Literature and Solution to packet collision in network in wireless communication

Shivani Sharma, Baljit Kaur

***Abstract*— A wireless sensor network consists of a large number of nodes spread over a specific area where we want to look after at the changes going on there. A sensor node generally consists of sensors, actuators, memory, a processor and they do have communication ability. All the sensor nodes are allowed to communicate through a wireless medium. The wireless medium may either of radio frequencies, infrared or any other medium, of course, having no wired connection. Many techniques are proposed for energy saving, Clustering is one of them.**

***Index Terms*— wireless sensor network, sensors, actuators, memory, a processor.**

I. INTRODUCTION

A sensor node generally consists of sensors, actuators, memory, a processor and they do have communication ability. In this technique, the clusters are formed by clustering of the grouping nodes. The cluster heads are elected periodically such that members of a cluster can communicate with their cluster heads. These cluster heads send data received from its members to a base station. The multi clustering can also be used. RFID is used in it. The cluster head should have to be rotated for the balancing of energy and then there will be equal load on every node. The energy consumption can be reduced. In present work, all the sensor nodes should be synchronized to avoid the packet collision.

II. LITERATURE VIEW

Chae-Seok Lee, Dong-Hyun Kim, and Jong-Deok Kim ” **An Energy Efficient Active RFID Protocol to Avoid Overhearing Problem”**

Author purposed Reservation Aloha for No Overhearing that is used to inform the tag of its effective communication for eliminate overhearing problem .large of energy is reduced due to overhearing is many times larger than consumed effective communication .to eliminate this problem author purpose algorithm (RANO). A tag has information about the time and duration of communication advance because it maintain active mode for kept the sleep mode due to other transmission period. RANO Protocol save the 60 times energy than another protocol.

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Norah Tuah, Mahamod Ismail and Ahmad Razani Haron “**Energy Consumption and Lifetime Analysis for Heterogeneous Wireless Sensor Network”**
The author proposed a new technique which is used to elaborate the results from the simulation. The technique proposed by author is used for energy efficient routing protocol for hetrogenious WSN and compare the HlEACH,EEHC and EECDA .author conclude them which resulted in significant increase in network.

LI Jian-qi, CAO Bin-fang2, WANG Li,Wang Wen-Hu”**Energy Optimized Approach Based on Clustering Routing Protocol for Wireless Sensor Networks”**
The Author proposed improved clustering routing algorithm which priority to energy efficiency. First, generate cluster head by random competition in the nodes which have advantage in energy; next determine the internal structure of clusters by calculating dynamically tightness coefficient of each cluster, after that, optimize transmission path between cluster heads through improved multi-objective particle swarm algorithm.

Yu Wang, Shuxiang Guo ” **Optimized Energy-Latency Cooperative Transmission in Duty-Cycled Wireless Sensor Networks**”
Author proposed energy efficient and delay tolerant cooperative transmission algorithm which show simulations validate that EDTCT outperforms the store-wait forward way no matter in E2E sleep latency and E2E energy consumption. In particular, our scheme is adaptive to dense network and it works efficiently in low-duty-cycled WSNs.

Degan Zhang, Guang Li, Ke Zheng, Xuechao Ming and Zhao-Hua Pan,” **An Energy-Balanced Routing Method Based on Forward-Aware Factor for Wireless Sensor Networks”**
Author proposed a method forward aware factor (FAF-EBRM).this method is used for the next hop node selected according to the forward energy density and link weight .The FAF-EBRM compared with LEACH and EEUC. The proposed method balance the energy reduction, function in lifetime and provide good quality of service . reduces the probability of successive node breakdown.

Nicolas Gouvy,Essia Hamouda, Nathalie Mitton and Dimitrios Zorbas, **” Energy Efficient Multi-Flow Routing in Mobile Sensor Networks”**IEEE,2013
The author proposed PAMAL (PATH MERGING ALGORITHM) new geographies routing algorithm for mobile node .the proposed first routing protocol which is located and uses paths crossing to adapt the topology to reduce the network traffic in this way while still optimize energy efficiency. The protocol makes the intersection to

move away from the destination, getting closer to the sources, allowing higher data aggregation and energy saving. It improves the network life time 37% than exiting.

Peyman Neamatollahi, Hoda Taheri, Mahmoud Naghibzadeh **"A Hybrid Clustering Approach for Prolonging Lifetime in Wireless Sensor Networks"** international symposium on computer network and distributed system ,2011

The Author proposed a hybrid clustering approach a cluster head reduce of its energy, it indirectly informs all other nodes and clustering is used to beginning of the upcoming round. Clustering is performed on demand. To elaborate the efficiency of proposal, the distributed clustering protocol HEED (Hybrid *Energy Efficient Distributed*) hybrid clustering algorithm is used as baseline example. Through simulation results, it show that HCA is approximately 30% more efficient in terms of network lifetime than the other protocol. The main reason is that the clustering is executed on demand.

Maciej Nikodem and Bartosz Wojciechowski "**Upper Bounds on Network Lifetime for Clustered Wireless Sensor Networks**", 2011 IEEE

This paper focuses on the theoretical aspects of clustering in wireless sensor networks, as a mean to improve network lifetime. We investigate whether clustering itself (with no data aggregation) can improve network lifetime in particular application when compared to non- clustered networks. We use integer linear programming to analyze 1D and 2D networks, taking into account capabilities of real- life nodes. Our results show that clustering itself cannot improve network lifetime so additional techniques and means are required to be used in synergy with clustering.

Dahlila P. Dahnil, et al. **"Energy-Efficient Cluster Formation in Heterogeneous Wireless Sensor Networks: A Comparative Study"** Feb. 2011

This paper presents a comparative study of clustering techniques and cluster quality of a single criterion cluster heads election and cluster formation in Wireless Sensor Networks. The HEED, LEACH and Energy-based LEACH protocols are simulated and their performance are compared in terms of the number of cluster head generated, cluster size, cluster head distribution, scalability and coverage. The results of these protocols are presented to show how the cluster formation helps to prolong the network lifetime. We investigated scalability aspects in the presence of advanced nodes in the network and its effect on the network lifetime. We proposed to investigate A HEED and AE-LEACH protocols, a new approach for cluster heads election that improved network lifetime in the presence of advanced nodes. The simulation shows that having fraction of advanced nodes in the network gives significant improvement in network lifetime as compared with having more homogeneous nodes in the network.

Ewa Hansen, et al. **"Efficient Cluster Formation for Sensor Networks"**

In this paper they discussed that wireless sensor networks becoming very important for developing of energy efficient infrastructure. They found the minimum separation distance between cluster heads in a cluster based sensor network, prolonging net-work lifetime by lowering the energy consumption. They performed simulation to determine how much energy is consumed by sensor network in separating the cluster heads. They also discussed the effect of energy consumption for a given minimum separation distance between cluster heads. They showed that wireless sensor network could better performed when they introducing a minimum separation distance between cluster heads. It is checked by comparing the number of message was received by the base station.

T. Shankar, et al. **"Selection of Cluster Head using Neural Network in Wireless Sensor Network"** 2012

In this paper they discussed, in the wireless sensor network the selection of cluster head done by using neural network for energy efficiently used by sensor nodes. In cluster based routing, special nodes called cluster heads form a wireless backbone to the sink. The cluster heads collect the data from sensing nodes and forward data to their sink. In homogeneous networks all nodes have same capabilities. In heterogeneous networks cluster nodes have more resources than other nodes. Energy saving in these approaches can be obtained by cluster formation, cluster-head election, data aggregation at the cluster-head nodes to reduce data redundancy and thus save energy. In the cluster each node became a cluster head for a limited time period in this way they saved energy of each node.

Matthias R. Brust, et al. **"Topology-based Cluster head Candidate Selection in Wireless Ad-hoc and Sensor Networks"** June 2010

In this paper they discussed hierarchal network is created by clustering techniques is called clusters. In a cluster all sensor nodes elect the cluster head. To elect the cluster head in wireless sensor network and in ad hoc network is main issue due to their dynamic nature. They proposed a topological criteria for robust cluster head candidate selection, resilient to sporadic node mobility and failure as well as for efficient information dissemination. In this approach is to avoid the border nodes to select the cluster head because they can move to other cluster anytime and again re-clustering will occur and again elect a new cluster head. This is totally wastage of time and more energy consuming. They conducted experiments both for static topologies as well as for cases in the presence.

Arun K. Somani, et al. **"Distributed Dynamic Clustering Algorithm in Uneven Distributed Wireless Sensor Network"** 2004

They discussed a distributed, light weight, scalable clustering algorithm for clustering in wireless sensor networks. The environment where the sensors are deployed randomly here clustering algorithms are very suitable. There are not necessarily of the same size in terms of the number of nodes in a cluster for distributed clusters. The size is set by the radius of the radio signal range. In the cluster formation one

node could join the one cluster at a time. The cluster head can communicate to other nodes direct or indirect. The cluster head can communicate to the base station through an overlay network and intermediates node in between. They analyzed that the performance of clustering algorithm by using simulation. Results show that very few nodes (less than 5%) are not able to join a cluster or remain orphan, many are isolated due to random deployment and communication range limitation.

Ebin Deni Raj **"An Efficient Cluster Head Selection Algorithm for Wireless Sensor Networks –Edrleach"** 2012

In this paper they discussed the cluster head Gateway Switch Routing protocol (CGSR) uses a hierarchical network topology. In this they organize all the nodes into cluster and all the nodes should trust on a cluster head which is elected by any selection algorithm. They discussed about some algorithms that enable to optimize power consumption during the selection of cluster head in wireless sensor network that is LEACH and LEACH with deterministic. There are several factors which play an important role in selection of cluster head like power efficient, threshold based, density, load balancing, scalability and distance. Algorithms based on load balancing reduce communication cost to a great extent. They discussed on algorithms which focus on a Density and Distance based Cluster Head, An Energy Efficient Algorithm for Cluster-Head Selection in WSNs, Consumed Energy as a Factor for Cluster Head. They analyzed of these algorithms and gave birth to a new algorithm called EDR LEACH.

Vinay Kumar, et al. **"Energy Efficient Clustering Algorithms in Wireless Sensor Networks: A Survey"** 2011

In this paper they discussed in wireless sensor networks to maximize the lifetime of the sensor network, for the data transfer the path is selected in such a way in which the energy consumption is minimized in that path. To support high scalability and better data aggregation, sensor nodes are often grouped into clusters. Clusters create hierarchical wireless sensor network, the sensor nodes utilization their limited resources in efficient way and thus extends network lifetime. They presented taxonomy of energy efficient clustering algorithms in WSNs, and also presented timeline and description of LEACH and Its descendant in WSNs.

Limin Meng, et al. **"A Dynamic Clustering-Based Algorithms for Wireless Sensor Networks"** 2008

In this paper they discussed that in wireless sensor networks one of the most important factor is energy. Clustering algorithms are used to obtain long lifetime. WSN should meet various requirements for quality of service (Qos). Accordingly, this paper they presented an energy aware Qos routing algorithm for WSN, which can also run efficiently with best-effort traffic. their work had been differs from existing algorithms in two ways: (1) improve the first order energy consumption model with dynamic clustering; (2) use clustering to build the multi-objectives programming model to support Qos. They compared their work with some typical route algorithms that showed algorithm is robust and effective. V veillance, widespread environmental sampling, security and health monitoring [11].

Chae-Seok Lee et.al **"An Energy Efficient Active RFID Protocol to Avoid Overhearing Problem"** IEEE, 2014

In this paper, the communication process was analyzed to reduce the energy consumption of the tags in the active RFID system environment. It was verified that the existing method allowed the tags to waste energy due to overhearing. To solve this problem, a new protocol was proposed. The tag makes a reservation for communication via the RANO protocol in advance, and goes into the sleep modeto reduce energy consumption during the other's communication time. RANO makes a reservation of collected tags via the broadcast frame at once. Therefore, RANO has benefits not only to reduce energy consumption, but also to improve the speed of tag collection. To evaluate relative performance of protocols, parameters presented in the radio module data sheet were applied to each protocol for its performance evaluation. RANO protocols saved the energy about 60 times than the standard protocol when the number of tags increases, and tag collection time was improved 10% additionally. Based on the results, the system performance was greatly improved by significantly saving energy in the active RFID system with many tags. The applicability of the proposed method will be verified by applying it to a container port and a container hip in the follow-on study.

III. SOLUTION IMPLEMENTATION

The solution proposed in my thesis is explained in this section

1.1 Network deployment: The network is deployed with the finite number of sensor nodes and sensor nodes responsible for sensing the environment conditions like pressure, temperature, moist etc. every sensor node contains the sensors inside it which senses the environmental conditions. This is then converted into electrical signals and then the processing takes place and the data is then send to the sink.

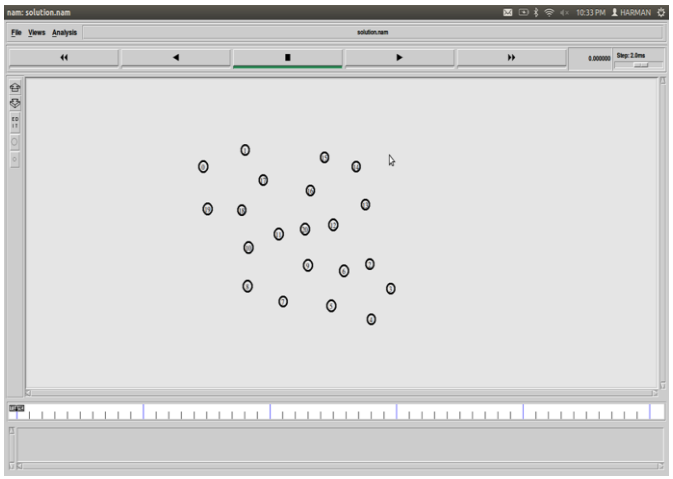

Figure 1.1: Network deployed

1.2 Election for cluster: Network is divided into the fixed size clusters using the location based clustering. These clusters are selected to send the data further to the sink. The clustering is a better technique to reduce the energy consumption of the sensor nodes. The multihop clustering is mostly used in the sensor networks.

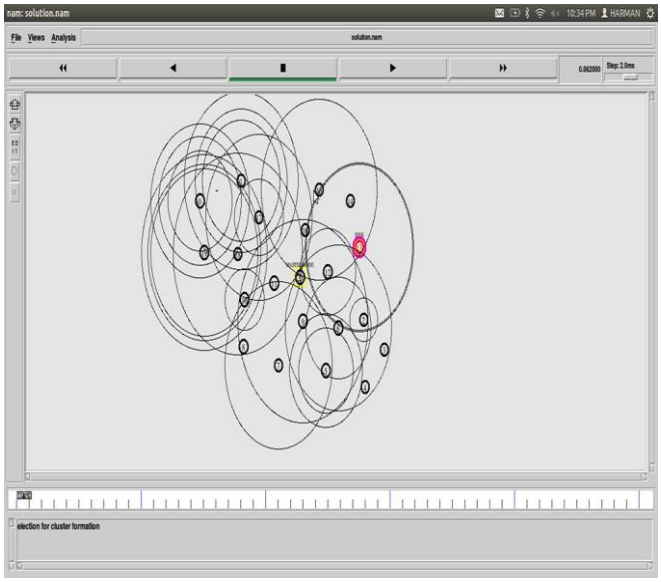

Figure 1.2 Election for cluster

1.3: Master node deployed: The master node is deployed in the network and master node synchronizes its clock using Global Positioning System (GPS). The clustering process continues. The master node synchronizes the network. It does not takes part in the communication purposes. all the network synchronizes according to the master node.

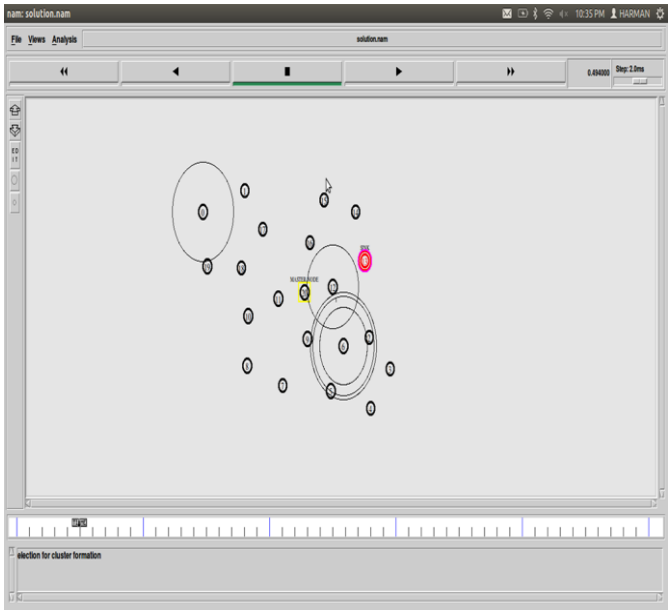

Figure 1.3: Master node deployed

1.4 Cluster formation: The network is divided into fixed size clusters and master node synchronize its clock using global positioning system (GPS). The clusters are formed in the hexagonal shape because this covers the network more appropriately. There are four clusters and every cluster have the five nodes in the hexagonal shape.

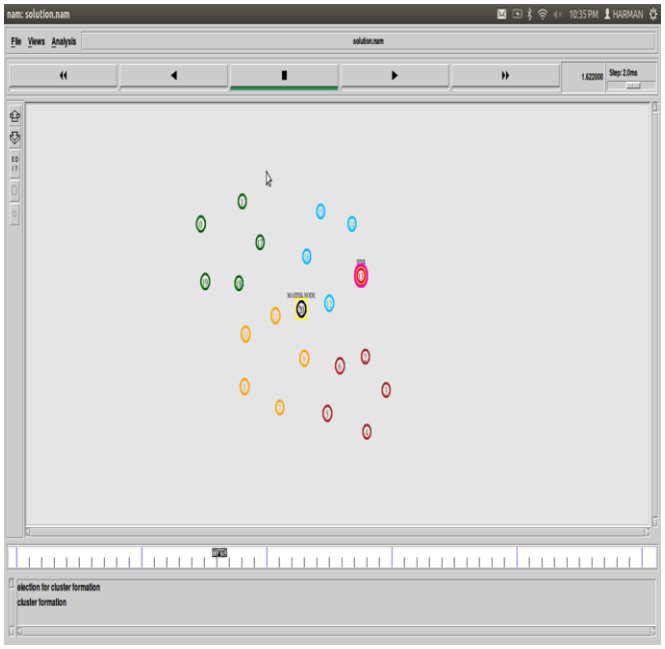

Figure 1.4: Cluster formation

1.5 Election for cluster head: The cluster heads are formed in each cluster. The cluster heads are formed with election algorithm. Every node is presents its resources to its corresponding nodes. The nodes which are having higher number of resources is selected as cluster head. The cluster head is elected on the basis of election algorithm (bully algorithm). It means that the node which is having the more battery is elected as a cluster head. If node is having more battery power then there are lesser chances of the change in network topology and the number of election procedures can also be reduced and the battery consumption is also reduced.

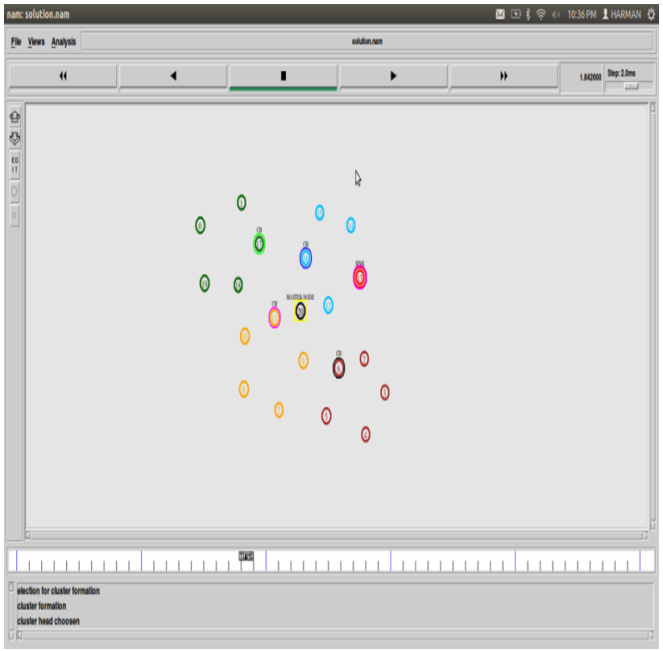

Figure 4.14: Election for cluster head

1.6 Synchronization of CH with master node: Cluster head in each cluster synchronizing its clock with the master node. The master node synchronizes its clock according to the Global Positioning System (GPS).

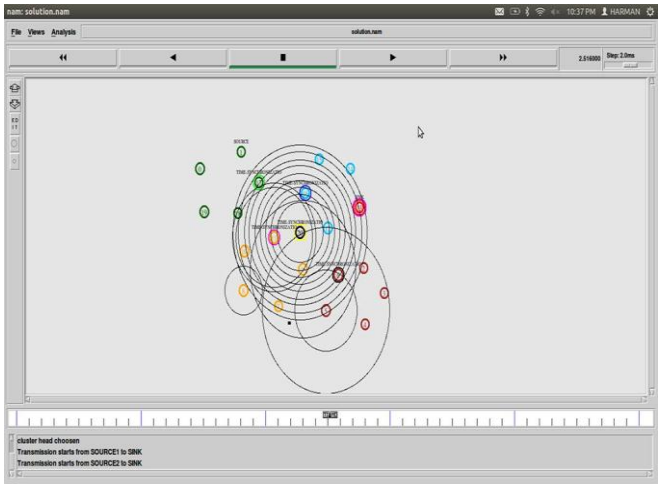

Figure 1.6: Synchronization

1.7 Virtual Path Establishment: The virtual path is established between source and sink through cluster heads. The reactive routing protocol AODV is used for path establishment. The source node sends route request packets to the cluster heads. The cluster heads which is having path to destination will reply back with the route reply packets.

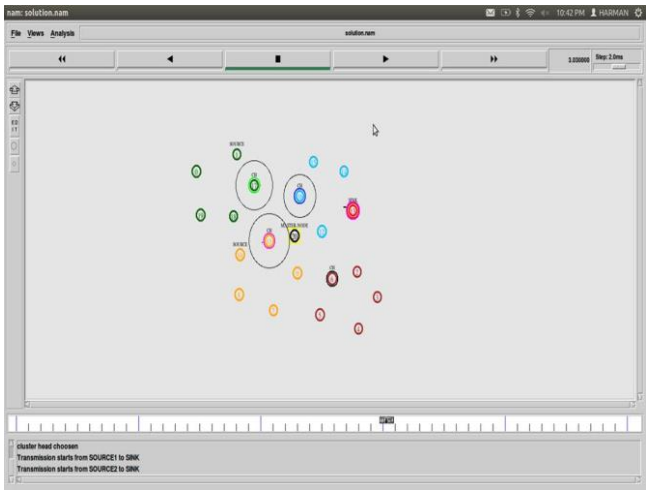

Figure 1.7: Virtual Path Establishment

1.8 Intracluster communication: When the path is established between source and destination. The communication starts. The communication starts from source 1 to the another cluster head. Also the communication starts from the source 2 towards the cluster head. And the network is synchronized according to the master node. Now there is no collision between the nodes

Figure 1.8: Intracluster communication

1.9 Channel sensing: RFID protocol is used for channel sensing and efficiency of the slotted ALOHA increases when cluster heads clocks are timely synchronized. By using the master node which is using the network time protocol (NTP). And the efficiency of the network increases. If there is no collision between the packets, then there is no need to transmit the packets again. The most of the energy consumed in the communication. If the communication reduced to again transmit the packets then the battery consumption of the nodes can also be reduced. Hence there is a less energy consumption.

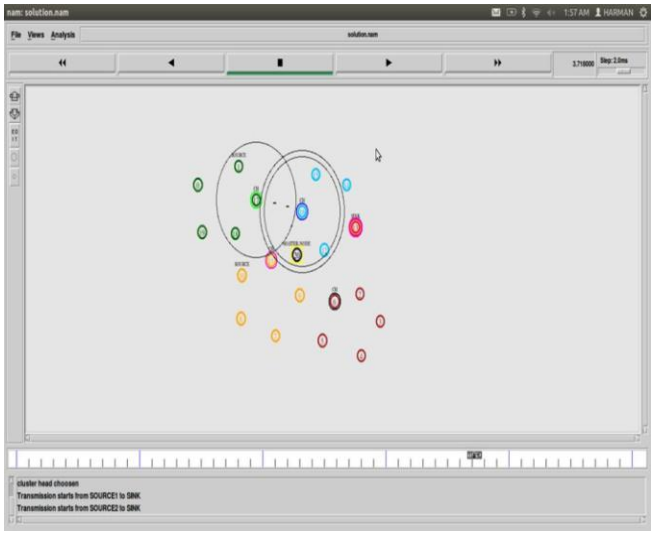

Figure 1.9: Channel sensing

IV. CONCLUSION

In wireless sensor networks there is a problem of energy consumption. First of all the sensor nodes are deployed in the fixed size area. Then the clustering of the sensor nodes is done. By using the bully algorithm the cluster head is selected means that node which has the highest energy that will be the cluster head. The virtual paths are selected between the cluster heads. The shortest path is selected by using the reactive AODV protocol. Here to avoid the collision the NTP protocol is used the clock is synchronized on each cluster head. RFID is used for the channel sensing to avoid the collisions. The master node synchronizes the clock through the GPS (Global Positioning System).

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