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AN IMPACT OF NETWORK SURVIVABILITY WITH DIFFERENT TRANSMISSION RANGE AND MOBILITY ON AODV OVER MANET

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ABSTRACT

Mobile devices are equipped with power(energy). In order to utilize this energy equipped devices efficiently for transmission of data packets, many energy aware routing strategies are followed. Effective transmission power control is a critical issue in the design and performance of wireless ad hoc networks. Transmission Power affects the Survivability of the Network. Mobility speed of the nodes and extension of ad hoc network affects the performance of the network as well. This paper is analysing one of the widely used routing protocol AODV with varying transmission range, mobility speeds and number of nodes. Data transmitted by a node is received by all the nodes within its communication range. This paper is focused on the analysis of varying the range of the transmission in terms of distance, mobility speed of the nodes and number of nodes in the network. The performance metrics comprises of Network Survivability and QoS parameters such as packet delivery ratio, end to end delay, routing overhead and throughput has been analysed in this paper.

Keywords : Ad hoc networks, QoS, Transmission range.

I INTRODUCTION

Mobile ad hoc network(MANET) is a collection of mobile nodes interconnected by multi-hop wireless paths in a strictly peer to peer fashion. The Network Survivability and QoS parameters differ from application to application e.g., in case of multimedia application bandwidth, delay jitter and delay are the key QoS parameters. Network Survivability also differs with different routing protocols in different environments like variable transmission range and mobility speeds. In this paper it is shown that variable range transmission control should underpin the design of future wireless ad hoc networks and not, common-range transmission control. It is compared how routing protocols based variable-range transmission control techniques impact Network Survivability and a number of QoS performance metrics on different routing protocol of wireless ad hoc networks.

Power control affects the performance of the network layer. Higher transmission power decreases the number of forwarding hops between source-destination pairs, therefore reducing the signaling load necessary to maintain routes when nodes are mobile. The signaling overhead of routing protocols can consume a significant percentage of the available resources at the network layer, reducing the end user's bandwidth and power availability. Modifying existing MANET routing protocols to promote lower transmission power levels in order to increase network capacity and potentially higher throughput seen by applications, is neither a trivial nor viable solution. Similarly, there is a minimum transmission power beyond which nodes may become disconnected from other nodes in the network. Because of these characteristics MANET routing protocols do not provide a suitable foundation for capacity-aware and power-aware routing in emerging wireless ad hoc networks.

II RELATED WORK

To reduce the energy consumption in AODV, DSR, author proposed enhanced AODV and enhanced DSR. Simulations are done using NS-2 and the results show that enhanced AODV and enhanced DSR consumes less energy compared to existing protocols and also comparison of energy consumption in each protocol. Results show that AODV performs better than DSR in terms of energy consumption. In this paper result shows that AODV performs better than DSDV in terms of energy consumption and Packet Delivery Fraction. Performance analysis of AODV on different mobility speeds with varying number of connections has been done in using NS2 as simulator. Simulation results show that performance of AODV increases with increase in power. The performance of AODV and DSR on the basis of residual energy and other performance metrics has been evaluated using NS2 simulator with increasing number of nodes. Analysis shows that on the basis of Energy consumption and throughput DSR performs better than AODV. In authors compared DSR, AODV, DSDV and Bee AdHoc protocols and analysed their Energy consumption and traditional performance metrics using NS2 as simulator. Simulation result shows that in low speed environment DSR is generally best out of all but in highly Dynamic environment Pro-active protocols save more power.

This paper compares the performance of various AdHoc routing protocols such as DSDV, AODV, TORA and AOMDV in terms of energy efficiency using NS2.34 as simulator with fixed Transmission range and Mobility speed. The energy efficiency performance of DSDV, AODV, DSR and TORA has been evaluated in using NS2 simulator with varying pause time, mobility speeds and number of sources. Simulation result shows that DSR and AODV perform better than DSDV and TORA. The performance of AODV, DSDV and Improved DSDV (I-DSDV) routing protocols by varying number of nodes, pause time and mobility speed with fixed transmission range 250m on 30 nodes has been evaluated.

Parameters such as loss ratio, hop counts, velocity of the nodes are analyzed by varying the node density using various mobility models and routing protocols. It is also observed that I-DSDV is even better than AODV protocol in packet delivery fraction but lower than AODV in end to end delay and routing overhead. In the performance of AODV and DSR routing protocols has been observed in group mobility model by varying mobility speeds. The result of AODV is better than DSR in CBR traffic and real time delivery of data, but DSR perform better in TCP traffic under restriction of bandwidth.

The simulation result on different QoS metrics shows that AODV, ZRP perform better than DSR and OLSR. The performance of AODV and DSR routing protocols in wireless sensor network with varying load by varying number of sources and mobility speeds on 50 and 100 nodes scenario has been simulated. A simulation based performance comparison of DSDV and DSR routing protocols with variation in number of nodes with fixed transmission range 250m has been analyzed and it has observed from their results that DSR outperforms DSDV. A simulation based performance analysis on AODV, TORA, OLSR and DSR routing protocols for voice communication support over hybrid MANETs has been conducted. The result shows that overall performance of OLSR is best as all QoS parameters have favorable results. The performance of TORA is less than OLSR and AODV but its performance is better than the performance of DSR. DSR protocol has minimum throughput and maximum end-to-end-delay with highest jitter and all these factors make this protocol unsuitable for voice transmission.

The performance of AODV, DSDV and DSR routing protocols by varying pause time and mobility speed is analyzed. The observations of simulation analysis show that AODV is preferred over DSR and DSDV. An impact of scalability on QoS Parameters such as packet delivery ratio, end to end delay, routing overhead, throughput and jitter has been analyzed by varying number of nodes, packet size, time interval between packets and mobility rates on AODV, DSR and DSDV has been analyzed. The result shows that AODV protocol is QoS-aware routing protocol under the impact of scalability in terms of variation in number of nodes, mobility rate and packet intervals. The performance of AODV, DSDV and DSR routing protocols in different mobility speeds with fixed nodes has been analyzed. After analyzing in different situations of network, it is observed that AODV performs better than DSDV and DSR.

The performance of transport layer protocols TCP and UDP on AODV, DSDV, TORA and DSR routing protocols in multicast environment by varying pause time with 50 nodes scenario has been simulated. The result indicates that TCP is not appropriate transport protocol for highly mobile multi hop networks and UDP is preferred. This paper is analyzing the impact on certain QoS parameters by taking variation in transmission range, mobility and number of nodes on routing protocols (AODV, DSR and DSDV).

III NETWORK SURVIVABILITY AND QOS BASED PERFORMANCE METRICS

Routing protocols for MANETs have been classified according to the strategies of discovering and maintaining routes into three classes: proactive, reactive and Hybrid. This paper is analyzing a reactive routing protocol, AODV.

Ad hoc On-demand Distance Vector (AODV)

AODV routing protocol is also based upon distance vector, and uses destination numbers to determine the freshness of routes. AODV minimizes the number of broadcasts by creating routes on-demand as opposed to DSDV that maintains the list of the entire routes node discards a route request packet that it has already seen. The route request packet uses sequence numbers to ensure that the routes are loop free and to make sure that if the intermediate nodes reply to route requests, they reply with the latest information only.

Network Survivability

Each time a MAC layer operation takes place, certain amount of power is consumed for this operation. Each node consumes some energy whenever it is involved in the communication. Node’s survival time can be find out using this consumed amount of energy and after getting the survival times of all the nodes after the end of simulation, average survival time of the network can be find out. The performance metrics includes the QoS parameters such as Packet Delivery Ratio (PDR), Throughput, End to End Delay, Routing Overhead and Jitter.

Packet Delivery Ratio (PDR)

PDR also known as the ratio of the data packets delivered to the destinations to those generated by the CBR sources. This metric characterizes both the completeness and correctness of the routing protocol.

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.

Throughput

Throughput is the ratio of total number of delivered or received data packets to the total duration of simulation time.

Normalized Protocol Overhead/ Routing Load

Routing Load is the ratio of total number of the routing packets to the total number of received data packets at destination.

IV RESULTS AND DISCUSSIONS

The performance of AODV has been analyzed with varying transmission range, mobility speed and number of nodes. The performance metrics comprises of Network Survivability and QoS parameters such as packet delivery ratio, end to end delay, routing overhead and throughput.

TABLE 1: SIMULATION PARAMETERS

Parameters	**Values**
No of Node	25, 50
Simulation Time	10 sec
Environment Size	1200 x 1200
Traffic Size	CBR (Constant Bit Rate)
Queue Length	50
Source Node	Node 0
Destination Node	Node 2
Mobility Model	Random Waypoint
Antenna Type	Omni Directional
Simulator	NS-2.34
Mobility Speed	100, 500, 1000 m/s
Transmission Range (in meters)	200, 250, 300, 350, 400, 450, 500, 550, 600
Operating System	Linux Enterprise Version-5

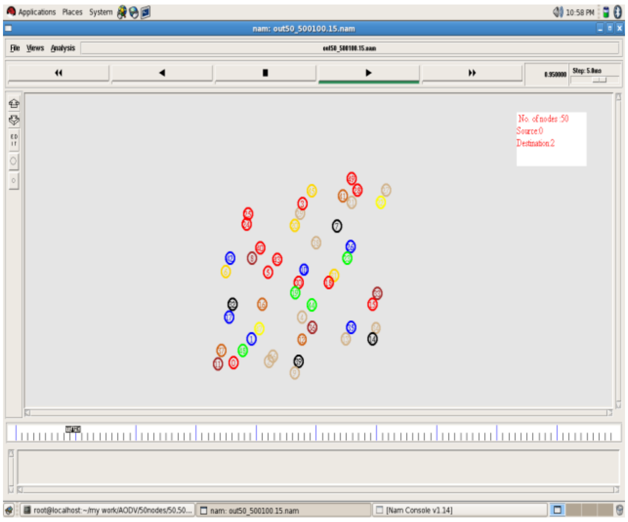

Figure 1: Initial Positioning of 50 nodes

A. NETWORK SURVIVABILITY

AODV at higher mobility speeds and higher transmission range shows more NETWORK SURVIVAL TIME than the lower mobility speed and lower transmission ranges. So this is the best combination for 25 nodes. Figure 4 shows that survival time of the network is most when mobility speed in 500m/s and transmission range is 500m or mobility speed is 1000m/s and transmission range is 550m for 50 nodes. Results also shows that at lower transmission ranges and lower mobility speed network survivability time is less and keeps on increasing with the increment in mobility speed and transmission range.

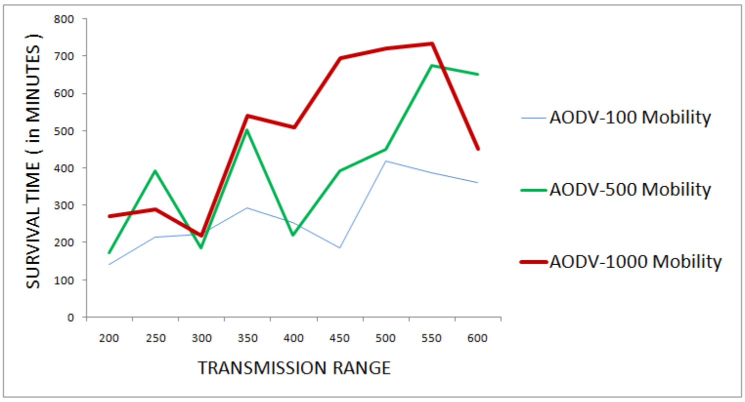

FIGURE 2: Impact of Varying Transmission Range and Mobility Rate on the Network Survivability for 25 nodes

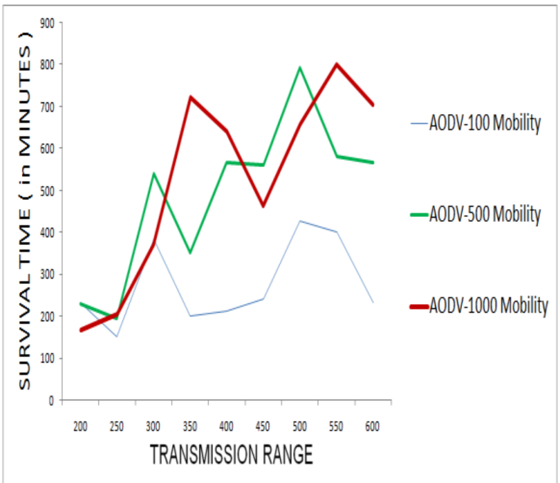

FIGURE 3: Impact of Varying Transmission Range and Mobility Rate on the Network Survivability for 50 nodes.

B.PACKET DELIVERY RATIO

It has been observed that AODV with mobility rate 1000m/s and transmission range over 400m for both 25 nodes and 50 nodes scenario has best packet delivery ratio. On the other hand, AODV at 100m/s mobility speed and 250m transmission shows poor performance in packet delivery ratio in both 25 nodes and 50 nodes scenario. At transmission range below 350m and mobility speed 500m/s AODV shows its worst performance in packet delivery ratio for both 25 nodes and 50 nodes.

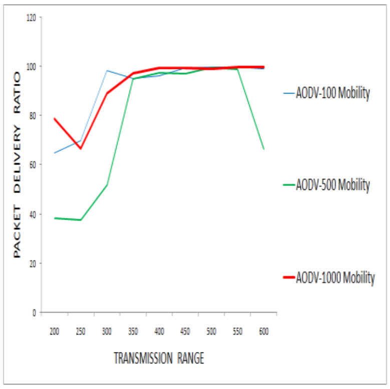

FIGURE 4: Impact of Varying Transmission Range and Mobility Rate on the Packet Delivery Ratio for 50 nodes.

C.END TO END DELAY

In AODV protocol it is higher with mobility speed 1000m/s than both the other mobility speeds in both 25 and 50 node scenario. For 25 nodes AODV protocol shows very less average end to end delay on range 250m and 100m/s mobility speed. In 50 nodes scenario AODV protocol shows very low average end to end delay on ranger 200m and 250m with 100m/s mobility speed. So AODV is better in term of average end to end delay when mobility speed is lower.

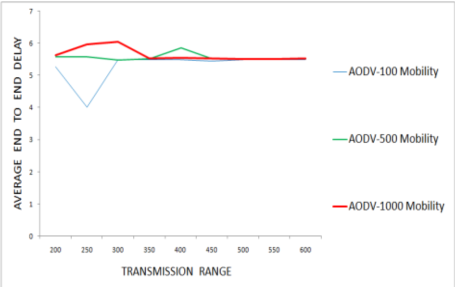

FIGURE 5: Impact of Varying Transmission Range and Mobility Rate on the Average End to End Delay for 25 nodes.

D. THROUGHPUT

The results analyzed from figure 9 and figure 10 indicates throughput provided by the three different mobility speeds with variable transmission ranges in 25 nodes and 50 nodes scenario is most when transmission range is high for any mobility speed. With highest mobility and transmission range more than 350m AODV has the highest average throughput as compared to all the other scenarios in both 25 nodes and 50 nodes. As observed from results that AODV performed worst in terms of average throughput when mobility speed is 500m/s as compared to other mobility speeds.

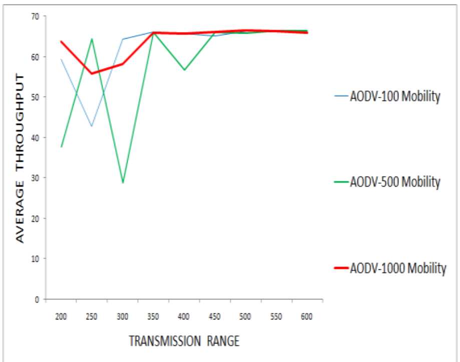

FIGURE 6: Impact of Varying Transmission Range and Mobility Rate on Throughput for 25 nodes

E.ROUTING OVERHEAD

The routing overhead depending on their internal efficiency, and thus protocol's efficiency may or may not directly affect data routing performance. If control and data traffic share the same channel, and the channels capacity is limited, then excessive control traffic often impacts data routing performance. In both 25 nodes and 50 nodes scenario graphs shows that AODV at 500m/s mobility speed and 200m transmission range has highest routing overhead unless it uses transmission range more than 500m.

When the transmission range is highest, routing overhead is minimum and at lowest transmission range routing overhead in maximum. AODV protocol is performing best in lowest mobility speed in both 25 nodes and 50 nodes scenario.

FIGURE 7: Impact of Varying Transmission Range and Mobility Rate on Routing Overhead for 25 nodes.

V. CONCLUSIONS

The performance of AODV routing protocol shows some differences by varying transmission range, mobility speed and number of nodes. From our experimental analysis it is concluded that AODV has maximum network survival time with higher mobility speed and lowest network survival time with lowest mobility speed. Packet delivery ratio and throughput is best when transmission range is high for all the mobility speeds and it is directly proportionate to transmission range. AODV is best when transmission range is 550m with highest mobility speed. This paper compares the AODV protocol with variation in transmission range and mobility speeds in the analyzed scenario, it is found that overall performance of AODV is best with highest mobility speed and higher transmission ranges in terms of Network Survival Time and QoS parameters. The transmission range, mobility and different number of nodes as a system parameter affects the overall energy consumption and performance of MANET.

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