Review Paper: To Reduce The Handover Delay In Wimax When The Mobile Station Moves At Higher Speed.

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ABSTRACT

The real potential of the broadband wireless networks lies with the mobility. WIMAX is a Wireless Interoperability for Microwave Access. It is a telecommunication technology that provides wireless the data over long distances in several ways, from point-to-point links to the full mobile cellular type access. The main consideration of Mobile Wimax is to achieve seamless handover such that there is no loss of data. In this review paper we have compared different techniques which provides no data losses when the mobile station moves at higher speed. In this we discuss the combination of adaptive forward error correction (FEC) with retransmission which provides the extra protection for handover signaling messages to enhance the probability of a successful handover, especially at a higher velocity, Media Independent Handover (MIH) standard which proposes a new neighbor discovery mechanism, considering the hierarchical view of the network information, soft handover to avoid the data losses during handover by using base station selection procedure that will optimize the soft handover such that there is no data loss; handover decision is taken quickly and thus improving overall handover performance.

I. INTRODUCTION

The introduction of broadband wireless WiMAX solution based on IEEE 802.16 technology makes it possible a standard based low cost solution for the last mile [7]. In particular, with its coverage of 30 miles and non line of sight technology based on OFDM, it will be able to construct a metropolitan network where broadband access from anywhere within the area is possible. Handover is one of essential issues in mobile wirelessCommunications since it is needed to maintain uninterrupted services during user's movement from one location to another [3], [4]. It manages mobility between subnets in the same network domain (micro-mobility) and between two different network domains. The current mobile WiMAX standard defines handover operations to support micro-mobility for the point-to-multipoint (PMP) mode communication.Most previous work considered the handover performancefrom the viewpoint of the MAC or IP layer, but paid littleattention to the physical layer. That is, physical channelquality and/or user's mobility are not taken into account.Usually, handover occurs in the boundary of BS's coveragearea, where signals transmitted on the radio channel are weakand unstable. When channel quality degrades, both signalling messages and data packets are at a higher risk of being lostor corrupted.Moreover, user's mobility plays an important role in the handover process. The radio channel quality for mobile users at a higher velocity often suffers from severe degradation due to the Doppler frequency shift. Since the overlap area is limited between adjacent BSs, the requirement on handover latency is more stringent for users with higher mobility. In order to support full mobility (which means seamingless handover for users moving at a speed of 120 kilometer per hour or higher), these issues become severer and have to be addressed.

Specification known as IEEE 802.16e-2004 which is wireless but fixed, it lacks the ability for user to move during data transmission. The main purpose of Wimax is to provide users in rural areas with high speed communications as an alternative to expensive wired connections (e.g. cable or DSL). That is Wimax is capable to provide high speed internet to last mile connections. But this is not the only purpose of Wimax systems. Mobile Wimax allows the user to move freely during data transmission. The main consideration of mobile Wimax is that there should be no data loss when the moving user switches from one base station to another i.e. during handover. Handover is procedure when a mobile station changes the serving base station. The reason for handover could be relatively low signal strength or work load of base station.[3] Wimax is a state-of-the-art wireless technology which utilizes adaptive modulation and coding, supports single carrier (SC) and orthogonal frequency division multiplexing techniques (OFDM) and several frequency bands for different operation environments. WiMAX system is able to constantly monitor the quality of the radio channel and change its operational parameters (e.g. modulation and coding) accordingly.

The integration of various types of wireless technologies IEEE 802.11 Wi-Fi and IEEE 802.16 WiMAX allows mobile users to choose an optimum network interface in mobile users to choose an optimum network interface in accordance with the desired requirements in terms of quality of service,price, transmission rate, security and other characteristics. The IEEE 802.21 standard [1] aims to facilitate handover procedure in heterogeneous access networks by providing information, events and commands to the entities that assist in the handover decision. In this heterogeneity of the technologies, discovering the available access network is one of the main challenges. The standard [1] specifies a Media Independent Information Service (MIIS) server supporting various information elements that provide network information within a geographical area. Based on information from several access networks and operators, a mobile node

(MN) can take an optimized handover decision. There have been proposals [2]-[5] taking into consideration the IEEE 802.21 MIIS service for network discovery. Current literature considers the existence of only one MIIS server in the network which responds with neighborhood information. However, the number of network to the MN, causing handover performance delay.
There are many shortcomings related to the specification of single MIIS server

1) Too much information to store
2) Can represent a single point of failure
3) High discovery delay if the MIIS server is located many hops away from the MN.

II. FEC WITH RETRANSMISSION

To increase the successful handover probability of an MS at a vehicular speed, we need to establish more reliable wireless links in transmitting signaling messages besides using auto retransmission scheme. In this section, we investigate the improvement of the probability of a successful handover by adding extra protection for handover signaling messages. Forward error correction codes provide an error control technique for data transmission, where a sender adds redundant data to messages. These redundant data can assist the receiver detecting and correcting errors to further improve wireless channel quality. During the WiMAX handover procedure, signaling messages mostly consist of small data packets whose size is less than 50 bytes. Consequently, the amount of parity-check data needed for error correction in each message is small and the resource required by error correction does not increase excessively. In comparison, the cost of the only retransmission scheme is relatively higher. In other words, this method offersan efficient solution to improve the handover performance. Different FEC schemes have different error correcting capabilities. For the same type of FEC codes, the more the redundant data, the higher the error correction capability. For a given MS velocity, we can estimate the size of FEC codes in order to achieve the desired successful handover probability. And for the sake of simple, we can use the average successful message probability the higher the velocity of an MS, the more the number of bits needed in an adaptive FEC scheme to achieve the target successful handover probability. For example, to achieve a probability of 80%, 2, 10 and 28 bits have to be added into each handover signaling message when the MS is moving at a speed of 50, 70 and 90 km/h, respectively. Then, to achieve the target probability, we can adopt an adaptive FEC scheme that uses a different redundant bit size according to the MS velocity.

2.1.SOFT HANDOVER

The soft handover, in contrast to hard handover, establishes multiple connections with neighboring cells. Soft handover is used by the code division multiple access (CDMA) systems where the cells use same frequency band using different code words. Each MS maintains an active set where BSs are added when the RSS exceeds a given threshold and removed when RSS drops below another threshold value for a given amount of time specified by a timer. When a presence or absence of a BS to the active set is encountered soft handover occurs. The systems using soft handoff are Interim Standard 95 (IS-95) and Wideband CDMA (WCDMA).

III. METHODS OF SOFT HANDOVERS IN WIMAX

A. **Macro Diversity Handover (MDHO)**The MDHO supported by MS and by BS, the “Diversity Set” is maintained by MS and BS. The Diversity Set is a list of the BSs, which are involved in the handover procedure. The Diversity Set is maintained by the MS and BS and it is updated via MAC (Medium Access Control) management messages. A sending of these messages is usually based on the long-term CINR (Carrier to Noise plus Interface Ratio) of BSs and depends on two thresholds: Add Threshold and Delete Threshold. Threshold values are broadcasted in the DCD (Downlink Channel Descriptor) message. The Diversity Set is defined for each MS in the network. The MS continuously monitors the BSs in the Diversity Set and defines an “Anchor BS”. The Anchor BS is one of the BSs from Diversity Set in MDHO. The MS is synchronized and registered to the Anchor BS, further performs ranging and monitors the downlink channel for control information. The MS communicates (including user traffic) with Anchor BS and Active BSs in the Diversity Set[1]

B. Fast Base Station Switching (FBSS) We are considering fast base station switching technique. In this method a diversity set is maintained for each mobile station. The serving base station and mobile station monitors the neighboring base stations that can be added in diversity set. Diversity set is maintained by both mobile station and serving base station. Diversity set is collection of base stations that can chosen as target base station for a handover. The mobile station selects one base station from diversity set as anchor base station sends its current location to it which is sent to base station controller for decision of a handover. Whenever there is a need of handover base station controller sends handover initiation message to mobile station. Handover decision can be taken by mobile station, base station or base station controller depending upon the implementation [1].

IV. HIERARCHICAL NEIGHBOR DISCOVERY SCHEME

This section describes our proposed scheme and how it supports an optimized MN mobility performance. We argue that a solution considering multiple networks and operators has to contemplate a hierarchical splitting of the existing information. This is due to fact that amount and detail of information pertaining to specific PoAs of single access network, and the combination of all these details for a number of access networks, and details for a number of access networks and different operators, may be very large.The IEEE 802.21 allows the MN to restrict the response message size by optionally setting the MaxResponseSize parameter in the query message. When the response message exceeds the maximum size, some information must be removed from the MIIS response. Clearly, this is not suitable for the user. Removing important information may cause a sub-optimal handover decision. Considering this, and in order to improve the MIIS response in quality, we propose a hierarchical neighbor discovery scheme in which the network hierarchical neighbor discovery scheme in which the network coverage area is divided into mobility zones, managed by different MIIS servers. From bottom to up, the first level of hierarchy is composed by mobility zones defined by the amount of existing networks, users, while even considering areas where networks are overlapped. In the second level, there are Zone MIIS servers (ZMIIS) which are in charge of supplying highly detailed information about specific PoAs in a particular mobility region. The third level refers to the local MIIS servers (LMIIS) managing information of different mobility zones, which belong to the same operator. Finally, a global MIIS server (GMIIS) is specified to be used in multi-operator environments.

Whenever a MN wishes to obtain information regarding the surrounding networks, it sends a MIH Get Information request message to its ZMIIS server. The MN is able to send this message when it detects a new network or when the signal level has crossed pre-defined thresholds. In this work we have proposed for the first method of triggering the MIIS query message. The MN sends a request message to the ZMIIS server through the current PoA link. If the query is related to an entity outside that zone, it is forwarded to the LMIIS server which is able to contact the target zone's ZMIIS and obtain the required information. In the case that the request zone belongs to another operator, the LMIIS server towards the message to the GMIIS server, acting as an interface pointer between relevant mobility regions of different operator. In this way, to which it replies using the MIH get information response message. In case none of MIIS server store information about the detected PoA, the GMIIS server replies with null MIH Get Information response message.Accessing critical information from other operators through non-secure links and third party servers raises important security issues. Other than service agreements, the LMIIS servers must be able to access Authentication, Authorization, and accounting frameworks where users can be authentication prior to do query. One solution in secure inter-domain handover is presented in [2]. We also consider that a node can obtain direct network information without authentication, but in case the information MN receives is minimal.

V. CONCLUSION

The use of FEC with retransmission to protect the handover signaling messages can improve the probability of a successful handover. To achieve the target successful handover probability at different velocities, an adaptive FEC scheme that adaptively adjusts the number of redundant bits according to the MS velocity.Although, using link-going down mechanism will dramatically reduce the handover latency, it is still a challenge to achieve the full mobility: up to 120 km/h, handover latency of less than 50 ms with an associated packet loss that is less than 1 percent. By using the hierarchical view of MIIS server is able to provide the terminal with optimized handover choices.

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