

The Constraints in Wireless Sensor Network - A Review

Ms. Maheshwari Marne¹ Ms.Swapna Patil²

¹P.G Student ²Assistant Professor

^{1,2}SLRTCE, Mumbai, India

Abstract— Wireless sensor networks (WSN) consist of tiny sensor nodes scattered on a relatively large geographical area. Wireless Sensor Networks (WSNs) are low cost, low-power, multifunctional sensor nodes that are small in size and communicate untethered in short distances. The WSN nodes are used in numerous applications in different areas including military, health, industry and ecology. However, there are several restrictions such as low capability of computation, limited energy resources, unreliable channels, and the power consumption. This paper proposes different constraints and the solution for the same.

Key words: Wireless sensor network, Constraints in WSN, Applications

I. INTRODUCTION

In current years, WSN has found a huge number of applications in the field of both research and academics. In WSN, the nodes are called as sensors, which sense the data like temperature, pressure, humidity, noise or sound, soil variety, stress levels, movements of objects, uncovering of objects around[1] and other properties from the surroundings and then send this gathered information to the base station for the further analysis and decision making. The sink may communicate with the task manager node via Internet or Satellite. The sensor nodes scattered in a sensor field are shown in Fig. 1[2][3].

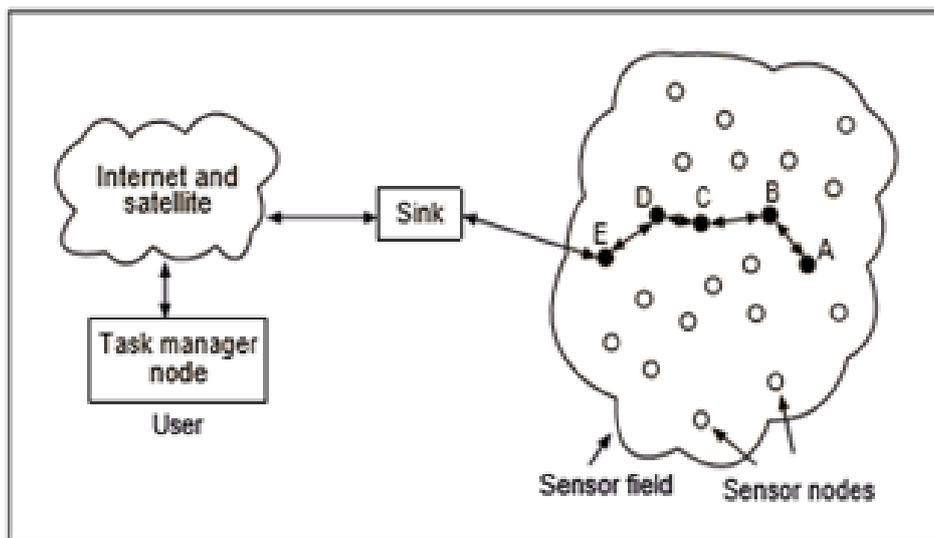


Fig. 1: Sensor Nodes scattered in a sensor field [2]

Depending on the complexity the size and cost of each node may vary. The main characteristics of wireless sensor networks are Ability to cope with node failures, Communication failures, Mobility of nodes, Heterogeneity of nodes, Scalability to large scale of deployment, Ability to withstand harsh environmental conditions, Ease of use, and Power consumption. [4]

II. DIFFERENT CONSTRAINTS IN WSN

Individual sensor node in WSN is a resource constrained. They have limited processing capability, storage capacity, and communication bandwidth. It is necessary to consider the hardware constraints of the sensor nodes [11]

A. Energy

In WSN Energy is the biggest constraint. Energy consumption in sensor nodes can be divided into three parts:

- 1) Energy for the transducer.
- 2) Energy for communication among sensor nodes.
- 3) Energy for microprocessor computation.

It was found that each bit transmitted in WSNs consumes about as much power as executing 800–1000 instructions. Thus, communication is more costly than computation in WSNs [5].

B. Power Consumption

The wireless sensor node are micro-electronic device that can be equipped with very limited power source (<0.5 Ah, 1.2 V). In some application, replenishment of power resources might be impossible. Sensor node lifetime, therefore, shows a strong dependence on battery lifetime [2].

C. Memory

Memory of sensor nodes usually consists of flash memory and RAM. Flash memory is used to store downloaded application code and RAM is used for storing application programs, sensor data, and intermediate computations. There is limited space to run complicated algorithms and functions after loading OS and application code [5].

D. Transmission Range

Range of communication in sensor nodes is very limited for both technically and by the need to conserve energy. The actual range achieved from a given transmission signal strength is dependent on various environmental factors such as weather, vibration, humidity, pressure and terrain etc.

E. Communication

A sensor node utilize maximum energy in data communication. This involves both data transmission and reception. It can be seen that for short-range communication with low radiation power, transmission and reception energy costs are nearly the same. Mixers, frequency synthesizers, phase locked loops (PLL), voltage control oscillators (VCO) and power amplifiers, all consume valuable power in the transceiver circuitry [2].

F. Higher Latency In Communication

Network congestion, Multi-hop routing and processing in the intermediate nodes of WSN may give rise to higher latency in packet transmission. So, it is very difficult to achieve synchronization. Such synchronization issues may sometimes be very critical in security as some security mechanisms may rely on critical event reports and cryptographic key distribution [6].

G. Unattended Operation Of Networks

Generally, the nodes in a WSN are deployed in remote regions like mountain, terrain and are left unattended. The likelihood that a sensor experiences a physical attack in such an environment is therefore, very high. Detection of physical tampering is virtually impossible due to remote management of a WSN [7].

III. APPLICATION OF WSN

Wireless sensor network are deployed widely and they give an economical solution to many problems. In this section we give a survey on applications of Wireless Sensor Networks. Here are some typical and promising applications of WSNs are:

A. Military Applications

It can be used as commanders to monitor the status (position, quantity, availability) of their troops, equipment and battlefield surveillance or reconnaissance of opposing forces and terrain to target the enemy, to detect attack etc [2].

B. The Medical Application

Sensors can be extremely useful in patient diagnosis and monitoring. Patients can wear small sensor devices that monitor their physiological data such as heart rate or blood pressure [8].

C. Commercial Applications

It can be used to detect/track/monitor a vehicle, to support interactive devices, or to control environmental condition of a building [3].

D. Environmental Monitoring

It can be used to monitor the condition/status of environment such as humidity, temperature, pressure, and pollution in soil, marine, and atmosphere. It also includes traffic, habitat, Wild fire etc. [8]

E. Infrastructure Protection Application

It includes water distribution monitoring power grids monitoring, etc. [8].

F. Scientific Exploration

WSNs can be deployed under the water or on the land surface of a planet for scientific research purpose.

G. Public Safety

WSNs can be applied to monitor the chemical, biological or other environmental threats, it is important that the availability of the network is never threatened [2]

IV. FUTURE SCOPE

Power saving mechanisms can be used like optimal sleep control mechanism which reduces power consumption of the wireless sensor nodes. Different data routing protocols that are responsible for transmission and coverage protocols that are concern with the coverage of the area by the individual sensor nodes can be taken into consideration in order to use the energy of the sensor nodes in Wireless Sensor Network efficiently thereby increasing the lifetime of the nodes

V. CONCLUSION

The demand for the WSNs has increased. There are various limitations like energy, memory, Unreliable communication, Transmission range. These restrictions makes WSNs different from the conventional ad hoc wireless networks.

This paper gives a brief study on different constraints of wireless sensor network. It also provides information on the application of WSN in various areas including critical areas like military and surveillance etc. In the future, this wide range of application areas will make sensor networks an integral part of our lives

REFERENCES

- [1] Heena Singh¹, Monika Agrawal², Nidhi Gour³, Prof. Dr. Naveen Hemrajani⁴ “vA Study on Security Threats and Their Countermeasures in Sensor Network Routing” International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014
- [2] Akyildiz, I. F., Su, W., Sankarasubramaniam, Y, and Cayirci, E., “Wireless Sensor Networks: A Survey”, Computer Networks, 38, 2002, pp. 393-422
- [3] Ian F. Akyildiz, Weilian Su, Yogesh Sankarasubramaniam, and Erdal Cayirci “A Survey on Sensor Networks” IEEE communication magazine August 2002
- [4] Paolo Baronti, Prashant Pillai, Vince Chook, Stefano Chessa, Alberto Gotta, Y. Fun Hu, “Wireless Sensor Networks: a Survey on the State of the Art and the 802.15.4 and ZigBee Standards”, PhD Seminar
- [5] J. Hill et al., —System Architecture Directions for Networked Sensors, SIGOPS Oper. Syst. Rev., vol. 34, no. 5, 2000, pp. 93– 104.
- [6] J.A. Stankovic et al, —Real-time communication and coordination in embedded sensor networks, In Proceedings of the IEEE, Vol. 91 (7), pp. 1002-1022, July 2003
- [7] Usham Robinchandra Singh, Sudipta Roy, Herojit Mutum “A Survey on Wireless Sensor Network Security and its Countermeasures: An Overview” International Journal of Engineering Science Invention(IJESI), Volume 2 Issue 9 September. 2013
- [8] Kalpana Sharma, M K Ghose “Wireless Sensor Networks: An Overview on its Security Threats” IJCA Special Issue on “Mobile Ad-hoc Networks” MANETs, 2010.