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Performance Evaluation of Heterogeneous Networks for Various Applications Using OPNET Modeller

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Abstract: Wireless networking is an attractive networking solution due to its flexibility, mobility and ease of installation without damaging the furnishing of buildings (this factor play most important role in situations where buildings are of higher heritage importance).Wireless networks such as WLAN, WIMAX, UMTS etc are growing rapidly and there is a strong need to support multimedia applications. Wireless networks are becoming more and more popular in recent years from digital cellular telephony up to satellite broadcasting. With the increasing demand and wireless services, users of wireless networks now expect Quality of Service (QoS) and performance comparable fixed networks. Internetworking of network is done to support 4G and provide a boon to next generation wireless communication system. It also provide anywhere anytime connectivity to users as mobile moves from one place to another. Also Providing QoS requirements like good throughput and minimum access delay are challenging tasks.

Keyword*s: WLAN, WIMAX, UMTS, QoS*

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I. Introduction

Wireless technologies such as WLAN, WIMAX etc were developed with different standards and these technologies offer variety of services, different data rates and diverse area of coverage [13]. One of the major issues for the converged heterogeneous networks is to provide seamless connectivity with QoS support [20].

Internetworking between heterogeneous wireless access network constitute important issues to networking community. There are several benefits to a HWN as opposed to a traditional homogeneous wireless networks including increased reliability, improved spectrum efficiency and increased coverage.

Reliability is improved because when one particular RAT within the HWNs fails, it may still be possible to maintain a connection by falling back to another RAT. Spectrum efficiency is improved by making use of RATs which may have few users through the use of load balancing across RATs and coverage may be improved because different RATs may fill holes in coverage that anyone of the single networks alone would not be able to fill.

One of the forthcoming challenges in network management is to connect between end to end heterogeneous wireless technologies. To provide such end to end connection between heterogeneous networks we need to perform vertical handoff. The term interworking is used to express interactions between heterogeneous networks with the aim of providing an end-to-end communication [13].

In wireless network, mobility management provide mobile users with continuously get the connection when they move among different subnets based on their service needs. With this heterogeneity, users will be able to choose radio access technology that offers higher quality, data speed and mobility which is the best suited to the required multimedia application with the best performance and minimum cost. Many wireless technologies, such as WIMAX, WLAN, and UMTS are emerging to satisfy the user growing requirements to provide anytime anywhere access to internet [16].

Even though, the wired networks has benefits like packet loss, more security and less delay, it has its main drawback as immobility which makes the wireless networks to be prominent since it supports mobility. Nowadays, the voice and video transmission is widespread among the mobile users .In this case, the effective quality of speech at the destination side is more essential. The quality of speech in any network is determined by using Mean Opinion value (MOS) value, delay, jitter, load, delay and throughput as well. Rest of the paper is organized as follows. Section II represents the contribution made by different authors in the field of wireless communication between networks to provide better quality of services. Section III represents the simulation setup of integrated networks for different applications. Section IV shows the results of simulation and section V represents the conclusion and future work.

II. Related Work

Recent advances in Internet technology have changed the way people communicate. With the rapid growth of wireless packet-switched networks, sending data through the Internet rather than the Public Switched Telephone Network (PSTN) has become a better option in terms of cost for users and service providers, leading to huge growth of voice applications over IP networks. Heterogeneous network plays an important role in this contest. With the new emerging set of mobile phones such as iPhones, VoIP has become a de facto standard for voice applications in the Internet. Mobile phone users can make a voice/video call through the Internet anywhere anytime with better communication quality and less cost than PSTN. Internetworking of networks together provides better reliability and improved quality of services.

The communication is now possible between different networks easily and effectively. This improvement is going to impact businesses like call centers, multinational companies, as well as the normal users to a great extent than ever imagined.

K. S. Munasinghe and A. Jamalipour [7] provided architecture for interworking heterogeneous networks with an in-depth analysis of its performance. The novelty of this framework was that it freely enables any 3G cellular technologies, such as the Universal Mobile Telecommunications System (UMTS) or the CDMA2000 system, to interwork with a given Broadband Wireless Access (BWA) system, such as the worldwide interoperability for Microwave Access (WIMAX) network or the Wireless Local Area Network (WLAN) via a common signaling plane.

[11] S. Rizvi, A. Aziz, et al. [11] provided different integration mechanisms of UMTS and WLAN. More precisely, an integrated mechanism for the integration of UMTS and WLAN based on two different variations of tight coupling, i.e., interconnecting WLAN with Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN) had designed and analyzed.

A. Mohamed, F. W. Zaki, et al. [14] provided an effort to study the performance evaluation of VoIP for fixed users, as well as, the variation of the QoS parameters by using sector antenna for both BS and SS and reduced the distance between them, increased the average MOS and decreased the average packet end-to-end delay.

A. Dhiman, K. S. Sandha [18] analyzed handover procedures by using OPNET Modeler 14.5 in details. Using this simulator, they assessed performance such as delay, packet loss and throughput of Wi-Fi and WIMAX during handover. They found the simplest and affordable way to connect MS to BS. That approach also helped to reduce the complexity of the system.

A. L. Karthika, M. G. Sumithra, et al. [17] simulated two different heterogeneous networks and compared to find which gives better voice quality. Initially UMTS-WLAN network is integrated, simulated and compared with the later simulated WIMAX-WLAN network. The parameters that are validated in this simulation setup are NMOS value, jitter, delay, load and throughput. From this comparison, the overall performance to increase the MOS value at the end user is easily done by integrated WIMAX-WLAN.

Vijay Verma and Silki Baghla [20] presented a performance analysis of various types of wireless networks with many applications using OPNET simulator. The simulation results show that the WIMAX performance is good as compared with WLAN and UMTS for voice application and in heterogeneous networks, WLAN-WIMAX network gives the best results among all heterogeneous networks with 0 sec of jitter and maximum value of MOS.

III. Integration Of Various Wireless Networks

In this paper three wireless technologies WLAN, WIMAX and UMTS are integrated for communication using OPNET Modeler. When a user moves from one coverage area to another while communication it require proper quality of services for the effective communication. Various parameters include delay, packet loss, jitter, latency etc

The performance of integrated network is evaluated with the help of following scenario. Simulation is done using different applications as follows:

i. FTP
ii. VOICE
iii. VIDEO

The results are compiled and compared on based of various parameters which includes delay, traffic sent and received, load, MOS value, jitter etc.

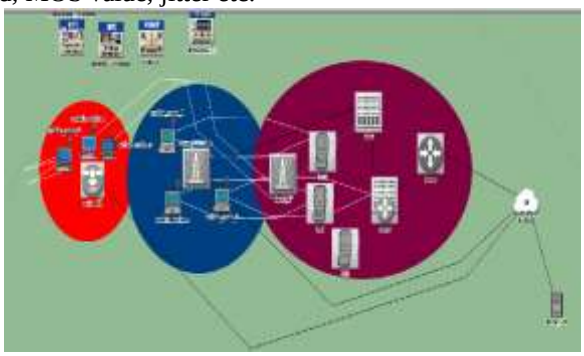

Fig1.Integrated network

IV. .Simulation Results

In this scenario, when simulation is done the packet delay ,traffic sent and received can be seen as shown for different application .The variation in output is due to the transfer of signal within them. WIMAX, WLAN, UMTS load, traffic send and received, delay.

The first simulation is done using FTP application and the results are shown along with. The performance evaluation of FTP application is shown in figure 2. Table 1 shows other parameters in which the delay is 0.5sec, response time of 10sec

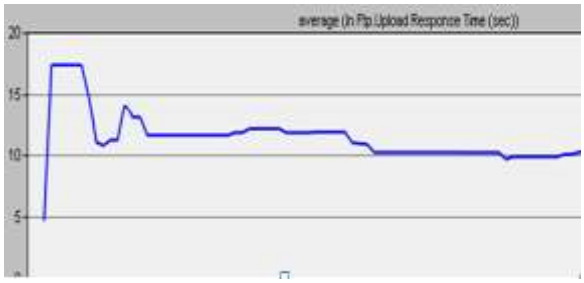

Fig2: Response time using FTP application

Table1: FTP application parameters

PARAMETER	VALUE
Delay	0.5sec
Response time	10sec

The second simulation is done for video application and the results are depicted as under. The performance evaluation of the video application in figure3 shows the traffic sent and received during communication. Table 2 shows parameters of video application in which delay is 4.3sec and the response time is 17.5sec.

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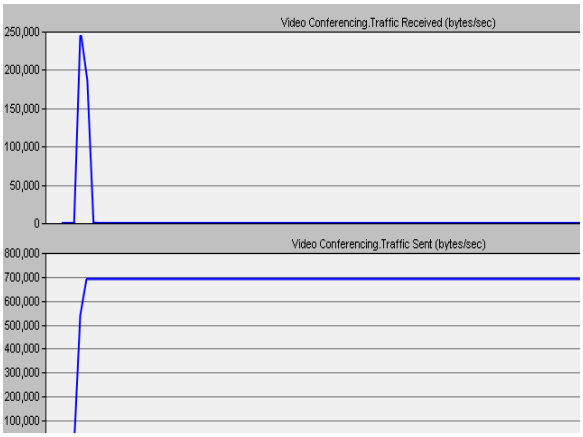

Fig 3: Traffic sent and received using video application

Table 2: Video application parameters

PARAMETERS	VALUE
Delay	4.3sec
Response time	17.5sec

Next the simulation is done for voice application. The simulation results are described below. Figure4 represent traffic sent and received during voice application. Table3 shows the other parameters of voice application where delay is 3sec and MOS value is 2.75sec.

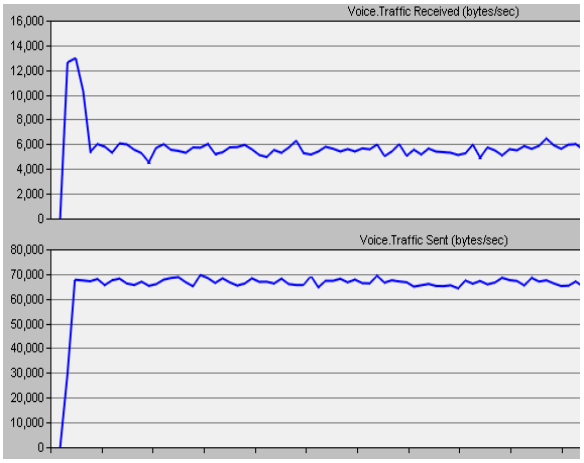

Fig4: Traffic sent and received using voice application

Table 3: Voice application parameters

PARAMETERS	VALUE
Delay	3sec
MOS value	2.75sec

V. V.CONCLUSION AND FUTURE SCOPE

In this paper, we present a performance analysis of wireless networks with different applications using OPNET simulator. The simulation results show when applications are changed the parameters changes e.g. Delay for ftp (0.5sec) ,voice(3sec) and video (4.3sec) . Similarly the traffic and response time for each vary .Traffic sent for FTP its 22bps, for voice its 67000bps and for video its 700,000bps where as response time 0.5sec for FTP, 2.75sec for voice and 17.5sec for video application.MOS value is measured in voice (2.75) which is an important parameter. As we could see the delay, traffic and response time for FTP application is least and for video it's the most. The further work in this can be done by simulating more results and increasing number of users per cell.

References

[1] LI MA, FEI YU, et al. "A New Method to support UMTS-WLAN vertical handover using SCTP" IEE E. Pp 44-51 August 2004.
[2] M. Liu1, Z. C. Li, et al**. "**Performance evaluation of vertical handoff decision algorithms in heterogeneous wireless networks".
[3] H. Karjaluoto, "Vertical handoff in wireless networks" pp.82-89
[4] Mrs. Chandralekha and Dr. P. K. Behera (2006), "Multiple optimization concept in vertical handoff" pp.54-61
[5] Wonjun Lee et.al, "Movement-Aware Vertical Handoff of WLAN and Mobile WIMAX for Seamless Ubiquitous Access" IEEE, pp. 1268-1275.
[6] M. Kassar, B. Kervella, et al., "An overview of vertical handover decision strategies in heterogeneous wireless networks" pp . 2607-2620
[7] K. S. Munasinghe and A. Jamalipour, "Interworked WLAN-WIMAX cellular data Networks" pp.1547-1553.
[8] S. N´adas and Z. Nagy, "HSUPA flow control and Quality of services of network" pp 625-634.
[9] K. S. Munasinghe and A. Jamalipour, "Interworked WIMAX-3G cellular data Networks: An architecture for mobility management and performance evaluation" IEEE, pp.1847-1853.
[10]. Alkhayat, A. Kumar, et al., "End –to-End Mobility solution for vertical handoff between heterogeneous wireless networks" IEEE, pp.750-755.
[11] S. Rizvi, A. Aziz, et al**., "**Tight Coupling Internetworking Between UMTS and WLAN: Challenges, Design Architectures and Simulation Analysis" pp.116-134.
[12] N. Qasim, "Vertical handover in Wireless Overlay Networks with Quality of services factors" .
[13] L. Nithyanandan and I. Parthiban, "Vertical handoff in WLAN-WIMAX-LTE heterogeneous network through gateway relocation" IJWMN, pp. 203-215.
[14] A. Mohamed, F. W. Zaki, et al., "Implementation of VOIP over WIMAX network" IJECET, pp. 310-320
[15] Sankaranarayanan Radha Ramyah,"3D Visualization of UMTS/WLAN Integration Using OPNET Modeler" pp. 281-285.
[16] D. J. Kadhim and S. S. Abed, "Performance and handoff evaluation of heterogeneous wireless networks(HWNs) using opnet simulator" IJECET, pp. 477-496.
[17] A. L. Karthika, M. G. Sumithra, et al., "Performance of voice in integrated WIMAX-WLAN and UMTS-WLAN" pp.1188-1194.

[18] A. Dhiman, K. S. Sandha, "Vertical and horizontal handover in heterogeneous wireless Networks using OPNET" IJERT, pp. 842-846.
[19] E. Onyekachi and E. Elias, "Investigating the QoS of voice over IP using WIMAX access Networks in a campus Network" pp.70-83.
[20] Vijay Verma and Silki Baghla, "Performance evaluation of quality of services in heterogeneous networks using OPNET modeler" IJECET, pp. 67-74.
[21] Vijay Verma and Silki Baghla, "Performance evaluation of QoS in WLAN-UMTS network using OPNET modeler, IJSR, pp.857-860.
[22] www.opnet.com.
[23] http://en.wikipedia.org/.