

**Kingdom of Saudi Arabia**  
**Ministry of Education**  
**Northern Border University**  
**Faculty of Computing and IT**



المملكة العربية السعودية  
وزارة التعليم  
جامعة الحدود الشمالية  
كلية الحاسبات وتقنية المعلومات

# **Internet of Things (IoT)**

## **Chap 1: IoT Overview**

### **Selected Topics**

**CPCS 495 – CPIT 490 – CPIS 490**

# History of IOT

**1999!**

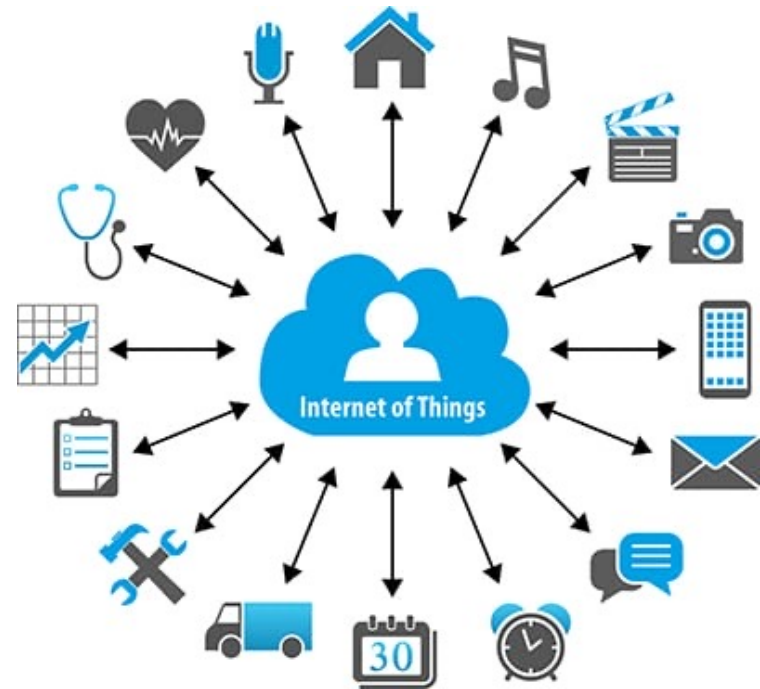
**“THE INTERNET OF THINGS IS  
ABOUT EMPOWERING COMPUTERS  
...SO THEY CAN SEE, HEAR  
AND SMELL THE WORLD FOR  
THEMSELVES”**

**KEVIN ASHTON  
INVENTOR OF THE TERM  
“INTERNET OF THINGS”**



# Introduction to IoT (Internet of Things)

The term Internet of Things (IoT) has become popular in the last few years. In recent time, it's getting more attention due to the advancement of wireless technology. The basic idea is due to variety of objects such as Radio-frequency identification (RFID), Near Field Communication (NFC), Sensors, Actuators, Smartphones, etc. which can interact with each other by having a distinct address.



# Idea of IoT

The IoT enables objects to see, hear, think and perform tasks by making them “talk\*”, share information and synchronize statements.

The IoT transforms these objects into smart objects by manipulating its technologies, embedded devices\*, communication technologies, sensor networks, protocols\* and applications.

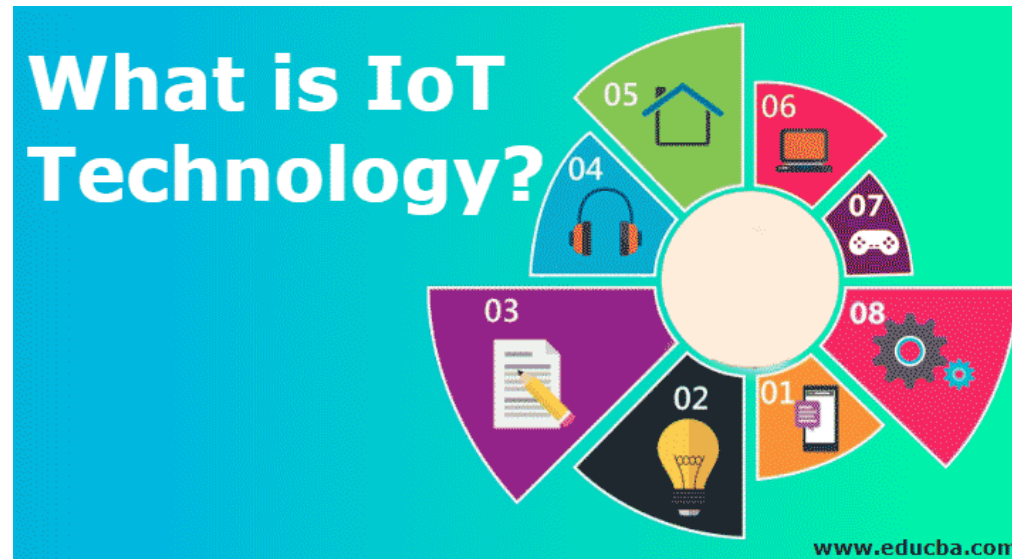


\* Talk : the meaning here is respond / do something

Embedded devices : الأجهزة المدمجة

Protocol : Official procedure or system of rules

# Technologies used in IoT



When, IoT was introduced:

Radio frequency (**RFID**) seemed to be necessary for it. There are various technologies similar to RFID, Near Field communications (**NFC**), Machine to Machine (**M2M**) and vehicular to vehicular communications (**V2V**), which can be used to implement the modern idea of IoT.

# What is M2M?

M2M, or machine-to-machine, is a direct communication between devices using wired or wireless communication channels.

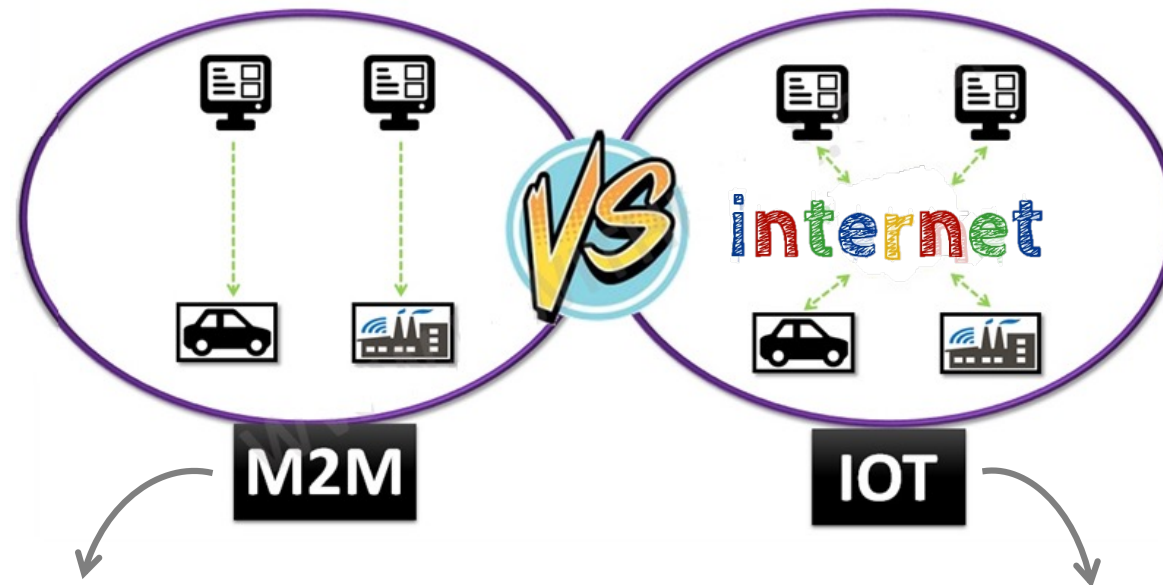
M2M refers to the interaction of two or more devices/machines that are connected to each other.

These devices capture data and share with other connected devices, creating an intelligent network of things or systems.

Devices could be sensors, actuators, embedded systems or other connected elements.



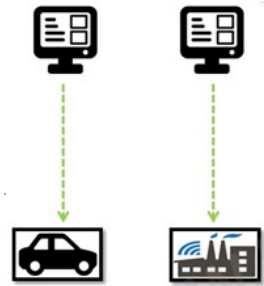
# Difference between M2M & IoT



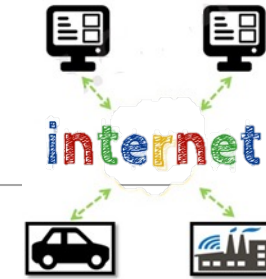
M2M technology could be present in our homes, offices, shopping malls and other places. Controlling electrical appliances like bulbs and fans using RF or Bluetooth from your smartphone is a simple example of M2M applications at home. Here, the electrical appliance and your smartphone are the two machines interacting with each other.

The Internet of Things (IoT) is the network of physical devices embedded with sensors, software and electronics, enabling these devices to communicate with each other and exchange data over a computer network. The things in the IoT refer to hardware devices uniquely identifiable through a network platform within the Internet infrastructure.

# M2M versus IoT



**M2M**



**IoT**

M2M is about **direct** communication between machines.

The IoT is about sensors automation and Internet platform.

It supports point-to-point communication.

It supports cloud communication.

Devices do not necessarily rely on an Internet connection.

Devices rely on an Internet connection.

M2M is mostly hardware-based technology.

The IoT is both hardware- and software-based technology.

Machines normally communicate with a single machine at a time.

Many users can access at one time over the Internet.

A device can be connected through mobile or other network.

Data delivery depends on the Internet protocol (IP) network.

# What is V2V?

Vehicle-to-vehicle-(V2V) communication enables vehicles to wirelessly exchange information about their speed, location, and heading\*. The technology behind V2V communication allows vehicles to broadcast\* and receive omni-directional\* messages (up to 10 times per second), creating a



360°-“awareness” of other vehicles in proximity. Vehicles equipped with appropriate software (or safety applications) can use the messages from surrounding vehicles to determine potential crash threats as they develop. The technology can then employ visual, tactile, and audible alerts—or, a combination of these alerts—to warn drivers. These alerts allow drivers the ability to take action to avoid crashes.

\* Heading : اتجاه

broadcast : اذاعة

omni-directional : متعددة الاتجاهات

# Impact of IoT

The life of a user can become easy and comfortable by adopting various technologies based on IoT.

In addition, IoT has dramatic effect\* on domestic sphere, such as assisted living\*, smart homes, smart cars, etc.

In business sector, IoT has noticeable advancement in manufacturing\* and service industry such as better services, more production and superior quality.

The worldwide adaption of above mentioned technologies does appear smooth but involves lots of issues, that needed to be solved before it worldwide acceptance.



\* Dramatic effect : تأثير كبير

Assisted living : العيش بمساعدة

manufacturing : تصنيع

# IoT challenges

The major issue of IoT is related to security because of Internet **hackers**.

Some other problems of IoT are **standardization\***, **addressing\*** and **scalability\*** problems etc.

Therefore, research is needed to resolve these complicated issues.



\* Standardization : التوحيد

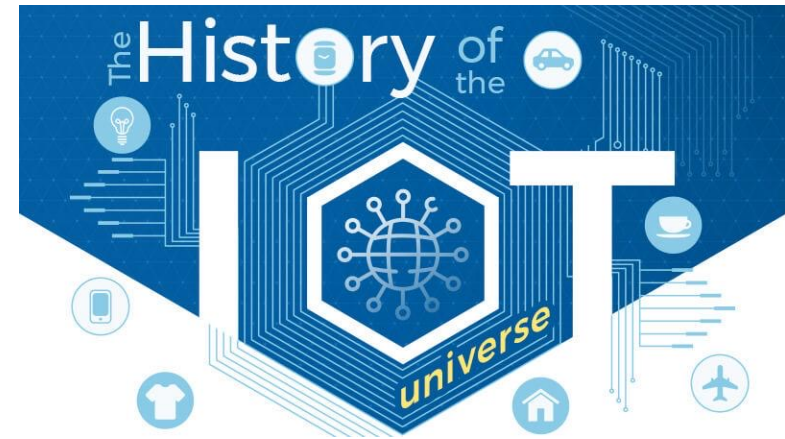
Addressing : معالجة

Scalability : قابلية التوسع

# IoT challenges

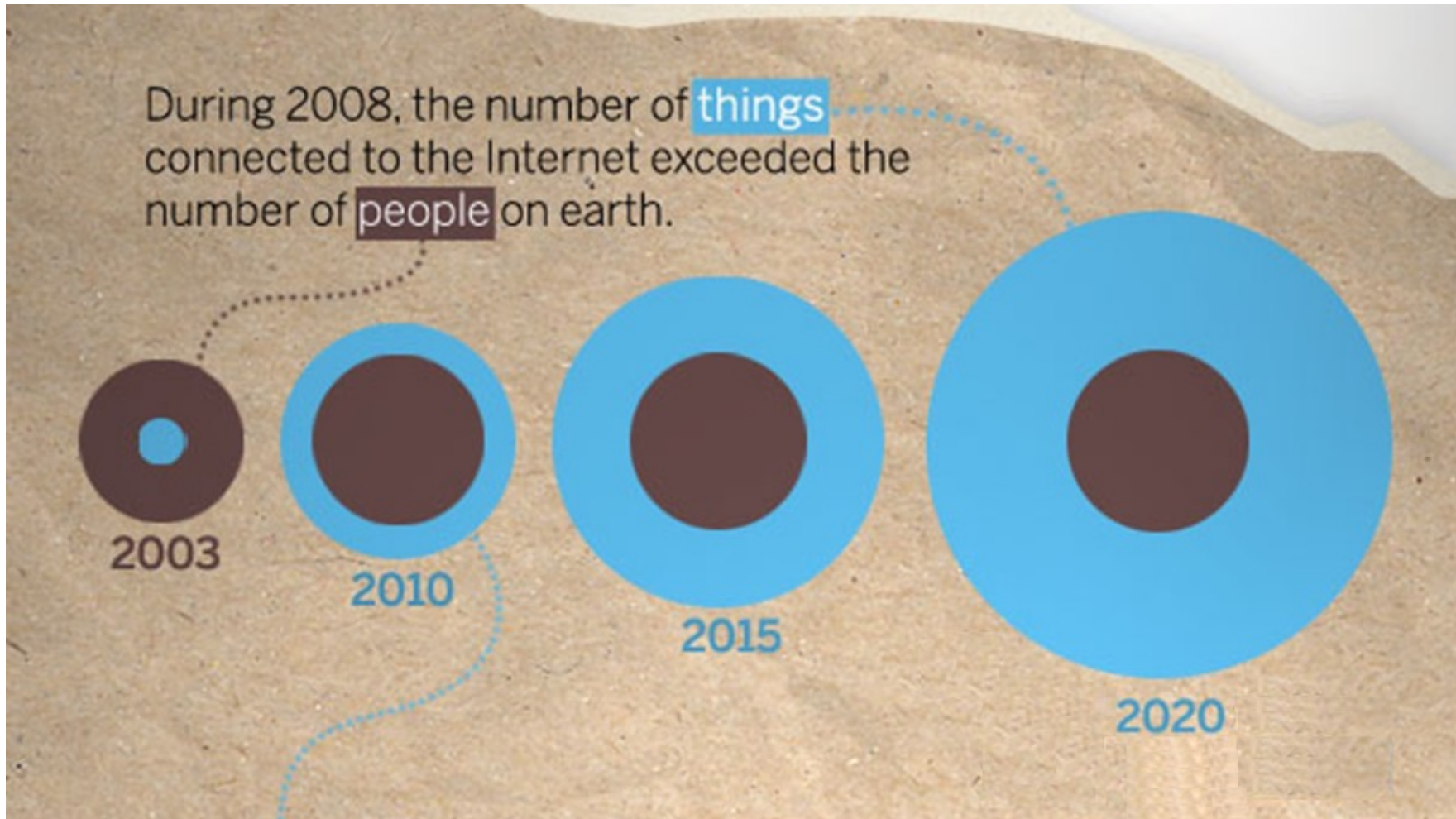
In the first decade of the twenty-first century, we have entered a new era of ubiquity\*, in which the number of “users” of the Internet will be in the billions and where humans can become a minority as generators and receivers of traffic.

Instead, most of the traffic will flow between devices and all kinds of "things," creating a larger and more complex Internet of Things.

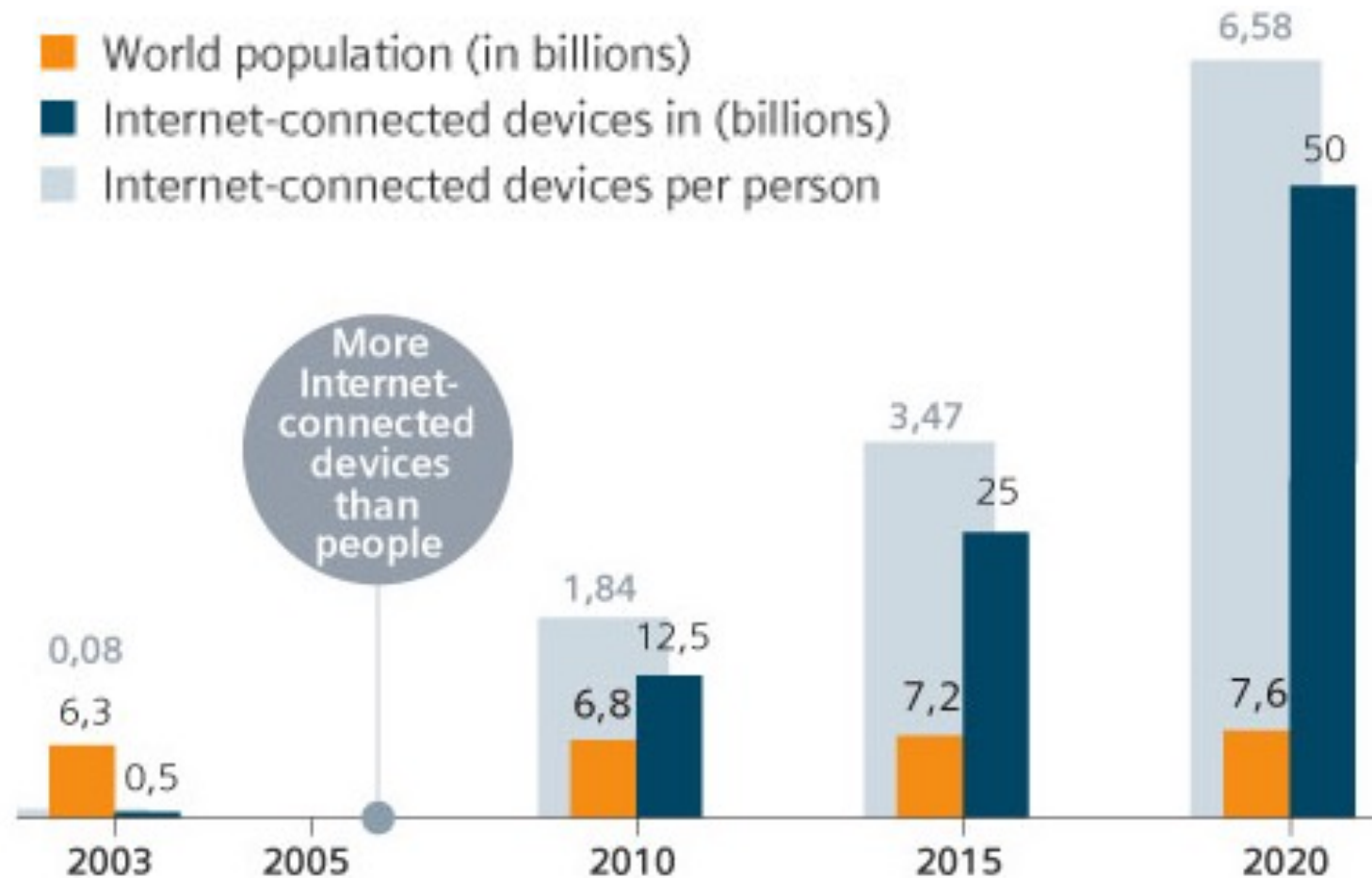


\* Ubiquity : التواجد في كل مكان

# “IoT Things” Versus “People”

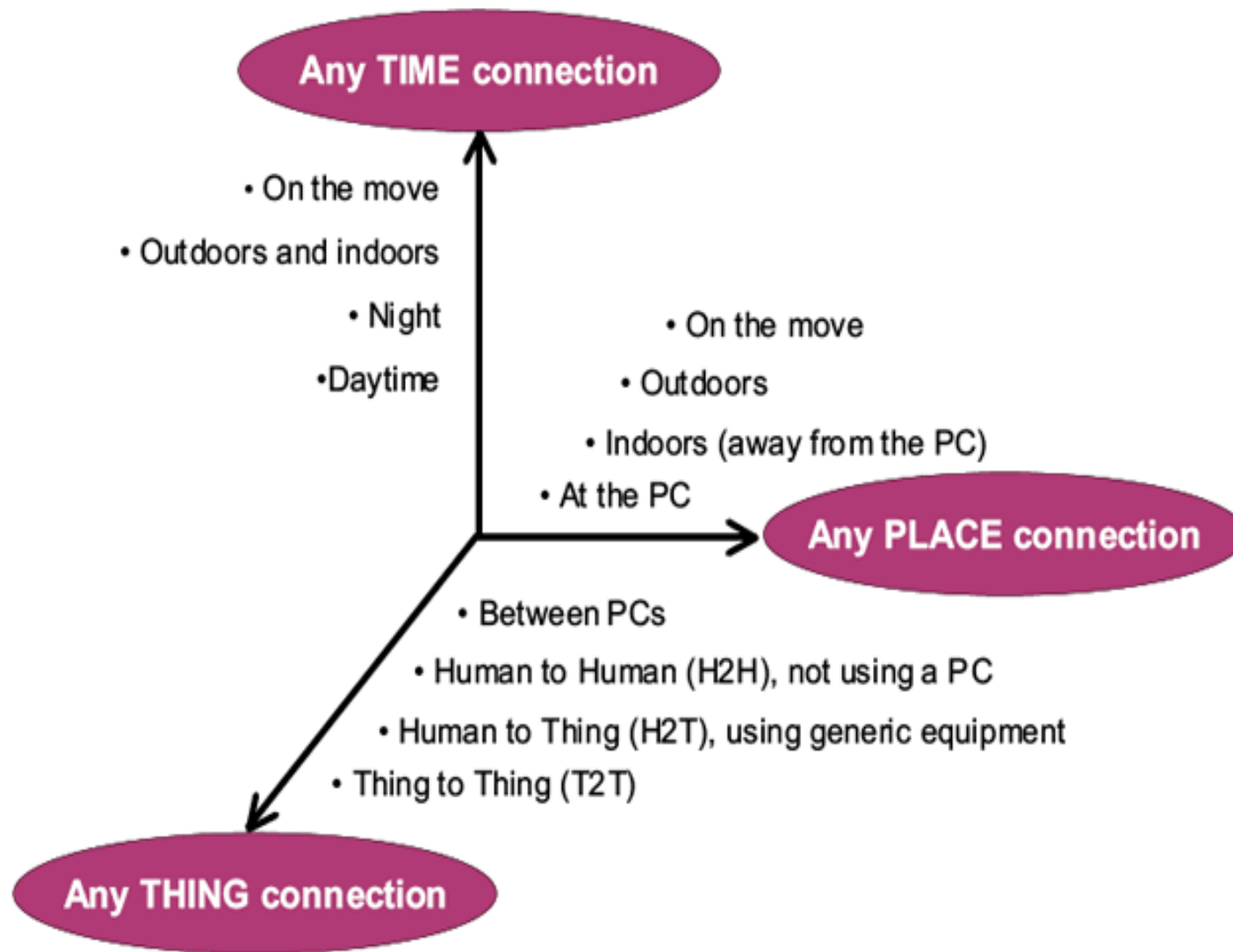


# Growth in Internet Connected devices



Source: Cisco IBSG.

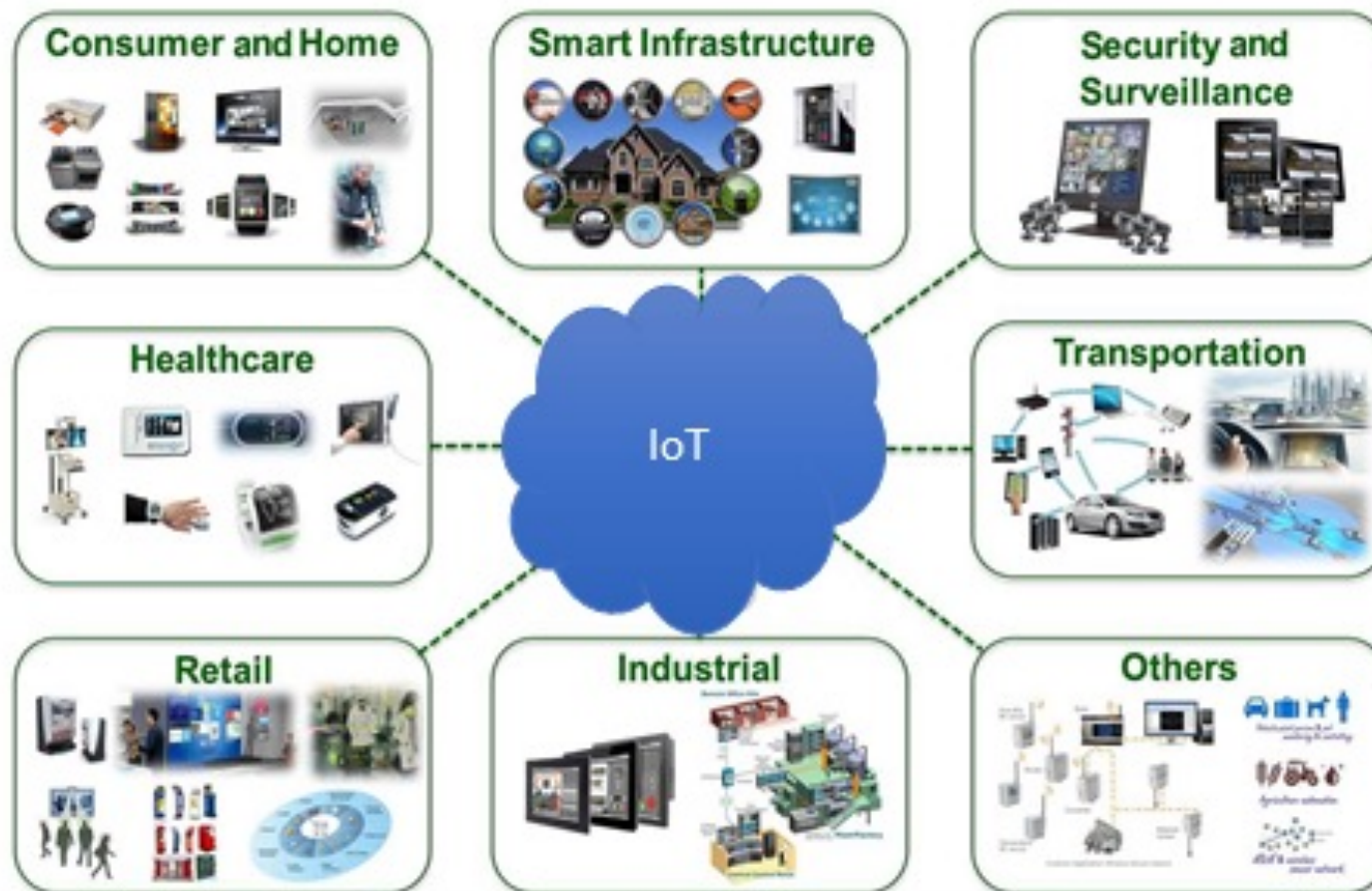
# IoT Networking Features



Source: ITU adapted from Nomura Research Institute

# IoT Application Domains

By enabling easy access to, and interaction with, a wide variety of physical devices or things such as vehicles, machines, medical sensors, and more, IoT facilitates the development of applications in many different domains. The following diagram highlights the key application domains of IoT:



# IoT Application Domains

## Consumer & Home



## Smart Home Control

# IoT Application Domains

## Security & Surveillance



IP Security Camera Control with Smartphone

# IoT Application Domains

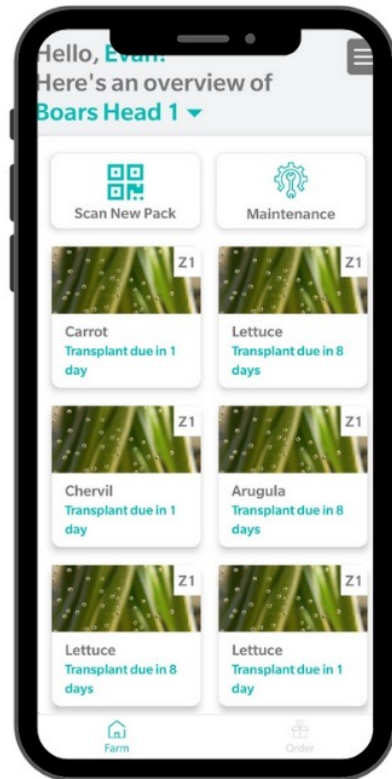
## Transportation



GPS Car Tracking Device

# IoT Application Domains

## Agriculture



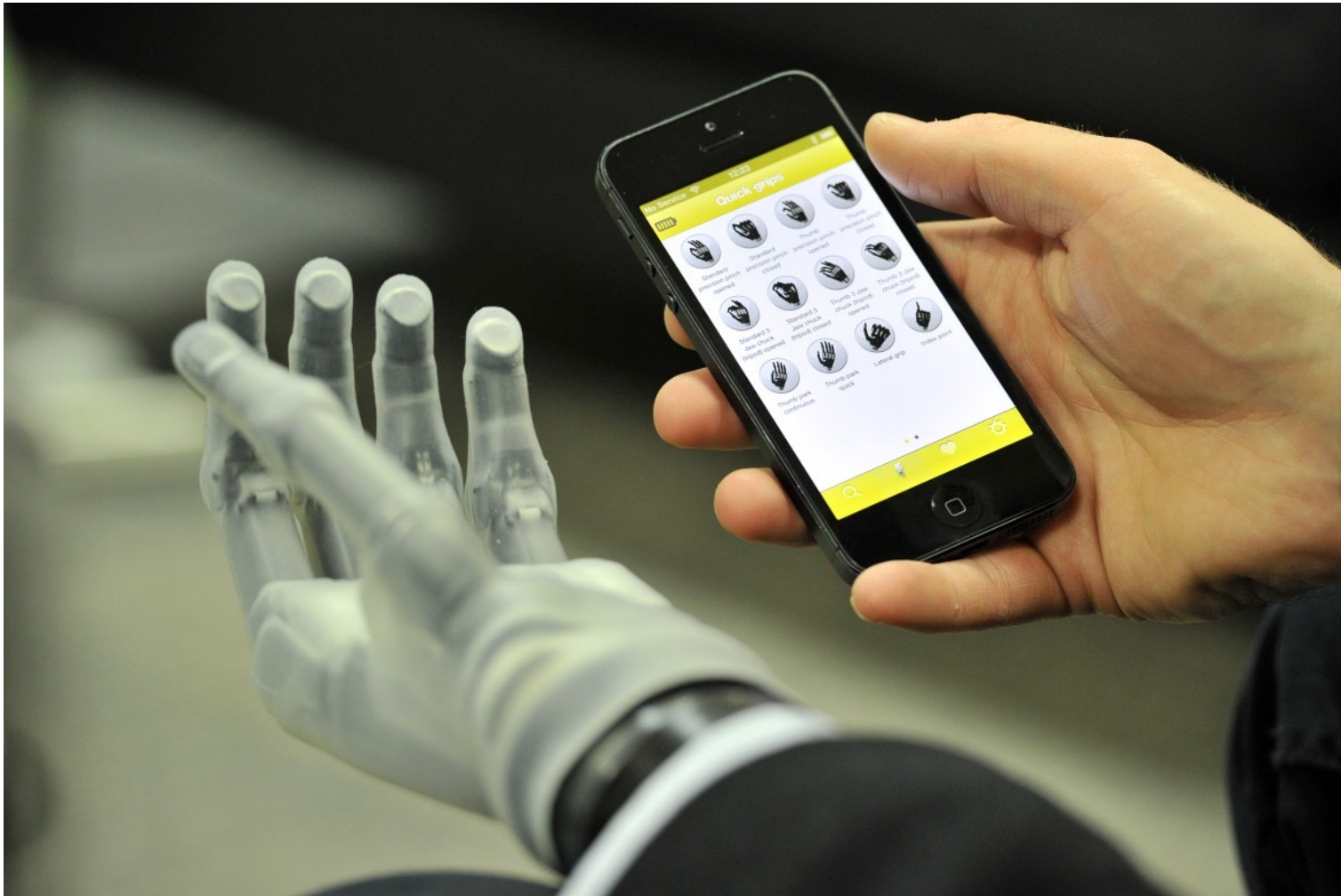
Smart Control of Vertical-Micro-Farms

# IoT Application Domains

## Healthcare



Heart rate measurement with a smart watch



App-controlled sensitive touch prosthetic hand

# IoT Application Domains

## Coronavirus Control



### **Police use 'Smart Helmets' to detect people with Coronavirus**

The fast-scanning, infrared camera is connected to an AR (augmented reality) headset, allowing officers to measure people's temperature in real-time. Developed by Chinese company KC Wearable, the helmet is able to identify individuals with Covid-19 at 96 per cent accuracy. It can scan up to 13 people at once and 200 in a minute.

The helmet can also be paired with contact-tracing apps, helping to provide a more detailed and accurate overview of the spread of the virus.

# IoT Application Domains

## Industrial Automation



Machine Learning Techniques for Smart Manufacturing

# IoT Application Domains

## Wireless Control



Smartphone drone control

# IoT Application Domains

## Traffic violation Control



Road Speed Control Radar in Saudi Arabia

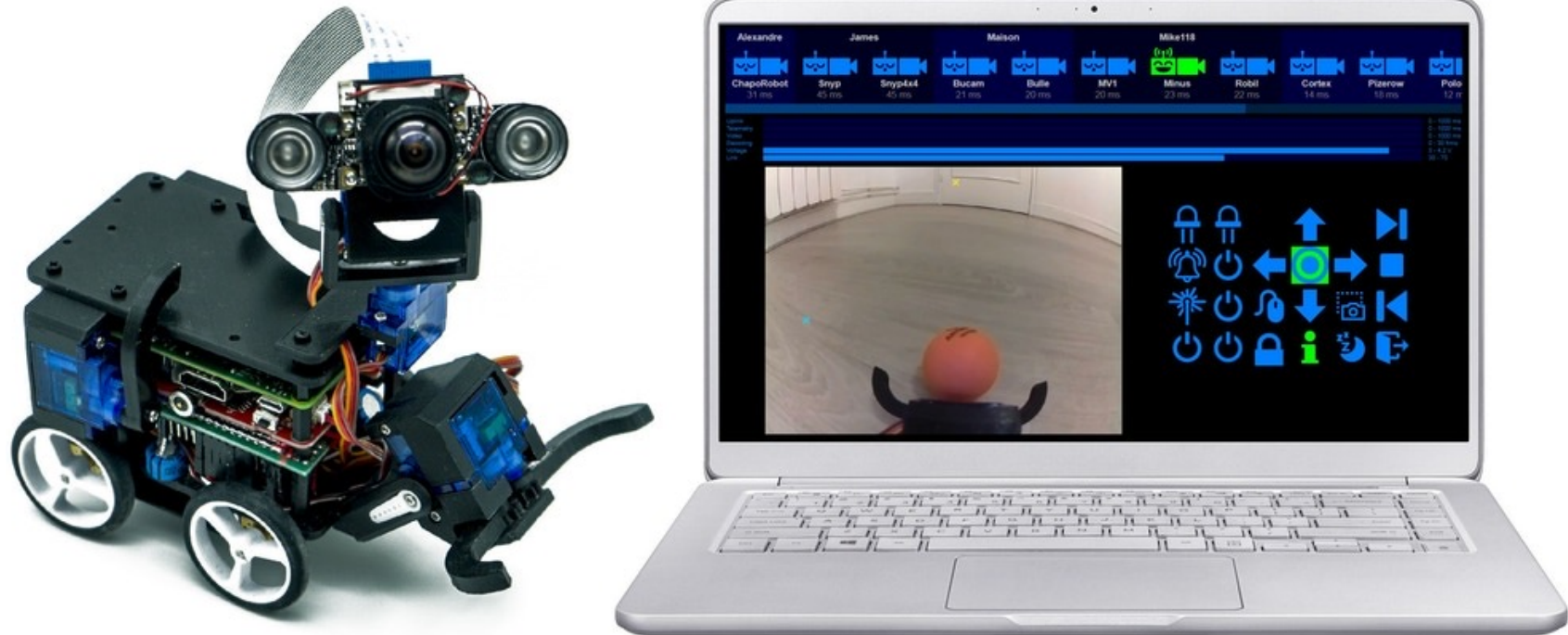


Traffic Cameras Monitoring in Saudi Arabia

Many countries such as Saudi Arabia have installed smart systems to control traffic violations and send fines to violators

Research

# IoT Application Domains



Raspberry Pi Robot Control with Laptop

Military

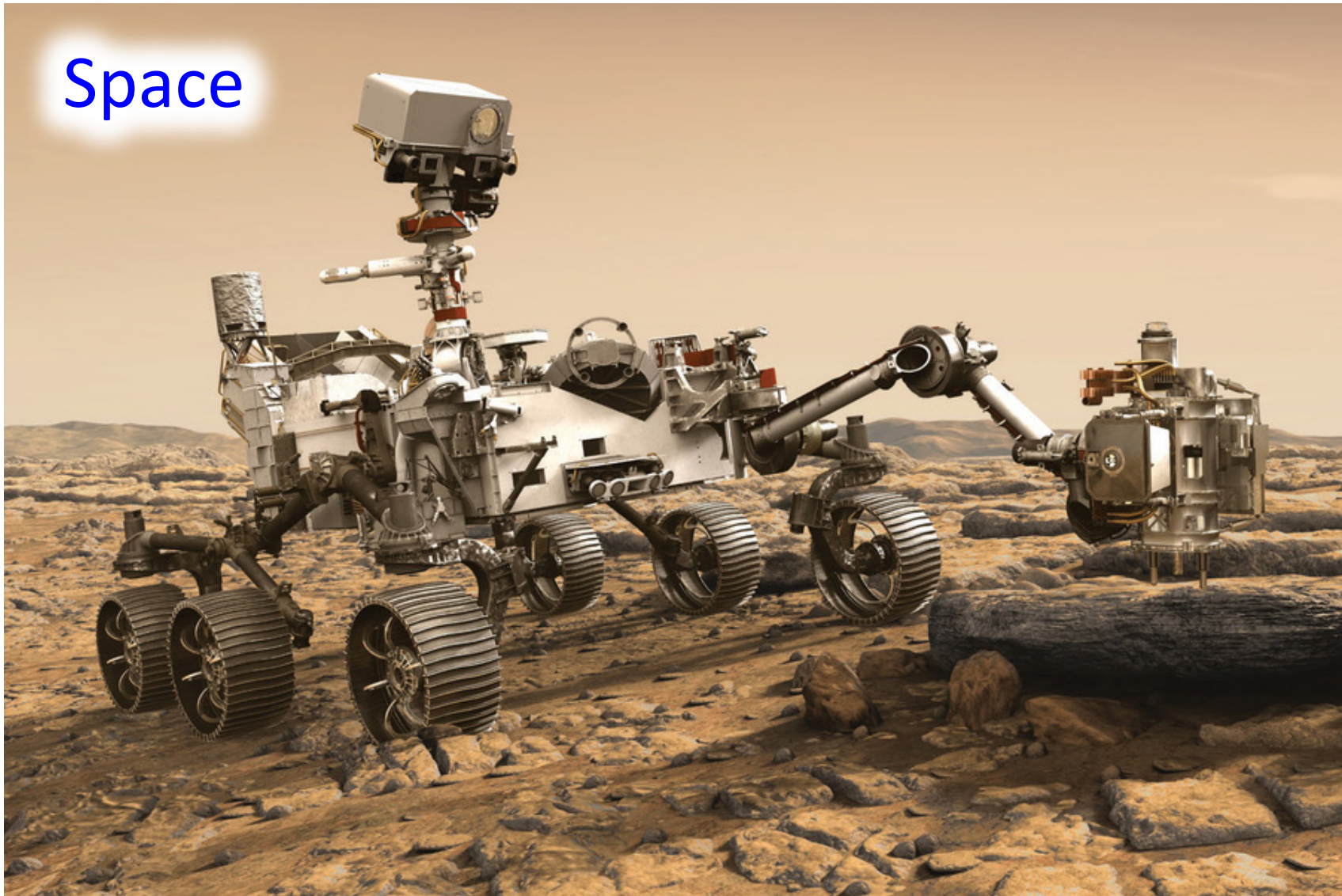
## IoT Application Domains



Autonomous War Shooting Robots

# IoT Application Domains

Space



NASA's Perseverance Rover Generates Oxygen on Mars

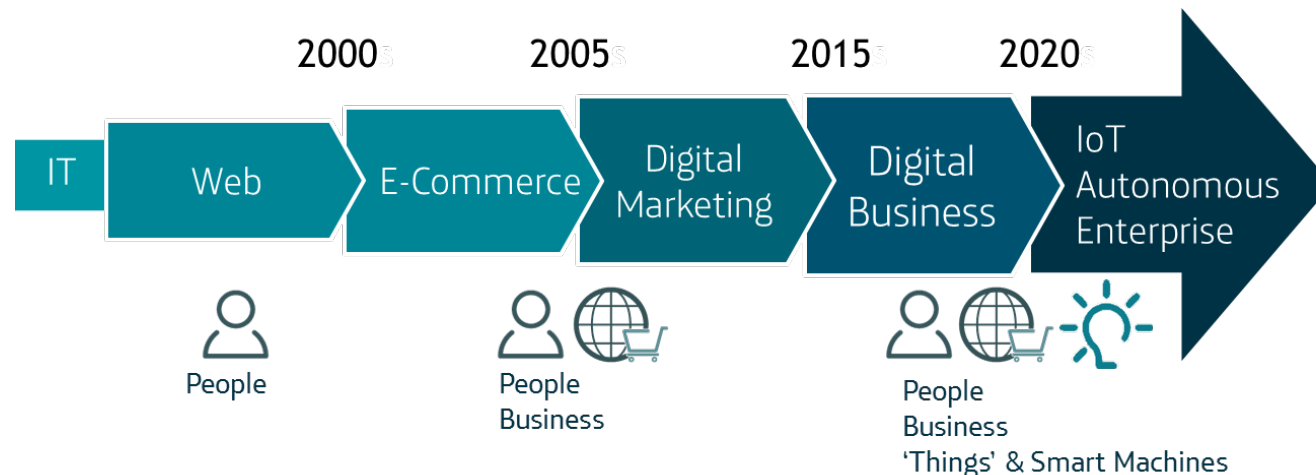
## Future Scope of IoT

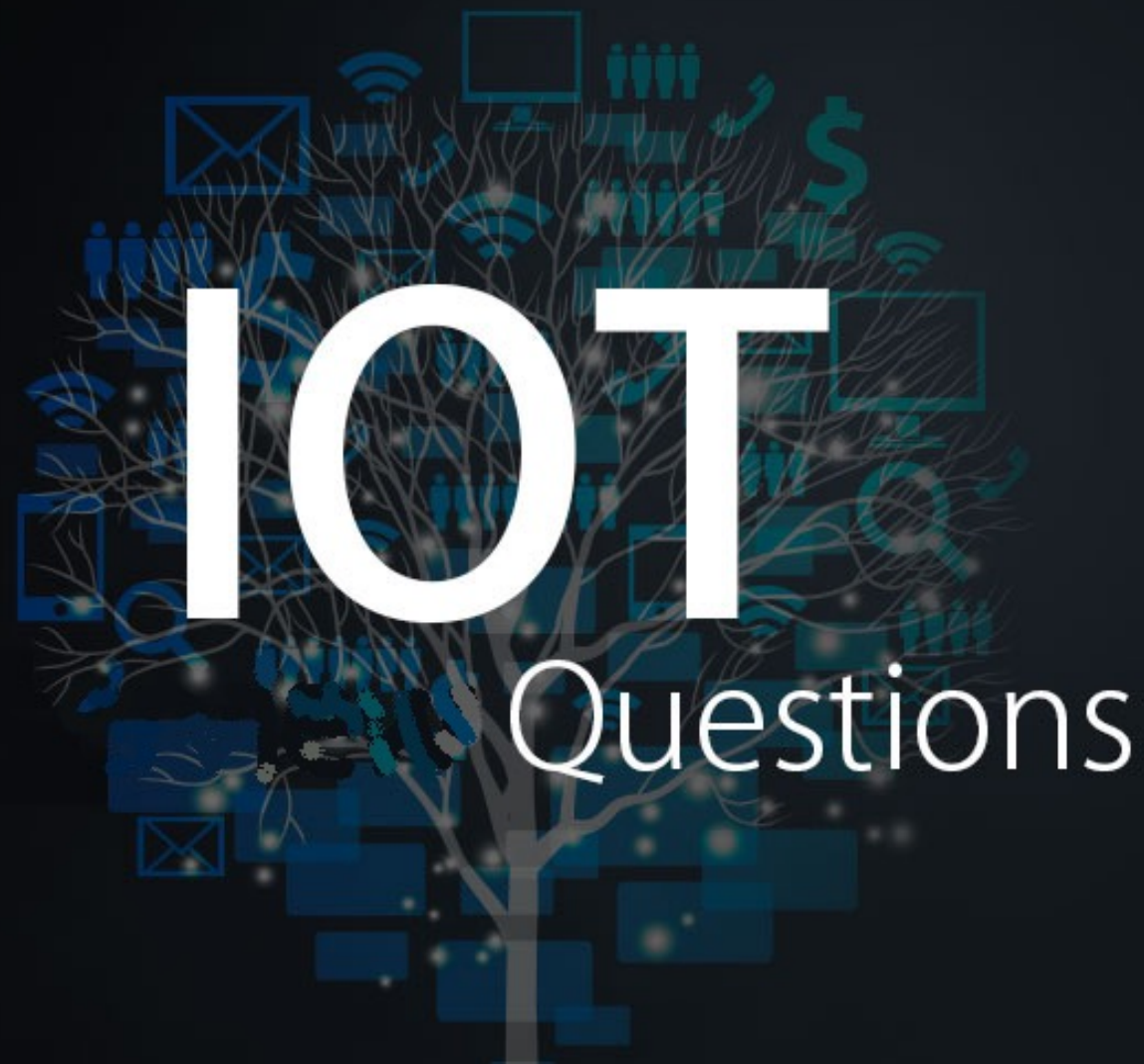


In just 1-year internet connected devices went from 5 million to billions.

IoT iterates, improves and keeps building. Its networks don't arrive pre-assembled, they grow over time. The **Internet of Things (IoT)** has amalgamated hardware and software to the internet to create a smarter world.

It has been growing at a significant pace and offers a multitude of opportunities for government and business. In fact, the number of openings for IoT professionals is at an all-time high.





IoT

Questions