



# EMERGING TRENDS

**INFORMATION PRACTICES  
CLASS XI**

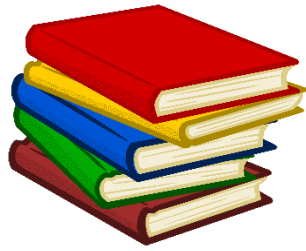
## **E-content: Emerging Trends.**

(Based on NCERT)

It includes, Lesson Plan, Reading Material, and Hyperlink of YouTube video explanation of e-content, Question / Answer and Activity Exercise based on this topic.

**Designed By:**

**SHILPI RANI**  
PGT IT  
JNV GUNTUR



## Lesson Plan Table


### Emerging Trends

#### Overview & Purpose:

Computers have been around for quite some time now. New technologies and initiatives emerge with each passing day. In order to understand the existing technologies and have a better view of the developments around us, we must keep an eye on the emerging trends. Many new technologies are introduced almost every day. Some of these do not succeed and fade away over time. Some of these new technologies prosper and persist over time, gaining attention from users. Emerging trends are the state-of-the-art technologies, which gain popularity and set a new trend among users. In this topic, we will learn about some emerging trends that will make a huge impact (in the future) on digital economy and interaction in digital societies.

#### Education Standard Addressed:

Senior Secondary

| ↓  | Teacher Guide   | Student Guide  | Material Needed  |
|--|---|--|--|
| Objectives<br>(Skills & information to be taught)          | Aware the students of new technological developments that are succeeding in each field.   | Know about different technology and how it is working, their usage.  | E-content reading material, Reference book by Preeti Arora / Sumita Arora, Internet & Newspaper. |
| Information<br>(Demonstrate necessary information)         | Artificial Intelligence, Machine learning, Natural language processing, Immersive experience, Robotics, Big Data, Internet of Things, Web of Things, Sensors, Smart Cities, Cloud Computing, Blockchain Technology. | To be involve with lesson with curiosity and try to find out latest trend related to each topic from Internet and try to find out what new you can add to technological development. |             |
| Verification<br>(Steps to Check for student understanding) | Give e-content exercise as Homework and take class test based on it.  | Attend all Exercise and class test based on the topic.   | E-content exercise, previous year CBSE question papers, Model question papers.                   |
| Activity<br>(Independent Activity to reinforce the Lesson) | Conduct e-content 'Activity corner' in classroom in oral-exam mode to check student understanding.  | Attempt class based 'Activity corner' program with enthusiasm and try to answer all oral-questions.  | E-content 'Activity Corner' & latest technological developments from internet / newspaper.       |
| Summary  | The topic is very informative and its prime objective is to aware students about different technology growing day by day and have been increasing its essence in every field of life.                               |  |  |

## Artificial Intelligence (AI)

- Artificial Intelligence endeavors to simulate the natural intelligence of human beings into machines, thus making them behave intelligently.
- An intelligent machine is supposed to imitate some of the cognitive functions of humans like learning, decision-making and problem solving.
- In order to make machines perform tasks with minimum human intervention, they are programmed to create a knowledge base (a knowledge base is a store of information consisting of facts, assumptions and rules which an AI system can use for decision making) and make decisions based on it. AI system can also learn from past experiences or outcomes to make new decisions.

## Machine Learning

- Machine Learning is a subsystem of Artificial Intelligence, wherein computers have the ability to learn from data using statistical techniques, without being explicitly programmed by a human being.
- It comprises algorithms that use data to learn on their own and make predictions. These algorithms, called models, are first trained and tested using a training data and testing data, respectively.
- After successive trainings, once these models are able to give results to an acceptable level of accuracy, they are used to make predictions about new and unknown data.

## Natural Language Processing (NLP)

- Natural Language Processing (NLP) system deals with the interaction between human and computers using human spoken languages, such as Hindi, English, etc.
- An NLP system can perform text-to-speech and speech-to-text conversion.
- The predictive typing feature of search engine that helps us by suggesting the next word in the sentence while typing keywords and the spell checking features are examples of Natural Language Processing (NLP).

- Machine translation is a rapidly emerging field where machines are able to translate texts from one language to another with fair amount of correctness. Another emerging application area is automated customer service where a computer software can interact with customers to serve their queries or complaints.



Figure 1: Use of natural language processing

## Immersive Experiences

- Immersive experiences allow us to visualize, feel and react by stimulating our senses. It enhances our interaction and involvement, making them more realistic and engaging.
- Immersive experiences have been used in the field of training, such as driving simulators, flight simulator and so on.
- Immersive experience can be achieved using **virtual reality** and **augmented reality**.



Figure 2: Driving Simulator

## Virtual Reality:

- Virtual Reality (VR) is a three-dimensional, computer-generated situation that simulates the real world. The user can interact with and explore that environment by getting immersed in it while interacting with the objects and other actions of the user.

- **\*\*\* Everything that we experience in our reality is perceived through our senses. From this came the idea that if we can present our senses with made-up or non-real information, our perception of reality would also alter in response to that.**
- **At present, it is achieved with the help of VR Headsets. In order to make the experience of VR more realistic, it promotes other sensory information like sound, smell, motion, temperature, etc.**
- **It is a comparatively new field and has found its applications in gaming, military training, medical procedures, entertainment, social science and psychology, engineering and other areas where simulation is needed for a better understanding and learning.**



**Figure 3: VR Headset**

### **Augmented Reality:**

- **The superimposition of computer generated perceptual information over the existing physical surroundings is called as Augmented Reality (AR). It adds components of the digital world to the physical world, along with the associated tactile and other sensory requirements, thereby making the environment interactive and digitally manipulable.**
- **With the help of location-based AR App, travelers can access real-time information of historical places just by pointing their camera viewfinder to subjects. Users can access information about the nearest places with reference to their current location.**
- **Unlike Virtual Reality, the Augmented Reality does not create something new, it just alters or augments the perception of the underlying physical world through additional information.**



**Figure 4: Location based**

# Robotics

- A robot is basically a machine capable of carrying out one or more tasks automatically with accuracy and precision. A robot is programmable, which means it can follow the instructions given through computer programs. Sensors are one of the prime components of a robot.
- Robots were initially conceptualized for doing repetitive industrial tasks that are boring or stressful for humans or were labor-intensive.
- Robot can be of many types, such as wheeled robots, legged robots, manipulators and humanoids. Robots that resemble humans are known as humanoids. Some examples are:
  - a. NASA's Mars Exploration Rover (MER) mission is a robotic space mission to study about the planet Mars.
  - b. Sophia is a humanoid that uses artificial intelligence, visual data processing, and facial recognition and also imitates human gestures and facial expressions.
  - c. A drone is an unmanned aircraft which can be remotely controlled or can fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with onboard sensors and GPS. Drones are being used in many fields, such as journalism, filming and aerial photography, shipping or delivery at short distances, disaster management, search and rescue operations, healthcare, geographic mapping and structural safety inspections, agriculture, wildlife monitoring or poaching, besides law-enforcement and border patrolling.



Figure 5: NASA's Mars



Figure 6: Sophia: Humanoid



Figure 7: an Unmanned aircraft

- **Robotics is primarily concerned with the design, fabrication, operation, and application of robots.**

## Big Data

- Today, there are over a billion Internet users, and a majority of the world's web traffic is coming from smartphones. Figure below shows that at the current pace, around 2.5 quintillion bytes of data are created each day, and the pace is increasing with the continuous evolution of the Internet of Things (IoT).
- This results in the generation of data sets of enormous volume and complexity called Big Data.

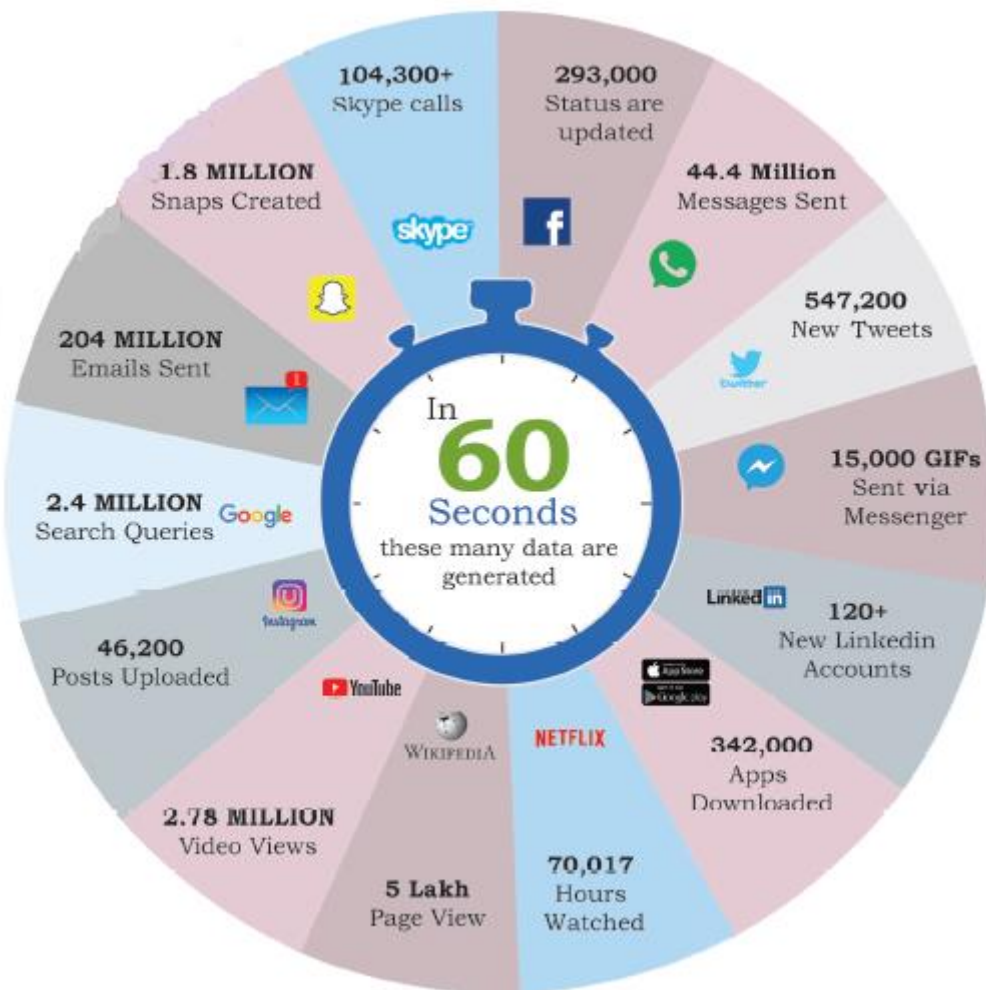


Figure 6: Sources of big data (numbers are approximate)

- Such data cannot be processed and analyzed using traditional data processing tools as the data is not only voluminous, but also unstructured. Big data not only represents voluminous data, it also involves various challenges like integration, storage, analysis, searching, processing, transfer, querying and visualization of such data
- Big data hold rich information and knowledge which is of high business value, and therefore there is a keen effort in developing software and methods to process and analyze big data.

## Characteristics of Big Data:

### (A) Volume:

The most prominent characteristic of big data is its enormous size. If a particular data set is of such large size that it is difficult to process it with traditional DBMS tools, it can be termed as big data.

### (B) Velocity:

It represents the rate at which the data under consideration is being generated and stored. Big data has an exponentially higher rate of generation than traditional data sets.

### (C) Variety:

It asserts that a data set has varied data, such as structured, semi-structured and unstructured data. Some examples are text, images, videos, web pages and so on.

### (D) Veracity:

Big data can be sometimes inconsistent, biased, and noisy or there can be abnormality in the data or issues with the data collection methods. Veracity refers to the trustworthiness of the data because processing such incorrect data can give wrong results or mislead the interpretations.

### (E) Value:

Big data is not only just a big pile of data, but also possess to have hidden patterns and useful knowledge which can be of high business value. But as there is cost of investment of resources in processing big data, we should make a preliminary enquiry to see the potential of the big data in terms of value discovery.

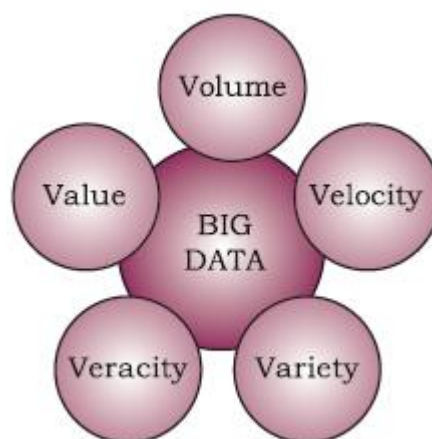


Figure 7: Characteristics of Big Data

## Data Analytics

- Data analytics is the process of examining data sets in order to draw conclusions about the information they contain, with the aid of specialized systems and software.

- Data analytics are used in commercial industries to enable organizations to make more informed business decisions. In the field of science and technology, it can be useful for researchers to verify or disprove scientific models, theories and hypotheses.

## Internet of Things (IoT)

- The 'Internet of Things' is a network of devices that have an embedded hardware and software to communicate (connect and exchange data) with other devices on the same network.
- At present, in a typical household, many devices have advanced hardware (microcontrollers) and software. These devices are used in isolation from each other, with maximum human intervention needed for operational directions and input data. IoT tends to bring together these devices to work in collaboration and assist each other in creating an intelligent network of things.
- For example, if a microwave oven, an air conditioner, door lock, CCTV camera or other such devices are enabled to connect to the Internet, we can access and remotely control them on-the-go using our smartphone.

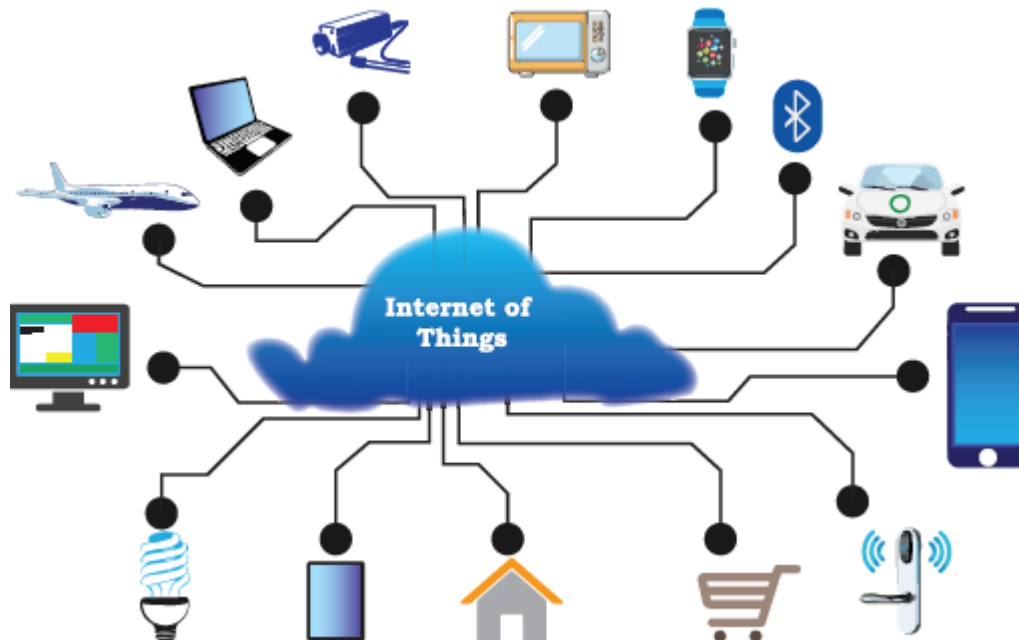


Figure 8: Internet of Things (IoT)

## Web of Things (WoT)

- Web of Things (WoT) allows the use of web services to connect anything in the physical world, besides human identities on web. It will pave way for creating smart homes, smart offices, and smart cities and so on.

## Sensors:

- A smart sensor is a device that takes input from the physical environment and uses built-in computing resources to perform predefined functions upon detection of specific input and then process data before passing it on.
- For example, what happens when we hold our mobile vertically or horizontally? The display also changes to vertical or horizontal with respect to the way we hold our mobile. This is possible with the help of two sensors, namely accelerometer and gyroscope (gyro). The accelerometer sensor in the mobile phones detects the orientation of the phone. The gyroscope sensors tracks rotation or twist of our hand and add to the information supplied by the accelerometer.
- The evolution of smart electronic sensors is contributing in a large way to the evolution of IoT. It will lead to creation of new sensor-based, intelligent systems.

## Smart Cities:

- With rapid urbanization, the load on our cities is increasing day-by-day, and there are challenges in management of resources like land water, waste, air pollution, health and sanitation, traffic congestions, public safety and security, besides the overall city infrastructures including road, rail, bridge, electricity, subways, disaster management, sports facilities, etc.
- These challenges are forcing many city planners around the world to look for smarter ways to manage them and make cities sustainable and livable.
- *The idea of a smart city as shown in Figure makes use of computer and communication technology along with IoT, WoT to manage and distribute resources efficiently. The smart building shown here uses sensors to detect earthquake tremors and then warn nearby buildings so that they can prepare themselves accordingly. The smart bridge uses wireless sensors to detect any loose bolt, cable or crack. It alerts concerned authorities through SMS. The smart tunnel also uses wireless sensors to detect any leakage or congestion in the tunnel. This information can be sent as wireless signals across the network of sensor nodes to a centralized computer for further analysis.*

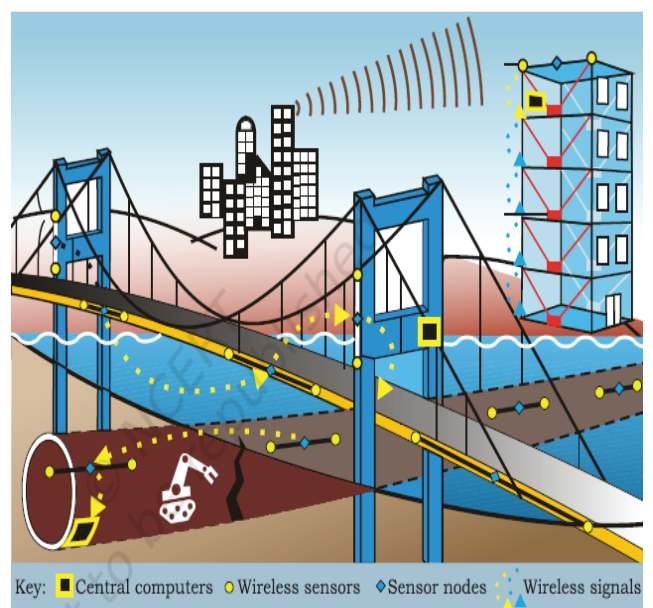


Figure 9: Smart City

# Cloud Computing

- Cloud computing is an emerging trend in the field of information technology, where computer-based services are delivered over the Internet or the cloud, for the case of their accessibility from anywhere using any smart device.
- The services comprise software, hardware (servers), databases, storage, etc. These resources are provided by companies called cloud service providers and usually charge on pay per use basis.

## Cloud Services:

- A service corresponds to any facility provided by the cloud. There are three standard models to categorize different computing services delivered through cloud. These are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

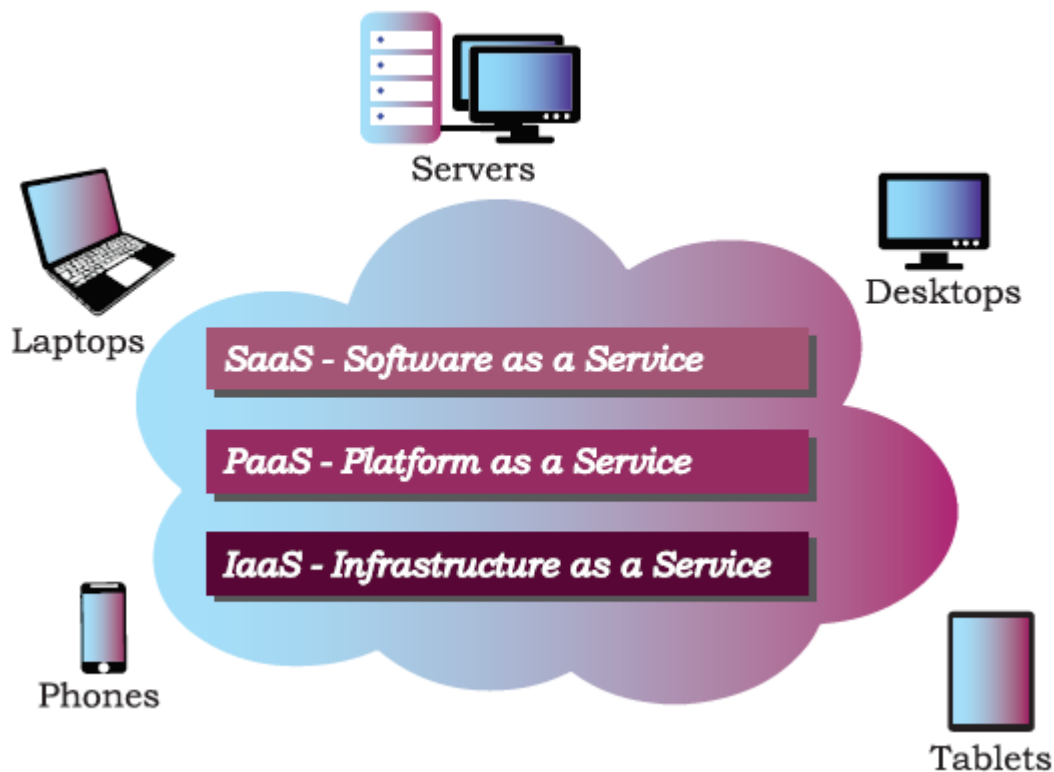


Figure 10: Cloud Computing Services

### (A) Infrastructure as a Service (IaaS):

- The IaaS providers can offer different kinds of computing infrastructure, such as servers, virtual machines (VM), storage and backup facility, network components, operating systems or any other hardware or software.
- Using IaaS from the cloud, a user can use the hardware infrastructure located at a remote location to configure, deploy and execute any

software application on that cloud infrastructure, thereby they can save the cost of software, hardware and other infrastructures as well as the cost of setting up, maintenance and security.

#### **(B) Platform as a Service (PaaS):**

- PaaS provides a platform or environment to develop, test, and deliver software applications.
- In PaaS, the user has complete control over the deployed application and its configuration. It provides a deployment environment for developers at a much reduced cost lessening the complexity of buying and managing the underlying hardware and software.
- For example, we have developed a web application using MySQL and Python. To run this application online, we can avail a pre-configured Apache server from cloud having MySQL and Python preinstalled. Thus, we are not required to install MySQL and Python on the cloud, nor do we need to configure the web server (Apache, nginx).

#### **(C) Software as a Service (SaaS):**

- SaaS provides on-demand access to application software, usually requiring a licensing or subscription by the user.
- For example, while using Google doc, Microsoft Office 365, Drop Box, etc., to edit a document online, we use SaaS from cloud.
- A user is not concerned about installation or configuration of the software application as long as the required software is accessible. Like PaaS, a user is provided access to the required configuration settings of the application software that they are using at present.

**In order to utilize and harness the benefits of cloud computing, Government of India has embarked upon an ambitious initiative —‘GI Cloud’ which has been named as ‘MeghRaj’ (<https://cloud.gov.in>).**

## Grid Computing

- A grid is a computer network of geographically dispersed and heterogeneous computational resources. Unlike cloud, whose primary focus is to provide services, a grid is more application specific and creates a sense of a virtual supercomputer with an enormous processing power and storage. The constituent resources are called nodes. These different nodes temporarily come together to solve a single large task and to reach a common goal.
- Grid can be of two types — (i) **Data grid**, used to manage large and distributed data having the required multi-user access, and (ii) **CPU or Processor grid**, where processing is moved from one PC to another as needed or a large task is divided into subtasks, and allotted to various nodes for parallel processing.
- Grid computing is different from IaaS cloud service. In case of IaaS cloud service, there is a service provider who rents the required infrastructure to the users. Whereas in grid computing, multiple computing nodes join together to solve a common computational problem.
- The grid provides an opportunity to solve computationally intense scientific and research problems without actually procuring a costly hardware.
- To set up a grid, by connecting numerous nodes in terms of data as well as CPU, a middleware is required to implement the distributed processor architecture. The **Globus toolkit** (<http://toolkit.globus.org/toolkit>) is one such software toolkit used for building grids, and it is an open source. It includes software for security, resource management, data management, communication, fault detection, etc.

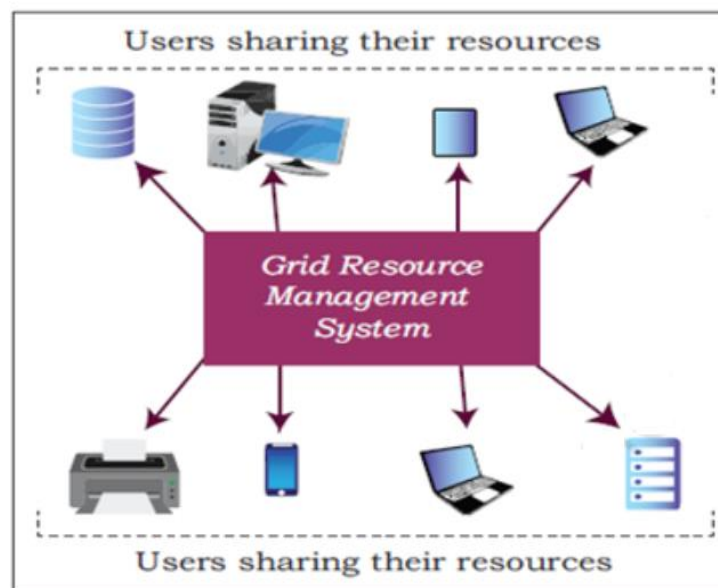


Figure 11: Grid computing

## Blockchains

- Digital transactions are performed by storing data in a centralized database and the transactions performed are updated one by one on the database. However, since all the data is stored on a central location, there are chances of data being hacked or lost. So, rescue is blockchain technology.
- The blockchain technology works on the concept of decentralized and shared database where each computer has a copy of the database.
- A block can be thought as a secured chunk of data or valid transaction. Each block has some data called its header, which is visible to every other node, while only the owner has access to the private data of the block.
- Blockchain can define as a system that allows a group of connected computers to maintain a single updated and secure ledger. Each computer or node that participates in the blockchain receives a full copy of the database. It maintains an 'append only' open ledger which is updated only after all the nodes within the network authenticate the transaction.
- Safety and security of the transactions are ensured because all the members in the network keep a copy of the blockchain and so it is not possible for a single member of the network to make changes or alter data.

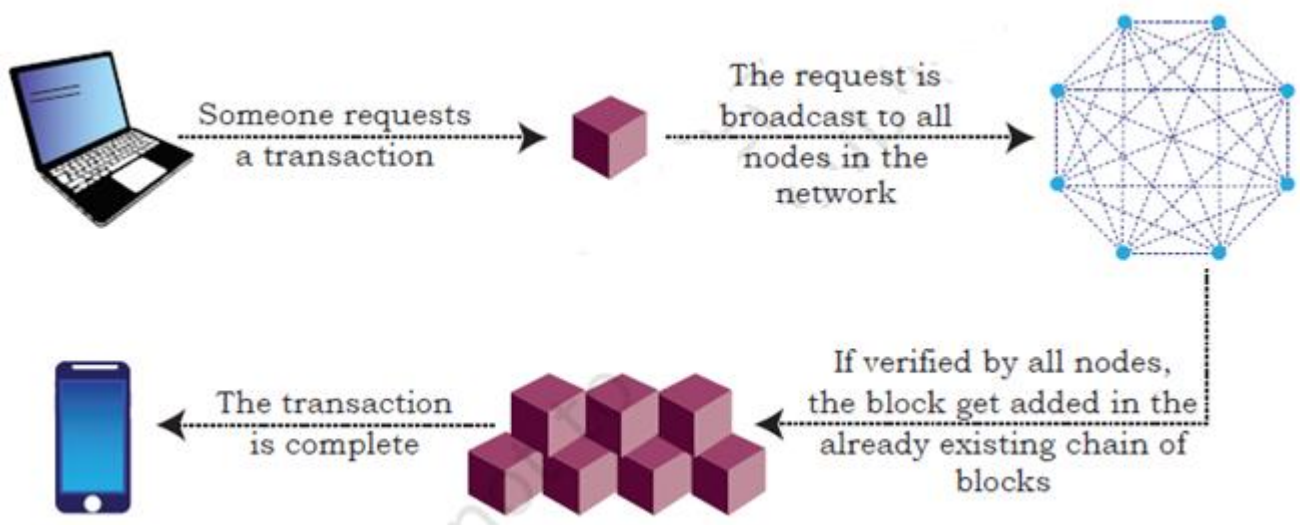


Figure 12: Block chain technology

## Applications of Blockchain Technology:

- The most popular application of block chains technology is in digital currency.
- In healthcare, better data sharing between healthcare providers would result in a higher probability of accurate diagnosis, more effective treatments, and the overall increased ability of healthcare organizations to deliver cost-effective care.
- Another potential application can be for land registration records, to avoid various disputes arising out of land ownership claims and encroachments.
- A blockchain based voting system can solve the problem of vote alterations and other issues. Since everything gets stored in the ledger, voting can become more transparent and authentic.
- The blockchain technology can be used in diverse sectors, such as banking, media, telecom, travel and hospitality and other areas.

For video explanation of the topic, click the link:

<https://youtu.be/gnMpg21FhEo>

## **EXERCISE**



1. List some of the cloud-based services that you are using at present.
2. What do you understand by the Internet of Things? List some of its potential applications.
3. Write a short note on the following:
  - a) Cloud computing
  - b) Big data and its characteristics
4. Explain the following along with their applications.
  - a) Artificial Intelligence
  - b) Machine Learning
5. Differentiate between cloud computing and grid computing with suitable examples.
6. Justify the following statement- 'Storage of data is cost effective and time saving in cloud computing.'
7. What is on-demand service? How it is provided in cloud computing?
8. Write examples of the following:
  - a) Government provided cloud computing platform
  - b) Large scale private cloud service providers and the services they provide.
9. A company interested in cloud computing is looking for a provider who offers a set of basic services such as virtual server provisioning and on-demand storage that can be combined into a platform for deploying and running customized applications. What type of cloud computing model fits these requirements?
  - a) Platform as a Service
  - b) Software as a Service
  - c) Infrastructure as a Service
10. Which is not one of the features of IoT devices?

- a) Remotely controllable
- b) Programmable
- c) Can turn themselves off if necessary
- d) All of the above

11. If Government plans to make a smart school by applying IoT concepts, how can each of the following be implemented in order to transform a school into IoT enabled smart school?

- a) e-textbooks
- b) Smart boards
- c) Online tests
- d) Wifi sensors on classrooms doors
- e) Sensors in buses to monitor their location
- f) Wearable's (watches or smart belts) for attendance monitoring

12. Five friends plan to try a startup. However, they have a limited budget and limited computer infrastructure. How can they avail the benefits of cloud services to launch their startup?

13. Governments provide various scholarships to students of different classes. Prepare a report on how blockchain technology can be used to promote accountability, transparency and efficiency in distribution of scholarships?

14. How IoT and WoT are related?

15. Match the following:

| Column A  | Column B        |
|---|-----------------|
| You got a reminder to take medication                                 | Smart Parking   |
| You got a sms alert that you forgot to lock the door                  | Smart Wearable  |
| You got the sms alert that parking space is available near your block | Home Automation |
| You turned off your LED TV from your wrist watch                      | Smart Health    |

## ACTIVITY CORNER

Activity 1: Find out how NLP is helping differently-abled persons?

Activity 2: Find out what role are robots playing in the medical field?

Activity 3: Explore and list a few IoT devices available in the market.

Activity 4: We use GPS to navigate outdoors. VPS is another emerging trend that uses Augmented Reality. Explore and find its other utilities.

Activity 5: Name a few data centers in India along with the major services that they provide.

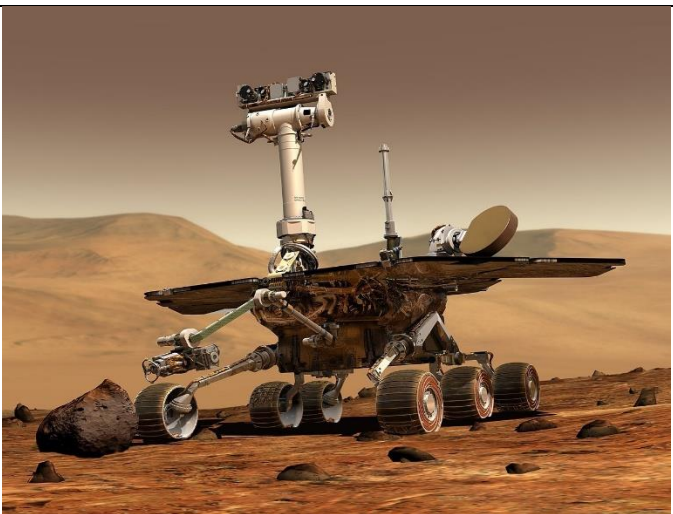
Activity 6: Identify the pictures given below and give one suitable word to it.



a. \_\_\_\_\_



b. \_\_\_\_\_



c. \_\_\_\_\_



d. \_\_\_\_\_