Improved Performance of SPIN Protocol Using Clustering in Wireless Sensor Network

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Abstract- *Wireless sensor networks are the field which becomes a focus of intensive research in recent years. This network is particularly for analyzing and characterizing of big physical atmosphere and for tracking various environmental or physical conditions such as temperature, pressure, wind and humidity. SPIN (Sensor Protocols for Information via Negotiation) which is a family of adaptive protocol. In this paper, we mainly focused on spin protocol which forms clustering for sending data from one place to another. NS2 simulation is used to perform the simulation on the nodes which also show that our proposed technique is quite better than the existing techniques.*

Keywords- wireless sensor network, Base Station, SPIN adaptive protocol, information dissemination

I. INTRODUCTION

A WSN is comprised of several base station (BS) and sensor nodes. The nodes in a WSN are typically deployed randomly indoor the region of interest. The BS is involved to give instructions to each the sensor nodes and collect info from the sensor nodes. Wirelessly sensor nodes have many limits, incorporate modest processing power, little storage, and confined power source. The BS is generally a whole lot extra powerful than sensor nodes and has power provided. The BS wants to save the sensed info from the sensor nodes and transmit it back to the customer. Due wirelessly sensor nodes are lowest-powered; the constraint on the power consumption is a significant subject when designing WSN protocols [1].

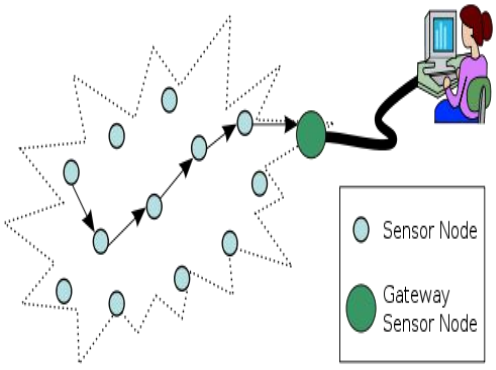

Figure 1. WSN

However, WSN may face an amount of challenges which can hamper their extensive utilization. A WSN must be self-adaptive and resilient to errors thru given efficient devices for info distribution especially indoor the multi-hop scenario. These necessities have to be realized in a networking atmosphere which is constrained thru limited processing capability, scarce energy resources and unreliable communiqué channels. In particular, in a

features harsh atmosphere, the radio signal is mostly affected thru interference: multipath fading, shadowing, medium access conflicts etc. These difficulties may outcome in important packet losses in WSNs. Furthermore, the success of several usages (particularly mission-critical ones as life-care data and alarms) necessitates the delivery of highest priority events to sinks without any loss from the unique sources to the last receivers. These restraints emphasize the necessity for a scalable, trustworthy data transfer system and energy-efficient [2].

II. ADAPTIVE PROTOCOL

Adaptive protocols in which the period of the protocol may also vary as a characteristic of the noise, but the sequence of say remains predetermined. We signify the class of such protocols as Mterm.

Intuitively, modify the protocol length is helpful for two aim. Initial, the parties may realize that they still did not whole communicate and computation, more info in sequence to complete the task. The parties may observe which the noise level is so highest that there is no hope to correctly whole the protocol. In this case the parties should abort the computation, since for such a high noise level, the protocol is not required to be correct anyway. The difficult element for the parties is, though, to be able to differentiate between the first case and the second one in a coordinated way and despite the adversarial noise. If the protocol length is not fixed (and subsequently, its communication complexity), the noise rate must be defined with care. Generalizing the case of fixed-length protocols, we consider the ratio of corrupted symbols out of all the symbols that were communicated in that instance, and call it the relative noise rate. We highlight that both the

denominator and the numerator and of this ratio vary in adaptive protocols [3].

III. SPIN PROTOCOL

SPIN is a change of classic flooding. In classic flooding the data is transmit on every outgoing link of the node. The disadvantages of flooding comprises, draining out the battery life of the sensor network to a great extent. Hence a novel protocol named SPIN was established to overcome the disadvantages.

SPIN is an adaptive routing protocol that transfers the data initial thru negotiating. As specified previous, transmission of data consumes more energy. To cope up with this problematic SPIN create exploit of metadata of the actual data to be transfer. Suppose a node has to transfer a sensed imaginary file it initial generates the metadata for imaginary, and this metadata is broadcast [6]. Metadata will comprise define of the message which the node wants to transfer.

The actual data will be transferred only if the node wishes to accept it. For this purpose SPIN create exploit of 3 messages that are:

A) ADV

Earlier transfer a message, a node initial generates the descriptor message to be transmitted. This metadata is exchanged thru creating exploiting of ADV message. ADV message notifies the contents, necessities and size of the message. This aid the delivery node on deciding transmission of the message.

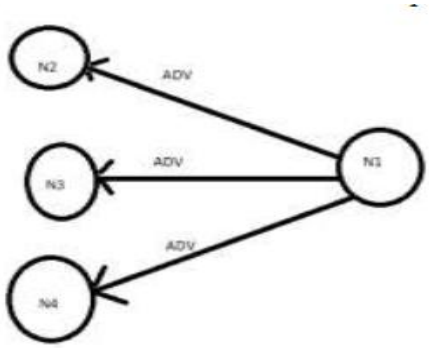

Figure 2. ADV message

B) REQUEST

Next accept the ADV message destination node confirms the descriptor whether the message is a duplicate and whether destination node's battery abilities are sufficient to transfer the data. If the node is interested in data, it replies with a REQUEST message to the source node.

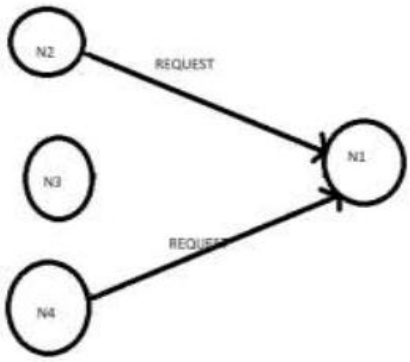

Figure 3. Request message

C) DATA

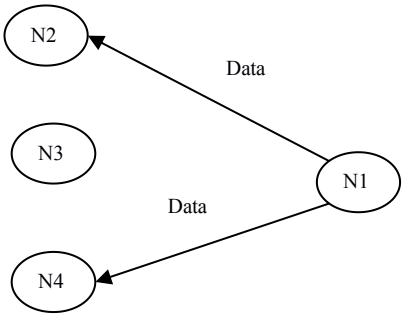

Figure 4. Sending DATA

If the source node accepts a REQUEST message, it initials the actual data transmission thru making exploit of DATA message. This is the actual data transfer phase.

The SPIN transmission is data centric; it's only transfer to the nodes which have interest in the data. This procedure continues until the data reaches the sink node. SPIN decreases both the energy consumption and network overhead in the transmission. There will not be duplicate messages in the network since nodes negotiate earlier transferring the data [4].

IV. INFORMATION DISSEMINATION

It's information that survival and self-development are the main problem central to several adults in many communities. The necessity to increase their socio-economic status is thus urgent and necessary. This necessitates empowering adults, the economically and under-privileged weaker segments of society with technical education and skills. Though, organizing programs meant mainly for raising awareness, education, and training are info and communiqué dependent. Information dissemination e.g. constitutes a

significant and serious element for the success of learning programs and adult education. More mostly than not, organizers perceive information dissemination to be a one-way form of communiqué, circulating info and advice mostly thru mass media in a timely manner and cost-effective. In few cases, the media are pamphlets and posters, while in sure others reliance is solely on text-based print medium. However, two-way form of communication is relatively more relevant and effective for organizing awareness programs and activities in adult education.

A) Nature of Information Dissemination for Adult Community

In the context of this Unit we have used the phrase 'adult community' to refer to the groups of adult people, who have something in general such as lowest phase of literacy with a higher level of knowledge and skills, yet poor living standards and poor economic conditions. Special features of disseminating information to adult community are as follows:

- Information dissemination programs, organized mainly for adult community, need not be always one way such as thru mass media alone.
- For impact and vitality, adult educators need to organize information dissemination activities in classroom mode and structure them around face-to-face interactions. One of their goals could be to offer services for example counseling, referral, practical help, advice, advocacy, community education, etc.
- Practical assistance may mean aids such as facilitating and liaison with different government agencies to address day-to-day problems.
- The scope of information dissemination could too expand to training and educational programs to improve employment potential of adult-learners.
- The two-way form of communication needs to dominate information dissemination activity, with focus on contents relevant to problems of the adult community.
- It's vital that communiqué with adult community takes place in the language that they understand [5].

V. LITERATURE SURVEY

Kui Zhang et. al (2017) in this paper, To ensure long network (n/w) life-time, the duty-cycle of WSN is often set to be low. This brings with itself the risk of either missing a sent packet or delaying the message delivery and dissemination depending on the duration of the duty-cycle and number of hops. This risk is increased in wirelessly sensor applications with hybrid architecture, in which a static ground WSN interacts with a n/w of mobile sensor nodes. Dynamicity and mobility of mobile nodes may lead to only a short rendezvous between them and the backbone n/w to exchange data. Additionally, such dynamicity generates complex and often random data traffic patterns. To support successful data delivery in case of short rendezvous between static and mobile wirelessly sensor nodes, They define MobiBone, an energy-efficient and adaptive n/w protocol that exploiting data packet traffic to characterize the sleep schedule. Our simulation outcomes demonstration which equate with n/w protocols with fixed duty-cycles, MobiBone offers a good trade-off between energy consumption, latency, and detection rate of mobile nodes (which indicates awakens of the backbone n/w at crucial times of mobile node presence) [6].

Cheng Kiat Tan et. al (2017) in this paper, Energy consumption, traffic adaptability, fast data collection, etc are the major problems in WSNs. Most existing WSN protocols are able to handle one or two of the above issues with the other(s) being compromised. In sequence to lessen the energy consumption of wirelessly sensor nodes while having fast data collection under different traffic generating rates, this paper define a rapid, adaptive, and energy-efficient multi-path-multi-channel (FAEM) data group protocol. FAEM makes use of the Basketball Net Topology proposed in the literature, in which a multi-parent-multi-child connection table is pre-established at each node; each node is also pre-assigned a receiving channel which is different from those of the neighboring nodes so as to eliminate the transmission interference. During data transmission, time is separated into duty cycles, and each consists of two phases, namely distributed iterative scheduling phase and slot-based packet forwarding phase. The former is to match parents and children of the entire WSN in a distributed method in sequence to determine whether a node should be in upload (to which parent), download (from which child), or sleep mode in a particular slot; while the latter is for nodes to take action according to the schedule. Simulation shows that our protocol is able to achieve lower energy consumption, data reliability and low latency even during a high traffic load [7].

Laraib Hamada et. al (2016) in this paper, Adaptive Scheduling Predictive-Wakeup MAC (AS-PW-MAC), a newest MAC protocol depend on asynchronous duty cycling. AS-PW-MAC introduces RTE and RAS messages for pending data transmission. RTE and RAS are beneficial for varying traffic loads. We evaluate the presentation of AS-PW-MAC through detailed ns-2 simulation and compare it to PW-MAC and RI-MAC, two well-known MAC protocols. Our evaluation includes clique, grid and random n/w scenarios. In all experiments, AS-PWMAC significantly out performs RI-MAC and PW-MAC protocols. AS-PW-MAC achieves higher

PDR below an extensive traffic range loads linked to RI- PW-MAC and MAC. Particularly, when there are contending flows, e.g transmissions or bursty traffic from unseen nodes, AS-PW-MAC significantly recovers the PDR and delivery latency. The delivery latency for AS-PW-MAC is less than 21% compared to RI-MAC and PW-MAC. In all experiments, AS-PW-MAC maintained approximately 100% packet delivery ratio [8].

Thien D. et. al (2016) in this paper, adaptive MAC protocol which maintains EE and QoS for an IEEE 802.15.4 standard-based IoT n/w. To this end, we introduce a new algorithm, referred to as RF-AASP that dynamically adjusts the sleeping period in order for sensor nodes to harvest RF energy from a surrounding LTE eNodeB. The define algorithm adapts the active sleeping period in response to varying IoT traffic load conditions, residual energy of sensor nodes and available RF energy from the LTE eNodeB. The RFASSP algorithm reduces the n/w contention level and exploits the harvested energy that in turn recovers the EE as well as the n/w throughput. Simulation results confirm that the define algorithm offers higher EE and QoS support in an IEEE 802.15.4 IoT n/w for variable traffic load conditions [9].

Song Ling et. al (2016) in this paper The events which are monitored in WSNs always happens randomly , so the n/w traffic is dynamic. This paper defines a traffic adaptive asynchronous MAC protocol of WSN. TAASMAC gets the amount of packets which are waiting to be transmitting in the queue, according to the number, TAASMAC can get the current information of n/w traffic, and changes the sleep time. The TAASMAC also solves the broadcasting problem in asynchronous MAC. This paper uses NS2 to validate the TAASMAC, and the results show that the TAASMAC gets lower energy consumption while in low n/w traffic situation, and gets lower delay while in high n/w traffic situation [10].

Eyuel D. Ayele et. al (2016) in this paper, propose HAMA, i.e., a herd movement adaptive MAC protocol appropriate for WSN with mobility nodes. The specific focus of HAMA is nature monitoring usage, in which n/w protocol is necessary to adapt to the movement patterns of herds to create the communiqué more energy-efficient and reliable. The protocol is an extension of preamble sampling scheme with an adaptive sleep-interval based on n/w traffic conditions. They have evaluated and carried out HAMA on Contiki Cooja platform. Outcome demonstration 22.28%-52.28% diminution of average n/w energy consumption as well as 11.65%-14.63% lessening of average end-to-end latency when HAMA is equaled with X-MAC and A-MAC. The general packet reliability of the gateway node(s) is also increased by up to 16.3% [11].

Rajasekaran et. al (2016) in this paper, WSN are primarily battery operated. Because of diffuse of WSN in harsh atmosphere, of WSN in harsh environment, it's extraordinarily tough to recharge or interchange the battery. Thus to improve the lifetime of WSN, it's very essential to decrease energy consumption. Non-identical traffic patterns of WSN plays a significant role in the power consumption. TAHMAC is defining to conserve energy in several traffic patterns. It allows the nodes to operate in three different modes based on the traffic. If the n/w traffic is lowest, MAC will operate in CSMA/CA mode and insert into TDMA mode if the traffic is medium. Hybrid mode is elected when the traffic is bigger. Hybrid mode set the reimbursements of FDMA and TDMA. Also, the show of the defined protocol isn't worse than CSMA/CA mode in the worst case. TAHMAC operates in collision-free achieves and manner highest energy efficiency. Simulation is carried out in NS-2 and the result shows that TAHMAC is better in terms of energy efficiency, throughput and delay [12].

Himangi Pande et. al (2016) in this paper, wireless Communication and Wireless Networking is the popular research in this era. The grouping of this is helpful technique for one step ahead to raise the life of human being on this world. The issue is to increase the growth of all this living mankind from different serious diseases, so the technology and communication is BAN (Body Area Network) through wireless is Wireless BAN. They do the research on the adaptive energy efficient MAC protocol exploited in WBAN, so to raise the life of sensor node. Once the energy is exploited we can't extend its energy only thru the battery. Define protocol incorporates dynamic cycle as well as adaptive contention window patterns. They have simulated the protocol in NS2 and checked the presentation of data transmission in dissimilar situation may be in Normal, On- Traffic and demand which leads to consume more energy [13].

VI. PROPOSED WORK

In the existing work, SPIN protocol is used where Meta data is forwarded to each node within the range. But the original data is forward only when the receiver node is interested in that data. If the intermediate nodes are not interested then the optimal route is difficult to form. This affects the overall performance of network as data is not forwarded to the destination from the optimal route.

To overcome the above problem, we perform clustering for forwarding the data to all nodes. Sender node transmits the data to the cluster head (CH) then the present node can get the data from the CH. Then the CH forward the Meta data to different CH until it reaches the destination. This

method improves the energy consumption and storage as only cluster head stores the Meta data and performs all the operations.

Proposed Algorithm:

Step:1 Initialize network
Step:2 Select source node
Step:3 If source has data
Then it send ADV packet to cluster head
Step:4 If cluster head is interested
Then it send REQ packet to source
Source sends full data to cluster head
Else
Forward the Meta data to other cluster head
Then it send REQ packet to source
Source sends full data to cluster head
Step:5 Now cluster head has original data
Step:6 It forward data to other cluster head
Step:7 Performed process until packet reach to destination
Step:8 Exit

VII. RESULT ANALYSIS

In our implementation, we used NS2 simulator which generate the results in the form of graphs.

1. Packet Delivery Ratio:

It is known as the total number of packets received per total number of packets sent. It is shown from the below figure that our proposed work has better PDR value than the existing work.

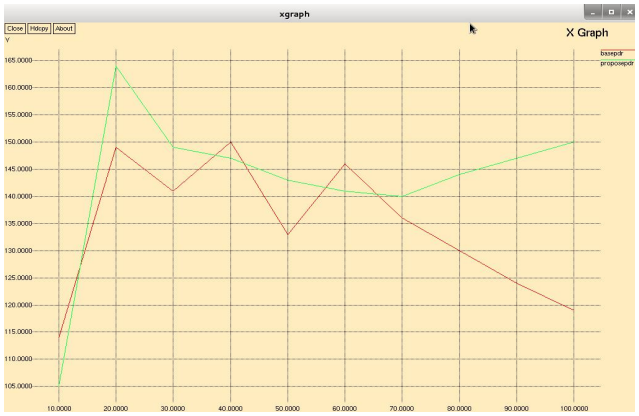

Figure 5. Packet Delivery Ratio Graph

2. Routing Overhead:

It is the total number of packets which is required to perform the communication of the sender and receiver nodes in the network. It is shown from the graph that our routing overhead is less in our proposed work which is good for our network.

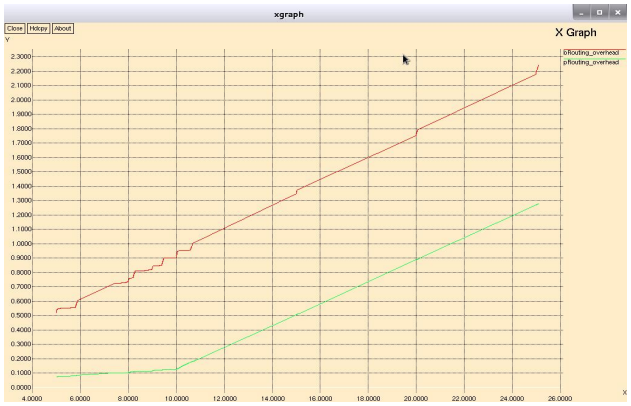

Figure 6. Routing Overhead Graph

3. Routing Overhead:

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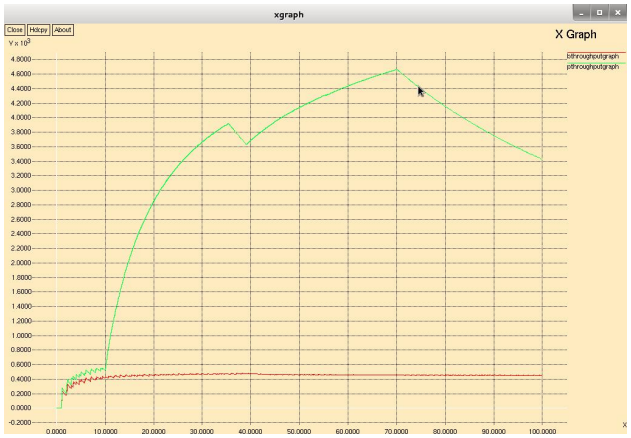

Figure 7. Throughput Graph

VIII. CONCLUSION

We discussed spin protocol which use Meta-data which is used at the initial level then each node store this Meta-data for further communication. In this paper, we mentioned clustering for the formation of clusters to send data from the optimal path. Cluster heads store the Meta data and then transmit it to the other cluster heads. With our proposed technique, we achieve more security of our data as it is only available at cluster head and it also reduces energy consumption. Storage is also main concern of our work as there is no need to store this data at each node.

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