MOBILITY MANAGEMENT VERTICAL AND HORIZONTAL HANDOVER DECISIONS IN HETEROGENEOUS WIRELESS NETWORKS USING OMNET

Author Ms Sonal D Agrawal 1, Co-Author Prof C.M Mankar 2.

PG Student [1], Guide [2] SSGMCE College of Engineering Shegaon

Abstract—

wireless and mobile computing a new technology and fastest growing area with regularly increased data rates and coverage areas. Future challenge is to make the best possible use of the available different networks vertical or Horizontal. In this paper used Wi-Fi and Wi-MAX heterogeneous networks. In this proposed paper analyse handover procedures by using OMNET. Using this simulator, we assessed performance such as delay, packet loss and throughput of GSM,Wi-Fi and Wi-MAX during handover. Recent focus on handover decisions for customized mobility management in heterogeneous wireless networks. Our algorithm supports the best access point horizontal handover decisions and vertical as well as the best access network vertical handover decisions to user based on the current set of user preference, application requirements, and context information. In this paper our main contributions are: First A novel decision making algorithm for personalized handover, Second an enhanced autonomic architecture to apply to personalized mobility management, and Third an extensible and user-friendly OMNET platform for implementing and evaluating and testing handover decision .

Keyword Mobile Device Management, Mobility Management, Heterogeneous Mobile Networks.

I INTRODUCTION

Mobile wireless technology has gained tremendous popularity information access to users on the move. Presently, there is no single wireless network technology that is capable of simultaneously providing a low latency or high bandwidth and wide area data services to a large number of mobile users.New generation wireless network, mobile users are connected to the best available networks that suit their services requirements and switch in between different networks based on their service needs. Efficient mobility management protocols are required to manage and support mobility across heterogeneous Handover management, one of the mobility management components, controls and change of the MT point of attachment during active communication Mobility management contains two components such as location management and handover management. Location management enables the system to track the locations of mobile users between communications channel.

In mobile networks, first three generations evolved to contribute in increasing data rates and enriched communication , achieving its peak in the third generation (3G) cellular networks. The next evolutionary steps after the 3rd generation aimed at providing extended mobility features with optimized enhanced data rates mobile services.

These systems are generally named as Beyond 3G (B3G) or Fourth Generation (4G) networks. They make heavy use of heterogeneous networking technologies in order to deliver mobile users more flexibility when using multi-service networks that provide diverse range of services [1] like seamless connection to the Internet by means of heterogeneous wireless networks, navigation services, location-aware services and IP based real-time multimedia.

Some of the wireless technologies such as 3G,WLAN,WiMAX etc. using different technologies and offer variety of services. They are

developed with different standards and used different area of coverage and data rates[1]. One of the upcoming challenges in network is to connect end to end heterogeneous wireless technologies. To deal with end to end connections between heterogeneous networks we have to perform vertical handoff. Vertical handoff is also defined as the exchange of connections between different access points in the same network that can either be in Wi-Fi, WiMAX or LTE. Access point used in WLAN system is worked similar to the base station and covers shorter area. Wireless network is everywhere like at pedestrian, a moving vehicle, a moving train etc. while on a moving vehicle different access networks connected to provide services within its coverage area and in this the handover process is very fast[2].

IEEE 802.11 standards are much cheaper than IEEE 802.16 standards. The deployment of high speed network (11 Mbps in 802.11b and 54 Mbps in 802.11a/g) can be used by unlicensed spectrum (2.4 GHz in 802.11b/g and 5 GHz in 802.11a)[1].

One of the emerging wireless technologies is WiMAX based on IEEE 802.16 standards, where the IEEE 802.16d is for fixed WiMAX and 802.16e for mobile WiMAX system. WiMAX base station offers greater coverage area around 8 Km with data rate of 70 Mbps. Another technology is LTE which was developed by 3GPP with system handover between LTE and 3G such as UMTS, GSM etc

II LITERATURE SURVE

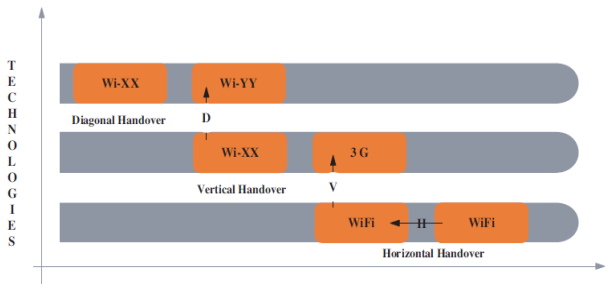


Fig. 1. Handover types

Horizontal Handover: In Horizontal handover process has been considered and studied among wireless networks using the same access technology. When a mobile node moves between two cells using the same technology, then this kind of handover process is defined as horizontal handover. Another way It is also known as Intra cell handover and sustaining the running services is change of IP address like in Mobile IP or dynamically bringing.

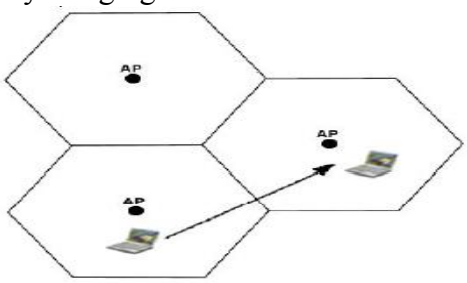


Fig 2 Horizontal HandOff

In Above Figure 2 shows the horizontal handoff process. In this above figure each hexagon represents the cell of the access point and all of them belong to the same and different wireless network technology. Mobile device moves from one cell to another, the horizontal handoff process is happening.

Vertical Handover: A handover between two different access technologies is says as a vertical handover.It is also known as Inter cell handover as it occurs when the user moves into an adjacent cell and all of the terminals' mobile connections and must be transferred to a new base station [8]. The main concern of vertical handover and uphold running services alteration of IP addresses, but also the modification of network interfaces and QoS features of different networks accordingly.

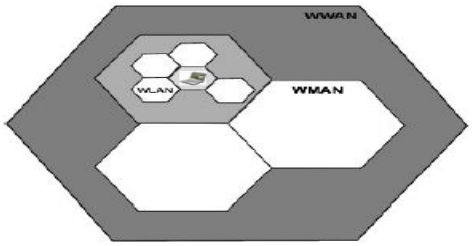


Fig 3 Vertical Handoff

between two base stations that are used different wireless network technologies [8].Horizontal and vertical network structure that has been increasing cell sizes at higher levels in the hierarchy.

1) **Handover Decision Management:**

Handover is the process of maintaining a user's used a new active session when a mobile device changes its connection point to an access network.Depending on the

access network that each point of attachment and belongs to, the handover can be either horizontal or vertical [45]. A horizontal handover inplant place between points of attachment supporting the same network technology and. on the other hand, a vertical handover occurs between some points of attachment supporting different network technologies.

a)**Cost Function-based Approaches** :

vertical handover decision cost function: is a measurement of the benefit obtained by handing over to a particular network. an optimized cost function is used to evaluate the target network establishing a tradeoff between user satisfaction and network efficiency. The cost function is applied on two vertical handover policies, one for all the user's active sessions collectively and one for each of the user's active sessions independently

b) **AI-based Approaches**

The concepts of Fuzzy Logic , Neural Networks , Expert Systems, and Genetic Algorithms from AI can be used to choose when handover occurs and which network to choose among different available access networks. These AI mechanisms are combined with multiple criteria or attribute concepts in order to develop advanced decision algorithms for both non-real-time and real-time applications.

III RELATED WORK

OBJECTIVE AND GOAL

Our approach proposes a handover decision process based on a three-phased process to find the network that can best full the user's requirements. The three phases are Network Detection, Network Evaluation, and Handover Execution [1, 2]. Network detection is used to discover available access networks and collect appropriate metrics to evaluate them.

The goal of this Project is to show the development of a simulator for modeling heterogeneous networks transitions for the correct and time based decision making in the vertical handoff process.

CHALLENGES

Heterogeneous mobile environments, the challenge now is to allow user's access at any time and place to the services that offers, independently of the networks and devices that are used and the involved to provide Wireless Internet Services . At the moment at which the mobile devices change of network technology, the users do not have to notice this situation,it may be happens in the homogenous mobile environments, nevertheless, is advisable that users can define their preferences as cost .

The challenge in heterogeneous environments is to implant the same concept of transparent mobility of homo and hetero environments and different kinds of network technologies and administrative domains. The problem transparent vertical mobility is to get that transitions between heterogeneous technologies and different administrative domain are imperceptible causes less distraction as much as possible to the user..

EXISTING SYSTEM

There are two types of handoffs that take place in an integrated network. The horizontal handoff between the same networks and vertical handoff between different networks. Handoff decision, radio link transfer and channel assignment are the three stages in a handoff [1]. There are vertical handoffs in two directions, for an integrated cellular or WLAN network, from WLAN to cellular network and the other from cellular network to WLAN. When the cellular network gets into the area of WLAN, used larger bandwidths, it would fancy changing the connection to WLAN. But, on the other hand when user is server by WLAN and moves to cellular network, coverage is abrupt and hence to unwanted voice data call dropping thus affecting the quality of service. Now to make sure the communication is seamless, the user must switched to the cellular network before the WLAN link breaks while reducing the dropping probability of ongoing calls.

PROPOSED REQUIREMENTS

Our proposed requirement is OMNET platform that surveyed the characteristics of mobile devices and OMNET and general functions of emulators and simulators. We also surveyed management issues related to mobile devices in OMNET, especially mobility management for vertical and horizontal Handoff.

We summarized the requirements as follows:

Heterogeneous Networks Modeling: The tool should provide to create, modify, and delete multiple kinds of mobile networks or mobile nodes and network servers. It should provide to specify their characteristics.

Mobile Devices: The tool should provide to create, modify,and delete mobile devices with their own functions.

Network Traffics: The tool should be provide a network traffic for each application between a

mobile node and an application server through mobile networks.

Scalability: The tool should provide to run simulations with a large number of nodes ..

DESIGN AND IMPLEMENTATION

PROPOSED SRCHITECTURE

In 4G network, there are different wireless networks available with may the same coverage area. So MS will always ready to connect to heterogeneous networks like GSM, WiMAX and Wi-Fi simultaneously. And as we know that every technology needs a gateway to access to Internet. The role of gateway is to provide an IP address to MS with proper authentication to interact to server. At the server the authentication procedure will be performed for the MS. Since each gateway will provide a different IP for each NIC at the MS[6]. So the new MS will have more than one IP address. A table will be created showing different IP's at the server. One distinguished IP address will be assigned by server with the unique IP called Master IP (MIP) address and all the data from the server will be routed via this MIP address. Since the remaining IP address work as temporary address and these could be changed if the gateway changed.

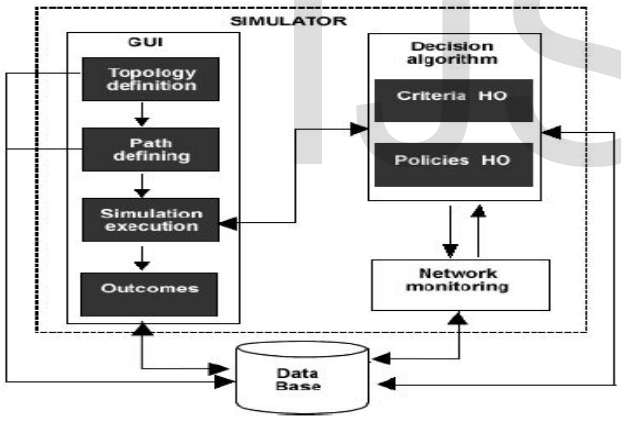


Fig 4 Proposed Architecture

MODULES

- The simulator will be integrated of three modules
- Graphic user interface,
- Decision algorithm and network monitoring data bases**.**

PROPOSED TOOL

OMNET

OMNeT stands for Objective Modular Network Testbed in C++**. It is a discrete event simulation tool** designed to simulate computer networks, multi-processors and other distributed systems. Its applications can be extended for modelling other systems as well. It has become a popular network simulation tool in the scientific community as well as in industry over the years.

PLATFORMS OF OMNET:

OMNeT++ works well on multiple platforms. It was first developed on Linux. Omnet++ runs on most Unix systems and Windows platforms.

HARDWARE REQUIREMENTS

Hard disk	:	500 GB
RAM	:	2 GB
Processor speed	:	i3

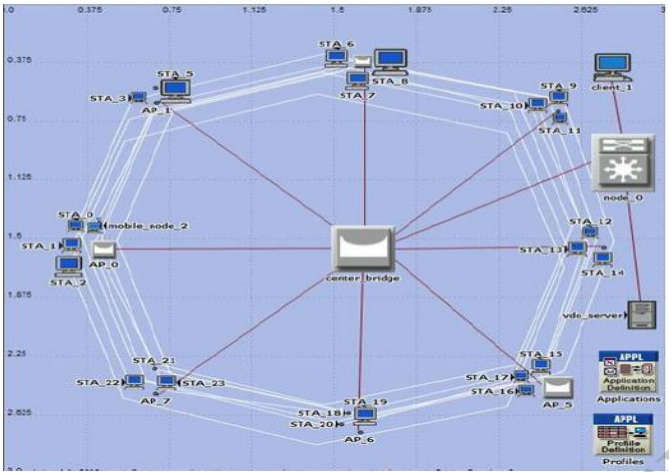
SOFTWARE REQUIREMENTS

Operating System	:	Win 7,Win 8
Platform	:	OMNET
Programming Language		C,C++
Database		Mysql

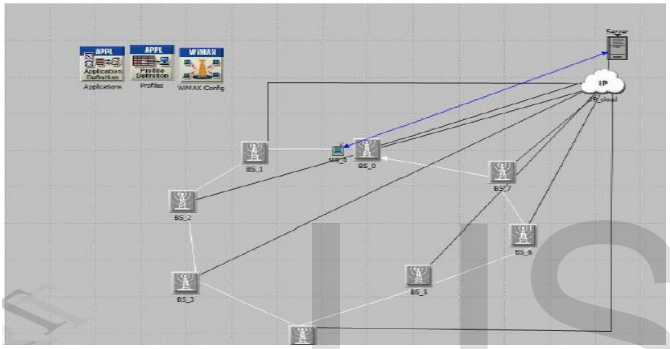
EXPERIMENT

We implemented our Project in OMNET++ by using the C++ programming language is used for coding purpose and OMNET++ are used displaying performance result graphs. Finally, we used Simulation for constructing a GUI. Movement of Node Vertical to Horizontal Handoff..

Horizontal Handover in Wi-Fi network



Horizontal Handover in Wi-MAX network



VERTICAL HANDOVER INTEGRATION

RESULT

This simulation part is divided into three parts showing different delays and throughput in different wireless networks. Performance behavior in horizontal and vertical handover in Wi-Fi and Wi-MAX All the simulation is done on the OMNET simulator.

CONCLUSION

In this paper proposed a novel tool suite for emulating and simulating mobile devices in heterogeneous mobile networks for testing management methods. Our OMNET Suite allowed the user to create multiple types of wireless access networks, mobile nodes, and network servers for creating simulation scenarios. In the case study, we presented context aware handover decision management which is a management issue for mobile devices. We also deployed this tool as an open source projected and encourage other researchers to test and improve it.

FUTURE CHALLENGES

For future work, we will integrate our tool into existing network simulators . Currently, time-series packet traffic data is manually configured for simulation.We will also apply our tool suite to other useful case studies such as configuration, fault, and performance management

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