

Autoconfiguration of OCTANE Nodes in MANET to Reduce flooding

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Abstract: MANET is infrastructure less network and the routing protocol in MANET is not designed specifically with dynamic, self-starting behavior required for wireless networks. Each and every node in MANET acts as a forward and receiver node. Performance of most of the protocols is not encouraging in a highly dynamic interconnection topology. Most routing protocols in MANETs rely on a flooding mechanism to broadcast data and control packets over the entire network for establishing routes between source destination pair. However, the basic nature and characteristics flooding mechanism causes a large number of packets propagation in MANETs. This will eventually overload the network and traffic is congested affecting the overall performance of network. So, there is a need of such a protocol which not only reduces the flooding but also reduces the routing overhead. In this paper, a reliable broadcast approach for MANET is proposed, which improves the transmission rate. This work proposes a methodology where certain nodes are assumed to be high energy transmission nodes known as Octane Routing Node (ORN)/ High Power Routing (HPR) nodes, or Tower Node (TN) in the network which are utilized for routing. The route is established only through these nodes which are capable of communicating to long distance. Since the proposed approach reduces the flooding, we have considered functionality of the proposed approach with AODV variants. The effect of network density on the overhead and collision rate is considered for performance evaluation. The performance is compared with the AODV variants found that the proposed approach outperforms all the variants

Keywords: Ad hoc networks, computer network management, rebroadcast protocol, broadcast storm problem, Network Simulator (Version 2), cluster, , network connectivity

I. INTRODAUCTION

In the recent trends high mobility of nodes in mobile ad hoc Networks (MANETs), there exist link breakages which lead to Frequent path failures and route discoveries .This type of serious -s Failure cannot be neglected. In this route discovery We try to implement the Broadcasting is a fundamental and effective data dissemination mechanism, where a mobile node blindly rebroadcasts the first. Received route request packets unless it has a route to the destination, and thus it causes the broadcast storm problem. In this we propose a neighbor coverage-based probabilistic rebroadcast protocol for reducing routing overhead in MANETs. In order to effectively exploit the neighbor cove-rage knowledge, we propose a novel rebroadcast delay to deter-mine the rebroadcast order, and then we can obtain themore accurate additional coverage ratio by sensing neighbor covrerag –e knowledge. We also define a connectivity factor to provide The node density adaptation. By combining the additionalcoverage ratio and connectivity factor, we set a reasonablerebroadcast probability. Our approach combines the advantages of the neighbor coverage knowledge and the probabilistic Mechanism, which can significantly decrease the number of retrains missions so as to reduce the routing overhead, and can also Improve the routing performance. Autonomous addressing protocols require a distributed and self-managed mechanism toavoid address collisions in a dynamic network with fadingchannels, frequent partitions,

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and joining/leave nodes. The software used is Network Simulator (Version 2), widely known as NS2, is simply an event-driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviours. Due to its flexibility and modular nature, NS2 has gained constant popularity in the networking research community since its birth in 1989. Ever since, several revolutions and revisions have marked the growing maturity of the tool, thanks to substantial contributions from the players in the field.

Since 1995 the Defence Advanced Research Projects Agency (DARPA) supported development of NS through the Virtual Inter Network Testbed (VINT) project [1][2]. We'll use NS2 for this project. NS2 is a discrete event simulator written in C++, with an OTcl interpreter shell as the user interface that allows the input model files (Tcl scripts) to be executed. Most network elements in NS2 simulator are developed as classes, in object-oriented fashion. The simulator supports a class hierarchy in C++, and a very similar class hierarchy in OTcl. The root of this class hierarchy is the TclObject in OTcl. Users create new simulator objects through the OTcl interpreter, and then these objects are mirrored by corresponding objects in the class hierarchy in C++. NS2 provides substantial support for simulation of TCP, routing algorithms, queuing algorithms, and multicast protocols over wired and wireless (local and satellite) networks, etc. It is freely distributed, and all source code is available. In clustering procedure, a representative of each sub domain (cluster) is 'elected' as a cluster head (CH) and a node which serves as intermediate for inter-cluster communication is called gateway. Remaining members are called ordinary nodes. The boundaries of a cluster are defined by the transmission area of its CH.

II. BACKGROUND

In recent years, wireless technologies and applications have received a lot of attention [Sheu2002]. Owing to rapidly emerging wireless computing, users can communicate with each other through network connectivity without being tethered off of a wired network [Crow1997]. An ad hoc wireless local area network (WLAN) consists of a group of mobile hosts creating a temporary network without the help of any pre-existed infrastructure or centralized administration [Sheu2002, Johnson1994, Frodigh2000, Perkins2000]. Since the nodes in an ad hoc network are able to serve as routers and hosts, they can forward packets on behalf of other nodes and run user applications [Frodigh2000]. That is, when two nodes are within the wireless transmission range of each other, they can communicate with each other directly. However, if they are out of their transmission range to each other, intermediate nodes can forward a packet for the two nodes to communicate with. Since ad hoc networks do not need any help of centralized infrastructure, wireless applications are becoming more and more popular where wired networking is not available or not economically feasible [Sheu2002]. In general, a wireless ad hoc network that consists of mobile nodes and communicates over radio without the aid of any infrastructure is popularly called MANET (Mobile Ad-hoc NETWORK) [Gunes2002].

Geographic ad hoc networks using position-based routing are targeted to handle large networks containing many nodes. Position-based routing algorithms can employ single path, multi path, or flooding. Flooding protocols are usually restricted directional, such as DREAM [3] and LAR [4]; the flooding is done only in a section of the network, which is selected based on the source and destination node location. Multipath protocols such as c-GEDIR [5] attempt to forward the message along several routes toward its destination in order to increase the probability of finding a feasible path. Single path protocols, on the other hand, aim for good resource consumption to throughput ratio. Most common among the single path protocols are those based on greedy algorithms. The greediness criteria can be distance, minimum number of hops, power (best usage of battery resources), etc. Greedy routing algorithm [6] is a memory less algorithms (only requires information about destination). When using greedy forwarding, a node selects for the next hop, the node that is closest to destination (including itself). It is easy to come up with examples where this algorithm does not converge, due to local minima that occur in regions void of neighbors. IJCA Special Issue on "Mobile Ad-hoc Networks" MANETs, 2010

121Position based routing eliminate the limitation of topology based routing. It requires the information about the physical position of the participating nodes. Each node must be aware of its own location and location of the participating nodes. One distinct advantage is no establishment or maintenance of path required, and it is suitable for highly dynamic large networks. A major issue in greedy routing algorithms is how to proceed when a concave node is reached, i.e., A Concave node is a node that has no neighbor that can make a greedy progress toward some destination (for the greedy routing algorithm in use). The simplest solution is to allow the routing algorithm to forward the packet to the best matching neighbor, excluding the sender itself. Such a solution can guarantee the packet delivery but can result in routing loops in algorithms that are otherwise loop free. Other solutions require switching to a recovery algorithm that guarantees packet delivery. Since position-based routing uses local information for forwarding decisions, a concave node cannot be predicted in advance, based on the position of its neighbor nodes. Even using the information of the neighborhood cannot prevent reaching concave nodes, though can improve decisions made during the algorithm.

III. RELATED WORK

The lack of servers hinders the use of centralized addressing schemes in ad hoc networks. In simple distributed addressing schemes, however, it is hard to avoid duplicated addresses because a random choice of an address by each node would result in a high collision probability, as demonstrated by the birthday paradox [7]. The IETF Zeroconf working group proposes a hardware-based addressing scheme [8], which assigns an IPv6 network address to a node based on the device MAC address. Nevertheless, if the number of bits in the address suffix is smaller than number of bits in the MAC address, which is always true for IPv4 addresses, this solution must be adapted by hashing the MAC address to fit in the address suffix. Hashing the MAC address, however, is similar to a random address choice and does not guarantee a collision-free address allocation. A few extensions to the Duplicate Address Detection (DAD) protocol use Hello messages and partition identifiers to handle network partitions [5], [9]. These identifiers are random numbers that identify each network partition. A group of nodes changes its partition identifier whenever it identifies a partition or when partitions merge. Fan and Subramanian propose a protocol based on DAD to solve address collisions in the presence of network merging events. This protocol considers that two partitions are merging when a node receives a Hello message with a partition identifier different from its own identifier or when the neighbour set of any node changes [5]. Other proposals use routing information to work around the addressing problem. Weak DAD [10], for instance, routes packets correctly even if there is an address collision. Other more complex protocols were proposed to improve the performance of network merging detection and address reallocation [6], [11]. This technology of neighbor coverage knowledge includes additional coverage ratio and connectivity factor less redundant rebroadcast, the proposed protocol mitigates the network collision and contention, so as to increase the packet delivery ratio and decrease the average end-to-end delay. Wireless distributed micro sensor systems will enable their reliable monitoring of a variety of environments for both civil and military applications.

In This we look at communication protocols, which can have significant impact on the overall energy dissipation of these networks. Based On our findings that the conventional protocols of direct transmission, minimum-transmission-energy, multihop routing And static clustering may not be optimal for sensor networks[3]. Clustering protocols have been investigated in the context of routing protocols [23], [14], [22], [15], [24], or independent of routing [16], [17], [13], [18], [19], [20]. In this work, we present a general distributed clustering approach that considers a hybrid of energy and communication cost. Based on this approach, we present the HEED (Hybrid, Energy-Efficient, Distributed) clustering protocol. HEED has four primary objectives [21]: (i) prolonging network lifetime by distributing energy consumption, (ii)

terminating the clustering process within a constant number of iterations, (iii) minimizing control overhead (to be linear in the number of nodes), and (iv) producing well-distributed cluster heads. Our clustering approach does not make assumptions about the distribution of nodes, or about node capabilities, location awareness. The approach only assumes that sensor nodes can control their transmission power level.

IV. Flooding

Broadcasting has been used widely in wired and wireless networks to understand the data and topology information. There are various routing protocols in MANETs rely on a flooding mechanism to broadcast data and control packets over the entire network for establishing routes between source destination pair. The simplest way of broadcasting a packet to all nodes in the network is basic flooding or blind flooding which allows each node to retransmit a packet to its neighbors, in case it has not received broadcast packet during earlier transmission. The rebroadcasting process continues until all nodes in the network have received a copy of the packet. Since, topology packets pass through every possible path in parallel, it is assured that the flooding can always find the shortest path between various source and destination combinations.

However, the basic nature and characteristics flooding mechanism causes a large number of packets propagation in MANETs. This will eventually overload the network and traffic is congested, which is depicted in Figure 1.

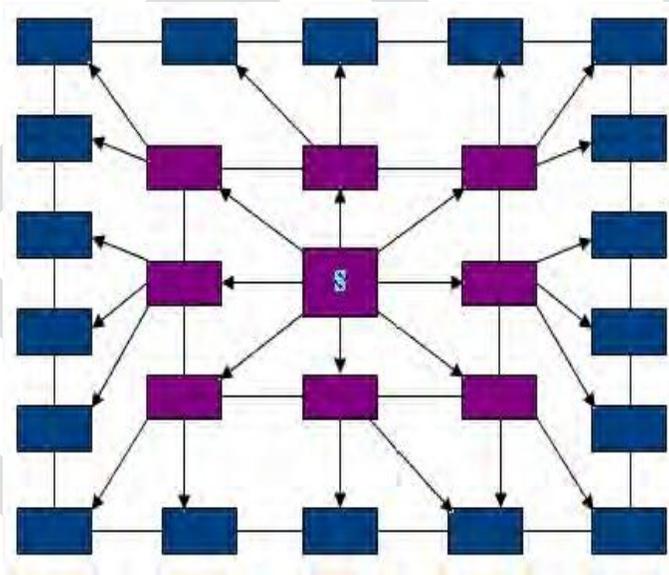


Figure 1- Sample Flooding Scenario

In Figure 1, the centre node is the source node; nodes in the first inner circle are one-hop neighbours and the nodes in the outer circle are two-hop neighbours. While S, transmit out the packet, all the one-hop neighbours broadcast copies of the packet to all its two-hop neighbours of S at the same time. As a result, there is a heavy redundant rebroadcasting, which means same packet is being received more than once by some nodes, contention and collision that are referred to as the broadcast storm problem. There are various methods have been proposed for achieving efficient broadcasting to solve the broadcast storm problem. In general, these broadcast protocols can be categorized into three classes such as probability-based methods, area-based methods and neighbour knowledge methods. The probability-based methods are similar to

basic flooding, except that each node rebroadcasts packets with a predetermined probability. This mechanism is found to be suitable in dense networks while multiple nodes with similar neighbour coverage. However, the effect of this approach is encouraging only in the sparse network. In area-based methods, the rebroadcast process depends on the distance between itself and the source node. While the distance between them is longer than a predefined threshold, the packet is rebroadcasted, so that a larger additional area can be reached. However, area-based methods do not consider whether some nodes actually exist within that additional area that leads to inefficient broadcasting. The neighbor knowledge methods are further classified as neighbor-designated methods and self-pruning methods. While a node in the neighbor-designated methods transmits packet with a specification to denote, which one of its one-hop neighbors should forward the packet and in self-pruning methods, the receiving node will decide whether the or not to transmit the packet by itself.

V. Simulation Environment

In order to evaluate the performance of the proposed NCPR protocol, we compare it with some other protocols using the NS-2 simulator. Broadcasting is a fundamental and effective data dissemination mechanism for many applications in MANETs. In this paper, we just study one of the applications: route request in route discovery. In order to compare the routing performance of the proposed NCPR protocol, we choose the Dynamic probabilistic Route Discovery [24][26] protocol which is an optimization scheme for reducing the overhead of RREQ packet incurred in route discovery in the recent literature, and the conventional AODV protocol.

We evaluate the performance of routing protocols using the following performance metrics:

MAC collision rate: the average number of packets (including RREQ, route reply (RREP), RERR, and CBR data packets) dropped resulting from the collisions at the MAC layer per second.

Normalized routing overhead : The ratio of the total packet size of control packets (include RREQ, RREP, RERR, and Hello) to the total packet size of data packets delivered to the destinations. For the control packets sent over multiple hops, each single hop is counted as one transmission. To preserve fairness, we use the size of RREQ packets instead of the number of RREQ packets, because the DPR and NCPR protocols include a neighbor list in the RREQ packet and its size is bigger than that of the original AODV.

Packet delivery ratio: the ratio of the number of data packets successfully received by the CBR destinations to the number of data packets generated by the CBR sources.

Average end-to-end delay: the average delay of successfully delivered CBR packets from source to destination node. It includes all possible delays from the CBR sources to destinations.

What Problem Remained Unsolved

Consider a normal AODV route discovery process. For example, if the node S starts a route discovery process by broadcasting a RREQ message, then all the neighbours of S will receive the request and process the request. If a neighbouring node knows the route, then it will send a reply otherwise, it will forward the RREQ message by rebroadcasting it again. In fact, all the nodes in the network will receive that RREQ message. If the message will reach the destination D, then D will send a RREP message.

Based on above discussion, it is noticed that most of the above mentioned protocols is applicable in multipoint MANET and all of them tries to minimize the number of messages. However, to achieve this it is observed that lot of energy is consumed or special hardware is required. Thus, it is imperative that a protocol is required to reduce the number of messages during broadcasting to avoid flooding.

1. AIM

To design a method which will reduce the routing overhead in both route discovery and route maintenance, by reducing the flooding in route discovery process and to avoid broadcast storm problem.

2. OBJECTIVE

The objective is to implement a method for improving the performance of Mobile Ad hoc Network (MANET) routing protocols under highly mobile time sensitive communication scenario. The performance is improved by identifying certain nodes as HPR nodes which involve in routing and the rest of the normal nodes which receive the routing packets are not allowed to process those requests. HPR nodes can be assumed as higher capability nodes which are having sufficient battery power and they may be deployed as HPR nodes and behave as HPR nodes during the entire life of the network. Only HPR node will be used for routing or route discovery if destination is not in neighbor list of source.

So, ultimate objectives here will be implementation of method to reduce routing overhead by using HPR nodes and design of header of HPR node.

3. SCOPE

Since there is no routing overhead for the normal nodes in the network, the end-to-end delay will be reduced very much. A route cannot be established through any arbitrary node in the network; hence the security in communication increases. Since the route is established only through HPR nodes, the other nearby normal nodes which will receive the routing packets will not process those requests and reduce the message overhead in a typical on-demand routing protocol.

4. LIMITATIONS

1. Dividing the normal nodes for using HPR nodes is necessary, how to group these nodes is an uncovered issue.
2. How many HPR nodes to be used in one group. Using more HPR nodes will increase the network cost.
3. Large change in HPR node's header may lead to make changes in normal nodes too.
4. If HPR node fails whole group associated with that HPR node will suffer failure of communication path.

VI. Plan for development & Implementation process:

We proposed a probabilistic rebroadcast protocol based onNeighbor coverage to reduce the routing overhead in MANETs.

This neighbor coverage knowledge includes additional coverageratio and connectivity factor. We proposed a new scheme to

Dynamically find the path through the Energy Efficient power-d node which is used to determine the cover-age knowledge knowledge. Simulation results show that the proposed protocol generates less rebroadcast traffic than the flooding and some other optimized scheme in literatures. Because of less redundant rebroadcast, the proposed protocol mitigates the network collision and contention, so as to increase the packet delivery ratio and decrease the average end-to-end delay. The simulation results also show that the proposed protocol has good performance when the network is in high density or the traffic is in heavy load.

Wireless distributed micro sensor systems will enable the reliable monitoring of a variety of environments for both civil and military applications. we look at communication protocols, which can have significant impact on the overall energy dissipation of these networks. Based on our findings that the conventional protocols of direct transmission, minimum-transmission-energy, multihop routing, and static clustering may not be optimal for sensor networks

VII. Proposed scheme:

In proposed routing scheme, as shown in Figure 4, the HPR nodes only will be allowed to forward the RREP and RREQ messages. In other words, between S and D, a route can be established only through HPR nodes. Since the normal nodes will not rebroadcast the RREQ or forward RREP messages, it will reduce a lot of overhead as well as transmission power. Since the HPR nodes are capable of passing messages to longer distances, it will reduce the overall path length. The reduction in path length will reduce the end to end delay. Further, the normal nodes will only need to transmit up to the next nearest HPR node where the transmission (tx) power is reduced according to that distance, which reflects in the overall power consumption and reflects in reducing the routing overhead.

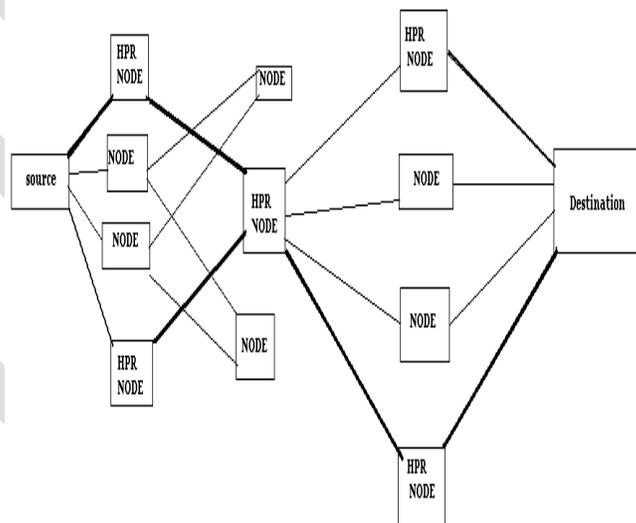


Figure 4. The proposed AODV-HPR method

The tx power to transmit packets from a HPR node to another HPR node will be constant and the established link will not be affected by a little mobility.

A. HPR Node Selection

HPR nodes can be assumed as higher capability nodes which are having sufficient battery power and they may be deployed as HPR nodes and behave as HPR nodes during the entire life of the network. On the other hand, even the status of a node can be changed as HPR node or normal node in a random dynamic fashion for balanced power consumption in all the nodes in a normal network of similar capability nodes. Anyway, a HPR node can transmit or allowed transmit to higher distance than normal nodes. HPR nodes can also be a source or destination node but anyway, a route can be established only through HPR nodes.

B. Advantages of AODV-HPR

Since there is no routing overhead for the normal nodes in the network, the end-to-end delay will be reduced very much. A route cannot be established through any arbitrary node in the network; hence the security in communication increases. In a typical MANET, mobility causes link failures and results in increased overhead and reduced performance. In the proposed AODV_HPR, the HPR nodes uses little bit of higher energy, so that it is resistant to mobility to some extent. Since the HPR nodes are capable of communicating to high distance, little bit of mobility in individual nodes will not cause frequent link failures. Since the route is established only through HPR nodes, the other nearby normal nodes which will receive the routing packets will not process those requests and reduce the message overhead in a typical on-demand routing protocol.

POSSIBLE OUTCOME:

It is been predicted that AODV HPR will give maximum throughput also less number of dropped packet. The AODV-HPR will generate minimum number routing/control messages in the network while transmitting data packet from source node to destination indirectly reducing routing overhead and end to end delay

VIII. CONCLUSION:

The performance of proactive and reactive protocols is always questionable if used in a highly mobile short time communication scenario. Here, the routing protocols require certain time for achieving stable performance due to the periodic route discovery and maintenance mechanisms in their inherent design. In this paper, the performance of AODV is improved by identifying certain nodes as HPR nodes which involve in routing and the rest of the normal nodes which receive the routing packets are not allowed to process those requests acting as only the simple neighboring nodes. HPR nodes can be assumed as higher capability nodes which are having sufficient battery power and they may be deployed as HPR nodes and behave as HPR nodes during the entire life of the network. A HPR node can transmit or allowed to transmit to higher distance than normal nodes. HPR nodes can also be a source or destination node but, a route can be established only through HPR nodes. The modified AODV termed as AODV_HPR.

IX. FUTURE SCOPE:

In the future, combining the additional coverage ratio and connectivity factor, and set a reasonable rebroadcast probability with AODV-HPR may reduce the routing overhead more efficiently. Moreover, the AODV-HPR will work regularly updated and instantly available to all learners [29]. It also provides collaborative learning which promotes collaborative learning thus resulting in a more engaging and richer learning experience, Scalability where content can be delivered to a small or large number of learners with little effort [30]

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