Research on Electronic Medical/Health Record System suited for Developing Countries Environment (Indonesia)

Medic-One
Private Emergency Medical Service Study Case
http://www.medic-one.org

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Current Fact & Situation

- In developing country like Indonesia, Emergency Medical Services (pre-hospitalization) is soon expected to have a more sophisticated and efficient way to manage information flow among each expertise.
- Critical locations of Urgent Care Point Facility, Alarm Call Center and Fleet of Paramedics are located in different area within the city.
- Current electronic medical records are created and stored within Urgent Care Point Facility and unfortunately still in Word Document format, and can only be accessed locally for printout.
- Alarm Call Center and Fleets of Paramedics needs to access patient medical/health information.
- Fleet of Paramedics currently use only Emergency TRIAGE for standard guidelines in emergency medical situation without knowing the patient past medical history.

Current Fact & Situation

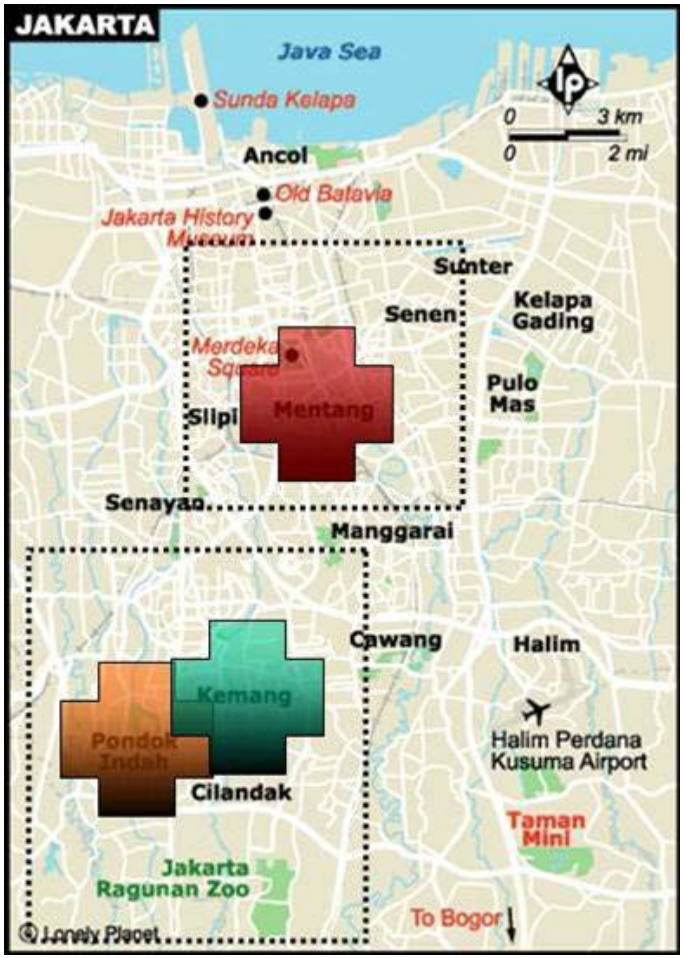


Figure 1. Jakarta City Map (modified)
Source: Google maps

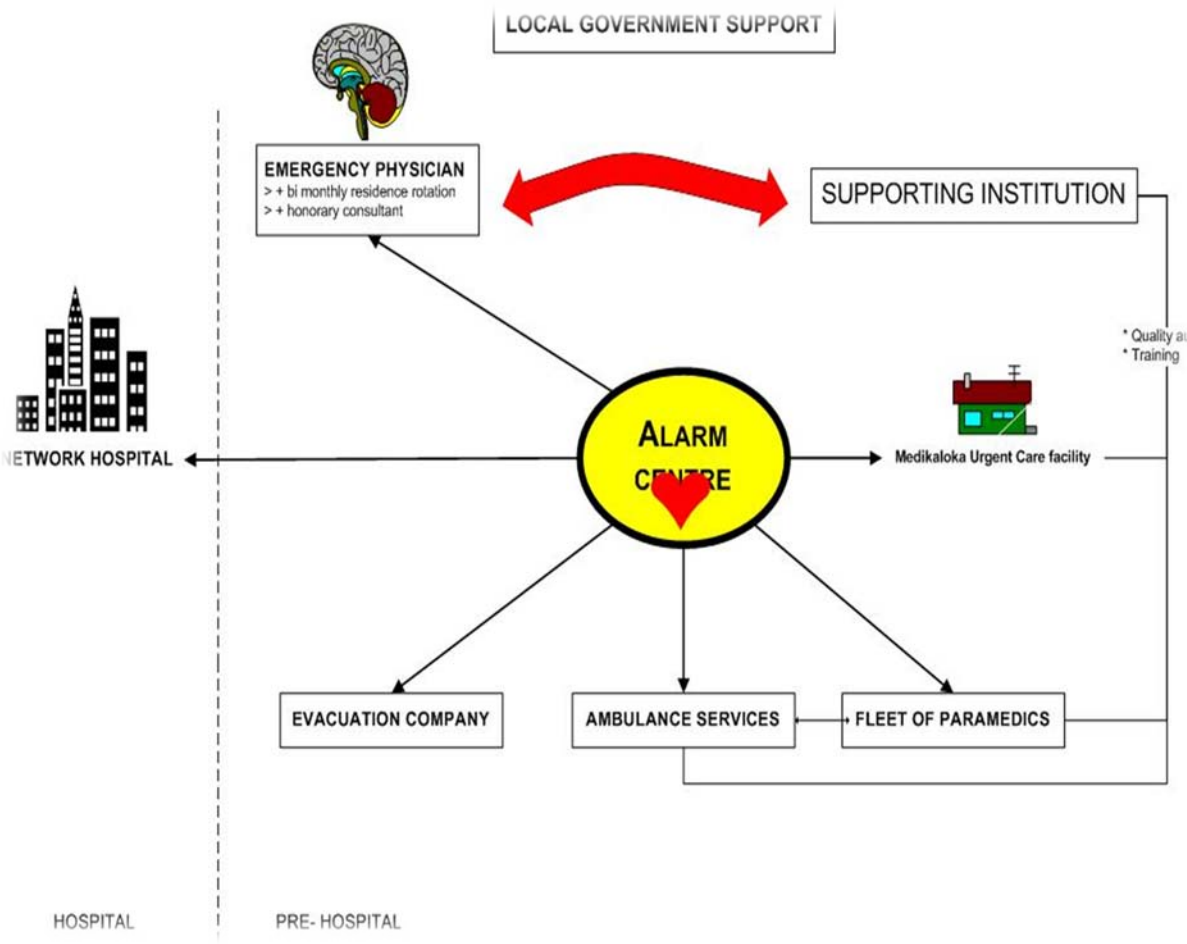


Figure 2. Medic-One Operational System
Source: Self Designed

Problem Description

- Now Patient Health Data is only accessible locally within the Urgent Care Point facility and it is also in the Word Document is not a flexible format for Electronic Health Record, and it cannot be a future standards for Electronic Health Record

- Alarm Call Center Team and Fleet of Emergency Paramedics also need to access Patient Health Data for a better medical judgment to rescue, not only based on TRIAGE standards.

- Cost and affordability issue remains as the main problem in deploying proprietary Electronic Medical/Health Records Software

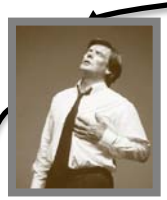
Research Objective

- To develop an Open Standards (flexibility & interoperability) of Web based (ubiquitous) Electronic Health/Medical Records to help the Alarm Call Center Team and Fleet of Emergency Paramedics to easily access patient health information before and during medical emergency cases.
  - Open Standards mean not only the application is built from an open source based programs and it is free (does not mean free of cost), but also the application will allow to create a dynamic space for users to write their own description/preference that can be kept locally or shared with other users.

- To evaluate the efficiency and cost benefits (lowest cost possible) of Open Standards EMR/EHR to support the Emergency Medical Service Operation compared to the existing Solution of the manual Emergency Medical Service Operation

Pre-Hospital Emergency Service Operation

Alarm Call Center, Fleet Paramedics and Urgent Care Point Facility

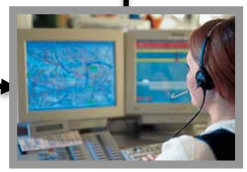


Patient Call

Alarm Call Center

Wireless Internet Access
To Receive
Patient Health Info

Pre arrival Instruction
to paramedics using
Analog Radio
Communication



Telecommunicator

SMO

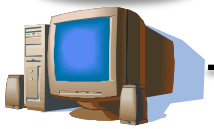
Dispatcher

Fleet of Paramedics

Urgent Care Point
Facility

Open Standards
EMR/EHR

database



Web Hosting

internet

Figure 3. EMS Information System
Source: Self Designed

Patient's Management in Medical Emergency Situation

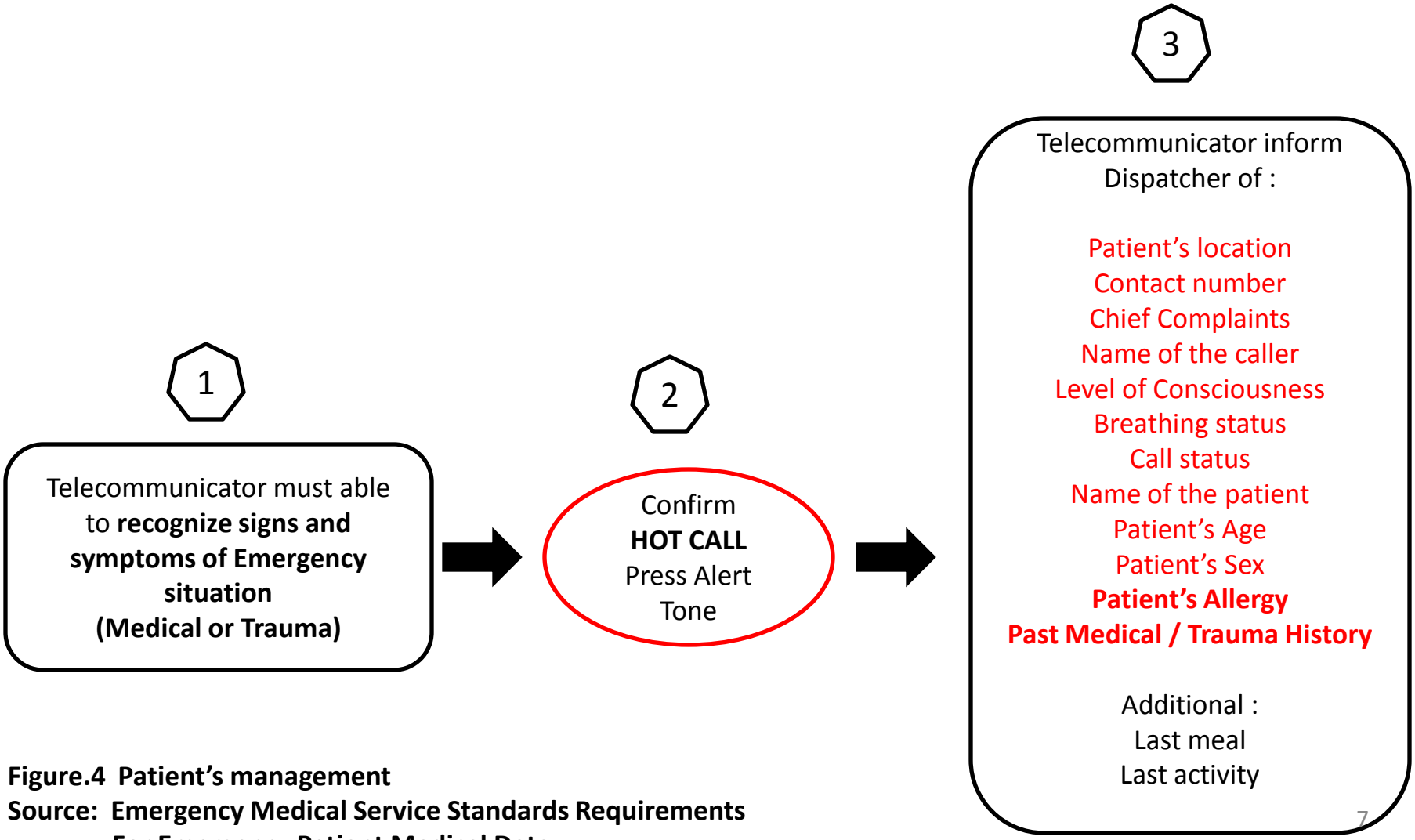


Figure.4 Patient's management
Source: Emergency Medical Service Standards Requirements For Emergency Patient Medical Data

Research Methodology

- How to build an Open standards EMR/EHR ?
  - OpenEHR Archetype Editor (Max Clinical Sets of Data that is Globally shared)
  - OpenEHR Knowledge Manager (Search Engine of Globally shared Archetypes Data Available)
  - Extracting Basic Archetype Data from ADL/XML format into Java Environment (JDK and JRE).
  - Constructing Web based Java Environment EMR/EHR Application from Open EHR Archetypes Data structures by using Eclipse Software.
  - Creating mysql Database for storing medical/health data format.
  - Exporting database into an XML language format for better options in mobile users/remote pc access (HTML).

Research Methodology

- Why is OpenEHR ?
  - It is an open standards medical data structures and features that provide not only standard interoperability solution, but flexibility as well in constructing data layer in EMR/EHR.
  - It contains Maximum Set of Globally Common Clinical Concept as Archetype Data Set.
  - Common medical/health parameters and tags are set to global standards.

Research Methodology

- Why built over Java Environment?
  - Java can be implemented over independent platform, which means it is a free platform based language
  - It is more sophisticated because it is most commonly used as a community based language; therefore, it is more promising in provides interoperability for long term future.
  - Java language provide flexibility and compatibility in different computer & server platforms from Unix, Windows, Linux and etc.
  - It is an open source and free language provided by sun micro system corporation.

Research Methodology

- Why use MySQL database?
  - MySQL has easy learning curve for database
  - MySQL provides best compatibility with java language environment since both now acquired by sun micro system.
  - Best interoperability as well for a small database but can provide high performance on any server such as Apache server (mostly used in the world).
  - It is free database provided by sun micro system corporation.

Research Methodology

- Why use XML data format?
  - Most of mobile browser interface now is using x-html, c-html, or the original html format; therefore, exporting data into xml format will allow the data to be mapped easily and rule based into a mobile web browser environment by using XSLT as an xml processor
  - XML Data format provide faster real time functionality with a more simple codes to use compared to database format.
  - XML Data format will also give more possibility to be extracted into different technology.

Research Methodology

Construction of Open Standards EHR/EMR Application for Emergency Medical Services

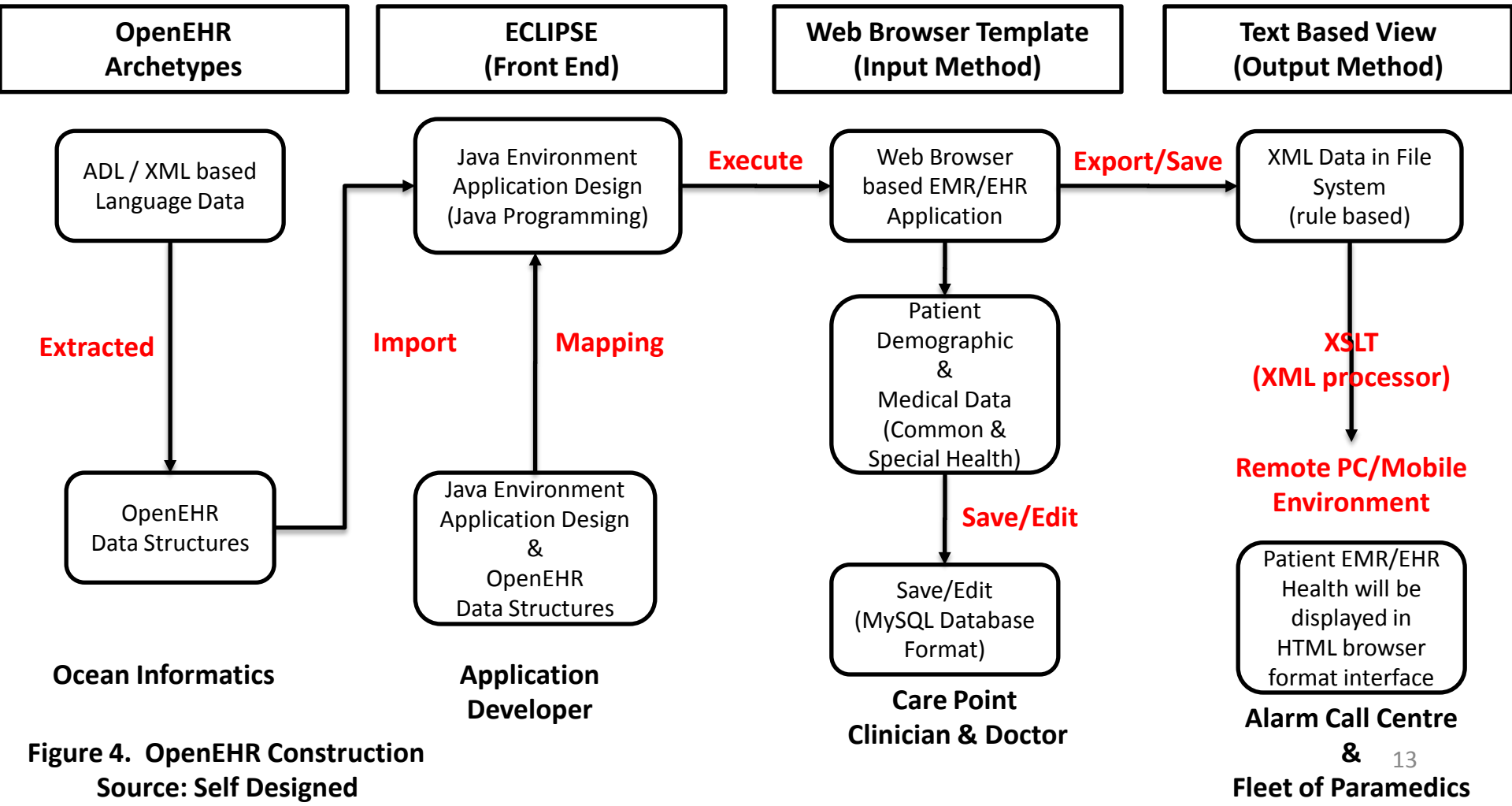


Figure 4. OpenEHR Construction
Source: Self Designed

Research Methodology

Open Standards EHR Database Application on Java Environment

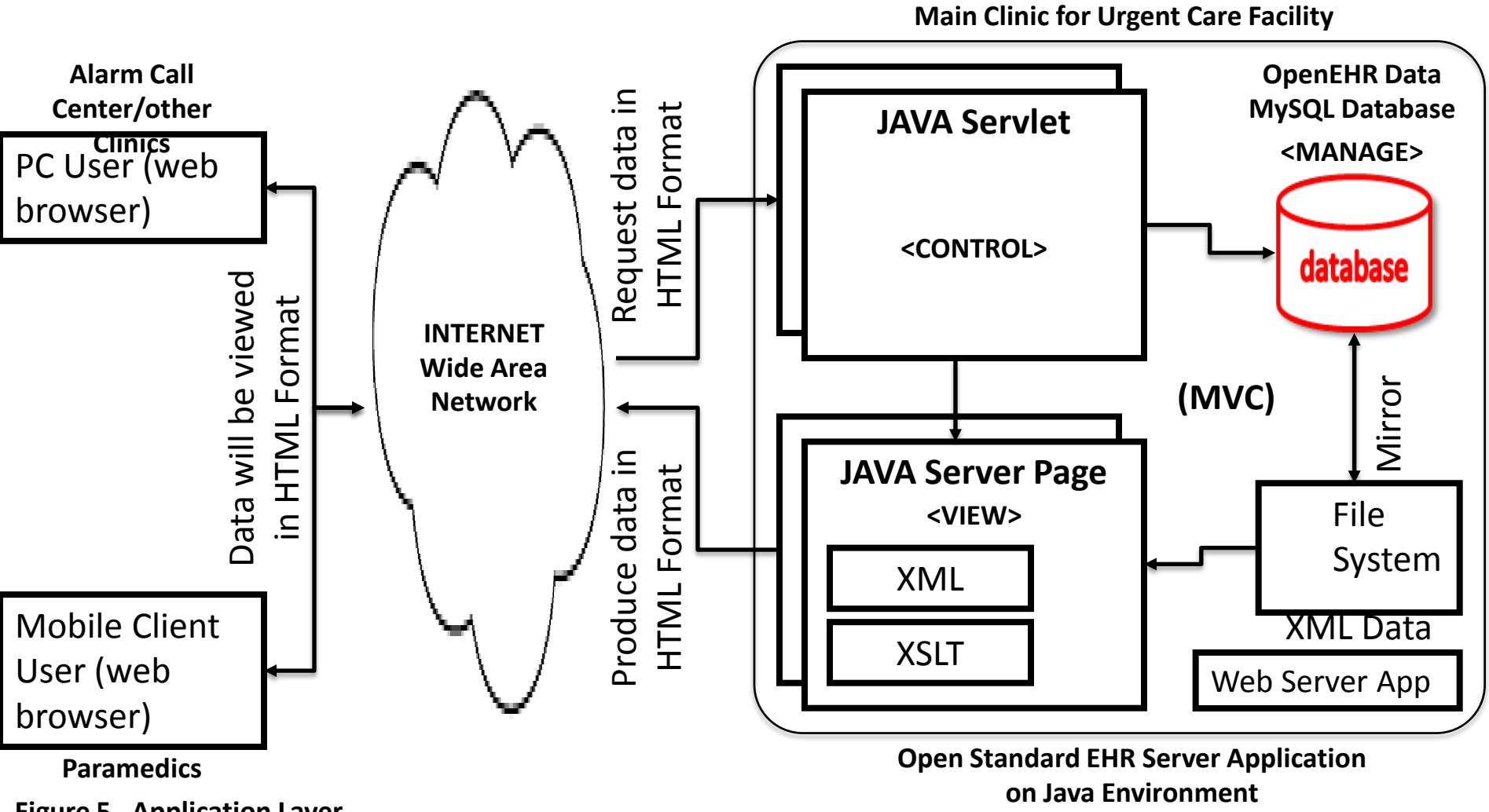


Figure 5. Application Layer
Source: Self Design from Java MVC Modelling

Research Methodology

Simple Use Case Diagram

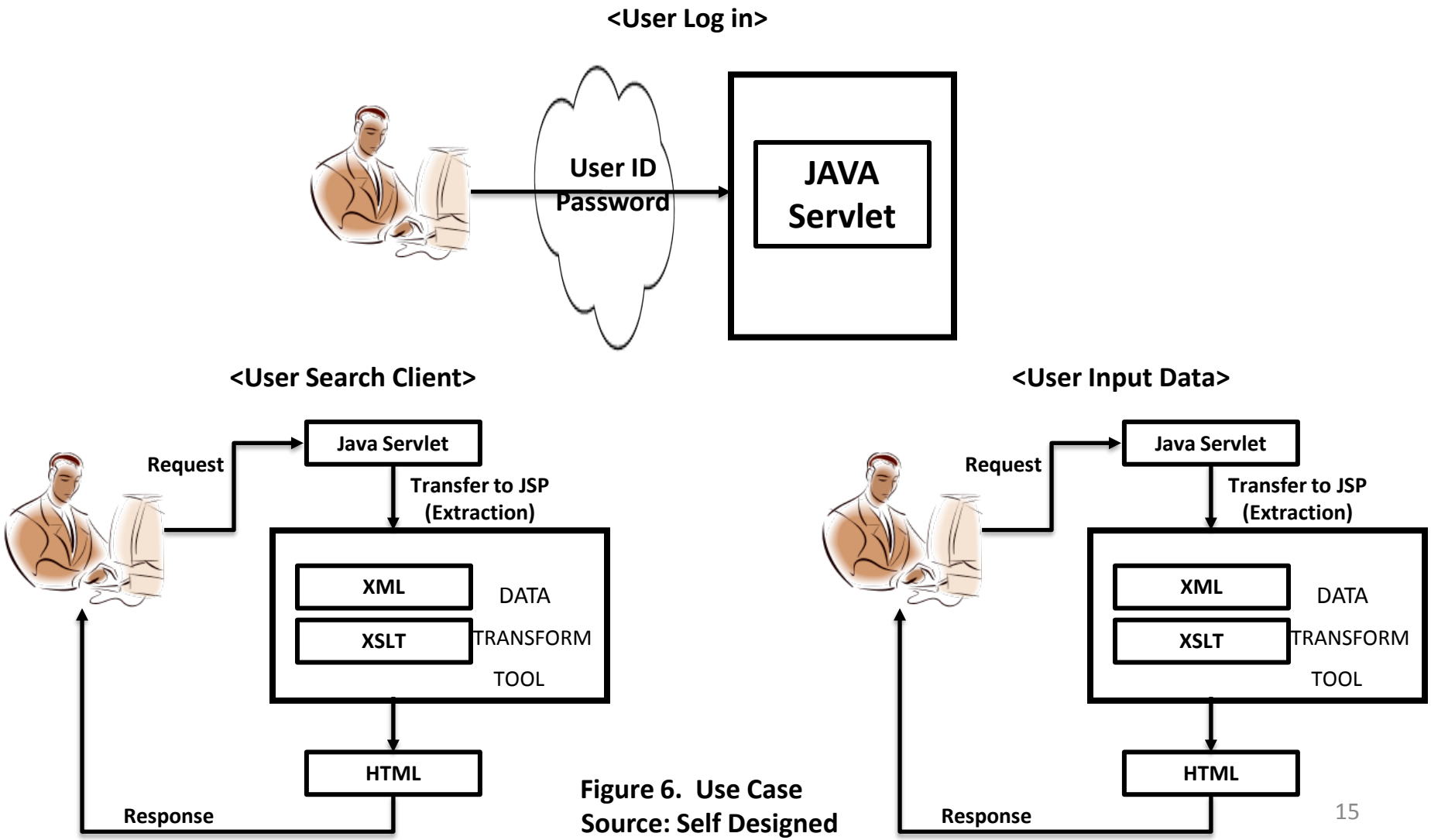


Figure 6. Use Case
Source: Self Designed

Research Target

- Open Standards EHR/EMR Prototype Application (Static) for the Emergency Medical Service Patient.

Research Conclusion

- Social and Economic Evaluation over Open Standards EMR/EHR Application compared to Proprietary EMR/EHR Application.

Further Research Study

- Link to Dolphin Server Environment Project.
- (MML Format Conversion).
- Dynamic java based openEHR application with all the 200+ archetypes data structures included within the system.