Handover Improvement Techniques in Mobile WiMAX–A Comparative Analysis

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Abstract

Mobile WiMAX is a wireless technology based on IEEE 802.16e standard for broadband wireless access. Mobile WiMAX introduces the most significant new feature, mobility to support for handovers, which can be considered as a basic requirement for mobile communication system. The main issue in mobile WiMAX network is the handover delay which occurs due to excessive scanning of frequencies by the Mobile Station (MS) in order to select a Target Base Station (TBS) as well as during the actual handover from the serving Base Station (SBS) to the TBS. In this paper survey of different algorithms for the improvement of handover in mobile WiMAX is done.

Keywords: Mobile WiMAX, Handover, Handover delay

1. Introduction

Worldwide Interoperability for Microwave Access (WiMAX) is an emerging technology that enables the delivery of last mile wireless broadband access as an alternative to wired broadband access such as cable and DSL. It provides a convenient way to build a wireless metropolitan area network (WMN) [5]. WiMAX is a wireless telecommunication technology based on the IEEE 802.16 standard. It uses licensed spectrum to provide high speed wireless data transmissions over long distances in many different ways. Nowadays there are two versions which are interesting for common use: A fixed usage model (IEEE 802.16-2004) and A portable usage model (IEEE 802.16e) more familiar terms for these are Fixed WiMAX and Mobile WiMAX [2]. Mobile WiMAX users have the characteristic of mobility which allows users to move anywhere at any time and be served as long as there is network coverage within the area. Mobile WiMAX (802.16e) provides mobility support at frequency bands between 2 and 6 GHz. Mobile WiMAX introduces OFDMA and supports several key features necessary for delivering mobile broad band services at vehicular speeds greater

than 120 km/hr [3].The basic mean of WiMAX handover is to provide the continuous connection when mobile station (MS) migrates from an air interface of one Base station (BS) to another air interface provided by another BS. Currently in mobile WiMAX two major types of handovers (HO) are defined [1]. They are: Hard Handover (HHO) and Soft Handover (SHO). HHO is set as mandatory for MS with low speed while SHO is optional particularly in case of MS with High speed. SHO is further divided into two types: Macro Diversity Handover (MDHO) and Fast Base Station Switching Handover (FBSS) [1].

WiMAX Features

- High capacity all IP- based technology
- Allows non line of sight (NLOS) broadband connectivity with the BS.
- Well defined Quality of service (QoS) features for real and non- real time IP- based applications.
- Easy to organize and cost-effective
- Very high data rate
- Coverage:1- 10 miles

2. Literature Survey

Techniques/Algorithms for Minimizing Hand over Delay

In Mobile WiMAX, the Received Signal Strength Indicator (RSSI) is used to measure the signal strength of each BS. When the RSSI of SBS is lower than that of TBS the handover is executed. The MS scans the multiple BSs and selects the most suitable BS as the TBS. The TBS selected is the most appropriate because of its stronger signal strength when compared to other adjacent BSs. But in order to select this TBS excessive scanning of the NBS needs to be performed by the MS [2]. Prashant shinde presented a methodology using an implementable enhanced

handover target cell selection algorithm for WiMAX network. In this scheme the handover delay is minimized by reducing the Target Base Station to be scanned. The Target Base station is selected based on parameters like signal strength and effective idle capacity [3].

Arun Khosla et al [8] presented the mobility improvement handover scheme in which threshold Handover value greatly depend on velocity of the MS and scanning trigger value and skips some unnecessary handover stages, reduces handover delay by adjusting the handover parameters. Sayan K. Ray introduced Mobility management in IEEE 802.16e based wireless Metropolitan Area Network. In this scheme prediction of target Base station is done on the basis of two databases: TMDB (Temporary Movement Database) and PHDB (Potential Handover Database).This prediction saves the time-consuming unnecessary scanning activities to select a target base station [4]. .Shreedatta S. Sawant et al presented scheme for Minimizing Excessive Scanning of Target Base Station by Mobile Station using GPS. In this scheme GPS is used to find the position of Mobile Station and determines the nearest base station to which the Mobile station heading to and list out only probable Base stations [7].

Mary Alatise et al presented a combined method of signal strength and distance to initiate fast handover. In this scheme they have considered the distance as a parameter in initiating the potential handover activity i.e. depending on the distance between the BS and MS the handover is executed. [5]. Shreedatta S. Sawant et al presented a dynamic distance handover scheme to reduce handover delay in case of fast moving MS. This scheme makes use of dynamic distance threshold for the handover which is set depending on the velocity of the MS on when exactly handover should begin in order to reduce the delay incurred in deciding handover [7].

3. Comparative Analysis

Table .1 Comparative analysis of different techniques for handover in Mobile WiMAX

No.	Techniques/ algorithm	Advantages	Limitations
1.	RSSI (Received signal strength Indicator) technique [2]	Used for Selection of TBS for Handover	Excessive scanning of Neighboring base station (NBS) is required
			handover delay and packet loss occurs.
2.	Enhanced handover target base station selection algorithm [3]	Scan less neighbor base station thus reduced handover latency	Handover latency is slightly reduced in comparison to convectional handover scheme based on RSSI
3.	Prediction of TBS using two database: Temporary movement data base (TMDB) and Potential handover database (PHDB) [4]	Saves time consuming unnecessary scanning activities to select a target base station	For limited no. of MS and BS
4.	Combined method of signal strength and distance to initiate fast handover [5]	Reduced handover delay	Inconvenient for fast moving MS
5.	Minimizing Excessive scanning using GPS technique [7]	Fast handover is performed using GPS, Provides accurate locations, minimizes number of frequencies to be scanned	GPS is quite complex and costly to implement
6.	Dynamic distance handover scheme [7]	Reduce handover delay occurring in case of fast moving MS reduce packet loss	

4. Conclusion

Survey of various Handover Improvement schemes for minimizing handover delay during excessive scanning of frequencies by the Mobile Station (MS) in order to select a Target Base Station (TBS) as well as

during the actual handover from the serving Base Station (SBS) to the TBS is done in this paper.

5. References

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