



# INTRODUCTION TO IOT

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# INTRODUCTION TO INTERNET OF THINGS

- **Internet of Things (IoT)** is a network of physical objects or people called “things” that are embedded with software, electronics, network, and sensors that allows these objects to collect and exchange data. The goal of IoT is to extend to internet connectivity from standard devices like computer, mobile, tablet to relatively dumb devices like a toaster.
- IoT makes virtually everything “smart,” by improving aspects of our life with the power of data collection, AI algorithm, and networks. The thing in IoT can also be a person with a diabetes monitor implant, an animal with tracking devices, etc.
- IoT networking is one of the key features that needs to be supported by IoT. It's connecting things, people, applications, and data, and in order to connect, networking is essential. It connects through the Internet, so that's why we have Internet of Things, IoT, as the overall name for this new emerging technology. It's basically targeted to connect everything that can be controllable and needs to be monitored. It enables remote control, management, interactive integrated services.

# SCOPE OF IOT

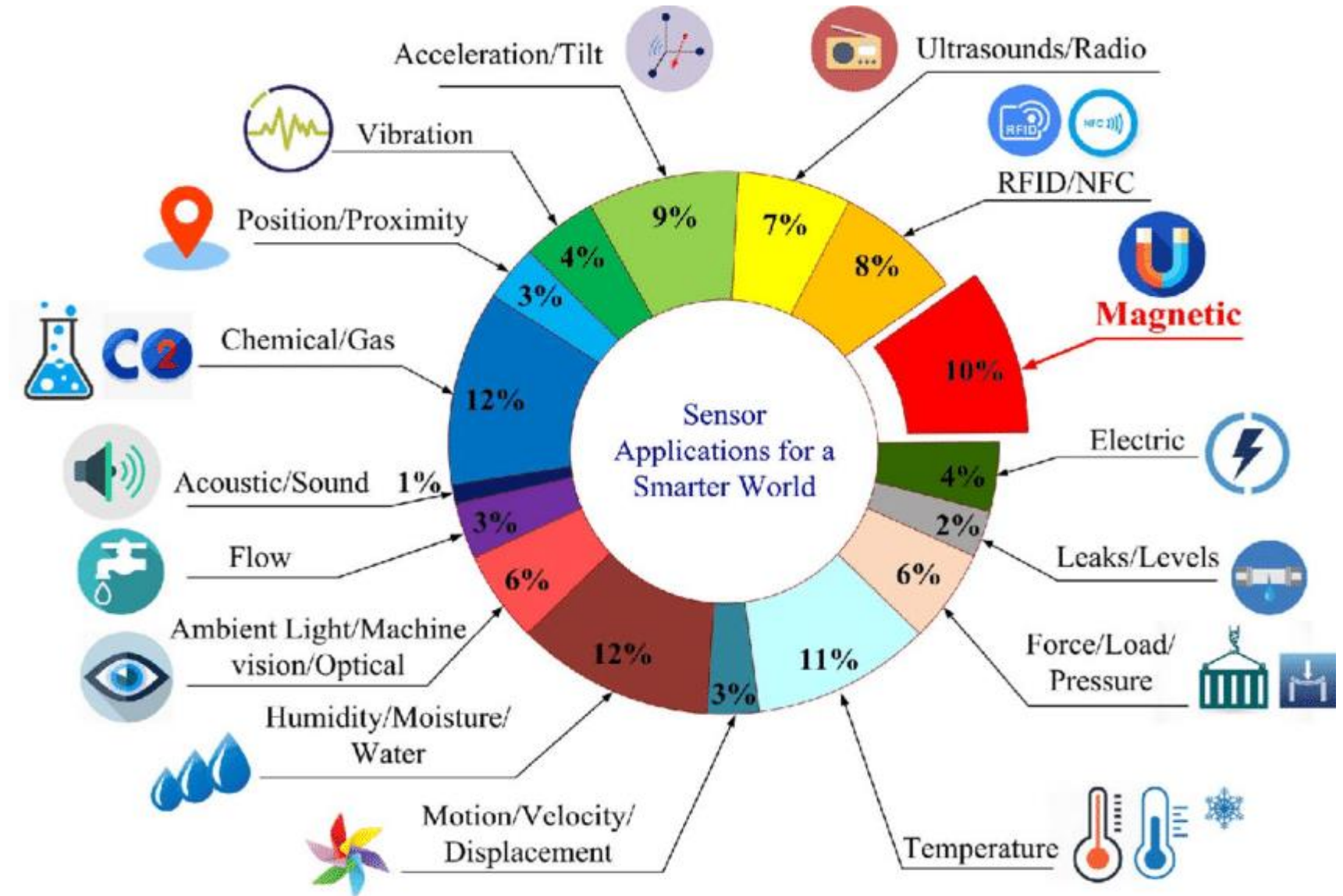
- The number of mobile devices will exceed the number of people on earth. The number of people is approximately 7.6 billion, and the number of mobile devices are expected to exceed this number based on the fact that some people will have more than one smart device, more than one mobile device supporting their needs. Think about it already, you may have a smart tablet or a smart pad, as well as a smartphone. In addition, you may have a smartwatch. Soon in the future, you're going to have smart glasses that support augmented reality, and various virtual reality interactive services, and there was going to be smart wearable devices such as your shoes, your belt, your necktie, and various other components. Considering that, expecting for the number of mobile devices, especially smart devices to exceed the number of people, that is very obvious.
- Then predictions are made that there will be 50 billion things connected to the Internet by 2020, that is a tremendous number. In addition, you need to consider the fact that look at the overall population of 7.6 billion compared to the 50 billion things. So therefore, in our workplace when we're transporting from home to our office or back, or what we have at home, you consider the number of things that are surrounding individual users and then you average it out, then you can see the massive spectrum of where and how IoT devices will be placed. That's what makes IoT service supports so important and we have so much to do in this area.

# WHAT IS SENSOR?

- A device that gives an output by detecting the changes in quantities or events can be defined as a sensor. In general, sensors are termed as the devices that generate an electrical signal or optical output signal corresponding to the variations in the level of inputs.
- **Different Types of Sensors in Electronics**
- In our day-to-day life, we are habituated to implement different types of sensors frequently in our power systems such as electrical and electronics appliances, load control systems, home automation or industrial automation, and so on.
- All types of sensors can be basically classified into analog sensors and digital sensors. But, there are a few types of sensors such as temperature sensors, IR sensors, ultrasonic sensors, pressure sensors, proximity sensors, and touch sensors are frequently used in most electronics applications.



1. Temperature Sensor
2. IR Sensor
3. Ultrasonic Sensor
4. Touch Sensor
5. Proximity Sensors
6. Pressure Sensor
7. Level Sensors
8. Smoke and Gas Sensors
9. Vibration Sensor
10. Magnetic Sensor etc.

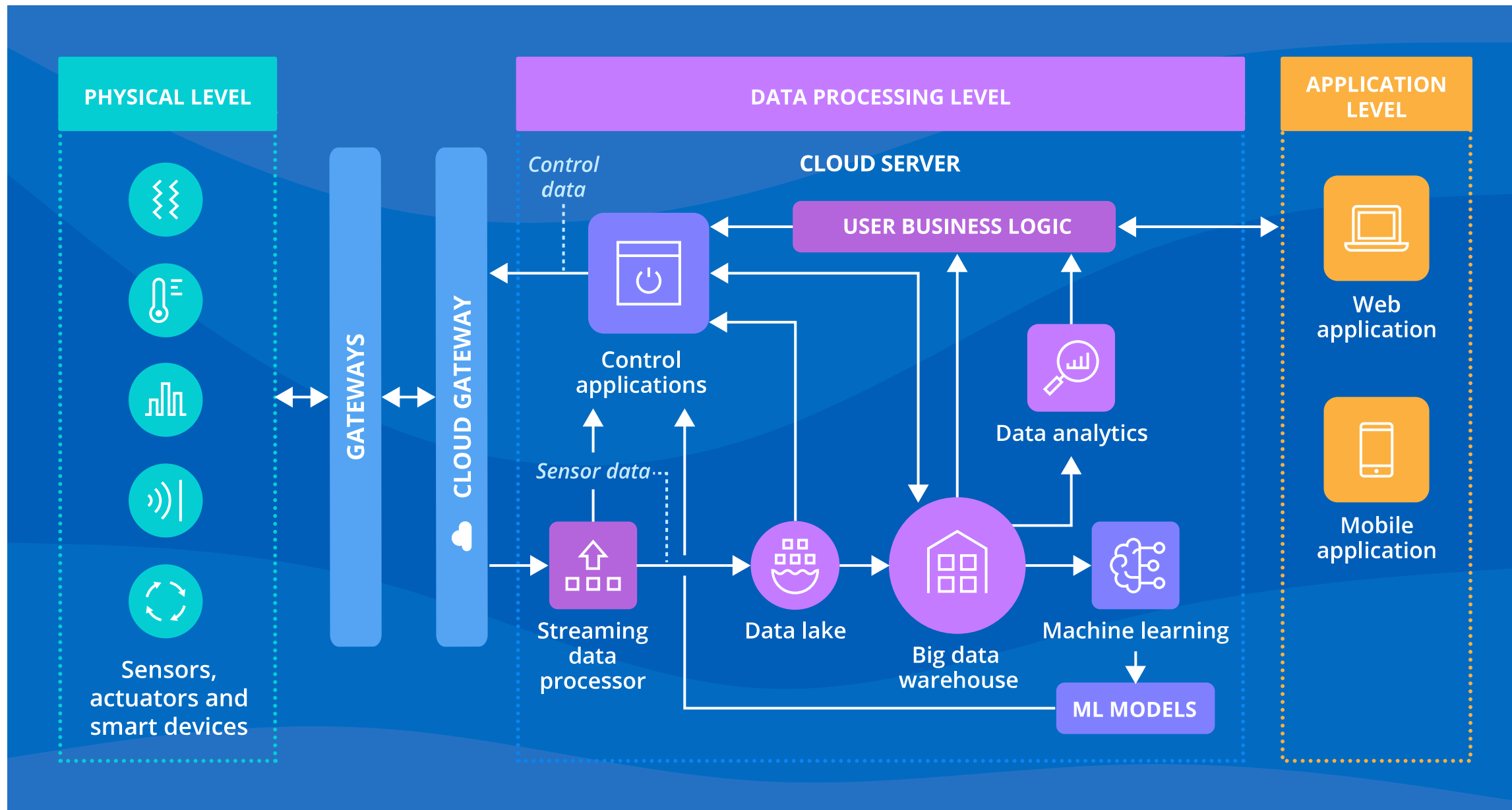


# HISTORY OF IOT

- 1970- The actual idea of connected devices was proposed
- 1990- John Romkey created a toaster which could be turned on/off over the Internet
- 1995- Siemens introduced the first cellular module built for M2M
- 1999- The term “Internet of Things” was used by Kevin Ashton during his work at P&G which became widely accepted
- 2004 – The term was mentioned in famous publications like the Guardian, Boston Globe, and Scientific American
- 2005-UN’s International Telecommunications Union (ITU) published its first report on this topic.
- 2008- The Internet of Things was born
- 2011- Gartner, the market research company, include “The Internet of Things” technology in their research

# MAKING DEVICE IOT ENABLED


- Some advanced IoT devices will need to collect, analyze, and process segments of raw sensor data and turn it into operational control information. You can think of it this way, when I say raw sensor data, these are numbers, these are metric values, these are symbols, these are text values that may not have specific meaning.
- However, once you collect it and you put it together with other information that is collected together, then you get information, something that has a meaning to it, something that gives you directions, something that tells you about an alarm, or what to do, or what not to do. Typically, that's what we mean of transforming data into information.
- Well, some sensor databases may have massive sizes due to the large number of IoT devices. Then IoT databases will need Cloud Computing support because of this massive size of data that is collected. In addition, in order to make data that we have coming down and turning it into information, then Cloud Computing is also going to play the foundation of where the Big Data technology is applied. This will enable for Cloud services to support the transformation of information through our original data sources. In order to do that, what the Cloud engine needs to do is first, it will use various filtering technologies to filter out the useless information, integrate what is important, weight the more important ones compared to the less important ones, aggregated into a form such that we can get exactly answers to what we want to know, and that is going to be our core information.





# HOW IOT WORKS?

- The entire IoT process starts with the devices themselves like smartphones, smartwatches, electronic appliances like TV, Washing Machine which helps you to communicate with the IoT platform.
- Four fundamental components of an IoT system :
- **1) Sensors/Devices:** Sensors or devices are a key component that helps you to collect live data from the surrounding environment. All this data may have various levels of complexities. It could be a simple temperature monitoring sensor, or it may be in the form of the video feed.
- A device may have various types of sensors which performs multiple tasks **apart** from sensing. Example, A mobile phone is a device which has multiple sensors like GPS, camera but your smartphone is not able to sense these things.
- **2) Connectivity:** All the collected data is sent to a cloud infrastructure. The sensors should be connected to the cloud using various mediums of communications. These communication mediums include mobile or satellite networks, Bluetooth, Wi-Fi, WAN, etc.



**3) Data Processing:** Once that data is collected, and it gets to the cloud, the software performs processing on the gathered data. This process can be just checking the temperature, reading on devices like AC or heaters. However, it can sometimes also be very complex like identifying objects, using computer vision on video.

**4) User Interface:** The information needs to be available to the end-user in some way which can be achieved by triggering alarms on their phones or sending them notification through email or text message. The user sometimes might need an interface which actively checks their IoT system.

For example, the user has a camera installed in his home. He wants to access video recording and all the feeds with the help of a web server.

However, it's not always one-way communication. Depending on the IoT application and complexity of the system, the user may also be able to perform an action which may create cascading effects.

For example, if a user detects any changes in the temperature of the refrigerator, with the help of IoT technology the user should be able to adjust the temperature with the help of their mobile phone.

# CHALLENGES OF INTERNET OF THINGS (IOT)

- At present IoT is faced with many challenges, such as:
  - Insufficient testing and updating
  - Concern regarding data security and privacy
  - Software complexity
  - Data volumes and interpretation
  - Integration with AI and automation
  - Devices require a constant power supply which is difficult
  - Interaction and short-range communication

# ADVANTAGES OF IOT

- Key benefits of IoT technology are as follows:
- **Technical Optimization:** IoT technology helps a lot in improving technologies and making them better. Example, with IoT, a manufacturer is able to collect data from various car sensors. The manufacturer analyzes them to improve its design and make them more efficient.
- **Improved Data Collection:** Traditional data collection has its limitations and its design for passive use. IoT facilitates immediate action on data.
- **Reduced Waste:** IoT offers real-time information leading to effective decision making & management of resources. For example, if a manufacturer finds an issue in multiple car engines, he can track the manufacturing plan of those engines and solves this issue with the manufacturing belt.
- **Improved Customer Engagement:** IoT allows you to improve customer experience by detecting problems and improving the process.

# DISADVANTAGES OF IOT

- Now, let's see some of the disadvantages of IoT in this Internet of Things tutorial:
- **Security:** IoT technology creates an ecosystem of connected devices. However, during this process, the system may offer little authentication control despite sufficient security measures.
- **Privacy:** The use of IoT, exposes a substantial amount of personal data, in extreme detail, without the user's active participation. This creates lots of privacy issues.
- **Flexibility:** There is a huge concern regarding the flexibility of an IoT system. It is mainly regarding integrating with another system as there are many diverse systems involved in the process.
- **Complexity:** The design of the IoT system is also quite complicated. Moreover, its deployment and maintenance also not very easy.
- **Compliance:** IoT has its own set of rules and regulations. However, because of its complexity, the task of compliance is quite challenging.



# IOT BEST PRACTICES

- Design products for reliability and security
- Use strong authentication and security protocols
- Disable non-essential services
- Ensure Internet-managed, and IoT management hubs & services are secured
- Energy efficient algorithms should be designed for the system to be active longer.

# SUMMARY

- Introduction to Internet of Things (IoT): The Internet of Things (IoT) is a network of physical objects or people called “things” that are embedded with software, electronics, network, and sensors which allows these objects to collect and exchange data.
- The actual idea of connected devices was proposed in 1970
- Four Key components of IoT framework are 1) Sensors/Devices, 2) Connectivity, 3) Data Processing, 4) User Interface
- Various applications of IoT are Smart Thermostats, Connected Cars, Activity Trackers, Smart Outlets, Connect Health, etc.
- Technical Optimization, Improve Data Collection, Reduced Waste, Improved Customer Engagement are key benefits of IoT
- Security, Privacy, Complexity, Compliance, are key challenges of IoT



THANK YOU