

# A review of performance evaluation of the Routing Protocols in MANETs

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## Abstract

Mobile Ad hoc Network (MANET) are temporary networks without any fixed infrastructure. The nodes in network are free to move, resulting in no centralized system and ever changing topology in MANET. The performance of the network is highly depending upon the routing. Various routing schemes like reactive, proactive and hybrid are used in MANETs each category has many routing protocols. These various routing protocols are used in MANETs with their category routing strategy. In this paper the OLSR, ABR, ZRP, TORA, GRP routing protocols are reviewed to analyse their performance on the basis of various parameters like load, throughput, network size, packets overhead and delay. The overall goal of the paper is to choose best routing scheme and protocol to enhance the network performance.

## Keywords

GRP; MANET; OLSR; TORA; ZRP; ABR

## I. Introduction

A mobile ad hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. MANETs are vigorous in nature, they are used in many situations. MANETs are used in disaster situations, where we cannot afford to develop a wired network. Presently vast work has been done in the routing protocols used in MANETs. In this paper we aim to assess the performance of OLSR, GRP, ZRP, ABR and TORA routing protocols [1]. The routing protocols in MANETs are classified into three categories: proactive (table driven), reactive (demand driven), hybrid routing protocols. In this paper we have chosen each category routing protocols. Our aim is to compare all the Routing protocols based upon parameters.

## II. Types of routing protocols

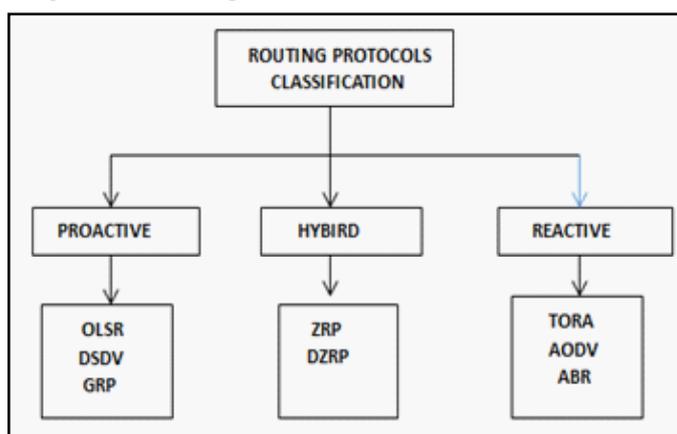


Fig. 1: Classification of routing protocol

### A. Proactive Routing Protocols

The Proactive Routing protocol is also called table driven protocol. In Proactive Routing each node updates and maintains its routing protocol every time the topology changes in the network. Therefore it is obscure task to store and maintain entries of each node. So this routing is not appropriate for large networks. Most proactive routing protocols proposed for mobile ad hoc networks

have inherited properties from algorithms used in wired networks [2].

### 1. Optimized Link State Routing (OLSR)

It is table driven protocol. OLSR is a table driven protocol. It usually stores and updates its routes so when a route is needed, it present the route immediately without any initial delay. In OLSR, some candidate nodes called multipoint relays (MPRs) are selected and responsible to forward broadcast packets during the flooding process [3]. This technique reduces the overhead of packet transmission compared to flooding mechanism. OLSR performs hop-by-hop routing, where each node uses its most recent routing information to route packets. MPR's is made in a way that it covers all nodes that are two hops away (i.e. neighbours of the neighbours). A node senses and selects its MPR's with control messages called HELLO messages. Hello messages are used to ensure a bidirectional link with the neighbour. HELLO messages are sent at a certain interval. Nodes broadcast "TC" or Topology control messages to determine its MPR.

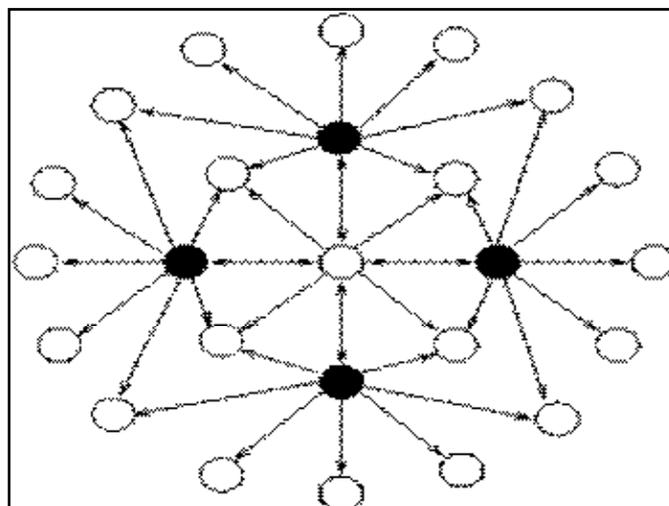


Fig. 2: Flooding a packet in a wireless multi-hop Network to MPR

**2. Geographic Routing Protocol:**

Geographic routing has become one of the most suitable routing strategy in wireless mobile ad hoc network mainly due to its scalability. That is because there is no need to maintain explicit routes. The principle approach in geographic routing is greedy forwarding, which fails if the packet encounters a void node (i.e., a node with no neighbour closer to the destination than itself). Geographic routing protocols scale better for ad hoc networks mainly for two reasons one is that there is no necessity to keep routing tables up-to-date and second is that there is no need to have a global view of the network topology and its change. Therefore, geographic routing protocols have attracted a lot of attention in the field of routing protocols for MANETs. These geographic approaches allow routers to be nearly stateless because forwarding decisions are based on location information of the destination and the location information of all one-hop neighbours [5].

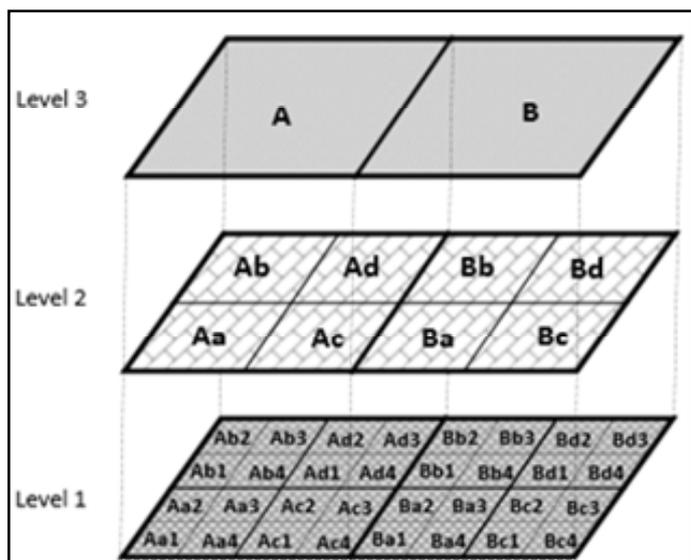


Fig. 3: GRP QUARDANT AREA

**B. Reactive Routing Protocol**

Reactive routing protocols are acquiring routing information only when it is needed they are on-demand protocol. In reactive routing, a route determination process is invoked on demand when a source node request for a route to destination node [7].

ii. Comparison Of Routing Strategies And Protocols

Table 1: Parametric Comparison Of Routing Protocol Strategies

Parameters	Reactive Protocol	Proactive Protocol	Hybrid Protocol
Routing Philosophy	Flat	Flat/Hierarchical	Flat/Hierarchical
Routing scheme	On demand	Table driven	Combination of both
Topology dissemination	Periodical	On demand	Both
Route latency	Always available	Available when needed	Both
Communication Overhead	High	Low	Medium
Scalability	Suitable for small Networks	Low	Designed for large networks
Storage capacity	Low	High	Depend upon zone , as capacity inside zone is high
Types	AODV, DSR, TORA	DSDV, WRP, FSR	ZRP, WARP

**i. Temporally Ordered Routing Algorithm (TORA)**

The TORA use a "flat", non-hierarchical routing algorithm which enable it to achieve a high degree of scalability. TORA builds and maintains a Directed Acyclic Graph (DAG).It is a source-initiated on-demand routing protocol. It finds multiple routes from a source node to a destination node. The main feature of TORA is that the control messages are localized to a very small set of nodes near the occurrence of a topological change. To achieve this, the nodes maintain routing information about adjacent nodes. The protocol has three basic functions: Route creation, Route maintenance and Route erasure [7].

**ii. Associativity Based Routing Protocols(ABR):**

The Associativity Based Routing (ABR) protocol is a new approach for routing .ABR defines a new metric for routing known as the degree of association stability. It is free from loops, deadlock, and packet duplicates. In ABR, a route is selected based on associativity states of nodes. The routes thus selected are liked to be long-lived. All node generate periodic beacons to signify its existence. When a neighbor node receives a beacon, it updates its associativity tables. For every beacon received, node increments its associativity tick with respect to the node from which it received the beacon. Association stability means connection stability of one node with respect to another node over time and space. A high value of associativity tick with respect to a node indicates a low state of node mobility, while a low value of associativity tick may indicate a high state of node mobility. Associativity ticks are reset when the neighbors of a node or the node itself move out of proximity. The fundamental objective of ABR is to find longer-lived routes for ad hoc mobile networks [9]. The three phases of ABR are Route discovery, Route reconstruction (RRC) and Route deletion.

**C. Hybrid routing protocol**

Hybrid protocol is association of the advantage of the both proactive and reactive routing protocol.

i. Zone routing protocol (ZRP)- The Zone Routing Protocol (ZRP) combines the qualities of the proactive and reactive approaches by maintaining an up- to-date topological map of a zone centred on each node [9]. ZRP uses proactive approach for routing inside the zone i.e. intra-zone routing protocol (IARP) and reactive approach for routing outside the zone i.e. inter-zone routing protocol (IERP) [7].

Table 2 : CHARACTERISTIC SUMMERY OF FSR, DSR, ZRP

PROTOCOL CHARACTERSTIC	OLSR	GRP	TORA	ABR	ZRP
Routing Philosophy	Proactive	Proactive	Reactive	Reactive	Hybird
Type of routing	Hop-by-hop routing	Hop-by-hop routing	Hop-by-hop routing	Source routing	Zone routing
Throughput	High	Medium	Low	Medium	Medium
Delay	Low	Low	High	Least	Medium
Route recovery	Notify source	Notify source, local repair	Start repair at failure point	Avoid weak link	Inside zone
Route repository	Routing table	Routing table	Routing table	Routing table	Interzone table
Frequency of updates	Periodically	Periodically	Based on mode of operation	Periodically	Based on mode of operation
Multiple path	No	No	No	Yes	No
Communication overhead	High	Low	Medium	Low	High inside zone
Worst case	Pure link state	Full flooding	Full flooding	Full flooding	Zone flooding

#### IV. Conclusion

Routing plays an important role in MANETs. These are dynamic networks where topology is changing very rapidly. Every time the topology changes the source to destination path also change, so implemented routing protocol must able to handle the all challenges of routing. We have discussed the three type of routing protocols. The proactive, reactive and hybrid routing protocol, with the help of taking example of each protocol.

The OLSR is most widely accepted routing protocol, it shows best throughput and delay. The performance of TORA shows worst results in compare to GRP and OLSR. The ABR is new scheme free from deadlock, with an good performance. The ZRP protocol is suitable for large networks. ZRP is not an independent protocol but rather a routing framework. Further, any evaluation of the ZRP version with support for unidirectional links could not be found. The overall conclusion ofis that, the performance demand and the network size plays a key role in selecting the protocol to be implemented. It is quite natural that one particular solution cannot be applied for all sorts of situations and, even if applied, might not be optimal in all cases. Often it is more appropriate to apply a hybrid protocol rather than a strictly proactive or reactive protocol as hybrid protocols often possess the advantages of both types of protocols. The performance of hybrid is acceptable but most best results are shown by OLSR. So, for large networks it is better to implement OLSR, and for small size networks hybrid protocols are better to implement.

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