

4. EMERGING TECHNOLOGIES

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Different Emerging Technologies.

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

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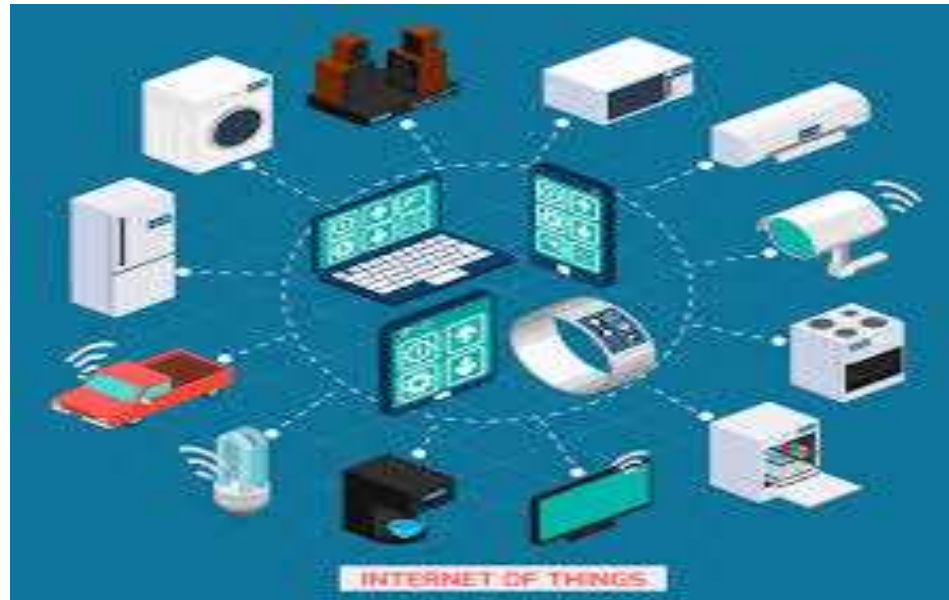
From:--

Mrs. Shilpa Prashant Kate (IT Teacher)

S.B.Patil college of Science and Commerce, Ravet

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.
- Physical devices are connected to internet and they share and collect data.
- Remotely monitored and controlled.



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 lighting



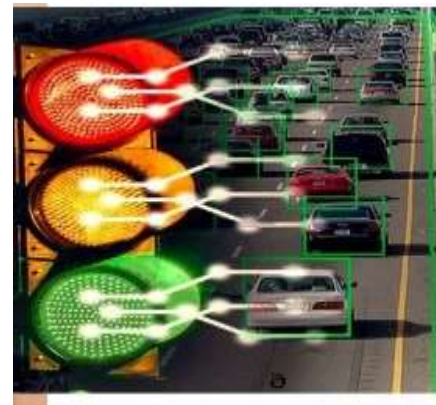
Smart thermostat



Smart locks and garage-door openers



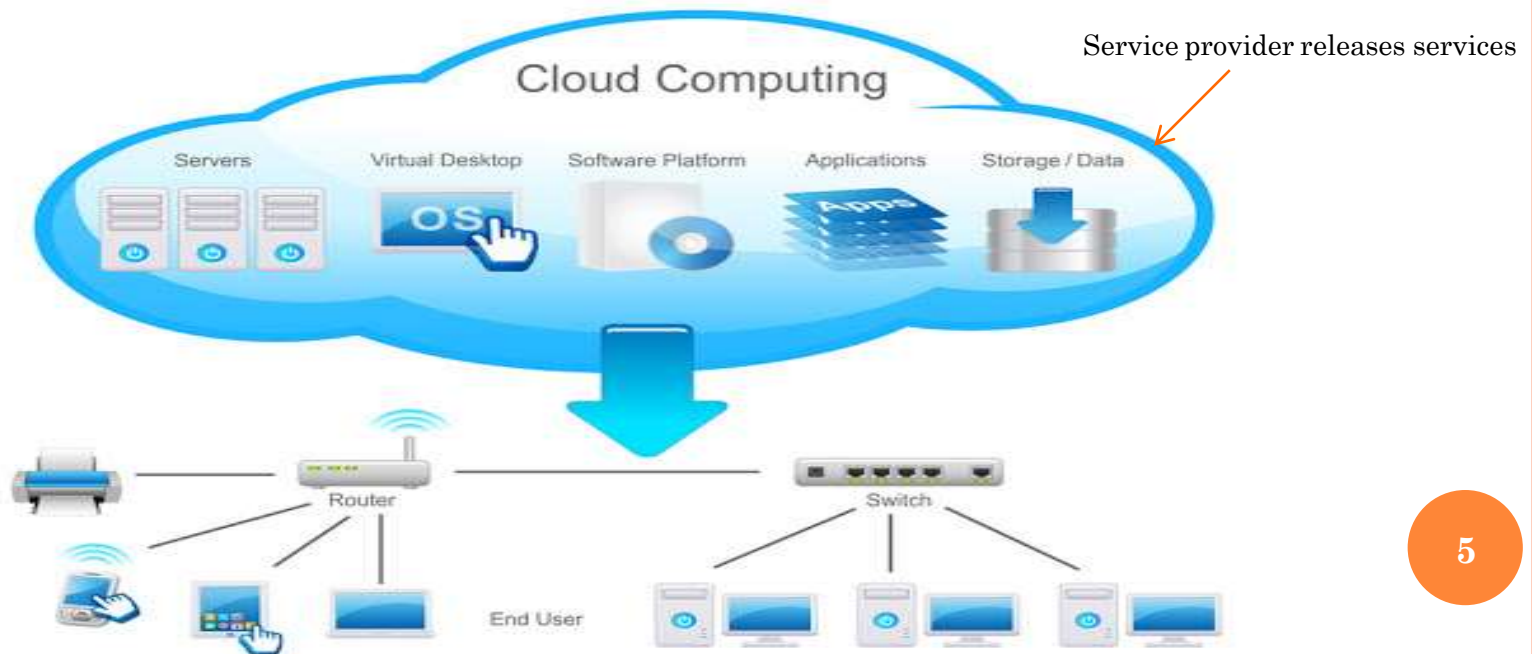
Smart Security cameras



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.
- Use of remote servers on the internet to store, manage, process data rather than Local server or on your PC



TYPES OF CLOUD COMPUTING

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

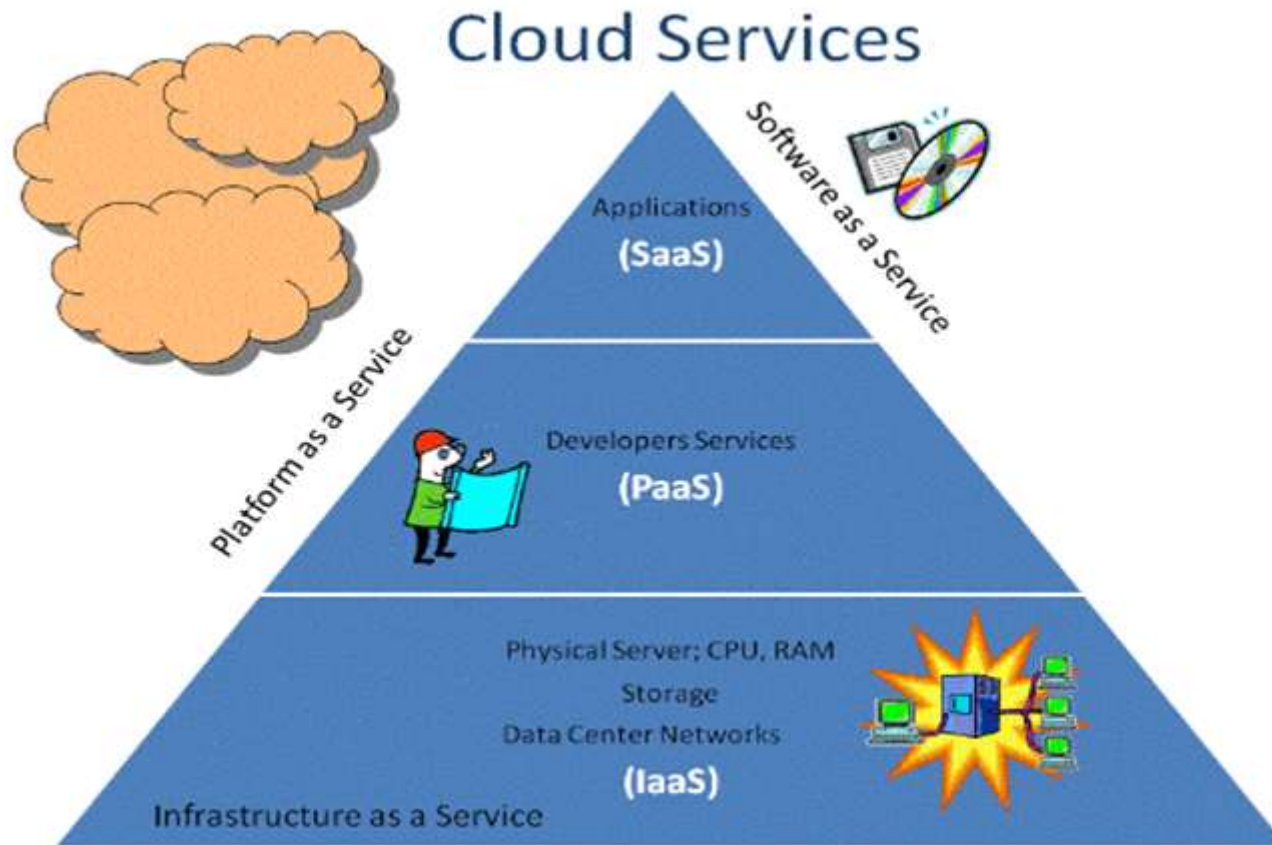


- Not shared, of only one customer/organization
- Data is protected behind the firewall.
- Ex. Amazon VPC (Virtual Private Cloud)



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

MODELS OF CLOUD COMPUTING



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)

- 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)

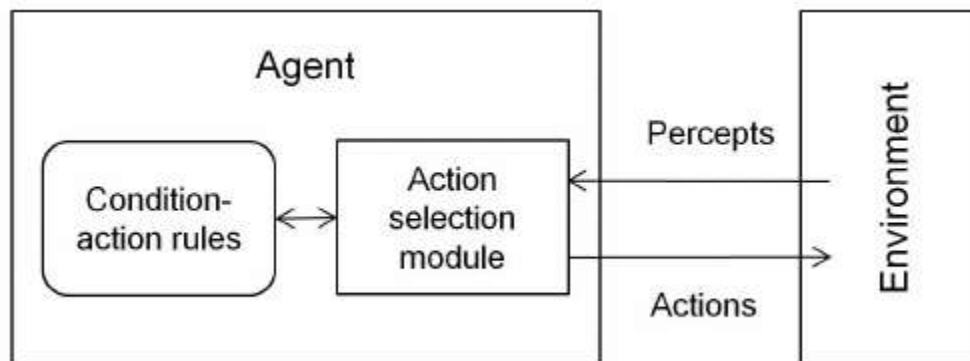
- It delivers software and applications through the internet , users accessed these applications through the web.
- **Key features :**
 - Users do not have to manage, install or upgrade software; SaaS providers manage this.
 - Data is secure in the cloud; equipment failure does not result in loss of 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)

- 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

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

AI

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,WWW

- **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 :**

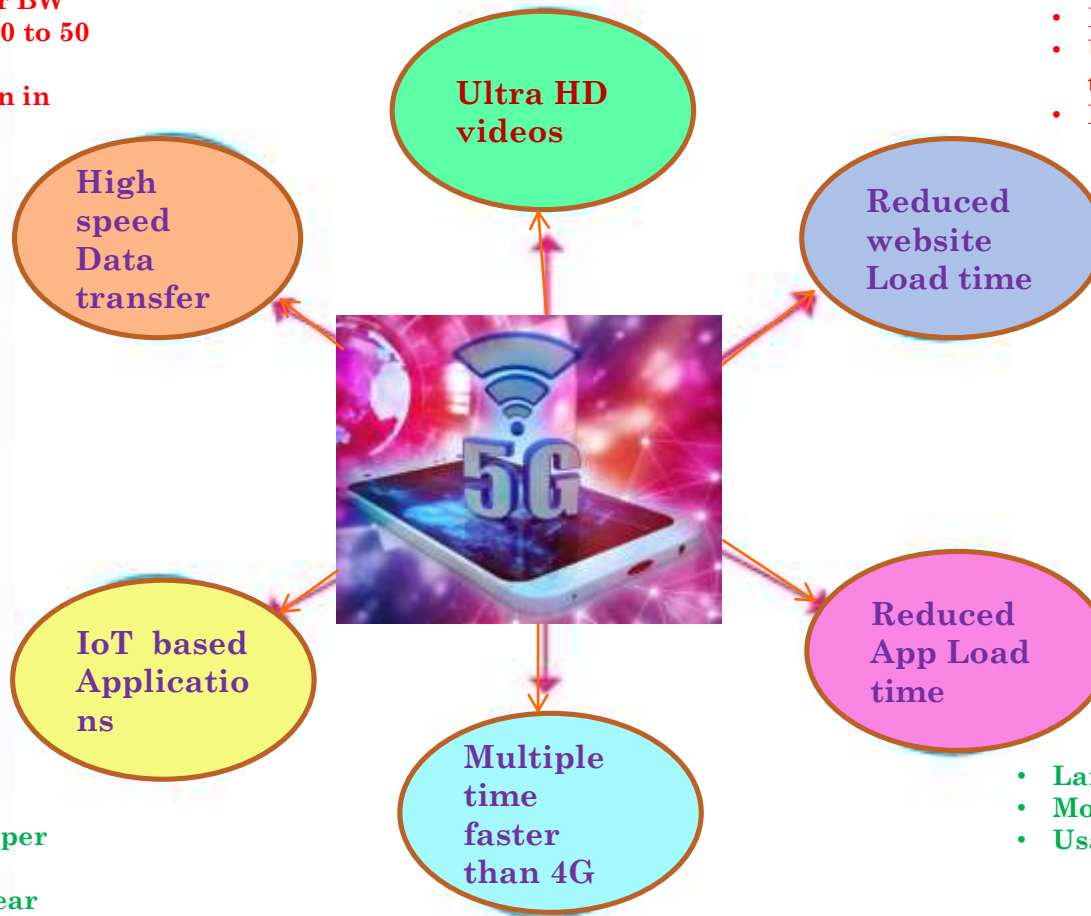
Easily obstructed by the walls of buildings, trees and other foliage, and even changes in the weather.

FEATURES OF 5G

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

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

- 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