IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

EFFECT OF VARIABLE TRAFFIC LOAD IN ON ENERGY CONSUMPTION OF NODES IN MOBILE AD-HOC NETWORK FOR DIFFERENT ROUTING PROTOCOLS

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Abstract: Traffic load is an important parameter in Mobile Adhoc Network(MANET). MANET is a infrastructureless networking system where battery life-time is a vital factor. Here we have designed a network of 1500x1500 sq. Meter where 25 nodes are arranged in grid pattern using Qualnet simulator. We have calculated average energy required in transmit mode, receive mode and idle mode in physical layer by taking traffic load of 5,10 and 15 in Proactive, Reactive and Hybrid Protocol.

***Index terms*:** Energy Consumption, Traffic Load, Routing Protocol, Adhoc network.

I. INTRODUCTION

Mobile Ad-hoc Network (MANET) is infrastructureless network where each node communicate with other node in multi-hop manner. As it is used in war-zones, devastated fields by natural calamity as earth-quake, cyclone or tsunami etc., battery power is a major issue of consideration. Different researchers proposed different ways to reduce the energy consumption of nodes as battery life-time of nodes solely decides the life-time of the network. Here we have investigated how traffic load in a particular network controls the energy consumption of a node in mobile ad-hoc network.

Energy consumption of node are divided into four states. These states are transmit mode, receive mode, idle mode and sleep mode. If traffic load is increased, more communication is required between nodes. Here we propose to limit number of traffic loads to conserve the energy in nodes. Routing protocols are discussed in section II, Review of Literature is discussed in section III. Simulation results are discussed in section IV and section V describes conclusion and future work.

II. ROUTING PROTOCOLS

Routing protocols play an important role in Mobile Adhoc Network. In MANET, routing protocols are divided into three categories: Proactive, Reactive and Hybrid. In Proactive protocol which is also known as Table driven, each node keeps a table in its cache. In this table, the shortest path to reach other are mentioned along with the number of hops. In MANET as all nodes are mobile in nature, hence a periodic update of this table is required. There are different types of proactive protocols are proposed as Bellman-ford, DSDV, Fisheye, STAR etc. In reactive protocols which is also known as on demand protocols, no periodical updates are not required. When a communication is required from a node, a route request message is broadcast from the source nodes in search of destination node. Neighboring nodes receives the route request and rebroadcast it . The route request keeps a number as well as source node ip address and destination node ip address to avoid the collision of broadcast. After searching out the destination node, a route reply is sent to the source node through shortest path. This process is called route discovery. During communication between two nodes, if data is missing for a specified time, route maintenance procedure is followed to repair the path breakage. There are different types of reactive protocols are proposed as AODV,DSR, TORA etc. Hybrid protocols are a mix-up of proactive and reactive protocols. Total scenario are divided into some zones. For intra-zone communication, proactive protocols are used where for inter zone communication reactive protocols are used. Example of hybrid protocol is ZRP.

III. REVIEW OF LITERATURE

In the year of 2017, **K.Venkatachalapathy, D.Sundaranarayana**[1] have made survey on different factors for energy efficiency issues in mobile adhoc network. In the year of 2007, **Xiaoqin Chen, Haley M. Jones, A .D .S. Jayalath** [2] have proposed congestion aware routing protocol for mobile adhoc network. In the year of 2013 **S.Sheeja , Dr.Ramachandra.V.Pujeri**[3] have proposed congestion avoidance scheme and measured its effect using NS2. In the year of 2011, **Shashank Bharadwaj, Vipin Kumar, Ankit Verma**[4] have discussed load balancing routing protocols in mobile adhoc network. In the year of 2012 **S. Subburam, P. Sheik Abdul Khader**[5] have discussed congestion control of mobile adhoc network. In the year of 2002, **Dmitri D. Perkins, Herman D. Hughes, and Charles B. Owen[6]** have discussed different factors which affects the performance of adhoc networks. In the year of 2014, **Dimitra Kampitakia, Anastasios A. Economides[7]** have made simulation and studied Mobile Adhoc Network for different routing protocols using traffic of File Transfer Protocol. In the year of 2014, **B. Sivakumar, N. Bhalaji, D. Sivakumar**[8] discussed in their paper a short survey on the specialized algorithms and protocols related to energy efficient load balancing for critical link detection in the recent literature and suggested a machine learning based hybrid power-aware approach for handling critical nodes via load balancing.

IV. SIMULATION RESULTS

We have used Qualnet software for simulation of our experiment. Details of the simulation characteristics are given in Table1 below. Simulation scenario and snapshot of simulation are given in figures below. Simulation results are plotted in figures below.

Table1: Simulation Characteristics

Serial No.	Parameters	Values
1	Simulator	QualNet Version 5.0.2
2	Terrain Size	1500 x 1500 sq. Meter
3	Antenna model	Omnidirectional
4	No. of nodes	25
5	No. Of Traffic load	5,10,15
5	Radio Type	802.11b
6	Propagation Model	Two Ray Ground
7	Channel Frequency	2.4 GHz
8	Traffic Source	CBR
9	Pattern of arrangement	Grid
10	Antenna Height(meters)	1.5
11	Data size	512 bytes
12	Data Rate	2Mbps
13	Antenna Gain(dB)	0.0
14	Performance Metrics in Physical Layer	Energy consumed in Transmit mode, Energy consumed in Received mode, Energy Consumed in Idle mode
15	Battery Model	Generic
16	Mobility Model	Random Way Point

17	Routing Protocols	Proactive: DSDV Reactive: AODV Hybrid : ZRP
18	Transmit circuitry power consumption(mW)	100.0
19	Receive circuitry power consumption(mW)	130.0
20	Idle circuitry power consumption(mW)	120.0
21	Sleep circuitry power consumption(mW)	0.0
22	Supply voltage(volt)	6.5

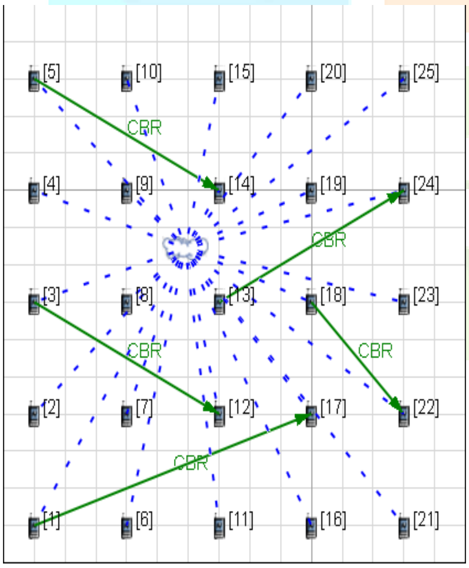

Fig.1: Network scenario with 5 traffic load.

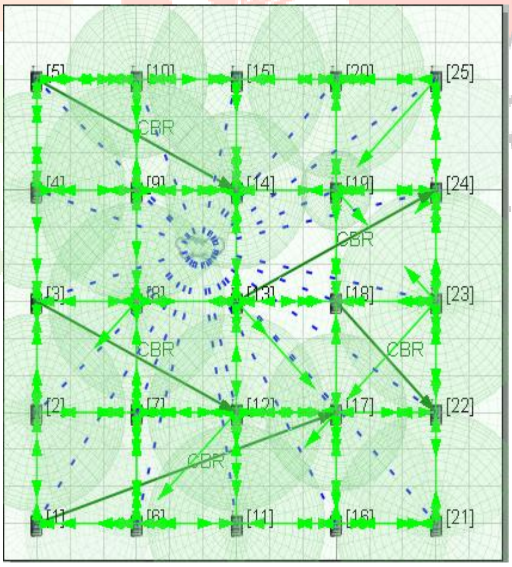

Fig.2: Simulation of 5 traffic load.

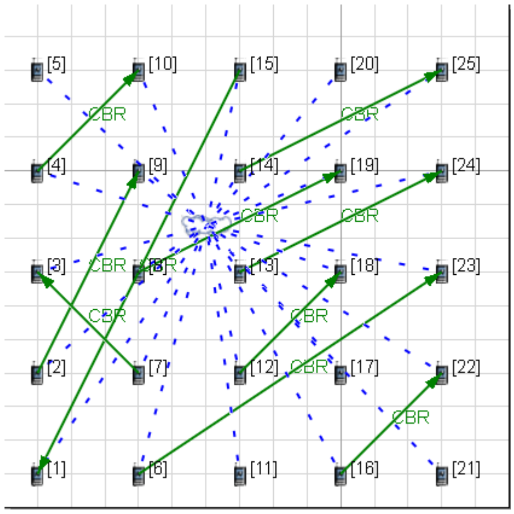

Fig.3: Network scenario with 10 traffic load.

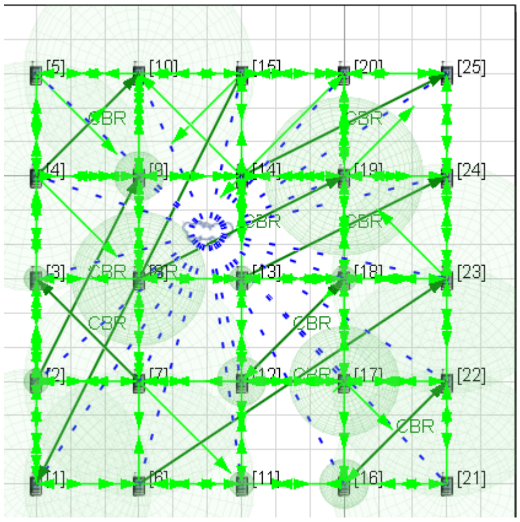

Fig.4: Simulation of 10 traffic load.

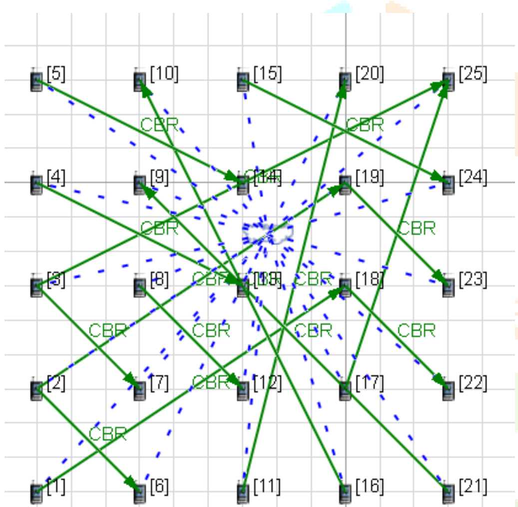

Fig.5: Network scenario with 15 traffic load.

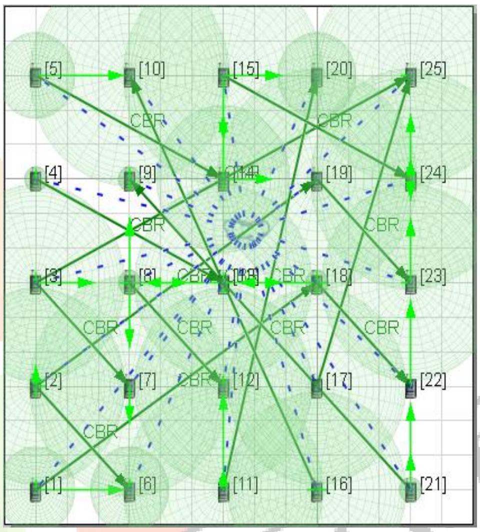

Fig.6: Simulation of 15 traffic load.

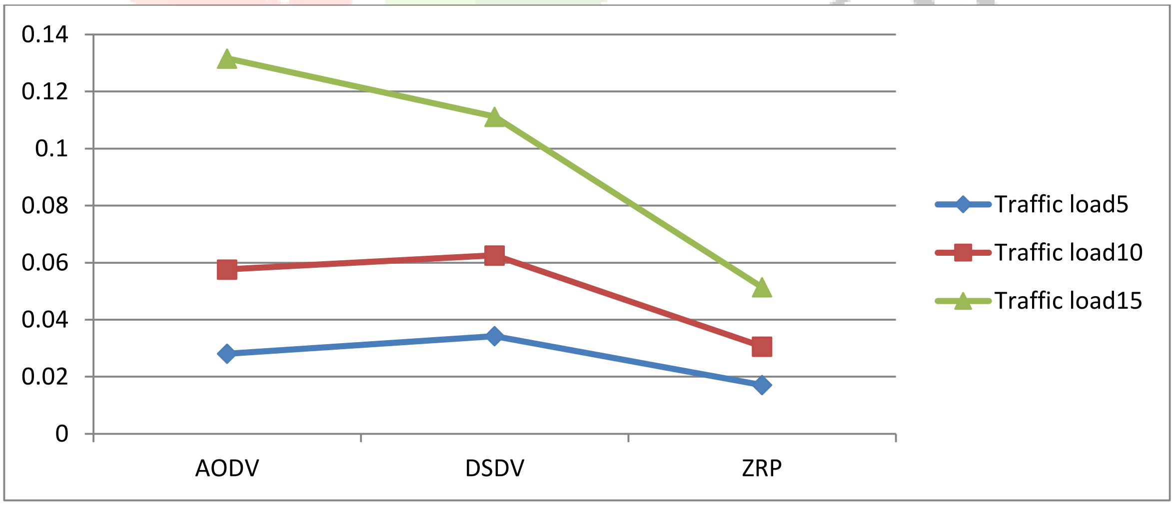

Fig.7:Graph of Average TX Energy Consumption in mJoule for variable traffic load in different routing protocol.

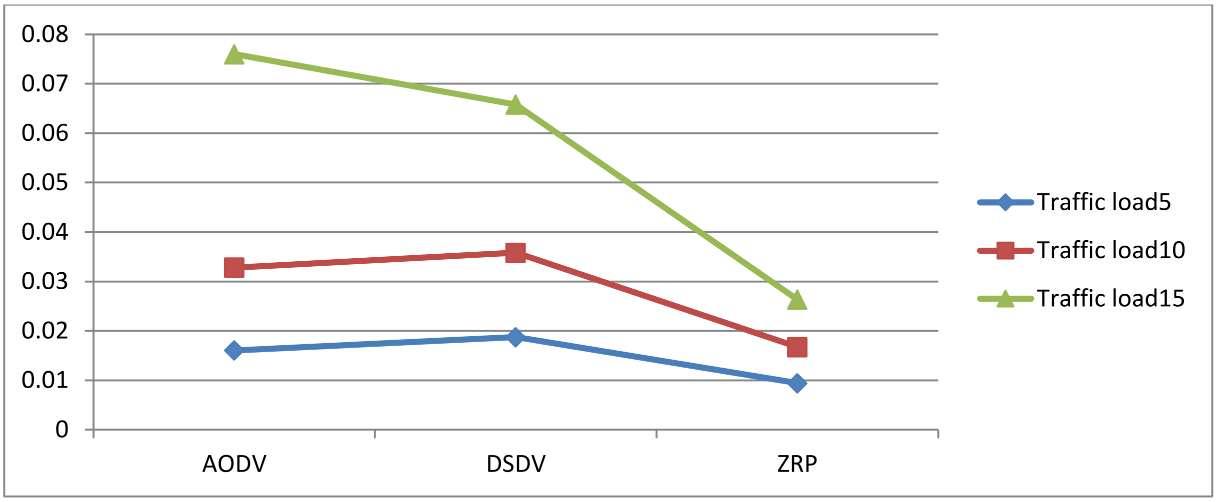

Fig.8:Graph ofAverage RX Energy Consumption in mJoule for variable traffic load in different routing protocol.

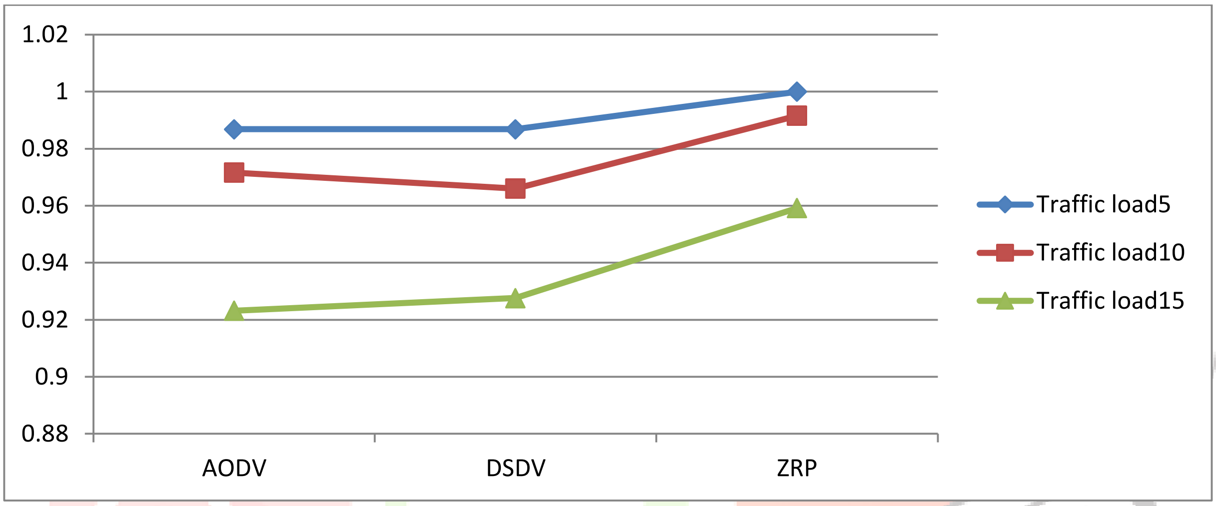

Fig.9:Graph of Average Idle Energy Consumption in mJoule for variable traffic load in different routing protocol.

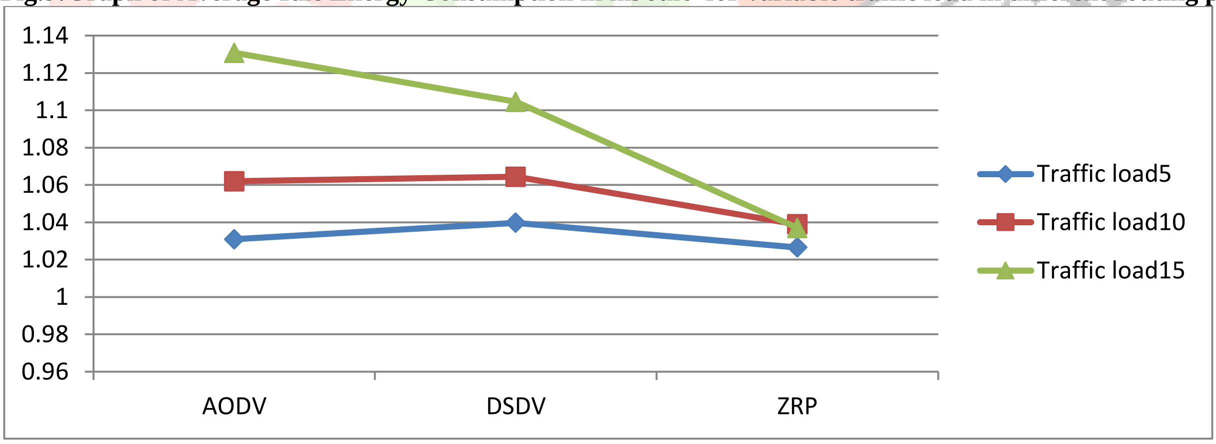

Fig.10:Graph of Average in Total(TX+RX+Idle) Energy Consumption in mJoule for variable traffic load in different routing protocol.

V. CONCLUSION AND FUTURE SCOPE

By observing fig.6 to fig.10 we get some conclusions. From fig.7 , we see transmit energy increases with number of traffic loads for all routing protocols. In fig.8, received energy consumption shows same type of characteristics as in fig. 7. In fig.9 we observe idle energy consumption decreases with increase in traffic loads. We have calculated and plotted total energy consumption which shows very less amount of change with traffic load variation. To save more energy idle energy consumption should be reduced .

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