# Advance Technique in Wireless Communication

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**ABSTRACT**
Wireless network refers to any type of computer network that is wireless, and is commonly associated with a telecommunications network whose interconnections between nodes is implemented without the use of wires. Wireless telecommunications networks are generally implemented with some type of remote information transmission system that uses electromagnetic waves, such as radio waves, for the carrier and this implementation usually takes place at the physical level or "layer" of the network..  In this paper, I have described about various applications, standards, type of wireless network. . Mobility and wireless, special services and lessons learnt from particular deployment complement the traditional wireless topics.   Wireless network is demand of today's generation because of high speed, accessibility, bandwidth and other characteristics.

**Introduction**: The concept of mobility is becoming more and more important in the field of communications - so much so that it has developed into an important economic factor which will undoubtedly continue to play an important role well into the future. Moreover, the world-wide triumphal march of the Internet will also continue on into the medium to long-term. The relentless expansion of the availability and the quality of the "network of all networks" will guarantee this success. Easy and fast availability of the Internet at any time and any place - represents a great challenge. With its funding activities in the area of mobile communications, the BMBF encourages cooperation and supports industry and research institutes in their efforts to further reinforce the favorable competitive position Germany has already built for itself. In addition to projects in the field of mobile broadband communication, there is also funded research on narrow band sensor networks.

**Mobile devices networks**

- Global System for Mobile Communications (GSM): The GSM network is divided into three major systems: the switching system, the base station system, and the operation and support system. The cell phone connects to the base system station which then connects to the operation and support station; it then connects to the switching station where the call is transferred to where it needs to go. GSM is the most common standard and is used for a majority of cell phones.[4]

- Personal Communications Service (PCS): PCS is a radio band that can be used by mobile phones in North America. Sprint happened to be the first service to set up a PCS.

- D-AMPS: D-AMPS, which stand for Digital Advanced Mobile Phone Service, is an upgraded version of AMPS but it is being phased out due to advancement in technology. The newer GSM networks are replacing the older system.

**Wireless Standards** This chart views the  some quick information which  differentiate between the available wireless networking standards and  describes which standard might be the right fit for your business. See below the chart for further information on wireless networking standards.

| Standard | Data Rate | Modulation Scheme | Security | Pros/Cons & More Info |
|---|---|---|---|---|
| IEEE 802.11 | Up to 2Mbps in the 2.4GHz band | FHSS or DSSS | WEP & WPA | This specification has been extended into 802.11b. |
| IEEE 802.11a (Wi-Fi) | Up to 54Mbps in the 5GHz band | OFDM | WEP & WPA | Products that adhere to this standard are considered "Wi-Fi Certified." Eight available channels. Less potential for RF interference than 802.11b and 802.11g. Better than 802.11b at supporting multimedia voice, video and large-image applications in densely populated user environments. Relatively shorter range than 802.11b. Not interoperable with 802.11b. |
| IEEE 802.11b (Wi-Fi) | Up to 11Mbps in the 2.4GHz band | DSSS with CCK | WEP & WPA | Products that adhere to this standard are considered "Wi-Fi Certified." Not interoperable with 802.11a. Requires fewer access points than 802.11a for coverage of large areas. Offers high-speed access to data at up to 300 feet from base station. 14 channels available in the 2.4GHz band (only 11 of which can be used in the U.S. due to FCC regulations) with only three non-overlapping channels. |
| IEEE 802.11g (Wi-Fi) | Up to 54Mbps in the 2.4GHz band | OFDM above 20Mbps, DSSS with CCK below 20Mbps | WEP & WPA | Products that adhere to this standard are considered "Wi-Fi Certified." May replace 802.11b. Improved security enhancements over 802.11. Compatible with 802.11b. 14 channels available in the 2.4GHz band (only 11 of which can be used in the U.S. due to FCC regulations) with only three non-overlapping channels. |
| IEEE 802.16 (WiMAX) | Specifies WiMAX in the 10 to 66 GHz range | OFDM | DES3 and AES | Commonly referred to as WiMAX or less commonly as WirelessMAN or the Air Interface Standard, IEEE 802.16 is a specification for fixed broadband wireless metropolitan access networks (MANs) |
| IEEE 802.16a (WiMAX) | Added support for the 2 to 11 GHz range. | OFDM | DES3 and AES | Commonly referred to as WiMAX or less commonly as WirelessMAN or the Air Interface Standard, IEEE 802.16 is a specification for fixed |

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|---|---|---|---|---|
| | | | | broadband wireless metropolitan access networks (MANs) |
| Bluetooth | Up to 2Mbps in the 2.45GHz band | FHSS | PPTP, SSL or VPN | No native support for IP, so it does not support TCP/IP and wireless LAN applications well. Not originally created to support wireless LANs. Best suited for connecting PDAs, cell phones and PCs in short intervals. |
| HomeRF | Up to 10Mbps in the 2.4GHZ band | FHSS | Independent network IP addresses for each network. Data is sent with a 56-bit encryption algorithm. | Note: HomeRF is no longer being supported by any vendors or working groups. Intended for use in homes, not enterprises. Range is only 150 feet from base station. Relatively inexpensive to set up and maintain. Voice quality is always good because it continuously reserves a chunk of bandwidth for voice services. Responds well to interference because of frequency-hopping modulation. |
| HiperLAN/1 (Europe) | Up to 20Mbps in the 5GHz band | CSMA/CA | Per-session encryption and individual authentication. | Only in Europe. HiperLAN is totally ad-hoc, requiring no configuration and no central controller. Doesn't provide real isochronous services. Relatively expensive to operate and maintain. No guarantee of bandwidth. |
| HiperLAN/2 (Europe) | Up to 54Mbps in the 5GHz band | OFDM | Strong security features with support for individual authentication and per-session encryption keys. | Only in Europe. Designed to carry ATM cells, IP packets, Firewire packets (IEEE 1394) and digital voice (from cellular phones). Better quality of service than HiperLAN/1 and guarantees bandwidth. |
| OpenAir | Pre-802.11 protocol, using Frequency Hopping and 0.8 and 1.6 Mb/s bit rate | CSMA/CA with MAC retransmissions | OpenAir doesn't implement any encryption at the MAC layer, but generates Network ID based on a password (Security ID) | OpenAir is the proprietary protocol from Proxim. All OpenAir products are based on Proxim's module. |

**Wireless ad-hoc network**:  A wireless ad-hoc network is a computer network in which the communication links are wireless. The network is ad hoc because each node is willing to forward data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity. This is in contrast to wired network technologies in which some designated nodes, usually with custom hardware and variously known as routers, switches,

hubs, and firewalls, perform the task of forwarding the data. It is also in contrast to managed wireless networks, in which a special node known as an access point manages communication among other nodes.

Minimal configuration and quick deployment make ad hoc networks suitable for emergency situations like natural disasters or military conflicts. The decentralized nature of most wireless ad hoc networks makes them suitable for a variety of applications where central nodes cannot be relied on, and may improve the scalability of wireless ad-hoc networks compared to wireless managed networks, though theoretical and practical limits to the overall capacity of such networks have been identified.

Types of wireless ad-hoc networks include Mobile ad hoc networks (MANets), wireless mesh networks, and wireless sensor networks.

In most wireless ad-hoc networks the nodes compete to access the shared wireless medium (the "ether"), often resulting in collisions. Using Cooperative wireless communications improves immunity to interference by having the destination node combine self-interference and other-node interference to improve decoding of the desired signal.

The earliest wireless ad hoc networks were called "packet radio" networks, and were sponsored by DARPA.

**WiFi- WIRELESS FIDELITY -WIRELESS NETWORKS** -  For Wi – Fi and  wireless network  terminologies which are used must be known and clear.  These terms describes what wireless network technology is  and how it works. Wi-Fi: Wi-Fi is a commonly used wireless network in computer systems to enable connection to the internet or other machines that have Wi-Fi functionalities. Wi-Fi networks broadcast radio waves that can be picked up by Wi-Fi receivers attached to different computers or mobile phones.

**Wi-Fi –Terminologies**

Following are the terms which are involved in Wi-fi and wireless networks.

**Gigahertz-**

Gigahertz is frequency measurement and its unit is GHz. It represents frequencies in the billions of cycles per second range. Giga represents 1 billion and hearts is standard unit used for measuring different frequencies.GHz is used with wireless communication as radio frequencies and computer performance. GHz refer to clock speed of central procession unit, (CPU). The higher the GHz , or CPU clock is the better the performance of the computer. The lowest clock GHz in Pentium 1 series is 133 which had reached up to 4 GHz along the time.

 Whereas in radio communication GHz is refer as bands of electric spectrum. Different band different uses for example, 802.11b/g falls some where between 2.4GHz to 5.0GHz.Latest technologies like Bluetooth, cordless phones, Wi-Fi operates on S-bandsSatellite communication and global possible system (GPS) operates on L-bands. There are other popular bands like Ku, Ka which have different uses.

## WiBro

Wibro have nothing to do with Wi-Fi directly, but it can be called extended version of Wi-Fi, Its is known as Wireless broadband. It is developed in south korea and it is latest technology in mobile access of wireless broadband. Wi-Fi operates on 802.11 standards developed by IEEE, WiBro on the other hand operates on 802.16 just as WiMax do. WiBro is specially design for connectivity while on move, where as WiMax is not recommended on move connectivity.

## Hotspot

 Hotspot is the place where wireless network is available for puplic use. Devices like laptops, handsets, Pdas, Note books etc are mostly installed with Wireless network cards which are designed to connect to Wi-Fi network in surrounding area. The place where wireless network is available to access is called hotspot. HotSpots are mostly available for free at Coffee shops, Public libraries, Public grounds, Universities, Airtports, Railway Stations etc.

## WiFi Finder

 As name suggests, it portable device to find Wireless network available for public use in certain area. This devices helps to find hotspots so laptop battery do not get waste just for finding Wireless network around. Wi-Fi finder are mostly battery operated device which is about a mouse size. When WiFi find is turn on it stats searching wirless network around if wifi network found it turns on its LED which says network is around and ask if wants to connect to it. If no network is found LED remain turned off. WiFi finders operates on 802.11b/g bands. Different versions of WiFi finders are available in market depending upon the aditonal features, Expensive modules comes with built in antenna which enhance the range and connectioncapabilities. WiFi finder Modules can ranges from 150 feet to 300 feet depending how sophisticated and expensive the module is. Wi-Fi finders once scan the network can be connected to laptops through USB.

## Access Point

 This is another important term which Wi-fi users mostly heard. Access point is almost like HotSpot. Its is also known as WAP, Wireless access point. WAP device connects wireless communication devices together to form a wireless network. WAP network are mostly connected to wired network and can provide interface between wireless devices with wired devices.

## Ultra-Wideband (UWB) Technology

## What is UWB?

Ultra-Wideband (UWB) technology , based on the WiMedia standard, brings the convenience and mobility of wireless communications to high-speed interconnects in devices throughout the digital home and office. Designed for low-power, short-range, wireless personal area networks (WPANs), UWB is the leading technology for freeing people from wires, enabling wireless connection of multiple devices for transmission of video, audio and other high-bandwidth data. UWB, short-range radio technology, complements other longer range radio technologies such as Wi-Fi*, WiMAX, and cellular wide area communications. UWB's combination of broader

spectrum and lower power improves speed and reduces interference with other wireless spectra. It is used to relay data from a host device to other devices in the immediate area (up to 10 meters, or 30 feet). UWB radio transmissions can legally operate in the range from 3.1 GHz up to 10.6 GHz, at a limited transmit power of -41dBm/MHz. Consequently, UWB provides dramatic channel capacity at short range that limits interference.

**UWB applications**

Today, most computer and consumer electronic devices-everything from a digital camcorder and DVD player to a mobile PC and a high-definition TV (HDTV)-require wires to record, play or exchange data. UWB will eliminate these wires, allowing people to "unwire" their lives in new and unexpected ways. Through UWB:

- A digital camcorder could play a just-recorded video on a friend's HDTV without anyone having to fiddle with wires.
- A portable MP3 player could stream audio to high-quality surround-sound speakers anywhere in the room.
- A mobile computer user could wirelessly connect to a digital projector in a conference room to deliver a presentation.
- Digital pictures could be transferred to a photo print kiosk for instant printing without the need of a cable.
- An office worker could put a mobile PC on a desk and instantly be connected to a printer, scanner and Voice over IP (VoIP) headset

**Types of wireless N/W**

**Wireless PAN**

Wireless Personal Area Network (WPAN) is a type of wireless network that interconnects devices within a relatively small area, generally within reach of a person. For example, Bluetooth provides a WPAN for interconnecting a headset to a laptop. ZigBee also supports WPAN applications.

**Wireless LAN**

Wireless Local Area Network (WLAN) is similar to other wireless devices and uses radio instead of wires to transmit data back and forth between computers on the same network. Wireless LANs are standardized under the IEEE 802.11 series.
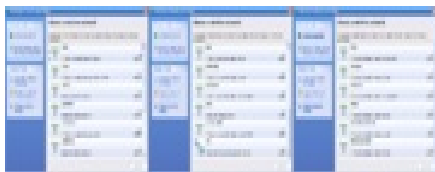


Screenshots of Wi-Fi Network connections in Microsoft Windows. Figure 1, left, shows that not all networks are encrypted (locked unless you have the code, or key), which means anyone in range can access them.

**Fixed Wireless Data**: Fixed wireless data is a type of wireless data network that can be used to connect two or more buildings together to extend or share the network bandwidth without 6physically wiring the buildings together.

**Wireless MAN**

Wireless Metropolitan area networks are a type of wireless network that connects several Wireless LANs.

- WiMAX is the term used to refer to wireless MANs and is covered in IEEE 802.16d/802.16e.

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**Uses**



An embedded RouterBoard 112 with U.FL-RSMA pigtail and R52 mini PCI Wi-Fi card widely used by wireless Internet service providers (WISPs) in the Czech Republic.

Wireless networks have had a significant impact on the world as far back as World War II. Through the use of wireless networks, information could be sent overseas or behind enemy lines easily, efficiently and more reliably. Since then, wireless networks have continued to develop and their uses have grown significantly. Cellular phones are part of huge wireless network systems. People use these phones daily to communicate with one another. Sending information overseas is possible through wireless network systems using satellites and other signals to communicate across the world. Emergency services such as the police department utilize wireless networks to communicate important information quickly. People and businesses use wireless networks to send and share data quickly whether it be in a small office building or across the world. Another important use for wireless networks is as an inexpensive and rapid

way to be connected to the Internet in countries and regions where the telecom infrastructure is poor or there is a lack of resources, as in most developing countries.

Compatibility issues also arise when dealing with wireless networks. Different components not made by the same company may not work together, or might require extra work to fix these issues. Wireless networks are typically slower than those that are directly connected through an Ethernet cable.

A wireless network is more vulnerable, because anyone can try to break into a network broadcasting a signal. Many networks offer WEP - Wired Equivalent Privacy - security systems which have been found to be vulnerable to intrusion. Though WEP does block some intruders, the security problems have caused some businesses to stick with wired networks until security can be improved. Another type of security for wireless networks is WPA - Wi-Fi Protected Access. WPA provides more security to wireless networks than a WEP security set up. The use of firewalls will help with security breaches which can help to fix security problems in some wireless networks that are more vulnerable.

**Conclusion**:  Wireless Networking has effective and essential applications. In most wireless ad-hoc networks the nodes compete to access the shared wireless medium (the "ether"), often resulting in collisions. Using Cooperative wireless communications improves immunity to interference by having the destination node combine self-interference. In this paper, I have described the terminologies of wireless and its scope , region  and ranges.

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