

INTRODUCTION TO IoT

Internet of things (IoT) is more than device to device communication, it is a collection of many services, objects, humans and devices that are interconnected that can communicate as well share data and information in order to attain a common goal in different areas and applications. **Kevin Ashton coined INTERNET OF THINGS (IoT) and defined in various ways.**

- A phenomenon which connects a Variety of *things* – Everything that Has the ability to communicate
- A global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities
- A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies

Goal of IoT:

- Connect the unconnected
- Objects that are not currently joined to a computer Network-Internet, will be connected so that they can communicate and interact with people and other objects.
- IoT is a technology transition in which the devices will allow us to sense and control the physical world by making objects smarter and connecting them through an intelligent network.
- When objects and machines can be sensed and controlled **remotely** by across a network, a tighter integration between physical world and computers are enabled. This allows enablement of advanced applications.

Evolution of IoT:

ARPANET was the first connected network – granddad of the Internet as we know it today. The history of IoT starts with ARPANET. In 1989 Tim Berners Lee proposed the framework of world wide web, which laid the foundation of the Internet.

In 1990 John Romkey developed a toaster that could be turned on and off over the Internet. It was a toaster wired to the computer as there was no Wi-Fi then!! This toaster is considered to be the first IoT device – the first “thing” that began Internet of Things.

The next milestone in development of IoT came in 1999 when Kevin Ashton, current Executive Director of the Auto-ID Labs, coined the term internet of things. In March 2008, the first IoT conference was held in Zurich. It brought together researchers and practitioners from both academia and industry to facilitate sharing of knowledge. In the same year, the US National Intelligence Council included the Internet of Things as one of the six disruptive civil technologies. Cisco Internet Business Solutions Group (CIBSG) said that internet of things can truly be said to be born between 2008 and 2009 when the number of things connected to the internet exceeded the number of people connected to it. CIBSG calculated that the things to people ratio grew from approximately 0.8 in 2003 to 1.84 in 2010. Fig.1.1 depicts the Evolution of IoT.

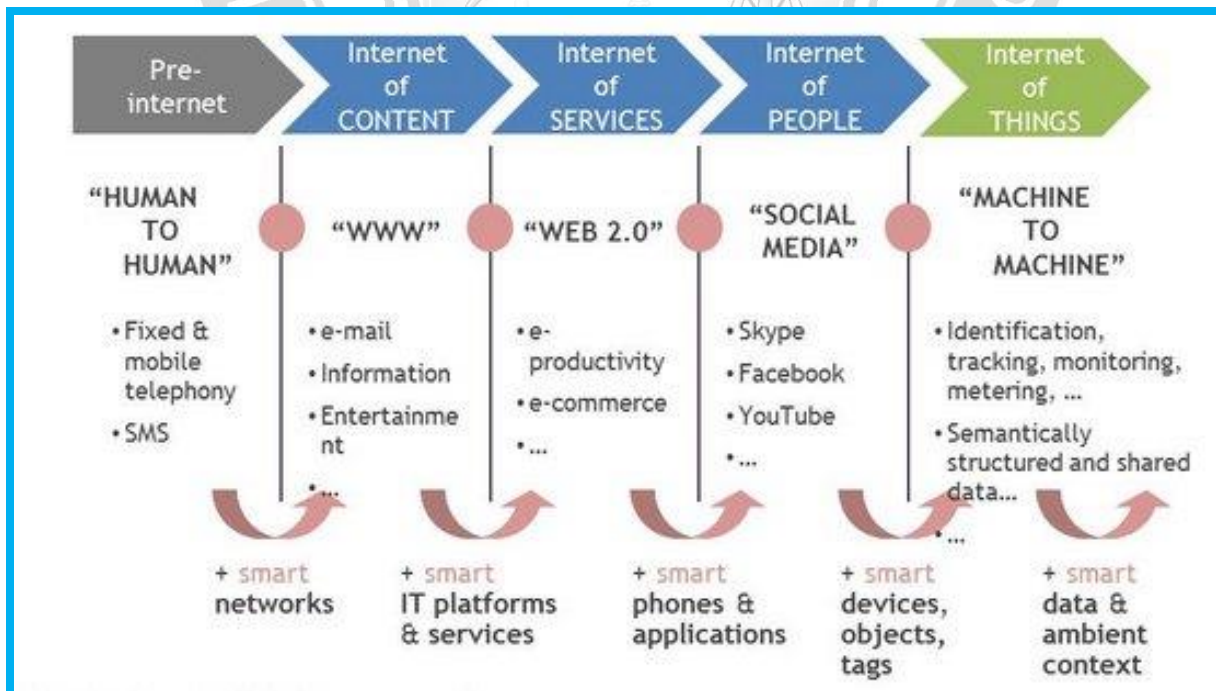


Fig.1.1 Evolution of IoT

Definition of IoT(Internet of Things):

The IoT can be defined in two ways based on

- existing Technology
- Infrastructure

Definition of IoT based on existing technology: IoT is a new revolution to the internet due to the advancement in sensor networks, mobile devices, wireless communication, networking and cloud technologies.

Definition of IoT based on infrastructure: IoT is a dynamic global network infrastructure of physical and virtual objects having unique identities, which are embedded with software, sensors, actuators, electronic and network connectivity to facilitate intelligent applications by collecting and exchanging data.

Characteristics of IoT:

Various characteristics of IoT are:

- Dynamic and self-adapting
- Self-configuring
- Interoperable Communication protocols
- Unique identity
- Integrated into information network

Dynamic and self-adapting: The IoT devices can dynamically adapt with sensed environment, their operating conditions, and user's context and take actions accordingly. For ex: Surveillance System.

Self-configuring:

- IoT devices can be able to upgrade the software with minimal intervention of user, whenever they are connected to the internet.
- They can also setup the network i.e a new device can be easily added to the existing network. For ex: Whenever there will be free wifi access one device can be connected easily.

Interoperable Communication:

IoT allows different devices (different in architecture) to communicate with each other as well as with different network. For ex: MI Phone is able to control the smart AC and smart TV of different manufacturer.

Unique identities:

- The devices which are connected to the internet have unique identities i.e IP address through which they can be identified throughout the network.
- The IoT devices have intelligent interfaces which allow communicating with users. It adapts to the environmental contexts.
- It also allows the user to query the devices, monitor their status, and control them remotely, in association with the control, configuration and management infrastructure.

Integrated into information network:

- The IoT devices are connected to the network to share some information with other connected devices. The devices can be discovered dynamically in the network by other devices. For ex. If a device has wifi connectivity, then that will be shown to other nearby devices having wifi connectivity.
- The devices ssid will be visible though out the network. Due to these things the network is also called as information network.
- The IoT devices become smarter due to the collective intelligence of the individual devices in collaboration with the information network. For Ex: weather monitoring system. Here the information collected from different monitoring nodes (sensors, arduino devices) can be aggregated and analysed to predict the weather.