



# ECAP470: CLOUD COMPUTING

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# Learning Outcomes



After this lecture, you will be able to,

- ✓ know about Internet of Things (IoT), Cloud of Things (CoT), and mobile IoT.

# Internet-of-Things (IoT)

Network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

# Internet-of-Things (IoT)

“Thing” in context of IoT:

An entity or physical object that has a unique identifier, an embedded system & ability to transfer data over a network.

# History of IoT



1999

## The IoT Gets a Name

Kevin Ashton coins the term "Internet of things" and establishes MIT's Auto-ID Center, a global research network of academic laboratories focused on RFID and the IoT.

# History of IoT

## KEVIN ASHTON – “FATHER OF THE IOT”



“So you get stuff like the smart wine bottle, the smart bikini, and the smart water bottle. This stuff is not the Internet of Things – this stuff is all rubbish.”

He believed IoT could “turn the world into data” that could be used to make macro decisions on resource utilization.

“Information is a great way to reduce waste and increase efficiency, and that’s really what the Internet of Things provides”

[Source: The Reimagination Thought Leaders Summit ,Sydney, 17 November 2015]

# Growth of IoT

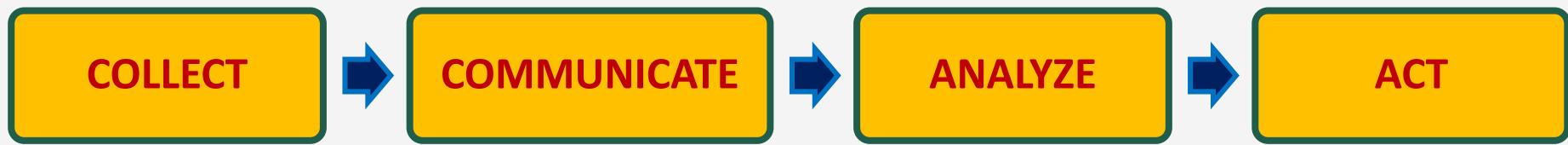
- In 2008, the number of things connected to the Internet was greater than the people living on Earth.
- Within 2020, the number of things connected to the Internet has crossed about 50 billion.

# How IoT Works?

- Also, called **Internet of Everything (IoE)** or **Machine-to-Machine (M2M)**, Skynet.
- Consists of all the **web-enabled devices** that collect, send and act on data they acquire from their surrounding environments using **embedded sensors, processors & communication hardware**.

# How IoT Works?

## IoT Lifecycle



# Structure of IoT

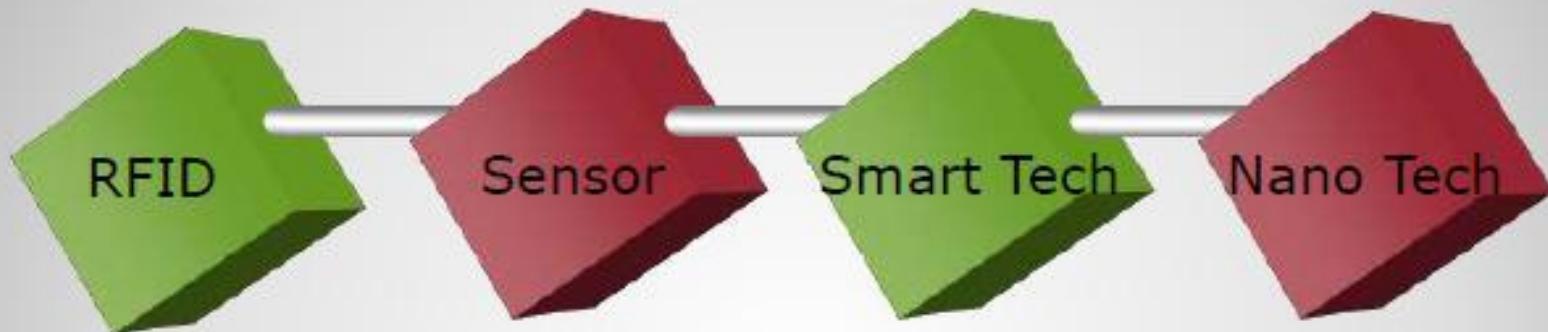
Tagging Things

Feeling Things

Shrinking Things

Thinking Things

# Structure of IoT



To identify  
and track  
the data  
of things

To collect  
and process  
the data to  
detect the  
changes in  
the physical  
status of  
things

To enhance  
the power of  
the network  
by developing  
processing  
capabilities to  
different part  
of the  
network.

To make the  
smaller and  
smaller  
things have  
the ability to  
connect and  
interact.

# Structure of IoT- RFIDs

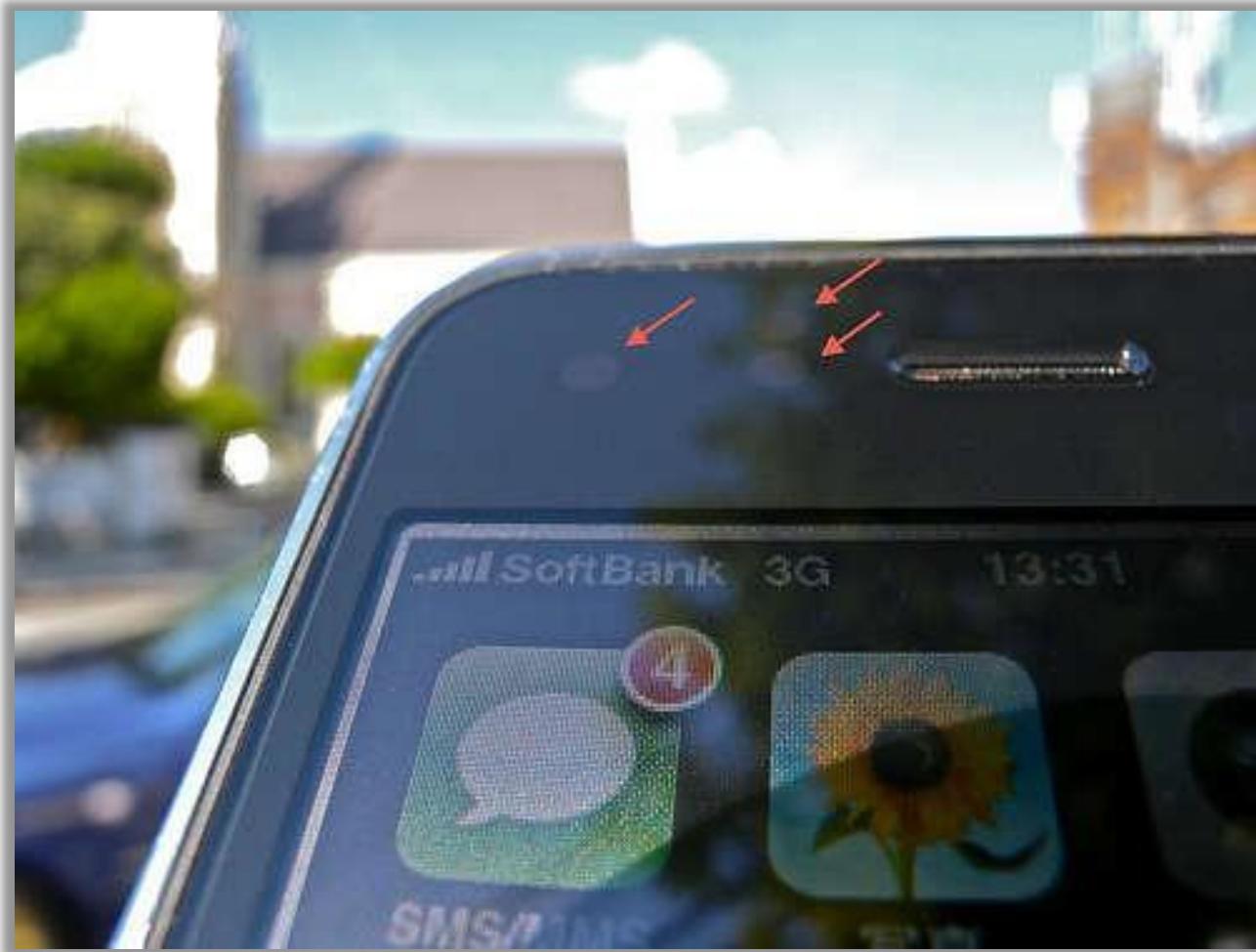
Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects.



# Structure of IoT- WiFi

Widely used both in indoor and outdoor environments.

# Structure of IoT- Sensors and smartphones



# Characteristics of IoT

Intelligence

Connectivity

Dynamic nature

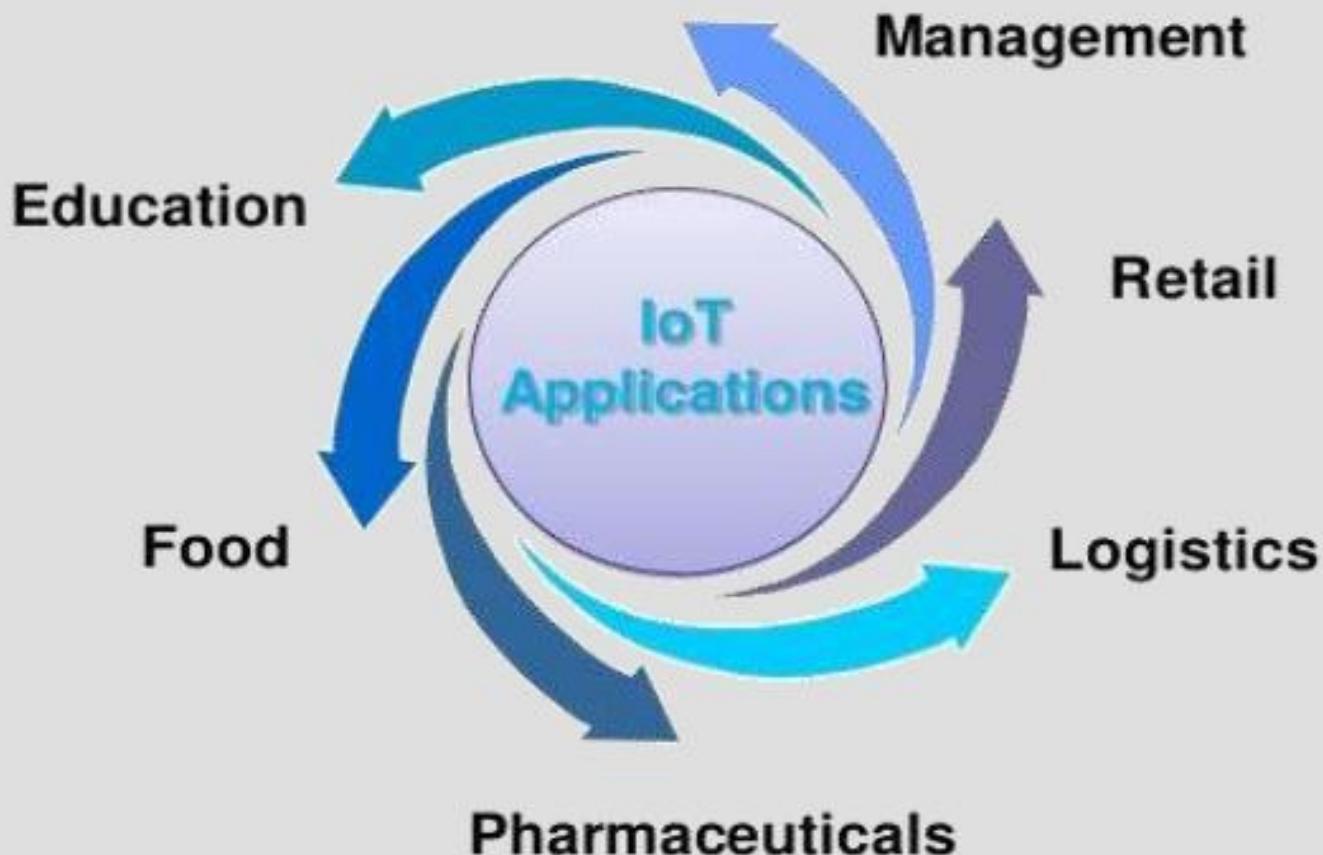
Enormous scale

Sensing

Heterogeneity

Security

# Applications of IoT



# Applications of IoT

- IoT in Food Industry
- IoT in Education
- IoT in Pharmaceuticals
- IoT in Retail
- IoT in Logistics
- IoT in Management

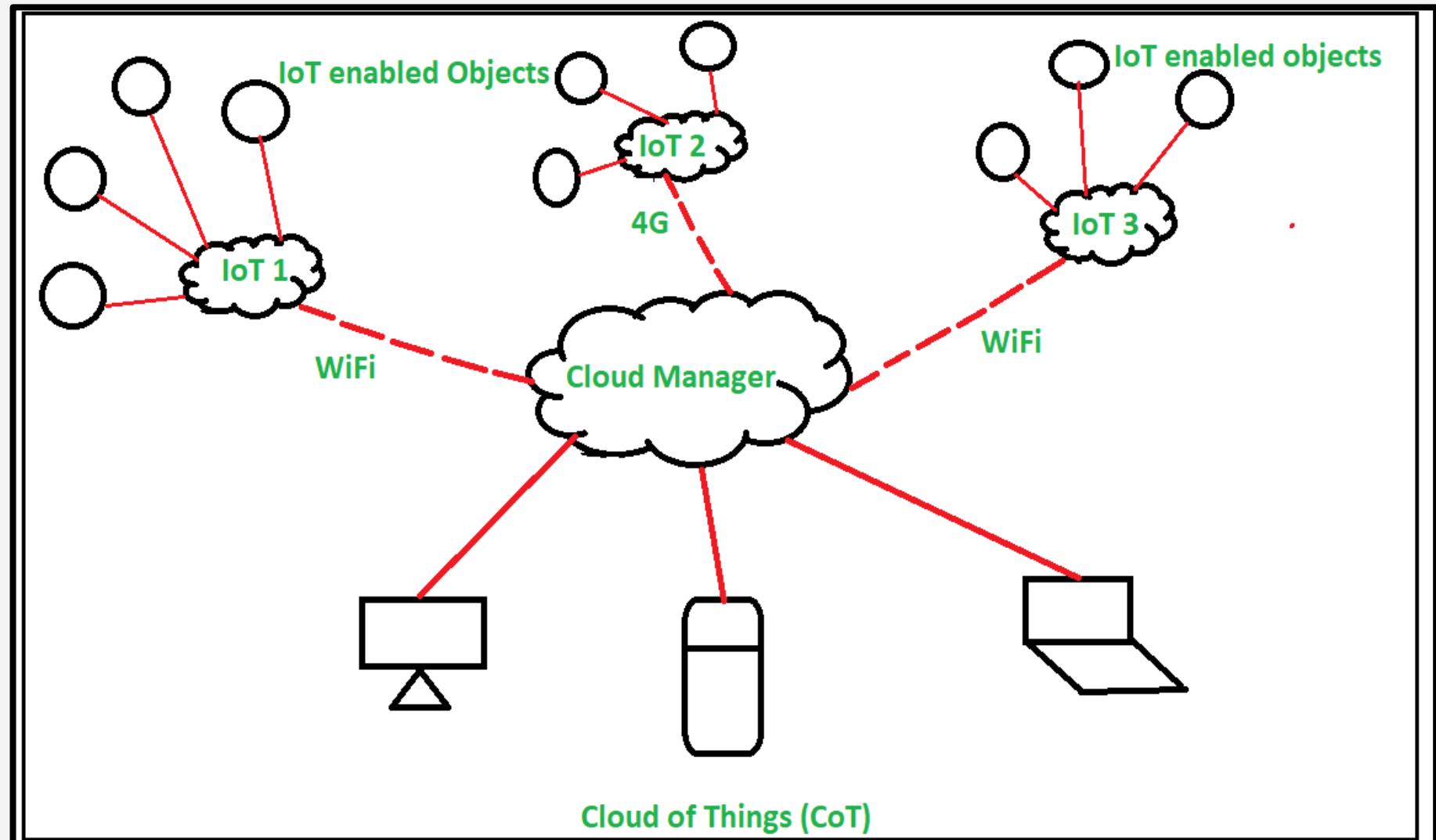
# Cloud of Things (CoT)

- Integration of Internet of Things (IoT) with Cloud Computing (CC).
- A **high-performance cloud-based IoT application platform** which allows to remotely monitor, manage and control the IoT enabled devices.
- Can be used to connect devices and machines and monitor and manage it.

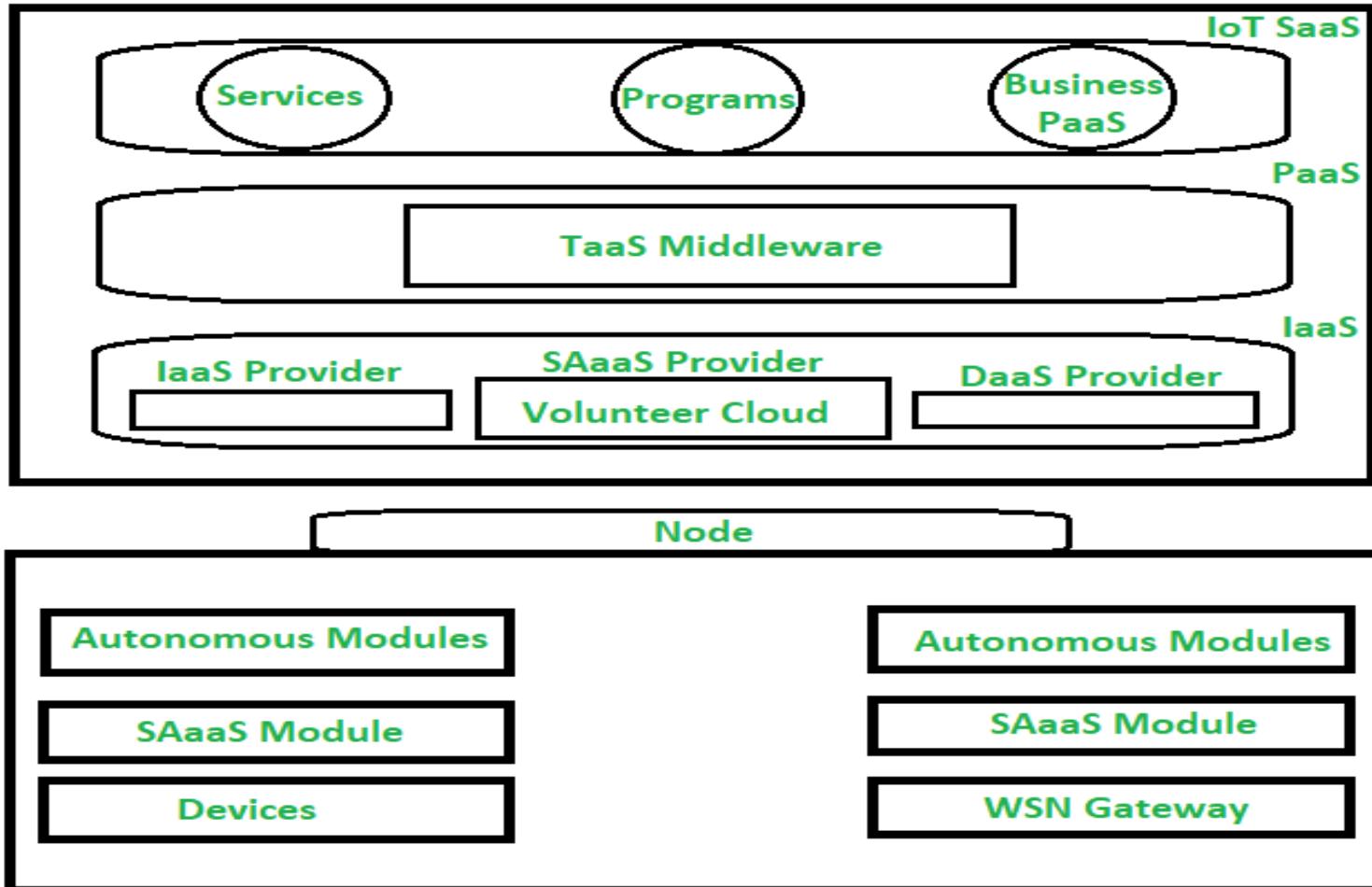
# Cloud of Things (CoT)



# Cloud of Things (CoT)



# Architecture of Cloud of Things (CoT)



# Cloud of Things (CoT)

## Application areas of Cloud of Things (CoT):

- Healthcare
- Smart home
- Smart city
- Smart energy
- Smart mobility
- Smart surveillance
- Smart logistic
- Environmental monitoring

# Mobile Internet of Things (Mobile IoT)

Refers to low power wide area (LPWA) 3GPP standardised secure operator managed IoT networks in licensed spectrum. In particular, LPWA networks designed for IoT applications that are low cost, use low data rates, require long battery lives and often operate in remote and hard to reach locations. Existing cellular networks have evolved to deliver service to billions of new devices providing complete IoT connectivity.

- **Mobile IoT= Trusted IoT**
- **GSMA Mobile IoT**



# Mobile Internet of Things (Mobile IoT)

Why do we need low power wide area networks?

# Mobile Internet of Things (Mobile IoT)

Example of Mobile IoT Provider- BeWhere Inc.

**That's all for now...**