An Improvement in Energy Efficient Ring Clustering Protocol for Wireless Sensor Network

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Abstract: As the WSN used in industrial and Environmental monitoring the most critical issues in the WSN is to reduce the energy consumption to extend the lifetime of the wireless sensor network. The intermediate hop nodes are working throughout the data transmission so those nodes drain out their energy which automatically reduces the life time of the wireless sensor network. To overcome these drawbacks, the EARCHR protocol (Energy Aware Re-Clustering Heterogeneous Routing). The four important processes which are present in this protocol was Clustering, data aggregation, Re-clustering by swapping algorithm and sink relocation. The theoretical analysis and the simulation analysis are done and the shows that the EARCHR protocol reduces the energy consumption and increase the energy efficiency. Many emerging applications such as intruder detection and border protection drive the fast-increasing development of device-free passive (DfP) localization techniques. In this paper, we present the EARCHR protocol reduces the energy consumption and increase the energy efficiency.

Keywords: *Ring Clustering, energy, delay, wireless, sensor, network*

I. INTRODUCTION

A wireless sensor network is composed of wireless sensor nodes and a sink node. Nodes are wirelessly interconnected to one another and to the sink. These networks are characterized as Low-power and Lossy Networks (LLNs), as individual nodes possess limited power and operate in harsh environments. If a node is not in direct communication range with the sink, the data it captures is reported in a multi-hop manner. In this way, nodes located closer to the sink end up relaying data for nodes that are farther away, thus creating hotspots near the sink. These hotspot nodes tend to deplete energy faster, thus reducing the wireless sensor networks lifetime. Wireless sensor network energy consumption is a popular research topic. Considering of LLN characteristics and possible applications, the Internet Engineering Task Force (IETF) Routing Over Low-power and Lossy networks (ROLL) group has standardized a low-power and lossy network routing architecture called RPL. This protocol is an open and accepted technical standard in regards to wireless sensor network IP-based development. The salient design feature of RPL is a routing framework that allows the use of different routing metrics and objective functions (OFs) to manage LLNs, including limitations and heterogeneous application requirements.

Many other RPL-based routing protocols for different optimization objects., for example, investigated packet forwarding and other factors to find that when nodes number is 150, the network is stable enough to satisfy practical application general requirements (based on the cortex M3-nodes for original RPL routing protocol in networks). Li utilized an original RPL protocol implemented by TinyRPL and contikiRPL operating systems to test real-world performance per factors including routing fairness and packet delivery rate; the showed that the protocol merits further improvement in regards to network packet and routing control packet overhead. G add our tested energy consumption, packet delay, and packet loss rates of the original RPL protocol to find that energy consumption and packet loss rates significantly increase as the number of network nodes increases. The original RPL routing protocol is planar and the objective function is singular, rendering it unable to adapt to the excessive packet numbers that accompany an excessive number of nodes. Iova performed detailed test and performance analyses of the original RPL routing protocol to explore end-to-end delay, DIO packet transmission, and other parameters. The network is flooded with control packets as soon as route maintenance becomes necessary. These control packets substantially impact overall energy efficiency and network stability.

If the inter-cluster transmission mode in the wireless sensor network clustering routing algorithm is single-hop transmission, the outer cluster head nodes will be located far away from the base station. Inner cluster head node energy consumption is greater than that of other nodes due to lengthy transmission distance. If the inter-cluster transmission mode is multi-hop, the inner nodes will be close to the sink and consume more energy due to the large amount of data transmitted to them from outer cluster head nodes. In a ring domain multi-sector cluster network, the inter cluster transmission mode is generally multi-hop, meaning the outer cluster head nodes send data layer-by-layer through the cluster head node of the adjacent ring to the sink. The optimal cluster number of each ring makes the size of the outer cluster larger than that of the inner cluster, thus intra cluster transmission energy consumption carried out by the outer cluster head nodes is higher than that of intra-cluster transmission carried by the inner cluster head nodes. In a uniform split ring, the larger area of the outer cluster produces additional transmission energy consumption. Inner and outer cluster region shape is thus made more uniform by imposing a non-uniform split ring structure. However, an uneven split

ring can also balance inner and outer cluster head energy consumption owing to an increase in outer ring spacing.

II. IMPLEMENTATION

In general, the Cluster is referred as the formation of the group of nodes in the network. And the cluster head is called as, it is head among the cluster children. At the end of the Top-Disc topology discovery process, the sensor network is divided into n clusters and each cluster is represented by one node, which is called the cluster head. The cluster head is able to reach all the sensor nodes in the cluster directly because they are all within its communication range. On behalf of using the cluster and the cluster head concept in the network we can increase the tolerance of the network. The network monitoring is also increased by using this concept.

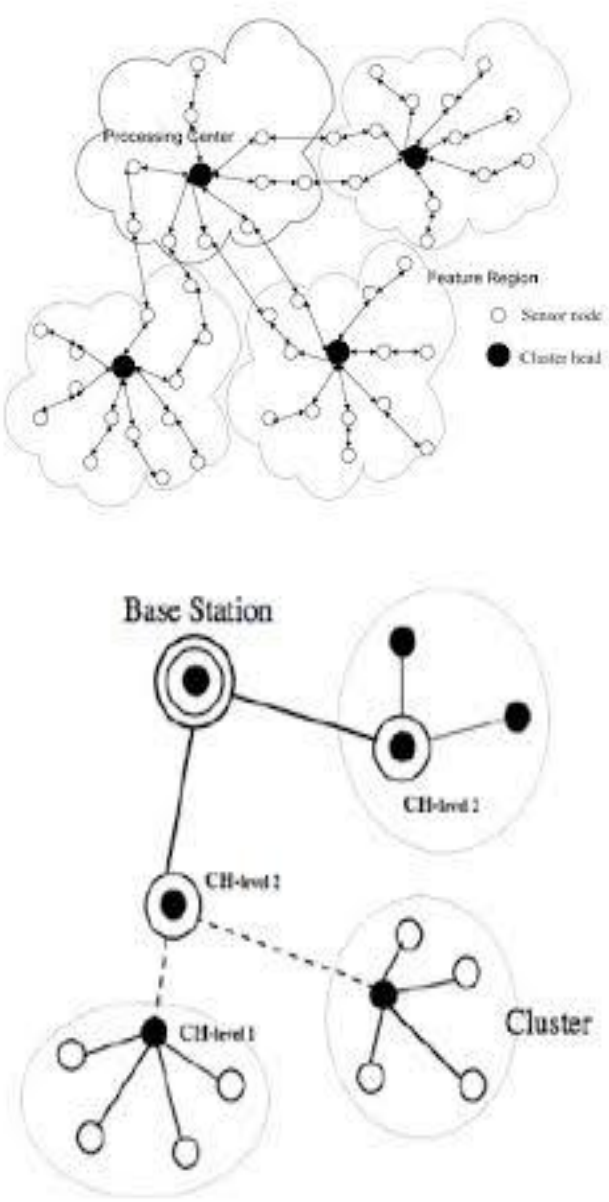

Figure 1: Re-Clustering

The energy aware clustering method consists of four main divisions. They are cluster head creation, cluster formation, gateway creation and the cluster retransmission in the cluster. Cluster Head Creation – The cluster head is chosen dynamically according to the network formation. Cluster formation – The cluster head sends the request to the neighbor nodes to form its own cluster. Here the gateways are helpful for the inter-cluster communication. Due to this continuous functioning process the cluster head drain out its own energy and it causes delay and lack of energy efficiency. To overcome this drawback, we the cluster head retransmission in the energy aware clustering process.

III. DATA AGGREGATION

Here the cluster head nodes perform the action of data aggregation which means collecting the data from the ordinary nodes. After collecting all the data its sends to the base station or to the neighboring cluster head with the help of the gate ways.

Step 1: Initial setup is to design the network as less hop count transmission.

Step 2: Design a pp from the sensor devices (here we are setting PP which can receive the data from number of nodes).

Step3: If sensor having the data, then sensor finding the PP, which is near to that sensor.

Step 4: If sensor found any PP point node is available then transfers data to PP

Step 5: If PP has more data then it informs to control station.

Step 6: Control station receives the number of control information from different PP's.

Step 7: After collecting the control message, CS makes the shortest route to collect the data from PP's.

Step 8: MC moves towards each PP's and collects the info and returns back to CS

There are five sub modules in this section. Those are

I. Analyzing the data sink details

II. Setting less hop count transmission
- Problem in static forward node
- Dynamic forward node

III. Select sensor as pp
- Static P
- Dynamic PP

IV. Find and collect data from pp's

V. Handover the data o BS

IV. PERFORMANCE EVALUATION

The main parameters which are concentrated by using this protocol was Total remaining energy, Average remaining energy, Energy differences, Packet delivery ratio, Average end to end delay, Average number of hops, Control packet overhead, Throughput, Data packet sent, Data packet received, Simulation end time, Total delivery time, Total number of hops, Maximum number of hops and the minimum number of hops.

V. RESULTS

In figure 2 to 9, result comparison is shown in various parameters and it shows the new algorithm with re clustering is better than previous ring clustering.

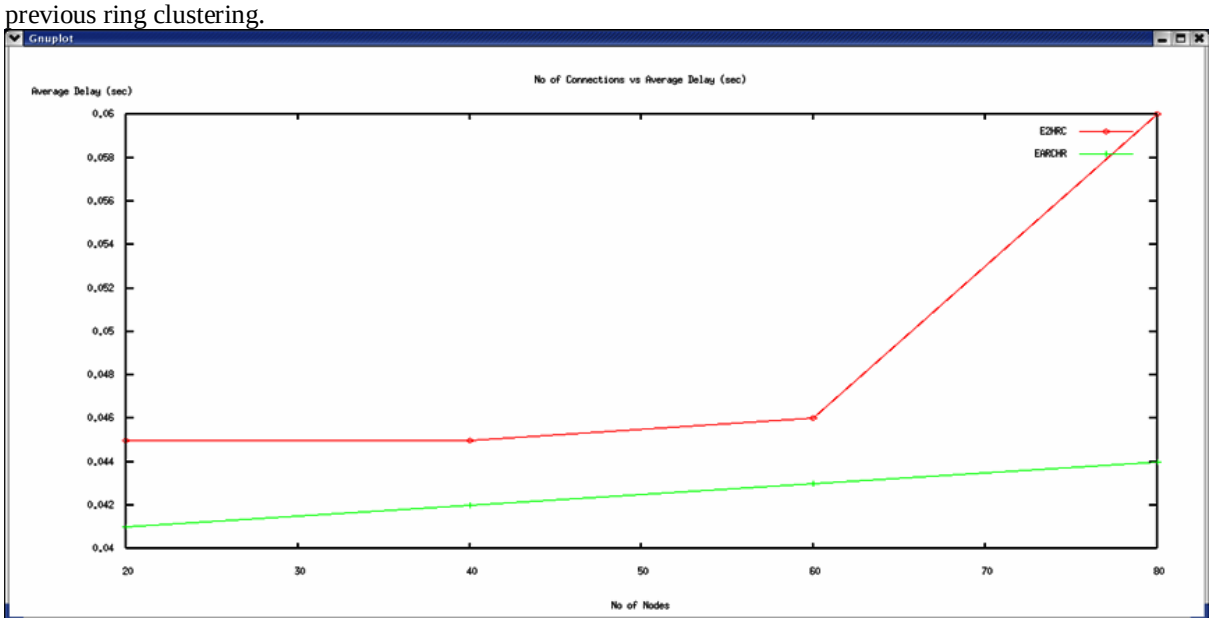

Figure 2: Average Delay Calculation Vs Number of nodes

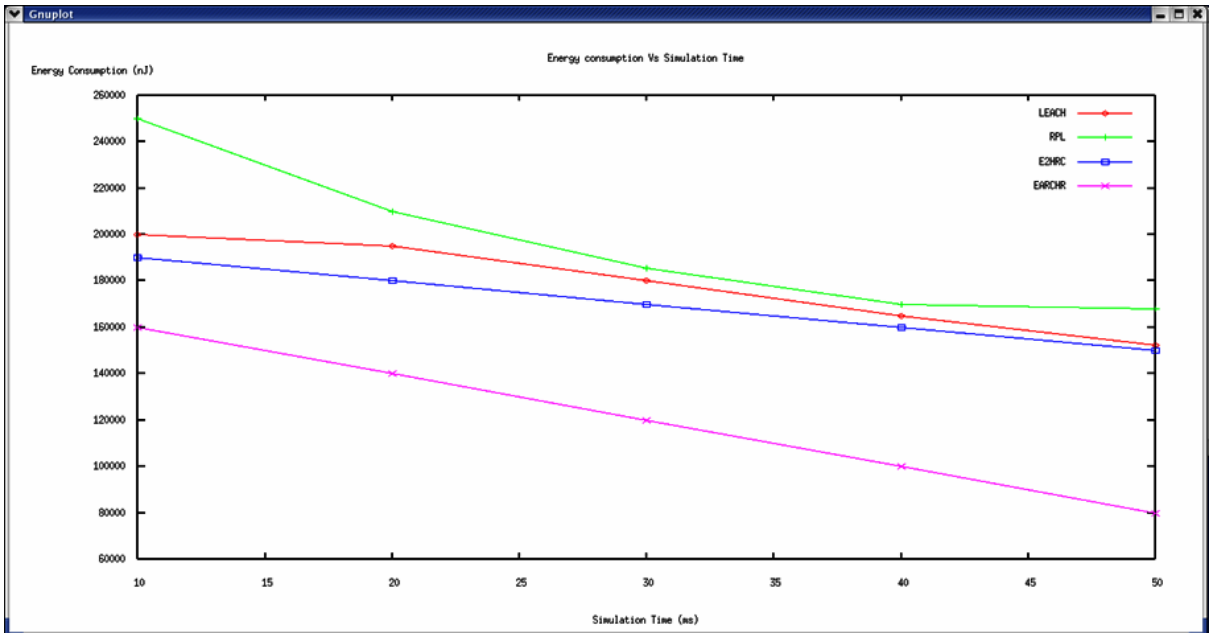

Figure 3: Energy Consumption Calculation of the network

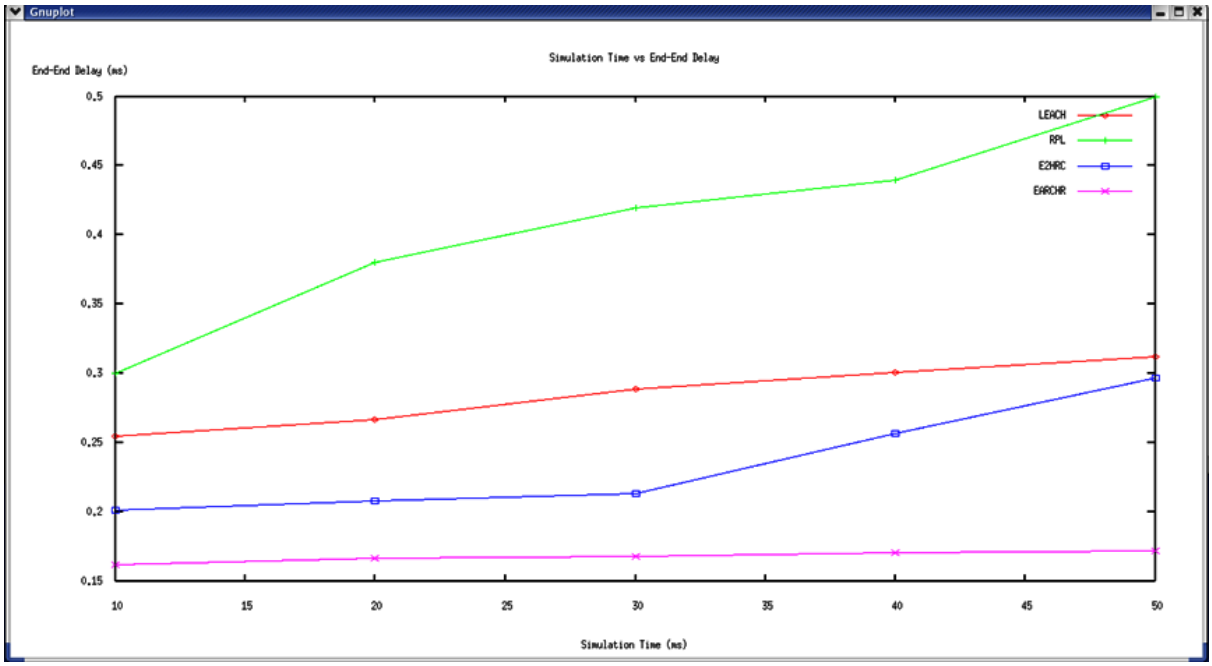

Figure 4: End to End Delay of the Network

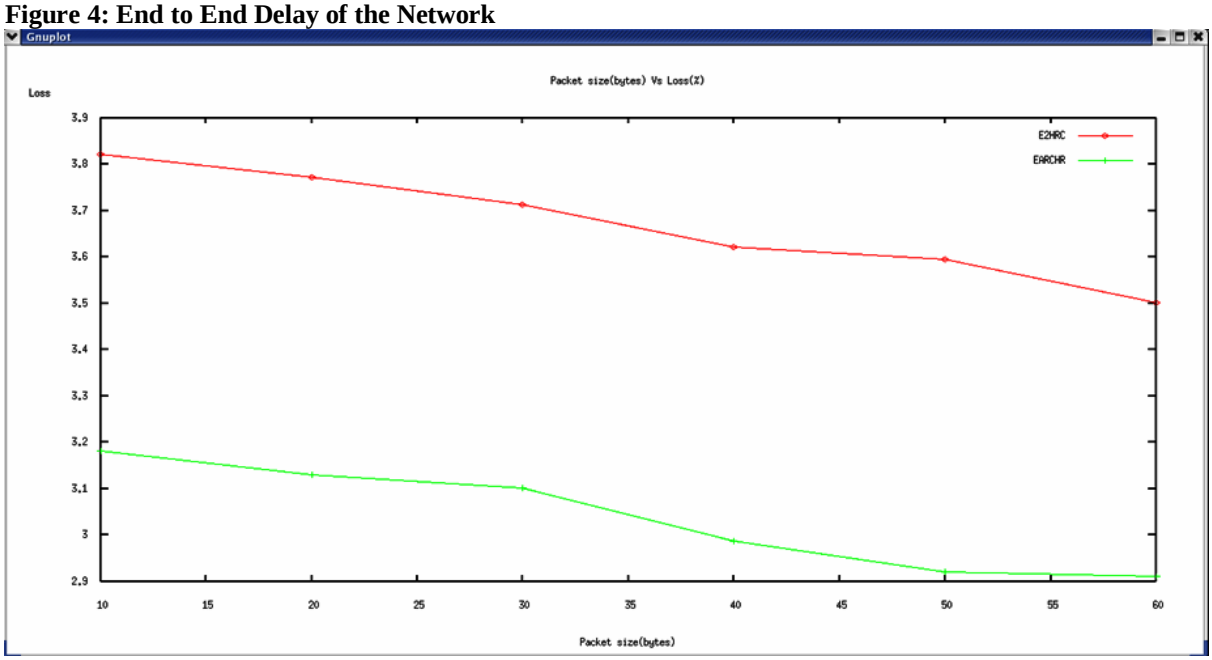

Figure 5: Packet loss calculation in the Network

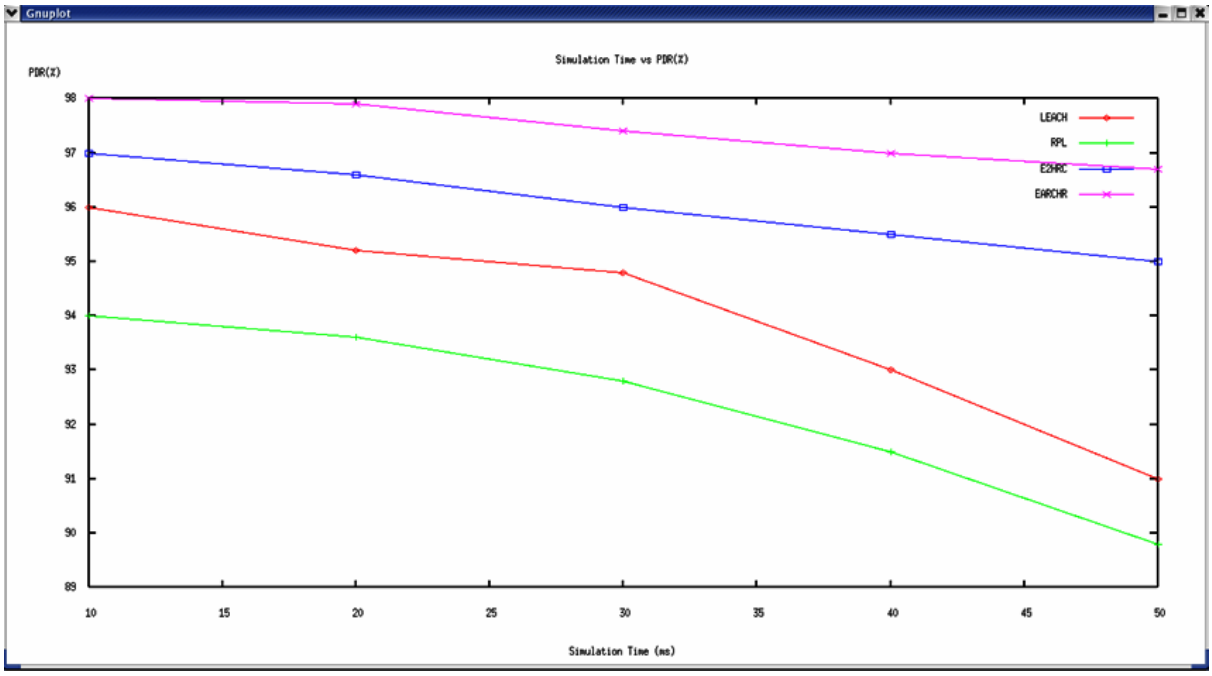

Figure 6: Packet Delivery Ratio of the Network

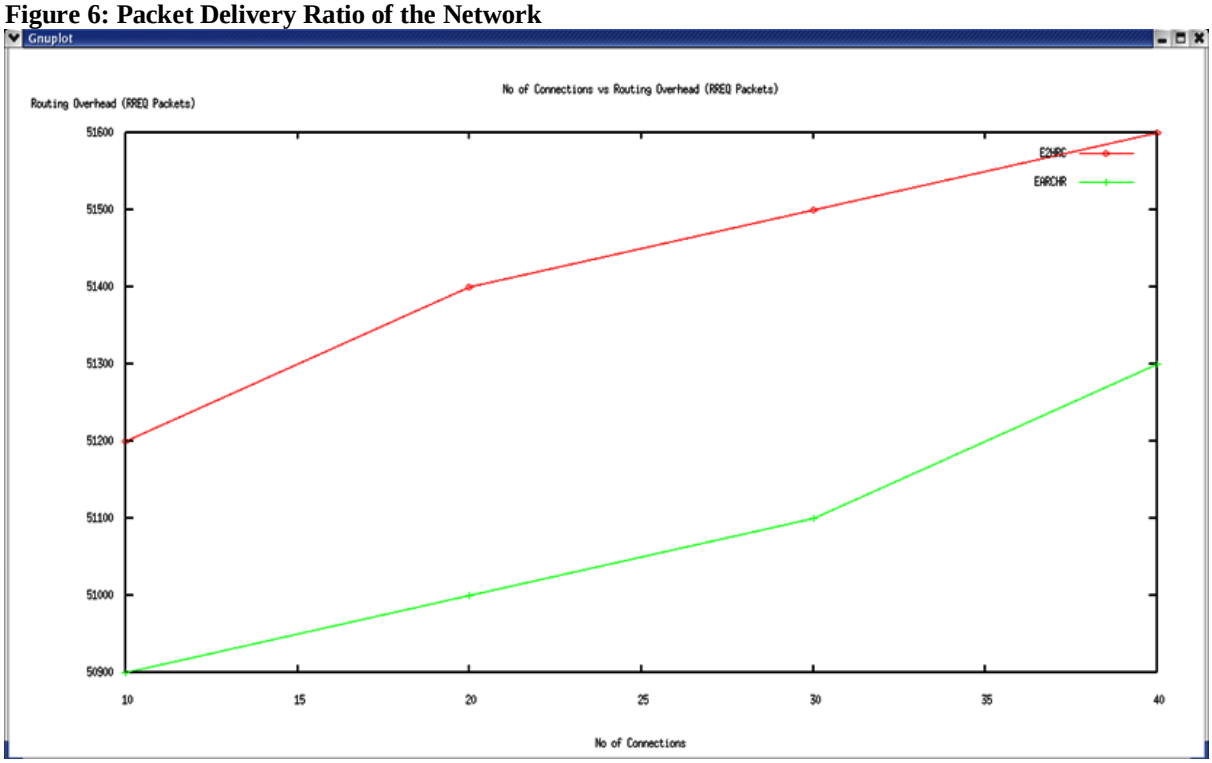

Figure 7: Routing Overhead calculation of the Network

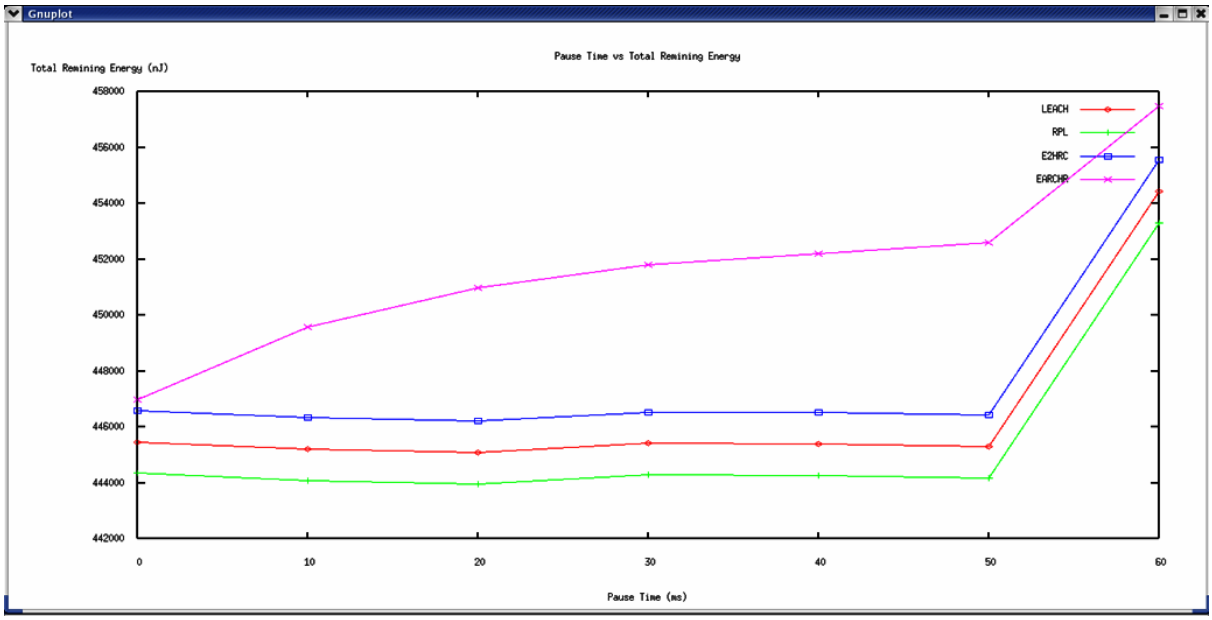

Figure 8: Remaining Energy Calculation of the Network

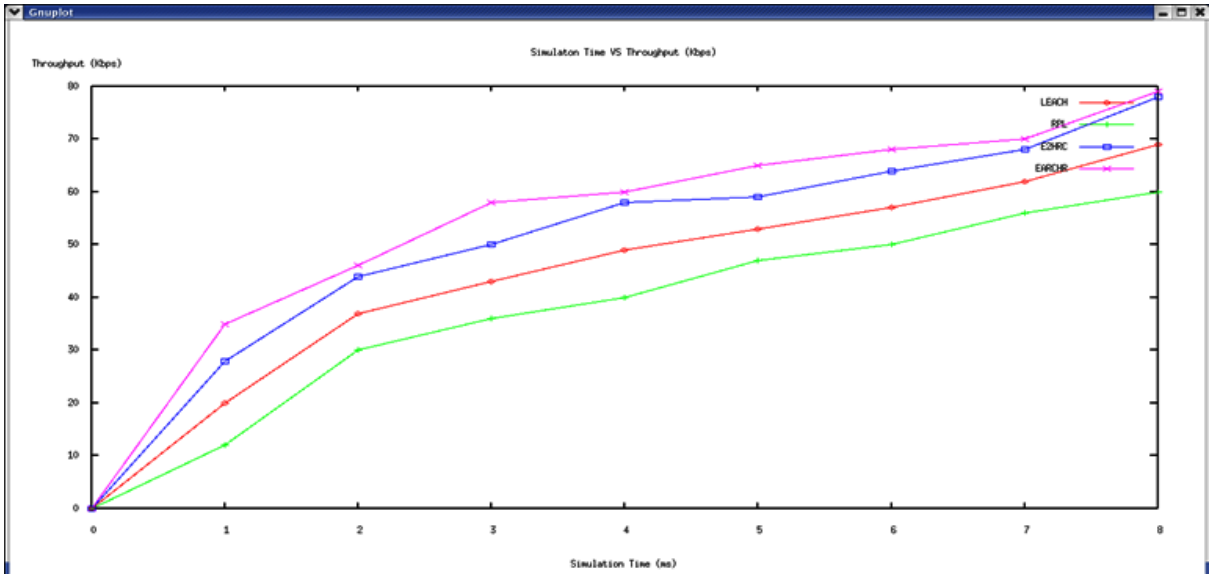

Figure 9: Throughput calculation of the Network

VI. CONCLUSION

In the WSN, while data transmission the intermediate hop nodes drain out their energy due to the continuous multi hopping method. By the use of the Energy Aware Cluster – Aggregate Rotation with sink relocation (EAC-ASR) protocol. The energy loss which is happened by the multi-hopping concept is reduced and the energy consumption due to cluster communication is also comparatively reduced. By using this protocol, the energy efficiency and the network life time is increased. We presented the design, analysis, and implementation of Spot: a system for accurate and efficient multi-entity device free WSN localization. Spot leverages probabilistic techniques to provide a smooth environment image. It uses a cross calibration technique and an energy minimization framework to reduce the calibration overheard to linear in the number of locations, which turns the DF multi-entity tracking to a tractable problem. We showed an efficient solution to the energy minimization framework by mapping the energy function to a binary graph-cut problem.

VI. REFERENCES

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