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Survey of Impact of Transmission Range on MANET Routing Protocols

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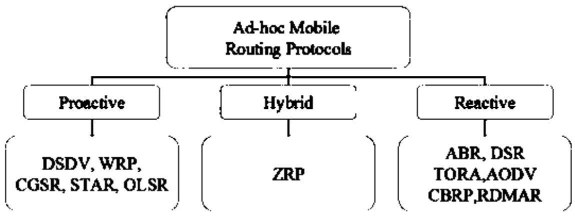
ABSTRACT
Mobile Ad-hoc Network (MANET) is normally recognized in zones someplace infrastructural services such as base station, routers etc. do not happen or have been damaged due to natural hardship. They have numerous pressures such as bandwidth, computational volume and battery power of each node as of their infrastructure-less nature. Power preservation is serious to appropriate actions of MANET. Countless scientists have been provided several mechanisms to diminish the power consumption variable transmission range of nodes is one such tool taken into interpretation. This paper studies the impact transmission range of routing protocols by designing a simulator in Qualnet. We note an obvious impact of variable transmission range on power consumption. All extra protocols are defined in terms of Packet Delivery Ratio (PDF), End-To-End Delay (ETED), average jitter rate, throughput etc.

General Terms
MANET, AODV, DSR, OLSR, Propagation Model

Keywords
Transmission range, transmitted power, received power, packet delivery rate

1. INTRODUCTION
A network that does not depend upon pre-existing substructure or concentrated governance and is demonstrated by a group of active wireless network is known as A Mobile Ad hoc Network (MANET) [1]. Active network topology and imagination restraints in price of bandwidth and battery power are qualified in MANET's. In MANET applications due to campaign of nodes, failure of nodes, fading effects of nodes the property of nodes changes often. The neighbor discovery outline is one of the significant challenges in MANET and this part effort a node to alter its information of nearest nodes frequently. To find burst links in ad-hoc routing protocol a neighbor discovery scheme is used for route conservation [2].

Due to lack of centralization, dynamic topologies and singular port characteristics mobile ad hoc networks are wireless multi hop networks and routing has become a challenge in MANET. To overcome this challenge a lot routing protocols are discovered and is split into two distinguishable categories: Reactive (on demand) routing protocols and Proactive routing protocols. In Reactive or on-demand routing protocols whenever a node requires transmitting the data packets a path is detected. AODV (Ad-hoc On-Demand Distance Vector), DSR (Dynamic Source Routing)are reactive routing protocols. Proactive routing protocol are ensured flooded that is sent around the network and circulate periodically routing data. OLSR (Optimized Link State Routing) is the type of proactive routing protocols [3].



Classification of Routing Protocols (Fig-1)

1.1 Overview of Routing Protocols
Features of AOD, DSR and OLSR are described as follows:

1.1.1 Ad Hoc On-Demand Routing (AODV)
This routing protocol is described as it broadcast a route request (RREQ) packet when any source wants to send the data packet to destination. it minimizes the number of broadcast by creating routes based on demand. The process continues until the packet reaches the destination the nearest nodes successively circulate the packet to their neighbors. The intermediate nodes enter the destination of the neighbor from which the first copy of the beam is encountered during the process of sending on. This assist for building an invert path and record is stored in their route tables. The packets are discarded if additional copies of RREQ are received. Using reverse route the answer is placed. For path sustenance, it can start route finding action when a source node moves. The neighbor of the floated node can find the link failure and transmit a link failure notification to its upstream neighbor if any intermediate node acts within a exceptional path. The failure notification reaches the origin node till the process goes along. The source might determine to re-initiate the route discovery stage on the found information.[4]

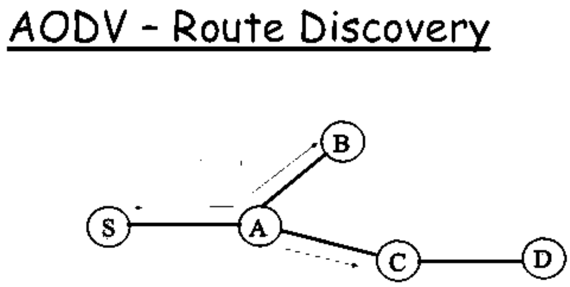


Fig-2 AODV Algorithm Diagram

1.1.2 Dynamic State Routing (DSR)
In the MANET DSR allots nodes to dynamically attain a origin path around many network hops to any Address. The mobile nodes are needed to assert path caches or the acknowledged routes. When some fresh route is acknowledged for a particular foundation in the route cache path is informed. Route discovery and route maintenance is completed in DSR by having these two stages. It first confers its path cache to decide whether it so soon cognizes about any path to the address or not when a root node wants to deliver a packet to a destination. The root applies that to send the packet. If not, it broach a route request broadcast if already is a creation of that destination.[4]

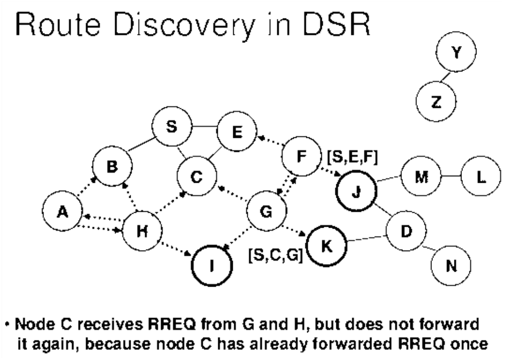


Fig-3 DSR Algorithm Diagram

1.1.3 Optimized Link State Routing (OLSR)
OLSR protocol acquires the stability of link state Algorithm. Each node in the network applies its many recent entropy to road a packet and executes hop-by-hop routing. Its packets can be successfully sent to it, if its acceleration is similar that its motion could leastwise be adopted in its neighborhood when the nodes are is in the motion. The optimization in the routing is done mainly in two ways. Firstly, by declaring only a set of associates with the nearest nodes who are its multipoint relay pickers, rather of all Links in the network OLSR minimizes the size of the control packets for specific node. Secondly, it circulates data in the network it reduces swamping of the control dealings by using particular nodes which is known as multipoint relays. This protocol importantly decrease the number of Contagion in a swamping or broadcast operation as only multipoint relays of a node can resend its broadcast messages [4].

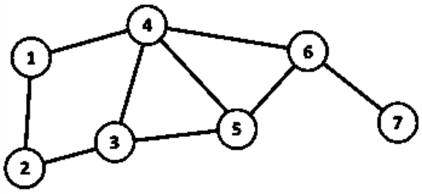


Fig-4 OLSR Algorithm Diagram

2. RELATED WORK
In section 2.1 many researchers have observed transmission range impact on different parameters, which are given below as

2.1 Literature Survey
[1] Pooja Saini.,This paper evaluated Binary Exponential Back off (BEB), customized logarithmic, Exponential Increase Exponential Decrease (EIED), and Multiplicative Increase Linear Decrease (MILD) back off algorithms for IEEE 802.11 Distributed Coordinate Function based MAC protocol in multi-hop ad hoc network environment. Performance of algorithms is evaluated.

[2] Neung-Um Park et.al calculated, the impact of transmission range on hello interval is measured in terms of throughput using AODV routing protocol. They confirmed that the hello interval throughput depends on node speed and transmission range.

[3] Md. Aziz Rehman et.al, evaluated that DYMO achieve higher than OLSR when nodes are affecting and topology Are altering continually.

[4] G.Vijaya Kumar et.al told about a number of routing protocols for MANET, which are broadly sort out as proactive and Reactive. Proactive routing protocols be prone to afford worse latency than that of the on-demand protocols Reactive protocols generate an enormous quantity of traffic when the network modify regularly.

[5] Akram A. AL Mohammed et.al the performance was estimated in terms of packet delivery ratio and end-to-end delay. When the transmission range was higher than 500 meters, PDR will start to decrease and end-to-end delay will increase. The performance dishonored as the number of flows increased. Higher PDR and lower end to end delay is achieved when the transmission range is below 500 meters

[6] Adam Macintosh et.al, established that Protocols that have link layer support for link breakage detection, are much more stable. A Higher sending rate sources the protocol to detect broken links faster, reacting faster; this escort to a minor increase in control packets, which affects the byte overhead.

[7] Muneer Bani Yassein et.al shows that when the Transmission range values increases the performance of algorithms improved, where the protocol with higher Achieve better results comparing to all other protocols in terms of Packet Delivery Factor, End To End Delay and the routing overhead.

[8] Rajneesh Kumar Gujral, et.al concluded that The transmission range, mobility and different number of nodes as a system parameter affects the overall energy consumption and performance of ad-hoc networks.. AODV has maximum packet delivery ratio and maximum throughput, it is directly proportionate to transmission range AODV has minimum routing overhead than DSR and DSDV But average end to end delay is maximum in AODV which Decreases its performance to some extent. DSR is the best protocol when transmission range is 550m with highest mobility.

[9] Jitender Grover, et.al shows that The performance of ZRP shows some differences by varying Transmission Range, Zone Size, Mobility and different number of nodes. From experimental analysis they conclude that transmission range has inverse effect with scalability

[10] Mohammad Izharul et.al shows that we can achieve higher values of throughput by increasing the number of Participating nodes. The PDR can be increased and the drop packets, which increase with the increase in the transmission range, and can be decreased by increasing the number of nodes. This is because sufficient amount of energy is consumed and less residual energy left to the participating mobile nodes to transmit the data packets from the source to destination node

2.2 Motivation

Transmission range plays an important role in mobile ad-hoc network. The impact of transmission range on different routing protocols is overviewed in above tables. Paper [2] showed that the Hello interval of AODV depends on mobility and throughput depends on transmission range. Paper [5] observed that the higher PDR was achieved below 500 meters of transmission range. They also determined that end to end delay increased above 500 m coverage area. [10] Showed that PDR can be increased with the increase in transmission range. Transmission range also impacts energy consumption and overhead. From above papers it is cleared that the transmission range has impact on various parameters. Thus we are focused on transmission range impact. Hence the reactive routing protocol can be analyzed for different transmission range and propagation model.

3. PROPAGATION MODEL

A propagation model, also known as the frequency propagation model, is an experiential mathematical formulation for the classification of broadcasting wave propagation as a function of frequency, distance and other conditions .A single model is frequently developed to calculate the behavior of propagation for all analogous links under similar constraints. Produced with the goal of formalizing the way radio waves are propagated from one place to another, such models naturally guess the path loss along a link or the useful coverage area of a transmitter.

3.1 Two Ray Propagation Model

The two-ray model or the two-path model is one of the popular models. The free space model explain free space model suppose that there is only one single path from the transmitter to the receiver. But in reality the signal arrive at the receiver through multiple paths (because of reflection, refraction and scattering). The two ray propagation model tries to capture this fact. that The model assumes that the signal reaches the receiver through two paths, one a line of-sight path, and the other the path through which the reflected wave is received. The formula is given as

$$P_r = \frac{PT * GT * GR * HT^2 * Hr^2}{D^4 * L}$$

WHERE Pr=received power

P_t=transmitted power

G_t=transmitted gain

G_r=received gain

H_t=transmitted height

H_r=received height

D=Distance

L=length

The received power in (dbm) is given as

Pr (dbm) = 10 log (Pr/1000)

3.2 Friss Free Space Model:

Free space model predicts that the received power decays as negative square root of the distance It accounts mainly for the fact that a radio wave which moves away from the sender has to cover a larger area. So the received power decreases with the square of the distance. The free space propagation model assumes the ideal propagation condition that there is only one clear line-of-sight path between the transmitter and receiver. Friis free space equation is given by

$$P_{R=} P_t G_t G_r \frac{\lambda}{(4\pi)^2 L D^2}$$

Where, $P_r P_t$ =transmited and received power
$G_{t,} G_r = receivedandtransmittedgain$

$D = distance$
λ=wavelength

The path loss, representing the attenuation suffered by the signal as it travels through the wireless channel is given by the difference of the transmitted and received power in dB and is expressed as:

P L (dB) = 10 log Pt/Pr

In this paper the transmission range value will be enhance for distinct routing protocols.

The different routing protocols are examined by using Average Jitter Rate, Packet Delivery Ratio, End-To-End Delay, Number of Node Breakage etc.

On the basis of above parameters transmission range will be optimized.

4. PERFORMANCE METRICS

4.1 Packet Delivery rate (PDR): The ratio of the data Packets delivered to the destinations to the generated By the Constant Bit Rate (CBR) source.
i.e., Packet delivery fraction (puff %) = (Received Packets / Sent Packets) *100.

4.2 Throughput

Throughput is the ratio of total number of Delivered or received data packets to the total duration of Simulation time.

$$\text{Throughput} = \frac{\text{Total No. of Successful Packets Received in Bits}}{\text{Total Simulation Time in Sec}}$$

4.3 Average End to End Delay

Average End to End delay is the average time taken by a data packet to reach from source Node to destination node. It is ratio of total delay to the number of packets received.

$$\text{Delay} = \frac{\sum(\text{Received Time} - \text{Sent Time})}{\text{Total Data Packet Received}}$$

4.4 Average jitter: Jitter is the variation in the time between packets arriving, caused by network congestion, timing drifts, or route changes. It should be less for a routing protocol to perform better.

$$\text{Average Jitter} = \frac{\Sigma\ |\text{Delay}|}{\text{total packet number}}$$

4.5 Normalized Protocol Overhead/ Routing Load: the number of routing packets channeled per data packet delivered at the address to each one ho p-wise

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transmission of a routing packet is calculated as one transmission. I.e. Normalized routing load = (routing packets sent) / receives. In another words it is the ratio of total number of the routing packets to the total number of received data packets at destination.

5. PROPOSED WORK:

The transmission range can be varied by changing transmission power. Thus the appropriate transmission power value will be calculated for highest performance of routing protocol. For this, the reactive routing protocol like AODV, DSR and OLSR will be analyzed for different transmission range and propagation model

5. RESULTS AND ANALYSIS

Table 1. Simulation Parameters

PARAMETERS	VALUES
Map size	1500m*1500m
Simulation Time	900 seconds
Node density	50
Data Sinks	17 pairs
Node Movement	Random Wave point Mobility
Speed	10 mps
Transmission Range	2,4,6,8 up to 16 dbm
MAC Protocol	802.11b
Propagation Model	Free space and Friis Model
Message Size	512kbytes
Transmission Rate	2Mbps
Simulator	Qualnet
Antenna Type	Omni Directional
Traffic mode	Constant Bit Rate(CBR)

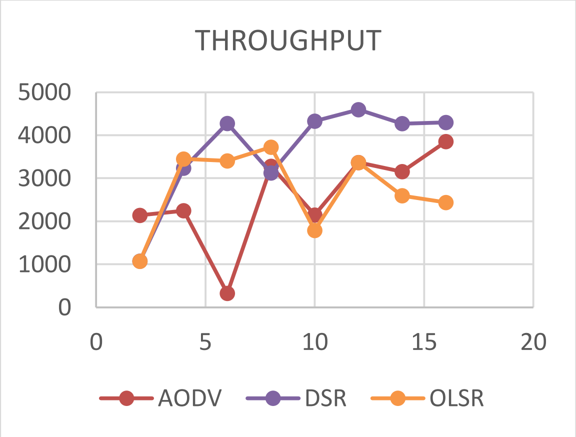

Fig-5 (Throughput)

As the transmission range increases the throughput value of DSR protocol increases as compared to AODV and OLSR

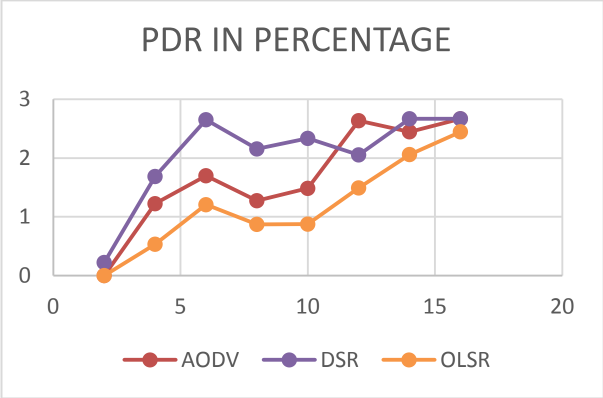

Fig-6 (Packet Delivery Rate)

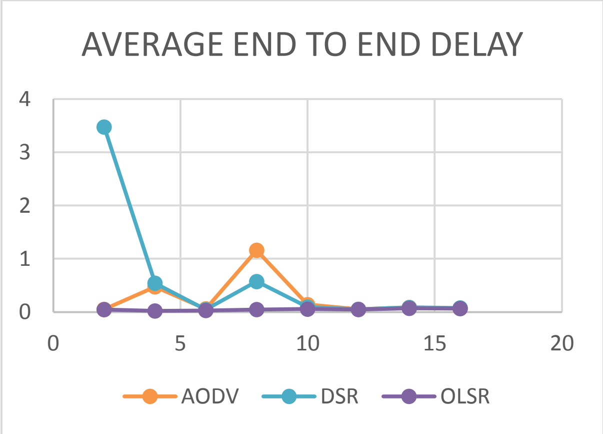

Figure-7 (Average End To End Delay)

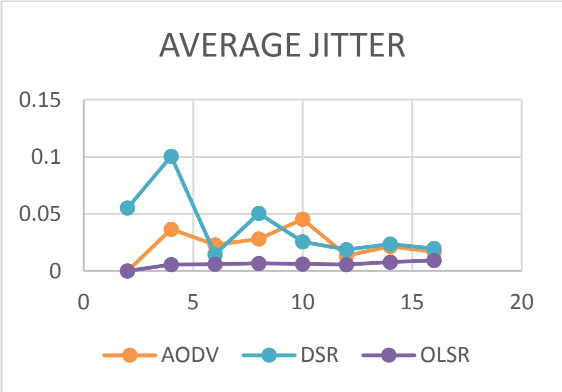

Fig-8 (Average Jitter)

6. CONCLUSION

MANET is a wireless network which is continually self configuring infrastructure less connected wirelessly. Reactive routing protocols are used to determine to establish a route for data transmission. This paper has given a survey of impact of transmission range on various parameters. From literature review it is clear that transmission range has impact on throughput Packet Delivery Ratio, delay overhead, energy consumption etc. AODV, DSR, OLSR are analyzed for different values of transmission range from 2dbm to 16dbm. Result shows that DSR has better performance for high transmission range. End to end delay is least in OLSR for a wide range of transmission range. Thus it is concluded that if the value of transmission range is evaluated properly the performance of the network can be improved.

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