Chapter 1

INTRODUCTION

1.1 GENERAL

The present mobile health care solutions that is followed in rural areas of different countries ensures improved access every year in giving primary care to all the patients except in India. Existing gate keeping functions in our country especially in rural areas placed for less chances of patients being subjected to inappropriate health interventions. The shortfalls in rural areas are (i) primary health care management and (ii) infrastructure concerned. In present-day, all primary healthcare clinics which are located in rural areas do not use any electronic system or mobile technologies. Even though if they not properly maintained due to several reasons. They are still a paper based system. In such situations patient’s records are kept by the patients themselves. Numerous mobile wireless technologies are available for an open source of healthcare and learning which provides an exciting opportunity for low cost with high reach service. Government can adopt Mobile services to monitor the shortfalls of staff, service management in primary health care and also can help the health professionals to update their knowledge.

Mobile P2P (Peer-to-Peer) applications constitute an important part of online services to the world today. A set of open generalized P2P protocols allows any connected device on the network application can easily share documents and is content visible across the network. Dynamic discovery across firewalls monitor peer activities remotely secure communication with other peers on the network with services anytime, anyplace on individual mobile device. P2P provides certain interesting capabilities which are not possible in client server networks.

1.2 JXTA ESSENTIALS

JXTA (Juxtapose) a P2P protocol specification based on java can enable any connected devices (mobile phones, wireless to PC and servers) on the network. JXTA peers create a virtual network where any peers can interact with other peers
and resources directly. Peers are the mobile nodes on a P2P health care and education network that forms a fundamental processing unit of any P2P solutions. A peer is capable of performing an application and communicating the results to another peer over a network either directly or indirectly. Generalized peer-to-peer protocols allows any network devices like sensors, cell phones, PDAs, laptops, workstations, servers and supercomputers to communicate and collaborate mutually as peers. Their common use of the JXTA protocols means that they are fully interoperable.

1.3 LOGICAL LAYERS OF JXTA

This spotlight on JXTA binding for the Java Platform and Standard Edition software (JSE). JXTA core known as the platform layer enables key mechanisms for P2P applications for monitoring different peer groups, individual peer ID which provides advertisements for peer groups with security. The service layer includes joining membership with new peer groups, discovering and searching new peer groups. The application layer includes integrated applications such as instant messaging resource sharing and files sharing.

JXTA provides a common set of open protocols which are backed with open source reference implementation for developing peer-to-peer applications. The JXTA protocols standardize the manner in which peers can:

- Discover each other
- Self-organize into peer groups
- Advertise and discover network resources
- Communicate with each other
- Monitor each other.

1.4 JXTA ENTITIES

Peers work independently and asynchronous with other peers by publishing one or more interfaces that are used by other peer to establish P2P connections.

- Limited Edge Peer
- Complete Edge Peer
- Rendezvous Peer
- Relay Peer
1.4.1 PEER GROUP
Collection of peers that provide a secured sharing environment for participating peers. They can decide own policy of peer membership. Peers that is in the peer group belong to more than one peer group.

![JXTA Software Architecture Diagram]

1.4.2 PIPES
Virtual communication channel is established between two processes. JXTA offers both unidirectional non secure and bidirectional secure pipes. Pipes transmit a separate mode of message transfer of one peer group to other peer group without loss of files.

1.5 PEERS ON THE NETWORK
1.5.1 SIMPLE PEER
It is designed to serve single end users allowing the user to provide services from his mobile device and consuming services provided by other peers on the network.
1.5.1.1 RENDEZVOUS PEERS

The network location is provided to the peers and used to discover other peers and resources. It usually resides outside a private internal network firewall.

1.5.1.2 ROUTER PEERS

It provides a separate mechanism for peers to communicate with other peers.

1.5.1.3 RELAY PEERS

A relay peer maintains information about the routes to other peers and routes messages. A peer first looks in its local cache for route information. Relay peers also forward message and directly address another peer.

1.5.2 PEER GROUPS

Set of peer groups is created to serve common interest which can provide services to their member peers that is not accessible to other peers in the P2P network. The services can transfer a file by obtaining status information and perform calculation. The functionalities offered by one peer on the network is used by other peers on the network. The services which are provided with the peer is very unique till it is available in the network. Once the peer disconnects the service is no longer available on the network.

1.6 P2P SECURE COMMUNICATION

Security is one of the major factors considered in any network environment. Even a peer-to-peer network is not exempted from these security issues. Security attacks of P2P systems can be classified into two broad categories active and passive network attack. JXTA has many built-in security features that can enhance applications built over it. Some of the security features provided by JXTA are

- TLS as a Secure Transport layer (TLS) also known as Secure Sockets Layer (SSL) V3.1, is based on public key technology.
- Peer certificates.
- Personal security environment.

For the proposed architecture a personal security environment would be the best choice since it provides peer ID and a password for every individual peer.
participating in updating their knowledge process. This personal security environment helps in defending the local attackers or loss of mobile phones.

1.7 PROXYLESS & PROXIED PEERS

Mobile devices (peers) that do not rely or depend on any super peer in order to communicate with other peers are called as proxy less peers. Mobile devices (peers) with limited resources and less capability are connected to a special peer called relay peer or rendezvous peer in order to communicate with other peer groups in JXTA/JXME. A relay peer is capable of handling 150 peers. A relay peer is helpful in effective communication with different peers.

1.8 ADVERTISEMENTS

Advertisement is imposing on hierarchy elements in the proposed system peer group advertisement is followed which describes peer group specific recourses service name, group id, service description, patient specification and service parameters. A new group is created using different uid’s from different groups can be joined as a group. The name for new group is mentioned with some description about the group. Thus a peer Group advertisement is created. Any advertisement comes to this group pass the message to the many identifiers.

For Instance, a free check-up camp is proposed in the hospital organized by the Doctors peer group a message is passed to all the registered patients. A lecture hour with date and time is ADVT by the individual peer for the university education environment.

1.9 JXTA PROTOCOLS

The method of structuring and exchange of information between two or more peer groups using rules that has been agreed upon all the Peer groups. Variety of protocols architectures and implementations analyse and results to an existing P2P solutions. To design P2P application developers use diverse methodologies. All of these are asynchronous and are based on query response model. Using these protocols peers can discover one another or can discover network resources. Peers do not require for implementing all the protocols, they just implement what they need. JXTA protocols used as a foundation to build Mobile Commerce
applications. It resembles and identifies Poor overhead protocols analyse the low level network topology.

The identification of various protocols that could be used in JXTA framework of various functionalities is analysed. PMP (Peer Membership Protocol) protocol used for these JXTA frameworks.

1.9.1 PEER MEMBERSHIP PROTOCOL (PMP)

A peer includes PMP for joining and leaving between peer groups. PMP identifies methods accessed by peers and JXTA messages for hospital management.

1.9.1.1 REQUEST

New membership requests can be applied to the authenticator if a peer is interested in entering the Group. The response message or an acknowledgement is sent back by the authenticator to peer as a form.

1.9.1.2 ADDITION

An addition is done to the record after applying, the peer selects to add to the peer group.

1.9.1.3 MODIFY & UPDATE

Update is done in the record peer group patient record keeps changing after the consultation with the doctor. A message is sent to the patient used for updating the membership information if it needs to change.

1.9.1.4 REJECT

Authenticator can select and reject their peer membership. PMP is used in architecture to join with the peer group

1.10 PMP FUNCTIONALITY

It creates groups and publishes advertisement ADVT. Protocol also provides a code for the membership Policies. Authentication and authorization can be achieved using implementation. Expending this protocol in any peer (user) can automatically change the group ID by leaving the present group and join in another new group. Any peer in proxy groups can leave that group using “finish” command and can join in another group considering as proxy group two.
1.10.1 PEER DISCOVERY PROTOCOL
Peer discovery is a service provided to the peer information that is not available until peer uses a discovery service. Service is provided to all the peers in the peer group.

1.10.2 PEER RESOLVER PROTOCOL
Resembles TCP/IP for sending request to the server. Peers send a request and gets response from other peers. It repeatedly solves the query by the client.

1.10.2.1 RENDEZVOUS PROTOCOL
Provides an optimised routing mechanism and efficient propagation of messages. It provides separate path of the peers for transmission of messages and files.

1.10.2.2 PEER INFORMATION PROTOCOL
Peer ADVT contains endpoint information for contacting the peer. Peer is contacted directly to obtain its peer information. Advertisement is sent to all peer groups regarding their availability of service.

1.10.2.3 PIPE BINDING PROTOCOL
Continuous flow in structure of any application that makes connections to send and receive messages. Two peers interact continuously without any delay or break of service when bound.

1.10.2.4 END POINT ROUTING PROTOCOL
Controls and examines the flow of JXTA network enables pipes for simple messages. This protocol examines how routes are formed. The protocols are self-forming and have no need for centralized server. The peers have the ability on private networks behind firewalls. Protocols are purely JXTA specific and are not language specific.
1.11 COMPARASIONS TO EXISTING P2P SOLUTIONS

These sections briefly analyse and examine the existing P2P solutions.

Table 1.1 Prevailing P2P elucidations

<table>
<thead>
<tr>
<th>Napster</th>
<th>Gnutella</th>
<th>Client/Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralize server to perform search functionality.</td>
<td>Searches for the network propagated by peers called peer neighbours.</td>
<td>Client acts as a simple peer and server as rendezvous peer.</td>
</tr>
<tr>
<td>Does not provide complete solution for bypassing firewalls</td>
<td>Advertisements for content consists of IP Address, Port no, index number identifying the file.</td>
<td>No capabilities for traversing firewall</td>
</tr>
<tr>
<td>No message routing capabilities.</td>
<td>Searches for the network propagated by peers called peer neighbours.</td>
<td>Client server side programming needed.</td>
</tr>
<tr>
<td>Each peer gets a simple router.</td>
<td>Peers don’t provide full router peer capabilities.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.2 JXTA & JINI significant plugs

1.12 COMPARING JXTA WITH JINI

The comparison listed below provides advantages of using JXTA over JINI. The open source tools are more flexible and error prone. JXTA is more user friendly than JINI.

Table 1.2 JXTA & JINI significant plugs

<table>
<thead>
<tr>
<th>JXTA</th>
<th>JINI</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2P centric virtual network with XML</td>
<td>Java Object Centric</td>
</tr>
<tr>
<td>Protocols specified are centric</td>
<td>Protocols are unsure</td>
</tr>
<tr>
<td>Mobile devices are not device centric</td>
<td>Java object is required to connect to a service</td>
</tr>
<tr>
<td>Centric Peer Id for particular peer group</td>
<td>Service are through RMI, TCP, SOAP</td>
</tr>
</tbody>
</table>
The other open source tools used are Napster, Alpine, Shareaza when compared with JXTA.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Napster</th>
<th>Alpine</th>
<th>Shareaza</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sharing of Files between users</td>
<td>Decentralized search shares resources</td>
<td>peer-to-peer client for windows</td>
</tr>
<tr>
<td>2</td>
<td>Server Access is not there, Files stay with client machine</td>
<td>Suited to profiling, filtering and alerting services</td>
<td>Dwnload any file-type on several popular P2P networks</td>
</tr>
<tr>
<td>3</td>
<td><em>opennap</em> is a server for connecting the clients together, and is not a client itself.</td>
<td>Defaults to searching file names but can be expanded to locate other content.</td>
<td>contains NO Spyware or third-party products</td>
</tr>
<tr>
<td>4</td>
<td>Sharing of any media type, and the ability to link servers together</td>
<td>Retrieves dynamic and rapidly changing data</td>
<td>Easy installation</td>
</tr>
</tbody>
</table>

Table 1.3 open source tools compared with JXTA

### 1.12.1 JXTA BENEFITS AND DRAWBACKS

JXTA supports wonderful capabilities and are well formed advantageous when compared to other open source p2p solutions. JXTA provides a talented platform for producing P2P applications that have the flexibility required to grow in future.

#### 1.12.2 BENEFITS

- Intellectual language for P2P communication.
- Provides variety of services and network transports used in P2P network.
- Employed to XML standard format for structured data and easily adapted.
- Use of XML specifies all aspects for supporting applications for P2P communications.
• Interconnecting any type of device over any network no dependence on any particular programming language.
• JXTA relies on XML to exchange structured data and discover services across all peers on the P2P network.

1.12.3 DRAWBACKS
• Not suited for standalone P2P Applications.

1.13 RESEARCH OBJECTIVE

The primary objective of this thesis is to provide structured efficient architectures for hospital management, healthcare and education domains. The main objectives of this thesis are listed below.

• To design efficient hospital management framework for rural public health centers in India.
• To develop architecture of continuing education through mobile devices among the health professionals in rural public health centers.
• To design a framework that integrates cloud with JXTA to provide efficient solutions in case of emergency situations.
• To design secured and synchronized eco system for storing patient’s health records.
• To design efficient, relaxed M-Learning system for university.

With the above advantages and the gaps existing in the research motivated to proceed for: information’s about managing hospital networks and provide solutions for emergency healthcare at ambulance. An elucidation for storing patient’s records is secured and synchronized. A promising method to enhance university education through collaborative learning.

1.14 SCOPE OF THE THESIS

In count to this introductory chapter, the thesis is organized as follows.

Chapter 2 explores a complete literature survey related to our research i.e., about hospital management, health care, emergency health care and mobile learning.
Chapter 3 presents a hospital management and health care system in JXTA Mobile P2P environment.

Chapter 4 describes integrated solutions for emergency services through cloud with JXTA.

Chapter 5 is on Synchronized sharing of patient’s health and medical reports with Security.

Chapter 6 explains how knowledge update can be done among health professionals, even in a rural public health centres using JXTA Mobile P2P.

Chapter 7 is on the active mobile learning environment using JXTA with group learning facilities form mobile environment.

Chapter 8 is about conclusions of the work done with future directions.