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Low Power Wireless Sensor Networks Algorithm: EASRP

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Abstract*: Wireless Sensor Networks comprises of a huge number of communicating devices called as, sensor node. These nodes are powered by a limited battery source. Moreover, the sensor nodes will be instigated in harsh and hostile environment, after which, battery replacement become very difficult. Hence energy conservation and power saving is very crucial. The LEACH provides good energy conservation, but there is still scope for some improvement, which is addressed by the proposed ENERGY AWARE SECURE ROUTING PROTOCOL (EASRP) scheme.*

Key Words*: Wireless Sensor Networks, Clustering, AES, DES, Clusters, Network Lifetime, LEACH, Encryption.*

I. Introduction

A Wireless Sensor Networks comprises of various wireless devices which observe and sense variations in physical or ecological conditions, for example, temperature, moisture, humidity, atmospheric pressure, or toxins, etc., at various territories. Such Networks are required to be instigated in a wide range of environments for business, industrial and military applications, for example, medical purposes, object tracking, surveillance, atmosphere and climate monitoring, and acoustic information, etc. The main drawbacks of wireless sensor networks are the storage capacity, energy, memory and processing. network topologies like Star, Mesh, Bus,etc.

II. Existing System

The recent developments in communication technology has empowered the advancement of cost-effective, energy-aware, multifunctional network devices for wireless networking applications. The blend of these variables has enhanced the capability of using a sensor network systems with huge amount of sensor nodes, which helps in data accumulation, aggregation, handling and transmission, under various environmental conditions. A sensor system is made out of an extensive number of sensor nodes which comprise of detecting, processing and transmitting the data.

III. Problem Identification

Wireless sensor network are used in a wide range of application and purposes. To ensure their proper working, the network needs to be more accurate and routing protocols must be efficient. In order to design new protocols, certain challenges must be considered [3], they are given below.

- Energy Constraints: it is the most significant drawback of the wireless sensor network. Since the nodes are powered by batteries, the available energy is always limited. A depleted battery is also hard to replace or recharge. Once the battery is completely discharged, the node will switch off, which creates a break in the network. Therefore, the lifetime of the network is adversely affected. Subsequently the energy utilization is principle concern for any routing protocol. Low memory and low processing power is another limitation of nodes. Therefore, it is essential for any routing algorithm to be efficient, light-weight and should consume less energy.
- Security: Security is another crucial parameter for wireless sensor networks. Increasing the security will increase the computations. Hence, there is always a trade-offs between security and bandwidth of the network. As the wireless sensor networks are deployed over insecure and harsh environment, data security is very important. Most of the routing protocols does not provide viable security measure which is highly risky. Hence a secure routing protocol with energy-aware mechanism is needed.
- Quality of Service: The data in wireless sensor networks are very critical and carry important information. They must be delivered on time without any information leakage or tampering. The QoS parameter ensure that the message will be delivered within restricted time and not causing any damage to the data.
- Fault-Tolerance: In any harsh working domain, a sensor node may be exposed several adversaries, which may lead to node failure. A failed node hinders network communication and finally degrade the network lifetime. Therefore, the routing protocols must be effective enough to prevent the node from failures. This will not only enhance the network lifetime, but also increases energy conservation.

IV. Energy Aware Secure Routing Protocol (Easrp)

The LEACH has several drawbacks, which reduce the efficiency and performance of the network. Such as the sensor nodes are obliged to send their residual energy to cluster heads or base station at each round. This substantially increases the energy consumption and the resources such as processor and memory are wasted. The additional data transfer also increases channel traffic, and available bandwidth will decrease. It will eventually lead to low lifetime of the network, Cluster heads positions and numbers are not considered and the communication in WSN is not entirely secured.

The measures taken to overcome the challenges of LEACH are given below. These parameters also form a foundation for the proposed algorithm, they are,

1. Formation of clusters
2. Selecting suitable cluster heads
3. Establishing a secure communication channel between nodes and cluster heads.
4. Providing security to data and transmission channel.
5. Hybrid cryptography system is used to provide security.
6. The system uses AES and DES algorithms for encryption.

With this proposed work, a new energy aware secure routing protocol(EASRP) is proposed as an enhancement to traditional LEACH.

V. System Design Description

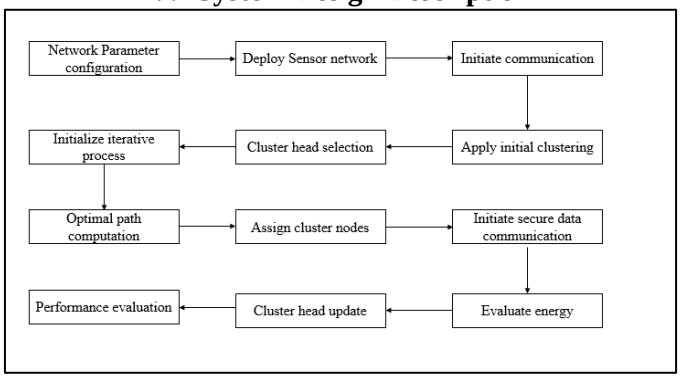

Fig.1 System Architecture

Figure shows the system architecture diagram for the routing algorithm.

Step 1: Define Network parameters

Step 2: Deploy N number of Nodes

Step 3: Initialize network communication

Step 4: Apply initial clustering technique

Step 5: Cluster head Selection (Higher Energy Node will be selected as head)

Step 6: Do

// here starts iterative updation of energy, clusters, cluster head and optimal distance for communication

Step 7: for each cluster head (CH)

Step 7 : for each node (n)

(a) Distance computation for optimal path selection (d)

(b) Assigning nodes to the corresponding closest cluster $c \rightarrow C$

(c) Optimal path computation using various hop counts based on the distance $(Path \rightarrow Min_{Distance})$

(d) Initialize data transmission from source node to destination node.

(e) Apply hybrid data encryption during transmission

(f) Transmit through optimal hop counts i.e. start from source node and deliver to destination by passing through optimal nodes

(g) Evaluate energy per iteration

(h) Dead and alive node computation

(i) Update cluster and cluster head based on energy and distance

(j) Repeat until total number of iterations achieved

(k) End

Step 7: performance evaluation in terms of packet delivery, throughput, energy etc.

VI. Result And Conclusion

6.1 Dead Node Performance analysis between EASRP and LEACH

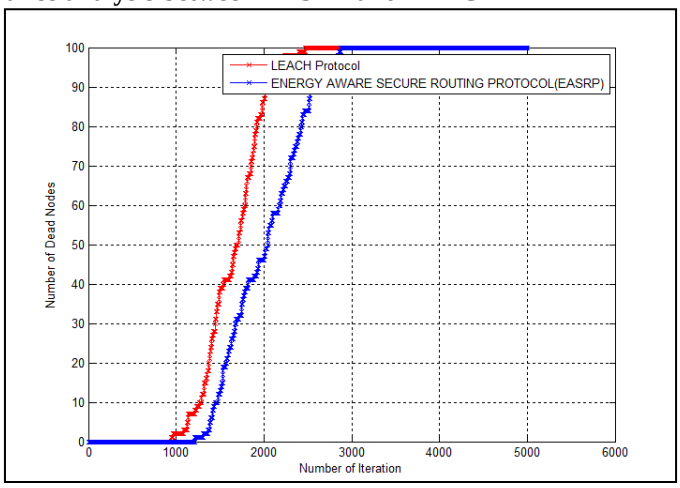

Chart1: Dead Node Performance analysis

6.2 Alive Performance analysis between EASRP and LEACH

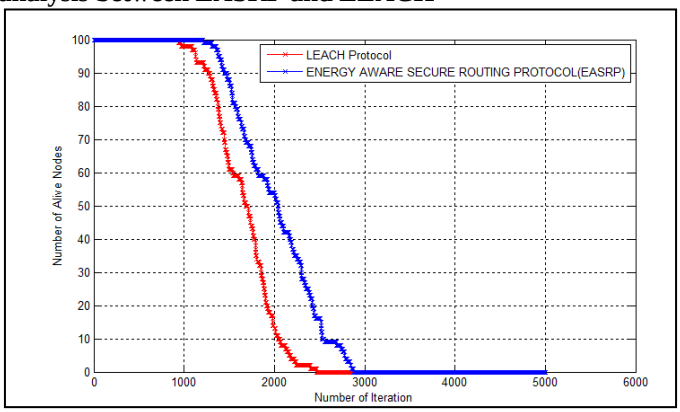

Chart2: Alive Node Performance analysis

6.3 Packet delivery performance between EASRP and LEACH

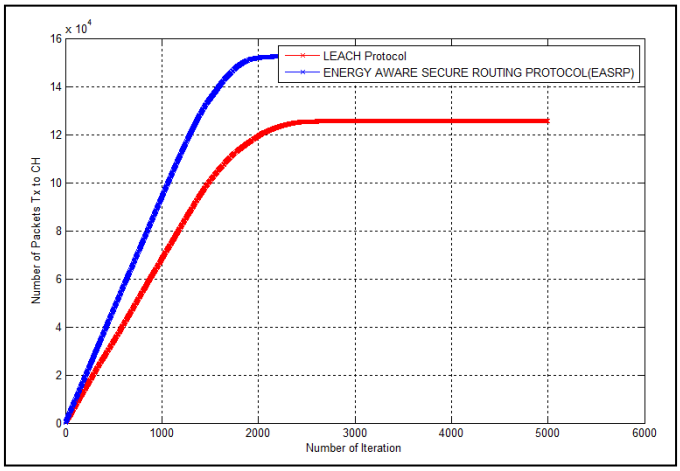

Chart3: Packet delivery performance

6.4 End-to-end throughput (QOS) between EASRP and LEACH

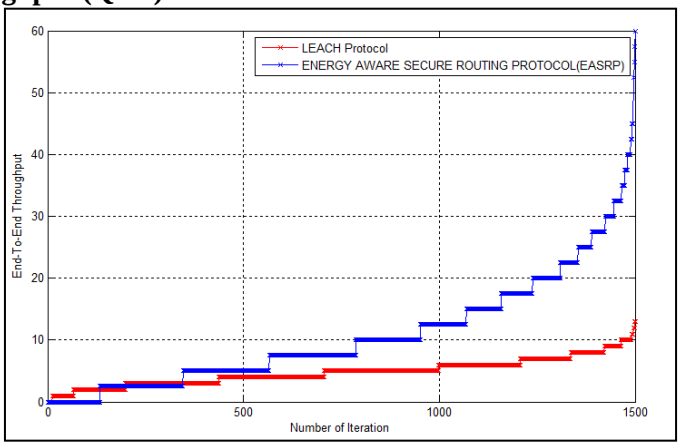

Chart4: End-to-end throughput (QOS)

6.5 Average Energy-consumption performance between EASRP and LEACH

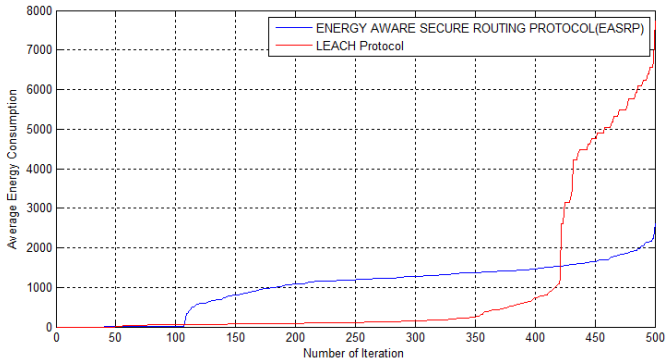

Chart5: Average Energy-consumption performance

VII. Conclusion

This experimental study shows that proposed approach consumes less average energy when compared with conventional LEACH protocol. Average energy consumption using LEACH is 848.247 (joules) whereas proposed approach consumes 482.31 for complete simulation.

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