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Comparative Study of Existing Efficient Data Transmission Protocols in Cluster-Based Wireless Sensor Networks

Durga Nikam¹, Vijaya Yaduvanshi², Sonali Jadhav³

Assistant Professor, Department of Electronics and Telecommunication, SKN College of Engineering, Pune,
Maharashtra, India¹

Assistant Professor, Department of Electronics and Telecommunication, SKN College of Engineering, Pune,
Maharashtra, India²

Assistant Professor, Department of Electronics and Telecommunication, SKN College of Engineering, Pune,
Maharashtra, India³

ABSTRACT: Remote Sensor Network (WSN) has developed endlessly in the previous couple of years and pointing out the vital requirement for versatile and energy efficient network. Clustering is a powerful and down to earth approach to upgrade the framework execution of WSNs. In this paper, we contemplate a safe information transmission for cluster based WSNs (CWSNs), where the clusters are shaped progressively and occasionally. Security and energy efficiency in WSN is testing task due to constrained assets of accessible vitality and handling power. We look at secure and effective information transmission (SET) conventions for CWSNs, called Leach, SET-IBS and SET-IBOOS, by using the identity-based digital signature (IBS) scheme and the identity-based online/offline digital signature (IBOOS) scheme, respectively. In writing survey, researcher proposed various routing protocols in WSN, in which cluster-based routing protocols shows better performance as compare to other routing protocols. Along these lines, the target of this paper is to give a survey on some proficient cluster based routing conventions with favourable circumstances and restrictions.

KEYWORDS: Wireless Sensor Network (WSN), Energy efficiency, clustering, Secure and Efficient data Transmission protocols

I. INTRODUCTION

Cluster based Wireless Sensor Network is utilized to lessen the system utilization and furthermore the increment in energy efficiency. Clustering in WSN is done to limit the vitality utilization and likewise to lessen the information transmission over the system required to transmit the message to the BS, as the CH winds up in charge of correspondence, which results into delayed system lifetime. The individual hubs are fit for detecting their surroundings, preparing the data information locally, and sending information to at least one gathering focuses in a WSN [1]. Productive information transmission is a standout amongst the most vital issues for WSNs. In the interim, numerous WSNs are sent in unforgiving, dismissed, and regularly antagonistic physical situations for specific applications, for example, military spaces and detecting undertakings with trustless surroundings [2]. Secure and productive information transmission (SET) is, in this way, particularly vital and is requested in numerous such pragmatic WSNs

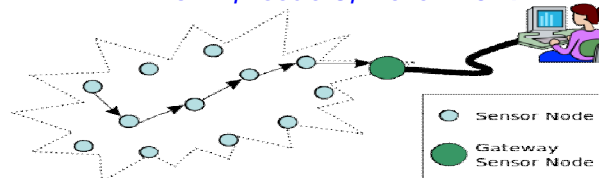


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1. WSN Network

II. RELATED WORK

In the past, expansive measure of research brought through group based calculations in WSNs. A study on vitality proficient bunching directing convention in WSN by V. kumar et al. [5] revealed LEACH and its relatives with various vitality proficient grouping calculations for improving the system lifetime of WSNs.

V. Kumar et al. [8] creators exhibited diverse various leveled grouping calculations. These are most centered around information total/combination so measure of information transmitted to the base station is decreased and improve the vitality productivity of WSNs. Moreover, looked at the grouping calculations dependent on bunch check, heterogeneity, group covering and so on exists in writing of WSNs.

S. K. Gupta et al. [7] creators displayed vitality proficient calculations dependent on bunch head determination strategies, these are: likelihood based and non-likelihood based. In which, likelihood based system are less vitality consumable. In this paper, a few grouping approaches are explained with correlation dependent on grouping properties and different parameters, for example, bunch head portability and area mindfulness.

S. R. Prabhu et al. [6] Authors exhibited some much of the time utilized conveyed grouping calculation and demonstrates the distinction among them dependent on certain measurements for example, group check, dependability, bunch head versatility, group head job, grouping objective, bunch head choice, benefits and impediments.

III. CLUSTERING IN WSN

In clustering, the sensor organize is separated into various groups. Each group has an agent hub known as CH and other are bunch individuals. Part hubs don't discuss legitimately with the sink hub or BS. They need to advance the totaled information to the CH. The CH will perform collection of the got information from part hubs and sends it to the BS.

LEACH stands for Low Energy Adaptive Clustering Hierarchy which is the first protocol of hierarchical routing which proposed data fusion, it is of milestone significance in clustering routing protocol.

All the nodes in a network organize themselves into local cluster, with one node acting as the cluster head. All non-cluster head node transmit their data to the cluster head, while the CH node receive data from all the cluster members or leaf nodes, perform signal processing functions on the data aggregation and transmit data to the remote base station. Therefore, being a cluster head node is much more energy intensive than being a non-cluster head node. Thus, when a cluster head node dies, all the nodes that belong to the cluster lose communication. The problem of LEACH protocol is balance the energy consumption, network energy consumption.

LEACH minimize the communication energy that is dissipated by the cluster heads and the cluster members as much as 8 times when compared with direct transmission and minimum transmission energy routing. LEACH incorporates randomized rotation of the high-energy cluster-head position such that it rotates among the sensors in order to avoid draining the battery of any one sensor in the network. In this way, the energy load associated with being a cluster-head is evenly distributed among the nodes. Since the cluster-head node knows all the cluster members, it can create a TDMA schedule that tells each node exactly when to transmit its data.

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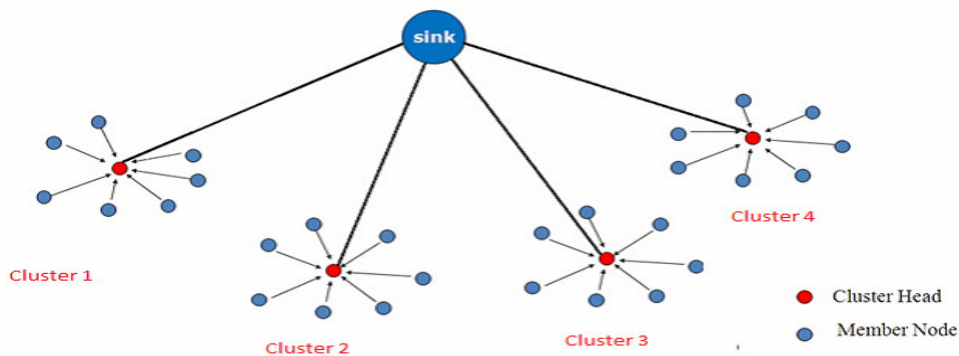


Figure 2: LEACH Protocol

In addition, using a TDMA schedule for data transfer prevents intra-cluster collisions. The operation of LEACH is divided into rounds. Each round begins with a **set-up phase** when the clusters are organized, followed by a **steady-state phase** where several frames of data are transferred from the nodes to the cluster-head and onto the base station.

In the **set-up phase**, the clusters are arranged and cluster-heads are chosen. In the first round, each node selects a random number between 0 and 1 and compares it to the threshold $T(n)$ given in (4) and if the number is less than a threshold, the node becomes a cluster head.

$$T(n) = \frac{P}{1 - P * (r \bmod \frac{1}{P})} \text{ if } n \in G, 0 \text{ otherwise}$$

Where

Where p is the desired percentage of cluster heads,

r is the current round,

G is the set of nodes that have not been cluster heads in the last $1/p$ rounds

Online/Offline Signature Schemes: Online/Offline signature plans separate the procedure of message marking into two stages, the Offline stage and the Online stage. The Offline stage, which comprises of complex calculations, is performed before the message to be marked ends up accessible. When the message is known, the On line stage begins. This stage recovers the fractional mark determined amid the Offline stage and plays out some minor brisk calculations to get the last signature. [1]The Online stage is thought to be exceptionally quick, comprising of little calculations. The Offline stage can be performed by a creative gadget. On the web/Offline permits an asset obliged sensor hub to sign a message rapidly.

ID-based Online/Offline Signature (IBOOS): An Online/Offline Signature (OOS) plot partitions the procedure of message marking into two stages, the Offline stage and the Online stage. The Offline stage is performed before the message to be marked winds up accessible. This stage performs the majority of the calculations of mark age and results in an incomplete mark.[1] When the message is known, the On line stage begins. This stage recovers the incomplete signature determined amid the Offline stage and plays out some minor fast calculations to acquire the last signature. The Online stage is thought to be exceptionally quick comprising of little calculations while the Offline stage can be



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performed by some other clever gadget. IBOOS is the ID-based form of OOS, where a message marked with a underwriter's private key is confirmed utilizing the endorser's ID.

IV. COMPARISION RESULTS

Examination of Cluster-based Routing Schemes Table 1. outlines the correlation between group put together directing plans with respect to the premise of versatility, bunch strength, vitality proficiency, load adjusting, calculation intricacy and conveyance delay. Filter, SET IBS AND SET IBOOS have comparable includes and fixed design in some degree.

SCHEMES NAME	SCALABILITY	CLUSTER STABILITY	ENERGY EFFICIENCY	LOAD BALANCING	DELIVERY DELAY
LEACH	Very low	Moderate	Very low	Moderate	Very small
SET IBS	Moderate	High	Moderate	Moderate	Moderate
SET IBOOS	low	Moderate	Moderate	Moderate	Moderate

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