International Journal of Modern Engineering Research (IJMER)
www.ijmer.com Vol.3, Issue.1, Jan-Feb. 2013 pp-424-430 ISSN: 2249-6645

Comparative Study for MCDS and DSR Which Are Used For Packet Forwarding In Ad Hoc Network

Prof. Nirmala Chouhan Thorwe, [1] Dr. Dinesh. M. Yadav, [2] Manoj Chouhan[3]
[12]*Computer Engineering/BSIOTR – Pune*
[3]*Shri Vaishnav Institute of Technology and Science –Indore*

Abstract: *this paper provides a brief overview of the operation of the DSR protocol; providing only enough detail that the reader can understand the analysis of DSR And comparative study of MCDS and DSR which is used for better understanding of step by step packet forwarding in to the Ad Hoc network. MCDS algorithm and DSR Protocol both are used in Ad hoc networking. In DSR, Blind broadcasting is used.*

By using MCDS overcome from the limitation of DSR. It's proved comparative result on every step which is helpful for identify variation in packet forwarding.

Keywords: *Ad hoc, DSR, MCDS, Blind broadcasting, packet forwarding.*

I. Introduction

The routes that DSR discovers and uses are source routes. That is, the sender learns the complete, ordered sequence of network hops necessary to reach the destination, and, at a conceptual level, each packet to be routed carries this list of hops in its header. The key advantage of a source routing design is that intermediate nodes do not need to maintain up-to-date routing information in order to route the packets that they forward, since the packets themselves already contain all the routing decisions. MCDS provides solution for Blind broadcast in DSR.

II. Route Discovery in DSR

Route Discovery works by flooding a request through the network in a controlled manner, seeking a route to some target destination. In its simplest form, a source node A attempting to discover a route to a destination node D broadcasts a ROUTE REQUEST packet that is re-broadcast by intermediate nodes until it reaches D, which then answers by returning a ROUTE REPLY packet to A. Many optimizations to this basic mechanism are used to limit the frequency and spread of Route Discovery attempts. The controlled flood approach used by DSR works well in wired networks, but it is particularly well-suited to the nature of many wireless networks, where the communication channel between nodes is often inherently broadcast.

A single transmission of a ROUTE REQUEST is all that is needed to re-propagate the REQUEST to all of a node's neighbors. Figure 1.1 illustrates a simple Route Discovery. Before originating the ROUTE REQUEST, node **A** chooses a *request id* to place into the REQUEST such that the pair <originating address, request id > is globally unique.1 As the REQUEST propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the REQUEST on to its neighbors (any host within range of its wireless transmission). When receiving a REQUEST, if a host has recently seen this request id or if it finds its own address already recorded in the route, it discards that copy of the REQUEST and does not propagate that copy further.

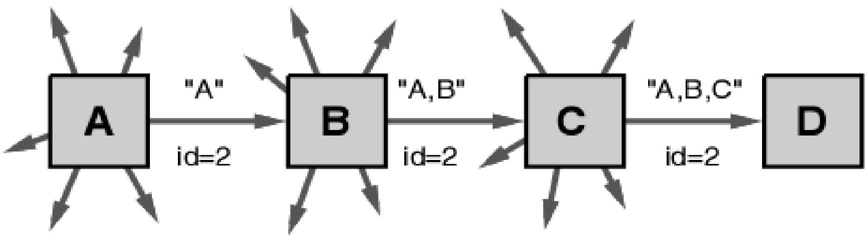


Figure 1.1 Basic operation of Route Discovery.

As a result of the duplicate check in the recorded source route, the algorithm for Route Discovery explicitly prohibits ROUTEREQUESTS from looping in the network. This is an important correctness property and is responsible for the loop-free property of DSR. The use of request ids represents a simple optimization that results in the ROUTE REQUESTs primarily spreading outwards from the originator, as shown in Figure 1.2, and curtails the number of REQUEST packets that circle around the originator.

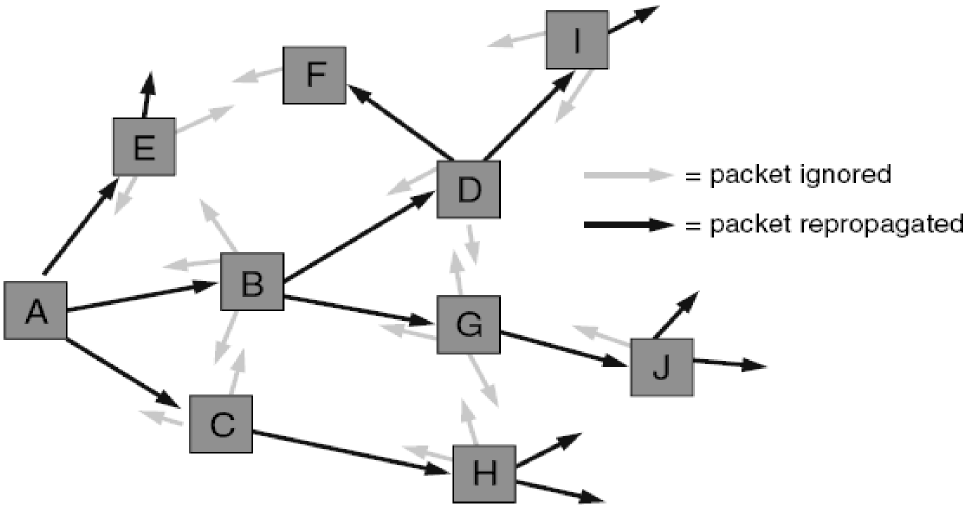


Figure 1.2 the use of request ids constrains the propagation of ROUTE

As an optimization, the protocol will still function correctly if the request ids are either not used or not cached long enough to prevent lateral movement of an outward propagating ROUTE REQUEST, though the overhead will REQUESTs into an organized outward-moving wave-front.be higher. While propagating a ROUTE REQUEST, nodes obey the normal rules for processing the Hop-Count or Time-to-Live field in the IP header of the packet carrying the ROUTE REQUEST. This mechanism can be used to implement a wide variety of "expanding ring" search strategies for the target, in which the hop limit is gradually increased in subsequent retransmissions of the ROUTE REQUEST for the target.

III. Proposed Solution MCDS

MCDS in mobile ad hoc network is treated as a virtual backbone for whole network. A virtual backbone structure on the ad-hoc network will useful, in order to support uncast, multicast, and fault-tolerant routing within the ad-hoc network. This virtual backbone differs from the wired backbone of cellular network. The hosts in the MCDS maintain local copies of the global topology of the network, along with shortest paths between all pairs of nodes. Finding a minimal CDS for a connected graph is an NP-hard problem. For a small graph, we can enumerate all possible cases to find a minimal solution. However, this approach is not feasible for larger graphs.

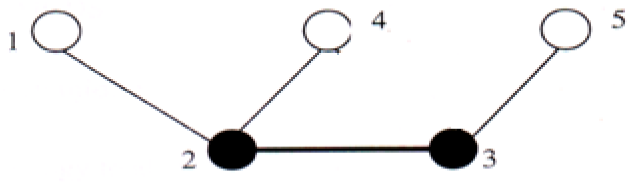


Fig 3.1 Two MCDS nodes in Ad Hoc Network

The algorithm for finding the MCDS can be classified into two categories:-
Findings a minimal CDS for a connected graph is an NP-hard problem. For a small graph, we can enumerate all possible cases to find a minimal solution. However, this approach is not feasible for larger graphs. Different approximation algorithms to find a minimal CDS have proposed. Generally distributed in to two classes:

- Global information based algorithms
- Local information based algorithms

Algorithms that use all information in the network are called global algorithms. The global algorithms assume that nodes keep identical copies of the entire topology. This is always true in a proactive link state routing protocol. Local algorithms utilize only local neighbor information.

The global algorithms, finds a dominating set 'c' in the first phase by selecting the node with the largest effective degree and stopping when "C" covers all nodes, (The effective degree is the number of neighbors not in c".) C' may contain several disconnected components. In the second phase, CDS tries to use the minimum number of extra nodes to connect the components of C' to form a CDS. In this phase, links are assigned weights. If a link connects two non-CDS nodes that are in the same component, this link is assigned weights of infinity. The weight for other links is the number of end points that are not in C". The lightest links are chosen to connect components. This phase ends when a CDS is found.

The different global algorithms, start at the node with the highest degree. It extends the set of selected CDS nodes by including the nodes adjacent to the current set that have the largest number of uncovered neighbors or two-hop uncovered neighbors until no uncovered nodes is left. The local algorithms are implemented in a distributed manner. This algorithms assumes that all nodes know all the other nodes that are within their two-hop range and that nodes have unique IDs. In the first phase, a nodes is selected as a potential member of the CDS if and only if it has two non-adjacent neighbors.

Nodes broadcast if they elect themselves as members of the potential CDS. Two extensions are used in the second phase to reduce the size of the CDS. A node stays in the CDS unless a neighbor CDS node with a larger ID covers its entire neighbor set. As an extension, if two adjacent CDS neighbors with larger IDs cover the neighbor set of a node, this node may change itself to a non-CDS node.

To determine routes with the MCDS, global knowledge of G is gathered into all the MCDS nodes and compute shortest paths based on local copies of G (akin to the link state approach restricted to MCDS Nodes. In general, the routes determined by the MCDS nodes do not pass through the MCDS.

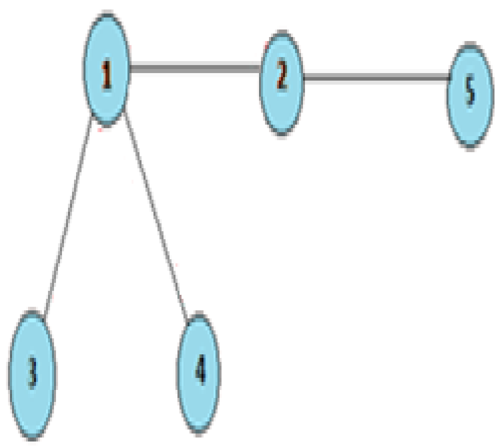
However, the MCDS can handle routes in two situations:

- When a non-MCDS edge or node fails, the MCDS provides an immediate backup route to use while another shortest path is found, and
- The MCDS can be used for multicast and broadcast routing.

At a high level of abstraction, the MCDS based routing algorithm consists of the following steps to determine routes:

- Compute the MCDS.
- Gather topology information from non-MCDS nodes to MCDS nodes.
- Broadcast topology to all MCDS nodes.
- Determine routes. Each node runs an all pairs shortest path algorithm on its local copy of graph.
- Propagate information out to non- MCDS nodes.
- Send periodic maintenance update. Every T second for some large value of T, the MCDS nodes repeat the topology broadcast step. This periodic broadcast ensures that the MCDS nodes recognize drastic topology changes.

IV. Testing set



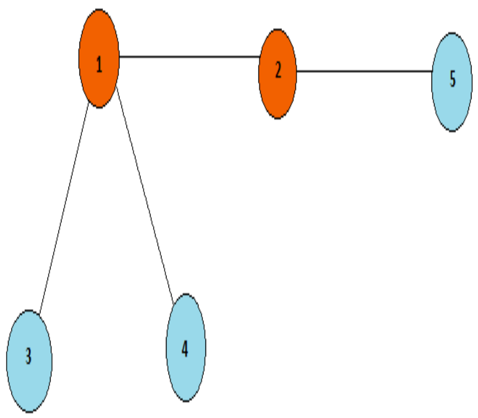


Fig 4.1 (a) DSR **(b)MCDS**

4.1 Connection between nodes represented by table for algorithm-II: -
(1 indicate connection and **0** indicate no connection between nodes)

	1	2	3	4	5
1	0	1	1	1	0
2	1	0	0	0	1
3	1	0	0	0	0
4	1	0	0	0	0
5	0	1	0	0	0

Table 4.1 Connections between nodes.

4.2 Value analysis for Node 1:-

Source node	Destination	DSR	MCDS
1	1	0	0
	2	3	1
	3	3	1
	4	3	1
	5	5	2

Table 4.2.1 Packet forwarding from NODE 1

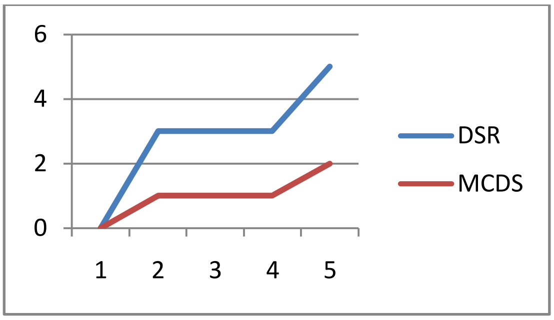


Fig. 4.2.1 Packet forwarding from NODE 1

4.3 Value analysis for Node2:-

Source node	Destination	DSR	MCDS
2	1	2	1
	2	0	0
	3	5	2
	4	5	2
	5	2	1

Table 4.3.1 Packet forwarding from NODE 2

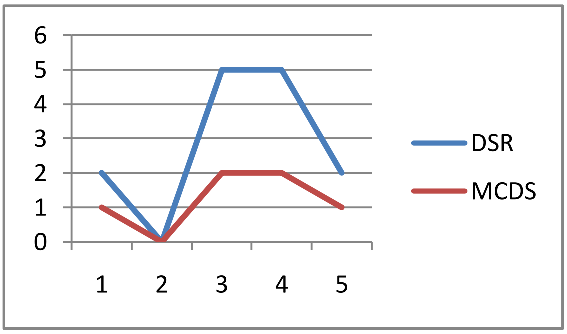


Fig. 4.3.1 Packet forwarding from NODE 2

4.4 Value analysis for Node 3 :-

Source node	Destination	DSR	MCDS
3	1	1	1
	2	3	2
	3	0	0
	4	6	2
	5	6	3

Table 4.4.1 Packet forwarding from NODE3

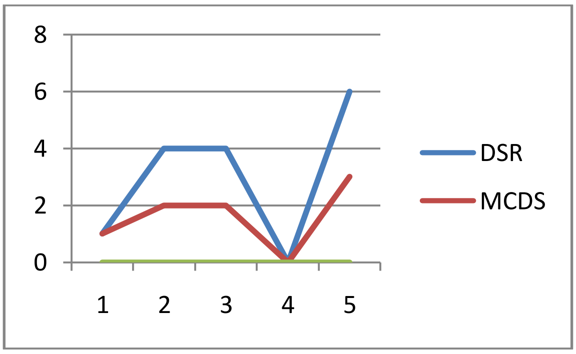


Fig. 4.4.1 Packet forwarding from NODE 3

4.5 Value analysis for Node 4 :-

Source node	Destination	DSR	MCDS
4	1	1	1
	2	4	2
	3	4	2
	4	0	0
	5	6	3

Table 4.5.1 Packet forwarding from NODE 4

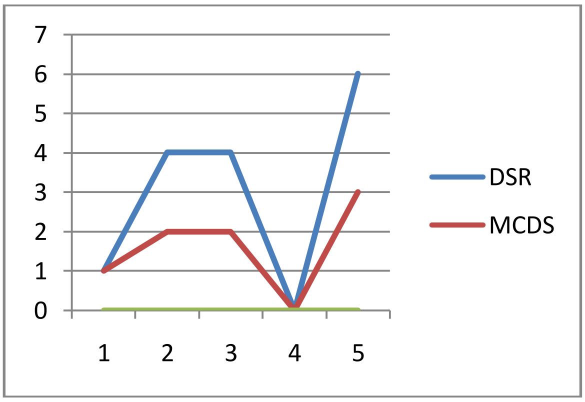


Fig. 4.5.1 Packet forwarding from NODE 4

4.6 Value analysis for Node 4 :-

Source node	Destination	DSR	MCDS
5	1	2	2
	2	1	1
	3	6	3
	4	6	3
	5	0	0

Table 4.6.1 Packet forwarding from NODE 5

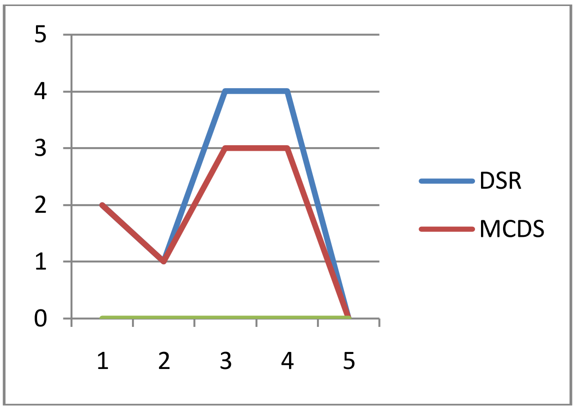


Fig. 4.6.1 Packet forwarding from NODE 5

V. All routing Analysis

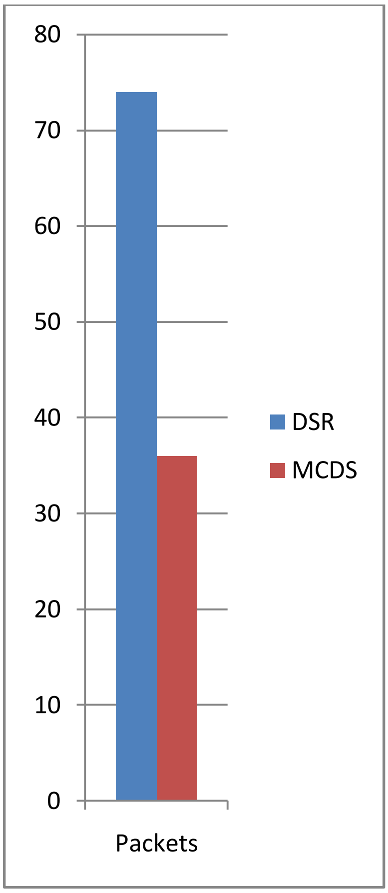


Table 5.1 Total Packet forwarding

Total Number of forwarding	DSR	MCDS
Packets	74	36

Fig 5.1 Results

VI. Conclusions

When the performance of DSR, in terms of packet loss rate and routing protocol overhead, is compared with that of three other routing protocols are DSDV, TORA, DSR, AODV designed for use in multi-hop ad hoc networks, DSR significantly outperforms the other protocols across a wide range of scenarios. If DSR protocol use MCDS algorithm for routing in ad hoc network then it is possible to significant reduction of overhead by using the MCDS to reduce redundancy due to blind broadcasts in DSR protocol. In DSR 74 packet forwarding is needed and in MCDS 36. With the help of resulting packet ratio, DSR with MCDS is better than simple DSR.

6.1 Various advantages of applying DSR on MCDS are:-

1. Total number of Nodes: - Fig 6.1.1 shows that the number of nodes in reaching from source to destination can be reduced

2. Time: **-** The above example helps to reduce the extra time required during route discovery to find the path from source to destination .Instead the path is already maintained by the MCDS members of the graph.

3. Broadcasting: - The Source need not broadcast the route request to all its neighbors; instead it can send the request only to the MCDS neighbors.

4. Bandwidth consumption: - The packet header size grows with the route length resulting in more bandwidth utilization. Thus, by applying DSR over MCDS, there is a significant reduction in total number of nodes, thereby reducing the bandwidth consumption.

6.2 Limitation

For example if a wireless ad hoc network is in form of a graph as shown in figure(a) then MCDS obtained by using algorithm in this like figure(b) where, black nodes is minimal connected dominating set. But practically it is not possible case for figure (a).

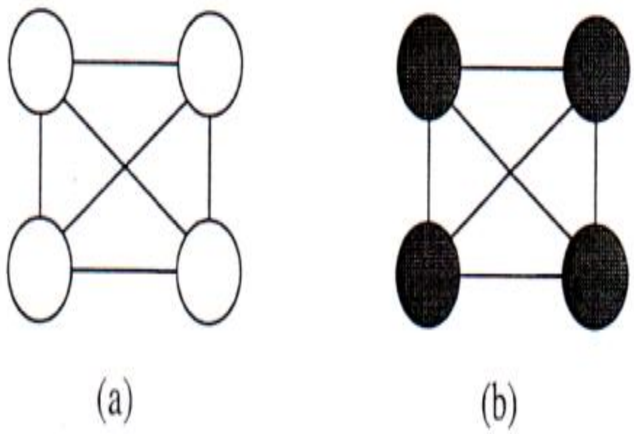


Fig 6.2.1

6.3 Future Scope

Numerous areas for future research can be described using this report. The various areas are:**-**

1 Node mobility:-The topology change is one of the most important issues in ad hoc network. Various researches can be done in this field.

2 Multi hop:-All the research work has been done considering the nodes at 1 hop or 2 hop distance .The efforts can be made to apply the work done in the cases of multi hop distance

While many challenges remain to be resolved before large scale MANETs can be widely deployed, small-scale mobile ad hoc networks will soon appear. If the above mentioned scopes can be successfully applied to the ad hoc networks this field will act as a boom to the wireless transmission.

REFERENCES

[1] A Distributed approach for computing the minimum connected dominating set in ad hoc networks by Kais Mnif , Bo Rond and Michel Kadoch
[2] David B. Johnson, David A. Maltz, and Josh Broch. DSR The Dynamic Source Routing Protocol for Multihop Wireless Ad Hoc Networks. In Ad Hoc Networking, edited by Charles E. Perkins, chapter 5, pages 139–172. Addison-Wesley, 2001.
[3] David B. Johnson, David A.Maltz, Yih-Chun Hu, and Jorjeta Jetcheva. The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks. Internet-Draft, draft-ietf-manet-dsr-04.txt, November 2000. Work in progress.
[4] David A.Maltz. Resource Management in Multi-hop Ad Hoc Networks. Technical Report CMU CS TR00-150, School of Computer Science, Carnegie Mellon University, November 1999. Available from http://www.monarch.cs.cmu.edu/papers.html.
[5] M. Scott Corson and Anthony Ephremides. A Distributed Routing Algorithm for Mobile Wireless Networks. Wireless Networks, 1(1):61–81, February 1995.
[6] National Science Foundation. Research Priorities in Wireless and Mobile Communications and Networking: Report of a Workshop Held March 24–26, 1997, Airlie House, Virginia. Available at http://www.cise.nsf.gov/anir/ww.html.
[7] RajendraV. Boppana and Satyadeva P. Konduru. An Adaptive Distance Vector Routing Algorithm for Mobile, Ad Hoc Networks. In Proceedings of IEEE INFOCOM 2001, pages 1753–1762, Anchorage, Alaska, April 2001.
[8] IEEE Computer Society LAN MAN Standards Committee. Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, IEEE STD 802.11-1999. The Institute of Electrical and Electronics Engineers, New York, New York, 1999.

[9] John Jubin and Janet D. Tornow. The DARPA Packet Radio Network Protocols. Proceedings of the IEEE, 75(1):21–32, January 1987.
[10] Stephen E. Deering and Robert M. Hinden. Internet Protocol, Version 6 (IPv6) Specification. RFC 2460, December 1998.
[11] Charles E. Perkins and Pravin Bhagwat. Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers. In Proceedings of the SIGCOMM '94 Conference on Communications Architectures, Protocols and Applications, pages 234–244, August 1994. A revised version of the paper is available from http://www.cs.umd.edu/projects/mcml/pub.html.
[12] On-Demand Multicast Routing in Ad Hoc Networks with Unidirectional Links Jorjeta G. Jetcheva and David B. Johnson December 15, 2004 CMU-CS-04-175 School of Computer Science Computer Science Department Carnegie Mellon University Pittsburgh, PA 15213
[13] Vincent D. Park and M. Scott Corson. A Highly Adaptive Distributed Routing Algorithm for Mobile Wireless Networks. In Proceedings of INFOCOM'97, pages 1405–1413, April 1997.
[14] Vincent D. Park and M. Scott Corson. Temporally-Ordered Routing Algorithm (TORA) Version 1: Functional Specification. Internet-Draft, draft-ietf-manet-tora-spec-01.txt, August 1998. Work in progress.
[15] M. S. Corson, S. Papademetriou, P. Papadopoulos, V. Park, and A. Qayyum. An Internet MANET Encapsulation Protocol (IMEP) Specification. Internet-Draft, draft-ietf-manet-imep-spec-01.txt, August 1998. Work in progress.
[16] David B. Johnson and David A. Maltz. Dynamic Source Routing in Ad Hoc Wireless Networks. In Mobile Computing, edited by Tomasz Imielinski and Hank Korth, chapter 5, pages 153–181. Kluwer Academic Publishers, 1996.
[17] DavidA.Maltz, JoshBroch, and David B. Johnson. Experiences Designing and Building a Multi-Hop Wireless Ad Hoc Network Testbed. Technical Report 99-116, School of Computer Science, Carnegie Mellon University, March 1999. Available from http://www.monarch.cs.cmu.edu/papers.html.
[18] Charles Perkins, editor. IP Mobility Support. Internet Request For Comments RFC 2002, October 1996.
[19] Josh Broch, David A. Maltz, and David B. Johnson. Supporting Hierarchy and Heterogeneous Interfaces in Multi-Hop Wireless Ad Hoc Networks. In Proceedings of the Workshop on Mobile Computing held in conjunction with The International Symposium on Parallel Architectures, Algorithms, and Networks, pages 370–375, Perth, Australia, June 1999.
[20] Elizabeth M. Royer and C.K. Toh. "A Review of current routing protocols for ad-hoc mobile wireless networks, ' IN IEEE personal communication magazing, pp. 46-55, April 1999