



HYPERLOOP 2018

ICT

CONSOLIDATED PRELIMS CURRENT AFFAIRS

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1. INFORMATION AND COMMUNICATION TECHNOLOGIES

1.1 SATELLITE COMMUNICATION

1.1.1 Desi Global Positioning System

Indian Space Research Organisation (ISRO) has deployed an indigenous regional positioning system named as “Navigation with Indian Constellation” (NavIC).

- It consists of seven satellites in a constellation to provide Position, Navigation and Timing (PNT) services in Indian mainland and surrounding region up to 1500 Km.
- An Extended Service Area lies between primary service area and area enclosed by the rectangle from Latitude 30 deg South to 50 deg North, Longitude 30 deg East to 130 deg East.
- The IRNSS System is expected to provide a position accuracy of better than 20 m in the primary service area.
- The seven satellites are - three Geostationary Earth Orbit (GEO) satellites and four Geosynchronous orbit (GSO) satellites.
- It provides two types of services viz. Standard Positioning Service (SPS) and Restricted Service (RS).
- It can support commercial civil applications like
 - Terrestrial, Aerial and Marine Navigation
 - Disaster Management
 - Vehicle tracking and fleet management
 - Integration with mobile phones
 - Precise Timing
 - Mapping and Geodetic data capture
 - Terrestrial navigation aid for hikers and travellers
 - Visual and voice navigation for drivers.
- Restricted Services (RS) will grant access only to authorized users.
- Indian entrepreneurs are being enabled for providing services through NavIC receiver system and requisite information has been made available in public domain.
- Mobile-Apps for navigational alerts across maritime jurisdictions is developed and tested for the Fishermen community using first generation NavIC receivers.
- It may take couple of years to become fully operational in the market

The Atomic Clocks

- All three rubidium atomic clocks on IRNSS-1A failed in mid-2016.
- Indian Space Research Organisation will soon launch a replacement navigation satellite fitted with corrected atomic clocks
- In India The National Physical Laboratory (NPL) is the keeper of standard time. It maintains accuracy of ± 20 nanoseconds through the Primary Time Scale, an ensemble of five caesium clocks and one hydrogen maser

Other Navigation Systems

- GPS (Global Positioning System) of the US , Glonass of Russia, Galileo of Europe China's Beidou etc
- GPS and Glonass are fully functional global systems
- The Chinese and the Japanese systems offer regional coverage
- Europe's Galileo is yet to be operational.

1.1.2 High-Throughput Communication Spacecraft

India plans to deploy five high-throughput communication spacecraft (HTSs).

- Gen-5 spacecraft
- The first of them, GSAT-19, is slated for launch from India in December.
- HTSs can provide Internet connectivity many times faster, smoother, easier and probably cheaper than now.
- HTS reuses satellite frequencies several times over smaller areas.
- HTS can support point-to-multipoint applications and even broadcast services such as DTH distribution to relatively small geographic areas
- Individuals, planners in government, businesses like banks, ATMs, reservation systems, cellular and private networks and users in remote areas are expected to benefit from improved connectivity.

China's HTS satellites, is capable of providing better Internet access on planes and high-speed trains, as well as in less-developed regions.

HTS Properties

1. **Higher transmit/receive gain:** because of its higher directivity and therefore higher gain, a narrower beam results in increased power (both transmitted and received), and therefore enables the use of smaller user terminals and permits the use of higher order modulations, thus achieving a higher rate of data transmission per unit of orbital spectrum.
2. **Frequency reuse:** when a desired service area is covered by multiple spot beams, several beams can reuse the same frequency band and polarization,

boosting capacity of the satellite system for a given amount of frequency band allocated to the system.

1.1.3 GSAT-18

ISRO's communication satellite GSAT-18 has successfully been launched.

- GSAT-18 is the 20th satellite from ISRO to be launched by the European space agency.
- The main aim of GSAT-18 is to provide telecommunications services like Television, telecommunication, VSAT and digital satellite news.
- The GSAT-18 has been placed in a Geosynchronous Transfer Orbit (GTO). ISRO will perform the orbit raising manoeuvres to place the GSAT-18 in the Geostationary Orbit (36,000 km above the equator).

1.1.4 North-Eastern Space Applications Centre (NE-SAC)

NE-SAC, located at Umiam (near Shillong), Meghalaya, is a joint initiative of Department of Space (DOS) and North Eastern Council to provide developmental support to the North Eastern region using space science and technology.

- The centre has the mandate to develop high technology infrastructure support to enable NE states to adopt space technology inputs for their development.
- NE-SAC support includes specific application projects using remote sensing, GIS, satellite communication and conducting space science research.
- NE-SAC has tested unmanned aerial vehicles (UAVs) to assess several regional problems, ranging from measuring diseased paddy fields to damage caused by frequent landslides in the north eastern region of the country.

1.2 INTERNET TECHNOLOGIES

1.2.1 Aquilla

Facebook successfully completed its first test flight of its solar powered internet drone Aquilla.

- The company hopes to develop a fleet of Aquillas that can fly for at least three months at a height of 60,000 feet and communicate with each other to provide internet access.
- Trying to bring internet access to areas where internet connectivity is bad or non-existent.

1.2.2 Project Loon

Project Loon by Google aims to provide internet services to the remote parts of the world.

- Rather than using under-ground fibre optic cables or construct cell towers to connect users, it will use balloons that float in the stratosphere.
- Huge helium filled balloons will be launched at altitudes of 20 km above the earth, above the zone where airplanes fly.
- The balloons can then act as cell towers to receive and transmit signals.
- Solar panels will power these 'loons' with their batteries storing up charge for night-time operation.
- The balloon's path will be controlled by changing its altitude, so that it can optimally use wind speed and direction.
- Users will need a special antenna for receiving and sending radio signals to/from the balloon.

1.2.3 White Space Technology

Maharashtra government officials raised a red flag over extensive use of White Space Technology for Rural internet by Microsoft citing security issues. The intelligence agencies have concerns as it was an unregulated band.

White space Technology

- Television networks have unused broadcasting frequencies between channels which is kept idle for buffering purposes.
- These unused bands can be dynamically allocated to transmit Internet broadband while regular TV transmissions go on uninterrupted.
- Is as secure as any other wireless transmission medium
- The project was on a pilot basis under the state's Village Social Transformation initiative

1.2.4 Under-sea super-fast cables

Microsoft, Facebook and the telecom infrastructure company Telxius have laid a 6,598 km cable across the Atlantic Ocean is capable of transmitting 160 terabits of data per second.

- It is called 'Marea' (tide) that delivers 16 million times faster Internet than an average home web connection.
- 99% of data we use travel under the oceans.

- The first transcontinental cable was laid in 1858 and ran from Ireland to Newfoundland making telegraph communication between England and Canada a reality

1.2.5 Novel technology to boost Internet speed

New hardware can consistently provides high-speed broadband connectivity. To maximise the capacity of optical fibre links, data is transmitted using different wavelengths, or colours, of light. The new technology enables dedicated data rates at more than 10 megabits per second (Mb/s) for a truly superfast, yet low-cost, broadband connection.

1.3 MOBILE COMMUNICATION

1.3.1 USSD (Unstructured Supplementary Service Data)

- Is a Global System for Mobile (GSM) communication technology
- Is used to send text between a mobile phone and an application program in the network.
- It is a protocol used by cellular phones to communicate with a service provider – especially in retail payments for utility bills, money transfers etc.
- With Short Messaging Service (SMS), messages can be stored for several days.
- USSD is similar SMS, but, unlike SMS, USSD transactions occur during the session only.

1.3.2 Volte service

Airtel has started to support voice over LTE.

VoLTE

- 4G LTE-enabled technology that significantly improves the clarity of voice calls using Internet data.

Advantage over Reliance jio

Unlike Reliance Jio's VoLTE offering, which only works with 4G network, Airtel said VoLTE calls made on its network will automatically fall back on 3G/2G network to ensure that customers continue to stay connected at all times

LTE

Long Term Evolution (LTE) is a 4G wireless broadband technology developed by the Third Generation Partnership Project (3GPP), an industry trade group.

- 3GPP engineers named the technology "Long Term Evolution" because it represents the next step (4G) in a progression from GSM, a 2G standard, to UMTS(Universal Mobile Telecommunications Service) - the 3G technologies based upon GSM.
- LTE provides significantly increased peak data rates, with the potential for 100 Mbps downstream and 30 Mbps upstream, reduced latency, scalable bandwidth capacity, and backwards compatibility with existing GSM and UMTS technology.

1.3.3 5G rollout by 2020

The government has formed a high-level panel to evaluate and approve road maps and action plan to achieve the target of rolling out 5G technology in India by 2020. Local manufacturers should be able to capture 50% of the Indian market and 10% of the global market over the next five to seven years.

5G

- 5G is the term used to describe the next-generation of mobile networks beyond the 4G LTE mobile networks of today.
- It is assumed that 5G networks can become commercially available by 2020
- 5G will feature network speeds that are blazingly fast at 20 G/bps or higher and have a latency that is mere milliseconds.
- Not only will people be connected to each other but so will machines, automobiles, city infrastructure and more.
- 5G networks are also expected to have always-on capabilities and be energy efficient
- Is based on the IEEE 802.11ac standards.

According to the Groupe Speciale Mobile Association (GSMA), to qualify for a 5G, a connection should meet most of these eight criteria:

- One to 10Gbps connections to endpoints in the field
- One millisecond end-to-end round trip delay
- 1000x bandwidth per unit area
- 10 to 100x number of connected devices
- (Perception of) 99.999 percent availability
- (Perception of) 100 percent coverage
- 90 percent reduction in network energy usage
- Up to ten-year battery life for low power, machine-type devices

Potential Applications

- 5G network is estimated to create a \$27 billion worth revenue opportunity for Indian telecom operators by 2026
- 5G is expected to play a major role in digitalization of industries
- 5G in agriculture can be a potential application in areas like field monitoring and mapping, livestock routing and monitoring, on-field applications, and related services

1.4 WIRELESS COMMUNICATION**1.4.1 Millimeter wave Technology**

Facebook plans to bring the internet to new areas with this technology.

- Millimeter waves are smaller in wavelength than the radio waves that transmit cell phone and Wi-Fi signals.
- Millimeter waves are not as widely used as others
- The only challenge would be the higher power consumption by millimeter wave setup relative to the radio wave technology.

1.4.2 Cognitive Digital Radio

Indian intelligence agencies have found a new app called “Calculator” which is used by terrorists.

- The technology is based on the concept of ‘cognitive digital radio’ that enables users to turn their smartphones into peer-to-peer, offgrid communication tools.
- The technology was first used by a U.S.-based company during Hurricane Katrina so that the affected residents could remain in touch with each other.

Cognitive Digital Radio

- It is a form of wireless communication in which a transceiver can intelligently detect which communication channels are in use and which are not, and instantly move into vacant channels while avoiding occupied ones.
- This optimizes the use of available radio-frequency (RF) spectrum while minimizing interference to other users.

1.4.3 RFID (Radio Frequency Identification Tag)

Jawaharlal Nehru Port has become the first port in the country to implement logistics data tagging of containers.

- RFID tagging is an ID system that uses small radio frequency identification devices for identification and tracking purposes.
- An RFID tagging system includes the tag itself, a read/write device, and a host system application for data collection, processing, and transmission.
- RFID tags can contain their own power source, and are known as active tags.
- A passive tag is briefly activated by the radio frequency (RF) scan of the reader.

1.4.4 Li-Fi or light-fidelity Technology

Li-Fi, or light fidelity is a wireless technology that makes use of visible light in place of radio waves to transmit data.

- Li-Fi accommodates a photodetector to receive light signals and a signal processing element to convert the data into streamable content.
- An LED light bulb can be dipped and dimmed, up and down at extremely high speeds, without being visible to the human eye.
- Transmits data more than 100 times the speed of Wi-Fi.

Advantages

- Due to its shorter range, Li-Fi is more secure than Wi-Fi.
- Li-Fi systems consume less power.

Uses

- Li-Fi can be used in street and traffic lights to communicate to the vehicles and with each other. Through the use of Li-Fi, traffic control can be made intelligent and real-time adaptable.
- Visible light being safer, they can also be used in places where radio waves can't be used such as petrochemical and nuclear plants and hospitals.
- They can also be used in aircraft, where most of the control communication is performed through radio waves.
- Li-Fi can also easily work underwater, where Wi-Fi fails completely.
- Another unique possibility is transmitting power wirelessly

Disadvantages

- The range is restricted, as visual light can't pass through opaque objects.
- Li-Fi is likely to face interference from external light sources and obstructions in the path of transmission.

1.5 OTHER DEVELOPMENTS

1.5.1 Quantum Communication

It is a field of applied quantum physics closely related to quantum information processing & quantum teleportation.

China recently launched a 712-km quantum communication line, stated to be the world's longest secure telecommunications network.

Quantum Cryptography

- Has ultra-high security making it impossible to wiretap, intercept or crack the information transmitted through them
- The technology allows one to distribute sequence of random bit sequence of photons whose randomness and secrecy are guaranteed by the laws of quantum physics.
- These sequences can then be used as secret keys to guarantee the confidentiality of data transmissions.

Quantum Teleportation

Chinese researchers successfully teleported a photon from an instrument on the Tibetan plateau to an orbiting satellite 1,400 km away in space through quantum entanglement.

- The particles share their 'quantum states' — such as energy, motion and magnetic field — regardless of the distance separating them.
- If one particle changes, its co particle in the other location also changes
- It can be the basis of futuristic quantum internet, quantum information technology, quantum computing, quantum cryptography etc
- Micius is the the world's first quantum-enabled satellite launched by China

1.5.2 India joins quantum computing race

Keen to tap into the next big advance in computing technology, the Department of Science and Technology (DST) is planning to fund a project to develop quantum computers.

- Quantum computer employs the principles of quantum mechanics to store information in 'qubits' instead of the typical 'bits' of 1 and 0.
- Qubits work faster because of the way such circuits are designed, and their promise is that they can do intensive number-crunching tasks much more efficiently than the fastest comparable computers.

- Internationally, Canada's D-Wave Systems, is a pioneer in developing quantum computers and has sold machines to Lockheed Martin and Google.

1.5.3 Super Computers

Sunway Taihulight

It is a new Chinese supercomputer that can make 93 quadrillions calculations per second. Uses processors entirely designed and made in China. It is twice as fast as Tianhe-2 (the previous fastest supercomputer) of China. USA's Titan supercomputer is now at third in the Top 500 supercomputer list.

Param Ishan

Union Human Resource Development Minister launched the supercomputer Param Ishan at IIT Guwahati.

- Param-Ishan has the power of 250 Teraflops and three hundred terabytes capacity.
- This supercomputer can be used in application areas like computational chemistry, computational fluid dynamics, computational electromagnetic, civil engineering structures, nana-block self-assemble, optimization etc.
- It can also be used for weather, climate modelling and seismic data processing.

1.5.4 India's first augmented reality (AR) education and training institute

India's first augmented reality (AR) education and training institute will be set in Varanasi. The institution will be established by the central government in partnership with Eon Reality, an augmented reality company based in the US.

Augmented Reality

- Augmented reality is a computer technology that functions on computer vision-based recognition algorithms to augment sound, video, graphics and other sensor based inputs on real world objects.

1.5.5 Merged Reality

Project alloy is a device made by IBM that creates 'merged reality'.

- It is a headset that enables people to interact with elements of the virtual world.
- There is no need for cables to connect to the computer.
- It goes beyond virtual reality

- It digitizes the real world and allows people to experience the virtual world without coming into conflict with the real world.

1.5.6 QR code (Quick Response code)

It is a two-dimensional (matrix) machine-readable bar code made up of black and white square.

- This code can be read by the camera of a smartphone.
- It is capable of 360 degrees (omnidirectional), high speed reading.
- QR Code can store up to 7089 digits as compared to conventional bar codes which can store max 20 digits.
- It has error correction capability and data stored in it can be restored even if it is partially damaged or dirty.

1.5.7 Blockchain Technology

Blockchain Technology is a distributed database technology for storing continuously growing records.

- Blockchains are secure by design as data is kept in `blocks' that cannot be tampered with.
- Is the technology driving digital currency bitcoins.
- Several state governments, including Karnataka, Gujarat and Maharashtra, have started evaluating the technology for purposes of e-governance
- Telangana has begun a pilot programme to use blockchain technology for land registration and integration with the state revenue department.
- ICICI Bank executes India's first banking transaction on blockchain in partnership with Emirates NBD

2. ARTIFICIAL INTELLIGENCE RELATED ADVANCEMENTS

2.1 Automation

Disruptive Technology effect:

- Studies by Deloitte in UK and McKinsey in the US are estimating that currently demonstrated technologies will kill from a third to a half of all jobs within a decade.
- 3- D technology , agricultural robotics industry, automated farming , robots replacing vehicle assembly are all grave threat to labour intensive sector leading to huge unemployment .

2.2 Data science

Decision sciences are the cornerstone of success in the data-driven world.

- Decision sciences is helping corporations in BFSI (banking, financial services and insurance), ecommerce, telecom, transportation and many such industries process massive amount of data to leverage their true business potential and these are next sunrise sectors.
- There is a lack of skilled manpower to harness the benefit of this analytic field in India

2.3 Boost to M2M technology

TRAI has sought industry feedback on delicensing a portion of 700 MHz band for short-range M2M communications, especially since M2M devices have lower power and spectrum needs.

What is M2M?

Machine to machine (M2M) is a broad label that can be used to describe any technology that enables networked devices to exchange information and perform actions without the manual assistance of humans.

- Allow wired and wireless devices to talk to each other using sensors
- Applications can be deployed in new age infrastructure projects such as smart cities, smart grids, smart health and smart transportation.
- It forms the basis for the concept of Internet of Things (IoT)
- Key components of an M2M system include sensors, RFID, a Wi-Fi or cellular communications link and autonomic computing software programmed to help a networked device interpret data and make decisions.
- The Internet and improved standards for wireless technology have expanded the M2M to everyday use
- Products built with M2M communication capabilities are often marketed as being “smart.”
- Currently, M2M does not have a standardized connected device platform

2.4 Natural Language Processing

Natural language processing (NLP) and voice interaction are the next big shift in digital tech voice-based interaction. Natural language processing (NLP) is the ability of a computer program to understand human language as it is spoken.

Opportunities:

- Using predictive analytic platforms for the banking and financial services sector, etc.
- NLP can be used to interpret free text and make it analyzable, like patients' medical records, for example
- Sentiment analysis is another primary use case for NLP. Using sentiment analysis, data scientists can assess comments on social media to see how their business's brand is performing
- Current approaches to NLP are based on deep learning, a type of AI that examines and uses patterns in data to improve a program's understanding.

2.5 Google Assistant

The feature, earlier available only on Pixel phones, is being rolled out across all Android devices

The Assistant can give complete information about the song, including title, artist, lyrics, through Google Play Music, YouTube links, and any third party apps installed on your device

How it works?

- Uses a technique called spectrography, wherein it takes a database of thousands of popular songs and creates a unique spectral signature or "acoustic fingerprint" for each one.
- This fingerprint captures and stores sound data in three parameters — frequency, amplitude and time, and creates a numeric signature for the song.

2.6 Google genomics

It enables scoreboard and researchers to store, search and run vital simulations in vast amount of data. Run by Google X

2.7 Google Deep mind

What separate deep mind from other AI system is the way it's algorithms are built. Instead of focusing on a single task, Deep mind's algorithms are general, allowing it to perform well across a variety of tasks straight out of box

2.8 Project Soli

By ATAP(advanced technology and projects)

- uses radar to detect minute hand and finger movements
- used to manipulate real devices, or even allow as unprecedented level of interactions in virtual Environment

2.9 Nasscom Product Council opens a DeepTech Club

Nasscom's Product Council (NPC), a platform for software product companies launched a DeepTech Club to nurture startups with mentors and investors.

- It will help core deep learning startups in India collaborate with educational institutions worldwide
- Help in go-to-market, scaling-up, technology development, fundraising and international expansion

2.10 Centres of excellence to better learn Artificial Intelligence

The National Association of Software and Services Companies (NASSCOM), a trade association of Indian Information Technology and Business Process Outsourcing industry is setting up centres of excellence on artificial intelligence (AI) and data sciences for a better understanding on the emerging technologies. Centre of excellence on AI and data sciences in Bengaluru and Hyderabad.

- Promoting startups in that area and also best practices globally, including regulatory aspects.
- Machine learning and artificial intelligence are cropping up as solutions for handling data.
- Machine learning will help businesses automate processes and analyse vast amounts of data and help replicate a human task and reach a new conclusions.

2.11 Intel 'Loihi' Self-Learning AI Chip

Intel has announced a self-learning neuromorphic chip that could raise the bar for artificial intelligence. Codenamed Loihi, Intel's self-learning AI chip is said to mimic "how the brain functions" by learning to operate based on various modes of feedback from the environment.

Uses:

- The potential benefits from self-learning chips are limitless.
- One example provides a person's heartbeat reading under various conditions. The system can then continuously monitor incoming heart data in order to flag patterns that do not match the "normal" pattern.

3. APPLICATIONS IN ENGINEERING AND NETWORKING

3.1 INDUSTRIAL APPLICATIONS

3.1.1 Industrial Internet

IoT's industrial applications are called as the 'Industrial Internet'. It draws together fields such as machine learning, big data, the Internet of things and machine-to-machine communication to absorb data from machines, analyze it (in real-time), and use it to adjust operations.

- It has applications in manufacturing, energy sector, agriculture, defence, mining, transportation and healthcare etc.
- It holds great potential for quality control, sustainable and green practices and overall supply chain efficiency.
- It is applied intelligent projects, such as driverless cars and intelligent railroad systems.

The internet of things (IoT)

- The internet of things (IoT) is the network of physical devices, vehicles, buildings and other items-embedded with electronics, software, sensors, and network connectivity that enable these objects to collect and exchange data.
- IoT creates opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefits
- IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems.
- It can also be used to improve crop yield to help feed the world's growing population.

IOT India Congress

Aims to bring together stakeholders across the value chain and verticals to collaborate on a common roadmap for IoT implementation.

- First session of IOT India Congress was held at Bengaluru.

3.1.2 Database on Industries

GIS-enabled portal maps land-related information Centre has brought out an online database of more than half a million hectares of land. The database is being developed by the Department of Industrial Policy and Promotion (DIPP) and the National e-Governance Division in the Ministry of Electronics and Information

Technology as well as the BISAG – an institute for space applications and geoinformatics under the Gujarat Government.

- The Geographic Information System (GIS) enabled database has details of close to 3,000 industrial parks/clusters, as well as area-wise availability of agricultural/horticultural crops, and mineral production.
- The portal will soon incorporate information on warehouses, power-grid and financial institutions as well as the demand for industrial infrastructure
- Can add database about government-approved technical institutions will indicate the availability of skilled and semi-skilled talent.

3.1.3 Big Data

‘Big Data’ refers to a massive accumulation of information, siphoned from multiple sources and domains, which can then be analysed to make informed decisions.

- It is an all-encompassing term for any collection of data sets so large and complex that it becomes difficult to process using traditional data processing applications.
- Big data “size” is a constantly moving target.
- It requires exceptional technologies to efficiently process large quantities of data within tolerable elapsed times.
- The use and adoption of Big Data within governmental processes and business is beneficial and allows efficiencies in terms of cost, productivity, and innovation.

3.1.4 Robotics

Software Robotics

ICICI Bank has deployed ‘Software Robotics’ in over 200 business processes across various functions of the bank. Software Robotics emulates human actions to automate and perform repetitive, high volume and time consuming tasks across multiple applications. It would reduce the response time to customers and increase accuracy, thus sharply improving the bank’s productivity and efficiency. It also helps the bank’s employees to focus more on value-added and customer-related functions.

Lakshmi Robot

It is India’s first banking robot. It has been launched by City Union Bank. It will be capable to answer queries related to account balance, loans, fixed deposits, payments etc. Apart from generic questions, it can also deal with core banking

solutions like history of payment transaction by any user etc. Sensitive financial information will only be displayed discretely and not announced out loud. It is currently adept in English. Since it is based on artificial intelligence, it also has the capability to learn from the consumers. It can also give real time updates on currency exchange, interest rates etc.

3.1.5 Cleaning Ganga

IOT

Institution of Engineering and Technology (IET), a non-profit engineering organization, has created a blueprint through their IoT India panel to implement internet of things devices and related technology for curbing pollution and improving water flow for the 2,525-km long river Ganga

- IoT is just not for collecting data but about analyzing the data and give aforesaid results.
- Devices can monitor the situation across the length of the river and then share the data with local authorities and universities to work on it.

Geospatial Technology

Geo-spatial and crowd sourcing technologies like Bhuvan Ganga app can be effectively used to evoke a mass movement to popularize Namami Gange Programme

- National Remote Sensing Centre (NRSC), which is a part of Indian Space Research Organization (ISRO) has been supporting NMCG to use geospatial technology for water quality monitoring, hydrological monitoring and evaluation, geomorphological monitoring and evaluation, bioresources monitoring and evaluation, comprehensive geospatial database, develop mobile application for enabling community participation and to coordinate necessary linkages with other agencies.
- NMCG also strives to achieve GIS mapping of the entire Ganga river basin for effective execution and decision-making.
- Water quality assessment using satellite data of main Ganga from Kannauj to Varanasi, real time water quality data visualization etc. are planned by NRSC

3.1.6 Driverless Cars

- Is a vehicle that is capable of sensing its environment and navigating without human input.

- Use a variety of techniques to detect their surroundings, such as radar, laser light, GPS, odometry, and computer vision.
- LIDAR (Light Detection and Ranging - a technology similar to radar) sensor monitors surroundings around the car and creates a dynamic 3-D map of the car's current environment.
- Odometry is the use of data from motion sensors to estimate change in position over time
- Artificial intelligence (AI) software in the car is connected to all the sensors
- Advanced Driver Assistance System (ADSS) - information to be exchanged between vehicles for establishing the optimal coordination includes the vehicle dynamics, state measurement, road geometry and static and dynamic road map information

The potential benefits

- would eliminate accidents caused by driver error, which is currently the cause of almost all traffic accidents.
- could improve traffic flow, dramatically increase highway capacity and reduce or eliminate traffic jams
- allow commuters to do other things while traveling, such as working, reading or sleeping

Challenges:

- The accuracy of GPS is affected by various sources of errors, such as ionospheric, tropospheric etc., which cause signal blockage
- Impairments associated with wireless channels
- In urban environments, satellite signal blockage or multipath fading due to tall vegetation, high-rise building and dense road infrastructures
- Insufficient number of GNSS satellites

3.1.7 Algorithm to fix factory woes

Scientists at IIT-Madras have written a code that can help factories spot performance-dragging parameters

- By just studying patterns from large, unstructured historical data sets and real-time feed from IoT-enabled electronics placed inside the factories
- The software is built on general purpose computing languages like Python and Java.
- It will find application wherever control valves used
- It can detect malfunctions in control valves effectively by studying frictional data and flag discrepancies

3.1.8 Business process management (BPM) sector

India remains the largest BPM base in the world with revenues close to \$30 billion and employee strength of 1.2 million in FY 2017.

- The revenues for India's BPM sector is projected to increase
- The industry body NASSCOM has listed six new business opportunities like advanced analytics, robotic process automation (RPA), artificial intelligence and machine learning, virtual and augmented reality, chatbots and digital assistance voice search which will expand the BPM market.

Business process management (BPM) is a systematic approach to making an organization's workflow more effective, more efficient and more capable of adapting to an ever-changing environment.

3.1.9 Digital Payments

Payment app - Tez

Google launched a Unified Payments Interface (UPI)-based digital payment service called "Tez". Facilitates the instant fund transfer between two bank accounts on the mobile platform

3.1.10 AI in Agriculture

Price Forecasting

A multi-variant price forecasting model for tur crop, being developed by Microsoft for the Karnataka government using artificial intelligence (AI) and machine learning algorithms, is expected to help growers. AI and a host of digital tools such as cognitive computing, image processing and advanced analytics can be used. IBM running pilots on precision agriculture using technologies such as geospatial analytics, the Internet of Things and forecasting technologies. Price forecasting model has been done for tur by Microsoft, it will plan to develop such a model for 10 crops.

Soil Testing

The government's massive scheme to analyze the soil quality of farms across the country may get a technology boost.

Analysis without collecting sample

- Uses sophisticated imaging techniques and can picture the nutrient balance of a patch of land without necessarily collecting soil sample.
- Using custom-developed algorithms, satellite-images, or those taken from low flying planes or drones, can be used to calculate the proportion of nitrogen, potassium and phosphorous

- The researchers have figured out ways to measuring organic carbon and phosphorous in a soil sample via images.

3.1.11 AI in Health Sector

Predict Alzheimers 10 years in advance

Scientists have developed an artificial intelligence system that can accurately identify signs of Alzheimer's disease almost 10 years before clinical symptoms appear. The idea was to teach the algorithm to correctly classify and discriminate between diseased and healthy brains, researchers said. Crucially, it could also tell the difference between healthy brains and those with MCI with an accuracy of 84 per cent.

Computer brain-training

A computerised brain training program reduces risk of dementia among older adults by 29 per cent. The participants in the computerised speed training group were trained on a highly specific task designed to improve the speed and accuracy of visual attention, including both divided and selective attention exercises.

Internet of Things enabled ultrasound scans

- A system that will validate the data and do a preliminary scanning of the organ
- In the IoT-enabled remote scanning, if the scans are uploaded to the cloud without being first analysed, there is a possibility that the doctor sees a huge amount of data, which they may find difficult to interpret.
- So scanning devices must work more intelligently and do a preliminary classification of images
- Uses a deep-learning algorithm which can differentiate between cysts and stones in the kidney images

Digital dispensaries

Rely on semantics and deductive logic to suggest tests and arrive at the disease or condition a patient may be suffering from.

How it works?

- It's linked to an automatic dispenser
- The system converts 38 different complaints into parent symptoms and, as more information is recorded, it starts matching with sibling symptoms.
- When the doctor selects a prescription, the machine talks to the dispenser which shells out the required dosages of the medicines.
- Theoretically, the algorithm can be fine-tuned to arrive at a final diagnosis and prescription on its own.

The liftware spoon

Enables patients who suffer from tremors (such as Parkinson's) to eat food without spills. Lift lab, which designed the this, availed by Google in 2014.

ICT and Economic Growth

India added the highest number of first-time internet users India saw the highest number of people going online for the first time during 2012-15 periods among all countries, according to a recent report of the UN Conference on Trade and Development (UNCTAD). Report titled "Measuring the Evolving Digital Economy" says that more people going online will spur purchase of goods and services resulting in greater inclusion and involvement of citizens with the government and economic growth

3.2 NETWORKING APPLICATIONS**3.2.1 Social Media and Digital Technologies**

India figures among the top two or three adopters of digital technologies and social media

- Has larger number of mobile Internet users and smartphone users and users of Facebook, Twitter and YouTube
- Has one of the cheapest data rates in the world
- Yet Internet is out of reach of millions

3.2.2 Global co-location players

In India International co-location firms are looking at entering the data centre market here.

- A co-location firm provides a data centre facility
- Provides the building, cooling, power, bandwidth and physical security while the customer provides servers and storage.
- In the past two years, the market opportunity has exploded with Amazon, Microsoft and IBM putting their public cloud servers also called hyperscale cloud in the country

3.2.3 Cloud powered productivity

The State Bank of India (SBI) chose Office 365, the cloud powered productivity solution from Microsoft to improve communication and collaboration.

Highlights:

- The employees will now experience a modern digital workplace platform that will empower them to collaborate effectively from any device anywhere (Android, iOS, Mac and Windows)
- It provides an integrated experience and reduce complexity.
- They will be able to use familiar and easy-to-use tools naturally in everyday work.
- It will also address the key aspects of data security and sovereignty.
- Helps to engage customers in new ways and transform their products and services
- Helps to maintain security, trust and compliance with industry regulations
- It enables in transforming it into a modern workplace

3.2.4 GST Network

The Confederation of All India Traders (CAIT) , an association of traders has blamed Infosys for the glitches in the GST Network and demanded a CBI probe into its alleged negligences

- Infosys in 2015 won a Rs 1,380-crore deal for developing and running Goods and Services Tax's (GST) backend, called GST-Network or GSTN.
- Infosys said the network has seen 37 crore invoices being uploaded till date while the system is designed to handle 300 to 320 crore invoices every month .
- Central and state level tax regimes have been integrated with all 29 States and 7 Union Territories successfully migrating onto this system .

3.2.5 Bots

Bot is a computer programme designed to work automatically. It is mainly used to gather information on the Internet or perform repetitive jobs.

- Bots as malwares
- Bots in disguises are called web crawlers
- Malicious bots are self-propagating malware that infects its host and connects back to a central server(s).

Malicious bots can gather passwords, log keystrokes, obtain financial information, relay spam, and exploit back doors opened by viruses and worms, among other things.

Automated accounts on Twitter and Facebook can spread misinformation on the respective platforms.

Good uses

- Automatic interaction using instant messaging, instant relay chat or other web interfaces.
- Dynamic interaction with websites is yet another way bots are used for positive purposes.
- Artificial intelligence-based bots are increasingly being used by organisations and entities to provide customer care, and sales and marketing services.
- Some popular examples of bots are Apple's Siri, the Google Assistant, Amazon's Alexa and Microsoft's Cortana.

4. E-GOVERNANCE**4.1 E-governance models**

The four basic models are available – government-to-citizen (customer), government-to-employees, government-to-government and government-to-business

G2C

The goal of government-to-customer (G2C) e-governance is to offer a variety of ICT services to citizens in an efficient and economical manner, and to strengthen the relationship between government and citizens using technology

G2E

Help employees maintain communication with the government and vice versa. E-payroll, e-training, online PPF etc. are some examples

G2G (E-government)

Aimed at efficient file routing, quick search and retrieval of files and office orders, digital signatures for authentication, forms and reporting components etc.

G2B

Refers to the conduction through the Internet between government agencies and business companies. The Main Goal of Government to Business is

- **Lowering cost of doing business**
 - electronic transaction save time
- **Cutting red tape**

- rules and regulation placed upon business normally take time and are most likely to cause a delay
- G2B will allow a much faster process with less delays and decreasing the number of rules and regulations
- **Transparency**
 - More information will be available
 - makes business transactions transparent
 - Better interaction between business' stakeholders and governments

4.2 Digital Revolution

In India Digital revolution in India is significant as it promises to bring a multi-dimensional metamorphosis in almost all sectors of the society.

Sectoral Revolution

1. Education Sector:

- SWAYAM' scheme provides an opportunity to students to access courses taught in classrooms from ninth standard to post graduation
- ePATHSHALA' which disseminates all educational content through website
- mobile app - Mid-Day Meal Monitoring App
- 'Shaala Sidhi' and 'Shaala Darpan' that focus on quality of school administration and evaluate the schools and kendriya vidyalayas to improve the quality of education
- OLABS-online labs for school lab experiments provide students with ease of conducting experiments over internet
- National Scholarship Portal
- 'eGranthalya'
- 'National Knowledge Network' for higher education

2. Health Sector:

- 'Digital AIIMS' a project that aims to create an effective linkage between UIDAI and AIIMS
- 'e-hospitals' scheme that is an open source health management system
- 'mRaktkosh' – a web based mechanism that interconnects all blood banks of the state into a single network

3. 'UMANG' aims to bring one stop solution to all government services

4. Agriculture sector:

Digital India initiative is also proving a number of schemes for the benefit of the farmer

- 'mkisan',
- 'farmer portal'
- 'Kisan Suvidha app'
- 'Pusa Krishi'
- 'Soil Health Card app'
- 'eNAM'
- 'Crop Insurance Mobile APP'
- 'Agri Market app'
- 'Fertilizer Monitoring App.'

5. Women safety:

- 'Nirbhaya app' and 'Himmat app' have been launched that facilitate sending of distress calls
- There are also apps for law enforcement agencies, courts and judiciary

6. Governance:

- 'E-panchayat', 'eDistricts', 'eOffice' are also some of the services to digitize governance and administration in the country.
- 'National Voters Service Portal' and 'ECI-EVM Tracking Services' are also bringing about transparency in governance

7. Economy:

- The AADHAR scheme and BHIM app are also significant in speeding up the process of digitizing the economy.

4.3 UMANG App

The UMANG App that aims to bring 162 government services on a single mobile app, with a larger goal to make the government accessible on the mobile phone of our citizens.

- Uniform User Friendly Interface across Government services
- 162 services of 33 department/ applications and 4 States
- Single mobile app to access 1200+ services of various government services from Centre, State and utility services
- Supports 13 Indian languages and caters to on-demand scalability
- Will soon support feature phones without internet connectivity through USSD

4.4 Social revolution in a JAM

JAM, deriving from Jan Dhan, Aadhaar and Mobile, combines bank accounts Direct transfer of benefits into these accounts and the facility of making financial payments through mobile phones

- Aadhaar is allowing the government to ensure that benefits reach the poor and enabling them to make payments through ordinary mobile phones.

4.5 PRAGATI- Pro-Active Governance and Timely Implementation

By Prime Minister's Office (PMO) aimed at starting a culture of Pro-Active Governance and Timely Implementation.

Aims

- Addressing common man's grievances
- Monitoring and reviewing important programmes and projects of the Government of India as well as projects flagged by State Governments

PRAGATI platform uniquely bundles three latest technologies:

- Digital data management
- video-conferencing and
- Geo-spatial technology.

A three-tier system:

- It brings on one stage the Secretaries of Government of India and the Chief Secretaries of the States.
- Prime Minister will hold a monthly programme where he will interact with the Government of India Secretaries, and Chief Secretaries through Videoconferencing enabled by data and geo-informatics visuals
- The system will ride on, strengthen and re-engineer the data bases of the CPGRAMS for grievances, Project Monitoring Group (PMG) and the Ministry of Statistics and Programme Implementation.
- It will also take into consideration various correspondences to PM's office by the common people or from high dignitaries of States and/or developers of public projects.
- The issues flagged are uploaded seven days prior to the PRAGATI day
- These issues can be viewed by the Union Government Secretaries and Chief Secretaries after entering into the application
- Union Government Secretaries and Chief Secretaries will be able to see the issues pertaining to their Department /State

4.6 CPGRAMS (Central Public Grievance Redress and Monitoring System) Portal

CPGRAMS is a standardized web based solution and an integrated application to register and to redress the grievances received online, by post and by hand.

Citizen can use this system to raise grievances if prescribed service norms are not met with or there is any mistreatment due to discharge of regulatory and service functions.

4.7 Monitoring Fund Flow to Schemes

Finance Minister said the mandatory use of Public Finance Management System (PFMS) will help monitor the flow of funds to beneficiaries of different government welfare schemes

PFMS:

- Is a Web-based software app
- It reduce the float in the financial systems by enabling "just in time" releases
- It would help in tracking and monitoring the flow of funds to the implementing agencies.

4.8 MCA 21

The first Mission Mode Project MCA 21 is a path-breaking project implemented by Ministry of Company Affairs

- MCA21 is envisioned to provide anytime and anywhere services to businesses.
- The project seeks to put in place across the country a uniform system that will enable: Businesses to register a company and file statutory documents online
- Public to have quick and easy access to records they want
- Professionals to offer efficient services to their clients
- Financial institutions to easily register and verify charges

4.9 Procurement Made Smart (GeM)

Public procurement forms a very important part of Government activity and reform in Public Procurement is one of the top priorities of the present Government. Government e-Marketplace (GeM) aims to transform the way in which procurement of goods and services is done by the Government Ministries/Departments, PSUs, autonomous bodies etc.

- GeM is a completely paperless, cashless and system driven e-marketplace that enables procurement of common use goods and services with minimal human interface.
- Benefits of GeM Transparency, Secure and safe: All the documents on GeM are e-Signed Efficiency, etc.

4.10 Hortinet

Hortinet is an integrated traceability system developed by APEDA for providing Internet based electronic services to the stakeholders for facilitating farm registration, testing and certification of Grape, Pomegranate and Vegetables for export from India to the European Union in compliance with standards.

The key features:

- Online Farm registration application and status tracking
- Processing and approval on on-line farmer applications by State Horticulture /Agriculture department.
- Registration of farmers, farms and products by State Horticulture/Agriculture department
- Capture geo location of the farms registered through the app
- Sample collection by APEDA authorized Laboratories along with geo location of the sample.

4.11 e-RaKAM

Portal for selling agri produce E-RaKAM is a first-of-its-kind initiative that leverages technology to connect farmers of the smallest villages to the biggest markets of the world through internet and e-RaKAM centres.

- The portal is a joint initiative by state-run-auctioneer MSTC and Central Warehousing Corporation arm CRWC
- To auction 20 lakh tonnes of pulses in the first phase through the platform.
- Various crops whose price increases due to rainfall or bad weather conditions, will be managed and get the market.
- Farmers would be paid through e-Payment directly into their bank accounts.

4.12 CHAMAN project

For developing the horticulture sector using remote sensing technology and geoinformatics. India is the second-largest producer of fruits and vegetables in the world. CHAMAN acronym for Coordinated Horticulture Assessment and Management using geoinformatics

- Using remote sensing technology to study soil conditions, land use, weather and cropping pattern.
- Under CHAMAN, Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat and Maharashtra have been identified as the major banana-growing states.
- Mango cultivation is being promoted in Andhra, Bihar, Uttar Pradesh, Karnataka and Telangana,
- Onion is the focus for Maharashtra, Gujarat, Karnataka and Madhya Pradesh.

4.13 CCE Agri App

- In old crop insurance schemes there was considerable delay in settlement of claims.
- Under the new scheme, the Pradhan Mantri Fasal Bima Yojana (PMFBY), the States are required to give Crop Cutting Experiment (CCE) data to insurance companies within one month of harvest and the companies have to settle the claims within three weeks of receiving the CCE data.
- This is possible using technology – the smartphones/CCE Agri App for capture/transmission of yield data to the crop insurance portal.

E-technology for farmers

- A Central Crop Insurance Portal has been developed which integrates farmers and other stakeholders and also provides for online registration of farmers.
- This has led to increase the coverage of farmers including sharecroppers.
- Common Service (CSC) has been engaged to facilitate enrolment of non-loanee farmers also
- Direct Benefit Transfer (DBT) has been initiated to facilitate transmission of claims amount directly to the farmers' account.
- Provision has been made for use of advanced technology such as drone, remote sensing etc. for promoting transparency and immediate settlement of insurance claims.

4.14 Online platform for food inspection Food regulator FSSAI

FSSAI put in place a nationwide online platform.

- It would help eliminate discrepancy and make food safety officer accountable.

- The new system will bring together all key stakeholders — food businesses, food safety officers (FSOs), designated officers, state food safety commissioners — on a nation-wide IT platform.
- Data related to inspection, sampling and test result data will be shared seamlessly by all the officials.
- Directing the states to adopt the new system, the FSSAI said this requires a hand-held device with internet connectivity with FSOs

4.15 CCTNS

The physical police verification for getting a passport may soon be dispensed with as the Centre plans to connect the procedure with **Crime and Criminal Tracking Network and Systems Project (CCTNS)**

- Is an exhaustive national database of crimes and criminals
- aims to connect the country's all 15,398 police stations
- mandate of the CCTNS had been expanded by incorporating citizen-centric services such as tenant verification, quick registration of FIR in any crime and connecting the network with criminal justice delivery system
- The portal will initially offer seven Public Delivery Services in 34 States & UTs.
- The Ministry of Home Affairs will undertake steps to integrate the various organs of the Criminal Justice System such as the Police, Courts, Prisons, Prosecution, Forensic Laboratories, Fingerprints Interpol, etc.

Advantages

- Facilities citizens for online complaint registration
- Central investigating and research agencies have also been provided logins to the digital police database to access crime statistics

4.16 Smart Border Management

- BSF is working on a Comprehensive Integrated Border Management System (CIBMS) which will be deployed along the International Border with Pakistan.
- Latest technology which would detect infiltration via land, underwater, air and tunnels.
- Concept of CIBMS is the integration of manpower, sensors and command and control to improve situational awareness and facilitate quick response to emerging situations.

4.17 CSC to Play Major Role in The Making of New India

Common Services Centers (CSCs) are a strategic cornerstone of the Digital India programme that works on PPP model

- They are the access points for delivery of various electronic services to villages in India, thereby contributing to a digitally and financially inclusive society.
- CSCs enable the three vision areas of the Digital India programme

Village Level Entrepreneur (VLE)

- Is a CSC operator
- and she/he is key to success of CSC operations
- There is a direct correlation between the quality of services offered at CSCs and entrepreneurial abilities of VLEs operating them.

The new services launched under CSC are

- Launch of Patanjali products through CSCs
- Launch of Bharat Bill Pay service through CSCs
- Launch of Deposit Service in Aadhaar Enabled Payment System – Digi Pay
- Exchange of MOU for Sale of IFFCO Products like Fertilizers, Seeds etc through CSCs
- Exchange of MOU between CSC & IGNOU for Services like online admission form & examination form submissions etc
- Exchange of MOU for Tele-Radiology service through CSC - 5C Network, India's first diagnostic network that connects hospitals and diagnostic centers with X-Ray, CT and MRI to radiologists, is partnering with CSC
- Exchange of MOU for Tally GST Service

4.18 Bharat Bill Pay service

It is a unified bill payment system under the umbrella of National Payment Corporation of India (NPCI).

4.19 eMudra

eMudhra which manages digital identity and transaction for customers has launched Aadhaar eSign based authentication for NACH (National Automated Clearing House) mandate with National Payments Corporation of India for large and small enterprises to collect recurring payments from their customers.

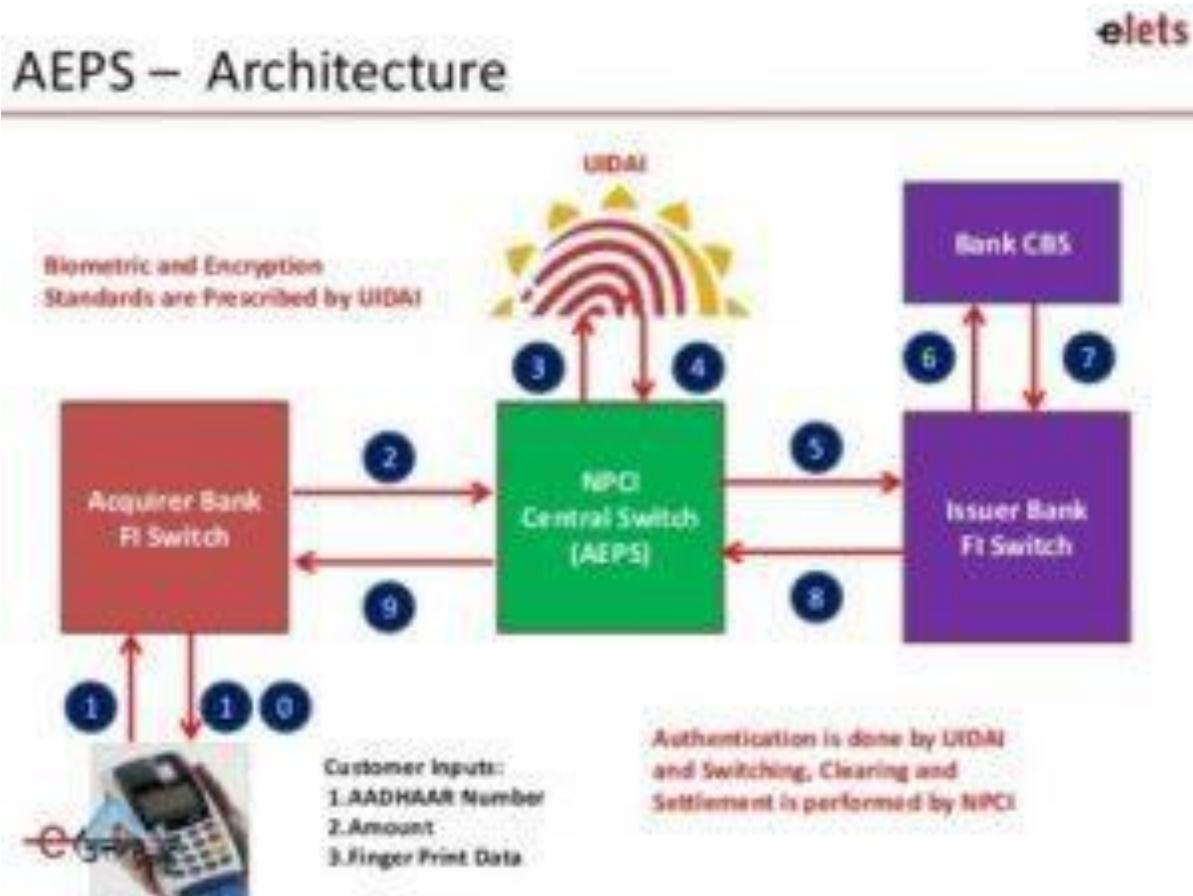
Advantages:

- Paperless.
- Save transaction cost to corporates.

- Increase accountability in payment process.
- Paperless authentication helps to overcome geographical barriers.

4.20 The Aadhaar Enabled Payments System (AEPS)

The Aadhaar Enabled Payments System (AEPS) could be at the forefront of increasing financial inclusion in rural India . Is a bank led model which allows online interoperable financial transaction at PoS (Point of Sale / Micro ATM) through the Business Correspondent (BC)/Bank Mitra of any bank using the Aadhaar authentication.



The four Aadhaar enabled basic types of banking transactions are as follows:-

- Balance Enquiry
- Cash Withdrawal
- Cash Deposit
- Aadhaar to Aadhaar Funds Transfer

The only inputs required for a customer to do a transaction under this scenario are:-

- IIN (Identifying the Bank to which the customer is associated)

- Aadhaar Number
- Fingerprint captured during their enrollment

4.21 Bharat QR code

- Has been developed jointly by National Payments Corporation of India (NPCI), Visa, MasterCard and American Express under instructions from Reserve Bank of India (RBI).
- It works as common interface for the MasterCard/Visa/RuPay platforms and also facilitate acceptance of Aadhaar-enabled payments and Unified Payments Interface (UPI).
- It eliminates the need of using card swiping machines for digital payments.

Interoperability-Using Bharat QR code

The merchants will be required to display only one QR code instead of multiple ones. Interoperability of QR code for payments QR code now stands high on the government's policy agenda for digital payments

- New version of BHIM will have the capability to read both the dynamic QR as well as the Bharat QR.
- The whole country will converge into a single form of QR.
- India is the first country to have brought such interoperability in the use of QR code in payments domain.

4.22 E-tolling

NHAI takes steps to facilitate availability of FASTags for Electronic Toll Collection

- Common Services Centre to set up sale points at Toll Plazas
- FASTags can also be purchased online from Issuer Banks websites / NHAI website / IHMCL website and will be delivered by courier
- Exclusive lane for FASTag vehicles to be operational at all toll plazas from 1st September, 2017.
- Two mobile apps - MyFASTag and FASTag Partner are released
 - Agencies like common services centre, banking partners and vehicle dealers can sell and enrol FASTag through this app
 - In addition, the app can also be used to activate the RFID tags that came built in with around new cars

What is a FASTag?

- Is a reloadable tag affixed on a vehicle's windscreen having radio frequency identification (RFID) technology

- Is linked to a prepaid account for automatic deduction of toll charges and the vehicle is not required to stop at the toll booths for cash transaction
- Uses electromagnetic fields to automatically identify and track tags attached to objects
- The tags contain electronically stored information.
- Uses radio waves
- Serves the same purpose as a bar code or a magnetic strip

4.23 Sagar Vani Application

ESSO-Indian National Centre for Ocean Information Services (INCOIS) under Ministry of Earth Sciences launches 'Sagar vani'.

- For the timely dissemination of Ocean Information and Advisory Services that includes Potential Fishing Zone (PFZ) advisories, Ocean State Forecast (OSF), High Wave Alerts and Tsunami early warnings.
- The 'Sagar Vani' is a software platform where various dissemination modes will be integrated on a single central server.
- The 'Sagar Vani' includes Multilingual SMS, Voice Call / Audio Advisory, Mobile Apps (User / Admin modules), Social Media (Facebook, Twitter, etc.), Email, GTS, Fax, Digital Display Boards, Radio / Television broadcast units, IVRS, Cloud Channels, etc
- Focused community: The coastal community, the fishermen community

4.24 'e-sign'

Adobe invests in Aadhaar-based authentication for its 'e-sign' solution. Adobe sign is the industry's first solution to make e-signatures legally binding in India
Electronic Signature

eSign is envisaged to be a giant leap towards large scale adoption of digital signature and hence paperless transactions

- Digital Signature Certificate treated on par with physical signature as per IT Act, 2000
- Gap in operational aspects of Digital Signature Certificate
 - Dongle based
 - Time-bound Validity
 - Prone to misuse like impersonation
 - Limited adoption

E-Sign advantages

- Safe and Secure and biometric based authenticated

- Lifelong, issued each time.
- Cannot be impersonated
- Hassle free as it cannot be misplaced, misused or lost
- Cost effective as business model could be based on transacti

4.25 “Relief 123” Service

VNL, BSNL launch Relief 123 The communication solution will bring BSNL and disaster management agencies NDMA and NDRF on one platform.

- The "Relief 123" service is an integrated disaster response solution for first responders and public safety agencies.
- Is based on "ResQMobil", an integrated portable communication solution.
- The service will restore connectivity at disaster sites, help locate the affected people and integrate information across platforms.

4.26 Land records digitisation

The Centre’s Digitisation Programme envisages the computerisation of the land records, including the mutations, digitisation of maps, survey/re-survey and updating all surveys/ settlement records.

- The National Informatics Centre(NIC) will be developing the software for the digitisation programme
- The computerisation of registration and integrating it with the land records maintenance system as well as the development of the Geospatial Information System (GIS)are part of its aims
- Digitisation of the land records will limit the scope of the land disputes and help to bring in transparency of the land records.

4.27 BMTc buses to have panic buttons & tracking systems

The Bengaluru Metropolitan Transport Corporation (BMTc) has chalked out an eight-point plan to make its buses safer for women making use of grant from the Centre's Nirbhaya Fund

- The emergency button will send alert messages to three people (police, BMTc's control room and the family).
- Bluetooth-based passenger tracking system will keep the family in the know of the passenger's travel details All the buses are GPS enabled and are tracked by the control room

4.28 NCLT goes digital easing operations

The National Company Law Tribunal(NCLT) is all set to join the country's digital move.

- The government is working on a digital platform that will soon enable e-filing of cases, adding to operational ease amid a rising number of cases
- Besides Delhi, there are nine NCLT courts.
- Since the introduction of the Insolvency and Bankruptcy Code, there has been a spike in the number of default cases landing in the tribunal.
- The online move will help save man hours as NCLT officials are to deal with huge logistics works.

4.29 'TSavaari' app for metro rail passengers

The authorities of Hyderabad Metro Rail launched a mobile app TSavaari

- The mobile app would provide a comprehensive transport solution, with information on all modes of transport for a journey.
- The mobile app would provide information on TSRTC bus, MMTS Train, metro trains and private carriers.

5. TECHNOLOGY BASED EDUCATION

5.1 Nano degrees

Udacity, an educational venture offers free and paid online certification courses for students who earn Nano degrees and learn skills such as front-end web developing, iOS and Android programming, or machine learning. Recently rolled out 'Introduction to Self Driving Cars' and 'Flying Car' nanodegree programmes to give students the skills to create autonomous flight vehicles. The idea offers a curriculum that finds takers among top tech companies across the world.

5.2 Massive Open Online Courses Massive Open Online Courses (MOOCs)

To provide best quality e-learning resources to students across country.

SWAYAM

- Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) is being developed for hosting of MOOCs.
- Intended to address the needs of school level 9-12 to Under Graduate and Post Graduate students, covering all disciplines.

- Government plans to recognize certificates issued via SWAYAM platform in the country.

5.3 National Academic Depository

An initiative of MHRD to maintain a national-level database of all academic qualifications from secondary school certificate to university and professional certificates.

- It will provide digital or a printed copy of the academic award with security features to the students or other authorized users.
- NAD will verify academic awards online on the same day of request initiated by any authorized user
- Requests for access to academic awards, for example, from potential employers, and academic institutions would be only on the basis of consent of the student.
- NAD shall maintain the authenticity, integrity and confidentiality of its database.
- It will also train and facilitate academic institutions/boards/ eligibility assessment bodies to efficiently lodge academic awards in the database.

6. CYBER SECURITY

6.1 Data protection and Data residency

Justice BN Sri Krishna will head a committee for suggesting a Data Protection Framework for the country.

Why data protection?

- With the advent of digitalization and big data technologies, protection of citizen's private data has become an issue in policy making.
- Needs laws on privacy and data protection because once a person's biometrics have been compromised, they cannot be reissued like passwords
- Some technologies like blockchains are promising with the possibility of individual control over some crucial data.

Data residency

- It refers to the physical or geographic location of data or information.
- Data residency legislation is required, to mandate that data on Indians should necessarily reside within India
- India has restrictive policies on data mobility, which has to be changed.

- Advances in artificial intelligence depend on access to all kinds of data, so India needs global best practices in data protection, for tapping the potential

6.2 Mobile data regulations

The telecom regulator has started a consultation process to assess whether the data rights of mobile phone users are adequately protected or not.

- Privacy and data is protected on the internet subjected to relevant laws.
- But in case of mobile phones, there are no such provisions despite of India having one of the largest mobile phone users.

IT ministry's data security call

- To understand the data handling practices of firms from all geographies including India
- Based on the response of the companies, it would initiate verification and audit of devices.
- IT ministry had cited international and domestic reports about data leaks from mobile phones.
- Devices and preloaded software and apps would be under scrutiny.

TRAI consultation paper

- Issues pertaining to data protection in relation to delivery of digital services, including telecom and data services, as well as devices, networks and applications that collect and control data generated by users through telcos.
- The regulator wants to know if there should be greater parity in data protection norms applicable to carriers and internet-based voice and messaging services.

6.3 White paper on data protection

The government has sought public comments on the white paper, which is aimed at securing digital transactions and addressing customer and privacy protection issues.

Observations:

- The sensitivity of the data could also develop based on its combination with other types of information.
- For example, an email address taken in isolation, is not sensitive.

- However, if it is combined with a password, then it could become sensitive as it opens access to many other websites and systems, which may expose the individual to harm such as cyberattacks and phishing frauds.
- there may be a need to create safeguards which will prevent misuse of personal information in these contexts of use
- To designate certain lawful grounds under which data can be processed, even in the absence of consent.

6.4 Data captured by Aadhaar

Types of information in Aadhaar Act:

- Biometric information essentially refers to photograph, fingerprints and iris scan
- Identity information includes biometric information and demographic characteristics such as name, address, date of birth, phone number, and so on.
- Personal information includes not only identity information but also other information about a person Concerns:
- The main privacy concern with Aadhaar is the confidentiality of the Central Identities Data Repository (CIDR)

Government Websites made Aadhaar details public

- More than 200 central and State government websites publicly displayed details such as names and addresses of some Aadhaar beneficiaries
- The Unique Identification Authority of India (UIDAI) took note of the breach and got the data removed from those websites.

Security for Aadhaar Data

- UIDAI has a well-designed, multi-layer approach robust security system in place.
- UIDAI is being constantly upgraded to maintain highest level of data security and integrity.
- The architecture of the Aadhaar ecosystem has been designed to ensure data security and privacy which is an integral part of the system from the initial design to the final stage.
- Various policies and procedures have been defined, these are reviewed and updated continually thereby appropriately controlling and monitoring any movement of people, material and data in and out of UIDAI premises, particularly the data centres.

6.5 Aadhaar introduces dynamic OTP

The unique identification authority of India (UIDAI) has introduced time based onetime password (TOTP) as a new feature to fast track authentications via the app.

Dynamic OTP

- With the introduction of TOTP, people will not have to wait for OTP to arrive on their mobile since a dynamic OTP will be always available on mAadhaar App on their mobile phones.
- It is an 8 digit long numeric string generated as one-time temporary password (OTP) by an algorithm and valid only for 30 seconds.

6.6 Cyber Audit

The Reserve Bank of India is planning to conduct a cyber-audit of all banks in the country instead of just a few bigger banks as it did in the past because of increasing cyber-attacks.

- RBI have created a cyber-cell under the department of banking supervision to provide Cyber-security and IT audit on banks
- The cyber-security framework requires banks to report any breach within two-three hours even if there is a suspicious breach
- At national level there is CERT-in to handle the cyber attacks
- Now there will also be a Fin-CERT, which will deal with financial sector breaches and will start from RBI.

6.7 CERT-In (the Indian Computer Emergency Response Team)

CERT-In is a government-mandated information technology (IT) security organization.

- CERT-In was created by the Indian Department of Information Technology in 2004
- The purpose of CERT-In is to respond to computer security incidents, report on vulnerabilities and promote effective IT security practices throughout the country.
- According to the provisions of the Information Technology Amendment Act 2008, CERT-In is responsible for overseeing administration of the Act.

6.8 Cyber Swachata Kendra

It is a botnet cleaning and Malware analysis centre . It is part of Digital India initiative for detecting botnet infections in India and to notify, enable cleaning and securing systems of end-users to prevent further infections.

- The systems will be scanned by the Computer Emergency Response Team (CERT-in) for free of all those users who register to the CSK website.
- It will then notify, enable cleaning and secure systems of end users to prevent further infections
- This centre will work in coordination with the internet service providers (ISPs) and Industry.
- This Kendra will also enhance awareness among citizens regarding botnet and malware infection along with measures to be taken to secure their devices.

Tools provided under CSK Function

- M Kavach: Special anti-virus tool for smartphones and tablets.
- USB Pratirodh: It is a USB protector to help clean various external storage devices like USB(s), memory cards, external hard disks, etc.
- AppSamvid This is a whitelisting tool for the desktop.

6.9 McAfee unveils solutions for endpoints, cloud protection

'Together is power' principle

- It will go beyond machine learning to take advantage of the speed and accuracy of advanced analytics, deep learning and artificial intelligence (AI).
- Is the collaborative security that combines the unique advantages of people, machines and partners enabling teams to be situationally aware of security events and take swift action
- McAfee's machine learning technology learns from 300 million sensors and the innovations feature ransomware decryption and steganography detection.

6.10 Blockchain has potential to re-engineer cybersecurity

US and European capital markets are moving onto Blockchain platforms.

- Zero trust security model - The enterprise systems will vigorously authenticate whether users are indeed entitled access to specific sets of data, before making them available
- Blockchain will become the implementer of the 'zero trust' policy.

6.11 Malwares

Xafecopy

Is a trojan that has been detected in India which steals money through victims' mobile

- Disguised as useful apps like Battery Master, and operates normally.
- The Trojan secretly loads malicious code onto the device.
- The Xafecopy malware clicks on web pages with Wireless Application Protocol (WAP) billing - a form of mobile payment that charges costs directly to the user's mobile phone bill.
- The malware silently subscribes the phone to a number of services.
- The malware uses technology to bypass 'captcha' systems designed to protect users by confirming the action is being performed by a human

FreeMilk

It keeps on installing malware on the system. It was named FreeMilk by researchers, who found this phrase in the malware's code. These attacks have been spotted from May 2017 India is at vulnerable position due to large number of unpatched and outdated Windows machines.

How to defend against FreeMilk ?

- Use the latest operating system.
- Make sure automatic updates are enabled and downloaded regularly.
- Ensure Firewall is enabled to block all network-based attacks.
- Never download anything from untrusted emails.
- Use latest/updated antivirus. Remove all pirated/un-patched/outdated devices.

6.12 Misuse of Voice Over Internet Protocol Technology

As technology develops, so does the scope to misuse it. The police observed it with Voice Over Internet Protocol (VoIP) facility, which is increasingly used for criminal activities.

- Flashers, devices that can change IMEI (International Mobile Equipment Identity) numbers of handsets, are used to make stolen cell phones untraceable
- SIM boxes enable setting up of illegal telephone exchanges
- Each SIM box can hold up to 32 SIM cards which route international calls

In June this year, the Maharashtra Anti-Terrorism Squad, acting on information from the Military Intelligence unit in Jammu and Kashmir, busted three illegal telephone exchanges in Latur.

6.13 Lethal autonomous weapons

On November 13, a United Nations (UN) group of experts in Geneva kicked off the first formal inter-governmental discussion on what machine autonomy means for the laws of armed conflict and the future of international security.

- Recent advancements in artificial intelligence (AI) make it possible to design weapons systems that can target and attack without human intervention
- Convention on Conventional Weapons (CCW) Group of Governmental Experts was established in 1980. This is the first meeting on lethal autonomous weapons systems.
- Many technology leaders are worried about autonomous systems taking life-and-death decisions without “meaningful human supervision or control”.

Ethical Concerns of AI

- Questions of legal liability when autonomous vehicles share the streets with pedestrians, predictive analytics subverting due process, and the algorithmic entrenchment of human biases are other concerns
- As has been the experience with other dual-use technologies, AI developed for civilian purposes could be repurposed

Note

- Alan Turing, the British scientist is called the father of AI
- He first speculated on the promise of thinking machines

7. GOVERNMENT SCHEMES AND POLICIES

7.1 Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA).

Background

- As per the 71st NSSO Survey on Education 2014, only 6% of rural households have a computer.
- A significant number of the households are likely to be digitally illiterate.

PMGDISHA

It is expected to be one of the largest digital literacy programmes in the world.

- Under the scheme, 25 lakh candidates will be trained in the FY 2016-17; 275 lakh in the FY 2017-18; and 300 lakh in the FY 2018-19.

- To ensure equitable geographical reach, each of the 250,000 Gram Panchayats would be expected to register an average of 200-300 candidates.
- It is initiated under Digital India Programme
- This would empower the citizens by providing them access to information, knowledge and skills for operating computers / digital access devices.

Ending digital divide

Prime Minister calls for ending digital divide in the country and launched the Pradhan Mantri Gramin Digital Saksharta Abhiyan in Gujarat.

7.2 Digital Divide

Digital divide is a term that refers to the gap between demographics and regions that have access to modern information and communications technology, and those that don't or have restricted access. This technology can include the telephone, television, personal computers and the Internet.

Need for bridging digital divide

- Information and communication technology (ICT) will ultimately serve to improve livelihoods around the globe, only if digital resources are accessible
- Advances in the Internet of Things, big data analytics, cloud computing and artificial intelligence will enable tremendous innovations and fundamentally transform business, government and society.
- However, the digital divide remains a challenge which needs to be addressed
- There is considerable differences between geographic regions in the levels of ICT development

7.3 Bharat Net Project

Bharat Net is a remodelled version of National Optical Fibre Network (NOFN) started in 2011 to connect all 2,50,000 gram panchayats .

- It aims to connect all households of India, particularly in rural areas, through broadband (2-20 Mbps) by 2017
- Bharat Broadband Network Limited (BBNL), a special purpose vehicle, has been set up under the Telecom Ministry for the establishment, management and operation of NOFN.
- The NOFN project is funded by the Universal Service Obligation Fund (USOF).

Aims of Bharat Net project

- To provide a minimum bandwidth of 100 Mbps to each of the 2.5 lakhs GPs.
- Link 600 million rural citizens of India across 2.5 lakhs Gram Panchayats of India, thereby facilitating delivery of e-governance, e-health, e-education, e-banking, public internet access, G2C, B2B, P2P, B2C etc., weather, agricultural and other services to rural India.
- BharatNet was conceived as a nation-wide broadband network.

WiFi service in panchayats

- The government expects to start broadband services with about 1 Gbps across 1 lakh gram panchayats by the end of this year under the project.
- The WiFi rollout will ride over Bharat Net project and rest of the hotspots will be linked to it later.

7.4 Digital India

Aims to transform India into a digitally empowered society and knowledge economy through improved IT infrastructure and service delivery

The Digital India programme is centred on three key vision areas:

1. Digital Infrastructure as a Utility to Every Citizen
2. Governance & Services on Demand
3. Digital Empowerment of Citizens

It aims to provide the much needed thrust to the nine pillars of growth areas, namely :

1. Broadband Highways,
2. Universal Access to Mobile Connectivity,
3. Public Internet Access Programme,
4. e-Governance: Reforming Government through Technology,
5. e-Kranti - Electronic Delivery of Services,
6. Information for All,
7. Electronics Manufacturing,
8. IT for Jobs and
9. Early Harvest Programmes.

Some of the projects launched under the Digital India initiative:

- Digital locker system to minimise usage of physical documents and enable their e-sharing via registered repositories.
- MyGov.in as an an online platform to engage citizens in governance through a "Discuss, Do and Disseminate" approach.

- Bharat Net program as a high-speed digital highway to connect all 250,000 gram panchayats of country -- the world's largest rural broadband project using optical fibre.

7.5 Roadmap for emerging technologies

The government is looking at forming a comprehensive strategy to encourage and adopt emerging technologies such as Blockchain, artificial intelligence (AI) and Big Data Analytics.

- Not just to increase their usage in the official machinery but also to promote the increasing number of emerging startups in this space.
- Work out a roadmap on how to make sure we have the requisite competency and capability.
- In the past the government has followed a similar strategy for emerging technologies such as cloud, mobile, social media, etc

7.6 Government to Boost Space Technology Applications

- Application of Space Technology in carrying out the Urban Development programmes, including Smart City programmes
- The use of Space Technology for geo-tagging of MGNREGA works
- The assistance from ISRO for the manning of Railway crossings
- India's Space capability in the field of Disaster Management

7.7 Technology integration into health sector

Health Ministry is at the forefront of incorporating the benefits of digital technology towards achieving the goals elucidated in National Health Policy (2017) which are synchronous with the Sustainable Development Goals (SDGs).

- Registration of vital health statistics like births and deaths
- Monitoring of Mobile Medical Units (MMUs) through Geographical Positioning Systems(GPS)
- Preventing female foeticide through implementation of The Pre-Conception and Prenatal Diagnostic Techniques (Prohibition Of Sex Selection) Act 2003 Act, etc

7.8 Cash-free campuses

The Ministry of Human Resource Development aims to make financial transactions completely digital in all higher education institutions.

- The move will bring within the digital ambit all such institutions public and private

- The Centre had launched the Vittiya Saksharta Abhiyan (VISAKA), meaning financial literacy campaign, for digital financial literacy early in 2017
- The Scheme enrolled lakhs of volunteers from among students to train families in their neighbourhood to conduct financial transactions digitally.

7.9 IT policy of Telangana

The Telangana government announced two new policies focussing on Internet of things and e-waste, which are part of the 10 major focus areas of the state's IT policy

- The state's e-waste policy calls for earmarking industrial space or sheds for dismantling and recycling e-waste in existing and upcoming industrial parks, estates and industrial clusters.
- Government would promote management of e-waste through collaborations with bulk consumers of electronic products, major industry organisations and other stakeholders.
- The IoT policy is focussed on developing smart city solutions, medical health IoT, smart logistics and agri-tech.

7.10 Kerala to set up electronic manufacturing hub

Kerala government had earlier brought out an Electronic System, Design and Manufacturing policy to boost the sector in the state

- The aim of the policy is to set up an electronics manufacturing hub in the state by leveraging on its skilled human resources and high consumption
- The Electronics and Hardware Mission was set up to coordinate the activities of multiple agencies working in the sector;
- To create a single point of contact for various strategic projects and investment proposals

7.11 The Global Conference on Cyberspace 2017

GCCS 2017 event was conducted with

- The Ministry of Electronics and Information Technology (MeitY).
- National Critical Information Infrastructure Protection Center (NCIIPC).
- MyGov.
- Cyber Peace Foundation (CPF).
- Policy Perspectives Foundation (PPF) as collaborators.

Theme -Cyber4All

An Inclusive, Sustainable, Developmental, Safe and Secure Cyberspace

- Cyber4Inclusive Growth

- Cyber4Digital Inclusion
- Cyber4Security
- Cyber4Diplomacy.

Participants

- Over 2000 delegates
- Representatives from 100 countries.
- More than 50 ministerial delegates.
- Participation of policy makers, industry, academia, civil society and think tanks

Digital Transformation

Digital transformation is described as “the total and overall societal effect of digitalization”.

- It resulted in stronger opportunities to transform and change existing business models, socio-economic structures, legal and policy measures, organizational patterns, cultural barriers, etc.

7.12 ICT 2025 Vision Document of Election Commission

ICT 2025 is about setting up core IT infrastructure and process to consolidate multitude of election process and functions.

- Digitalization is the key strategy in ICT 2025.
- It is the strategy of adopting recent technologies and consolidating existing technologies in IT to make the most of the digital resources available in the Election ecosystem.

The ICT 2025 Projects which capitalise on Digitalization, will capture both Electoral Process and the conduct of elections. **There are four major components of the ICT 2025.**

1. Integrated Software application
2. GIS, Analytic and Integrated Contact Centre
3. IT infrastructure including data center, IT security, disaster recovery
4. Knowledge Management, Capacity building and social media engagement

7.13 TRAI (Telecom Regulatory Authority of India) on Net neutrality

Rules

1. No service provider can offer or charge discriminatory tariffs for data services on the basis of content.
2. No service provider shall enter into any arrangement, agreement or contract, by whatever name called, with any person, natural or legal, that

the effect of discriminatory tariffs for data services being offered or charged by the service provider for the purpose of evading the prohibition in this regulation

3. Reduced tariff for accessing or providing emergency services, or at times of public emergency has been permitted
4. To bring more users on the Internet, this prohibition would not apply to other forms of tariff differentiation that were entirely independent of content.
5. There are certain exceptions for services that do not fall in the purview of net neutrality. These include content delivery networks, which store data from companies, who pay for it to reach faster to its users and 'specialised networks,' such as video-conferencing services used internally by businesses
6. flexible, reasonable traffic management can be allowed only when it is necessary for the delivery of an acceptable level of quality of services
7. Financial disincentives for contravention of the regulation have also been specified
8. TRAI may review these regulations after a period of two years.

What is net neutrality?

- Net Neutrality means an internet that enables and protects free speech.
- It means that ISPs(Internet Service Provider) should provide us with open networks — and shouldn't block or discriminate against any applications or content that ride over those networks.
- Just as your phone company shouldn't decide who you call and what you say on that call, your ISP shouldn't interfere with the content you view or post online.

What happens without net neutrality?

- Without Net Neutrality, cable and phone companies could carve the internet into fast and slow lanes.
- An ISP could slow down its competitors' content or block political opinions it disagreed with.
- ISPs could charge extra fees to the few content companies that could afford to pay for preferential treatment.
- This would destroy the open internet.

In February 2016, TRAI had barred telecom providers from charging differential rates for data services effectively blocking such attempts by Facebook and Airtel.

Facebook had earlier rolled out its Free Basics service in partnership with Reliance Communications as a “differential service” and lobbied hard for it on social media

