⇒ Wi-Fi

Wi-Fi stands for Wireless-fidelity. Wi-Fi is based on the IEEE 802.11 family of standards and is primarily a Local Area Networking (LAN) technology designed to provide in building broadband coverage.

A. Wifi Network

1) Allows to instantly creating a home or office Network without running cables.
2) Allows sharing high-speed internet wirelessly.
3) Listen to streaming audio and view video.
4) Synchronize and uplink mobile devices.

A wireless LAN does not require costly wiring, the main benefit is that it's generally easier, faster and cheaper to set up.

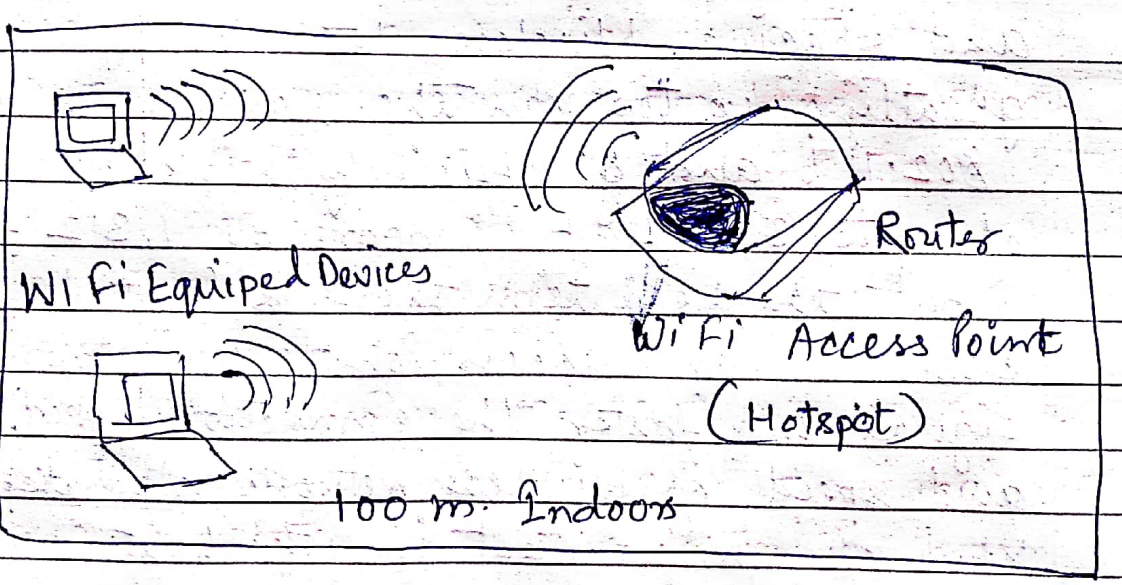
Current Wi-Fi systems support a peak physical layer data rate of 54 Mbps and typically provide indoor coverage over a distance of 100 feet. Wifi offers higher peak data rate than do 3G systems, primarily since it operates over a larger 20 MHz bandwidth but Wi-Fi systems are not designed to support high speed mobility. One advantage of Wi-Fi over WiMAX and 3G is the wide availability of terminal devices. Laptops are manufactured today with built in Wifi interface. Wi-Fi interfaces are now also being built into a variety of devices, including Personal Data Assistants (PDAs), cordless Phones, cellular phones, cameras and media players.

Channel Bandwidth → The Wi-Fi standards define a fixed channel bandwidth of 25 MHz for 802.11b and 20 MHz for either 802.11a or g networks.

Speed and Range → official speeds of 802.11b, 802.11g and 802.11n networks are 11, 54 and 270 Mbps respectively. This wireless network is by definition a shared network so the more computers are connected to a wireless access point the less data each will be able to send and receive. Wireless Network's speed can vary greatly, so too can the range. For example:- 802.11b and g officially work over a distance of upto 328 feet indoors or 1,312 feet Outdoors, but the key term there is 'upto'. As one is closer to an access point, the stronger the ~~gain~~ signal and faster the connection speed. The range and speed of wireless network also depends on the kind of environment in which its operates.

Interference:→ The potential for interference is especially great indoors, where different types of building materials (concrete, wood, drywall, metal, glass and so on) can absorb or reflect radio waves, affecting the strength and consistency of a wireless network's signal. Similarly, devices like microwave ovens and some cordless phones can cause interference because they operates in the same 2.4 GHz frequency range as 802.11b/g/n networks.

⇒ The Basics :→ The cornerstone of a wireless network is a device known as an Access Point (AP). The primary job of an access point is to broadcast a wireless signal that computers can detect and 'tune' into. Since wireless networks are usally connected to wire ones, an access point also often serves as a link to the resources available on the wired network, such as an internet connection.



Wi-fi System.

There are three important items which makes Wi-fi working in Laptop or Desktop.

1) Radio Signals
2) Wi-fi Card (built in Laptop or PC)
3) Hotspots which create Wi-fi Network.

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Radio Signals :→ Radio signals are the keys which make Wi-Fi networking possible. Whenever a computer receives any of the signals within the range of a WiFi network which is usually 300-500 feet for antennas, the Wi Fi card will read the signals and thus create an internet connection between the user and the network without the use of a card. Access point which consists of antennas and routers are the main source which transmit and receive radio waves.

Wi Fi Cards → Wi Fi card connects computer to the antenna for a direct connection to the internet. Wi Fi card can be external or internal, if a wi Fi card is not installed in any computer, it may be externally connect to the USB Port or have an antenna-equipped expansion card installed directly to the computer.

Wi Fi Hotspots → A Wi Fi Hotspot is created by ~~not~~ installing an access point to an internet connection. The access point transmits a wireless signal over the distance. Then Wi Fi enabled device such as a PC, encounters a hotspot, the device connect to that network wirelessly. Most hotspots are located in places that are readily accessible to the public, like airports, hotels, book-stores etc. The largest public Wi Fi networks are provided by Private Network Service Providers (ISPs) that charge a fee for users to connect to the Internet.

RFID

A class of applications for short range wireless is Radio Frequency Identifications. (RFID) RFID application is the use of an object ~~affixed to a tag on RFID~~ applied to or incorporated into a product, animal or object for the purpose of identification and tracking using radio waves.

These are small transponders that respond to queries from a reader by wirelessly transmitting a serial number or similar identifier. RFID tag is a microchip combind with an antenna is a compact package. The tag's antenna picks up signals from an RFID reader and than returns the signal, usually with some additional data.

They are heavily used to track items in production environments and to label items in supermarkets. They are usually thought of as an advanced barcode, these can be used for locating lost items, tracking moving objects, and others.

Most RFID tags contains at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a Radio frequency (RF) signal and other specialized functions. The second is an antenna for receiving and transmitting the signal.

Operation frequencies range from 125 KHz upto 2.45 GHz. Frequencies are usually

Those specified for non-licensed applications. Higher data rates demand higher frequencies.

⇒ Frequency Bands :→

1) Low Frequency Tags :→ The most common frequencies used for Low frequency Tags are 125 - 134.2 KHz and 140-148.5 KHz.

2) High Frequency Tags :→ These have higher transmission rates and ranges but also cost more than LF tags. Smart tags are most common member of this group and they works at 13.56 MHz.

3) UHF Tags → Typical Frequencies ranges are 868 MHz, 915 MHz, 950 MHz and 2.45 GHz.

TYPE OF TAGS :→ These are a variety of tag designs, shapes and sizes. RFID tags are active, passive and semi-passive forms.

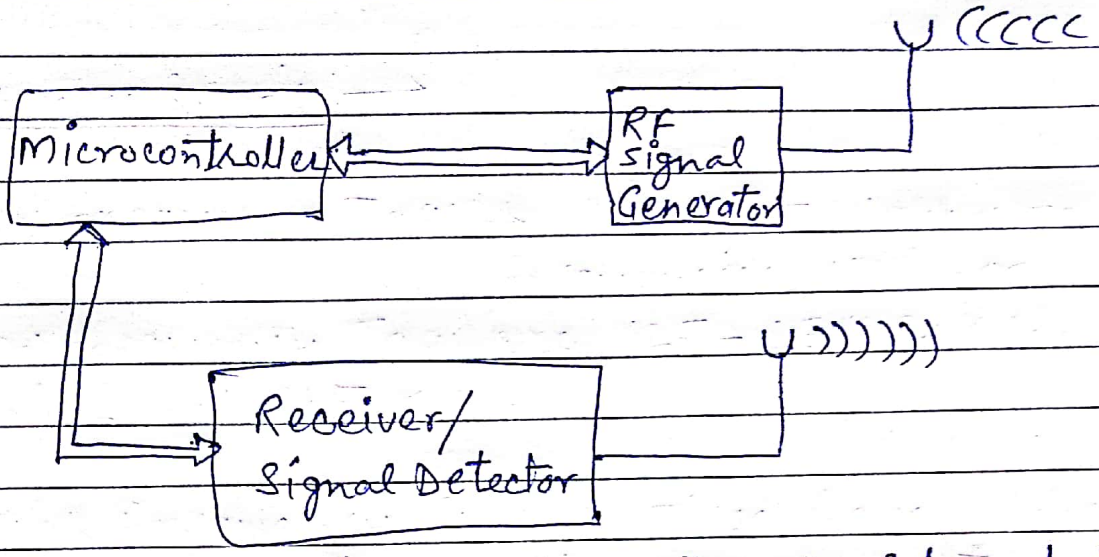
Active Tags :→ These tags contains a battery and can transmit signals autonomously. which is used to energize the tag, sending RF signal to a reader. They transmit signals over greater distance to other tags.

active tags are more expensive than passive tags and lifetime is upto 5 years.

Passive Tags :→ These tags have no battery and require an external source to provide signal transmission. It is most common type of RF Tag. Passive RFID uses very high Radio signal levels. Transmission range for passive tags is limited compared to active tags, but with no battery the tags can be much smaller and less expensive, also they have unlimited life span.

Semi Passive Tags :→ These tags are a combination of active and passive styles. These tags have an internal power source that keeps the micro chip powered at all times.
Advantages → 1) Because the chip is always powered, it can respond faster to requests, therefore increasing the number of tags that can be queried per second which is important to some applications.
2) Since the antenna is not required for collecting power it can be optimized for back scattering and therefore increasing the reading range.

Block Diagram of RFID Reader



1) The reader transmits an interrogation signal (an electromagnetic field), which is received by the antenna and converted into current.
2) The current is used to power the chip.
3) Once activated the tag receives commands from the reader and replies by sending its requested information.
4) The tag may alter the incoming signal in some unique manner and reflect back to its transmitting circuit may be triggered to read its ID code residing in memory and transmit this code back to the receiver.
5) During the reading cycle, the reader has to continuously power the tag. The created field is called continuous wave, and because the strength of field decreases with the square of the distance the readers have to use a rather larger power.