Difference Between

	Hard handoff		Soft handoff
1.	Old connection is broken before a new connection is activated.	1.	New connection is activated before the old is broken.
2.	"break before make" connection	2.	"make-before-break" connection.
3.	In Mobile communication that assigned different radio channels during a hand off, spread spectrum mobiles share the same channel in every cell is called Hard Hand off	3.	The ability to select between the instantaneous received signals from a variety of base stations is called Soft Hand Off.
4.	A handover that requires a change of the carrier frequency is always performed as hard handover.	4.	Soft handover can be used when cells operated on the same frequency are changed.
5.	Only one radio links can be active at the same time.	5.	Several radio links are active at the same time.
6.	hard handoff it can be rough on the network because the subscriber is just pushed on that tower	6.	In a soft handoff, the cell is allowed to cycle, find that better tower and then be pulled into the tower.
7.	Hard handover can be seamless or non-seamless.	7.	Gives seamless connectivity to a Mobile station.
8.	Primarily used in FDMA and TDMA systems	8.	Used in UMTS to improve the signal quality
9.	Cell frequency before and after handover will be same or different.	9.	Cell frequency before and after handover will be same.
10.	Service interruption due to handover.	10.	No service interruption due to handover
11.	Intra Cell Handover. Inter Cell Handover.	11.	Macro Diversity Handover (MDHO). 2.2. Fast Base Station Switching (FBSS)

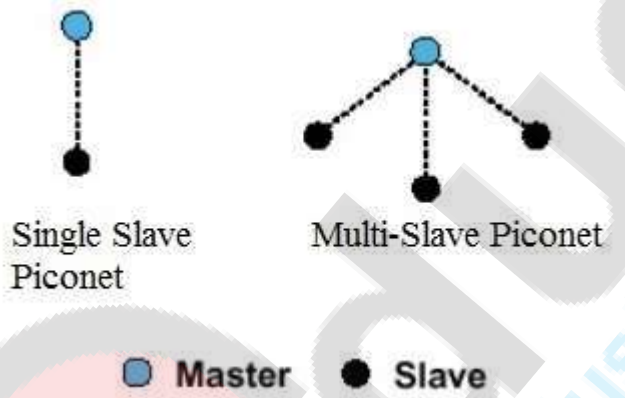
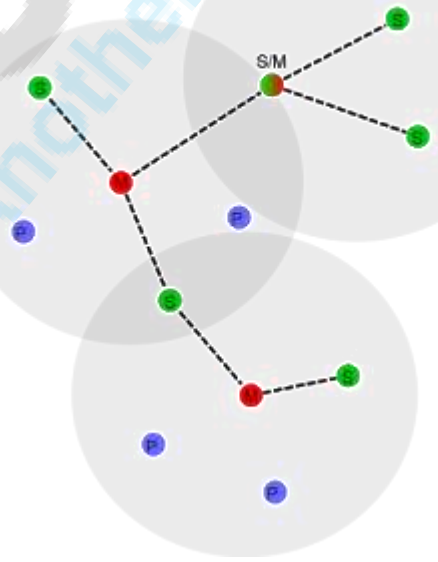
	Analog	Digital
Signal:	Analog signal is a continuous signal which represents physical measurements.	Digital signals are discrete time signals generated by digital modulation.
Waves:	Denoted by sine waves	Denoted by square waves
Representation:	Uses continuous range of values to represent information	Uses discrete or discontinuous values to represent information
Example:	Human voice in air, analogelectronic devices.	Computers, CDs, DVDs, and other digital electronic devices.
Signal:	continuous electromagnetic waves  Used mainly for transmitting data across a network.	sequence of voltage pulses  Used mainly internally within computers.
Data:	Continuous	Discrete
Technology:	Analog technology records waveforms as they are.	Samples analog waveforms into a limited set of numbers and records them.
Data transmissions:	Subjected to deterioration by noise during transmission and write/read cycle.	Can be noise-immune without deterioration during transmission and write/read cycle.
Response to Noise:	More likely to get affected reducing accuracy	Less affected since noise response are analog in nature
Flexibility:	Analog hardware is not flexible.	Digital hardware is flexible in implementation.
Uses:	Can be used in analog devices only. Best suited for audio and video transmission.	Best suited for Computing and digital electronics.
Applications:	Thermometer	PCs, PDAs
Bandwidth:	Analog signal processing can be done in real time and consumes less bandwidth.	There is no guarantee that digital signal processing can be done inreal time and consumes

		morebandwidth to carry out the same information.
Memory:	Stored in the form of wave signal	Stored in the form of binary bit
Power:	Analog instrument draws large power	Digital instrument drawS only negligible power
Cost:	Low cost and portable	Cost is high and not easily portable
Impedance:	Low	High order of 100 megaohm
Errors:	Analog instruments usually have a scale which is cramped at lower end and give considerable observational errors.	Digital instruments are free from observational errors like parallax and approximation errors.

FDMA	TDMA
FDMA stand for frequency division multiple access.	TDMA stand for time division multiple access.
The FDMA (frequency division multiple access) is not required synchronization.	It is required synchronization.
It has less power efficiency.	It has more power efficiency.
It requires high carrier frequency stability.	The high carrier frequency is not necessary.
It has divide frequency band into disjoint subband.	It has divided the time into non overlapping time slot.
Its Entire band of frequencies is divided into multiple RF channels/carriers. Each carrier is allocated to different users.	Its entire bandwidth is shared among different subscribers at fixed predetermined or dynamically assigned time intervals/slots.
It has continuous transmission scheme.	It discontinuous transmission scheme.
It used in GSM and PDC.	It is used in advanced mobile phone systems (AMPS).

FHSS	DSSS
FH systems use a radio carrier that “hops” from frequency to frequency in a pattern known to both transmitter and receiver	DS systems use a carrier that remains fixed to a specific frequency band.
A broad slice of the bandwidth, Spectrum is divided into many possible broadcast frequencies.	The data signal is spread onto a much larger range of frequencies (at a much lower power level) using a specific encoding scheme.
Frequencies are randomize	Frequency is constant
Data is constant	Data are randomize
Resistance to noise	Less resistant to noise
Limited throughput (2-3 Mbps @ 2.4 GHz)	Much higher throughput than FH (11 Mbps)
System generate wideband signals controlled by commanding the carrier frequency,(frequency hopping)	Syestem,generate wideband signals controlled by the code is direct carrier,modeulation (direct sequence)
Frequency-hopping devices use less power and are cheaper	Performance of DS-CDMA systems is usually,better and more reliable.
FHSS are significantly less sensitive to Bluetooth interference.	Though bandwidth efficiency decreases; reliability, integrity and security increase.
FHSS systems operate with SNR (Signal to Noise Ratio) of about 18 dB	DSSS systems, because of the more efficient modulation technique used (PSK), can operate with SNR as low as 12 dB
FHSS spreads the signal by hopping from one frequency to another across a bandwidth of 83 Mhz.	DSSS spreads the signal by adding redundant bits to the signal prior to transmission which spreads the signal across 22 Mhz

FHSS	DSSS
To some other receiver, FHSS appears to be a short-duration impulse noise. Thus, the data security increases	To,some other receiver, DSSS appears as low-power, wideband noise and is,rejected.

Piconet	Scatternet
In this bluetooth network, device can function either as master or slave.	In this bluetooth network, device can function as master or slave or (master+slave)
It serves smaller coverage area.	It serves larger coverage area.
It supports maximum 8 nodes.	It supports more than 8 nodes.
It allows less efficient use of available bluetooth channel bandwidth. 	It allows more efficient use of available bluetooth channel bandwidth.  Scatternet (master=red, slave=green, parking=blue)

S.no	GSM	CDMA
1	The GSM is based on wedge spectrum called a carrier.	The CDMA is based on spread spectrum technology.
2	This carrier is divided into time slots, and each user is assigned a different time slot. Thus, until the ongoing call is finished, no other user can access the same slot.	This technology allows each user to transmit over the entire frequency spectrum all the time.
3	Less security compared to CDMA technology.	More security is provided in CDMA technology.
4	No built-in encryption.	It has built-in encryption
5	Signals can be detected as the GSM signals are concentrated in the narrow bandwidth.	The signals cannot be detected easily in CDMA.
6	The GSM network operates in the frequency spectrum of 850MHz and 1900MHz.	The CDMA network operates in the frequency spectrum of 850MHz and 1900MHz.
7	GSM is used over 80% of the world's mobile network.	CDMA is exclusively used in the United States, Canada and Japan.
8	GSM uses EDGE data transfer technology.	CDMA has faster data transfer as EVDO ready data transfer technology is used
9	It offers a maximum download speed of 384 Kbps.	It offers a maximum download speed of 2 Mbps.
10	A SIM card is required for the working of GSM device.	CDMA phones do not have these pulses.
11	A GSM is more flexible than CDMA as the SIM can be replaced with other GSM devices.	A CDMA is not flexible.
12	GSM phones emit continuous wave pulse. Thus, there is a need to reduce the exposures to electromagnetic fields.	CDMA phones do not have these pulses.
13	GSM phone emits about 28 times more radiations on an average as compared to CDMA.	Very less radiation

Parameters	1G	2G	3G	4G
Image				
Name	1st Generation Mobile Network	2nd Generation Mobile Network	3rd Generation Mobile Network	4th Generation Mobile Network
Introduced in year	1980s	1993	2001	2009
Location of first commercialization	USA	Finland	Japan	South Korea
Technology	AMPS (Advanced Mobile Phone System), NMT, TACS	IS-95, GSM	IMT2000, WCDMA	LTE, WiMAX
Multiple Address/Access system	FDMA	TDMA, CDMA	CDMA	CDMA
Switching type	Circuit switching	Circuit switching for Voice and Packet switching for Data	Packet switching except for Air Interface	Packet switching
Speed (data rates)	2.4 Kbps to 14.4 kbps	14.4 Kbps	3.1 Mbps	100 Mbps
Special Characteristic	First wireless communication	Digital version of 1G technology	Digital broadband, speed increments	Very high speeds, All IP
Features	Voice only	Multiple users on single channel	Multimedia features, Video Call	High Speed, real time streaming
Supports	Voice only	Voice and Data	Voice and Data	Voice and Data
Internet service	No Internet	Narrowband	Broadband	Ultra Broadband
Bandwidth	Analog	25 MHz	25 MHz	100 MHz
Operating frequencies	800 MHz	GSM: 900MHZ, 1800MHz CDMA: 800MHz	2100 MHz	850 MHz, 1800 MHz
Band (Frequency) type	Narrow band	Narrow band	Wide band	Ultra Wide Band
Carrier frequency	30 KHZ	200 KHz	5 MHz	15 MHz
Advantage	Simpler (less complex) network elements	Multimedia features (SMS, MMS), Internet access and SIM introduced	High security, international roaming	Speed, High speed handoffs, MIMO technology, Global mobility
Disadvantages	Limited capacity, not secure, poor battery life, large phone size, background interference	Low network range, slow data rates	High power consumption, Low network coverage, High cost of spectrum licence	Hard to implement, complicated hardware required
Applications	Voice Calls	Voice calls, Short messages, browsing (partial)	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, Wearable devices