A Review on Wireless Sensor Networks

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Abstract- Wireless sensor networks (WSNs) enable new applications and require non-conventional paradigms for protocol design due to several constraints. Owing to the requirement for low device complexity together with low energy consumption (i.e., long network lifetime), a proper balance between communication and signal/data processing capabilities must be found. This motivates a huge effort in research activities, standardization process, and industrial investments on this field since the last decade. We consider routing security in wireless sensor networks Trends and possible evolutions are traced. Emphasis is given to the IEEE802.15.4 technology, which enable many applications of WSN. In this paper we discuss about the wireless sensor network, its introduction , architecture of protocol design of Wireless Sensor Network and its applications. Advances in sensor technology and computer networks have enabled distributed sensor networks (DSNs) to evolve from small clusters of large sensors to large swarms of micro sensors, from fixed sensor nodes to mobile nodes, from wired communications to wireless communications, from static network topology to dynamically changing topology.

Keywords- Wireless sensor network, routing, protocol, networks.

I. INTRODUCTION

A WSN can be generally described as a network of sensor nodes that cooperatively sense and may control the environment enabling interaction between persons or computers and the Surrounding environment [1].These sensor nodes are autonomous devices using a variety of sensors to monitor the environment in which it is deployed. On one hand, WSNs enable new applications and new paradigms. In fact, the activity of sensing, processing, and communication under limited amount of energy, ignites a cross-layer design approach typically requiring the joint consideration of distributed signal/data processing, medium access control, and communication protocols [2].WSNs have several common aspects with wireless ad hoc network [3] and in many cases they are simply considered as a special case of them. This could be lead to erroneous conclusions, especially when protocols and algorithms designed for ad hoc networks are used in WSN. For this reason in Section 2 an appropriate definition of WSN and discussion is provided.

Wireless Sensor Networks are heterogeneous systems containing many small devices called sensor nodes and actuators with general purpose computing elements. These networks will consist of hundreds or thousands of low cost, low power and self organizing nodes which are highly distributed either inside the system or very close to it. These nodes consist of three main components sensing, data processing and communication. Two other components are also there called, aggregation and base station [4] Aggregation point's gathers data from their neighboring nodes integrates the collected data and then forwards it to the base station for further processing. Various applications of WSN includes habitat monitoring, manufacturing and logistics, environmental observation and forecast systems, military applications, health, home and office application and a variety of intelligent and smart system.

II. ARCHITECTURE OF PROTOCOL STACK FOR WSN

Senor nodes are usually distributed in a sensor field as shown in fig 1. Each of these distributed nodes has the to collect data and route data back to the sink and the end users. Data are routed back to the end user by a multi hop infrastructure less architecture through the sink. The protocol stack combines power and routing awareness, integrates data with networking protocols, and communicates power efficiently through the wireless medium.

The protocol stack consists of the application, transport, network, data link physical layer, power management plane, mobility management plane and task management plane. Depending on the sensing task, different types of applications software can be built and use on the application layer. The transport layer helps to maintain the flow of data if the sensor networks application requires it. The network layer takes care of routing the data supplied by the transport layer.

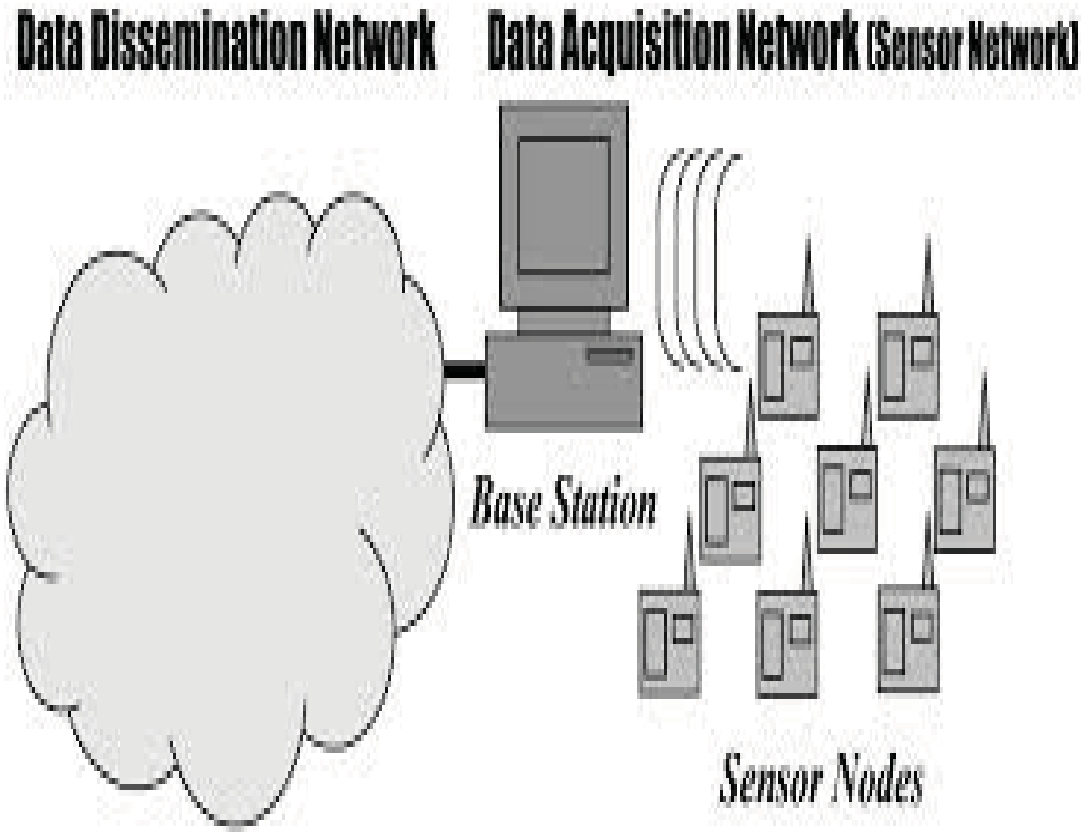

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Fig1.Wireless Sensor Network

Since the environment is noisy and sensor nodes can be mobile, the MAC protocol must be power aware and able to minimize collision with neighbors broadcast. The physical layer addresses the needs of the simple but robust modulation, transmission and receiving techniques. In addition, the power, mobility and task management planes monitor the power, movement and task distribution among the sensor nodes. These planes help the sensor nodes coordinate the sensing task and lower the overall power consumption [5].

The architecture of protocol stack [6] used by the sink and sensor nodes is shown in Fig. 2. This protocol stack integrates power and routing awareness (i.e., energy-aware routing), integrates data with networking protocols (i.e., data aggregation), communicates power efficiently through the wireless medium, and promotes cooperative efforts of sensor nodes (i.e., task management plane). This protocol stack (Fig. 2) is made up of physical layer, data link layer, net-work layer, transport layer, application layer, power management plane, mobility management plane, and task management plane.

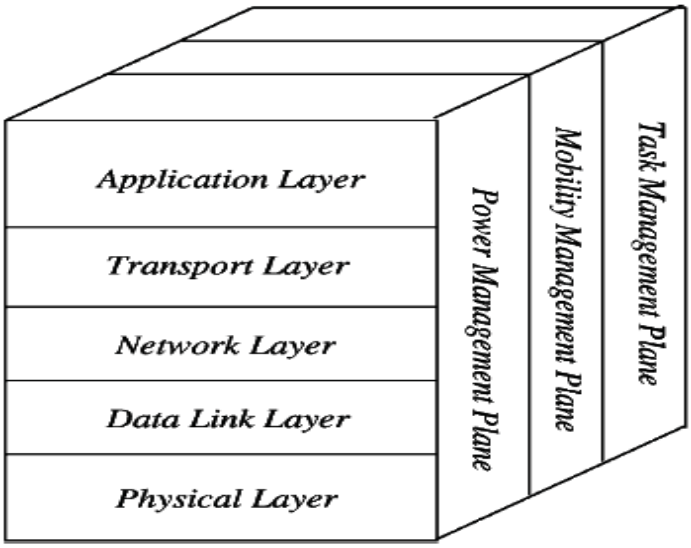

Fig 2. Protocol Stack

2.1 Physical layer

It addresses the needs of a robust modulation, transmission and receiving techniques. Briefly discusses how the choice of a modulation scheme affects the power requirements. The authors consider that this is a largely unexplored area. Open research issues: Design of simple and low power modulation schemes, strategies to overcome signal propagation effects and implementing the hardware in very small volume.

2.2 Network layer

It takes care of routing the data supplied by the transport layer. *Small Minimum Energy Communication Network:* Creates a sub graph of the sensor network that it contains the minimum energy path. And *Flooding***:** Broadcasts data to all neighbor nodes. Simplest routing protocol with serious deficiencies such as implosion, overlap and resource blindness

2.3 Data Link Layer

Data Link Layer: Responsible for creating the network infrastructure (hop by hop communication and self organizing ability) and efficiently sharing communication resources among sensor nodes.

2.4Transport Layer

It helps to maintain the flow of data if the wireless sensor network application requires it. Depending on the sensing tasks, different types of application Software can be set up and used on the application layer.

Power management-This plane manages how a sensor node uses its power and manages its power consumption among the three operations (sensing, computation, and wire- less communications)

Mobility management- This plane detects and registers the movement/mobility of sensor nodes as a network control primitive.

Task management plane (i.e., cooperative efforts of sensor nodes)-This plane balances and schedules the events' sensing and detecting tasks from a specific area.

III. SENSOR NETWORK APPLICATIONS

We categorize the applications into military, environmental, health, home, and other commercial areas:

3.1 Military Applications: Wireless sensor networks can be an integral part of military command, control, communication, computing, intelligence, surveillance and targeting (C4ISRT) systems. The rapid deployment, fault tolerance and self-organization characteristics of sensor networks make them a very promising sensing technique for military (C4ISRT). Since sensor networks are based on dense deployment of disposable and low cost sensor nodes, destruction of some nodes by hostile actions does not affect military applications as much as the destruction of traditional sensor, which makes sensor networks concept a better approach for battlefield. Various military applications of sensor networks are monitoring friendly forces, equipments and ammunition; biological and chemical (NBC) attack detection and reconnaissance.

3.2 Environmental Applications: Some environmental applications of sensor network include tracking the movement of birds, small animals and insects; monitoring environmental conditions that affect crops and livestock ; irrigation; macro instruments for large scale earth monitoring and planetary exploration; chemical/biological detection; precision agriculture; biological, Earth and environmental monitoring in marine, soil and atmospheric contexts; forest fire detection and meteorological and geo physical research; flood detection; bio complexity mapping of the environment and pollution study.

3.3 Health Application: Some of the applications are providing interfaces for the disabled; integrated patient monitoring; diagnostics; drug administration in hospital; monitoring the movements and internal process of insects or other small animals, tele monitoring of human physiological data; and tracking and monitoring doctors and patients inside a hospital.

3.4 Home Applications: Home automation; as technology advances, smart sensor nodes and actuators can be buried appliances, such as vacuum cleaners, microwave ovens, refrigerators and VCRs. These sensor nodes inside the domestic devices can interact with each other and with an external network via the internet or satellite. They allow end users to manage home devices locally and remotely more easily.

3.5 Other Commercial applications: Some of the commercial applications are monitoring material fatigue; building virtual keyboards; managing inventory; monitoring product quality; constructing smart office spaces; environmental control in office buildings; robot control and guidance in automatic manufacturing environment; interactive toys; interactive museums; factory process control and automation; monitoring disaster area; smart structures with sensor nodes embedded inside; machine diagnosis; transportation; factory instrumentation; local control of actuators; detecting and monitoring car thefts; vehicle detection and tracking; and instrumentation of semiconductor processing chambers, rotating machinery, wind tunnels and anechoic chambers[7].

IV.CONCLUSION

In this paper we study about wireless networks and its protocol stack architecture and about its applications. But there are some problems related to routing and security of wireless networks. There are further various techniques to overcome the problems related to security and routing. This paper is the review of wireless sensor networks. Security is an important requirement and complicates enough to set up in different domains of WSN. We also discuss various dimensions of security (availability, integrity, confidentiality and authenticity) that are being directed by different physical attacks.

V. FUTURE WORK

In the future, the wireless sensor networks will have wide range of application areas to make sensor networks an integral part of our lives. However, realization of sensor networks needs to satisfy the constraints introduced by factors such as fault tolerance, scalability, cost, hardware, topology change, environment and power consumption.

REFERENCES

[1] Verdone, R.; Dardari, D.; Mazzini, G.; Conti, A. *Wireless Sensor and Actuator Networks*; Elsevier:London, UK, 2008.
[2] Verdone, R. Wireless Sensor Networks. In *Proceedings of the 5th European Conference*, Bologna,Italy, 2008.
[3] Basagni, S.; Conti, M.; Giordano, S.; Stojmenovic, I. *Mobile Ad Hoc Networking*; Wiley: SanFrancisco, CA, USA, 2004.
[4] Rina Bhattacharya, "A Comparative Stud y of Physical Attacks on Wireless Sensor Networks", *IJRET,* vol. 2, issue 1, pp. 72-74, Jan 2013.
[5] LuisJaveir Garcia Villalba, Ana Lucila Sandoval Orozco, Alicia Trivino Cabera and Claudia Jacy Barenco Abbas, routing Protocolsin Wireless Sensor Networks, Sensors2009.
[6] I.Akyildiz, W. Su, Y. Sankarasubramaniam, and E.Cayirci," A survey on Sensor Networks," IEEE CommunicationsMagazine,vol.40, Issue: 8, pp. 102-114, August2002.
[7] Rajashree.V.Biradar,V.C.Patil, Dr. S.R.Sawant,Dr.R.R.Mudholkar,Classification and Comparison of Routing Protocols in Wireless Sensor Networks, Special Issue on Ubiquitous Computng Security Systems.