A Mobility based Routing method for Efficient Rebroadcasting in Mobile Ad Hoc Networks

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***Abstract*— MOBILE ad hoc networks (MANETs) are defined as the collection or a group of nodes where they can move independently. The nodes organize or group themselves. They don't have any fixed infrastructure. The challenge of the mobile ad hoc network is their routing protocols are dynamic which increases performance and decreases the routing overhead. The objective of Transition based Percolation Model for improved Probabilistic Rebroadcasting in MANET is to increase network routing performance. It determines phase transition of a probabilistic broadcast stream. The Phase transition is a sudden change of state, where small changes of a given parameter induces great shift in network. The global behavior transition occurs at a specific critical threshold. The Phase transition probability rebroadcast is arrived to improve routing performance on high mobility node. It observes phase transition in probabilistic rebroadcast algorithm within all or known subsets of MANET topologies. The Phase transition in percolation models is observed as a change of state between finite number of clusters and one infinite cluster. Percolation theory evolves the existence and value for which phase transition occurs, cluster numbers, sizes and structures. Simulations were conducted on different ad hoc nodes to measure the performance in terms of Packet delivery ratio, MAC Collision rate, and Average end to end delay.**

***Keywords*—Mobile Ad hoc Networks (MANET); probabilistic rebroadcast; routing overhead.**

I. INTRODUCTION

A Mobile Ad hoc Network (MANET) has a large number of mobile hosts, which are connected to each other through the wireless communication. Before reaching the destination, the packet must go to number of hops typically. Hence, the mobile host in each and every network have a restriction and behave when needed as a router to ensure the delivery of the packet. Mobile ad hoc networks (MANETs) consists of a freely moving nodes collection. They can dynamically arrange and organize themselves without any type of infrastructure. It will be based on the arbitrary topology if the group. The fundamental challenge in the mobile ad hoc networks is their dynamic routing protocol design that increases performance and reduces the overhead. The number of routing protocols such as Dynamic Source Routing, Ad hoc on Demand Distance Vector Routing have been used for the mobile networks. The demand routing protocols that are mentioned above increases the scalability of the mobile ad hoc networks by decreasing the routing overhead when a new route request is established. Still, due to presence of mobility of nodes in the mobile networks, there exists a link breakages often and as well as the discovery of route that stimulates the overhead of routing and decreases the ratio of the packet delivery.

The conventional protocols for the on-demand routing discover route using the flooding algorithm. The Route Request (RREQ) is broadcasted from the packet to the networks, and excessive redundant retransmissions is induced by broadcasting the RREQ packet and the broadcast storm problem is caused, which leads to a number of packet collisions, where the network is very denser. Therefore, optimizing this broadcasting mechanism is very dispensable. For optimizing this broadcast problem, many methods have been proposed in mobile ad hoc networks. The broadcasting protocols are categorized into four classes: "probability-based methods, simple flooding, neighbor knowledge methods and area based methods". For the broadcasting protocols of above four type, an increase in the number of nodes are showed where the static network will degrade the performance of the area-based and probability-based methods. The uncovered neighbors (UCN) scheme considers the rebroadcast probability contains information about the connectivity

metric and local node density. The Rebroadcast probability is of two parts additional coverage ratio and connectivity factor.

Additional coverage ratio of the number of nodes covered by a single broadcast to total number of neighbors. Connectivity reflects relationship of network connectivity and number of neighbors of a given node to maximize coverage in the network to reduces the rebroadcast, redundancy and broadcast latency.

For stable route broadcast scheduling, the random nodes are simultaneously integrated for transmission Schedules. The Minimum broadcast schedule leads to maximum data transmissions in the network. It achieves less collision and bandwidth of channels are properly utilized. Hence it increase rebroadcast efficiency, throughput, and route stability.

As the results of advances in wireless communication technology, portable computers with wireless interfaces can communicate among themselves, It is argued that future wireless network will be converged to be more easily reconfigurable situations such as Mobile Ad hoc network (MANET). MANET is a type of some special wireless mobile network where they can communicate using the mobile host without any infrastructure established. be deployed For applications such as disaster relief ,battlefield, and rescue, etc they can be deployed.

II. RELATED WORK

T.K. Araghi, M. zamani, M. Mnaf, [1] in their paper described that a collection of wireless mobile hosts is an ad hoc network that forms a temporary group without any infrastructure established on a central network administration. It is necessary for some environment where the mobile host depends for aid of some other hosts during a packet forwarding to the destination with the limited range in the wireless transmission of the mobile host.

The routing protocol presented in this paper used dynamic source routing for ad hoc networks. he routing change will be quickly adapted by the protocol where frequent movement of node is there. Based on packet level simulation from the mobile hosts which operated in ad hoc network, performs well with many of the conditions which as movement rates and the density of the hosts.

A.A. Jeng, Rong-Hong Jan [2] in their paper described that broadcasting in the mobile networks provides a control that is important for the establishment of the route with many number of multicast and unicast protocols. A building block of the network is considered for the network layer of other protocols, a standardized MANET community is needed for delivering the packet efficiently to the nodes in the network.

As a number of broadcasting schemes which are proposed are considered and an analysis based on comparative is done previously. He in this paper an analysis is provided with the existing schemes of broadcasting and the category is simulated. Thus a comparison is supplied for each nodes present in the network..

By pinpointing the simulations for each category, there are some failures for the network which are related to the dynamic topology and the congestion of bandwidth. The protocol extensions in addition uses some responses to the network conditions are proposed, and it is implemented and analyzed for comparative study.

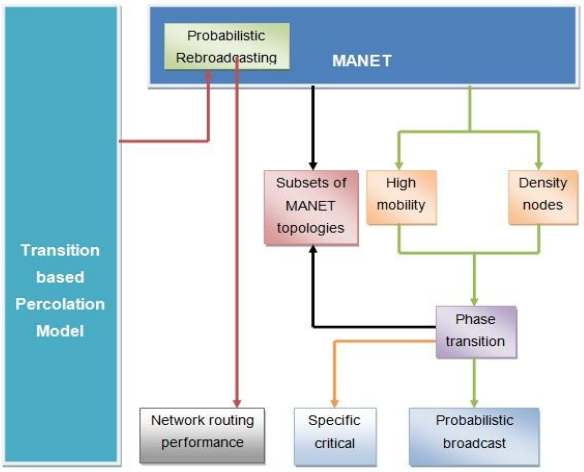
S.A.V. Ali, W.R. Jayaseelan, S. Hariharan, [3] in their paper, a large scale wireless network is considered with a low density of nodes per unit area with less critical interferences and contrary with connectivity. The latter property is studied in this paper for a hybrid network and a pure ad hoc networks where the base stations fixed can be reached easily. The power constraints assumed here uses maximal distance for modeling with the nodes that are not connected directly. As the sparse network is introduced with the base stations which significantly helps in improving the connectivity, only when the density of the node is larger.

The results are explained by using the percolation theory that uses the analytical expressions for the node connectivity. Also a low spatial density of nodes is shown because of the unavoidable bottlenecks. The results obtained from the actual population of data with findings. If all the networks are connected each other with base station so that they can communicate each other although the distance separates each of the nodes in the networks

. D. Kasamatsu, Y. Kawamura, M. Oki, N. Shinomiya, [4] in their paper described that the High stream MANET broadcast topology each node operates with limited transmission range. It's able to directly communicate only with nodes within its transmission range (neighbors).

The Node does not know the entire topology indulges in a broadcast-based query-reply mechanism to discover routes to distant nodes. The nodes outside its neighborhood is to send data packets to the other nodes.

III. ARCHITECTURE DIAGRAM



The architecture of mobility based rebroadcasting for efficient routing in mobile ad hoc network.

The phases involved in the proposed scheme are:

A. High stream MANET broadcast topology

B. Controlled phase transition

C. Percolation based rebroadcast

A). High streamMANET broadcast topology

The Broadcast of a communication paradigm message originating from one node reaches every other node in the network. The Broadcast is realized through active involvement of all nodes in terms of forwarding message in each other's neighborhood. If all the links in a MANET are used for broadcasting messages, it results in too much of redundancy.

The node would receive a copy of the same message from each of its neighbor's energy consumption, collision of messages, referred as high stream broadcast. The Broadcast optimization mechanism choose only subset of nodes in network to broadcast a message (in its neighborhood) so that message reaches every node in the network. The Broadcast optimization mechanisms select the set of nodes that forward a message to their neighbors

B) Controlled Phase Transition

L.C. Llewellyn, K.M. Hopkinson, S.R. Graham, [5] in their paper said that the Controlled phase transition is a phenomenon where MANET undergoes sudden change of state. The Small changes of a given parameter in the system induces great shift in global behavior in the group of nodes which are present in the clusters. This behavior therefore brings a change in the transition of the nodes in network.

The Abrupt transition occurs at a specific value called critical point or critical threshold. The below critical point system is said to be in a subcritical phase. The global behavior is non-existent in above critical point system and is in supercritical phase and has global property.

The Cost-efficient phase transition in probabilistic flooding algorithm is carried out within all or known subsets of MANET topologies. The implication within such cases is that there exists certain probability threshold at which flooded message reach all nodes within multi-hop broadcast reach. The Broadcasting with probability greater than critical point did not provide any significant results.

C) Percolation Based Rebroadcast

In general, the cluster is a collection or a group of nodes. Here the Cluster is a set of connected entities with edges for bond percolation sites for site percolation. The Cluster that reaches from one side of lattice to other is said to be an infinite cluster. In percolation based rebroadcast there is no loss of fluid. It Arrives a model useful for extracting best-case results for specific MANET topology reduced to percolation case with known theoretical results. The Nodes' communication range is R.

Shakkeera [6] said that the Phase transition in percolation models is observed as change of state between finite number of clusters and one infinite cluster.The Nodes are randomly placed on an m×n area according to probability distribution such as Poisson functions. Link connecting nodes i and j is added to graph if Euclidean distance between nodes is less than R.

The Probabilistic flooding implies a node. To choose not to broadcast a message to all its neighbors within range with probability 1− p resulting in fluid not flowing in any of links attached to node using percolation. In random graph models edges are added or removed independently.

IV. EXPERIMENTAL RESULTS

Here the Mobility Based Probabilistic Rebroadcasting for Efficient Routing Performance in the mobile ad hoc network is evaluated by the following metrics.

i) Packet Delivery Ratio
ii) MAC Collision rate
iii) Average end to end delay

TABLE 1. PACKET DELIVERY RATIO

Number of Node	Packet delivery Ratio in Existing System	Packet Delivery Ratio in Proposed System
10	88.34	99.10
20	90.13	99.99
30	92.89	100.45
40	94.34	102.56
50	96.56	104.57

Table I demonstrates the Packet delivery ratio. X axis represents the number of nodes whereas Y axis denotes the Packet Delivery Ratio using both the proposed Transition base percolation model (TPM).

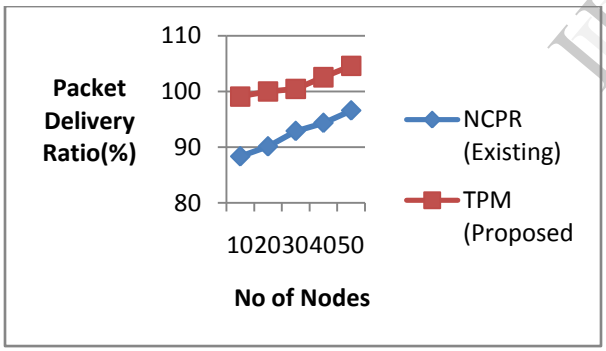


Figure 1. Packet Delivery Ratio.

When the number of nodes increased, Packet delivery ratio rate gets increases accordingly. The rate of Packet delivery ratio is illustrated using the existing NCPR and proposed TPM Techniques.

It shows better performance of proposed TPM Technique in terms of No of nodes density than existing and proposed TPM. Transition percolation model 15 to 25% less Packet delivery ratio rate variation when compared with the packet delivery ratio of the existing system.

TABLE II. MAC COLLISION RATE

Number of Node	MAC Collision rate in Existing System	MAC Collision rate in Proposed System
10	67.11	55.12
20	76.23	67.12
30	89.45	78.12
40	93.67	88.08
50	99.10	90.23

Table II demonstrates the MAC Collision rate.

Here X axis represents the number of nodes whereas Y axis denotes MAC Collision rate the using both the NCPR and our proposed TPM.

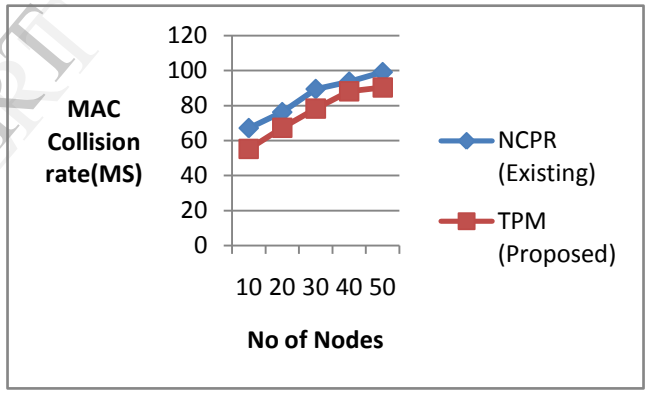


Figure 2. MAC Collision Rate

When the number of nodes increased, MAC Collision rate also gets decreases accordingly. The MAC Collision is illustrated using the existing NCPR and our proposed TPM.

Figure 2 shows a better performance for the model described in terms of nodes than existing NCPR and our proposed TPM. Transition percolation model achieves 20 to 35% less MAC Collision rate variation when compared with existing system.

The analytical results obtained with the proposed model are in a close agreement with simulation results which are obtained from the discrete-event of simulations.

TABLE III. AVERAGE END TO END DELAY

Number of Node	Average end to end delay in Existing System	Average end to end delay in Proposed System
10	89.22	83.24
20	91.28	85.89
30	93.78	87.27
40	95.22	89.99
50	98.02	92.45

Table III demonstrates the Average End to End Delay.

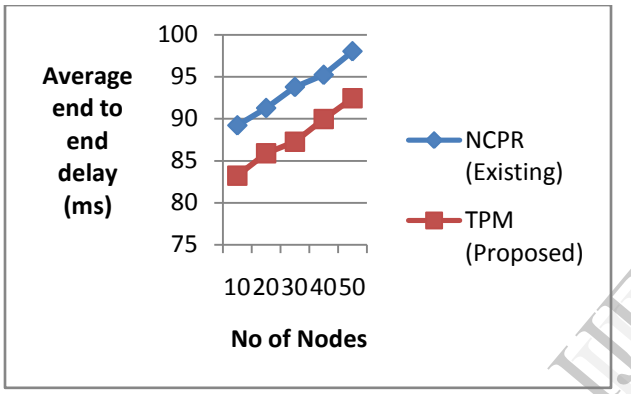


Figure 3. Average End to End Delay

The X axis represents number of nodes whereas Y axis denotes the Average End to End Delay using both the NCPR and our proposed TPM Technique. When the number of nodes increases, the Average End to End Delay gets increased. Transition percolation achieves 30% to 50% more Average End to End delay when compared with existing schemes.

Tsung-Chuan Huang, Sheng-Chieh Chen, Lung Tang, [7] described the approach based on the gossiping where forwarding of message to each node with a probability to decrease the overhead with routing protocols. Some execution fraction is carried where message in nodes depends on probability of gossiping and the network topology. For the networks, the probability of gossiping will be between 0.6 to 0.8 to ensure that each node receives a message at all execution. For the networks that are larger the gossip protocol will be up to 33 % with fewer flooding and increased performance. Various optimizations can be combined with gossiping to get more benefits. The optimizations that are applied for flooding by the other protocols (for example, the scheme based on cluster) can be combined usefully with the gossiping to get some performance improvements further. It is proceeded by selecting some random nodes to which gossip is carried out.

Xiaoqin Chen, Jones, M. Haley, D. Jayalath, [8] in their paper discussed that the mobile ad hoc network is a group of mobile nodes that are co-operative without any requirement of an infrastructure or an access point. An ad hoc on demand distance vector routing is presented in this paper for operating the mobile ad hoc networks which is based on the novel algorithm. A router which specially operates the mobile host and the routes as needed are obtained..

For self starting of the network dynamically a new routing algorithm should be needed for the users. The AODV algorithm provides some free routes for the ad hoc networks when the links are broken or even repaired.. The advertisement for global periodic routing is not necessary for this protocol. The number of nodes is less as the available bandwidth is low for this protocol. This mechanism has an advantage with distance vector routing and can be easily maintained. The results can be verified from the operation of the simulation and methodology of the routing algorithm provided.

Hui Xu, Xianren Wu, H.R. Sadjadpour, [9] presented a framework based on the mathematical evaluation of the proactive performance and the routing reactive protocols in the mobile ad hoc networks. This framework is unified and provides a parametric view of the given protocol which gives a deeper sight of the operations and the effects rare revealed further. The acting effect of the network parameter is combined. It comes from a combinational model and a parametric model for analyzing the routing logic with the performance of the MAC. Each of the wireless node is seen independently with a queue priority based on customer queue. The broadcast packets and the unicast are the two types. The captured model is essential in the behavior and the network size is limited by the scalability that provides a very good performance with the proactive routing protocols under different types of network configurations and different mobility conditions.

L.C. Llewellyn, K.M. Hopkinson, K.M, S.R. Graham, [10] said that a mobile ad hoc network (MANET) is a number of nodes with communicating hosts which forms an arbitrary network by a topology with a number of wireless media communications. The communications in MANET is represented by by a technology in the communication which are necessary

to solve the requirements of the network communications in the group.

With a number of challenges in the distributed system the routing based problem with a number of customer preferences that are predefined which ensures the service provided. This is the main aim of the research. But when featuring the nodes that are present in the network, this becomes very critical. A new fault tolerant algorithm is used for calculating the recovery time of the failure time. This also ensures the quality of service which decreases the bandwidth usage that decreases the failure of the nodes.

R.J. La, Eunyoung Seo, [11] studied about the overhead of the routing and collected the information about the mobile networks for setting the route based on the geography. A number of new framework is provided initially with the increase in routing overhead to chare the information of the actual location. By decreasing the available number of bits, he node location can be easily and identified and the message is sent to the destination.

This result can be used for simulating the the overhead that is, $\Omega (n^{1.5}\log (n))$, where n stands for the number of nodes, under the both type of routing that is assumed previously. Here the mobility of the nodes is free in nature and each can manage themselves to maintain the range for the connectivity. Hence we can prove the less amount of the overhead expected based on $\Theta (n \log (n))$.

V. CONCLUSION

In this paper we performed a tradeoff analysis gain in reliability, timeliness, and security for ad hoc utilizing Transition percolation based model to answer user queries. Finally, we applied our analysis results to the design of a TPM Techniques to identify and apply the best design parameter settings in Ns2. we implemented the proposed scheme, and conducted comprehensive performance analysis and evaluation, which showed its efficiency over existing schemes.

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