

## STATISTICAL METHOD TO ANALYZE AND COMPARE ENERGY DISPERSION OF VARIOUS D2D PROTOCOLS

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### I. ABSTRACT:

In this fastest growing techno-world, the Device to Device communication plays a vital role in the network. In MANET each node acts as router to establish communication between sources to destination. It is a self-organized network based on demands. The nodes are mobile in nature. It is not possible to predict the node's position at time 't'. Because of mobility, network formation and deformation will occur often which results in high energy access. Due to this high diffusion node will die quickly. It is possible to replace for small network. If the scalability increases, replacement of several nodes will become high cost. In this paper, we are considering different protocols of MANET and its energy diffusion based of network size. In addition to this, statistical method has been applied to analyze and compare the energy efficiency of different protocols.

Keyword: MANET, Markov method, Scalable, Energy, Protocols, Mobility

### II INTRODUCTION:

Networking plays a major role in today's world. A network is a group of nodes meant for communication. It has been divided into wired and wireless networks. A wireless network further divided into 802.11 and Ad-hoc network. An ad-hoc network is a infra-structure less with no access point. Here in this network, each node will self-configures and participate in the communication. Since nodes are mobile in nature, it faces lot of issues like scalability, reliability, security, energy consumption, durability etc. In order to avoid it, entire network has to be analyzed time to time. If any of the issues occur, necessary steps to be taken.

Quality of Service (QoS) aims at providing better networking services over current technologies such as ATM, Ethernet and others. Delay, Jitter and Loss, Reliability and Scalability, Responsiveness, Power Efficiency, Mobility and Bandwidth. Here in this paper, we are considering mobility analysis based on scalability issues on energy utilization. Consider a scenario, a big network has more than 10000 nodes which is in active communication, all nodes in the network are mobile. It means that we cannot predict the position of node. Because of mobility, transmission range between the nodes will vary. Any node can come and contact with the network and participate in the communication. And also if the distance becomes more then it will not participate in the communication. So the entire topology has to be constructed again.

In this paper, we are simulating various network topologies which contain n number of nodes which vary from time to time. Based on the scalability, we are finding the relative energy efficiency on each node and for the entire network. Further we analysed and compared various protocols of MANET such as AODV, DSDV, DSR, ZRP and CBRP protocols. In next section, concepts from various papers were discussed. In section IV, the method of analysis and comparison are described in detail. In section V, results are discussed in detail along with the graph. In section VI and VIII, conclusion and references are included.

### III LITERATURE OVERVIEW:

[1] Proposed An Energy and Mobility Aware Multi-Point Relay (EMA-MPR) choice mechanism is brought and utilized by the MBMA-OLSR to set the willingness of nodes to contribute as MPRs, for flooding topological statistics. they implemented the proposed scheme as an extension to the EXata network simulator [2] Proposed a mechanism calls for a minimal exchange to the routing protocol and a minimum overhead to the network. The proposed scheme benefits from the open transmission nature of wi-fi gadgets (i.e. Minimizing strength consumption) and attempts to construct a cooperative surroundings to display and take a look at the behaviour of on-going transmission.[3] Proposed an EPAR uses mini- max formulation method for the choice of the path that has maximum packet shipping ratio on the smallest Residual Battery Power. With distinct network eventualities, EPAR is dominating in phrases of Residual Battery Power, Power Consumption, Network lifetime and Throughput with appreciate to time and routed statistics packets. [4] Described about the life of nodes and community performance, durations which include the Hello-Interval and TC-Interval of the optimized hyperlink nation routing (OLSR) protocol are tuned. [5] provides a scientific literature assessment (SLR) of the kingdom of the artwork approach in network survivability analysis in MANETs. From this SLR they found that the present of analysis technique is specializing in person node wherein the node is handled as unbiased event.

[6] Presents the implementation of Adaptive HELLO messaging scheme to determine the neighbourhood hyperlink connectivity information for monitoring the hyperlink reputation between nodes together with the incorporation of Dynamic On Demand Routing Protocol to reduce the electricity consumption of cell nodes to certain extent. [7] Explains awareness of the networking gaps in MANET for navy scenarios and decorate networks efficiency primarily based on networks demand. This paper affords 3 exceptional community conditions and possible solutions. These methods were analyzed with network simulations using NS2.

[8] Describes that the node does no longer ahead RREQ unless there is sufficient energy (battery lifetime), and until the node density in its surrounding exceeds a selected threshold. These parameters are defined deliberating diverse records. [9] Proposes ACO routing set of rules uses position records and strength parameters as a routing metric to improve the overall performance and lifetime of community. Typical routing protocols have constant transmission power no matter the distance among the nodes. [10] Proposed a technique to remedy the storm hassle with the aid of preventing positive nodes from rebroadcasting obtained messages and/or through differentiating the timing of rebroadcasts.

### IV IMPLEMENTATION:

#### AODV:

MANET protocols are typically divided into three classes. They are Table-Driven, on-demand and Hybrid routing protocol. AODV is an Ad-hoc On-demand Routing Protocol which comes under the on-demand routing protocol. In on-demand routing protocol, nodes could be lively most effective if it receives any message from the node. Nodes will communicate handiest if it is required. In AODV there are three not unusual messages to be communicated between the nodes. They are ROUTE\_REQUEST, ROUTE\_REPLY and ROUTE\_ERROR. The communication exchange falls into two classes either DISCOVERY phase or RECOVERY section.

**DSR:**

Dynamic Source Routing protocol is an on-demand protocol as like as AODV protocol. It has 3 stages Route Discovery, Route Cache and Route Maintenance. In Route Discovery segment, the source node proclaims the RREQ message to its neighbours. The RREQ message includes Source ID, Destination ID and Hop Count. Each node caches the course from which it receives the RREQ message. When it reaches the destination node it selects the direction with lesser hop matter. If the link is bidirectional, then the communication exchange is less complicated because the routes are cached. If the link is unidirectional, then destination node starts communication to the intermediate node with lesser hop relies without route cache.

**STATISTICAL METHOD:**

Covariance is used to measures the strength of two or more set of random variables. The correlation is defined for two random variables x and y with input size N,

$$cov(X,Y)=\{(Y-\mu_x)(Y-\mu_y)\} \text{----- (1)}$$

Where  $\mu_x=\{X\}$  and  $\mu_y=\{Y\}$  are means of X and Y respectively. Hence the covariance can be definexd as

$$cov(X,Y)=\sum \frac{(x-x_i)*(y-y_i)}{N} \text{----- (2)}$$

Uncorrelated variables are,

$$cov(X,Y) = (XY) - \mu_x * \mu_y = 0 \text{----- (3)}$$

Correlation between two variables can be defined using covariance and standard deviation.

$$cor(X,Y) = \frac{\sigma_{XY}}{\sqrt{(\sigma_{XX} * \sigma_{YY})}} \text{----- (4)}$$

**ENERGY EFFICIENCY CALCULATION:**

Energy module is included in ns2 for calculating the energy level of each and individual node of all the protocols in MANET. Initial energy will be provided before starts the simulation. At the end of each simulation during the particular time interval, the energy level of each node will be calculated and stored for each protocol. Energy utilised by the entire network also calculated and compared.

$$Energy\ Utilization\ of\ each\ node = IE_i - RE_i \text{----- (5)}$$

$$Energy\ Utilization\ of\ entire\ network = \sum_{i=1}^N \frac{EU_i}{N} \text{----- (6)}$$

In the above formula (6), EU represents the energy utilized by i<sup>th</sup> node, N indicates number of nodes in the network and it gives average energy utilised by the entire network.

**V RESULT:**

In this section, all the above discussed protocols in section IV has been compared with the issue factors and found the correlation between Number of nodes and energy factor.

USING AODV PROTOCOL			
Number of nodes	Energy Utilization	Simulation Time	Correlation (N,E)
10	20	100	-0.13
25	46	100	-0.25
30	54	200	-0.34
43	67	200	-0.50
56	72	200	-0.63
75	90	200	-0.88

Table 1. Performance and Correlation factor using AODV Protocol

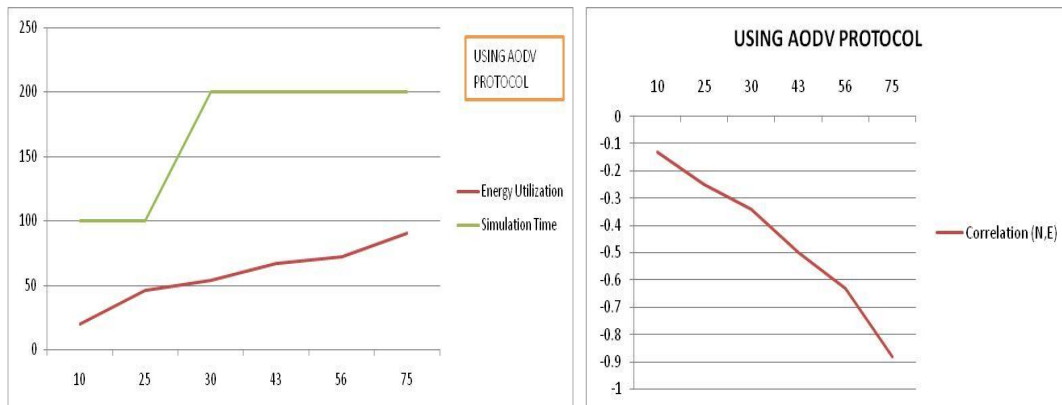


Figure 1(a) and 1(b) shows the performance analysis and correlation factor of (Nodes, Energy) respectively using AODV Protocol

In the above table 1 and figure 1(a) and 1(b) represents energy utilization and Simulation time of the communication for n number of nodes using AODV protocol. The correlation factor calculated for two metrics N and E where N is Number of nodes and E represents Energy Utilization. The negative sign in correlation indicates negative correlation where number of nodes is inversely proportional to energy factor.

USING DSR PROTOCOL			
Number of nodes	Energy Utilization (J)	Simulation Time (ns)	Correlation (N,E)
10	14	100	-0.10
25	33	100	-0.16
30	41	200	-0.24
43	49	200	-0.32
56	56	200	-0.45
75	71	200	-0.69

Table 2. Performance and Correlation factor using DSR Protocol

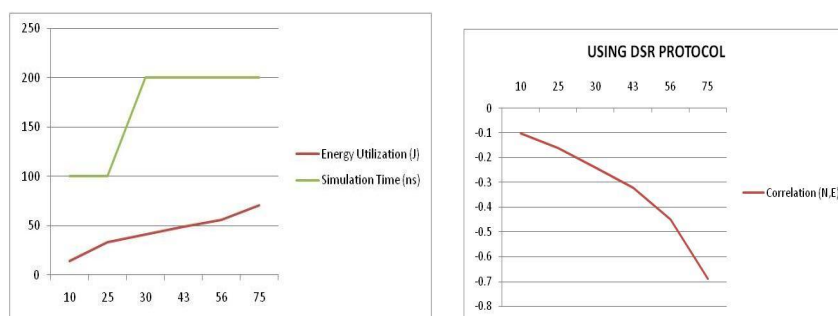


Figure 2(a) and 2(b) shows the performance analysis and correlation factor of (Nodes, Energy) respectively using DSR Protocol

In the above table 2 and figure 2(a) and 2(b) represents energy utilization and Simulation time of the communication for n number of nodes using DSR protocol. The correlation factor calculated for two metrics N and E where N is Number of nodes and E represents Energy Utilization. The factors values are less and effective when compared to AODV protocol.

## VI CONCLUSION:

Mobile Ad-hoc network is a infrastructure-less network mainly used for device to device communication. A VANET is a fundamental application of MANET. It plays a vital role in vehicular communication and it is a broad research area for the researchers. In this paper, we analyzed and compared various protocols based on their energy utilization which uses statistical correlation method for analysis between variables. Results are well described and efficiency in terms of energy has been compared. Correlation method are clearly explained and based on the correlation method dependency between two variables are measured. In our future work, we have an idea to apply Markov Analysis for predicting the future behaviour's of the node.

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