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A Review: Data Aggregation in Wireless Sensor Network by using Mobile Agent

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Abstract: ***wireless sensor network is the wide collection of multiple nodes where each node can sense, processing and communicating with each other. Mobile agents play a major role in the wireless sensor network. Mobile agent collects the data to the source nodes available in the wireless sensor network. In wireless sensor network, data aggregation is the process of collecting and aggregating the useful data. In this paper, we give a review that how mobile agents aggregate data from the source node. We can explain various approaches that help to aggregate data from wireless sensor network by using mobile agents. In this paper, we can explain various issues that are produced in the data aggregation process.***

Keywords: Wireless sensor network; Mobile Agent; Data aggregation; Source node; Cluster.

I. INTRODUCTION

A. Wireless Sensor Network

A wireless sensor network is one of the busiest networks because of multicast and broadcast network .In case of separate communication of some mechanism that can select multiple communications in single communication. This kind of merging is called data aggregation. A wireless sensor network (WSN) consist of spatially distributed autonomous sensor to monitor physical or environmental conditions ,such as temperature, sound, vibration, pressure, motion, or pollutants and to cooperatively pass their data through the network to a main location [2]. The development of wireless sensor network was motivated by military application such as battlefield surveillance; today such network are used in many industrial and consumer application such as industrial process monitoring and control, machine health monitoring, so on .A wireless sensor network (WSN) is a combination of large amount of sensor nodes. In WSN sensor are densely deployed. Wireless sensor network combine with hundreds to thousands of sensor nodes that can congregate information from an unattended position and convey the collected data to a fastidious user, as per requirement of application [3].

A wireless sensor networks consist of a collection of communicating nodes, each incorporated with sensors collecting real-time data to the sink node. Sensor nodes are battery powered and energy is the most crucial resource [4]. The wireless sensor network is ad-hoc network. It consist small light weighted wireless nodes called sensor nodes, deployed in physical or environmental condition. Wireless sensor network have various applications like habitat monitoring, building monitoring, health monitoring, military survival lance and target tracking. However wireless sensor network is a resource constraints if we talk about energy, computation, memory and limited communication capabilities. All sensor nodes in the wireless sensor network are interacts with each other or by intermediate sensor nodes. A sensor node that generates data based on its sensing mechanisms observations and transmit sensed data packet to base station (sink). Fig1. Shows wireless sensor network:

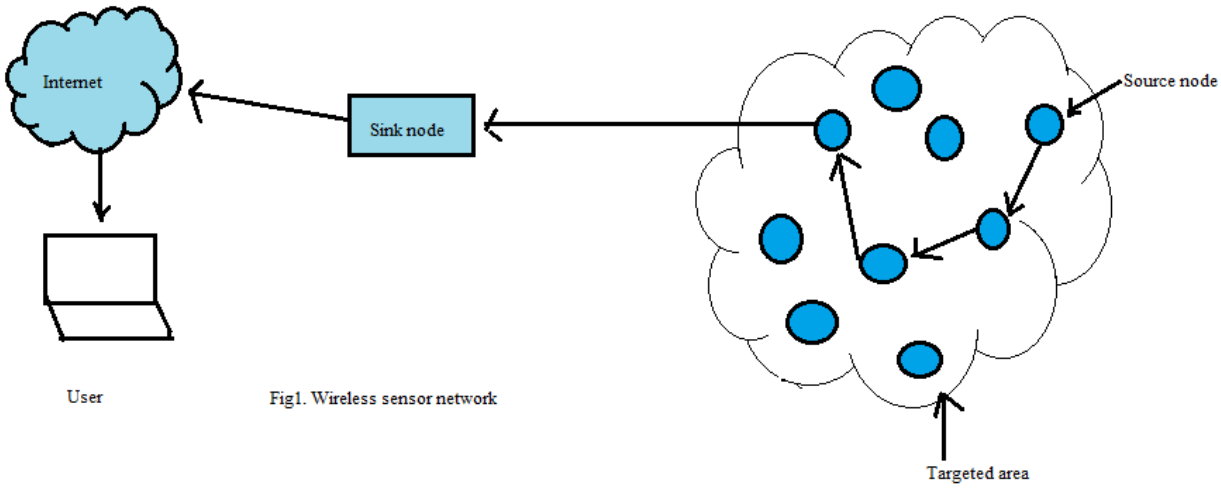

Fig1. Wireless sensor network

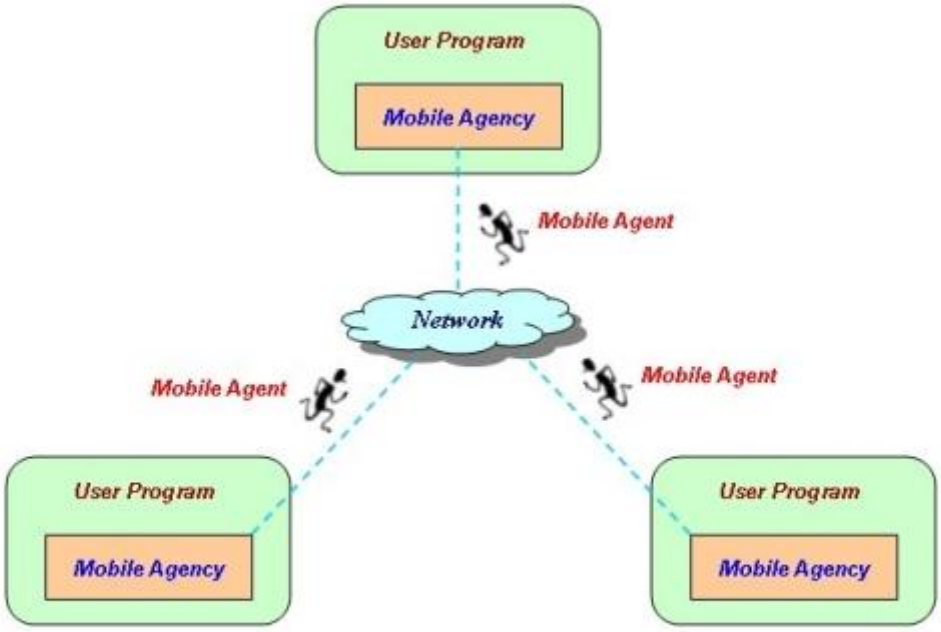

Fig2. Data Aggregation By using Mobile Agents

B. Mobile Agent

Mobile agent in wireless sensor network is an entity which can represent the desire of the sink node. The mobile agent can move to the target are autonomously and carry out application- specific task intelligently [1]. Mobile agents are basically re- usable codes that provide dynamic programming feature to wireless sensor network. In such case of dynamic programming, new nodes can be easily injected into the wireless sensor network and it helps in node replacement when old one node died. Fig2. Shows the mobile agent.

II. DATA AGGREGATION

Data aggregation is the process of collecting and aggregating the useful data. Data aggregation is considered as one of the fundamental processing procedures for saving the energy. In WSN data aggregation is an effective way to save the limited resources. The main goal of data aggregation algorithms is to gather and aggregate data in an energy efficient manner so that network lifetime is enhanced. Wireless sensor network have limited computational power and limited memory and battery

power, this leads to increased complexity for application developers and often results in applications that are closely coupled with network protocols.

Data aggregation typically involves the mixture of the data from multiple sensors at intermediate nodes and transmission of the aggregated data to the base station (sink) [5]. Data aggregation efforts to collect the most critical data from the sensors and make it available to the sink in an energy efficient manner with minimum data latency. Data latency is important in many applications such as environment monitoring, where the freshness of data is also an important factor. In wireless sensor networks, sensor nodes are usually resource-constrained and battery-limited .In order to save resources energy, data must be aggregated to avoid overwhelming amount of the traffic in the network. There has been extensive work on data aggregation schemes in sensor networks, The aim of data aggregation is that eliminates redundant data transmission and enhances the lifetime of energy in wireless sensor network [6]. Data aggregation is the process of the one or several sensors then collects the detection result from other sensor. Data generated from neighboring sensor is often redundant and highly correlated. As well, the amount of data generated in large sensor network is frequently massive for the base station for processing. So data aggregation tries to collect the most vital data from the sensors and make it available to the sink in an energy efficient way maintaining minimum data latency. Data aggregation is a widely used technique in wireless sensor networks. The security issues, data confidentiality and integrity, in data aggregation become vital when the sensor network is deployed in a hostile environment. Data aggregation is the process of aggregating the sensor data using aggregation approaches.

III. Data Aggregation Approaches in Wireless Sensor Network

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 protocol is based on the considered approaches.

A. Tree based approach

In which all nodes are organized in form of means hierarchical, with the help of intermediate node we can perform data aggregation process and data transmit leaf node root node. Tree based data aggregation is suitable for application which involve in-network data aggregation [7]. The tree based approach is defining aggregation tree. The form of tree is minimum spanning tree, sink node consider as a leaves. Information flowing of data start from leaves node up to root means sink (base station). Fig3. Shows tree based approach:

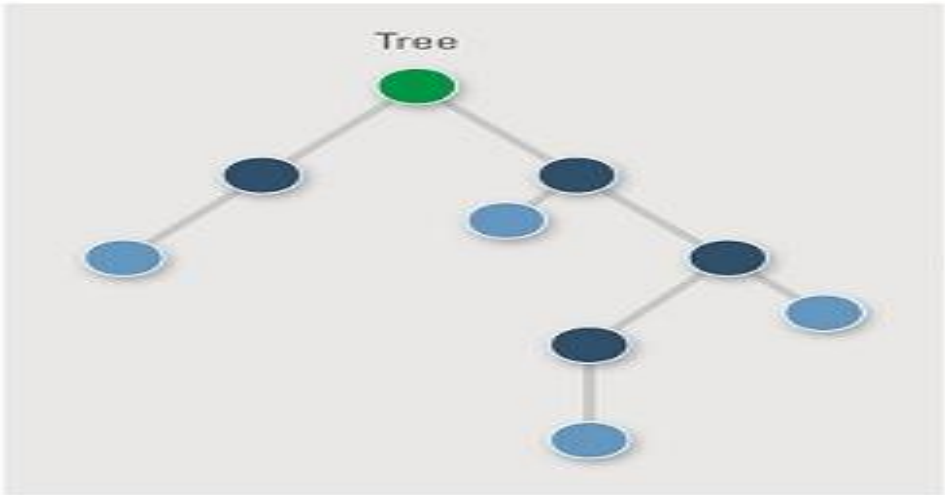

Fig3. Tree based approach

B. Cluster based approach

In this approach, entire network is divided in two numbers of clusters. There is a cluster-head in each cluster, which is selected among cluster members locally and after that transmit it to base station (sink) [3]. Several cluster-based network organization and data-aggregation protocols have been proposed for wireless sensor network. The cluster head can communicate with the sink directly via long range transmissions or multi hopping through other cluster heads. Fig4. Show cluster based approach:

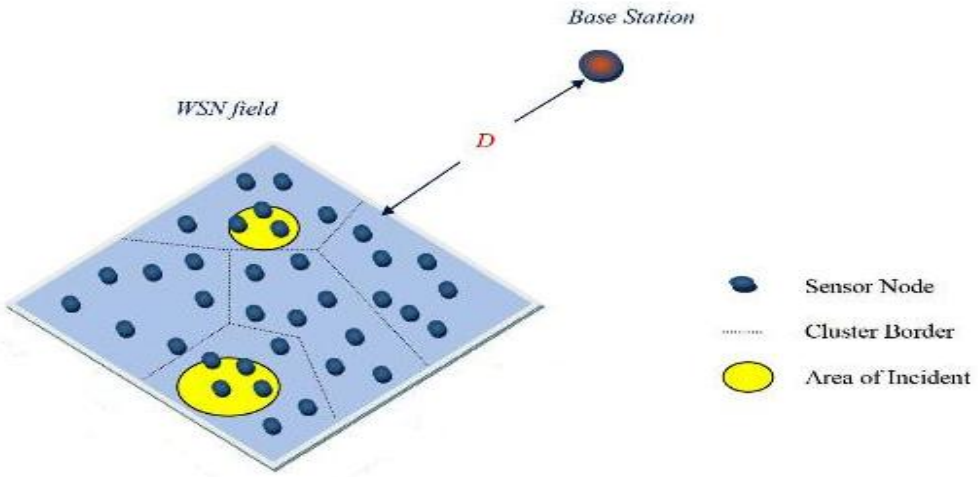

Fig4. Cluster based approach

C. Multipath approach

Multi-path approach is proposed to overcome the drawback of tree based approach which is the limited robustness of the system [7] .In the multipath approach, partially aggregated data is sent to single parent node in aggregation tree.Fig5. Shows multipath approach:

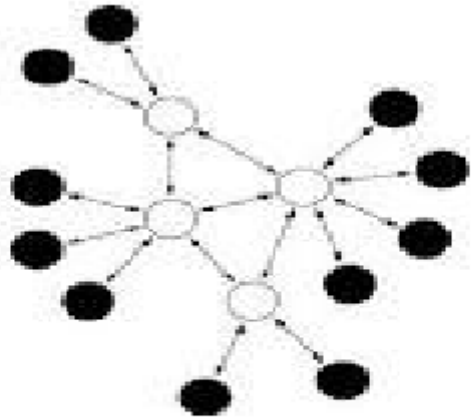

Fig5. Multipath based approach

IV. Security Issue in Data Aggregation

Data aggregation in wireless sensor network refers to exploit the sensed data from the sensors to the gateway node. Data aggregation plays a significant role in wireless sensor network since the aggregation schemes followed here involve in reducing the amount of power consumed throughout data transmission between sensor nodes. There are two types of securities are

require for data aggregation in wireless sensor network, confidentiality and integrity [8]. The basic security issue is data confidentiality; it is protecting the sensitive data transmission and passive attack, like eavesdropping. If we talk about hostile environment so data confidentiality is mainly used because wireless channel is vulnerable to eavesdropping by cryptography method. The complicated encryption and decryption operations such as modular multiplication [7]. The security issues is data integrity with the help of integrity we reduce the compromised sensor source node or aggregator nodes from significantly altering the final aggregation value. Sensor node in a sensor network is easily too compromised. Compromised nodes have a capability to modify or discard messages. Method of secure data aggregation: There are two types of method for securing data hop by hop encryption and end to end encryption, both methods follows some step. Encryption process has to be done by sensing nodes in wireless sensor network [7]. Decryption process has to be done by aggregator nodes. After that aggregator nodes aggregates the result and then encrypt the result again. The sink node gets final aggregated result and decrypts it again.

V. Working Principle of Data Aggregation in WSN by using mobile agent

In data aggregation, the mobile agent collects the data to the source nodes. In wireless sensor network, various nodes are available in the target region. Here in the WSN, the mobile agent only collect the Data to the source nodes not other nodes. The working of data aggregation process is started after the initialization of the mobile agent. The sink node when request for data the mobile agent goes to source node to collect that data. Here mobile agent act as a communication medium wireless sensor network and sink node. Then the collected data is send back to the sink node and the sink node sends it to its proper designation. All such process represents the working area of the mobile agent.

VI. Advantages and Disadvantages of Data Aggregation in Wireless sensor network

A. Advantages

With the help of data aggregation process we can enhance the robustness and accuracy of information which is obtained by entire network , certain redundancy exits in the data collected from sensor nodes thus data fusion processing is needed to reduce the redundant information .Another advantage is those reduces the traffic load and conserve energy of sensor.

B. Disadvantages

The cluster head means data aggregator nodes send fuse these data to the base station. This cluster head or aggregator node may be attacked by malicious attacked. If a cluster head is compromised, then the base station (sink) cannot be ensure the correctness of the aggregate data that has been send to it [9]. Another drawback is existing systems are several copies of the aggregate result may be sent to the base station (sink) by uncompromised nodes. It increase the power consumed at the nodes.

VII. Conclusion

In this paper, we study various approaches that represent the way how to aggregate data in wireless sensor network. We also study various security issues that are produced in data aggregation. In this paper we describe that how mobile agent aggregate data in the wireless sensor network.

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