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IMPROVE QUALITY OF SERVICE IN SELF-ORGANIZING NETWORKS BASED ON MULTICAST INTELLIGENT ROUTING PROTOCOLS

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Abstract

An ad-hoc routing protocol is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a mobile ad hoc network .In ad-hoc networks, nodes are not familiar with the topology of their networks. Instead, they have to discover it. The basic idea is that a new node may announce its presence and should listen for announcements broadcast by its neighbours. Each node learns about nodes nearby and how to reach them, and may announce that it, too, can reach them. Changes in the MANET context lead to changes in the routing protocol behaviour for better or worse performance. The location agent will assist the packet routing to the destination, which will upgrade the validity of location information caching in the network and improve the performance of geographic routing. ODMRP is a mesh-based, rather than a conventional tree based, multicast scheme and uses a forwarding group concept. ABR distinct adhoc network feature is the use of associativity ticks which is required to only form routes based on the stability of nodes, under the fact that there is no use to form a route using a node which will be moving out of the topology and thus making the route to be broken. MAODV fabricate and maintains a multicast tree based on the hard state, whereas ODMRP does the multicast operation based on the soft state by constructing the forwarding group. This paper presents an efficient routing and flow control mechanism to implement multi destination message passing in networks.

Index Terms: *ODMRP, AMRIS, MAODV, ABR, PAR, CQMRA, MRMP, EABR*

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1. INTRODUCTION:

An ad-hoc mobile network is a collection of mobile nodes that are dynamically and randomly located in such a manner that the interconnections between nodes are capable of changing on a continual basis. In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The primary goal of such an ad-hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Route construction and maintenance should be done with a minimum of overhead and bandwidth consumption moves randomly resulting in a dynamic topology. They are self organized, dynamically changing multi-hop networks**.**

Routing protocols design for MANETs is a very active research area and many proactive and reactive protocols have been proposed [3].

Proactive protocols find routes between all source- destination pairs regardless of the actual need for such routes. The more traditional proactive protocol can reduce the needed time to get a route by inducing a high routing load over the network. In Reactive routing, when a source node needs to send data packets to some destination then it checks for route availability. If no route exists, it performs a route discovery procedure to find a path to the destination. Hence, route discovery becomes on demand. Therefore the Reactive routing techniques, also called on demand routing. The route discovery typically consists of the network-wide flooding of a request message. Once a route has been established, it is maintained by some form of route maintenance procedure until either the destination becomes inaccessible or until the route is no longer desired. Dynamic Source Routing (DSR)[8] is a type of Reactive routing protocol.

Ad-hoc Network[4] is a multi-hop packet based wireless network composed of a set of mobile nodes, in which nodes assist by forwarding packets for each other to allow them to communicate and move at the same time, without using any kind of fixed wired infrastructure. It is self-organizing, rapidly deployable, adaptive and dynamic reconfigurable network of mobile nodes connected by wireless links. Node acts as host and router to support in transmitting data to other nodes in its range. It differs from wired/wireless networks in that there is no central control, no base station, no access points and no wireless switches. It can be quickly and economically set up as needed and it can be used in scenarios in which no infrastructure exists, or in which the existing infrastructure does not meet application requirements for reasons such as security or cost.

There are numerous applications of Ad-hoc Networks, each having different characteristics such as network size (geographic range and number of nodes), rate of topological change, node mobility, communication requirements, and data characteristics. Applications such as military, disaster recovery and mine site operation, conferences, classroom, campus, may benefit from ad hoc networking, but secure and reliable communication is a needed prerequisite for these applications. Each node is directly connected to all nodes within its possess effective transmission range and the communication among the nodes that are not within range of each other is accomplished by establishing and using multi-hop routes that involve other nodes which act as routers. New nodes can join the network at any time and existing nodes can leave the network as well.

Ad hoc network routing protocols are difficult to design, and secure because unable to handle rapid node mobility and network topology changes. Due to the dynamic nature of Ad hoc networks, designing communications and networking protocols for these networks is a challenging process. Routing in an Ad hoc network has two phases: route discovery and route maintenance. Route Discovery is the technique in which a node S be determined to send a packet to destination D and get hold of a route to D. Route Maintenance is the mechanism in which node S is able to distinguish, while using a route to D and that have one or more links along the route have failed. When a broken link is discovered, the source can use another route or can revoke Route Discovery.

Ad hoc network routing protocols are generally classified into two types and they are proactive and demand based [1]. Proactive routing continually maintains information on all available paths using periodic updates so when a packet needs to be sent, routes are known and can be used immediately. The proactive method takes little time to discover routes but must maintain routing information for unused paths. Demand based routing, rather than maintaining paths between all nodes at all times, invokes a route discovery procedure on demand. Demand based schemes use less network bandwidth as they avoid sending unnecessary routing information but they typically take longer to discover routes.
The major focus in such environment is to provide scalable routing in the presence of mobile nodes. Several multicast routing protocols have been proposed for Ad hoc networks, which are classified as either *mesh based* or *tree based*. In a mesh based multicast protocol, there may be more than one path between a pair of source and receiver, thus providing more robustness compared to tree based multicast protocols. In a tree based multicast protocol, there is only a single path between a pair of source and receiver, thus leading to higher multicast efficiency.

All nodes in the adhoc networks behave as routers and take part in discovery and maintenance of routes to the other nodes in the network. Ad hoc networks have to pact with numerous challenges and the most important issue is route selection. So the routing algorithm must be dynamic and must be adaptive to the frequent topology changes due to node mobility. Many algorithms have been proposed and that can be used in ad hoc networks for finding routes [1][2][3]. Availability of low cost wireless devices and enormous application areas of ad hoc networks has encouraged researchers to develop new and efficient routing protocols. A key component of Ad-Hoc wireless network is an efficient routing protocol since all the nodes in the network act as routers. Ad-Hoc network routing protocols are difficult to design because of its highly dynamic nature and due to high mobility of the nodes. It needs to operate efficiently with limited resources such as network bandwidth, CPU processing capacity, memory and battery power of each individual node in the network. An idea and constitution of Ad-Hoc networks make them prone to be easily attacked using several techniques such as modification, impersonation, and fabrication.

Intelligent network (IN) is an important service system in current telecommunication network and it has little vulnerability analysis. IN is computing system and support Internet service as advanced ability. Its vulnerability and security problem should be cared in order to reduce security risks and avoid losing.

During the MANET operation, the network's efficiency might decline according to changes in the network context. However, a different routing protocol can give better performance for the same context, i.e. a routing protocol that is not optimally chosen could cause a severe degradation in the network performance.

Multicasting [2] has emerged as one of the most focused areas in the field of networking. As the technology and popularity of the Internet have grown, applications that require multicasting (e.g., video conferencing) are becoming more widespread. Another interesting recent development has been the emergence of dynamically reconfigurable wireless ad hoc networks to interconnect mobile users for applications ranging from disaster recovery to distributed collaborative computing. Multicast plays a key role in ad hoc networks because of the notion of teams and the need to show data/images to hold conferences among them. Protocols used in static networks (e.g., DVMRP [7], MOSPF [14], CBT [2], and PIM [8]), however, do not perform well in a dynamically changing ad hoc network environment. Multicast tree structures are fragile and must be readjusted continuously as connectivity changes. Furthermore, typical multicast trees usually require a global routing substructure such as link state or distance vector. The frequent exchanges of routing link state tables are triggered by continuous topology changes, yields excessive channel and processing overhead. Limited bandwidth, constrained power, and mobility of network hosts make the multicast protocol design particularly challenging to overcome these limitations, we have developed the On- Demand Multicast Routing Protocol (ODMRP). ODMRP applies *on-demand* routing techniques to avoid channel overhead and improve scalability. It uses the concept of *forwarding group* [5], a set of nodes responsible for forwarding multicast data on shortest paths between any member pairs, to build a forwarding *mesh* for each multicast group. By maintaining and using a mesh instead of a tree, the drawbacks of multicast trees in mobile wireless networks (e.g., intermittent connectivity, traffic concentration, frequent tree reconfiguration, non-shortest path in a shared tree, etc.) are avoided. A *softstate* approach is taken in ODMRP to maintain multicast group members. No explicit control message is required to leave the group. We believe the reduction of channel/storage overhead and the relaxed connectivity make ODMRP more scalable for large networks and more stable for mobile wireless networks.

2. VARIOUS MULTICAST ROUTING PROTOCOLS:

2.1. Tree-Based Multicast:

A tree-based multicast routing is presented for all direct networks, regardless of interconnection topology. The algorithm delivers a message to any number of destinations using only a single start up phase. A tree-based multicast routing protocol establishes and maintains a shared multicast routing tree to deliver data from a sender to receivers of a multicast group and there is only a single path between a pair of sender and receiver, thus leading to higher multicast efficiency. In the tree-based multicasting, structure can be highly unstable in multicast ad-hoc routing protocols, as it needs frequent re-configuration in dynamic networks

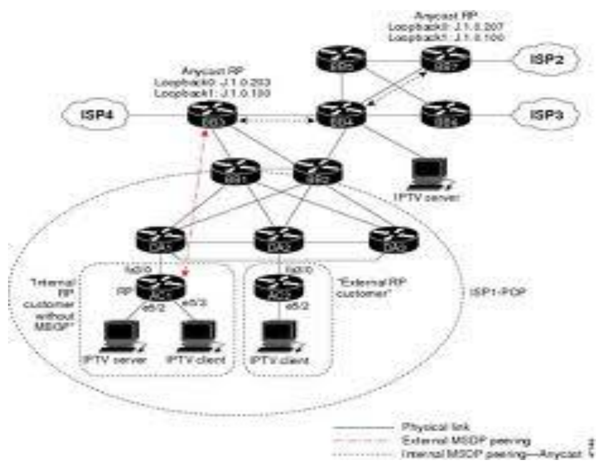

Fig-1:

2.2. Mesh-Based Multicast:

A mesh-based multicast routing protocol maintains a mesh consisting of a connected component of the network and it contains all the receivers of a group. In this, there may be more than one path between a pair of source and receiver, thus providing more robustness compared to tree based multicast protocols. Mesh-based multicast routing protocols are more than one path may exist between a sender and receiver pair.

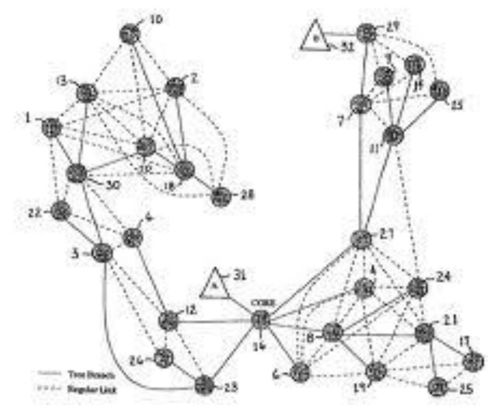

Fig-2:

Performance:

To measure external performance of this protocol, we consider throughput and end-to-end delay as metrics and to measure internal performance of this protocol; we consider routing overhead, normalized routing load, packet delivery ratio and average hop count as metrics.

Forming self organizing networks helps in reducing the network time and space and it should support quality of service (QoS) [4]. It is difficult or even impossible to describe the routing information accurately in these networks. In this paper, self-organizing behaviours are introduced based on bio-inspired networking and a QoS multicast routing scheme based on AntNet[5] is devised to find a QoS multicast path with utility win-win.

Two technologies are currently in demand on the Internet. One is Quality of Service (QoS) guarantee, which is a necessity for realizing applications that have strict QoS requirements for telephone and video transmissions. The other is multicasting, for transmitting data to multiple receivers simultaneously. Obviously, QoS guarantee requires QoS routing and multicasting requires multicast routing.

But QoS routing is also necessary for multicasting and multicast routing is necessary for QoS guarantee. Protocols that realize only one of the two are of little use in practice. It is necessary to have protocols that are designed for both. We propose such a protocol.

The paper uses the tree model by exploiting minimum route discovery of ant-like agents. Choosing the next hop based on probabilities calculated by pheromone trail causes the routing algorithm to evade from dead-end and make more consistencies with mobile networks [4,5]. Pheromone trail and evaporation result in performing autonomous traffic management and tolerating changes of subscriber’s interests and network topology.

AQM is compared to a non- QoS scheme with particular emphasis on these criteria. Simulation results show that, by applying QoS restrictions, AQM significantly improves multicasting efficiency. Thus, QoS is both essential for and applicable to multicasting in order to support mobile multimedia applications in ad hoc networks.

Quality of service: dynamic network topology, make it difficult to perform efficient resource utilization or to execute critical real-time applications in such environments. to effectively control the total traffic that can flow into the network. QoS multicast routing is a routing mechanism under which paths for flows are determined according to resource availability in the network as well as the QoS requirement of flows. QoS multicast routing means that it selects routes with sufficient resources for the requested QoS parameters. The goal of QoS multicast routing has two points. The first one is to meet the QoS requirements for each admitted connection, and the second one is to achieve global efficiency in resource utilization. Thus, QoS routing will consider multiple constraints and provide better load balance by allocating traffic on different paths, subject to the QoS requirement of different traffic.

2.3. Cross -layer design for multicast QoS

In QoS the system performance in wireless networks can be enhanced by taking available information across different layers of the network. In cross-layer enhancement to QMR, admission control at the network layer makes a decision to accept or reject the new request depends on the information that comes from the MAC layer.

2.4. Issues in Designing a Multicast Routing Protocol:

Many unique characteristics of MANETs have posed new challenges in multicast routing protocol design like dynamic network topology, energy constraints, lack of network scalability and a centralized entity, and the different characteristics between wireless links and wired links such as limited bandwidth and poor security.

- **Robustness**: Because nodes will be moving, link failures are common in MANETs. Data sent by a source may be dropped, which results in a low packet delivery ratio. Hence, a multicast routing protocol should be robust enough to withstand the mobility of nodes and achieve a high packet delivery ratio.
- **Efficiency**: In an ad hoc network environment, where the bandwidth is scarce, the efficiency of the multicast routing protocol is very important. “Multicast efficiency” is defined as the ratio of the total number of data packets received by the

receivers to the total number of data and control packets transmitted in the network.

- **Control overhead:** To keep track of the members in a multicast group, the exchange of control packets is required. This consumes a considerable amount of bandwidth. Because bandwidth is limited in ad hoc networks, the design of a multicast protocol should ensure that the total number of control packets transmitted for maintaining the multicast group is kept to a minimum.
- **Quality of service**: dynamic network topology, make it difficult to perform efficient resource utilization or to execute critical real-time applications in such environments. to effectively control the total traffic that can flow into the network. QoS multicast routing is a routing mechanism under which paths for flows are determined according to resource availability in the network as well as the QoS requirement of flows. QoS multicast routing means that it selects routes with sufficient resources for the requested QoS parameters. The goal of QoS multicast routing has two points. The first one is to meet the QoS requirements for each admitted connection, and the second one is to achieve global efficiency in resource utilization. Thus, QoS routing will consider multiple constraints and provide better load balance by allocating traffic on different paths, subject to the QoS requirement of different traffic.
- **Dependency on the unicast routing protocol**: If a multicast routing protocol needs the support of a particular routing protocol, then it is difficult for the multicast protocol to work in heterogeneous networks. Hence, it is Desirable if the multicast routing protocol is independent of any specific unicast routing protocol.
- **Resource management**: Ad hoc networks consist of a group of mobile nodes, with each node having limited battery power and memory. An ad hoc multicast routing protocol should use minimum power by reducing the number of packet transmissions. To reduce memory usage, it should use minimum state information.

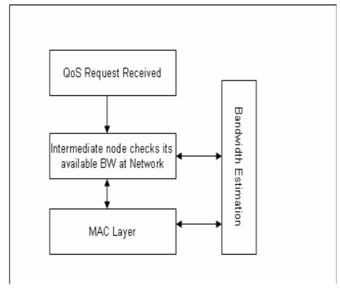

Fig-3: Cross -layer QoS framework

The QMR protocol address the impact of mobility by updating forward nodes (FNs) periodically by freeing the allocated BW for old paths and allocating it for new paths[6]. However, there might be an interval where FNs in the old path might not be aware that the amount of allocated bandwidth was changed since we use 5 second FN update intervals. During this time, QoS requirements of other ongoing flows that use the same or nearby FNs are respected and protected. This is better than using extra overhead to free the allocated bandwidths. This proposed version of bandwidth estimation is what is found in E-QMR.

3. ON-DEMAND MULTICAST ROUTING PROTOCOL:

In ODMRP, group membership and multicast routes are established and updated by the source *on demand*. Similar to on-demand unicast routing protocols, a request phase and a reply phase comprise the protocol (see Fig. 3.1).

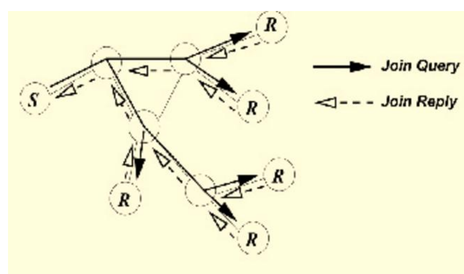

Fig-4: On-Demand Procedure for Membership Setup and Maintenance.

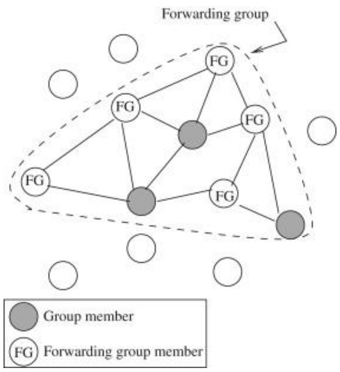

Fig 5: The forwarding group concept

When the JOIN REQUEST packet reaches a multicast receiver, the receiver creates or updates the source entry in its Member Table. While valid entries exist in the Member Table, JOIN TABLES are broadcasted periodically to the neighbours. When a node receives a JOIN TABLE, it checks if the next node ID of one of the entries matches its own ID. If it does, the node realizes that it is on the path to the source and thus is part of the forwarding group.

The forwarding group is a set of nodes in charge of forwarding multicast packets. It supports shortest paths between any member pairs. All nodes inside the .bubble. (Multicast members and forwarding group nodes) forward multicast data packets. Note that a multicast receiver can also be a forwarding group node if it is on the path between a multicast source and another receiver. The mesh provides richer connectivity among multicast members compared to trees. Flooding redundancy among forwarding group helps overcome node displacements and channel fading. Hence, unlike trees, frequent reconfigurations are not required.

The advantages of ODMRP are:

- Low channel and storage overhead
- Usage of up-to-date and shortest routes
- Robustness to host mobility
- Maintenance and exploitation of multiple redundant paths
- Scalability to a large number of nodes

3.1. Associativity Based Routing (ABR)

The Associativity Based Routing (ABR) protocol is in the family of MANET on-demand routing protocol. Its distinct feature is the use of associativity ticks which is required to only form routes based on the stability of nodes, under the fact that there is no use to form a route using a node which will be moving out of the topology and thus making the route to be broken. ABR therefore emphasizes on the longevity of the routes formed.

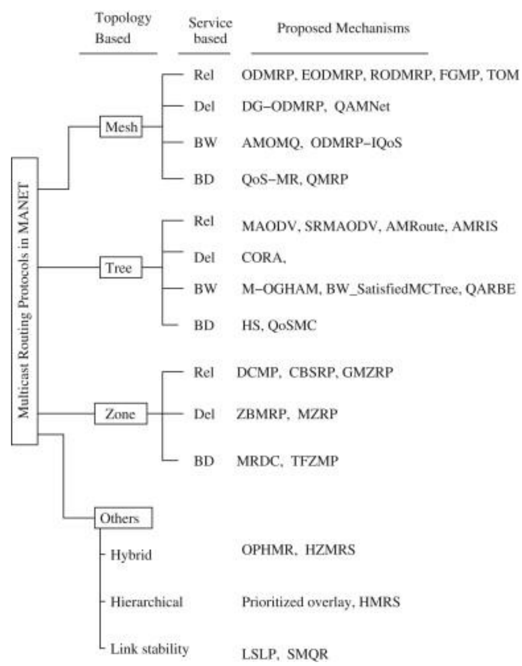

Fig-6: The Multicast operation of Ad-hoc On-demand Distance Vector (MAODV)

Most of the existing multicast routing protocols, such as DVMRP (Distance- Vector Multicast Routing protocol)[3] and FGMP (Forwarding Group Multicast Protocol)[4] require periodical transmission of control packets in order to maintain multicast group membership and multicast routes, thereby wasting a lot of bandwidth. But MAODV and ODMRP try to minimize the communicating overhead by invoking the route discovery process on-demand.

MAODV is an extension of AODV (Ad-hoc On-Demand Distance Vector) to support multicasting and it builds multicast trees on demand to connect group members. Route discovery in MAODV follows a route request/route reply discovery cycle. Multicast Ad hoc on demand distance vector routing protocols provides better performance as compared to the ad hoc on demand distance vector routing protocols in mobile ad hoc networks.

4. EABR- ENHANCED ASSOCIATIVITY BASED ROUTING PROTOCOL

EABR consists of two phases, namely route discovery and phase and route reconstruction phase. The analysis of the EABR depends on two factors; Operation complexity (OC), which can be defined as the number of steps required in performing a protocol operation and Communication complexity (CC), which can be defined as the number of messages exchanged in performing a protocol operation [1]. The values represent the *worst-case* analysis.

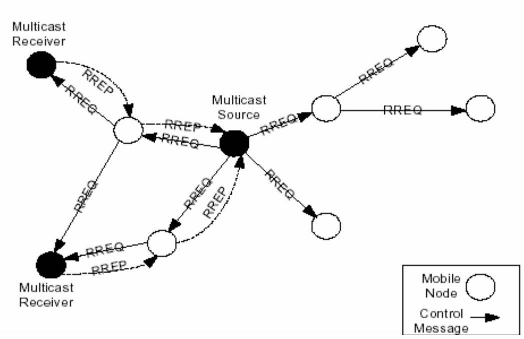

Fig 7: Pure Adaptive Routing (PAR)

This routing protocol not only provides a better way to discover a QoS and energy efficient route but it considers an efficient route maintenance scheme. Route maintenance scheme has greatly enhanced the performance of the protocol in terms of network life time and packet delivery ratio. Simulation results show that the performance of the proposed protocol is better than DSR for different network scenarios.

4.1.Multiple Constrained long life QoS Multicast Routing protocol in Adhoc (CQMRA).

The key idea of CQMRA protocol is to construct the new metric-entropy and select the stability path with the help of entropy metric to reduce the number of route reconstruction so as to provide QoS guarantee in the ad hoc network. This protocol is to develop a protocol to find out QoS based multicast routing provisioning for guaranteed QoS, and to reduce the protocol's complexity through the local broadcasting feature in the ad hoc networks.

4.2. MRMP (*Maximum-Residual Multicast Protocol*) is a power-aware multicast protocol designed for large-scale mobile ad hoc networks, in which nodes may be with high mobility. Most of the existing results rely on the knowledge of certain global information, such as the remaining energy of all nodes and the minimum transmission power between every pair of nodes. The maintenance problem of similar global information is highly challenging in protocol designs because of the difficulty and cost in the maintenance of up-to-date information. As a result, various assumptions, such as static network topologies and fixed traffic patterns, are made to reduce the problem complexity.

5. FUTURE WORK:

In future we propose a new routing multicast algorithm which has more minimum transmission power and the time of transmission will duly be less in a multicast routing thereby duly reducing the wastage of bandwidth and try to minimize the communicating overhead by invoking the route discovery process .The cost of the routing has to be reduced as a challenge. This protocol is to develop a protocol to find out QoS based multicast routing provisioning for guaranteed QoS, and to reduce the protocol's complexity through the local broadcasting feature in the ad hoc networks.

CONCLUSION:

In this paper an on demand quality of service based pure adaptive routing protocol is proposed for mobile ad hoc networks. This protocol finds a route with end to end QoS constraints together with energy efficiency from a source to destination. We have discussed the multicast routing protocols with multiple QoS constraints, which may deal with the bandwidth, entropy and cost metrics, and describes a network model for researching the ADHOC QoS multicast routing problem. Various other protocol techniques have been discussed to ensure that the routing in multicast network will be helpful in improving the QoS in network environment which results in an optimistic time complexity, usage of bandwidth.

The EABR proofed to be better in route reconstruction, which is attributed to the novel way.

REFERENCES:

1. Toh, C.K., 2002. Ad Hoc Mobile Wireless Networks: Protocols and Systems. Prentice Hall.

2. Tanenbaum, A.S., 2003. Computer Networks. Fourth Edn., Prentice Hall.

3. C. Perkins, E. Belding-Royer, and S. Das. Ad hoc On-Demand Distance Vector (AODV) Routing. RFC 3561 (Experimental), July 2003.

4. C.Siva Rammurty and B.S.Manoj [2011],"Ad hoc wireless networks architectures and protocols".

5. S.J. Lee, M. Gerla, C.C. Chiang [Sept 1999], On Demand Multicast Routing Protocol. Proceedings of IEEE WCNC'99, New Orleans, pages 1298-1302.

6.Configuration — IP Multicast Routing Protocols, Avaya Virtual Services Platform 9000.

7.Subir kumar sarkar T G Basavaraju C Puttamadappa [2008],"Ad hoc Mobile Wireless Networks Principles ,Protocols and Applications".

8.T. Ballardie, P. Francis, and J. Crowcroft, "Core Based Trees (CBT): An Architecture for Scalable Inter-Domain Multicast Routing," ACM SIGCOMM, pp. 85-95, San Francisco, CA, Sept. 1993.

9.Available: http://en.wikipedia.org/wiki

10.http://www.ietf.org/html.charters/manet-charter.html

11. C. Yuan and J. Billington, ―An Abstract Model of Routing in Mobile Ad Hoc Networks,‖ in Proc. of CPN'05, pp. 137–156, DAIMI PB-576, 2005.

12. Bertsekas, D. and Callager.R, (1987) "Data Networks", 5th International conference on computing and communication, pp.325- 333.

13. C.-C. Chiang, M. Gerla, and L. Zhang, "ForwardingGroup Multicast Protocol (FGMP) for Multihop, Mobile Wireless Networks", ACM-Baltzer Journal of Cluster Computing: Special Issue on Mobile Computing.

14. S. Corson, and J. Macker. Mobile ad hoc networking (manet): Routing protocol performance issues and evaluation considerations, 1999. DSR Rfc by D. Johnson Rice University Y. Hu UIUC D. Maltz Microsoft Research February 2007.