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Efficient Data Transfer by using Load balancing in wsn

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Abstract: *There is a unprecedented growth in heterogeneous networks and network applications because of the combination of demand of the Internet with the dramatically increase in computing devices and complex computing capacity. Communication routing protocol and network management issues have been reached at very high difficult level to manage and secure these days because of the drastic increase in the system complexity. In this way, stability of current systems and data is at the greater risk to suffer outages and general disrepair. Future routing protocols need to be robust and scalable. it should possesses distributed ,self-organized architectures and must have congession control system. The problem is that the number of nodes starts increasing automatically when there is sustainable increase in the growth of Network, at such a condition energy efficiency becomes the serious problem. Then there is a need of balancing the load at every particular node for the better communication in the desired network. In the current work we are going to present Fuzzy based technique to balance the load with hybrid protocol which is a energy efficient protocol the provides better results.*

Keywords: *WSN, Wireless Network, Load balancing, Hybrid protocol.*

1. INTRODUCTION

Wireless sensor network is a network that is formed by the combination of different sensor nodes to form the cluster in an unattended environment with the capabilities of sensing. These sensor nodes construct and dynamically maintain the structure of the network through wireless communication and transmit the respective data to the Base-Station after aggregating it from all the nodes in the cluster. In current situation the wireless technology plays a vital role in Information technology, and many new wireless devices have been launched in the market just to solve the real world problem. Also these further leads to many research and analysis. Thus wireless sensor network is one of them. Since Internet is growing exponentially and users are increasing day by day, the information is need to be in move diverse form. To make the wireless sensor network, we need nodes and base station and it has to be distributed as per our requirement. Every node does a specific task and it detects some events and also characterizes these events. The final outcome information has to be transmitted to at particular Base station by using direct or multihop way, considering that with automatic routing from single or several nodes. To implementation of such a network, it requires lot of effort in which there is use of hardware and software modules and these modules are communicating each other just like both are cooperating each other. Thus, for stationary network of such types of sensor nodes which act as a fixed position with respect to the base station needs further processing of the information and other tasks has to be triggered.

2. WORKING OF WSN

2.1. Design Considerations for Sensor Network

For designing of new protocol for WSN(wireless sensor network), Many parameters need to be considered such that it should be capable to guess the argument which are very mandatory for Wireless sensor application. There so many methods in Routing Protocol can provide so many advantages for application that we are using in WSN.

2.2. Deployment of WSN

As we know Wireless sensor network comprised of many nodes and these nodes need to place in their corresponding Fashion. Thus we can imagine that if nodes are too small and each node will have many tiny

circuits and these nodes has to extract very important information from many remote areas. Thus it needs either self configured protocol or it should have fixed infrastructure

2.3. Lifetime in WSN

The lifetime of the sensor networks can be determined with the help of various generic and application-specific algorithms. For example: time until the node die in case of generic algorithm and the time of missed events when sensor network is not providing any suitable results. Sensor Networks should work as long as possible.

2.4. Latency

It is really mandatory to receive the data in sensor network in timely fashion because data is actually time-sensitive. Moreover, data is always considered to be unacceptable because of long delay that normally occurs due to communication or processing.

2.5. Quality

The good quality of wireless sensor network means it should be able to sense all the information from particular Environment. Since all this basically depends as if what type of application we are using in the wireless sensor network because it has to further find the data in specific fashion from base station. Thus if data is very large and it is being sent via base station then it should be accurately received to the Sensor node along with different parameters. There should have specific algorithm which should adapts several situation according to the need, as what is required to the wireless sensor network. Thus user should have good quality results. For sending the larger data there should be restricted energy in network. There must also have the algorithm as well as routing protocols which should prevent the wastage of energy .Then we can say there is good quality in wireless sensor network.

2.6. Design and Analysis of Scalable Wireless Sensor Network

There is a great need to design the routing algorithms for managed, organised, self-configured and self-protecting network system based on the analysis and observations of complex adaptive systems found in nature. Autonomic system managed and configures itself on the basis of various predefined rules without getting any human interaction and also keeps on gaining knowledge over the time.

2.7. System Components and operations in a WSN

2.7.1. Load Balancing

In general sense, Load Balancing means dividing the total amount of work between two or more computers resources so that all users get served and more work gets done in same amount of time. Example: Computers, Computer Cluster, Disk Drives and Network lines. Load Balancing aims to avoid overload of any particular single resources and it provides maximum throughput and minimum response time .Typically, the main reason behind the clustering concept is “Load Balancing" only.

2.7.2. Clustering in WSN

Clustering is an effective method for extending the lifetime of sensor network and it aims to achieve self organization, power saving and scalability. Clustering aim to reduce the energy consumption for extend the lifetime of a sensor network can be used for load balancing and it also increase the network scalability. Clustering provides various advantages of reducing the size of routing table and decreasing redundancy of data packets.

2.8. Proposed Technique

2.8.1. IAODV Protocol

IAODV is a improved Ad hoc On-Demand Distance Vector routing protocol. It provides much fast adaptation to dynamic link conditions, memory overhead, low processing, low network utilization and it is primarily used by the mobile nodes. With-in the network, IAODV is intended to determine unicast routes to destination. Routing Protocol is defined to be of two types which are reactive and proactive. In Reactive Routing Protocol, when source wants to transfer data to the destination, only then routes are created. On the other side, Proactive Routing protocols are table driven. IAODV being a reactive routing protocol uses traditional routing tables that mean one entry per destination. For further checking up-to-date routing information and also to prevent routing loops, sequence number is being used. IAODV used destination sequence number for checking loop freedom at all times and to avoid further problems that is associated with distance vector protocols.

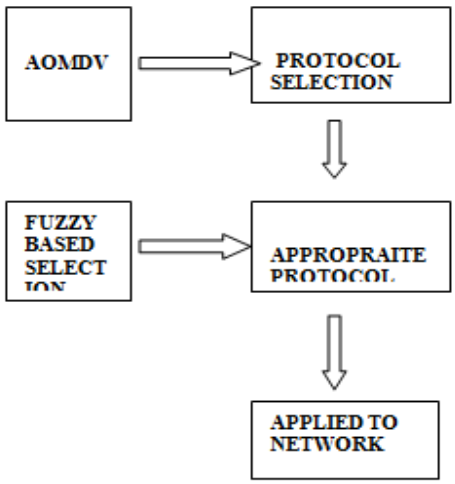

Figure1. Proposed Working

2.8.2. Performance Metrics
Three important performance metrics are evaluated:

1. Packet delivery fraction:
It is the ratio of data packets that is being transferred to the destination by those packets that is generated by the traffic type source. Greater value of the packet delivery ratio indicates the better performance of the protocol.

{Number of packet receive / {Number of packet send**.**
.
2. Average end to end delay of data packets:
It is defined as the average time taken by data packet to reach at the destination from the source. Only those data packets that successfully reached at the destination are being counted. It includes retransmission delays, propagation, transfer type delay and delay that is caused by buffering. Lower value of end to end delay always indicates the better performance of the routing protocol.

{(reach time-send time) / {Number of connections.

3. Throughput:
It is defined as the average rate on which successful message is being transferred over a communication channel. Data can be transferred over logical link or physical link. Throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second also**.**

2.9. Simulations Results
2.9.1. Average end-to-end delay of data packets
The average end-to-end delay of packet delivery is higher in case of AODV as compared to Hybrid. The proposed hybrid technique basically finds the optimal path where usually least traffic occurs and hence make efficient for less delay.

2.9.2. Packet delivery fraction
The delivery fraction is higher in Hybrid as compared to Earlier Technique (AODV protocol). This is due to optimal path finding and load balancing during data transfer

2.9.3. Throughput or network throughput
The throughput data packet is higher in Hybrid as compared to Earlier Technique. Transfer the data as optimal bandwidth which makes the balance between others node too.

2.10. Result for Simulation of Sensor Network
There is a Calculation of Send, Received Packets,Average PDF,Average End-To- End Delay,Average Throughput for Earlier and proposed technique AODV for 50 nodes by running Different AWK script

2.11. Figures and Tables
Below is the simulation parameter taken for Hybrid and Earlier technique. Parameter values for IAODV and AOMDV simulations have been showed in below Table1.

COVERAGE AREA	1000m*1000m
PROTOCOLS	IAODV AND AOMDV
NUMBER OF NODES	50
SIMULATION TIME	50 seconds
TRANSMISSION RANGE	250m
MOBILITY MODEL	Random way sensor point model
LOAD	5 kb-UDP packets
TRAFFIC TYPE	CBR,UDP,FTP.TCP
PACKET SIZE	512 kbps
PAUSE TIME	10,20,30,40,50

Table1. Parameter values for IAODV and AOMDV simulations

In Table2 ,all three performance metrics of proposed and existing techniques have been measured and it's been concluded after comparing these performance metrics that EED is more in case of existing technique, PDF and throughput is higher in case of proposed technique as compares to existing technique.

Technique	**Average EED**	**Average PDF**	**Average TH**
Earlier	44.107 ms	0.90%	580.76 kbps
Proposed	19.47 ms	0.99%	613.00 kbps

Table2. Average Analytical Results for three performance metrics

2.12. Graphical Analysis

2.12.1 END to END Delay Graph Results
In below figure 2, we can conclude that our proposed technique has lesser delay time while earlier technique has higher delay time.

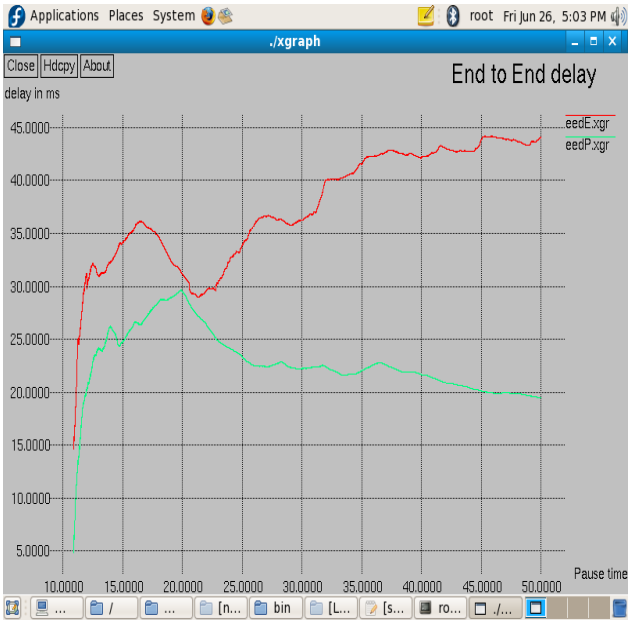

Figure2. END to End Delay graph between Pause time and Delay time (in milliseconds)

2.12.2 Packet Delivery Fraction Graph Results

In below figure3, we study the packet delivery fraction under different pause time. It is worth noting that our proposed technique have high delivery fraction while earlier technique has lesser delivery fraction.

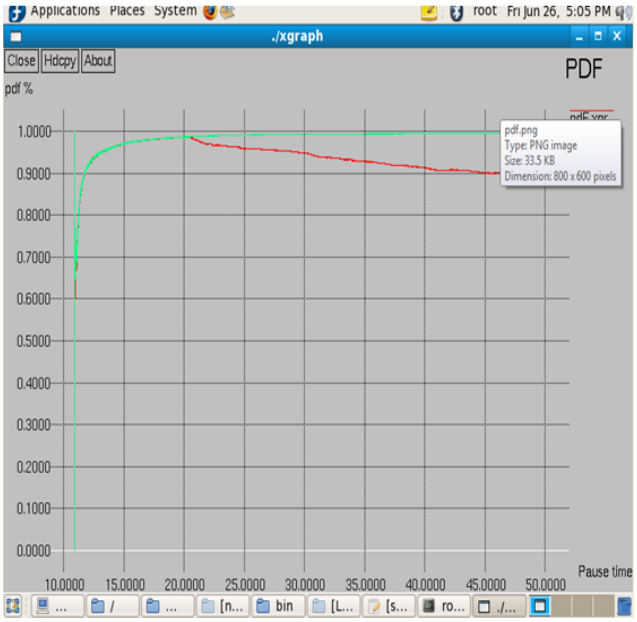

Figure3. Packet Delivery fraction graph between pause time and packet fraction

2.12.3 Throughput Graph Results

In below figure 4, we study the 'Throughput Graph' under different pause time. It is worth noting that our proposed technique have high throughput while earlier technique has lesser Throughput.

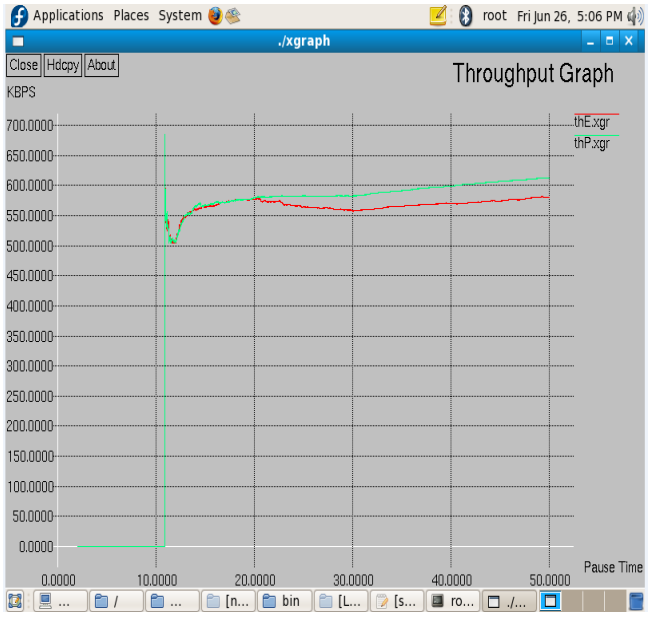

Figure4. Throughput graph between Pause time and KPBS

From the simulations results in figure 2 to 4, it's worth observing that our proposed technique can achieve both energy efficiency and load balancing as comparing with existing routing technique.

3. Conclusions and future work

In this paper, we have proposed hybrid routing protocol for WSNs which can achieve both energy efficiency and load balancing with fuzzy. The Sensor Networks should have to be self-learning and should operate by adapting to the environmental changes when sensor monitors. It should have to be reliable by maintaining the network functionalities instead of the fact of the failure of various sensor Nodes. Network should be able to organise itself and is able to detect failure. Reasons behind failing the sensor node can be communication problem, environment interference, lack of energy or physical damage. By measuring different performance metrics, simulations results have showed that our hybrid technique performs good result, better performance and is superior to existing AODV routing protocol. Research study has been performed by doing comparison analysis for Hybrid and AODV. For future, we will explore our work upon Network life time by using the same technique and these techniques may be implemented with multicast routing protocols such as on-demand multicast routing protocol (ODMRP) by using better security models. Every result given by the simulations and tests of the thesis are very promising and encourage us to investigate towards the hybrid framework even further.

This can conclude the following:

- Full development of the hybrid framework in NS-2

- Formal analysis and evaluation of the on-line hybrid framework extensions to large scale.

This Thesis has shown various promising better results on congestion control either by configuring specific network parameters or by using congestion solutions related with resource control. At theoretical level , a hybrid congestion control framework have been proposed on the basis of concluded results and can be considered as a good way for the future research in the direction of congestion control in WSNs.

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