Analysis Wireless Sensor Network

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*Abstract-***A wireless sensor network (WSN) of spatially distributed autonomous sensors to monitor physical or environmental conditions. It simple, tiny, inexpensive, battery-powered ad-hoc network**. **In wireless sensor network, each sensor node plays a dual role of data originator and data router. Wireless sensor need to operate in conditions that are not encountered by typical computing device. In wireless sensor network modulated signal are send to turned resonant antenna which further provides electromagnetic wave. (WSN) is low power consumption and change the organization and live data.It is use in industry, health care monitoring, area monitoring etc. Wireless sensor network has change the way of organization industries work and live today.**

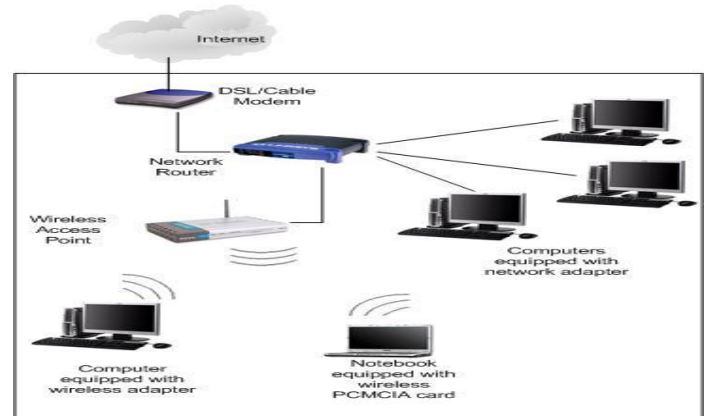*Keywords: wireless sensor network (WSN), ad-hoc, Sensors (nodes).*

I. INTRODUCTION

A Network that transmits information over public airways. The term wireless networking refers to technology that enables two or more computers to communicate using standard network protocols, but without network cabling. Strictly speaking, any technology that does this could be called wireless networking. Smart environments represent the next evolutionary development step in building, utilities, industrial, home, shipboard, and transportation systems automation. Like any sentient organism, the smart environment relies first and foremost on sensory data from the real world. Sensory data comes from multiple sensors of different modalities in distributed locations. The smart environment needs information about its surroundings as well as about its internal workings.

The challenges in the hierarchy of: detecting the relevant quantities, monitoring and collecting the data, assessing and evaluating the information, formulating meaningful user displays, and performing decision-making and alarm functionsareenormous.

Fig.1:Wireless Sensor Network

II.WIRELESS SENSOR NETWORK (WSN)

A network that is formed when a set of small sensor devices that are deployed in an "ad hoc fashion" no predefined routes, cooperate for sensing a physical phenomenon. A Wireless Sensor Network (WSN) consists of base stations and a number of wireless sensors. It simple, tiny, inexpensive, and battery-powered…

A wireless sensor network (WSN) of 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. Wireless communication is not a new technology but cell phones have brought revolution in wireless communication Wireless Technology has changed the way Organizations & individuals work & live today…

In less than 10 years: World has moved from fixed to wireless networks. Allowing people, mobile devices & computers talk to each other, connect without a cable. Only available option for field data acquisition. Interconnectivity with multiple devices. Using radio-waves, sometimes light Frees user from many constrains of traditional computer & phone system.

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. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.
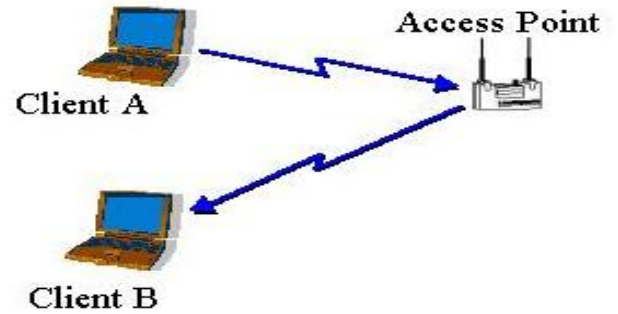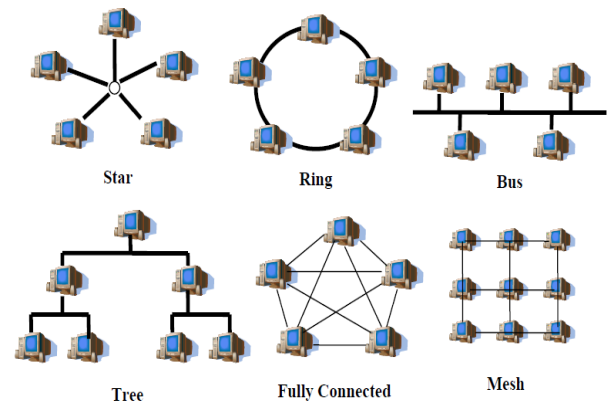
III.WORKING OF WIRELESS SENSOR NETWORK (WSN)

- Each system contains a transmitter.
- The transmitter consist of a system which modulates the signal properties namely amplitude, frequency, phase or there combination.
- Modulated signals are send to tuned resonant antenna. Which further provides electromagnetic waves.
- These electromagnetic waves isintercepted by a tuned receiver and are finally demodulated.

Fig 3:Working of WSN

Network Topology in WSN

Fig 3:Network Topology

The basic issue in communication networks is the transmission of messages to achieve a prescribed message throughput (Quantity of Service) and Quality of Service (QoS). QoS can be specified in terms of message delay, message due dates, bit error rates, packet loss, economic cost of transmission, transmission power, etc. Dependingon QoS, the installation environment, economic considerations, and the application, one of several basic network.
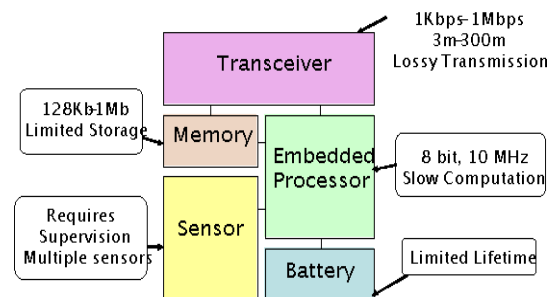
Sensor Node Hardware

Fig 4: Block Diagram of Sensor Node Hardware

Sensor node hardware has sensor which requires supervision multiple sensors , Actuator , ADC , Microprocessor , Powering Unit , Communication Unit (RF Transceiver) , GPS. Portable and self- sustained (power, communication, intelligence).Capable of embedded complex data processing. Transceiver is the device which receive the signal as well as transmit it to the receiver. It has lossy transmission. Memory is connected to sensor node hardware for transmission of data. Also if the signal is busy then memory use as temporary store data. It can store data near about 128Kb - 1Mb. Battery is shortest device. It has limited lifetime. Sensor required supervision multiple sensor. It sense the signal and their parameters. It work like nervous system which present in human beings. It performs important function in the operation of wireless sensing network. Embedded processor has 8 bit and 10 hz frequency. Also it includes slow computational processor. Portable and self sustained (power communication , intelligences). Capable of embedded compl.ex data processing

There are typical Sensor. That has following component. A sensor node has:

1.Sensor Node

Physical – Magnetic, Light, Sound

Chemical – CO, Chemical Weapons

Biological – Bacteria, Viruses, Proteins

There are various types of sensors: Pressure , Temperature , Light , Biological , Chemical , Strain , fatigue. Capable to survive harsh environments (heat, humidity, corrosion, pollution etc). No source of interference to systems being monitored and/or surrounding systems.

2. Integrated Circuitry (VLSI)

A-to-D converter from sensor to circuitry
Packaging for environmental safety

3. Power Supply:
Passive – Solar, Vibration   Active– Battery power, RF Inductance sustained (power, communication, intelligence).Capable of embedded complex data processing.

Network Characteristics of WSN

Generally, the network:
Consists of a large number of sensors   (10^3 to 10^6). Spread over large geographical region (radius = 1 to 10^3 km). Spaced out in 1, 2, or 3 dimensions. Is self-organizi. Uses wireless media May use intermediate "collators"

7. Constraints of Wireless Sensor Network (WSN)

It required limited Power Source. That's why battery Lifetime is limited . Each sensor node plays a dual role of data originator and data router (data processor) , The malfunctioning of a few nodes consumes lot of energy ((rerouting of packets and significant topological changes)

- Power consumption constraints for nodes using batteries or energy harvesting
- Ability to cope with node failures
- Mobility of node.
- Communication failures
- Heterogeneity of nodes
- Scalability to large scale of deployment
- Ability to withstand harsh environmental conditions
- Ease of use

IV. APPLICATIONS OF WSN

1 Area monitoring

Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors detect enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines. area monitoring is most important part.
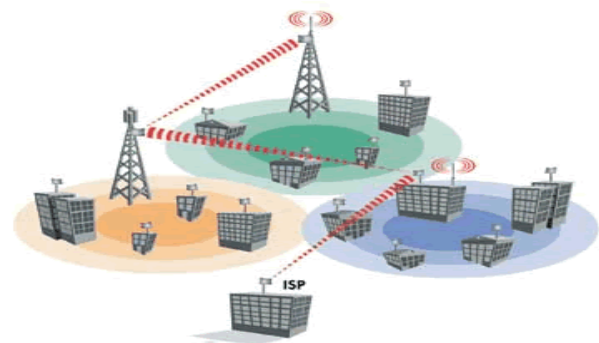
Fig 5: Networks in Area

2.Health care monitoring

The medical applications can be of two types: wearable and implanted. Wearable devices are used on the body surface of a human or just at close proximity of the user. The implantable medical devices are those that are inserted inside human body. There are many other applications too e.g. body position measurement and location of the person, overall monitoring of ill patients in hospitals and at homes. Body-area networks can collect information about an individual's health, fitness, and energy expenditure.
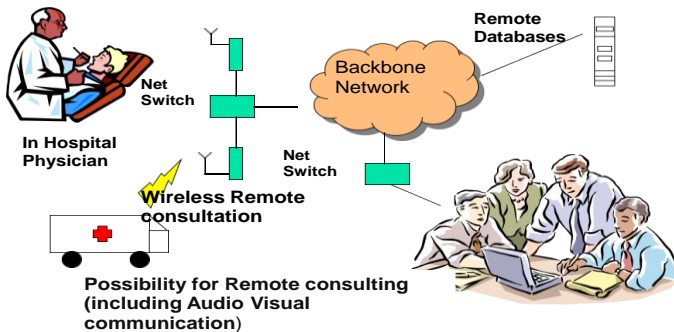

fig. 4 : Medical and Health Applications

2. Forest fire detection A network of Sensor Nodes can be installed in a forest to detect when a fire has started. The nodes can be equipped with sensors to measure temperature, humidity and gases which are produced by fire in the trees or vegetation. The early detection is crucial for a successful action of the firefighters; thanks to Wireless Sensor Networks, the fire brigade will be able to know when a fire is started and how it is spreading.

3. Landslide detection

A landslide detection system makes use of a wireless sensor network to detect the slight movements of soil and changes in various parameters that may occur before or during a landslide. Through the data gathered it may be possible to know the occurrence of landslides long before it actually happens.

4. Water quality monitoring

Water quality monitoring involves analyzing water properties in dams, rivers, lakes & oceans, as well as underground water reserves. The use of many wireless distributed sensors enables the creation of a more accurate map of the water status, and allows the permanent deployment of monitoring stations in locations of difficult access, without the need of manual data retrieval.

5 Air pollution monitoring

Wireless sensor networks have been deployed in several cities (Stockholm, London and Brisbane) to monitor the concentration of dangerous gases for citizens. These can take advantage of the ad hoc wireless links rather than wired installations, which also make them more mobile for testing readings in different areas.

6.Natural disaster prevention

Wireless sensor networks can effectively act to prevent the consequences of natural disasters, like floods. Wireless nodes have successfully been deployed in rivers where changes of the water levels have to be monitored in real time.

7.Industrial monitoring

a.Machine health monitoring

Wireless sensor networks have been developed for machinery condition-based maintenance (CBM) as they offer significant cost savings and enable new functionality.In wired systems, the installation of enough sensors is often limited by the cost of wiring. Previously inaccessible locations, rotating machinery, hazardous or restricted areas, and mobile assets can now be reached with wireless sensors.

b.Water/Waste water monitoring

Monitoring the quality and level of water includes many activities such as checking the quality of underground or surface water and ensuring a country's water infrastructure for the benefit of both human and animal.

Fig 6:Industrial Uses

V.CONCLUSION

- Wireless Sensor Network provide a tremendous amount of freedom and flexibility and support the increasing desire for always-on, always-available connectivity.

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