Contents

MOBILE TELECOMMUNICATION

Global Positioning System

The Global Positioning System (GPS) is a satellite-based navigation system that was developed by the U.S. Department of Defense (DoD) in the early 1970s. Initially, GPS was developed as a military system to fulfill U.S. military needs. However, it was later made available to civilians. Today GPS is under dual-use system that can be accessed by both military and civilian users. GPS provides continuous positioning and timing information, anywhere in the world under any weather conditions. Because it serves an unlimited number of users as well as being used for security reasons, **GPS is a one-way system**, which means that users can only receive the satellite signals.

GPS normally consists of a constellation of 24 operational satellites. Such constellation, known as the initial operational capability (IOC), was completed by the U.S. Department of Defense (USDOD) in July 1993. The official IOC announcement, however, was made on December 8, 1993. It became fully operational in 1994.

Constellation:

To ensure continuous worldwide coverage, GPS satellites are arranged so that four satellites are placed in each of six orbital planes. With such a constellation geometry, four to ten GPS satellites are visible anywhere in the world.

Orbits:

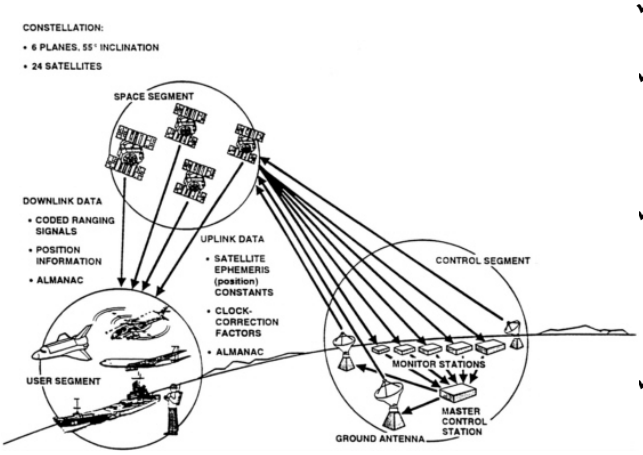
GPS satellite orbits are nearly circular (an elliptical shape with a maximum eccentricity is about 0.01), with an inclination of about 55° to the equator. The semimajor axis of a GPS orbit is about 26,560 km (i.e., the

satellite altitude of about 20,051 km above the Earth's surface). The corresponding GPS orbital period is about 12 sidereal hours (11 hours, 58 minutes).

Segments:

GPS consists of three segments: the **space segment**, the **control segment,** and the **user segment**.

The space segment consists of the 24-satellite constellation. Each GPS satellite transmits a signal, which has a number of components: two sine waves, also known as carrier frequencies, two digital codes, and a navigational message. The codes and the navigation message are added to the carriers as binary biphase modulations. The carriers and the codes are used mainly to determine the distance from the user's receiver to the GPS.



- ✓ The 24 satellites are arranged in 6 orbital planes of 55-degree inclination, 20,051 kilometers above the Earth.
- ✓ Each satellite completes one orbit in one-half of a sidereal day and, therefore, passes over the same location on earth once every sidereal day, approximately 23 hours and 56 minutes.
- ✓ With this orbital configuration and number of satellites, a user at any location on Earth will have at least four satellites in view 24 hours per day

Control Segment

- ✓ The Control Segment consists of the master control station (MCS), located at Falcon Air Force Base in Colorado Springs, Colorado; remote monitoring stations, located in Hawaii, Diego Garcia, Ascension Island, and Kwajalein; and uplink antennas, located at three of the four remote monitor stations and at the Master Control Segment.
- ✓ The primary task of the operational control segment is tracking the GPS satellites in order to determine and predict satellite locations, system integrity, behavior of the satellite atomic docks, atmospheric data, the satellite almanac and other considerations.
- ✓ This information is then packed and uploaded into the GPS satellites through the S-band link. The four stations can track and monitor the whereabouts of each GPS satellite 20 to 21 hours per day. Land-based and space-based communications connect the remote monitoring stations with the MCS.

User Equipment

GPS user equipment includes the Receiver sets that can range from simple devices that provide only basic positioning information to complex multichannel units that track all satellites in view and perform a variety of functions. Most GPS receivers consist of three basic components viz. antenna, receiver-processor unit and control/ display unit.

- ✓ Antenna receives the signal and, in some cases, has anti-jamming capabilities
- ✓ Receiver-processor unit converts the radio signal to a useable navigation solution
- ✓ Control/display unit displays the positioning information and provides an interface for receiver control.

- ✍ NAVSTAR is the official U.S. Department of Defense name for GPS
  The first GPS satellite was launched in 1978.
- ✍ A full constellation of 24 satellites was achieved in 1994.
- ✍ Each satellite is built to last about 10 years. Replacements are constantly being built and launched into orbit.
- ✍ A GPS satellite weighs approximately 2,000 pounds and is about 17 feet across with the solar panels extended.
- ✍ Transmitter power is only 50 watts or less.

How GPS works

As we studied above, GPS is a network of 24 satellites that orbits the Earth twice a day, transmitting signals back to earth. A GPS receiver locks onto signals from three or more satellites and determines its location, using a method called **trilateration**. The receiver calculates the difference between the time a satellite sent a signal and the time the system received it. Using the information gathered from several signals, the receiver triangulates the exact position. It can even determine how fast one is going and how long it will take to reach one's destination.

- Please note that the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received.
- The time difference tells the GPS receiver how far away the satellite is.
- Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map. This is the fundamental principle behind GPS.
- A GPS receiver must be locked on to the signal of **at least three satellites** to calculate a 2D position (latitude and longitude) and track movement.
- With four or more satellites in view, the receiver can determine the **user's 3D position** (latitude, longitude and altitude).

✓ Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more.

Please note that the GPS receiver is only a receiver, without any transmitting capability. The satellites do not contain any databases about the locations or anything. They contain highly precise atomic clocks which generates some code which it keeps transmitting to the earth. The GPS receiver gets that code from multiple satellites which is slightly time-shifted due to difference in the distances of satellites. Using this difference the receiver calculates the longitude and latitude.

What are the GPS Signals?

GPS satellites transmit two low power radio signals, designated L1 and L2. Civilian GPS uses the L1 frequency of 1575.42 MHz in the UHF band. The signals travel by line of sight, meaning they will pass through clouds, glass and plastic but will not go through most solid objects such as buildings and mountains. A GPS signal contains three different bits of information as follows:

1. A pseudorandom code : The pseudorandom code is simply an I.D. code that identifies which satellite is transmitting information
2. Ephemeris data : Ephemeris data, which is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date and time. This part of the signal is essential for determining a position.
3. Almanac data: The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.

Applications of GPS

Although GPS was originally designed as a military system, its civil applications have grown much fuster. GPS has revolutionized the surveying and navigation fields since its early stages of development.

Survey:

GPS has replaced the conventional methods in many survey applications. GPS positioning has been found to be a cost-effective process, in which at least 50% cost reduction can be obtained by using the real-time kinematic (RTK) GPS, as compared with conventional techniques. In terms of productivity and time saving, GPS could provide more than 75% timesaving whenever it is possible to use the RTK GPS method. GPS does not require intervisibility between stations has also made it more attractive to surveyors over the conventional methods.

Earth and Oceanic Sciences

The use of GPS networks for research in the Earth and oceanic sciences has been well established for many years. For example, the National Aeronautics and Space Administration (NASA) and other organizations from various nations have established the International GPS Service for Geodynamics, a network of more than 140 continuously operating reference stations, data centers, and analysis centers that collectively support geophysical and geodetic research, such as the measurement of active tectonic processes, ice sheet movements, changes in sea level, and variations in the Earth's rotation.

Atmospheric Sciences

Ground-based GPS networks and receivers on board low Earth orbiting (LEO) satellites are also being used to sense the atmosphere by measuring the delay encountered as GPS signals pass through the troposphere and the ionosphere. Water vapor measurements made with GPS-based remote sensing may be important for weather forecasting and research on global climate change.

Navigation

GPS has also numerous applications in land, marine, and air navigation. Vehicle tracking and navigation are rapidly growing applications. It is expected that the majority of GPS users will be in vehicle navigation.

Global Navigation Satellite System (GNSS)

- ✓ A satellite navigation system with g**lobal coverag**e may be termed a global navigation satellite system or GNSS.
- ✓ The United States NAVSTAR Global Positioning System (GPS) is the **only fully operational GNSS** as of now.
- ✓ China is making its **Beidou** navigation system and is working towards making it a complete GNSS by 2020.
- ✓ Similarly, Galileo is the GNSS of European Union, currently in initial deployment phase, scheduled to be fully operational by 2020 at the earliest.
- ✓ Russia is on advance stage of achieving full coverage by its GLONASS system. GLONASS has achieved 100% coverage of Russia's territory.
- ✓ It has 22 operational satellites, short of the 24 satellites needed to provide continuous global coverage, and is expected to be completed during 2011.
- ✓ The GLONASS satellites designs have undergone several upgrades, the latest is GLONASS-K.

Please note that India is pursuing space cooperation with Russia currently on joint lunar exploration; development of small experimental satellite for space science studies; use of Russian global navigation satellite system (GLONASS); and preliminary studies for human spaceflight.

The Integration of India's Regional Navigational Satellite System with Russia's GLONASS constellation will facilitate reliable and enhanced performance in satellite based navigation, in a seamless manner through dual system receivers.

3G, 4G and 5 G

3G, 4G and 5 G are the generic names for a set of mobile technologies. These use a host of high-tech infrastructure networks, handsets, base stations, switches and other equipment to allow mobile phones to offer broadband wireless Internet access, data, video, live TV and CD-quality music services.

The 3G wireless networks are capable of transferring data at speeds of 384 kbps going up to 2 mbps. Average actual speeds for 3G networks ranges between 128 kbps and 384 kbps. It is a huge leap when compared to the currently available wireless data speeds of under 100 kbps on EDGE that is the 2.75G on the GSM network. On the CDMA platform the equivalent 3G networks are called CDMA-2000. 3G technologies have turned phones and other devices into true multimedia players, making it possible to download media rich content and do full scale banking on the move.

- ✓ Japan was the first country to introduce 3G, where it was called the Freedom of Mobile Multimedia Access (FOMA).

- ✓ FOMA used the Wideband Code Division Multiple Access (W-CDMA) technology to transfer data over its networks.
- ✓ WCDMA is not the only 3G technology. Other technologies include **CDMAOne**, which differs technically, but provides similar services. The 3G services and phones are expensive and uptake of this market is expected to be slow.

Today there are over hundreds of commercial 3G operators around the world with the service being popular in countries like Japan, Sweden, UK, Denmark and Australia.

Today high-speed broadband wireless experience is available on 3G. Wireless videophones, high-speed Internet access and TV have become a reality with 3G. The 3G-phone are the ultimate converged device.

4G Technology

Software developers are already working on what they call **Deep 3G**, that is future standard higher than 3G also called **3.9G or 4G**. The data transfer speeds here will be **four time that of 3G** making **IPTV** and interactive gaming a reality on mobile phones. All this will make the mobile phone much like a digital Swiss Knife: a single wireless device for all our needs.

- ✓ 4G adheres to the IMT Advanced specifications by the International Telecommunication Union.
- ✓ Please note that In 4G systems, the **circuit-switched infrastructure is abandoned**, and **only a packet-switched network is provided,** while 2.5G and 3G systems require both packet-switched and circuit-switched network nodes, i.e. two infrastructures in parallel.

This means that in 4G, **traditional voice calls are replaced by IP telephony**. Cellular systems such as 4G allow seamless mobility; thus a file transfer is not interrupted in case a terminal moves from one cell (one base station coverage area) to another, but handover is carried out.

The terminal also keeps the same IP address while moving, meaning that a mobile server is reachable as long as it is within the coverage area of any server. In 4G systems this mobility is provided by the mobile IP protocol, part of IP version 6, while in earlier cellular generations it was only provided by physical layer and datalink layer protocols.

In addition to seamless mobility, 4G provides flexible interoperability of the various kinds of existing wireless networks, such as satellite, cellular wirelss, WLAN, PAN and systems for accessing fixed wireless network

- ✓ Please note that 12 host cities for the 2014 FIFA World Cup to be held in Brazil will be the first to have their networks upgraded to 4G.

5G Technology

The term 5G is not used officially and is used in some research papers and projects to denote the next major phase of mobile telecommunications standards beyond the 4G/IMT Advanced standards. Some of the feaures are lower battery consumption, lower outage probability, better coverage, high bit rates in larger portions of the coverage area, cheaper or no traffic fees due to low infrastructure deployment costs, or higher aggregate capacity for many simultaneous users. Some of the intersting concepts beyond 4G wireless communications are included in the 5G technology and also encompass further development in the current technologies. Some important are Cognitive Radio Technology and the WWWW. These two have been discussed here:

WWWW

World wide wireless web (WWWW), is the comprehensive wireless-based web applications that include full multimedia capability beyond 4G speeds and comes under 5G development.

Cognitive Radio Technology

Cognitive Radio Technology or "Smart Radio" or "Intelligent Radio" is a radio that can sense, learn and adapt to the surrounding environment according to its inner and outer stimuli. A primary feature of cognitive radios is the ability to adapt the transmission parameters given a dynamic wireless environment.

- ✓ Please note that Cognitive Radio Technology is based upon the core principles of "Software Defined Radio (SDR)".

How does it work?

As we know that Electromagnetic Spectrum , particularly the Radio Frequency portion of this Spectrum has become the most valuable natural resource in recent times. The Radio Spectrum has no mass, not a source of energy, gives no food but is so valuable that small portion of this resource is worth billions of Dollars, leading to a scam worth Trillions of Rupees in India. Though conceptually, the amount of spectrum is infinite, practically for propagation and other reasons it is finite because of the desirability of certain portions of the band. Even the spectrum which is assigned is far from being 100% utilized.

So, there is a concern about the efficient use of the spectrum. The answer is Cognitive Radio. It can intelligently detect whether any portion of the spectrum is in use or not, and can temporarily latch into or out of it without interfering with the transmissions of other users thereby efficiently utilizing spectrum.

- ✓ Thus the main objective of the Cognitive Radio is to "efficiently utilize the spectrum" .

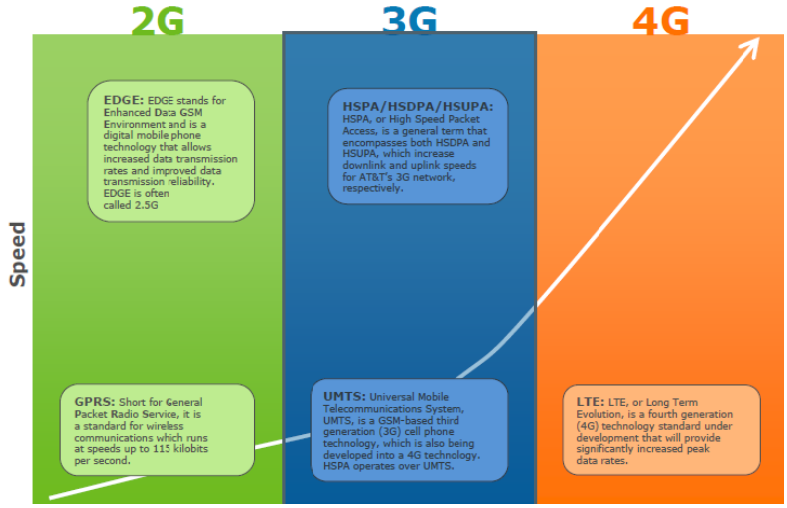
Cognitive Radio finds the unused spectrum and shares it without harmful interference with other users. It is an important requirement of the Cognitive Radio network to **sense spectrum hole** and adapt the transmission scheme to the requirements of the technologies currently sharing the spectrum. **Cognitive Radio comes under IEEE 802.22 standard** for Wireless Regional Area Networks.

IEEE 802.22

IEEE 802.22 is a standard for Wireless Regional Area Network using white spaces in the TV frequency spectrum. It is the first worldwide effort to define a standardized air interface based on CR techniques for the opportunistic use of TV television bands on a non-interfering basis. IEEE 802.22 WRANs are designed to operate in the TV broadcast bands while assuring that no harmful interference is caused to the incumbent operation, i.e, digital TV and analog TV broadcasting, and low power licensed devices such as wireless microphones. The standard was expected to be finalized in Q1 2010. 802.22 Draft D1 is available and comment resolution is underway.

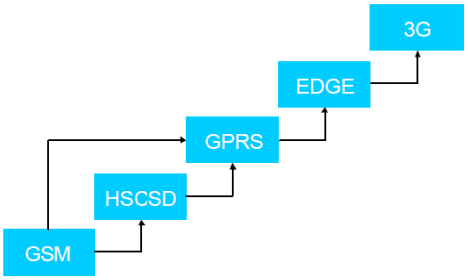
IEEE 802.16

IEEE 802.16 is a series of Wireless Broadband standards authored by the IEEE. The current version is IEEE 802.16-2009 amended by IEEE 802.16j-2009. IEEE 802.16 is written by a working group established by IEEE Standards Board in 1999 to develop standards for the global deployment of broadband Wireless Metropolitan Area Networks. The Workgroup is a unit of the IEEE 802 LAN/MAN Standards Committee. The most popular implementation of the IEEE 802.16 standard is the Mobile WirelessMAN originally defined by the 802.16e-2005 amendment that is now in process of being deployed around the world in more than 140 countries by more than 475 operators. (wiki)



GPRS Technology

- ✓ Sony Ericsson T39m cell phone was the first GPRS enabled phone in world.



General Packet Radio Service (GPRS) allows information to be sent and received across a mobile telephone network. It supplements Circuit Switched Data and Short Message Service.

Please note that GPRS is a 2.5G technology that supports data transmissions up to 56-114k bit/ sec, though theoretically can provide speed up to 171.2 kbps.

So, it is basically a link between GSM and GPRS and many GSM service providers adopted it before jumping to the full 3G technology.

GSM manages the voice and data communications over **circuit switched connections**. GPRS is an extension of GSM which allows subscribers to send and receive data over **packet-switched connections**. The use of GPRS is particularly appropriate for applications where there is **time between successive transmissions** greatly **exceeds**.

What are packets?

GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA networks. Packet switching means that data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. This was one of the reasons that made it popular instantly.

Since, cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks, it gives almost instantaneous connection set-up and continuous connection to the Internet.

Difference between GPRS and GSM:

- ✓ GPRS is different to GSM because it offers higher bandwidth and, therefore, data speeds.
- ✓ GPRS is seamless, immediate and continuous connection to the Internet – 'always on-line'.
- ✓ Due to high speed, the new text and visual data and content services such as email, chat, still and moving images, information services (stock prices, weather reports, train times), video conferencing, e-commerce transactions (buying flight and cinema tickets) and Internet-based remote access to corporate intranets and public networks was made possible via GPRS.
- ✓ The **major technical difference is that GPRS uses packet-switching rather than circuit-switching,** which means that there is higher radio spectrum efficiency because network resources and bandwidth are only used when data is actually transmitted even though it is always connected.
- ✓ GPRS **supports leading Internet communications protocols** - Internet protocol (IP) and X. 25.

Please note that from upgrade from GSM to GPRS needs additional components and protocols to the GSM network – the key elements are **SGSN (serving GPRS support node), GGSN (gateway GPRS support node)** and a charging gateway. The devices are different devices (not GSM phones). In summary GPRS served as first important step on the path to 3G.

Serving GPRS Support Node

SGSN is the most important element in a GPRS network. It is the service access point for the mobile station. Its main functions include mobility management and registration and authentication. It also interacts with a mobile with packet data flow and functions related to it like compression and ciphering. These are handled by protocols such as the SNDCP (sub-network dependent convergence protocol) and LLC (logical link control). SGSN is also responsible for GTP (gate tunneling protocol) tunneling to the other support nodes.

Gateway GPRS Support Node (GGSN)

The GGSN is connected to the SGSN on the network side and to the outside world external networks such as the Internet and X.25. As it is a gateway to the external networks, its main function is to act as a 'walt' for these external networks in order to protect the GPRS network. When data come from the external network, after verification of the address, the data are forwarded to the SGSN. If the address is found to be invalid, the dala are discarded. On the other hand, the SGSN also routes the packets it receives from the mobile to the correct network. Thus, for the outside networks the SGSN acts as a rooter.

High Speed Circuit Switched Data (HSCSD)

Please note that HSCSD (High Speed Circuit Switched Data) comes in between GSM and GPRS. It was the first step towards faster data speeds on GSM circuit switched networks. HSCSD concentrated up to four GSM timeslots and allowed data speeds of up to 64 kbit/s. Today mobiles supporting HSCSD are not available.

Enhanced Data for GSM Evolution (EDGE)

GPRS was followed by EDGE (Enhanced Data for GSM Evolution), which was the second step towards 3G for GSM/GPRS networks. EDGE was able to increase data rates on GSM to 384 kbit/s by bundling up to eight channels or 48 Kbit/s per channel. EDGE was deployed on GSM networks beginning in 2003.

Difference between EDGE and GPRS:

GPRS is based on a modulation technique known as Gaussian minimum-shift keying (GMSK). EDGE is based on a new modulation scheme that allows a much higher bit rate across the air interface - this is called eight-phase-shift keying (8 PSK) modulation. This was the major difference between the two.

UMTS (Universal Mobile Telecommunication System)

UMTS (Universal Mobile Telecommunication System) is one of the five members of the IMT-2000 family of standards and is a European third-generation mobile telecommunications technology, which is also being developed into a 4G technology. The first deployment of the UMTS is the release99 architecture. It is specified by 3GPP and is part of the global ITU IMT-2000 standard. Please note that to meet the IMT-2000 standards, a system is required to provide peak data rates of at least 200 kbit/s. Recent 3G releases, often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to smartphones and mobile modems in laptop computers.

The most common form of UMTS uses W-CDMA as the underlying air interface but the system also covers TD-CDMA and TD-SCDMA Being a complete network system, UMTS also covers the radio access network and the core network, as well as authentication of users via SIM cards UMTS combines three different air interfaces, GSM's Mobile Application Part core, and the GSM family of speech codecs.

Research began on UMTS as early as 1988 as part orthe EU's Research and Development in Advanced Communications in Europe (RACE) programme [DAS-95]. EU has continued to play a prominent role in support of research and development throughout the 1990s, notably through the Fourth Framework Advanced Communications Technologies and Services (ACTS) programme (1994-1998) and the Fifth Framework Information Society Technologies (IST) programme (1998-2002).

These were some of the efforts that led to international cooperation among the manufacturers, operators, service providers and research establishments. The four year 4-year ACTS programme played a prominent role in the development and standardisation of UMTS technologies, particularly in the areas of radio interlace and network technologies.

In 1996, an association of telecommunications operators, manufacturers and regulators joined together to create the UMTS Forum. The Forum was established to promote and accelerate the development of UMTS through the definition of necessary policy actions and standards. In 1998, the 3GPP was formed with an aim to provide globally applicable technical specifications for a 3G mobile system

W-CDMA

W-CDMA is also known as UMTS-FDD, UTRA-FDD, or IMT-2000 CDMA Direct Spread. It is one of the air interface standard found in modern 3G mobile telecommunications networks. Japan's NTT DoCoMo's FOMA service was based upon it. It utilizes the DS-CDMA channel access method and the FDD duplexing method to

achieve higher speeds and support more users compared to most time division multiple access schemes used today. The world's first commercial W-CDMA service, FOMA, was launched by NTT DoCoMo in Japan in 2001. Elsewhere, W-CDMA deployments are usually marketed under the UMTS brand. See the main UMTS article for more information

3rd Generation Partnership Project (3GPP)

- ✓ The 3rd Generation Partnership Project is a collaboration between groups of telecommunications associations, known as the Organizational Partners.
- ✓ The initial scope of 3GPP was to make a globally applicable third-generation mobile phone system specification based on evolved Global System for Mobile Communications specifications within the scope of the International Mobile Telecommunications-2000 project of the International Telecommunication Union.
- ✓ 3GPP was followed by **3rd Generation Partnership Project 2 (3GPP2),** which specifies standards for another 3G technology based on IS-95, commonly known as **CDMA2000**.

3GPP2

- ✓ The 3rd Generation Partnership Project 2 is a collaboration between telecommunications associations to make a globally applicable third generation mobile phone system specification within the scope of the ITU's IMT-2000 project.
- ✓ In practice, 3GPP2 is the standardization group for **CDMA2000**, the set of 3G standards based on earlier 2G CDMA technology.
- ✓ The participating associations are ARIB/TTC, China Communications Standards Association, Telecommunications Industry Association and Telecommunications Technology Association GSM/GPRS/EDGE/W-CDMA is the most widespread wireless standard in the world.
- ✓ A few countries use both set of standards, but most countries only the GSM family.

CDMA2000

- ✓ CDMA2000 is one of the approved radio interfaces for the ITU's IMT-2000 and is a family of 3G mobile technology standards, which use CDMA channel access, to send voice, data, and signaling data between mobile phones and cell sites.
- ✓ CDMA2000 has a relatively long technical history and is backward-compatible with its previous 2G iteration IS-95 In the United States, CDMA2000 is a registered trademark of the Telecommunications Industry Association.
- ✓ The successor to CDMA2000 is LTE, part of the competing 3GPP family.

Long Term Evolution (LTE)

- ✓ We have studied that the mobile networks continue to develop at an exciting pace. The analysts say that the amount of data traffic on mobile networks could surpass that of today's broadband connections in the next decade or so.
- ✓ As consumer demand grows for ever-richer services and connected lifestyles, mobile networks will evolve, and the mobile industry is already working hard to define the technical solution that will allow mobile networks to meet the growing demand for wireless broadband services.
- ✓ The radio access technologies enabling these networks have been given the name Long Term Evolution of Universal Terrestrial Radio Access Network – or LTE for short.
- ✓ **3GPP Long Term Evolution** is the latest standard in the mobile network technology tree that produced the GSM/EDGE and UMTS/HSPA network technologies.
- ✓ It is a project of the 3rd Generation Partnership Project, operating under a name trademarked by one of the associations within the partnership, the European Telecommunications Standards Institute.
- ✓ The current generation of mobile telecommunication networks are collectively known as 3G, although LTE is often marketed as 4G, first-release LTE does not fully comply with the IMT Advanced 4G requirements. Next generation networks are based upon Internet Protocol See, for example, the **Next Generation Mobile Networks Alliance.**

I-Mode

- ✓ NTT DoCoMo's **I-Mode** is a mobile internet service popular in Japan. Unlike Wireless Application Protocol or WAP, i-mode encompasses a wider variety of internet standards, including web access, e-mail and the packet-switched network that delivers the data.
- ✓ i-mode users have access to various services such as e-mail, sports results, weather forecast, games, financial services and ticket booking. Content is provided by specialized services, typically from the mobile carrier, which allows them to have tighter control over billing.
- ✓ The worldwide partnership is called the i-mode Alliance. E-Plus, the KPN-owned German mobile operator, ended its i-mode service on April 1, 2008. (wikipedia)

e-UTRAN

- ✓ e-UTRAN or eUTRAN is the air interface of 3GPP's Long Term Evolution upgrade path for mobile networks. It is the abbreviation for evolved UMTS Terrestrial Radio Access Network, also referred to as the 3GPP work item on the Long Term Evolution also known as the **Evolved Universal Terrestrial Radio Access** in early drafts of the 3GPP LTE specification.
- ✓ This improvements in performance allow wireless operators to offer quadruple play services - voice, high-speed interactive applications including large data transfer and feature-rich IPTV with full mobility. For release 8 and 9, 5 LTE UE categories are defined depending on the maximum peak data rate and MIMO capabilities support.

WiBro

- ✓ WiBro is a wireless broadband Internet technology developed by the South Korean telecoms industry.
- ✓ WiBro is the South Korean service name for IEEE 802.16e international standard. By the end of 2012, the Korean Communications Commission intends to increase WiBro broadband connection speeds to 10Mbit/s, around ten times the current speed, which will complement their 1Gbit/sec fibre-optic network.
- ✓ WiBro base stations will offer an aggregate data throughput of 30 to 50 Mbit/s per carrier and cover a radius of 1–5 km allowing for the use of portable internet usage. In November, 2004, Intel and Samsung Electronics executives agreed to ensure compatibility between WiBro and Mobile WiMAX technology.

Orthogonal frequency-division multiplexing (OFDM)

- ✓ Orthogonal frequency-division multiplexing, essentially identical to coded OFDM and discrete multi-tone modulation, is a frequency-division multiplexing scheme used as a digital multi-carrier modulation method.
- ✓ A large number of closely-spaced orthogonal sub-carriers are used to carry data. The data is divided into several parallel data streams or channels, one for each sub-carrier.
- ✓ Each sub-carrier is modulated with a conventional modulation scheme at a low symbol rate, maintaining total data rates similar to conventional single-carrier modulation schemes in the same bandwidth.
- ✓ This section describes a simple idealized OFDM system model suitable for a time-invariant AWGN channel.

VOiP

- ✓ Voice over Internet Protocol is one of a family of internet technologies, communication protocols, and transmission technologies for delivery of voice communications and multimedia sessions over Internet Protocol networks, such as the Internet.
- ✓ Other terms frequently encountered and often used synonymously with VoIP are IP telephony, Internet telephony, voice over broadband, broadband telephony, and broadband phone. Internet telephony refers to communications services—voice, fax, SMS, and/or voice-messaging

applications—that are transported via the Internet, rather than the public switched telephone network

Mobile VoIP

- ✓ Mobile VoIP or simply mVoIP is an extension of mobility to a Voice over IP network. Mobile VoIP will require a compromise between economy and mobility.
- ✓ For example, Voice over Wi-Fi offers potentially free service but is only available within the coverage area of a Wi-Fi Access Point.
- ✓ The challenge for the mobile operator industry is to deliver the benefits and innovations of IP without losing control of the network service. Users like the Internet to be free and high speed without extra charges for visiting specific sites.
- ✓ Such a service challenges the most valuable service in the telecommunications industry — voice — and threatens to change the nature of the global communications industry.

iScuzzy or iSCSI

- ✓ iSCSI, is an abbreviation of Internet Small Computer System Interface, an Internet Protocol -based storage networking standard for linking data storage facilities.
- ✓ By carrying SCSI commands over IP networks, iSCSI is used to facilitate data transfers over intranets and to manage storage over long distances.
- ✓ iSCSI can be used to transmit data over local area networks, wide area networks, or the Internet and can enable location-independent data storage and retrieval.
- ✓ The protocol allows clients to send SCSI commands to SCSI storage devices on remote servers. It is a popular Storage Area Network protocol, allowing organizations to consolidate storage into data center storage arrays while providing hosts with the illusion of locally-attached disks.
- ✓ Unlike traditional Fibre Channel, which requires special-purpose cabling, iSCSI can be run over long distances using existing network infrastructure.

Augmented reality

- ✓ Augmented reality is a term for a live direct or an indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input, such as sound or graphics.
- ✓ It is related to a more general concept called mediated reality, in which a view of reality is modified by a computer.
- ✓ As a result, the technology functions by enhancing one's current perception of reality. By contrast, virtual reality replaces the real world with a simulated one.
- ✓ **Ronald Azuma** offered a definition in 1997. Azuma's definition says that *Augmented Reality combines real and virtual, is interactive in real time and is registered in 3D.*

The mind-blowing Augmented reality uses the tools of mobile computing, GPS, Mobile Camera, Google Maps etc. and brings powerful experience to Humans.

Wired Glove

One of the example devices of Augmented Reality is **Wired glove**.

- ✓ A wired glove is a glove-like input device for human-computer interaction, often in virtual reality environments. Various sensor technologies are used to capture physical data such as bending of fingers.
- ✓ Often a motion tracker, such as a magnetic tracking device or inertial tracking device, is attached to capture the global position/rotation data of the glove. These movements are then interpreted by the software that accompanies the glove, so any one movement can mean any number of things.
- ✓ Gestures can then be categorized into useful information, such as to recognize Sign Language or other symbolic functions.

Visual Hull

Another example of Augmented Reality is **Visual Hull**, which is basically a geometric entity created by shape-from-silhouette 3D reconstruction technique introduced by Laurentini.

- ✓ This technique is used in some modern touchscreen devices employs cameras placed in the corners situated opposite infrared LEDs.
- ✓ It assumes the foreground object in an image can be separated from the background. Under this assumption, the original image can be threshold into a foreground/background binary image, which we call a silhouette image.
- ✓ The foreground mask, known as a silhouette, is the 2D projection of the corresponding 3D foreground object.

Satellite Television

Satellite TV was invented to bring many solutions to broadcast and cable TV problems. Satellite TV is a wireless system for delivering television programming directly to a viewer's house. The limitations of Broadcast TV are because of the curved surface of earth. If Earth were perfectly flat, one could pick up broadcast TV thousands of miles from the source. But because the planet is curved, it eventually breaks the signal's line of sight, thus limiting the signal quality. Further, in broadcast TV, signal is often distorted, even in the viewing area. To get a perfectly clear signal like cable TV, there should not be too many obstacles in the way.

Satellite TV solves the problems of range and distortion by transmitting broadcast signals from satellites orbiting the Earth. A huge number of customers are in the line of sight of the satellite TV **because, satellites are located high in the sky.** Satellite TV systems transmit and receive radio signals using specialized antennas called satellite dishes.

Definition: *Satellite television is television delivered by the means of communications satellite and received by an outdoor antenna, usually a parabolic mirror generally referred to as a satellite dish, and as far as household usage is concerned, a satellite receiver either in the form of an external set-top box or a satellite tuner module built into a TV set. Satellite TV tuners are also available as a card or a USB stick to be attached to a personal computer. In many areas of the world satellite television provides a wide range of channels and services, often to areas that are not serviced by terrestrial or cable providers.*

Orbit: The TV satellites either in geosynchronous orbit or naturally highly elliptical (with inclination of +/- 63.4 degrees and orbital period of about 12 hours (Molniya orbit) or geostationary orbit, the circular orbit just above earth's equator.

Radio Frequency Band: Early satellite television was broadcast in C-band radio in 4-8 GHz. Today, the Digital broadcast satellite transmits programming in the C-Band or Ku frequency range (12-18GHz) or Both known as Hybrid.

Difference between C-Band and Ku-Band

The early C-band radio signals could be caught by the early satellite TV viewers which were free but the viewers needed to hunt them. The C-Band is still used, in fact, microwave frequencies of the C-band perform better in comparison with Ku band microwave frequencies, under adverse weather conditions, which are used by another large set of communication satellites. The adverse weather conditions, collectively referred to as rain fade, all have to do with moisture in the air, including rain and snow. Ku band is primarily used for satellite communications, most notably for fixed and broadcast services, and for specific applications such as NASA's Tracking Data Relay Satellite used for both space shuttle and ISS communications. Some frequencies in this radio band are used for vehicle speed detection by law enforcement, especially in Europe. Today Satellite communication uses a Hybrid. Please note that C-band transmission is susceptible to terrestrial interference while Ku-band transmission is affected by rain (as water is an excellent absorber of microwaves at this particular frequency). The latter is even more adversely affected by ice crystals in thunder clouds.

Uplink: The signal in the satellite TV starts with a transmitting antenna located at an uplink facility, which feeds the signal to the satellite. The Uplink satellite dishes are very large, as much as 9 to 12 meters, so that there is accurate aiming and increased signal strength at the satellite. The uplink dish is pointed toward a

specific satellite and the uplinked signals are transmitted within a specific frequency range, so as to be received by one of the transponders tuned to that frequency range aboard that satellite.

Transponders: The transponder 'retransmits' the signals back to Earth. A typical satellite has up to 32 transponders for Ku-band and up to 24 for a C-band only satellite, or more for hybrid satellites. Please note that Transponders "retransmits' the signal to earth at a different frequency band, which is known as Translation. The objective of translation is to avoid interference with the uplink signal. The signal is retransmitted in C-band (4–8 GHz) or Ku-band (12–18 GHz) or both.

Downlink: The leg of the signal path from the satellite to the receiving Earth station is called the downlink.

Role of Dish: The down linked satellite signal is usually quite weak after traveling the great distance. It is collected by using a parabolic receiving dish, which reflects the weak signal to the dish's focal point. At the focal point of the Dish is mounted a feed horn that gathers the signals at or near the focal point and 'conducts' them to a probe or pickup connected to a low-noise block down converter or LNB.

Role of LNB: LNB amplifies the relatively weak signals, filters the block of frequencies in which the satellite TV signals are transmitted, and converts the block of frequencies to a lower frequency range in the L-band range. The evolution of LNBs was one of necessity and invention.

Duo LNB

Duo LNB is a double low noise block-downconverter developed by SES Astra for the simultaneous reception of satellite television signals from both the Astra 23.5°E and Astra 19.2°E satellite positions. So it has two feedhorns with a single body of electronics containing the LNB stages along with switching circuitry to select which received signal is passed to the output. A Duo LNB can be purchased in most parts of Europe.

Role of Set Top Box: Set-top box demodulates and converts the signals to the desired form (outputs for television, audio, data, etc.). Sometimes, the receiver includes the capability to unscramble or decrypt the received signal; the receiver is then called an integrated receiver/decoder or IRD.

Impact of Equinox on Geostationary Satellites

Please note that there is a sun outage for all kinds of communications from Geostationary Satellites, twice a year on equinoxes, when there is temporary disruption of communications satellites. On Equinox, sun goes directly behind the satellite relative to Earth (i.e. within the beam-width of the groundstation antenna) for a short period each day. The Sun's immense power and broad radiation spectrum overload the Earth station's reception circuits with noise because of sun emitting microwaves on the same frequencies used by the satellite's transponders , and, depending on antenna size and other factors, temporarily disrupt or degrade the circuit. The duration of those effects can vary from few minutes to an hour. Sun Outage affects both the C-band and the Ku-band.

Conditional Access System

- ✓ Conditional Access System (CAS) is the electronic transmission of digital media, especially satellite television signals, through cable to limited subscribers. The signal is scrambled, encrypted and is unavailable for unauthorized reception.
- ✓ **Scrambling** is a process in which the picture is altered in such a way that it is impossible to watch those particular channels without being a subscriber.
- ✓ We all know that the set-top box (STB) is required to be placed near the TV to receive and decrypt the signal. The STB decrypts the video signal by which data is transmitted which can be used to control the subscriber's access to any channel. If a viewer subscribes to a particular channel, the signal is descrambled with no defects in sound or picture quality. This will also enable viewers to pay only for channels that they choose to watch.
- ✓ CAS treats channels as two categories — pay channels and free-to-air (FTA) channels. Pay channels will need a STB to be viewed and we pay for only those channels that we choose to watch. The free-to-air channels will not need any set-top box to be received and we can watch them like we watch cable channels.

Satellite Internet

The DSL and cable Internet access are popular in urban and suburban areas but in rural and remote areas, DSL and cable Internet may not be available. This is because the terrestrial connections are not installed everywhere. The Satellite Internet Access is an answer to this problem. Satellite connection offers Internet to those who live in locations so remote that there are no telephone lines, or even to those who travel in mobile vehicles.

Satellites Used:

The service can be provided to users world-wide through **Low Earth Orbit satellites.** The LOE are preferred because - though the **geostationary satellites** can offer higher data speeds, yet their signals cannot reach **some polar regions** of the world. Different types of satellite systems have a wide range of different features and technical limitations, which can greatly affect their usefulness and performance in specific applications.

SkyTerra-1 was launched in mid-November 2010 and will provide service across North America while Hylas-1 was launched at the end of November, 2010 and will target Europe.

HYLAS

HYLAS refers to "Highly Adaptable Satellite". It was a small **geostationary communications satellite**, which was launched on 27 November by European Ariane 5 V198 launch vehicle from the Guyana Space Centre at Kourou in French Guyana.

Purpose:

HYLAS will provide new and innovative services including the High Definition Television (HDTV) and interactive satellite delivered broadband services. It will also address the issue of the poor broadband coverage in many parts of Europe which have less developed ground infrastructure.

Construction:

HYLAS has been constructed by EADS Astrium(Europe's largest space company), and Antrix, a commercial arm of the Indian space agency (ISRO). The owner of this satellite is UK telecommunications company Avanti Communications Plc. It is based upon the ISRO's I-2K small satellite platform under a cooperative arrangement between EADS Astrium and ISRO/Antrix.

Weight and other information:

It is 2541 kilogram satellite and has 10 power transponders which are designed to deliver high speed broadband services for Europe. It will work for an estimated period of 15 years. The Antrix Corporation is also responsible for the post-launch operations of HYLAS, which are being conducted from the Master Control Facility, Hassan.

Success of the Launch:

The satellite reached the geostationary orbit on December 1, 2010. Immediately after, ISRO's Master Control Facility at Hassan immediately took over the control and command operations of the satellite.

Components:

Two-way satellite Internet consists of a Dish, Two Modems (for uplink and Downlink) and Coaxial cables between dish and modem. The satellite Internet uses Internet Protocol (IP) multicasting technology, which means up to 5,000 channels of communication can simultaneously be served by a single satellite. IP multicasting sends data from one point to many points (at the same time) by sending data in compressed format. Compression reduces the size of the data and the bandwidth.

Use of GEO: Problem of Latency:

This is one of the biggest hurdles of the Satellite Internet. Latency means the delay between requesting data and the receipt of a response. Satellite Internet is two way communications unlike the one-way communication in Satellite TV. Compared to ground-based communication, all geostationary satellite communications experience high latency due to the signal having to travel 35,786 km (22,236 mi) to a satellite in geostationary orbit and back to Earth again. The Latency in two way satellite internet access is typically between 1,000–1,400 ms in comparison to the dial-up internet where it is 50–200 ms total latency. This delay can also be irritating and debilitating with interactive applications, such as VoIP, videoconferencing, or other person-to-person communication. Some applications such as Skype will fail. Conversation over a high-latency connection makes communication difficult and may lead to a feeling of mistrust or hesitation, even when both sides are aware of the lag.

Use of LEO & MEO

The LEO and MEO present some solution to the latency problem. There is no way to eliminate the latency for GEO satellites and Medium Earth orbit (MEO) and low Earth orbit (LEO) satellites do not have such great delays. The current LEO constellations of Globalstar and Iridium satellites have delays of less than 40 ms round trip, However, they are not yet popular modes of internet access as throughput is less than broadband at 64 kbit/s per channel. The planned COMMStellation™, scheduled for launch in 2015, will orbit the earth at 1,000 km with a latency of approximately 7 ms. This polar orbiting constellation of 78 microsatellites will provide global backhaul with throughput in excess of 1.2 Gbit/s.

Information Technology Projects India

National e- Governance Plan

- ✓ A major initiative of the Government for ushering in e-Governance on national scale, called National e-Governance Plan (NeGP) was approved on 16th May 2006.
- ✓ NeGP consists of 27 Mission Mode Projects (MMPs) encompassing 9 Central MMPs, 11 State MMPs and 7 integrated MMPs that span multiple backend Ministries/ Departments.
- ✓ It also includes 8 program support components aimed at creating the right governance and institutional mechanisms, core infrastructure, policies & standards and the necessary legal framework for adoption of e-Governance in the country.
- ✓ It is implemented at the Central, State and Local Government levels.

State Wide Area Networks (SWAN)

- ✓ State Wide Area Network (SWAN) is envisaged as the converged backbone network for data, voice and video communications throughout a State/UT and is expected to cater to the information communication requirements of all the Departments.
- ✓ Under this Scheme, technical and financial assistance is being provided to the States/UTs for establishing SWANs to connect all State/UT Headquarters up to the Block level via District/Sub-Divisional Headquarters, in a vertical hierarchical structure with a minimum bandwidth capacity of 2Mbps per link.
- ✓ As on 31st December, 2010, SWAN is operational in 23 States/UTs.

State Data Centres

- ✓ State Data Centre has been identified as one of the important elements of the core infrastructure for supporting e-Governance initiatives under NeGP.
- ✓ Under the SDC Scheme, it is proposed to establish Data Centres in all the States/UTs so that common secure IT infrastructure is created to host State level e-Governance applications/Data to enable seamless delivery of Government to Government (G2G), Government to Citizen (G2C) and Government to Business (G2B) services duly supported by State Wide Area Network and Common Service Centres established at the village level.
- ✓ As on 31st December, 2010, 3 SDCs have been made operational. SDCs in 14 States are under implementation.

Common Services Centres

- ✓ The Government has approved the Common Services Centres (CSCs) Scheme for providing support for establishing 100,000 Common Services Centres in 600,000 villages of India.
- ✓ The Scheme envisions CSCs as the front-end delivery points for Government, private and social sector services to rural citizens of India, in an integrated manner. As of December 2010, number of CSCs rolled out in 31 States of India is 87,594.
- ✓ It has been decided that the Common Services Centres will be suitably repositioned to be a network of Panchayat level Bharat Nirman Common Services Centres, to provide Government services to the citizens in rural areas. Accordingly, the CSCs are to be leveraged for various services for Bharat Nirman and flagship Schemes like NREGA, NRHM and SSA.
- ✓ July 16 will be observed as Common Service Centre (CSC) Diwas every year. This day has been chosen as CSC Day to mark the incorporation of CSC e-Governance Services India Ltd on this day in 2009.

E-District

- ✓ e-District is a State Mission Mode Project under the National e-Governance Plan. The Project aims to target certain high volume services currently not covered by any MMP under the NeGP and to undertake backend computerization to enable thedelivery of these services through Common Services Centres.
- ✓ The Department has approved 16 Pilot e-District projects covering 41 districts. Pilot projects have been launched/ gone live in 18 districts across 6 States. The pilot project is in advance stage of implementation in 8 States.

National Skill Development Policy

- ✓ Government of India announced the National Skill Development Policy which has set a target of skilling 500 million persons by 2022.
- ✓ The policy also aims at taking the advantage of demographic dividends, i.e. increasing population of working age group in India.
- ✓ The Department has been listed as a part of the skill development initiative and has been given a target to train 10 million persons by the year 2022 in the domain of Electronics, Information and Communication Technology. The Department has prepared a road map for achieving the set target.

Indian Computer Emergency Response Team (ICERT)

- ✓ With the passage of Information Technology (Amendment) Act 2008, Indian Computer Emergency Response Team (ICERT) has been designated as Nodal agency for coordinating all matters related to cyber security and emergency response.
- ✓ It is now assigned with the task of oversight of the Indian cyber space for enhancing cyber protection, enabling security compliance and assurance in Government and critical sectors and facilitating early warning & response as well as information sharing and cooperation.
- ✓ In order to have the optimum uptime and support 24x7 operations of ICERT, initiatives have been taken to setup a Disaster Recovery site at C-DAC, Bengaluru

CERT-In

- ✓ Indian Computer Emergency Response Team (CERT-In) CERT-In is a functional organization of Department with the objective of securing Indian cyber space. CERT-In provides Incident Prevention and Response services as well as Security Quality Management Services.

National Knowledge Network

- ✓ Government had decided to establish a National Knowledge Network (NKN) which will consist of an ultra-high speed Core (multiples of 10Gbps and upwards), and over 1500 nodes covering all universities, research institutions, libraries, laboratories, hospitals and agricultural institutions across the country.
- ✓ In the initial phase, a core Backbone consisting of 18 Points of Presence (PoPs) have been established with 2.5 Gbps capacity.
- ✓ A total of 104 Institutions have been connected to NKN and 15 virtual classrooms have been set up. (annual Report 2010-11)

Free and Open Source Software Initiative (FOSS)

- ✓ Free and Open Source Software Initiative Cell has been established with an objective to develop and proliferate Free/Open Source Software (FOSS) in the country.
- ✓ Indian industry/SMEs can benefit from the liberal licensing norms of FOSS which enables software to be freely modified and distributed.
- ✓ The National Resource Centre for Free/Open Source Software (NRCFOSS) has been established to provide design, development and support services to the FOSS community in the country and also strengthen the global FOSS ecosystem by contributing to the open source pool. Several milestones have been achieved including BOSS.

Bharat Operating System Solutions (BOSS)

- ✓ Indian industry/ SMEs can benefit from the liberal licensing norms of Free and Open Source Software (FOSS) which enables software to be freely modified and distributed.
- ✓ GNU/Linux Bharat Operating System Solutions (BOSS) desktop version 4.0 with support for all 22 constitutionally recognized Indian languages and BOSS Advance Server version 1.0 has been released for deployment. 27 BOSS Support Centres have been established across the country.

National Informatics Centre

National Informatics Centre (NIC), an attached office of the Department, is a premier S&T organization. It has been playing a significant role in using ICT to streamline internal Government functions and facilitating implementation of e-governance. Accordingly, NIC has been engaged in setting up of Internet/ Intranet Infrastructure, preparing IT Plans and developing IT enabled Services including G2G, G2B, G2C and G2E portals.

NIC offers telecommunications-networking services including Ku band (TDMA, FTDMA, SCPC & satellite broadband) VSATs, wireless metropolitan-area networks (MANs) and local-area networks (LANs) with gateways for Internet- and Intranet-resource sharing. It also provides services like computer-aided design (CAD), digital-signature certification, geographical-information system (GIS), **domain-name registration for gov.in**, informatics, biomedical informatics, patent informatics, rural informatics, internet data centre (IDC), mathematical modelling and simulation, Computer networking, office-procedure automation (OPA), videoconferencing, website hosting & website development and training.

- ✍ The NIC publishes an E-Governance quarterly entitled **"Informatics"** in both print and PDF format.
- ✍ GePNIC is an e-Tendering solution of NIC for various Departments was implemented in a number of States.

National Internet Exchange of India (NIXI)

To bring about a substantially increased proliferation of '.in' domain name, a new '.in' internet domain name policy framework and implementation plan has been formulated. The new policy announced by the Government seeks to remove restrictions in the existing procedures and aims at adopting a liberal and market- friendly approach to register large number of '.in' domain names. The registration has already crossed more than one lakh registrations. For this purpose '.in' Registry was created by the National Internet Exchange of India (NIXI) promoted by the Department of Information Technology (DIT), as a 'not-for-profit' company in association with the Internet Service Providers Association of India.

India Development Gateway (InDG)

India Development Gateway (InDG) is a national level initiative that seeks to facilitate rural empowerment through provision of relevant information products and services, responding to the strategic needs of the rural communities, in their local languages. InDG catalyzes the use of ICT for collaboration and knowledge sharing among development stakeholders representing from Government, NGOs, community based organizations, private, academic and research institutions. This initiative is supported by the Department and being implemented by C-DAC, Hyderabad since 2006. As part of this initiative a

multilingual platform (www.indg.in) has been established for knowledge sharing with information, products and services in 8 Indian languages on 6 identified verticals.

eG-SWARAJ – Gram Swaraj Digital Approach

This is an e-Governance initiative for creation of digital database of multiple thematic layers and development of decision support system for various natural resources management. The implementing agency is JSAC, Ranchi, Jharkhand. This is on the verge of completion.

Cyber Appellate Tribunal (CAT)

As per the IT Act 2000, any person aggrieved by an order made by the Controller of Certifying Authorities and an Adjudicating Officer can prefer an appeal to the Cyber Appellate Tribunal (CAT). The office and Court of the CAT was inaugurated in July 2009 at its new location at LIC Building, Connaught Place, New Delhi.

Information Technology Investment Regions (ITIR)

To promote investment in the IT/ITES/Electronic Hardware Manufacturing (EHM) units, the Government has decided to attract major investment by providing a transparent and an investment friendly policy and set up Information Technology Investment Regions (ITIRs). These would be endowed with excellent infrastructure and investorfriendly policy environment. Such ITIR would reap the benefits of co-sitting, networking and greater efficiency through use of common infrastructure and support services. Such a complex would boost, augment exports and generate employment. Information Technology Investment Regions (ITIR) policy resolution has been notified in the Gazette of India under which each State/UT in India can set up an integrated township for facilitating growth of IT/ BPO and Sunrise Industries with world class infrastructure. Proposals have been received from 4 States namely Karnataka, Andhra Pradesh, Orissa and Tamil Nadu.

Media Lab Asia

The Media Lab Asia (MLAsia) is a not-for-profit Company of the Department of Information Technology, Government of India. The aim of this Company is to bring the benefits of ICT to daily lives of common man in the areas of Education, Empowerment of the Disabled, Healthcare & Livelihood Generation. It works in collaboration with academic and R&D institutions, industry, NGOs and State Governments in this endeavor. It is also identifying technologies that can be taken to the land for deployment along with the aim to reach the common man. With the help of its projects MLAsia has already touched nearly 1.5 Million people's lives in 1500+ locations.

Shruti-Drishti

The Shruti-Drishti (Text to Speech & Text to Braille) is a special web browser for visually impaired developed with the Department's support, with the associated required hardware (Computer Systems, UPS, Braille Embossers, Braille Keyboards, Tactile Readers). It has been deployed along with support and training in 40 visually impaired women/Co-Ed schools throughout the country. It is benefitting 4081 blind students (including 2314 female blind students) and 80 teachers.

Punarjjani™

Punarjjani™ is a web based tool to aid the teachers for the progress assessment and evaluation of the MR children and analysis of the results. It has been developed by MLAsia.

eGalla™

eGalla™ is an affordable Retail Management System designed to address the needs of the unorganized retail sector. The end users of eGalla may be whole salers, small scale retail shopkeepers and people employed in small shops. This software is an easy to use, accurate and multiuser application which can be ported on any computers / laptops. eGalla is available both as

stand alone and web based product. It includes inventory, customer management, vendor management, account receivable, account payable and bill printing modules in addition to different business reporting tools. The system has been tested in 20 shops in & around Mumbai. It has been developed by MLAsia.

Asociado™

Asociado™ system empowers the grass root level health workers with mobile/handheld based data collection. A centralized health database is created for generating different statistical and graphical reports. The reports are being used as an input to health planning and decision making authorities at higher levels. The system is implemented at three Blocks (20 HCs/CHCs/BPHCs, covering 7.8 lakh population) of Mallapuram district, Kerala.

mDhanwanthari

mDhanwanthari is Low Cost mobile Telemedicine Van operating at 20 locations of Cherthala Taluk, Kerala through KVM Hospital, Cherthala for the treatment of TB patients, Diabetic patients and mother & child care. This service can be availed by 4.34 lakh population of the Taluk w h e r e a s more than 8000 rural p a t i e n t s have been benefited through the system. A nominal amount is charged from the patients for diagnostic tests to maintain the sustainability of the system.

e-Dhanwanthari™

e-Dhanwanthari offers quality medical care at patient's door step. A specialist at one site delivers health care, diagnoses the diseases, gives intraoperative assistance, provides therapy or consults with another physician or paramedical personnel at a remote site. The system has been integrated with 4 Specialty Hospitals Centres/Medical Colleges and 8 Remote Centres (CHC/PHC) in Kerala. More than 400 patients have been treated in the 2010-11 and over all more than 800 patients have benefited from the system. The advanced telemedicine facility is provided to different patients like paediatric patients, TB patients, orthopaedic patients, neurological patients and others.

Sanyog Project

Under this project object based iconic communication interface has been enhanced for Bengali, Hindi and English. By object driven icon selection, the system can generate simple sentences in all the three languages. A new interface has been designed for connecting the special access switches with the system. An initial testing of Embedded Sanyog has been done.

SAMBHAV Project

National Resource Centre on Disability "Sambhav" provides the facilities for demonstration and practical use of the displayed items by persons with disabilities. It helps them in getting acquainted with the devices and taking decisions for buying a particular device. The centre will have information about the price, availability and usage of devices.

Technology Development for Indian Languages Programme (TDIL)

Advances in Human Language Technology will offer access to information and services to people in their language. There are 22 constitutionally recognized languages and these are in 11 scripts. Technology Development for Indian Languages

(TDIL) will enable people to access and use IT solutions in their own languages. Development of technologies in multilingual computing areas initiative is directed towards R&D efforts

CHIC Project

CHIC is a Computer Aided Design (CAD) tool for enhancing the productivity of the Chikankari designers. CHIC allows capturing of Chickankari motifs in digital form, use of these motifs to create new designs with fast turnaround time, engrave the designs directly on to the blocks. This allows creating library of traditional Indian & Persian designs for use. CHIC is 'cost-effective' and less 'time-consuming' as compared to the existing traditional methods and can help in creation of better designs. This system is being field tested in Uttar Pradesh. Now plans are being made for large scale deployment in a sustainable way. Private companies are also showing their interest in deployment of the software. This is ready for commercialization. Now this CAD system has been extended to Carpet design. (2010)

Indian Language CorporaInitiative" project

Under this project, Annotated Text Corpora for 11 Indian languages i.e. Hindi, English, Gujarati, Punjabi, Oriya, Bengali, Telugu, Malayalam, Marathi, Urdu, Konkani and Tamil is being developed.

Indian Rupee Sign

The Government has approved a unique symbol for Indian Rupee. The Indian rupee sign was selected through an open competition among Indian residents. The design was presented to the public by the government of India on 15 July 2010. The design of the Indian rupee sign is a combination of the Devanagari

letter ra and the Latin capital letter "R" and is denoted by ₹ . The Indian rupee sign is placed at U+20B9 in the Unicode character set – U+20B9 ⃁ indian rupee sign (HTML: &#8377)

Virtual Observatory – India

The Next Generation (VOI-TNG) is being set up at Inter University Centre for Astronomy & Astrophysics (IUCAA, Pune):

MCA 21 Project

Rs 350-croreMCA 21 is one of the largest project in the e-governance initiatives. It was launched in New Delhi on 18th March 2006. It has been introduced in Coimbatore, Pondicherry, Ernakulam and New Delhi offices of the Registrar of Companies. The basic objective is to enable the electronic filing of the forms related to Companies Act, 1956.

NISG

National Institute of Smart Government is an e-Governance body. It is working with global networking major CISCO Systems. CISCO spreads awareness among government departments to the benefits of these initiatives. CISCO works on projects like pilots and proof - of -concept labs for demonstration of technologies like LAN / WAN, IP communications, wireless and security.

e-SEVA Project

Launched on the 25th of August 2001, electronic seva (e-Seva) is the improved version of the TWINS project launched in 1999, in the twin cities of Hyderabad and Secunderabad in Andhra Pradesh. The project aims at integration of departments of both Centre and State Governments as well as the integration of Government to citizen (G2C) and B2C. e-SEVA has grown to nearly 200 centres offering 160 services.

e-Sagu

e-Sagu is an IT-based personalized agricultural advisory system. The advice by the experts is provided at the farmers door tep on regular basis from sowing to harvesting. This helps to reduce the cost of cultivation and increases the farm productivity as well as quality of agro - commodities. At present the system is covering crops such as cotton, chillies, rice, groundnut, castor, red gram and fish. Content development for other crops for other regions is under progress. A revenue model with collection of subscription from farmers has been implemented for testing sustainability. Work is going on to deliver the agri advices through SMS.

Akshaya

Akshaya was launched in 2002 by Kerala State Department of Information Technology; to make Kerala 100 per cent e-literate. First phase was implemented in Malappuram district. The second phase involved setting up of over 6,000 centers in all districts.

e-Bharat Project

To support National e-Governance Plan (NeGP), GoI has been carrying out a dialogue with World Bank for possible programme management and financial support (called “e-Bharat project”). The project is expected to contribute to: Improving government effectiveness; empowering marginalized communities; Increasing fiscal revenues; Reducing public procurement costs; and Promoting private sector-led growth through PPPs. Discussions with respect to funding mechanism and project design are currently underway.

Karnataka: Land Resources Information System (LRIS)

The project is being implemented by Karnataka State Remote Sensing Application Centre, Bangalore in collaboration with Department of IT & Biotechnology, Government of Karnataka for demonstration at Mysore district. It envisages an up-to-date comprehensive land information system and digital cadastral map, that is to be prepared for developmental and managerial requirements

Jharkhand: e-Kalyan

e-Kalyan is an e-Governance initiative for welfare Department inJharkhand State for development of web based Management Information System (MIS) and Budget Creation System.

Project Chetna

The objective of Project Chetna is to build enabling ICT platforms for empowering women and children in rural communities. Deliverables of the project include multimedia content on 10 development themes i.e., Life Skills, Compulsory Education, Health, nutrition, child care, age care & HIV/AIDS, SHG / VO capacity building, content for women entrepreneurs, Legal rights & duties, financial literacy and livelihood skills. As a part of its strategy and attempt to serve the communities better and empower them, several Community Radio Stations & Community TV Centres being established.

3i Infotech

3i Infotech is a project of ICICI group and works on an e- Governance assessment project. It is also executing the National Tax Information Exchange System, a national-level Information Technology outsourcing initiatives. 3i Infotech is a fiveyear project built on a build-own-operate and transfer model.

Rajasthan :AARAKSHI Project

AARAKSHI is an Intranet based system developed and implemented for Jaipur City Police.

Kerala: e-Srinkhala

e-Srinkhala is a Government to People'(G2P) project of Government of Kerala develped in assocation with public sector company Keltron. e-Srinkhala network aims to provide a decentralised facility for services like information on various schemes, downloading of applications and online submission for government services, incentives and subsidies.

Rajasthan: Lok Mitra

Lok Mitra project in Rajasthan is first of its own kind of Electronic service in the state.It is a one-stop, citizen friendly computerized centre, providing relief to a common man as he gets efficient services through IT driven interfaces at a single window. Similar project with same name has been started by Himachal Pradesh also.

Bihar: MUDRA

MUDRA refers to Municipal Corporation towards Digital Revenue Administration. its a project started in Bihar for revenue purposes for the Holding owners, Tax collectors, officials at headquarter levels and Circle levels.

Haryana: Nai Disha

This project of Haryana Government comes under the "Sarkar Apke Dwar" and includes Haryana Registration Information System (HARIS), a Web-Enabled Electoral Rolls System (WEER) etc. NAI-DISHA is a web portal to provide about 25 services to Citizens of Haryana.

Karnataka: Khajane

Khajane was launched in 2003 by Government of Karnataka as an online treasury project, which computerises all the 216 treasury offices in Karnataka and is connected to a central server at the State Secretariat through VSAT.