Volume 4, Issue 8, August 2014 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

A Review of Wireless Sensor Protocols

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Abstract- Wireless Sensor Networks (WSN) is very attracted area for researchers for providing new capabilities. One important challenge is to design sensor networks that have long system lifetimes. This challenge is especially difficult due to the limited energy of the devices. So the energy consumption is the primary concern. This is because in many practical scenarios, sensor node batteries cannot be (easily) refilled, thus nodes have a finite lifetime or limited energy and forward messages of different importances (priorities). Now we are going to study the different protocol used to transmit the message or communication or any other work which is energy efficient or not. This paper shows the comparative study of different protocols in wireless sensor network.

Keywords- Sensor networks, Energy-aware systems, Energy aware protocol, Consumption.

I. INTRODUCTION

A sensor network composed of large no of sensor node that is densely deployed either inside the phenomenon or very close to it. The position of sensor nodes need not be predetermined. This allows random deployment means that sensor network protocol and algorithms must possess self-organizing capabilities. The major components of a typical sensor network are: sensor nodes, the sensor field, the sink and the task manager.

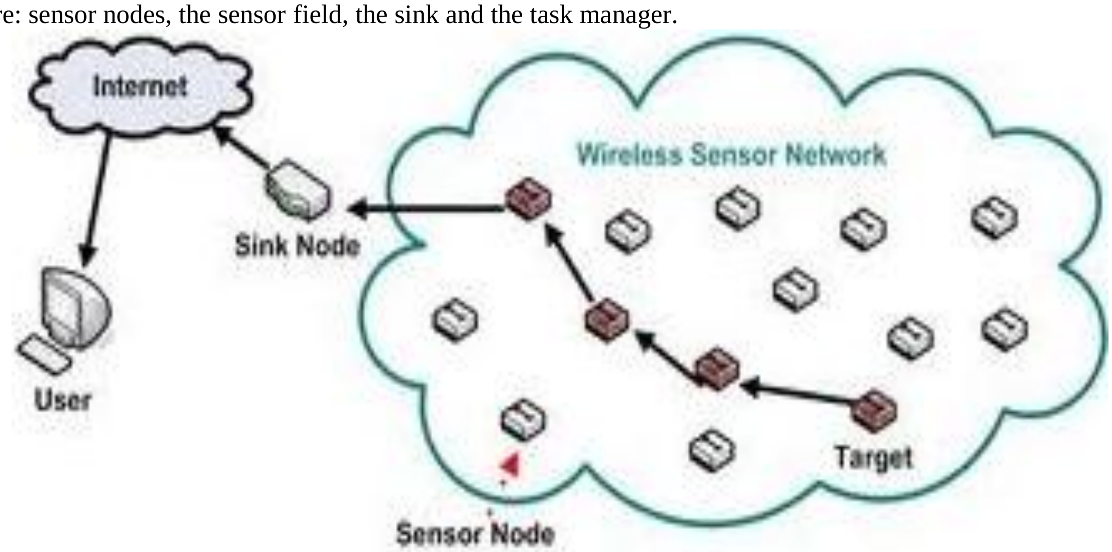

Figure1. WSN Architecture [12]

WSNs architecture is shown in Figure 1 which contains all major components. A sensor field can be considered as the area in which the nodes are placed i.e. the area in which we expect a particular phenomenon to occur. Sensors nodes or motes are the heart of the network. They are in charge of collecting data and routing this information back to a sink.

A sink is a sensor node with the specific task of receiving, processing and storing data from the other sensor nodes. They serve to reduce the total number of messages that need to be sent, hence reducing the overall energy requirements of the network. Such points are usually assigned dynamically by the network. Regular nodes can also be considered as sinks if they delay outgoing messages until they have aggregated enough sensed information. For this reason sinks are also known as data aggregation points. The task manager or base station is centralized point of control within the network, which extracts information from the network and disseminates control information back into the network. It also serves as a gateway to other networks, a powerful data processing/storage centre and an access point for a human interface.

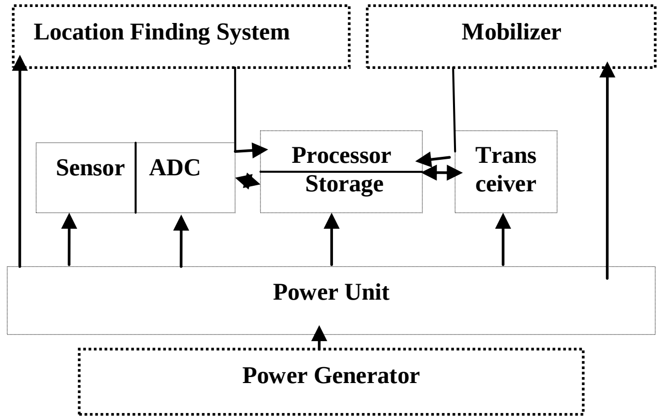

Figure 2. Components of WSN [12]

Shown in figure 2 is component of WSN which is very important part of wireless sensor network for energy consumption because the energy will be filled or refilled by hardware components example battery. Sensor nodes have four very important basic components of hardware.

a sensing unit, a processing unit, a radio transceiver and a power unit. Additional components may include location finding systems such as GPS, mobilizes and power generators. Mobilizers are required to move the node in specific applications. The analog signals that are measured by the sensors are digitized via an ADC and fed into the processing unit. The processing unit and its associated storage manage then procedures that make the sensor node carry out its assigned sensing and collaboration tasks. The radio transceiver connects the node with the network and serves as the communication medium of the node. The power unit is the most important component of the sensor mote because it is used to determine the lifetime of the entire sensor network.

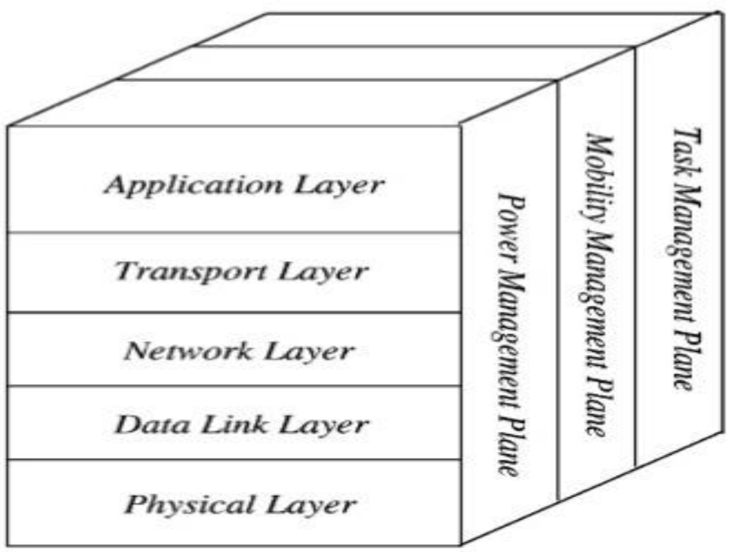

Figure 3. Protocol Stack of WSN [12]

There is also a protocol stack in wireless sensor network shown in figure 3. Layered network architectures are adopted because they most certainly always improve the robustness of a system. Following are the functionality of different layers. The Physical Layer is responsible for carrier frequency generation, frequency selection, signal detection, modulation and data encryption. Techniques such as Ultra Wideband, Impulse Radio and Pulse Position modulation have been used to reduce complexity and energy requirements, whilst improving reliability and reducing path loss effects and shadowing.

The Data Link Layer is responsible for medium access, error control, multiplexing of data streams and data frame detection. It ensures reliable point to point and point to multihop connections in the network.

The Network Layer is responsible for routing information through the sensor network i.e. finding the most efficient path for the packet to travel on its way to a destination. Most protocols can be categorized under one of the following techniques: flooding, SMECN (Small Minimum Energy Communication Network).

The Transport Layer is needed when the sensor network intends to be accessed through the internet.

The Applications Layer is responsible presenting all required information to the application and propagating requests from the application layer down to the lower layer.

Characteristic of Wireless Sensor Network:
Dense sensor node deployment: Sensor nodes are usually densely deployed and can be several orders of magnitude higher than that in a MANET.

Battery-powered sensor nodes: Sensor nodes are usually powered by battery and are deployed in a harsh environment where it is very difficult to change or recharge the batteries.

Severe energy, computation, and storage constraints: Sensors nodes are having highly limited energy, computation, and storage capabilities.

Self-configurable: Sensor nodes are usually randomly deployed and autonomously configure themselves into a communication network.

Unreliable sensor nodes*:* Since sensor nodes are prone to physical damages or failures due to its deployment in harsh or hostile environment.

Data redundancy: The data sensed by multiple sensor nodes typically have a certain level of correlation or redundancy.

Application specific*:* The design requirements of a sensor network change with its application because the sensor network is usually designed and deployed for a specific application.

Many-to-one traffic pattern*:* In most sensor network applications, the data sensed by sensor nodes flow from multiple source sensor nodes to a particular sink, exhibiting a many-to-one traffic pattern.

Frequent topology change*:* Network topology changes frequently due to the node failures, damage, addition, energy depletion, or channel fading.

The variety of possible applications of WSNs to the real world is practically unlimited, from environmental monitoring, health care, positioning and tracking, to logistic, localization, and so on.

II. DESIGN ISSUES AND CHALLENGES

Here we describe that how we can create the sensor network which is useful in real life. Our topic is energy consumption so it is necessary that we should maintain the energy amount of when we are going to create the wireless sensor network. Below we describe design issue which help us to minimize the energy consumption.

Small node size: When node size will be small then it will reduce the power consumption and cost of sensor nodes.

Low node cost*:* Sensor nodes are usually deployed in large numbers and cannot be reused so reducing cost of sensor nodes is important and will result into the cost reduction of whole network.

Low power consumption*:* As we know that sensor nodes are powered by battery and it is often very difficult or even impossible to charge or recharge their batteries, so it is very necessary to design such type of protocol which reduce the power consumption of sensor nodes so that the lifetime of the sensor nodes will increase.

Scalability: The network protocols designed for sensor networks should be scalable to different network sizes because the numbers of sensor node are huge.

Reliability: Network protocols designed for sensor networks will be reliable means it must provide error control and correction mechanisms to ensure reliable data delivery over noisy channel.

Self-configurability*:* Sensor nodes should be able to autonomously organize themselves and reconfigure their connectivity when topology will changed and node failures after deployment.

Adaptability: Network protocols designed for sensor networks should be adaptive for density and topology changes because the node in sensor network may fail, join or move.

Channel utilization*:* The protocol should utilize total bandwidth because the networks have limited bandwidth resources.

Fault tolerance*:* Sensor nodes should be fault tolerant and have the abilities of self testing, self-calibrating, self-repairing, and self-recovering.

Security: A sensor network should have effective security mechanisms to prevent the data information in the network or a sensor node from unauthorized access.

QoS support*:* Network protocol design should consider the QoS requirements of specific applications because different applications may have different quality-of-service (QoS).

Sensor locations*:* Routing protocols should manage the locations of the sensors. Most of the proposed protocols use some localization technique to learn about their locations.

Limited hardware resources: Network protocol design should responsible for hardware constraint because processing and storage capacities are also limited.

Random node deployment and unreliable environment: Sensor nodes can be scattered randomly in an intended area which effects for protocol design and also sensor network operates in a dynamic and unreliable environment so topology is also changeable.

Data Aggregation*:* Data aggregation technique has been used to achieve energy efficiency and data transfer optimization in a number of routing protocols.

Diverse sensing application requirements: No network protocol can meet the requirements of all applications. So the routing protocols should guarantee data delivery and its accuracy so that the sink can gather the required knowledge about the physical phenomenon on time.

III. LITERATURE REVIEW

As we know that the power consumption can be divided into three domains: sensing, communication and data processing. So for all these three issues protocol is very necessary. Routing in wireless sensor networks differs from conventional routing in fixed networks in various ways. There is no infrastructure, wireless links are unreliable, sensor nodes may fail, and routing protocols have to meet strict energy saving requirements.Following table shows the list of routing protocol for sensor network.

Table I. Routing Protocol

Category	Protocol Name
Location-based Protocols	MECN, SMECN, GAF, GEAR, Span, TBF, BVGF, GeRaF
Data-centric Protocols	SPIN, Directed Diffusion, Rumor Routing, COUGAR, ACQUIRE, EAD, Information-Directed Routing, Gradient- Based Routing, Energy-aware Routing, Information-Directed Routing, Quorum-Based Information Dissemination, Home Agent Based Information Dissemination
Hierarchical Protocols	LEACH, PEGASIS, HEED, TEEN, APTEEN
Mobility-based Protocols	SEAD, TTDD, Joint Mobility and Routing, Data MULES, Dynamic Proxy Tree-Base Data Dissemination
Multipath-based Protocols	Sensor-Disjoint Multipath, Braided Multipath, N-to-1 Multipath Discovery
Heterogeneity-based Protocols	IDSQ, CADR, CHR
QoS-based protocols	SAR, SPEED, Energy-aware routing

In reference paper [3] tries to develop low power sensor network. The sensor network is used in various application and there are different technical issues are available for different application area. In this paper the solutions are discussed under their related protocol stack layer. All the design issue, the protocol stack layer and the hardware description are describe in this paper. The power consumption is also very major issue which is focused for all layers.

Sensor network needs to satisfy the constraints by fault tolerance, scalability, cost, hardware, topology change, environment and power consumption. So new wireless techniques are required to solve these issues for different layer of the sensor network protocol stack.

Reference paper [6] tries to describe the experiences with developing a combined hardware and software platform for medical sensor networks, called Code Blue. CodeBlue provides protocols for device discovery and publish/ subscribe multihop routing, as well as a simple query interface that is tailored for medical monitoring. This paper also study the effect of node mobility, fairness across multiple simultaneous paths, and patterns of packet loss, confirming the system's ability to maintain stable routes despite variations in node location and data rate.

There are various critical areas in Code Blue. The most serious is the lack of reliable communication; this problem can be mitigated somewhat through redundant transmissions. Another area worth exploring is the impact of bandwidth limitations and effective techniques for sharing bandwidth across patient sensors. An important shortcoming of the current Code Blue prototype is its lack of security.

In this paper [2] focused the design of sensor networks that have extremely long lifetimes, and propose a physical layer driven approach to designing protocols and algorithms. This paper, first present a hardware model for wireless sensor node and then introduce the design of physical layer aware protocols, algorithms, and applications that minimize energy consumption of the system. These papers also showhow to reduce energy consumption of non-ideal hardware through physical layer aware algorithms and protocols.

This paper advocate a physical layer driven approach to protocol and algorithm design for wireless sensor networks. In order to meet the system lifetime goals of wireless sensor applications, considering the parameters of the underlying hardware are critical. If protocol designers treat the physical layer as a black box, system designers may design protocols that are detrimental to energy consumption.

The Ref papers [7] give a survey of routing protocols for Wireless Sensor Network and compare their strengths and limitations. The sensor nodes have a limited transmission range, and their processing and storage capabilities as well as their energy resources are also limited. Routing protocols for wireless sensor networks are responsible for maintaining the routes in the network and have to ensure reliable multi-hop communication under various types of physical and environmental conditions, data processing, and wireless communication.

This paper surveyed a sample of routing protocols by taking into account several classification criteria, including location information, network layering and in-network processing, data centricity, path redundancy, network dynamics, QoS requirements, and network heterogeneity.

The Ref paper [11] work on ,to avoid the packet loss and also to reduce energy consumption using optimal selective rebroadcast (or) forwarding lost packet by applying Dynamic Source Routing (DSR) algorithm .Mobile objects is used to retrieve sensor-data from sampling points within a large sensor field.

Each sensor maintains the routing table and only if the route is available then the optimal selective forwarding scheme is applied. This scheme depends on parameters such as the available battery at the node, the energy cost of retransmitting a message, or the importance/preference of the messages. The forwarding schemes are designed for three different cases: the sensors maximize the importance of their own transmitted messages; the sensors maximize the importance of messages that have been successfully retransmitted by at least one of its neighbors; and 3) the sensors maximize the importance of messages that successfully arrive to the sink. Since by using the optimal selective forwarding and Dynamic Source Routing techniques the packet loss can be controlled.

IV. CONCLUSION

The objective of this paper is to compare the power saving protocol. Firstly the brief introduction of wireless sensor network with architecture, working of the hardware component and the protocol stack and then the challenges to create the wireless sensor network are discussed in this paper.

In the literature survey, we present the short overview of the energy conservation protocol for calculating energy. The protocol list is also given which help us to understand the categorization of the protocol in wireless sensor network. The previous and modified protocol used for energy saving are compared which give the way to develop the good power saving protocol.

REFERENCES

[1] V. Rodoplu and T. Meng, "Minimum energy mobile wireless net- works", *IEEE J. Selec. Areas Mob. Comp.*, vol. 4, no. 3, pp. 310–317, 1999.

[2] E. Shih, S.-H. Cho, N. Ickes, R. Min, A. Sinha, A. Wang, and A. Chandrakasan, "Physical layer driven protocol and algorithm design for energy-efficient wireless sensor networks," in Proc. 7th Annual *ACM/IEEE* Int'l Conf. on Mobile Computing and Networking *(Mobicom 01)*, July 2001.

[3] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "A survey on sensor networks," *IEEE Commun. Mag.*, vol. 40, no. 8, pp. 102–114, Aug. 2002.

[4] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirici, "A survay on sensor networks", *Commun. ACM*, pp. 102–114, Aug. 2002.

[5] A. Hac, *Wireless Sensor Network Design*. New York: Wiley, 2003.
[6] V. Shnayder, B. Chen, K. Lorincz, T. Fulford-Jones, and M. Welsh, "Sensor networks for medical care," Division of Engineering and Applied Sciences, Harvard University, Tech. Rep. TR-08-05, 2005.
[7] Shio Kumar Singh , M P Singh and D K Singh "Routing Protocols in Wireless Sensor Networks –A survey" in International Journal of Computer Science & Engineering Survey (IJCSES) Vol.1, No.2, November.
[8] P. Santi, *Topology Control in Wireless Ad Hoc and Sensor Networks*. Chichester: Wiley, 2005.
[9] P. Kwaśniewski and E. Niewiadomska-Szynkiewicz, "Optimization and control problems in wireless ad hoc networks", in *Evolutionary Computation and Global Optimization*. Warsaw: WUT Publ. House, 2007, no. 160, pp. 175–184.
[10] J. Branch, G. Chen, and B. Szymański, "ESCORT: Energy- efficient sensor network communal routing topology using signal quality metrics", Lecture Notes in Computer Science, vol. 3420, Berlin/Heidelberg: Springer, 2005, pp. 438–448.
[11] P. Santhiya and J. Bhavithra "An Optimal Selective Forwarding Algorithm for Reducing Packet Loss in Mobile Sampling of Sensor Field" in Bonfring International Journal of Research in Communication Engineering, Vol. 2, Special Issue 1, Part 3, February 2012
[12] http://yrublog.appspot.com/?p=39001

