Picture archiving & communication system (PACS)

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Key issues

- **PACS in medical imaging.**

- **Applications.**

- **Architecture.**

- **Integration.**

PACS in medical imaging

- **What is PACS?**

- Picture archiving & communication system (PACS) have been developed in an attempt to provide economical storage, rapid retrieval of images, access to images acquired with multiple modalities, and simultaneous access at multiple sites. Meaning ?

- PACS eliminates the need to manually file, retrieve, or transport film jackets.

- The universal format for PACS image storage and transfer is DICOM (Digital imaging & communication in medicine).

PACS in medical imaging

- **DICOM:**
- Digital imaging & communications in medicine is a standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network communication protocol. The communication protocol is an application protocol that uses IP to communicate between systems. DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format.
- DICOM enables the integration of scanners, servers, workstations, printers, and network hardware from multiple manufacturers into PACS.

PACS in medical imaging

- **PACS major components:**

1. The imaging modalities such as CT and MRI.

2. A secured network for the transmission of patient information.

3. Workstations for interpreting and reviewing images.

4. Archives for the storage and retrieval of images and reports.

- Combined with available and emerging Web technology, PACS has the ability to deliver timely and efficient access to images, interpretations, and related data.

PACS in medical imaging

- **Types of images**

Modality	Description
BI	Biomagnetic Imaging
CD	Color Flow Doppler
CR	Computed Radiography
CT	Computed Tomography
DD	Duplex Doppler
DG	Diaphanography
DX	Digital Radiography
EC	Echo cardiography
EM	Electron Microscope

Modality	Description
ES	Endoscopy
GM	General Microscopy
LS	Laser Surface Scan
MA	Magnetic Resonance Angiography
MG	Mammography
MR	Magnetic Resonance
MS	Magnetic Resonance Spectroscopy
NM	Nuclear Medicine
OT	Other

PACS in medical imaging

- **Types of images**

Modality	Description
PT	Positron Emission Tomography
RF	Radio Fluoroscopy
RG	Radiographic Imaging (conventional film screen)
RT	Radiation Therapy
SC	Secondary Capture
SM	Slide Microscopy
ST	Single-Photon Emission Computed Tomography
TG	Thermography
US	Ultra Sound
VL	Visible Light
XA	X-Ray Angiography
XC	External Camera (Photography)

Applications

- **PACS has four main uses:**

1. **Hard copy replacement**: PACS replaces hard-copy based means of managing medical images, such as film archives. With the decreasing price of digital storage, PACS provides a growing cost and space advantage over film archives in addition to the instant access to prior images at the same institution. Digital copies are referred to as Soft-copy.

2. **Remote access**: PACS expands on the possibilities of conventional systems by providing capabilities of off-site viewing and reporting (distance education, telediagnosis). It also enables practitioners in different physical locations to access the same information simultaneously for teleradiology.

Applications

3. **Electronic image integration platform**: PACS provides the electronic platform for radiology images interfacing with other medical automation systems such as Hospital Information System (HIS), Electronic Medical Record (EMR), Practice Management Software, and Radiology Information System(RIS).

4. **Radiology workflow management**: PACS is used by radiology personnel to manage the workflow of patient exams.

Architecture

- The architecture is the physical implementation of required functionality.

- There are different views, depending on the user. A radiologist typically sees a viewing station, a technologist cares for quality assurance (QA) workstation, while a PACS administrator might spend most of their time in the climate-controlled computer room.

- PACS requires multiple steps in order to reach the final destination of image archiving.

Architecture

- **Steps to final destination:**

1. The first step in typical PACS systems is the modality. Pending on the facilities workflow most modalities send to a quality assurance (QA) workstation or sometimes called a PACS gateway.

2. The QA workstation is a checkpoint to make sure patient demographics are correct as well as other important attributes of a study.

3. If the study information is correct the images are passed to the archive for storage.

4. Then PACS workflow goes into the reading workstations. The reading workstation is where the radiologist reviews the patient's study and formulates their diagnosis.

Architecture

- **Steps to final destination:**

5. Normally tied to the reading workstation is a reporting package that assists the radiologist with dictating the final report.

6. There is normally CD/DVD authoring software used to burn patient studies for distribution to patients or referring physicians.

7. Most PACS include web-based interfaces to utilize the Internet wide area network as their means of communication.

Architecture
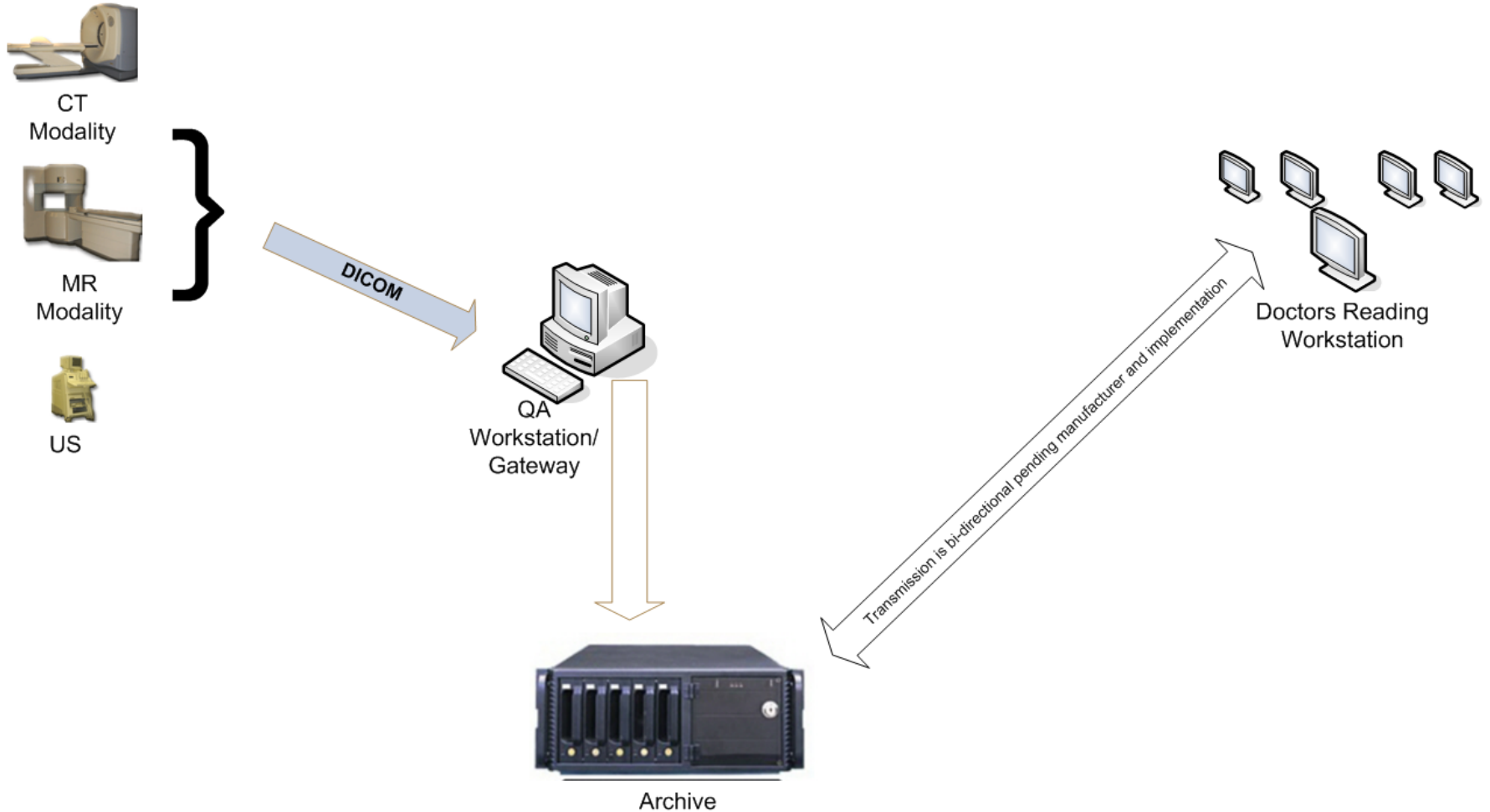
Integration

- **A full PACS should provide a single point of access for images and their associated data. That is, it should support all digital modalities, in all departments, throughout the hospital. Advantages?**

- Less risk of entering an incorrect patient ID for a study.

- Data saved in the PACS can be tagged with unique patient identifiers, providing a robust method of merging datasets from multiple hospitals.

- When a study has been reported by a radiologist the PACS can mark it as read. The report can be attached to the images and be viewable via a single interface.

- Improved use of online storage in the image archive. The PACS can obtain lists of appointments and admissions in advance.

PACk your bags for the exam

DON'T