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Research Paper

Analysis and Implementation of Propagation Model's Quality of Services

Computer Science

KEYWORDS : MANET,Transmission range,AODV,NS-2.34,propagation model,routing protocol,metrics.

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ABSTRACT

A Mobile Ad-Hoc (MANET) networks represents a system of wireless mobile nodes that can freely and dynamically self-organize into arbitrary and temporary network topologies,allowing people and devices to seamlessly internetwork in areas without any preexisting communication infrastructure. In this paper we have work on to set different transmission range under the three propagation model using a single routing protocol, AODV By using the well known simulator NS-2.34.The performance of this study analyzed with selected metrics .

1) Introduction

A Mobile Ad-hoc networks [5] is an autonomous ad-hoc wireless networking system consisting of independent nodes that move dynamically changing network connectivity unlike cellular wireless networks,no static or fixed infrastructure exist in MANET [5] . The network can be formed anywhere,at any time,as long as two or more nodes are connected and communicate with one another either directly when they are in radio range of each other or via intermediate mobile nodes because of flexibility that a MANET [5] offers. QoS performance [4] requirements(e.g. Delay,throughput,loss),which are usually represented as a set of QoS parameters associated with the service model. There are two main traffic types:Delay-sensitive and loss-sensitive traffic. Delay-sensitive traffic is characterized by rate and duration and may need transmission [3] in real life(e.g. Video-conferencing). Loss-sensitive is characterized by the amount of information transmitted(e.g. Web page,files).

2) Related Work

Basically my work is related to find the quality of service of three propagation model [11] under the AODV routing protocol by changing a transmission range [3] and compute the performance [4] metrics such as packet delivery ratio,delay and routing overhead in this study. In this paper we observed and analyzed our experiment with the varying transmission range for AODV [2] in ad-hoc [1,7] networks. In this study we found that with varying transmission range [3] ,there is no change in performance metrics like if we set transmission range [10] above 1000,than we see that there is no change in delay,Routing overhead,Packet delivery ratio on the above range. So finally our research says that there is no effect has been found on heavy transmission range [3].

2.1) AODV: a routing protocol

The Ad hoc On-Demand Distance Vector (AODV) [2] algorithm enables dynamic,self-starting, multihop routing between participating mobile nodes wishing to establish and maintain an ad hoc network [1]. AODV allows mobile nodes to obtain routes quickly for new destinations, and does not require nodes to maintain routes to destinations that are not in active communication. AODV allows mobile nodes to respond to link breakages and changes in network topology in a timely manner. The operation of AODV [2] is loop-free, and by avoiding the Bellman-Ford"counting to infinity" problem offers quick convergence when the ad-hoc network [8,9] topology changes (typically, when a node moves in the network). When links break, AODV causes the affected set of nodes to be notified so that they are able to invalidate the routes using the lost link. One distinguishing feature of AODV is its use of a destination sequence number for each route entry. The destination sequence number is created by the destination to be included along with any route information it sends to requesting nodes. Using destination sequence numbers ensures loop freedom and is simple to program. Given the choice between two routes to a destination, a requesting node is required to select the one with the greatest sequence number. AODV [2] is a routing protocol, and it deals with route table management. Route table information must be kept even for short-lived routes. It is an efficient routing protocol for varying a range of the communication under CBR(Constant Bit Rate) connection. The benefit of the protocol is setup delay is less.

2.2) Two Ray Ground : a mobility model

The two-path model attempts to account for this phenomenon. In other words, the model advocates that the signal attains the receiver via true paths: a line-of-slight path and a path through which the reflected wave is received (Singh and Kapang, 2011). In the two-path model, the received power is represented by Eq-1:

$$Pr(d) = \frac{P_t G_t G_r h_t^2 h_r^2}{d^4 L} \quad (1)$$

where, ht and hr are the heights of the transmitter and receiver respectively. Nonetheless, for short distances,the two-ray model does not give accurate results because of in oscillation caused by the constructive and destructive combination of the two rays.

2.3) Free Space Model: a mobility model

The free space model assumes that in the ideal propagation [11] condition between the transmitter and the receiver, there is only one clear Line Of Slight (LOS) path. The following equation calculate the received signal power in a free space Eq.2-

$$Pr(d) = \frac{Pt\ Gt\ Gr\ \lambda^2}{(4\pi)^2\ d^2\ L} \quad (2)$$

where, Pt is the power transmission (in watts), Gt and Gr are the antenna gains of the transmitter and receiver respectively. L is the system loss factor. λ is the wave length and d is the distance between the transmitter and the receiver (Singh and Kapang, 2011).

2.4) Shadowing Model: a mobility model

Both the free space and the two-ray models predict the received power in terms of the distance. They also represent a communication area as an ideal circle. In fact, the received power at a given distance varies randomly because of multi-path propagation effects, known as fading effects. Thus, the two aforementioned models predict the mean received power at distance d. The shadowing model is twofold (Singh and Kapang, 2011). The first model is the path loss model represented by Pr (d). It employs a close in distance d0 as follows Eq. 3:

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$$\frac{P_r(d_0)}{P_r(d)} = \left(\frac{d}{d_0}\right)^{\hat{a}} \qquad (3)$$

Where â is called the path loss exponent.

3) Simulation Description

A variety of metrics have been used for the MANET [5] environment .In this study ,we study the most popular mobility parameters,Delay,Routing Overhead,Packet Delivery Ratio. Our evaluations are based on the simulation using network Simulator (NS-2.34) [6] environment with wireless ad-hoc [1] networking and we extract the Outdoor environment useful data from trace file then the graphs are generated using X-graph version 12. Simulation environment consists of 25 wireless nodes forming an ad hoc network, moving over a 500 X 500 flat space,AODV [2] routing protocol for 100 seconds of simulated time. Each run of the simulator accepts as input a scenario file that describes the exact motion of each node and the exact sequence of packets originated by each node, together with the exact time at which each change in motion or packet origination is to occur. We have generated different scenario files with varying movement patterns and traffic loads (CBR), transmission range 100,400,800 m. and ran against each of these scenario files. When Nodes in street move according to TwoRayGround, FeeSpace , Shadowing Model. The movement scenario files we used for each simulation . Each simulation ran for 100seconds. We ran our simulations with movement patterns generated for 3 different Transmission Range [3] -100,400,800 m. Here 100m transmission range [3,10] shows 1,400 shows 4 and 800 shows 8m in graph plotting.

Table 1: Simulation Parameter

Parameter	Value
Network Simulator	NS-2.34
Channel type	Wireless channel
Radio-propagation model	Two Ray Ground, Free Space, Shadowing.
Antenna type	Omni Antenna
Interface queue type	Queue/DropTail/Priqueue
Routing protocols	AODV
MAC type	802_11
No. of Nodes	25
Traffic Type	CBR
Maximum packet in Queue	50
Simulation Time	100 ms
Transmission Range	100,400,800 m.(1,4,8 m.)

4) Simulation Result

The analysis of simulation results is performed based standard metrics of Delay,Routing Overhead,Packet Delivery Ratio between Transmission Range [3,10]. We conducted our simulations on changing the parameters for Transmission Range [3] movement scenario files and connection pattern files. Here we calculate the value of all these parameters through the AWK script file.

4.1-Routing Overhead

Routing Overhead indicates the ratio of the number of routing packets (total number of control packets) required to route a CBR generated data packets.

Figure-1displays,the graph b/w transmission range [3,10] and Routing Overhead . It shows that if transmission Range [10] increases then RO of the TwoRayGround decreases,so in between three mobility models ,TwoRayGround is better than other two models because its RO is minimum at almost transmission range [3].

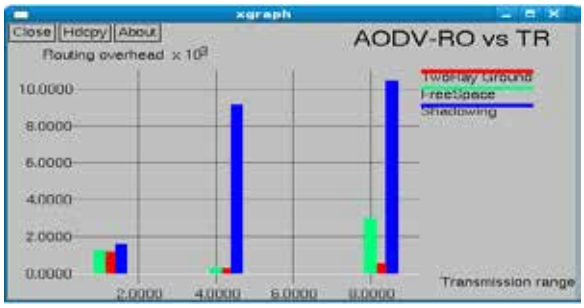

Fig-1:Routing Overhead vs Transmission Range

4.2) Delay

End to End Delay is time taken for the packets to reach the next node. If there is Delay increases than performance is decreases.

Figure-2 displays, the number of connection between Delay and transmission range and its shows that shadowing model is better than other two models because its delay rate is very low at almost transmission range[3] .

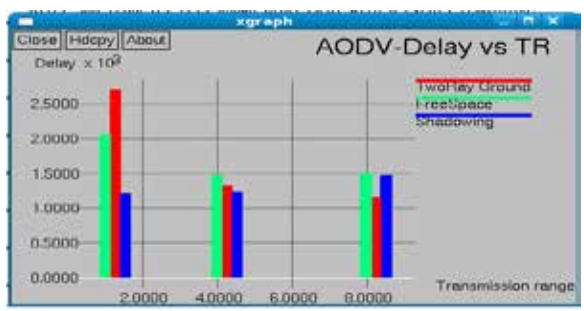

Fig-2: Delay vs Transmission Range

4.3) Packet Delivery Ratio

Packet Delivery Ratio uses the ratio of the total number of CBR (constant bit rate) packets received in the network to the total number of CBR packets sent during the simulation.

Figure-3 displays, the connection between PDR and transmission range [3] and shows that TwoRayGround is better than other two models because its packet delivery ration is very high.

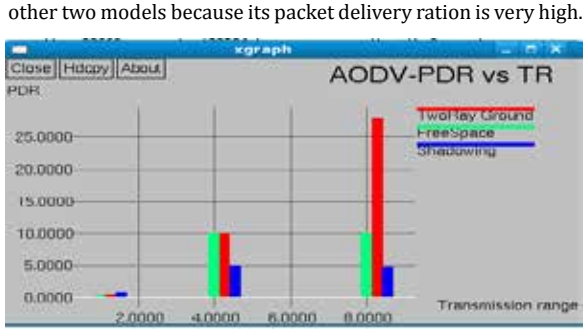

Fig-3) PDR vs Transmission Range

5) Conclusion

In this paper we study the Quality of services of Three Propagation model [11] under the single routing protocol AODV [2] by using the network simulator(NS-2.34) [6] .In this paper we calculate the quality on the basis of routing parameter(Delay,Routing Overhead,Packet delivery ratio). Finally we have conclude that TwoRayGround model is better in all respect than other two models Shadowing and FreeSpace model.

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