**M S Ramaiah Institute of Technology**

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A Synopsis on

**BUILDING A STOW SERVICE TO STORE DICOM FILES**

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**SYNOPSIS**

**A BRIEF OVERVIEW**

A subset of the systems responsible for the generation, management, storage, and retrieval of medical and patient related information in a healthcare organization are:

**Hospital Information system (HIS)**

A Hospital Information System (HIS) is primarily concerned with the administrational needs of a hospital. It is a comprehensive, integrated information system designed to manage all the aspects of a hospital's operation, such as medical, administrative, financial, and legal issues and the corresponding processing of services.

With regard to patient care, it is entrusted with the task of patient ID, admitting/registration, billing, and forms the common source of information of a patient’s health history. The HIS is responsible for upholding the confidentiality and the security of patient data at all times and strictly controls its access. It also enhances the ability of health care professionals to coordinate care by providing a patient’s health information and visit history at the place and time that it is needed. Hence, it can be regarded as the ‘master system’ in a hospital.

**Radiology Information System (RIS)**

The Radiology Information System (RIS) is a subset of the HIS. It is a computerized database used by radiology departments to store, manipulate, and distribute patient radiological data and imagery. The system consists of scheduling of patient exams (An exam is a request for an imaging service, for example, a CT scan, a MRI, and so on.) to specific modalities (defined next), execution and completion of exams, storing and distribution of exam reports, and generation of bills.

**Modality**

The imaging equipment which provides an imaging service is termed as a modality. It can be a Magnetic Resonance, a Computed Tomography, an Ultrasound, an Angiography, and so on. A modality can also be called a Performing Resource.

**Picture Archiving and Communication System (PACS)**

PACS provides an infrastructure for the electronic management of images and related information. PACS is employed by hospitals all over the world for long-term storage of medical images and also for facilitating sharing of images between physicians/radiologists. The primary characteristics of PACS are:

* They bring an end to the use of film as the legal mode of archiving medical images.
* They enable simultaneous access to images and related information, by authorized personnel at any time and from any location.
* They provide the ability to diagnose a medical condition from these images with a computer i.e. Computer Aided Diagnostics.
* They promote accelerated access to data, increase productivity, and reduce patient stay.
* They improve the scanned image quality, and reduce the need for retakes.

**Review Workstation**

At the review workstation, the radiologist dictates a report for the patient based on – a review of the patient’s history, the patient’s radiological history, and the images of the current exam.

The relation between the functioning of these systems is depicted IN Figure.1 below:



**Figure 1.INTERACTION BETWEEN THE SYSTEMS**

A patient arrives at a hospital in request for a healthcare service. The patient registers himself at the Hospital Information System (HIS) and is assigned a unique Medical Record Number (MRN). If he/she is a recurring patient to the hospital, his/her MRN is used to identify him. After successful registration, he is examined by a physician who advises him to get an exam done. Consequently, the patient places an order for an exam/scan at the HIS. The RIS takes charge of scheduling the exam to a specific modality. The images captured by the modality are archived in the PACS. From the PACS, the images/study could be retrieved for viewing, report creation, to study radiological history, and so on, by the radiologist or referring physician.

The interaction between these systems occurs with the assistance of communication protocols and standards. Two of them are:

**Digital Imaging and Communications in Medicine (DICOM)**

DICOM is a standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network communications protocol. The storage and retrieval of images in PACS occurs in DICOM. It is also the protocol used by a system to interact with the PACS and modality.

**Health Level 7 (HL7)**

HL7 is the protocol used for the exchange of healthcare information in the application layer of the network stack. HL7 operates predominantly in the administrative domain which includes registration, billing, scheduling, and handling medical records. This is the primary protocol used to communicate with the HIS and RIS.

**DICOMweb**

It is the web standard for medical imaging. It is primarily a set of RESTful services, enabling web developers to unlock the power of healthcare images using industry-renowned tool-sets. DICOMweb provides web access to underlying imaging systems that speak DICOM through the following services:

* STOW-RS (Store Over the Web - Restful Service)

This service enables to store a DICOM file in PACS using RESTful Services. For every new DICOM file, this service creates a new resource if it doesn’t already exist.

* WADO-RS (Web Access to the DICOM Objects - Restful Service)

This service enables the retrieval of DICOM files from PACS using RESTful Services.

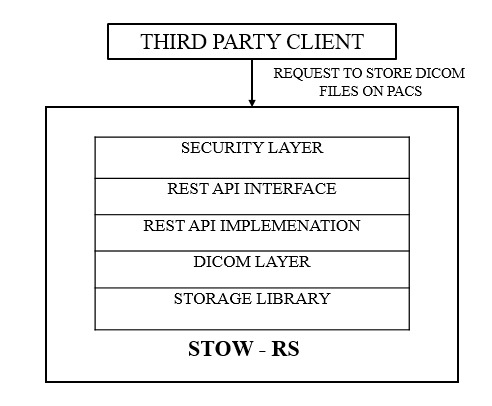
Both STOW-RS and WADO-RS have multiple action types to store/ retrieve study, series, instance, bulk data, and the meta-data. [A study is set of images associated with an exam. Images in a study can be grouped into a series when - the images obtained are from the same modality and they contain the same series information. Finally, each series is composed of several DICOM instances.]

**PROJECT SCOPE**

Consider two healthcare organizations, namely X and Y. A patient arrives at hospital X and is advised by his referring physician to get a CT exam done. However, hospital X does not own the CT modality. Hence, the patient is forced to get his CT scan from another hospital owning CT, say Y. Now, after successful completion of CT exam at Y, the radiologist at Y must be able to post the patient’s medical images to his host hospital, that is, X. This is critical considering that the referring physician at X, who had asked for the scan in the first place, must examine the images and advise further treatment. Additionally, the patient’s scan images must be assembled with his other medical images/information history for further need.

The goal of our project is to build a STOW – RS service to facilitate third party clients to post DICOM files (all scans are in compliance with the DICOM standard) to the PACS.

A block diagram of the STOW - RS service is shown in Figure.2:



**Figure 2:ARCHITECTURE OF STOW - RS**

A brief overview of the architecture of STOW is as follows:

* The third – party client is the entity external to the healthcare organization that wishes to store DICOM files from the PACS.
* The Security Layer is responsible for – authenticating, that is, verifying the identity of the external client wanting to store a DICOM file.
* The REST Interface is the REST API used to enable the client to access STOW – RS service.
* The REST Implementation layer refers to the actual implementation of the REST API interface.
* The DICOM Library is used to validate the DICOM information being pushed into PACS by the client.
* The Storage Library is responsible for the physical storing of DICOM files into the PACS.

SIGNATURE OF PROJECT GUIDE

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