

Comparison of Various Routing Protocols & Brief of MANET

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Abstract- An aim of this paper is to analyze the performance of traditional topology based protocols in mobile ad hoc networks. A Mobile Ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by radio links and has dynamic topology. MANETs consist of mobile nodes that can freely move in and out of the network at any instant. This ad-hoc topology may change with time as the nodes move or adjust their transmission and reception parameters. Routing is considered to be one of the major challenging tasks in MANET's due to this dynamic network topology and also due to the absence of a centralized control. In this paper comparison of various traditional routing protocols like DSDV (Destination Sequence Distance Vector), DSR (Dynamic Source Routing) and AODV (Ad-hoc On Demand Distance Vector) are summarized.

Keywords- MANET, Routing Algorithms, DSDV, DSR, AODV, Needs of MANET, Challenges in MANET.

I. INTRODUCTION

In Latin, *ad hoc* literally means 'for this purpose only'. An ad-hoc (or spontaneous) network is a small area network, especially one with wireless or temporary plug-in connections. In these networks some of the devices are part of the network only for the duration of a communication session. An ad-hoc network is also formed when mobile, or portable devices, operate in close proximity of each other or with the rest of the network. When we beam a business card from our PDA (Personal Digital Assistant) to another, or use an IrDA (Infrared Data Association) port to print document from our laptop, we have formed an ad hoc network. The term 'ad hoc' has been applied to networks in which new devices can be quickly added using, for example, Bluetooth or wireless LAN (802.11x). In these networks devices communicate with the computer and other devices using wireless transmission. Typically based on short-range wireless technology, these networks don't require subscription services or carrier networks

II. BACKGROUND THEORY

2.1 ADVANTAGES OF MANET

- Instant infrastructure
- Disaster relief
- Remote areas
- Effectiveness
- No expensive infrastructure must be installed.
- Use of unlicensed frequency spectrum.
- Quick distribution of information around sender.

2.2 NEEDS OF MANET

- Setting up of fixed access points and backbone infrastructure is not always viable
- Infrastructure may not be present in a disaster area or war zone
- Infrastructure may not be practical for short-range radios; Bluetooth (range ~ 10m)

- MANET are easy to deploy

2.3 MANET CHALLENGES

- To design a good wireless ad hoc network, various challenges have to be taken into account:
 - **Dynamic Topology:** Nodes are free to move in an arbitrary fashion resulting in the topology changing arbitrarily. This characteristic demands dynamic configuration of the network.
 - **Limited security:** Wireless networks are vulnerable to attack. Mobile ad hoc networks are more vulnerable as by design any node should be able to join or leave the network at any time. This requires flexibility and higher openness.
 - **Limited Bandwidth:** Wireless networks in general are bandwidth limited. In an ad hoc network, it is all the more so because there is no backbone to handle or multiplex higher bandwidth
 - **Routing:** Routing in a mobile ad hoc network is complex. This depends on many factors, including finding the routing path, selection of routers, topology, protocol etc.

III. ROUTING IN MANET

Routing in Mobile Ad hoc networks is an important issue as these networks do not have fixed infrastructure and routing requires distributed and cooperative actions from all nodes in the network. MANET's provide point to point routing similar to Internet routing. The major difference between routing in MANET and regular internet is the route discovery mechanism. Internet routing protocols such as RIP or OSPF have relatively long converge times, which is acceptable for a wired network that has infrequent topology changes. However, a MANET has a rapid topology changes due to node mobility making the traditional internet routing protocols inappropriate. MANET-specific routing protocols have been proposed, that handle topology changes well, but they have large control overhead and are not scalable for large networks. Another major difference in the routing is the network address. In internet routing, the network address (IP address) is hierarchical containing a network ID and a computer ID on that network. In contrast, for most MANET's the network address is simply an ID of the node in the network and is not hierarchical. The routing protocol must use the entire address to decide the next hop.

IV. COMPARISON OF ROUTING PROTOCOLS IN MANET

A. DESTINATION SEQUENCED DISTANCE VECTOR PROTOCOL (DSDV)

- This routing protocol attempts to route packets through an optimal path. DSDV protocol is based on the Bellman-Ford algorithm. It is a proactive protocol. Routes between the nodes in the network are always maintained and updated [2]. Each node maintains a routing table which contains information about the shortest distance as well as the first node on the shortest path to every other node. It also holds the information about how old the route is.
- As topological changes are detected, routing tables are broadcasted either completely or incrementally. If complete routing table is broadcasted periodically, it is known as periodic update. If only significant changes in the network topology are broadcasted, it is known as triggered update.

Routing Protocol	Route Acquisition	Flood for Route Discovery	Delay for Route Discovery	Multipath Capability	Upon Route Failure
DSDV	Computed a priori	No	No	No	Floods route updates throughout the network
DSR	On-demand, only when needed	Yes. Aggressive use of caching often reduces flood scope	Yes	Not explicitly. The technique of salvaging may quickly restore a route	Route error propagated up to the source to erase invalid path
AODV	On-demand, only when needed	Yes. Conservative use of cache to reduce flood scope	Yes	No, although recent research indicate viability	Route error broadcasted to erase invalid path

Figure 1. Protocol Characteristics [6]

B. DYNAMIC SOURCE ROUTING (DSR)

- DSR is a reactive protocol. The main feature of DSR is the use of source routing technique. In this method the source knows the complete hop-by-hop route towards the destination node [3][4]. DSR consists of two phases: route discovery and route maintenance. Using these phases, it discovers and maintains a route to the destination node in the network. A route discovery phase is initiated when a source node want to send data to the destination node. Reliability is ensured by route maintenance phase.
- Working of DSR Algorithm is explained in below figures

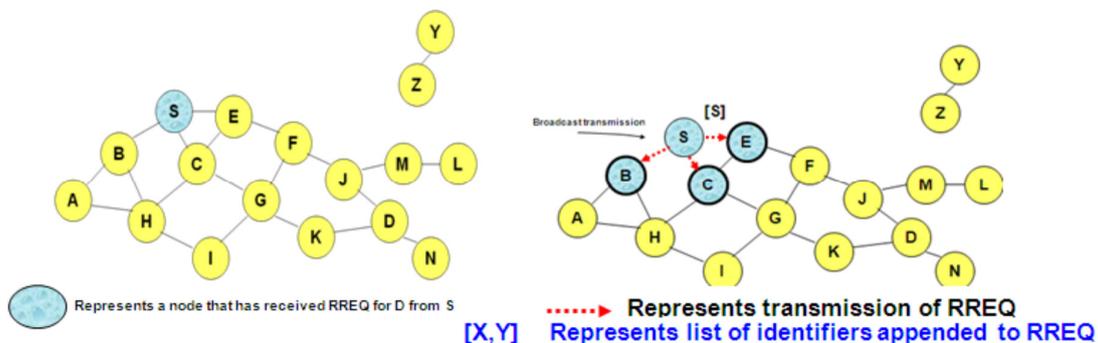


Figure 2 Working of DSR Algorithm

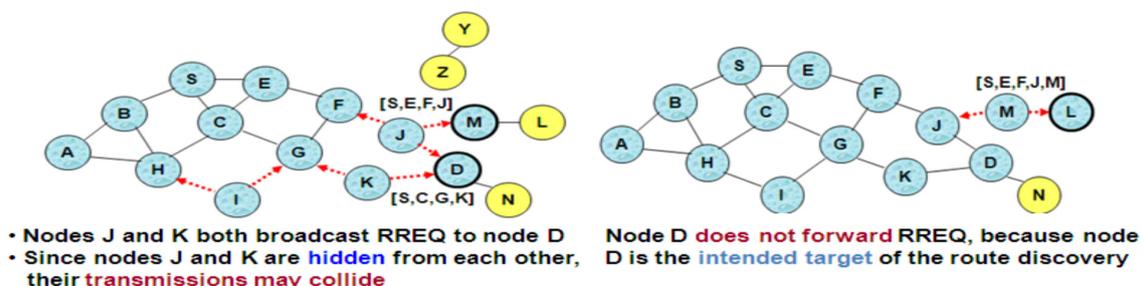


Figure 3 Working of DSR Algorithm

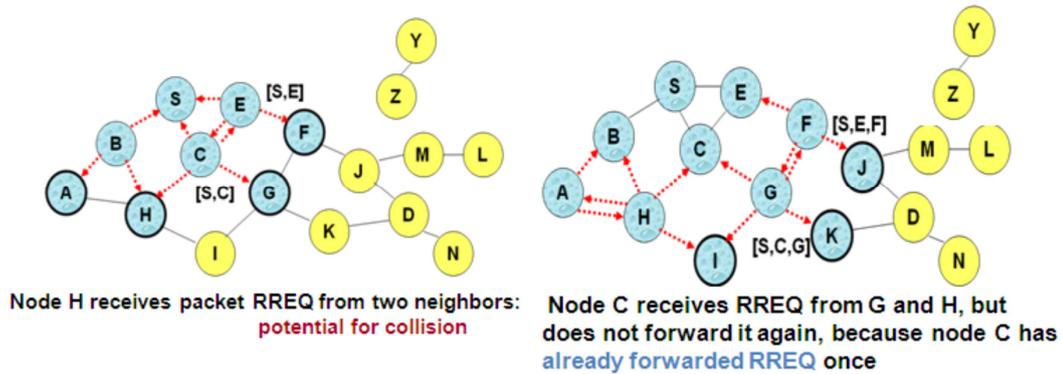


Figure 4 Working of DSR Algorithm

C. AD-HOC ON-DEMAND DISTANCE VECTOR (AODV)

AODV is simple, efficient and effective routing protocol for a mobile ad-hoc network. It is a reactive protocol. It combines the advantages of both DSDV and DSR algorithms [5]. Concepts like on demand route discovery and route maintenance from DSR and hop-by-hop routing, usage of node sequence number from DSDV are included in AODV. Each node maintains a routing table containing information's regarding its neighbor nodes.

V. CONCLUSION

Most of the research in mobile computing tends to assume that all links are bidirectional. However, due to a variety of reasons, only unidirectional communication may be possible between some pairs of adjacent nodes. Existing distance vector based algorithms will fail in the presence of such links.

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