

Basic Concepts of Wireless Network

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Abstract: A wireless network is the computer network that uses wireless data connections for connecting network nodes. Wireless networking is a method by which homes; telecommunications networks and business installations avoid the costly process of introducing cables into a building, or as a connection between various equipment locations. Wireless telecommunications networks are generally implemented and administered using radio communication. This implementation takes place at the physical level (layer) of the OSI model network structure. In this paper we study different types of wireless networking systems and their topologies used.

Keywords: Network, Links, Nodes, Networking Elements (NE), LAN, Standard.

1. Introduction

A wireless network is nothing but a wireless media connecting via Radio waves. A wireless local-area network (LAN) uses radio waves to connect devices such as laptops to the Internet and to business network and its applications. When one connect a laptop to a WiFi hotspot at a cafe, hotel, airport lounge, or other public place, a wired network connects devices to the Internet or other network using cables. In the past, some believed wired networks were faster and more secure than wireless networks. But continual enhancements to wireless networking standards and technologies have eroded those speed and security differences. Wireless technologies employ radio waves and/or microwaves to maintain communication channels between computers. Knowing the basics can be very helpful when configuring a network and troubleshooting problems.

Wireless networks are computer networks that are not connected by cables of any kind. The use of a wireless network enables enterprises to avoid the costly process of introducing cables into buildings or as a connection between different equipment locations. The bases of wireless systems are radio waves, an implementation that takes place at the physical level of network structure.



Figure 1: Wireless Network

2. Main Types of Wireless Network

1. **Wireless Local Area Network (LAN):** LAN links two or more devices using a wireless medium, providing a connection through access points to the wider Internet. Wireless personal area networks (WPANs) interconnect devices within a relatively small area, which is generally within a person's reach.^[3] For example, both Bluetooth radio and

invisible infrared light provides a WPAN for interconnecting a headset to a laptop.

2. **Wireless Metropolitan Area Networks (MAN):** It connects several wireless LANs that make a larger wireless network called MAN. WiMAX is a type of Wireless MAN and is described by the IEEE 802.16 standard.
3. **Wireless Wide Area Network (WAN):** It covers large areas such as neighboring towns and cities. Wireless wide area networks are wireless networks that typically cover large areas, such as between neighboring towns and cities, or city and suburb. These networks can be used to connect branch offices of business or as a public internet access system. The wireless connections between access points are usually point to point microwave links using parabolic dishes on the 2.4 GHz band, rather than omnidirectional antennas used with smaller networks.
4. **Wireless Personal Area Network (PAN):** PAN interconnects devices in a short span, generally within a person's reach.

Apart from these types Global area network, Cellular network and space network are the types of wireless networking.

3. Wireless Network Elements

Wireless NEs are products and devices used by a wireless carrier to provide support for the backhaul network as well as a Mobile Switching Center (MSC). The telecommunications network at the physical layer also consists of many interconnected wire line Network Elements (NEs). These NEs can be stand-alone systems or products that are either supplied by a single manufacturer, or are assembled by the service provider (user) or system integrator with parts from several different manufacturers. The important NEs are the NEs that are located on the cell tower to the Base Station (BS) cabinet. The attachment hardware and the positioning of the antenna and associated closures/cables are required for adequate strength, robustness, corrosion resistance, and rain/solar resistance for expected wind, storm, ice, and other weather conditions. Components, such as hardware, cables, connectors, and closures, shall take into consideration the structure to which they are attached are the NEs.

3.1 Difficulties While Setting Up a Wireless Network

3.1.1 Interference

Interference is the main problem faced in the wireless network. Electromagnetic interference occurs in this network. This can be caused by other networks or other types of equipment that generate radio waves that are within, or close, to the radio bands used for communication. Interference can degrade the signal or cause the system to fail. This is the basic problem faced.

3.1.2 Absorption and Reflection

Absorption of electromagnetic waves due to some material which prevent it from reaching the receiver, Reflection can cause dead zones where no reception is available particularly with metallic or conductive materials.

3.1.3 Multipath Fading

In multipath fading the signal takes two or more routes or paths, Reflections can cause the signal to cancel out at certain locations and to be stronger in other places which is called upfade.

3.1.3 Hidden Node Problem

In some types of network the hidden node problem comes when a node is visible from a wireless access point (AP), but not from other nodes communicating with that AP. This leads to difficulties in media access control.

3.2 Different Wireless Links

- **Terrestrial microwave:** It uses earth based transmitter and receiver which resembles dishes which work on satellite communication. Terrestrial microwaves work in the low-gigahertz range, which limits all communications to line-of-sight. Relay stations are spaced approximately 48 km (30 mi) apart.
- **Radio and spread spectrum technologies** – Wireless local area network uses a high-frequency radio technology that is similar to digital cellular and a low-frequency radio technology.
- **Communications satellites** : Satellites communicate via microwave radio waves, which are not deflected by the Earth's atmosphere. The satellites are stationed in space, typically in geostationary orbit which is 35,400 km (22,000 mi) above the equator. These Earth-orbiting systems are capable of receiving and relaying voice, data, and TV signals.
- **Free-space optical communication:** it uses visible or invisible light for communication purpose. In most cases, line-of-sight propagation is used, which limits the physical positioning of communicating devices.

4. Future Scope of Wireless Network

Wireless network has less maintenance and less cost. Next generation will be Worldwide Interoperability for Microwave Access (WiMAX). An improvement over the existing wireless networking that uses a standard called

802.11. One will not need to change the equipment, as it will run on the existing hardware. Its biggest advantage will be that it will cover a wide area, which could be as much as up to 50 kilometers! The term Local Area Network (LAN) will be replaced by Metropolitan Area Network (MAN), which would cover the whole city! It will also offer higher speeds of up to an astounding 10MB per second, coupled with improved security.

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