**INTERNET OF THINGS**

**Assignment – 1**

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**Features of IOT**

#### **1. Connectivity**

In the case of IoT, the most important feature one can consider is connectivity. Without seamless communication among the interrelated components of the IoT ecosystems (i.e sensors, compute engines, data hubs, etc.) it is not possible to execute any proper business use case. [IoT devices](https://www.educba.com/iot-devices/) can be connected over Radio waves, Bluetooth, Wi-Fi, Li-Fi, etc. We can leverage various protocols of internet connectivity layers in order to maximize efficiency and establish generic connectivity across IoT ecosystems and Industry. There may be special cases where the IoT ecosystem is built on-premises or in an intranet.

#### **2. Sensing**

We humans can naturally understand and analyze our circumstances easily based on our past experiences with various things or situations. In the case of IoT in order to get the best of it, we need to read the analog signal, convert it in such a way that we can derive meaningful insights out of it. We use Electrochemical, gyroscope, pressure, light sensors, GPS, Electrochemical, pressure, RFID, etc. to gather data based on a particular problem. For example for automotive use cases, we use Light detection sensors along with pressure, velocity and imagery sensors. To make a use case successful we need to choose the proper sensing paradigm.

#### **3. Active Engagements**

IoT device connects various products, cross-platform technologies and services work together by establishing an active engagement between them. In general, we use [cloud computing](https://www.educba.com/what-is-cloud-computing/) in blockchain to establish active engagements among IoT components. In the case of Industry grade, IoT solutions raw analog data need to be acquired, preprocessed and rescale as per business capacity. As per Google, only 50% of structured and 1% of unstructured data is used to make important business decisions. So while designing the IoT ecosystems carriers need to consider the future needs of manipulating such a huge scale of data to satisfy incremental business needs. One can confuse the need of active engagements with scale, practically it means your systems should be able to handle huge data across various technologies, platforms, products, and industries.

#### **4. Scale**

IoT devices should be designed in such a way that they can be scaled up or down easily on demand. In general, IoT is being used from smart home automation to automating large factories and work stations, so the use cases vary in scale. A carrier should design their IoT infrastructure depending upon their current and future engagement scale.

#### **5. Dynamic Nature**

For any IoT use case, the first and foremost step is to collecting and converting data in such a way that means business decisions can be made out of it. In this whole process, various [components of IoT](https://www.educba.com/components-of-iot/) need to change their state dynamically. For example, the input of a temperature sensor will vary continuously based on weather conditions, locations, etc. IoT devices should be designed this keeping in mind.

#### **6. Intelligence**

In almost every IoT use cases in today’s world, the data is used to make important business insights and drive important business decisions. We develop machine learning/ deep learning models on top of this massive data to obtain valuable insights. The analog signals are preprocessed and converted to a format on which [machine-learning models](https://www.educba.com/machine-learning-models/) are trained. We need to keep in mind the proper data infrastructure based on business needs.

#### **7. Energy**

From end components to connectivity and analytics layers, the whole ecosystems demand a lot of energy. While designing an IoT ecosystem, we need to consider design methodology such that energy consumption is minimal.

#### **8. Safety**

One of the main features of the IoT ecosystem is security. In the whole flow of an IoT ecosystem, sensitive information is passed from endpoints to the analytics layer via connectivity components. While designing an IoT system we need to adhere to proper safety, security measures, and firewalls to keep the data away from misuse and manipulations. Compromising any component of an IoT ecosystem can eventually lead to failure of the whole pipeline.

#### **9. Integration**

IoT integrates various cross-domain models to enrich user experience. It also ensures proper trade-off between infrastructure and operational costs.

Applications of IOT :

**1. Smart Homes**

One of the best and the most practical applications of IoT, smart homes really take both, convenience and home security, to the next level. Though there are different levels at which IoT is applied for smart homes, the best is the one that blends intelligent utility systems and entertainment together. For instance, your electricity meter with an IoT device giving you insights into your everyday water usage, your set-top box that allows you to record shows from remote, Automatic Illumination Systems, Advanced Locking Systems, Connected Surveillance Systems all fit into this concept of smart homes. As IoT evolves, we can be sure that most of the devices will become smarter, enabling enhanced home security.

### 2. ****Smart City****

Not just internet access to people in a city but to the devices in it as well – that’s what smart cities are supposed to be made of. And we can proudly say that we’re going towards realizing this dream. Efforts are being made to incorporate connected technology into infrastructural requirements and some vital concerns like Traffic Management, Waste Management, Water Distribution, Electricity Management, and more. All these work towards eliminating some day-to-day challenges faced by people and bring in added convenience.

### 3. ****Self-driven Cars****

We’ve seen a lot about self-driven cars. Google tried it out, Tesla tested it, and even Uber came up with a version of self-driven cars that it later shelved. Since it’s human lives on the roads that we’re dealing with, we need to ensure the technology has all that it takes to ensure better safety for the passenger and those on the roads.

The cars use several sensors and embedded systems connected to the Cloud and the internet to keep generating data and sending them to the Cloud for informed decision-making through Machine Learning. Though it will take a few more years for the technology to evolve completely and for countries to amend laws and policies, what we’re witnessing right now is one of the best applications of IoT.

### 4. ****IoT Retail Shops****

If you haven’t already seen the video of Amazon Go – the concept store from the eCommerce giant, you should check it out right away. Perhaps this is the best use of the technology in bridging the gap between an online store and a retail store. The retail store allows you to go cashless by deducting money from your Amazon wallet. It also adds items to your cart in real-time when you pick products from the shelves.

If you change your mind and pick up another article, the previous one gets deleted and replaces your cart with the new item. The best part of the concept store is that there is no cashier to bill your products. You don’t have to stand in line but just step out after you pick up your products from shelves. If this technology is effective enough to fetch more patronage, this is sure to become a norm in the coming years.

### 5. ****Farming****

Farming is one sector that will benefit the most from the Internet of Things. With so many developments happening on tools farmers can use for agriculture, the future is sure promising. Tools are being developed for Drip Irrigation, understanding crop patterns, Water Distribution, drones for Farm Surveillance, and more. These will allow farmers to come up with a more productive yield and take care of the concerns better.

### 6. ****Wearables****

Wearables remain a hot topic in the market, even today. These devices serve a wide range of purposes ranging from medical, wellness to fitness. Of all the IoT startups, Jawbone, a wearables maker, is second to none in terms of funding.

### ****7. Smart Grids****

One of the many useful IoT examples, a smart grid, is a holistic solution that applies an extensive range of Information Technology resources that enable existing and new gridlines to reduce electricity waste and cost. A future smart grid improves the efficiency, reliability, and economics of electricity.

### 8. ****Industrial Internet****

The Industrial Internet of Things consists of interconnected sensors, instruments, and other devices connected with computers’ industrial applications like manufacturing, energy management, etc. While still being unpopular in comparison to IoT wearables and other uses, market researches like Gartner, Cisco, etc., believe the industrial internet to have the highest overall potential.

### 9. ****Telehealth****

 Telehealth, or Telemedicine, hasn’t completely flourished yet. Nonetheless, it has great future potential. IoT Examples of Telemedicine include the digital communication of Medical Imaging, Remote Medical Diagnosis & Evaluations, Video Consultations with Specialists, etc.

### 10. ****Smart Supply-chain Management****

Supply-chains have stuck around in the market for a while now. A common example can be Solutions for tracking goods while they are on the road. Backed with IoT technology, they are sure to stay in the market for the long run.

### ****11. Traffic monitoring****

The Internet of things can be very useful in the management of vehicular traffic in large cities, contributing to the concept of smart cities.

**When we use our mobile phones as sensors, which collect and share data from our vehicles through applications such as Waze or Google Maps, we are using the Internet of Things to inform us and at the same time contribute to traffic monitoring,** showing the conditions of the different routes, and feeding and improving the information on the different routes to the same destination, distance, estimated time of arrival.

### ****12. Fleet management****

The installation of sensors in fleet vehicles helps to establish an effective interconnectivity between the vehicles and their managers as well as between the vehicles and their drivers. Both driver and manager/ owner can know all kinds of details about the status, operation and needs of the vehicle, just by accessing the [*software*](https://www.fracttal.com/pt/fracttal-on-board?hsLang=en) in charge of collecting, processing and organizing the data. Even, receive alarms in real time of maintenance incidents without having been detected by the driver.

**The application of the Internet of Things to fleet management assists with geolocation (and with it the monitoring of routes and identification of the most efficient routes), performance analysis, telemetry control and fuel savings , the reduction of polluting emissions to the environment and can even provide valuable information to improve the driving of vehicles.**

### ****13. Hospitality.****

The application of the IoT to the hotel industry brings with it interesting improvements in the quality of the service. **With the implementation of electronic keys, which are sent directly to the mobile devices of each guest, it is possible to automate various interactions.**Thus, the location of the guests, the sending of offers or information on activities of interest, the realization of orders to the room or room service , the automatic charge of accounts to the room or the request of personal hygiene supplies, are activities that can be easily managed through integrated applications using the Internet of Things technology.

With the use of electronic keys, the check-out process is automated, disabling the operation of doors, offering information about the rooms immediately available, and even assigning housekeeping tasks to maintenance personnel.

## **14. Industrial Automation**

This is one of the fields where both faster developments, as well as the quality of products, are the critical factors for a higher Return on Investment. With IoT Applications, one could even re-engineer products and their packaging to deliver better performance in both cost and customer experience. IoT here can prove to be game changing with solutions for all the following domains in its arsenal.

* **Factory Digitalization**
* **Product flow Monitoring**
* **Inventory Management**
* **Safety and Security**
* **Quality Control**
* **Packaging optimization**
* **Logistics and Supply Chain Optimization**

### 15. Connected Cars

The automotive digital technology has focused on optimizing vehicles internal functions. But now, this attention is growing towards enhancing the in-car experience.

A connected car is a vehicle which is able to optimize it’s own operation, maintenance as well as comfort of passengers using onboard sensors and internet connectivity.

Most large auto makers as well as some brave startups are working on connected car solutions. Major brands like Tesla, BMW, Apple, Google are working on bringing the next revolution in automobiles.

### 16.Energy Engagement

Power grids of the future will not only be smart enough but also highly reliable. Smart grid concept is becoming very popular all over world.

The basic idea behind the smart grids is to collect data in an automated fashion and analyze the behavior or electricity consumers and suppliers for improving efficiency as well as economics of electricity use.

Smart Grids will also be able to detect sources of power outages more quickly and at individual household  levels like near by solar panel, making possible distributed energy system.

### 17.IoT in Poultry and Farming

Livestock monitoring is about animal husbandry and cost saving. Using IoT applications to gather data about the health and well being of the cattle, ranchers knowing early about the sick animal can pull out and help prevent large number of sick cattle.

**18.Media & Entertainment**

An entertainment design and production firm uses sensors in turnstiles of venues to understand the foot traffic of people at events. Their IoT application visualizes the attendee traffic patterns in real time to help sponsors understand the best places to advertise, and to ensure the attendee count stays within the fire code compliance of the venue.

**19.Airline**

An equipment tracking app provides an airline’s engineers with a live view of the locations of each piece of maintenance equipment. By increasing the efficiency of engineers, this IoT application is not only generating significant cost savings and process improvements, but also impacting the customer experience in the end through more reliable, on-time flights.

**20.Insurance**

An insurance company offers policyholders discounts for wearing Internet-connected Fitbit wristbands. The fitness tracking service is part of the insurer’s Vitality program aimed at integrating wellness benefits with life insurance. Through this IoT application, this insurer is creating smart life insurance products and rewarding customers for their positive actions.