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# A Wsn Energy Efficient Routing Protocol Implementation Based On Ai

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**Abstract- Recent developments in low-power communication and signal processing technologies have led to the extensive implementation of wireless sensor networks (WSNs). In a WSN environment, cluster formation and cluster head (CH) selection consume significant energy. Typically, the CH is chosen probabilistically, without considering the real-time factors such as the remaining energy, number of clusters, distance, location, and number of functional nodes to boost network lifetime. Based on the real-time issues, different strategies must be incorporated to design a generic protocol suited for applications such as environment and health monitoring, animal tracking, and home automation. Elementary protocols such as LEACH and centralized-LEACH are well proven, but gradually limitations evolved due to increasing desire and need for proper modification over time. Since the selection of CHs has always been an important criterion for clustered networks, this paper overviews the modifications in the threshold value of CH selection in the network.**

**Keywords- machine learning; routing algorithms; energy efficient; wireless sensor networks.**

## I. INTRODUCTION

The advent of ubiquitous computing and the proliferation of portable computing devices have raised the importance of mobile and wireless networking. A mobile ad hoc network is an autonomous collection of mobile nodes forming a dynamic network and communicating over wireless links [Figure 1.1]. Ad hoc communication concept allows users to communicate with each other in a multi-hop fashion without any fixed infrastructure and centralized administration. Due to their capability of handling node failures and fast topology changes, such networks are needed in situations where temporary network connectivity is required, such as in battlefields, disaster areas, and large meeting places.

Such networks provide mobile users with ubiquitous communication capability and information access regardless of location. TCP has gained its place as the most popular transmission protocol due to its wide compatibility to almost all today's applications. However, TCP as it exists nowadays may not well fit in mobile ad hoc networks since it was designed for wire-line networks where the channel Bit Error Rate (BER) is very low and network congestion is the primary cause of packet loss. On the contrary of wired links, wireless radio channels are affected by many factors that may lead to different levels of BER. TCP has gained its place as the most popular transmission protocol due to its wide compatibility to almost all today's applications. However, TCP as it exists nowadays may not well fit in mobile ad hoc networks since it was designed for wire-line networks where the channel Bit Error Rate (BER) is very low and network congestion is the primary cause of packet loss.

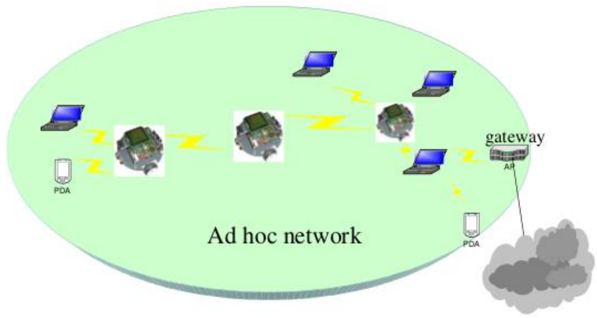


Fig 1. Ad hoc Network .

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In addition to wireless channel behavior, one of the most prominent features of Ad Hoc networks is mobility of nodes. Thus, since the devices of such a network are battery operated, they need to be energy conserving so that battery life is maximized. In the last few years, lot of research efforts have been undertaken in order to design ad hoc networking protocols that takes into consideration energy consumption aspects. Among them, a set of routing protocols [1] that have been proposed in the last few years in order to ensure network connectivity when minimizing energy consumption of mobile nodes at the same time.

In the mean time, only few works dealing with energy efficiency of TCP variants have been undertaken. The objective of our work is, first, to study the performance of these TCP variants and their impact on the energy consumed by mobile nodes. Then, our second objective is to study the effect of IETF MANET routing protocols on TCP energy consumption. The result of this work can then be used, in a near future, as a guideline to design new energy-efficient TCP variant for ad hoc networks.

## II. PROBLEM STATEMENT

TCP was mainly developed to be implemented within wired networks where the main cause for packet loss in network congestion, In this work, we aim to make a clear comparison between the most common TCP variants. This comparative study takes place under different error loss situations. We take into consideration wireless channel effects and link failure cases. We make our simulations using a large number of connections which are 5,10,15,20, and 25 connection with node density100 nodes in order to realize the effect of losing a non-adjacent node on energy consumption of the other nodes in the network.

The aim of this study is to help understanding the impact of the different TCP loss recovery mechanisms on TCP performance in ad hoc environments. Thus, obtained results can be used as a guideline for efficient design of new specific TCP enhancements for ad hoc networks.

TCP/IP protocol was designed for wired networks which provides end to end reliable communication between nodes and assures ordered delivery of packets. It also provides flow control and error control mechanisms. As it is still a successful protocol in wired networks, losses are mainly due to congestion. But in case of ad hoc networks packet losses are due to congestion in the network and due to frequent link failures. so when network adapt TCP to ad hoc networks it misinterprets the packet losses due to link failure as packet losses due to congestion and in the instance of a timeout, backing-off its retransmission timeout (RTO).

This results in unnecessary reduction of transmission rate because of which throughput of the whole network degrades. Therefore, route changes due to host mobility can have a detrimental impact on TCP performance. Therefore a new strategy is required for providing the more reliable MANET.

TCP is considered as the most popular reliable transport protocol today. It is compatible with almost all other Internet protocols and applications. However, TCP as it exists now-a-days may not well fit in wireless ad hoc networks since it was designed for wired networks where network congestion is the primary cause of data packet losses. On the contrary of wired links, wireless radio channels are affected by many factors that may lead to different levels of channel errors. Wireless channel behavior cannot be predictable, but in many cases, such channels have high channel errors that cannot be neglected when studying light-infrastructure networks such as wireless ad hoc networks. Furthermore, in addition to wireless channel behavior, there are many other factors that could affect TCP performance within this kind of networks. Link failures and network partitioning due to nodes' mobility or battery depletion may have a negative effect on the performances of TCP connections. Hence, TCP does not have the capability to recognize whether the packet loss is due to network congestion, channel errors, or link failure. It reacts to all packet losses as if it was due to congestion.

## III. SOLUTION TO THE CHALLENGES

Sensor nodes are driven by the battery and in many applications, these batteries cannot be replaced. They die when the battery exhaust and the network functionality are affected. Thus, a routing technique is very much essential to enhance the life span and manages the battery efficiently. This characteristic motivates to design energy-efficient routing techniques. Wireless sensor network is a multi-hop network where data are transmitted through the intermediate sensor nodes. The links between sensor nodes are highly prone to failure. The frequency of link failure directly affects the data delivery ratio and decreases the reliability of the network. This issue motivates to design reliable routing techniques. The energy hole problem can be solved using the mobile sink.

However, the mobile sink management is a tedious task. Many routing protocols are working in the mobile sink environment but possess flaws like; ineffective management, increased energy consumption, and reduced data delivery ratio. It is essential to efficiently manage the mobile sink to prolong the lifetime of the network. In many applications, the generated data should reach the base station at the earliest. However, the unavailability of the routing path, sink location and frequency of node failure increases the end-to-end latency. Therefore, it is required to incorporate techniques to reduce latency.

### 1.Routing in Ad Hoc Network

In the latest years, research has been conducted on improving the performance of the MANET routing protocols. To deal with the complexity of the routing protocols, MANET has become a vital issue for The Internet Engineering Task Force (IETF) and therefore a MANET working group (WG) is established by IETF. The role of this group is to be involved in the development of two routing protocols such as AODV and DSDV and so on.

The routing protocols for ad hoc wireless network should be capable to handle a very large number of hosts with limited resources, such as bandwidth and energy. The main challenge for the routing protocols is that they must also deal with node density, meaning that nodes can appear and disappear in various scenarios. Thus, all nodes of the ad hoc network act as routers and must participate in the route discovery and maintenance of the routes to the other nodes. For ad hoc routing protocols it is essential to reduce routing messages overhead despite the increasing number of nodes and their mobility. Keeping the routing table small is another important issue, because the increase of the routing table will affect the control packets sent in the network and this in turn will cause large link overheads [2].

**2.Classification of Ad Hoc Routing Protocols**

Routing protocols are divided into two categories based on how and when routes are discovered, but both find the shortest path to the destination. Proactive routing protocols are table-driven protocols; they always maintain current up-to-date routing information by sending control messages periodically between the nodes which update their routing tables. When there are changes in the structure then the updates are propagated throughout the network. Other routing protocols are on-demand routing protocols, in other words reactive, ones which create routes when they are needed by the source node and these routes are maintained while they are needed [3]. Route construction should be done with a minimum of overhead and bandwidth consumption taking into consideration the constraint of battery lifetime. In real life systems, energy consumption is a major issue, and the routing protocols affect the energy dynamics in two ways. First, the routing overhead affects the amount of energy used for sending and receiving the routing packets, and second, the chosen routes affect which nodes will have faster decrease in energy [4].

Ad hoc routing protocols must operate in a distributed fashion allowing each node to enter and leave the network on its own, and should avoid data looping in the network. For very dynamic topologies, proactive protocols can introduce a large overhead in bandwidth and energy consumption on the network. Reactive protocols trades off this overhead with increased delay, as the route to the destination is established when it is needed based on an initial discovery between the source and the destination [5]. Following is a category of routing protocols in these protocols we are working on AODV and DSDV protocols.

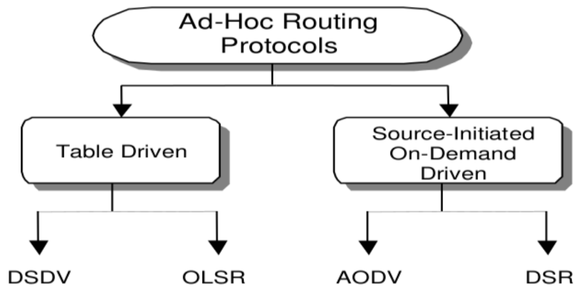


Fig.2 Ad hoc Routing Protocols

**3.Ad Hoc on Demand Distance Vector Routing (AODV)**

The Ad Hoc On-Demand Distance Vector (AODV) routing protocol described in [1-10] builds on the DSDV algorithm previously described. AODV is an improvement on DSDV because it typically minimizes the number of required broadcasts by creating routes on a demand basis, as opposed to maintaining a complete list of routes as in the DSDV algorithm. The authors of AODV classify it as a pure on demand route acquisition system, since nodes that are not on a selected path do not maintain routing information or participate in routing table exchanges [6].

## IV. LITERATURE SURVEY

F. Guerriero et al. [1] In this paper, the problem of finding optimal paths in mobile ad hoc networks is addressed. More specifically, a novel bicriteria optimization model, which allows the energy consumption and the link stability of mobile nodes to be taken into account simultaneously, is presented. In order to evaluate the validity of the proposed model, a greedy approach is devised. Some preliminary computational experiments have been carried out, in a simulation environment. The numerical results are very encouraging, showing the correctness of the proposed model. Indeed, the selection of a shorter route leads to a more stable route, but to a greater energy consumption. On the other hand, if longer routes are selected the route fragility is increased, but the average energy consumption is reduced.

Zhihao Guo, et al. [2] In this paper we develop a novel energy aware routing approach for mobile ad hoc network (MANET) problems. The approach is based on using Optimized Link State Routing Protocol. Energy Aware OLSR labeled as OLSR_EA measures and predicts per-interval energy consumptions using the well-known Auto-Regressive Integrated Moving Average time series method.

Fahad Taha AL-Dhief et al. [3] This paper gives an extensive review of the modern techniques used in the forest fire detection based on recent MANET routing protocols such as reactive Location-Aided Routing (LAR), proactive Optimized Link State Routing (OLSR) and LAR-

Based Reliable Routing Protocol (LARRR). Mobile Ad-Hoc Network (MANET) is a type of structure-less wireless mobile network, in which each node plays the role of the router and host at the same time. MANET has gained increased interest from researchers and developers for various applications such as forest fire detection. Forest fires require continuous monitoring and effective communication, technology, due to the big losses are brought about by this event. As such, disaster response and rescue applications are considered to be a key application of the MANET.

Dipika Sarkar et al. [4] This proposed work, pheromone value of a route is calculated based on end to end reliability of the path, congestion, number of hops and residual energy of the nodes along the path. The path which has highest pheromone value will be selected for transmission of the data packet. The simulation result shows that the proposed scheme outperforms AODV, Dynamic Source Routing (DSR) and Enhanced-Ant- DSR routing algorithms.

Ahmad Mohamad Mezher et al. [5] In this paper, we present a novel game-theoretical approach of a multimetric geographical routing protocol for VANETs to forward video-reporting messages in smart cities. Game theory is considered a very interesting theoretical framework to analyze and optimize resource allocation problems in digital communication scenarios. Our contribution has shown to enhance the overall performance of VANETs in urban scenarios, in terms of percentage of packet losses, average end-to-end packet delay and peak signal to noise ratio (PSNR).

S.A.Gunasekaran et al. [6] this paper proposes an optimization-based routing protocol namely Energy Efficient Robust Bacterial Foraging Routing Protocol (EE-RBFRP) which is inspired from foraging behavior of bacteria. EE-RBFRP initially investigates the whole search space and performs local-search and global-search separately to exploit the promising regions of the network to find the best route to access the big data in cloud computing. EE-RBFRP is evaluated against existing protocol using NS2 with benchmark performance metrics. Results make a better indication that EE-RBFRP has better performance than existing protocols in terms of reducing the delay and energy consumption.

## V.CONCLUSION

In this Algorithm, the DEEC heterogeneous WSN protocols are studied and compared. The simulation results that DEEC increases significantly the network performances. This study is only interested in the case of heterogeneity at two and three levels. In the next work, we propose to address other protocols with higher levels of heterogeneity. In addition to the fact that the Wireless sensor networks supply remote processing centers with information collected at the level of the environments in which they evolve, also make it possible to establish interactions between distant objects in ubiquitous and instantaneous ways. In future works, it is envisaged to study the impacts of these networks when they are disseminated on very large scales and the possible divisions according to their relative distributions by area of interest.

As future work, we will extend our dataset with new values from new scenarios using heterogeneous city maps with very different street layouts and orography. Notice that it would just be necessary to conduct a large amount of new simulations and process the data properly to include more registers in the dataset. We would then follow the same procedure designed in this work to train and validate a new version of the ANN-based forwarding algorithm. Finally, an evaluation of the performance in different types of cities will show the accuracy of results concerning the current multimetric predictive artificial neural network-based MPANN version.

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