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Design A Smart Relay in Advance Metering Infrastructure Using Matlab

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ABSTRACT-: In this paper, we suggest a wireless network infrastructure which connects the smart meters of each consumer with the data aggregation points (DAP). The sensor is send the meter reading to the Distribution Pannel (DP) of our colony or area. For transmitting meter reading we assume a set of smart meters that need to send information, and receive information from DP so forming the advanced metering infrastructure (AMI) stage of smart grids. We consider a single-hop system, where information is routed through single node (Cluster Head) which act as DAP. If compare, the present-day wireless technology are developed as much as necessary to provide reliable data communication to a large number of users. In addition, they are fast and relatively easy to set up and do not require the majority imperative structure challenge or structural interventions in buildings.

KEYWORDS: Advanced metering infrastructure, Data Aggregation Point (DAP), Smart Relay, Sensor.

I. INTRODUCTION

Applications of Wireless Sensor Networks (WSN) range from military and health to home monitoring due to their capacity to WSN is energy-constrained. In a loose sense, we are investigating joint relay and router, and thereby, are improving the energy efficiency communicate free over short distances, their small size, low-cost and low-power consumption. Since WSN operates on batteries, the lifetime of of the network. We proposed WSN architecture for advance metering infrastructure. Short range communication is via wireless sensor nodes, while long range communication is via GPRS (General Packet Radio Service).

In a typical application of wireless sensor, data of the co-located sensor nodes will be highly correlated. Hence, it would be efficient to aggregate the data, do local assessment and then communicate only the local decision. We propose distributed clustering protocols for the problem. It is an improvement of Energy-Efficient Distributed clustering. Node uses circulated clustering, in which the conclusion of energetically electing the cluster head (CH) is taken exclusively by the group of individual nodes based on their local information. Clustering a group of sensor nodes and energetically electing a head responsible to transmit the summary of aggregated data of individual nodes is an energy efficient approach, as compared to the sending of individual data to the Base Station (BS).

II. RELATED WORK

In [1] author propose, a hybrid wireless mesh network infrastructure which connects the smart meters of each consumer with the data aggregation points (DAP). Suppose a set of smart meters that need to send information, and receive information from a central office on electrical enterprises, Consider a multi-hop system, where information is routed through several nodes which act as DAP. Wireless mesh networks are known to extend coverage and increase deployment efficiency, so they could be an alternative for the connection between Home Area Network (HAN) and the Neighborhood Area Network (NAN). However, the NAN data must be send through wider area cabled networks to Metropolitan Area Network (MAN), and based on the WDM-PON architecture. Consider a novel planning model which simultaneously solves both architectures and analyses the overall performance based on average packet delay.

In [2] The unique characteristics of advanced metering infrastructure (AMI) communications such as large number of devices, small data burst transmission, high reliability and variable propagation conditions require a robust

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communication network to serve them in an efficient and scalable manner. Being the two promising technologies of the next generation wireless networks, the synergic operation of WiMAX and WLAN can significantly improve the cost and efficiency of an AMI network by extending transmission range, improving link quality and allowing flexible data aggregation to reduce signalling and protocol overheads. In this paper, we provide some of our initial studies on a WiMAX-WLAN heterogeneous network (Hetnet) architecture for AMI communications in the smart grid. Using a basic numerical analysis and discrete event simulation models based on OPNET, we compare the behaviour and performance of a WiMAX-WLAN Hetnet with a standalone WiMAX network. The results indicate that the Hetnet provides a significant performance edge over the standalone network in terms of capacity, coverage and latency.

In [3] Wireless sensor networks are subject to failures. Deployment planning should ensure that when a sink or sensor node fails,

the remaining network can still be connected, and so may require placing multiple sinks and relay nodes in addition to sensors. For network performance requirements, there may also be path-length constraints for each sensor node. We propose two local search algorithms, GRASP-MSP and GRASP-MSRP, to solve the problem of multiple sink placement and the problem of multiple sink and relay placement, respectively. GRASP-MSP minimises the deployment cost, while ensuring that each sensor node in the network is double-covered, i.e. it has two length-constrained paths to two sinks. GRASP-MSRP deploys sinks and relays to minimise the deployment cost and to guarantee that all sensor nodes in the network are doublecovered and noncritical. A sensor node is noncritical if upon its removal, all remaining sensor nodes still have length-constrained paths to sinks. We evaluate the algorithms empirically and show that both GRASP-MSP and GRASP-MSRP outperform the closely-related algorithms from the literature for the lowest total deployment cost.

III. **PROPOSED METHODOLOGY**

A. *Design Considerations:*

- Initially consider number of nodes.
- The initial energy of each node is taken as 2J/Node.
- Each node participates in forming a cluster.
- Calculate its residual energy of each node.
- The cluster head is selected on the bases of connectivity and residual energy.
- Add a relay in between head of cluster to avoid conjunction and also boost up the energy of head of cluster.
- Find a final path for each smart meter or DAP that minimizes interference and allows the data transmission from each smart meter and DAPs.
- Finally we get results after simulation in a form of larger life span.

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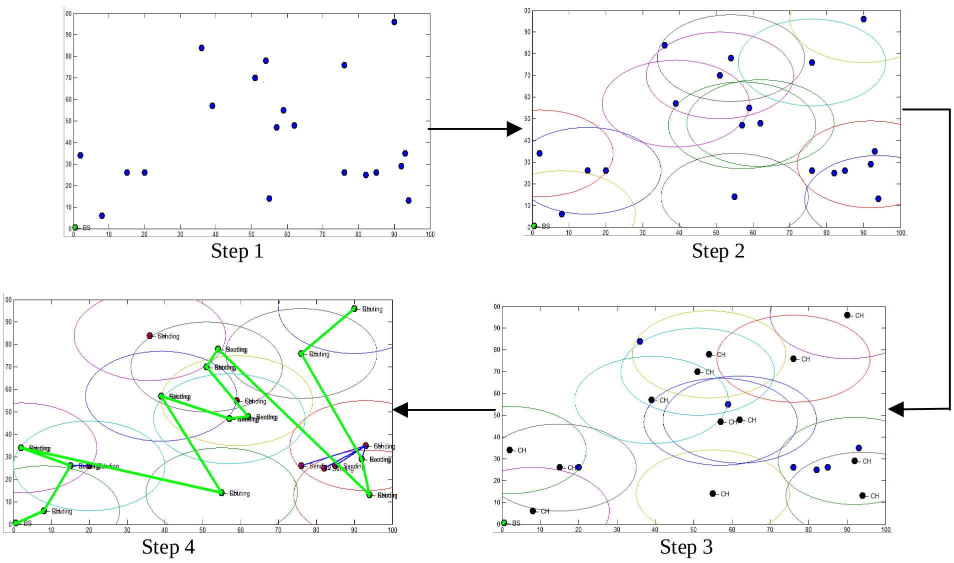

Fig Working process

The above figure shows total simulation process. In step 1 the numbers of nodes are form whose initial energy of each node is taken as 2J/Node. In step 2 each node participates in forming a cluster and calculates its residual energy of each node. In step 3 a cluster head is selected the criteria for selecting a cluster head depend on their connectivity and energy. Then final path is form for the simulation. If a number of nodes increase at that time conjunction is also increase so to reduce the conjunction we add relay. The relay increase energy of cluster head.

IV. SIMULATION MODEL

For the sake of consistency, we have taken the same energy model and parameters as that of LEACH. The simulations were done in Matlab and 50 nodes are randomly deployed in a square grid of 50x50 area:

1) Topology = (0,0) to (50,50)
2) Base Station = (0,0)
3) Number of nodes = 50
4) Initial Energy = 2J/node
5) Efusion = 5nJ, the average amount of energy consumed for aggregating the data.
6) Eamp = 10 pJ/bit, energy consume per bit in the transmitter amplifier.
7) Eelec = 50 nJ/bit, energy consume for processing a bit.
8) Broadcast packet = 25 bytes.
9) Data packet = 500 bytes.

If a node has to transmit bits over a distance of d, it must expend energy.

$$Etx = (Eelec * n) + (Eamp * n * d2)$$

And while receiving it must expend energy

$$Erx = Eelec * n$$

HEED parameters:

1) Cprob = 0.05 the initial probability of being a cluster head
2) Pmin = 0.0001, the minimum energy of the node
3) Number of times clustering selection algorithm run =300
4) Number of TDMA rounds within a clustering round = 25

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V. PSEUDO CODE FOR CLUSTERING AND DATA ROUTING

Step 1: Every node starts a timer with the timer value.
Step 2: The node, say ηi, having the least timer value (or the node having the highest energy) and satisfying connectivity criterion advertise itself to be a head.
Step 3: The nodes in the neighborhood of ηi terminates their timers.
Step 4: Each non-head node selects the nearest head.
Step 5: The head broadcasts TDMA schedule for its members.
Step 6: The nodes transmit data to their respective heads.
Step 7: Each head transmits the aggregated data to the BS via the shortest path.
Step 8: After sufficient rounds of data transmission in a clustering round, the protocol repeats from Step 1.

VI. SIMULATION RESULT

The simulation studies involve the deterministic small network to larger network i.e from 0 to 100 nodes. The proposed system is implemented with MATLAB. The number of node forms the cluster and one of node is selected as a head of cluster. The criteria for selecting the head of cluster is depend on their connectivity and energy. As a node is increases at that time the problem of conjunction is also increases and a lifespan of simulation is decreases so to overcome these problems we add a smart relay. We considered the simulation time as a nodes running time in (sec). Simulation time is calculated through the CPUTIME function of MATLAB. The simulation results show that the energy of nodes is preserve as compare to without relay. The result in Fig. 1 shows the comparison between average energy of nodes and simulation time (sec) or running time. The simulation result shows that average energy of nodes is improve by using a smart relay as compare to without relay.

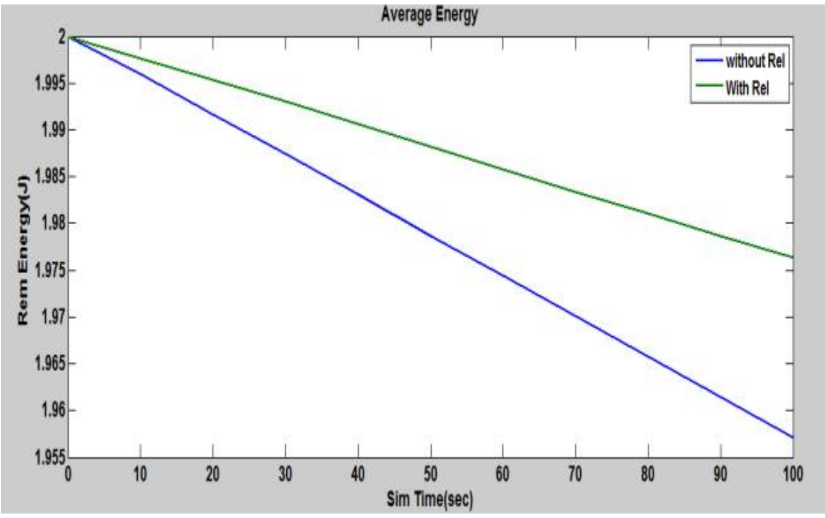

Fig.1. Average energy of 0 to 100 nodes

VII. CONCLUSION

The simulation results show that the average energy of nodes is preserve as compare to without relay.Also it provides energy efficient path for data transmission and maximizes the lifespan of entire simlation. The problem of conjunction is minimized by using a smart relay. The goal of project is to find a final path for each smart meter or DAP that minimizes interference and allows the data transmission from each smart meter and DAPs.

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