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Implication on Handover Schemes In Mobile Wimax

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Abstract:

Mobile WiMAX (IEEE 802.16e), where WiMAX stands for Worldwide Interoperability for Microwave Access within the past some years has been developedas one of the most important technologies is the flexibility in the Metropolitan Area Network for users with a high-speed wireless network. IEEE 802.16e provides users with the ability to use wireless broadband connectivity even when the device travels. Mobility brings with it the need for transfers which happens as users switch from cell to cell. The connection between the mobile terminal and the base station serving will break off during the handoff process. We discussed the procedure and types of Mobile WiMAX handover in this paper.

Keywords-Handover,Procedure of Mobile WiMAX Handover,Types of Handover, IEEE 802.16e,

I. INTRODUCTION

WiMAX means "Worldwide Interoperability for Microwave Access" founded on the standard IEEE 802.16 standard [7]. This is abroadband wireless technology providing high speeds for long distance in metropolitan areas [8]. It is the technology that is able to provide triple services(voice, video and data) [1]. The initial IEEE 802.16 standard do not support mobility and IEEE 802.16e-2005 has been introduced for this purpose[14]. It is also sometimes called Mobile WiMAX, which allows full mobility of users[8].It allows the user to move freely until data transmission is possible means users moves from one cell to another cell [14].This fulfills the demands for fast wireless data speeds, low cost and wide area coverage fruitfully[8]. A transition (HO) process is important when a client transfers from one cell to another to switch the wireless connection from the BS server to the current BS

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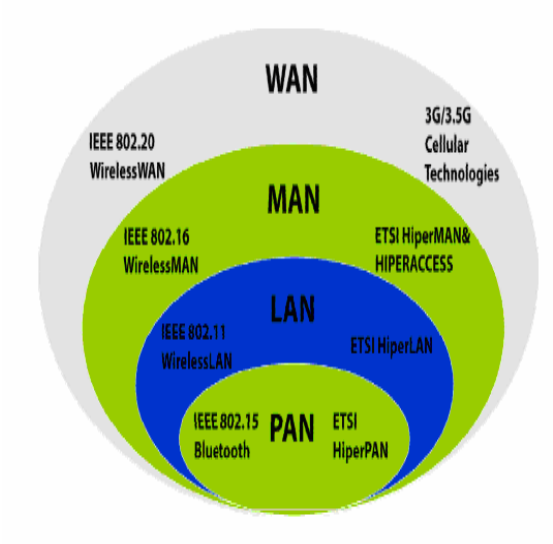
without interrupting any contact in progress[8]. So, in Wireless Networks, Handover is a supreme and prominent concept where the states handles and govern transmission from one MS to another BS. This scheme may occur when one BS is distributed by the MS and another BS is entered. The overloading of BS by requests may be another prevailing explanation for a switch in BS. The BS is often called the SBS in combination with the MS before HO, while new BS is called TBS. [19].

Figure 1, shows the various wireless standards.The Wireless Metropolitan Area Network is



the working group for IEEE 802.16 [20].

Figure 1: Wireless Standards [1]

The Workgroup could be a unit of the IEEE 802 LAN/MAN Standards Committee [1].

Table 1: Summary of IEEE 802.16 Standards [1]

Standards	**IEEE 802.16**	**IEEE 802.16a**	**IEEE 802.16e**
Mobility	Fixed	Fixed	Movable
Bit Rates	32 to 134 Mbps	Upto 75 Mbps	Upto 15 Mbps
Channels Condition	Line of Sight	Non Line of Sight	Non Line of Sight
Frequency	10 to 66 GHz	< 11 GHz	< 6 GHz

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Completed	December 2001	May 2004	Mid 2005

II. RELATED WORKS

Lee E., et al.[2017] developed a fuzzy logic-based handover decision methods that needed or did not determine a handover. Authors found that the induced transfer to the WiMAX network depends on particular factors such as altitude and speed[25].

Sharma P., et al.[2016] suggested a fuzzy-based model that minimized horizontal WiMAX handover latency. Additionally reduced packet loss as handover delay and amplified system efficiency. Authors concluded that the delay of handoff reduced the true handoff by more than half. As the transfer delay decreased the loss of the packet and increased the output of the system[2].

Kammoun A., et al.[2016] suggested a vertical handover decision algorithm for the initiation of the handover and the utility function for the choice of the network by and on the fuzzy logic model. Authors refer to the algorithm based on the RSS. Authors have reported that the proposed algorithm has higher performance when bloating mobile speed[9].

Zineb A., et al.[2015] suggested a fuzzy logic-based on the vertical handoff's decision algorithm to decide whether the handoff is needed or not and pick of finest access network of candidates in the shortest possible time. A Multiple Attribute Decision Making (MADM) methodology was used by authors to make proper decisions about the transfer. The authors concluded that the decision time had been increased by 40% compared to the traditional method [6].

Suganya C., et al.[2014] discussed the handovers and their functions used by the moving user in both homogeneous and heterogeneous networks,. Authors concluded that hard handovers are mostly used and the quality of these handovers was seamless[5].

Yadav J., et al[2014] suggested a technique to pick the most effective base station for future soft wire transfer in WiMAX and compared the quality of services with hard wire transfer and soft wire transfer. Authors found that, once the mobile station moves at a speed of 20 m / s, this technique provided a seamless transfer in Mobile WiMAX [14].

Omar K., et al[2014] discussed two main interworking frameworks ; namely, MIH and IMS for the seamless vertical handover in the heterogeneous networks and further proposed algorithm depend on MIH using fuzzy logic. Authors concluded that the proposed algorithm reduced chance of VHO connection failure by up to 75% [4].

Khan A.N., et al[2013] addressed a number of mobile WiMAX handover techniques (including the latency reduction,cross-layer handover, techniques in handover by using

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flexibility patterns and some other algorithm of Mac layer handover) and compared proof of handover demand and latency. Authors concluded that the mobility pattern scheme is most appropriate and reduces HO latency by nearly 50%[8].

Nandal D., et al.[2012] suggested an overview of the standard procedure for Mobile WiMAX handover and its different types. Authors have determined that for the pre-initiation handover process, network topology acquisition as well as target BS association, neighboring base station (BS) scanning and network topology adsis done by its backbone network[7].

III. HANDOVER IN MOBILE WIMAX

The ability to change the Base Station (BS) service is a special demand for a mobile device if the Mobile Node (MN) hits another BS with superior communication quality[5]. Handover / Handoff (HO) is characterized as a process in which the mobile node (MN) transits from one of the BS air interface to another BS air interface[5]. Essentially, it is used to hook up one base station to another base station to ensure the call's continuity[2]. When an MS moves between the coverage areas of the numerous BSs[10] from the current location to another as shown in Figure (2), it is the process of maintaining a connection in a communication session.

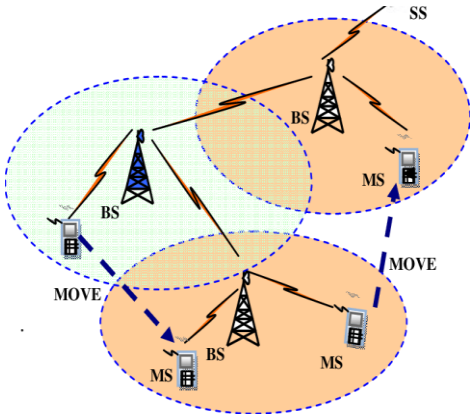

Figure 2: WiMAX Handover [19]

The reasons for HO can be various they are [5]:

1) RSS is not sufficient to maintain an acceptable contact at the edge of the cell, the call must be transferred to another cell as shown in Fig 3.

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2) When the MSS moves away from the region covered by one BS and reaches the area covered by another BS, the transfer of the relation between the MSS from current BS and the other BS is necessary before the MSS moves out of the scope of the first BS to avoid the termination of the call[16].

3) When the capacity of any BS to handle traffic is exhausted in order to accommodate more or more new calls, loaded BS allocates the current or newly originated call to the neighboring BS with overlapping coverage area[16].

4) A fast network sometimes changes its available network to the cheaper one in vertical handoff.

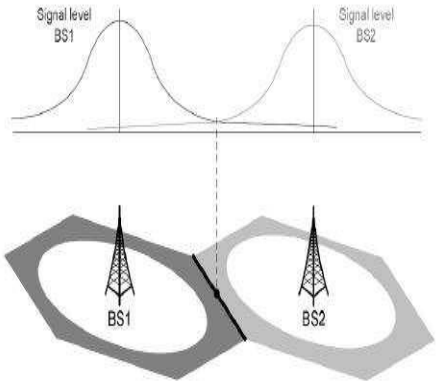

Figure 3: Need of Handover [7]

IV. TYPES OF HANDOVER

There are four major types of Handover in Mobile WiMAX [5]:

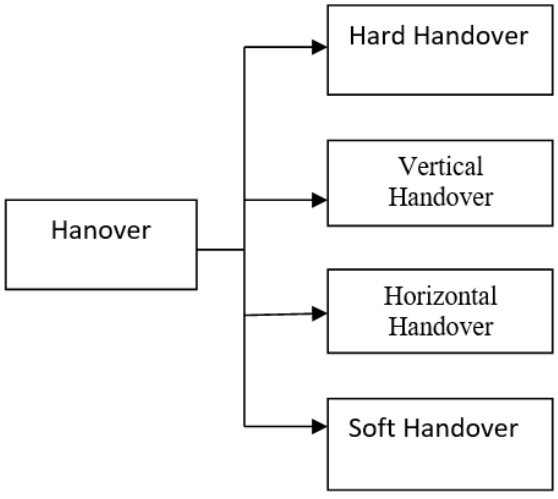

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Figure 4: Types of Handover

A. Horizontal Handover

Horizontalhandoff is the one that merely occurs within the same network i.e. when the mobile users shift between the networks with the same technology [10]. It is additionally known as layer 2 handover in Mobile WiMAX [1] that is shown by Fig 7.

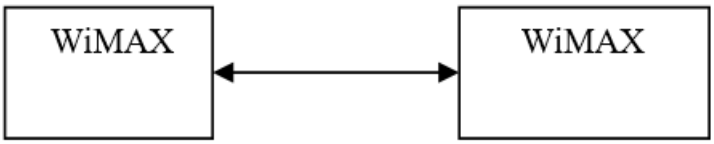

Figure 5: Horizontal Handover [2]

Fig 5 depicts,Horizontal transition, as MS transfers from the WiMAX network to the WiMAX network, i.e. both origin and goal BS are used under WiMAX standards[15].

B. Vertical Handover

Handoff occurs in the heterogeneous wireless network i.e. when the mobile users move in different networks which have different technology [10]. It is additionally referred to as layer 3 handover in Mobile WiMAX [2].

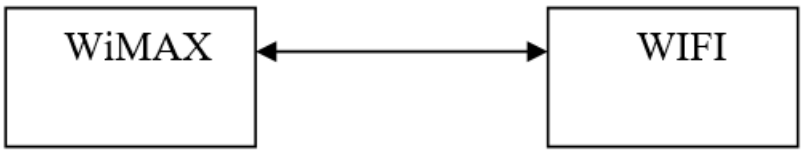

Figure 6: Vertical Handover [2]

Fig 6 shows Vertical Handover, When MSS switches from WiMAX to some other [like WiF] network, i.e. origin BS is used on WiMAX standard, but goal BS is used on WiFi (802.11)[16] as shown in Fig 7.

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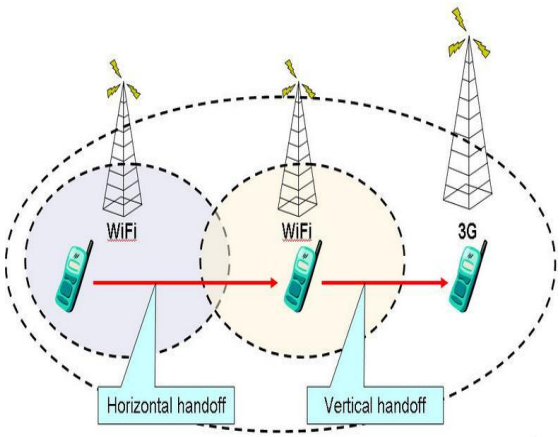

Figure 7: Horizontal and Vertical Handover [26]

C. Hard Handover

Hard handoff (HHO) is based on the principle of "break before make mechanism" means before connecting to new base station the connections with current base station should be terminate [2]. During HHO, the MS communicates to merely one BS at a time [7]. Hard handoff also occurs at a lower mobile speed [2].

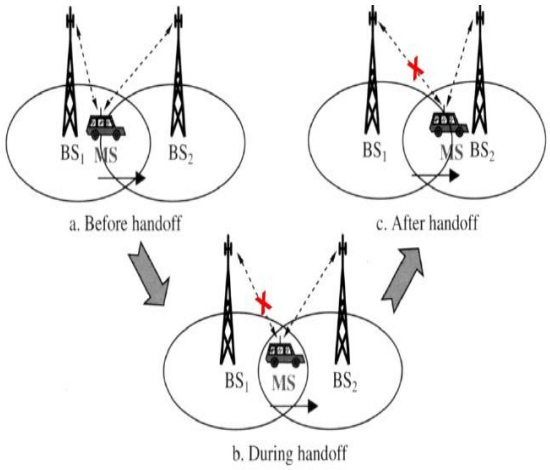

Figure 8: Hard Handover [17]

D. Soft Handover

Soft handover (SHO) isestablished on the standard of "making before breaking mechanism" meaning connections are established beforehand termination of currentconnection [2]. During SHO, a mobile station communicates with two base stations at the same time [7]. Soft handoff is basically used when the mobile speed is high [2].

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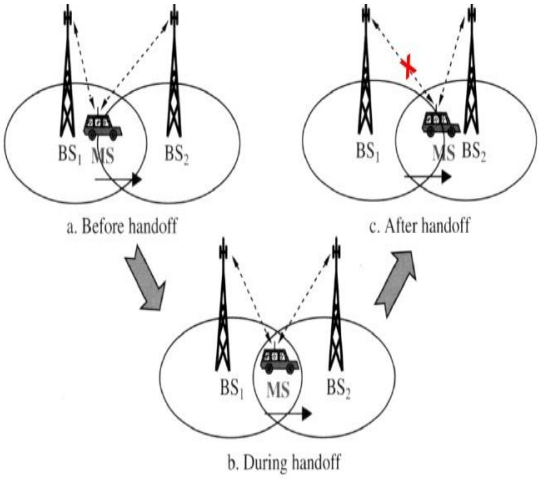

Figure 9: Soft Handover [17]

V. PROCEDURE OF MOBILE WIMAX HANDOVER

A handover is often seen as a switch to a neighboring base station(BS) to retain one link once transmitted signal decreases on current base station's coverage boundary. Therefore, the target wireless network's preference is that it is important for this phase of handover. Dividing the process into the four phases[25]:

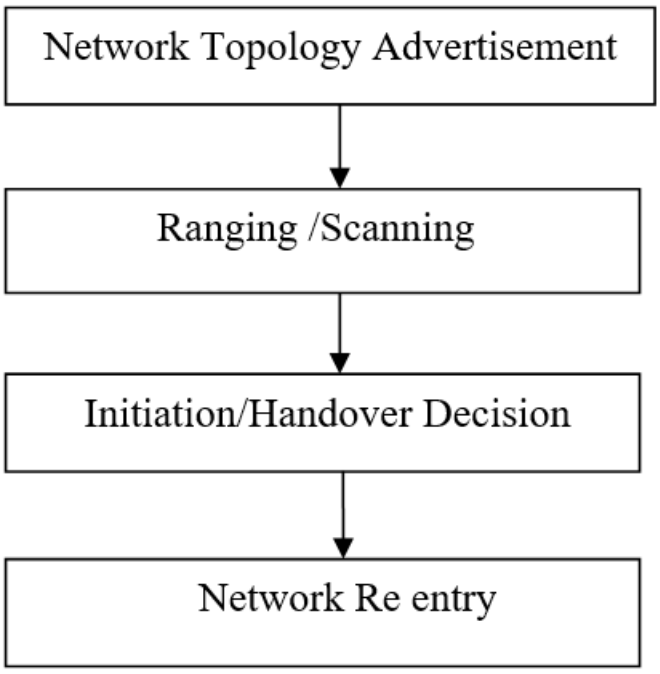

Figure 10: Steps of Mobile WiMAX Handover

The handover method is shown in Fig.11[6][25].

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Phase 1: Network Topology Advertising BSs broadcast at least every 30s regularly Mobile Neighbor Advertisement (MOB NBR ADV)[6]. Such messages include network information such as the number of adjacent BSs, channel information for each adjacent BS, their physical frequency, downlink and channel descriptor uplink (DCD / UCD) according to the identity of each adjacent BS (BSID). The MS becomes attentive to neighboring BSs through such broadcasts. Then the second phase ends with the MS.

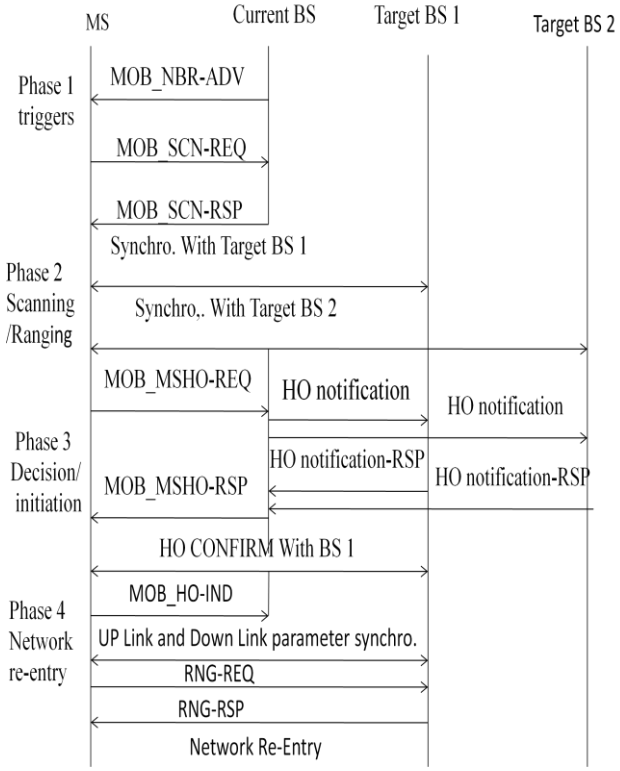

Figure 11: Handover procedure. MOB NBR-ADV = the mobile neighbors advertisement control; MOB SCN-REQ = the mobile scanning requests; MOB SCN-RSP = the mobile scanning responses; RNG-REQ = the ranging requests; RNG-RSP = the ranging responses; MOB MSHO-REQ = the mobile station handover requests; MOB BSHO-RSP =the mobile base station handover responses [25].

Phase 2: Scanning/ranging Procedure

The MS scans and coordinates with neighboring BSs in the second phase of HO depend on neighboring advertising channel data. If the synchronization is successful, the ranging process will be initiated. Next, on the side of the target base station list, the mobile station sends one mobile scanning request (MOB SCN-REQ) message to base station. The other

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answers by message mobile scanning response (MOB SCN-RSP) to assign an inquiry amount to the mobile station [25].

Phase 3: Handover Decision/Initiation

Mobile Station Handover Request (MOB MSHO-REQ) message or the Mobile Base Station Handover Reaction (MOB-BSHO-RSP) message[25] may initiate the handover decision and initiation.

Phase 4: Network Re-Entry

Upon completion of the physical parameter range procedure, the relationship between mobile station and base station will be determined by a network re-entry system. In broad, negotiation, verification and registration are included in this process. Upon completion of thenetwork re-entry, the packet transmission will be resumed by the new channel [25].

VI. CONCLUSION

In Mobile WiMAX, the network mobility management is that the core issue. When Mobile Station moves continuously, handover is required to transfer the MS form current BS link to another BS to avoid termination of the call. As a result, the delay in handover must be as minimal as possible. As the lag of handoff decreases and the amount of packet loss also decreases. Network topology acquisition as well as the target BS association, neighboring base station(BS) scanning, and network topology ads were performed by the backbone network within the handover phase prior to initiation of HO.

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