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COMPARISON OF ENERGY CONSUMPTION IN MOBILE AD-HOC NETWORK BY INCREASING THE SPEED OF THE NETWORK USING OFDM

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ABSTRACT: This paper shows the comparison of energy of Mobile ad-hoc network by increasing the mobile speed of the entire network. The technology used in this paper is OFDM and the results is shown using Qualnet.

KEYWORD: - QUALNET, OFDM, MANET, QPSK, DPSK

I. INTROUCTION

Communication is one of the important aspects of life. The purpose of communication is to transport an information bearing signal from a source to a user destination through a communication channel. A communication system may be in analog as well as in digital form. In analog form continuous signals are being used that vary continuously with time where as in digital system discrete electrical signals are used for transmission.

II. ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM)

OFDM is a modulation technique used for many wireless communication applications including Mobile Communication. OFDM is similar to frequency division multiplexing with a difference that in OFDM all the sub-bands are used by one source at a given time. In OFDM the band is divided into 52 sub-bands with 48 sub-bands for sending data and 4 sub-bands for the control information. The interference is reduced due to this division in sub-bands. DPSK (Differential Phase Shift Keying) and QPSK (Quadrature Phase Shift Keying) is used in OFDM systems to avoid need to track the time varying channel. It provides much more security to the data. It is robust to channel pair impairment and provides large data rates. Parallel Transmission is used in OFDM while the data is transmitted. The two basis limitations of OFDM include High PAPR (Peak to Average Ratio) and the large dynamic range of signals. The OFDM Mainly works at Physical and MAC layer only. OFDM provides transmission of many signals simultaneously through a single channel where each signal has its own separate frequency. It is used in systems such as Wi-Fi(802.11a/g/n), Wi-Max(802.16), DSL (Digital Subscriber Line) and DVB-T (Digital Video Broadcasting-Terrestrial). It handles the multi-path interference which generates frequency selective fading and Inters symbol Interference (ISI). It is a modulation scheme that can convert a single wideband signal into series of independent narrow band signals placed side-by side in frequency domain. Its main benefit is that the sub carriers in OFDM can overlap each other. With the advancement of DSP Technologies, It delivers up to 54 Mbps in 5 GHz ISM band. The applications of OFDM have been scarce.

III. RESULTS AND ANALYSIS

Here initially we have considered a network with 4 mobile nodes placed in rectangular grid as shown in fig 1. The protocol distance is taken as 1 hop. The OFDM works in 5 GHz ISM band hence the channel frequency is taken as 5.2 GHz with a bandwidth of 20 MHz, the minimum data rate is set as 6Mbps. The Antenna Height is 1.5m. The maximum mobile speed is taken as 1.3m/s. The model is taken as two ray path loss model with shadow fading of 12dB for making it suitable for indoor environment. The two ray path loss model is a model that is valid for line of sight and it consist of one direct ray and other reflected ray. It is a type of deterministic path loss model. The path loss is defined as the difference between transmitted and received power. OFDM has symbol duration of 4μs.Each OFDM can support 24 un-coded bits. The effect of fading is neglected.

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The result of Energy consumption is shown in Fig 1 to Fig 3. The total energy consumption in this case is 13.4595mJ. as calculated using Table 1

Table1

	Transmit	**Receive**	**Idle**
NODE1	0.044822	0.00103	3.33127
NODE2	0.042501	0.000622	3.33173
NODE3	0.020789	0.00013	3.33272
NODE4	0.02107	0.00015	3.3327

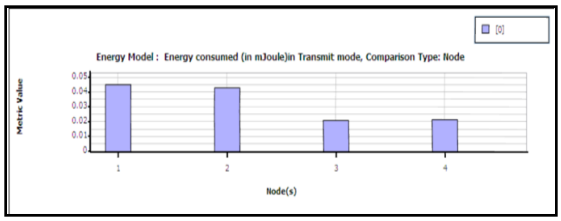

Fig. 1 Energy Consumed in Transmit mode when the speed is 1.3 m/s

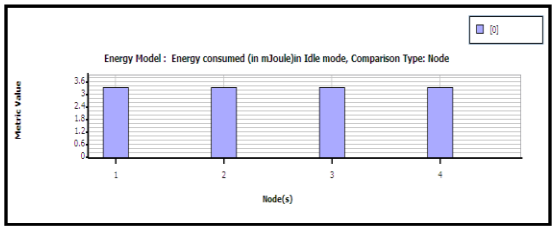

Fig. 2 Energy consumed in idle mode when the speed is 1.3 m/s

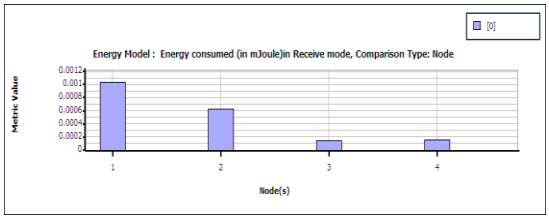

Fig. 3 Energy Consumed in Receive mode when the speed is 1.3 m/s

When the speed of the network is increased to 1.73m/s the total energy consumption is 13.717143 as calculated from Table 1 and it shows slight increase in the energy consumption. Hence it can be concluded that more is the network speed the more the energy the network will consume. Hence for energy efficient system the speed of the ad-hoc network must be less.

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Table 2

	Transmit	Receive	Idle
NODE1	0.106261	0.000592	3.33028
NODE 2	0.09715	0.000144	3.33094
NODE 3	0.096021	0.000253	3.33086
NODE 4	0.093474	0.000228	3.33094

The graphs from Fig. 4 to Fig. 6 shows the energy consumption in all the three modes when the speed of network is increased to 1.73m/s

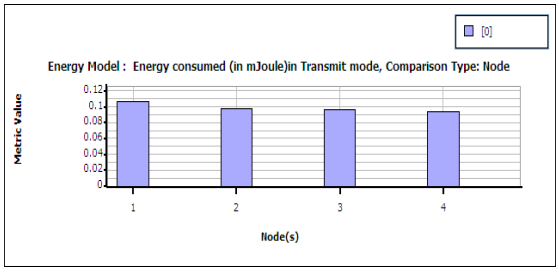

Fig. 4 Energy Consumption in transmitting mode when the speed of network is increased to 1.73m/s

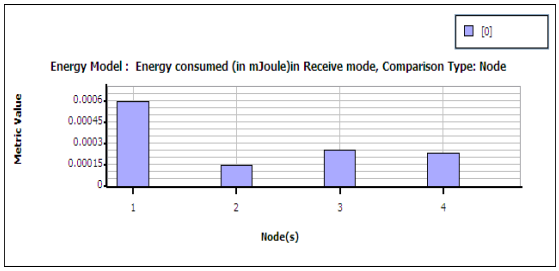

Fig. 5 Energy Consumption in receiving mode when the speed of network is increased to 1.73m/s

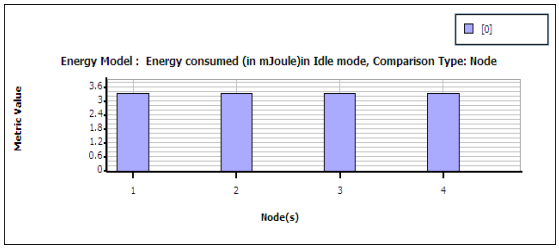

Fig. 6 Energy Consumption in idle mode when the speed of network is increased to 1.73m/s

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IV. CONCLUSION AND FUTURE WORK

The above results show that when the speed of the mobile ad-hoc network is increased the energy consumption also increases correspondingly. This practical result is obtained using the simulation tool Qualnet. There is further much scope in reducing the energy consumption of mobile ad-hoc networks with the use of same technology OFDM. OFDM can be used in adaptive as well as non- adaptive form. Current works are being implemented on MIMO-OFDM-IDMA. The combined technology for OFDM with IDMA (Interleave Division Multiple Access)

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REFERENCES

[1] Kamol Kaemarungsi and Prashant Krishnamurathy, "*On the Use of Adaptive OFDM to Preserve Energy in Ad Hoc Wireless Networks*", Telecommunication Program, School of Information Science, University of Pittsburg
[2] Ka Ki Yeung, "*Detailed OFDM Modeling in Network Simulation of Mobile Ad-Hoc Networks*", Ph.d Thesis, University of California
[3] Tobias Doerffel, "*Simulation with Wireless Ad-hoc Sensor Networks with Qualnet*", Documentation
[4] Irena Orovic, Nikola Zaric, SrdjanStankovic, Igor Radusinovic and ZoranVeljovic, "*Analysis of Power Consumption in OFDM System*", Journal of Green Engineering, pp 477-489, July 2011
[5] Xiao Lin, You Chunyan, Du Guoxin, He Tonglin, "*Fast Adaptive Loading for OFDM based On Energy Consumption Intensity Analysis*" , ICCP 2011 Proceedings, pp 249-252
[6] Wee Sian Wong, Chong Eng Tan, "*Ad-Hoc Wireless Routing Scheme based on Adaptive Modulation in OFDM Broadband Networks*" IEEE 2008
[7]R.V.Nee and R.Prasad, "*OFDM Wireless Multimedia Communications*", Norwood, MA: Artech House, London, 2000
[8] J.A.C. Bingham, "*Multicarrier Modulation for Data Transmission: An idea whose time has come*", IEEE Communication Magazine, volume 28, no 5, pp 5-14, may 1990
[9]T.Keller and L.Hanzo, "*Adaptive Multicarrier Modulation: A convenient framework for Time-Frequency Processing in Wireless Communications*", Proc IEEE Wireless Communications, Vol.88, pp 611-640, 2000
[10] J. Campello de Souza, "*Discrete Bit loading for multicarrier modulation Systems*", PhD Dissertation, Stanford University, 1999