International Journal of
Science Inventions Today
www.ijsit.com
ISSN 2319-5436
Research Article

CHANNEL MANAGEMENT IN INTEGRATED NETWORK ON NON-TRANSPARENT-MODE

Pritpal Singh[1] and Aashima Bansal[2]

[1](*MTech CSE Student, pritpal.ahluwalia02@gmail.com, Gurukul vidyapeeth institute of Engineering and technology, Banur, India*)

[2](*Assistant Professor CSE, aashimabansal86@gmail.com, Gurukul vidyapeeth institute of Engineering and technology, Banur, India*)

ABSTRACT

The wireless network management is the crucial task when deploying two different networks on one test-bed. This paper uses two wireless standards i.e. IEEE 802.11 and IEEE 802.16; these standards called as Wi-Fi and Wi-Max Networks or integrated networks. These networks combined to together and both of them share the packet data unit (PDU). The integrated network uses time division multiple access (TDMA) for accessing channel from the base station (BS) to the subscriber stations (SSs). This paper utilizes the downlink and uplink mode for accessing or transmitting the data in the entire experimental test bed. The probability of found the available channels, blocking channels and occupied channels also being shown in this paper. The transmission of current arrival frames and received frames on different Wi-Fi hot spots also implemented on the network scenario. We trying to use the effective wireless networks in this paper and avoid some communication deficiency such as droppler spread, noise and interference. Therefore, we are managing congestion and queue in the integrated networks, thus improving the overall throughput and minimizing delay.

Keywords: Wi-Fi, Wi-Max, BSs, SSs, RSs, channel.

INTRODUCTION

The most interesting field is an wireless networks that grow day by day and spread small to medium, medium to large areas. The mobility requires wireless transmission for communicating both transmitter and receiver in the wireless areas. The frequency spectrum used by the wireless transmission for fulfilling the need of transmitter-receiver. The path connects two wireless stations for exchanging data in the wireless areas; this path depends on the frequency offset causing any mobility happens. This frequency offset is also known as 'droppler-spread'. The mobility in any wireless standard causing droppler- spread, for frequently channel was changing. The Wi- fi was performing on the peer to peer (P2P) and Ad- Hoc networks. Peer to Peer wireless networks connecting to each other for sharing files and data in the workgroup or two stations. The transmission range of the Wi-Fi networks had limited for architecture of this standard. The Ad-Hoc networks split into two categories: Infrastructure networks -- Infrastructure-less networks--supported nodes communicating with base station, without base station. The indoor application support in Wi-Fi network was high but it disappoint in outdoor application support. This deficiency of the Wi-Fi networks easily overcome by the newer Standard i.e. Wi-Max.

Wi-Max stands for Worldwide Interoperability for Microwave Access [7] are expected to be mobile users with energy-constrained devices such as smart phones, minimizing the energy consumption of these devices becomes an important problem in order to extend the viewing time [4]. Wi-MAX uses schedules to allocate slots in both uplink (UL) and downlink (DL) directions by using separate UL and DL sub frames [2].The Non-transparent-mode frame structure shows in the fig. 1.1 [2]:

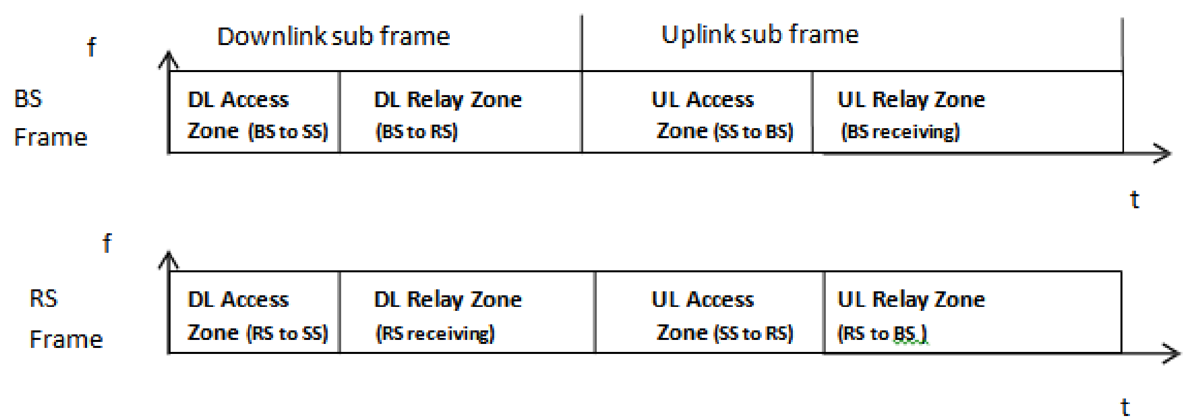

Figure 1.1: Frame structure of Non-transparent-mode [2]

This figure shows three different station namely Base stations (BSs), Relay Stations (RSs) and Subscriber Stations (SSs). The non-transparent relay stations (RSs) transmit the frame-message on the same frequency. The subscriber stations (SSs) communicating with RSs and BSs in the access zone. The RSs has been communicating with the base station that formed Relay Zone. The planned communication taken place for scheduled communication whenever different stations active. Orthogonal frequency division multiple access (OFDMA) is single carrier transmission provides transmission to back-haul links. This orthogonal frequency is invisible to any other subcarrier frequency in the multi-hop wireless domain. It also occupied narrow frequency band considering, not overlapped channel frequencies. The rest of the paper is organized as follows: In section II explained the related work. The system model of Wi-Max and Wi- Fi networks is representing in Section III. Section IV represents simulation scenario, Section V shows the simulation results that extracted from the scenario and Section VI concludes the paper.

RELATED WORK

Kejie Lu,Yi Qian (2007), described WI-MAX had cost effective solution since deployed multiple nodes on the network. The proposed framework contains two components: service aware--unified control scheme. The service aware control scheme could be located in a single node in the network or distributed in multiple locations in the network. In unified control scheme, packets flow would be forwarded based on the service and security requirements. The numbered-packet with sequence number 4k + m travel through m path; k,m is any integer number.

The distributed-secure service provided to the multicast-multipath networks. The key distribution scheme utilizes by compromised node that share single key on the group.

Yongchul Kim, Mihail L. Sichitiu (2011), scheduled Wi-Max to allocate slots in both uplink (UL) and downlink (DL) directions by using separate UL and DL sub frames. During the access zone, the Subscribe (SSs) directly communicate with the Base Station (BS) and the multi-hop relay stations (RSs). During the relay zone, the RSs communicate with the BS. To calculate the inference on WI-MAX networks, the transmission power divided by the antenna gain, thereby; the power of interference determined by the same frequency of dual current cells.

Jie Huang, Chin-Tser Huang (2011), detailed about WI-MAX, faces big challenges even with the advanced signal processing techniques employed. The authentication process has employed in the proposed solution, each RS and BS is pre-registered with the Authentication Server (AS) by providing their MAC addresses and other necessary credentials. Each RS and BS shares its own public key (KRS, KBS) with AS, and each RS and BS also gets AS's public key from AS. The nodes in the deployed network, AS maintains a correct database of all legitimate registered nodes MAC addresses, each node's corresponding public key and other credentials. It is easier to ensure the physical security of AS because AS can always be indoor.

Somsubhra Sharangi et.al.(2011), addresses the problem in WI-MAX multimedia deployed on different receivers. Multicast and Broadcast Service (MBS) used to deliver multimedia traffic to large- scale user communities. Authors mathematically formulate the problem of selecting the best set of sub streams from the scalable video streams in order to maximize the quality for mobile receivers. Subscribers of the WI-MAX multimedia services are expected to be mobile users with energy-constrained devices such as smart phones, minimizing the energy consumption of these devices becomes an important problem in order to extend the viewing time. The given problem reduces the energy consumption of mobile receiver's help of proposed solution. The Algorithm selects the best sub streams and then transmits these sub streams in bursts. The burst transmission of the video data enables mobile receivers to turn off their wireless interfaces for longer periods of time in order to save energy.

SYSTEM MODEL

The queue management in Wi-Max is difficult but when to integrated Wi-fi and Wi-Max its challenging task. where there is a request queue and a certain number of active requests on the network, you can formulate the relationship between the queue length and active requests (Ni), the average time of the request (Ri), and the throughput (Xi) as follows [20]:

$$Ni = Ri \times Xi \qquad (1)$$

This same equation reshuffled shows that if you know the queue length and the throughput, then you can calculate the response rate as follows:

$$Ri = Ni / Xi \qquad (2)$$

The request in the queue that is processed must at some time be completed by the system. The time that any one request spends in the queue isn't relevant; it can be random, Last-in-Last-out, First-in-First-out. The model uses time division multiple access (TDMA) for accessing channel and each spread between BS and SS nodes with distance d, and γ denoted as radio channel between Wi-Fi and Wi-Max networks. The MAC layer transmitted frames in between number of subcarriers and base station in particular time slot t. The request of individual station served on first come first serve basis. The quality of service is maintaining with minimum number of channels assured for a particular class of users, this minimum number of channels occupied by I and J represent number of Wi-Max and Wi-Fi users respectively. The probability P represents the Wi- Max and Wi-Fi clients broadcast the data and effectively utilizes the network. The Blocking probability [6] recalculated in the Wi-Max networks; occupied channel S apply to the integrated Wi-Fi and Wi-Max networks then the expression written as:

$$\forall S = \{(I,J) \mid (I,J) \leq N\} \qquad (3)$$

This equation applicable both of the networks-- N specifies the number of channels-- for all S occupied channels provided to this integrated networks. The above equation (3) shown in the table I; the active and de-active represents the availability of the channels. When the channel was active then number of clients ready to transfer the data otherwise the node exist but not ready for communication. When I and J are communicating with each other then they utilized all channels and share the information on different hotspots (i.e. 'J').

Wi-Max (I)	Wi-Fi (J)	I € J
Active	Active	$\forall S$ (All Channel Used)
Active	De-Active	Channel utilized by I
De-Active	Active	Channel utilized by J
De-Active	De-Active	N (All channels freed)

Table 1: Channel Occupation

The traffic rate is also capturing in this section, and public network might be accessible to the integrated network (I,J). ƛS is the arrival time of the frame i.e. capturing by one phase represented S=1, or signifies normal traffic; S=(1,2.....,S) phases.

$$f_a(ƛ) = \sum_{a=1}^{S} f_a(ƛ, t) \qquad (4)$$

SIMULATION SCENARIO

The BS assigns a unique identifier for each connection or service flow represented in fig. 1.2. The connection between Wi-Max and Wi-fi can identify by a connection identifier (CID). Therefore, the bandwidth request easily maintained by the upper link (UL) direction, whenever sufficient resources available on the network. We have used only one CID to transmit the TCP traffic. The IEEE 802.16

MAC layer enables classification of traffic flow and maps them to connections with specific scheduling services. Each connection is associated with a single scheduling data service and each data service is associated with a set of QoS parameters that quantify aspects of its behavior. BS transmits signal to individual SSs and allocated linearly time slots. The 802.16 Wi-Max MAC provides a connection-oriented service to BS and SSs.

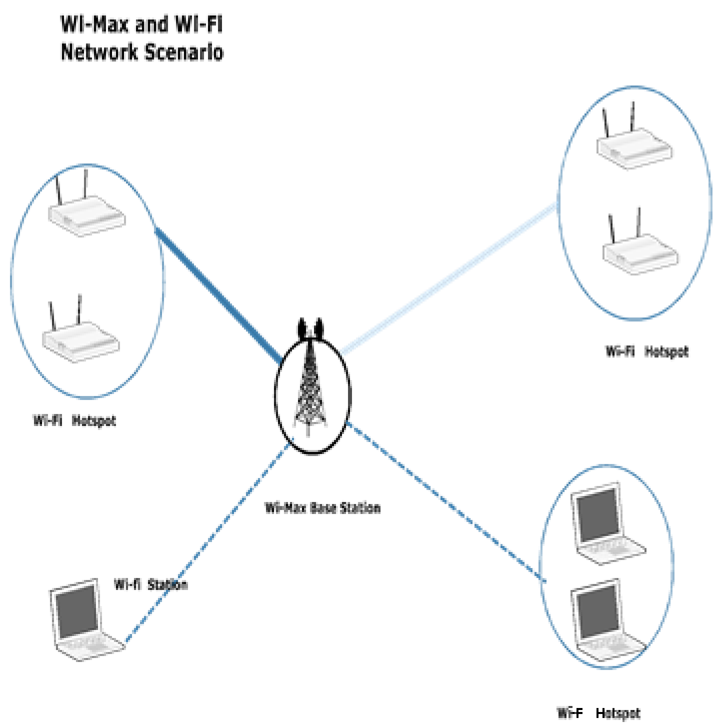

Figure 1.2: Wi-Max-Wi-Fi Topology

This topology implementing in the network simulator [22], and performs the following operations:

1. The request-reply messages provided by this centralized topology.
2. Each Wi-Fi communicates with one other to facilitates provided by the BS.
3. The BS allows the permissions to different Wi-Fi hotspots.
4. The routing table information maintained by the BS.
5. Each request sends in every station by collision free manner.
6. Downlink and uplink sub frames are used for transmissions initiated by the BS and SSs.

7. The Wi-Fi station sends their request unicast; minimum broadcast domain.

SIMULATION RESULTS

The TCP traffic associated to the integrated Wi-Fi and Wi-Max networks as shown in figure 1.2. The base station granted the permissions to the subscribers so they communicated with each other. The transmitted power is 43dBm to proper coverage of the network. The results calculated from the mesh operating mode that implies full support to subscribers that connected to the base networks. In this section, we measured the performances of Wi-Fi and Wi-Max networks and those evaluated results shown in subsection A and B.

A. Throughput

The throughput (see fig. 1.3) depends on the bandwidth provided to the integrated networks. The ratio of received packets with send packets implies throughput of the network. As the number of subscriber stations (SSs) attached to the base station (BS) and repeatedly communicated with each other. The number of subscriber stations is 25 and the average throughput received is 15 Mbps. Some congestion lies on the subscriber station resultant some effects on the throughput; this problem arises due to interference and noise. The interference removed in other subscriber stations resultant we achieved the average throughput of the network. From equation 4, we implement on the network scenario with the help of network simulator [22].

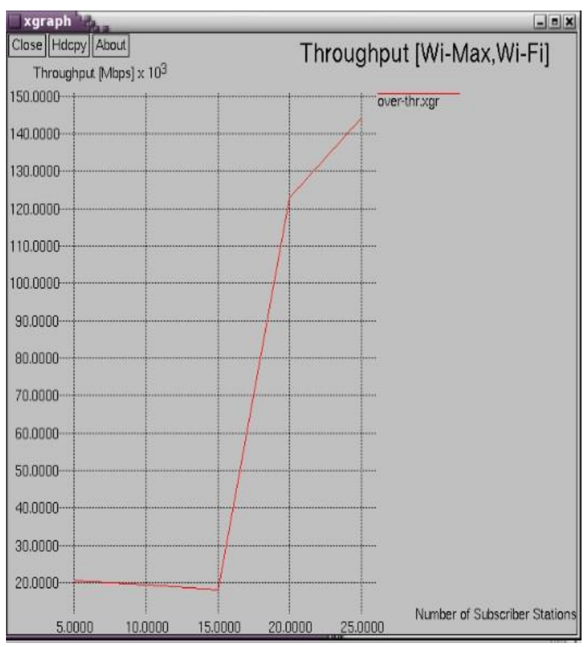

Figure 1.3: Throughput of Wi-Max-Wi-Fi Topology

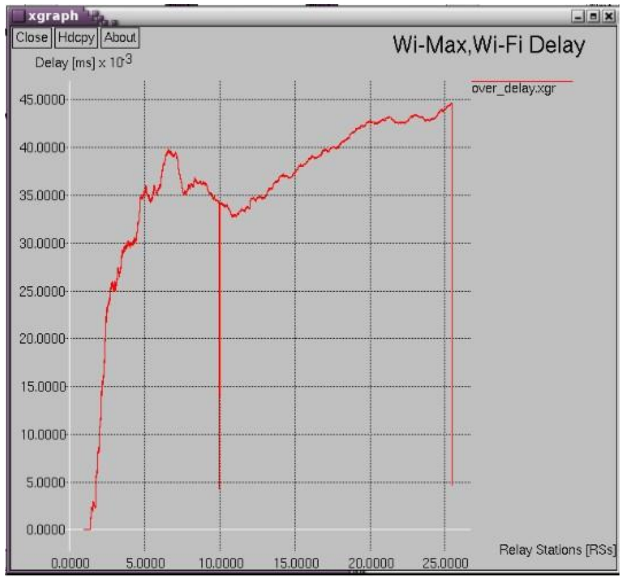

Figure 1.4: Delay of Wi-Max-Wi-Fi Topology

B. Delay

The delay (see fig. 1.4) depends on the payload transmitted from the base station to subscriber station. If the network throughput decreases that it directly affects on the delay. The delay calculated from this integrated network by the subtraction of the received payload with the transmitted payload. The minimum delay of the network is .005 milliseconds (ms) that mean the Wi-Max fully supported to the Wi-Fi hotspots. The maximum delay calculated at the relay stations is 0.04 milliseconds (ms).

CONCLUSION

The two different network models studied in this paper and these different network models related to different standards. These standards are IEEE 802.11 and IEEE 802.16. These standards have different techniques to manage the nodes on the network area. The dual model integrated it and deployed on the one network scenario and calculated the Quality of service (QOS) parameters i.e. Throughput and delay. From the results (see section V), The delay at the starting stage has more when two different models been deploying but when all nodes make routing table (RT) then the performance of throughput becomes better and all subscriber stations received data without any delay. The interference model is deploying on the network scenario, when a node transmit and received packet at same time; and this problem avoided by managing channels on different nodes.

REFERENCES

1. Kejie Lu,Yi Qian," A Secure And Service-Oriented Network Control Framework For WiMax Networks",IEEE,2007,pp.124-130.
2. Yongchul Kim, Mihail L. Sichitiu," Optimal Max–Min Fair Resource Allocation In Multi-hop Relay-Enhanced Wimax Networks",IEEE,2011,pp.3907-3918.
3. Jie Huang, Chin-Tser Huang," Secure Mutual Authentication Protocols For Mobile Multi-Hop Relay Wimax Networks Against Rogue Base/Relay Stations",IEEE,2011.
4. Somsubhra Sharangi, Ramesh Krishnamurti, Mohamed Hefeeda,"Energy-Efficient Multicasting Of Scalable Video Streams Over WiMax Networks",IEEE,2011,pp.102-115.
5. Sayan Kumar Ray,Krzysztof Pawlikowski,Harsha Sirisena,"Handover In Mobile Wimax Networks: The State Of Art And Research Issues",IEEE,2010,pp.376-399.
6. Nirmal Andrews, Yogesh Kondareddy, Prathima Agrawal," Channel Management In Collocated Wifi-Wimax Networks",IEEE,2010, pp.133-137.
7. Jeremy Brown,Xiaojiang Du,"Towards Efficient And Secure Rekeying For IEEE 802.16e Wimax Networks",IEEE,2009.
8. Ioannis Papapanagiotou,Dimitris Toumpakaris,Jungwon Lee,Michael Devetsikiotis," A Survey On Next Generation Mobile Wimax Networks: Objectives, Features And Technical Challenges",IEEE,2009,pp.3-18.
9. Ehsan Haghani,Shyam Parekh,Doru Calin,Eunyoung Kim,Nirwan Ansari,A Quality-Driven Cross-Layer Solution For Mpeg Video Streaming Over Wimax Networks",IEEE,2009,pp.1140-1147.
10. Bong-Ho Kim, Jungnam Yun, Yerang Hur," Capacity Estimation And Tcp Performance Enhancement Over Mobile Wimax Networks",IEEE,2009,pp.132-141.
11. Chih-He Chiang, Wanjiun Liao, Tehuang Liu, Iam Kin Chan,Hsi-Lu Chao,"Adaptive Downlink And Uplink Channel Split Ratio Determination For TCP Based Best Effort Traffic In TDD- Based Wimax Networks",IEEE,2009,pp.182-190.
12. Chakchai So-In,Raj Jain,Abdel-Karim Tamimi,"Scheduling In Ieee 802.16e Mobile Wimax Networks: Key Issues And A Survey",IEEE,2009,pp.156-171.
13. Ehsan Haghani,Nirwan Ansari,"Voip Traffic Scheduling In Wimax Networks",Ieee,2008,Pp.1-5.

14. Raj Jain, Chakchai So-In, And Abdel-Karim Al Tamimi,"System-Level Modeling Of Ieee 802.16e Mobile Wimax Networks: Key Issues",IEEE,2008,pp.73-79.

15. Chin-Tser Huang,J. Morris Chang," Responding To Security Issues In Wimax Networks",IEEE,2008,pp.15-21.

16. Kejie Lu,Yi Qian,Hsiao-Hwa Chen,Shengli Fu," WiMax Networks: From Access To Service Platform",IEEE,2008,pp.38-45.

17. Shun-Fang Yang,Jung-Shyr Wu,"Mobile Ipv6 Mobility Management In Integrated Wi-Fi And Wimax Networks",IEEE,2007,pp.1152-1156.

18. Yun Hou,Kin K. Leung,"A Distributed Scheduling Framework for Multi-User Diversity Gain and Quality of Service in Wireless Mesh Networks",IEEE, 2009, pp.5904-5915.

19. Jim Martin, Bo Li, Will Pressly, James Westall,"WiMAX Performance at 4.9 GHz",IEEE,2010,pp.1-8.

20. Barrie Sosinsky, "Networking Bible",Wiley Publishing, Inc.,2009.

21. Parminder Singh, "Comparative study between unicast and Multicast Routing Protocols in different data rates using vanet", IEEE, 2014, pp.278-284.

22. www.isi.edu/nsnam

23. www.nsnam.org/

24. Amir Esmailpour,Nidal Nasser," A Novel Scheme For Packet Scheduling And Bandwidth Allocation In WiMax Networks",IEEE,2011.