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Modified Efficient Handover mechanism For WiFi-WiMAX Heterogeneous Network Environment.

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Abstract- *The future wireless communication networks, heterogeneous network designing are very important and common systems. In heterogeneous network, more than one wireless standard can exist so that end users having the freedom to choose the connectivity based on application requirements and environmental conditions. The two main building blocks of heterogeneous networks is IEEE 802.11 (called WiFi) and IEEE 802.16 (Called WiMax) due to their cost-effectiveness, sustainability, and capability of supporting the high data rate in wireless communications. The integration and interoperability of WiFi and WiMax networks is challenging tasks since from last decade. The WiFi standard provides the connectivity with short communication range and less infrastructure support. The WiMax needs the specific infrastructure and provides long communication range. Therefore designing handover decision method for WiFi-WiMax integration is challenging task in order to achieve the less power consumption, QoS and QoE requirements. In this paper, we are proposing efficient handover decision technique for WiFi-WiMax integration with goal of achieving, QoS, QoE as well as guaranteed energy efficiency performance. We are proposing bandwidth management algorithm and energy management algorithm. Based on these two algorithms proposed handover decision policy is designed to achieve the QoS, QoE and energy efficiency.*

Keywords- *Vertical handover, WiFi, WiMAX, QoS, Load balancing*

I INTRODUCTION

As wireless communication evolves, many different signaling schemes and methods emerge and are standardized. Despite the obvious dominance of some specific types of networks in daily life such as cellular mobile networks, emergence of new standards forces different types of networks to coexist. Therefore, the concept next generation networks needs to allow for heterogeneous structure and to aim at collaboration of these various wireless technologies in order to provide quality of service (QoS)supported and cost efficient connections at anywhere and anytime[3]. Even though heterogeneous network structure is a very big concern by itself, terminals within the networks bring about some other issues for the next generation wireless networks. In this regard, it can be said that the next generation wireless networks need to include terminals that are able to: (i) be aware of the existence of heterogeneous networks around, and (ii) manage seamless transitions between existing networks when necessary. Considering (i)and (ii) together, one can deduce that recently emerging technology called cognitive radio (CR) can be a remedy for both, since CRs are able to be aware of, learn about, and adapt to the changing conditions in radio environment. Here, note that the term radio environment has many aspects such as physical propagation environment, radio frequency spectrum, available networks and terminals around, and so on. Because these aspects are highly dynamic, capabilities of CRs become crucial from the perspective of both individual terminals and networks including them. Along with CR, cooperative networks concept should also be considered in the context of next generation wireless systems.[5] The cooperative networks concept assumes that all of the wireless technologies such as cellular networks, wireless local/metropolitan area networks, wireless personal area networks, short range communications, and digital video/audio broadcasting can coexist in a heterogeneous wireless access infrastructure and cooperate in an optimal way in order to provide high speed and reliable connectivity anywhere and anytime. In addition to the considerations related to the capabilities of both terminals and networks, next generation wireless networks should also provide high data rate transmission despite their heterogeneous topology and complex structure. Moreover, they are desired to perform as close to wired networks as possible over wireless medium in terms of cost efficiency and of supporting highly sophisticated services that imply seamless transmission of different traffic types such as voice, data, and video.[1]

II LITERATURE SURVEY

1. Gamal Abdel Fadeel Mohamed Khalaf et.al (2012)

In [1], A multi-criteria vertical football play system sensitive to numerous mobile- terminals quality parameters together with distance and speed during a heterogeneous wireless network is analytically developed and valid via simulations. it's targeted to estimate the essential football play parameters together with outage likelihood, residual capability, and signal to interference and noise threshold moreover as network access value. Moreover, the football play theme is triggered victimization on line football play initiation-time estimation theme. After start, the football play procedure begins with a network classification system supported multi-attribute strategy which ends in choice of doubtless promising network parameters. Simulation results square measure shown to trace well the analytical formulations.

2. Mohamed A. Al Masri et.al (2015)

In [2], the author's planned derives AN analytical expression for hard the packet loss likelihood for orthogonal frequency division multiple access primarily based networks.

Taking users quality and spatial distribution into consideration, this paper develops a Markovian based framework for evaluating inter-RAT offloading performance. The accuracy of this quality model is more and therefore the efficaciousness of the system performance analysis framework square measure valid.

3. Murad Khan et.al(2014)

In [3], they planned an optimized relinquishing triggering technique. They compare planned theme with existing schemes in context of energy consumption for scanning, frequent and failing handovers, packet ratio, and relinquishing delay. The planned theme shows superior performance and it outperforms existing schemes used for similar purpose. Moreover, simulation results show the accuracy and performance of the planned theme.

4. Celaleken et.al (2009)

In [4], a fuzzy logic-based football play call rule is introduced for wireless heterogeneous networks. The parameters; rate, received signal strength indicator (RSSI), and mobile speed square measure thought-about as inputs of the planned fuzzy-based system so as to determine football play format method and choose the simplest candidate access purpose around a sensible mobile terminal. Also, in distinction to the standard fuzzy primarily based algorithms, the strategy planned takes close interference power, that is mentioned as interference rate, as another input to the choice method. The results show that the performance is considerably increased for each user and network by the strategy planned.

5. Dong Ma et.al (2012)

In [5], they investigate many necessary problems for the interworking of Mobile WiMAX and WiFi networks. we tend to address a tightly coupled interworking design. Further, a seamless and proactive vertical football play theme is meant supported the design with aims to produce invariably the simplest quality of service (QoS) for users. each the performance of applications and network conditions square measure thought- about within the football play method. WiFi networks in terms of accessible Moreover, we tend to derive analysis algorithms information measure and packet delay. to estimate the conditions of each WiMAX and

Sr. No	Paper Name	Author	Description	Methods Used
1	Integration of WiMAX and WiFi: Optimal Pricing for Bandwidth Sharing	DusitNiyato and Ekram Hossain, TRLabs and University of Manitoba	In this article Authors have presented an integrated WiMAX/WiFi network architecture for mobile hotspot services.	A genetic algorithm had used to iteratively obtain.
2	An Integrated WiMAX/WiFi Architecture with QoS Consistency over Broadband Wireless Networks	Hui-Tang Lin, Ying-You Lin, Wang-Rong Chang, and Rung-Shiang Cheng	This study has proposed a unified connection-oriented architecture to support the integration of WiFi and WiMAX technologies in broadband wireless networks.	data packets are forwarded by the through the Common Part Sub-layer (CPS) and the Convergence Sub-layer (CS) of Layer 2 BSMAC.
3	Integration Gain of Heterogeneous WiFi/WiMAX Networks	Wei Wang, Xin Liu, Member, IEEE, John Vicente	In this study, authors are interested in integration gain that comes from the better utilization of the resource rather than the increase of the resource.	Authors propose an approximation algorithm.
4	Implementation and performance study of IEEE 802.21 in integrated IEEE 802.11/802.16e networks	Wan-Seon Lim a, Dong-Wook Kim a, Young-JooSuh a, Jeong-Jae Won	In this paper, author propose a framework for the implementation of the IEEE 802.21 Media Independent Handover (MIH) standard. .	Authors developed a MIHcapable mobile node and the MIH information service server.
5	Integration of WLAN and WiMAX with Base Station Assisted QoS	G. Arul Prasath, Student Member IEEE;	In this paper, Authors have proposed an integration model and a base station assisted scheduling mechanism to be implemented at the CPE to provide QoS guarantee.	Authors proposed an integration model for WLAN and WiMAX at the CPEs and develop a adaptive scheduling algorithm

Table 1: Literature Survey

III EXISTING SYSTEM

The most important design aspect for WiFiWiMAX integration is: when should a user perform handover from the WiFi interface to the WiMAX interface and vice versa. A lot of researches has been already carried out to answer how to handover between WiFi and WiMAX, however most of these works remain silent on when to perform the handover. IEEE 802.21 or media independent handover (MIH) framework standardizes the vertical handover (handover between two different technologies) procedure, although it discusses about 'how to perform the handover', rather than 'when to perform the handover'. In a typical WiFiWiMAXHetNet environment, the WiMAX connectivity symbolizes an umbrella like coverage under which the WiFi access points (APs) or basic service sets (BSSs) formulate small WiFi connectivity areas. Because of its long communication ranges, it can be safely assumed that in such a HetNet environment, users have always access to the WiMAX connectivity, however access to WiFi is only available at few areas, typically known as
'HotSpots'[5]. Users prefer WiFi over WiMAX because of its low-cost availability, and less power consumption, and WiMAX is typically used to provide connectivity to the endusers when Wi-Fi network is not available or performs poorly. A user migrates from WiFi to WiMAX either because there is no WiFi connectivity, or the WiFi fails to provide desired QoS requirements. Mobility is not the only issue that triggers handover between two technologies in a HetNet environment. A quintessential problem of WiFi hotspots is unbalanced traffic load distribution among the APs or BSSs. The traffic load at WiFi access points are highly dynamic and vary with time of the day and geographic locations[3]. This causes overload in some APs where as other APs in the network remains underutilized. QoE of users connected through the overloaded APs deteriorates as the traffic load increases in the APs. Real time applications have strict bounds on network parameters such as end-to-end delay, jitter and packet loss rate. Violation of these bounds may cause disruptions in application performance.

IV DISADVANTAGES OF EXISTING SYSTEM

1. Existing system remain silent on when to perform the handover.
2. Users running voice over IP applications on their terminal may experience echo, noise or empty gaps in the communications if end-to-end delay exceeds 150 ms or packet loss exceeds 2%.

V PROPOSED SYSTEM

This paper considers a scenario where users migrate from WiFi to WiMAX when QoS/QoE of the running application drops, other than loss in WiFi connectivity, due to traffic overload at the WiFi network. It can be noted that QoS provisioning in WiFi is based on differentiated service architecture (DiffServ) where service provisioning is assured, however not guaranteed. On the contrary, WiMAX is based on integrated service architecture (IntServ), where strict service guarantee is maintained. However, as discussed earlier, cost per bit data transmission as well as power consumption are significantly lower in WiFi compared to WiMAX, and therefore this paper designs a handover policy in a WiFi-WiMAXHetNet environment, such that both the QoE of the end users as well as cost-topay per bit and average power consumption are minimized (by means of allowing more users to communicate via WiFi, whenever available, while maintaining QoS and QoE). The proposed handover policy can coexist and work on the top of any vertical and horizontal handover (handover between two similar technologies) framework, that takes care of lower layer complexities, such as message decoding, differences in lower layer (MAC and physical) frame formats, signal decoding issues etc. The major contributions of this paper are as follows. This paper proposes a bandwidth management and admission control scheme for proper distribution of total network traffic over the WiFi-WiMAX integrated environment. The load-imbalance problem in WiFi BSSs is mitigated through distributing the traffic load among the overlapping APs in a WiFi hotspot. The WiMAX network is used to distribute traffic load among the underlying WiFi hotspots, as it has access to all the users' information. Based on the bandwidth management scheme, a handover policy is designed that instructs the users when to do a handover between WiFi and WiMAX interfaces, other than normal handover performed due to mobility, to maintain QoS and QoE of the end-users while preferring WiFi interface for communication.

VI ADVANTAGES OF PROPOSED SYSTEM

1. Proposed system allows more users to communicate via WiFi, whenever available, while maintaining QoS and QoE.
2. The load-imbalance problem in WiFi BSSs is mitigated through distributing the traffic load among the overlapping APs in a WiFi hotspot.

VII ARCHITECTURE

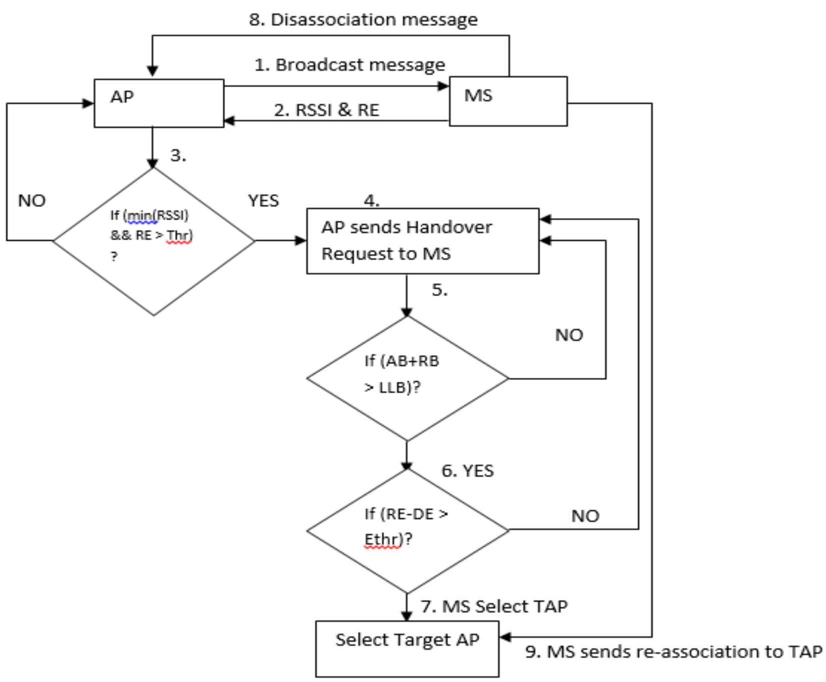

Fig 1: Architecture of the proposed system

The proposed Architecture balancing scheme is designed for a scenario, where excess bandwidth is available at the network to allow MSs to associate either with the AP or with the BS, while maintaining QoS and QoE. It can be noted that traditionally WiFi network does not have any admission control mechanism, and therefore QoS/QoE can be affected if more MSs associate with an AP than its maximum capacity. Therefore, an admission control mechanism is designed in this paper to tackle this situation.

VII ALGORITHM

based on Traffic class C and remaining energy for load balancing and energy efficiency
Inputs: WiFi-WIMax Network Integration,
Thr = Remaining Energy Threshold Value
LLB = Lower Limit of Bandwidth
EThr= Energy Threshold

Output: Successful Handover

Step 1: WiFi AP Triggers the handover at
MS
Step 2: AP broadcast probe message to all connected MSs
Step 3: MSs respond with RSSI and Remaining Energy (RE) Information Step 4: AP Select MN for handover based
on If (min(RSSI(MS)) if (RE >Thr) select MS for handover end if end if
Step 5: AP sends MoveRequest to MS
Step 6: MS sends MoveResponse to AP
Step 7: MS builds APList
Step 8: AP send LoadRequest to APs in APList
Step 9: APs respond with LoadResponse to AP
Step 10: AP selects target APs based on bandwidth requirement and energy
requirement If (APi (AB + RB < LLB))
If (APi (RE - DE >EThr)) TagetAPList = APi end if end if
where AB is available bandwidth, RB is required bandwidth and DE is demanded energy.
Step 11: AP sends TagetAPList to MS Step Step 12: MS selects Target AP (TAP) from list with strongest RSSI and RE
Step 13: MS sends disassociation message to AP
Step 14: AP sends context information to target TAP
Step 15: MS changes channel to TAP
Step 16: MS sends re-association with TAP
Step 17: STOP

VIII CONCLUSION

Designing an effective handover mechanism in a WiFi-WiMAX integrated HetNet environment should consider maintaining a proper handover policy to allow the users to migrate from one network to another based on their QoS/QoE requirements. This enables the end users to effectively utilize the capacity and advantages of both the networks. This paper proposes a bandwidth reservation and admission control policy based on traffic requirements for different QoS associated services. A class aware load balancing and context aware handover policy is designed, that maintains the bandwidth reservation for different traffic classes, and instructs the users to perform a handover to distribute traffic load uniformly throughout the network. This load balancing mechanism allows more end users to associate with the WiFi network, while using the WiMAX for smooth handover to maintain QoS/QoE.

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