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Investigate the Effect of Different Mobility Trajectory on VOD over WIMAX

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Abstract: *In this paper the effect of different Mobility trajectory is analyzed by making some good sectors and bad sectors for VOD over Wimax. To investigate given effect the SVC codes are considered in simulation environment through opnet modeler 14.5. The performance is examination in the terms of throughput, traffic received and packet end to end delay. The result concerns that SISO is better than MIMO. Simulation also shows that the performance of trajectory model is better for Adaptive and for QPSK, when some nodes are not moving.*

Keywords: *IEEE 802.16, MIMO, OPNET, SISO, VOD, Wimax, Wireless Network.*

I. Introduction

Wireless Communication is the most needed in everybody's life; numerous techniques are used to communicate through wireless technology like Wimax, MANET, VANET, Wi-Fi, Bluetooth etc. WiMAX is Wireless Interoperability for Microwave Access; it is the latest innovation for Wireless Communication which is in view of the IEEE 802.16-2004 and IEEE 802.16e-2005 benchmarks and was outlined with much impact from Wi-Fi. IEEE 802.16 backings two sorts of transmission duplexing: Time Division Duplexing (TDD) and Frequency Division Duplexing (FDD) and strengthen both full and half duplex stations [1, 4, 5]. WiMAX manages with the IEEE 802.16 standard to make the communication. WiMAX standard IEEE 802.16 is sub divided into various categories like 802.16a, 802.16c, 802.16d and 802.16e this standard gives the point-to multipoint telecast in 10 to 66 GHz repeat range for Line of Sight (LOS) environment [13, 16].

1.1 Siso: SISO means Single Input Single Output. SISO has been being used following the creation of wireless system. It refers to a wireless communications system in which one antenna is used at the source and one antenna is used at the destination. SISO systems are typically less convoluted than multiple-input multiple-output (MIMO) systems. SISO is used in radio, satellite, GSM and CDMA systems.

1.2 Mimo: MIMO means Multiple Input Multiple Output. MIMO is viably a radio antenna technology as it uses multiple antennas at the transmitter and receiver to permit an array of signal paths to carry the data, Choosing separate paths for each antenna to enable multiple signal paths to be used. It utilizes multiple antennas to make use of reflected signals to provide gains in channel robustness and throughput. Wi-Fi, LTE; Long Term Evolution, and many other radio, wireless and RF technologies are using the new MIMO wireless technology to provide increased link capacity and spectral efficiency. MIMO system conveys higher data rate because of transmission of multiple data symbols simultaneously using multiple antennas. MIMO is used in next generation wireless technologies such as mobile Wimax -16e, WLAN-11n.11ac, 11ad, 3GPP LTE etc.

II. WIMAX

WiMAX technology is able to relay video, voice and real time data. WiMAX can be considered as IP access network and is very apparent for packet based core networks. WiMAX systems are required to convey broadband access administrations to private and enterprise clients in an efficient way. WiMAX would work like Wi-Fi yet at higher speeds over huge distances and for a greater number of clients. WiMAX, which is an IP-based wireless broadband innovation, can be coordinated into both wide-area third-generation (3G) mobile and wireless and wire line networks permitting it to become part of a seamless anytime, anywhere broadband access solution. Based on IEEE 802.16 WiMax is claimed as an alternative broadband rather than cable and DSL. It is a connection-oriented wide area network

2.1 WIMAX system

WiMAX systems have four major design segments [5, 8, 11].

Base Station which use the hub that consistently join wireless endorser gadgets to administrator systems. BS uses the component like radio wires, handsets, and other electromagnetic wave transmitting gear.

Subscriber Station is a stationary WiMAX-proficient radio framework that communications with a base station.

Mobile Station is a subscriber station that is planned to be utilized while as a part of movement at up to vehicular paces.

Relay Station is SSs designed to forward movement to different RSs or SSs in a multi-hop Security Zone.

III. VOD Technology

Video on demand permits users to select and view to video on demand. VoD content that can be transmitted through IPTV platform includes a library with movie titles, music on demand etc. VoD is utilized to convey information through Internet Protocols. With video on demand, viewers can quick forward, rewind or respite. VOD is deliberate to broadcast the streams of video programming to each user.VOD is obtainable through a link, broadband or phone supplier. These streams are persistant. Each user can select the stream they want to view. This process is functionally alike to the programming delivered by local broadcasters [4, 7]. Service providers need intellectual mechanisms in core and in distribution networks to offer VOD services. VOD service providers accept content in distinctive formats and from diverse sources. Through VOD technology all of these formats should be improved in IP format in order to be transmitted to user as service with high eminence in the same IP network. Figure 1 shows the concept of VOD using with WiMAX [1, 2, 16]

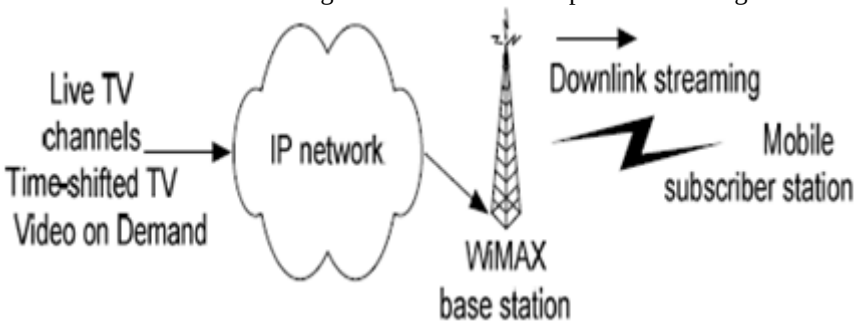

Fig. 1 VoD Channel

IV. Scalable video coding

SVC institutionalizes the encoding of a top notch feature bit stream that additionally contains one or more subset bit streams. The SVC codec interprets bits from a network data stream into a picture and then again makes an interpretation of camera feature into a bit stream. It separates video bit streams into bit stream subsets that include layers of quality and determination to video signal. SVC has accomplished significant upgrades in coding effectiveness with an expanded level of supported adaptability in respect to the adaptable profiles of earlier video coding standards. The following video applications can benefit from SVC are Streaming, Conferencing, Surveillance, Broadcast. SVC, the scalable extension of H.264/AVC, allows to jointly transmitting numerous videos with diverse aspect-ratios and resolutions. Scalable video is engaged in wireless environments primarily because of the following three reasons.

First, it has been exposed that scalable video is accomplished of coping with the changeability of bandwidth elegantly. Second, scalable video representation is a good elucidation to the heterogeneity problem in the multicast case. Third, scalable video representations naturally fit irregular error protection which can effectively combat bit errors induced by the wireless medium. Scalable video coding schemes have initiated a number of applications. For video applications over the Internet, scalable coding can assist rate control during network congestion; for web browsing of a video library, scalable coding can engender a low-resolution video preview without decoding a full resolution picture [15]; for multicast applications, scalable coding can afford a range of picture quality suited to heterogeneous requirements of receivers. The main purpose of scalable video coding is to encode video into a scalable bit stream such that videos of lower qualities, spatial resolutions and/or temporal resolutions can be generated by simply truncating the scalable bit stream

V. Experimental Setup

In this experiment the Effect of Different mobility trajectory (Given path, random way point and some moving and some not) on VOD over WiMAX is analyzed by using OPNET Simulator. OPNET Simulator 14.5 [10] was used to analyze the performance of WiMAX. We used OPNET modeler, as OPNET modeler provides a comprehensive development environment supporting the modeling of communication network and distributed

systems. OPNET modeler provides better environment for simulation, data collection and data analysis [15]. In this research work SVC codes is used. In each scenario seven Hexagonal cells are taken. Each cell has a radius of 2 Km. In each cell there is one Base station and 15 mobile nodes are taken. These nodes are circularly placed. The BS connected to the IP backbone via a DS3 WAN link. The base stations are connected to backbone cloud through ppp_DS3 link. The Backbone Cloud is also connected to VOD server through Sonet os12 link. To analyze the performance of misbehavior nodes different research is carried out as follows:-

Research 1: Here we used scenarios simulation to study the effect of different mobility models by using Adaptive Modulation. In this scenario some nodes have good sectors (16qam 3/4) and another nodes have Adaptive modulation.

Research 2: Here we used scenarios simulation to study the effect of different mobility models by using QPSK3/4 Modulation. In this scenario some nodes have good sectors (16qam 3/4) and another nodes have QPSK3/4 modulation.

VI. Results

- **Traffic received:**

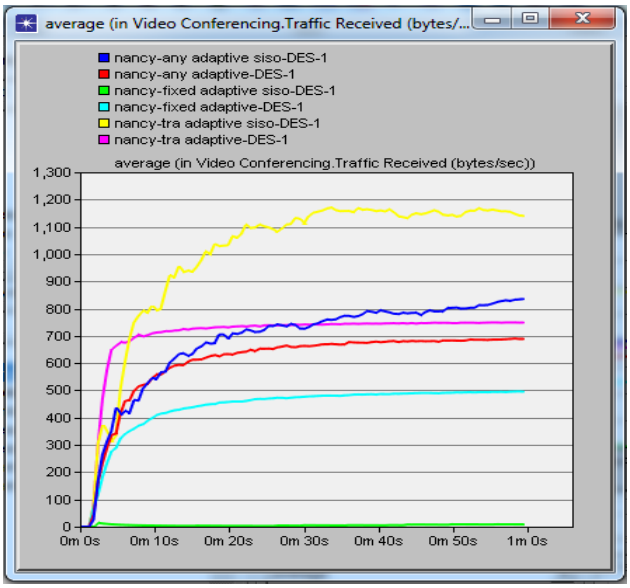

Fig. 2 Traffic received for adaptive

Figure 2 shows the result of traffic received for adaptive modulation for MIMO and SISO transmitter. The result shows that for MIMO when nodes are moving in fixed trajectory then traffic received is 750, when moving randomly then traffic received is 690 and when some move and some fixed than traffic received is 500. The result also shows that for SISO when nodes are moving in fixed trajectory then traffic received is 1150, when moving randomly then traffic received is 840 and when some move and some fixed than traffic received is 10.

This shows that the performance of SISO is better than MIMO and performance of Wimax under given trajectory is better than other.

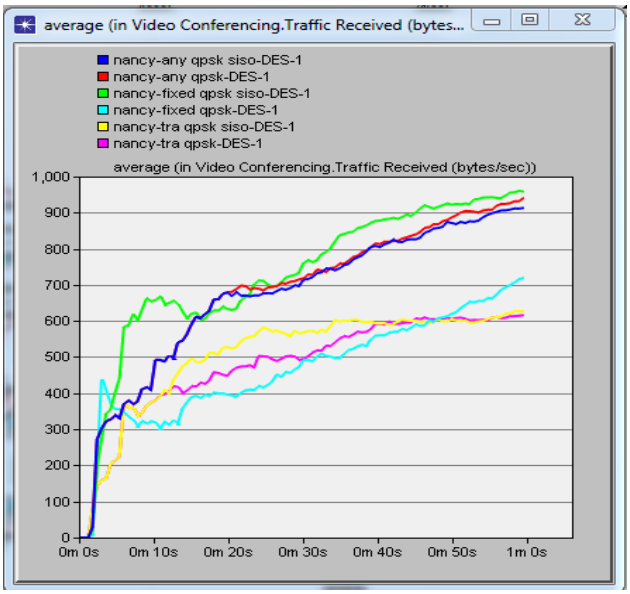

Fig. 3 Traffic received for QPSK

Figure 3 shows the result of traffic received for QPSK modulation for MIMO and SISO transmitter. The result shows that for MIMO when nodes are moving in fixed trajectory then traffic received is 620, when moving randomly then traffic received is 940 and when some move and some fixed than traffic received is 720. The result also shows that for SISO when nodes are moving in fixed trajectory then traffic received is 630, when moving randomly then traffic received is 920 and when some move and some fixed than traffic received is 960. This shows that the performance of SISO is better than MIMO and performance of Wimax is better when some nodes are not moving than other. Result also shows that the performance of QPSK is better that adaptive.

- **Packet end to end delay:**

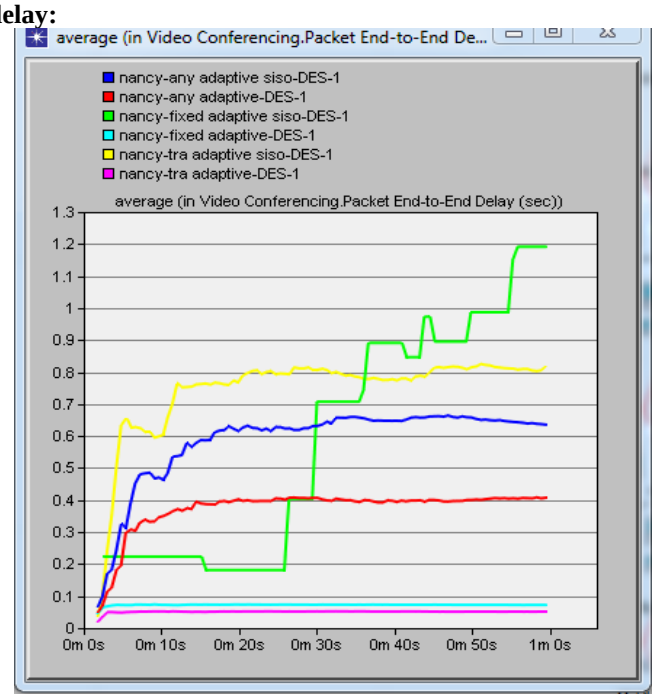

Fig. 4 Packet end to end delay for adaptive

Figure 4 shows the result of Packet end to end delay for adaptive modulation for MIMO and SISO transmitter. The result shows that for MIMO when nodes are moving in fixed trajectory then Packet end to end delay is 0.05, when moving randomly then Packet end to end delay is 0.4 and when some move and some fixed than Packet end to end delay is 0.07. The result also shows that for SISO when nodes are moving in fixed trajectory then Packet end to end delay is 0.80, when moving randomly then Packet end to end delay is 0.65 and when some move and some fixed than Packet end to end delay is 1.2.

This shows that the performance of MIMO is better than SISO and performance of Wimax under given trajectory is better than other when MIMO.

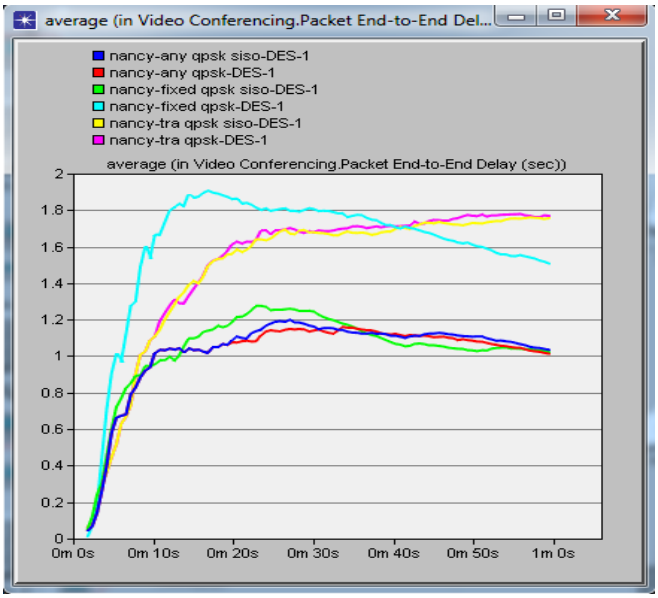

Fig. 5 Packet end to end delay for QPSK

Figure 5 shows the result of Packet end to end delay for QPSK modulation for MIMO and SISO transmitter. The result shows that for MIMO when nodes are moving in fixed trajectory then Packet end to end delay is 1.79, when moving randomly then Packet end to end delay is 1 and when some move and some fixed than Packet end to end delay is 1.5. The result also shows that for SISO when nodes are moving in fixed trajectory then Packet end to end delay is 1.78, when moving randomly then Packet end to end delay is 1 and when some move and some fixed than Packet end to end delay is 1. This shows that the performance of SISO is better than MIMO and performance of Wimax is better when some nodes are not moving than other. Result also shows that the performance of adaptive is better that QPSK.

- **Throughput:**

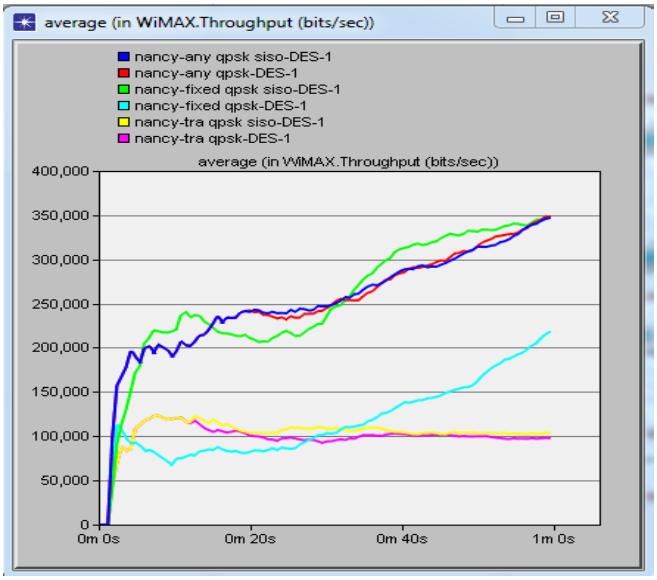

Fig. 6 Throughput for adaptive

Figure 6 shows the result of Throughput for adaptive modulation for MIMO and SISO transmitter. The result shows that for MIMO when nodes are moving in fixed trajectory then Throughput is 100000, when moving randomly then Throughput is 350000 and when some move and some fixed than Throughput is 22000. The result also shows that for SISO when nodes are moving in fixed trajectory then Throughput is 400000, when moving randomly then Throughput is 110000 and when some move and some fixed than Throughput is

350000. This shows that the performance of SISO is better than MIMO and performance of Wimax under given trajectory is better than other when MIMO and Random when SISO.

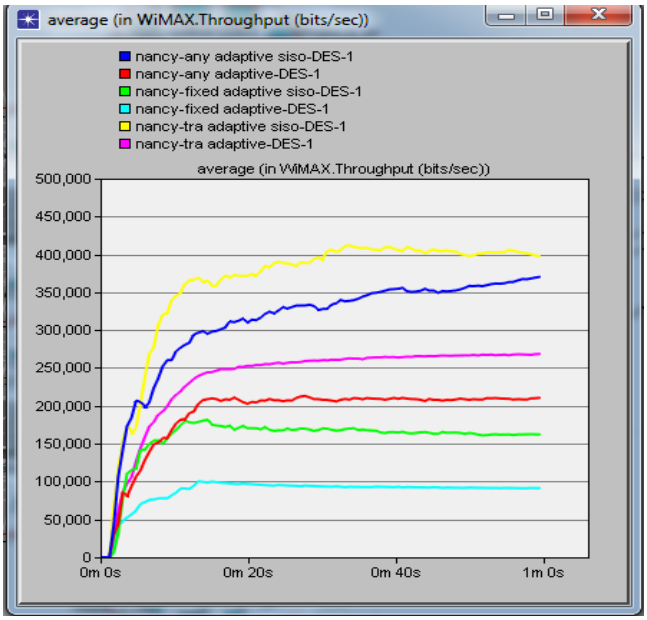

Fig. 7 Throughput for QPSK

Figure 7 shows the result of Throughput for QPSK modulation for MIMO and SISO transmitter. The result shows that for MIMO when nodes are moving in fixed trajectory then Throughput is 270000, when moving randomly then throughput is 210000 and when some move and some fixed than throughput is 90000. The result also shows that for SISO when nodes are moving in fixed trajectory then throughput is 400000, when moving randomly then throughput is 370000 and when some move and some fixed than throughput is 170000. This shows that the performance of SISO is better than MIMO and performance of Wimax is better when nodes are moving randomly than other. Result also shows that the performance of QPSK is better that adaptive.

VII. Conclusion and Future Scope

In this research work the effect of different mobility trajectory is analyzed for VOD over Wimax. For this good sectors and bad sectors are made. For VoD SVC code is used. To compare the performance throughput, packet end to end delay and traffic received is used. The result shows that that the performance of SISO is better than MIMO. Result also shows that the performance of Give trajectory model is better for Adaptive and for QPSK when some nodes are not moving is better. In future one can see the effect by varying different mobility, for node failure and by using different applications.

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