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A Study on Mobile Internet Protocol and Mobile Adhoc Network Routing Protocols

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ABSTRACT

The internet has become ubiquitous and there has been tremendous growth in wireless communications in recent years. Many wireless communication techniques are commercially available, such as the Wireless LAN, Bluetooth, GSM, GPRS, and CDMA. Because an all-IP network will be a trend, access to the Internet via wireless communication devices has become an important issue. Mobile Internet protocol is an extension to Internet Protocol proposed by the Internet Engineering Task Force (IETF) which enables mobile user devices to move from one network to another regardless of their location and without changing their IP address. A Mobile Ad-hoc Network (MANET) is an autonomous system of mobile hosts connected by wireless links. The ad-hoc network is a non-infrastructure architecture in which nodes can access services from another regardless where they are. Ad-hoc network is that the ad-hoc method has no fixed infrastructure, allowing nodes to communicate with one another at any time and anywhere. Therefore this survey paper reviews about internet protocol and routing protocols in MANETS.

Keywords: Mobile IP, Ad-hoc, MANET, Routing Protocols

1. INTRODUCTION

Mobile IP can be thought of as the cooperation of three major subsystems. First, there is a discovery mechanism defined so that mobile computers can determine their new point of attachment as they move from place to place with in the internet. Second once the mobile computer knows the IP address at its point of attachment and registers with an agent representing it at its home network. Lastly Mobile IP defines simple mechanisms to deliver datagrams to the mobile node when it is away from its home network.

This mobility binding is maintained by some specialized routers known as mobility agents. Mobility agents of two types – home and foreign agents. The home agent, a designated router in the home network of the mobile node, maintains the mobility binding in a mobility binding table where each entry is identified by the tuple permanent home address, temporary care-of address, association life time. Figure 1 shows a mobility binding table. The purpose of this table is to map a mobile node's home address with its care-of address and forward packets accordingly [1].

Home address	*Care-of Address*	*Lifetime(in sec)*
131.193.171.4	128.172.23.78	200
131.193.171.2	119.123.56.78	150

Fig. 1: Mobility Binding Table

2. MOBILE IP TERMINOLOGY

2.1. Mobile IP

Mobile IP is an internet protocol designed to support host mobility. Its goal is to provide the ability of a host to stay connected to the internet regardless of their location. Mobile IP is able to track a mobile host without needing to change the mobile host's long-term IP address [2].

2.2. Agent Advertisement

An advertisement message constructed by attaching a special Extension to a router advertisement [4] message. Foreign agents are expected to periodically issue agent advertisement messages. If a mobile node needs agent information immediately, it can issue an ICMP router solicitation message. Any agent receiving this message will then issue an agent advertisement.

2.3. Care-of Address

The termination point of a tunnel towards a mobile node, for datagrams forwarded to the mobile node while it is away from home. The protocol can use two different types of care-of address. A "foreign agent care-of address" is an address of a foreign agent with which the mobile node is registered, and a "co-located care-of address" is an externally obtained local address which the mobile node has associated with one of its own network interfaces. However, in some cases a mobile node may move to a network that has no foreign agents

or on which all foreign agents are busy. A colocated care-of address is an IP address obtained by the mobile node that is associated with the current interface to a network of that mobile node.

The means by which a mobile node acquires a colocated address is beyond the scope of Mobile IP. One means is to dynamically acquire a temporary IP address through an Internet service such as Dynamic Host Configuration Protocol (DHCP). Another alternative is that the colocated address may be owned by the mobile node as a long term address for use only while visiting a given foreign network.

2.4. Correspondent Node

A peer with which a mobile node is communicating. A correspondent node may be either mobile or stationary. This node sends the packets which are addressed to the mobile node.

2.5. Foreign Network

Any network other than the mobile node's Home Network. It delivers information between the mobile node and the home agent.

2.6. Home Address

A permanent IP address that is assigned to a mobile node. It remains unchanged regardless of where the mobile node is attached to the internet [2].

2.7. Home Agent (HA)

A router that maintains a list of registered mobile nodes in a visitor list. It is used to forward mobile node-addressed packets to the appropriate local network when the mobile nodes are away from home. After checking with the current mobility bindings for a particular mobile node, it encapsulates datagrams and sends it to the mobile host's current temporary address when the mobile node.

2.8. Foreign Agent (Fa)

A router that assists a locally reachable mobile node that is away from its home network. It delivers information between the mobile node and the home agent.

2.9. Mobility Agent

An agent which supports mobility. It could be either a home agent or a foreign agent

3. TUNNEL

The path which is taken by encapsulated packets. It is the path which leads packets from the home agent to the foreign agent.

3.1. Support Services

The following services are supported in Mobile IP [2]:

3.2. Agent Discovery

Home agents and foreign agents broadcast their availability on each link to where they can provide service. A newly arrived mobile node can send a solicitation on the link to learn if any prospective agents are present.

3.3. Registration

When the mobile node is away from home, it registers its care-of-address with its home agent so that the home agent knows where to forward its packets. Depending on the network configuration, the mobile node could either register directly with its home agent, or indirectly via the help of its foreign agent.

3.4. Encapsulation

The process of enclosing an IP datagram within another IP header which contains the care-of address of the mobile node. The IP datagram itself remains intact and untouched throughout the enclosing process.

4. IP PACKET DELIVERY

When IP datagrams are exchanged over a connection between the mobile node (A) and another host (server X in Figure 2), the following operations occur Server X transmits an IP datagram destined for mobile node A, with A's home address in the IP header. The IP datagram is routed to A's home network. At the home network, the

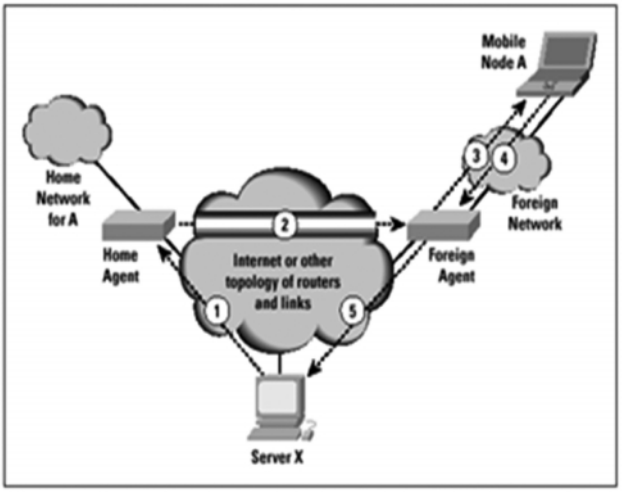

Fig. 2: Mobile IP Datagram Flow

Incoming IP datagram is intercepted by the home agent. The home agent encapsulates the entire datagram inside a new IP datagram, which has the A's care-of address in the header, and retransmits the datagram. The

use of an outer IP datagram with a different destination IP address is known as *tunneling*. The foreign agent strips off the outer IP header, encapsulates the original IP datagram in a network-level *Protocol Data Unit* (PDU) (for example, a LAN *Logical Link Control* [LLC] frame), and delivers the original datagram to A across the foreign network. When A sends IP traffic to X, it uses X's IP address. In our example, this is a fixed address; that is, X is not a mobile node. Each IP datagram is sent by A to a router on the foreign network for routing to X. Typically, this router is also the foreign agent. The IP datagram from A to X travels directly across the Internet to X, using X's IP address.

5. MOBILE ADHOC NETWORKS

A MANET is defined as a collection of mobile platforms or nodes in which each node is free to move about arbitrarily. The term MANET describes distributed, mobile, wireless, multihop networks that operate without the benefit of any existing infrastructure except for the nodes themselves. A MANET is an autonomous system of mobile nodes that operates in isolation. Each node's position and transmitter and receiver coverage patterns with transmission power levels and co-channel interference levels exists only between the nodes. This MANET topology may change with time as the nodes move or adjust their transmission and reception parameters.

MANETS has the following characteristics:

- Dynamic topologies.
- Bandwidth-constrained, variable capacity links.
- Energy-constrained operation.
- Limited physical security.

6. COMPARISONS OF ROUTING PROTOCOLS

The following sections provide comparisons of the previously described routing algorithms. The next section compares table-driven protocols, and another section compares on demand protocols.

6.1. Table Driven Protocols

DSDV: The Destination-Sequenced Distance-Vector Routing Protocol was designed ad hoc with a table-driven routing protocol. This is a hop-by-hop distance vector routing protocol requiring each node to periodically broadcast routing updates. The key advantage of DSDV is that it guarantees loop-freedom. If a node cannot access any base stations, the DSDV routing protocol allows a path along which data can be exchanged with all nodes. A sequence number is used with the basic Bellman–Ford mechanism to each route table entry. When the network topology is modified with decreased frequency little routing table data is exchanged [3, 5].

6.2. Source-Initiated On-Demand Routing Protocols

CGSR: Cluster-Head Gateway Switch Routing is similar to the DSDV routing protocol. In Cluster- Head Gateway Switch Routing (CGSR) the nodes form clusters. A cluster head is selected. All nodes within the cluster heads radio transmission range.

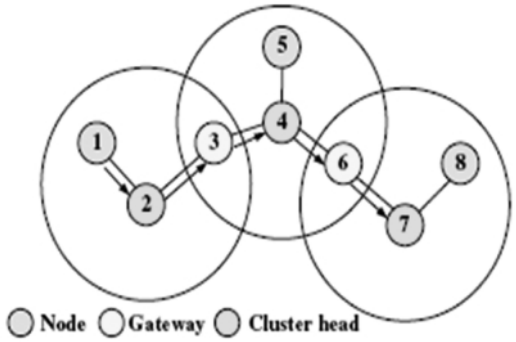

Fig. 3: CGSR: Routing from Nodes 2-4, 6 and 7 form a Single Cluster

A cluster head is selected for every department. A gateway node can communicate with two or more cluster heads (Fig. 3).

AODV: Ad Hoc On-Demand Distance Vector Routing offers a pure distance-vector approach. It does not maintain a routing table. AODV is a purely ''on demand'' method that follows a route request and reply discovery cycle when the nodes communication with other nodes. Fig. 4 shows the AODV format. The AODV routing table will record a message with a destination sequence number (as with DSDV) to avoid a routing loop and produce the latest new routing topology [3].

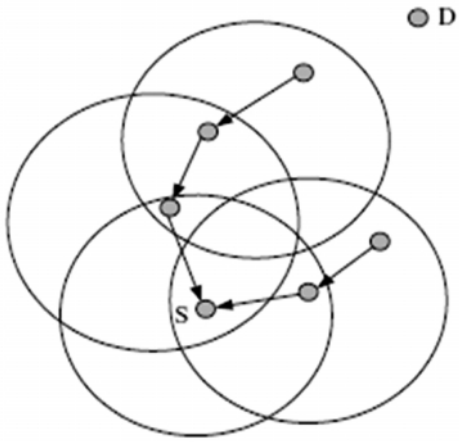

Fig. 4: AODV: Reverse Path Formation

DSR: The Dynamic Source Routing (DSR) protocol presented in Fig. 12 is an on-demand routing protocol based on the source routing concept. When mobile nodes request communications, the DSR protocol will search

for a path. Mobile nodes are required to maintain route caches that contain the source routes of which the mobile is aware. Entries in the route cache are continually updated as new routes are learned [3,4]. The DSR protocol is similar to AODV and uses the source broadcast method as the DSR is shown in Figs. 5 and 6.

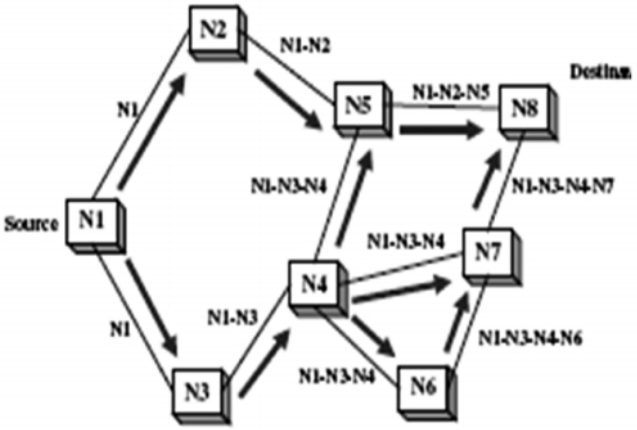

Fig. 5: DSR: Route Request

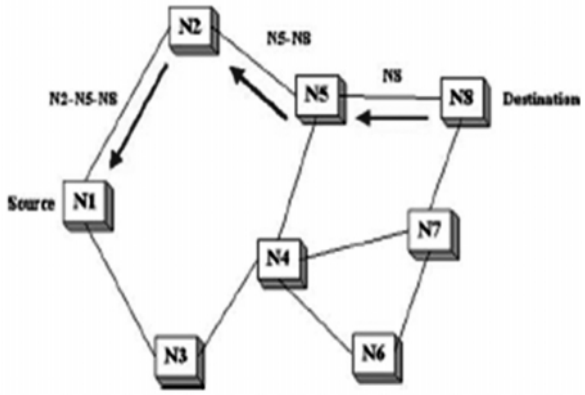

Fig. 6: DSR: Route Reply

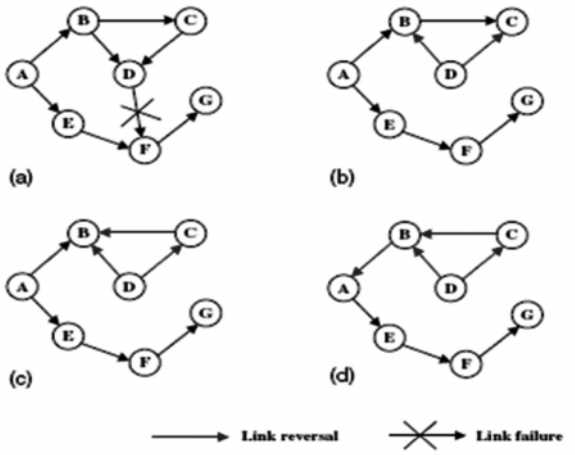

Fig. 7: TORA: Route Maintenance(A: Source, G: Destination)

TORA: The Temporally Ordered Routing Algorithm (TORA) is a highly adaptive loop-free distributed routing algorithm based on the link reversal concept. TORA is designed to operate in a highly dynamic mobile networking environment. There are three steps in the TORA protocol: Route Creation, Route Maintenance and Route Erasure [3]. During the route creation and maintenance phases, the nodes use a ''height'' function. This algorithm does not make changes to other routes when the topology is modified, as shown in Fig. 7.

Comparisons of the three protocol characteristics:

Table 1

	Proactive (table-driven)	*Reactive (on-demand)*
Routing protocols	DSDV	AODV,DSR, TORA
Route acquisition delay	Lower	Higher
Control overhead	High	Low
Power requirement	High	Low
Bandwidth requirement	High	Low

7. CONCLUSION

This paper presented a survey of routing protocols designed for MANETs. We provided the classification between proactive and Reactive protocols by giving their performance in various aspects. To design a MANET routing protocol with multiple metrics is a challenge task, especially as the network topology and traffic are changing all the time. We may consider not limiting the mobile nodes to a single predefined routing protocol, instead we let each node decide which protocol to choose based on the environment around it at that time where it is called active adhoc routing. Since there are many routing protocols, we can't say which is best algorithms results depends on situation and given parameters. We plan future investigations to find better algorithm implementing swarm intelligence doing simulation.

REFERENCES

[1] Chen Yi-an. *A Survey Paper on Mobile IP. http:// www.cis.ohio- state.edu/~jain/cis788-95/mobile_ip.*

[2] Charles E.Perkins, "Mobile IP", *in Proceeding of the IEEE Communications Magazine*, 50th Anniversary Commemorative Issu/May 2002.

[3] Tin-Yu Wu *, Ching-Yang Huang, Han-Chieh Chao "A Survey of Mobile IP in Cellular and Mobile Ad-Hoc Network Environments" *Department of Electrical Engineering, National Donghwa University*, Hualien, Taiwan, ROC.

[4] D. B. Johnson and D. A. Maltz, "Dynamic Source Routing in Ad-Hoc Wireless Networks," *Mobile Computing*, T. Imielinski and H. Korth, Eds., Kluwer, 1996, pp. 153–81.

[5] C. E. Perkins and P. Bhagwat, "Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers," *Comp. Commun. Rev.*, Oct. 1994, pp. 234–44.

[6] S. Murthy and J. J. Garcia-Luna-Aceves, "An Efficient Routing Protocol for Wireless Networks," *ACM Mobile Networks and App. J., Special Issue on Routing in Mobile Communication Networks*, Oct. 1996, pp. 183–97.

[7] Kwan-Wu Chin, John Judge, Aidan Williams and Roger Kermode "Implementation Experience with MANET Routing Protocols" *ACM SIGCOMM Computer Communications Review 49*, **32**, No. 5, November 2002.

[8] C-K. Toh, "A Novel Distributed Routing Protocol to Support Ad-Hoc Mobile Computing," *Proc. 1996 IEEE 15th Annual Int'l. Phoenix Conf. Comp. and Commun.*, Mar. 1996, pp. 480–86.