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Improving Node Stability Using Hotspot Algorithm in Mobile Ad-hoc Network

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Abstract- MANETs can manage without fixed infrastructure and can stay active rapid changes in the network topology. The primary challenge in building a MANETS is equipping each device to continuously maintain the information required to appropriately route traffic. Routing with high scalability and robust performance are the key challenges in deploying Mobile Ad-Hoc Networks. In order to operate the Ad-Hoc Networks more efficiently, suitable on-demand routing protocols have to be incorporated, to find more suitable routes between source and destination. The dynamic topology of a mobile ad hoc network (MANETS) poses a real challenge in the design of a MANETS routing protocol. Over the last many years, a variety of routing protocols have been developed and their performance simulations are made by network researchers. In the paper, we have used DSR protocol for the network. We have also emphasized on node stability which is an important consideration to enhance network efficiency.

Keywords: MANETs, Routing in MANETs, Stability of Nodes, Hotspot Algorithm.

1. INTRODUCTION

As the importance of computers in our daily life is increases, it also need new demands for connectivity. Wired connectivity have been around for a long time but there is increasing demand on working wireless solutions. Wireless communication between mobile users is growing more popular than ever before. This growth is due to the technological advancements in the field of computers and communicating devices. Technology has enabled computers and communicating devices (like wireless devices such as laptops, mobile phones, tablets, wireless modems, etc. To be equipped with radio interfaces to communicate on fly. Wireless networking increased the utility of carrying a computing device. It provides the mobile user with versatile and flexible communication and continuous access of networked services.

Network without having a fixed infrastructure is another promising type of network used in communication. It is used for any areas, planned or unplanned events like in war fields or in a meeting of business people scattered geographically. This type of network can be created or destroyed when we needed and that is why it is called mobile ad-hoc network and it has no central and controlling authority.
Wireless networks are playing a major role in the area of communication network. Now we are using wireless networks for the military applications, industrial applications and also in personal area networks. The main difference between wireless and wired networks was only in communication channel. In wired networks, there exist physical medium while on the other side physical medium doesn't exist on the wireless networks. Wireless networks became very famous in different applications considering the following factors: for the installation, reliability factor, cost, bandwidth, required power, security and performance between nodes of network. All networks were based on fixed infrastructures of nodes. Most common infrastructure based wireless networks are cordless telephone, cellular networks, Wireless Fidelity, Microwave communication, Worldwide Interoperability for Microwave Access, Satellite communication and Radio Detection and Ranging etc.

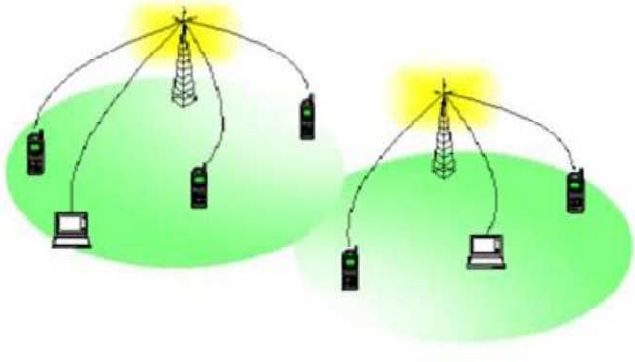


Figure 1: Infrastructure based wireless network

1.1 MANETs

MANETs stand for Mobile Ad hoc Networks. Mobile implies "mobility". Ad hoc is a Latin word and it means "for this only". MANETs is an collection of mobile routers or nodes that communicate over wireless links. MANETs is an Infrastructure-less wireless network. The routers or nodes moves randomly and organize themselves arbitrarily. The nodes directly communicate through the wireless links between each other's radio

range of nodes, while that are distant apart use other nodes as relay, in a multi-hop routing function in network. As the nodes are mobile and not stable, the structure of the network changes dynamically and unpredictably over time. Ad-hoc networks are self-configuring and self-organizing, so to provide communication between nodes in the network, each node behaves as a transmitter, a host and a router in a network.

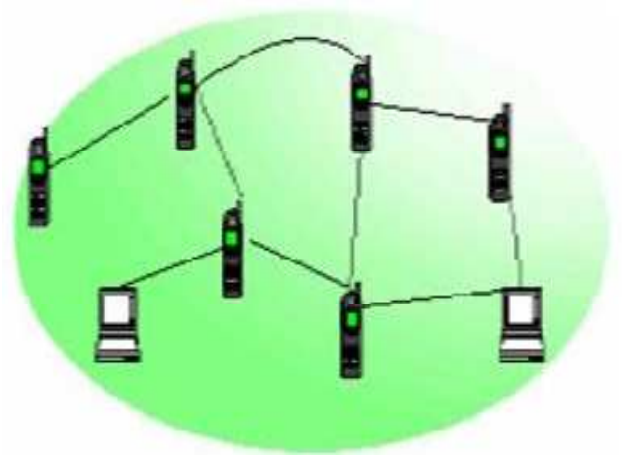


Figure 2: Mobile Ad-Hoc Network

1.2 Routing in MANETs

Described routing is an act of moving information from a source to a destination in an internetwork. At least one intermediate node in the internetwork is encountered during the transfer of information. Basically two process are involved in the concept of considered the optimal routing paths for nodes and transferring the packets through the internetwork. The transferring of the packets through the internetwork is called as packet switching which is straight forward, and the route determination could be difficult.

Routing protocols use several metrics as standard measurement to determine the best path for routing the packets to its destination node that could be number of hops between nodes, which are used by the routing algorithm to determine the optimal route for the packet to its destination in network. The process of path determination is that, routing algorithms find out and hold routing tables, which contain the route information for the packets in network. The information of route varies from one routing algorithm to another between nodes. The routing tables are filled with entries in the routing table are internet protocol address prefix and the next hop. Destination/next hop optimally by sending the packet to a route representing the address prefix specifies a set of destinations for which the routing entry is valid. Routing is mainly classified into static and dynamic routing.

1.3 Stability of Nodes

To improve routing efficiency is to select the most stable path so as to reduce the latency and the overhead due to route reconstruction. To maximize throughput and reduce traffic latency, it is essential to ensure reliable source-destination connections overtime. A route should therefore be selected based on some knowledge of the nodes motion and on a probability model of the path future availability.

In MANETs, neighbors that do not change too frequently will not impose large control overhead in constructing a path from source to the destination as well as provide better packet delivery ratio. The mobility of the nodes is a complicating factor that significantly affects the Effectiveness and performance of the routing Hence it is needed to find out the mobility of the node with respect to itself and considers neighbor mobility. We propose a stability factor that will be computed based on self stability and neighbor node stability. Once after finding the stability factor of a node, if the node is stable, then we can establish a path from the source to the destination through intermediate stable nodes for routing the packets to obtain less control overheads, less delays and higher packet delivery ratio. A node is said to be stable, if a node movement is restricted to half/quarter of transmission range with reference to previous position.

The stability factor of only stable nodes will be computed and calculated stable timing of nodes.

***Stable nodes*: -** To maximize throughput and reduce traffic latency, it is essential to ensure reliable source-destination connections over time. A route should therefore be selected based on some knowledge of the nodes motion and on a probability model of the path future availability.

***Efficient route repair*: -** If an estimate of the path duration is available, service disruption due to route failure can be avoided by creating an alternative path before the current one breaks. Note that having some information on the path duration avoids waste of radio resources due to pre-allocation of backup paths.

***Network connectivity*: -** Connectivity and topology characteristics of a MANETs are determined by the link dynamics between nodes. These are fundamental issues to network design, since they determine the system capability to support user communications and their reliability level.

Performance evaluation: - The performances achieved by high-layer protocols, such as transport and application protocols, intemperately depend on the quality of service metrics obtained at the network layer. For an example, the duration and frequency of route disruptions have a significant effect on TCP behavior, video streaming and VoIP services. Thus, characterizing nodes stability is the basis to evaluate the quality of service perceived by the users.

1.4 Hotspot algorithm

The purpose of the hotspot algorithm is to identify regions of local enrichment of short-read 27-mer sequence tags mapped to the genome. Improvement is gauged in a small window (250bp) relative to a local background model based upon the binomial distribution, by using the observed tags in a 50kb surrounding window. Each mapped tag gets a z-score for the 250bp and 50kb windows centered on the tag. A hotspot is defined as a sequence of neighboring tags within a 250bp window, each of those compared having z-score greater than 2. When the hotspot is identified in network then hotspot itself is assigned a z-score relative to the 250bp and 50kb windows centered on the average position of the tags forming the hotspot.

Two-pass hotspots. A problem occurs with hotspot scoring in regions of very high enrichment. These "monster hotspots" inflate the background for neighboring regions in network, and deflate neighboring z-scores. The effect of this is regions of otherwise high enrichment can be shadowed by the monster. For this problem, we implement a two-pass hotspot scheme. After the first round completed of hotspot detection in area, we delete all tags falling in the first-pass hotspots. Then we compute a second round of hotspots with this deleted background. The hotspots from the first and second passes computed are then combined with each other, and all are re-scored using the deleted background: the number of tags in each hotspot is computed using all tags, but 50kb background windows are used only the deleted background.

2. RELATED WORK

Shrivastava (2013) et al. [31] in the paper "Overview of Routing Protocols in MANETs's and Enhancements in Reactive Protocols". An ad hoc network doesn't have any centralized arbitrator or server. In MANETs each and every mobile node is assumed to be moving with more or less relative speed in arbitrary direction. MANETs have very enterprising use in emergency scenarios like military operations & disaster relief operation where there is need of communication network immediately following some major event, or some temporary requirement like conference & seminar at new place where there is no earlier network infrastructure exist and need alternative solution.

Abedalmotaleb Zadin (2013)et al. [32] paper "Maintaining Path Stability with Node Failure in Mobile Ad Hoc Networks" As the demand for mobile ad hoc wireless network (MANET) applications grows, so does their use for many important services where reliability and stability of the communication paths are of great importance. One approach or existing failure recovery protocols is based on using backup paths, or multi-paths. Our work is focused on protecting the route of mobile wireless communications in the presence of node failure in order to improve their use in MANETs applications by discovering efficient stable communication channels with longer lifetimes and increased number of packets delivered.

Basarkod(2013) et al [33] this paper "Mobility Based Estimation of Node Stability in MANETs" providing an efficient, robust and low overhead unicast path from source node to destination node in MANETs is a critical issue due to frequent changes in the network topology and mobility of the nodes . The stability factor of a node may be used to establish a path from the source to the destination. The stable nodes in the path will
provide higher packet delivery ratio and lower latency

Richard (2013) et al. [34] in this paper "On the Selection of Management/Monitoring Nodes in Highly Dynamic Networks" the problem of provisioning management/monitoring nodes within highly dynamic network environments, particularly virtual networks. A subset of nodes has to be chosen for management/monitoring, each of which will manage a subset of the nodes in the network. A new, simple, and locally optimal greedy algorithm called Pressure is provided for choice of node position to minimize traffic. This algorithm is combined with a system for predicting the lifespan of nodes, and a tunable parameter is also given so that a system operator could express a preference for elected nodes to be chosen to reduce traffic, to be "stable," or some compromise between these positions. The combined algorithm called Pressure Time is lightweight and could be run in a distributed manner. They perform well, both at reducing traffic and at choosing long lifespan nodes.

3. PROPOSED METHODOLOGY:-

Mobile ad hoc network is wireless network of mobile nodes, with no centralized management and control. In this work, we present a protocol with an enhanced route discovery mechanism that avoids the congestion in the route. This protocol selects route on the basis of traffic load on the node and resets path as the topology changes. Instead of transmitting entire data through one route, new efficient paths are discovered from time to time during transmission. This is an efficient technique for transmissions that requires a link for longer period of time. In this work, we will use opportunistic routing scheme to manage the nodes in highly dynamic networks. In this work, we also use optimization technique to optimize the network.

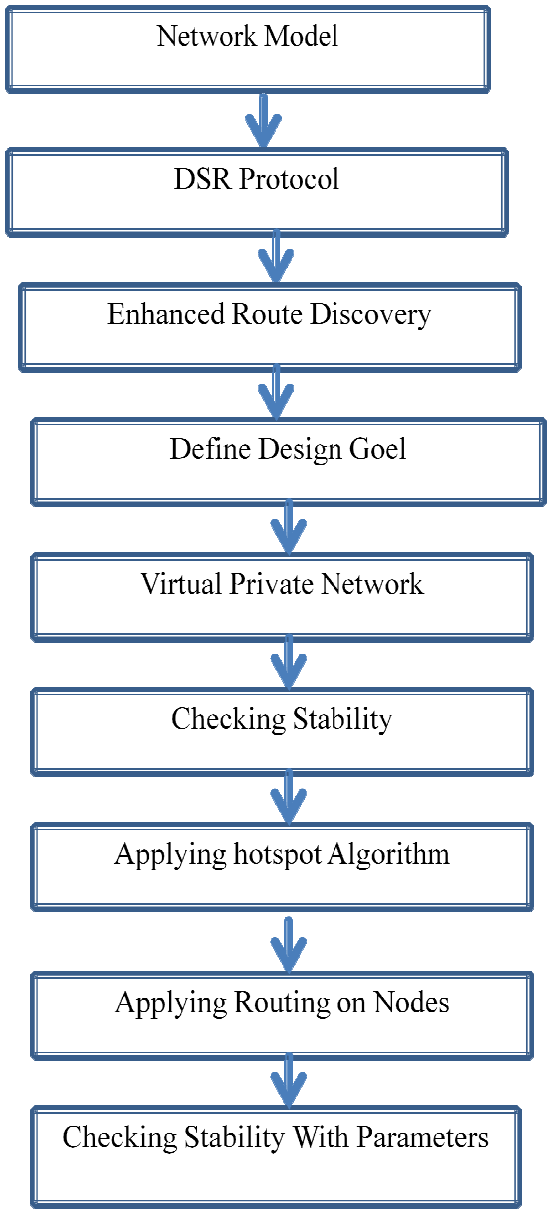
4. PROPOSED MODEL

- To improve stability of nodes in MANETs with the use of Hotspot algorithm.
- To improve other network parameters Congestion control, to maintain Quality of service in MANETs.
- Analyze the proposed solution using network simulator-2 (NS-2)

In this work, the scenario of virtual private network is created. We are basically focusing on the stability of nodes. Stability of nodes is checked by applying

Hotspot algorithm. We are applying Routing on Nodes in Virtual Network and stability is checked on the basis of parameters. The DSV protocol is used for routing in the network which provides better routing between nodes. It also help for controlling traffic of packets between nodes in network. This protocol selects route on the basis of traffic load on the node and resets path as the topology changes. Instead of transmitting entire data through one route, new efficient paths are discovered from time to time during transmission. In this work, we are using routing scheme for the management of nodes in networks. Optimization technique is used for the optimization. Congestion control and quality of service is improved in MANETs by this work. We have also analyzed the proposed solution using Network Simulator-2 (NS-2) under different network parameters.

4.1 Flow of Work



4.2 Algorithmic Steps

Step 1. Develop a ad-hoc scenario.

Step 2. Apply and deploy nodes to scenario.

Step 3. Create hotspot effective area.

Step 4. Hotspot area, random compromise model.

Step 5. According to detection rate, analyze the probability of attack.

Step 6. Efficiency measure, finding average number of false hotspots per trackback session.

Step 7. High compromise level of filter index in static scenario.

Step 8. As to suppress new route request of hotspot to ensure that routed traffic doesn't compound congestion problem.

Step 9. To throttle traffic locally at hotspot to force tcp flows to slow down.

Step 10. Design and evaluate mechanism, that can seamlessly interwork with existing routing protocols to migrate the impact of hotspot.

Step 11. An efficient routing is done according to hotspot.

Step 12. Quality of service factor is obtained.

5. RESULTS AND FUTURE WORK

5.1 Simulation Table

Parameter Name	**Value**
Channel	Wireless channel
Number of Nodes	10
Antenna	Omni antenna
Network Simulator	NS2.35
Mac version	802.11
Simulation Time	90s
Routing protocol	DSR
Area	1000m*1000m
Packet Size	512
Hello Interval	2s
Traffic Rate(packets/s)	10s
Network Interface	Physical

Scenario 1

Scenario 1 is shown below in figure.In this scenario number of nodes are deployed are 10. In this scenario blue line shows that data is transfer between nodes.

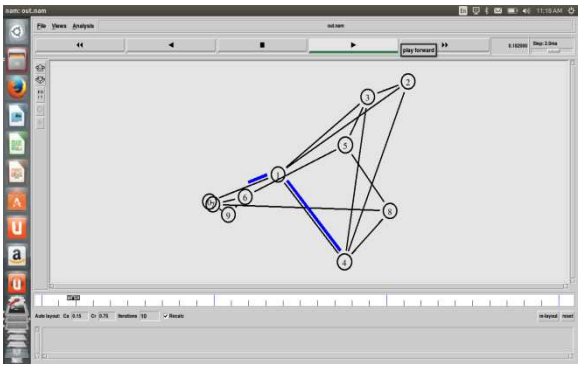


Fig 3. data Transmission Between Node0 and Node4 with Node1(hotspot)

Scenario 2

Scenario 2 in figure 4.2 shows data transfer and the red line between node1 to node 3 shows that it is next node to transfer data.

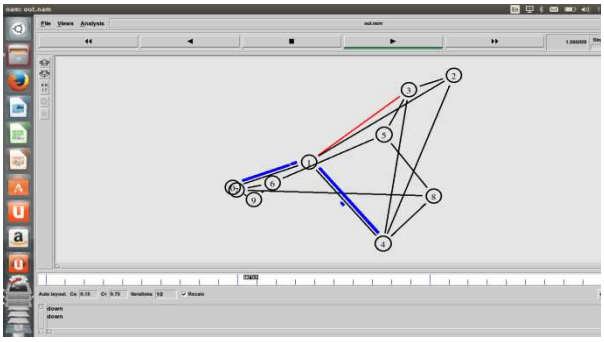


Fig 4. Acknowledgement send by another node to hotspot node

5.2 Graphs

1. Packet Loss

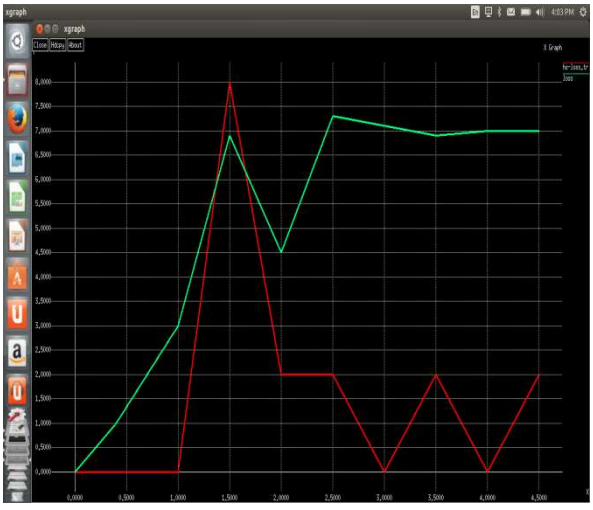


Fig 5 Graph represent packet loss.

This graph represents loss in wireless sensor network in case of hotspot algorithm. These graphs represent that the loss become low at later levels.

2.Throughput

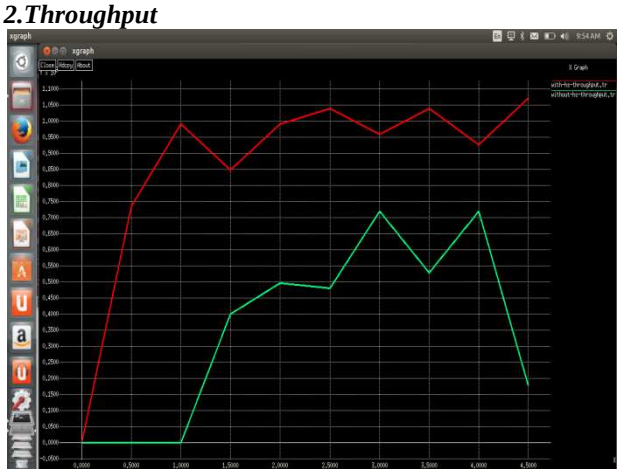


Fig 6. Represent throughput

In above graph (figure) the throughput is shown for the network with hot spot or network without hotspot. Throughput with hotspot is higher than the throughput without hotspot which is representing by red arc and green arc representing throughput without hotspot.

3. Lifetime

Fig 7 Graph represent various lifetime

In this graph the lifetime is shown here the red line shows lifetime for ideal condition.

5. CONCLUSION

In this work, the scenario of virtual private network is created. Basically focusing on the stability of nodes. Stability of nodes is checked by applying Hotspot algorithm. We are applying Routing on Nodes in Virtual Network and stability is checked on the basis of parameters. . This protocol selects route on the basis of traffic load on the node and resets path as the topology changes. Instead of

transmitting entire data through one route, new efficient paths are discovered from time to time during transmission. In this work, we are using routing scheme for the management of nodes in networks. Optimization technique is used for the optimization. Congestion control and quality of service is improved in MANETs by this work. Parameters taken in this work are loss, throughput, lifetime and on the bases of these parameter conclusion is drawn that hotspot is better than the previous system and this can be better enhance in future by using some optimization technique in hotspot algorithm.

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