Journal of Advanced Research in Embedded System
Volume 7, Issue 3&4 - 2020, Pg. No. 1-6
Peer Reviewed Journal

Article

Efficient Dynamic Acknowledgement Scheme for Manet

K Thamizhmaran

Assistant Professor, Department Electronics Communication Engineering, Government College of Engineering, Bodi, Theni, Tamil Nadu, India.
DOI: https://doi.org/10.24321/2395.3802.202005

I N F O

E-mail Id:
tamil10_happy@rediff.com
Orcid Id:
https://orcid.org/0000-0001-7813-8163
How to cite this article:
Thamizhmaran K. Efficient Dynamic Acknowledgement Schemefor Manet. *J Adv Res Embed Sys* 2020; 7(3&4): 1-6.

Date of Submission: 2020-07-29
Date of Acceptance: 2020-08-17

A B S T R A C T

Mobile Adhoc Networks (MANET) is the decentralized type of network and it does not rely on pre-existing infrastructure. All nodes work as routers and take path in discovery and maintenance of routes to other nodes in the network. The Energy Efficiency continues to be a key factor in limitingthe deploy ability of ad-hoc networks. Deployingan energy efficient system exploiting themaximum life time of the network has remained agreat challenge since years. The major concern inWireless network in recent days is Energy Consumption. There are numerous algorithms proposed to overcome this issue. In this paper proposed a new intrusion detection system is Enhanced Adaptive 3 Acknowledgement (EA3ACK) using Energy Efficiency Dynamic State (EEDS) algorithm. This algorithmis designed to increase the network lifetime and remaining energy bycontinuously monitoring the individual nodes inthe network, thereby it increases the quality ofservice of the network. Network Simulator (NS2) is used to implement & test our proposed system. The proposed EEDS- EA3ACK algorithm provides secure transmission & further it improves network performance.

Keywords: MANET, IDS, EA3ACK, EEDS, Network Lifetime, Dynamic States

Introduction

Network is the collection of nodes (Computer Systems) that can be connected together through the communication link. The link can be wired orwireless. If the nodes are connected through the air orspace, then it is called wireless network. MANET is built for special purposes, It does notrely on the base stations or routers. MANET represent a new form of communication consisting of mobile wireless terminals where it is an infrastructure less IP based network of mobile and wireless machine nodes connected with radio frequencies. As shown in the Figure 1, nodes of a MANET do not have a centralized administrator. It is known for its routable network properties where each node act as a "router" to forward the traffic to other specified node in the network. MANET were wireless multi-hop networks without any fixed infrastructure and centralized administration, in contrast to today's wireless communications, which is based on fixed, pre-established infrastructure. To improve thequality of service we need to improve mainly the 3 parameters that are, PDR (Packet Delivery Ratio) isthe essential parameter to measure the network performance. PDR is defined as the Ratio between the total numbers of packets received to the total number of packets sent by the nodes. Through put isthe second essential parameter. In networks, through put is defined as the amount of data can besent by the source node per unit time. Typically it canbe measured by bits per second (bps). Network lifetime is the most essential parameter to improvethe performance

of the network. It is the time taken by the node at which it starts participating in routing until the node running out of energy. While improving the above 3 parameters we should avoid the attacks to the nodes, reduce the congestion and traffic and maintain the energy.

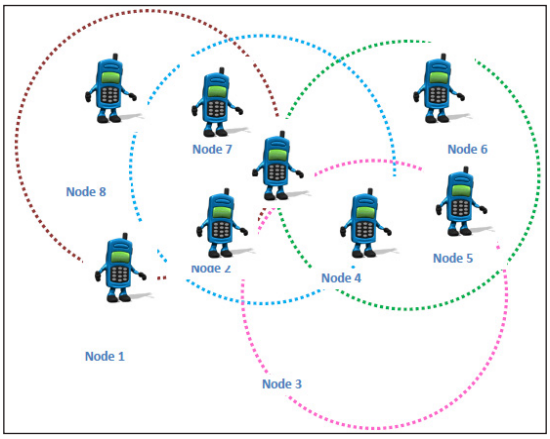

Figure 1.Mobile Adhoc Networks

All networking functions, such as determining the network topology, multiple accesses, and routing of data over the most appropriate paths, must be performed in a distributed way. These tasks are particularly challenging due to the limited communication band width available in the wireless channel.

Routing Protocol

A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a network. Routing algorithm determines the specific choice of route. Each router has a priori knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. The two main types of routing: Static routing and dynamic routing. The router learns about remote networks from neighbor routers or from an administrator and builds a routing table. If the network is directly connected then the router already knows how to get to the network. The router must learn how to get to the remote network with either static or dynamic routing. If static routing is used, then the administrator has to update all changes into all routers and therefore no routing protocol is used. Only Dynamic Routing uses routing protocols, which enable routers to.Generally, there are two different stages in routing; they are route discovery and data forwarding. In route discovery, route to a destination will be discovered by broadcasting the query. Then, once the route has been established, data forwarding will be initiated and sent via the routes that have been determined. The power consumption, route relaying load, battery life, and reduction in the frequency of sending control messages, optimization of size of control headers and efficient route reconfiguration should be considered when developing a routing protocol.

Literature Survey

Subhan karmishra (2016) proposed the algorithm called LEAD that deals with the energy efficiency round scheduling of cluster head allocation of nodes and maximizing the network lifetime usingANDA algorithm. Performance analysis of dynamic source routing protocol for mobile adhoc network from Johnson et al (1998). Two acknowledgements based preventing selfish node for routing protocol from Balakrishnan et al (2005). Detecting various malicious nodes in routing protocol for mobile adhoc network from Jongoh choi et al (2005). Discover various malicious nodes in network in intruder detection system from Nidal Nasser et al (2007). Acknowledgment based detecting of route misbehaviour nodes in MANET from Liu et al (2007). Secure routing protocol for hybrid cryptography from Subasree et al (2010). Various security challenges and solution for routing protocol from Hao yang et al (2010). Detecting various malicious nodes in trust based cross layer for secure routing protocol from Rajaram et al (2010). Detecting packet dropping attack using acknowledged based from Aishwarya sagar et al (2010). Detecting various misbehaviour nodes in MANET from Nan Kang et al. (2010). Secure intruder detection system in routing protocol for mobile adhoc network from Elhadi et al (2010). Misbehaviour node detecting for intruder detection system using adaptive acknowledgement based from Roubaiey et al (2013). Acknowledged based various intruder detection system to routing protocol for MANET form Abdnlsalam Basabaaa et al (2014). Sumithradevi (2011) proposed the ANDA algorithm which comprises two algorithm which are covering algorithm and reconfigure algorithm. Singh (2006) proposed Homogeneous Clustering Algorithm (HCA) the whole network is virtually divided into zones based on geographical layout anddensity of the network and it ensures the uniform selection of cluster heads. Sasikala (2008) proposed HEED (Hybrid Energy Efficient Distributed) clustering method maximizesthe network life time by distributing the energy consumptions and it creates well distributed cluster heads. HEED extends the scheme of LEACH. Anantha Chandrakasan (2014) proposed LEACH- Low Energy Adaptive Clustering Hierarchy. LEACH itwill randomly distributes the energy among the nodesin the network. The nodes in the network organize themselves as a local network and assign a clusterhead. LEACH compresses the data which is sent fromthe cluster heads to the BS. Hence it reduces theenergy dissipation. So it enhances the network lifetime. Deosarkar (2013) proposed the idea led to the construction of the sensor network as a number ofclusters with a dynamically elected cluster-head nodeis only allowed to forward the data to the sink. XueQ (2010) proposed a cellular-assisted UE CH

ISSN: 2395-3802
DOI: https://doi.org/10.24321/2395.3802.202005

selection algorithm for the WSN, which considers several parameters to choose the optimal UE gateway CH. They analyze the energy cost of data transmission from a sensor node to the next node orgateway and calculate the whole system energy costfor a WSN. Lukachan (2014) consider these issues in the design ofa simple, Scalable, Energy-Efficient Location Aidedrouting (SELAR) protocol for WSN. In SELAR, location and energy information of neigh boring nodes together with the location information of the sink node are used to perform the routing function.

Proposed Methodology

Simulation Framework

Simulation is regulated using NS2 2.35. Because of the link stability and route lifetime, no route over head was considered in our simulation. In 500 X500 areas, mobile nodes exist. Square area is used to increase average hop length of a route with relatively small nodes. Every mobile node is, moving based onthe mobility data files that were generated bymobility generator module. A number of 50 nodes arecreated. The transmission range is fixed at 100 meters. 100 nodes have destinations and try finding routes to their destination nodes. Maximum speed ofnode is set to 20 m/sec. The nodes are assigned withan initial position. All nodes do not stop moving and the simulation second is 500 seconds. In this section we describe the EEDS algorithm. Initially, the network is divided into virtual grids. Each virtual grid is assigned with n number of nodes based on their current position. The nodes which arein the same virtual grid are designed in such a way that these nodes within a grid will rely on one another i.e., any node in the virtual grid can assign its work to the any other node which is present in the same virtual grid. In this paper we discuss about three different states where a node can enter to conserve its energy. i) Active state – it contains the nodes which is actively participating in the routing process. ii) Night mode -it contains the nodes which are idle and it is in aenergy consuming state. iii) Discovery state- it contains nodes which are ready to participate inrouting process.

```
# configure node

        $ns_ node-config -adhocRouting $val(rp) \
                         -llType $val(ll) \
                         -macType $val(mac) \
                         -ifqType $val(ifq) \
                         -ifqLen $val(ifqlen) \
                         -antType $val(ant) \
                         -propType $val(prop) \
                         -phyType $val(netif) \
                         -channelType $val(chan) \
                         -topoInstance $topo \
                         -agentTrace ON \
                         -routerTrace ON \
                         -macTrace OFF \
                         -movementTrace OFF      \
                         -energyModel $val(energymodel) \
                         -initialEnergy $val(initialenergy) \
                         -rxPower 35.28e-3 \
                         -txPower 31.32e-3 \
                         -idlePower 712e-6 \
                         -sleepPower 144e-9
```

Figure 2.Initialization of Nodes

Flow Diagram of EA3ACK

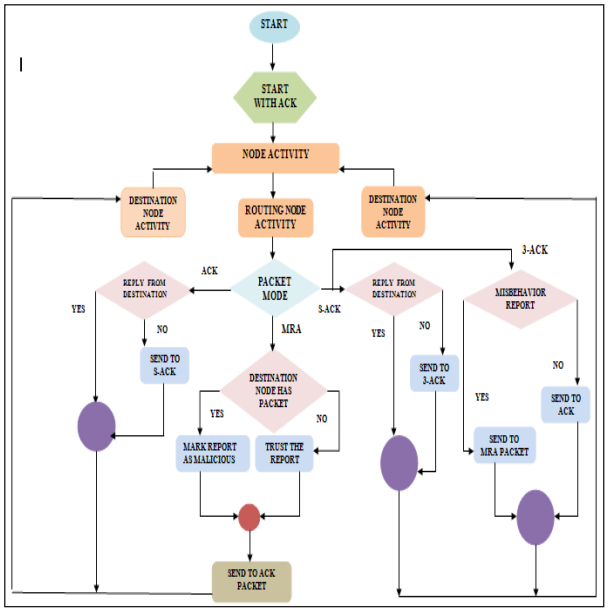

Figure 3.Flow diagram for EA3ACK

In this section, we describe our proposed EA3ACK scheme in detail. The approach described in this research paper is based on previous work EAACK, where the backbone of EA3ACK was proposed and evaluated through implementation to prevent the attacker from forging acknowledgment packets. EA3ACK is consisted of four major parts, namely, ACK, secure ACK (S-ACK), 3-ACK and misbehaviour report authentication (MRA). Figure 3 presents a flowchart describing the EA3ACK scheme. Please note that, in our proposed scheme, we assume that the link between each node in the network is bidirectional. Further more, for each communication process, both the source node and the destination node are not malicious.

Flow Chart of EEDS

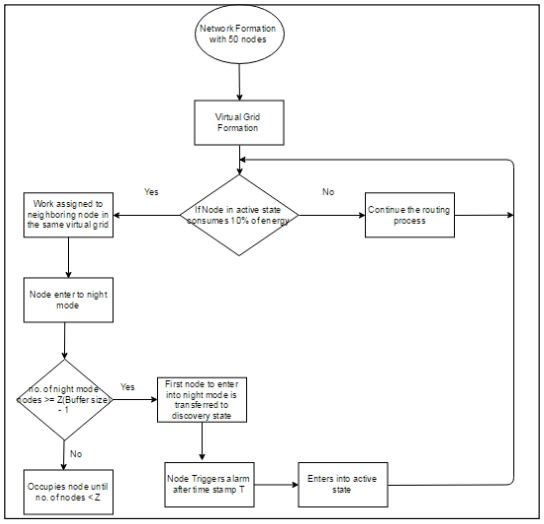

Figure 4.Energy Efficient Dynamic State Algorithm

ISSN: 2395-3802
DOI: https://doi.org/10.24321/2395.3802.202005

In this section we describe the EEDS algorithm. Initially, the network is divided into virtual grids. Each virtual grid is assigned with n number of nodes based on their current position. The nodes which are in the same virtual grid are designed in such a way that these nodes with in a grid will rely on one another i.e., any node in the virtual grid can assign its work to the any other node which is present in the same virtual grid.

EEDS Algorithm

```
INPUT: N nodes with 100% of energy
Z- Buffer Size, T- Time Stamp
1. Initialize n nodes to the network
2. Form the virtual grids
3. IF node losses 10% energy
4.    Assign its work to its neighboring node
5.    Node enters into night mode
6.    IF No. of nodes in the night mode >= z - 1
7.          First node is transferred to the discovery state
8.          IF node in the discovery state exceeds timestamp T
9.                Node triggers the alarm
10.               Enter into the active state
11.   ELSE
12.         Occupy the buffer until the No. of nodes< z
13.   ENDIF
14. ELSE
15.    Continue the routing Process.
16. ENDIF
```

Figure 5.Energy Efficient Dynamic State (EEDS)

This algorithm is found to be more efficient that existing algorithms since entire network lifetime is maintained uptime throughout the simulation

Experimental Analysis

The packets are routed very efficiently by nodes that are actively participating in the routing process. The Packet loss Ratio is evaluated with the parameters such as number of packets sent and number of packets received. It is inferred that as the number of nodes with minimum energy increases with respect to the simulation time the packet loss ratio increases gradually as shown in the Figure 6. The Calculated packet loss ratio is lesser than the value that obtained without any Energy efficiency algorithm incorporated in nodes in the network.

From the above graph, it is inferred that once the Energy Efficiency Dynamic State Algorithm has been incorporated with the routing protocol the results produced are far better than the other traditional methods used for energy efficiency. Here the Packet Drop Ratio is tremendously reduced when each and every node in the network can actively participate in transmitting and receiving the packets beyond a stipulated timestamp. Similarly they obtained results for throughput also infers that results are better than other existing works. EEDS Algorithm has been compared with other routing protocols for comparison.

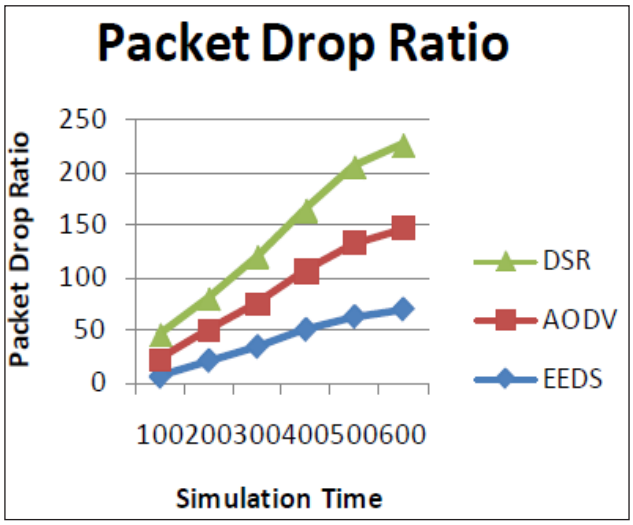

Figure 6.Packet drop ratio comparison between AODV and OLSR and EEDS

In the below table, the nodes lifetime are compared with respect to simulation time. The results obtained are more encouraging that above 80 percentages of the nodes maintain its energy level above 50 Percentage after the end of simulation. This shows that the entire network can perform more than a expected timestamp with uptime efficiency.

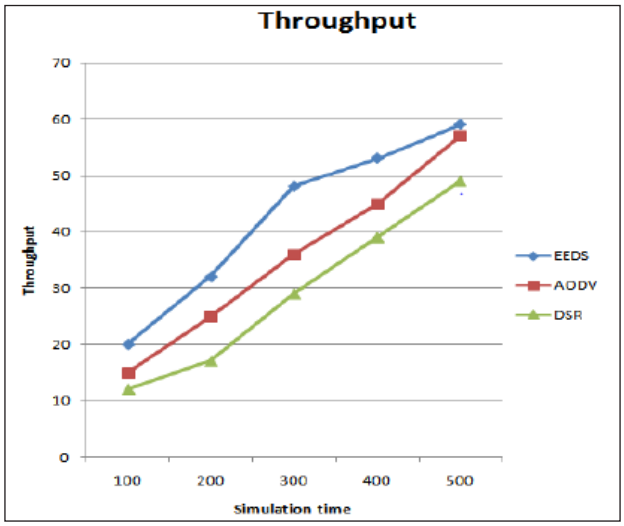

Figure 7.Throughput comparison between AODV and OLSR and EEDS

From the all above figure and Table shows that the comparison of the EAACK EEDS-EA3ACK algorithm where it shows the through put is increase with increase in the number of malicious nodes on while.

ISSN: 2395-3802
DOI: https://doi.org/10.24321/2395.3802.202005

Table 1.Comparison of active nodes with respect to simulation time

Simulation Time	No. of nodes > 50 percent energy level
100	50
200	49
300	47
400	43
500	41

Conslusion

In the recent research year there has been a lot of interest within the field of cryptography in MANET. Because during the transmission drop (or) attack the packet without acknowledgement. So acknowledge based transmission is very safe and high security. Network lifetime is considered to be themajor impact that influences the performance of thenetwork. This Paper proposed a solution to improvethe entire lifetime of the network by monitoring thenodes continuously. The EEDS-EA3AC Kenhances the nodes performance through out the simulation by maintaining the energyof the node uptime than other traditional methodsused to provide energy efficiency. This EEDS-EA3ACK provide better performance compare to existing EAACK routing protocol and also improve packet delivery ration above 80% of the nodes maintain its energy level above 50 Percentage after the end of simulation compare to existing EAACK routing protocol, all the nodescan actively perform in the routing process beyond the expected timestamp the overall performance isalso increased. Our future work will be implementingthis algorithm that can sustain the attacks and still maintain the same quality of service.

References

1. Mathew S, Jacob KP. A Novel Fast Hybrid Cryptographic System: MARS4. *IEEE* 2006.
2. Subasree S, Sakthivel NK. Design of a New Security Protocol Using Hybrid Cryptography Algorithms. *IJRRAS* 2010; 2(2).
3. Nasser N, Chen Y. Enhanced Intrusion Detection System for Discovering Malicious Nodes n in Mobile Ad hoc Networks. *IEEE Comm Society* 2007.
4. Mishra S, Satpathy SM, Mishra A et al. Energy Efficiency In Ad Hoc Networks. *International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC)* 2011; 2(1).
5. Mohanaradhya KA, Sumithradevi, Dharani A et al. Clustering methodologies and theirimplications in sensor networks. published in springer.
6. Kang N, Elhadi et al. Detecting Misbehaving Nodes in MANETs. International conference on Advanced Information Networking and Applications. 2010; 488-494.
7. Elhadi M, Shakshuki, Kang N et al. EAACK-A Secure Intrusion-Detection System for MANETs. *IEEE Trans on industrial electronics* 2013; 60(3): 1089-1098.
8. Basabaaa A et al. Implementation of A3ACKs intrusion detection system under various mobility speeds. 5th International Conf. on Ambient Systems, Networks and Technologies, 2014; 571-578.
9. Liu K, Deng J, Varshney PK et al. An acknowledgment-based approach for the detection of routing misbehaviour in MANETs. *IEEE Trans Mobile Comput* 2007; 6(5): 536–550.
10. Balakrishnan K, Deng J, Varshney VK et al. TWOACK: preventing selfishness in mobile ad hoc networks. Wireless Communications and Networking Conference. 2005; 4(10): 2137-2142.
11. Al-Roubaiey A, Sheltami T et al. AACK: Adaptive Acknowledgment Intrusion Detection for MANET with Node Detection Enhancement. 24th IEEE Conf. on AINA. 2010; 634-640.
12. Johnson D, Maltz DA, Broch J. The dynamic source routing protocol for mobile ad hoc networks. Internet Draft, Mobile Ad Hoc Network (MANET) Working Group, IETF. 1998.
13. Ramanathan S, Steenstrup M. A survey of routing techniques for mobile communication networks. *Mobile Networks and Applications* 1996; 89-104.
14. Yang H, Luo H, Ye F et al. Security in Mobile Ad hoc Networks: Challenges and Solutions. UCLA Computer Science Department. 2010.
15. Choi J, Cha S, Park GW et al. Malicious Nodes Detection in AODV-Based Mobile Ad Hoc Networks. GESTS Trans. Comp. *Science and Engr* 2005; 18(1): 49-55.
16. Rajaram A, Palaniswami S. Detecting Malicious Node in MANET Using Trust Based Cross-Layer Security Protocol. *(IJCSIT) Int. Journal of Com Sci and Information Technologies* 2010; 1(2).
17. Ukey ASA, Chawla M. Detection of Packet Dropping Attack Using Improved Acknowledgement Based Scheme in MANET. *IJCSI* 2010; 7(4).
18. Singh SK, Singh MP, Singh DK. Energy Efficient Homogenous Clustering Algorithm forWireless Sensor Networks. *International Journal ofWireless & Mobile Networks (IJWMN)* 2010; 2(3).
19. Sasikala MSc, Phil M, Nithya A. Clustering In Wireless Sensor Networks: A Survey 1 M. *International Journal of Computer Trends and Technology (IJCTT)* 2014; 17(3).
20. Heinzelman WR, Chandrakasan A, Balakrishnan H. Energy-Efficient Communication Protocol for Wireless Microsensor Networks. Published inthe Proceedings of the Hawaii International Conference onSystem Science. 2000.
21. Deosarkar BP, Yada NS, Yadav RP. Cluster Head Selection

ISSN: 2395-3802
DOI: https://doi.org/10.24321/2395.3802.202005

in Clustering Algorithms for Wireless Sensor Networks: A Survey. In Proceedings of the 2008 International Conference on Computing, Communication and Networking, Virgin Islands, USA.
22. Xue Q, Ganz A. Maximizing sensor networklifetime: analysis and design guides. In the Proceedings ofthe 2004 military communications conference. 2004; 2: 1144-1150.
23. Lukachan G, Labrador M. SELAR: Scalable Energy-Efficient Location Aided Routing Protocol for WirelessSensor Networks. In Proc. 29th Annual IEEE InternationalConference on Local Computer Networks, USA, Florida 2004; 694-695.
24. Aslam N, Phillips W, Robertson W et al. A multi-criterion optimization technique for energyefficient cluster formation in wireless sensor networks. Inf. Fusion 2011; 12: 202–212.
25. Ergen SC, Varaiya P. On Multi-Hop Routing forEnergy Efficiency. IEEE Commun. Lett., 2005; 9(10): 880-881.
26. Lv Q, Cohen E, Shenker S. Search andReplication in Unstructured Peer-to-Peer Networks. ICS '02 Proceedings of the 16th international conference on Supercomputing. 1996.
27. Cohen E, Shenker S. Replication strategies inun-structured peer-to-peer network's. In Proceedings of ACM SIGCOMM' 2002.
28. Giwon On, Schmitt J, Steinmetz R. QoS Controlled Dynamic Replication in Peer-to-Peer Systems. 2016 International Conference on Engineering and Technology (ICET).

ISSN: 2395-3802
DOI: https://doi.org/10.24321/2395.3802.202005