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Infrastructures for Secure Data Aggregation, use of Wireless Sensor Networks for Industrial Monitoring and its application in Networks Monitor Transportation

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***Abstract*:**-With the help of this paper we come to know that need for accurate time synchronization in the order of $0.6-9$ μs every few minutes is necessary for data collection and analysis. Two-stage energy-efficient time synchronization is proposed in this paper. Firstly, the network is divided into clusters and a head node is elected using Low-Energy Adaptive Clustering Hierarchy based algorithm. Later, multiple packets of different lengths are used to estimate the delay between the elected head and the entire network hierarchically at different levels Wireless sensor networks (WSNs) have not only become an attractive solution for low power implementations and embedded systems but also for the Power transmission and distribution. Research is ongoing to develop an innovative power source to facilitate the running of advanced sensing and communications technology in hazardous areas using WIFI to Power Sensors, Energy Harvesting using novel MEMS Electromagnetic Transducers, Powering sensors with Pipeline heat

***Keywords*-** Electromagnetic Transducers, Adaptive Clustering Hierarchy, Energy Harvesting

I. SECURE DATA AGGREGATION IN WSN

A Wireless Sensor Network (WSN) typically consists of a sink node sometimes referred to as a Base Station and a number of small wireless sensor nodes. The base station is assumed to be secure with unlimited available energy while the sensor nodes are assumed to be unsecured with limited available energy as shown in figure 1. The sensor nodes monitor a geographical area and collect sensory information. Sensory information is communicated to the Base Station.

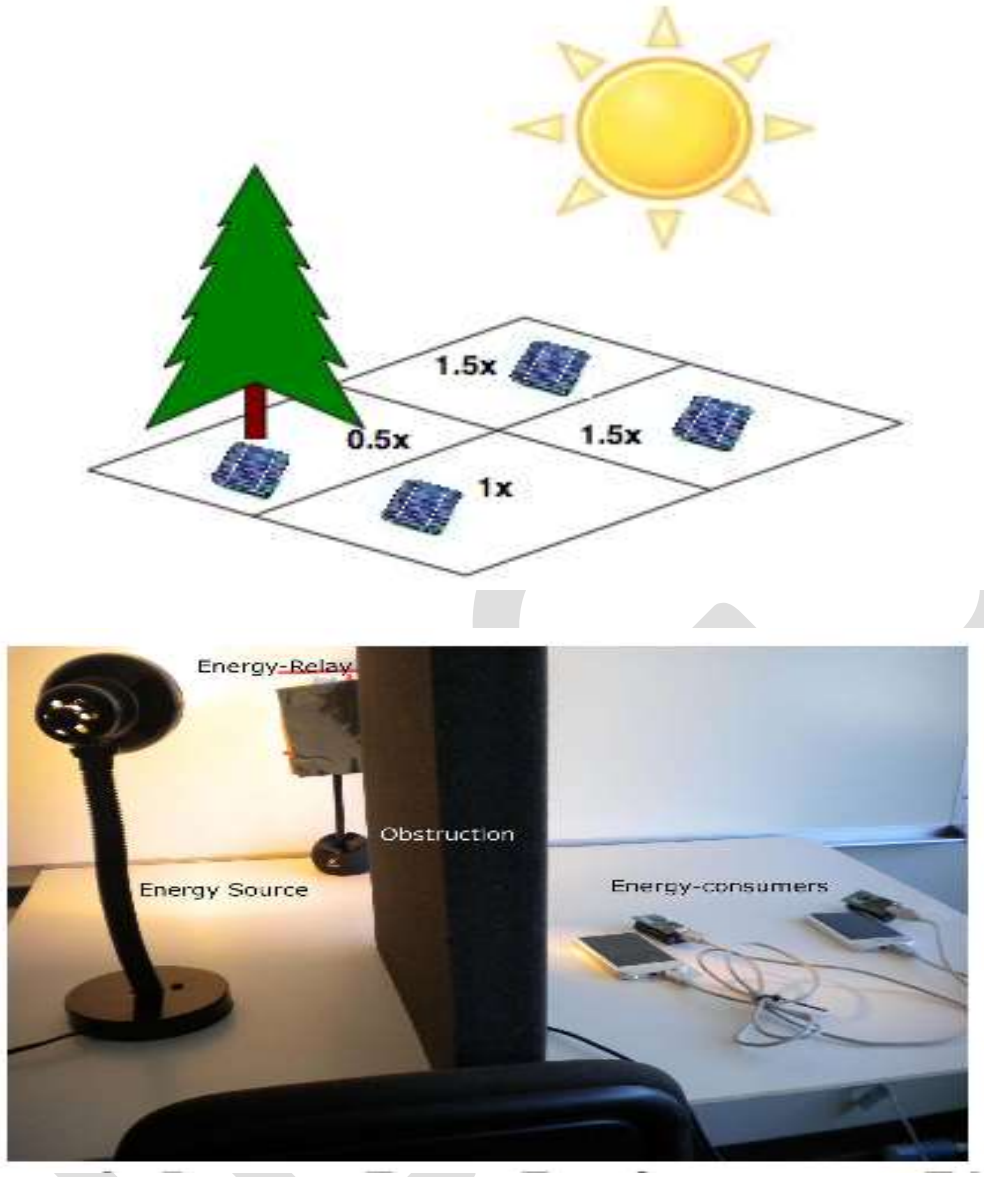

Figure1. Relationship between energy relay, obstruction and energy consumption

To conserve energy this information is aggregated at intermediate sensor nodes by applying a suitable aggregation function on the received data. Aggregation reduces the amount of network traffic which helps to reduce energy consumption on sensor nodes [1]. It however complicates the already existing security challenges for wireless sensor networks and requires new security techniques tailored specifically for this scenario. Providing security to aggregate data in Wireless Sensor Networks is known as Secure Data Aggregation in WSN. Were the first few works discussing techniques for secure data aggregation in Wireless Sensor Networks?

Two main security challenges in secure data aggregation are confidentiality and integrity of data. While traditionally encryption is used to provide end to end confidentiality in Wireless Sensor Network (WSN), the aggregators in a secure data aggregation scenario need to decrypt the encrypted data to perform aggregation [2]. This exposes the plaintext at the aggregators, making the data vulnerable to attacks from an adversary. Similarly an aggregator can inject false data into the aggregate and make the base station accept false data. Thus, while data aggregation improves energy efficiency of a network, it complicates the existing security challenges.

II. WIRELESS SENSOR NETWORKS FOR INDUSTRIAL MONITORING AND CONTROL

Figure2. Smart Mesh Wireless Sensor Network infrastructure.

Greater access to monitoring and control information gives engineers better visibility and ultimately better decision-making power when it comes to industrial environments such as plants, factories, and refineries as shown in figure 2.

Smart Mesh wireless sensor networks (WSN) are used to dramatically reduce the cost and complexity of applications for a wide variety of applications including process monitoring, process control, machine health monitoring, corrosion detection, and to ensure regulatory compliance [3]. Benefits of wireless sensor networks for industrial automation and process control Lowers systems and infrastructure costs with reduced maintenance and elimination of cabling Improves efficiency of materials use by monitoring and predicting requirements Improves process safety by automating activities previously unmanageable with a wired solution

Process Monitoring

The rock-solid reliability and simple installation and management of Smart Mesh Wireless HART-enabled solutions lets engineers get the measurements they need, when they need them to improve productivity. And, by leveraging field devices based on the Wireless HART (IEC62591) standard, device commissioning is just as simple as in the wired world—no need for new skills, tools, or consultants. Real-world installations have demonstrated that self-organizing Wireless HART networks provide a 90% reduction in installation cost compared to wired sensors, knocking down the barrier to widespread deployment of sensors in the industrial environment. For example, the GlaxoSmithKline plant in Cork, Ireland, is a strategic operation, manufacturing many of the active ingredients used in the formulation of prescription drugs [4]. To increase productivity, they added two new water storage tanks. Wanting to measure water levels and usage, GlaxoSmithKline selected Emerson Process Management's Rosemount® Smart Wireless flow and pressure transmitters because of the reduced installation costs and because it would be easy to expand the network without disrupting operations or data collection. Using Dust Networks® Smart Mesh® technology, the Rosemount Smart Wireless product family created a resilient, reliable and secure wireless mesh sensor network over which to transmit sensor data without digging trenches and laying cable, reducing installation costs significantly. The Smart Mesh intelligent network also allowed secure, non-disruptive expansion of the network as needed. Click here for case study.

III TRADITIONAL LAYERED APPROACH

Traditional layered approach cannot share different information among different layers , which leads to each layer not having complete information. The traditional layered approach cannot guarantee the optimization of the entire network. The traditional layered approach does not have the ability to adapt to the environmental change. Because of the interference between the different users, access confliction, fading, and the change of environment in the wireless sensor networks, traditional layered approach for wired networks is not applicable to wireless networks. So the cross-layer can be used to make the optimal modulation to improve the transmission performance, such as data rate, energy efficiency, QoS (Quality of Service), etc. Sensor nodes can be imagined as small

computers which are extremely basic in terms of their interfaces and their components [5]. They usually consist of a processing unit with limited computational power and limited memory, sensors or MEMS (including specific conditioning circuitry), a communication device (usually radio transceivers or alternatively optical), and a power source usually in the form of a battery. Other possible inclusions are energy harvesting modules,[9] secondary ASICs, and possibly secondary communication interface (e.g. RS-232 or USB).The base stations are one or more components of the WSN with much more computational, energy and communication resources. They act as a gateway between sensor nodes and the end user as they typically forward data from the WSN on to a server. Other special components in routing based networks are routers, designed to compute, calculate and distribute the routing tables.

IV WIRELESS SENSOR NETWORKS MONITOR TRANSPORTATION

Figure3. Transport monitoring in case of Wireless sensor networks.

Wireless sensor networks allow cities, rail systems and logistics operations to cost-effectively gather information and use that field data to develop applications that lead to cost savings and ultimately improved quality of life.

(a) Benefits of wireless sensor networking for transportation applications.

(b) Enables new applications by eliminating need for wires.

(c) Improves safety by automating processes previously managed manually.

(e) Reduces costs associated with maintenance with greater reliability and extended battery life.

(f) Minimizes deployment time and costs with easy installation and no cabling.

Reliable, easy to deploy, and built with the priorities of cities and citizens in mind, Street line Networks is leading the way in the development of intelligent infrastructure solutions for urban areas. The Street line solution is a complete information system designed specifically for applications in urban resource management [6]. The platform integrates ultra low power sensing with Web-based solutions that optimize the use of city assets, in this case parking spaces. Here. At the heart of the solution is the Smart Mesh-enabled ultra low power vehicle sensor [7]. These pavement sensors work by detecting a disturbance in the magnetic field from a vehicle parked in a space [8]. Data hops from sensor to sensor until it makes its way to a gateway, a small box sitting on top of a streetlamp or a traffic-signaling box. Leading the revolution in relieving congestion on city streets, solutions like Street line's will have a cascade of positive effects on transportation the economy and the environment.

V CONCLUSION

It is used to detect energy imbalance among static nodes and even them out using rechargeable robots send query to the network to find out the static nodes that needs service, sensors that need service reply back, robots select one and then navigate to the location In present paper we have discussed various kinds energy availability must be decoupled from sensor net operation "Energy relay (with harvesting capabilities) to deliver energy to energy consumers. Enable energy to be treated as a network wide, exchangeable and route-able commodity.

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