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Effect of interference of UMTS and WLAN during Handoff

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Abstract--*In this paper the performance of WLAN is analyzed in the presences of UMTS nodes. To analyze this interference UMTS are nodes are moving using different trajectories. While moving UMTS nodes handoff (soft and hard) techniques are used in this paper. To analyze this effect OPNET modeler is used. The performance is compared In terms of load, media access delay and packet delay variation. The result shows that the performance of soft handoff is better than hard handoff.*

Keyword: WLAN, UMTS and Handoff.

1. INTRODUCTION

Wireless computing allows the user rapidly to connect with each other without using wire. A LAN to which mobile users (clients) can connect and communicate by means of high-frequency radio waves rather than wires. IEEE 802.11 is the standard for Wireless Local Area Networks (WLANs) developed by the Institute of Electrical and Electronics Engineers (IEEE). The IEEE 802.11 standard defines two types of networks; ad hoc and infrastructure. The Basic Service Set (BSS) is the fundamental building block of the IEEE 802.11 architecture. A BSS is defined as a group of stations that are using the same medium access protocol and the same frequency band.

- An ad hoc network is a deliberate grouping of stations to form a single BSS for the purpose of internetworked communications without the aid of a base station.
- Infrastructure networks are established to provide some specific services and range extension. Infrastructure networks in the context of IEEE 802.11 are established using Access Points (APs).

WLANs Standards

The IEEE 802.11 standards for [6] for wireless local area networks are:-

- IEEE 802.11a: 802.11a works on frequency of 5.8 GHZ and by using OFDMA technique and provides protocols that allow transmission and reception of data at rates of 1.5 to 54Mbit/s.
- IEEE 802.11b: It provides less speed and is less expensive. Due to its low cost it is more popular. The 802.11b standard used DSSS (Direct Sequence Spread Spectrum) modulation technique. IEEE 802.11b has maximum data rate 11 Mbps and uses carrier sense multiple access/carrier avoidance (CSMA/CA) medium access technique. But it has disadvantage that the users using 802.11b experience interference from other products operating in the 2.4 GHz band.
- IEEE 802.11g: This works in the 2.4 GHZ band (like 802.11b), but uses the same OFDM_based transmission scheme as 802.11a. It operates at a maximum physical layer bit rate of 54 Mbit/s exclusive of forward error correction codes, or about 22 Mbit/s average throughputs.

Handoff in WLAN

While moving one user is may GRT out of link of the present cell due to that there may be data drop. To overcome this problem a technique called handoff is used. In this technique a user is shifted to other cell when the power of present cell is decrease so that packet don't drop

Types of handoff

- Hard handoff: The success rate of this handoff is less. Because in this type of handoff the present cell is terminated first and then connection to new cell is established
- Soft handoff: The success rate of this handoff is high. Because in this type of handoff the present cell is not terminated until connection to new cell is established

2. EXPERIMENTAL SETUP

In this paper the effect of intrusion of UMTS nodes is analyzed over WLAN. This interference is analyzed during handoff (soft and hard). To introduce interference WLAN network is made in which three floors are made (ground floor, first floor and second floor). There is also a server room in which two servers are placed in which one have VOIP application and other have VOD application as shown in Fig 1. In ground floor 2 access point is used and 14 WLAN nodes are used. In this scenario half node are having video and other half have voice application. In first floor access point is increased to 4 and nodes decrease to 10. Similar to ground floor half node are having video and other half have voice application. In 2nd floor less number of nodes is taken which are 6 and for this 1 access point is used. In this scenario half nodes are using VOD and other half node using VOIP application. To analyze the effect in each floor there is UMTS mobile nodes is place which are moving at speed of 5m/s by using different trajectories and have soft hand off. In second scenario UMTS mobile nodes are having hard handoff.

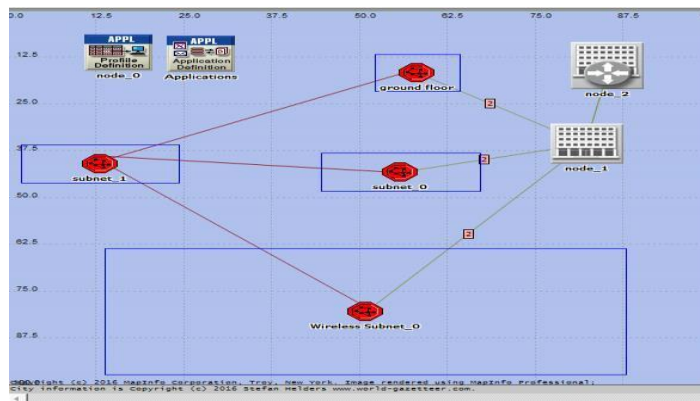


Fig. 2.1: Network Scenario

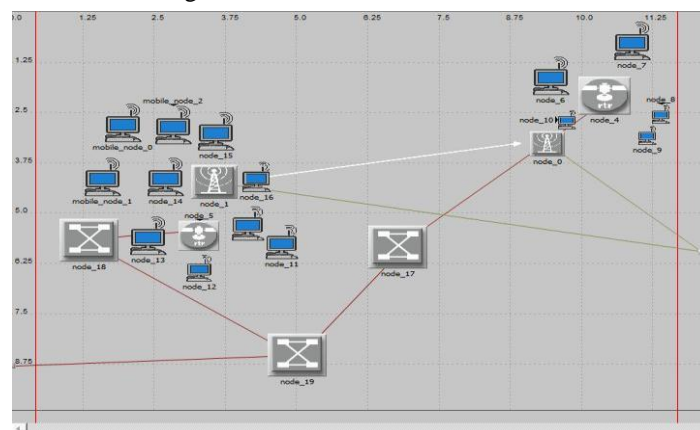


Fig. 2.2: UMTS Interference

3. RESULTS

Fig. 3.1 shows the result of load for hard handoff. Fig shows that when nodes are moving then **line** and zigzag have minimum load which is 3600000 bits/sec and square 3700000 bit/sec.

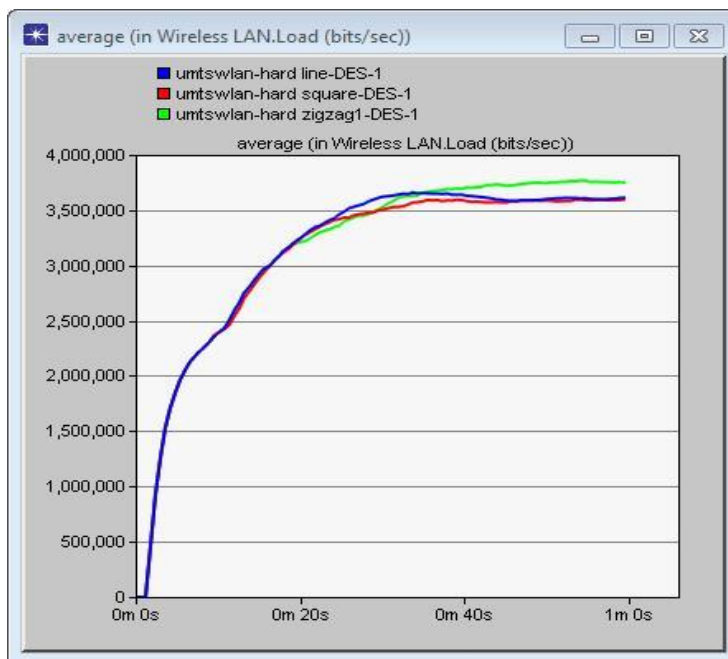


Fig. 3.1: Load for Hard Handoff

Fig. 3.2 shows the result of load for soft handoff. Fig shows that when nodes are moving then **line** have minimum load which is 3500000 bits/sec and square and zigzag have maximum same load which is 3600000 bit/sec.

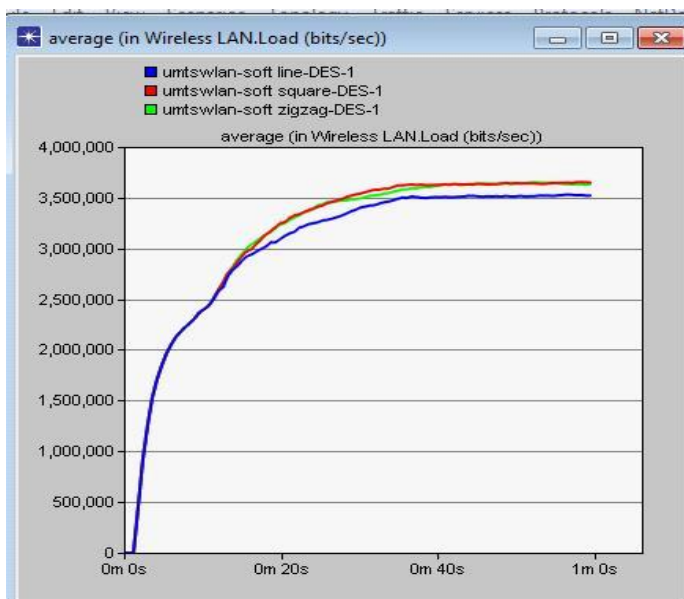


Fig. 3.2: Load for Soft Handoff

Media Access Delay

Fig 3.3 shows the result of Media access delay. Fig shows that when nodes are moving then **line** have Media access delay which is 0.27sec and then zigzag have maximum 0.28sec and Then Square have minimum 0.080sec.

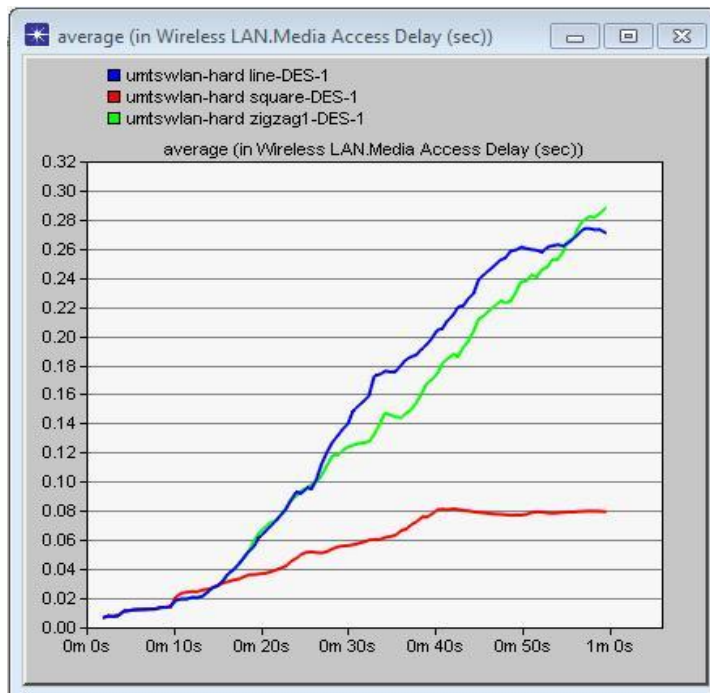


Fig 3.3: Media access delay for Hard Handoff

Fig 3.4 shows the result of Media access delay. Fig shows that when nodes are moving then zigzag have Media access delay which is 0.11 sec and then line have minimum 0.7 sec and then square have maximum 0.22sec.

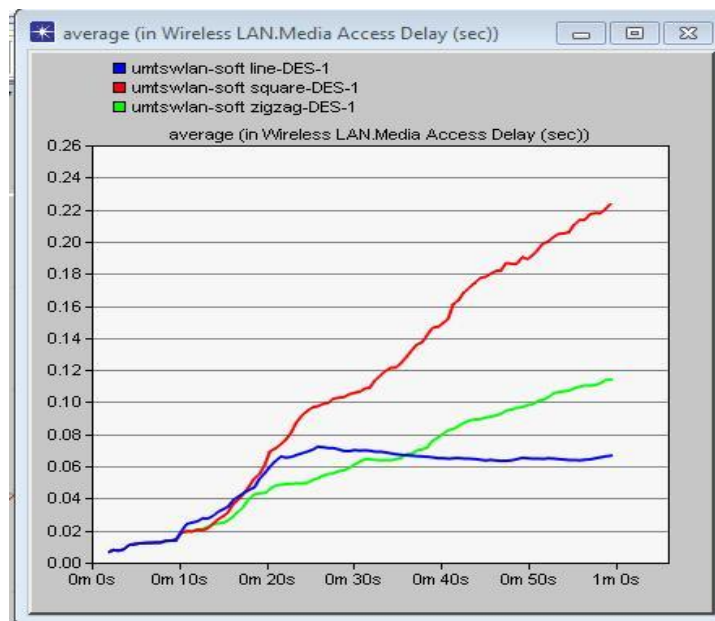


Fig 3.4: Media Access delay for Soft Handoff

Packet Delay Variation

Fig 3.5 shows the result of Packet delay variation. Fig shows that when nodes are moving then **line** have maximum Packet delay variation which is 0.75 sec and then square have 0.60 sec and then zigzag have 0.05sec.

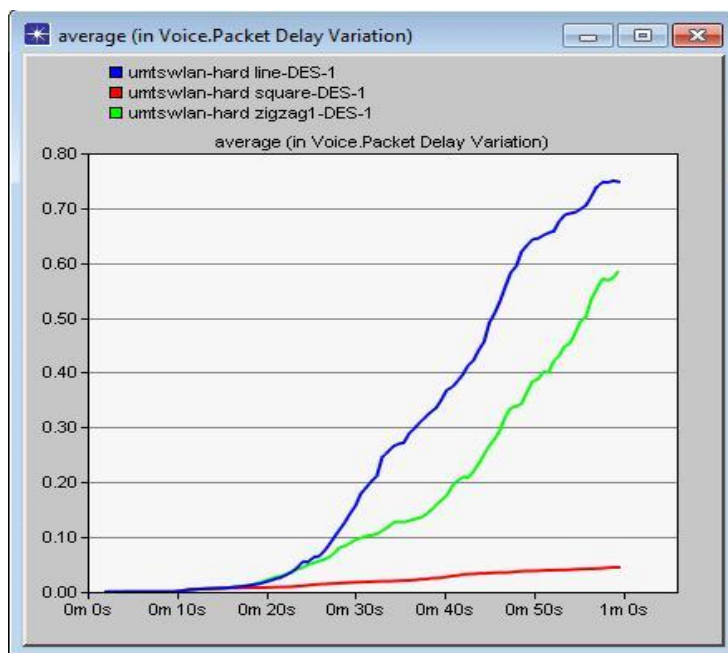


Fig 3.5: Packet delay variation for Hard Handoff

Fig 3.6 shows the result of Packet delay variation. Fig shows that when nodes are moving then square have maximum Packet delay variation which is 0.36 sec and then zigzag have 0.08 sec and then line have 0.04sec.

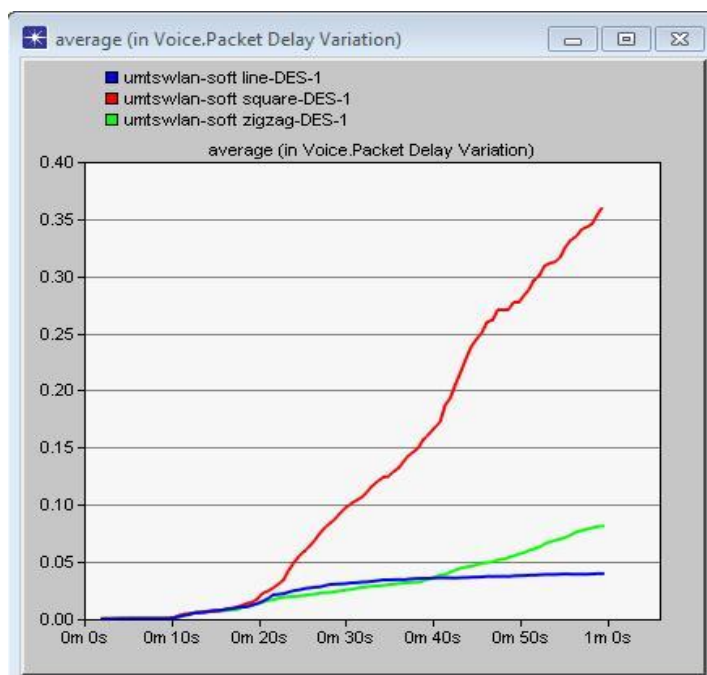


Fig 3.6: Packet delay variation for soft handoff

TABLE SHOW RESULTS

Media Access Delay

For Hard

Without WLAN	Zigzag		Line	Square
0.0070	0.28		0.27	0.080
For Soft				
Without WLAN	Zigzag		Line	Square
0.0070	0.11		0.7	0.22

Load

For Hard				
Without WLAN	Zigzag		Line	Square
<u>80000000</u>	<u>3600000</u>		<u>3500000</u>	<u>3700000</u>
For Soft				
Without WLAN	Zigzag		Line	Square
<u>80000000</u>	<u>3600000</u>		<u>3500000</u>	<u>3650000</u>

Packet Delay

For Hard				
Without WLAN	Zigzag		Line	Square
<u>0.0070</u>	<u>0.05</u>		<u>0.75</u>	<u>0.60</u>
For Soft				
Without WLAN	Zigzag		Line	Square
<u>0.0070</u>	<u>0.08</u>		<u>0.04</u>	<u>0.36</u>

4. CONCLUSION

In this paper the interference effect of UMTS and WLAN is analyzed. For this UMTS nodes are moved using different trajectories at fixed speed 5m/s. For transferring nodes from one point to another handoff (soft and hard) techniques are used. To analyze this effect OPNET modeler is used. The performance is compared In terms of load, media access delay and packet delay variation. The result shows that the performance of soft handoff is better than hard handoff.

5. REFERENCES

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