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Study of Grid and Cluster based Network in Wireless Sensor Network

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Abstract- ***Grid approach in wireless sensor network is a key technique for extending the life time of a network by reducing energy consumption. This also increases network's capacity, reduces the routing overhead and makes it more scalable when nodes are in large number. Clustering in wireless adhoc network is a key technique for reducing the energy consumption which increases the network lifetime, capacity. Scalability of network is increase by increasing the no of nodes. In section two there are no. In this paper we will study about grid based network and cluster based network and discuses about which one is more efficient to make energy consumption more considerable.***

1. Introduction

A wireless sensor network (WSN) is a group of sensor nodes cooperating to form a network over wireless links. The goal is to make the sensor nodes cheap and disposable, allowing them to be deployed everywhere and creating omnipresent networks. Originally, the technology was developed for military monitoring systems, with the goal of creating a system that was cheap and quick to deploy at the same time as it was hard to destroy. The low price of sensor nodes, ease of deployment and geographical distribution make WSN technologies attractive. The WSN can offer better capabilities and higher flexibility to a lower cost compared to traditional wired systems or large and capable sensor nodes. The basis of a WSN is a sensor node, containing a radio, a power source, a sensing unit and a processing unit. The sensor nodes are intended to be cheap and disposable as they are deployed in environments that range from uncontrolled to intensely hostile where the loss of sensor nodes can be expected. Typically, the sensor nodes are deployed in large numbers. A small network may contain up to fifty sensor nodes while a large network contains many thousands. The high number of sensor nodes helps providing good coverage and compensates for failures of individual sensor nodes. The sensor nodes are deployed densely and each node has contact with several other sensor nodes. After the sensor nodes are deployed they connect and organize an ad-hoc network to communicate. The ad-hoc nature of the large-scale networks results in a new class of management, routing, and security problems. The sensor nodes are typically battery powered and very tightly power constrained, making the energy consumption a limiting factor in the design. Calculations and communication have to be kept at a minimum to avoid a pre-mature failure of the sensor nodes. As the sensor nodes have to be as cheap as possible they also have limited hardware, limited memory, and are usually not tamper proof.

Here in this paper we will discuss about grid based network and cluster based network

2. GRID based Network:

GRID is fully location-aware because it tries exploit location information in all issues. During the construction of Grid, to select the grid node is a very critical issue because the grid node is responsible for the forwarding of packets. in the construction if grid, Grid Topology used to deploy the sensor nodes in the field with all calculations.

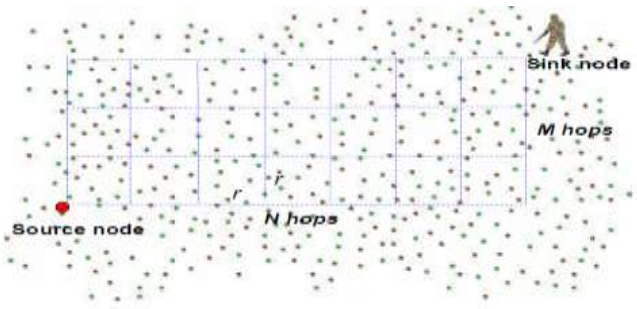

Figure 1: Grid Architecture

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3. Simulation Model for Grid based Network

A Wireless sensor network consisting of 16 nodes is used for simulation. Our proposed model is evaluated by using QUAL NET. In our simulations, we consider a cluster based network composed of 25 sensor nodes, 4 FFD and 1 sink (PAN coordinator). The nodes are distributed on a 1000*1000. 4 sensor nodes are FFDs (Full-Function Devices) except the leaf nodes are RFD (Reduced-Function Devices). The center node of the clusters is the PAN coordinator (sink) located in the center we are working on DSR and AODV algorithms using energy model as GENRIC and battery model as LINEAR. we have also taken Antenna height as 2.0 , Antenna Gain as 0.4 and Antenna efficiency as 0.8.

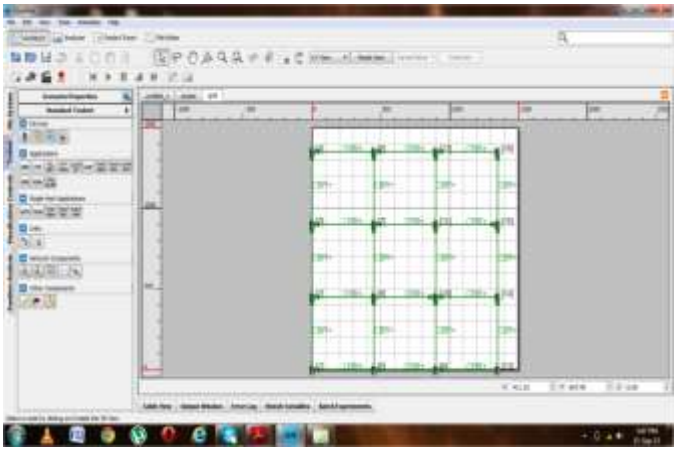

Figure 2 : Snapshot of GRID architecture (16 nodes)

4. Performance Metrics and Result in Graphs

PARAMETERS	VALUE
Simulation time	1000 ms
Number of nodes	16
Number of sinks	1
Energy model	MICA MOTES
Battery model	Linear
Data rate	2 mbps
Antenna Gain	1.2 dB
Antenna Height	3.0 meters
Antenna Efficiency	3.2
Transmission Power	1.4
Channel Frequency	2.4 GHz
Traffic type	2 CBR sources
Simulator	DSR

Table 1: Simulation parameters of first scenario

5. Simulation results

A. Energy consumed in transmit mode

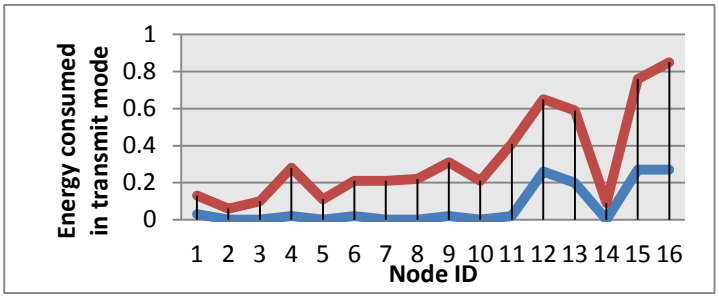

Figure 3 : Comparison graph of DSR with M_DSR for transmit mode (16 nodes)

Above graph represents the relationship of Energy consumed in Transmit mode between energy model and M_energy model. M_energy model represents the modified properties of Dynamic Source Routing algorithm. In above graph when we applied different parameters value that is user specified it will results energy consumption in transmit mode is more efficient than predefined value.

B. Energy consumed in received mode

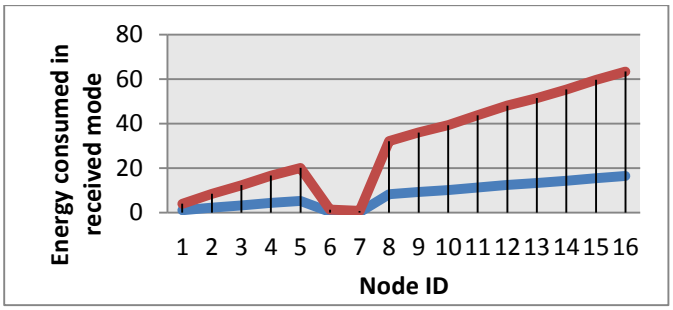

Figure 4 : Comparison graph of DSR with M_DSR for received mode

Above graph represents the relationship of Energy consumed in received mode between energy model and M_energy model. M_energy model represents the modified properties of Dynamic Source Routing algorithm. In above graph when we applied different parameters value that is user specified it will results energy consumption in received mode is more efficient than predefined value.

C. Energy consumed in Idle mode

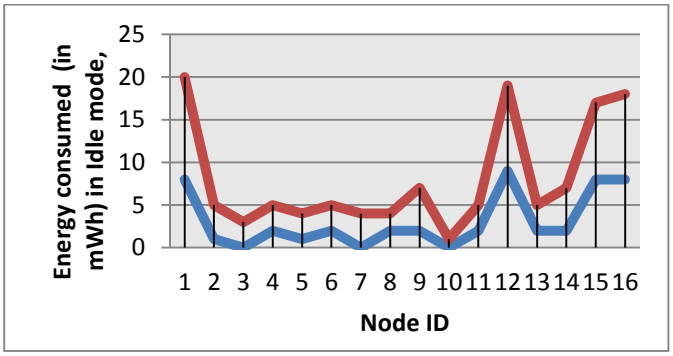

Figure 5: Comparison graph of DSR with M_DSR for Idle mode (16 nodes)

Above graph represents the relationship of Energy consumed in Idle mode between energy model and M_energy model.

M_energy model represents the modified properties of Dynamic Source Routing algorithm. In above graph when we applied different parameters value that is user specified it will results energy consumption in Idle mode is more efficient than predefined value.

6. Cluster based Network

Clustering in wireless adhoc network is a key technique for reducing the energy consumption which increases the network lifetime, capacity. Scalability of network is increase by increasing the no of nodes. In section two there are no. Of research papers which describe the various cluster formation techniques but they are not so efficient. In this dissertation analyzation of energy consumption is done by increasing the number of cluster head in a network with various nodes.

7. Simulation Model of first Scenario

A Wireless sensor network consisting of 25 nodes is used for simulation. Our proposed model is evaluated by using QUAL NET. In our simulations, we consider a cluster based network composed of 25 sensor nodes, 4 FFD and 1 sink (PAN coordinator). The nodes are distributed on a 1000*1000. 4 sensor nodes are FFDs (Full-Function Devices) except the leaf nodes are RFD (Reduced-Function Devices). The center node of the clusters is the PAN coordinator (sink) located in the center we are working on AODV algorithms using energy model as GENRIC and battery model as LINEAR. We have also taken Antenna height as 2.0, Antenna Gain as 0.4 and Antenna efficiency as 0.8.

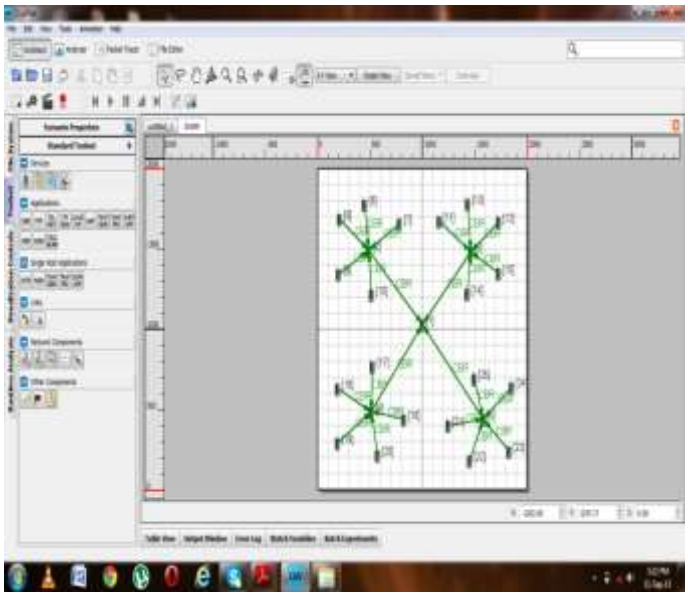

Figure 6 : Snapshot of cluster architecture (25 nodes)

8. Performance Metrics and Result in Graphs

PARAMETERS	VALUES
Simulation time	1000 ms
Number of nodes	25
Number of sinks	1
Energy model	Generic
Battery model	Linear
Data rate	2mbps
Antenna Gain	.2 dB
Antenna Height	3.0 meters
Antenna Efficiency	3.2
Transmission Power	1.8
Channel Frequency	4 GHz
Traffic type	CBR sources
Simulator	QualNet

Table 2: Simulation parameters

9. Simulation results & Analysis

A. Energy consumed in transmit mode

Above graph represents the relationship of Energy consumed in Transmit mode between energy model and M_energy model. M_energy model represents the modified properties of AODV algorithm. In above graph when we applied different parameters value that is user specified it will results energy consumption in transmit mode is more efficient than predefined value

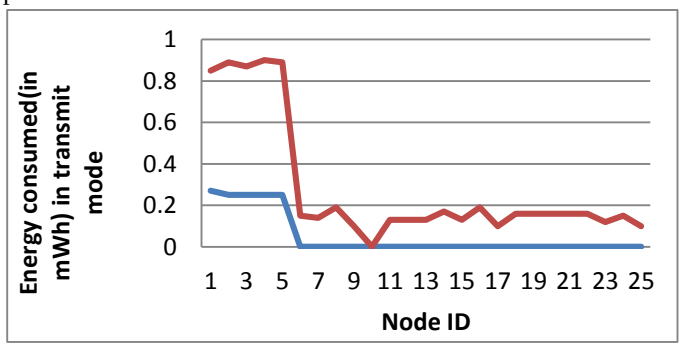

Figure 7 : Energy consumed in transmit mode (25 nodes)

B. Energy consumed in received mode

Above graph represents the relationship of Energy consumed in received mode between energy model and M_energy model. M_energy model represents the modified properties of AODV algorithm. In above graph when we applied different parameters value that is user specified it will results energy consumption in received mode is more efficient than predefined value.

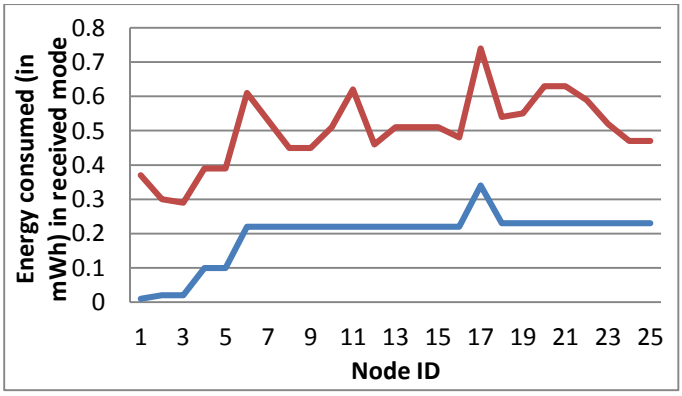

Figure 8 : Energy consumed in received mode (25 nodes)

C. Energy consumed in Idle mode

Above graph represents the relationship of Energy consumed in Idle mode between energy model and M_energy model. M_energy model represents the modified properties of AODV algorithm. In above graph when we applied different parameters value that is user specified it will results energy consumption in Idle mode is more efficient than predefined value.

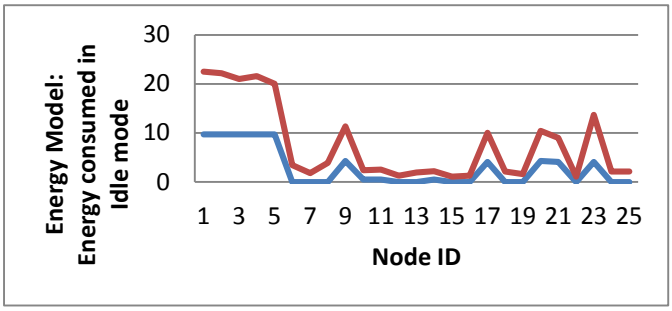

Figure 9 : Energy consumed in Idle mod

9. Conclusion

This paper present and discuss the results obtained by the proposed work. Many protocols were develpoed to tackle the challenges posed by wireless sensor network. Here comparison is done in two different scenario based on grid network . In first scenario we have taken 16 nodes to make node energy more efficient. Grid based approach is more suitable to be applied to query a specific interest over the spread area by a sink node.In addition, the existence of multiple path between the source node and sink node in the grid topology makes the selection of forwarding path more flexible. And comapre the results of default with modified DSR. Application of grid is Nuclear area network, Detect enemy , Data Mining Grid, Natural Disaster like places (Earth quake, flooding, wildfire, fighting), Animation Projects…etc. In the second scenario we worked on 25 nodes to study a cluster network. Clustering has been used to address various issues like Routing, Energy Efficiency, Management. Clustering is an efficient approach for building scalable and energy balanced applications. So gris network is useful to sense small area and cluster network can be used as a large network to sense data.

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