Prolonged Network Lifetime and Data Wholeness By Clusters Using B-Ct Algorithm

M.Keerthika and Dr.P.S.Periasamy

Abstract-The unique characteristics of cost and rapid deployment of sensor networks feigns exciting applications in the areas of communication and in industrial automation, which makes the wireless sensor network, an integral part of our life. The key challenge in the design of WSN is being the power consumption of the entire network thereby prolonging the network lifetime. This is possibly being achieved by introducing the cluster head multicast routing communication. The existing methods lacks in minimizing the power consumption of data transmission from source to destination due to network overhead. Thus, the cluster head is built to overcome the deficiencies of existing works.The basic concept of cluster head is to perform filtering of raw data collected from its clusters and transmitting the filtered packets to the destination. This paper deals in performing the concept in two different topologies which abruptly reduces the network overhead and achieves in the reduction of total power consumption of WSN. Further, the implemented algorithm is validated through simulations and has proven its mere performance and scalability.

Index terms: Mobile sinks, wireless sensor networks, information retrieval, clustering, sensor islands, rendezvous nodes.

1 INTRODUCTION

A Wireless Sensor Network (WSN) is formed from a large number of tiny nodes deployed in a particular region of wireless networks. Each sensor node has its own availabilities with it. The specifications of these nodes vary, depending on the requirements and the application. Further the nodes has its advantage of using minimal power and memory. With those specifications the wireless sensor networks use the sensor nodes in various application. However, at the same time, WSNs pose a variety of challenges and difficulties. The typical WSN consists of two main components: sensors and sink. The main purpose of sensor is to sense , process and to collect the data from its sources. The sink, or base station (BS), is the place where the gathered data is received and then delivered to the user.Providing Quality of Service (QoS) support in WSNs for improving their timing and reliability performance under severe energy constraints has attracted recent research works. The standardization efforts of the IEEE task have contributed to solve this problem by the definition of the IEEE 802.15.4 protocol are cheap and its widely used in Wireless Personal Area Networks (WPANs). In fact, this protocol shows great potential for flexibly fitting different requirements of WSN applications by adequately setting its parameters (low duty cycles, guaranteed time slots (GTS)).

M.Keerthika is studying M.E Communication Systems, K.S.R. College of Engineering, Tiruchengode. And Dr.P.S.Periasamy is working as Proff & Head, Department of ECE, K.S.R College of Engineering, Tiruchengode. Keerthi.mks@gmail.com,periasamy.ps@gmail.com.

A PAN composed of multiple devices that have to transmit data to the PAN coordinator through single or multiple hops. We assume that the application requires periodic data at the PAN coordinator each node, upon reception of a query coming from the PAN coordinator, generates a packet and attempts to access the channel to transmit it.

Therefore, each node has only one packet per query to be transmitted. If the node does not succeed in accessing the channel before the reception of the next query, the packet is lost, and a new one is generated in the mode in which the beacon is enabled, the IEEE 802.15.4 protocol uses slotted CSMA/CA as a Medium Access Protocol (MAC). Even though the IEEE 802.15.4 protocol provides the GTS allocation mechanism for real-time flows, the allocation must be preceded by an allocation request message. However, with its original specification, the CSMA/CA which is slotted has no QoS support for such time-sensitive events, including GTS allocation requests, alarms, PAN management commands, etc., which may result in unfairness and in the reduction of network lifetime, particularly in high load conditions.

II. TECHNICAL OVERVIEW

Zigbee is cheap, low-power, wireless mesh network. First, it allows the technology to be widely used in various applications such as monitoring and deploying the sensors. Second, it allows low power-usage with longer life which employs only smaller batteries. Third, the given wireless mesh standard provides high reliability and wide range. It has not possess the capability of power network which is used along with other necessary elements. In other words, Zigbee protocol has its purpose not to support power line networking but intended to support for various smart applications. e.g. Penn Energy, which has its intent to require them to interoperate again via the open AN standards.

III.PROTOCOLS

The protocols build on recent algorithmic research (Ad-hoc On-demand Distance Vector, neuRFon) to automatically construct a low-speed ad-hoc network of nodes. In large wireless sensor networks, it has its group of clusters. Which can also group into a mesh or a single cluster. The beacn and non- beacon modes are supported by current profiles of the ZigBee protocol .

In unslotted CSMA/CA mechanisms it uses non-beacon interval mode . In such network zigbee has its robust power requirement out of which some met its power requirements whereas some needs external stimulus.The light switch being the best example. The lamp which uses ZigBee node will receive continous power supply, since it is connected to the given mains supply, while a power light battery will be in asleep mode when it is thrown. It then wakes up to receive the data, acknowledge it and then goes to sleep mode again. Such a network is used in lamp node and zigbee found its requirements in all such traits accordingly.

The beacon-enabled network uses special network nodes called ZigBee Routers which transmit periodic beacons in which other nodes confirm its presence. Nodes may swing between its duty cycle and battery life. Beacon intervals has its range from 15.36 milliseconds to 15.36 ms * 214 = 251.65824 seconds at 250 kbit/s, from 24 milliseconds to 24 ms * 214 = 393.216 seconds at 40 kbit/s and from 48 milliseconds to 48 ms * 214 = 786.432 seconds at 20 kbit/s. However, long beacon intervals with low duty cycle requires less power. In general, the ZigBee protocols use less power and as this being used in two different mode such as beacon and non-beacon, the power requirements is used accordingly. In beacon mode the node is active only at the time of transmitting and receiving data and in the remaining time, the nodes fall asleep. Whereas, in non-beacon mode the nodes should be active all the time through the entire network.

The general access mode is "carrier sense, multiple access/collision avoidance" (CSMA/CA). That is, the nodes talk as in the same way as persons do. It has its expectations in three ways such as time scheduling, message acknowledgement and not to use CSMA.. Finally, Guaranteed Time Slots used by devices in Beacon Oriented networks has low latency which by definition do not use CSMA indispensable in system such as IVC to have the ability of selectively revoke the group memberships of the compromised vehicles by updating keys or releasing Certificate Revocation Lists (CRLs).

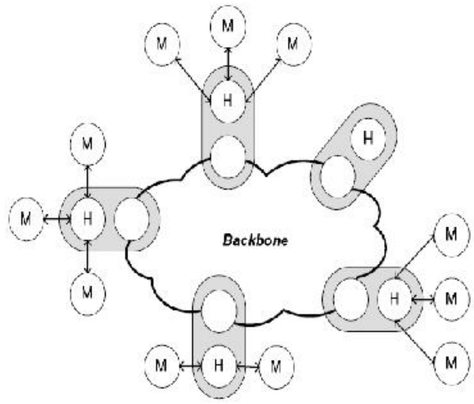
IV. CLUSTERING TECHNIQUE

The network is sectioned into a set of subnetworks, each of which is called a cluster. Ineach cluster, one node represents the others and is called the cluster head (CH). Since theCH is responsible for all of the events inside its clusterin which according to essential algorithm it moves to another node and form its CH when the probability is high. One of the notable protocolsthat follows this technique is LEACH and EDACH.Since LEACH in WSN is introduced first. TheLEACH (Low-Energy Adaptive Clustering Hierarchy) protocol, which is presented by Heinzelmanet al., is a well-known protocol that follows the clustering scheme. LEACH assumes thatthe nodes inside the fixed network , and that the base station is away from them. All nodes in the network are homogenous and energy constrained. However, in LEACHprotocol, some nodes consume more energy than others, which leads, over time, to somenodes being disconnected from its network. The main reason to use the LEACH protocol is to divide the network into a number of sub-networks called clusters.

Each clusterconsists of a fixed number of nodes in which the nodes vote and select its representative, theCH. Each sensor inside the cluster should send its data to the CH, which is responsible to deliver the data to its sink. As mentioned above, this process can lead the CH tohandle the most significant tasks inside the cluster, which means the CH loses its energy faster than the other nodes. LEACH is a Time Division Multiple Access (TDMA) –based protocol which gives time slots for each node to exchange data between its member nodes and their CH. The TDMA with round algorithm measures the probability of nodes becoming CH. The rounds are the corner stones of the LEACH protocol and algorithm. Each round is composed generally oftwo phases: setup phase and a steady-state phase. During the setup phase, the cluster is elected by creating the clusters. The second phase is responsible for distributing the timeslots among the network nodes.

V. BACK - BONE CLUSTER PROTOCOL

In the proposed protocol, the public buses which is mounted by circulating within urban environments on fixed trajectories and in its near-periodic schedule. We assumption that sensors are deployed in urban areas in which the proximity to public transportation vehicle routes in different area. Also, an adequate number of nodes are emplyed as RNs gives energy depletion and less throghput. Finally, separate clusters are grouped under SN.



The structure of a protocol node in the B-CT protocol is shown in Figure 2. The node has its backbone protocol in which cluster members do not join the backbone overlay topology. The B-CT node exploits a property of the overlay node design that permits a multiple internal overlay nodes contain in a overlay node. Virtual adapter is used to communicate via internet protocol, called a dummy adapter, and protocol messages from the internal protocol nodes are multiplexed on a encapsulation header. The Muliplexing protocol (MUX) is also performed by encapsulation header.

The B-CT protocol has only a single exchange of protocol messages, whose purpose is to assign a backbone logical address LABBone to a cluster member.

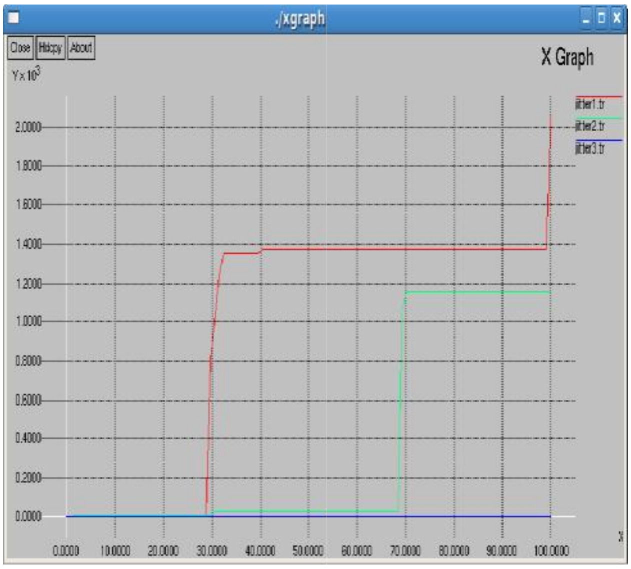
A cluster head send its request to the cluster members.In HyperCast, application data is forwarded in spanning trees that are embedded in the overlay topology. Each node forwards data to one or more of its neighbours in the overlay topology. A multicast message is forwarded downstream in a rooted tree that has the sender of the multicast message as the root. A unicast message is forwarded upstream in a rooted tree that has the destination of the message as the root. In HyperCast, each node can locally compute its upstream neighbour (parent) and its downstream neighbours (children) with respect to a given root note. In the B-CT protocol, the computation must consider neighbours in a cluster topology as well as in the backbone topology. If a B-CT that contains a CT node that is a cluster member, the situation is simple since a node has only one neighbour, i.e., its cluster head. Let us now look at a B-CT node that contains a cluster head.

The neighbourhood of this node is the union of the neighbours in the cluster and the backbone network. When this node calculates the downstream neighbours in the overlay network and it identifies the cluster network. If so, the neighbours in the downstream are all other cluster members and all downstream neighbours in a spanning tree that has the local node as the root. If the root is not one of its cluster members, then the downstream nodes consists of its downstream neighbours with respect to the given root in the backbone and all cluster members. An upstream neighbour uses any one of its cluster members(if the root is in its cluster), and in the backbone network (if the root node is not one of its cluster members).Thus, the overhead of multihop data relaying to the edge RNs is minimized. Given that the communication cost is several orders of magnitude higher than the computation cost in-cluster data aggregation can achieve significant energy savings. Also, we assume that each node has a fixed number of transmission power levels. Finally, we assume theunit disk model, which is the most common assumption in sensor network literature. The underlying assumption in this model is that nodes which are closer than a certain distance (transmission range R)can always communicate. However, in practice a message sent by a node is received by the receiver with only certain probability even if the distance of the two nodes is smaller than the transmission range. It will describe how our protocol can be adapted so that it can still work on the top of a morerealistic physical layer.

VI. SIMULATION RESULTS

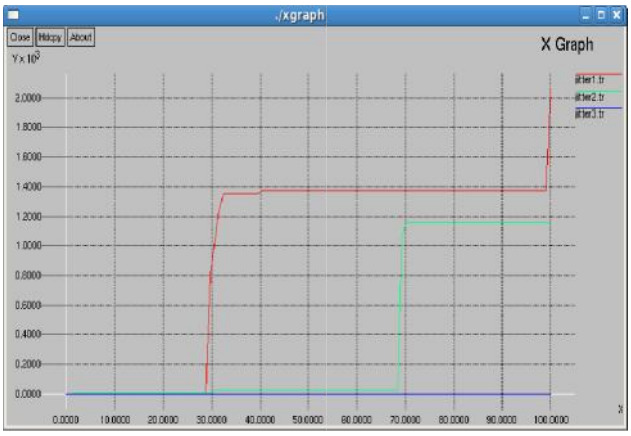
Distribution of traffic

graph 1, pstree as a function of N1, for different values of N, D, and SO, having set BO = 5, is shown. There exists an optimum value of N1 maximizing pstree , and this value obviously increases by increasing N and is approximately equal to √N; therefore, it is independent of D and SO. This means that, once we fix N, there exists an optimum split between level one and level two nodes, maximizing the probability of success traffic are shown.



Throughput

In graph 2, results related to the two topologies, showing the success probability as a function of N for different values of SO and BO by setting D = 5, are compared. For a fair comparison, the success probability is computed by fixing the same value of TB and, therefore, by giving to nodes the same time to transmit the data to thecoordinator.



To this aim, we set SO = BO for the star topology y, and we compare the case “star” with SO = BO = 1 with the case “tree,” with BO = 1 and SO = 0, whereas the case “star” with SO = BO > 1 (note that the cases SO = BO = 2, 3, etc., bring the same ps) are compared with the cases “tree” with BO > 1, whatever SO is. In the “tree” case, N1 is set to the optimum value maximizing pstreeobtained. As we can see, when BO = 1, the “star” is preferable since in the “tree” only one router has a part of the superframe allocated; therefore, many packets of level two nodes are lost. For BO > 1, instead, the “tree” outperforms the “star.” The difference between the “star” and the “tree” obviously increases by increasing BO and SO, resulting in an increase in pframe and ps, respectively.

Probability of success changes when different loads

The average delays obtained in case of star and tree-based topologies as a function of N are shown. The curves are obtained by setting D = 5 and N1 = 3 in the case of trees. The delays increase by increasing N since the probability of finding the channel busy and delaying the transmission gets larger. A horizontal asymptote is also present due to the maximum delay that a packet may suffer, which is equal to the superframe duration TA in the "star" case and to TB + TA in the "tree" case. As expected, the delays are larger for trees since packets coming from level two nodes need two super frames to reach the coordinator. Also note that by increasing BO, delays get significantly larger. The curves "tree" with SO=0, BO=3 and "tree" with SO = 1 and BO = 3 overlapped since TB assumes the same value and the delays of level one nodes are approximately the same (in fact, the curves "star" with SO =BO = 0 and SO = BO = 1 are also approximately the same).By comparing Figs. 11 and 12, we can finally deduce that the choice of the topology depends on the application requirements.

VII. CONCLUSIONS

This paper introduced backbone clustering protocol that proposes the use of urban buses to carry MSs that retrieve information from isolated parts of WSNs. The connectivity objective is to employ MSs to collect data from isolated urban sensor islands and also through prolonged lifetime of selected peripheral RNs which lie within the range of passing MSs and used to cache and deliver sensory data derived from remote source nodes. High data throughput is assured by regulating the number of RNs for allowing sufficient time to deliver their buffered data and preventing data losses.

Unlike other approaches, B-CT moves the processing and datatransmission burden away from the vital periphery nodes (RNs) and enables balanced energy consumption across the WSN through building cluster structures that exploit the high redundancy of data collected from neighbor nodes and minimize intercluster data overhead.

While comparing the performance of those three protocols,will get an minimum power consumption from the B-CT protocol.The performance gain of Backbone cluster over alternative approaches has been validated by extensive simulation tests.

REFERENCES

[1] Charalampos Konstantopoulos,Grammati Pantzi ou, DamianousGavalas, Aristides Mpitziopoulos, and Basillis Mamalis, "A Rendezvous Based Approach Enabling EnergyEfficient Sensory Data Collection with Mobile Sinks"., vol. 23, NO .5, MAY 2012.

[2] E. Hamida and G. Chelius, "Strategies for Data Dissemination to Mobile Sinks in Wireless Sensor Networks," IEEE Wireless Comm., vol. 15, no. 6, pp. 31-37, Dec. 2008.

[3] S. Olariu and I. Stojmenovic, "Design Guidelines for Maximizing Lifetime and Avoiding Energy Holes in Sensor Networks with Uniform Distribution and Uniform Reporting," Proc. IEEE INFOCOM, 2006.

[4] X. Li, A. Nayak, and I. Stojmenovic, "Sink Mobility in WirelesSensor Networks," Wireless Sensor and Actuator Networks, A. Nayak, I. Stojmenovic, eds., Wiley, 2010.

[5] B. Mamalis, D. Gavalas, C. Konstantopoulos, and G. Pantziou, "Clustering in Wireless Sensor Networks," RFID and Sensor Networks: Architectures, Protocols, Security and Integrations, Y. Zhang, L.T. Yang, J. Chen, eds., pp. 324-353, CRC Press, 2009.

[6] G. Chen, C. Li, M. Ye, and J. Wu., "An Unequal Cluster-Based Routing Protocol in Wireless Sensor Networks," Wireless Networks, vol. 15, pp. 193-207, 2007.

[7] S. Soro and W.B. Heinzelman, "Prolonging the Lifetime of Wireless Sensor Networks via Unequal Clustering," Proc. 19thIEEE Int'l Parallel and Distributed Processing Symp., 2005.

[8] J. Luo and J-P.Hubaux, "Joint Mobility and Routing for Lifetime Elongation in Wireless Sensor Networks," Proc. IEEE INFOCOM, 2005.

[9] M. Demirbas, O. Soysal, and A. Tosun, "Data Salmon: A Greedy Mobile Basestation Protocol for Efficient Data Collection in Wireless Sensor Networks," Proc. Int'l Conf. DistributeComputing in Sensor Systems (DCOSS '07), pp. 267-280, 2007.

Keerthika.M -Received B.E degree in Electronics and communication Engineering in Sengunthar college of engineering.She is pursing Master of Engineering in Communication Systems at K. S. R. College of Engineering. She presented a paper in an International conference at Magna Engineering College.and she is presented many papers in national level conferences, Her research interests include wireless sensor network, network security, and Digital image processing.

Dr.P.S.Periasamy- received B.E degree in Electrical and Electronics Engineering in Government college of engineering,Salem,University of Madras.and completed his M.E in Applied Electronics in Government College of Technology,Coimbatore,bharathiyar university,Tamilnadu.and he is presently working as a Proff & Head in K. S. R. College of Engineering**.**He published seven papers in international journal and two papers in national journal,his area of interest is Digital Image Processing,computr ntworks and signal processing,He pulished many papers in internatinal and national conferences.He is a life member of ISTE,IETE,BES,and CSI.