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A Review on Congestion Control for Mobile Ad-hoc Network

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ABSTRACT

A mobile ad-hoc network (MANET) is a type of network in which all nodes are connected to each other without using the external infrastructure. In this network nodes can communicate with one another by using wireless transmission range. In MANET congestion control is the basic problem. The congestion is the problem in the mobile ad-hoc network which decreases the performance of the transmission of information in the network. Various parameters of the network affected due to the congestion. In this paper we have study about the different routing protocol, security issues, attacks in MANET and different challenges faced by MANET.

Keywords: MANET, Routing Protocols, Security, Characteristics, Congestion, AODV, DSR, DSDV

I. INTRODUCTION

Wireless network is a kind of network in which numbers of nodes are connected to one another over wireless channel. Wireless network is the dynamic network in which nodes are free to move. In this network all nodes act as router and there is not any centralized devices that control the whole network. In this network all nodes store the data and forward it to the next node for the communication of the source and destination.

Mobile ad-hoc network is the infrastructure les network in which no fixed access point, router or host. A mobile ad-hoc network is a kind of network in which the numbers of nodes are grouped together through wireless connection for communication or sharing the information.in wireless communication there are two different ways i.e. one is that in which communication is carry through central infrastructure. In the central infrastructure, there is fixed access point router or host.

In the other approach, there is no need of central infrastructure for the communication from source to destination. In this infrastructure all nodes act as the access point or central device. So in MANET there is not any need of stable centralized device, thus this type of network is build anywhere anytime. In MANET host can be move frequently and topology of network change frequently.

In this network data can be routed in two different ways i.e. direct communication and indirect communication. In the direct communication data can be directly routed from source to destination if these two nodes are in range. And in the indirect communication data can be routed from source to destination through the intermediate nodes. Due to the mobility of the nodes it may causes the change of routes that are created for the data transmission. So this network is not flexible it may changes according to the environment of the network.

Mobile ad-hoc networks are mobile networks they use wireless connections for the communication like Wi-Fi, Bluetooth and other medium like cellular system or satellite transmission. Due to the dynamic nature of the MANET they are not secure. In wireless network all nodes use the store and forward technique. Each node in the network act as router, that collect the data from surroundings and send that data to the next nodes. By using of intermediate nodes data is transmitted from source to destination.

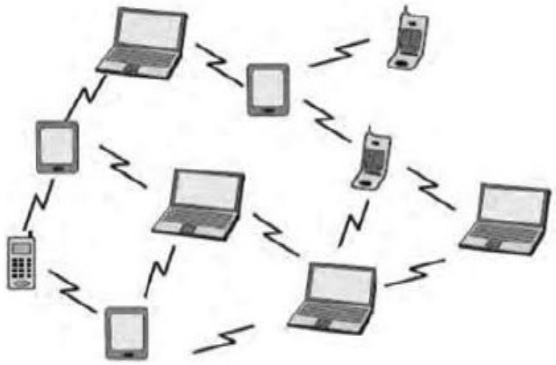

Figure 1. Mobile Ad-hoc Network

Due to dynamic nature of the network, it may affect the performance of the network like throughput of network may vary due to the mobility of the nodes. And also energy consumption of the network may vary. Different factors are here which causes the affect are unreliable communication in the system, change of topology and also energy consumption of nodes. The main factor traffic of network is also computed when the path is selected by routing protocol.

A. Characteristics of MANET:

a. In MANET, there is the lack of centralized controller of system

b. Communication among the nodes is done via wireless medium like Wi-fi, satellite communication through radio waves, cellular system etc.

c. In this, topology of the network changes frequently due to the dynamic nature of MANET.

d. This network is flexible, it can be created anywhere anytime.

e. In this network nodes are act as routers or host, which has limited battery power.

f. This type of network has limited security.

g. There is frequently change in the route of data transmission because of the mobility of nodes.

B. Advantages and disadvantages of MANET:

There are many advantages and disadvantages of MANET:

- **Advantages of MANET**:
  a. They provide access to information or services at any geographic location.
  b. These networks are easy to develop at anywhere and anytime.
  c. These networks are low cost networks.
  d. This network can be used as temporary network.
  e. And this network requires less time to develop.
- **Disadvantages of MANET:**
  a. This type of network has lack of resources and security.
  b. This type of network has absence of authorization facilities.

C. Challenges for MANET:

a. Routing: Due to dynamic nature of the MANET, transferring the data between the pair of nodes is the challenging task. And also trusted relationship between the nodes is hard to create. Routes between the nodes may have multiple bounds, which is more complex than one bound communication.

b. Topology maintenance: Due to the dynamic nature of this network updating the information of dynamic links among nodes is the difficult task.

c. Lack of Central infrastructure: Because of MANET have not centralized monitoring authority and lack of central controller reduces the performance of the while network.

d. Scalability: MANET is flexible network and its size can be increased or decreased. In MANET, nodes are connected with one another with limited power, storage. As the size of the network increases, the data packets are also increases. As the size of network is increases, topology maintenance of this dynamic network is create another challenging issue.

e. Energy efficiency: movable nodes or devices are normally operated on batteries whose power is limited. There is problem battery drainage is challenging issue in this network.

f. Security and privacy: Due to the mobility of the nodes of peer to peer network and shared wireless network are easily accessible by the attackers and unauthorized users.

g. Poor transmission quality: in this network nodes are freely move, so the link created between two nodes are not permanent. So loss of data packets or information.

D. ROUTING PROTOCOLS

Routing protocol defines that how multiple nodes are communicated to one another for distributing the information which is send from source to destination, and allow them to make the route between any two

nodes on a computer network. These protocols use the routing algorithms to define the ideal network for data transmission. Figure 2 shows the classification of routing protocol.

a. Proactive protocols:

This type of protocol is also known as table driven protocol which use one or more tables to store the current routing information. The table is updated when topology is changed. Routing information is transmit between the nodes frequently, by which routing table is set up.

There are various proactive routing protocols are like DSDV, OLSR, WRP etc.

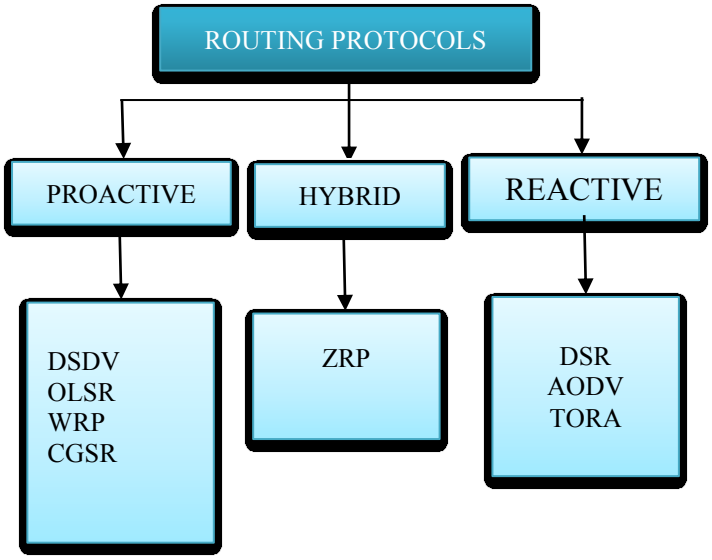

Figure 2: Classification of Routing Protocols

b. Reactive Protocols

Reactive protocol is also called as On demand protocol.in this type of protocol an ideal route is created when request is received for sending the packets to the next nodes or destination. Nodes started route analysis when demanded. Due to the on demand nature of this protocol, so to forward the data it sends the message to find the destination.

There are following reactive routing protocols like DSR, AODV etc.

c. Hybrid protocols:

By combining the properties of both protocols proactive and reactive protocol gives a hybrid protocol. When the numbers of nodes in the network are fewer then these two protocols are used and when the number of nodes increases then these protocols are not efficient to handle the mobile ad-hoc network. So to achieve the higher performance of large network hybrid protocol is used.

There are various types of hybrid protocols like ZRP, HSLS and SRP.

d. Comparison of protocols:

Protocol	Advantages	Disadvantages
Proactive	In this type of protocol information is always available.	Information is flowed in the whole network
Reactive	When we have send the data then route is available.	In this protocol latency is increase
Hybrid	This type of protocol is suitable for the large network.	Due to the large network complexity increases.

E. SECURITY:

a. Security Criteria

For the safe communication among the network security is the main factor in unfriendly environment. With dynamic nature of the network it results in emergence of challenges. Due to the dynamic nature of the network hackers or unauthorized users can easily accessing the network. As mobile ad-hoc networks are temporary developed for some time so security solutions created for the wired network may not suitable for mobile ad-hoc network. All movable nodes perform the every function like routing, data forwarding and network management. Therefore these nodes must be ready for attack every time for communication.

Security solution's aim is to provide the security services like privacy, availability and authentication to MANET. Availability is the main term which means that all nodes should maintain their presence for all services to the network. Authentication is the term which means that all nodes prove their identities for accessing the services of the network or information that flow in the network. If there is the absence of

authentication mechanism then attackers can easily accessing the information or services that are provided by network. No one can assume to be another authorized person to acquire useful information.

b. Attacks on MANET:

Attack is an effort is go around the security system in the network. Attackers can change the real information or data that is flow among the network. Attackers can damaged the entire system after theft the information or may update the wrong information in the system. These all attackers illegally access the system. These attacks are of following types, Active attacks and Passive attacks.

- **Active attacks:** these attacks are those which may attempt by communicating by the system and after that they can destroy data, therefore they can disturbing the system's functionality. Internal and external attacks are two types of active attacks. In internal attack the attackers gains the information by unauthorized access of the system and disturb the network. In external attack the attackers cause the congestion, flooding, create the fake route for flow of information and provide the wrong services to the nodes or system. And these types of attacks are carried out by the nodes that are not related to the system.
- **Passive attacks:** in the passive attack attackers do not disturb the system or not changing the information transmitting over the network. These attackers spread the sensitive information over the network. Passive attackers are not easily detected. To save the information from these attackers encryption of the information is main mechanism. Figure shows the types of attacks in MANET:

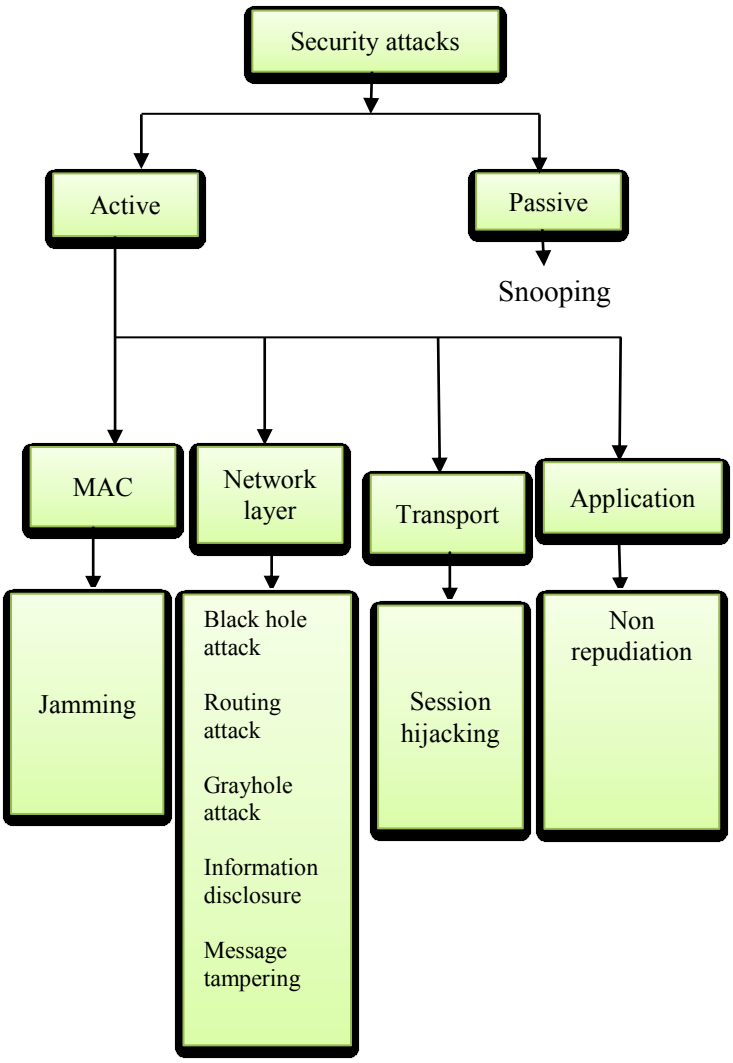

Figure 3. Classification of attacks in MANET

F. PROTOCOL USED

- **OLSR (OPTIMIZED LINK STATE ROUTING) PROTOCOL:** OLSR is proactive protocol in nature. This protocol is established for MANET. OLSR protocol reduces the size of packets and number of packets as required for transmission. MPR (Multi Point Relays) used by this protocol that reduce the duplication of packets when they are forward. And also MPR reduce the control traffic. Due to the MPR, OLSR protocol is comfortable for large mobile networks. OLSR protocol will decrease the duplicate transmission. Also MPR used in OLSR provide the shortest path to the destination.
- **DSDV (Destination Sequenced Distance Vector) routing protocol:** DSDV is proactive routing protocol which is developed for mobile ad-hoc networks. This protocol is developed on the

Bellman ford algorithm. In DSDV protocol all mobile nodes have routing table which contains the all available destination and number of hops for each node. Every route or path to the destination combined with the sequence number. In the network when DSDV protocol is used then this protocol requires that each mobile node announce its own routing table to neighbors. This announcement is done by broadcasting or multicasting. Due to this announcement the neighbors can be understand about the changes that is done in the all system. "Full dump and incremental" are the two ways through which routing updates sent to the all nodes in the network.

- **DSR (Dynamic Source Routing) protocol:** DSR is routing protocol that use the route for sending the message to the destination. In this protocol the data sender verify the path from where the data is transmit to the destination. Nodes in the network are along with the path information and the data is forward from node to the nest node until it reached at its destination. There are two main feature of this protocol is that route discovery and route maintenance. This protocol is reactive protocol , such as in this type of routing protocol route is established when it is required.
- **AODV (Ad-hoc On demand Distance Vector) routing protocol:** AODV is also type of reactive protocol. In this protocol routes are developed on demand. AODV have the combine properties of DSR and DSDV. AODV protocol is designed for mobile ad-hoc network in which all nodes are act as router and host. In this protocol when a sender wants to send the data to the destination or receiver, firstly sender send the RREQ to its neighboring nodes and this message is send until it reaches at its destination. When the RREQ message reaches at its destination then destination send back the RREP message to the sender. And by this method the route is develop for the transmission of information. And in this protocol the sender maintain the link until it requires and after that it breaks the link from the routing table.

G. CONGESTION IN MANET

Congestion is the state when packets are overflow in the network. These packets are that from which information is transfer from source to destination. Due to congestion packets are loss. When number of packets are greater than the capacity of the network then congestion is occur. Due the congestion in network it causes the demotion in performance, long delay, many packet losses and disclosure of information. When load of the traffic in the one route is increase then this also cause the congestion. There are many factors which causes the packet loss, etc. These factors are breakage of link, mobility nature of nodes. Mobile ad-hoc network is dynamic in nature so congestion in this network may occur easily. So congestion control is important for this network.

II. LITERATURE REVIEW

Hao Yang et.al.[1] In this paper they reviewed about mobile ad-hoc networks security which is most important matter to provide the protected communication among the mobile nodes. Due to unique characteristics of mobile ad hoc networks such as flexible infrastructure or open peer-to-peer network architecture, shared wireless medium, stringent resource constraints, and highly dynamic network topology, so these networks are easily developed at any location any time. In this paper they focused on the fundamental security problem in MANET.

Latha Tamilselvan and Dr. V Sankaranarayanan [2] In this paper they discussed about ad hoc networks and how these networks are created and their construction. In ad hoc networks AODV is used as routing protocols. Black Hole attacks make concession the security of AODV. In this attack a evil node announce itself as having the shortest route to the node whose packets it wants to catch. To reduce the attack chances in this they planned to wait and check the replies from all the neighboring nodes to find a safe path. They discussed the results of proposed method.

Changling Liu et al. [3] In this paper the major problem which is the generation of an effective routing protocol within the MANETs. The generation of an suitable routing protocol has become difficult due to the increase in complexity of the network. In order to provide high quality communication, the protocols are employed which can only transfer the data from the routing process.

Helge Wiemann et.al [4], In this paper the important properties of Geo-based routing protocols. Within these protocols the geographical addresses of the protocols are applied and the IP addresses are skip out. This results in improving the scalability of the network. The

address of destination is important to be defined initially only then the packet be transmitted.

Prof. S.A. Jain et. Al[5] The ad hoc connections, which opens many circumstances for MANET applications. In ad hoc network nodes are in mobile nature and there is no centralized controller. Routing is an important aspect in mobile ad hoc network which not only works well with a small network, but also it can also work well if network get expanded dynamically. Routing in MANETs is a main aspect considered among all the issues.

Vishnu Kumar Sharma and Dr. Sarita, [6] A Congestion control is a key issue in mobile ad-hoc networks. The standard TCP congestion control system is not able to handle the special properties of a shared wireless channel. Many ways have been recommended to overcome these difficulties. Ideas and show their interrelations. Mobile agent based congestion control technique routing is applied to avoid congestion in ad hoc network.

III. CONCLUSION

In this paper we can give the review of different routing protocols and security issues in the MANET. There are different routing protocols are used by MANET, these are like AODV, DSDV,DSR, OLSR etc. AODV has the combined properties of DSR and DSDV and this protocol is used for both unicast and multicast routing. And here in this paper we have study about the dynamic nature of the network i.e. nodes are in mobile nature, so due to this nature of the network the problem of the congestion occur in this network easily. So to reduce the problem of congestion in the MANET there are many techniques that control the congestion in the network.

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