© 2015 IJSRSET | Volume 1 | Issue 6 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology

Energy Efficient AODV (EE-AODV) for Improving QoS Routing in Mobile Adhoc Network and Classified Normal and Suspicious traffic using NS-3 Simulator

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ABSTRACT

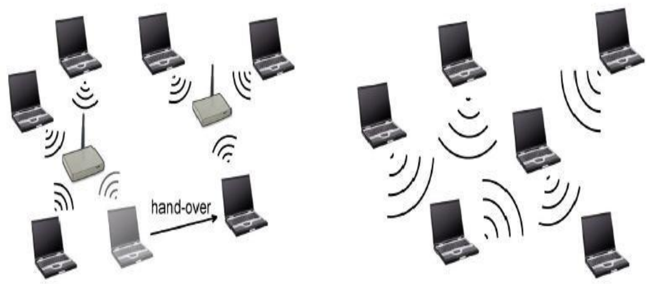
Mobile ad hoc networks support multi hop routing where the deployment of central base station is neither economic nor easy. Efficient routing of the packets is a major challenge in the ad hoc networks. There exist several proactive (like DSDV etc.) and reactive (Like AODV etc.) routing algorithms for the dynamic networks.The EEAODV ALGORITHM selects the path with minimum cost value indicating that the path has the shortest distance to the destination and has the maximum of the minimum available battery power of the node among the different paths. This selected path is chosen as the best path for packet transmission till any node in the path exhausts battery power beyond a threshold value. At this point of time, a backup path having the next lower cost is selected as an alternate path for packet transmission. The process is repeated till all the paths from the same source to destination are exhausted with their battery power. When this situation occurs, the cost of the paths is re-calculated and the process continues. The simulation result of the proposed algorithm EEAODV ALGORITHM enhances the network life time over the AODV and EEAODV algorithm and for better refinement of result our approach is to classified suspicious and normal traffic using different filtering rules using WireShark.

Keywords: Mobile Ad-hoc Networks; Multipath Routing; Routing Protocols; Energy Efficiency; Network Life Time, WireShark.

I. INTRODUCTION

Mobile Ad Hoc Networks

With the advancement in technologies and relatively low cost, there is a rapid rise in the use of personal communication devices like mobile phones, personal digital assistants (*PDAs*) and mobile computers. These devices easily get access to network through wireless interfaces.



(a) An infrastructured network with two base stations.(b) A mobile ad-hoc network. Fig 1 Infrastructured and ad-hoc networks

There exist three types of mobile wireless networks: *infrastructured networks*, *ad-hoc networks* and *hybrid networks* which combine infrastructured and ad-hoc aspects. An infrastructured network (Figure 1(a)) comprises of wireless mobile nodes and one or more connecting bridges (called as *base stations*) to connect the wireless network to the wired network. A mobile node within the network looks for the nearest base station (e.g. the one with the best signal strength), connects to it and communicates with it. In this type of network, all communication takes place between the wireless node and the base station and not between different wireless nodes. When any mobile node gets out of range of the current base station, a *handover* to a new base station occurs and that will let the mobile node communicate seamlessly with the new base station.

These wireless interfaces also allow the devices to interconnect directly with each other in a decentralized way and *self-organize* into "*Ad Hoc Networks*". An ad-hoc network does not have any infrastructure. It is devoid of base stations, routers and centralized administration. Nodes may move randomly and connect dynamically to one another. Thus all nodes act as routers and must be capable of discovering and maintaining routes to every other node in the network and to forward packets accordingly.

Mobile Ad hoc Networks (MANET) is a communication network formed by the union of autonomous aggregation of mobile nodes (computers, mobiles, PDAs etc.) and connecting wireless links. The network is modeled in the form of an arbitrary communication graph [2]. In a MANET, there is no fixed infrastructure (Base Station) and since nodes are free to move, the network topology may dynamically change in an unpredictable manner. MANET is decentralized and self-organizing network where the functions from discovering the network topology to delivering the message are carried out by the nodes themselves; In this network each node acts as a router along with its job as an ordinary device. The organization of Ad hoc networks is peer-to-peer multi hop and information packets are relayed in a store-and-forward mode from a source to any arbitrary destination via intermediate nodes. As the nodes are mobile, any change in network topology must be communicated to other nodes so that the topology information can be updated or eliminated. It is not possible for all mobile nodes to be within the range of each other. However, all the nodes are close by within radio range.

II. METHODS AND MATERIAL

A. RELATED WORK

Routing Protocol in Mobile Ad-Hoc Network

In wireless Ad-hoc networks, nodes relay packets using multi-hop links. These lack any fixed infrastructure or base station for communication. Each node is capable of exchanging packets to/from other nodes, thus, acting as a router. Routing in ad-networks is a challenging task and it has been posing challenges from the time the wireless networks came into being. The reason for the constant change in network topology is due to high degree of node mobility [5]. Many protocols have been proposed to accomplish this task.The various routing protocols are reviewed along the typical characteristics of each protocol. Here, we discuss the major routing protocols in MANET:

Proactive, reactive and hybrid routing

One of the ways to classify MANET routing protocols is based on when and how routing information is gathered and maintained by mobile nodes. On this basis MANET routing protocols are classified into **proactive**, **reactive** and **hybrid** routing protocols.

In *proactive protocols* (also called "*table driven*" approach), nodes in the network regularly evaluate routes to all reachable nodes and tries to keep consistent and up-to-date routing information thereby facilitating a source node to get a routing path easily and immediately when required. All the nodes have to maintain a consistent view of the network topology and respective updates need be communicated throughout the entire network to notify any change in the topology [4]. Most of the proactive routing protocols designed for MANET inherit properties from procedures deployed in wired networks and required amendments is made on conventional wired network routing protocols to incorporate the dynamic features of MANET. In this protocol nodes keep an updated network state and maintain a route when data traffic does not exist. This results in high overhead to maintain up-to-date network topology information. Some of the typical proactive routing protocols for MANET are Wireless Routing Protocol (WRP), Destination Sequence Distance Vector (DSDV) and Fisheye State Routing (FSR).In *reactive protocols* (also called "*on-demand*" routing approach) routing paths are discovered only on demand. A route discovery task invokes a route-determination procedure and which terminates when either a route is found or there is no possible route available. Because of nodes mobility, active routes may be disconnected and therefore route maintenance is important in reactive routing protocols. A reactive routing protocol has less control overhead as compared to the proactive routing protocol and therefore a reactive routing protocol has better scalability than a proactive routing protocol. However, source nodes may suffer from long delays for route discovery in reactive approach. Dynamic Source Routing (DSR) and Ad hoc On-demand Distance Vector routing (AODV) are popular reactive routing protocols for MANET.

Hybrid routing protocols are the third category of routing protocols in MANET that combine the advantages and remedy the shortcomings of both proactive and reactive routing protocols. Generally, these protocols exploit hierarchical network architectures. Proper proactive and reactive routing approaches are utilized in different hierarchical levels, respectively. Some hybrid routing protocols for MANET are Zone Routing Protocol (ZRP), Zone-based Hierarchical Link State routing (ZHLS) and Hybrid Ad hoc Routing Protocol (HARP).

Comparison of DSR, AODV and TORA

AODV has lesser traffic overhead and is more scalable because of the limited size of route record field in DSR data packets. DSR and TORA and not AODV support asymmetrical links and multiple routes. AODV exercises extra control traffic overhead due to periodic sending of Hello message by nodes.

While AODV and DSR use flooding to inform the affected nodes about a link failure TORA localizes the effect in a set of node near the periphery of the link failure.

To avoid formation of route loops AODV uses sequence numbers and DSR checks addresses in route record field of data packets. A loop-free property can be guaranteed in TORA because each node in a currently participating route has a unique height and packets are transmitted from a node with higher height to a lower one. But to achieve this all nodes in TORA must have synchronized clocks and oscillations may occur when coordinating nodes currently execute the same operation.

B. PROPOSED WORK

Author has presented a very good idea to ensure QoS in MANET using AODV routing protocol [8]. Our research objective has influence from the author proposed work to enhance the QoS routing adding a new feature security on it.

Following modification has been performed to make better Energy enabled AODV (En-AODV)-

1. Adopting the jitter estimation integrating with energy for fast delivery of the packet.

2. Identification of selfishness behavior of the node to shield it from packet dropper attack.

3. To achieve above mentioned enhancement a global machine learning classifier will be enable on each node that takes all the metrics including jitter to classify the nodes and best route before delivery and also indicate about the selfishness behavior of the node I of present.

Mobile ad hoc network can be modeled as a unidirectional graph G= (V, E), where V is the set of mobile nodes and E is the set of links that exist between the nodes in the network. By the virtue of mobility of the nodes they change their position and the connectivity is also changed. Thus, the cardinality of the nodes V remains same throughout where as the cardinality of the edges E changes with the mobility of the nodes. The link between two nodes exists when the distance between nodes i and j is less than their transmission range, i.e. distij < trange. Calculation of distance between the two nodes is done using the distance formulae as we know the coordinate position of each node as we are using GPS.

In such a multi hop network [7], packet routing takes place by the intermediate nodes that play the role of the routers. Every node maintains a routing table that gets updated periodically or with the occurrence of a specific event. The current work basically focuses on the event driven updation of the routing table. Energy Saving Ad Hoc Routing (EEAODV ALGORITHM)[9] is an on demand routing algorithm where distance is the main factor for selecting the route between the source and destination and it is determined and maintained when they require sending data among each other. It is a hop-by-hop routing algorithm where each data packet carries the destination address as well as the next hop address. The routes are adaptable to the dynamic topology of the network as they update their routing table when receive any fresh information about the routes.

In the same fashion other packets are transmitted, by calculating the cost value of each path every time a packet has to be sent. And energy calculation as follows:

$$E_{N/M} = I_{n>0}(I_{M-N}E_{Tack} + I_{M-N}E_{Rack}) + I_{m>0}(I_{M-N}E_{Tpck} + I_{M-N}E_{Rpck})$$

$E_{N/M}$	=	energy spent at node N due to node M
E_{Tack}	=	energy spent for transmission of one acknowledgement packet
E_{Tpck}	=	energy spent for transmission of one data packet
E_{Rack}	=	energy spent for reception of one acknowledgement packet
E_{Rpck}	=	energy spent for reception of one data packet

$$I_p = \begin{cases} 1 & p \text{ is true} \\ 0 & \text{otherwise} \end{cases}$$

Wireshark is a network packet analyzer. A network packet analyzer will try to capture network packets and tries to display that packet data as detailed as possible. You could think of a network packet analyzer as a measuring device used to examine what's going on inside a network cable, just like a voltmeter is used by an electrician to examine what's going on inside an electric cable (but at a higher level, of course). In the past, such tools were either very expensive, proprietary, or both. However, with the advent of Wireshark, all that has changed.

Wireshark network data after capturing in real time our anomaly classifier checks the following-

- Check the anomaly in TCP packet and behavior during making connection.
- DNS activities for the intrusion of flooding
- UDP for UDP flood attack.
- And ARP/RARP for LAN (second layering attack).

For applying these rules over routing data generated using ns3 simulator for AODV energy and find out the suspicious traffic and with this classification approach we can easily classify suspicious and normal traffic in network

a. Sniff real time traffic from wireshark
b. Extract TCP protocol traffic and UDP
c. Apply IDS detection scheme

{

Calculate the length and Control bits of the TCP protocol

```
    Len[TCP]
    Len [TCP]
   COUNTER (UDP)
   COUNTER(DNS_ERRPR per minute)
  Void   TCP_cntr ()
  {
   If (S-F > 23)
    FLAG = "Alert- traffic suspicious"
  Else
   FLAG = OK
 }
}
```

By using each node packet capturing file (pcap) file we have shown the node is malicious and it comes under suspicious traffic and we have done this by using filtering rule applied to each node pacap file.

III. RESULTS AND DISCUSSION

SIMULATION AND RESULTS

We have done simulation on NS-3 and *ns-3* has been developed to provide an open, extensible network simulation platform, for networking research and education. In brief, *ns-3* provides models of how packet data networks work and performs, and provides a simulation engine for users to conduct simulation experiments. Some of the reasons to use *ns-3* include to perform studies that are more difficult or not possible to perform with real systems, to study system behavior in a highly controllled, reproducible environment, and to learn about how networks work. Users will note that the available model set in *ns-3* focuses on modeling how Internet protocols and networks work, but *ns-3* is not limited to Internet systems; several users are using*ns-3* to model non-Internet-based systems.

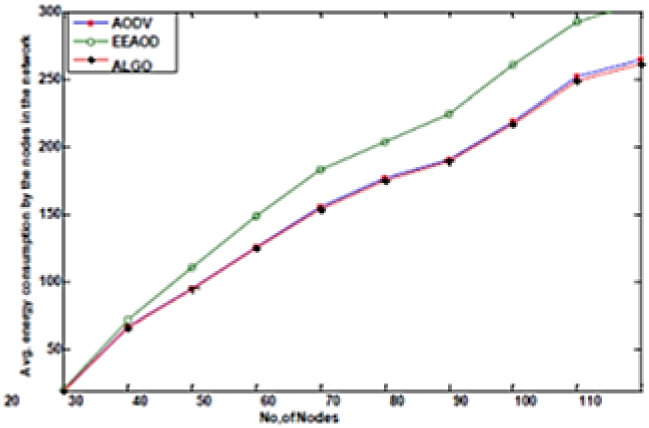


Fig 3.1 Comparison Graph for Avg. Energy comparison vs No. of Nodes

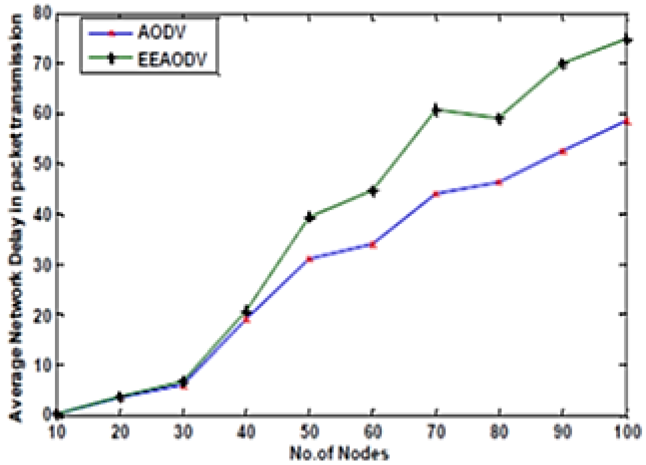


Fig 3.2 EEAODV Delay comparison with Aodv

IV. CONCLUSION AND FUTURE WORK

In this paper energy efficient routing protocol was designed as per the problem statement which successfully made runs and achieved the objective. EEAODV overcomes the limitation of AODV i.e. the network life is increased but energy consumption has to be compromised as well as delay also increases in the case of EEAODV, our proposed algorithm EEAODV ALGORITHM overcomes the limitations of AODV i.e. increases the network life as well as energy is not compromised so it also overcomes the limitation of EEAODV, delay is also minimum in case of EEAODV ALGORITHM. Delay is minimum as that path is always selected having the minimum actual distance between the source and destination always. Network Life is significantly more than AODV as well as EEAODV because in case of EEAODV ALGORITHM all the alternate paths are always taken into account so proper load balancing is done and thus all the nodes involved in the alternate paths are used up and thus no node is overused and we have applied classification technique for better result using WIRESHARK filtering rules. Future work may include hardware and software implementation of the proposed algorithm to get results in real world scenario. The mobile network when deployed with each node having Global Positioning System (GPS) is expected give the desires result in real time application.

V. REFERENCES

[1] C. E. Perkins. Ad Hoc Networking. Addison Wesley, 2000.

[2] Stefano Basagni, Macro Conti, Silvia Giordano and Ivan Stojmenovic, "Mobile Ad Hoc Networks" , IEEE press, A john Wily & Sons, INC publication, 2003

[3] C Siva Ram Murthy and B S Manoj. Ad Hoc Wireless Networks. Pearson Education, 2005.

[4] C K Toh. Ad Hoc Mobile Wireless Networks: Protocols and Systems. Prentice Hall PTR, 2002.

[5] Chinara S., Analysis and Design of Protocols for Clustering in Mobile Ad Hoc Networks., Ph. D thesis, National Institute of Technology, March 2011.

[6] http://w3.antd.nist.gov/wahn_mahn.shtml

[7] Liu C., Kaiser J., A Survey of Mobile Ad Hoc network Routing Protocols, University of Ulm Tech. Report Series, Nr. 2003-08

[8] E.M. Belding-Royer and C. K. Toh, "A review of current routing protocols for ad hoc mobile wireless networks", IEEE Personal Communications Magazine, pages 46–55, April 1999.

[9] http://www.ietf.org/rfc/rfc2501.txt

[10] http://www.cse.wustl.edu/~jain/cse574-06/ftp/energy_routing/index.html

[11] L.M. Feeney, "Taxonomy for Routing Protocols in Mobile Ad Hoc Networks", SICS Technical Report T99/07, October 1999.

[12] I. D. Chakeres and E. M. Belding-Royer, "AODV Routing Protocol Implementation Design," in Proceedings of the International Workshop on Wireless Ad hoc Networking (WWAN), Tokyo, Japan, March 2004.

[13] Y I Jiazi, Summary of Routing Protocols in Mobile Ad Hoc Networks, Polytechnic School of University of Nantes, March 2007

[14] Perkins CE, Belding-Royer E, Das S. Ad hoc on-demand distance vector (AODV) routing. Internet draft. http:// www.ietf.org/internet-frafts/draft-ietf-manet-aodv-13.txt