An Efficient Power Utilization Approach with Secure Data Transmission to Maximize the Life Time of Wireless Sensor Network with the Help of Duty Cycle Mechanism

Bhagyashree A V[1] , Khaja Moinuddin[2]

[1]Dept of ECE, RYMEC, Ballari, India
[2]Assosiate Professor, Dept of ECE, RYMEC, Ballari, India

Abstract:
Lifetime enhancement has always been a crucial issue as most of the wireless sensor networks (WSNs) operate in unattended environment where human access and monitoring are practically infeasible. Clustering is one of the most powerful techniques that can arrange the system operation in associated manner to attend the network scalability, minimize energy consumption and achieve prolonged network lifetime. An efficient path selection will reduce energy utilization on data transmission phase at this time data should be secure, by using RSA algorithm. In this paper, clustering mechanism and improvement in security is proposed. These two methods are used to decrease the energy consumption at data transmission phase and ensuring the security of the sensor data over wireless sensor .Key based security mechanism is used to secure the data. To ensure that any energy consumption associated with the role of the cluster head (CH) is shared between the nodes, the cluster head (CH) role is alternated between the nodes using duty cycle mechanism.

Keywords: Duty cycle, LEACH, security, wireless sensor network, cluster mechanism, intra and inter cluster key.

1. Introduction

The many applications of wireless sensor network gives many demands so this small no of wireless sensor nodes are controlling sensor battery and initialize the sensor randomly or passivity in crucial area where normal environment based networks are practically less. There are more essential issues like less vitality, less calculation limit, open place and remote correspondence makes the remote sensor arrange disappointments are more often than not. When the sensor hubs are instated that hubs have full battery capacity to support that put with no interference. A most genuine structures issue in remote sensor system to diminish the vitality utilization by utilizing equipment preserving, operating system and communication protocols .To increasing the sensor network lifetime and function to most successful utilizations of the sensor(wsn)in application's where interchanging or charging energy of the storage system(i.e. batteries') is impossible or not less cost. To propose the most important of many data collection of the application, full life extension sensor is most important. Even through more different types of technique are proposed to increase the network life of sensor's, the more famed application is to stable the sensor connection in the network in order to decrease the energy at an almost identical time or bit rate. In such proposal, routing protocol decision's to execute most important category in selecting the nodes paths in order's to stable energy in the sensor node. These days most advances in battery-fueling sensors hubs are expanded their applications and usefulness, incorporate full life observing like contamination checking condition checking, disappointment detection's, surveillance's, and web of-things applications. Cost is less and less size sensor nodes have gain the particular point in effective monitoring that involves millions of sensor nodes are measured and reported within a deployed area. Sensors nodes are typically scatter in a wide region without sophisticate coordination. Since

reviving the battery isn't conceivable, remote sensor systems (WSNs) are liable to vitality administration for boosting their lifetime.

2. Literature Survey

W. R. Heinzelman, A. Chandrakasan, and H. Balakrihnan [1] says Wireless scattered miniaturized scale sensor structures will active the strong checking of collection of circumstances for normal and army applications. In this concept, At correspondence traditions, which can have the colossal effect on the general imperativeness dispersal of these frameworks. In light of our disclosures that the standard traditions of straight transmission, slightest transmission imperativeness, multiple hop guiding, and static batching may not be perfect for sensor frameworks, we propose LEACH, a gathering based tradition that utilizations randomized turn of close-by bundle BS to similarly circle the essentialness stack among the sensors in the framework. In addition, LEACH can suitable essentialness scrambling similarly all through the sensors, duplicating the profitable structure lifetime for the frameworks we mirrored. Remote sensor systems (WSNs) comprises of unattended sensors with constrained stockpiling, vitality (battery power) and calculation and correspondence capacities. Along these lines, vitality proficient system for remote correspondence on every sensor hub is so critical for remote sensor systems.

S. Lindsey and C. S. Raghabendra,[2] In a Sensors consist of nodes with certain amount of the batter power and without wire connection are initialized to collect most useful data from the deployed sensor field. sensed information effective energy is more crucial to execute wireless senor nodes for high amount of time sensing data gathering issues by round's of connection, when each sensor node sense the data after sensing it sends the data to the bs. Every sensor hub send the information to base station effortlessly control is drained

I. Gupta, D. Riordan, and S. Sampalli, [3] is making remote sensor hubs, the most critical vitality utilization in light of the fact that the length of the sensor hub battery control more restricted. To conquer the power issue more papers are proposed. The gathering of hub is most essential methodology. In this bunching, the ch(cluster heads) gather information from other sensor hubs ,over all data is add up to it and send

collected data to bs. In this strategy, hubs can be decrease connection and communication cost that might be produced. In case each sensor sends data individually to base station more energy wastage and communication overhead should be happen. LEACH-2 protocol is most familiar sensor grouping that cluster the sensors mechanisms. Each sensor network chooses once cluster head. This procedure might lessen the sensor arrange lifetime since LEACH-2 does not consider the exploring of sensor center points and the essentialness remains of each center point.

J.-M. Kim, S. H. Park, Y. J. Han, and T. Chung, [4] we propose the sensor network, the sensor vitality is the more vital issues on the grounds that the lifetime's of the sensor hub's are constrained by its batteries. To conquer this issue many work have been finished. The grouping is the fundamental methodologies. In the gathering ,the pioneer hub gather the data from different hubs then all figured data should be aggregated to system after calculating all data when head node find the most important data is transferred to BS. After the receiving the data analyze whether condition give the alert to the people. Using this wore we can overcome the energy problem and communication overhead avoiding the delay of the networks reliability, stable network. When base station want to reveal all sensing information means base station give the request to cluster head .cluster head accept the request send to particular information to base station using this information cluster head check sensing information using this system we can overcome the memory wastage problem also.

3. Methods
3.1 Existing system

To increase the full lifetime of the networks, developments of the energy methodical path finding protocol is a main affair in connectionless sensing nodes. Grouping Protocols are first main approaches to distribute. In existing system LEACH is a various leveled steering convention that structures groups with two sorts of sensor hubs: bunch head and bunch part. Bunch heads are arbitrarily chosen for particular timeframe. Information is transmitted from bunch individuals to a group head. At that point it is totaled and sent to receiver from the group head.

Disadvantages:
LEACH-M protocols have certain limitation in practical deployment:

- This protocols want skills are require to obtaining the sensor location with extra hardware functionalities such as GPS.
- The collecting sensor data required for grouping at the base station (BS). When the base station induced unwanted signaling overheads.
- Gathering calculation's are utilized in those conventions are consider the vitality devouring, association between the bunch head and enrollment hubs just yet inability to fuse that association between bunch head and the base station, which has an importance affect on the gathering framing.
- Security lacking of the data is not considered on the LEACH-M protocol. Only energy efficiency achieved by using clustering mechanism at data transaction phase.

3.2   Proposed System

Grouping the set of nodes as a cluster's to reduce the work load of the sensor nodes by doing co-operative communication. In group one of the nodes will be select as cluster head (CH) and other sensor nodes are identified as member nodes. Member nodes have responsibilities. Such as data collection and forwarding to data head node. Head node has the responsibility such as collecting member node data, aggregating collected data, finding the path to base station and routing the data. Due to huge work load more energy depletion occurring at head node. So periodical switching of the head role among different nodes are followed to share the work load. This process is called head selection process.

In this work an effective CH (cluster head) selection mechanism is used to select the sensor node as head of the group. Our head selection logic considers balance energy of the node, distance between base station and the node, concentration of the nearby nodes are considered as parameters which is deciding the head node. In additionally to this Key based security mechanism is used to secure the sensor data.

Whenever network is implemented unique private key will be allocated to each sensor node by base station. Once sensor node is selected as head node it will generate the cluster key and advertise to its sensor nodes in the group. Collecting Data from the group member node will be validated by using the cluster key. If data coming from valid cluster key from member it will be accepted by head node. Else head will identify the sender node of the data as unknown node and it will eliminate the data from unauthorized node.

After collecting the data from member nodes head will aggregated the sensor data and it will encode the data by using RSA algorithm by using pre defined prime keys which will be available only on member of the group and base station. Then encoded data of the group will be redirect to the base station with pk (private key) of the head or leader node. SPA (Shortest path algorithm) is used to decrease the energy consumption on data transaction phase. At the BS(bas _station) side keys of the leader node will be validated and data will be reached by the BS(base station). Intra cluster data transaction will be secured by using cluster key and Inter cluster data transaction will be secured by using individual key. Cluster key will be modified in every round by leader node to avoid the compromising attacks.

Advantages:
- Less time consumption on security process
- highly secured data transaction using RSA technique
- Distance factor reduces energy consumption in intra cluster data communication
- node reach ability of the head node decreases communication overhead

3.3   System Implementation

The implementation phase is significant phases in the project development as it affords final solution that solves the issues. In this phase the low level designs are transformed into the language specific programs such that the requirements given in the SRS are satisfied. The phase requires actual implementation of ideas that were described in analysis and design phase. The technique and the methods that are used for implementing software must support reusability, ease of maintenance and should be well documented.
System implementation involves four modules.

1) Network initialization:

In this module, 'N' number of sensor hubs are made and arbitrarily conveyed in system region. Each sensor nodes equipped with initial energy as 100 joules to perform its functionalities such as data sensing, routing. In this stage, base station is assigning individual key for the entire node and maintaining generated key details in its

key base. This key will be used for secure data transaction by the nodes in further modules.

2) Cluster generation:

      In this module, 'n' cluster groups are identified with the help of deployed location of the nodes. For each cluster boundary values will be fixed in random manner. Nodes which are placed within the boundary of the cluster will be grouped as single cluster.

3) Cluster head selection:

      In each cluster head node will be elected by using this head selection module. In this module every hub execution characters, for example, remaining vitality, remove with base station and fixation factors are calculated and node status identification rules are applied on the nodes parameters to identify member function results such as less, average and high. Later these member function details will be input to head selection rules to decide the confidence factor which is the main possibility factor of the node to act as head node. At the end of head selection process, head nodes are identified in each cluster. Once head node is elected it will generate a random key as cluster key in each cluster. Then this key will be advertised to each member node of the cluster to use at the time of intra cluster communication.

4) Data transmission:

      Once clustering and head selection is completed, each node sense the data from its coverage area and forwarding to luster head node which is identified as intra cluster communication. In this process each member node will add the cluster key with the data to reveal it as genuine member of the cluster. Head will receive the data and it will compare key of the sender with its generated key value. If both are matching sender will be identified as genuine   and data will be accepted by head to aggregate the data. Else sender will be identified as unknown node and its data will be avoided from aggregation process. After collecting the data from its member node each head in clusters starts the data aggregation process. At the end of data aggregation it will discover the course to transmit the information to base station. After identifying route head will encode the data with RSA technique and individual private key which is given by BS at the time of network initialization will be added with encoded aggregated data. Finally head node

forwards encoded aggregated data to base station which is identified as inter cluster communication. At base station, key on the aggregated data will be validated by comparing key base of the base station If the key of head is valid then data will be accepted by base station else it will be avoided by base station.

4.   Results And Discussion

Packet delivery ratio is defined as a percentage of nodes that successfully receive a packet from the tagged node among the receivers that are within transmission range of the figure 1 shows the packet delivery ratio between Leach-m and proposed system is shown.Y-axis represents values of packet delivery ratio,x-axis represents time. PDR of proposed system is high compared to LEACH-M.

Figure 1: Packet Delivery Ratio

The distinction between the quantity of packet recived and the quantity of packets sent is known as packet drop. Packet drop is typically caused by network congestion. Packet drop is measured as a percentage of packets lost with respect to packets sent. Packet drop means overall number of dropped packets divided by overall number of sent packets. Packet drop occurs when one or more packets of data travelling across a computer network fail to reach their destination. Figure 2 shows the packet drop between proposed system and existing system.Y-axis represents the loss and X-axis reprents the time.Packet drop is reduced in proposed system compared to existing system.
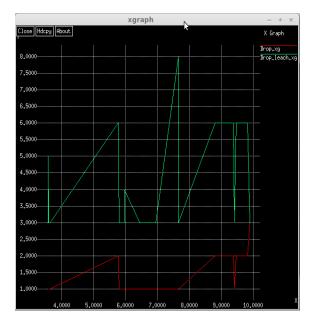
Figure 2: Packet Drop

The vitality show speaks to the vitality level of hubs in the system. The vitality show characterized in hub has an underlying quality that is level of vitality the hub has toward the start of the recreation. In reproduction, the variable vitality speaks to the vitality level in a hub at any predefined time. The vitality utilization level of a hub whenever of the recreation can be controlled by finding the contrast between the present vitality esteem and initial energy esteem. The measure of vitality utilization in a hub can be imprinted in the follow record. The vitality level of a system can be controlled by adding the whole hub's vitality stage in the system. Figure 3 shows energy consumption for both proposed system and existing system. Y-axis represents energy and X-axis represents node. Energy consumed by proposed system is lesser than the energy consumed by Leach
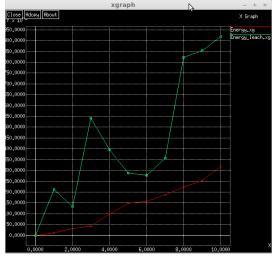

Figure 3. Energy consumption graph

5. Conclusion

Energy efficiency and security are the important factors of the wireless network which decides the quality of service of the entire network operations. Proposed method will decrease the energy consumption as well as improve security of data over the network. Energy consumption is reduced at data transmission phase by using the cluster mechanisms. A key based encoding and decoding mechanism is used to ensure the security of the network. Collected data of the sensor nodes are flagged with cluster key and validated by head node. Data from any node without cluster key will be identified as invalid member's data to avoid external attacks. At cluster head data from valid member nodes are aggregated and individual key of the head node is flagged with data and RSA based encoding is applied on the data finally base station validate key of the data and accepts the data as valid one. By using these approach energy consumption in the network reduced by using co-operative behavior and security of the network also improved using key based encoding scheme. Consequently this approach provides better results in life time and security of the network.

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