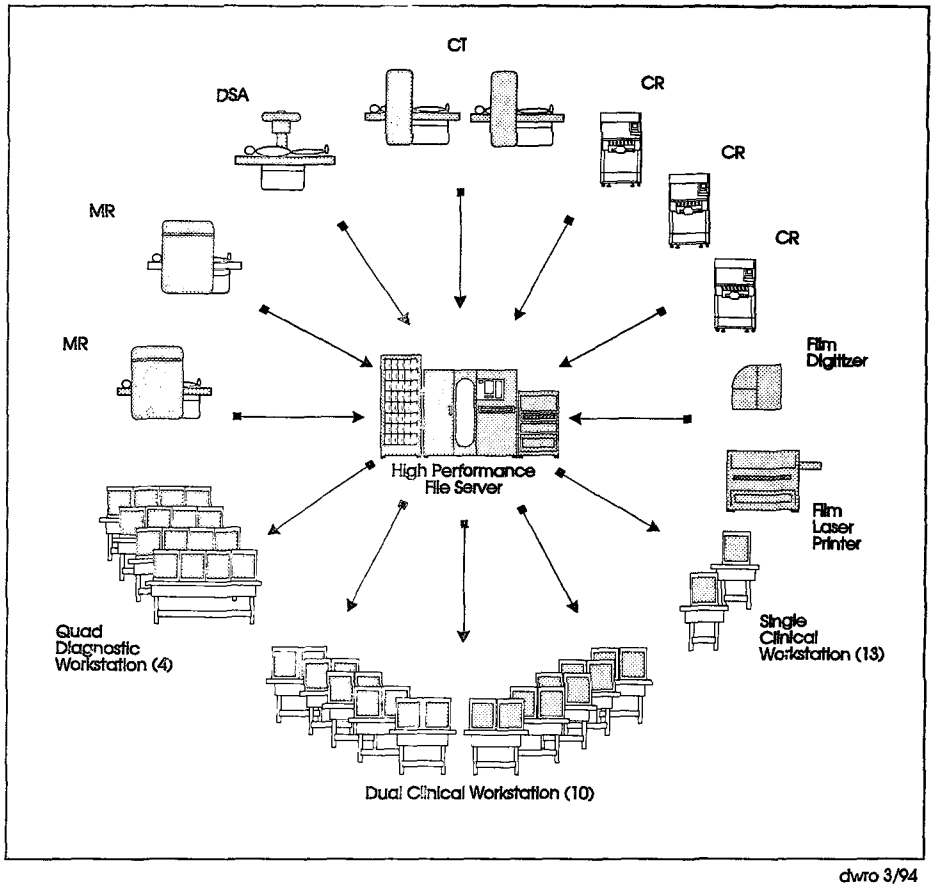
The first step implementation of a hospital-wide Picture Archiving Communications System (PACS) at a newly built hospital, Samsung Medical Center (SMC), is described. Current clinical operation encompasses the fiber optics delivery of direct-interfaced magnetic resonance imager (MRI), X-ray computed tomography (CT), digital subtraction angiography (DSA) and computed radiography (CR) digital images via high performance file server to the departments of radiology, neurosurgery, orthopedics surgery, neurology, emergency room and the surgical intensive care unit.

Introduction

Picture archiving and communications system is a computer-based image storage and retrieval system that can store, recall and display medical images rapidly on high-resolution monitors. Digitally formatted medical images may derive from various imaging modalities found in departments of radiology and nuclear medicine such as MRI, CT, CR, DSA, US, PET and SPECT. Although PACS technology has been available for several years the integration of the system into clinical operation has had a limited success due to stringent requirements of radiologists as well as the load demanded on the system. With the rapid improvements in both PACS hardware and software sophistication, in addition to the acceptance of standard protocols such as ACR-NEMA and DICOM [1] by the modality manufacturers, a full PACS system that can successfully operate in a large hospital is now available commercially. We present the first step of four steps required in the implementation of a full PACS at Samsung Medical Center.

Methods

One of the key requirement in the selection from various commercially available PACS was proven clinical capability to concurrently display at full resolution recently acquired images by any workstations within 2-4 seconds throughout the hospital [2]. As such, a turn-key PACS for SMC was designed and developed by Loral under contract [1]. SMC was responsible for the network installation of both optical fibers and ethernet cables. Although only 49 optical fibers outlets and 67 ethernet outlets are used in the first step of the installation, additional floor-to-floor vertical optical fiber trunk cables as well as 238 horizontal fan-out optical fibers cabling/outlets and 268 untwisted-pair ethernet cabling/outlets are installed for future expansion. Currently, eight major imaging modalities (2 MRI, 2 CT, 3 CR, 1 DSA) and a film digitizer for historical and other modality images (e.g. PET) will be DICOM interfaced to a fast file server via dedicated optical fibers link (see Figure 1). On-line availability of patient images on all 27 workstations consisting of 4 quad-monitor workstations, 10 dual-monitor workstations and 13 single-monitor workstations are 40



Gigabytes on short-term storage unit (roughly 10,000 images storage capacity with reversible 2:1 compression) and 1 Terabytes on optical juke box (more than 2 years storage capacity with irreversible 10:1 compression).

Conclusion

In preparation for a virtually "filmless" hospital-wide PACS before the year 2000, the infrastructure of SMC's PACS has been designed to readily grow with demand in terms of additional image display workstation connectivities in the inpatient/outpatient area (total of approx. 150 workstations), simple additions of both short-term storage and long-term archive, and additional connectivities of other imaging modalities (e.g. ultrasound, SPECT and PET).

Reference

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2. D. R. Haynor, D. V. Smith, H. W. Park and Y. Kim, "Hardware and Software Requirements for a Picture Archiving and Communication System's Diagnostic Workstations", J. of Digital Imaging, 5(2), pp. 107-117, 1992.