UTM Computing Proceedings
Innovations in Computing Technology and Applications
Volume: 1 | Year: 2016 | ISBN: 978-967-0194-81-3

An Efficient Mobile Ad Hoc Networking (MANET) for Cattle Monitoring System

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Abstract

The purpose of this research is to identify the efficient routing protocol for wireless network in cattle monitoring system. Nowadays, farming industries have widely used the wireless sensor network technology in agriculture and livestock. This technology is used to monitor the agricultural matter such as the maturity of plants and also use in livestock farming to monitor cow health, for an example cow's body heat. This study basically will test the available algorithm on wireless sensor network routing protocol to identify the most efficient routing protocol used in wireless sensor network for cattle monitoring system. There are some elements that need to be take care to ensure the efficiency of the system. Exterior aspects also need to be identify in this study, such as cow's mobility, radio interferences and others.

Keywords: MANET, Wireless, AODV, enhanced AODV

1.0 Introduction

Wireless AD-HOC network is distributed network having no centralized infrastructure, each node forward data packets in routing, sometimes other normal nodes may become router or gateway. This AD-HOC network is very useful in Emergency conditions, ease of deployment, speed of deployment and decreased dependence on infrastructure

There are three basic types of wireless AD-HOC network: MANET, Wireless mesh network and Wireless sensor network. MANET is a combination of independent mobile nodes that are connected with wireless links (radio waves) to perform peer-to-peer communication. MANET may operate in a standalone fashion, or may be connected to the other larger network like Internet. Applications of MANETs include military use in battle fields, where a centralized command center is not only infeasible but also undesirable; and disaster management scenarios, where on the run, communication between various rescue teams is required in the absence of any existing communication infrastructure. There are three major protocols used for MANET are: Proactive (table driven), Reactive (on-demand) and Hybrid (both proactive and reactive) which are discussed below.

Proactive Protocol

This type of protocols maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network. The main disadvantages of such algorithms include: Respective amount of data for maintenance, slow reaction on restructuring and failures. Examples of proactive are DSDV (destination sequenced distance vector) and OLSR (Optimized Link State Routing).

Reactive Protocol

This type of protocols finds a route on demand by flooding the network with Route Request packets. Determine route if and when needed Source initiates route discovery. Examples are DSR (dynamic source routing) and AODV (ad-hoc on demand distance vector).

Hybrid Protocol

This category is called as Adaptive; Combination of proactive and reactive. Example ZRP (zone routing protocol).

The objectives of this project are : (1) to design an enhanced routing protocol for cattle environment based on AODV, (2) to develop the enhanced protocol to handle the behavior of cattle environment in cattle monitoring system and (3) to evaluate the performance of the enhanced routing protocol for cattle monitoring system with selected existing protocol.

2.0 Methodology

i. Problems definition
ii. Data definition
iii. Development of network simulation and mobility module of nodes
i. Analysis of the result

2.1 Enhanced AODV

Give priority to source node with real time packets (UDP)

i. Broadcast the RREQ message to neighbors.
ii. Set active route time to constant.
iii. Upon reception of RREQ message, check whether the RREQ is real time. If YES, terminate the already stored entry in routing table and update real time packets to priority basis. Accept RREQ.
iv. Otherwise, do not update. Forward packets to next node.
v. If destination node discovered, send RREP message to update reverse route in the routing table.

Route expires when transmission is complete.

3.0 Result

A figure below illustrates the result on comparison between basic AODV and the enhanced AODV.

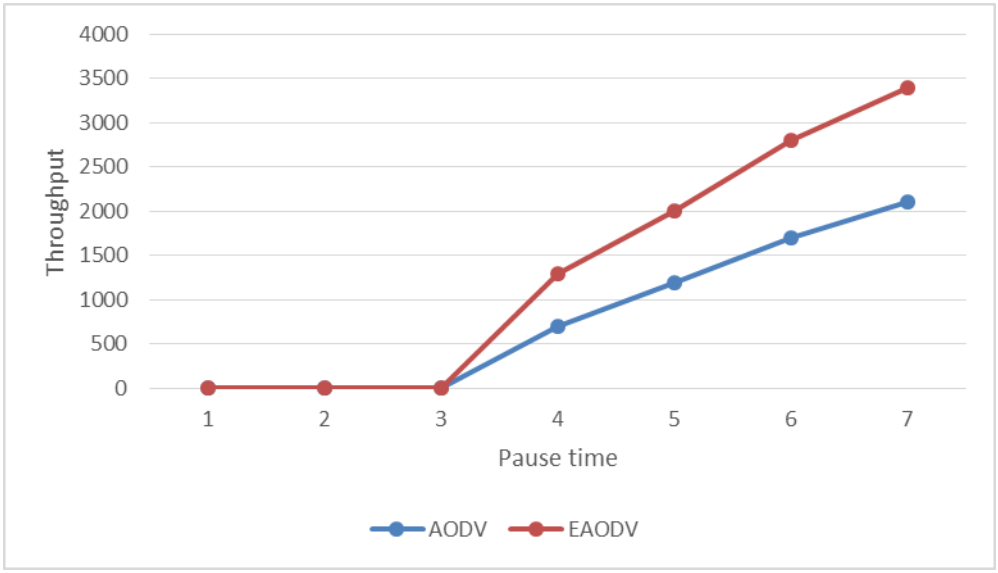

Figure 7: Graph of throughput versus pause time

Figure 1 shows the throughput comparison between AODV and EAODV is given and it is clear that the throughput of EAODV is greater than basic AODV as indicated by red line in the graph. At point 1, 2 and 3 throughput of CBR packets is zero because UDP transmission is not started yet. At point 3 UDP transmission start and a large increase occur in throughput of CBR packets during UDP transmission. After point 3 graphs shows a continuous increase in throughput rate of CBR packets as compare to basic AODV.

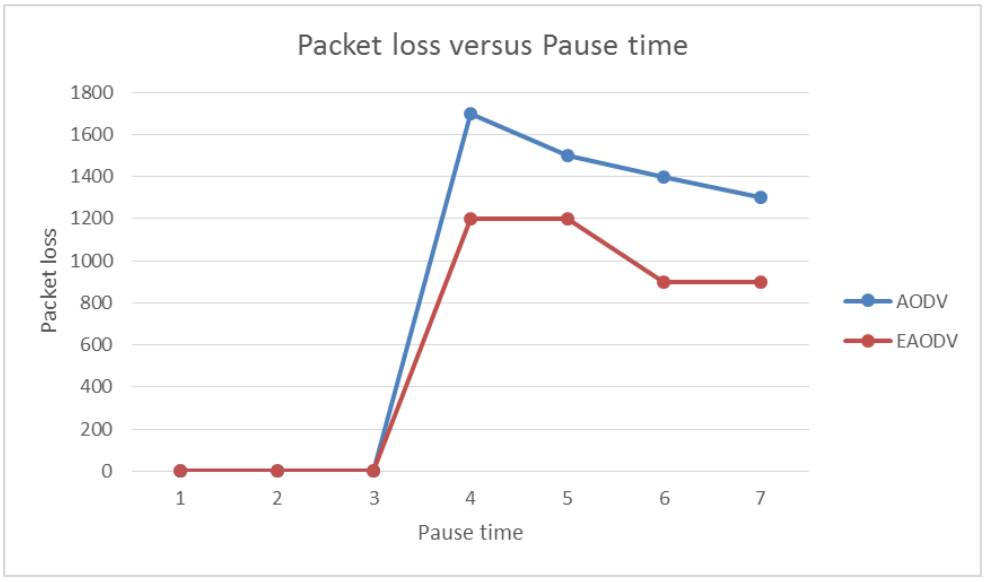

Figure 8: Graph of packet loss versus Pause time

The packet loss rate of both protocols is calculated at fixed interval of time. First we calculated the number of packets during fixed intervals and packet loss then packet loss rate is calculated. At point 1, 2 and 3 packet loss is zero because UDP transmission is not start at that time. At point 3 UDP transmission start and a large decrease occur in packet loss of CBR packets during UDP transmission as compare to basic AODV. The packet loss rate for the EAODV is smaller than basic AODV.

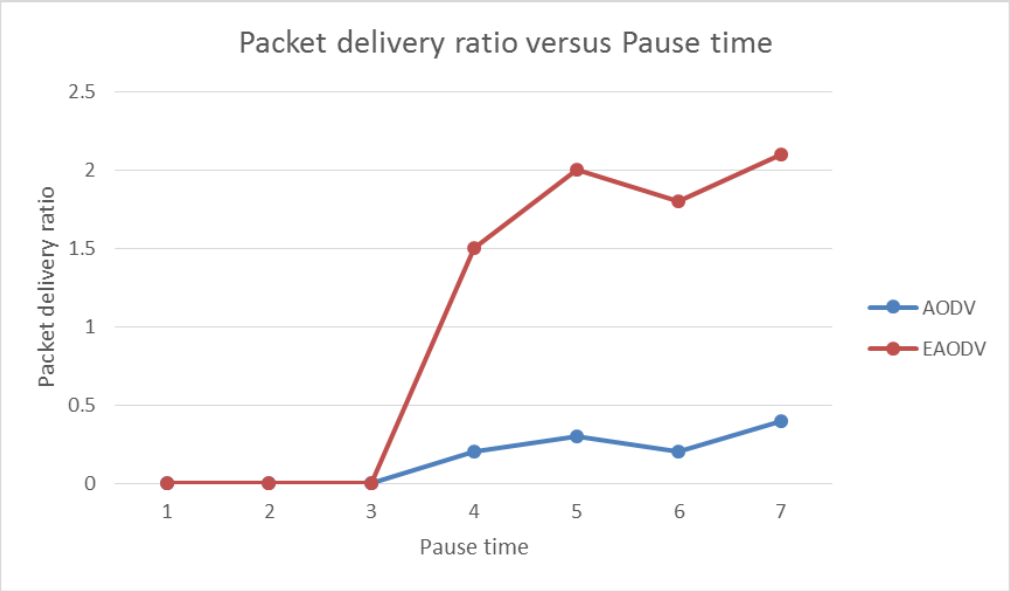

Figure 9: Graph of packet delivery ratio versus Pause time

Figure 3 shows the delivery ratio of both protocols. Red line is indicating the delivery ratio of EAODV and blue line indicates the basic AODV. At point 1, 2 and 3 delivery ratio is zero because UDP transmission is not start. At point 3 UDP transmission start and a large increase occur in delivery ratio of CBR packets during UDP transmission. Graphs shows continuous increase in delivery ratio because during UDP transmission no TCP packets are send or received, due to priority only CBR packets are transmitted. Hence delivery ratio of CBR packets is increased.

4.0 Discussion

The developed protocol of an enhanced route discovery mechanism that avoids the RREQ rejection and in results reduces the pre transmission delay. EAODV give priority to the source node of RT transmission. When RREQ packet sends to neighbor node, for RT transmission it accept route request on priority basis and starts the RT transmission. EAODV expire active routes of TCP when UDP transmission starts.

5.0 Conclusion

In this paper we have evaluated two of Mobile Ad Hoc Network (MANET) that is Ad hoc On Demand Vector (AODV and the enhanced AODV (EAODV). The performance metrics that has been considered in this study are Packet Delivery Ratio, Throughput, and Packet loss.

From the result that has been collected at Chapter 4, we can conclude that EAODV has a better potential to be used in cattle monitoring system. Cattle monitoring system can be very useful to cattle farmers in order to monitor their cattle eating behavior, movement pattern and health welfare. EAODV also has shown higher number in throughput, this means that packets that has been sent from source node are been received almost 85% at the destination node. The ratios of packet delivery also much higher for EAODV than AODV and this will make the monitoring process are much more reliable and accurate. This is again, proving that EAODV are the most efficient MANET routing protocol to be used in cattle monitoring system.

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