Capacity And Delay Analysis with Redundancy Relay in MANET'S

Dr. P. Marikkannu, Vipin Mohan

***Abstract*— The main aim of this project is by collecting the information of transmission capacity and packet delivery delay in mobile ad hoc networks and also calculate throughput of the MANET'S. In order to achieve the fundamental understanding of MANETs, we focus on various closed-form expressions of the network capacity and end-to-end delay. A MANET with the generalized correlated mobility model is considered in this paper, where the mobility of nodes clustered in one group is confined within a specified area, and multiple groups move uniformly across the network. Information theory, which has been vital for links and centralized networks, has not been successfully applied to decentralized wireless networks. Thus we take all the issues into account and collect different methods which and all gives a better solution to this.**

***Index Terms*— Mobile Ad hoc networks, Cluster, Multipoint relays, AODV,DSDV**

I. INTRODUCTION

A mobile ad-hoc network (MANET) consists of mobile hosts equipped with wireless communication devices. The transmission of a mobile host is received by all hosts within its transmission range due to the broadcast nature of wireless communication and omni-directional antennae. If two wireless hosts are out of their transmission ranges in the ad hoc networks, other mobile hosts located between them can forward their messages, which effectively builds connected networks among the mobile hosts in the deployed area. Due to the mobility of wireless hosts, each host needs to be equipped with the capability of an autonomous system, or a routing function without any statically established infrastructure or centralized administration. The mobile hosts can move arbitrarily and can be turned on or off without notifying other hosts. The mobility and autonomy introduces a dynamic topology of the networks not only because end-hosts are transient but also because intermediate hosts on a communication path are transient.

MANET nodes can move arbitrarily; therefore, the network that supports them must be self-adapting to the connectivity and propagation conditions, as well as to the traffic and user mobility pattern. Each node in a MANET network will logically consist of a router with one or more hosts, and communications devices. The MANET network is capable of functioning as a stand-alone network, but this delivers limited functionality. A more robust MANET network can be globally connected through an Internet point of presence (POP) accessible through one or more fixed networks.

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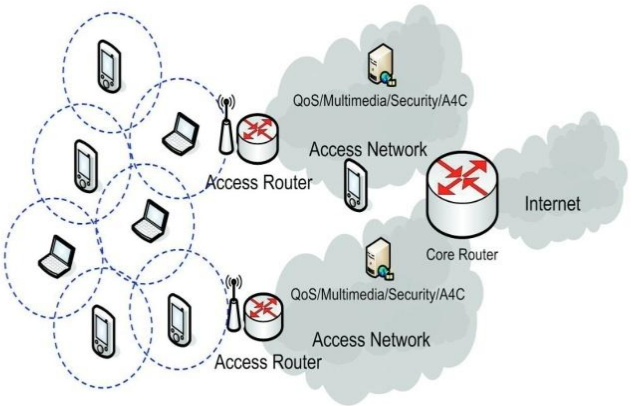

Fig.1 Mobile Ad-hoc Network Architecture

The mobile ad hoc network (MANET) is a collection of wireless nodes that are able to communicate with each other without the need of any established infrastructure. Such a self-configuring network is highly appealing for some specific applications, such as battle field or disaster recovery. However, the lack of MANET capacity theory has stunted its development and commercialization, and it is expected to develop a general capacity theory that is capable of describing the fundamental performance limits of MANETs .When considering the average packet delivery delay, many proposals have analyzed the throughput-delay trade offs for the MANET of n nodes under various scenarios. They have consider the Brownian mobility model, and shown that the two-hop relay routing considered to achieve a per-node throughput of with an expected packet delay of O(log n), where O(n) is the variance parameter of the Brownian mobility model.

II. RELATED WORKS

Most of the research literature involves comparing AODV, DSR and DSDV [1-3]. Very little work exists in literature that discusses TORA. P. Manickam *et al*. [3], N. Surayati *et al*. [4] and U. K. Acharjee *et al*. [5] provided a realistic and quantitative performance analysis of DSDV, DSR and AODV routing protocols using ns-2. The comparison was made on basis of delivery ratio, overhead and average hop count by varying mobility. Boomarani *et al*. [6] studied and compared performance of AODV with some other routing protocols like STAR, DYMO etc. Yinfei Pan [3] compared AODV and DSR for sensor networks. N. Vetrivelan *et al*. [2] compared three prominent routing protocols AODV, DSDV and TORA on basis of average delay, packet delivery fraction, routing load and varying MANET size. The simulation tool used was ns-2. The performance is analyzed using variable network size and simulation times. This work concluded that AODV performs well in terms of average delay and packet delivery fraction and TORA performs better when routing load is concerned.

E.M. Royer *et al.* [4] examined eight different routing protocols and evaluated those on a given set of parameters. T. Santhamurthy [1] presented a comparative study and performance analysis of three mobile ad hoc protocols OLSR, AODV and TORA on the basis of end to end delay, packet delivery ratio, media access delay, path optimality and routing overhead. It was concluded that TORA is better for dense networks and AODV is better for moderately dense networks. A. Patil *et al.* [2] compared the convergence times of three algorithms (AODV, DSDV and TORA) from each category (reactive, proactive and hybrid). The performance was compared by simulating them in ns-2. Tcl was used for simulation whereas Perl language was used to extract data from simulation output and calculate convergence time. According to the extensive simulations conducted in this paper, AODV outperformed DSDV when node density was low and pause time was high while DSDV performed better when the node density was high and pause time was low. No results for TORA have been shown in this work as there are bugs in ns-2 implementation of TORA. In [2] K. K. Sharma *et al.* present an analytical model for average end-to-end delay that takes into account the packet arrival process, backoff and collision avoidance mechanisms of random access MAC between a pair of source and destination and compare the end-to-end delay experienced by a QoS AODV protocol. In [3] the authors present a novel on-demand routing protocol for MANETs which is based on best route selection with learning automata and compare it with AODV and DSDV. In [4] I. A. Khan *et al.* propose asolution for the "broadcast storm problem" in MANETs routing protocols due to flooding. They calculate the re-broadcast probability (based on cover angles) by a node with respect to its neighbors. As future work they plan to evaluate the performance of their scheme on AODV and DSR algorithms.

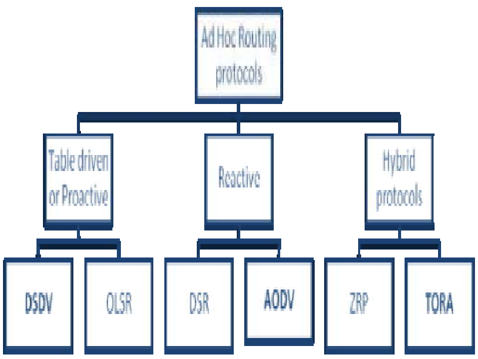

Fig.2 Classification of Mobile Ad-hoc Network Protocols

DSDV: Destination Sequenced Distance Vector or DSDV is a type of proactive routing protocol which is based on the Bellman Ford distance vector algorithm used in wired networks [1]. DSDV protocol was developed by C. Perkins and P. Bhagwat in 1994 . In this protocol, every node keeps the record of every other node in a routing table. This information includes hop counts and next hop's address. In order to eliminate looping, DSDV uses sequence number to indicate route update. This sequence number is sent to all nodes and is stored in next-hop table entry of these nodes. If current sequence number is larger than the recorded one, the node updates its route to the destination. Broadcasting sequence numbers to all nodes increases network load. This load increases if nodes are moving with high speed.

AODV: Ad hoc On Demand Distance Vector or AODV is a type of reactive routing protocol. In this protocol, one entry is stored for each destination in the routing table of nodes. Each packet of AODV carries the destination address and a sequence number. There is no real time maintenance of topology information in AODV. The changes are made only when the packet is not received by the destination node. This saves bandwidth. But there are few drawbacks of AODV, most importantly "it requires symmetric link to satisfy the needs of bidirectional transmission".

III. THROUGHPUT CAPACITY AND END TO END DELAY

Before proceeding to derive the expressions of through-put capacity and delay, we need the following preliminary probabilities.

Lemma 1 :

Let J denote the number of nodes belonging to group t that fall into one cell, and J represent the total number of nodes in the network that fall into the same cell. Given that Jt ≥ 1, then the expected number of nodes that fall into the same cell satisfies.

$$E\{J|J_t \geq 1\} \leq \begin{cases} 1 + \frac{9r_1^2}{l^4}(l - \frac{r_1}{3})^2 + r_1^2 & r_1 \leq l, \\ 1 + \frac{9}{r_1^2}(r_1 - \frac{l}{3})^2 + r_1^2 & r_1 > l. \end{cases}$$

Lemma 2:

Let p can be expressed as the probability that (i) s is in an active cell, (ii) given the position of s, the destination node d falls into A, and (iii) s is selected asthe transmitter. Let p(s) and p(d js) denote the occurrence probability of events i) and ii), respectively. Since the position of a node is uniformly distributed over the entire network, we obtain p(s) =, and p(ds) =The event (iii) happens with probability 1= Ef(J).Then we have as each time slot is divided to interior intra-group transmissions.

$$p_{s \to d} = \frac{r_1^4}{2nd_1^2 E\{J|J_1 \geq 1\}}$$

Lemma 3:

The expression of Ef(X)=s+d, g is the same as EfX g in Lemma 11 with s+ replaced by d+, and the range of t changed to 0 _ t _ f with I = 1 for 0 _ t _ f. The proofs of the Lemmas 2 and 3 are similar with t Lemma 11. Finally, it is straightforward to have the following result on Ef(g).

IV. PERFORMANCE ANALYSIS AND EVALUATION

We observe that the per node throughput capacity vanishes quickly as the packet redundancy f increases. Fig. 6 shows that with the increase of packet Redundancy f, the theoretical expected end-to-end delay first decreases and then increases, that is, there exists an optimal setting f to achieve the minimum packet delay EfT g. Fig. 5 and Fig. 6 indicate that it's possible to achieve a trade-off between the capacity and delay by a proper setting of the packet redundancy f. We also report the simulation result of the expected endto-end delay in Fig. 6, which matches just nicely with theoretical once there

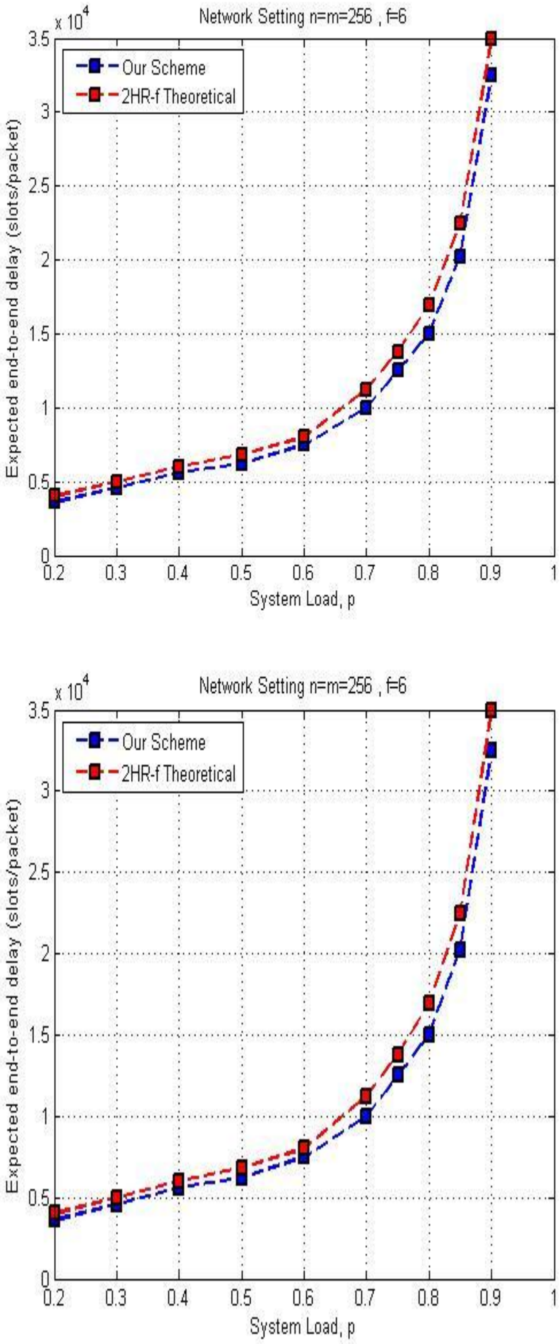

Fig 3 : Comparison between theoretical end to end delay and that of 2HF-routing algorithm

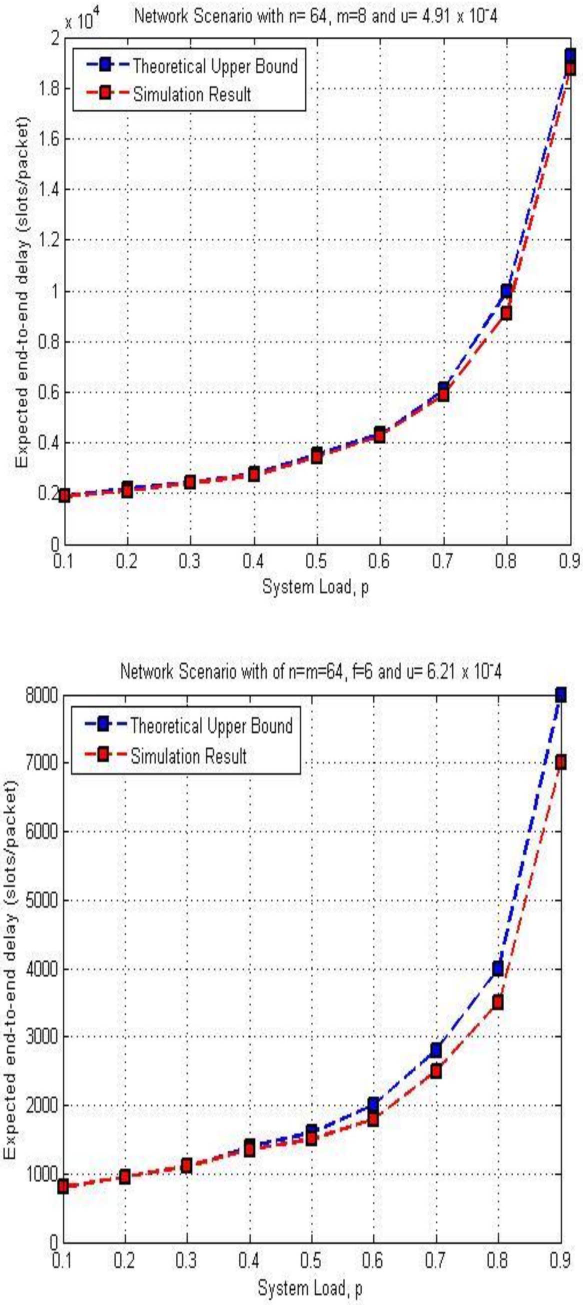

Fig 4:Comparison between theoretical end-to-end delay and simulated ones under small network scenarios with n = 64 and f = 6

If we set m = n; l = r = 1, the mobility pattern is reduced to the i.i.d. mobility model, and the routing scheme similar to the 2HR-f routing algorithm . In this case, we compare the theoretical results of packet delay developed by our scheme and the 2HR-f one. We consider two simulation settings of n = 64; f = 3 and n = 256; f = 6, and summarize the theoretical expected end-to-end delay results of our scheme and the 2HR-f one in Fig. . From Fig., we see that as the system load _ increases, both the theoretical results of packet delay in our scheme and that in the 2HR-f one rise up and become extremely sensitive to _ when _ approaches 1. Fig. shows the similar characteristics, which serves as a validation for the throughout and delay results developed under our scheme.

V. RESULTS

A. CLUSTER FORMATION

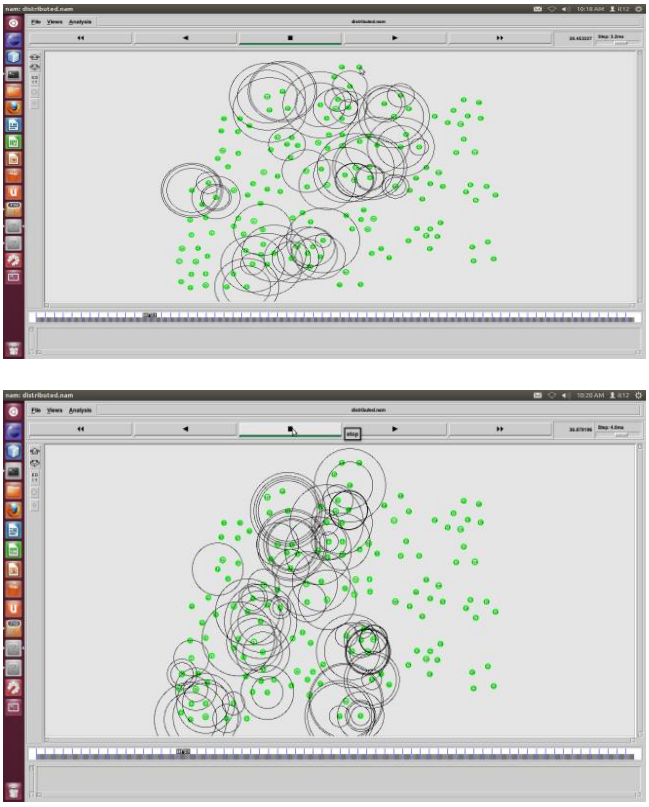

Fig 5: A number of clustering nodes are deployed based on speed and direction, mobility energy, position . The set of cluster-heads is responsible for resource allocation to all nodes belonging to its cluster and monitors communication.

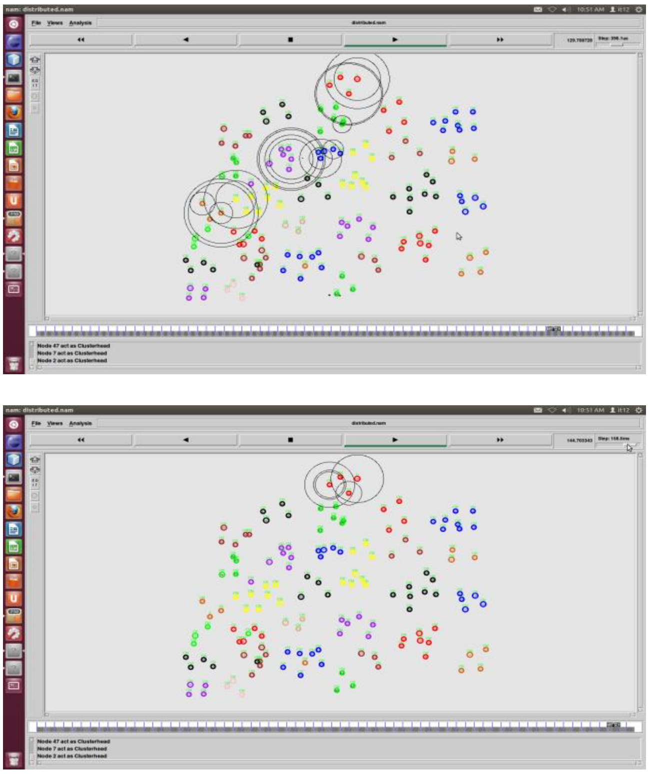

Fig 6: The network topology is static during the execution of the clustering algorithm. Each mobile node joins exactly one cluster-head. The node movements can be in the form of node joining or node leaving a cluster

VI. CONCLUSION AND FUTURE WORK

Routing in mobile ad hoc networks is an important and challenging research area due to infrastructure-less architecture of these networks, wireless links and mobility of end nodes. In this paper we take up the problem of comparing the performance of significant routing protocols from each of the three categories of reactive, proactive and hybrid routing algorithms. The metric of comparison is end to end delay for varying network conditions. We conclude that AODV and DSDV give better performance in terms of average end to end delay when network is less congested while TORA performs poorly while TORA gives better performance when network is congested. In terms of simulation time and average delay DSDV performs best. While comparing these protocols in terms of mobility, we conclude that DSDV again out performs in high network mobility while TORA gives better performance when mobility is low. In future we plan to design a suitable routing protocol for MANETs that gives stable performance under variable network conditions.

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