Radiology Module with dcm4chee (2014)

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Abstract

This project is aimed at extending the existing Radiology Module (2013) for OpenMRS – computer software for electronic medical records – from using Xebra PACS (Picture Archiving and Communication System) – a currently unsupported light weight medical imaging service - to dcm4chee medical imaging archive – a widely used open source medical imaging archive conforming with the DICOM standard - in conjunction with Oviyam/Weasis( DICOM image viewers) to form a PACS system as well as extending its basic functionality. The project required the understanding of the existing code base to remove inconsistencies and errors occurring due to changes in the code build architecture and also to resolve dependencies between DICOM toolkit applications and to finally upgrade the module to comply with the requirements of the latest version of the OpenMRS framework and community development practices. Additionally, several functionalities and interfaces were designed and implemented to satisfy the complete workflow from a physician’s perspective while ordering a Radiology exam on a patient.

This radiology module of OpenMRS is a module compliant with current DICOM and IHE radiology workflow standards. It facilitates the addition of radiological orders to form modality worklists available to various modalities to provide seamless porting of patient information. It also provides listeners to receive updates from modalities of the status of the order and storage commitment of images supplied by various modalities to form radiology studies. These functionalities are performed in accordance with the DICOM standard and follow the basic IHE radiology workflow. These features along with existing OpenMRS functionalities provide the basis for a Radiology Information System that can be easily deployed to improve the delivery of healthcare.

Objectives

- Analyze existing code structure and layout.
- Port existing code structure from Ant based layout to Maven based layout.
- Create radiology orders/worklists from OpenMRS and transfer these worklists to dcm4chee via HL7 messages.
- Update the status of an order as and when it is performed during the course of its execution.
- Launch appropriate viewers to view images and add observations to these studies.

Features

Some of the usability features are implemented/carried over from the previous Radiology Module (2013) :

- Design based on IHE Scheduled Workflow integration profile.
- Communication with modalities (CR, MR, CT, NM, US, XA) using the DICOM services: MWL,HL7, MPPS.
- Access to medical images through WADO from viewers deployed in dcm4chee.
- Creation of radiology orders.
- Generates a worklist via HL7 messages. Allows you to search, filter and sort patient information and procedure. Exchanges information with the modality.
- Tracking the status of the procedure.
- Assignment of reading physician.
- Display of DICOM metadata relating to the procedure, the study, equipment, etc..
- Generation of radiology reports.
- Association of imaging studies and reports of a patient.
- Generation of various reports of the same order, allowing other experts give their opinion.
- Access to the system based on user roles and privileges. Shows different views depending on the role.
- Addition of Radiology Tab in patient dashboard.
- Images can be viewed using web based HTML5 compliant image viewer Oviyam or Java based Weasis.

Code based features:

- Ported to Maven build archetype.
- Spring binding issues resolved.
- dcm4chee libraries included in maven’s pom.xml along with the versions linked to their public maven repository.
- Using OpenMRS 1.9 Obs and Order structure. OrderType and Roles support necessary to launch module.
- Could be ported to OpenMRS 1.8 with changing dependency versions and minor change in code.
- Removed packaging of Xebra PACS and Weasis from Radiology Module (2013).
- Using latest version of dcm4che2 toolkit application ‘dcmof’.
- Using latest version of dcm4che 3.0 toolkit application ‘hl7snd’.
Requirements

**OpenMRS Version**: 1.9.0 - 1.9.7 (tested across these versions)

**Operating Systems**: Tested on Windows 7 and Ubuntu 12.04.

**Browsers**: Chrome. (Oviyam 2.0 is not usable in Firefox)

Resources

- Install Guide
- User Guide
- Module OMOD
- Github Repository