# Performance of MANET: A Review

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***Abstract*— A "Mobile Ad-hoc Network" consists of mobile wireless nodes. The communication between these mobile nodes is carried out without any centralized control. Traditional routing protocols may not suffice for real time communications it depends upon the condition and our requirements. In MANET's Data transmission from one node to other nodes requires multiple hops as nodes transmission range is limited which does not extend. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. The main classes of MANET routing protocols are Proactive, Reactive and Hybrid. This paper reviews the aspect of Quality of service and discusses and evaluates Proactive routing protocol by focusing on Optimized Link State Routing Protocol (OLSR) routing protocol for better performance. For the simulation and evaluation of these protocols, the OPNET Modeler simulation tool was used.**

***Keywords*— Mobile Ad-hoc network, mobile nodes, OLSR, OPNET, Ad-Hoc routing protocol, Ad-Hoc Network.**

## I. INTRODUCTION

The nodes communicate without any physical media, the network is called wireless network. Ad hoc networks consist of mobile or stationary nodes that communicate over wireless links. Mobile Ad hoc Network (MANET) is a collection of wireless mobile nodes that dynamically create a temporary network without any recognized infrastructure or centralized management [1]. Network nodes in MANETs are free to move randomly (refer with: Fig. 1). Due to mobility of nodes, network topology of MANET may change dynamically without rotating to any existing centralized management. All network activities such as discovering the topology and delivering data packets have to be executed by the nodes themselves, either alone or in a group. In MANETs every node is a potential router for other nodes [2]. These nodes generally have a limited transmission range and, so, each node seeks the help of its neighbouring nodes in forwarding packets and hence the nodes in an ad-hoc network can act as both routers and hosts, thus a node may forward packets between other nodes as well as run user applications [3]. Each node in the network also acts as a router, forwarding data packets for other nodes. The lack of fixed infrastructure in a MANET poses several types of challenges. The biggest challenges among them are routing. Routing is the process of selecting paths in a network along which to send data packets [4]. A new other way for mobile communication, in which mobile devices form a self creating, self-organizing and self-administering wireless network, called a mobile ad hoc network[5].

In mobile Ad-hoc network (MANET) the quality of service (QoS) is difficult task, because of mobile nodes. Due to its dynamic nature, it is not easy to know the quality of service routing in MANETs. The aim of QoS routing is to find an best paths from source to destination. Many QoS routing algorithms are available as on date and most of these are extensions of existing routing algorithms [12]. In MANET the QoS is difficult task, because of mobile nodes.

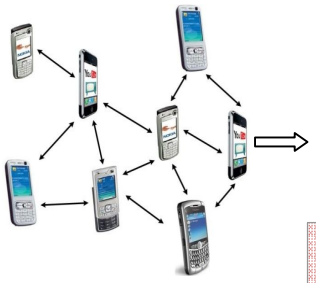

Figure 1: Mobile Ad hoc Network

This diagram shoes multipoint connection between Mobile Station though Ad hoc network.

## II. DEVELOPMENT OF RESEARCH IN MANET

Mobile Ad hoc network characterized into first, second and third generation. The first generation of ad hoc network can be traced back to 1970's. In 1970's, these are called Packet Radio Network (PRNET).

The PRNET then evolved into the Survivable Adaptive Radio Network (SURAN) in the early 1980's. SURAN provided some profit by improving the radio performance.

In 1990's the performance group of MANET is born in Internet Engineering Task Force (IETF) who worked to regular routing protocols for MANET and gives rise to the development of various mobile devices like PDA's , palmtops, notebooks, etc [6].

### *A. Properties of MANET*

Each device in a MANET is free to move alone in any path. Such networks may control by themselves or may be connected to the larger Internet. Limited wireless connectivity range requires that a node should move in the surrounding area of at least one nearby node within the wireless. Communication range, also the node should be provided with the access-point of wired communication [8].

*B. Issues in MANET Network*

There are a number of issues within ad hoc networks:

*1) Routing:* Routing is one of the most complex problems to solve as ad hoc networks have a faultless connectivity to other devices in its neighbourhoods [20]. Each node acts as a router and forwards each other's packets to enable information giving out between mobile nodes.

*2) Security:* The user can add spurious information into routing packets and cause routing loops, long time-outs and advertisements of false or old routing table updates [21]. Security has several unclear issues that are important to solve to make the ad hoc network into a good solution.

*3) Quality of Service (QoS):* QoS is a difficult task for the developers, because the topology of an ad hoc network will regularly change [9].

## III. ROUTING PROTOCOL TECHNIQUES

Moveable devices have limited ability (battery power, available memory, and computing power) that further complicates the protocol design. Several protocols for ad hoc networks have been developed [9]. MANET routing protocols are usually divided into three categories which are Proactive Routing Protocols, Reactive Routing Protocols, Hybrid (refer with: Fig. 2) [10].

*A. Table-driven (Proactive) routing*

Proactive Routing Protocols are also called table driven routing protocols and it regularly maintain the updated topology of the network. Each node in this protocol maintains person routing table which contains routing information of every node in the network [10]. This type of protocols maintains new lists of destinations and their routes by at times distributing routing tables throughout the network. The main disadvantages of such algorithms are: Respective amount of data for maintained. Slow reaction on restructuring and failures .Examples of proactive algorithms are: OLSR (Optimized Link State Routing Protocol) Destination Sequence Distance Vector (DSDV) [11].

*B. On-Demand (Reactive) routing*

Reactive Routing Protocol is also called on-demand routing protocol. Reactive protocols do not begin route discovery by themselves, until they are requested [10]. This type of protocols finds a route on demand by flooding the network with Route Request packets. The main disadvantages of such algorithms are: High latency time in route finding. Excessive Flooding can lead to network clogging. Examples of on-demand algorithms are: Ad hoc On-demand Distance Vector (AODV). Dynamic Source Routing [11].

*C. Hybrid (both proactive and reactive) routing*

Hybrid Routing Protocols can be derived from the two previous ones, containing the advantages of both the protocols [10]. This type of protocol combines the advantages of proactive and reactive routing. The routing is initially recognized with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. The choice of one or the other method requires predetermination for typical cases. The main disadvantages of such algorithms are: number of other nodes activated. Reaction to traffic demand depends on gradient of traffic volume. Examples of hybrid algorithms are: ZRP (Zone Routing Protocol) [11].

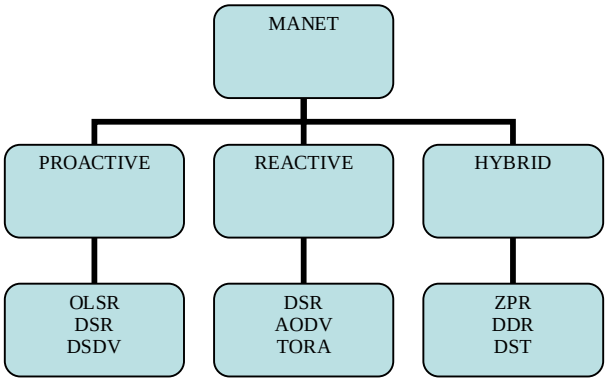


Fig 2: Classification of Routing Protocols

## IV. OLSR PROTOCOLS

*A. Overview*

The Optimized Link State Routing Protocol (OLSR) is an IP routing protocol optimized for mobile ad hoc networks, which can also be used on other wireless ad hoc networks. OLSR is a proactive link-state routing protocol, which uses hello and topology control (TC) messages to find out and then spread link state information throughout the mobile ad hoc network [13]. OLSR protocol is an optimization of a pure link state protocol for mobile ad hoc networks. First, it reduced the size of control packets: instead of all links, it declares only a subset of links with its neighbours who are its multipoint relay selectors [19]. Secondly, it minimizes flooding of this control traffic by using only the selected nodes, called multipoint relays, to circulate its messages in the networks. Only the multipoint relays of a node retransmit its broadcast message. This technique considerably reduces the number of retransmissions in a flooding or broadcast procedure [14].

*B. Multipoint Relay (MRP)*

The MPR is used to decrease the overhead by limiting the number of nodes. It forward the organize messages in the whole network for controlled flooding [15]. It minimizes the flooding of packets by reducing duplicate retransmissions in the same area and the size of the control message is reduced [16]. Each node in the network selects a

set of nodes in its neighbour nodes is called the multipoint relays of that node at times announces the information about who has selected it as an MPR. After selection of MPR OLSR protocol calculates its routes to all known destinations through these nodes, i.e. MPR nodes are selected as middle nodes in the path. It occasionally calculates and updates its routes to each known destination and keeps up-to-date a routing table [18].

## V . RELATED FIELD WORK

We discuss some previous work done in this field Mobile Ad-hoc network by some researchers as follows:

In [25] Ali Moussaoui, Fouzi Semchedine, Abdallah Boukerram have describe the active environment, such as Ad hoc networks, it is very complex to give an ideal solution to suit the QoS supplies for special applications. We have upcoming a method that allows maintaining a stable and sustainable at work topology. In this area we proposed two concepts: SND and FND to decide stable MPR nodes and stable topology. The simulation results have completed the value of our planned mechanism in terms of delay and lost packets. The view of the link stability is not the single parameter to assess the durability and the availability of the path.

In [22] Anelise Munaretto, Hakim Badis, Khaldoun Al Agha, Guy Pujolle have describe a Link-state QoS Routing Protocol for Ad Hoc Networks. This application implements the QoS functionality to contract with some degree of presented resources in a dynamic environment specifying a tailored metric for such a mobile wireless networks. To study the performance of the proposed QoS based routing, add some QoS values to the Optimized Link State Routing (OLSR) protocol, which previously considers the hop distance, without contain additional messages. The existing evaluation performance estimated the development acquired by the planned QoS-based routing protocol. The achieved add by our proposal can be an important improvement in such mobile wireless networks. The performance evaluation implementing more scenarios and varying the simulation parameters, and also including the bandwidth metric and the admission control applied in the MPR nodes.

In [23] Patrick Sondi, Dhavy Gantsou and Sylvain Lecomte have describe the benefits of using mobile ad hoc networks to provide multimedia services including Internet access, mobile phone connections and videoconference. The performance of the OLSR QoS addition proposed to use a voice communication application in various scenarios. The results of the simulations performed using OPNET give you an idea about that this QoS extension allows deploying efficiently voice communication over MANET and maintaining good quality to voice sessions, even when other traffics occur or when nodes are mobile. We also pointed out the impact of mobility on the behavior of the QoS extension, notably the fact that it increases the routing traffic received by each node.

In [24] Qingyang Song, Zhaolong Ning, Shiqiang Wang, Abbas Jamalipour have describe the link stability estimation scheme. Compared with link associatively based estimation schemes, the planned scheme middle on a probabilistic model and the estimation results have explicit meanings together in theory and practice. The proposed scheme is simpler than the methods using GPS or low layer measurements, and it is not controlled to a specific network topology. We adopted a variable sized sampling window which is more flexible for the dynamic link state, and is also a major contribution in our work. Link state has a persistent contact on routing process; a routing method which adjusts its operating mode based on the estimated link stability. Simulation results show that the proposed stability estimation scheme is able to estimate the link stability in both stationary and non-stationary scenarios and the future routing method enhances packet delivery rate effectively in ad-hoc networks.

In [12] Er. Manjit Thapa, Er. Bhubneshwar Sharma have work to evaluated the four performance parameters i.e. frequency distribution, cumulative distribution, bandwidth and average end-to-end delay with different number of nodes. The presentation of MANET routing protocol OLSR was analyzed and comparison of MPR algorithms with delay and bandwidth is analyzed. The paths were determined with delay and bandwidth parameters and their presentation is known with number of nodes. The comparison of algorithms concludes that the minimum delay route is best for dense network as compared to bandwidth. The result for delay concludes that as the number of nodes increases the delay increases very small and then it becomes almost constant. The increasing distribution varies with delay.

In [26] Anelise Munaretto, Mauro Fonseca has described the QoS-based routing protocol for mobile and wireless ad hoc networks. In categorize to include quality parameters in the routing information, QoS measurements were applied. The delay and bandwidth measurements were planned. The delay metric is calculated between each node and its neighbors having direct and symmetric links. The bandwidth measurements are calculated using IEEE 802.11b as the medium accesses organize protocol. The throughput is very instable due to network environment. Perfect throughput calculation is still a difficult task. We measured delay as a metric rather than bandwidth as a metric. The implications of routing metrics on path calculation were examined and the rationale behind the selection of QoS metrics. Heuristics for multipoint relays selection were proposed. The heuristic used in standard OLSR finds a MPR set with minimal size. There is no agreement that OLSR finds the optimal path considering QoS constraints. Three variants that allow QOLSR to find the minimum delay path were planned. To contain quality

requirements in the MPRs selection, and also in routing information, delay measurements are applied. The QOLSR3 heuristic finds the optimal shortest paths using only partial information of the network topology. The presentation of the proposed QOLSR variants was examined through computer simulations. The three QOLSR variants achieve better performance when compared with the standard OLSR protocol.

In [20] Harmanpreet kaur, Er. Jaswinder singh have describe performance of three routing protocols namely OLSR, GRP and TORA was analyzed .OLSR performs best in terms of load and throughput. GRP performs best in terms of delay and routing overhead. TORA is the bad preference when we consider any of the four performance parameters. The OLSR is best as compared to GRP and TORA in all traffic volumes since it has maximum throughput.

| Protocol | Routing Protocol Class | Routing Structure | Multiple Routes | Route Metric Method | Route Maintenance | Advantage/ Disadvantage |
|---|---|---|---|---|---|---|
| **Destination-sequenced distance vector (DSDV)** | Proactive Routing Protocol | Flat | No | Periodic and as required | Loop free | Loop free / High overhead |
| **Global state routing (GSR)** | Proactive Routing Protocol | Flat | No | Periodic and local | Localized updates | Localized updates / High memory overhead |
| **Optimized link state routing (OLSR)** | Proactive Routing Protocol | Flat | No | Periodic | Reduces control overhead using Multipoint Relay | Reduced control overhead and contention / 2-hop neighbour knowledge required |

Table 1. Characteristics of proactive routing protocols

| Protocol | Routing Protocol Class | Routing Structure | Multiple Routes | Route Metric Method | Route Maintenance | Advantage/Disadvantage |
|---|---|---|---|---|---|---|
| **Ad hoc on-demand distance vector (AODV)** | Reactive Routing Protocol | Flat | No | Freshest and shortest path | Route Table | Adaptable to highly dynamic Topologies / Scalability problems, large delays, hello messages |
| **Dynamic source routing (DSR)** | Reactive Routing Protocol | Flat | Yes | Shortest path, or next available in route cache | Route Cache | Multiple routes, Promiscuous Overhearing / Scalability problems due to source routing and flooding, large delays |
| **Temporally ordered routing algorithm (TORA)** | Reactive Routing Protocol | Flat | Yes | Shortest path, or next available | Route Table | Multiple routes / Temporary routing loops |
| **Associativity based routing (ABR)** | Reactive Routing Protocol | Flat | No | Strongest Associativity and shortest path | Route Table | Route stability / Scalability problems |

Table 2. Characteristics of reactive routing protocols

| Protocol | Routing Protocol Class | Routing Structure | Multiple Routes | Route Metric Method | Route Maintenance | Advantage/Disadvantage |
|---|---|---|---|---|---|---|
| **Zone routing protocol (ZRP)** | Hybrid Routing Protocol | Flat | No | Shortest path | Intrazone and interzone tables | Reduce retransmissions / Overlapping zones |
| **Distributed spanning trees based routing protocol (DST)** | Hybrid Routing Protocol | Hierarchical | Yes, if available | Forwarding using the tree neighbors' and the bridges using shuttling | Route tables | Reduce retransmissions / Root node |
| **Distributed dynamic routing (DDR)** | Hybrid Routing Protocol | Hierarchical | Yes, it alternate Gateway nodes are available | Stable routing | Intrazone and interzone table | No zone map or zone coordinator / Preferred neighbors' may become bottlenecks |

Table 3. Characteristics of hybrid routing protocols

## VI. Conclusion

This paper describes the infrastructure less Mobile Ad-hoc networks. Firstly, the brief introduction was given about the basic idea of MANET. Then properties of MANET, issues in MANET Network that help us to understand more about MANET. In part 2, routing protocols were discussed, including its types and examples. Then in part 3, the OLSR protocol of MANET was reviewed. The review also discussed OLSR routing protocol in this area. In this paper it is concluded that OLSR routing protocol is best in term of performance. This review article will help the new researchers to find their domain of interest and to identify research gaps which existing protocols are absent.

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## References

[1] Vikas Goyal, Shaveta Rani, Paramjit Singh, "Performance Comparison of Routing Protocols for Remote Login in MANETs" International Journal of Computer Science and Mobile Computing, Vol. 2, Issue. 7, 413-421, July 2013.

[2] Kuldeep Vats, Amit Rathee, "Simulation and Performance Analysis of OLSR Routing Protocol Using OPNET" International Journal of Advanced Research in Computer Science and Software Engineering 2012 2

[3] Bapuji, V and Sharma, SSVN and Naik, R Lakshman and Ramesh, D and Manjula, B "Quality of service for mobile Ad-hoc wireless networks" International Journal on Computer Science \& Engineering 2011 3

[4] Suchita Baxla, Rajesh Nema "A Review Paper on Performance Analysis of AODV, OLSR, DSR and GRP Routing Protocols of Ad hoc Networks'' International Journal of Science and Research (IJSR), Volume 2 Issue 5, May 2013.

[5] Hoebeke, Jeroen and Moerman, Ingrid and Dhoedt, Bart and Demeester, Piet "An overview of mobile ad hoc networks: Applications and challenges" Journal-Communications Network 2004 3 60--66

[6] Mohit Kumar Rashmi Mishra "An Overview of MANET: History, Challenges and Applications'' International Journal of Engineering Research and Technology Vol. 3 No.1 Feb-Mar 2012.

[7] **S**. Meenakshi Sundaram, Dr.S.Palani, Dr. A. Ramesh Babu, "Performance Evaluation of AODV, DSR and OLSR Mobile Ad hoc Network Routing Protocols using OPNET Simulator'' International Journal of Computer Science & Communication Networks Vol 3(1), 54-63.

[8] "Mobile Ad-hoc Network (MANET) Properties and Spectrum needs at the Nodes'' Oxford University Press 2007.

[9] Mukesh Kumar, Rahul Rishi, D.K.Madan "Issues and challenges of quality of service in mobile Ad-hoc network'' Int J of Computer Science \& Engineering Technology (IJCSET) 2010 .

[10] Naveen Bilandi, Harsh K Verma "Comparative Analysis of Reactive and Proactive Routing Protocols in MANETs Using Throughput, Delay and Network Load'' International Journal of Advanced and Innovative Research, Volume 1, Issue 1, June 2012.

[11] Ekta Nehra, Er. Jasvir Singh "Performance Comparison of AODV, TODV, OLSR and ABR using OPNET '' International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 5, May 2013.

[12] Er. Rupinder kaur, Er. Manjit Thapa, Er. Bhubneshwar Sharma "Quality of service routing for mobile Ad hoc networking as latest trends used in computer and electronics engineering" International Journal for Research in Science & Advanced Technologies**,** Issue-2, Volume-4, 166-171.

[13] http://en.wikipedia.org/wiki/Optimized_Link_State_Routing_Protocol.

[14] http://www.olsr.org/docs/wos3-olsr.pdf.

[15] P.Suganthi, Dr.A.Tamilarasi "Performance of OLSR Routing Protocol under Different Route Refresh Intervals in Ad Hoc Networks" International Journal on Computer Science \& Engineering Vol. 3 No. 1 Jan 2011.

[16] Upadhyay, Alok and Phatak, Rupali "Performance Evaluation of AODV DSDV and OLSR Routing Protocols with Varying FTP Connections in MANET" IJRCCT 2013 2 531—535

[17] Pooja Singh, Anup Bhola, C.K Jha, PhD "Simulation based Behavioral Study of AODV, DSR, OLSR and TORA Routing Protocols in Manet" International Journal of Computer Applications Volume 67– No.23, April 2013.

[18] Pankaj Palta, Sonia Goyal "Comparison of OLSR and TORA Routing Protocols Using OPNET Modeler" International Journal of Engineering Research and technology Vol. 1 Issue 5, July – 2012.

[19] Anjali, Maninder Singh "Simulation and Performance Analysis of AODV, OLSR, GRP Routing Protocol by considering IEEE 802.11Standard" International Journal Volume 2, Issue 6, June 2012.

[20] Harmanpreet kaur Er. Jaswinder singh "Performance comparison of OLSR, GRP and TORA using OPNET'' International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 10, October 2012.

[21] Kuldeep Vats, Monika Sachdeva, Dr. Krishan Saluja "Simulation and performance Analysis of OLSR, GRP, DSR Routing Protocol using OPNET'' International Journal of Emerging trends in Engineering and Development Simulation, Issue 2, Vol.2 (March-2012).

[22] Munaretto, Anelise and Badis, Hakim and Al Agha, Khaldoun and Pujolle, Guy and others "A link-state QoS routing protocol for ad hoc networks" MWCN 2002.

[23] Munaretto, Anelise and Badis, Hakim and Al Agha, Khaldoun and Pujolle, Guy and others "A link-state QoS routing protocol for ad hoc networks" MWCN 2002.

[24] Sondi, Patrick and Gantsou, Dhavy and Lecomte, Sylvain "Performance Evaluation of Multimedia Applications over an OLSR-Based Mobile Ad Hoc Network Using OPNET" Computer Modeling and Simulation (UKSim), 2010 12th International Conference on 2010

[25] Song, Qingyang and Ning, Zhaolong and Wang, Shiqiang and Jamalipour, Abbas "Link stability estimation based on link connectivity changes in mobile ad-hoc networks" Journal of Network and Computer Applications 2012 35 2051—2058

[26] Ali Moussaoui, Fouzi Semchedine, Abdallah Boukerram "A link-state QoS routing protocol based on link stability for Mobile Ad hoc Networks" Elsevier Journal of Network and Computer Applications 2013.

[27] Anelise Munaretto, Mauro Fonseca "Routing and quality of service support for mobile ad hoc networks" Elsevier Computer Networks (2007) 51 3142--3156.