Healthcare Practice Management App for Android Tablets

Executive Summary

This client is one of our existing clients who provide services to Healthcare industry with one of his flagship healthcare product. Earlier this product was developed as a desktop application in Mindfire and then he planned to develop one for Android tablets.

This case study illustrates the way of securely providing a Web based practice management application to hand held Android tablets. The application includes case studies of patients in DICOM format. Digital Imaging and Communications in Medicine (DICOM) is a standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network. DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format. All DICOM images needed to be securely exchanged over network.

 Radiologists, clinicians can view patient's x-rays on their tablet even if they are far from their clinic, sitting at home and if patients are at separate facilities.

About our Client

Client Healthcare Service Provider **| Location** USA | **Industry** Healthcare

Business Situation

The client had set out its primary goal to transfer DICOM images securely over the network and view, manipulate medical DICOM images with features like window level, zoom, maintaining aspect ratio of images, and contrast. Secure access to DICOM images was stored in the existing product. The primary complexity of the application was, not to reset DICOM image after applying any functionality and that other functionality must be implemented on the previous image (which is not the original image). Centralized control of all features on selected patient's DICOM image was required. The client was curious about the performance of GUI and features to be implemented on DICOM images.

The client was in search of an able outsourcing company who would understand their previous code base, match their objective and produce something that would be in sync with their existing process.
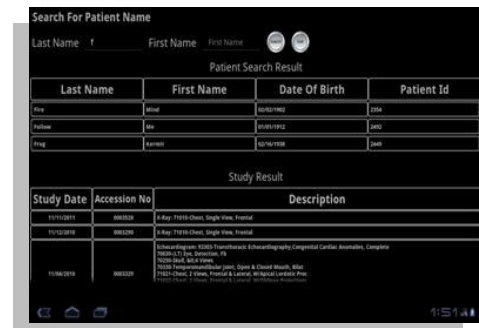
Solution Details

The Mindfire Solution

DICOM images were encoded and retrieved in binary format over the network, then decoded at client side to provide security. All features on selected patient's X-Ray image were controlled by centralized matrix. Aspect ratio of image was maintained by setting frames for different orientations in Android tablets.

MVC architecture was followed in order to achieve performance and GUI finesse, which is stated below.
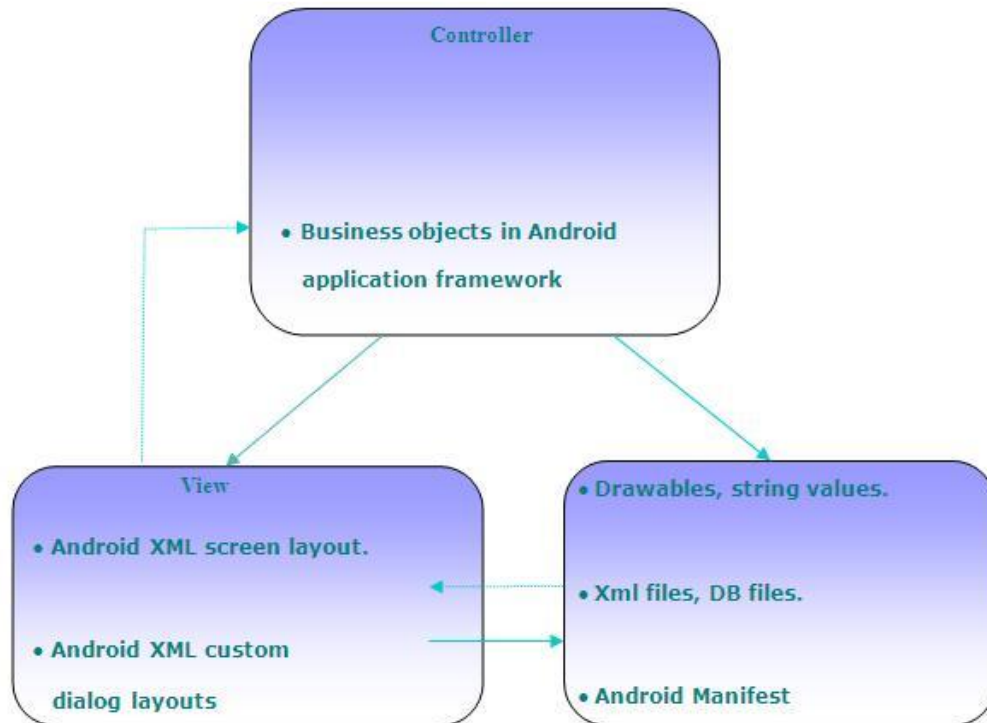

Fig 1: MVC Architecture

Model Tier:

- Drawables, string values were used to display images with text on UI screens.

- Xml files, DB files were used to store patient's meta-data and X-Ray images which were to be used to develop & study Tree of particular patient.

- Android Menifest was used to access different permissions for internet, write to external storage.

- Shared preferences were used to save user credential as key value pair.

Controller Tier:

- Business objects implementation – client server communication, event handling, adapters, handlers, data controllers, validations.

- Sources developed in Android application framework, garbage collected, implementation.

View Tier:

- Android XML screen layout to show different search results.

- Android XML custom dialog layouts to show status and notification for particular request process.

- Custom dynamic tree view for showing patient's study details with thumbnail images.

- Custom views to implement window leveling, zooming features.

Server side:

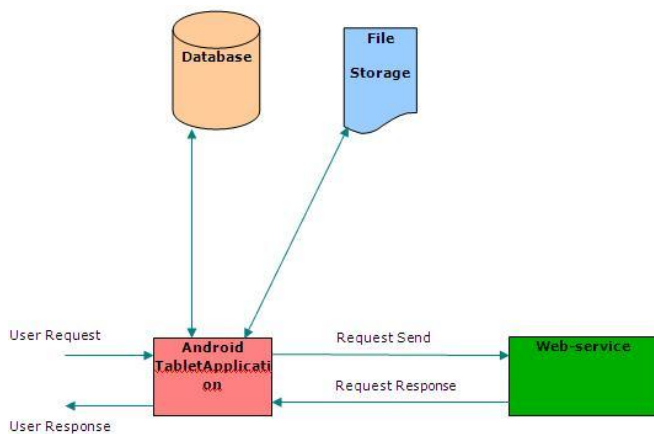- Client server was implemented using advanced JAVA.

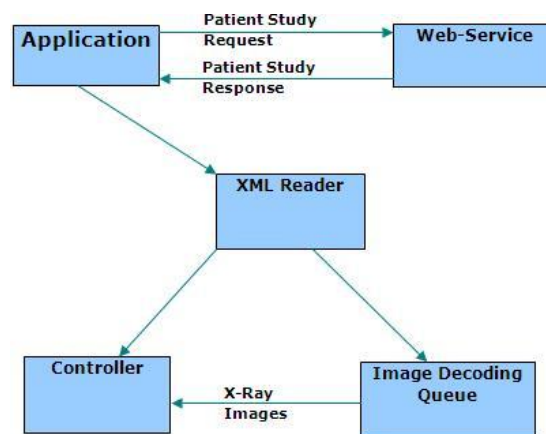**Fig 2: Deployment Diagram**   **Fig 3: Patient Detail Request Work Flow diagram**

Figure -2 shows a simplified deployment structure of the application. This also shows web service communication from application and persistent storage of data.

Figure-3 shows the flow diagram of patient study request. This also shows the parallel fetching of Patient's meta data and X-Ray images of DICOM patient .Parallel fetching of meta-data and X-ray images was done to reduce the time and increase performance as decoding of binary images takes a lot of time.

Achievements

We created scrollable dynamic tree view for patient studies, tree view including patient's meta-data and thumbnail image for particular study. All features control was centrally implemented for selected patient's X-Ray image. Using handlers we implemented multithreaded environment very efficiently. We created a greatly simplified MVC architecture and work flow based mechanism which could be used to handle single to multi patient's meta-data and X-Ray images.

Technologies

Android SDK 3.0 (Honeycomb), Java, Eclipse.

Final Results
Software System

Customer Benefits

Customers can view patient's x-rays on their tablet even if they are far from their clinic, sitting at home and also if patients are at separate facilities. Customers also have options of implementing different features on currently selected patient's DICOM image, which are stated below.

- Can apply window leveling.
- Can apply contrast.
- Can apply pinch to Zoom.
- Can apply magnifier.

Future relationship

The client was pleased to find out such a professional offshore IT unit. He was also happy with Mindfire's effort to develop such an application and agreed to continue with Mindfire for their next versions of the product. Alongside he allocated the support and maintenance work of their current system.