Dynamic Elimination of Low Energy Nodes To Perform Reliable Transmission in WSN

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***Abstract*---While working in Wireless Network, One of the common problems we faced is the congestion. As we know that the data transmission in such networks depends on energy of each node. Over the time as the data transmission is performed through a node, the energy of that node decreases and the node start dropping the data packets. In this paper we are working on the same problem. We are computing the nodes respective to some CPU Clock value. If a node will take more Elapsed time than this node will be represented as a block node and the data will be transferred from some other neighboring node. The solution is defined in terms of two stages. In first stage we have to find the node that is responsible for packet loss over the network. Another stage is the development of approach that will eliminate the node dynamically and get the reliable data transmission over the network. We are defining the complete work on a dynamic network that is topological independent. The proposed work is basically to Eliminate the Low Energy Nodes in such network due to their elapsed time. Result shows that proposed system takes less time and also have better performance as compared to existing system.**

***Keywords*--- WSN, Acknowledgement, Low energy node, Ad hoc network**

I. INTRODUCTION

A wireless sensor network(WSN) comprises of multiple detection stations i.e sensor nodes, each of which is lightweight, small and portable [4]. Each sensor node is comprises with a transducer, transceiver, microcomputer and power source [3]. The transducer produce electrical signals based on sensed physical effects and phenomena. The microcomputer processes and saves the sensor monitoring output. The transceiver, that can be wired or wireless, takes commands from a central computer and sends data to that computer or base station. The power for each sensor node is obtained from some electric utility or from a battery [2]. A sensor network is a combination of specialized transducers that has a communications infrastructure tends to monitor and record conditions at diverse locations. Normally monitored parameter applications are temperature, power-line voltage, pressure, illumination intensity, humidity, vibration intensity, sound intensity, wind direction and speed, chemical concentrations, pollutant levels and vital body functions [1].

One of the largest problems of sensor networks is power consumption, which is mostly affected by the communication between nodes. To resolve this issue, aggregation points are introduced to the network. This lessen the total number of messages exchanged between nodes and saves some power. Usually, aggregation points are regular nodes that takes data from neighboring nodes, do some kind of processing, and then sends the filtered data to the next hop [9].

Energy conservation in WSN is critical. Usually, energy conservation are deal on five different levels:

1. Efficient scheduling of sensor states to jump between sleep and active modes;
2. Energy-efficient routing, clustering, and data accumulation;
3. Efficient control of transmission power to assure an optimum trade-off between energy usage and connectivity;
4. Data compression (source coding) to trim the sum of uselessly transmitted data;
5. Efficient channel usage and packet retransmission protocols on the Data Link Layer(DLL).

Another problem with WSN(Wireless Sensor Network) is packet loss. In wireless environments, both congestion and link level bit error tends to packet loss, which drop end-to-end reliability and quality of services and moreover lower energy-efficiency [5]. Other factors that can cause in packet loss consist of node failure, wrong or outdated routing information, and energy depletion low energy nodes. Solution for this problem is to first search the low energy nodes and then apply some technique to solve this problem. The common mechanism for searching packet loss is to use a sequence number in each packet header. The continuity of sequence number will help in detecting losses. Loss detection and notification will be either end-to-end or hop-by-hop. In the end-to-end approach, the end-points (destination or source) are responsible for loss detection and notification. In the hop-by-hop method, intermediate nodes detect and notify packet loss [5].

II. LITERATURE SURVEY

Wireless networks have been of interest for quite long time in the research community. In this section we will give a short overview of existing work and entry points to the literature. [7] Presents a latest generation of real-time embedded systems with significantly various communication constraints from the conventional networked systems. [9] Presents an overview of the key technologies required for low-energy distributed micro sensors. [5] Presents a new locating algorithm (clock algorithm) which requires some fake nodes that know themselves position information in advance, then realizes position of other node. [9] Presents a survey of low latency, energy efficient and time critical routing protocols. [5] Discusses two points. First, the packet losses suffered by different receivers in a wireless broadcast are dependent in both indoor and outdoor environments. Second, manufacturing differences of wireless sensor nodes can be significant.

[14] Wireless Sensor Networks (WSN), which is composed of several thousands of sensor nodes which are capable of sensing, actuating, and relaying the collected information, have made remarkable impact everywhere. This paper presents an overview of the various research issues in WSN based applications. [12] Investigates the load balancing in sensor nodes and wireless link based on the performance of wireless sensor networks. [6] Presents a dynamic routing method for communication between sensor nodes and a base station in WSN. This method tolerates failures of arbitrary individual nodes in the network (node failure) or a small part of the network (area failure). [10] This paper inquire the load balancing in sensor nodes and wireless link depends on the functioning of wireless sensor networks. With an optimize(use best) model, the dynamic method of data collaborating and forwarding scheduling between grid-quorum. [13] This paper proposed a dynamic discover routing technique for communication between sensor nodes and a base station in wireless sensor network. Every node in the network perform only local routing preservation, requires to record only its neighbor nodes info, and obtain no additional routing overhead during failure vacant periods. It dynamically finds new routes when an mediate node or a small part of the network in the path from a sensor node to a base station fails. [8] In this paper routing-aware predictive congestion control (RPCC) yet deconcentrate method for WSN is projected that uses a collection of a hop by hop congestion control method to observe desired level of buffer tenancy, and a dynamic routing method that performs in concert with the congestion control mechanism to onwards the packets by less congested nodes. [11] This paper presents that always using lowest energy paths may not be optimal from the point of view of long-term connectivity and network lifetime. To analyze these measures, we suggest a new scheme called energy aware routing that uses sub-optimal paths infrequently to give substantial gains.

III. PACKET LOSS IN WSN

When we work with a huge sensor area network with dense sensors , there are some nodes that has to bear the heavy traffic load (Figure 1), then over the time such sensor goes weak and they start losing the packet. This packet loss is tolerable up to some threshold value, but as the packet loss exceed this level it disturb the whole network and now any kind of data transfer over this node is not reliable. Because of this there is the requirement of some such approach that can resolve this error.

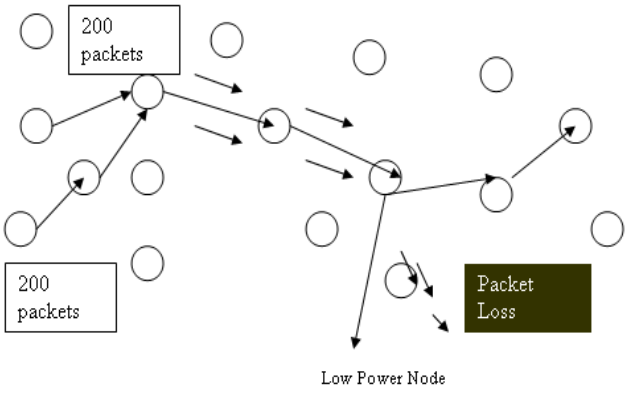


Fig. 1 Heavy traffic load on low energy node

If node is maximum load nodes, the problem is very critical. It starts losing useful information. So we need to use some approach to overcome this problem.

Now the proposed system will solve the problem in following steps:-

1. Identifying the low power nodes by calculating their elapsed time between sending the signal and receiving the acknowledge of all the nodes because in sensor area network it is not possible to track all the nodes always.

2. Then eliminate that Low Energy Nodes and send packets to other suitable nodes which takes less time for communication and efficiency of system should not degrade and we get required output.

IV. PROPOSED SYSTEM TO REDUCE PACKET LOSS AFTER ELIMINATE LOW ENERGY NODE

The proposed work is divided in two phases:

1. Locating the Low Energy Node
2. Define it in the list of Block Nodes.
3. Find alternate nodes such that efficiency of system should not degrade and transfer the packets of low energy node through these nodes.

LOCATING LOW ENERGY NODES

Due to continuous working sensor nodes becomes weak. These weak nodes start to loss the packets. So first these low energy nodes are detected. The efficiency of each node is determined. The nodes whose elapsed time is more are located as low energy nodes (Figure 2) and added to the list of critical nodes or block nodes.

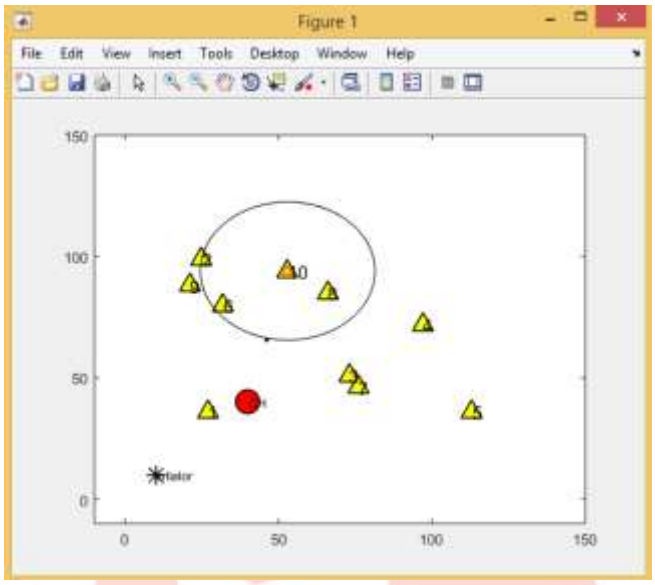


Fig. 2 Locating low energy nodes.

Red color nodes represent low energy nodes. Once the nodes are located then they are defined as the critical node and then some other node from its nearby position is selected for reliable data transfer.

TRANSFERRING THE DATA TO OTHER NODE

Next work is to shift the load of this low energy node to the neighboring node. This can be possible only in network where location of nodes can be found out. Here initiator send the signal to base station. The base station then sends the signal to all the nodes one by one and notice the elapsed time between sending the signal and receiving the acknowledge. By this Low energy Nodes(which takes more time to communicate) will be find out through its elapsed time. Compute the total elapsed time for sending packets from initiator to all the all the nodes in WSN without eliminating the low energy nodes. initially we find out the low energy nodes so at last we compute the total elapsed time for sending packets and receiving acknowledge from all the nodes after eliminating low energy node.

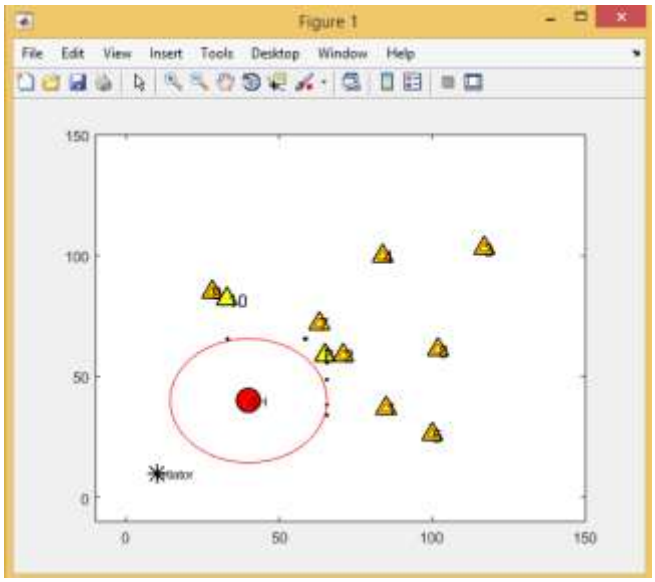


Fig. 3 Replacement of low energy nodes

In Figure 3. Red color nodes represent high energy nodes. Low energy nodes (without red color nodes) are eliminated. It means the removal of that node does not mean that there is some compromise with the efficiency. There is no chances of efficiency degradation because low energy node will eliminated from the route which takes more time to transfer packets over wsn network. By doing the node replacement, data transmission will be more reliable.

V. SIMULATION AND RESULTS

To evaluate the proposed systems, MATLAB simulator is used. The WSN's are simulated using MATLAB and the existing system is compared with proposed system in terms of elapsed time taken with and without Low Energy Nodes. X-axis and Y-axis represents the location of each nodes.

Simulation on a WSN with 10 nodes

Figure 4. below shows that initiator send the signal to base station. The base station then sends the signal to all the nodes one by one and notice the elapsed time between sending the signal and receiving the acknowledge.

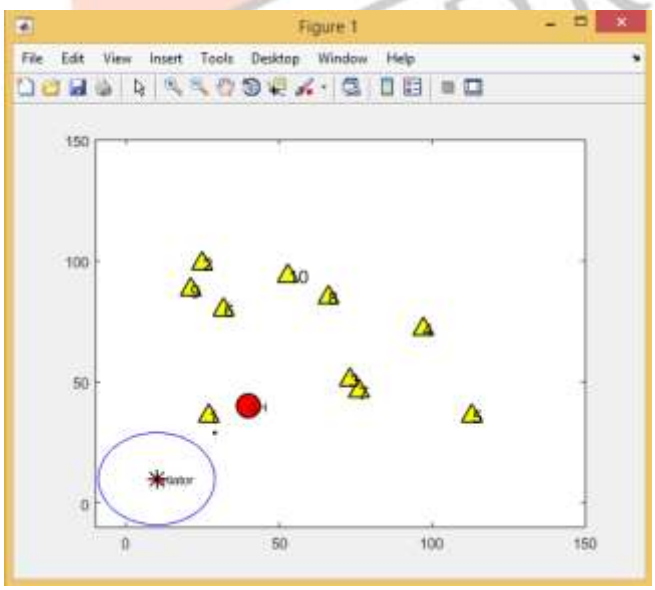
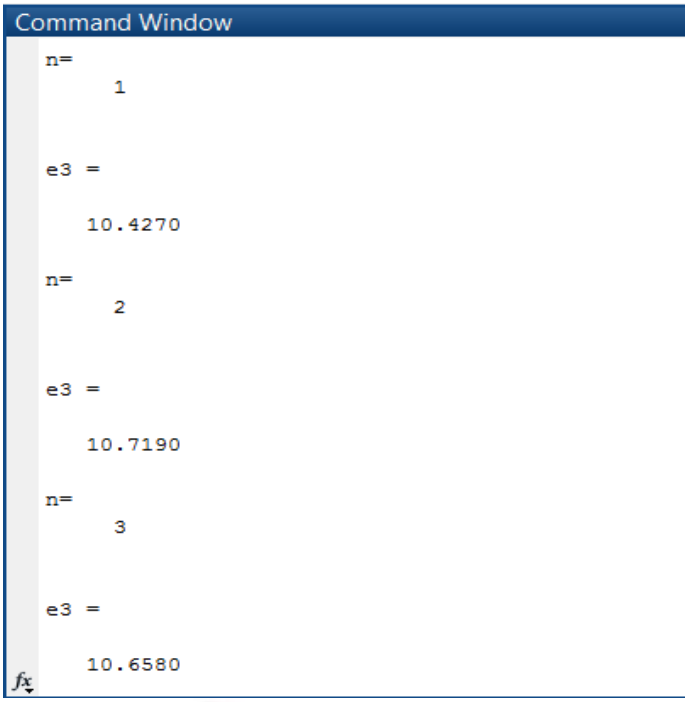
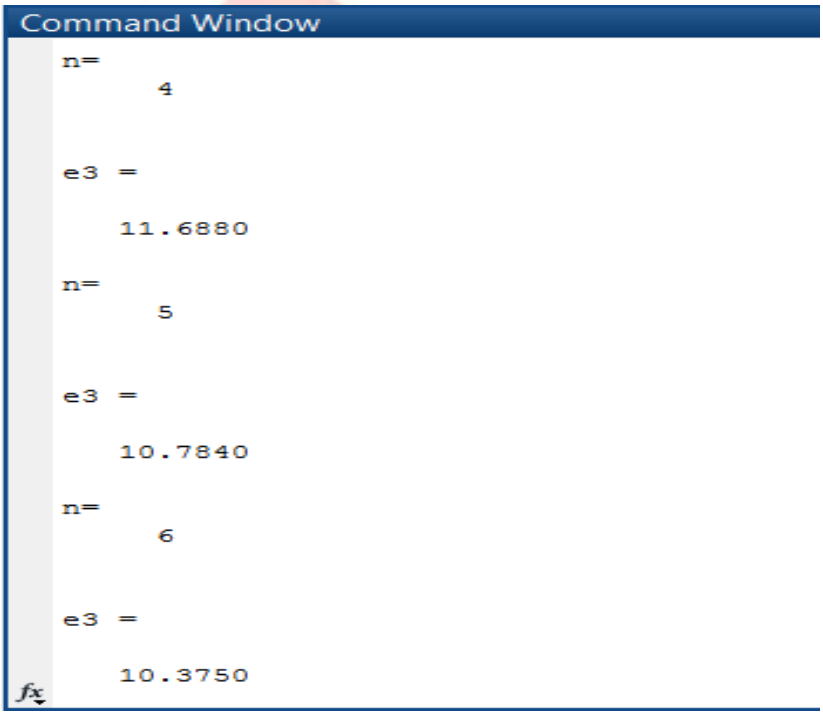


Fig. 4

Figure 5. below shows the elapsed time for each nodes in the wireless sensor network between sending packet from base station to particular node and getting back the acknowledge.


Command Window
n=
1
e3 =
10.4270
n=
2
e3 =
10.7190
n=
3
e3 =
10.6580


Command Window
n=
4
e3 =
11.6880
n=
5
e3 =
10.7840
n=
6
e3 =
10.3750

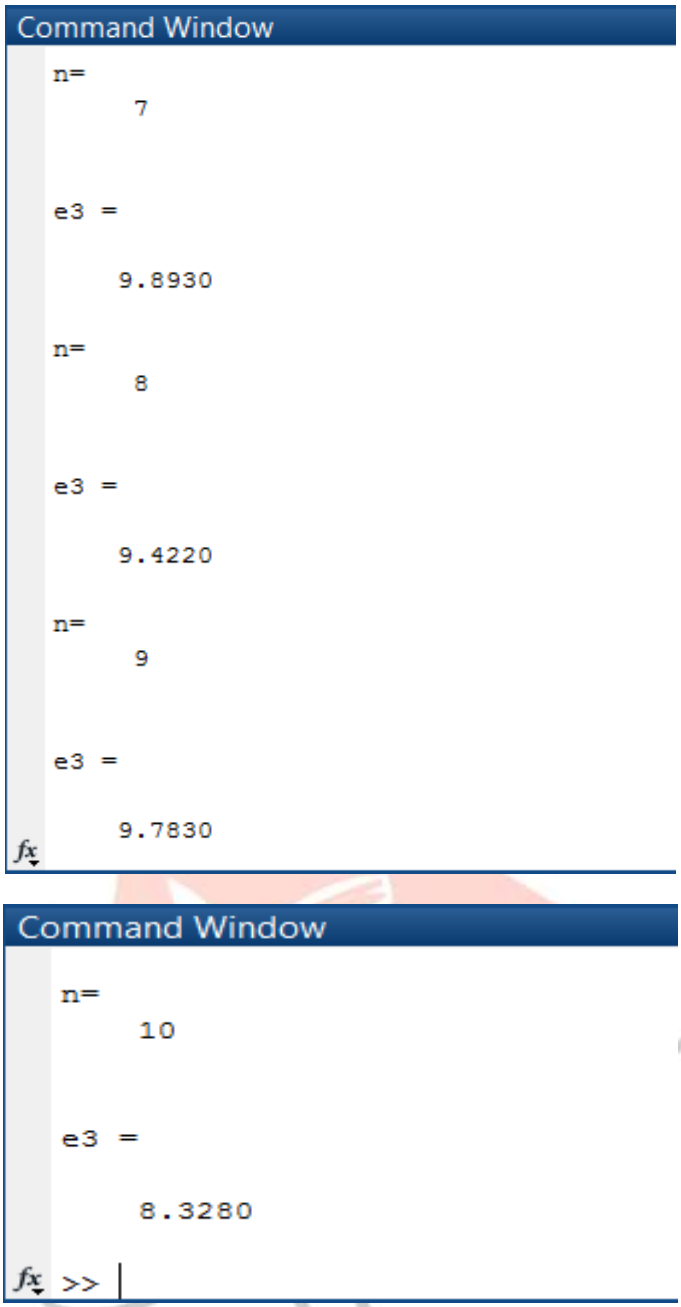
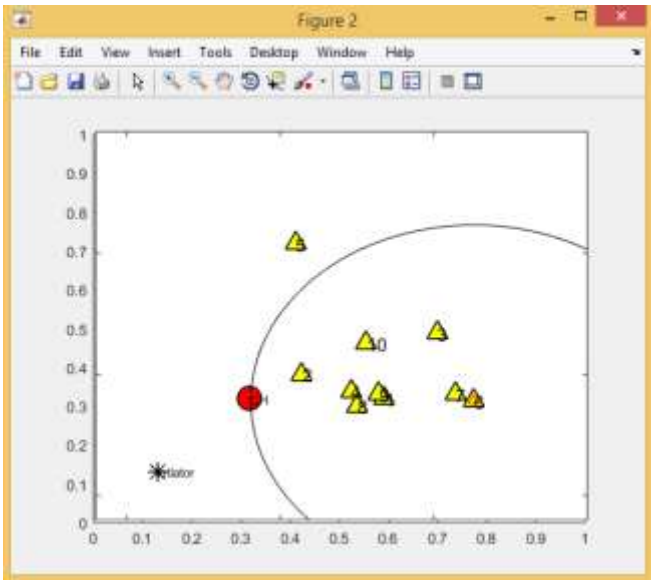


Fig. 5 Elapsed time for each node

Figure 6. below shows the total elapsed time for sending packets from initiator to all the all the nodes in WSN.

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int =

     1     2     3     4     5     6     7     8     9    10


el1 =

   21.6050

fx >>
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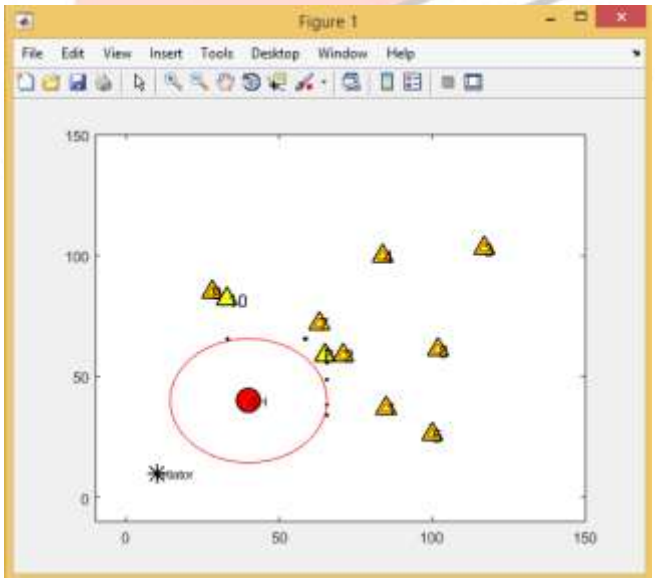
Fig. 6 Total Elapsed time with Low Energy Node

Figure 7. shows the total elapsed time for sending packets and receiving acknowledge from all the nodes after eliminating low energy node.



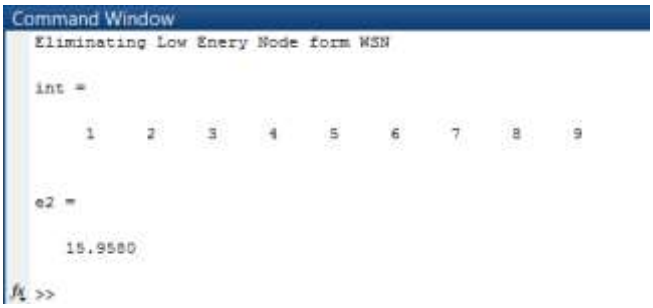


Fig. 7 Total Elapsed time without Low Energy Node

Figure 8. below shows the bar graph that compares the performance of sending packets with low energy nodes and without low energy node.

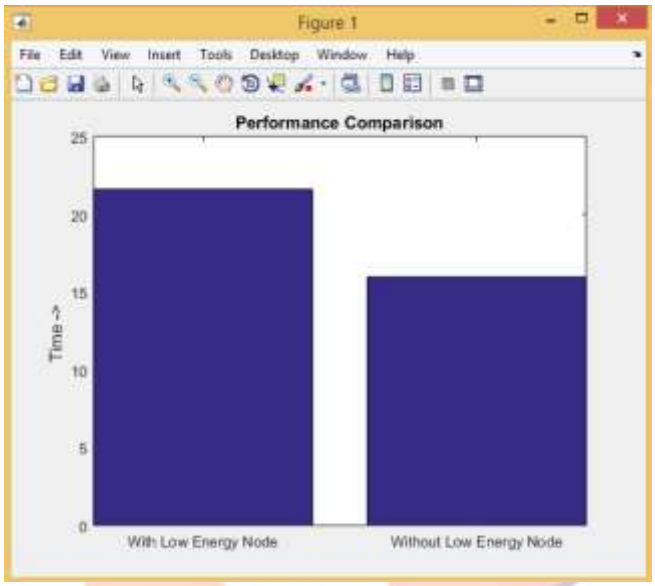


Fig. 8 Performance Comparison

From the above graph it is clear that performance will improve if we detect and eliminate low energy nodes from wireless sensor network.

VI. CONCLUSION AND FUTURE SCOPE

The work provides the solution of packet loss in case of any one weak sensor node over the sensor network. The proposed work first detects the weak sensor node over the network and then blocks it. Now instead of transferring data on this node, it passes the data from the surrounding nodes; it will only handle the transmission that is directed to it. This time evaluation provides better solution for handling the packet loss due to low energy nodes (weak nodes) over the network.
In this work we have defined the work respective to the packet loss on each node but still there is requirement of lot of work on such problem. We can enhance our work by including the detection of different kind of attacks on each node. These attacks can include the rushing attack, black hole attack etc. We can also enhance the work respective to the replacement of low energy nodes with a high energy node.

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