4. Emerging Technologies

Index:-

Different Emerging Technologies.

- **Basics of Internet Of Things (IOT).**
- **Basics of cloud computing.**
- **Introduction to Artificial Intelligence (AI).**
- **Introduction to 5G.**

From:--

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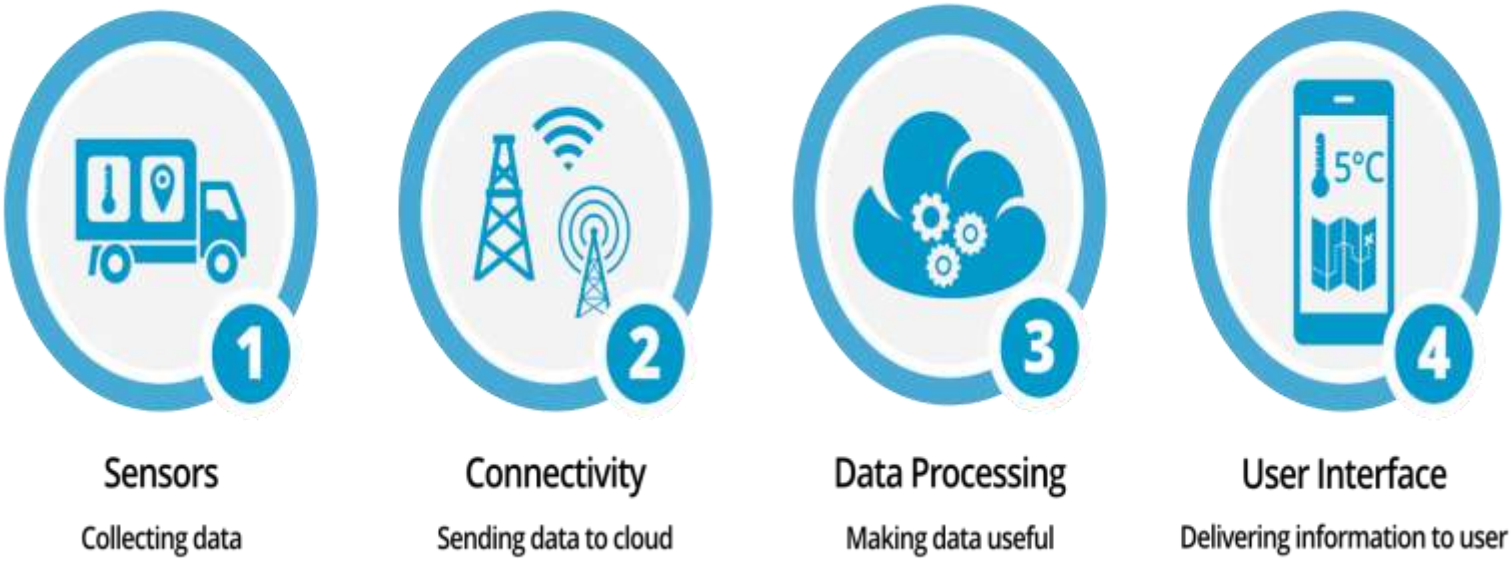
4.1 IoT (Internet of Things)

- **Internet of Things (IoT):** It is network of everyday things (physical devices, vehicles, home appliances) embedded with electronics, software, sensors ,connectivity which enables these things to connect, collect and exchange data.
- Internet of Things refers to **the rapidly growing network of connected objects that are able to collect and exchange data in real time using embedded sensors.**
- Physical devices are connected to internet and they share and collect data.
- Remotely monitored and controlled.

The term "Internet of Things" or IoT was first coined by Kevin Ashton in 1999.

IOT devices can communicate and interact over the Internet, and they can be remotely monitored and controlled.

HOW IT WORK


1
2
3
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Sensors
Collecting data
Connectivity
Sending data to cloud
Data Processing
Making data useful
User Interface
Delivering information to user

ADVANTAGES

- **Efficient resource utilization :** Due to known functionality and working of device we can increase efficient resource utilization
- **Minimize human effort :** devices interact and communicate with each other and do lot of task for us.
- **Time saving :** reduces the human effort , so saves out time.
- **Enhance Data Collection :** devices can collect data from environment like weather ,sound,pollution , and take decisions
- **Improve security :** can make home or office environment secure

Disadvantages:-

- **Privacy :** without the active participation on the user, provides important personal data in maximum detail.
- **Complexity:** designing, developing, maintaining and enabling the large technology is quite complicated.

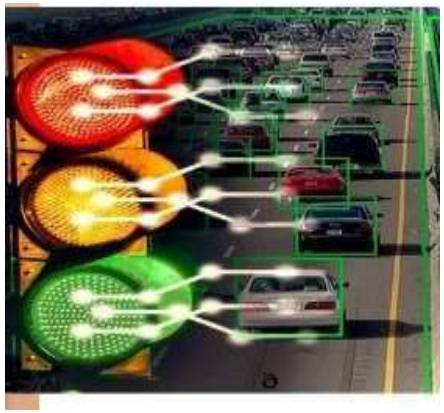
APPLICATIONS OF IOT :

- Smart Systems

Smart lighting

Smart thermostat

Smart locks and garage-door openers



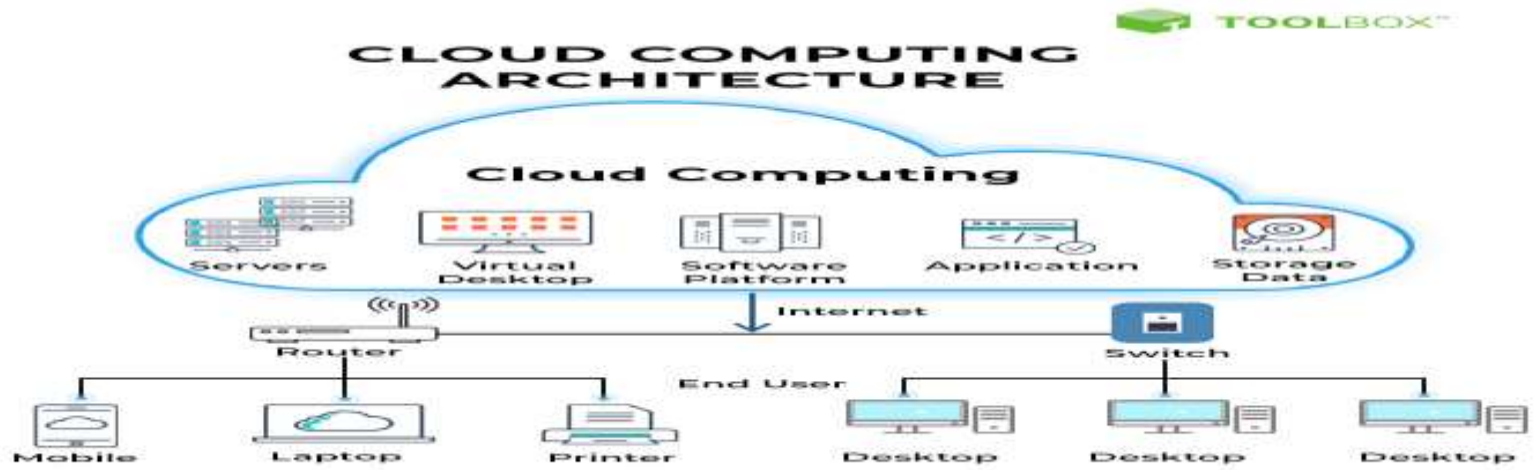
Smart Security cameras

Smart traffic signals

4.2 cLOUD cOMPUTING

- It provides on-demand network access to a shared pool of computing resources (network, servers, storage, applications) and releases services with service provider interaction.
- Cloud computing is the on-demand delivery of IT resources over the Internet.
- Use of remote servers on the *internet* to store , manage ,process data rather than Local server or on your PC

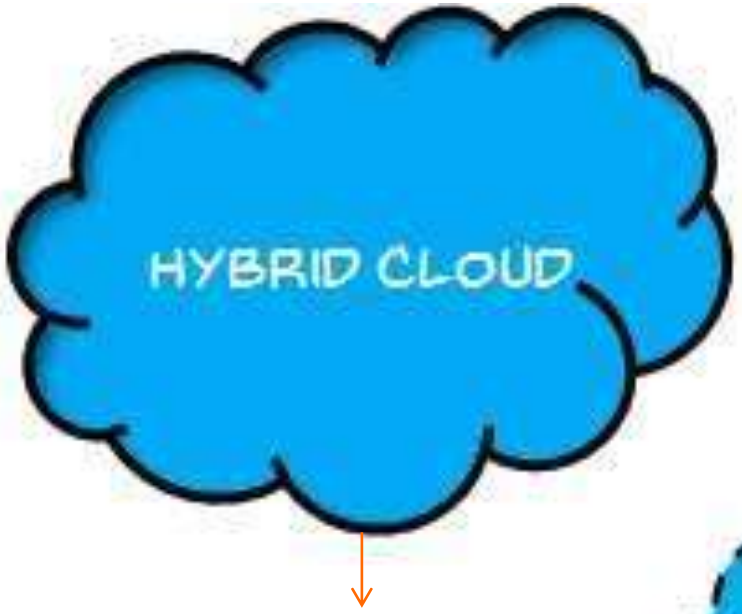
Service providerreleases services



TYPES OF CLOUD COMPUTING

TYPES OF CLOUD COMPUTING

shared across multiple users, globally
Ex. Amazon AWS, Google Cloud Platform.

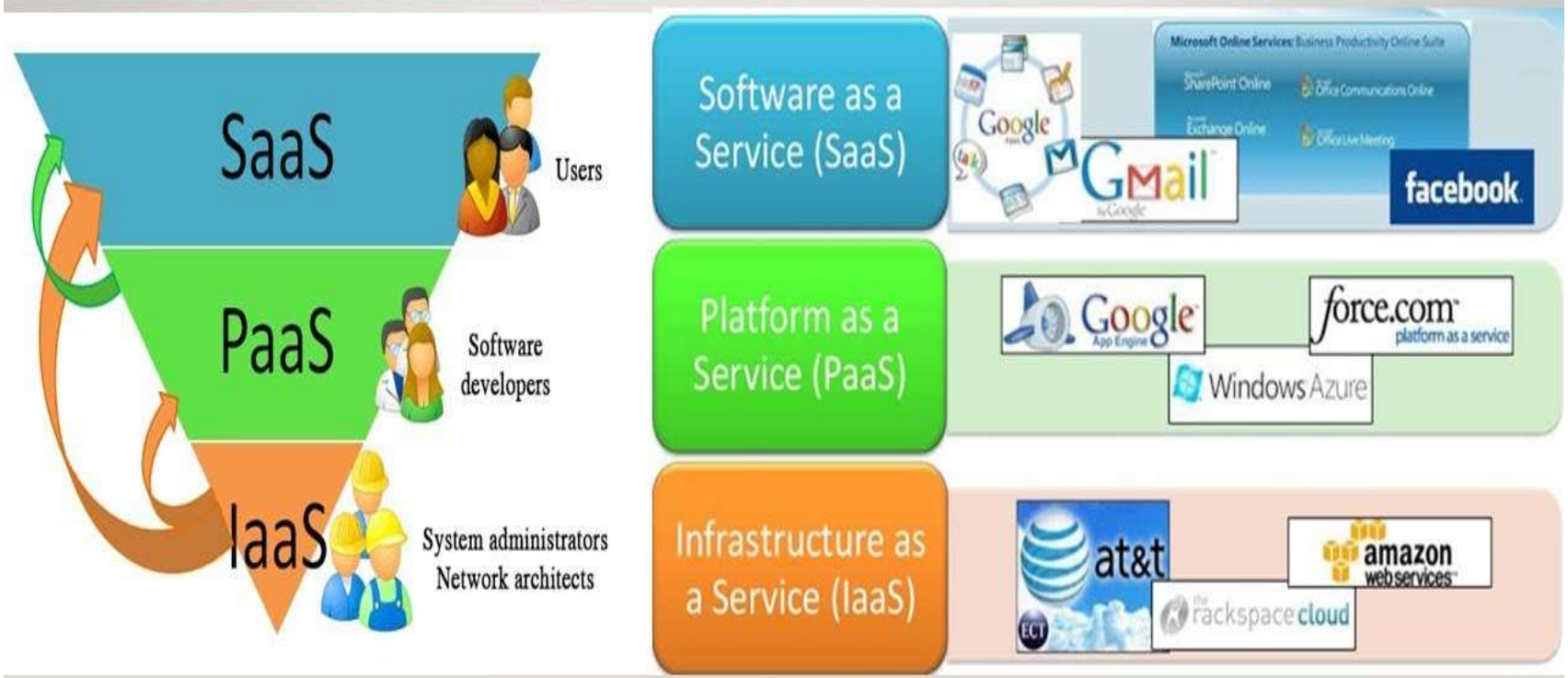


- Combines both private and public clouds elements
- greater flexibility with security
- Ex. VMware vCloud (Hybrid Cloud Services)

- Not shared, of only one customer/organization
- Data is protected behind the firewall.
- Ex. Amazon VPC (Virtual Private Cloud)

CLOUD COMPUTING IN HINDI

Cloud Computing Services Models



Infrastructure as a service (IaaS)

1] In the IaaS model, the cloud provider manages IT infrastructures such as storage, server and networking resources, and delivers them to subscriber organizations via virtual machines accessible through the internet.

2] Instead of purchasing hardware outright, users pay for IaaS on demand.

3] Infrastructure is scalable depending on processing and storage needs.

4] Enterprises saves the costs of buying and maintaining their own hardware.

5] IaaS can have many benefits for organizations, such as potentially making workloads faster, easier, more flexible and more cost efficient.

Examples : Amazon web services (AWS) ec2, Microsoft Azure VM, Google Compute Engine (GCE)

Platform as a service (PaaS)

- platform-as-a-service (PaaS) is a form of cloud computing where an application software platform is provided by another party. Primarily for developers and programmers,
- PaaS provides a platform with tools to test, develop and host applications in the same environment.
- Enables organizations to focus on development without having a worry about underlying infrastructure.
- Providers manage security, operating systems, server software and backups.
- Facilitates collaborative work even if teams work remotely.
- Ex:- Google Cloud, Microsoft Azure.AWS.IBM Cloud.
- Red Hat OpenShift.
- Oracle Cloud Platform (OCP)

Software as a service (SaaS)

- SaaS applications are sometimes called Web-based software, on-demand software, or hosted software
- Software-as-a-service (SaaS) is a form of cloud computing that delivers a cloud application—and all its underlying IT infrastructure and platforms—to end users through an internet browser. It can be an ideal solution for large enterprises, small businesses or individuals that:
- It uses by end user
- SaaS vendors provide users with software and applications via a subscription model.

Types of cloud computing

- Public cloud
- Public cloud is **open to all** to store and access information via the Internet using the pay-per-usage method.
- In public cloud, computing resources are managed and operated by the Cloud Service Provider (CSP).
- Public cloud is maintained by the cloud service provider, so do not need to worry about the maintenance.

- **Example**: Amazon elastic compute cloud (EC2), IBM Smart Cloud Enterprise, Microsoft, Google App Engine, Windows Azure Services Platform.

- Private Cloud
- Private cloud is also known as an **internal cloud** or **corporate cloud**.
- It is used by organizations to build and manage their own data centers internally or by the third party.
- Private cloud provides a high level of security and privacy to the users.
- The organization has full control over the cloud because it is managed by the organization itself. So, there is no need for the organization to depends on anybody.

- Hybrid Cloud
- Hybrid Cloud is a combination of the public cloud and the private cloud. we can say:
- ***Hybrid Cloud = Public Cloud + Private Cloud***
- Hybrid cloud is partially secure because the services which are running on the public cloud can be accessed by anyone, while the services which are running on a private cloud can be accessed only by the organization's users.
- **Example:** Google Application Suite (Gmail, Google Apps, and Google Drive), Office 365 (MS Office on the Web and One Drive), Amazon Web Services.

AI (ARTIFICIAL INTELLIGENCE

- Artificial intelligence (AI) is a wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence.
- Artificial Intelligence **is the ability of a computer program to learn and think.**
- In AI , machine sense their environment, perform calculation and do physical task either by themselves or under the direction of people.

Sub fields of AI

- Machine Learning

  Machine learning is the concept that a computer program can learn and adapt to new data without human intervention.

2 Machine learning can be applied in a variety of areas, such as in investing, advertising, lending, organizing news, fraud detection, and more.

INFRASTRUCTURE AS A SERVICE (IAAS)

- IaaS gives users access to storage, networking, servers and other computing resources via the cloud.

- **Key features :**
  - Instead of purchasing hardware users pay on demand.
  - Enterprises saves the costs of buying and maintaining their own.
  - Infrastructure is scalable depending on processing and storage needs.
  - **Examples :** Amazon web services, Google Compute Engine (GCE)

PLATFORM AS A SERVICE (PAAS)

PLATFORM AS A SERVICE (PAAS)

- It offers access to a cloud-based environment in which users can develop, manage and deliver applications.

- **Key features :**

- PaaS provides a platform with tools to test, develop and host applications in the same environment.
- Allows organizations to focus on development.
- Manage security, operating systems, server software and backups.
- Facilitates collaborative work even if teams work remotely.
- Ex. Force.com, Google App Engine, Apache Stratos

SOFTWARE AS A SERVICE (SAAS)

- It delivers software and applications through the internet , users accessed these applications through the web.

- **Key features :**
  - Users do not have to manage, install or upgrade software; SaaS providers manage this.
  - Data is secure in the cloud; equipment failure does not result in loss of data.
  - Use of resources can be scaled depending on service needs.
  - Applications are accessible from virtually anywhere in the world.
- **Examples :** Google's G suite, GitHub, SAP, Slack, Dropbox.

BENEFITS OF CLOUD COMPUTING

- **Cost saving :** Cloud computing solutions are low-priced than the actual Infrastructure set up for the I.T services.

- **Reliable :** Cloud computing solutions are more reliable than Internal I.T infrastructure.

- **Mobility :** Cloud computing solutions are more movable because user can access data anytime, anywhere as required

4.3 AI (ARTIFICIAL INTELLIGENCE)

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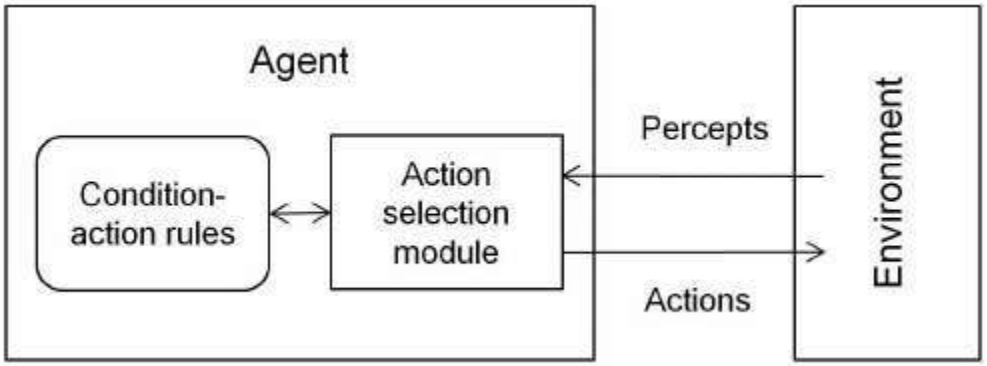
- Artificial intelligence (AI) is an area of computer science that highlights on creation of intelligent machines that work and react like humans.
- AI is different from robotics, in which machines sense their environment, perform calculations and do physical tasks either by themselves or under the direction of people.



ADVANTAGES OF ARTIFICIAL INTELLIGENCE

- **Reduction in human error :** gives 100% accuracy

- **Digital Assistance :** organizations use digital assistants to interact with customer for saving human resources. Example- chatbot

- **Faster Decisions** take decisions faster than a human and carry out actions quicker.

- **Daily Applications :** **Apple's Siri, Window's Cortana, Google's OK Google** it is for searching a location, taking a selfie, making a phone call, replying to a mail etc.

DISADVANTAGES OF AI :

- High Costs of Creation- As the machines used in AI based environments are very complex and high in price, it increases the cost for overall set up.

- Unemployment- As AI is replacing the majority of the repetitive tasks and other works with robots. This will reduced human interference but cause a major problems in the employment standards.

AI Sub Fields

AI

Machine learning :- used to find hidden patterns in data without being programmed to and draw a certain conclusion **e.g gmail filtering**

Neural networks :-Just like human brain's neurons it transmit information between various units for finding connections and derive meaning from data. E.g ATM network Control

Deep learning :-utilizes high neural network to find complex patterns in data, used in image and speech recognition .
e.g. Housekeeping robot

Cognitive computing:- to interpret speech and respond to it for creating a "natural, human-like interaction", e.g chatbot

Computer vision:- Understanding digital images, video's and extraction of high dimensional data from real world it uses that information for taking decisions .e.g .Automated car driving

Natural language processing :- involves analyzing and understanding human language and responding to it
e.g.Google language translator, spell checker

4.4 4.4

- 5G is the **fifth generation of cellular network technology.**
- **Digital cellular network:-**is service area covered by providers is divided into small geographical areas called cells.
- 5G is the next generation of wireless communications.

  Includes LAN,MAN,WAN,WWWW
- **Carry very large amounts of data at a short distance:-** use a variety of spectrum bands, millimeter wave , radio spectrum. etc

- **The drawback of the higher frequencies :**

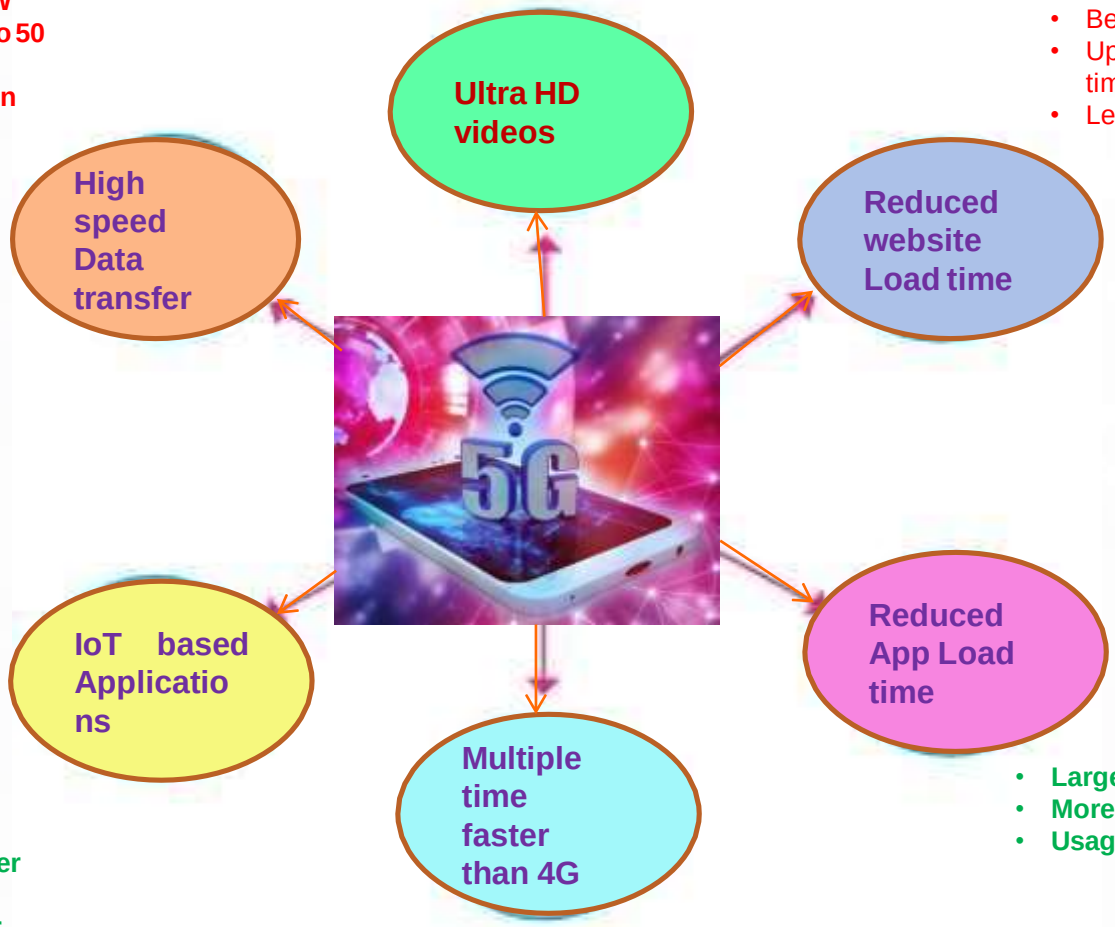
  Easily obstructed by the walls of buildings, trees and other foliage, and even changes in the weather.

FEATURES OF 5G

- Ultra-high-definition (UHD) video streaming
- More clarity in video, Audio

- **Uses ultra wind Band network with higher BW**
- **Data bandwidth is 10 to 50 GBPS**
- **90% energy reduction in network usages**

- 1-millisecond latency
- Better connectivity
- Uploading and downloading time speed is high
- Less traffic



- **Support 1 million connected devices per square kilometer**
- **Provide upto 10 year battery life for low power IoT device**

- **Large Phone memory**
- **More Dialing speed**
- **Usages Low power**

10 to 100x improvement over 4G and 4.5G networks

APPLICATIONS OF 5G

Automated Vehicles.

Virtual Classrooms

Online 5G gaming

Thank you