

MOBILE AD-HOC NETWORK: A REVIEW

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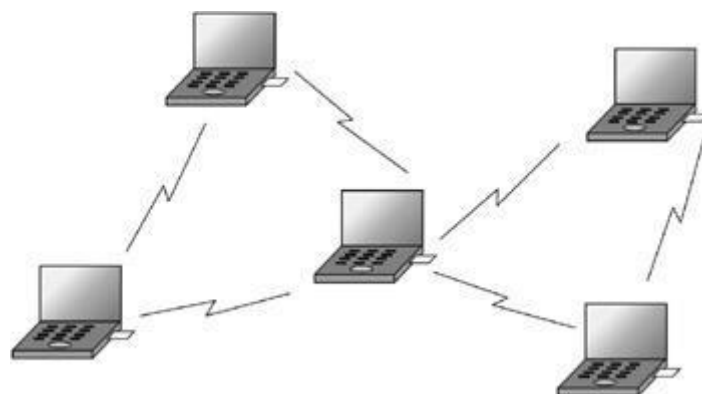
Abstract:

Ad-hoc networking is a idea in computer communications. Mobile Ad-hoc network are wireless network which are characterized by dynamic topologies. The concept of Ad-hoc network is one of the advance mechanisms that are used for wireless networking. Basically, Ad-hoc network consist of a collection of wireless nodes. These nodes are connected with each other to dynamically establish on Ad-hoc or on-the-fly network without any kind of support of any centralized infrastructure. Such type of network support anytime and anywhere in mobile computing and thus, allowing the spontaneous formation of mobile network for a period of usage. In this kind of network, each mobile host work as a router which allows peer-to-peer as well as peer to remote wireless communication. The most widely read Ad-hoc network are AODV (Ad-hoc on demand distance vector routing protocol), DSR(dynamic source routing protocol), DSDV(destination sequence distance vector routing protocol), TORA(temporary ordered routing protocol) etc.

Keywords: Ad-hoc networks, AODV, DSDV, DSR, MANET

Introduction: A Mobile Ad hoc Networks represents a system of wireless mobile nodes that can freely and dynamically self-organize in to arbitrary and temporary network topologies, allowing people and devices to seamlessly communicate without any pre-existing communication architecture. Each node in the network also acts as a router, forwarding data packets for other nodes. A central challenge in the design of ad hoc networks is the growth of dynamic routing protocols that can efficiently find routes between two connecting nodes. An Ad hoc routing protocol is a convention or standard that controls how nodes come to agree which way to route packets between computing devices in a mobile ad-hoc network (MANET). Our goal is to carry out a systematic performance study of three routing

protocol for ad-hoc networks Ad hoc On Demand Distance Vector (AODV), Destination Sequenced Distance Vector (DSDV), and Temporally Ordered Routing Algorithm (TORA). Mobile ad-hoc network (MANETS) are wireless network which are characterized by dynamic the topologies. The concept of ad-hoc networking is one of the advance mechanisms that is used for wireless networking. Basically, Ad-hoc network consist of a collection of wireless nodes. These nodes are connected with each other to dynamically establish on Ad-hoc or on-the fly network without any kind of support of any centralized infrastructure. Such type of network support anytime and anywhere in mobile computing and thus, allowing the spontaneous formation of mobile network for a period of usage. In this type of network, each mobile host works as a router which provides peer- to- peer as well as well peer-to-peer remote wireless communication.



Features of mobile ad-hoc network:-

1. Autonomous and infrastructure less.
2. Dynamic network topology.
3. Device heterogeneity.
4. Energy constraint operation.
5. Network scalability.
6. Multi-hop routing.
7. Limited physical security.

Properties of MANET:-

1. MANET enables fast establish of networks. When a new network established, the only requirement is to provide a new set of nodes with limited communication range.

2. MANET nodes have peer-to- peer connectivity among themselves.
3. MANET nodes have independent computational ,switching and computational capabilities .
4. There is no access point requirement in MANET.
5. The wireless connectivity range in MANET includes only nearest node connectivity.

Advantage of mobile Ad-hoc network:-

There are many better reason to use Ad-hoc then infrastructure .The biggest strength of Ad-hoc is its independency from any infrastructure. Therefore it is possible to establish Ad-hoc network in any difficult situation.

Routing in MANET'S:-

MANET provides point to point routing similar to the internal routing .The major difference between routing in MANET and regular routing is the route discovery mechanism. A MANET has a dynamic topology changer due to the mobility of nodes. Routing in MANET are depending on the various factor which are modeling of topology, selection of routers and specific characteristic's. Thus a proper routing protocols is used in MANET which full fill the following criteria.

1. Provides a possible selection route if a node connectivity fails.
2. It provides a path of minimum distance between the source and destination and also in least cost.
3. Give the nodes the best possible response time and throughput.

Traditional Routing protocols:-

Routing protocols can be classified into two types.

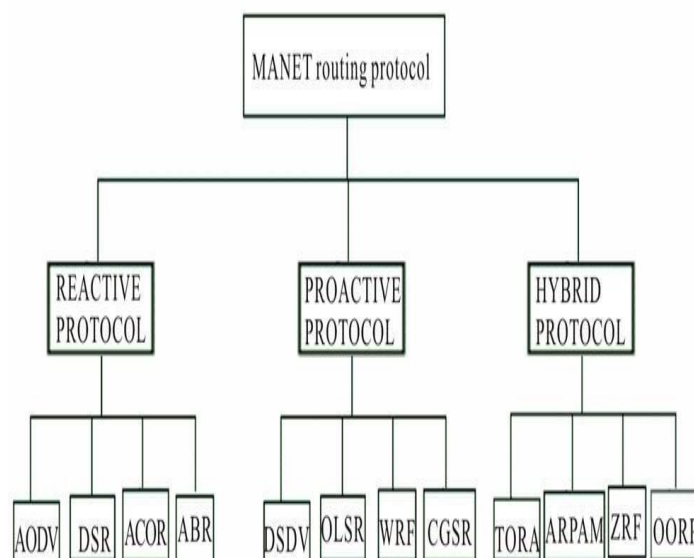
1. Distance vector routing protocols.
2. Link state routing protocols.

Distance vector routing protocols:- In distance vector routing protocols, routing tables are exchanged between neighboring nodes. Routes are obtained by comparing distance to the destination and comparing the shortest distance to each the host. RIP is one of such example.

Link state routing protocols:- In link staterouting protocols, neighboring nodes only exchange the link state and routes are obtained by computing a graph of Mostrecent network topology. Open shortest path first.

Classification of routing protocols:-

1. Proactive routing protocols
2. Reactive routing protocols
3. Hybrid routing protocols



Proactive routing protocols:- (DSDV routing Protocol)

The most popular proactive routing protocols is the destination-sequence distance vector routing protocols, also known as DSDV protocol. DSDV is a table driven scheme for the Ad-hoc network based on the Bellman ford algorithm. The main contribution of the Bellman ford algorithm was to solve the routing route problems. There are four distinct phases of DSDV protocol.

1. Route advertisement :-

Every mobile nodes in network maintain a routing table in which all possible destination to reach from one node to another node is given. Each entry is marked with a sequence number assigned by the destination node.

2. Routing table entry structure:-

As we know that every mobile nodes in network maintain a routing table in which all possible destination to reach from one node to another node is given and each node contain the new sequence number and gives the following information for each nodes.

- The destination address
- The number of hops require to reach destination
- The sequence number by the destination as a information.

3. Responding to the topologies changes:-

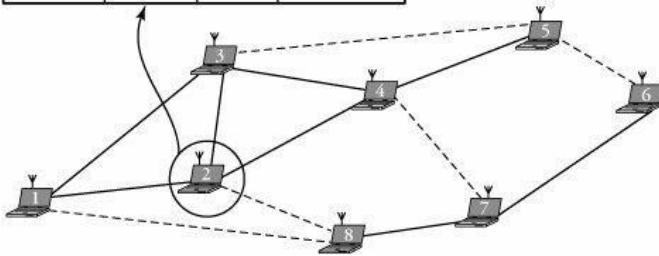
To maintain the consistency of the routing tables in a

dynamic changing topology, routing tables are updated periodically. These updates are transmitted by the mobile node to each of the correct neighbor's in the network updates are transmitted immediately when significant new information are available. The changes in the topology and information about routing is advertised by broadcasting or multicasting the packets. **4. Route selection criteria:-**

When a mobile host receive new routing information through an increment packets. It compares to that already exist routing packets. So the route with new sequence number is used and route with old sequence number is discarded.

Routing Table for Node 2

Destination	Next Hop	Metric	Dest. Seq. No.
1	1	1	123
2	0	0	516
3	3	1	212
4	4	1	168
5	4	2	372
8	1	INF	432

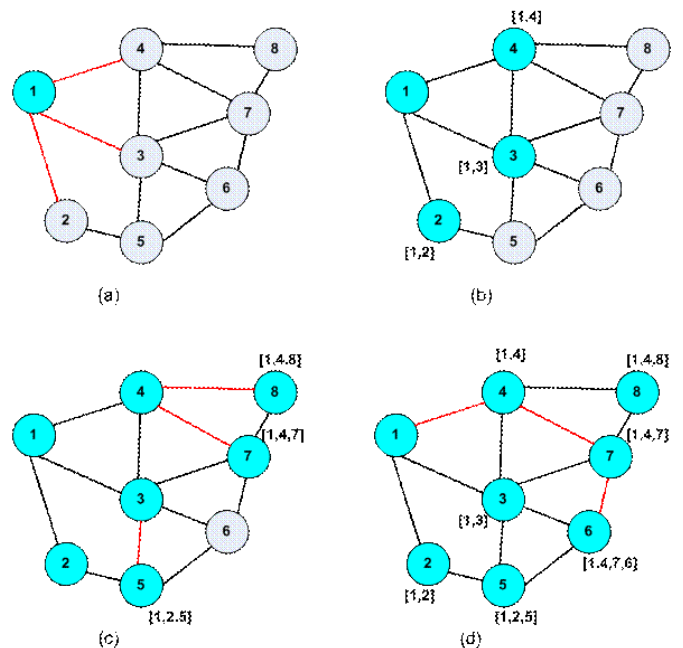


Reactive routing protocol (DSR routing protocol):- Reactive routing protocol are the intended to maintain the routing information about „active routes „only. Routes are created only when it is desired by the source node. Hence this protocol is known is on demand routing protocol. In this type of protocol route discovery procedure is needed routing protocol is a simple and efficient routing protocol designed specifically for use in multi-hop wireless Ad-hoc network DSR allows the network to be completely self organising, without the need of any existing network infrastructure or administration. This protocol is composed by two mechanism.

1. Route discovery in DSR
2. Route maintenance in DSR

Route discovery in DSR: If the source node have not a route to reach at the destination node while there are a number of routes in which we have to find

the shortest route for this it broad cost a route request (RREQ) message to the destination node. The route request message built there own record. The intermediate node receive the route request message and checks do they already in the record if yes then they drop the request. The intermediate nodes forward the route request to the next hop. When the destination hop receive the RREQ, it sends back a route reply message along his reverse route back to the source. Intermediate nodes may also use there route catch to reply a RREQ.



Here the destination node receive the route record. Now destination choose the shortest path and answer with the RREQ which goes back to source.

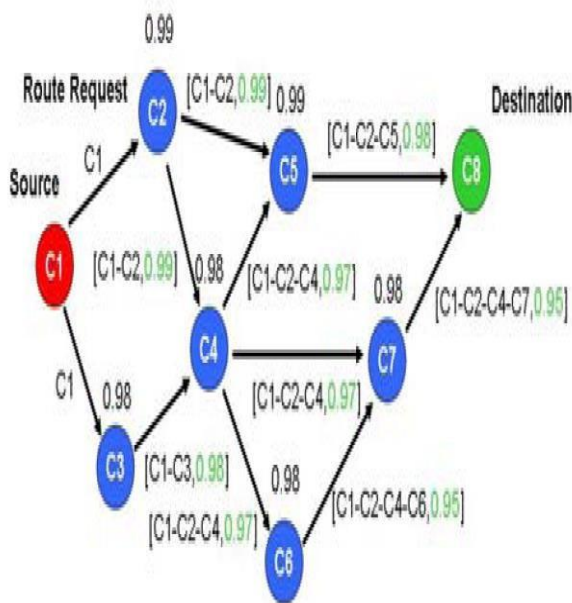
Route maintenance in DSR :- The route maintenance procedure maintain the operation of route. It means if any link is broken in the route and node is unsuccessful to send message to the next hop then the error route message (ERREQ) message will pass back to the source node. When a error message is received all routes containing the link in error are detected.

Advantage of DSR:-

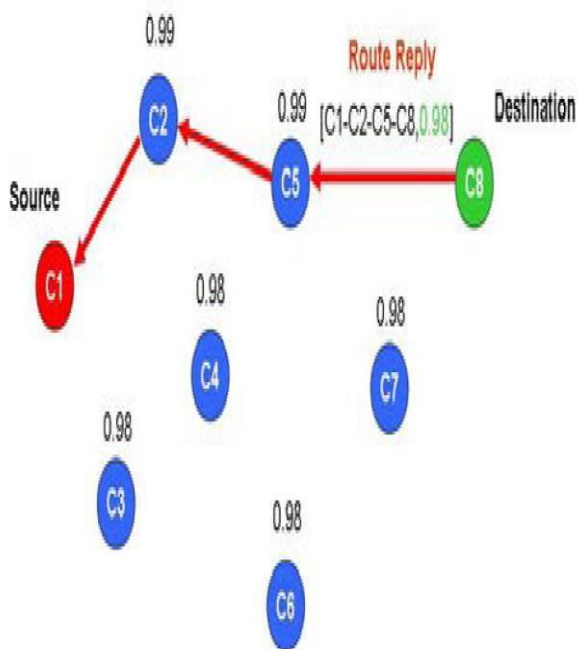
1. Route maintenance only between node who need to communicate thus reduce the overhead of route maintenance .
3. Intermediate node can answer the with

2. Route caching further reduce the route discover overhead.

(a) Route discovery.



(b) Route reply with the route record.



Disadvantage:-

1. Catching can result in faster route repair, but faster does not necessarily means correct.
2. Flood of route request may potentially reach all nodes in the network.
3. Route reply storm problem.

Ad Hoc on Demand Distance Vector Routing – AODV:-

The AODV routing protocol shares features of both DSDV and DSR algorithms. AODV shares DSR’s on-demand characteristics in that it also discovers route as and when needed by initiating a route discovery process. It maintains one entry per destination in its routing tables unlike in DSR, which maintains multiple route entries for each destination in its route cache. In AODV, the packets carry the destination address and sequence number. In AODV, when a source requires a path to the destination, a route request (RREQ) message is flooded in the network. When an intermediate node receives such a RREQ, it examines its local route cache to check whether a fresh route to the required destination is available or not. If a fresh route exists, then the node unicasts a route reply (RREP) message immediately back to the source. As an optimization, AODV uses an “expanding ring” flooding technique, where a RREQ is issued with a limited TTL only. If no RREP message is received within a certain time by the source node, then another RREQ is issued with a larger TTL value. If still no reply, the TTL is increased in steps, until a certain maximum value is reached. During route discovery process, all IP-Packets generated by the application for destination are

buffered in the source node itself. When a route is established, then the packets are transmitted. An important feature of AODV is the maintenance of timer-based states in each node, regarding utilization of individual routing table entries. A routing table entry is said to

FIG: ROUTE DISCOVERY AND ROUTE REPLY WITH ROUTE RECORD

nodes are notified with route error (RERR) packets when the next-hop link breaks. In the situation of link break, each predecessor node, forwards the RERR to its own set of predecessors. In this way all routes, which contain the broken link, are removed.

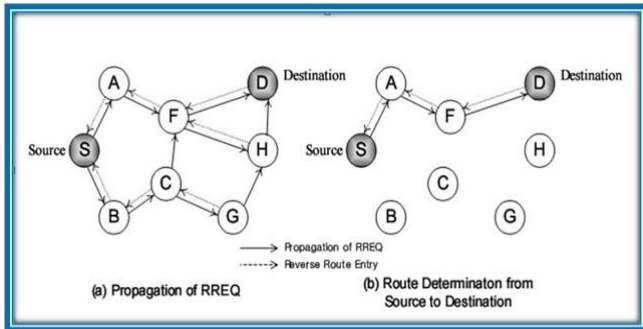


FIG: Route discovery in AODV

The following steps are followed for route discovery in AODV.

- Source S who want to send a data packet to destination D, first construct and broadcast an RREQ packets .The format of RREQ is shown in the following figure.

Source address	Request ID	destination address	Source sequence#	Destination sequence#	HOP count
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Fig: format of route request packet.

Source address	Destination address	Destination sequence	HOP count	Life time
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Fig: format of route reply packets.

It contain the source and destination internet protocol (IP) address and a request id which is a local counter which separate each nodes and each time it broadcast a RREQ. This is also user to discard duplicate RREQ. The route discovery process is initiate when a source need a route to a destination and it does not have a source in its table.to initiate route discovery the source floods the network with a RREQ packet specifying the destination for which the root is requested, when a

be expired if not used within certain duration. These

node receive a request packets it checks weather it is destination or not and transmit forward it.

Route maintenance in AODV:- When a node detect a broken link while attempting to forward a packet to the next hop. IT generates a RERR packet, the request (RERR) erases all routes using the link along the way. If a source receive a RERR and still a destination route required then it initiate a new route discovery process. Routes are also deleted from the routing table if they are unused.

Comparison between DSR and AODV:-

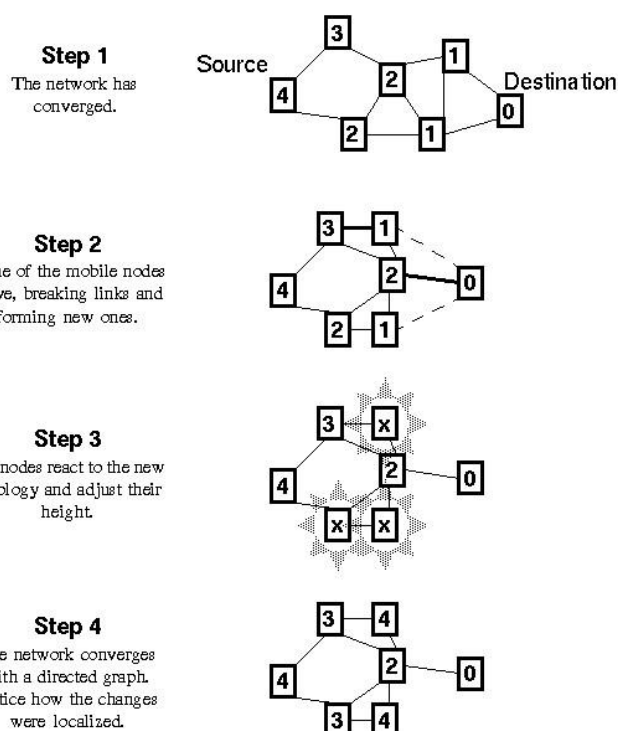
- While DSR and AODV both are reactive protocol and shows the on-demand behaviour.
- DSR uses source routing , whereas AODV uses a table driven routing framework and destination sequence number.
- DSR always demonstrate a lower routing overhead then AODV. The major contribution to routing overhead in AODV is from RERR's , while RREP's constitute a large function of routing overhead in DSR.

Item	Demeanorance Parameters AODV	Demeanorance Parameters DSR
Routing Philosophy	Low	Low
Loop Free	Yes	Yes
Multicast Capability	Yes	No
Multiple Route Possibilities	No	Yes
Routes Maintained in	Route table	Route cache
Route Reconfiguration Methodology	Notify source	Notify source
Routing Metric	Shortest path	Shortest path
Utilizes Route Cache/Table Expiration Timers	Yes	No

Temporally Ordered Routing Algorithm -TORA

The TORA is a highly adaptive loop-free distributed routing algorithm based on the concept of link reversal . TORA is proposed to operate in a highly dynamic mobile networking environment. It is source-initiated and provides multiple routes for any desired source/destination pair. The key design concept of TORA is the localization of control messages to a very

small set of nodes near the occurrence of a topological change. To accomplish this, nodes need to maintain routing information about adjacent (one-hop) nodes. The protocol performs three basic functions of Route creation, Route maintenance, and Route erasure. The first three elements collectively represent the reference level. A new reference level is defined each time a node loses its last downstream link due to a link failure. TORA's route erasure phase essentially involves flooding a broadcast clear packet (CLR) throughout the network to erase invalid routes.



SECURITY PROBLEM IN MANET

MANETS are much more vulnerable to attack than wired network. This is because of the following reason:

A. Open medium-

Eavesdropping is easier than in wired network. **B.**

Lack of centralized Monitoring-

Absence of any centralized prohibits any monitoring agent in the system. **C. Lack of clear line of defence**

The only use of line of defense attack prevention may not use, Experience of security research in wired world has taught us that we need to deploy layered

security mechanism because security is a process that is as secure as its weakest link. In addition to prevention, we need II line of defense detection and response.

D. Cooperative Algorithm-

The algorithm of MANET requires mutual trust between nodes which violates the principle of Network

CHALLENGE IN MANET A. Autonomous-

No centralized administration entity is available to manage the operation of the different mobile nodes

B. Dynamically a Changing Network Topology Mobile node come and goes from the network there by permitting any malicious node to join the network without being noticed.

C. Device discovery-

Identifying relevant newly moved in nodes and informing about their existence need dynamic update to facilitate automatic optimal route selection.

D. Bandwidth optimization:

Wireless linked has lower capacity than the wired network. Routing protocols in wireless network always use the bandwidth in an optimal manner by keeping the overhead as low as possible. The limited transmission range also imposes constrained on routing protocols in maintaining the topological information. Especially in MANETs due to frequent change topological information at all nodes involves more control overhead which, in turn, more bandwidth wastage.

E. Limited Resources :

Mobile nodes rely on battery power, which is a scare resource; also storage capacity and power are severely limited. **F. Scalability:**

Scalability can broadly define as whether the network is able to provide an acceptable level of service even in the presence of a large number of nodes

G. Infrastructure less and self-operated:

Ad-hoc networks are supposed to operate independently of any fixed infrastructure. **H.**

Poor transmission quality:

This is an inherent problem of wireless communication caused by several error source that result in degradation of received signal. **I. Ad-hoc addressing:**

Challenges in standard addressing schema to be implemented.

CONCLUSION

In this paper, we describe the arrangement less Mobile Ad Hoc networks. Firstly the brief introduction was discussed, with the basic idea of MANET. Then the representative and application of MANETWERE discussed that helps us to understand more about MANET. Routing protocols were discussed, including its types, example and pros and cons comparison among them .We describe the challenges of MANET, through which we can know the issue in MANET which leads to some problem in this type of networks. Security of MANET is discussed having the brief description of security criteria and then the attack on MANET. The solution of these issues is necessary to fulfill the condition of wide commercial placement of MANET. Mobile Ad hoc networking is one of the most important and essential technologies that support future computing scheme the characteristic of MANET bring this technology as a great opportunity together with many challenges. Now a day. MANET is becoming an interesting research topic and there are many research projects employed by theoretical and companies all over the world. MANETs can be broken in a wide are of application like military battleground, emergency search and rescue, law execution, commercial, local and personal contexts. The most important thing for the networks is security. It is also important for wireless Ad hoc network because its application is military.

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