

Comparative Scenario between Grid and Grid based Cluster network in Wireless Sensor Network

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Abstract- *Wireless Sensor Network composed of a set of tiny sensor nodes. The nodes are continuously sense and transmit the data. WSN have a wireless nature, due to this has a limited lifetime. So increase the lifetime of Wireless Sensor Network and Minimize energy cost in wireless sensor network are an important problem. To solve this problem different technique are always used, among the entire technique grid network and grid based clustering network are more efficient. In this paper we compare A Grid network with Grid based cluster network to provide a comparison results based on less energy consumption. We are working on QualNet tools to simulate the scenarios.*

Keywords-Hybrid; Cluster; Grid; Qualnet.

1. Introduction

In research work many routing algorithm have been discussed for making the various structure to deploy sensors in the ground or any areas. To come up with the solutions of problems of DSR, lots of other algorithm has been designed. For the solution of problem of DSR, In DSR routing protocol we have made changes in MAC layer and PHY layer properties with the help of QUALNET. Properties which we have changed in MAC layer are power save mode, enable power save mode and enable directional antenna mode. PHY layer properties in which we have made changes reception model, antenna model, gain efficiency and height. Battery model used in this algorithm is linear and energy model is MICA MOTE. Specified each node as FFD and RFD.

2. Proposed Model

The main motive of designing this approach is to combine all the benefits of two network model that is Grid based network and grid based Cluster network. In this scheme firstly divides the whole network area into grid form and based on the grid structure, CH creates on the basis of FFD and RFD. FFD stands for Fully Functional Device and RFD stand for the Reduced Function Device. This CH takes information from other related nodes and forward it to the sink node through different other intermediate coordinator nodes. DSR routing protocol is used to route information from source node to the destination node. Therefore, the layered structure shown with a grid based clustering scheme in which energy can be conserved by a route between the data source and the sink.

3. Work Model Description

The Proposed model is designed to make energy efficient. For this approach a scenario is constructed to show how Grid and Grid based cluster approach flow data from sensor nodes to sink node. Grid is formed by dividing the total area into grid structure. This structure contains number of grid area's small in size. Then number of nodes deployed into the whole grid area. Now assign a coordinator node as a CH in each grid cell to apply clustering concept.

The standard used in the proposed work is IEEE 802.15.4. This IEEE 802.15.4 standard contain two types of devices first one is FFD that is Fully Functional Device. This device is further classified into three categories PAN coordinator, Coordinator and Devices. And second one is RFD that is Reduced Functional Device. This is only Device. In proposed work assign node as FFD (PAN coordinator/ Coordinator / devices) or RFD (Devices). PAN Coordinator acts as a sink node. Coordinators are used to send information from device to PAN coordinator that is sink node. Because devices cannot directly communicate to sink node. It can communicate or send data to sink node only through coordinator nodes. After modifying the properties of nodes a routing algorithm is applied to route all information between nodes to sink node.

In Proposed work DSR routing algorithm is applied. In which MAC and PHY layer properties of DSR routing protocol are modified. Properties are modified in proposed work are Reception model, Antenna model, Gain, Efficiency and Height of PHY layer and MAC protocol, Power save mode, Enable

power save mode and Enable directional antenna mode of MAC layer. In proposed work Linear Battery model and MICA MOTES energy model are used. At last comparing the results of Default DSR with modified DSR on the basis of Energy consumed in Transmit mode, Energy consumed in Received mode and Energy consumed in Idle mode.

4. QualNet Tool 5.2

QualNet provides a comprehensive set of tools with all the components for custom network modeling and simulation projects. QualNet unparalleled speed, scalability, and fidelity make it easy for modelers to optimize existing networks through quick model setup and in-depth analysis tools. Model6. in source form provide developers with a solid library on which to build and experiment with new network functionality. The end result is accurate prediction of network performance for a diverse set of application requirements and uses. From wired LANs and WANs, to cellular, satellite, WLANs and mobile ad hoc networks, QualNet library is extensive. Because of its efficient kernel, QualNet models large scale networks with heavy traffic and mobility in reasonable simulation times. This chapter gives a brief introduction to the different components of QualNet, and introduces the protocol stack that forms the basis of QualNet architecture.

5. Simulation Model of Second Scenario

This section provides the simulation setup and scenario design. In this work Qualnet 5.0.2 simulator has been used to evaluate the performance of three different routing protocols. Table-1 shows the parameters for new simulation design of the scenario for different protocols.

Simulation parameters	
MAC Type	IEEE 802.15.4
Protocols under studies	DSR
Area size	1500x1500
Traffic type	CBR
Antenna	Omni- directional
Propagation model	Two ray
Node movement model	Random way point
Battery charge interval	60 sec.
Full battery capacity	100 (mA, h)
Battery model	Linear model
No. of nodes	33 nodes
Simulation time	30sec.
Energy model	MICA MOTES
PAN co-ordinator (FFD)	1

Co-ordinator (FFD)	4
Devices (RFD)	28
Scenario Types	Grid, Grid based Clustering
Performance metrics in physical layer	Energy consumed in transmit mode Energy consumed in received mode Energy consumed in idle mode

Table 1: Simulation parameter for second scenario

Simulation Scenario

In this work Qualnet 5.2 simulator has been used to evaluate the performance of the scenario. The nodes is deploying in terrain 1500m X 1500m. CBR is used data traffic application. These scenario nodes (1 to 16) made a grid, this node is reduced function device (RFDs) and centre node is PAN coordinator (FFDs), other four nodes is coordinator (FFDs) to connect PAN coordinator through CBR traffic and devices (RFDs) connect coordinators. In this scenario we are comparing Grid architecture without clustering with Grid architecture based on clustering and at last comparing the results based on Energy consumed in Transmit, Received and Idle modes.

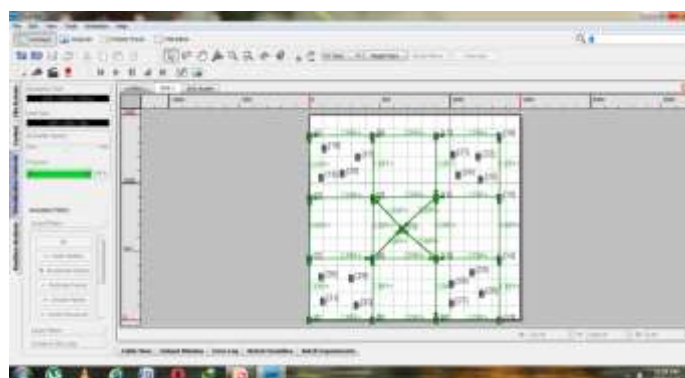


Figure 1: Grid architecture without clustering (33 nodes)

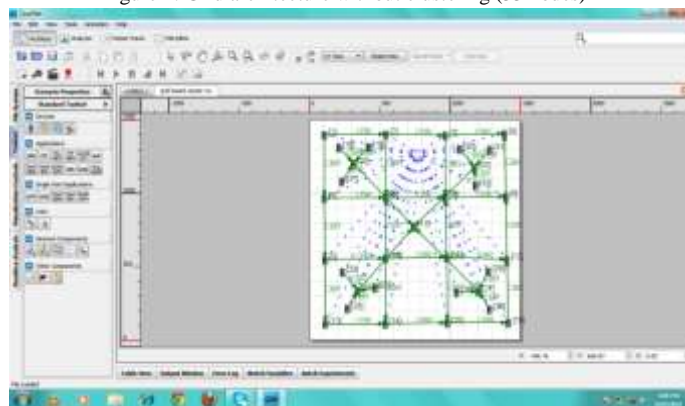


Figure 2: Grid based cluster network (33 nodes)

7. Simulation Result & Analysis

This section evaluates the performance results of grid based cluster network and grid based network without

clustering in WSN. A simulation performance is performed using Qualnet 5.2 simulator. In this simulation compare and analysis performance of energy consumed (in mWh) in Transmit, Receive and Idle mode.

A. Energy consumed in transmit mode-

In transmit nodes; packets transmitted source nodes to destination nodes. Figure shows how energy consumed in transmit mode and analysis the performance of each node. In transmit mode Grid network with clustering provide better results compare to Grid network without clustering. It consumes less energy than other.

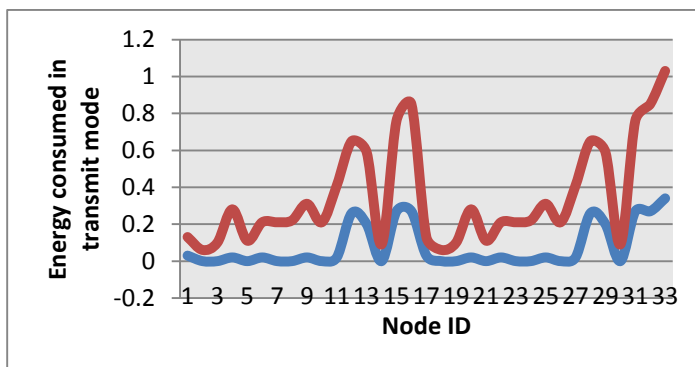
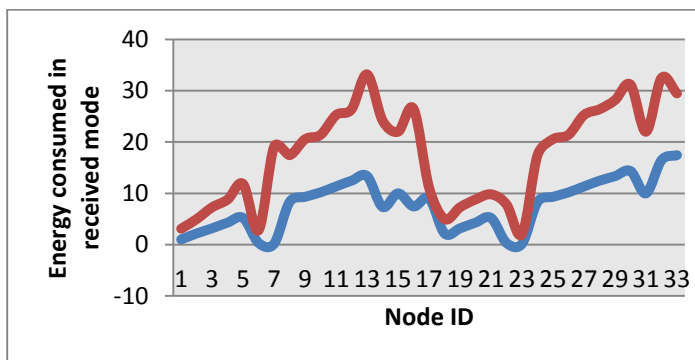


Figure 3 - Energy consumed in transmit mode (33 nodes)

B. Energy consumed in received mode-

In received nodes; packets received source nodes to destination nodes. Figure shows how energy consumed in received mode and analysis the performance of each node. In receive mode Grid network with clustering provide better results compare to Grid network without clustering. It consumes less energy than other.



This paper present and discuss the results obtained by the proposed work. Many protocols were developed to tackle the challenges posed by wireless sensor network. Here comparison is done in two different scenario based on grid network and grid- cluster network. In first scenario we have taken 33 nodes to make node energy more efficient. In second scenario we have taken 33 nodes and also applied the clustering concept to make node energy more efficient. And compare the results of simple grid structure with grid clustering based network.

Fig 4.9.2 (B): energy consumed in receive mode(33 nodes)

C. Energy consumed in idle mode-

In Idle modes Figure shows how energy consumed in Idle mode and analysis the performance of each node. In Idle mode Grid network with clustering provide better results compare to Grid network without clustering. It consumes less energy than other.

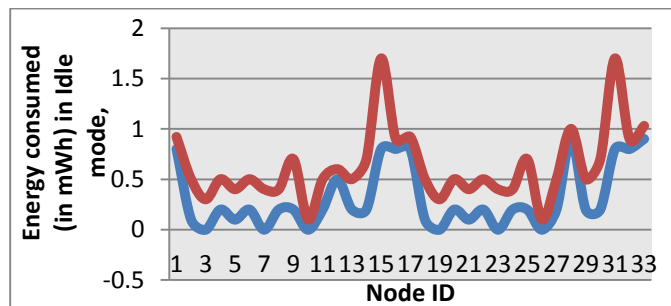


Fig 4.9.2 (C) :- Energy consumed in idle mode (33 nodes)

Performance Comparisons

MODES	(Grid) M_DSR (%)	(Grid based Cluster) DSR (%)
Energy consumed in Transmit mode	34.99	25.78
Energy consumed in Received mode	32.55	23.16
Energy consumed in Idle mode	9.32	4.67

Conclusion

Grid based clustering is more simple and feasible, and has so much advantage with respect to other method. In this paper we proposed a grid based clustering algorithm is better than simple grid based clustering network for minimizing energy consumption.

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