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Productive Energy Conservation Model for Wireless Sensor Network using NS3 Simulator

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ABSTRACT

A WSN primary outline issue for a sensor system is protection of the vitality accessible at every sensor node. We propose to convey different, versatile base stations to delay the lifetime of the sensor system. We split the lifetime of the sensor system into equivalent stretches of time known as rounds. Base stations are migrated toward the begin of a round. Our strategy utilizes a whole number straight program to focus new areas for the base stations and in view of steering convention to guarantee vitality proficient directing amid every round. We propose four assessment measurements and look at our answer utilizing these measurements. Taking into account the reproduction results we demonstrate that utilizing various, versatile base stations as per the arrangement given by our plans would altogether expand the lifetime of the sensor system.

Keywords: ***WSN, Lifetime, Sensor Networ,*** NBC, WSN, AODV, CMAX

I. INTRODUCTION

A remote sensor system comprising of little estimated gadgets which has detecting and correspondence abilities. These sensors screen physical or natural conditions, for example, temperature, weight, movement or contaminations in distinctive regions. Such sensor systems are relied upon to be generally sent in a tremendous assortment of situations for business, common, and military applications, for example, observation, vehicle following, atmosphere and natural surroundings checking, insight, therapeutic, and acoustic information gathering. Remote Sensor Networks (WSNs) are imagined to watch extensive situations at short proximity for broadened times of time. WSNs are by and large made out of an extensive number of sensors with moderately low reckoning limit and constrained vitality supply [3].

Wireless sensor networks (WSN) may consist of several to thousands of homogeneous or heterogeneous sensors that share the need to organize for data collaboration or network data collection sink routing. Small system platforms which integrate sensors, processors, and transceivers are referred to as motes. Remote sensing platforms are typically characterized by reduced processing capabilities, limited memory capacities, and fixed battery supplies. As technology makes the hardware smaller, WSN research continues developing innovative, energy-saving techniques at all network protocol layers in order to engineer sensor platforms which can operate unattended for months or even years. The WSN networks must also be scalable to support extremely dense sensor fields. Applications for energy-efficient WSN networks include homeland defense nuclear/biological/chemical (NBC) sensing, military surveillance, and environmental sensing [MaP02][SzM04][SzP04]. These applications generally work in a self-organizing, clustered environment that supports either a single application or collaborative applications. WSN network design requires tradeoffs in throughput and latency to extend network lifetimes.

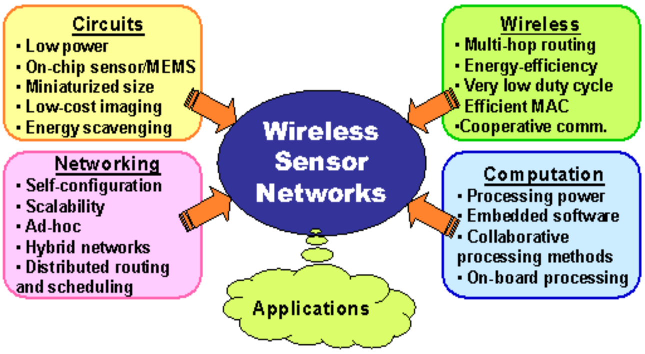


Figure 1: Wireless Sensor Network

II. METHODS AND MATERIAL

A. Related Work

A survey on sensor networks [1] ***I.F. Akyildiz, Weilian Su, Sankarasubramaniam, E. Cayirci*** IEEE Communications, Aug 2002

The authors present a communication architecture for sensor networks and proceed to survey the current research pertaining to all layers of the protocol stack: Physical, Data Link, Network, Transport and Application layers.

A sensor network is defined as being composed of a large number of nodes which are deployed densely in close proximity to the phenomenon to be monitored. Each of these nodes collects data and its purpose is to route this information back to a sink. The network must possess self-organizing capabilities since the positions of individual nodes are not predetermined. Cooperation among nodes is the dominant feature of this type of network, where groups of nodes cooperate to disseminate the information gathered in their vicinity to the user.

Major differences between sensor and ad-hoc networks:

- Number of nodes can be orders of magnitude higher.
- Sensor nodes are densely deployed.
- Sensor nodes are prone to failure.
- Frequent topology changes.
- Broadcast communication paradigm.
- Limited power, processing and power capabilities.
- Possible absence of unique global identification per node.

The authors point out that none of the studies surveyed has a fully integrated view of all the factors driving the design of sensor networks and proceeds to present its own communication architecture and design factors to be used as a guideline and as a tool to compare various protocols. After surveying the literature, this is our impression as well and we include it in the open research issues that can be explored for future work. The design factors listed by the authors:

- Fault Tolerance: Individual nodes are prone to unexpected failure with a much higher probability than other types of networks. The network should sustain information dissemination in spite of failures.
- Scalability: Number in the order of hundreds or thousands. Protocols should be able to scale to such high degree and take advantage of the high density of such networks.
- Production Costs: The cost of a single node must be low, much less than $1.
- Hardware Constraints: A sensor node is comprised of many subunits (sensing, processing, communication, power, location finding system, power scavenging and mobilizer). All these units combined together must consume extremely low power and be contained within an extremely small volume.
- Sensor Network Topology: Must be maintained even with very high node densities.
- Environment: Nodes are operating in inaccessible locations either because of hostile environment or because they are embedded in a structure.
- Transmission Media: RF, Infrared and Optical.
- Power Consumption: Power conservation and power management are primary design factors.

Energy-efficient communication protocol for wireless microsensor networks [30] ***W.R. Heinzelman, A. Chandrakasan, H. Balakrishnan*** IEEE Hawaii International Conference on System Sciences, 2000

The authors present a 2-level hierarchical routing protocol (LEACH) which attempts to minimize global energy dissipation and distribute energy consumption evenly across all nodes. This is achieved by the formation of clusters with localized coordination, by rotating the high-energy cluster heads and by locally compressing data.

The model used in this paper makes the following assumptions:

- There exists one fixed base station with no energy constraints and a large number of sensor nodes that are mostly stationary, homogeneous and energy constrained.
- The base station is located at some distance from the sensor nodes and the communication between a sensor node and the base station is expensive.

- The purpose of the network is to collect data through sensing at a _xed rate (i.e. there is always something to send) and convey it to the base station. The raw data is too much and must be locally aggregated into a small set of meaningful information. The nodes self-organize into local clusters with one node in each cluster acting as a cluster head. Once a cluster has formed, the cluster members send their data to the cluster head (low energy transmission) which in turn combines the data and sends it to the base station (high energy transmission). This organization of the nodes creates a 2-level hierarchy.

The operation of the protocol is broken up into rounds, during which the clusters are dissolved and recreated. During each round, a node decides probabilistically whether to become a cluster head. This decision is based on the suggested percentage of cluster heads for the network (determined a priori) and the number of times the node has been a cluster head so far. The cluster heads advertise their intention and the rest of the nodes decide which cluster to join, usually based on signal strength. Once the clusters are formed, the cluster head creates a TDMA schedule and sends it to its cluster members. To reduce interference, each cluster communicates using different CDMA codes.

For their analysis, the authors compare their scheme with a direct communication protocol (each sensor sends data directly to the base station) and the minimum-energy routing protocol. In the latter, data destined for the base station is routed through many intermediate nodes that can each be reached with minimum energy transmission. A static clustering scheme is also used where cluster heads are not rotated. Their results indicate that LEACH reduces communication energy by as much as 8x. Also, the _rst node death in LEACH occurs over 8 times later and the last node dies over 3 times later.

Some criticisms about LEACH ([4]):

- Not taking into account the possibility of nodes failing due to hostile environment.
- There is no provision for the cluster heads to be uniformly distributed with respect to their geographic location. Since in each round a node becomes a cluster head with a certain probability, it is possible that parts of the network will be left without a cluster head.
- In the analysis only a 100-node network network is considered, which at least one order of magnitude is less than the envisioned number of nodes.

Energy concerns in wireless networks [36] ***A. Ephremides*** IEEEWireless Communications, Aug 2002
Problem

This paper focuses on the major energy efficiency issues in ad-hoc networks (not only sensor networks) which are defined as infrastructureless networks that require multiple hops for connecting all the nodes to each other. Vertical layer integration and criticality of energy consumption are the two main characteristics of ad-hoc networks that drive their design. The separation of network functions into layers is characterized as the original sin in networking.

For any wireless node there are three major modes of operation: transmitting, receiving and listening. When the node is in listening mode the energy expenditure is minimal. However, if the node spends most of the time listening then this mode is responsible for a large portion of the consumed energy (as is the case in sensor networks).

B. Proposed Work

Development of the energy efficient routing protocols for the WSN – first OLM (online Maximum lifetime) and Capacity Maximization (CMAX)).Author has proposed a new routing based heuristics based on poison distribution and two matrixes CMAX and OLM.The main problem with the authors proposed work is computational overhead of CMAX and OLM.

To overcome the authors computational overhead we have adopted the idea of basic initial energy model which gives the node based on their energy remain. And then routed will be chooses, the benefit of this scheme is to simplicity due to energy model THAT REDUCES THE OVERHEAD OF TWO MATRIX COMPUTATION (CMAX and OLM) into one.

1. We will have to form wireless sensor network depending on user requirement of number of nodes.
2. Apply the Random 2D direction mobility model for creating topology between mobile nodes in WSN.

3. Apply the routing protocol AODV(on demand routing algorithm) for communication with efficient routing between mobile nodes.
4. Calculating energy of mobile nodes during communication and generate routing table for each mobile nodes in WSN.

Energy Mathematical Calculations Model :

E(N,M)=**ln>0(lm=nETack+lm!=nERack)+m>0(lm=n ETpck+ lm!=nERpck)**

E (N, M) =energy spent at node N due to node M

ETack=energy spent for transmission of one acknowledgement packet

ETpck= energy spent for transmission of one data packet

ERack= energy spent for reception of one acknowledgement packet

ERpck= energy spent for reception of one data packet

lp= p is true if value is 1

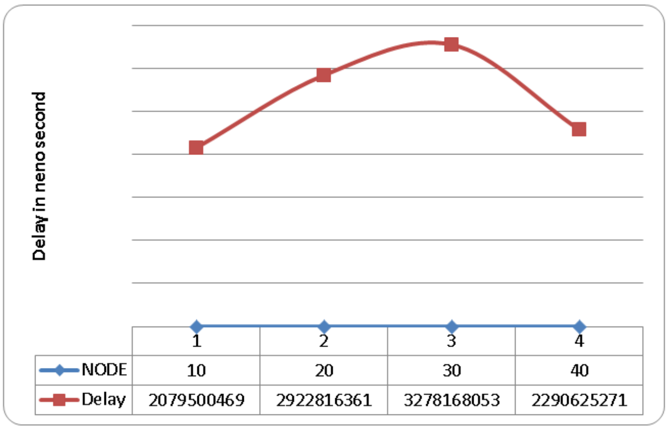
0 otherwise

III. RESULTS AND DISCUSSION

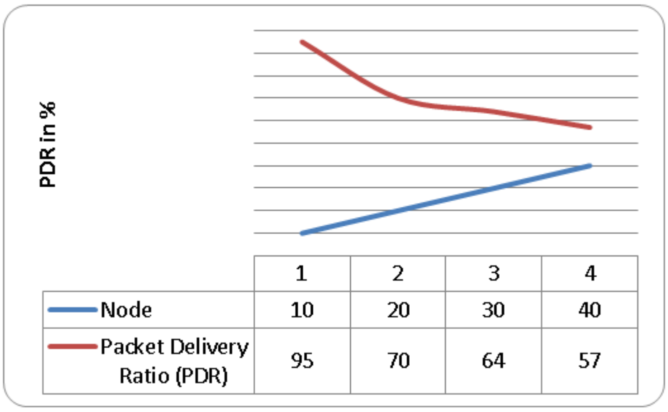
Our simulation on NS 3 ns (from network simulator) is a name for series of discrete event network simulators, specifically ns-1, ns-2 and ns-3. All of them are discrete-event network simulator, primarily used in research and teaching. Ns-3 is free software, publicly available under the GNU GPLv2 license for research, development, and use.

The goal of the ns-3 project is to create an open simulation environment for networking research that will be preferred inside the research community

(A) Flows Monitor Result During data transmission from nodes to sink node, delay in data packet delivervy in a time interval during Data Transmission phase are explained.

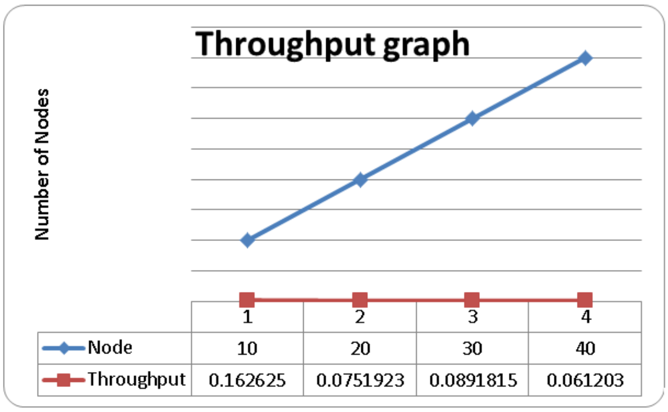


(B) Packet Delivery Ratio



Number of packets recived at sink node and transmited from sensor node in a given time interval.

(C) Throughput



This graphs shows increasing throughput in megabits per seconds based on node transmission rate and each node transmit data in different transmission rate.

IV. CONCLUSION

In this paper, we address the essentialness conservation issue to enable group in-framework get ready in broad scale WSNs. We consider WSNs made out of homogeneous remote sensors accumulated into gatherings, inside which applications are iteratively executed. Since imperativeness use capability is a champion amongst the most essential thoughts for any WSN game plan, our proposed plans intend to achieve essentialness adequacy from various viewpoints. To redesign information get ready utmost in WSNs, plan length streamlining is moreover bit of our framework objectives. The dedication of this investigation can be packed as takes after. Centers may be equipped with different sensors recognizing particular events.

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