

# Problem Solving with the Internet of Things and Python

## Unit 1

## Unit 1 Topics

- 1.1 What is IOT? What is a Thing?
- 1.2 IOT Connectivity
- 1.3 IOT Communication Protocols
- 1.4 IOT Services
- 1.5 IOT Security

## Unit 1.1

What is IOT? What is a thing?

## What is the Internet of Things?

Let's look at some definitions

### Definition one

“The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.”

### Definition two

“The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data.”

### Definition three

“The Internet of Things is actually a pretty simple concept, **it means taking all the things in the world and connecting them to the internet.**”

### Why connect a “Thing” to the Internet?

“Knowledge is power. Information is liberating.”

- Kofi Annan

## Why connect a “Thing” to the Internet?

Connecting a “thing” to the internet can enhance the “things” abilities and make it more useful.

## Why connect a “Thing” to the Internet?

Connecting a “thing” to the internet can provide  
**new solutions to a problem** and possibly  
**make our lives better or easier** in some way.

## IOT a Brief History

## IOT a Brief History

1999

The Internet of Things term is coined by Kevin Ashton, executive director of the Auto-ID Center at MIT. It was the title of a presentation given to Proctor & Gamble about using RFID in the supply chain.

## IOT is a relatively new idea?

*"When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole.....and the instruments through which we shall be able to do this will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket."*

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## IOT a Brief History

1966

Karl Steinbuch a German computer science pioneer said

*"In a few decades time, computers will be interwoven into almost every industrial product"*

## IOT a Brief History

1990

John Romkey created the first IOT device - a toaster that could be turned on and off over the Internet.



## IOT a Brief History

2008-2009

According to Cisco, more “things or objects” are connected to the internet than people and the Internet of Things is “born”.

## IOT a Brief History

2015

The Congressional Caucus on the Internet of Things is formed to keep lawmakers informed about the developing IOT industry.



IOT Now



Why use IOT as a learning platform?

## The present and future

- **In 2018**—there were 7 billion IoT devices
- **In 2019**—the number of active IoT devices reached 26.66 billion
- **Every second**—127 new IoT devices are connected to the web
- **During 2020**—experts estimate the installation of **31 billion IoT devices**
- **By 2021**—35 billion IoT devices will be installed worldwide
- **By 2025**—more than 75 IoT devices billion will be connected to the web

Why use IOT as a learning platform?

Might as well learn about a growing industry.

## Show me the \$\$\$

- **In 2016**—the global spending on IOT was \$737 billion
- **In 2018**—the North American IOT market generated \$83.9 billion in revenue
- **During 2020**—global spending on IOT should reach \$1.29 trillion
- **By 2021**—the *industrial IOT* market size should reach \$124 billion
- **By 2024**—the global *IOT healthcare* market should reach \$14 billion
- **By 2026**—Experts estimate that the IOT device market will reach \$1.1 trillion

Why use IOT as a learning platform?

Might as well follow the money!

But, I am still confused...

***What is IOT?***  
***What is a THING?***

In general, there are 3 types of  
IOT devices (Things)

1. Devices that collect and send data.
2. Devices that receive and respond to data.
3. Devices that can do both.

Devices that collect and send data.

A remote weather station.

A motion tracker attached to a cow.

A personal fitness tracker, e.g. FitBit

## Devices that receive and respond to data.

A remote controlled light.

An emergency shut off switch on an industrial machine.

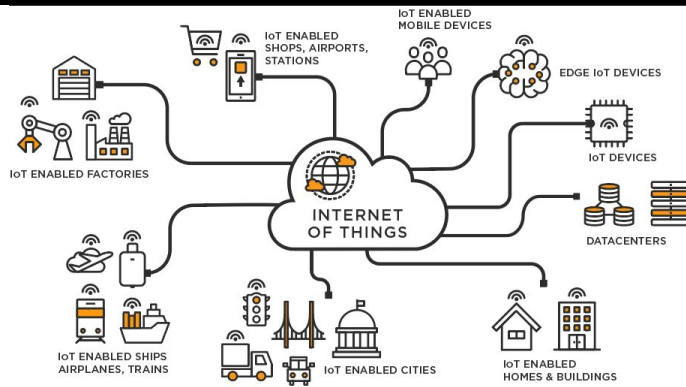
A remote controlled door lock .

## Devices that both collect and send data, and receive and respond to data.

A Tesla.

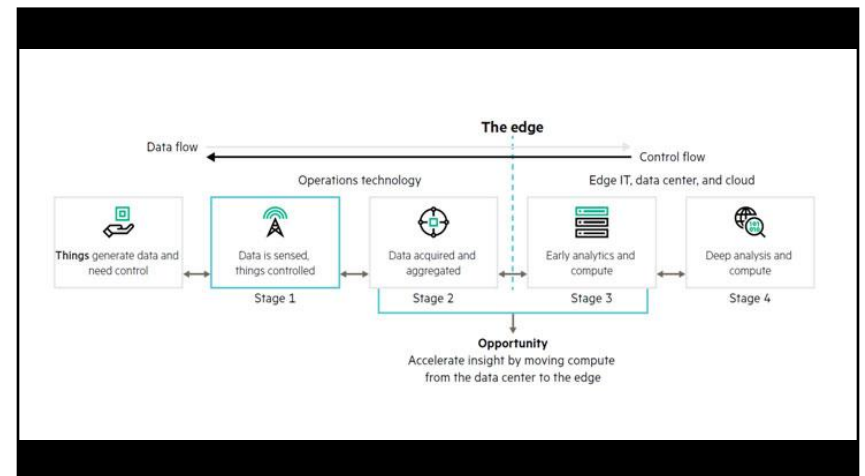
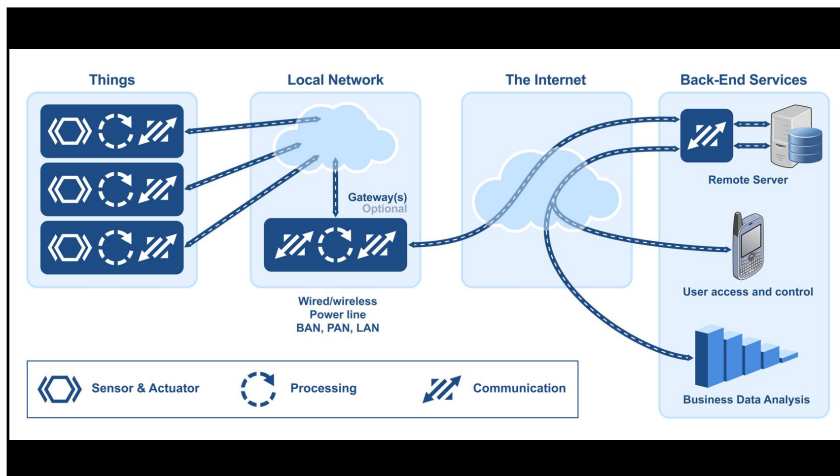
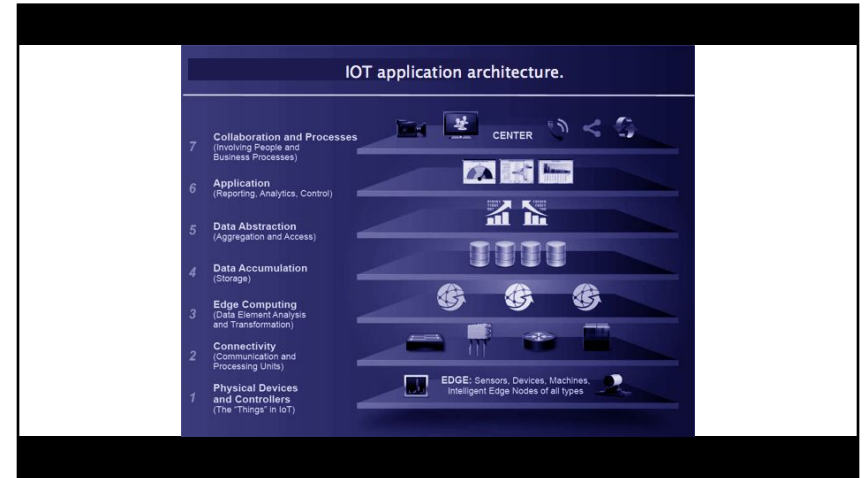
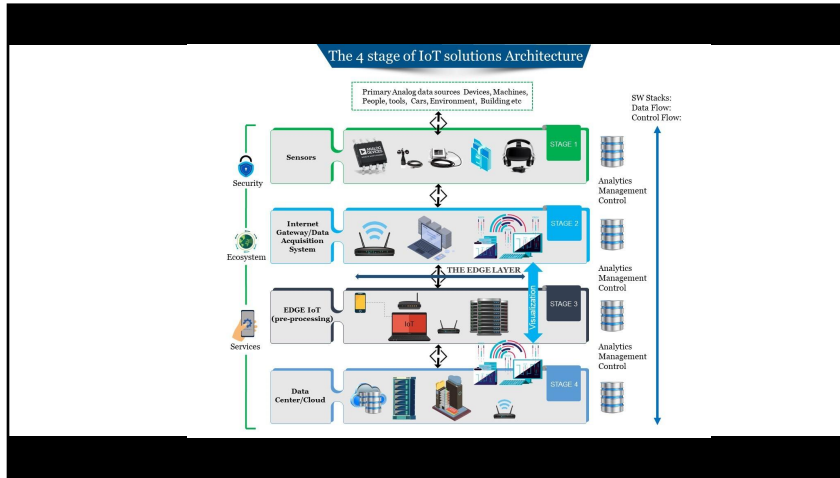
A greenhouse automation system.

A “smart” pill bottle.

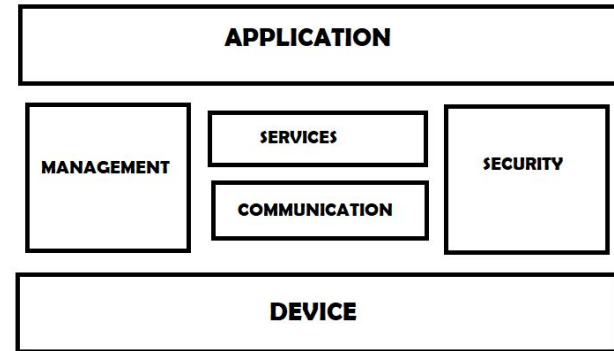
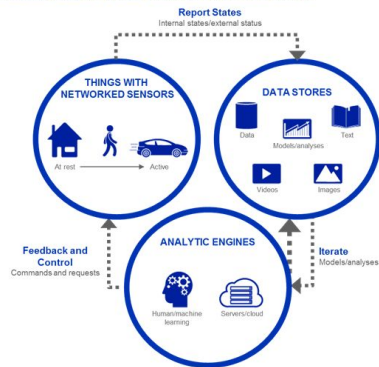


## A BIG PICTURE view of IOT.





Interaction Between the Three Components of the Internet of Things



What is the **BIG PICTURE**  
view of IOT?

It depends who you ask.

Bottom line - IOT is a complex  
System of Systems

The remainder of Unit 1 will highlight some  
different system requirements to create a  
functioning IOT system.

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- 1.6 IOT Power