



## Significance of OSPF Routing Protocol in Mobile Ad-Hoc NETWORKS (MANET)

Anuj Verma<sup>1</sup>  
Vanuj1512@gmail.com<sup>1</sup>

Disha Guleria<sup>2</sup>  
[dishaguleria@ymail.com](mailto:dishaguleria@ymail.com)<sup>2</sup>

---

**Abstract**— Mobile Ad Hoc Network (MANET) is collection of multi-hop wireless mobile nodes that can communicate with each other without centralized control or established infrastructure. The network in which wireless links are highly error prone and can go down frequently due to mobility of nodes, interference and less infrastructure. Routing in MANET is a quite difficult due to highly dynamic environment. Several routing protocols have been proposed for mobile ad hoc networks. This paper proposed OSPF routing protocol in Mobile Ad Hoc Network. Here, the router first find out the shortest path from source to destination and forwarded the packet in that path.

**Keywords**— MANET, Routing Protocol, OSPF.

---

### I. INTRODUCTION

A routing protocol defines that how routers can communicate with each other and spread information that enables them to select routes between any two nodes on a computer network. Algorithms of routing determine the specific choice of route and each router consisting of prior knowledge of networks which attached to it directly. Mobile Ad-hoc Network (MANET) is a wireless system that comprises mobile nodes and it is usually referred to a decentralized autonomous system [1, 3]. Mobile nodes are involved in MANET often work as client and the network in which nodes can be either fixed or mobile where the mobile nodes include laptop, mobile phone, MP3 player, home computer or personal digital assistance. These nodes may be located on ships, airplanes or land, irrespective of their location as they can participate in communication. Self connectivity and easy deployment of MANETs makes it apt for emergency, surveillance situations and rescue operations. MANET makes use of the wireless communication world as the common means for human communication. Devices are arranged with Wi-Fi as hot spots in many places such as universities, offices, airports and hotels, put as a major source for communication in this modern world which challenges the researchers around the world to enforce their research in developing MANET [2]. Advance network of communication, the routing plays a key role to route the data in network. The different protocols have been proposed so far by many researchers. This observation of wireless devices lead the path to focus our study on the large networks where hosts involved in the network engage to communicate each other in Ad hoc fashion [1].

Mobile Ad hoc Network (MANET) is a Wireless Ad-Hoc Network technology where mobile nodes in the network will act as clients and servers. Here the Figure 1. Shows the decentralized MANET consisting of mobile nodes functioning as routers along with the respective mobile nodes.



Figure 1: Ad-Hoc Wireless Network

### MANET Characteristics

MANETs do not have any central authority or fixed infrastructure, unlike the traditional network makes MANET decentralized system. MANETS connects themselves by discovering the topology and deliver the messages themselves makes MANET a self configuring network Mobile nodes in the MANET are free to take random movement. This will result frequent changes in the topology, where alternative paths are found automatically and they use different routing mechanisms in transmitting the data packet to the desired nodes by this it exhibits dynamic topology [9]. MANET usually operates in bandwidth-constrained variable-capacity links that result in high bit errors, low bandwidth, unstable and asymmetric links results in congestion problems. Power conservation plays a key role in MANET as the nodes involved in this network generally uses exhaustible battery/energy sources this makes MANETS energy-constrained. Finally, Mobile wireless networks are more vulnerable to eavesdropping and interception and the network control will increase the robustness of the failure, rather than centralized network dispersion [11, 14].

### Applications of MANET

- Flexibility of the MANET advanced its usage in the business applications such as conferences, file transfers and web application and home-automation such as to lock and unlock the doors and to operate the lights remotely.
- Nature of MANET makes benefit for communication: Self re-configuring, easy deployment, decentralized and infrastructure independent.
- MANET was used for military applications for communication where the data units and armed soldiers engaged in the battle field.
- MANETs are widely used at locations where the fixed infrastructure for communication has been destroyed such as earthquake, flood, fire explosions plane or air crash and the areas of disaster and natural calamities.

### MANET Routing Protocols

Routing protocols are usually engaged to determine the routes following a set of rules that enables two or more devices to communicate with each other. In an ad hoc network routes are enabled in between the nodes using multi-hop, as the propagation range of the wireless radio is limited. The nodes engaged in traversing the packets over MANET are not aware of the topology of the network. Routing protocols discovers the topology by receiving the broadcast messages from its neighboring nodes in the network and respond too accordingly [9, 13]. Routing protocols are classified based on

the different routing strategies. Pure distance vector algorithms are followed by the protocols Distributed Bellman Ford, Routing Internet Protocol. Due to the poor result of these algorithms new protocols are proposed with improvement enhancing the current algorithms, such as Least Resistance Routing (LRR), Distance Sequence Distance Vector (DSDV) protocol and Wireless Routing Protocol (WRP). Link state algorithms are used in the protocols Fisheye State Routing (FSR) protocol, Global State Routing (GSR) protocol, Optimized Link State Routing (OLSR) protocol, Source Tree Adaptive Routing (STAR) protocol etc [6, 17]. On demand routing protocols find routes on demand i.e., when traffic arrives to the protocol for routing. No prior routes are configured and it is not necessary to exchange the routing tables frequently. A route request packet is used by source to find a route before communication is initiated. The best route is found by a route selection algorithm. Several protocols follow this strategy i.e., Ad Hoc On-Demand Distance Vector (AODV), Dynamic Source Routing (DSR), Temporarily Ordered Routing Algorithm (TORA), Lightweight Mobile Routing (LMR) etc [8, 17, 18].

### **Open Shortest Path First (OSPF)**

OSPF is an interior gateway protocol (IGP) for routing Internet Protocol (IP) packets solely within a single routing domain, such as an autonomous system where it gathers link state information from available routers and constructs a topology map of the network. The topology presents as a routing table to the Internet Layer which routes datagram's based solely on the destination IP address found in IP packets. OSPF supports Internet Protocol Version 4 and Internet Protocol Version 6 networks and features variable-length subnet masking (VLSM) and Classless Inter-Domain Routing (CIDR) addressing models [4]. The OSPF routing policies for constructing a route table are governed by link cost factors associated with each routing interface. The cost factors may be the distance of a router, data throughput of a link, or link availability and reliability, expressed as simple unit less numbers which provides a dynamic process of traffic load balancing between routes of equal cost. The identifications of other areas may be chosen administrators which select the IP address of a main router in an area as area identification. For every additional area having a direct or virtual connection to the OSPF backbone area, these connections are maintained by an interconnecting router, known as area border router (ABR). ABR maintains the separate link state databases for each area it serves to maintain routes for all areas in the network. OSPF does not use a TCP/IP transport protocol, such as UDP or TCP, but encapsulates its data in IP datagram's with protocol number 89 [13]. OSPF implements its own error detection and correction functions. It uses multicast addressing for route flooding on a broadcast domain and also uses multicast IP packets never traverse IP routers, they never travel more than one hop and therefore a Link Layer protocol in the Internet Protocol Suite.

OSPF supports networks with multiple routers which including backup routers, to balance traffic load on multiple links to other sub networks. Neighbouring routers in the same broadcast domain or at each end of a point-to-point telecommunications communicate with each other via the OSPF protocol. Routers form adjacent when they have detected each other, this detection is initiated when a router identifies itself in a Hello protocol packet. This establishes a two-way state and is the most basic relationship and the routers in an Ethernet select a Designated Router (DR) and a Backup Designated Router (BDR) which act as a hub to reduce traffic between routers. Both unicast and multicast transmission modes used by OSPF to send "Hello" packets and link state updates. The link state routing protocol, where OSPF establishes and maintains neighbour relationships for exchanging routing updates with other routers [17]. OSPF router forms neighbour relationships only with the routers directly connected to it which forming a neighbour relationship between, the interfaces used to form the relationship must be in the same OSPF area [4].

## **II. RELATED WORK**

An effective MANET routing protocol must be equipped to deal with the dynamic and unpredictable topology changes associated with mobile nodes, whilst also being aware of the limited wireless bandwidth and device power considerations which may lead to reductions in transmission range or throughput. In addition to these core requirements MANET routing protocols should also be decentralized, self-healing and self-organizing and able to exploit multi-hopping and load balancing, these requirements ensure MANET routing protocols ability to operate autonomously [6]. MANET is easy deploying able, decentralized and needs no infrastructure result in rapid growth of its applications. In these ad-hoc networks routing plays a crucial role. Several routing protocols are proposed by the researchers to make an efficient routing over MANET. Routing protocols plays a major role in performance of the MANET. This aspect encouraged researchers to analyse the routing protocols under various network conditions and to find their impact over MANET performance [3].

## **III. CONCLUSIONS**

Manet places a vital role in various fields like military, hospitality, traffic control etc. Manet in which data send from source to destination and use various routing protocols out of those protocol OSPF finds the shortest distance at each node to find the shortest path from source to destination and forwarded the packet in that path. The OSPF protocol is a

link-state routing protocol which means that the routers exchange topology information with their nearest neighbours. It provides support for multiple paths of equal cost and provides a multi-level hierarchy called area routing.

#### ACKNOWLEDGMENT

Thanks to my Guide and family member who always support, help and guide me during my dissertation. Special thanks to my father who always support my innovative ideas.

#### REFERENCES

- [1] Komala CR, Srinivas Shetty, Padmashree S., Elevarasi E., "Wireless Ad hoc Mobile Networks", National Conference on Computing Communication and Technology, pp. 168-174, 2010
- [2] Samir R. Das, Charles E. Perkins and Elizabeth M. Royer, "Performance Comparison of Two On-demand Routing Protocols for Ad Hoc Networks"
- [3] Ramanarayana Kandikattu, and Lillykutty Jacob, "Secure Internet Connectivity for Dynamic Source Routing (DSR) based Mobile Ad hoc Networks", International Journal of Electronics, Circuits and Systems, pp. 40-45, 2007.
- [4] Kenneth Holter, "Wireless Extensions to OSPF: Implementation of the Overlapping Relays Proposal", Master thesis, Department of Informatics, University of Oslo, Norway.
- [5] C. E. Perkins and E. M. Royer, "Ad-Hoc On Demand Distance Vector Routing", Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications (WMCSA), New Orleans, LA.
- [6] C. E. Perkins and P. Bhagwat, "Highly dynamic destination-sequenced distance vector routing (DSDV) for mobile computers".
- [7] D. Bertsekas and R. Gallager, "Data Networks" Prentice Hall Publ., New Jersey.
- [8] D. B. Johnson, D. A. Maltz, Y.C. Hu, "The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)", IETF Draft, work in progress. <http://www.ietf.org/internet-drafts/draft-ietf-manet-dsr-09.txt>
- [9] D. B. Johnson and D. A. Maltz, "Dynamic Source Routing in Ad Hoc Networks", Mobile Computing, T. Imielinski and H. Korth, Eds., Kulwer Publ.
- [10] David A. Maltz, "On-Demand Routing in Multi-hop Wireless Mobile Ad Hoc Networks", available at [www.monarch.cs.rice.edu](http://www.monarch.cs.rice.edu)
- [11] E.M.Rover, C.K.Toh, "A review of current routing protocols for ad hoc networks", IEEE Communications.
- [12] F. Bertocchi, P. Bergamo, G. Mazzin, "Performance Comparison of Routing Protocols for Ad hoc Networks", IEEE GLOBECOM.
- [13] Farhat Anwar, Md. Saiful Azad, Md. Arafatur Rahman, Mohammad Moshee Uddin, "Performance Analysis of Ad hoc Routing Protocols in Mobile WiMAX Environment", IAENG International Journal of Computer Science.
- [14] J. Mwanza, B. Myirenda "Performance evaluation of Routing Protocols in Mobile Ad Hoc Networks (MANETs)" Jan2009.
- [15] D. Johnson, Y. Hu, D. Maltz "The Dynamic Source Routing Protocol (DSR) for Mobile Adhoc Networks for Ipv4" NWG, 2007.
- [16] S. Ahmad, I. Awan, A. Waqqas, B. Ahmad. "Performance Analysis of DSR and Extended DSR protocols" ICON-AICMS, 2008, pp.191-196.
- [17] T. Clausen, P. Jacquet "Optimized Link State Routing Protocol (OLSR)" NWG, 2003.
- [18] C. Perkins, E. Belding, S. Das. "Ad hoc On-Demand Distance Vector (AODV) Routing" NWG, 2003.