

A Review: Mobile AdQ Hoc Routing Protocols

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Abstract

Mobile adhoc network is defined as multi-hop radio relaying and are capable of operating without the support of any fixed infrastructure. The absence of any central coordinator makes the routing complex as compared to cellular networks. Ad hoc wireless network consist of multi-hop wireless link with distributing routing. Self-organizing and maintenance are built properties for ad hoc wireless network. The main aim of routing in ad hoc network is to find path with minimum overheads and amendment of broken paths. Time synchronization is difficult in ad hoc wireless networks. Section 1 and section 2 alleged the brief introduction of adhoc wireless network and different routing protocols used for routing in MANET's. Section 3 depicted the characteristics of an ideal routing protocol. Section 4 portrayed some of the previous work done in MANET and last is conclusion given in section 5.

Keywords: MANET, DSR, AODV, OLSR

1. Introduction

The basis of the future military network centric warfare architecture is set to be termed as adhoc networking. [13] Mobile nodes that autonomously established connectivity via multi hop wireless communication is collectively termed under adhoc networks. Talking about the historical background, it's started in 1970's and the interest in wireless networks has been growing ever since with full zest and zeal. [6]

Node mobility and frequent change in environment lead the links in mobile adhoc wireless networks liable to failure. The Group of mobile nodes, with wireless networks interfaces, termed as mobile adhoc networks may form a temporary network sans the aid of any established infrastructure or centralized administration. [12] The sharing of information, at present is hard nut shell to be cracked as the users need to perform administrative task and setup static, bi-directional links between the computers. [6] Network wide broadcast is crucial and vital network layer function for adhoc networks sustaining route discovery and maintenance in many adhoc unicast and multicast routing protocols. [8]

The different characteristics between these networks from wired networks include distributed peer-to-peer mode of operation, multi-hop routing over wireless links rather frequent changes in topology. [12] Mobile nodes most often work as groupism in a typical adhoc environment and are involved in collaborative computing. [12] Generally, the routing protocols of MANET's can be classified into - Table Driven proactive routing protocol and On-Demand reactive routing protocols. [9] Talking about table driven routing protocols, for instance OLSR and DSDV, every node persistently maintains the complete routing information of the network. A route is readily available, when a node needs to forward a packet. On the other hand, in On-Demand Routing Protocols, for instance DSR and AODV, mobile nodes maintain path information for destination only when they need to contact the source node or relay packets. [9] A search packet is granted and forwarded by the source node using the flooding technique to look for the destination node. [9]

Mobile nodes in MANET are devices which operate on batteries, the power conservation and optimized bandwidth are important to be emphasized. [11] Communication among nodes can be executed, especially in field such as emergency, disaster operation, battle field of military and collaborative computing. [11] Designing an efficient multicasting protocol in wireless mobile adhoc networks had been a challenging task due to few factors which reside limited bandwidth, battery power, and incessant modification topology of the network. Some of the advantages of MANET are to provide access to information and services regardless of geographic position, independence from central network administration, self-configuring network, less expensive as compared to wired network and nodes act as routers.

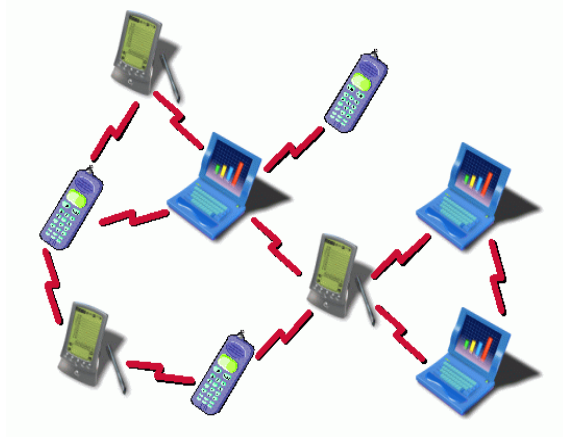


Figure 1. MANET [6]

2. Routing Protocol

Routing protocols are broadly classified into three types as shown in figure 2, Table-driven, On-demand driven and Hybrid protocols.

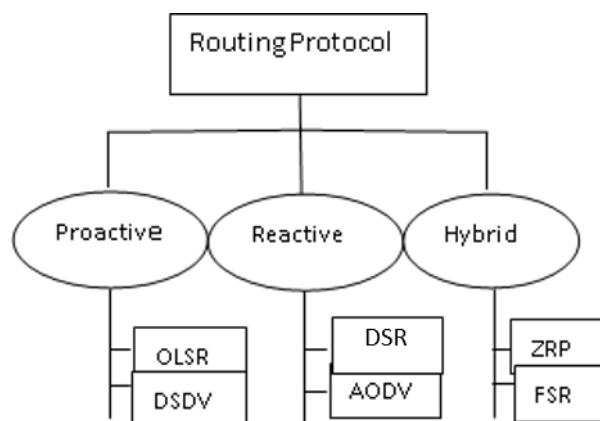


Figure 2. Adhoc Routing Protocol

2.1. Proactive Protocols

In a network table driven protocols or proactive protocols maintain uniform and latest routing information about each node. [4] The route information is available rapidly, when a route is required to send data from source to destination because each node broadcast the message to integral network. DSDV (Destination sequence distance vector), WRP

(Wireless routing protocol), OLSR (Optimized link state routing protocol) are instances of proactive routing protocols.

Optimized Link State Routing Protocol (OLSR)

Optimized link State routing protocol (OLSR) is an edition of complete link state protocol for MANET. [8] Multipoint relays (MPR) is a primary point of optimization. Each node in the network identifies its MPRs. After flooding the message to their MPRs, each node ensured that message whenever transmitted by MPRs, will be received by all its two-hop neighbors. For routing the OLSR protocol selects bi-directional links, hence evading packet transfer over the unidirectional links. [6]

2.2. Reactive Protocols

Reactive routing protocol is also called as “On-Demand based” routing protocols. [5] In the network route is determined only when the source node requests to find a route to send packets to the destination node. Distance vector routing algorithm is used in the reactive routing protocol. [4] Reactive routing protocol will establish a route when a node wants to relate with another node in the network, but source does not have a route to send information to the destination node. [2] Most commonly used protocols of reactive routing are AODV and DSR.

Adhoc On-Demand Distance vector Routing Protocol (AODV)

Ad-hoc on-demand vector routing (AODV) is on demand routing protocol, whenever a route from source to destination is needed then only it creates a route. [3] AODV is an advancement protocol of Destination Sequenced Distance-Vector (DSDV) routing protocol. It is created with the union of Dynamic source routing (DSR) and Destination Sequenced Distance-Vector (DSDV); AODV use properties of route request (RREQ) and also route maintenance procedure from DSR and some attributes like sequence number, periodic updates, hop by hop count from DSDV routing protocol.[5] Following data of the packet header is in the route request

- Source node IP address
- Broadcast ID
- Current sequence number for the destination

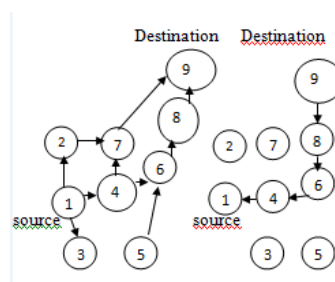


Figure 3. Route Discovery [3]

Dynamic Source Routing (DSR)

Dynamic source routing protocol is an On-demand routing protocol, mobile node save the source routes into the caches. [4] Dynamic source routing protocol is a loop-free and uses no cyclic routing messages, therefore preserve battery power, and reduce network bandwidth. [7] The working of DSR is classified into two parts:

- a) Route Discovery

b) Route Maintenance

Route Discovery: When node S wants to send a packet to node D, but does not know a route to D, node S originates a route discovery. [3] Source node S floods Route Request (RREQ) and each node attach own identifier when forwarding RREQ.

Route Maintenance: Route maintenance is a process by which a packet sender S detects if the topology of the network has been changed, so that it can no longer uses its route to the destination D. [9] This may due to failure in link or host listed in source node move out of transmitting range. [9]

3. Characteristics of an Ideal Routing Protocol for Ad Hoc Network

A routing protocol should have following qualities:

- It must be fully distributed.
- Flexible to frequent change in topology [6].
- Transmission should be reliable to reduce message loss.
- The convergence must be quick, once the network of the topology becomes stable.
- Optimal use of bandwidth, computing power, memory and battery power.
- It must provide a certain level of quality of service (QoS).

4. Previous Work

Extensive research has been done to develop Adhoc network models successfully for the different application domains. Many of the researchers, though, have faced the dilemma that much of their data is plagued by an uncertainty, vagueness and approximation. This review work on Mobile adhoc network elaborates the scope of Mobile adhoc networks in various fields.

S. Yiannis (2014) evaluated the performance of OLSR versus AODV and DSDV, under heavy background traffic in terms of packet loss, routing overhead, throughput. The author simulates the scenario under different duration times. A heavily loaded wireless environment is simulated with wide range of number of nodes and extracts specific results. Simulation duration indeed affect the performance both qualitatively and quantitatively.

M. Zafar (2014) analyzed the comprehensive experimental performance of DSR, AODV, and DSDV routing protocol for different metrics values with predefined constraints. Different scenario had been designed with fixed number of nodes but varying mobility.

K. Dilpreet (2013) described the characteristics of AODV, OLSR, TORA, DSDV, DSR routing protocols based on performance metrics under low mobility and low traffic network as well as high mobility and high traffic network in mobile ad-hoc networks.

M. Puneet (2013) analyzed the performance of AODV, OLSR, GRP and DSR Routing protocols under different parameter like delay, load, media access delay, network load with database load in MANET.

S. Lakhdev (2012) analyzed the effect of mobility on performance of three MANET on-demand routing protocols i.e. DYMO, DSR, and AODV. Author used EXata/Cyber 1.2 from scalable networks for simulation of these protocols.

A. Hossein (2010) evaluated the performance of four widely used ad hoc network routing protocols using different packet size patterns (uniform distribution and 1024 bytes) and also, different MAC layer (802.11b, 802.11g) for ordinary and large-scale MANETS using simulation environment (OPNET 14.0).

J. Geetha (2007) discussed various routing protocol of each category under mobile adhoc networks. The author described several routing schemes proposed for ad-hoc

mobile networks and also provided a classification of these schemes according the routing strategy.

S. Chien-Chung (2006) proposed to map probability-based directional and omnidirectional broadcast to bond and site percolation, respectively, and described a collection of directional antenna-based broadcast schemes for mobile ad hoc networks.

K. Latha (2005) described the performance analysis of a policy-based mobile adhoc network management system, developed under the CERDEC DRAMA (Dynamic Re-Addressing and management system) program. Authors presented their use of modeling and simulation (M&S) techniques to develop detailed models of the DRAMA architecture and analyze the performance under range of operational parameters.

L. Se-Young (2005) proposed ANMAS (Adhoc network multicasting with Ant system), a novel multicasting algorithm for mobile adhoc network (MANET). This algorithm utilized the indirect communication method of the ants via “pheromone” to effectively obtain dynamic topology change information, safer multicasting path are generated and adapts the well-known CBT (Core based tree) multicasting algorithm into the ANMAS framework with proper modifications to make “tolerable” multicasting group in MANET.

D. Andrea (2004) investigated the inefficiency of the overlay multicasting solution in mobile ad-hoc networks with respect to the network layer multicasting by comparing the distribution tree cost of different solutions. The authors measured the ratio between the cost of distribution tree in case of network layer and of multicasting overlay.

R. Aniruddha (2003) proposed Shared-Tree MZR a new multicast protocol. This protocol is a shared tree variant of the multicasting routing protocol based on Zone routing (MZR). The results shows that Shared-Tree MZR perform well and had low overhead in scenarios with multiple sources.

5. Conclusion

This paper has contributed a comprehensive review of mobile ad hoc networks and various characteristics of an ideal routing protocol in ad hoc network. We have also dispensed the classification of these schemes according to the routing strategy .i.e., table driven and on demand. Nevertheless, large volume of research activities and rapid progress has been made in the MANET technologies in past years, almost all research area (from enabling technologies to application) still harbor many open issues. The field of ad-hoc mobile networks is swiftly growing, but there are still many challenges that need to be met, it is likely that this network will see wide-spread use within the next few years.

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