RESEARCH PAPER | Engineering | Volume : 3 | Issue : 10 | Oct 2013 | ISSN - 2249-555X

Effective Handover Mechanism for Wimax Networks

KEYWORDS: Handover, Quality of Service, handover delay, Distance of the nodes

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ABSTRACT *The present work proposes the modified handover mechanism for Wimax networks. The modified handover mechanism guarantees the improvisation of the delay time of the handover process. The delay time of the handover mechanism is has reduced with the location of the mobile nodes in WiMAX networks. A number of simulation scenarios illustrating handover between WiMAX and 3G networks are evaluated. Our results indicate that mechanism can reduce more than 98% handover delay in WiMAX networks.*

INTRODUCTION

The Wireless Networks have been developed rapidly during the last decade and have become widely adopted as many device manufacturers integrate more network interfaces into their devices [1]. Many cell phone models support both Wi-Fi and third generation (3G) wireless networks. Notebook computers are available with built-in support for Wi-Fi, WiMAX, and 3G [1]. As this trend towards multi-interface devices continues, the need for sophisticated resource and mobility management mechanisms arise. Location based Handover LBH is a draft standard under development by the IEEE 802.21 working group [2]. This trend proposes to support the seamless session continuity during network migration. It defines a framework which significantly improves handover performance between heterogeneous network technologies [1]. It also defines a set of tools to exchange information, events, and commands to facilitate handover initiation and handover preparation [3]. IEEE 802.21 does not attempt to standardize the actual handover execution mechanism [4]. Therefore, the LBH framework is equally applicable to systems that employ mobile IP at the IP layer as to systems that employ Session Initiation Protocol (SIP) at the application layer. In this paper, we design the location based Handover Mechanism for WiMAX networks [4].

In particular it is focussed on the predictive location of the mobile nodes event which relies on a fast handover mechanism using L2 triggering. Implementations specified by the National Institute of Standards in Technology (NIST) propose a handover probability value which is calculated using received signal strength and the threshold of received signal strength to determine[2]. This paper focuses on the optimization of the calculation of the handover probability value considering the Mobile Node's (MN) velocity [5]. Several simulated scenarios are undertaken which utilize NS2 and the WiMAX mobility package from NIST [6]. Our results indicate that handover time reductions of up to 95% are achievable using the location of the mobile node based approach.

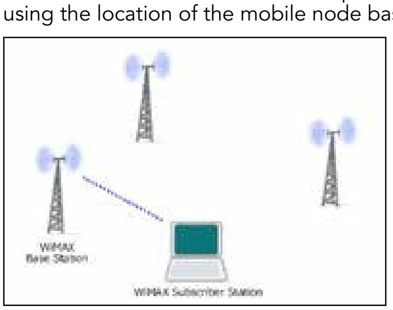

Figure 1. Communication model of WiMAX

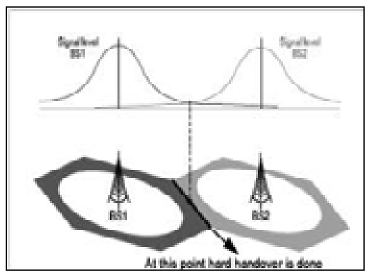

Figure 2. Handover signal level of BS.

Also known as "break before make", means that in this type of handover mechanism the connection of MSS with source BS is first terminated before the establishment of connection with another i.e. target BS [5]. In this manner the MSS is connected with only one BS at a given piece of time [5]. The hard handover is so quick that it is not perceptible to the user of MSS, and also provided with a failure management system that in case if the connection establishment to the target BS is failed than the connection is reestablished back with the source BS [4]. The mechanism of handover can be shown in Figure 1, which clearly shows that hard handover is done when the signal strength of the source BS has dropped below that of the signal levels of target BS.

LITERATURE SURVEY

Overview of Handover mechanism

Worldwide Interoperability for Microwave Access (WiMAX) supports multimedia applications. Then it is necessary to provide Quality of Service (QoS) guaranteed with different characteristics [7]. Therefore, an effective Handover (HO) is critical for the WiMAX systems. In this paper, it was tried to improve the Handover in WiMAX is significant due to effect on Handover time and latency. By simulation, we want to show that handover process and decrease latency of handover in WiMAX [7].

IEEE 802.16e WiMAX standards specify hard handover as mandatory whereas the soft handover as optional for BS and MSS both. Hard handover has an advantage of using only one channel at a time during call whereas soft handover uses two or more than two, due to which the MSS's hardware has to be specific to handle more than one channel at a time, which is quiet complex and expansive [7]. The handover time in hard handover is very small such that it is not perceptible to the user whereas it can be larger in case of soft handover [8]. Hard handover is possible only in case low speed mobil-

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ity of about walking speed of low vehicular speed where as at higher speed soft handover is needed [3]. Hard handover provide lesser connection reliability whereas the connection reliability is much higher in soft handover [8]. The reason to this is, in case of hard handover other connection is established on the release of the current one so in case the targeted connection is failed the call is dropped, whereas in case of soft handover as source connection is not released up to the moment till the target connection is established so, the chances of call drops are minimal and only observed in case of interference or fading of the source channel, which is rare [1]. As, in during soft handover single MSS uses several channels for the single call so, due to this the overall capacity of the network is decreased as single node is involving more than one channel which in turn cannot be made available for other MSS's for new call [3]. Also, in soft handover the call rates are costlier as more than one channel is occupied for single call .

Handover, as the process of transferring data communication from one sensor node to another without breaking the original link, is necessary to be triggered when an existing link deteriorates in the middle of data transmission [8]. In order to justify a handover, the duration of data communication should be comparatively long and the probability of link disconnection should be reasonably high [8].

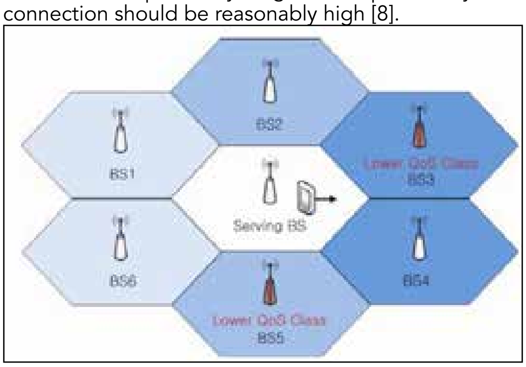

Figure 3. QoS for Base station.

Recent Resarches in Handover

For seamless handover in heterogeneous wireless networks, service continuity and minimal handover disruption time are the primary goals [2]. A Link-Going-Down event implies that a Link-Down event is imminent within a certain time interval. Therefore, the effectiveness of the Link-Going-Down trigger is critical in achieving this goal. If a Link-Down event isn't received within specified time interval then actions due to a previous Link-Going Down may be rejected, as in, those events will minimize connectivity disruption during link switching and influence the handover performance [1]. The timing of a the triggering of a Link-Going-Down event is a tradeoff between (a) a delayed trigger, which will lead to a long service disruption [2], resulting in packet lost and delay (b) an early trigger, which may force the handover to a new interface even when the link quality of the old interface is still sufficient to decode data. Previous Link-Going-Down algorithms are based on pre-defined thresholds associated with the received signal strength [1]. If the current received signal strength's value crosses the received signal strength threshold, then the Link-Going-Down trigger is generated and the handover process starts. Based on the Fritz path loss model the received signal strength depends on the path loss exponent and the distance from the transmitter which are both time-varying parameters [1].

$$Rxavg.new = \alpha \times new\_val + (1-\alpha) \times Rxavg.old$$

The weighed strength threshold *Pth* is calculated in the *Prxthred* is the threshold level of the received signal strength. αlgd is the anticipation factor, which is defined a configurable constant larger than 1 [1].

In order to test the performance of our VOSHM handover algorithm for WiMAX networks we use NS2 together with the NIST mobile package [1]. Figure shows the topological structure of the simulated network. There are 8 nodes; the Router (Node3) is the sender and the Multiface node (Node5) is the receiver. There are two base stations in the networks, one is a WiMAX base station (Node6) (coverage is 500m) and the other one is a UMTS base station (Node1). The mutiface node has two interfaces, one is a WiMAX interface (Node 7) and the other one is a UMTS interface (Node2) [5]. In this test scenario, the Node3 starts sending a Constant Bit Rate (CBR) traffic stream with a packet size of 500 bytes at 0.02 second intervals at the beginning and the mutiface node will move out of the WiMAX coverage with different speeds of 1m/s (m/s: meters/second), 2m/s, 5m/s, 10m/s, 20m/s and 50m/s. (Here we have only considered speeds under 50m/s, more experiments for high speeds will be done in the future).

PROPOSED SYSTEM
Quality of Service (QOS)

Support for QoS is a fundamental part of the WiMAX MAC layer design. WiMAX defines a concept of a service flow. A service flow is a unidirectional flow of packets with a particular set of QoS parameters and is identified by a service flow identifier (SFID) [6]. The QoS parameters could include traffic priority, maximum sustained traffic rate, maximum burst rate, scheduling type, ARQ (automatic repeat request) type, maximum delay, tolerated jitter, and so on. Service flows may be provisioned through a network management system or crated dynamically through defined signaling mechanisms in the standard [6]. The base station is responsible for issuing the SFID and mapping it to unique connection identifier (CID). Figure demonstrates the process of connection between BS and MS with service flows. Mobile WiMAX QoS Support When some type of data service (voice, data) is wanted to be offered, a connection has to be created between the BS and the MS. This is done by a unidirectional logical link between the peer MACs [6]. The service flow has certain QoS parameters that give the scheduler a chance to do decisions for transmission priorities.

In this node representation we have 5 nodes with one sink. We are taking 4 nodes as mobile nodes and then 1 node as a base node. The node 2 is the node which is around the region only. But incase of 3, 4, 5 are the outer nodes which are use to find out the location.

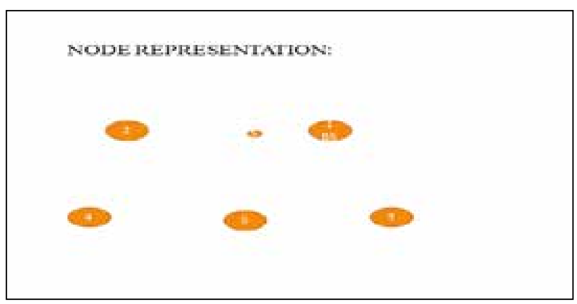

Figure 4.Node Representation

The handover time has been calculated with the speed of handover mechanism [3]. The speed and the distance are the two important parameters which are used to find the handover time. Then we need to calculate the handover delay, which is nothing but the delay of received packets in the nodes.

Configuration of Nodes
i) Configuration of Base Station

Base station set X_550.0
Base station set Y_550.0
Base station set Z_0.0
[bstation set mac_(0)]

Set channel 0.

ii) ***Configuration of Mobile Nodes***
ns node_config_mactype
mac/ 802.16
wired routing off.

iii) Speed and Distance
Speed 0 1.0
Speed 1 5.0
Speed 2 5.0
Set Start 1.0.
End 6.0.
Set X1 [$ node (0) set X]
Set Y1 [node (0) set Y]
Set X2 [bstation set X]
Set Y2 [bstation set X]

We have calculated the distance of the every node by the expression ,

Set Distance [expr sqrt ((x2-x1) * (x1-x2) + (y2-y1) * (y1-y2))] .

Location of the Nodes
i) Location of the nodes with axis

The X, Y and Z axis points should be the important notes of the axis. Then we need to calculate the handover delay, which is nothing but the delay of received packets in the nodes. The table has been representing the node location of the topology [4].

Table 1. Location of the node.

Node	X	Y	Z
0	340.0	550.0	0.0
1	650.0	250.0	0.0
2	250.0	250.0	0.0
3	450.0	250.0	0.0

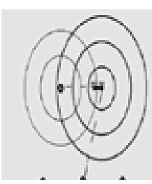

Figure 5. Communication b/w BS and MSs.

The location has been delivered with respect to the axis of the node. It depends on the biological representation of the points of the nodes. The X,Y and Z axis points should be the important notes of the axis. Then we need to calculate the handover delay, which is nothing but the delay of received packets in the nodes. The table has been representing the node location of the topology.

The location based diagram has defined by the topology. Then the sink has connected with Base station. The sink has been linked with the base station for data transferring in the WiMAX networks. The mobile nodes have been connected with the data nodes. The base station should be connected with node 3, 4, 5 mobile nodes. Then we need to calculate the distance of the nodes. And then we need to calculated speed of the node.

The proposed work on a handover algorithm that takes into account the service type required by the different service flow running at the MS, minimizing the handover time and selecting the best possible target BS within the framework of IEEE 802.16e standard[6]. The algorithm does not require any modification to the existing standard. This paper is organized the handover mechanism and Performance analysis results [7].

Handover Calculation
The Handover calculation has made by the result of the speed and the distance of the nodes. The Handover calculation result should be explained with the hand over delay of the nodes in the Wimax networks.

* Set Handover [expr sqrt ((distance 1 – distance) * (distance 1 - distance) + ((speed 2 - speed 0) * (speed 2 - speed 0))].
* Set Handover [expr sqrt ((distance 2 – distance 0) * (distance 2 - distance 0) + ((speed 1 - speed 0) * (speed 1 - speed 0))].
* Set Hand [expr (handover 1 + handover) / (Start + End)] .

The handover delay comprises of delay due to switching of the channel and network entry, it consists of the synchronization delay and ranging and registration latency, usually it is a constant value which link technology specified at all speeds and distance. However the handover delay is not a constant value which can be reduced [4].

The most important factor in handover is the delay contributed due to the neighbor discovery mechanism. Once the connection is established, a Link UP is detected by the location, which triggers a Router Solicitation (RS) message to discover the prefix of the new link. To reduce the handover delay, the MN needs to finish the handover before the current link breaks [5].

Handover triggers can provide information about events which can help and above entities better streamline their handover uses the predictive Link-Going-Down event which relies on a fast handover mechanism using L2 triggering. Link-Going-Down trigger can be used to indicate “broken link is imminent” and notify the upper layers for making a preparation to start handover produce; it is used as a signal to initiate handover procedures, so the handover can be done before the current link break.

Hand Over Delay Calculation
Handover time(ms)

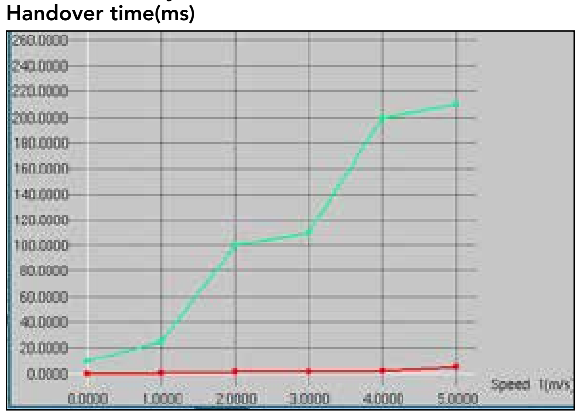

Figure 6. Handover Delay time.

The Handover calculation has made by the result of the speed and the distance of the nodes. The Handover calculation result should be explained with the hand over delay of the nodes in the Wimax networks.

Simulation Results

Handover time 1 ----- 106.30304
Handover time 2 ------ 214.30140
Total Handover time with delay time ----- 45.8006
No.Of Packets sent 391.
Total no.of packets sent through Base station 1060.

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The Handover time of the node 1 has been calculated with the speed of node and then the distance 106.30304.

The Handover time of the node 2 has been calculated with the speed of node and then the distance 214.30140.

The total handover time with the delay time has been calculated by the handover times between the nodes.

The total no. of packets has been sent through the Base station is 1060.

Performance Analysis

	Starting time (ms)	Ending time (ms)	Difference In time (ms)	Handover delay time(ms)
Exsisting method	34.88875	34.92001	0.03126	31.225
Our modified method	106.30304	214.30140	107.99836	45.8006

From the huge difference of the handover time the results has shown in the table. From our existing method the handover delay time has 0.03126.And the proposed system difference is 107.99836.

The delay has been reduces in the modified system with the improvement of the handover delay by 98%.

FUTURE WORK

Supporting mobility is both promising and challenging feature of the emerging IEEE 802.16e wireless networks, commonly known as WiMAX. Although the IEEE has released an amendment to the original IEEE 802.16 standard in which mobility and handover are added as basic capabilities, the amended standard (IEEE 802.16e) defines only a frame work without providing specific methods or algorithm for handover that can be deployed in mobile stations to enable them to switch seamlessly from one base station to another. In this paper, we propose a new handover algorithm for deployment in 802.11ecapable stations [5]. The algorithm takes into consideration the main important aspects of IEEE 802.16 operation such as ranging, authorization, and registration [5]. A special capability built into the proposed algorithm is service-flows awareness, i.e. the algorithm tries to minimize the time spent in handover based on the service flows running at the mobile station [5]. Analysis of the proposed algorithm shows that handover time can be reduced by several folds by taking advantage of different capabilities provided by the standard with the improvement of the handover delay in 98%.

CONCLUSION

Thus we have proposed the modified handover mechanism for WiMAX networks. The modified handover mechanism guarantees the improvisation of the delay time of the handover process. The delay time of the handover mechanism is has reduced with the location of the mobile nodes in WiMax networks. A number of simulation scenarios illustrating handover between Wimax and 3G networks are evaluated. Our results indicate that mechanism can reduce more than 98% handover delay in WiMax networks.

REFERENCE

[1] A New Method for Handover Schemesin Mobile WiMAX Zahra Taheri Hanjani, Neda Navidi, Reza Sedghi and Majid Bavafa Department of Electrical Engineering, Natanz Branch, Islamic Azad university, Natanz,Iran. J. Basic. Appl. Sci. Res., 2(7)6523-6531, 2012 © 2012, TextRoad Publication ISSN 2090-4304 Journal of Basic and Applied Scientific. | [2] Yu, Yongxue, "Handover performance in the mobile WiMAX networks" (2009). Graduate School Theses and Dissertations. | [3] Jong-Moon Chung, Jae-Han Seol, Sang-Hyouk Choi (2007). Media Independent Handover in Broadband Mobile Networks. Proceedings of the 6th WSEAS International Conference on Electronics, Hardware, Wireless and Optical Communications table of contents Corfu Island, Greece. | [4] S. Yoo, D. Cypher, N. Golmie (2008). Timely Effective Handover Mechanism in Heterogeneous Wireless Networks. Journal, Wireless Personal Communications. | [5] IEEE 802.21. Media Independent Handover Services. IEEE Standard under development. http://www.ieee802.org/21/. | [6] IEEE Standard 802.16e-2005. Part16: Air interface for fixed and mobile broadband wireless access systems Amendment for physical and medium access control layers for combined fixed and mobile operation in licensed band. December 2005. | [7] WiMAX Forum: Mobile WiMAX—Part I: A technical overview and performance evaluation. White Paper. March 2006. http://www.wimaxforum.org/ | [8] Ma, C., Fallon, E., Qiao, Y.: VOSHM: a velocity optimized seamless handover mechanism for WiMAX networks. Ninth IT & T Conference, Dublin Institute of Technology, Dublin, Ireland, 22nd. - 23rd. October, 2009. |