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Interpretation on Energy Consumption of DYMO Protocol Towards Green Environment

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Abstract*: Mobile Ad hoc Network is a decentralized network which can be deployed instantly. Routing is a very challenging task in this network due to dynamic movement of mobile nodes. Various routing protocols such as OLSR, DYMO and ZRP are proposed to establish the route for the data packets in MANET's. As deploying of the protocols into real environment is a cost expensive process, the protocols are initially evaluated through a simulated arena. Many of the mobile devices are battery equipped and each protocol consumes energy in different manner. In this paper, energy consumption evaluation is carried out on OLSR, DYMO and ZRP protocols in a grid environment. The experiments have shown that DYMO protocol has less energy consumption when compared to OLSR and ZRP protocols.

***Keywords* : DYMO, MANETS, OLSR, ZRP**

I. INTRODUCTION

Mobile Ad hoc Network [1] is a temporary wireless network formed with mobile nodes. The random behavior of the wireless nodes results in a dynamic layout for the connection. This dynamic connected pattern imposes new challenges in MANET. Routing is a major crucial task due to the unpredicted movement of the nodes. Various routing protocols [2] were developed in this regard and each protocol is having its own advantage and disadvantages. There is a necessity to evaluate the protocol before deploying into the real environment. In this work, three protocols DYMO [3], OLSR [4] and ZRP[5] are considered for evaluation in energy aspects. The remaining work is elaborated as follows: section 2 describes the routing protocols and sections 3 Experiment methodology and section 4 results and section 5 conclusion.

II. ROUTING PROTOCOLS

Routing protocols are the established procedures to deliver the packets in an appropriate way. Routing protocols in MANET are classified as proactive, reactive and hybrid. Proactive protocols always maintain the connectivity and OLSR belongs to a proactive category.

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Reactive protocols try to establish the path whenever it is required and DYMO belongs to a reactive category. Hybrid protocols contain both proactive and reactive procedures in their vicinity and out of their vicinity and ZRP belongs to a Hybrid category Optimized Link State Routing Protocol: It works based on link state algorithm and maintains a topology by exchanging the periodic messages such as Hello. It works on the principle of multipoint relay technique. The status of the neighbors and connectivity is always maintained through the periodic messages.

Dynamic MANET on Demand(DYMO) Routing Protocol: DYMO protocols establish their path when it is required. It maintains RREQ, RREP and RERR messages for determining the path and maintaining the path. The source node initiates the RREQ packet to find the path which is confirmed the RREP message from the destination. Link failures about the established path are informed through RERR messages.

Zone Routing Protocol (ZRP): ZRP is a hybrid protocol containing both proactive and reactive nature. In maintains proactive nature within the zone and reactive nature between the zones.

III. LITERATURE SURVEY

Alexander Klein [6] considered the protocols - OLSR, AODV and SBR to study their behaviour. The author evaluated these protocols in various mobile scenarios and concluded that SBR exhibits better end-to-end reliability. Abdul Kareem Basil et.al [7] evaluated OLSR and AODV in various traffic scenarios using NS-3. They concluded that OLSR exhibits better performance than AODV in case of throughput, PDR and delay.

S. Sagar et.al [8] evaluated DYMO and OLSR protocols in various performance metrics such as delay, overhead and packet delivery ratio. They conducted this evaluation in VANET and in MANET environment with the help of SUMO and NS-2 simulators. Jogendra Kumar et.al [9] studied AODV, DSR, DYMO and ZRP protocols. They evaluated these protocols in delay and packet delivery ration on CBR application. They conducted simulation using the Qualnet tool with version 5.0.2. Jegan Govindasamy et.al [10] conducted analysis on AODV, OLR and ZRP in wireless sensor network under wormhole attacks. The performance metrics used in their evaluation are pdr, delay and energy consumption. The simulator employed in their work is Qualnet 5.0.

Fihri Mohammed et.al [11] compared AODV, OLSR and ZRP protocols in terms of packet loss and energy. They conducted it in ad hoc environment. Tareq Emad Ali et.al [12] Conducted evaluation on six protocols namely AODV, DSR, OLSR, DYMO, ZRP and

DSDV in random environment with the performance metrics mainly throughput, delay and packet delivery ratio (pdr). Here authors have performed simulation in MANET environment. In the above literature, most of experiments and study are conducted in random environment but they ignored Grid environment. In this work, it is mainly concentrated on GRID environment.

IV. METHODOLOGY

Mobile nodes in a MANET are battery equipped devices and moves freely around the network. These nodes consume energy at every aspect of their process. Different protocols consume energy in various ways. The protocols should be evaluated before deploying into the real environment. Simulation is an inexpensive way to test the behaviour of the protocols. The experimental methodology employed in this work is Simulation. The simulator used in this work is Qualnet 7.0.[13] In these experiments, mobile nodes are deployed in an area of 1250 x 1250 sq.m. The mobile nodes can move up to 10 m/s with a pause time of 0 sec. The simulation time is set to 600 sec for conducting the experiments. The simulation parameters considered for experiments are shown in table 1.

Table- I: Simulation Parameters for Energy Evaluation

Simulation Environment	
Terrain (Area)	1250 x 1250 sq.m
Deployment model	Grid
Number of Nodes	64
Pause time	0 dec
Speed	10 m/s
Traffic	CBR
Packet size	512 bytes
Protocols	OLSR, DYMO, ZRP
Mobility Model	Random way point

V. RESULTS AND DISCUSSIONS

The OLSR, DYMO and ZRP protocols are evaluated in energy aspects under grid environment. The running scenario is illustrated in figure 1. The energy modes considered are transmit mode, receive mode and idle mode shown in figure 2,3 and 4 respectively.

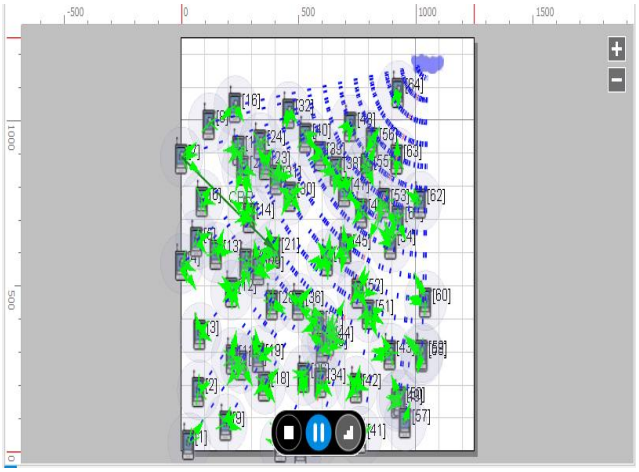

Figure 1. Typical running scenario in Qualnet

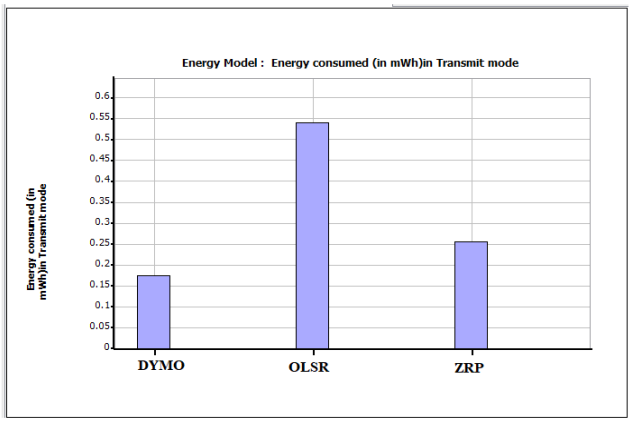

Figure 2. Energy Consumption in Transmit mode

Figure 2 illustrates the energy consumption of DYMO, OLSR and ZRP protocols in transmit mode and with DYMO routing protocol the energy consumption is less.

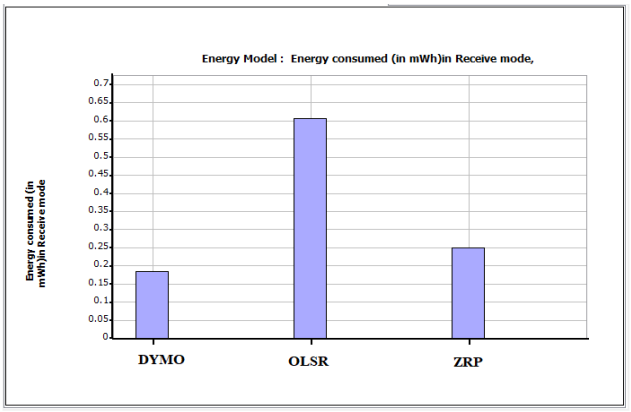

Figure 3.Energy Consumption in Receive mode

Figure 3 illustrates the energy consumption of DYMO, OLSR and ZRP protocols in receive mode and with DYMO routing protocol the energy consumption is less.

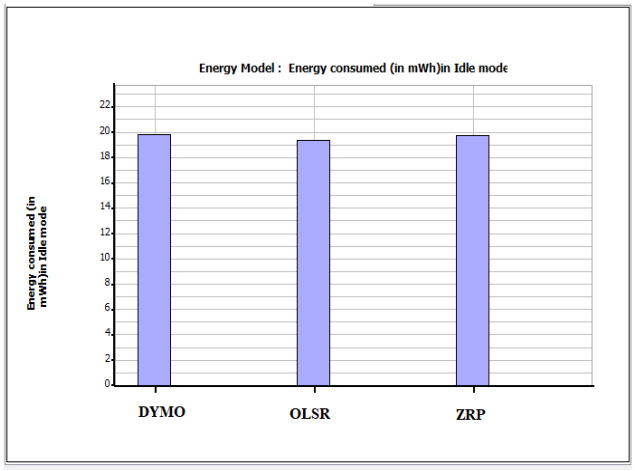

Figure 4. Energy Consumption in Idle mode

Figure 4 illustrates the energy consumption of DYMO, OLSR and ZRP protocols in idle mode. The energy consumption with DYMO and ZRP protocols is almost the same in idle mode.

Based on the experiments conducted on various protocols it is realized that DYMO protocol has less energy consumption and aids towards the sustainability of the environment.

VI. CONCLUSION

Mobile Ad hoc Network is a temporary wireless network formed with mobile nodes. Mobile devices in this network are battery equipped and hence lot of energy is consumed for transmitting, processing and receiving the data. Each routing protocol exhibits its own behaviour in case of energy matter. OLSR, DYMO and ZRP are evaluated in transmit mode, receive and idle mode under GRID environment. From the experimental results, DYMO exhibits less energy consumption compared to OLSR and ZRP. In future, it can be evaluated in other mobility models and the protocol can be further evaluated and considered for various implementations as it has less energy consumption that contributes towards the sustainability of green environment.

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