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## Review Paper on Design and Simulation Result Analysis of Data Aggregation in Ns2 for WSN with Security

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*Abstract Nowadays, Wireless Sensor Networks (WSN's) are becoming more and more promising and applicable to a variety of fields: military, environmental, medical, wild life habitat, and transportation as well wearable devices, target-tracking. Wireless sensor networks (WSNs) have significant potential in many application domains such as agriculture, health, environmental monitoring, battlefield surveillance, and wild fire detection. They, however cannot be used in large geographical areas due to the short communication range of sensors.. In addition, sensor networks have been the lack of available network management and control tools, such as for determining the degree of data aggregation prior to transforming it into useful information. Designing different network management tools such for routing, localization, and data aggregation are, therefore, required in large scale WSNs. Only few of the existing data aggregation methods have been developed for a large scale WSN. In this paper we have do a review of some literature and techniques for data aggregation in large scale WSN.*

**Keywords—** Availability, base station (BS), cluster head (CH), Data Aggregation, Data Clustering wireless sensor network (WSN).

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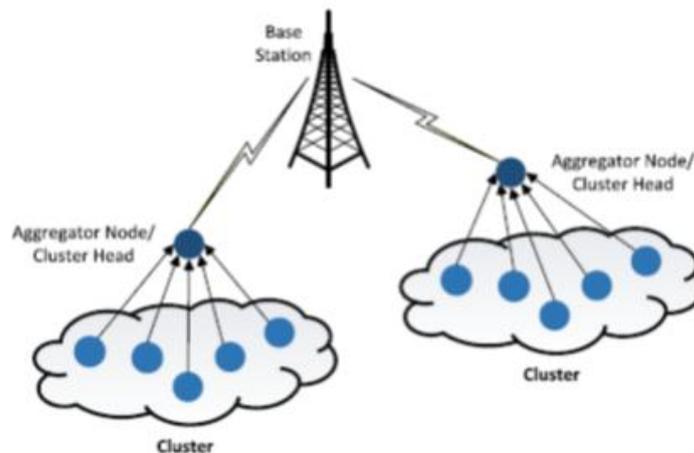
### I. INTRODUCTION

With advance in technology, sensor networks composed of small and cost effective sensing devices equipped with wireless radio transceiver for environment monitoring have become feasible. The key advantage of using these small devices to monitor the environment is that it does not require infrastructure such as electric mains for power supply and wired lines for Internet connections to collect data, nor need human interaction while deploying. These sensor nodes can monitor the environment by collecting information from their surroundings, and work cooperatively to send the data to a base station, or sink, for analysis. Clustering in WSN [6] the process of grouping the sensor nodes in a densely deployed large-scale sensor network is known as clustering. The intelligent way to combine and compress the data belonging to a single cluster is known as data aggregation in cluster based environment. There are some issues involved with the process of clustering in a wireless sensor network. First issue is, how many clusters should be formed that could optimize some performance parameter. Second could be how many nodes should be taken in to a single cluster. Third important issue is the selection procedure of cluster-head in cluster. Another issue is that user can put some more powerful nodes, in terms of energy, in the network which can act as a cluster-head and other simple node work as cluster-member only [1-3].

### II. DATA AGGREGATION

This is an address centric approach where each node sends data to a central node via the shortest possible route using a multihop wireless protocol. The sensor nodes simply send the data packets to a leader, which is the powerful node. The leader aggregates the data which can be queried. Each intermediate node has to send the data packets addressed to leader from the child nodes. So a large number of messages have to be transmitted for a query in the best case equal to the sum of external path lengths for each node [7-8]. In-Network Aggregation: In-network aggregation is the global process of gathering and routing information through a multi-hop network, processing data at intermediate nodes with the objective

of reducing resource consumption (in particular energy), thereby increasing network lifetime. There are two approaches for in-network aggregation: with size reduction and without size reduction [9-10]. In-network aggregation with size reduction refers to the process of combining & compressing the data packets received by a node from its neighbors in order to reduce the packet length to be transmitted or forwarded towards sink. In-network aggregation without size reduction refers to the process merging data packets received from different neighbors in to a single data packet but without processing the value of data. Tree-Based Approach: In the tree-based approach perform aggregation by constructing an aggregation tree, which could be a minimum spanning tree, rooted at sink and source nodes are considered as leaves. Each node has a parent node to forward its data. Flow of data starts from leaves nodes up to the sink and there in the aggregation done by parent nodes. Cluster-Based Approach: In cluster-based approach, whole network is divided in to several clusters. Each cluster has a cluster-head which is selected among cluster members. Cluster heads do the role of aggregator which aggregate data received from cluster members locally and then transmit the result to sink [12-14].



**Fig.1 Secure Data Aggregation Model**

Security in Wireless networks is vulnerable to security attacks due to the broadcast nature of the transmission medium. Furthermore, wireless sensor networks have an additional vulnerability because nodes are often placed in a hostile or dangerous environment where they are not physically protected.

### **Cryptography**

- Cryptography is basically the conversion of data into a secret code for transmission over a public network. Today's cryptography is more than encryption and decryption. Cryptography is the study of “mathematical” systems for solving two kinds of security problems: privacy and authentication [3]. 3.1 Private Key Cryptography A single key is used for both encryption and decryption. Encryption the data is encrypted by any encryption algorithm using the key. Only the user having the access to the same ‘key’ can decrypt the encrypted data. Examples are AES, 3DES etc.
- 3.2 Public Key Cryptography In public key cryptography each user or the device taking part in the communication have a pair of keys, a public key and a private key, and a set of operations associated with the keys to do the cryptographic operations . Only the particular device knows the private key whereas the public key is distributed to all devices taking part in the communication. Examples are RSA, etc.

### **III. LITERATURE SURVEY**

**DATA AGGREGATION APPROACH IN WSN** Data aggregation process is performed by specific routing protocol. Our aim is aggregating data to minimize the energy consumption. So sensor nodes should route packets based on the data packet content and choose the next hop in order to promote in network aggregation. Basically routing protocol is divided by the network structure, that’s why routing protocols is based on the considered approaches.

**Tree-Based Approach:** The tree based approach is defining aggregation from constructing an aggregation tree. The form of tree is minimum spanning tree, sink node consider as a root and source node consider as a leaves. Information flowing of data start from leaves node up to root means sink (base station).Disadvantage of this approach, as we know like wireless sensor network are not free from failure .in case of data packet loss at any level of tree, the data will be lost not only for single level but for whole related sub tree as well. This approach is suitable for designing optimal aggregation techniques’[15-16].

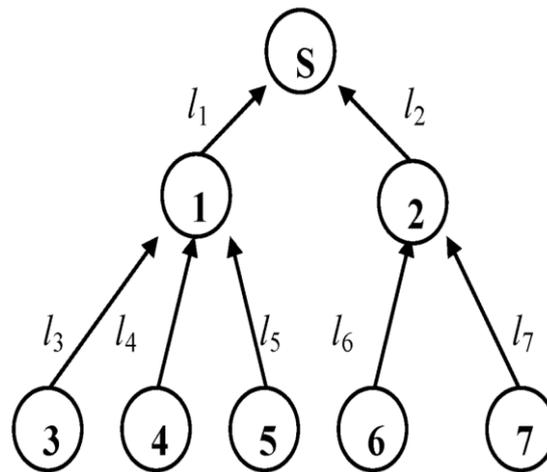


Fig. 2 Tree base Aggregation model

**Cluster-Based Approach:** In energy-constrained sensor networks of large size, it is inefficient for sensors to transmit the data directly to the sink in such scenarios, Cluster based approach is hierarchical approach. In cluster-based approach, whole network is divided in to several clusters [11]. Each cluster has a cluster-head which is selected among cluster members. Cluster-heads do the role of aggregator which aggregate data received from cluster members locally and then transmit the result to base station (sink). Recently, several cluster-based network organization and data-aggregation protocols have been proposed for the wireless sensor network. Figure shows a cluster-based sensor network organization.

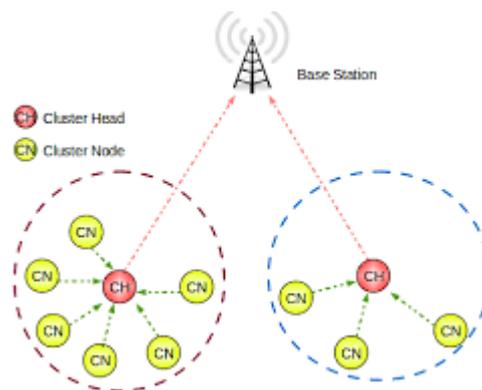


Fig.3 Cluster-Head base Aggregation model

**Multi-path Approach** The drawback of tree based approach is the limited robustness of the system. To overcome this drawback, a new approach was proposed by many researchers .in which sending partially aggregated data to single parent node in aggregation tree, a node could send data over multiple paths. In which each and every node can send data packets to its possibly multiple neighbours [4]. Hence data packet flow from source node to the sink node along multiple path, lot of intermediate node between source node to sink node so aggregation done in every intermediate node. Using this approach we will make the system robust but some extra overhead.

**Hybrid Approach:** Hybrid approach followed between tree, cluster based and multipath scheme. In which the data aggregation structure can adjusted according to specific network situation and to some performance statistics.

#### IV. PLANNING OF WORK/METHODOLOGY

In our new proposed protocol, the cluster contains access points which is having very high energy (unlimited) compared to cluster head. So here instead of cluster head, we are using Access points. The Access points are just like mini base stations. Each and every cluster has an access point. Every time there is no need to form new cluster head as there are no cluster heads. When the nodes rotate then also we have the same access point i.e. head. We have implemented this protocol using Ns2 Simulator. Network Simulator (Version 2), widely known as NS2, is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding

behaviour's. Due to its flexibility and modular nature, NS2 has gained constant popularity in the networking research community since its birth in 1989. NS2 provides users with executable command ns which takes on input argument, the name of a Tcl simulation scripting file.

## V. SOFTWARE USED AND SIMULATION RESULT

### Software NS-2

We use NS-2 (v-2.35), a network simulation tool to simulate wireless communication network. NS2 is discrete event simulator developed. It provides a good platform for wsn simulation. The random way point model is selected as a mobility model in a rectangular field (2000 x 2000 m<sup>2</sup>). AODV is used for simulation at network layer. Nodes send constant bit rate (CBR) traffic at varying rates.

The performance of Energy Efficient based Cluster protocol in Wireless Sensor Network (WSN) is being estimated with the help of simulation on network simulator-2.

Following results will be calculated by using performance .awk script. Using the output we plotted the bar graphs of following parameters .The result is carried out by NS-2 Simulator using following Parameters.

- Throughput
- Packet Delivery Ratio
- Energy Consumption
- Average End to End Delay
- Normalized Routing Load

System Configuration	
UBUNTU	12.04
CPU	Intel® Core2 Duo 1.80 GHz
RAM	3GB

## CONCLUSION

In our research, based on the results of simulation a comparative analysis was done between selected aggregation approaches and the results were documented. The performance has been evaluated based on parameters that aim to figure out the effects of routing protocols. By comparing these protocol performances, wireless sensor network is consisting a large number of sensor nodes. And these nodes are resource constraint. That's why lifetime of the network is limited so the various approaches or protocol has been proposed for increasing the lifetime of the wireless sensor network. In this paper we discuss the data aggregation are one of the important techniques for enhancing the life time of the network. And security issues is data integrity with the help of integrity we reduce the compromised sensor source nodes or aggregator nodes from significantly altering the final aggregation value.

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