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A novel approach for comparative analysis of networking routing protocol: Review paper

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ABSTRACT

A wireless sensor network is nowadays very popular important in the field of research because the world is now switching faster from wired communication to the wireless communication. We studied many research papers from various researchers and every research worked on diverse protocol. As we know protocol is classified in the different domain and every domain has its own advantages and limitations. In our research work, our main focus is to enhance the base work in term of network parameters. During the execution of any research, first of all, we have to execute in the virtual environment due to the cost factor. Because if we directly execute in the real world it is not necessary that work would be carried out successfully therefore in this scenario huge loss of money will come into existence. We executed our research work in NS2 simulation environment. WSN is collections of very small sensor nodes which accept information and transfer this valuable information to the base station via shortest routes so that energy consumption would be reduced. WSN has defined diverse routing protocols for the network. There is two main problem exist in WSN, the first one is to design a routing protocol which gives optimization of energy and another security issue due to dynamic topology. There are diverse routing protocols which are classified as their working and their application to different conditions. In our research work, we worked on four routing protocols and integrated these into NS 2 Software. Out of these protocols, we found that ECHERP protocol performance is excellent as compared to other routing protocol in WSN.

Keywords— *WSN, ECHERP routing protocols, Hierarchical routing, Flat routing protocols, PEGASIS*

1. INTRODUCTION

Wireless Sensor Network (WSN) is an advanced technology and a lot of work already have been done and right now smart grid concept also introduced in WSN and this technology have wide range of application including infrastructure protection, industrial sensing and diagnostics, environment monitoring, context-aware computing (for example intelligent home and responsive environment) and so on. This kind of network usually consists of a large number of nodes that bring themselves together to form a wireless network. The components of a WSN are sensor nodes, BS and monitored events

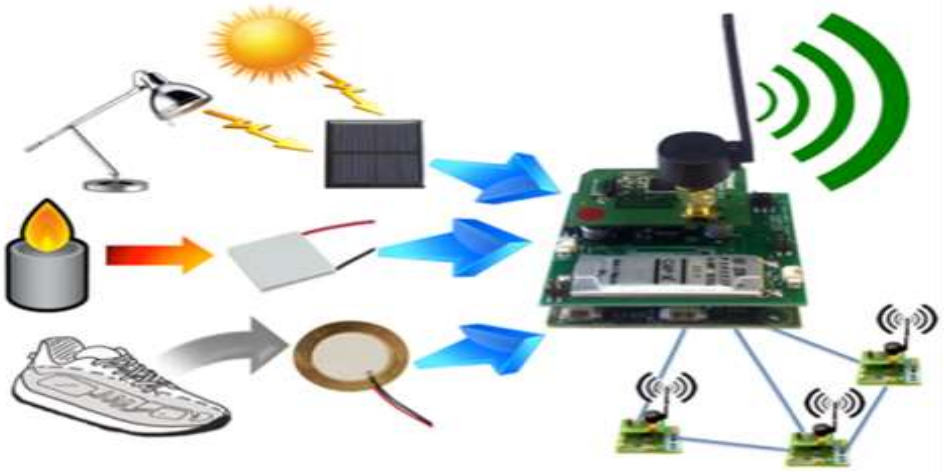

Fig. 1: Wireless Sensor Network

Despite the numerous applications of sensor networks, these networks have several limitations, including limited energy supply, limited computing power, and limited bandwidth of wireless links connecting sensor nodes. One of the main goals of sensor

network design is to achieve data communication while trying to prolong the lifetime of the network and prevent degradation of connectivity using techniques of aggressive energy management. The design of routing protocols in sensor networks is influenced by many factors difficult. These factors must be overcome before effective communication can be achieved in sensor networks. In what follows, we summarize some of the challenges of routing and design problems that affect the process of routing in sensor networks.

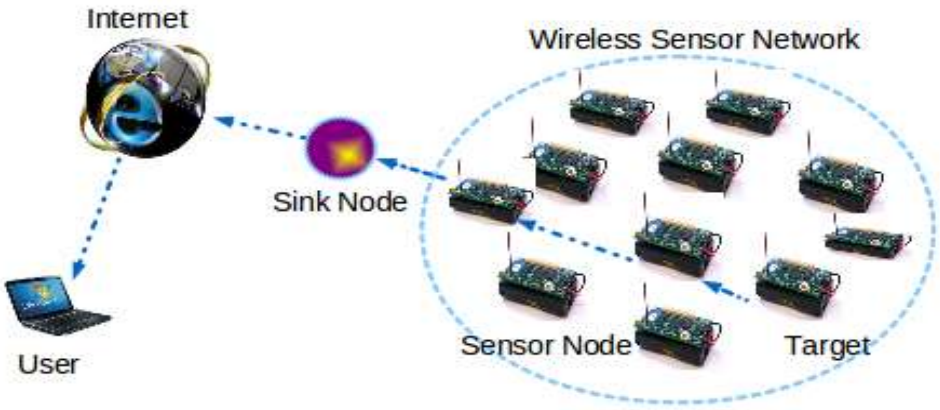

Fig. 2: Components of sensor network nodes

2. ROUTING IN WSN

Different kinds of a routing protocol in WSNs are shown below. Our thesis is based upon Hierarchical Routing.

- Flat Network Routing
- Hierarchical Routing
- Location Based Routing

2.1 Flat Network routing

The first category of routing protocols is the (multi-hop) FRP s. In flat networks, each node (sensor nodes typically plays the role of collaboration in the detection task. Due to a large number of these nodes, it is not possible to assign a global identifier at each node. This consideration led to centered on the routing data, where the BS sends requests and to certain regions of the expected data sensors in the selected regions. Since data is requested through queries, attribute-based naming is necessary to clarify data properties. Data-centric routing saves energy through data bargaining and the elimination of redundant data

2.2 Hierarchical routing

Hierarchical or cluster-based routing methods, originally proposed in wired networks, are well-known techniques with special advantages related to scalability and effective communication. As such, the concept of hierarchical routing is also used to perform energy efficiency in sensor networks routing. In hierarchical structure architecture, higher energy nodes can be used to process and send the information, while low energy nodes can be used to perform the detection in the vicinity of the target. The creation of clusters and assigning special tasks to cluster heads can greatly contribute to the overall system scalability, lifetime, and energy efficiency [16]. Hierarchical routing is an effective way to reduce energy consumption in a cluster, perform aggregation and fusion in order to reduce the number of messages forwarded to the BS. Hierarchical routing is mainly two-layer routing where one layer is used to select the cluster heads and the other for routing. However, most techniques in this category are not on the routing, but rather who and when to send or process global information, channel assignment, and so the, which can be orthogonal to the multi-hop routing function

2.3 Location Based Routing

In this kind of routing, sensor nodes are processed by means of their locations. The distance between neighboring nodes can be estimated on the basis of intensities of the incoming signal. The relative coordinates can be obtained by exchange information between neighboring nodes. Otherwise, the node locations are available directly by contacting a satellite using GPS if nodes are equipped with a small low power GPS receiver. To save energy, some plans require location-based that nodes must go to sleep if there is no activity. More energy savings can be achieved by having as many nodes of the network in sleeping as possible.

3. RELATED WORK

Abdul Razaque, et.al proposed in this paper that LEACH features the dynamicity, however, has limitations because of its cluster-based design, while PEGASIS defeats the limitations of LEACH yet needs dynamicity. This paper introduces PEGASIS-LEACH (P-LEACH), a close optimal cluster-based chain protocol that is an improvement over PEGASIS and LEACH. This protocol utilizes an energy-efficient routing algorithm to transfer the data in WSN. To validate the energy efficiency of P-LEACH, the authors reproduce the performance utilizing Network Simulator (NS2) and MATLAB. The performance of P-LEACH is compared with the LEACH and PEGASIS protocols. With simulation we watched that P-LEACH performs much superior to anything LEACH and PEGASIS in terms of network lifetime, a number of dead nodes and energy consumption. MATLAB is utilized for evaluating the performance of the protocol. Based on the simulation results, we determined that P-LEACH performs superior to anything LEACH and PEGAIS in terms of energy and lifetime of the network. The simulation results validate that our proposed approach could augment the network for WSNs applications [7].

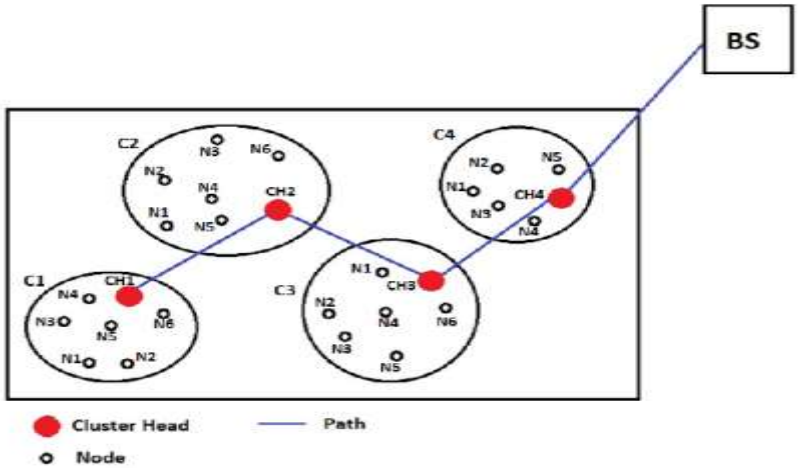

Fig. 3: Architecture of P Leach

.Ankita Bindlish, Anish Soni: Aims towards studying hierarchical-based routing protocols where nodes are considered to be forming clusters and one of the nodes acts as a cluster-head in a cluster. Four hierarchical routing protocols that are LEACH, EHRP, SEP, and FAIR have been studied and simulated. The performance of each routing protocol is measured on some performance parameters like network lifetime, packets transferred to BS, number of dead nodes etc. Due to energy limitations, the main focus of most routing protocols in wireless sensor networks is to provide energy efficient routing. Hierarchical routing protocols have shown noticeable energy improvements. Hierarchical algorithms have evolved to provide optimal clustering schemes thus minimizing energy requirements in the cluster-head selection and enhancing the lifetime of the whole network [10]. Saraswati Mishra et al: Analyzed energy efficient neighbor selection algorithms for routing in wireless sensor networks. Since energy saving or consumption is an important aspect of wireless sensor networks, its precise usage is highly desirable both for the faithful performance of the network and to increase the network lifetime. Through the experimental analysis, we can conclude that MECRT is better for medium to large network size, where node selects a path that consumes minimum energy among all available paths for data forwarding as compared to the HE algorithm where node delivers the data to the neighboring node having the highest energy for the homogenous network [8]. Shivakumara S Sasanura, Prof. B Sreenivas: Describes the characteristics of ad hoc routing Protocols Ad-hoc On-Demand Distance Vector Routing (AODV), Temporally Ordered Routing Algorithm (TORA), Destination-Sequenced Distance-Vector Routing (DSDV) based on the performance metrics like packet delivery fraction, Average delay, Normalized Routing load, Throughput and Jitter under low mobility and low traffic network as well as under high mobility and high traffic network. Results show that AODV has maximum throughput under low traffic and DSDV has maximum throughput under high traffic. As the network becomes dense DSDV perform well in terms of Throughput than AODV and TORA. TORA performs well in dense networks in terms of packet delivery fraction but at the same time, the Normalized Routing load of TORA is maximum among all the protocols in both the networks [11].

4. APPLICATION OF WSN

4.1 Military Applications

The essential part of military surveillance, communications, and targeting systems is WSN. Sensors are deployed for

- Battlefield Surveillance
- Battle Damage Assessment
- Monitoring friendly forces
- Detection reconnaissance of chemical or nuclear attack

4.2 Home Applications

WSNs have stepped into our normal life, Sensor is deployed to open the door, boil water or eggs, switch on the light or TV (for this purpose we deploy pressure sensors under the cushion or bed that automatically switch on /off light or TV), avoid theft cases and so many more applications like this some are shown in Figure 4.

Fig. 4: Homing with WSNs

4.3 Health Application

In the healthcare area, Modern hospitals nowadays using WSN to monitor patient psychological data

- Control drug administration track
- Monitor doctors and patients and inside a hospital -Unconsciousness detection
- Fall detection
- Dietary and exercise monitoring

4.4 Environmental Applications

In agriculture research and fire detection, WSNs are widely used. For this purpose, sensors are deployed to every plant for making sure that it gets right watering and right nutrients. To check the pollution in our environment Sensor nodes are also used.

5. SOFTWARE USED

Software NS-2

We use NS-2 (2.35), a network simulation tool to simulate wireless communication network. NS2 is a discrete event simulator developed. It provides a good platform for win simulation. The random waypoint model is selected as a mobility model in a rectangular field (1000*1000m2). LEACH, PEGASIS, TEEN, HEED is used for simulation at the network layer. Nodes send constant bit rate (CBR) traffic at varying rates.

The performance of Energy Efficient based Cluster protocol in Wireless Sensor Network (WSN) is being estimated with the help of simulation on network simulator-2.

Following results will be calculated by using performance .awk script. Using the output we plotted the bar graphs of the following parameters. The result is carried out by NS-2 Simulator using the following Parameters.

- Throughput
- Packet Delivery Ratio
- Energy Consumption
- Average End to End Delay
- Normalized Over Load

Simulation Tool	NS-2.35
Operating System	Ubuntu 12.04
Number of Nodes	10,20,30,40,50
No. of Cluster Head	3
MAC/PHY layer	IEEE 802.11
Antenna model	Omnidirectional
Interface queue size	50 packets
Data payload	512 bytes
Pause time	20 seconds
Channel bandwidth (data)	12Mbps
Transmission range	250m
Examined protocol	LEACH, PEGASIS, TEEN, ECHERP
Interface Queue Type	Queue/Drop Tail/PriQueue
Mobility model	Random waypoint
Simulation area	500M*500M
Link Layer Type	LL
R_x Power	0.6
T_x Power	0.6
Data Rate	200k
Simulation Time	100 c

6. CONCLUSION

In this research work routing protocols based on clustering protocols for selection of Cluster Head are developed for both Homogeneous WSNs. Through this research work, it has been proved that –Homogeneous protocols are a novel energy efficient data gathering protocols, where clustering is based on allocating the growth budget to neighbors, multi-hop, multi-path. As there are various networking parameters out of the parameters energy consumption is important parameter because every node having limited energy, therefore, we have to increase the lifetime of the node so novel approach must be applied to obtain the desired result. In our research work proposed protocol ECHERP arrange the sensor nodes into clusters and forms a multi-hop intra-cluster network. ECHERP is based on the residual energy and location information of the sensor nodes. In our research work, we worked on four routing protocols and integrated these into NS 2 Software. Out of these protocols, we found that ECHERP protocol performance is excellent as compared to other routing protocol in WSN. Our main work is to achieve higher throughput and consume less energy and propagation delay must minimum so that overall efficiency can be enhanced. Further, this research work can be integrated with help of artificial intelligence, deep learning so that better result can be achieved.

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