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Study and Performance Comparison of MANET Unicast Routing Protocol

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Abstract----The task of finding and sustaining routes in Mobile Ad-hoc Networks (MANETS) is an important factor in determining the efficiency of any MANET protocol. MANET characteristically is an autonomous system of mobile nodes connected by wireless links without any centralized infrastructure. Absence of fixed infrastructures and host mobility thus network may experience rapid and unpredictable topology changes. Hence, routing is required in order to perform communication among the entire network. There are several unicasting routing protocols namely proactive, reactive and hybrid etc. In this paper, we have studied details of AODV, DSR, TORA, DSDV, WRP, OLSR, ZHLS and ZRP routing protocols which are routing protocols on use in MANET This paper just presents the impact of comparison of different routing protocol in terms of different parameters.

I. MOBILE ADHOC NETWORK (MANET)

A MANET is an infrastructure less network because mobile nodes in the network subject to change and create paths dynamically among themselves to broadcast packets. Each node functions as a router to forward packets if it is not an end node. MANET can be viewed as a random graph because the nodes in the wireless network keep on moving. The nodes can move anywhere and organize themselves into the network. Since MANET has dynamic topology, it possesses several salient features like resource constraints, limited physical security, and no infrastructure.

Characteristics of MANET

MANETS have several salient characteristics:

- **Dynamic Topologies:** Nodes are free to move arbitrarily; thus, the network topology which is typically multichip may change randomly and rapidly at unpredictable times, and may consist of both bidirectional and unidirectional links.
- **Bandwidth-constrained:** Variable capacity links: Wireless links will continue to have significantly lower capacity than their hardwired counterparts. In addition, the realized throughput of wireless communications after accounting for the effects of multiple access, fading, noise, and interference conditions, etc.--s often much less than a radio's maximum transmission rate.

One effect of the relatively low to moderate link capacities is that congestion is typically the norm rather than the exception, i.e. aggregate application demand will likely approach or exceed network capacity frequently. As the mobile network is often simply an extension of the fixed network infrastructure, mobile ad hoc users will demand similar services. These demands will continue to increase as multimedia computing and collaborative networking applications rise.

- **Energy-constrained operation:** Some or all of the nodes in a MANET may rely on batteries or other exhaustible means for their energy. For these nodes, the most important system design criteria for optimization may be energy conservation.
- **Limited physical security:** Mobile wireless networks are generally more prone to physical security threats than are fixed- cable nets. The increased possibility of eavesdropping, spoofing, and denial-of-service attacks should be carefully considered.
- **Error-prone channel state:** The characteristics of the links in a wireless network typically vary, and this calls for an interaction between the routing protocol, necessary, find alternate routes.[4]
- **Hidden problem:** Node A and node C are in range for communicating with node B, but not with each other. In the event that both try to communicate with node B simultaneously, A and C might not detect any interference on the wireless medium. Thus, the signals collide at node B, which in turn will be unable to receive the transmissions from either node. The typical solution for this so-called “Hidden terminal” problem is that the nodes coordinate transmissions themselves by asking and granting permission to send and receive packets. This scheme is often called RTS/CTS (Request To Send/Clear To Send).
- **Exposed terminals:** Consider a topology similar to that of previous figure, but with an added node D only reachable from node C. Furthermore, suppose node B communicates with node A, and node C wants to transmit a packet to node D. During the transmission between node B and node A, node C senses the channel as busy. Node C falsely concludes that it may not send to node D, even though both the transmissions (i.e., between node B and node A, and between node C and node D) would succeed. Bad reception would only occur in the zone between node B and node C,

where neither of the receivers is located. This problem is often referred to as "the exposed terminal problem". Both the hidden and the exposed terminal problem cause significant reduction of network throughput when the traffic load is high.[4] Existing link security techniques are often applied within wireless networks to reduce security threats. As a benefit, the decentralized nature of network control in MANETs provides additional robustness against the single points of failure of more centralized approaches.

In addition, some envisioned networks (e.g. mobile military networks or highway networks) may be relatively large (e.g. tens or hundreds of nodes per routing area). The need for scalability is not unique to MANETS. However, in light of the preceding characteristics, the mechanisms required to achieve scalability likely are.

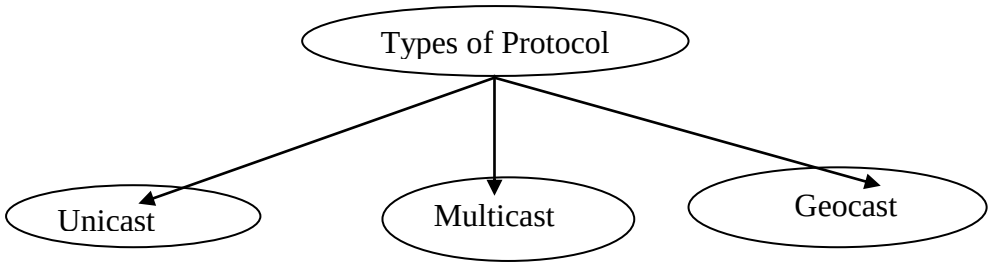
These characteristics create a set of underlying assumptions and performance concerns for protocol design which extend beyond those guiding the design of routing within the higher-speed, semi-static topology of the fixed Internet.

II. Routing protocols in MANET

Routing is the process to moving information / packet from a source node to a destination node in a mobile ad-hoc network.

Classification of Routing protocols in MANET

Protocols can be assumed to operate at unicast, multicast, geocast or broadcast situations.



In **unicast protocols** one source transmits messages or data packets to one destination. That is the most normal operation in any network. The unicast protocols are also the most common in adhoc environment to be developed and they are the basis on which it is a possibility to construct other type of protocols. Unicast protocols have thought some lacks when there is a need to send same message or stream of data to multiple destinations. So there is an evitable need for multicast protocols. While forwarding data packet dispatch node use the destination address in the data packet to look it up in routing table. If the destination address found in routing table the data packet will send to the corresponding next hop. But in such condition every node maintains the routing table in network. So the problem is that how the routing table is created and maintained in MANET

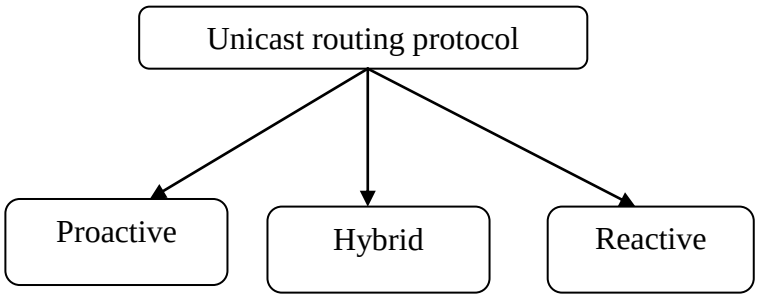
Multicast routing protocols try to construct a desirable routing tree or a mesh from one source to several destinations. These protocols have also to keep up with information of joins and leave ups to a multicast group.

The purpose of **geocast protocols** is to deliver data packets for a group of nodes which are situated on at specified geographical area. That kind of protocol can also help to alleviate the routing procedure by providing location information for route acquisition.

Broadcast is a basic mode of operation in wireless medium. Broadcast utility is implemented in protocols as a supported feature. Protocol only to implement broadcast function is not a sensible solution. That is the reason not to classify protocols to broadcast protocols.

III. Unicast Routing Protocols

Unicast routing protocols are further divided into three categories:



Proactive or Table Driven unicast routing protocol

In Proactive Unicast routing protocol each node in MANET maintains routing information to every other node in network to compute shortest path from the source to every destination node, which consumes lots of bandwidth. Such routing information is kept in many different types of tables. Such tables are time to time updates if network topology

changes or a node moves from network. Proactive routing is unsuitable for highly dynamic networks because routing tables must be updated with each topology change, this leads to increased control message overheads which can degrade network performance at high loads.

Proactive unicast routing protocol are Divided as Optimized Link State Routing Protocol (OLSR), Destination-Sequenced Distance- Vector (DSDV) Routing.

	DSDV	**WRP**	**OLSR**
Routing Philosophy	Flat	Flat	Flat
Multi cast capability	NO	NO	No
No. of Required tables	2	4	3
Frequency of update transmission	Periodically & as needed	Periodically & as needed	Periodic
Advantage	Loop free	Loop free	Reduced control overhead and connection
Disadvantage	High overhead	High Memory overhead	2 hop neighbor knowledge required

IV. Reactive Unicast Routing Protocol:

Reactive protocols are also known as On demand routing protocol. Such protocol were reduced the overheads of proactive protocol by maintaining route information for active routes. Its mean the routing information is required and maintained only when one node wants to send data packet to destination. The concept of Reactive protocol was proposed to keep the waste of bandwidth as little as possible. In reactive routing protocol the overall routing process is divided into following steps.

a) ***Route Discovery Process:*** In route discovery process of MANET, if source node does not have route information in its routing table, source node broadcast a route discovery packet to the MANET to find out route between source and destination.

b) ***Routing Maintenance:*** once the route between source and destination has been setup. Route maintenance takes place, because mobile nodes move regularly or dead because of battery drain in a network. In such situation link failure were found along with path, source will reinitiate to find new path.

Reactive unicast routing protocol are Divided as Dynamic Source Routing Protocol (DSR) and Ad-hoc On-Demand Distance Vector Routing Protocol (AODV)..

	AODV	**DSR**	**TORA**
Routing metric	Freshest & shortest Path	Shortest path	Shortest path
Route Maintained in	Route table	Route cache	Route table
Route configuration methodology	Erase route; notify short	Erase route; notify short	Link reversal & route repair
Loop free	Yes	Yes	Yes
Multiple route	No	Yes	Yes
Advantage	Adaptive to highly, dynamic topologies, Low overhead	Multiple routes, Loop free, promiscuous overhead	Multiple routes
Disadvantage	Scalability problems, Large delays , hello message	Scalability problems, Large delays , hello message	Temporary routing loops, overall complexity

V. Hybrid routing

These are protocols in which the routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding Some of the Hybrid Routing Protocols are: HWMP (Hybrid Wireless Mesh Protocol), OORP (Orde-rone Routing Protocol),ZRP (Zone Routing Protocol)[9]. Routing protocols for VANETs should rely on packet for-warding based on geographic location of sender and receiver, also should be broadcast oriented.

Hybrid protocols are the protocol which combines the nature of both proactive routing protocol and reactive routing protocol. Hybrid protocols are known as new generation protocols. Hybrid protocol reduced route discovery overheads by allowing nodes with closeness to work together to from some short of a backbone. Hybrid protocols are proposed based on zone (region). It means a network is divided into number of zone by each mobile node. ZRP is hybrid unicast routing protocol.

	ZRP	**ZHLS**
Loop free	Yes	Yes
Routing philosophy	Flat	Hierarchical

VI. Conclusion

Our literature study has revealed that designing an efficient routing protocol is a fundamental issue that is very pivotal to improving the overall performance of MANET where nodes are highly mobile. Since traditional routing protocols are table driven, they do not work efficiently in adaptive scenarios synonymous with MANET because it is not an easy task to maintain big routing tables with proper routing information for thousands of mobile nodes. The reactive and hybrid routing protocols work more efficiently in such adaptive scenarios. Tables are normally completely absent in these adaptive scenarios and new routes are established on demand basis using some control packets. Unicast protocol cannot perform better, in all network conditions. Every protocol performed better in some specific condition according its characters. In compare to proactive Unicast and reactive Unicast routing protocol, hybrid Unicast routing protocol performed better.

References

[1] D. B. Johnson and D. A. Maltz, "*Dynamic Source Routing in Ad-hoc Wireless Network*", Department of Computer Science Carnegie University, Mellon, 1996.

[2] Dr. F. Scott, Dr. A. Luiz Dr. J. Ira and Dr. P. Charles, "*Mobile Ad hoc network Routing Protocols Methodologies and Applications*", Department of Computer Engineering , Blacksburg Virginia, March 19, 2004.

[3] "Mobile Ad Hoc Networks", *http://w3.antd.nist.gov/wahn_mahn.shtml.* [Accessed: April,28, 2010].

[4] K. Gorantala, "*Routing Protocols in Mobile Ad-hoc Networks*", Department of Computer Science, Umeå University, June 15, 2006.

[5] H. Jeroen, L. Benoit, M. Ingrid, D. Bart, and D. Piet, "*Routing in Mobile Ad-hoc Networks*", Department of Information Technology (INTEC), Broadband Communication Networks (IBCN), 2003.

[6] Dr. G. Aditya and S. Ajaii, "*Performance of Mobile Ad-hoc Network using AODV Protocol*", Departmetn of Electronics & Communication Engineering, Department of Information Technology, Maulana Azad National Institute of Technology, Bhopal, India- 462051.

[7] D.B. Johnson, D.A. Maltz and J. Broch, "*The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks*," Department of Computer Science Carnegie Mellon University, 2001.

[8] L. Kwan Hui, "*Performance Enhancement of Temporally-Ordered Routing Algorithm*", School of Computer Science and Software Engineering, The University of Western Australia, 2007.

