International Journal of Future Generation Communication and Networking
Vol. 8, No. 3 (2015), pp. 207-212
http://dx.doi.org/10.14257/ijfgcn.2015.8.3.19

Effect on Throughput Due to Changes in Transmission Power of Nodes in MANETs

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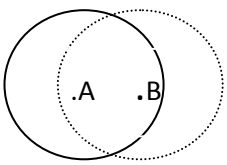
Abstract

Mobile Adhoc network is a unique paradigm, which can be deployed in the environment where traditional wired network cannot be established due to its required features and their limitation. Transmission power is one of the major concern in case of MANETs. In this paper, effect changes in transmission power of the node has been analysed and its impact on network throughput has been investigated. The results achieved by various variations have been used for proposing the possible improvement in the network performance.

Keyword*: AODV, MANET, transmission power, CBR.*

1. Introduction

In the present technological developments and its applications, almost all the communication systems are going wireless. The wireless communication has various infrastructure and infrastructure-less setups, which can be employed depending on its applicability and viability. The network setups with no fixed infrastructure are termed as wireless mobile adhoc networks. MANET is a unique paradigm for a host, who are mobile in nature. A mobile adhoc network is a self-organized network, formed by group of mobile node. These nodes are directly communicate with those node that directly come in similar radio coverage range as shown in Fig. 1, if not they are communicate with multi hop communication as shown in Fig 2. The communication establishes on the basis of connectivity between nodes on the basis of radio range and path established.



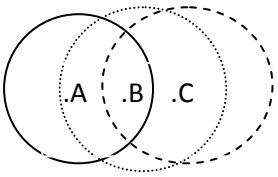
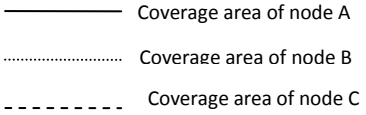


Figure 1. Node Connectivity Figure 2. Multihope Connection



In Fig1 node A & B are in direct radio range of each other, so whenever node A have data to node B it directly transmit to it. Fig 2 depicted the multi hop communication, node B is in direct radio range of node A but C is not in direct radio range of node A, and node

ISSN: 2233-7857 IJFGCN

B & C are in direct radio range of each other. Whenever node A want to transmit a packet to node C firstly this packet given to node B then node B transmit this packet to node C.

In MANET transmission range of the node is powerful feature, if the transmission range of the node is higher its give the better throughput even in the present of higher congestion [2]. In mobile ad hoc networks, congestion is a global issue, involving the behaviour of all the hosts, all the routers, the store-and-forward processing within the routers, and the media and occurs due to limited resources at any stage of path. Congestion results from applications sending more packets than the network devices/hosts can accommodate, thus causing the buffers on such devices to fill up and possibility of overflow prevails. This can result in delayed or lost packets and leads to performance degradation of the network. In order to reduce congestion, the routing protocol should reduce the number of packets in the network. However, simply dropping overflowed packets will reduce the data fidelity and increase the energy dissipation.

2. MANET Routing Protocols

Routing protocol – To find and maintain routes between nodes in a dynamic topology with possibly uni-directional links, using minimum resources.

A. Proactive Routing Protocol
B. Reactive Routing Protocol
C. Hybrid

A. Proactive or Table driven Routing Protocol

Proactive protocols, is also called table driven as the routes are predefined. Packets usually transferred to these predefined routes. As the routes are predefined the packets can be forwarded immediately. Each nodes stores the updated information whenever there is change in its network topology. For eg. Destination sequenced distance vector routing (DSDV)

B. Reactive or On-demand Routing Protocol

Reactive or on-Demand Routing protocols, In this routes are not predefined.In this reactive protocols, Nodes maintain there routes on the on-demand process to send its packets to the destination. Nodes sends its packets to all the neighbor or intermediate nodes and this technique is repetitive until packets are reached to its destination.

For eg. Adhoc on-Demand Routing protocol (AODV), Dynamic source Routing (DSR),TORA

Adhoc On-demand Distance Vector Protocol (AODV)

AODV is a pure on-demand route acquisition system .AODV discovers routes as and when necessary .It does not maintain routes from every node to every other. Routes are maintained just as long as necessary .In this protocol every node maintains its monotonically increasing sequence number increases every time the node notices change in the neighborhood topology

The AODV protocol consist of two phases

i. Route discovery
ii. Route maintenance

3. Simulation Analysis

Qualnetn 5.2 simulation tool is use to study all the behavior of MANET. The design of the scenario is random in which constant bit rate (CBR) is applied between source and destination Scenario is shown in fig2. The simulation parameter used in the scenario is shown in the table 1.

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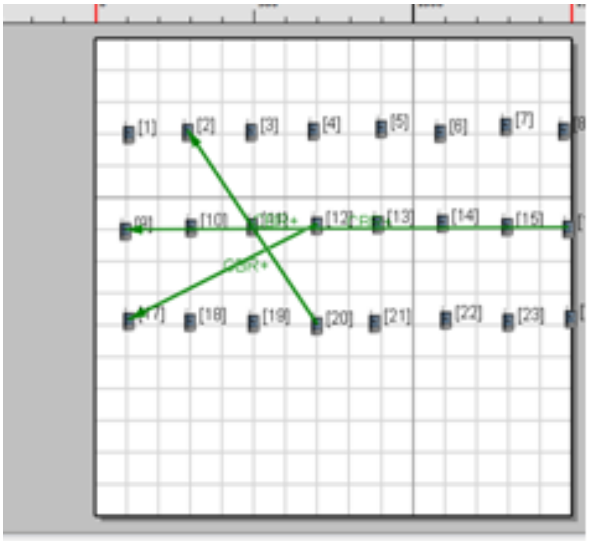

Figure 2. Network Scenario

Simulation Parameters

Table 1

Parameters	Value
Simulator	Qualnet 6.1
Terrain area (m*m)	1500*1500
Routing protocol	AODV
No. of nodes	24
CBR	3 (Bidirectional)
Packet Size	512 Byte,1024 Byte
Simulation time	300 sec
Antenna height	1.5m
Transmission power in dBm	15 dBm ,30 dBm

Performance Metrices

Some of the important performance metrices can be evaluated

Throughput

Throughput is the average rate of all the successful data packets received by the destination from source . this is measured in bits/sec

$$Throughput = \frac{Total\ packet\ received}{total\ packet\ sent}$$

Average End to end Delay

The delay in the average time, reception of data packet at latency, retransmission delay. This is calculated by the formula destination forwarded by source is end to end delay. It includes all possible delays caused by buffering during route discovery

$$D = (T_R - T_S)$$

Simulation Results

The simulation result have been shown in terms of Throughput, Average end to end delay,

Throughput - It is depict from the result that throughput of overall network for the transmission power of 30 dBm with packet size 1024 byte is better than that of transmission power 15dBm with packet size 1024 byte in the Routing protocol AODV. Since more the transmission power more the reception of data packets at the destination.

Table 2

Node no		2	9	12	16	17	20
Transmission power 15db	Packet size 512 Byte	3656	246	1117	220	3438	3538
	Packet size 1024 Byte	1453	370	3238	638	5134	3929
Transmission power 30db	Packet size 512 Byte	4139	4141	4137	4141	4136	4139
	Packet size 1024 Byte	8278	5744	8275	8116	8274	8276

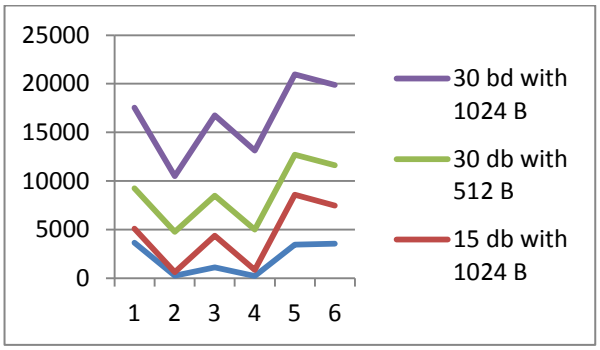

Figure 3. Power Analysis

Average end to end delay - Delay in the average time when the packet are delivered from source to destination is average end to end delay. In the analysis it is observed that transmission power of 15db with packet size 512 B has less average end to end delay in comparison to other transmission power. Because more the transmission power less will be the delay in packets delivery

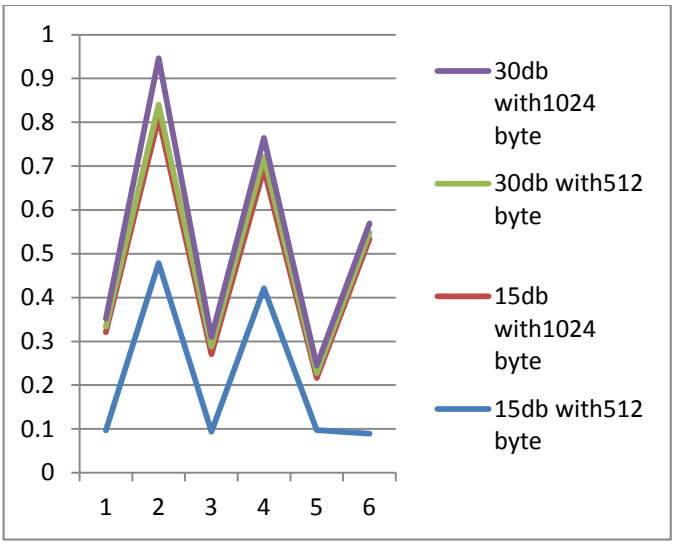

Figure 4. Packet Transmission on Various Power Ranges

4. Conclusion

In the proposed work the changes in the transmission power of the nodes the effect on packet delivery has been investigated. The results have shown encouraging results and the variations have been plotted on graphs. The results are showing improvement in the throughput at medium range of power and throughput at 12 dBm is in accordance to the predicted range.

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