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WIMAX BASED VERTICAL AND HORIZONTAL COUPLING TO MAXIMIZING QOS

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Abstract:

The integration of WiMAX and WLAN has been seen as a promising approach towards fourth generation. Vertical handoff plays important role while integration of WiMAX and WLAN heterogeneous overlay systems. Vertical handoff is preformed on the basis of Quality of Service (QoS) metrics of the two heterogeneous networks. A Seamless handoff scheme is based on the tightly coupled architecture so that undesirable signaling cost induced by the mobile Internet protocol can be avoided with aim to provide always best QoS for the users (mobile and fixed). By using the ad-hoc on demand multipath distance vector protocol a simple evaluation algorithm is used to measure the QoS metrics such as available bandwidth and packet delay of both mobile and fixed users. The proposed scheme can keep the users always being best connected.

Keywords— QoS, Seamless Vertical handover, AOMDV protocol.

1. INTRODUCTION

The Fourth generations (4G) wireless, the stage of broadband mobile communications that will supersede the third generation (3G). It is expected to provide end-to-end IP services with higher bandwidth and data rate, lower cost and authentication overhead and with service constantly provided to the user without any disruption. Another feature that 4G is expected to provide is high level of user-level customization. That is, each user can choose the preferred level of quality of service, radio environment, etc. For the migration towards 4G, the standardization bodies have been working on developing new access networks that promise to increase throughput and ease network load such as Mobile WiMAX (Worldwide interoperability for Microwave Access), Evolved Universal Terrestrial Radio Access (E-UTRAN) and Ultra Mobile Broadband (UMB). The Mobile WiMAX can be considered as a superior 4G technology designed to provide for 4G services, beyond the current 3G technologies horizon. However, the upgrading process to 4G standards is expensive, difficult, and time consuming. Therefore during the transition period, integrating a newer faster network with existing and evolving networks infrastructure seems to be the optimal option for providing user with always on connectivity and allowing service providers to incrementally upgrade their networks while maintaining coverage. In a heterogeneous wireless network, a handoff process will be different from that in a unique network. There could be two types of handoff processes: horizontal handoff (HHO) and vertical handoff (VHO). A HHO happens between different sectors controlled by different base stations (BS) or access points (AP) with the same wireless technology. A VHO is a handoff between different sectors with different wireless technologies. In conventional HHOs, only signal strength is considered for making a handoff decision. But in VHOs, some other metrics could be considered for the handoff decisions, such as QoS parameters. The design of seamless and efficient VHOs is an essential and challenging issue in the development of the 4G wireless networks. Worldwide interoperability for microwave access is a wireless metropolitan area network (man) technology that will provide a wireless alternative to cable, digital subscriber line and for last mile broadband access.

2. RELATED WORK

The related work on this paper is in [2] The proposed handover scheme and algorithm that simultaneously satisfy the three key QoS parameters that are, minimum data rate, and maximum data block delay, and maximum Bit Error Rate, for the arbitrary number of downlink and uplink multiservice connections. In[1]this paper propose a novel algorithm which embeds two independent Triggers, the first one aims at maintaining the wireless connection, the second one at maximizing the network performance. This algorithm, which combines data rate and channel occupancy in order to fairly balance users among the two networks, can be easily integrated in all 802.11 and 802.16 products. In paper this paper considers two issues arising in an integrated IEEE 802.16e/802.11 network first finding a possible network, which mobile station can switch to, and second making a decision whether to execute a vertical handoff (VHO). 802.16e Base Stations (BSs) periodically broadcast the information about the density of 802.11 access points (APs) within their cell coverage. Based on this information, developed a novel model, which predicts the successful scan probability during a given scan time. Using this analytical model, a devise an energy-efficient scan policy (ESP) algorithm, which enables an MSTA to decide first to whether to attempt to discover APs in the current 802.16e cell, and second how to set the 802.11 active scan intervals considering the energy consumption. In [5] this paper addresses a movement-aware vertical (MAV) handover algorithm between WLAN and Mobile WiMAX for seamless ubiquitous access. An MAV handover algorithm is proposed in this to exploit movement pattern for avoiding unnecessary handovers in the integrated WLAN and Mobile WiMAX networks. If a mobile station (MS) velocity is high and its movement pattern is irregular, unnecessary handovers likely occur more frequently.

3. ADHOC ON DEMAND MULTIPATH DISTANCE VECTOR

AOMDV uses the basic AODV route construction process. These are made to create multiple loop-free, link- disjoint paths. The main idea in AOMDV is to compute multiple paths during route discovery. In AODV, when a source needs a route to a destination, it initiates a route discovery process by flooding a Route Request (RREQ) for destination throughout the network. RREQs should be uniquely identified by a sequence number so that duplicates can be recognized and discarded. Upon receiving a non-duplicate RREQ, an intermediate node records previous hop and checks whether there is a valid and fresh route entry to the destination in routing table. If such is that case, the node sends back a Route Reply (RREP) to the source if not it rebroadcasts the RREQ. A node updates its routing information and propagates the RREP upon receiving further RREPs only if a RREP contains either a larger destination sequence number (fresher) or a shorter route found. In AOMDV each RREQ, respectively RREP arriving at a node potentially defines an alternate path to the source or destination. Just accepting all such copies will lead to the formation of routing loops. In order to eliminate any possibility of loops, the “advertised hop count” is introduced. The advertised hop count of a node for a destination represents the maximum hop count of the multiple paths for available. The protocol only accepts alternate routes with hop count lower than the advertised hop count, alternate routes with higher or the same hop count are discarded.

Vertical handoff

Vertical handoff refers to a network node changing the type of connectivity it uses to access a supporting infrastructure, usually to support node mobility. For example, a suitably equipped laptop

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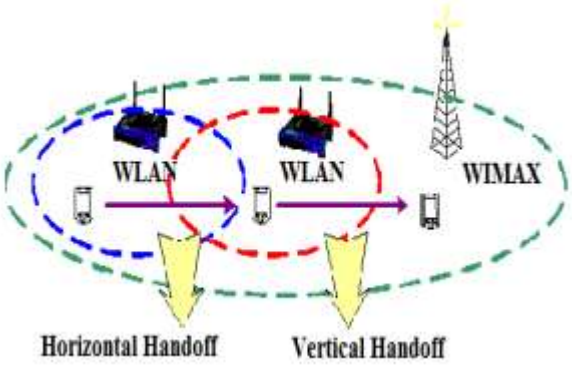

Fig.1. Vertical Handoff in heterogeneous networks

might be able to use both a high speed wireless LAN and a cellular technology for Internet access. Wireless LAN connections generally provide higher speeds, while cellular technologies generally provide more ubiquitous coverage. Thus the laptop user might want to use a wireless LAN connection whenever one is available, and to 'fall over' to a cellular connection when the wireless LAN is unavailable. The vertical handoff process involves three main phases, namely system discovery, vertical handoff decision, and VHO execution. During the system discovery phase, the mobile terminal determines which networks can be used. These networks may also advertise the supported data rates and Quality of Service (QoS) parameters. In Fig 3.1, the mobile terminal determines whether the connections should continue using the current network or be switched to another network. The decision may depend on various parameters or metrics including the type of the application (e.g., conversational, streaming), minimum bandwidth and delay required by the application, access cost, transmit power, and the user's preferences.

4. PROJECT DESCRIPTION

The important modules of this block diagram is Fading detection (delay analysis and bandwidth estimation) and Vertical handoff between WIMAX/WLAN Fading detection In order to know when the vertical handoff is to be performed the delay analysis and bandwidth estimation is calculated.

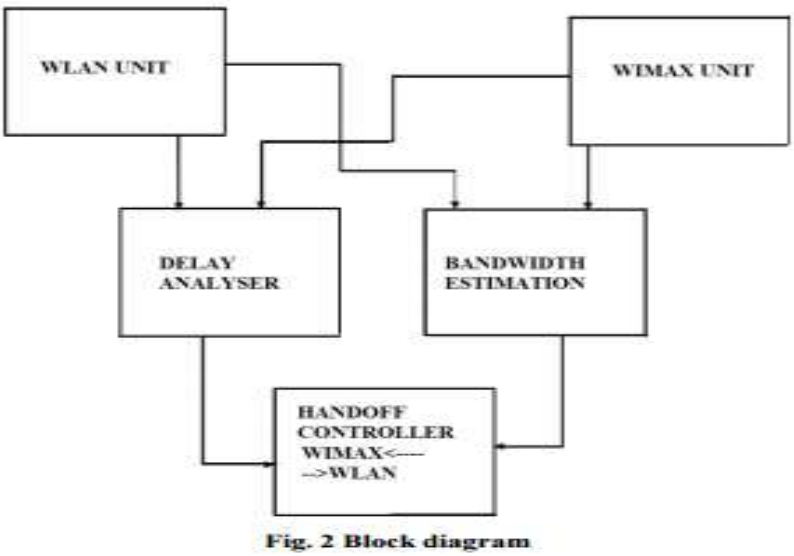

Fig. 2 Block diagram

Delay analysis in WLAN is calculated by the queuing delay and the service time .Delay analysis in WiMAX is calculated by the summation of scheduling delay, queuing delay, mapping delay and the

transmission delay. Bandwidth estimation in WLAN is determined with the number of DL and UL slots that a station obtains in one frame, therefore the bandwidth utilization is calculated. Bandwidth estimation in WiMAX is determined by the Network allocation vector (NAV). Channel fading occurs mainly because the user moves from one station to other station if the user is stationary almost no time variations of the channel occur. The average fade duration quantifies how long the signal spends below the threshold. Due to fading there should be delay to connect base station during hand off which reduces the QoS. In bandwidth estimation, the fundamental access method is distributed coordination function (DCF) known as carrier sense multiple access is used with collision avoidance (CSMA/CA). Network allocation vector (NAV) is the main scheme used to avoid collision by setting a busy duration on hearing frame transmissions from other stations.

5. SIMULATION RESULTS

The Simulation is done with NS-2 software and the end to end packet delay was high at the initial connecting stage and it varies as per the user's movement and at the handoff process the end to end packet delay is minimum.

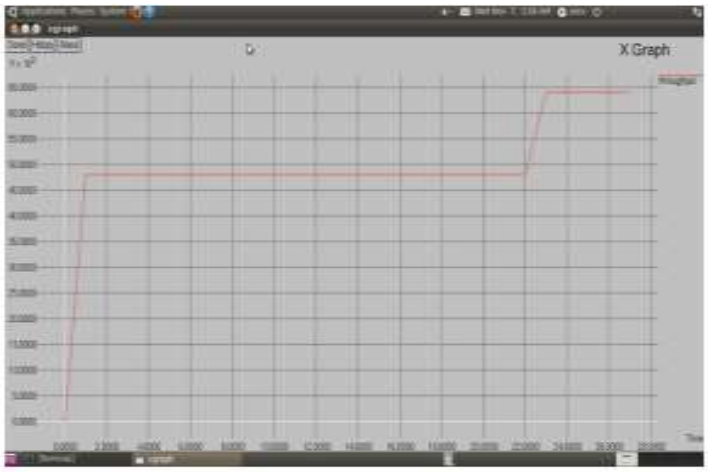

Fig.3. Simulation output 1

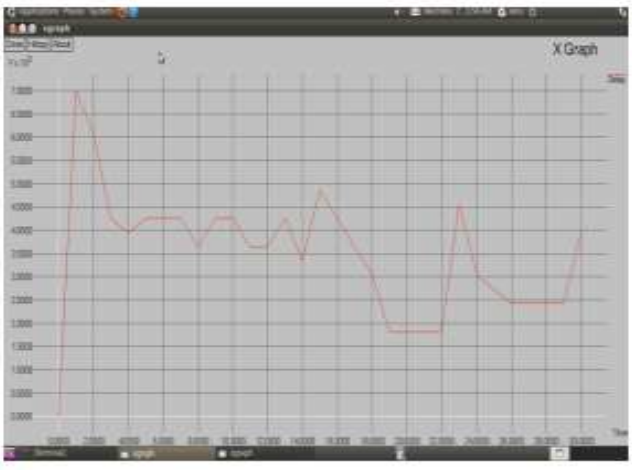

Fig.4. Simulation output 2

The Throughput was low at the initial connecting stage and it varies as per the user's movement and at the handoff process the throughput is maximum.

CONCLUSION

The QoS oriented integration of heterogeneous network is the important issues in fourth generation, to achieve that Ad-hoc on demand multipath distance vector is used. It addresses the tightly coupled architecture with seamless vertical handoff by measuring the available bandwidth and packet delay in WiMAX and WLAN overlay networks. Compared to the existing reactive protocols, AOMDV has better performance in vertical handoff execution of mobile user's .The simulation results presents that the AOMDV significantly improve the vertical handoff execution in terms of throughput and delay compared with the existing protocols. In future the execution of vertical handoff of WiMAX and WLAN overlay networks for fixed users also be implemented. The handoff may also be initiated by user's preference also the integration of two or more heterogeneous overlay networks can also be implemented.

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