

The Internet of Things Technology Road Map: Application and Challenges

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Abstract:

The Internet of Things (IoT) is the latest technology that incorporates interconnected devices by using sensors. Internet of Things is often people who are deploying and using them for their own reasons. To collect and integrating data from the devices the Internet of Things must provide the solution for discovering the devices for the connection. The solution comes from the Internet of Things must be capable of aggregating information either in the databases or in the cloud. Internet of Things promises a special communication between the objects and provides the smart life for the humans. This paper describes the overview of the Internet of Things and the issues.

Keywords

Internet of Things Applications, Smart Manufacturing, Applications, Challenges.

1. Introduction

The Internet of Things (IoT), sometimes referred to as the Internet of Objects, will change everything including ourselves. The Internet has an impact on education, communication, business, science, government, and humanity. Clearly, the Internet is one of the most important and powerful creations in all of human history and now with the concept of the internet of things, internet becomes more favorable to have a smart life in every aspect. Internet of Things is a new technology of the Internet accessing. By the Internet of Things, objects recognize themselves and obtain intelligence behavior by making or enabling related decisions thinks to the fact that they can communicate information about themselves. These objects can access information that has been aggregated by other things, or they can added to other services The Internet of Things (IoT) is a novel paradigm that is rapidly gaining ground in the scenario of modern wireless telecommunications. The basic idea of this concept is the pervasive presence around us of a variety of things or objects – such as Radio-Frequency Identification (RFID) tags, sensors, actuators, mobile phones, etc. – which, through unique addressing schemes, are able to interact with each other and cooperate with their neighbors to reach common goals.

Actualization of the IoT concept into the real world is possible through the integration of several enabling technologies. In this section we discuss the

most relevant ones. Note that it is not our purpose to provide a comprehensive survey of each technology. Our major aim is to provide a picture of the role they will likely play in the IoT.

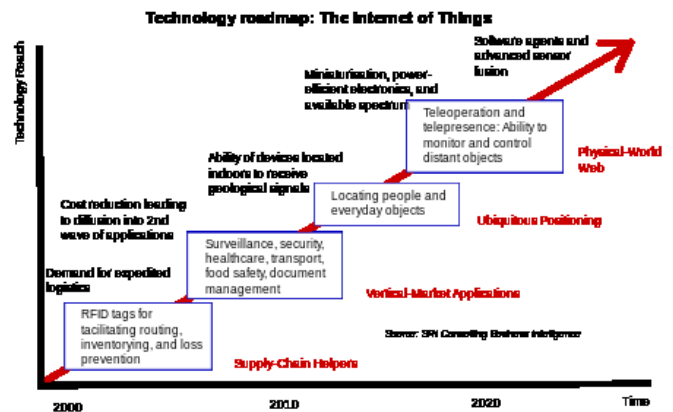


Figure 1: Technology roadmap: The Internet of Things

On the off chance that associating items to each other and to the Internet isn't new, it is sensible to ask, "Why is the Internet of Things a recently prominent theme today?" From an expansive viewpoint, the juncture of a few innovation and market trends²⁰ is making it conceivable to interconnect progressively and littler gadgets efficiently and effortlessly:

- Ubiquitous Connectivity—Low– cost, high– speed, inescapable system availability, particularly through Authorized and unlicensed remote administrations and innovation, makes practically everything "connectable".
- Widespread appropriation of IP– based systems administration—IP has turned into the prevailing worldwide standard for organizing, giving a well–characterized and broadly executed stage of programming and devices that can be fused into an expansive scope of gadgets effectively and cheaply.
- Computing Economics—Driven by industry interest in research, advancement, and fabricating, Moore's law²¹ keeps on conveying more noteworthy registering power at bring down value focuses and Bring down power consumption.
- Miniaturization—Manufacturing progresses permit bleeding edge processing and interchanges innovation to be fused into little objects.²³ Coupled with more noteworthy processing financial aspects, This has powered the headway of little and modest sensor gadgets, which drive numerous IoT applications.

- Advances in Data Analytics—New calculations and fast increments in processing power, information stockpiling, what's more, cloud administrations empower the total, connection, and examination of immense amounts of information; these expansive and dynamic datasets give new chances to extricating data and learning.
- Rise of Cloud Computing— Cloud figuring, which use remote, organized registering assets to process, oversee, and store information, enables little and appropriated gadgets to communicate with capable back-end logical and control capacities.

The Internet of Things Ecosystem

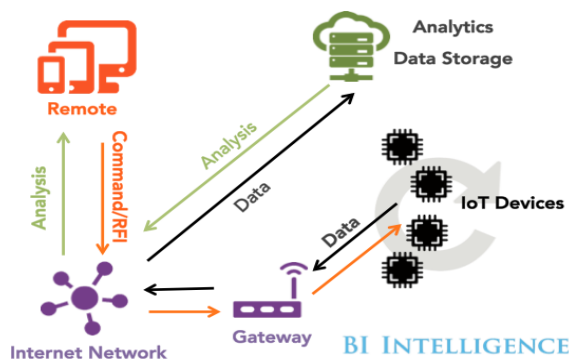


Figure 2: The Internet of Things EcoSystem

2. Proposed Work

Internet of Things Applications

Internet of things promises many applications in human life, making life easier, safe and smart. There are many applications such as smart cities, homes, transportation, energy and smart environment.

A. Smart Cities

Many major cities were supported by smart projects, like Seoul, New York, Tokyo, Shanghai, Singapore, Amsterdam, and Dubai. Smart cities may still be viewed as cities of the future and smart life, and by the innovation rate of creating smart cities today's, it will become very feasible to enter the IoT technology in cities development. Smart cities demand requires careful planning in every stage, with support of agreement from governments, citizens to implement the internet of things technology in every aspect.

B. Smart Home and Buildings

Wi-Fi's technologies in home automation have been used primarily due to the networked nature of deployed electronics where electronic devices such as TVs, mobile devices, etc are usually supported by Wi-Fi. Wi-Fi have started becoming part of the home IP network and due the increasing rate of adoption of mobile computing devices like smart phones, tablets, etc. For example a networking to provide online streaming services or network at homes, may provide

a mean to control of the device functionality over the network.

C. Smart Transportation and Mobility

The development in transportation is one of the factors to indicate the wellbeing of the country. A road condition monitoring and alert application is one of the most important of IoT transformation application. The main idea of the concept of smart transportation and mobility is to apply the principles of crowd sourcing and participatory sensing. The process began with user identified the route wishes and marked some points as pothole in the smart phone's application.

D. Smart Environment

Environment plays a major effect in human life. People, even animals, birds, fishes and plants may be affected in unhealthy environment. There were many researches efforts has been paid to solve the problems of environmental pollution and waste resources. Creating of a healthy environment is not easy because of industries and transportations wastes, with irresponsible human activities are daily factors that make the environment damaged.

Internet of Things Challenges

The fact that Internet of things applications and scenarios outlined above are very interesting which provides technologies for smart every thing. , but there are some challenges to the application of the Internet of Things concept in cost of implementation. The expectation that the technology must be available at low cost with a large number of objects. IoT are also faced with many other challenges such as:

Scalability: Internet of Things has a big concept than the conventional Internet of computers, because of things are cooperated within an open environment. Basic functionality such as communication and service discovery therefore need to function equally efficiently in both small scale and large scale environments. The IoT requires a new functions and methods in order to gain an efficient operation for scalability.

Self-Organizing: Smart things should not be managed as computers that require their users to configure and adapt them to particular situations. Mobile things, which are often only sporadically used, need to establish connections spontaneously, and able to be organize and configure themselves to suit their particular environment.

Data volumes: Some application scenarios of the internet of things will involve to infrequent communication, and gathering information's form sensor networks, or form logistics and large scale networks, will collect a huge volumes of data on central network nodes or servers. The term represent this phenomena is big data which is requires many operational mechanism in addition to new

technologies for storing, processing and management.

Data interpretation: To support the users of smart things, there is a need to interpret the local context determined by sensors as accurately as possible. For service providers to profit from the disparate data that will be generated, needs to be able to draw some conclusions from the interpreted sensor data.

Interoperability: Each type of smart objects in Internet of Things has different information, processing and communication capabilities. Different smart objects would also be subjected to different conditions such as the energy availability and the communications bandwidth requirements. To facilitate communication and cooperation of these objects, common standards are required.

Automatic Discovery: In dynamic environments, suitable services for things must be automatically identified, which requires appropriate semantic means of describing their functionality.

Software complexity: A more extensive software infrastructure will be needed on the network and on background servers in order to manage the smart objects and provide services to support them. That because the software systems in smart objects will have to function with minimal resources, as in conventional embedded systems.

Security and privacy: In addition to the security and protection aspects of the Internet such in communications confidentiality, the authenticity and trustworthiness of communication partners, and message integrity, other requirements would also be important in an Internet of Things. There is a need to access certain services or prevent from communicating with other things in IoT and also business transactions involving smart objects would need to be protected from competitors' prying eyes.

Fault tolerance: Objects in internet of things is much more dynamic and mobile than the internet computers, and they are in changing rapidly in unexpected ways. Structuring an Internet of Things in a robust and trustworthy manner would require redundancy on several levels and an ability to automatically adapt to changed conditions.

Power supply: Things typically move around and are not connected to a power supply, so their smartness needs to be powered from a self-sufficient energy source. Although passive RFID transponders do not need their own energy source, their functionality and communications range are very limited. Hopes are pinned on future low power processors and communications units for embedded systems that can function with significantly less energy. Energy saving is a factor not only in

hardware and system architecture, but also in software, for example the implementation of protocol stacks, where every single transmission byte will have to justify its existence.

Wireless communications: From an energy point of view, established wireless technologies such as GSM, UMTS, Wi-Fi and Bluetooth are far less suitable; more recent WPAN standards such as ZigBee and others still under development may have a narrower bandwidth, but they do use significantly less power.

3. Conclusion

Internet of things is another innovation which gives numerous applications to associate the things to things and human to things through the web. Every question on the planet can be distinguished, associated with each other through web taking choices autonomously. All systems and advancements of correspondence are utilized as a part of building the idea of the web of things such innovations are versatile figuring, RFID, remote sensors arranges, and installed frameworks, notwithstanding numerous calculations and techniques to get administration forms, putting away information, and security issues. This paper represents the Internet of Things applications and challenges.

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