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An Effective way to study various Performance metrics and issues in MANET

Yogita sangwan

Assistant professor, Department of computer science and application, Kurukshetra, Haryana

ABSTRACT: MANET is a self organized as well as self configurable network in which the mobile nodes move without any fixed topology. The mobile nodes are the devices capable of storing , processing and forwarding data to the next one on most appropriate route. The nodes involved in this system should coordinate with each other and can function as both hosts and routers. This network functions on the basis of mutual agreement among nodes, without knowing about the network topology around them. Hence, there is a need for efficient routing protocols to allow the nodes to communicate.Their are number of performance matrices with are effected due to mobility models, routing protocols , types of nodes , physical conditions ect.In this paper we will concentrate towards various performance metrices and issues affecting these metrices.

Keywords: MANET, PDR, QOS.

I. INTRODUCTION

A wireless ad hoc network is a collection of two or more devices/ nodes or terminals with wireless communications and networking capability communicating with each other without any fixed centralized administrator.

Topology of wireless Ad hoc network changes rapidly and re-organizes them-selves in an arbitrary fashion. Ad hoc network undergoes various challenges like less memory space, limited bandwidth, battery backup limitation, route discovery and selection, data forwarding etc. Limited characteristics that make the Ad-hoc wireless networks, vulnerable to intruders and attacks that damage the integrity of the network. Providing security against the intruder is a challenging task in MANET. All network activities such as discovering the topology and delivering data packets have to be executed by the nodes themselves, either alone or in a group. Nodes in MANET have a limited transmission range and, so, each node seeks the assistance of its neighboring nodes in transfer of packets and hence the nodes in an ad-hoc network can act as routers as well as hosts, thus a node may forward packets between other nodes as well as run user applications.

Figure 1: Structure of MANET

Each node in the network also acts as a router, forwarding data packets for other nodes. The lack of fixed infrastructure in a MANET poses several types of challenges. The biggest challenges among them are routing. Routing is the process of selecting paths or optimal route from source to destination node

II. METRIC

It is a property of a route in computer networking. It consist any value used by a routing protocol to decide this route should be chosen or another. The routing table includes only the best feasible routes, whiletopological databases or link-state may include all other information. For example, Routing InformationProtocol uses the metric called hop count to decide the best feasible path. The data will be routed in that direction ofthe gateway which has smallest hop count.

Packet Loss: This is the metric related to the loss of data on link which may due to limited buffer capacity or the time for wich the packet has been buffered exceeds the limit.The MAC layer related loss is due to the absence of node with in the range when packet was transmitted.It is due to obsolete information of routing.A packet may be dropped due to congestion also.There are two basic reason of packet loss due to congestion. Due to too busy wirelesschannel the times of back-off exceeds the limit.

The channel is also associated with queue that bufferes all packets waiting to be sent.When this queue is full incoming packet is dropped.Mobility is also a crucial reason for packet loss.

Total packet loss = packet loss due to buffer overflow + packet loss due to mobility + loss due to congestion.

InPacket loss, some data packets may also be discarded due to the network error .

Packet Delivery Ratio: This metric is related to the packets received by receiver node .It is the ratio of packets successfully received to the packet sent.If a network becomes congested and there is a good discipline , packets may queue up at the source and never enter the network.Those packets which do not contribute to throughput , but because they are never sent ,wont affect the PDR at all.

The main risk is having a traffic management that strives to keep the PDR highby limiting traffic so much that the throughput suffers.Thus PDR is important to identifying issues that might lead to poor throughput. PDR can be improved by link prediction algorithm.It is an approach to predict the future time usage of any link on a route.Nodes of any MANET acts as router and have limited transmission ranges , the communications links are broken and packets are lossed.Whenever a route constitutes such links ,the problem gets amplified.If any of these links fails , route fails resulting series of undesirable events and outcomes.In link prediction algorithm the life time of algorithm is predicted in advance which is a limited time called link life time before it breaks because of mobility.This algorithm can be implemented for any routing protcol to improve its PDR and throughput.

Average End-to-end delay: End to end delay is the summation of the node delay at each node plus the link delay at each link on path. It is the average time taken by the packet to reach the destination from the source across the network. It includes all possible delays by buffering due to route discovery, queuing at interface queue.This metric can be calculated by subtracting the sending time of first packet from source from the receiving time at destinations. It can also be calculated as:

End-to-end delay = dtransmission + dpropogation + dprocessing dtransmission is the delay during transmission, d propogation is delay during the travel and dprocessing is the delay due to processing at any node.

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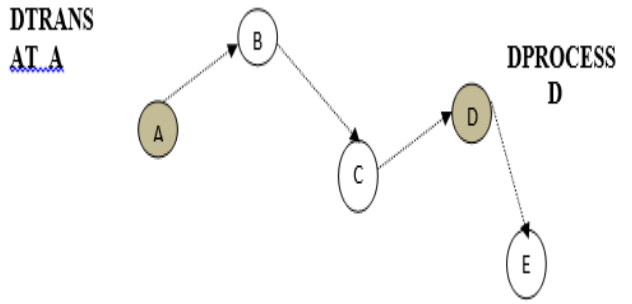

Figure 2: End to end delay

Node lifetime. This is the time duration for which any node in network remains alive or participates in current topology.Any node on network dies due to number of reasons.Any one nodes on route can die because of limited battery energy.Any one of connections is broken because of mobility of one node from the transmission range of neighbouring node.

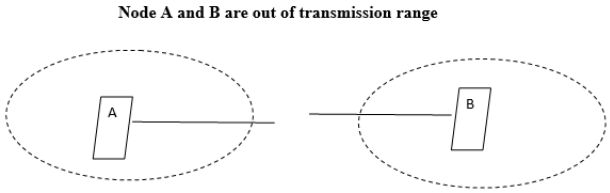

Figure 3: Connection broken due to mobility.

The energy drain rate of any node not only affected by its own but also its neighboring data flows as well.The network l life time can be improved by improving its node life time.Algorithm must be chosen that it select route by considering the energy state of nodes such as residual energy and energy drain rate. The node lifetime algorithm must select the route having longer life time.The network connectivity should be prior by choosing a route according to remaining battery.Algorithm should be selected so that it select the path with largest transmission capacity.

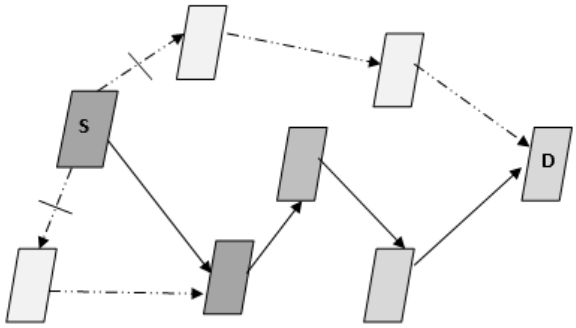

Figure 3: **Selection of longer life time route.**

Throughput: Throughput means the work done with in the time unit. It is the measure of successful transmission with in a time. It is defined as the total number of packets delivered over the total simulation time. It is the one prime parameter of the network which gives the overall result of transmission weather successful or not.It measures the fraction of channel capacity used for useful transmission selects the destination at the beginning of simulation.

III. PERFORMANCES ISSUES IN MANET

Mobile adhoc network (MANET) is a collection of mobile devices which form a communication network with no preexisting wiring or infrastructure.Nodes are free to move and can take any shape depending upon their current position .Due to the mobility and various other factors performance gets affected.In last section we discuss various performance metrices in Mobile Adhoc network and factors affecting

them.There are number of performance related issues which must be taken under consideration during network setup.Some major issues are discussed below.

Routing:As we know MANET does not have any fixed structure ,routing is the major issue which must be taken under consideration.There are number of algorithm to resolve this problem .Routing algorithm are considered to be of two types ,Reactive and Proactive. The main characteristic of reactive protocols is that they set up the routes on-demand. When a node wants to communicate with a node to which it does not have any route, this protocol tries to establish a route in between. Some of the the examples of reactive protocols are AODV , DSR , ACOR and ABR ect.

Ad Hoc On-Demand Distance Vector Protocol is a reactive or on-demand routing protocol. Tthe routes are established and maintained only when required due to transmission need.. Usersare permited to find and maintain routes to other users with in the network. The routing decisions are prepared or taken on the basis of distance vectors, *i.e.*, distances measured in hops to all available routers. The protocol supports all types of communications unicast, broadcast, and multicast. The traditional routing tables method is used, which includes one entry per destination as routing information. The updation of the routing information is identified by the sequence numbers, which are maintainedat each destination.

Dynamic Source Routing is also a the reactive routing protocols. DSR protocol uses a source routing technique, instead of an independent hop-by-hop technique, in which routing decisions are made by each node. In DSR, the complete hop-by-hop route to the destination is available to the sender.

Admission Control enabled On-demand Routing protocol enables quality of service (QOS) support. A route that demands QOS is created on demand without any need of routing information storage and exchange the routing table periodically. Whenever route is required by the source node, a Route Request packet is broadcasted by the source node towards the destination. Once the destination is achieved, it responds by unicasting a Route Reply packet to the source node. ACOR is based on simple and efficient techniques to provide quality of service.

Associativity-Based Routing protocol does not maintain routing information in every node consistently, and is associativity-based. A route is selected based on nodes having associativity states.

Security:

As the nodes in MANET are free to move ,topology keeps on changing.However due to pervasive communication nature and open network media in MANET , external attacks are much dangerous than the internal one.Security is the essential requirement in MANET as they are more vulnerable to security attacks due tolack of centralized authority and limited resources.Attacks in Adhoc networks are characterized in two types ,active and passive attacks.Passive attacks does not disturb the network operation so it is very difficult to detect.In this attacker just snoops the data exchanged in network without altering it.By using powerful encryption we can secure the data on network from passive attacks.On the other hand active attack attempts to alter or destroy the data exchanged over the network resulting affecting the network operation.This includes both external and internal attacks.

The data on open network must be protected against these attacks so it is a big challenge to implement security plans so as to improve the overall performance of network.

Quality of service: Ad hoc network should posses a provision of Quality of Service (QoS) to support multimedia application. However, the provision of QoS in a mobile ad hoc network is a challenging task. Quality of Service (QoS) may be defined as the network should provide some kind of assurance about the level or grade of service provided to an application. Quality of sevice is the standard required from any network to fulfill the expected performance. QoSA is application specific depending upon the requirement.The actual form of QoS and the QoS parameter to be considered depends upon specific requirements of an application. For example, a delay sensitive application may require the QoS in terms of delay assurance. Some applications may require packets should flow at certain minimum bandwidth so the bandwidth will be a QoS parameter in this situation. Certain application may require a guarantee that the packets are delivered from a given source to destination reliably, then, reliability will be a parameter for QoS.

IV. CONCLUSION

A mobile ad-hoc network is a collection of mobile nodes that can move freely in an open environment without any fixed topology or centralized infrastructure.Due to mobility ,and changing routing needs it is very difficult to establish high performance network.In this paper we discussed about various performance metrices used in MANET and various factors affecting these metrices with some solutions.we also discussed various issues which must be taken into consideration during Mobile adhoc network establishment.

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