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An application, challenges and routing protocol in Mobile Ad-Hoc Network

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***Abstract*— In this paper we are focusing a complete discussion on MANET is not a new one, it is discover in the year of 1990's. In the past few decay, we observing a rapid growth in the field of mobile communication due to low cost and widely available of wireless devices. Now a days, the introduction of new technologies such as the Wi-Fi, Bluetooth, IEEE 802.11 and Hyperlan are helping for MANET deployments outside the military application. These recent evolutions have been generating a renewed and growing interest in the research and development of MANET.**

This paper will address the overview of mobile ad hoc network, applications of ad hoc networks, Routine protocols and Issues in MANETs also presents technological challenges the defined in the mobile ad hoc network.

***Index Terms*— MANETs, Routine protocols, Issues in MANETs, Application of MANETs.**

I. INTRODUCTION

MANET is acronym of Mobile Ad-hoc network is the one of the most research area in recent years, MANET can communicate one node to another node without any physical infrastructure support i.e. MANET is infrastructure less network. Nodes are in motion so that topology of the network will change rapidly and unpredictly with respect to time, nodes are decentralized i.e. delivery of messages network organization can take place by nodes them self. The usages of smart phones in order to send or receive the email as well as browsing the internet. Recently, an increasing number of WLAN (wireless local area network) hot spots are emerging, portable computer can be allowing the travelers to browse the internet in any public place. The main characteristics of wireless networks is the ability to operate without fixed, wired communications infrastructure, supports coverage areas ,emergency requirements and short time requirements.

AD-HOC NETWORK:

These network are infrastructure less networks, self-configuring network, the nodes are in the mobile nature so that the topology of the network will change and its support multi-hop communication and this network routers are used to find the route randomly as well as arbitrary. There are several application of MANETs such as battlefield operation, data sharing in conference hall as well as disasters recovery operation.

The main advantages of using wireless network are to reduce the wired cost as well as data transmission can takes place independently in the environment.

Figure 1.An Example of MANETs

The applications of this wireless network are to public, disaster recovery, law enforcement and military application. The above figure will show an example of MANETs in this figure the mobile nodes are connected in an environment without any support of infrastructure these mobile node can send and receive the information as well as each node can act as router to find the route and help to give the information to another node. It will also manage the behavior of the network in a distributed way, packets are to be routed, QOS and Security. There are two main issues in MANETs i.e. rapidly changing the topology of the network as well as node in the MANETs are actively participates in operation of the network operation so that it is difficult to identify the attacker node during the operation.

The meaning of Ad-hoc in Latin "for this purpose", this network can be deployed anywhere without using any external base station support. About MANETs can be discussed as follows: MANETs is an anonymous system in this network the mobile routers are connected by wireless links, the union of which forms an arbitrary graph. In this network the routers are move randomly so that the topology of the network will change quickly such type of network are connected in a larger

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internet and network can operated in a standalone fashion. The signal strength would be rapidly change with respect to time, in the network topology the nodes are even disappeared, re-appear as well as appear depending on time, connection of the network can work between the nodes ,the Ad-hoc is a without preexisting infrastructure communication network, Base station and radio network controller can be represented in infrastructure network these networks are cellular network .In this network every communication radio terminal(RT) communicate with the neighboring node ,in order to perform end to end communication.

In this network every communication radio terminal (RT) Communicate with nearby node in order to perform communication link if the required radio terminal is not appearing then we have to call another radio terminal this type of communication is called as "Multihop end to end communication". In this ad-hoc networks the protocols will play vital role at the time of communication within a network a routine protocols are used to discover the route .we can briefly discuss about routine protocols in next section.

II. APPLICATION OF MANETS

There are number of application can be used for MANETs In our daily life such as file transfer from email, web server application can also possible if one of the node act as gateway to the external network node .some of the important applications can be summarized as follows.

- **Local area network:** Ad-hoc networks can be used temporary multimedia network like laptops and smartphones to share the information between the participants .for EX: class room or seminar halls or auditorium. Another application is domestic networks in this application devices are directly connected to exchanging the information, similarly it is also used in civilian environment, sports stadium, taxi cabs, shopping malls and PVRs.
- **Personal area network:** These network can be used to simplify the interconnection between the nodes. The cables might be exchange by wireless connection Ex: WLAN, GPRS and UMTs.
- **Military application:** in this application MANETs will play very important role some military components consists of computer equipment's. These network help to maintain the communication between the soldier and military headquarters information
- **Emergency sector:** Ad-hoc network can be used in rescue operation of the disaster environment such as earth quake and fire. Emergency operation can take place in such a place where communication range is completely destroy at that time these networks can be installed for secure communication operation, information is relayed between one rescue member of team to another member of team from a hand held component. Ex: law of enforcement and s2s communication (ship to ship).

III.CHALLENGES IN MANETs

The MANETs challenges can include routing protocol, secure, reliable operation, QOS, Internetworking, Power consumption, Multicast and location aided routing .In this section we can discuss briefly one by one as follows:

- **Routing protocol:** In MANETs as we already know that topology of the network is continuously changing, the main problem of routing packets between more pair of nodes become challenging task. Probably the routing protocols are based on reactive protocols. Multicasting routing is another issues in MANETs due to random movements of nodes potentially contain multiple hops, which is more different then single hop communication.
- **Secure and reliable operation:** In MANETs the mobility of nodes introduce a packet lose and data transmission error, due to limited wireless transmission range wireless link characteristic introduced a reliability operation and Broadcasting nature of the wireless medium(hidden traffic terminal.
- **Qos (Quality of service):** Giving different type of Qos level in a continuously changing environment will be a challenge, MANET having the feature like inherent stochastic feature the MANET can makes it difficult to offer fixed guarantee on the services offered into a device. Qos can be implemented in order to support multimedia communication services.
- **Internetworking:** The communication in the Ad-hoc network, internetworking among the MANETs and networks is often agree in many cases, in the mobile devices co-existence of routing protocol is challenges for harmful mobility management.
- **Power consumption:** The communication related function should be optimized power consumption Ex: Light weight mobile devices, the aware of the power routing and power conservation can be taken in to consideration.
- **Multicast:** It can support the multiple members in wireless communication network so that multicasting network tree is not static for longer time.
- **Location aided routing:** To utilize the location information and increasing the performance of routing protocols in Ad-hoc networks. To finding the new route so that it can reduce significantly more number of routing messages.

III. ROUTING IN MANETs

In MANETs there are 3 types of routing protocols namely Proactive, hybrid and reactive as shown in the following fig 2.

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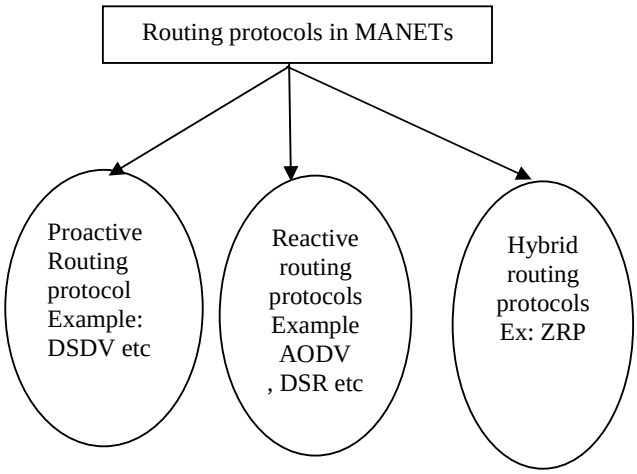

Fig 2: Classification of routing protocols in MANETs

Proactive routing protocols: It maintaining the routes to destination even if it is not required. It also maintain the up to date routing information on every node periodically updated.

Merit: Proactive routing algorithm the path is already exists on each node of the network so that connecting time is very fast.

Demerit: proactive routing protocols always using resources to communicate routing data (information) so that when there is no traffic which effect the overhead of control information**.**

Ex: DSDV, OLSR.

Reactive routing protocols: In this scheme routing table is not update every time, node only find the route when it want to send the information to destination or other nodes.

Merits: Traffic can be reduces when needed for routing.

Demerits: when packet can be send to first node to destination if it is not found the route in the network it can be introduce a delay.

Ex: AODV, DSR.

Hybrid routing protocol: This routing protocol can be formed by combination of merits of both proactive routing protocol and then reactive routing protocols. First it will use routing information next it will reactively acting as needy node.

Ex: LAR, ZRP.

1. Destination-Sequenced Distance Vector (DSDV):

- Every node in the network can maintains routing table with entering for every possible destination.
- Each node can periodically exchange the routing table with neighboring node.
- Routing tables are updated based on the received table information.

Each entry in table specifies

i) Identification of destination.

ii) Finding the distance on route to sink (destination).

iii) Identifying the distance in terms of hops to the destination.

iv) Fresh route can be specify the sequence of number.

Advantages: source node to sink node the route can be always available so that every node having path itself to neighboring.

Disadvantages: It uses bidirectional link**,** large number of routing overhead due to unavailable of traffic, Count to infinity problem can be exits.

2. OLSR (Optimized link state routing protocol):

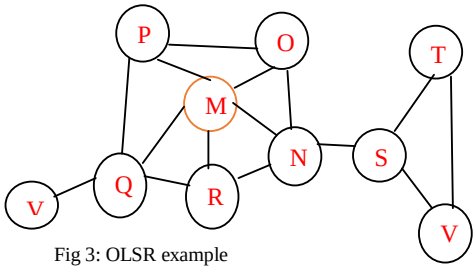

Fig 3: OLSR example

In figure 3 shows the Node M having two multipoint relay (MPR) i.e. Node Q and N.

- MRP of M are its neighbors such that each two-hop neighbor of M is a one-hop neighbor of one multipoint relay of M.
- Nodes exchange neighbor lists to know their two hop neighbors and choose the multipoint relays.
- Node Q & N forwarding the information and this information received from M
- Nodes N & U are MPR for node M
- Node U forwarding the information and these information receiving from S.

ADVANTAGES:

- Control information can be reduced.
- Usage of bandwidth traffic broadcast can be minimizes.

DISADVANTAGES:

- Bandwidth and delay are overhead at the multipoint relay node so that they acts as localized forwarding routers.
- OLSR produce a route from source to sink, here shortest route cannot be required because every path can forward the information through a multipoint relay node.

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3. AD-HOC ON DEMAND ROUTING PROTOCOL:

It is a type of reactive routing protocol.in this AODV protocol we using three types of messages namely route request (RREQ), route error (RERR) and route reply (RREP).

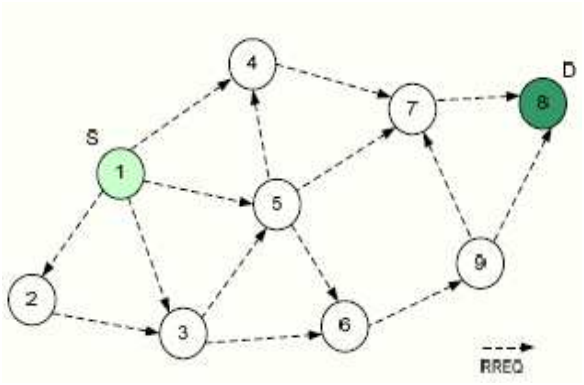

Fig 4. RREQ Flooding

- In fig 3 node 1 want to share the information to node 8
- The node 1 flood the route request message.
- Every node in the network can receive the RREQ message and stores it with previous hop and communicate or forward to the next node (neighboring node).

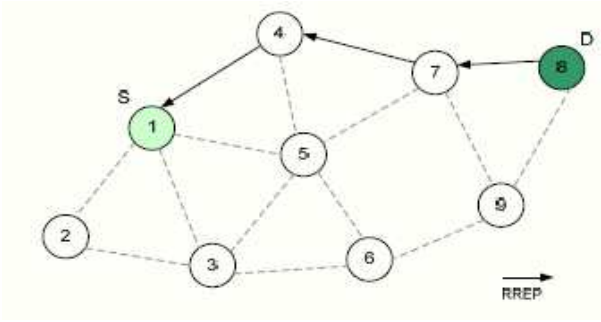

Fig 5. RREP Propagation

- In fig 4 node 8 want to reply the request information.
- Node 8 floods the route reply message.
- During the RREP process each node establish a routing table to smallest distance to the source.
- When source or destination creating a route, the intermediate node learns the route.

ADVANTAGES OF AODV

- AODV establish a routes only on request, it effect to decreasing the periodic control message overhead consisting with proactive routing protocols.

DISADVANTAGES OF AODV

- Route setup latency is established when a unique route is needed. When discovering unique routes and the queued packets are sent out only when unique routes are got. It effect the loss of throughput in high mobility scenarios, due to the packets get loss very quickly due to unstable route selection

4. DSR (DYNAMIC SOURCE ROUTING PROTOCOL)

It is also type of reactive routing protocol complete sequence of route is maintained in packet. Its help to control the route from source node to guarantee loop free node.

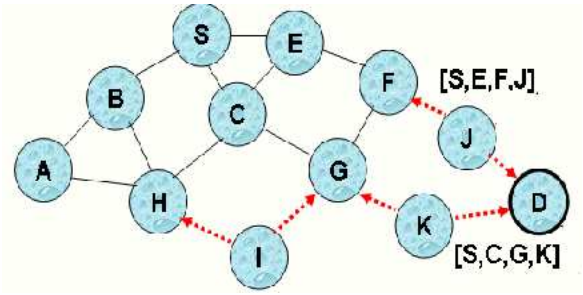

Fig 6.Path is found and RREQ is flooded

- In the figure 6, node S wants to send a information(packet) to node D, but node S did not know the route of node D, so that node S initiating a route discovery.
- Source node S flooding a (Route Request) RREQ, Every node appending its own identifier when forwarding Route request.

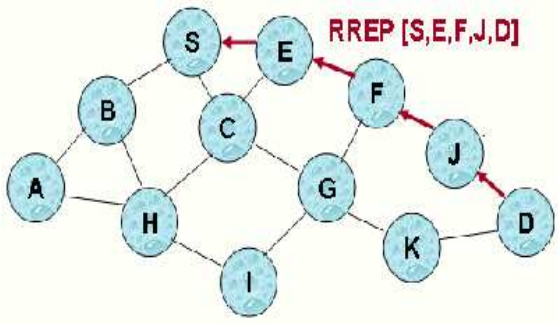

Fig 7. Path is setup and RREP is sent by Node D

- In fig 7, node D i.e. destination node receiving the Route Request (RREQ), sends a (Route Reply) RREP.
- Route Reply (RREP) is sent when a route can be search by reversing the route appended to receive Route Request (RREQ).

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- The Route from Source node S to destination node D includes RREP on which RREQ was received by destination node D.
- source node S receiving RREP, caught the route including in the RREP

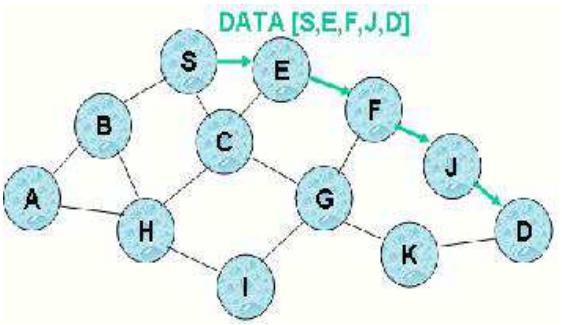

Fig 8. Data transmission

- In figure 8, when source node S sending a packet to destination node D, the entire route is lies between the packet header hence the name source routing

Intermediate to determine the from which node data packet should be forwarded.

ADVANTAGES OF DSR

- To reduce the control overhead, Intermediate nodes are utilizing the route cache information efficiently.
- It does not flooded the network with routing table update messages periodically.

DISADVANTAGES OF DSR

- Route maintaining scheme does not locally repaired or a break the link.
- As compare to table-driven protocols Connection setup delay is higher.
- Performance is inversely proportional to mobility i.e. as performance decreasing rapidly mobility increasing
- In DSR as routing overhead increases the path length also increases. I.e. routing overhead directly proportional to path length.

5. ZONE ROUTING PROTOCOL (ZRP)

It is the type of hybrid routing algorithm it will take the benefits of both reactive and proactive routing algorithm. ZRP can be introduce for in proactive algorithm it can decrease the control overhead and in reactive algorithm reduce the latency while discovering the new route.

All nodes within hop distance at most d from a node Y are said to be in the routing zone of node S.

- All nodes at hop distance exactly d are said to be peripheral nodes of node Y's routing zone
- Intra-zone routing: Proactively maintain routes to all nodes within the source node's own zone.
- Inter-zone routing: Using an on-demand protocol (similar to DSR or AODV) to finding routes outside the zone.

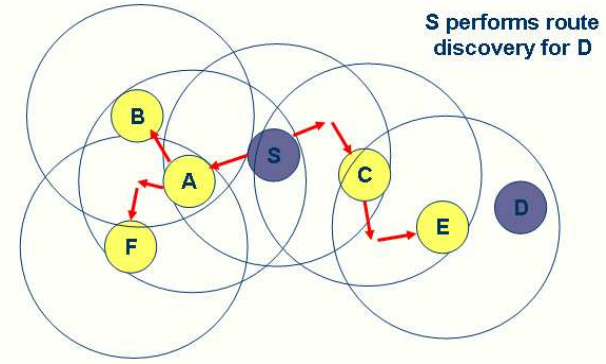

Fig 9. Broadcasting route request (RREQ)

- In fig 9, node S indicates route discovery for node D. initially, the data packet is sent within the routing zone of the source node to reach the Intra zone routing (peripheral nodes).
- Inter zone routing the data packet is sending from the peripheral nodes (Intra zone) to the destination node is known as inter zone routing.
- Every node in the network collecting the data to all the nodes in its routing zone proactively. This scheme is as same as a proactive protocol such as DSDV.
- Every node in the network maintains a routing table for its routing zone, so that it can find a route to any node in the routing zone from this routine table.
- ZONE NOTIFICATION MESSAGE: every node periodically broadcasting an information similar to a hello message

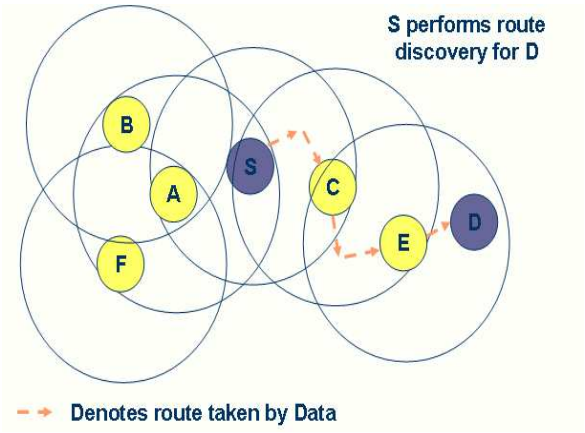

Fig 10. Route reply from node E

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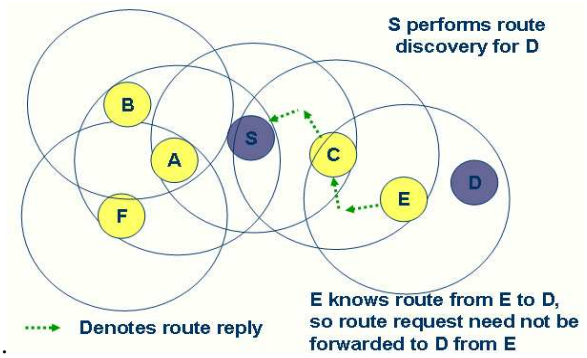

Fig 11. Data transmission

Advantages ZRP

- Less control overhead as in an on demand protocol or proactive protocol.

Disadvantages ZRP

- Latency will be short for finding new routes

CONCLUSION

The evolution in the field of mobile computing is driving a new alternative way for mobile communication, in which mobile devices form a self-creating, self-organizing and self-administering wireless network, called a mobile ad hoc network. Mobile Ad hoc networks are generally more vulnerable to physical security threats than fixed or hardwired networks. This paper throws a light on different concepts of MANETS that can help researchers to the maximum. Its intrinsic flexibility, lack of infrastructure, ease of deployment, auto-configuration, low cost and potential applications make it an essential part of future pervasive computing environments. As the involvement goes on, especially the need of dense deployment such as battlefield and sensor networks, the nodes in ad-hoc networks will be smaller, cheaper, more capable, and come in all forms. In all, although the widespread deployment of ad- hoc networks is still year away, the research in this field will continue being very active and imaginative.

REFERENCES

[1] N.H. Saeed, M.F. Abbod, H.S. Al-Raweshidy, "Modeling MANET Utilizing Artificial Intelligent," Second UKSIM European Symposium on Computer Modeling and Simulation, 2008, pp. 117-122.

[2] Mobile Ad-hoc Networks (manet) Working Group (http://www.ietf.org/html.charters/manet-charter.html

[3] M. Frodigh, P. Johansson, and P. Larsson.―Wireless ad hoc networking: the art of networking without a network, Ericsson Review,No.4, 2000, pp. 248-263.

[4] Chlamtac, I., Conti, M., and Liu, J. J.-N. Mobile ad hoc networking: imperatives and challenges. Ad Hoc Networks, 1(1), 2003, pp. 13–6.

[5] HaoYang, Haiyun & Fan Ye ― Security in mobile ad-hoc networks : Challenges and solutions, , Pg. 38-47, Vol 11, issue 1, Feb 2004

[6] Salehi, Mahmood , DSR vs OLSR: Simulation Based Comparison of Ad Hoc Reactive and Proactive Algorithms under the Effect of New Routing Attacks, 2012 Sixth International Conference on Next Generation Mobile Applications, Services and Technologies, 12-14 Sept. 2012

[7] Khan, Khaleel Ur Rahman, Reddy, A. Venugopal; Zaman, Rafi U.; Reddy, K. Aditya; Harsha, T. Sri, An Efficient DSDV Routing Protocol for MANET and its usefulness for providing Internet Access to Ad Hoc Hosts, TENCON 2008 - 2008 IEEE Region 10 Conference, 19-21 Nov. 2008

[8] A. Loutfi and M. EIKoutbi, Enhancing performance OLSR in MANET, Multimedia Computing and Systems (ICMCS), 2012, 10-12 May 2012

[9] Mohannad Ayash, Mohammad Mikki, Improved AODV Routing Protocol to Cope With High Overhead in High Mobility MANETs, 2012 Sixth International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing

[10] Zeki Bilgin, Bilal Khan, A Dynamic Route Optimization Mechanism for AODV in MANETs, This full text paper was peer reviewed at the direction of IEEE Communications Society subject matter experts for publication in the IEEE ICC 2010 proceedings

[11] F.D. Rango, J.C. Rango, M. Fotino, C. Calafate, P. Manzoni, S. Marano, OLSR vs DSR: A comparative analysis of proactive and reactive mechanisms from an energetic point of view in wireless ad hoc networks, Computer Communications Journal, Vol. 31, Issue 16, 2008.

[12] Jing Xie, Luis Gironés Quesada and Yuming Jiang, A Threshold-based Hybrid Routing Protocol for MANET, IEEE Transactions on Mobile Computing, May 2007.

[13] Sree Ranga Raju, Kiran Runkana , Jitendranath Mungara, ZRP versus AODV and DSR: A Comprehensive Study on ZRP Performance on MANETs, 2010 International Conference on Computational Intelligence and Communication Networks.

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