

# An Exploration on Existing Methods for Data Aggregation in Wireless Sensor Network

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**Abstract:** WSN is the field where most challenging task is a lifetime of nodes with the support of data aggregation and can increase the lifetime of the network. In some utility comparable to wireless sensor community, knowledge mining, cloud computing data aggregation is the technology which is mostly used. In diverse sensor applications, the data has been gathered from the different individual nodes and aggregating at a base station. For reducing the consumption of energy, various networks execute in network aggregation of data at the neighbouring nodes and route to the base station. The main challenge is to secure aggregated data from disclosing during an aggregating process as well as to obtain accurate aggregated results.

**Keywords:** WSN, Data-aggregation, network aggregation.

## I. INTRODUCTION

A wireless sensor network is a set of huge amount of sensor nodes with one base station. The node is an autonomous device that consists of mainly three units that are sensing, processing, communication and power supply. These sensors are used in the collection of data in the form of information from the nearby environment and pass it on to the base station. The collected data is processed, analyzed and presented to a useful application. New trends in wireless communications are the low-power electronics and power harvesting capabilities have enabled the development of low-cost WSNs. WSNs are characterized by limited battery backup, Unreliable communication, requirement for self-configuration and scalability, cooperative network behaviour and random deployment. Saving of battery power major acceptable challenge non-replaceable battery is used in the WSN. The vast area for the research to develop the energy efficient routing protocols since a lot of work has been on the power saving mechanisms and routing protocols to support efficient packet delivery to their destination. Selection of appropriate routing strategy becomes a typical task for researchers to deliver the information to their appropriate position to the maximization of the lifetime of the particular network. Based those characteristics, the applications of Wireless sensor network are environmental monitoring, medical area, terror threat detection, terrestrial and marine monitoring, disaster managements [1].

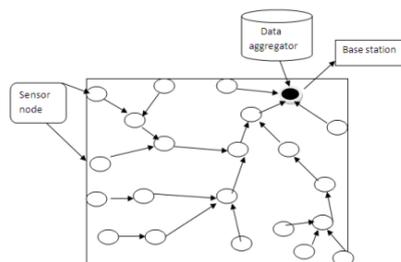


Fig.1 Scenario of Data aggregation

## II. RELATED WORK

The main concept of data aggregation is the process where data coming from different sensor nodes merge route and eliminating redundancy by analysing information so that minimizing the number of transmissions and in this way the energy of WSN is saved. By using various method of data aggregation, improve the performance of other parameter like robustness (system resist at the time of failure) and accuracy (correctness) of the entire network. Researchers focus on to reduce the traffic load and conserves power of the sensors [4]. The basic requirement of unattended operation in remote or even potentially hostile locations, sensor networks are extremely limited power. Redundancy in sensor data is common due to sensing the particular event by many sensor nodes. Network filtering processing techniques can help to reduce the energy resources.

Data aggregation has been put forward as the most important paradigm for wireless routing in sensor networks [3]. The architecture of the sensor network plays essential role in the efficiency of data aggregation protocols. These protocols will also be labelled centred on network items. There are two categories: Tree-based data aggregation and cluster-based data aggregation. Cluster-based data aggregation is the procedure of combining the information coming from quite a lot of sources and en route them after removing redundancy corresponding to toughen the overall network lifetime. The in-network processing is completed on the aggregator node.

An Aggregation scenario utilizing Clustering in the cluster heads acquire the information from the entire neighbours' sensor nodes and forwarded that information to the Base Station (Sink Node). The Base station sends that knowledge to the outside network via internet [5].

Ramesh Rajagopalan et al [12] recommended that, data aggregation makes an attempt to collect the most basic knowledge from the sensors and make it on hand to the sink in a power effective method with minimum data latency. The concept of Data latency is most important in lots of applications similar to atmosphere monitoring where the freshness of knowledge is also the most important aspect. It's vital to enhance energy effective data aggregation algorithms in order that network lifetime is superior. There are several factors which examine the vigour effectively of a sensor community comparable to network structure the information aggregation mechanism and the underlying routing protocol.

P. Kumarawadu et al [13], provided a comprehensive detailed analysis of clustering algorithms available for wireless sensor network and classify them based on the cluster formation parameters and cluster head (CH) election criteria. We additional learn the important thing design challenges and discuss the performance disorders associated clustering algorithms. Further summarize some more issues that should be considered in future researches in clustering.

Perwaiz et al [14], discussed about Data-Centric centered the subclass, about Directed Diffusion. All protocols including DD and variations have a typical goal for conserving energy and lifetime is expanded of the sensor system without lessen the delivery of information. This study has given knowledge of Distributed Diffusion and its variations in brief.

Suat Ozdemir et al [11] explain that, as the majority of wireless sensor applications require a precise level of safety, it's not possible to sacrifice security for data aggregation. Moreover, there's a robust conflict between safety and data aggregation protocols. Security protocols require sensor nodes to encrypt and authenticate any sensed knowledge prior to its transmission and decide upon knowledge to be decrypted with the aid of the bottom station. Then again, data aggregation protocols decide on undeniable data to put into effect data aggregation at every intermediate node so that power affectivity is maximized. In addition, a data aggregation outcome in alterations in sensor data and thus it's a difficult project to provide supply and data authentication together with data aggregation. Because of these conflicting objectives, data aggregation and security protocols must be designed collectively so that data aggregation may also be performed without sacrificing security.

Boyinbode et al [15], there are many algorithms that based on the clustering in the data aggregation methods. In which main intention mostly on distributed clustering approach because of suitability of large-scale sensor network. Utilization of energy during formation of network and its maintenance is high and challenge for scheduling in intra and inter-cluster transmission, making of optimality on cluster size and selection of cluster head in order to increase the lifetime of network.

Guo et al [16] Securities is the main aspect in current scenario in wireless sensor network. In this paper main focus on how to security implemented in data aggregation approaches are manage depend on four stage that are bootstrapping, information aggregation in the node ,verification and comfort.

Renjith et al [17] in this paper main focus on different type network architecture and its characteristics and discovered unique types of data aggregation scheme founded on network architecture, tactics and efficiency characteristics. Based on the power conservation, question processing, conversation & uncertainty in sensor readings.

John Major et al [18] explained, a number of data aggregation schemes centred on privatizes homomorphism encryption were designed and reviewed on WSN. Cluster heads can precisely mixture the cipher texts without decryption; accordingly, transmission overhead is lowered. Though, the bottom station most effective fetches the aggregated outcome, which foundation two problems. First, the usage of aggregation perform is obliged. 2d, the base station cannot verify the data integrity and authenticity. In this paper go to overcome the above two drawbacks. Within the design, the bottom station can recover the entire sensing data even the information has been aggregated. Apart from, the Design has been concluded and adopted on each homogeneous and heterogeneous wireless sensor networks.

Mousam Dagar et al [19], described security necessities in data aggregation that is confidentiality and integrity, must be consummated. Chiefly, the most important protection obstacle is data confidentiality that protects the touchy transmitted information from passive attacks, and eavesdropping. Data confidentiality is exceptionally very principle in a hostile atmosphere, the place the wireless channel is at risk of eavesdropping. Though there are lots of ways offered through cryptography, the complex encryption and decryption operations, like modular multiplications of giant numbers in public key primarily centred cryptosystems, will assign the sensor's energy rapidly. The other safety challenge is information integrity that stops the compromised source nodes or aggregator nodes from notably altering the ultimate aggregation price. Sensor nodes are handy to be compromised considering that they lack highly-priced tampering-resistant hardware, and even that tampering-resistant hardware would possibly not continually be safe. A compromised node will alter, forge or discard messages.

### III. DATA AGGREGATION TECHNIQUES

#### A. Structure Free Data Aggregation

Structure free data aggregation is the most suitable method to save the power consumption of the sensor nodes that are deployed in the random manner. This type of aggregation is manipulated by using the concept of local information. In this aggregation there is no loss of energy to make a structure of the sensor nodes. The main benefit

is flexibility along with power saving for enhancing the lifetime of the particular nodes in wireless sensor network. In some critical condition advantage of this aggregation may got shrink if the range of transmissions do not produce output in the packet that meet temporally at the transition sensor nodes [7].

**B. Structured Data Aggregation**

In this aggregation method wireless sensor nodes possess a well structure for gathering information. In this network sensor nodes define particular structure on the basis of its requirement that depend on the strategy of the aggregation. Different type of structure that used data aggregation methods like flat, tree, cluster and grid base network in such a way to maintain overhead in real time in the event based mechanism [6,9]. In mainly cases due to excessive communication overhead computations in dynamic scenario is not possible and required knowledge about the position of the nodes [8].

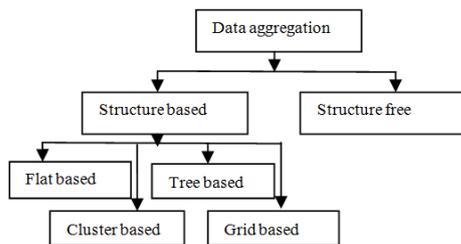


Fig.2 Data aggregation Techniques

Comparison between Structure based and Structure free techniques	
Structure based	Structure free
Increased overhead due to construction and maintenance of structure.	Since it is structure free it's cost effective to manage it.
Due to excessive it is not possible to compute overhead.	Due to mobility there is no overhead.
Performance of structured algorithm is sensitive.	Any link failure does not affect the aggregation performance.
Requires knowledge about the position of nodes.	Structure free techniques have great potential for event based applications.

Table.1 Comparison between Structures based and structure free techniques

**C. Data Aggregation in Flat networks**

In this network each sensor nodes have a same battery power and plays the similar type of role in a network. In this type of networks, data aggregation is done in data centric routing manner. The sink usually sends a data packet to the sensor nodes, for example, flooding. Sensors that have data matching the data packet along with transmit response data packet back to the sink in the flooding. In these aggregation methods normally node has the same role and sensor nodes cooperate with each other to perform the sensing task. Since the number of these

types of node is very large, so it is not possible to allocate a global identifier to each node. Therefore, Data centric routing is used, in which the base station sends queries to assured regions and waits for data from sensors located in the preferred regions [5].

**D. Hierarchical or Cluster based Data Aggregation**

In Hierarchical-based data aggregation, the similar kind of sensor nodes are subdivided into small group also called as clusters. There is a cluster head in each small group of the cluster. The head is generally selected to collect the data locally and transmitted the final result to the base station. Using radio transmission of long range, the clusters head can directly communicate with the sink in this way reduce the power consumption in the whole sensor network [11]. There are some types of Hierarchical or Cluster based Data Aggregation which is following.

**Cluster-Based Networks for data aggregation:** In this data aggregation method larger wireless sensor network is split into small network or into small cluster. Each cluster has a special kind of node that call cluster head ,there are many parameter on the bases like Euclidean distance, threshold criteria, weight matrix and genetic algorithms are uses for the selection of head of the cluster. In which sensor node communicate with the head of the cluster instead of base station and head send information to base station so that energy of sensor node can be saved in more efficient way.

**Data Aggregation in chain based network:** In this type of data aggregation, each sensor node sends data to the neighbour node i.e. adjacent to those sensor nodes. In which sensor nodes formulated into chain form in linear manner to performing data aggregation. The formation of nodes into chain by using the greedy algorithm or the sink can decide the chain in centralized pattern.

**Tree-Based Data Aggregation:** In this data aggregation method all nodes of the network are form a tree like structure in the hierarchy maintains. In which information aggregation process execute at the midway of the tree and data transmit by the leaf node to root node in this way reduce the energy of the network by maintain the distance between the sensor nodes.

**Grid-Based Data Aggregation:** Data aggregation is a kind of technique where no. of sensor is used to find out the region of sensor network, this sensor send the data packet from sender to data aggregator of that grid directly. Node of sensor inside the grid does not communicate with each other [8].

**IV. CONCLUSION**

WSN is a combination of sensor node and they can communicate together with in certain limit. There are several uses of wireless sensor network like monitoring, safety and military, disaster, and administration etc but having some limitation of using the resources of sensor network and limited capability of sensor node like

communication capacity, sensing computational potential and lifetime of sensor node, it is used in hazardous environment where all the possibility of communication is very low. So here data aggregation is most useful approach in WSN which is used to perform the communication operation between the two parties. In this research, we are forwarding with the technique of data aggregation and its associated operation.

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