# Investigation of Video Streaming over MANETS Routing Protocols

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**Abstract**—For industrial and academic researchers from all around the world, the Mobile Ad-hoc Network (MANET) is a specific focus. A MANET was created as a result of the fast growth of wireless gadgets. Mobile Ad hoc network is a self-organizing network with no framework. MANET's device has the ability to travel in any direction in order to transmit and receive data with other devices or network nodes. An administrator node which is capable of controlling other nodes is absent in MANET. All nodes in MANET act as its own router and host and arrange its own network. The most important element of MANET is Routing protocol. For routing in MANET, various routing protocol is responsible. Providing a video streaming service using mobile ad-hoc networks is a hard task. The network topology is immensely unstable and its instability causes data to be lost. The performance of MANET routing protocols for video applications has been examined in this paper. There are many routing protocols, however the Optimized Link State Routing (OLSR) protocol and Ad-hoc On-Demand Distance Vector (AODV) routing protocols are explored here. In this work, a comparison of these two effective routing protocols for supporting video streaming applications is offered.

**Keywords**—MANET, video streaming, AODV, OLSR, routing protocols

## 1 Introduction

MANET's utilization applications have risen quickly in recent years due to its less setup, low-cost, and easy-to-use characteristics. It can be deployed without any infrastructure or on-the-fly in a variety of conditions, including emergency and saving operations during flooding, earthquakes, and conflict. MANETs are self-configuring and self-organizing networks and it can be built and managed without any infrastructure. It functions in a multi-hop manner. In addition to transmitting its own packets, a mobile node can also relay packets to other mobile nodes [1]. Video streaming via the internet has grown in popularity in recent years, with a variety of uses including HD TV content (HDTC), mobile TV, mobile video chat, and surveillance systems.

Additionally, due to continual developments in wireless network transmission technology and physical properties of mobile devices, the extent of multimedia traffic via wireless networks has expanded dramatically. However, there are numerous obstacles in providing good Quality-of-Service (QoS) to wireless network receivers. Limited wireless channel capacity, fulfilling the delay and bandwidth constraints of video streaming requests, and processing with the dynamic features of the wireless atmosphere, also multimedia functions, are only a few of them [2]. The sample of MANET is shown in Figure 1.

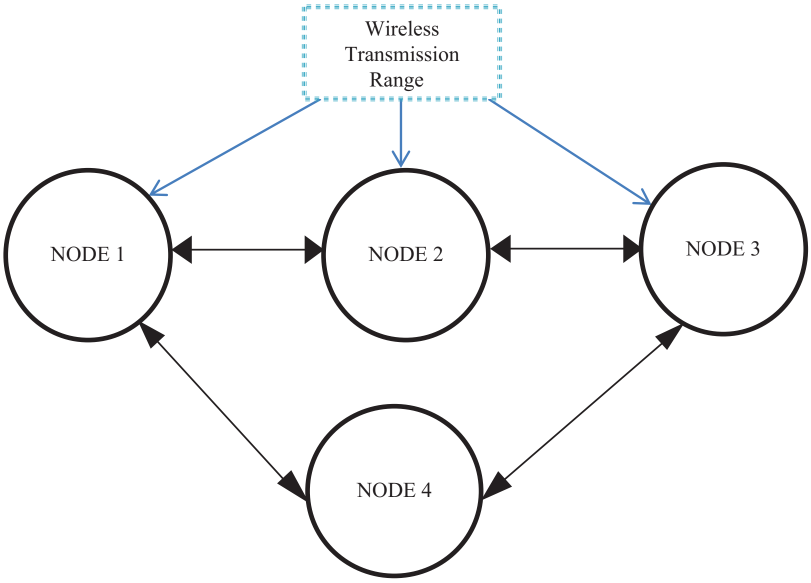



**Fig. 1.** Sample of MANET

### 1.1 Issues of video streaming

Video streaming need enough information transmission capability, especially to play at a better quality. As a result of the joint impacts of wireless communications aspects such as multipath fading and shadowing, collisions and interferences and topology preservation in the occurrence of node mobility in wireless networks, offering multimedia services over MANET is not a simple task. All of these consequences have a bad impact on the video streaming that is currently in progress. Especially, variations in topology induce inconsistent connectivity and as a result, massive packet loss bursts. So, network designers face a substantial challenge when it comes to allowing video transmission networks in MANET. The major goal of this research is to find an appropriate routing system for supporting video streaming by comparing two routing protocols.

## 2 Related work

Many studies have been done on the performance of routing protocols in MANETs. The vast majority of these linked works consider simply the best-effort traffic. The main aim of this paper is the investigation of MANET routing protocols performance for video streaming. [3] Considered the implementation of the AOMDV and EVSM routing protocols, with a special focus on EVSM. They discovered that EVSM performed better in simulation series. [4] Investigated the accomplishment of several routing protocols in response to network topology changes caused by node relocation, link failures, and other factors. The performance of routing protocols was assessed in the paper by altering the number of nodes. The work of protocols under huge mobility is not investigated in this paper. This paper concluded that a network with a large number of nodes and traffic sources can lead to congestion.

[5] Performance analysis of routing protocols for video application in MANET is investigated in this work. Comparative study of various MANET routing protocols has been given in this work. The default simulation parameters utilized in this paper to investigate the different routing protocols performance. This paper concluded that video streaming is possible with limited quality and throughput over MANETs. In order to obtain the real decision about the greatest protocol, many routing protocols need to be considered.

The skill of the H.264 protocol is assessed in [6] utilizing two protocols: Neighbor-Aware Head (NACH) and Dynamic Source outing (DSR). The authors demonstrate that video may be sent via MANETs with an average distance of six hops and a data rate of 5.5 Mbps. The throughput of video applications running MANETs was investigated in this paper.

Using the NS-2 simulator, [7] analyzed OLR and AODV. The simulation length for each situation was 900 seconds, and the replicated mobility network area was 800 m × 500 m. The nodes in each simulation situation were primarily placed in the simulation area's center. After the first 10 seconds of simulated time, the nodes begin to move. They used IP as the network layer protocol and traffic at a constant bit rate.

[8] Used QualNet 5.0 to analyze the performance of the existing wireless routing protocol AODV in various node placement schemes such as Grid, Random, and Uniform. They looked at four Quality of Service measures (average jitter & delay, ratio of packet delivery, routing load and throughput). The outcomes show that AODV performs better in a grid context than in other settings.

[9] The authors presented TCP based video streaming using OLSR. This protocol has been found to be suitable for immediately reforming path breaks and saving bandwidth. The effects of mobility, traffic type, and traffic intensity on the performance of multimedia traffic over a MANET utilizing the DSR protocol are investigated in paper [10]. The authors of this research looked at AODV, DSR, OLSR, TORA, and GRP, which are all popular routing protocols. For video transmission, the performance of these routing techniques has been explored.

## 3 MANET routing protocols overview

Routing protocols in MANET are divided into three categories: proactive, hybrid, and reactive. There are various routing protocols for MANET is shown in Figure 2. In this paper, OLSR and AODV routing protocols are compared for best result [11].

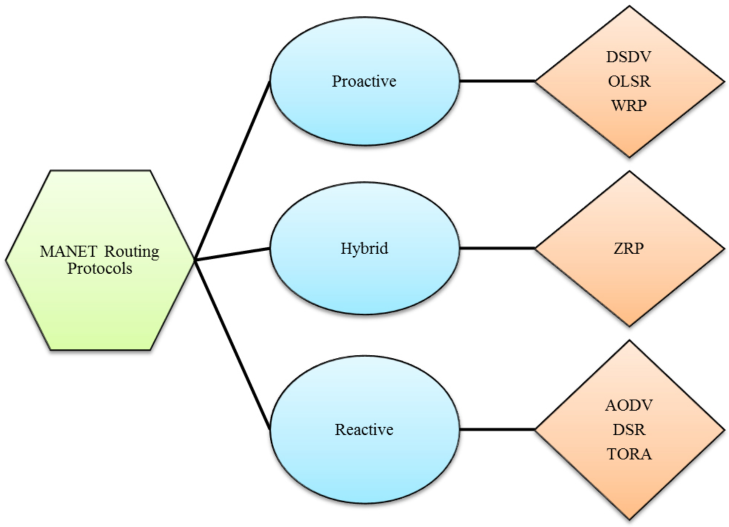



**Fig. 2.** Classification of MANET routing protocol

### 3.1 Reactive protocol

**Ad hoc on-demand distance vector routing protocol.** These protocols are only followed when they are specifically requested by source nodes. As a result, these types of protocols are often called as on-demand algorithm. And these protocols determine their route whenever a request for sending and receiving packets is made, which reduces the overhead of the routing table and eliminates the need to retain routing information. AODV routing protocol was the first developed protocol by MANET team just before OLSR. It does not form any additional traffic for communication with links and create trees to link members in multicast groups. To assure route freshness, AODV employs sequence numbers. AODV networks remain silent until connections are made. Network nodes send a request for connection if need connections. The AODV resting nodes forward the information and keep track of which node broadcast the connection request. As a result, a sequence of temporary routes back to the requesting node is formed.

When node A wants to transmit a message to node B, it sends a route request message (RREQ) to that node's neighbor (Figure 3). When neighbor's nodes receive the RREQ message, they have two options: they can send a Route Reply (RREP) back to node A if they know a route to the destination or if they are the destination (Figure 4).

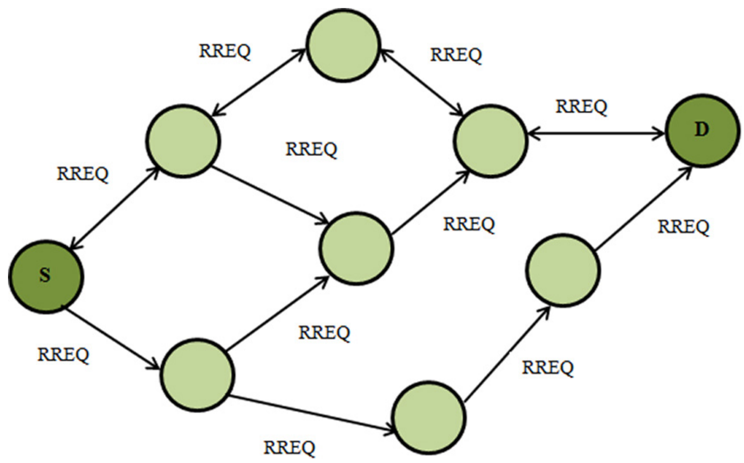



**Fig. 3.** Route request broadcasting in AODV

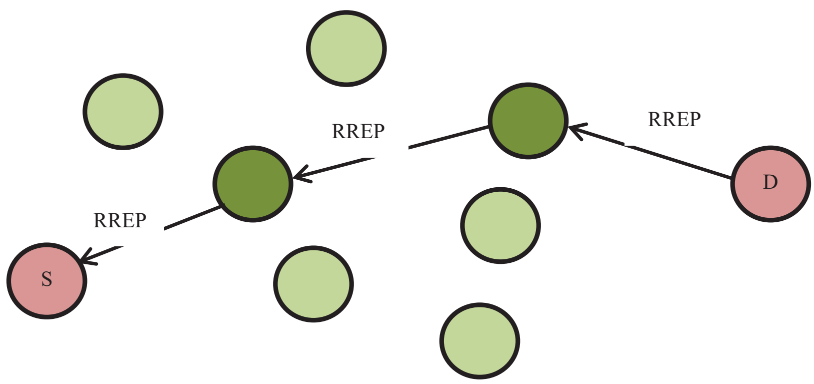



**Fig. 4.** Route reply in AODV

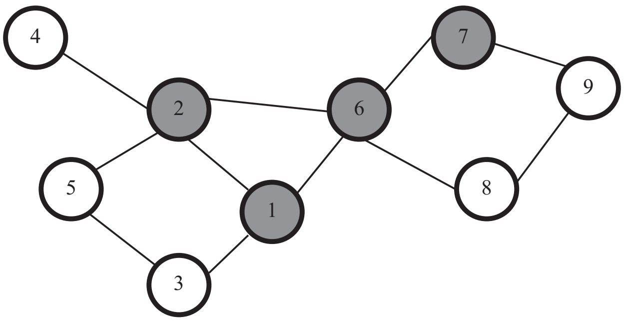
### 3.2 Hybrid protocol

The hybrid routing protocol bridges the gap between reactive and proactive behaviour. It eliminates all of the flaws in reactive and proactive systems.

### 3.3 Proactive protocol

It differs from reactive protocols in that it saves network routing data. As a result, it's called as table-driven routing protocol because it retain and updates network data on a periodic basis. However, it faces a network in a large network because it is hard to retain the data of each and every node in a huge network. When compared to reactive protocols, this one has a higher overhead.

**Optimized link state routing protocol.** Optimized link state employs MultiPoint Relaying as a method of reducing message flooding. Each node (n) in the framework chooses a group of neighboring nodes to act as multipoint relays MPR(n), that again send control packets from n-neighbors not in MPR(n) process control packets from n, but they do progress the packets. MPR(n) is chosen so that all of N's two-hop neighbors are covered by MPR's single-hop neighbors (n). OLSR is the most widely used ad-hoc routing protocol. The critical path method (CPM) is a significant node that has the distinction of being the optimal crossing points for reaching all nodes in a flooding procedure without spreading out in all directions. The MPR sends a connection status that decreases all supervisory positions. To give shortest path routes, OLSR just needs partial link state flooding and shown in Figure 5. OLSR is designed to operate in a completely distributed fashion, with no reliance on a single entity. The protocol does not require reliable control message transmission: because each node delivers control messages on a regular basis, it can withstand a fair loss of some of them.




| MPRs | Set of Selector |
|---|---|
| 1 | 2,3,6 |
| 2 | 1,5,6,4 |
| 6 | 1,2,7,8 |
| 7 | 6,9 |

**Fig. 5.** Example network of OLSR

## 4 Performance analysis & result

The parameters show how good MANET protocols are in finding the optimum path to the destination, such as throughput, network load and average delay and can be characterized as follows.

**Average delay**: The time (s) it takes a source node to form a data packet and deliver through the network until it reaches the destination node. Real-time traffic, such as video, is susceptible to the delay of data packet and requires the shortest possible delay.

**Load:** It can be calculated by the volume of traffic generated and forwarded by the nodes.

**Throughput:** The number of data packets that are successfully sent via a communication network to the ultimate destination node. It is necessary to have a high throughput in any network.

Characteristics of AODV & OLSR are shown in Table 1 and the simulation parameters are shown in Table 2.

**Table 1.** Characteristics of AODV & OLSR

| Protocol Property | OLSR | AODV |
|---|---|---|
| Multicast Routes | Yes | No |
| Proactive | Yes | No |
| Periodic Broadcast | Yes | Yes |
| Unidirectional Link Support | Yes | No |
| Distributed | Yes | Yes |
| Multicast | Yes | Yes |
| Routes Maintained in | Route Table | Route Table |
| QoS Support | Yes | No |
| Provide Loop-Free Routers | Yes | Yes |
| Reactive | No | Yes |
| Scalability | Yes | Yes |
| Route Optimization | Yes | Yes |
| Routing Philosophy | Flat | Flat |
| Route Reconfiguration | Link State Announcement | Erase Route Notify Source |

**Table 2.** Simulation parameters

| Simulation Parameters | Value |
|---|---|
| Network Type | Mobile |
| Routing Protocols | OLSR, AODV |
| Area | 1500*1500 (m) |
| Number of Nodes | 15, 30, 45, 60, 75 |
| Duration | 240s |
| Mobility Model | Random way point |
| Pause Time | 2s |
| Mobility | 60m/s |
| Traffic Type | Video application |
| Data Packet Size | 800 bytes |
| Data rate | 11 mbps |
| Address Mode | IPV4 |
| Physical Characteristics | IEEE 802.11 |
| Fragmentation threshold | None |
| Buffer size | 205000 bits |

The end-to-end average delay of the video traffic network is presented in Figure 6. Video traffic is greater for the AODV, because flow control system is not present in this information. Every network node sends real-time data packets without the knowledge of if the receiver nodes buffer has been acknowledged. As a result, packets in the buffer queue have to wait for a long period. The AODV routing protocol is unable to instantly establish node connections, causing network latency. The data packet may wait in the buffers until the AODV determines a path on its manner to the target node, due to the reactive approach nature of the protocol.

The OLSR protocol establishes fast connections between network nodes without causing significant delays in real-time traffic. This is due to the fact that the OLSR protocol requires little time for route finding. Because of its proactive nature, the routes are always accessible in advance at the routing tables, resulting in fewer end-to-end packet delays. This advantage in OLSR is mostly due to the use of MPR nodes, which allow control messages to be sent to other nodes, reducing network delay.

Figure 7 shows that AODV protocol has lower than OLSR. Because of the reactive nature of the AODV protocol, it relies on the route discovery process to deal with routes that are requested on a regular basis. Routing tables are used to keep track of route information. It is detected that OLSR routing protocol has the uppermost load. As a proactive routing protocol, the routes in the OLSR network are constantly prepared anytime whenever the application layer has traffic to send. Routing updates are performed on a regular basis to ensure that new routes are accessible for use.

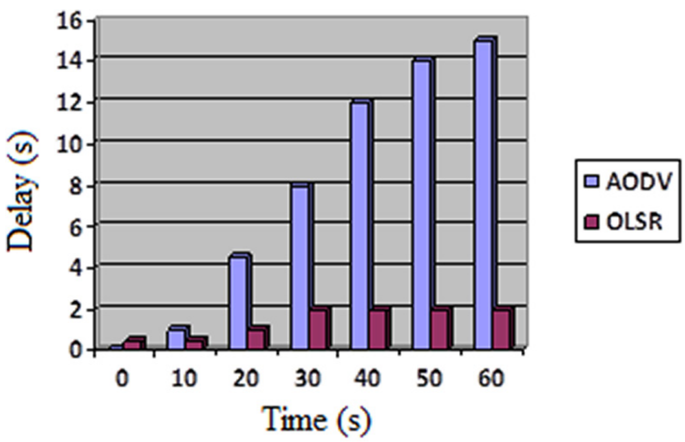



**Fig. 6.** AODV & OLSR-average delay

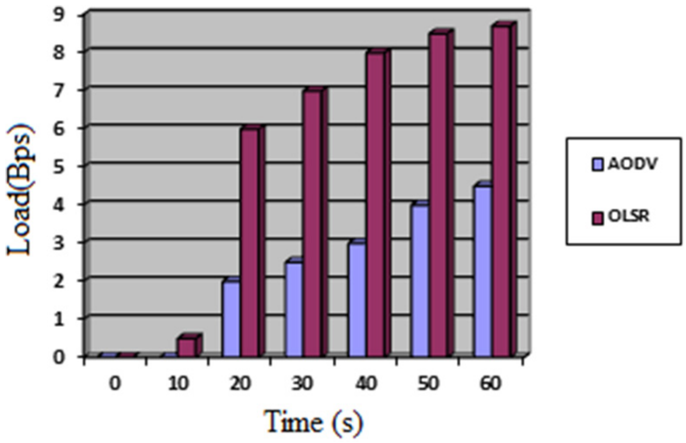



**Fig. 7.** AODV & OLSR-load

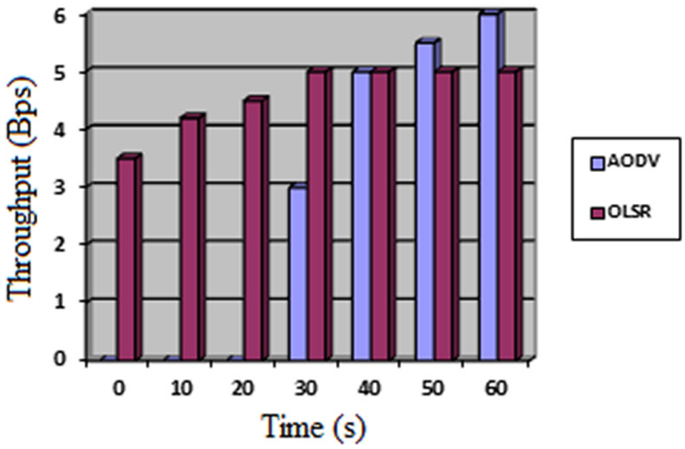



**Fig. 8.** AODV & OLSR-throughput

Figure 8 shows that the rate of throughput is not constrained by congestion and that the packet sizes are substantially higher, resulting in a high throughput. However, in terms of video traffic, the AODV protocol has a lesser throughput than the OLSR protocol. Similarly, the AODV protocol is ideal when the network's goal is to achieve better throughputs. The AODV protocol uses a hop-by-hop routing technique that eliminates the overhead of sender/source routing within the network.

## 5 Conclusion

In this research, the average delay, load and throughput of two routing protocols, AODV and OLSR, are examined and compared using a transmitting video streaming application. As a reactive routing protocol AODV sends network data only on demand and OLSR maintain table driven mechanism as proactive protocol. The minimal end-to-end average packet delay is achieved by OLSR. Meantime, lowest load is achieved by AODV and it provides high throughput for real time video traffic, although the delay is exceed the limited level for a transmission. We conclude that the proactive protocol OLST is identified to be very effective and efficient routing protocol for MANETs for real time data transmission.

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