A Study of Wireless Environment by means of Multiple Wireless Nodes

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ABSTRACT
Researchers are designing new MANET routing protocols and comparing and improving existing MANET routing protocols before any routing protocols are standardized using simulations. However, the simulation results from different research groups are not consistent with each other. This is because of a lack of consistency in MANET routing protocol models and application environments, including networking and user traffic profiles. Therefore, the simulation scenarios are not equitable for all protocols and conclusions cannot be generalized. Furthermore, it is difficult for one to choose a proper routing protocol for a given MANET application. In this paper Investigators for experimental purpose, considered 10 and 20 multiple random wireless nodes in 250mx250m terrain area and routing protocol DSR and find out the various simulation results like: Number of generated packets, sent packets, received, forward, dropped packet, Maximum and minimum generated packets size, Simulation length in seconds, number of generated bytes, number of sent bytes, number of received and forward bytes. Number of drop bytes.

Keywords
MANET, packets, simulation, wireless, bytes.

1. INTRODUCTION
Wireless networks has achieved a lot of focus in research since beginning, but enhancement of multiple increasing nodes and for recent times due to their importance in enabling wireless nodes to communicate without any existing wired or predetermined infrastructures has made it . One of the main features of network lies in the vibrant topology. As the nodes move within the network, the links between nodes are often formed and broken down. The node flexibility affects not only the source and destination, as in a conventional wireless network, but also the intermediate nodes [1]. This happens on account of the multihop nature of the network. Because of this the resulting routes can be extremely volatile, making successful ad hoc routing highly flexible and dependable on these topologies changes occurring due to efficient reaction to it. Structure of the network changes rapidly. This is mainly due to the mobility of nodes. The nodes in the network not only act as hosts but also as routers that route data to or from other nodes in network.

In this wireless network, network formed, without a central authority, by the collaboration of a number of nodes[2]. These machines can communicate with their neighbors directly by using radio links. Network packets are relayed from one machine (source) to another (destination) by other nodes within the network, on behalf of the source station, if and when the source and destination mobile nodes are not within each other's range. This means that each station acts as both a machine and a router. In this wireless network, mobile nodes act not only as end systems, but also as routing devices. The topology of the network is dependent on the relative locations and connections of nodes within the network. This results in a topology that is potentially extremely dynamic. This affects all aspects of an network, including the medium access control (MAC) layer and routing protocols. The node in this type of network plays a very different role than in a conventional wireless LAN. In a conventional WLAN, communications are centered on the base station or access point; the infrastructure up to the base station is mostly fixed, so the topology is stable. In order to achieve satisfactory performance in this type of network as a whole must find effective ways of managing the side caused by the changing topology. A better knowledge of the effects of various parameters and characteristics will greatly aid in the development of new ideas.

2. WIRELESS ENVIRONMENT
Wireless communication between these node users is becoming more popular than ever before. This is due to recent technological advances in laptop computers and wireless data communication devices, such as wireless modems and wireless LANs. This has lead to lower prices and higher data rates, which are the two main reasons why in this type of computing continues to enjoy rapid growth. Alteration in topology takes places very frequently during the lifetime of the network, as nodes may move around within the network by creating or breaking links between nodes.

Due to the movement, Nodes may also enter or leave the network if a node moves out of range of all other nodes in the network. This occurs most frequently near the geographical edge of the network cluster of nodes. An network uses no centralized administration. This is to be sure that the network cannot collapse just because one of the mobile nodes moves out of transmitter range of the others. Nodes should be able to enter/leave the network as they wish. Because of this limited transmitter range of the nodes. Multiple hops may be needed to reach other nodes. Every node is wishing to participate in ad-hoc network must be willing to forward packets for other nodes. Thus every node acts as a host and as a router. The source sends the packet to one of its neighbors, who in turn forward it to another neighbor, until the packet reaches the destination node. In order for this to occur, the path from source to destination must be determined[3]

3. APPEASEMENT IN THIS WIRELESS NETWORK
The dynamic nature of in this wireless network attributed to several inherent characteristics, such as variable link behavior, node movements, changing network topology and variable application demands. Sending packets in such a dynamic environment is very difficult. Because of the special

properties of mobile wireless networks, some researchers have proposed the notion of soft sending. Soft sending means that after the connection setup there may exist transient periods of time when the specification is not honored. However, we can quantify the sending packet satisfaction by the fraction of total disruption time over the total connection time. This ratio should not be higher than a threshold.[4]

In a fixed –level packet sending approach, a reservation is represented by a point in an n dimensional space with coordinates defining the characteristics of the service. In a dynamic packet sending, we can allow a reservation to specify a range of values, rather than a single point. With such an approach, as available resources change, the network can readjust allocations within the reservation range. Similarly, it is desirable for the applications to be able to adapt to this kind of re-allocations. The packet sending adaptation can be also done at various layers. The physical layer should take care of changes in transmission quality, for example, by adaptively increasing or decreasing the transmission power. Similarly, the link layer should react to the changes in link error rate, including the use of automatic repeat-request (ARQ) technique. A more sophisticated technique involves adaptive error correction mechanism which will increase or decrease the amount of error correction coding in response to the changes in transmission quality. As the link layer takes care of the variable bit error rate, the main effect observed by the network layer will be a change in effective throughput (bandwidth), delay and packet drop.[5]

4. ROUTING ALGORITHMS

Routing protocols for different types of wireless networks have been proposed by a number of researchers. Researchers traditionally classify these protocols as proactive protocols, reactive protocols, or hybrid of the two, based on the way they find new routes or update existing ones. Proactive routing protocols keep routes continuously updated, while reactive routing protocols react on demand [10]. Routing protocols can also be classified as link state protocols [11] or distance-vector protocols [12]. Routers using a link state routing protocol maintain a full or partial copy of the network topology and costs for all known links. Routers using a distance-vector protocol keep only information about next hops to adjacent neighbors and costs for paths to all known destinations. Generally speaking, “link state routing protocols are more reliable, easier to debug and less bandwidth-intensive than distance-vector” protocols [14]. Link state protocols are also more complex and more compute- and memory-intensive.

Routing algorithms represent an extension of existing classic best-effort routing algorithms. Many routing protocols have been developed which support establishing and maintaining multi-hop routes between nodes in MANETs. These algorithms can be classified into two different categories: on-demand (reactive) such as DSR, AODV, and TORA, and table-driven (proactive) such as Destination Sequenced Distance Vector protocol (DSDV). In the on-demand protocols, routes are discovered between a source and a destination only when the need arises to send data.

This provides a reduced overhead of communication and scalability. In the table-driven protocols, routing tables which contain routing information between all nodes are generated and maintained continuously regardless of the need of any given node to communicate at that time. With this approach, the latency for route acquisition is relatively small, which might be necessary for certain applications, but the cost of communications overhead incurred in the continued update of information for routes which might not be used for a long time if at all is too high. Furthermore, this approach requires more memory due to significant increase in the size of the routing table.

These requirements put limits on the size and density of the network. A third hybrid approach, the Zone Routing Protocol (ZRP), has also been proposed and attempts to reap the benefits of both methods. In ZRP, the network is divided into zones. A proactive table driven strategy is used for establishment and maintenance of routes between nodes of the same zone, and a reactive on-demand strategy is used for communication between nodes of different zones. This approach can be effective in larger networks with applications that exhibit a relatively high degree of locality of communication, where communication between nodes with close proximity to one another is much more frequent than that between nodes which are further apart [8].

4.1 Dynamic Source Routing (DSR)

The Dynamic Source Routing (DSR) [13] protocol is a distance-vector routing protocol for MANETs. When a node generates a packet to a certain destination and it does not have a known route to that destination, this node starts a route discovery procedure. Therefore, DSR is a reactive protocol. One advantage of DSR is that no periodic routing packets are required. DSR also has the capability to handle unidirectional links. Since DSR discovers routes on-demand, it may have poor performance in terms of control overhead in networks with high mobility and heavy traffic loads. Scalability is said to be another disadvantage of DSR [29], because DSR relies on blind broadcasts to discover routes.

The Dynamic Source Routing protocol (DSR) is, an on demand routing protocol. DSR is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. Using DSR, the network is completely self-organizing and self-configuring, requiring no existing network infrastructure or administration. The DSR protocol is composed of two main mechanisms that work together to allow the discovery and maintenance of source routes in the ad hoc network [9]

- Route Discovery is the mechanism by which a node S wishing to send a packet to a destination node D obtains a source route to D. Route Discovery is used only when S attempts to send a packet to D and does not already know a route to D.
- Route Maintenance is the mechanism by which node S is able to detect, while using a source route to D, if the network topology has changed such that it can no longer use its route to D because a link along the route no longer works. When Route Maintenance indicates a source route is broken, S can attempt to use any other route it happens to know to D, or it can invoke Route Discovery again to find a new route for subsequent packets to D. Route Maintenance for this route is used only when S is actually sending packets to D. In DSR Route Discovery and Route Maintenance each operates entirely" on demand"[9].

During the route discovery procedure, routers maintain ID lists of the recently seen requests to avoid repeatedly processing the same route request. Requests are discarded if they were processed recently since they are assumed to be duplicates. If a router receives a request and detects that the request contains its own ID in the list of intermediate routers, this router discards the request to avoid loops. The route

maintenance procedure is used when routes become invalid due to the unpredictable movement of routers.

Each router monitors the links that it uses to forward packets. Once a link is down, a route error packet is immediately sent to the initiator of the associated route. Therefore, the invalid route is quickly discarded [42]. To handle unreliable transmissions of control messages, DSR either relies on the underlying MAC protocol to provide guaranteed delivery or it retransmits control messages for a certain number of times. Since DSR is a reactive protocol, it cannot tell whether a destination is unreachable or the route request is lost.

Therefore, it suffers more overhead if the underlying MAC layer does not support guaranteed delivery. This is a common problem for reactive routing protocols because when no reply message is heard, routers with a reactive routing protocol cannot tell the difference between the case of a transmission error and the case of unreachable nodes. Reactive routing protocols try to use extra acknowledgements or a small number of retransmissions to solve this problem and, thus, introduce more overhead. Proactive routing protocols periodically broadcast

5. SIMULATION SETUP

The objective of this research paper is to analyze, simulate and do a comparative analysis various parameters in this wireless network, by routing protocol DSR, keeping terrain area fixed i.e 250 x 250 and the number of nodes are 10 and 20 . This network type has different properties and based on the way they are designed, it behave differently in different environments.

Therefore it becomes essential to analyze the different parameters by simulating it in an ideal environment and find out how it performs, so that appropriate methodologies could be followed in the future research works to improve on the areas where a protocol is lacking. In this paper for experimental purposes, Investigators considered ns2 simulator. NS, a network simulator which was developed by Berkeley University, is used for simulation purposes [6]. For representing charts MS Excel has been used.[7]

Following parameters have been set for simulation

Instead of specifying and control each nodes' position and movement pattern, we use a CMU tool "setdest" to generate large number of nodes and their movements. The tool uses a random waypoint model.

6. NODE MOVEMENT AND TOPOLOGY GENERATION

Node	Route Changes	Link Changes
0	0	0
1	0	0
2	4	4
3	0	0
4	6	6
5	3	3
6	0	0
7	5	5
8	0	0
9	2	2

Node movement generated for 20 nodes is as following:-

Parameters	10 nodes	20 nodes
Simulation length in seconds	297.8844101	280.863933
Number of nodes	10	20
Number of sending nodes	4	20
Number of receiving nodes	4	4
Number of dropping nodes	5	2
Number of generated packets	72060	67615
Number of sent packets	71827	67569
Number of received packets	71824	67567
Number of forwarded packets	9	0
Number of dropped packets	233	46
Minimal generated packet size	32	32
Maximal generated packet size	588	588
Average generated packet size	316	316
Number of generated Bytes	22829824	21367640
Number of sent Bytes	22703212	21350976
Number of received Bytes	22701484	21350344
Number of forwarded Bytes	492	0
Number of drop Bytes	126612	16664

The syntax is:

setdest -v 1 -n $numnodes -p $pt -M $maxspeed -t $simtime -x $maxx -y $maxy ./ setdest.exe

Node	Route Changes	Link Changes
0	2	2
1	4	4
2	2	2
3	12	12
4	6	6
5	6	6
6	4	4
7	0	0
8	0	0
9	0	0
10	4	4
11	0	0
12	6	6
13	4	4
14	2	2
15	8	8
16	0	0
17	2	2
18	2	2
19	12	12

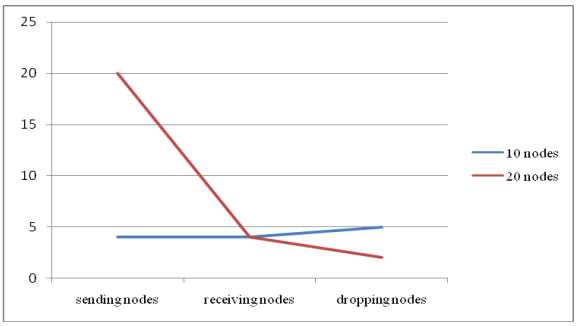

Fig 1 Showing sending, receiving and dropping of nodes

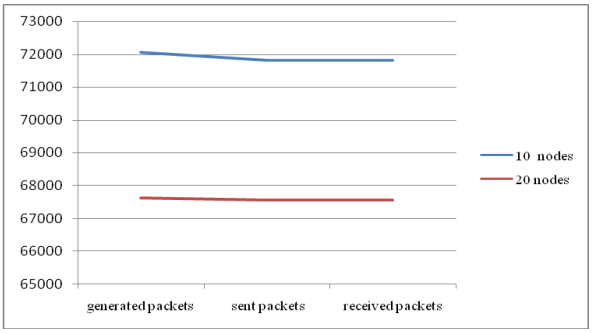

Fig 2 Packets generated, sent and received

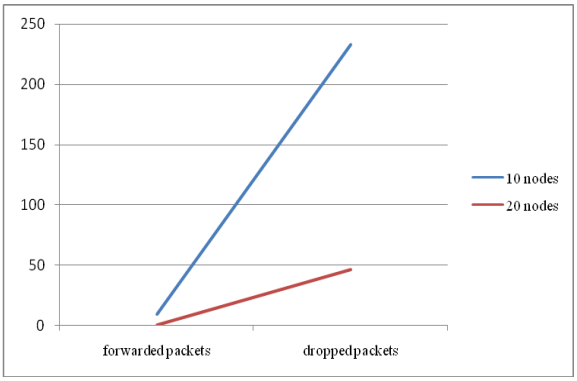

Fig 3 Packets Forwarded and Dropped

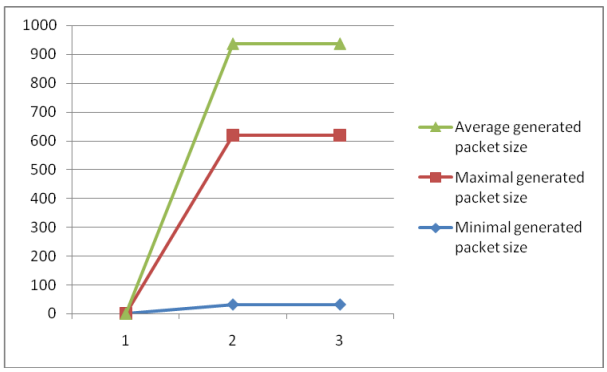

Fig 4 Averge, Maximum and Minimum generated packet Size

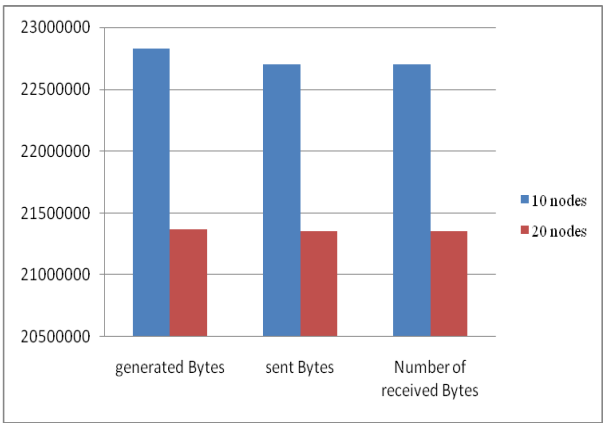

Fig 5 Generated, Sent & Received Bytes

Random traffic connections of TCP and CBR can be setup between mobilenodes using a traffic-scenario generator script. This traffic generator script is available under ~ns/indep-utils/cmu-scen-gen and is called cbrgen.tcl. It can be used to create CBR and TCP traffics connections between wireless mobilenodes. In order to create a traffic-connection file, we need to define the type of traffic connection (CBR or TCP), the number of nodes and maximum number of connections to be setup between them, a random seed and incase of CBR connections, a rate whose inverse value is used to compute the interval time between the CBR pkts. So the command line looks like the following:

ns cbrgen.tcl [-type cbr|tcp] [-nn nodes] [-seed seed] [-mc connections][-rate rate] >output.tcl

7. CONCLUSION:

After experimental studies of various results in respect of Number of generated packets, sent packets, received, forward, dropped packet, Maximum and minimum generated packets size, Simulation length in seconds, number of generated bytes, number of sent bytes, number of received and forward bytes, number of drop bytes in the fixed terrain area of 250 x 250 and the no of nodes 10 and 20. We are able to conclude that this type of wireless network will be suitable even the nodes are increasing from 10 to 20. This type of network has become an important area of research because we have seen that as the number of nodes are increasing, in this situation also dropping of packets are not too much affected and can be implemented.

8. FUTURE SCOPE

In this thesis work, one ad hoc routing protocol i.e. DSR have been analyzed and compared, the results of which could be useful in many situations. However there are other protocols also in MANETs such as AODV, DSDV, TORA, ZRP, INSIGNIA etc. The future scope is the extensive comparisons between the above said protocols. Research on new simulation environments similar to ns2 could also be done, resulting in the development of new features such as more detailed graphs. In addition to this, improving packet delivery efficiency is the challenging area to be explored more.

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