

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/347947375>

A Comparative Study of Wireless Networks and Wireless Sensor Networks

Article · January 2018

CITATIONS

0

READS

194

2 authors, including:



[Kalpana Govindaswamy](#)

Sri Ramakrishna College of Arts and Science for Women

16 PUBLICATIONS 11 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Cloud Computing [View project](#)



Mobile Adhoc Network [View project](#)



A Comparative Study of Wireless Networks and Wireless Sensor Networks

P. Monika¹ and Dr. G. Kalpana²

¹M.Phil. Research Scholar, Department of Computer Science,

Sri Ramakrishna College of Arts and Science for Women Coimbatore (Tamilnadu), India,

²Associate Professor, Department of Computer Science,

Sri Ramakrishna College of Arts and Science for Women Coimbatore (Tamilnadu), India,

ABSTRACT: Wireless networking is used for providing the wireless connection between different network nodes. Wireless Sensor Networks are similar to wireless ad hoc networks where it can be used for the transmission of sensor data between the nodes. Sensing is the type of a technique helpful for gathering the information from the devices or processes. This paper mainly focuses on the characteristics of wireless and wireless sensor networks and their differences between. Wireless network and wireless sensor network faces some of the issues when the data transmission take place in the wireless medium.

Keywords: Wireless networks, Wireless sensor networks, Ad hoc networks, Multi-hop transmission, bandwidth, wireless medium.

I. INTRODUCTION

Wireless networking is used for providing the wireless connection between different network nodes. It can be used in many places like homes, offices, etc and it can be used for avoiding the process of investing more on cabling infrastructure. Some of the examples of wireless networks are cell phone network, wireless local area network, satellite communication, etc [1]. IEEE 802.11 introduced the Wi-Fi wireless technology for providing the internet connections for the users at any place. Wireless Local Area Network (WLAN) devices are used in many organizations with the stable network connection when the devices move from one place to another within the office.

Wireless Sensor Networks (WSN) are similar to wireless ad hoc networks where it can be used for the transmission of sensor data between the nodes. Wireless Sensor Networks are defined as the infrastructure-less wireless network which is used for monitoring the physical and environmental conditions like temperature, pressure, vibration, etc. WSN have many functionalities like collecting, processing and transmitting those data to other devices. Zigbee is a type of WSN technology used for the transmission of data from one device to another through radio waves with low energy consumption [2].

II. WIRELESS NETWORKS

Wireless networking is used for providing the wireless connection between different network nodes [1]. In the wireless network technology, wireless links are required for transmitting the packets. The messages can be sent from the sender device via the wireless medium to the receiver within the transmission range of the sender. Wireless networks can be classified into two different types of network namely Infrastructure network and Ad Hoc networks.



Fig. 1. Wireless Networking Design.

In the infrastructure network, the access points (AP) are required for accessing the network. It can be denoted as the fixed technology in which the devices can connect to other device via the fixed device named as base station or access point [3]. Wireless network design with access points is represented in Fig 1. Ad Hoc Networks does not require the access points for the communication purpose. The nodes that are in the ad hoc network acts as the host or router. The devices can directly connect to other devices that are within the transmission range. When the sender tries to send message to the device that is not in coverage region then the message will be sent to the device within the sender transmission range and then sent to the exact receiver [4].

A. Characteristics of Wireless Networks

Some of the characteristics of wireless networks are discussed below:

Autonomous Behaviour: In the ad hoc networks, the devices can acts as a host or router, so that it has the capacity to switch the functionalities and work accordingly.

Multi-hop transmission: When the sender sends the message to the receiver out of the transmission range, then the message will be sent via the intermediate nodes [5].

Symmetric Environment: Since the devices in the wireless acts as a host or router, then all the devices have similar features and responsibilities, so that the devices are symmetric in nature.

Light weight features: The ad-hoc network devices have low CPU processing capability, less memory and power storage [4].

III. WIRELESS SENSOR NETWORKS

Wireless Sensor Networks (WSN) are similar to wireless ad hoc networks where it can be used for the transmission of sensor data between the nodes [2]. Sensing is the type of a technique helpful for gathering the information from the devices or processes. The main functionality of WSN is to monitor the environment and provide the report to the base station for further processing. WSN devices communicate with other devices via the gateway [6]. The gateway acts as a bridge between the WSN and other network. Wireless sensor network design is represented in Fig 2.

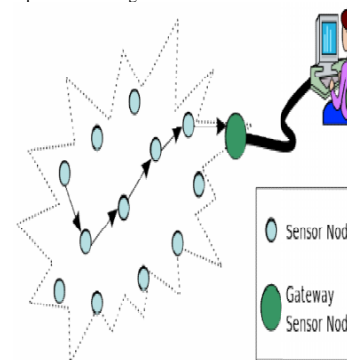


Fig. 2. Wireless Sensor Network.

The base station is a device that is used for controlling the activities of all other devices and take decisions according to the conditions [7]. Base stations play the vital role in wireless sensor network because the sensor nodes can cause many issues to the devices so that the base stations are used for collecting the data and take frequent backups of data. Those backup data can be used by the devices when

the master node fails [8]. Wireless sensor nodes are provided with many different sensors and those sensors can communicate between the devices using the radio signals. A wireless sensor node is constructed using the computing devices, radio transceivers and sensing devices. The sensor nodes are equipped with the built-in processor and it is used for processing the raw data before the transmission stage [9].

A. Characteristics of Wireless Sensor Networks

Characteristics of wireless sensor networks are explained below:

Scalability: Any number of nodes or devices can be attached to the infrastructure.

Responsiveness: The devices in the network are able to adapt to the changes that are made in future.

Reliability: The basic need of every network is to be reliable. The reliability is required in the data transmission of network structure.

Power efficiency: The devices in WSN have the ability to change its data path and handle all the nodes. It is designed in a way to work in power source other than direct power [10].

IV. WIRELESS NETWORKS Vs WIRELESS SENSOR NETWORKS

Features	Wireless Networks	Wireless Sensor Networks
Number of nodes	Limited	Unlimited
Sensing	It does not posses.	It posses.
Devices	Devices like laptops, PDA's are used.	Very small devices are used.
Power	Limited capacity	Larger capacity
Cost	Expensive	Inexpensive.
Transmission range	Ranges from 10 – 500 meters.	Ranges from 3 – 30 meters.
Node density	Lower	Higher
Communication	Data moves from one device to many devices.	Data moves from many devices to the gateway.

V. CHALLENGES IN WIRELESS NETWORKS

Some of the key challenges of wireless networks are:

A. Signal fading

In the wireless network infrastructure the signals are transmitted over the wireless transmission medium, so that the signals can travel in different path due to reflection or scattering caused by other objects. When the signals are transmitted in different directions it takes different time duration to reach the destination. Once the receiver get the signals it may has more

noise or attenuation than the original transmitted signal. Thus signal fading issue in wireless network cause more packet loss.

B. Power and Energy:

The devices in the wireless networks can be smaller in size and they are dedicated to perform some set of functions, but the power resources cannot be shared to the devices as expected. When the device moves from one place to other, it is hard to provide continuous power supply to all the movable devices.

C. Data Rate

Data rate is the major issue in wireless networks because the multimedia applications like audio and video should be supported by the devices with high speed data rate. The comparison ratios of the multimedia applications can be between 75 to 100. So that the audio and video with good quality should be provided at this comparison rates [3].

D. Security

Security is also a major issue in wireless networks because the data are transmitted via the radio frequencies. When the data are sent via wireless medium, the intruders have the access to the data that is sent. They can able to steal the data or deny the service to the users or receivers [1].

VI. CHALLENGES IN WIRELESS SENSOR NETWORKS

Some of the key challenges of wireless sensor networks are:

A. Limited Bandwidth

In WSN less power will be consumed for data processing when compared to data transmission. During data transmission, only limited bandwidth will be used so that it affects the messages that are sent between the sensors.

B. Energy

Power consumption in wireless sensor devices are allotted to three domains namely sensing, communication and data processing. All these factors depend on the battery life of the devices. Usually, the battery life can be recharged or replaced when it get decreased. But for some applications the sensors battery life should be available until its work has been completed [8].

C. Security

There are more security issues in the wireless sensor networks. Data integrity is the major issue in WSN. Since the data are sent via transmission medium, the receivers should ensure that the data they have received is original. The data that are sent should be authenticated and it should not be modified by the unknown users [11].

VII. APPLICATIONS

The applications that are used for wireless networks and wireless sensor networks are discussed below:

A. Wireless Networks

Military battlefield: Military equipments are provided with some of the computer equipments. It helps to maintain information among the vehicles, soldiers and military head quarters.

Commercial sector: Wireless network devices can be used in emergency or rescue operations for natural calamities relief efforts, e.g. in fire, flood, or earthquake. Information is delivered from one rescue team member to another.

Local level: Wireless devices can communicate between instant and temporary multimedia network using notebook computers or palmtop computers to spread and share information among participants at a conference. Another appropriate local level application might be in home networks where devices can communicate directly to exchange information [4].

B. Wireless Sensor Networks

Area monitoring applications: In area monitoring, the WSN can be deployed in a region to monitor any activities. When the sensors detect the event being monitored, the event is reported to the base station, which then takes appropriate action.

Environmental applications: A few environmental applications of sensor networks include forest fire detection, green house monitoring, etc. They can be used for tracking the movement of insects, birds and small animals.

Health applications: Some of the health applications for sensor networks are providing interfaces for tracking and monitoring doctors and patients inside a hospital and telemonitoring of human physiological data, etc [11].

VIII. CONCLUSION

Wireless technologies are used in many organizations in order to reduce time and the issues that are in the cables of wired infrastructure. This paper mainly focuses on characteristics, issues and applications of both wireless networks and wireless sensor networks.

REFERENCES

- [1]. Surabhi Surendra Tambe, "Wireless Technology in Networks", *International Journal of Scientific and Research Publications*, ISSN 2250-3153, Vol. 5 Issue 9, July 2015.
- [2]. Aamir Shaikh and Siraj Pathan, "Research on Wireless Sensor Network Technology", *International Journal of Information and Education Technology*, Vol. 2 Issue 5, Oct 2012, pp 476-479.
- [3]. Aniruddha Singh, Abhishek Vaish and Pankaj Kumar Keserwani, "Research Issues and Challenges of Wireless Networks", *International Journal of Advanced Research in Computer Science and Software Engineering*, ISSN: 2277 128X, Vol 4 Issue 2, Feb 2014, pp 572-575.

- [4]. Jagtar Singh and Natasha Dhiman, "A Review Paper on Introduction to Mobile AdHoc Networks", *International Journal of Latest Trends in Engineering and Technology*, ISSN: 2278-621X, Vol. 2 Issue 4, July 2013, pp 143-149.
- [5]. Sushmita Kopekar and Amresh Kumar, "A Study of Ad-Hoc Wireless Networks: Various Issues in Architectures and Protocols", *International Journal of Computer Applications*, ISSN 0975 – 8887, Vol. 122 Issue 6, July 2015, pp 36-40.
- [6]. Murat Dener, "A new gateway node for wireless sensor network application", *Scientific Research and Essays*, ISSN 1992-2248, Vol. 11 Issue 20, Oct 2016, pp 213-220.
- [7]. Shantala Devi Patil and Vijayakumar B P, "Overview of Issues and Challenges in Wireless Sensor Networks", *International Journal of Application or Innovation in Engineering & Management*, ISSN 2319 – 4847, Vol. 5 Issue 5, May 2016.
- [8]. S. Karthik and Dr. A. Ashok Kumar, "Challenges of Wireless Sensor Networks and Issues associated with Time Synchronization", *International Journal of Advanced Networking and Applications*, Mar 2015, pp 19-23.

- [9]. Edwin Prem Kumar Gilbert, Baskaran Kaliaperumal, and Elijah Blessing Rajsingh, "Research Issues in Wireless Sensor Network Applications: A Survey", *International Journal of Information and Electronics Engineering*, Vol. 2 Issue 5, Sep 2012, pp 702-706.
- [10]. Muhammad R Ahmed, Xu Huang, Dharmendra Sharma and Hongyan Cui, "Wireless Sensor Network: Characteristics and Architectures", *International Journal of Information and Communication Engineering*, Vol. 6 Issue 12, 2012, pp 1398-1401.
- [11]. Himani Chawla, "Some issues and challenges of Wireless Sensor Networks", *International Journal of Advanced Research in Computer Science and Software Engineering*, ISSN: 2277 128X, Vol. 4 Issue 7, July 2014, pp 236-239.