A REVIEW ON EVALUATION AND FUTURE DIRECTION OF THE ADHOC ON DEMAND DISTANCE VECTOR ROUTING PROTOCOL FOR HYBRID NODES

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Abstract

Ad-hoc network is decentralized type of wireless network; it is composed of collection of independent node, usually connected by data rate Radio frequency (RF). Transmitting video and high bandwidth application is challenging with RF.In this paper we proposed a routing protocol called AODVH .which is used for high bandwidth communication and for rescue operation in a disaster area. In AODVH using high bandwidth free space optical (FSO) and RF links. Ad-hoc network is decentralized type of wireless network, it is composed of collection of independent node, usually connected by data rate Radio frequency (RE) Transmitting video and high bandwidth application is challenging with RF.In this paper we proposed a routing protocol called AODVH .which is used for high bandwidth communication and for rescue operation in a disaster area. In AODVH using high bandwidth free space optical (FSO) and RF links. FSO is the primary link and RF as backup we case of failure. In this paper we evaluate the performance of AODVH using ns-2 simulation and composed with other three ad-hoc routing protocol. Our better in terms of pocket loss, end to end delay overhead ,packet delivery ratio, route discovery frequency and throughput when compare to with other three protocol.

Keywords: FSO, RF,ns-2 simulation, performance analysis.

INTRODUCTION

Ad-hoc network is decentralized type of wireless network. It does not rely on a preexisting infrastructure [2]. This networks is refers to any set of network where all devices have status on a network and are free to associate with any other Adhoc network device. It rapidly deployable, reliable and high bandwidth network is needed during natural or manmade disasters for regular communication disaster area wireless Network (DAWN) con be formed during the emergency[3]. DAWN network architecture consisting of helium filled balloons that carry self Configurable routers. Which composed ad-hoc network up in sky, which are communicate among themselves using free space optical and Radio frequency links. For FSO unavailability of link can occur due to water vapor, Fog and cloud cover [4], Bt It has higher bandwidth rate and lower error rate as compare to RF links [3]. Due to this problem we developed a novel routing protocol called AODVH in which[5]composed hybrid nodes consisting of FSO and RF links, RF link provide the backup in the network when is unavailability of link can occur in FSO.According to two aspects AODVH[5] different from other ad-hoc routing pouting protocol AODV, AOMDV,AODVM[6] [7] [8] etc.

- Unipath Ad-hoc routing protocol take long time to find new route in unavailability of link, theory are not suitable for DAWN.
- Earlier multipath protocol do not offer for hybrid links which consist FOS and RF

Now multipath Ad-hoc routing algorithms [2] [7] [8]. Adhoc reactive routing protocol via dynamic source routing [9] and AODV [6], Lee et al[2] develop a split multipath routing protocol with maximally disjoint path for homogenous RF nodes. Mariner et al [8] develop o loop free and link disjoint multipath routing protocol (AOMDV). Zheniqiang et al [8] proposed AODVM to discover multipath node disjoint path to achieve reliability in path setup for homogenous RF nodes. It is to be noted that all the above [2],[7],[8]. Are based on homogeneous nodes and are not suitable for hybrid nodes. Consideration of hybrid nodes with heterogeneous link this characteristic of our proposed protocol AODVH make a it differ from other multipath routing protocol. There exist research work on FSO in literature.[10] proposed a simulation model for pure FOS node structures with intermittent connectivity pattern. The primary purpose of this is to evaluate the performance of AODVH by comparing with other Adhoc routing protocol through simulation and experimental setup we have simulated AODVH in ns-2[11] with varying network size and compared the result with AODV and two multipath protocol AOMDV [7], AODVM[8].This paper is organized as, Review our proposed protocol AODVH in Sec. I. The ns-2[11] simulation setup is given in of in Sec. II, followed by the performance evaluation of simulation of AODVH and its comparison with AODV, AODVM, and AOMDV in Sec. III. Finally define remarks in Sec. IV

I. AODVH: AD HOC ON-DEMAND DISTANCE VECTOR ROUTING FOR HYBRID NODES

In this section, we briefly discuss our proposed protocol AODVH [1] which is based on AODV [6]. AODVH attempts to establish paths consisting of "FSO only" links as primary paths and uses RF links as backups when FSO links go down [1].For our protocol, we implement a hybrid node structure that supports two heterogeneous interfaces having RF and FSO characteristics. We opted for using multiple instances of the wireless channel at the node level and used the MAC features of ns-2 [14] to get the address of the interface the message arrives on. We can thus keep track of the interface used to send or receive information. The nodes set the flags for FSO and RF in their respective RREQ tables based on the interface the message has been received. During the first stage of RREQ message, the immediate neighbors receive RREQ from the source. The RREQ table for node 1 is shown in Fig.1. Nodes 2 and 3 also set up their respective RREQ tables the same way. During stage 2 of RREQ message, these intermediate- ate nodes send the RREQ messages received from the source to their neighbors. In this way, the duplicate RREQ messages, containing information regarding the type of interface (FSO, RF or both) used along the path, reach the destination node. Upon receiving RREQs from its neighbors, the destination node starts generating RREPs.

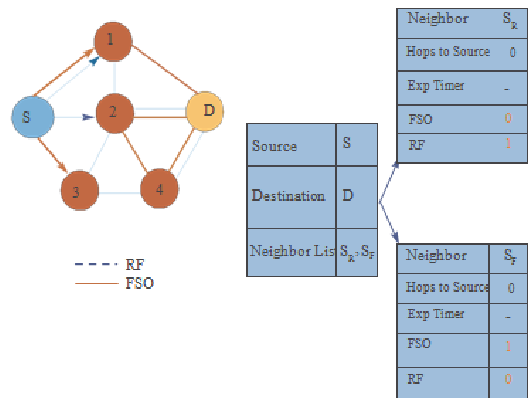

Fig 1.Route Request (RREQ) Table for Node1 (stage 1)

A forward path is setup during the generation of the RREP message from source to the destination for data delivery. The FSO link is directional (point to point). We adapted an FSO enhancement [12] for one of the interfaces in our hybrid node structure which used spherical multi transceiver structure to implement angular diversity and spatial reuse. Also this enhancement used an auto-alignment circuitry to handle the case of misalignment and drop out of FSO signals as described in [12]. Due to the multipath nature of AODVH, the destination node replies to all RREQs it receives and tries to find "FSO only" paths first followed by "Hybrid paths" if "FSO only path" is not available. After forwarding the first RREP from node 1, the entry for node 1 is deleted from the RREQ tables of other intermediate nodes to achieve node disjointness. When all the RREPs reach the source S, we have multiple paths to send data from source to destination D, with the first path being the primary one. The scenario is shown in Fig. 2.

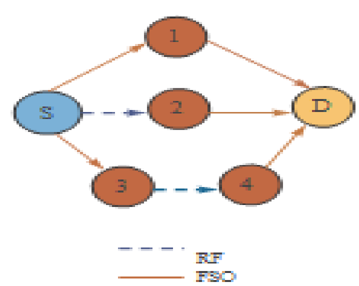

Fig. 2. Forward Path Set up from Source S.

II. SIMULATION SETUP

We simulated our proposed protocol (AODVH) using Network Simulator (ns-2) [11]. Our objective is to evaluate the effectiveness of AODVH relative to AODV, AODVM and AOMDV, especially when route failures occur due to mobility with varying network size. Values of relevant simulation pa parameters for hybrid nodes with two interfaces are summarized in Table I.We vary the number of nodes with a fixed node speed of 10 m/s. We averaged the outcomes of five runs and generated the plots. Traffic pattern consists of FTP/TCP connection between a source and destination pair. The data packets have a fixed size of 1000 bytes in all the experiments. The maximum number of multipath routes was set to three, which has been shown to be an optimal number for multipath routing [7]. The random way point mobility model was used to simulate node movements [12]

TABLE I: SIMULATION PARAMETERS

Network Size	**1000m x 1000m**
Number of Nodes	**16, 30, 50 and 80**
Simulation Time	**100 sec**
Traffic type	**FTP**
Channel Type1	**FSO Wireless Channel**
Channel Type2	**Wireless Channel**
Propagation Type1	**Free Space Optical**
Propagation Type2	**Two Ray Ground**
Channel capacity	**2 Mbps**
Node Transmission Range	**250 m**

III. SIMULATION RESULTS

In this section, we evaluate the effectiveness of AODVH and compare with those of AODV, AODVM and AOMDV using packet loss, end-to-end delay, routing overhead and throughput as the performance metrics.

Packet Loss**:** We measure packet loss by the percentage of packets that are dropped either at the source or at the intermediate nodes. We noticed that due to the increase in numbers of nodes the packet loss for all the protocols also increase due to link breaks with speed as shown in Fig. 3. For smaller node numbers (16), AODVH performs much better than other protocols (34% less packet loss than AODV, and 19% less than AOMDV and AODVM). The packet loss for all the protocols increase with node number increase, but AODVH still drops fewer packets compared to other protocols as we used "FSO only" paths for AODVH which ensure faster and more reliable packet deliveries at the destination due to the multiple transceivers. In AODVH, AOMDV and AODVM, the source will have alternative routes to the destination; hence packet losses occur mostly at the intermediate nodes for these protocols. For AODV, this is not the case, as routes will fail more frequently with mobility and increased node number resulting in larger number of route discoveries from the source to find a route and higher packet loss.

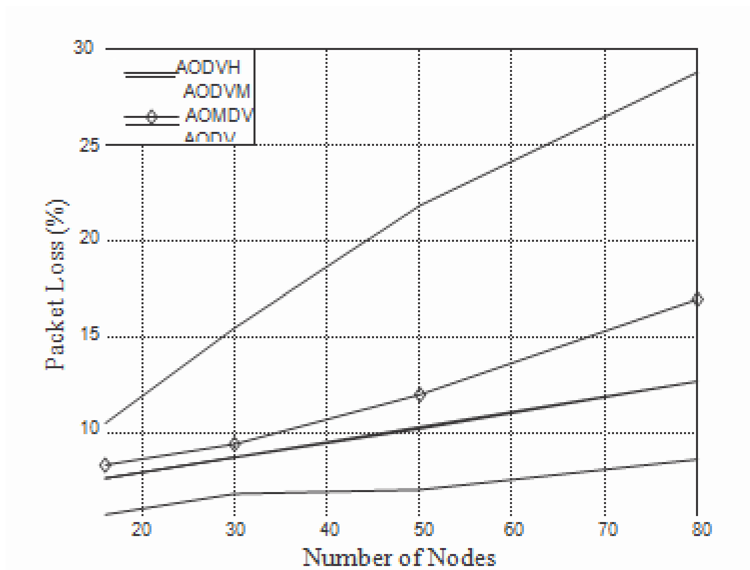

Fig.3 .Effect of number of nodes on packet loss

End-to-End Delay: End-to-end delay is the sum of all possible delays encountered by a packet between a source and destination including data transmission, buffering during the route discovery period, delays at MAC layers, time of propagation, etc. Fig. 4 compares average end-to-end delay of AODVH with the other three routing protocols. At a speed of 10 m/s, AODVH achieves minimum end-to- end delay when compared to AODV, AOMDV and AODVM, respectively. "FSO only" paths result in decreased end-to-end delay because of the higher speed of the FSO links due to the multiple transceivers.

Routing Overhead: Routing overhead is measured by the total number of routing messages per second. Fig. 5 shows the routing overhead of AODVH, AODVM, AOMDV and AODV protocols as a function of node number. The routing overhead of AODVH is higher than AODVM as AODVH sends a great number of routing messages to create the double interface feature which is not required in AODVM. The routing overhead of AODV is the highest among the four protocols.

Throughput: We measure throughput by the total number of bits received at the destination per unit time. Fig. 6 compares the throughput of AODVH ("FSO and hybrid" paths) with AODVM (RF only paths) and AODV (RF only paths). We found that the throughput of AODVH is highest among the protocols due to the availability of multiple paths and higher bandwidth than other protocols using both the "FSO" link or the "hybrid" link and the very minimal path pickup time in case of the breakage of primary path.

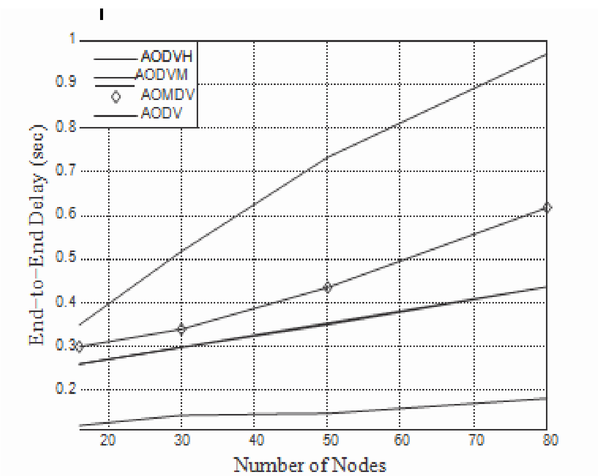

Fig.4 .Effect of number of nodes on end-to-end delay

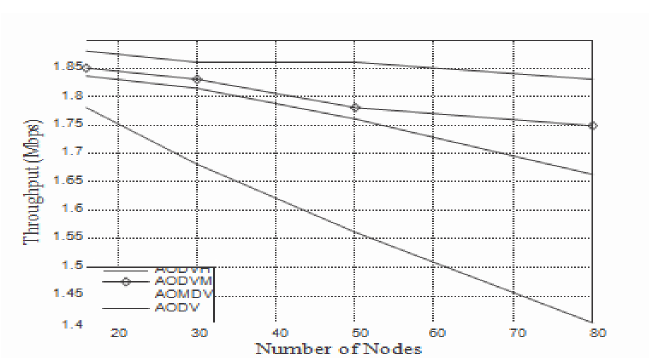

Fig.5 . . Throughput vs. number of nodes

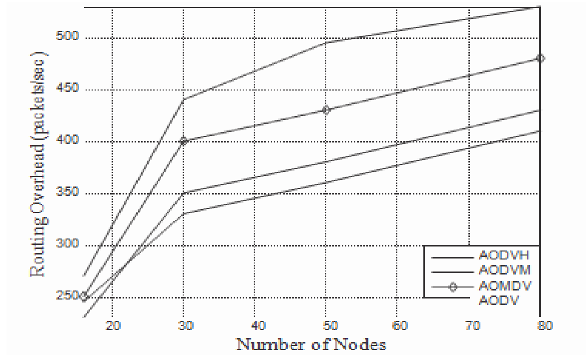

Fig.6. Effect of number of nodes on routing overhead

AODVM and AOMDV perform better than AODV due to availability of alternate path in case of link failure of the primary path. From the above results, we observe that AODVH achieves better performance than other three protocols (AODV, AOMDV and AODVM) in varying number of nodes in terms of packet loss, end-to-end delay and throughput.

IV. CONCLUSION

In this paper, we evaluated AODVH, a multipath on-demand Ad hoc routing protocol for Disaster Area Wireless Network with simulation and experimental setup. Results validated that the multipath feature of AODVH significantly minimized packet loss, end-to-end delay, route discovery frequency when compared to AODV, AOMDV and AODVM. Throughput also improved while using *hybrid* paths when "FSO Only" path is unavailable. In addition to disaster recovery, DAWN can be very useful in military and exploration missions, home area wireless networking, networking intelligent devices, sensors, mobile robots, and on-the-fly conference applications.

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