# MANCAFChat - An Application to Evaluate MANCAF Framework

## Mr. Hardik S. Mehta[1], Dr. Dhaval R. Kathiriya[2]

*[1](Research Scholar, School of Computer Science, RK University, Rajkot)*
*[2](Director IT, Anand Agriculture University, Anand)*

***Abstract:*** *The collaborative application uses the MANET to exchange the information between the available nodes. The development of such kind of application takes too much time to implement the network communication services. This paper describes the implementation of MANCAF framework by developing collaborative application named MANCAFChat. It was designed based on the MANCAF framework. The main purpose behind the design of such application is to evaluate the effectiveness of MANCAF framework and usefulness of collaborative application.*
***Keywords:*** *Collaborative Application, MANCAF Framework, MANET*

## I. Introduction

For last few decades, commercial and personal community were interested in the Computer Supported Cooperative Work (CSCW) [1] area and in mobile computing [2]. CSCW engages the study of how persons work together using network technology, and related software, hardware, techniques and services [3].

Wireless devices support different PAN technologies which includes IrDA, Bluetooth [4]. This technology can be used to transfer the data between mobile devices. It can be visualized as a digital sphere near the mobile device which support a collaborative network for users in a range. A MANET can be utilized to exchange the data between people with mobile devices. In MANET, devices can connect to and disconnect from the network dynamically making the topology unstable and random. Mobile devices in MANET can communicate with each other by initiating direct request by user, automatically by mobile device or hybrid of this two [5].

The new development in wireless technologies, mobile phones and programming languages for mobile phones have made possible to transfer the wired computing to a wireless network [6], [7]. The P2P architecture patterns fits very well to execute collaborative applications with nodes of network represent the users and the network between nodes represents the collaborative links among users. MANETs with the use of IrDA, Bluetooth and Wi-Fi allow a new kind of collaborative application to users that are actually collocated.

In [8], we proposed MANCAF framework to support collaborative application development for mobile device in short span of time. Main idea behind the framework is to present an advanced programming framework to developers so that they only need to use simple methods to manage the different task of MANET.

The rest of the paper is ordered as follows. Section 2 describes the MANCAF framework on which MANCAFChat application built. Section 3 describes the architectural design of MANCAFChat application. Section 4 describes the evaluation of MANCAFChat application and MANCAF framework. Section 5 describes the related framework. Finally, Section 6 concludes the paper.

## II. MANCAF Framework

The design of MANCAF is based on layered architecture to provide features like modularity and simplicity. Each layer is assigned a specific responsibility and it is based on the below layer. The drawback of this approach could be slower execution of application if it contains many layers to perform operation. MANCAF framework can be used in mobile devices which have limited resources so we limit the number of layers used in the architecture. Fig 1 shows the compact design of framework and Fig 2 shows the high-level design of framework.
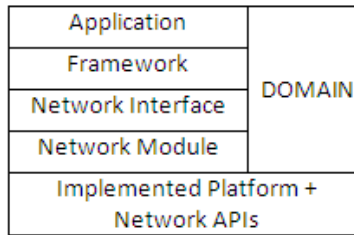
**Figure 1 Compact Design**

The MANCAF architecture contains the following part:

**Device:** It represents the mobile devices which run the application develop using framework. Two or more devices create ad-hoc network.

**Group:** It is logical collection of devices within communication range and aware of each other's existence. All devices can communicate with each other in a group.

**Service:** It is a unique ID for the device application running the MANCAF framework. The application which runs the same service can able to communicate with each other.

**Network:** It represents the communication medium used in the framework to communicate with neighbor devices.

**Message:** It is an entity which represents the different kinds of data transfer between devices. It can be sent to single device or a group of devices. It can contain text, objects or binary data like images, video or audio.

**Session:** It represent the duration of all communications between devices in a group. It maintains information about devices, group and communication medium.

**Framework:** It is core entity between application and system. It provide interface to developer and hides the complexity.

**Application:** It is application developed on some platform using MANCAF framework. It controls the framework.
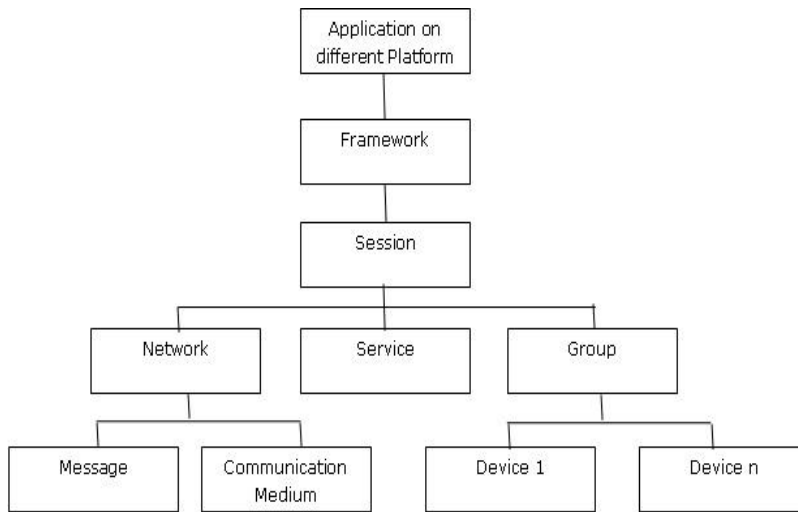

**Figure 2 High Level Design**

Table 1 shows the important list of requirements which framework needs to fulfil in order to design collaborative application. These requirements are identified by the analysis of scenario [8].

**Table 1**

| ID | Requirement description |
|----|-------------------------|
| R1 | The framework must be able to support mobile devices |
| R2 | The framework must work with different network mediums |
| R3 | The derived application must not be dependent on what network medium is used by framework. |
| R4 | The framework must be able to create a network without any central device |
| R5 | The framework must be able to create a group of more than one devices |
| R6 | The framework must be able to transfer the data to different connected devices |
| R7 | The framework allows the application to form a new group or join existing group |
| R8 | The framework must provide searching facility to find the existing group |
| R9 | The framework able to query the application for any arriving or leaving connection |
| R10 | The framework must notify about new device joining notification to every connected devices. |
| R11 | The framework must be able to maximum the number of devices in a group |

| R12 | The framework must be able to identify the source which originate the transfer |
| R13 | The framework must be able to send the same data to multiple devices |
| R14 | The framework must allow the continuous searching of group |
| R15 | The framework must support different resource management technique to balance the load |

## III. MANCAFChat Application

The MANCAFChat application was designed to provide a basic chat facility to users. The application was implemented to provide Chat utility by utilizing the PAN s of mobile devices. The mobile devices are so common now days so that every people carry it with them. Currently we have developed this application using J2ME and MANCAF framework.

Figure 3 shows the architecture of MANCAFChat application which is based on Model-View-Controller (MVC) pattern. The MVC pattern provides the flexibility to revise the user interface design without changing the logic of application.

The core part of the architecture is Controller package, where MANCAFChat class is the prime controller of the application which is responsible to handle the events and action. Some of the methods are shown in Figure 3. The View package contains classes represents the all the GUI components used in the development of mobile application. These classes inherit the GUI of programming language. Currently the MANCAFChat is implemented using J2ME so the classes will extend the GUI classes of J2ME.
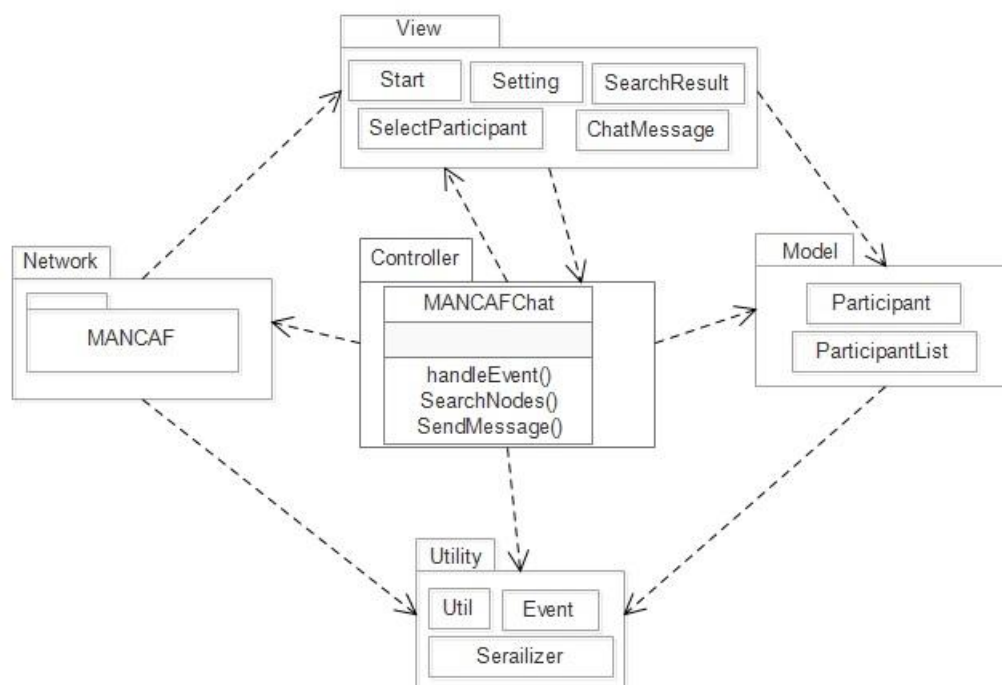


**Figure 3 MANCAFChat Architecture**

The classes which contain the logic of the application are in Model package. In Model package, participant class manages the information about the nodes which are found nearby. The Network package manages the communication between the mobile devices. It includes establishment of connection, management of new and gone devices, routing of messaging, session management and real data transfer.

The Util package provides the support to other classes in different packages. The Util class has number of static methods which other class can access. Event class help the MVC architecture to handle all the events generated in application and transfer the event information to handleevent method of MANCAFChat class. Before exchanging the data between nodes, data has to be serialized with help of methods provided by Serialize class.

Figure 4 illustrate the different steps to send or receive the message in MANAFChat application. At the beginning of application display setting page where user can set interface name. After that user have two menu choice named: Search and View Log. The View log display the previous data of chat messages. The log functionality given in application is for testing purpose only. It is very helpful to ensure that application is executing as per sequence. The Search selection starts the searching of devices in MANET. If no devices are found then application user can again initiate the search process. The participant is shown to user and one or

more participant is selected to start the chat process. Here only devices which run the MANCAFChat service are listed. After this mobile devices of selected participant swap the information.
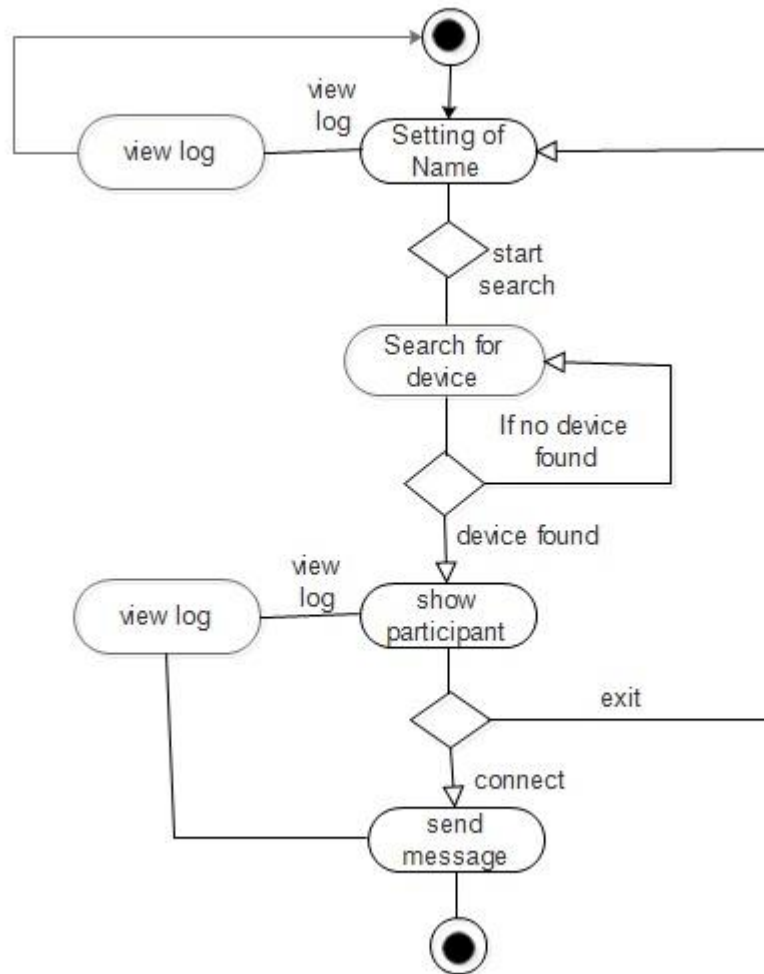


**Figure 4 MANCAFChatt Application Flow**

## IV.     Evaluation

This section describes the evaluation of MANCAFChat application through usability-test. It also describes the evaluation of MANCAF framework by stating those requirements defined in framework are satisfied or not.

In usability-test, we had observed and interviewed ten users. The test was carried out to identify the usefulness of the application and identify the crucial problems in real usage of such collaborative application in real world. The session was started with the introduction of application and working of it. Then that ten people were asked to send the messages in some small group. After that we give them set of question which they need to fill the answer. Following are the summary of results.

1.     Is application useful?
Observe Comment: 70% of people said that application is useful and they might use the application. They also pointed the issues like discovering of nodes takes too much time which needs to reduce.

2.     Are there any avoidable features?
Observe Comment: 90% of people pointed out the common problem which is Bluetooth security prompts. Except this, others feature are good. This makes application simple to use.

3.     Are there any features required?
Observe Comment: 90% of people pointed that it would be good if we add exchanging of file between the users.

4. What kind of improvement needed?

Observe Comment: All the people were mentions that make it likely to automate the procedure of getting purge on Bluetooth security message.

Table -2 shows the result of MANCAF framework evaluation.

**Table 2**

| ID | Requirement description | Fulfilled |
|---|---|---|
| R1 | The framework must be able to support mobile devices | Yes |
| R2 | The framework must work with different network mediums | Partial (Currently Bluetooth) |
| R3 | The derived application must not be dependent on what network medium is used by framework. | Yes |
| R4 | The framework must be able to create a network without any central device | Yes |
| R5 | The framework must be able to create a group of more than one devices | Yes |
| R6 | The framework must be able to transfer the data to different connected devices | Yes |
| R7 | The framework allows the application to form a new group or join existing group | Yes |
| R8 | The framework must provide searching facility to find the existing group | Yes |
| R9 | The framework able to query the application for any arriving or leaving connection | Yes |
| R10 | The framework must notify about new device joining notification to every connected devices. | Yes |
| R11 | The framework must be able to maximum the number of devices in a group | No (Implemented by Application) |
| R12 | The framework must be able to identify the source which originate the transfer | Yes |
| R13 | The framework must be able to send the same data to multiple devices | Yes |
| R14 | The framework must allow the continuous searching of group | No |
| R15 | The framework must support different resource management technique to balance the load | No |

## V. Related Work

This section describes the other frameworks for the development of mobile applications.

JXTA [7] is open-source framework with set of protocols and API to develop application. It is for computer-to-computer communication and independent of network platform. JXME is JXTA for J2ME which is light-weight implementation of JXTA for mobile devices. It provides the full functionality of JXTA through relay host.

Proem [9] is framework with an objective to provide a framework to develop collaborative application which runs in ad-hoc network. It is implemented on Java and runs of PDAs and other wireless devices. Proem design is independent from network protocols. It can be executed over TCP/IP and HTTP. J2ME version of Proem has not been succeeded.

Mobile Chedar[10] is middleware allowing mobile devices to access central chedar network and exchange the information with each other. The purpose of Chedar is to provide flexible API to application developer for developing collaborative application. It is implemented using J2ME and Bluetooth is used for communication. But the communication is based on Mobile Chedar gateway device which runs on PC. This approach has a problem of single point of failure.

The JMobiPeer[11] provides support to discover and group management. It offers interoperability with JXTA. Its execution is based on J2ME. The real implementation of it has tested only on simulators on standard computers.

## VI. Conclusion

In this paper we have describe the application for mobile devices to support collaboration. The application utilizes the MANET to perform the collaborative task. In this case, we developed an application to exchange the messages among the different users. The main question: Is it useful to use collaborative application running on mobile devices in MANET to exchange the messages? To find the answer of this question, we used usability-test. We provided the application to group of people and told them use the application without any kind of help. The idea behind the MANCAFChat application was to provide multiuser chat application without too much user interaction. The application is very useful if problem with Bluetooth security prompt is solved.

## References

[1] Baecker, R., "Readings in Groupware and Computer Supported Cooperative Work", Morgan Kaufmann, San Mateo CA, ISBN 1-55860-241-0, 1993

[2] Duchamp, D., "Issues in Wireless Mobile Computing", Proc. Third Workshop on Workstation Operating Systems, Key Biscayne, Florida, U.S.A., pp 2-10, 1992

[3] Brinck, Tom's CSCW and Groupware Page http://www.infres.enst.fr/~vercken/multicast/cscw.html

[4] Miller , B. A. and Bisdikian, C. (2004), Bluetooth Revealed, Addison-Wesley, 2 edition
[5] A. I. Wang, M. S. Norum, and C.-H. W. Lund. Issues related to Development of Wireless Peer-to-Peer Games in J2ME. In First Conference on Entertainment Systems (ENSYS 2006), page 6, Guadeloupe, French Caribbean, February 23-25 2006.
[6] Gerd Kortuem, Jay Schneider, Dustin Preuitt Thaddeus, G. C. Thompson, Stephen Fickas and Zary Segall. When Peer-to-Peer comes Face-to-Face: Collaborative Peer-to-Peer Computing in Mobile Ah-hoc Networks. In First International conference on Peer-to-Peer Computing, Linkoping, Sweeden, 27-29 August 2001.
[7] Nico Maibaum and Thomas Mundt. JXTA: A Technology facilitating Mobile Peer-to-Peer Networks. In International Mobility and Wireless Access Workshop (MobiWac'02), pages 7-13, Fort Worth, Texas, USA, 12 October 2012
[8] Hardik S. Mehta, Dr. Dhaval R. Kathiriya, "MANCAF: A framework for Building Collaborative Applications in Mobile Ad Hoc Networks", In IJCSIT, Vol 6 Issue 1, Pages 232-237, January 2015.
[9] G. Kortuem. A methodology and software platform for building wearable communities. PhD thesis, University of Oregon, December 2002
[10] N. Kotilainen, M. Weber, M. Vapa, and J. Vuori. Mobile Chedar A Peer-to-Peer Middleware for Mobile Devices. In Third IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOMW'05), pages 86–90, 2005.
[11] Mario Bisiganao, Giuseppe Di Modica and Orazio Tomarchio. JMobiPeer: A middleware for Mobile Peer-to-Peer Computing in MANETs. In First International Workshop on Mobility in Peer-to-Peer System (MPPS) (ICDCSW'05), pages 785-791, 2005.