



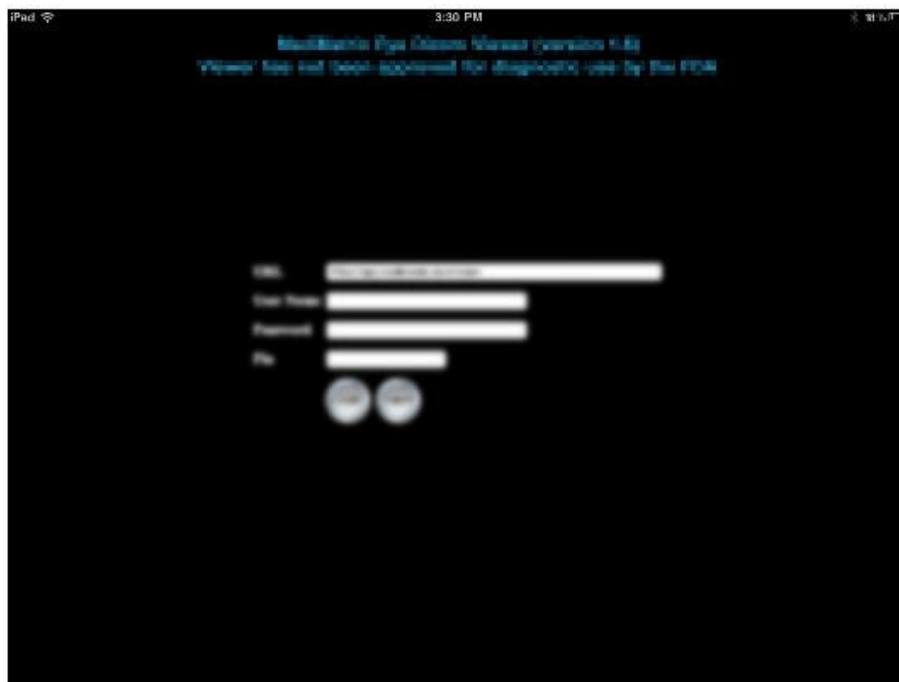
App for Health Services Industry

An iPad App developed on MVC Architecture

Executive Summary

This client for this project is into Health Services industry and had taken the services of Mindfire Solutions to develop a product which was a desktop application. Foreseeing the need to make this application available to its users using different devices, the client wanted to port the application on iPad. This case study illustrates the way of securely providing a Web Based practice management application to iPad. The Application has details of patients in DICOM format. Digital Imaging and Communications in Medicine (DICOM) is a standard format 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. The requirement was to ensure that all DICOM images are securely exchanged over network.

The benefit of using such an application is that radiologists, clinicians can view patient's x-rays on their iPad even if they are far away from their clinics or for that matter if the patients cannot physically come to the clinic.





About our Client

Client Service provider to the Health Industry | **Location** Faribault US | **Industry** Health

Business Situation

The primary goal of the client was to transfer DICOM images securely over the network and have features which would enable users to view and if need be manipulate medical DICOM images with features like window level, zoom while maintaining aspect ratio of images and contrast. The main complexity of developing this application was to ensure that in the event of certain functionalities being applied, the affected changes were made on a separate copy and not the original DICOM image. Also centralized control of all features on a selected patient's DICOM image was required. The client was curious about the performance of GUI and the various features which were to be made available to be applied on the DICOM images.

The requirement from the client's end to find an able outsourcing company, who would understand their previous code base, match their objectives and create something which 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 iPad.



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

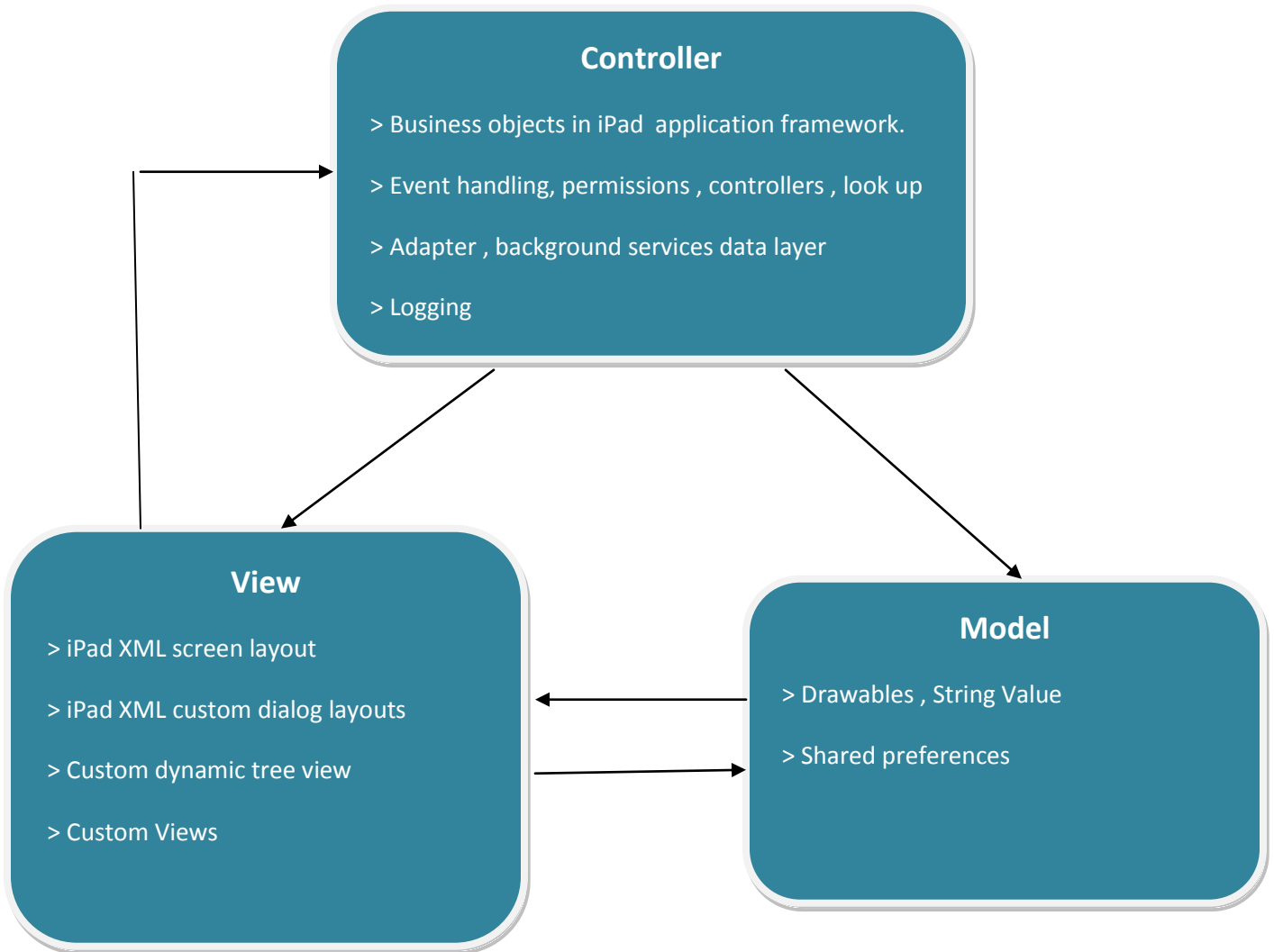


Figure 1-MVC Architecture



Achievements

We created scrollable dynamic tree views for patient studies. The tree views included 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

Model Tier:

- Drawables, string values are used to display images with text on UI screens.
- Shared preferences 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 iPad application framework, implementation.

View Tier:

- iPad XML screen layout to show different search results.
- iPad 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 implemented using advanced JAVA .



Final Results
Software System

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

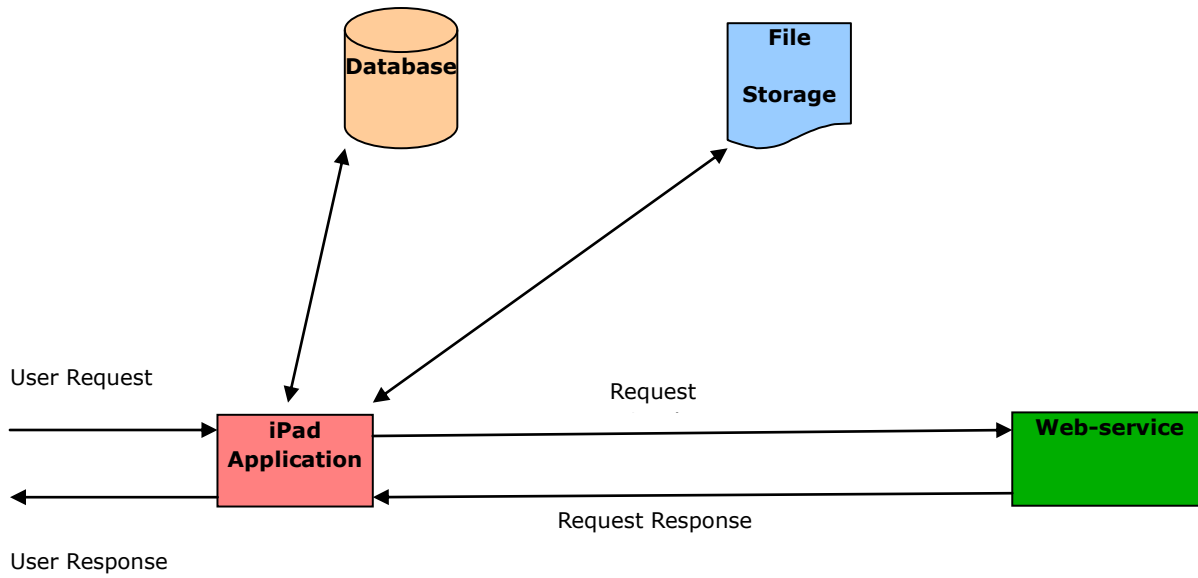


Figure 2 – Deployment Diagram



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 take a lot of time.

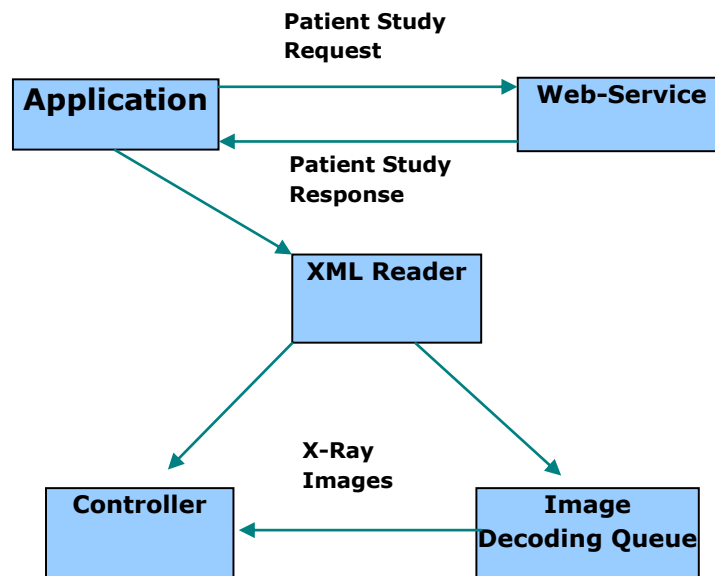
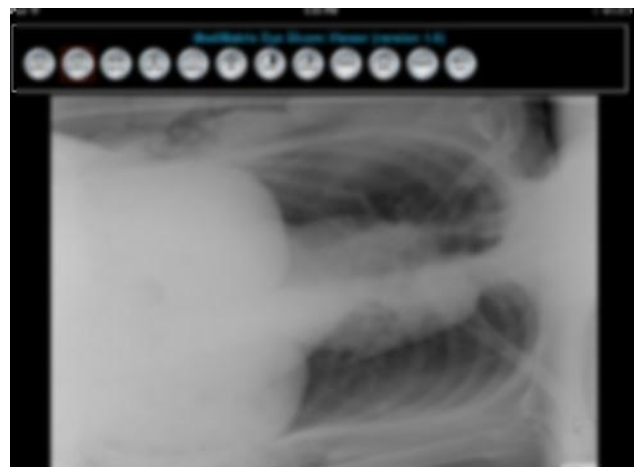


Figure 3 – Patient detail request work flow Diagram





Customer Benefits

Customers can view patient's x-rays on their iPad even if they are far from their clinic, sitting at home and 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 with Mindfire's effort and reckoned that they were happy to have discovered a professional offshore IT unit. We shall continue to be the service provider for the next versions of the client's product. They have not only allocated the support and maintenance work of the current system to Mindfire but have also chosen us for future customization work.