

Efficient Method for Wimax Soft Handover in VOIP and IPTV

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Abstract – WiMax stands for Wireless Interoperability of Microwave access. WiMax is a new technology that gives the fast access to data even on long distances through various ways for point to point communication and also give full coverage to the wide areas for cellular type of communication. The main goal of WiMax in cellular system is to make the handovers faster and efficient so that there will be no loss of data during a handover. In this paper we will consider soft handover that uses WiMax technology under the implementation of real time applications like VOIP and IPTV. VOIP and IPTV are the protocols that are used in the wireless communication weather for the voice calls or some other transfer of data but in large amount. So these protocols always create a kind of congestion in network. We need to consider both of these protocols during a soft handover. Basically this paper is about to carry out an efficient soft handover method called beta under various conditions. This method has the capability to carry out an efficient soft handover by checking the different network conditions like distance, congestion and signaling. Then choose a target base station that is capable to carry out the handover. As WiMax is used then the handover will be fast and more efficient. It will give 90% efficient results.

Keywords: Mobile WiMax, VOIP, IPTV, IEEE 802.16, Soft handover.

I. INTRODUCTION

Handovers generally occur in cellular system. These handovers arises when a mobile station (MS) moves from one cell to another. Large areas are divided into small parts and these small parts are called cells. Each cell has its own base station that provides coverage to the user equipment. These small cells usually need to increase the system capacity as it uses a limited spectrum. In this a frequency band is divided into further small bands and these bands are reused again and again. As per concern with the mobility concept, it keeps a mobile station active when it travels through various small geographical areas called cells. It means that it keeps conversation continued on mobile phone when the user is moving from one location to another simply by transferring the call from one base station to another base station residing at some location in different cells. So this process of transferring the call from one cell to another is called handoff or handover. So this process keeps the call continuation as well as avoids any kind of interruption during a phone call. Handovers arises through various reasons like if the signal strength is low, distance is large and also because of congestion in network. The handover process is actually performed when the mobile stations are connected to a new access point.

Handovers basically are of two type hard handover and soft handover. In hard handover when new connection is establish it's necessary to break the previous connection. In soft handover if new connection is establish there is no need to break the previous connections. Soft handover or soft handoff has the capability to have more than one BS connected at a time. These handovers are needed to avoid latencies and packet loss. Basically this cellular system involves the mobility and handovers; it means that it allows the user to move in between the range of various BS and allow connecting to the nearest BS for the proper services. In this research paper we are introducing a new efficient method for soft handover using mobile WiMax for real time applications. This efficient method will make a soft handover more efficient by reducing the latencies and by avoiding the packet loss.

I. Mobile WiMax with VOIP and IPTV

We are using mobile WiMax so it will give you a fast switching between the various base stations during a handover. The standard that a mobile WiMax used is 802.16e, which deploy a system of mobile broadband wireless access. Mobile WiMax physical layer uses OFDMA technology. OFDMA stands for orthogonal frequency multiple accesses that are used almost in wireless applications to provide the access. OFDMA technology used the division of channels and each channel works in parallel. There are several advantages of using OFDMA like attenuation of high frequency, frequency fading due to multiple paths and narrowband inference. Mobile WiMax reduces the latency and increase the quality of service. It can easily use the various technologies like VOIP and IPTV. Mobile WiMax provides the various modes of transmission like point to point, point to multi point to portable and various internet accesses on mobile phones. Mobile WiMax provides full scalability to radio waves technology and network architecture therefore it is more flexible in network and offering services. Mobile WiMax is very popular because it gives the full coverage to the cell and also provides speed in switching between the base stations during handover. So it helps to increase the quality of service

VOIP stands for voice over internet protocol. It a protocol that is used for the digitalization of the voice. In VOIP it simply compresses the voice into small packets to send over the network. These packets contain a destination address, a sequence number and the error checking. Whenever a voice is comprises and send over the network to the destination through sequence number they arrived at

the destination. These packets contain the voice messages that enable the user to hear the voice of another user during a communication. IPTV stands for Internet Protocol Television; it is a protocol that provides the service of television via an internet protocol using packet switching i.e. the data sends over the network in the form of packets and this protocol do not use the traditional transmission. Instead of using the traditional transmission its uses the signals via satellite or cable television formats. IPTV also give the advantage of streaming of data it means that a media file begins to play before download it simply called the streaming of data. These two protocols works according to the increase demand of the multimedia applications. But these protocols need a wide bandwidth and sometimes cause congestion in network. As cellular point of view these are the real time applications basically VOIP is used so as it increase the congestion on the serving BS as well as also increase the load on network. This efficient method also works in this situation to handle the load and to reduce the congestion on BS.

This new efficient method for soft handoff or soft handover using mobile WiMax will work in such a way that it gives you efficient results in throughput, packet delivery ratio and decrease the end-to-end delay during a soft handover. In this technique the efficient method is named as beta (also known as path lost exponent) will automatically checks the appropriate conditions to give handoff to another base station. It checks the various factors that gives the conditions to carry the handoff like signal strength, congestion on BS and distance between the MS and BS. As we are considering the soft handoff then it will checks more than one BS at a time and checks all the factors and then gives the handoff to that BS that is capable in all aspects. The MS will automatically get connected to that BS. So this technique automatically evaluates all the factors and then the handover will be preceded. It also works to balance the load on network. So this method is efficient in all aspects.

II. SOFT HANDOVER PROCESS AND ANALYSIS

In this section, we will discuss about the soft handover and the whole procedure that is used to carry the efficient soft handover using mobile WiMax.

A. Soft Handover Process In Mobile Wimax

Soft handover also known as “make before break”. In soft handover, it is not necessary to terminate the previous connection before making a new connection. In this type of handover, serving BS can access more than one target BS to check the capability of BS for handover. Here we have used mobile WiMax to increase the quality of service. We have two methods for soft handover in WiMax.

1. Macro diversity handover.
2. Fast base station switching.

The proposed scheme is to define a procedure that can select the target base station for soft handover faster and efficiently. First of all we need to maintain a diversity set for each mobile station which is updated regularly according to the current location of mobile station. Then select the anchor base station for mobile station for monitoring the neighboring base stations. We need to

define a threshold level below which the handover will be initiated by the mobile station. This threshold level depends on the parameters like signal strength of base station, traffic at base station and distance of base station from the mobile station. These are the reasons for a handover to occur and based on these parameters, the mobile station will select the target base station for further services. After the target base station is being selected from the diversity set by anchor base station that are continuously monitors the neighboring base stations for a base station. Then a scanning process will be carried out. When this scanning process is completed the mobile station will do range selection with the target base station. When the link is properly established then it breaks the connection with serving base station.

B. Proposed Soft Handover Scheme

Here basically we are discussing about the selection of a base station which is appropriate to take a handover. Base station will be selected from the diversity set. for this first of all , a cell section will be initiated. All selections give us the information about the current available service and about the neighboring base stations.

In this proposed technique, we are trying to modify the fast base station switching procedure to optimize the target base station for soft handover in WiMax. We are introducing the monitor base station; a monitor base station is selected from the diversity set that will monitor all the neighboring base stations. it communicates to the mobile station and maintain a database that is required to check the potential of target base station, to carry the soft handover in WiMax. Monitor base station has one advantage i.e. whenever the anchor base station or the serving base station fails, then mobile station will continue its service with monitor base station by sending a register message.

Then mobile station sends its current location to the monitor base station and according to the information present in the databases like history of mobile station movement and its current location. It will maintains a diversity set that contains all the base stations nearer to the mobile station such that a target base station will be selected from that diversity set. Mobile station sorts the target base station having the maximum diversity parameters.

$$\text{Div} = s/w - d$$

S is received signal strength, w is work load and D is the distance between mobile station and base station

$$d = \sqrt{(x_s - x_i)^2 + (y_s - y_i)^2}$$

Where (x_s, y_s) are coordinates of mobile station and (x_i, y_i) are coordinates of i 'th base station where $i=1,2,3, \dots, N$ N is the total number of base station in diversity set

$$s = (k * s^t) / d$$

Where s^t is the transmitted signal strength and k is other factors affecting signal (interference).

The MBS scans the neighboring base stations and calculates div parameter for each base station. Then MBS sorts the BS's in diversity set using sorting algorithm in descending order such that the BS having maximum value of div is on the top of diversity set. When a mobile station gets registered to a base station (ABS), it sends SCAN_REQ message to ABS, it responds to this message

by sending the data of its neighboring base stations through SCAN_RSP message. With this data the mobile station will choose the MBS having maximum value of div parameter. That is mobile station will communicate with best suited target base station so at any point if ABS goes down, the mobile station can easily switch to MBS. As the mobile station is moving continuously the diversity set is required to update according to current location of mobile station. If the div value of MBS goes below the threshold value. It will send the stored information to ABS and ABS will select new MBS the mobile station.

III. SIMULATION

In simulation we are using network simulator program (version 2.34). In this we have find the average results of throughput, end-to-end delay and packet delivery ratio. As the previous work on handover using technique was alpha and it was simply based on the probability factor. But in this efficient method to carry a soft handover firstly it will maintain a diversity set then it will calculate the various factor like distance, congestion and signal on each base station. Then by finding the appropriate values depends on the factors it will give the handover to the target base station. As we are using mobile WiMax it will give good coverage as well as speed. So it will give more efficient results as compare to the previous research in term of throughput, end-to-end-delay and packet delivery ratio.



Fig. 1:End-to-end delay graph using alpha and beta method



Fig.2:Packet delivery ratio graph using alpha and beta method

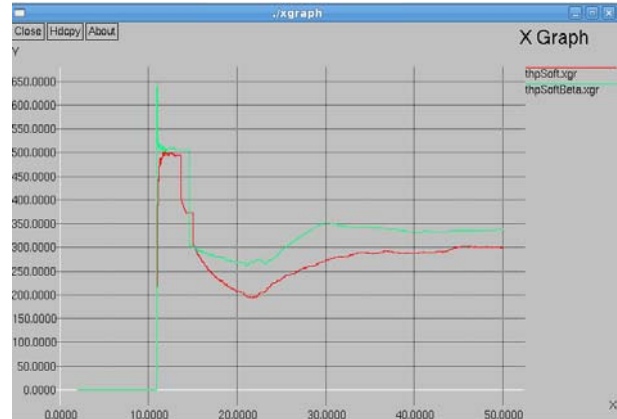


Fig.3:Throughput graph using alpha and beta method

Simulation will give the more efficient results using beta method known as efficient method in soft handover. This method will avoid the packet loss and any kind of interruption during a phone call. There will be great increase in throughput and packet delivery ratio and decrease in the end-to-end delay. This scheme gives more efficient results as compare to the previous results.

IV. CONCLUSION

From the proposed scheme, it will make a soft handover efficient by 90%. It will make effect on throughput, end-to-end delay and packet delivery ratio. As we are using mobile WiMax then it will also works to improve the quality of service and balance the load by checking each base station congestion and distance factors. These factors have a great impact on the handovers. For an efficient handover it is necessary there will be no packet loss and the frequency band must be reused. So this is an efficient method for soft handover (beta) also known as path lost exponent. So in this the beta efficiently adjusts itself according to the available conditions and makes a soft handover decision more efficient. So the beta varies according to the available network conditions. In future work we will make some hybrid methods that are efficient for different conditions such as the number of BTS at long distances or heavily congested BTS that find near distance. Thus it can be implemented in real situation.

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