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WIRELESS SENSOR NETWORK-A REVIEW

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ABSTRACT:

This paper describes the concept of Wireless sensor network .Firstly, We describe the architecture or working modules of the sensor network and then tried to focus on the flaws of the sensor network such as scalability, energy efficiency etc. As sensor network consist various tiny and low cost sensor nodes with low battery life which will cause entire network die.

Keywords: Wireless sensor Network, Sensor nodes, Power unit, Transceiver, Controller ,fault tolerance, scalability.

INTRODUCTION

A wireless sense network (WSN) are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. These nodes are varying in size and totally depend on the size because different sizes of sensor nodes work efficiently in different fields. Wireless sensor networking have such sensor nodes which are specially designed in such a typical way that they have a micro controller which controls the monitoring, a radio transceiver for generating radio waves, different type of wireless communicating devices and also equipped with an energy source such as battery.

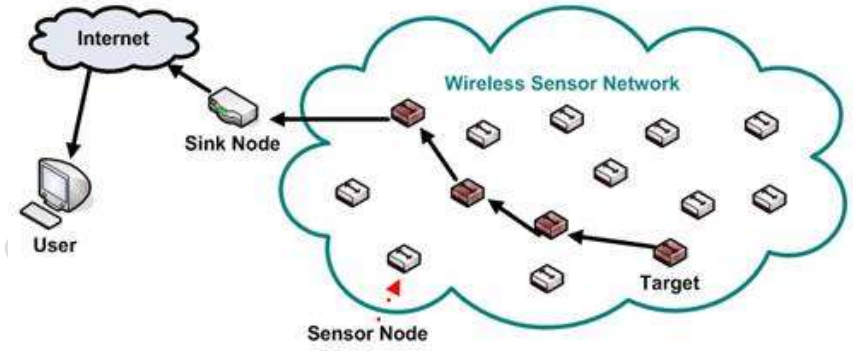
NEW PERSPECTIVE

- **In contrast to traditional wireless networks, wireless sensor networks:**
    - Are deployed for a specific sensing application not for only communication purposes
    - Energy consumption a primary issue to prolong network's lifetime
        - Nodes deployed in harsh environments
        - Large number of nodes
    - Nodes collaborate to accomplish a common task
    - Generally low bandwidth data transmission
    - Dense deployment, redundancy in acquired data
    - Nodes prone to failure, topology may change frequently
    - Limited in power, computing and memory resources
    - Nodes collaborate (not compete) on resource allocation.
    - Nodes may not have global ID .
    - Need some sort of geographical/functional labeling
    - Optimization emphasis on energy efficiency (instead of QoS and other BW, throughput constraints).
    - Data flow mostly uni-directional (source to sink), often broadcasting.

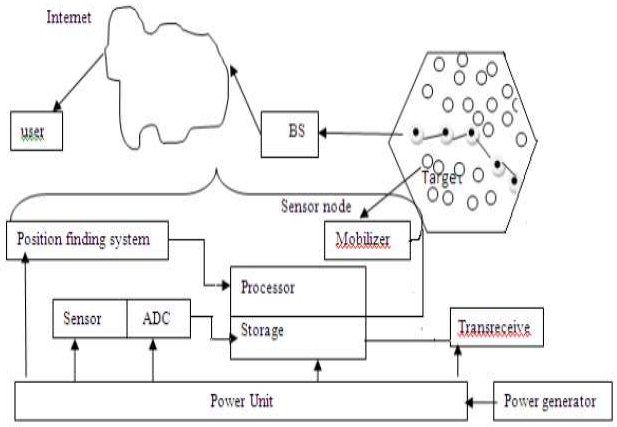
OTHER WIRELESS NETWORKS	WIRELESS SENSOR NETWORKS
Network's role: data transport	Network's role: information collection and dissemination
Network nodes compete for resources	Nodes collaborate on resource allocation
High data rates (e.g. full images transmitted)	Low data rates (e.g. image attributes transmitted)
Metric: maximize network throughput	Metric: Maximize network lifetime

SENSOR ARCHITECTURE DESIGN

Senor nodes are usually distributed in a sensor field as shown in fig. Each of these distributed nodes has the capabilities 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.



Components of a sensor Nodes



Controller(Processor and Storage):

The controller performs tasks, processes data and controls the functionality of other components in the sensor node. While the most common controller is a microcontroller, other alternatives that can be used as a controller are: a general purpose desktop microprocessor, digital signal processors, FPGAs and ASICs. A microcontroller is often used in manyembedded systems such as sensor nodes because of its low cost, flexibility to connect to other devices, ease of programming, and low power consumption.

Sensors (Sensor and ADC):

Sensors are hardware devices that produce a measurable response to a change in a physical condition like temperature or pressure. Sensors measure physical data of the parameter to be monitored. The continual analog signal produced by the sensors is digitized by an analog-to-digital converter and sent to controllers for further processing. A sensor node should be small in size, consume extremely low energy, operate in high volumetric densities, be autonomous and operate unattended, and be adaptive to the environment.

Power Unit

A wireless sensor node is a popular solution when it is difficult or impossible to run a mains supply to the sensor node. However, since the wireless sensor node is often placed in a hard-to-reach location, changing the battery regularly can be costly and inconvenient. An important aspect in the development of a wireless sensor node is ensuring that there is always adequate energy available to power the system. The sensor node consumes power for sensing, communicating and data processing. More energy is required for data communication than any other process.

Transceiver

The functionality of both transmitter and receiver are combined into a single device known as a transceiver. Transceivers often lack unique identifiers. The operational states are transmit, receive, idle, and sleep. Current generation transceivers have built-in state machines that perform some operations automatically.

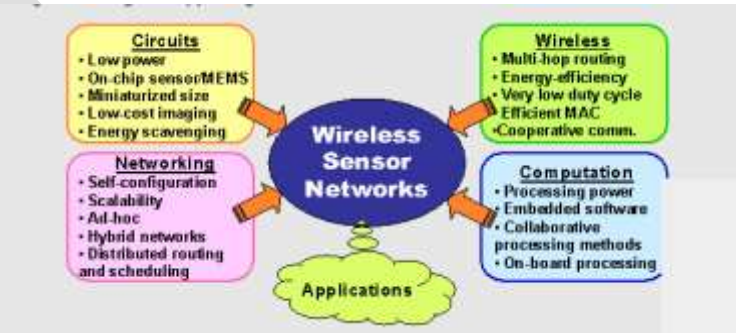
The working of sensor network can be categorized in four modules[2]:

A. Computing Module: This module contains Micro controller unit (MCU), which is responsible for the control of the sensors and execution of communication protocols.

B. Communication Module*:* This module is responsible for radio communication between neighboring nodes and the outside world. In this functioning it is better to completely shut down the radio rather than put it in the idle mode when it is not transmitting or receiving because of the high power consumed in this mode.

C. Sensing Module: It consists of a group of sensors and actuators and links the node to the outside world. Energy consumption can be reduced by using low power components and saving power at the cost of performance which is not required.

D. Power Supply Module: It consists of a battery which supplies power to the node. It should be seen that the amount of power drawn from a battery is checked because if high current is drawn from a battery for a long time, the battery will die even though it could have gone on for a longer time.



CHARACTERISTICS OF A WIRELESS SENSOR NETWORK [1]

The fundamental characteristics of a Wireless sensor network include:

1. Energy consumption constraints for nodes using batteries:

The nodes of wireless sensor networks are battery powered and in many cases no replacement of batteries can be done once deployed to the user .So, energy consumption has to be efficiently managed to increase the life time of the sensor networks .

2. Mobility of nodes:
In Wireless sensor networks nodes can change their location with time. Mobility of nodes help us from the problems regarding the constraints of network connectivity.

3. Communication failures:
Communication is done by either flooding or routing. Communication devices mainly used in wireless sensor networks are the radio transceivers. Radio transceivers are the devices comprising of both transmitter and receiver to work within the radio frequency range . Communication failures occur due to battery depletion.

4. Heterogeneity of nodes:
Wireless sensor networks are provided with heterogeneity of nodes .For example three primary types of hardware heterogeneities are Computational heterogeneity in which some nodes are provided with extra computational abilities. Link heterogeneity, where some nodes are provided with long-distance highly reliable communication links . Energy heterogeneity where nodes have unlimited energy resources.

5. Scalability to large scale of deployment :
Wireless sensor networks are scalable on a large scale. If sensor nodes are being deployed then battery cannot be changed and even providing maintenance cannot be possible.

DESIGN ISSUES

Since the performance of a routing protocol is closely related to the architectural model, in this section we strive to capture architectural issues and highlight there implications

1) Network dynamics: There are three main components in a sensor network. These are the sensor nodes , sink and monitored events . Aside from the very few setups that utilize mobile sensor , most of the network architecture assumes that sensor nodes are stationary. On the other hand supporting the mobility of sink or cluster heads (gateways) is sometimes deemed necessary.

2) Node Deployment: Another consideration is the topological deployment of the nodes which is Application dependent and affects the performance of the routing protocol. The deployment is either deterministic or self organizing. In deterministic situations, the sensors are manually placed and data is routed through pre determined paths. However in s elf organizing system the sensor nodes are scattered randomly creates an infrastructure in an ad -hoc manner.

3) Energy Consideration: During the creation of an infrastructure, the processes of setting up the routes are greatly influenced by energy considerations . Since the trans miss ion power of a wireless radio is proportional to the distance squared or even higher order in the presence of obstacles , multi hop routing will consume less energy than direct communication. However, multi hop routing introduces significant overhead topology management and medium access control. Direct routing would perform well inform if all the nodes are very close to the s ink. Most of the time sensors are scattered randomly over an area of interest and multi hop routing becomes unavoidable.

4) Data Delivery Models: Depending on the application of the sensor network, the data delivery model to the sink can be continuous, event- driven, query-driven and hybrid. In continuous delivery model, each sensor sends data periodically. In event driven and query driven models , the transmission of data is triggered when an event occurs or a query is generated by the s ink. So me network applies a hybrid network using a combination of continuous , event driven and query driven data delivery. The routing

protocol is highly influenced by data delivery model, especially with regard to the minimization of energy consumption and route stability.

REQUIREMENTS FOR WSNS

Fault tolerance

The network functionality must be maintained even though the built-in dynamic nature and failures of nodes due to harsh environment, depletion of batteries, or external interference make networks prone to errors.

Lifetime

The nodes are battery powered or the energy is scavenged from the environment and their maintenance is difficult. Thus, energy saving and load balancing must be taken into account in the design and implementation of WSN platforms, protocols, and applications.

Scalability

The number of nodes in WSN is typically high. Thus, the WSN protocols must deal with high densities and numbers of nodes.

Realtime

WSNs are tightly related to the real world. Therefore, strict timing constraints for sensing, processing, and communication are present in WSNs.

Security

The need for security in WSNs is evident, especially in health care, security, and military applications. Most of the applications relay data that contain private or confidential information.

Production cost

The number of nodes in WSNs is high, and once nodes run out of batteries they are replaced by new ones. Further, WSNs are envisioned to be everywhere. Therefore, to make the deployments possible, the nodes should be extremely low cost.

Conclusion:

As sensor network consist various tiny and low cost sensor nodes with low battery life So to increase network lifetime , a efficient Protocol needs to use for better routing algorithm, better resource utilization and long life span of a network with minimum energy loss .We encourage more insight into the problems and intend to motivate a research for solutions .

REFERENCES:

1. Rohit Kr Batwada, Meenakshi Tripathi, M.S.Gaur, Vijay Laxmi ISSUES IN OPTIMIZING THE PERFORMANCE OF WIRELESS SENSOR NETWORKS, IJRET: IJRET: International Journal of Research in Engineering and Technology.

2. Rajan Kumar , Naveen Prakash Energy Efficient Approach for Wireless Sensor Network, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 6, June 2013.

3. I.F. Akyildiz, W. Su*, Y. Sankarasubramaniam, E. Cayirci, Wireless sensor networks: a survey, Broadband and Wireless Networking Laboratory, School of Electrical and Computer Engineering, Georgia Institute of Technology,,Atlanta, GA 30332, USA