Internet Of Things

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Abstract

The Internet of Things(IoT) responds a vision in which the Internetextends into the real world embracing everyday objects. Physical items are no longer disconnected from the virtual world but can controlled remotely and can act as physical access points to Internet services. Ubiquitous sensing enabled by Wireless Sensor Network(WSN) technologies cuts across many areas of modern day living. This offers the ability to measure, infer and understand environmental indicators, from delicate ecologies and natural resources to urban environments. The proliferation of these devices in a communicating actuating network creates the Internet of Things (IoT). Wherein, sensors and actuators blend seamlessly with the environment around us, and the information is shared across platforms to develop a common operating picture (COP). As we move from www (static pages web) to web2 (social networking web) to web3 (ubiquitous computing web) the need for data-on-demand using sophisticated intuitive queries increases significantly.

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Introduction

The next wave in the era of computing will be outside the realm of the traditional desktop. In the Internet of Things (IoT) paradigm, many of the objects that surround us will be on the network in one form or another. Radio Frequency IDentification (RFID) and sensor network technologies will rise to meet this new challenge, in which information and communication systems are invisibly embedded in the environment around us. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based system, and resulting in improved efficiency, accuracy and economics benefit.

Considering it to the next level, linked devices can help the people personally like you get an alert from the refrigerator reminding you to shop some vegetables when the vegetable tray is empty, our home security systems enables you to open the door for some guest with help of connected devices (IoT). Since there is a massive growth in number of devices day by day, the amount of data generated would also be enormous.

1.How it works?

Many of us have dreamed of smart homes where our appliances do our bidding automatically. The alarm sounds and the coffee pot start brewing the moment you want to start your day. Lights come on as you walk through the house. Some unseen computing device responds to your voice commands to read your schedule and messages to you while you get ready, then turns on the TV news. Your car drives you to work via the least congested route, freeing you up to get caught up on your reading or prep for your morning meeting while in transit.

We've read and seen such things in science fiction for decades, but they're now either already possible or on the brink of coming into being. And all this new tech is forming the basis of what people are calling the Internet of Things.

1.1Without Authentication There is no Security

The Internet of Things (IoT), also sometimes referred to as the Internet of Everything (IoE), consists of all the web-enabled devices that collect, send and act on data they acquire from their surrounding environments using embedded sensors, processors and communication hardware. These devices, often called "connected" or "smart" devices, can sometimes talk to other related devices, a process called **machine-to-machine**(M2M) communication, and act on the information they get from one another. Humans can interact with the gadgets to set them up, give them instructions or access the data, but the devices do most of the work on their own without human intervention. Their existence has been made possible by all the tiny mobile components that are available these days, as well as the always-online nature of our home and business networks.

Connected devices also generate massive amounts of Internet traffic, including loads of data that can be used to make the devices useful, but can also be mined for other purposes. All this new data, and the Internet-accessible nature of the devices, raises both privacy and security concerns.

But this technology allows for a level of real-time information that we've never had before. We can monitor our homes and families remotely to keep them safe. Businesses can improve processes to increase productivity and reduce material waste and unforeseen downtime. Sensors in city infrastructure can help reduce road congestion and warn us when infrastructure is in danger of crumbling. Gadgets out in the open can monitor for changing environmental conditions and warn us of impending disasters. These devices are popping up everywhere, and these abilities can be used to enhance nearly any physical object.

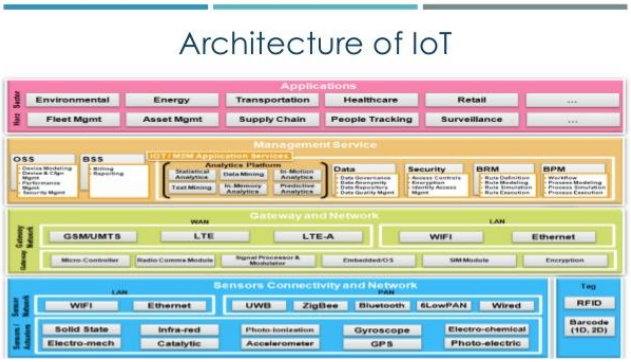
2. Architecture of IoT

The Internet of Things provides solutions based on the integration of information technology, which refers to hardware and software used to store, retrieve, and process data and communications technology which includes electronic systems used for communication between individuals or groups. The rapid convergence of information and communications technology is taking place at three layers of technology innovation: the cloud, data and communication pipes/networks and device. The synergy of the access and potential data exchange opens huge new possibilities for IoT applications. Already over 50% of Internet connections are between or with things. In 2011 there were over 15 billion things on the Web, with 50 billion+ intermittent connections. By 2020, over 30 billion connected things, with over 200 billion with intermittent connections are forecast. Key technologies here include embedded sensors, image recognition and NFC. By 2015, in more than 70%of enterprises, a single executable will oversee all Internet connected things. This becomes the Internet of Everything.

As a result of this convergence, the IoT applications require that classical industries are adapting and the technology will create opportunities for new industries to emerge and to deliver enriched and new user experiences and services.

In addition, to be able to handle the sheer number of things and objects that will be connected in the IoT, cognitive technologies and contextual intelligence are crucial. This also applies for the development of context aware applications that need to be reaching to the edges of the network through smart devices that are incorporated into our everyday life.

The Internet is not only a network of computers, but it has evolved into a network of devices of all types and sizes, vehicles, smartphones, home appliances, toys, cameras, medical instruments and industrial systems, all
connected, all communicating and sharing information all the time. The Internet of Things had until recently different means at differentlevels of abstractions through the value chain, from lower level semiconductorthrough the service providers. The Internet of Things is a “global concept” and requires a common
definition. Considering the wide background and required technologies, from sensing device, communication subsystem, data aggregation and pre-processing to the object instantiation and finally service provision, generating an unambiguous definition of the “Internet of Things” is non-trivial.



Architecture of IOT

3. Technology Enablers

IoT is wide and complex technical area as reflected from above diversity. Number of significant technologies coming together is enabling the rise of IoT, as it cannot be achieved by just one or two. Below we provide a glimpse of high impact technologies that have emerged tremendously. New advancements and overwhelming innovative products in each individual category in recent years are making IoT technically feasible and evolving it from just being a science fiction. Some other ecosystem enablers to facilitate connected homes are drop in prices of sensors and cost of bandwidth, extremely high growth in smartphones, ubiquitous wireless coverage.

3.1. Communication

Zigbee or Thread like suite of high level communication protocols to create personal area networks, designed specifically for the home. Mesh network designed to securely and reliably connect hundreds of products around the home – without blowing through battery life. Designed to support a wide variety of products for the home: appliances, access control, climate control, energy management, lighting, safety, and security. Designed to have extremely low power consumption. Devices efficiently will communicate to deliver a great user experience; yet will run for years on the smallest of batteries.

3.2. Back Bone

IPv6 or 6LoWPAN, the newest version of the Internet Protocol (IP) standard that is intended to replace IPv4. IPv4 supports 32bit addresses, which translates to about 4.3 billion addresses – a number that has become largely exhausted by all the connected devices globally. In contrast, IPv6 can support 128bit addresses, translating to approximately 3.4 x 1038 addresses – an almost limitless number that can amply handle all conceivable IoT devices. 6LoWPAN is an acronym of IPv6 over Low power Wireless Personal Area Networks. The 6LoWPAN group has defined encapsulation and header compression mechanisms that allow IPv6 packets to be sent to and received from over IEEE 802.15.4 based networks.

3.3. Embedded OS for IoT devices

Software designed to require as little battery power and memory as possible. It is based on a microkernel and designed for energy efficiency, hardware independent development, a high degree of modularity. Supporting 6LoWPAN, IPv6, RPL, TCP, and UDP.

3.4. Cloud Computing

Cloud is secret weapon in internet of things and IoT is the next big market for cloud. Cloud computing in nutshell is computing in which large groups of remote servers are networked to allow the centralized data storage, and online access to computer services or resources. They are classified as public, private or hybrid. Smart objects will be endowed with sensors that will feed data back to cloud platforms for analysis. With so much data flowing in from potentially millions of different nodes, the diversity and precision of the knowledge we have about the world will explode. The cloud is the only technology suitable for filtering, analyzing, storing, and accessing that information in useful ways. Cloud computing will be driving Internet of things in every step of the way forward.

3.5. Big Data and Analytics

Big data analytics is the process of examining large amounts of different data types, or big data, in an effort to uncover hidden patterns, unknown correlations and other

useful information. As the IoT will by definition generate voluminous amounts of data, the availability of big data analytics is a key enabler. Currently also Google nest uses this to carve out usage patterns of user and make auto adjustments to the temperature after learning the user behavior and preferences. So, this technology in general will enable importantly interconnecting the data from different devices from home, drawing more intelligence collectively and allowing various innovative applications emerging based on the same.

4. Applications

4.1.Smart Refrigerators

Have you ever experienced a situation when you have some friends at home and you opened the fridge for some cold drinks and there were no cold drinks in the refrigerator! In that situation you must have wished that, someone would have informed you about the cold drinks and you had bought them before.

But don't worry, now this is possible with IoT, Smart refrigerators are there, which not only inform you about the consumed items or empty bottles in the fridge but also order them online before they runs out. These refrigerators can do much more than this although the production has not started at big scale yet.

4.2.Smart Phones

Everybody knows about the smart phones now, and Smart Phones are the most common example of IoT or we can say Smart Phone is one of the first few "Things" in the 'Internet of Things'.

All the devices explained above can be controlled using your smart phone and smart phone is become the centre of this network like the stick of the magician. Like a magician do the magic by moving his stick, Smart Phone can do the "Real magic" by just few touches.

4.3. Smart Cars

The automotive companies like Ford, Tesla has already stepped into the world where Car would also the part of IoT. Tesla car is really a big achievement in this field. Imagine that a car automatically opens the garage door before you arrive at home and you can remotely control the temperature, lights, charging of the car. Tesla car have all these feature, it also have a App framework where you can build your own app to control the car and know its speed, location, battery status from anywhere.

The car can upgrade itself automatically by downloading and installing the latest firmware and software. It has 18 sensors to automate the things, and it can fix a service schedule at the car service station by itself.

4.4. Micro Chips

We are hearing about microchips for a long time and have their applications in some of the sensitive and dangerous fields like defence. But now one of the most integrated circuit have found its way to our day-to-day life. Microchips are generally used in the forms of tracer as the radar detectors can detect data about various things.

Now with IoT, you can fit a microchip on collars of pet or attach it to them to keep a track of their movement without being physically looking for them. There is more freedom to your pets now and this also enables you to keep a record of their health too.

Conclusion:

The proliferation of devices with communicating-actuating capabilities is bringing closer the vision of an Internet of Things, where the sensing and actuation functions seamlessly blend into the background and new capabilities are made possible through access of rich new information sources. The evolution of the next generation mobile system will depend on the creativity of the users in designing new applications. IoT is an ideal emerging technology to influence this domain by providing new evolving data and the required computational resources for creating revolutionary apps.

Therefore, connecting those smart devices (nodes) to the web has also started happening, although at a slower rate. The pieces of the technology puzzle are coming together to accommodate the Internet of Things sooner than most people expect. Just as the Internet phenomenon happened not so long ago and caught like a wildfire, the Internet of Things will touch every aspect of our lives in less than a decade.

REFERENCES

[1]. Internet of Things Architecture

[2]. From the Internet of Computers to the Internet of Things

[3]. IoT. Wikipedia 2017

[4]. Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions