

Internet of Things

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I.INTRODUCTION

The Internet of Things(IoT) is the network of physical objects, devices, vehicles, buildings and other items which are embedded with electronics, software,sensors, and network connectivity, which enables these objects to collect and exchange data.The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure,creating opportunities for more direct integration between the physical world and computer based systems, and resulting in improved efficiency, accuracy and economic benefit; when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber physical systems, which also encompasses technologies such as smart grids,smart homes,intelligent transportation and smart cities.Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existingInternet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.British entrepreneur Kevin Ashton first coined the term in 1999 while working at Auto-ID Labs (originally called Auto-ID centers -referring to a global network of Radio-frequency identification (RFID) connected objects).

Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a Smart Grid,and expanding to the areas such as smart cities.

"Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants,biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring or field operation devices that assist firefighters in search and rescue operations. These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.Current market examples include smart thermostat systems and washer/dryers that use Wi-Fi for remote monitoring.

Besides the plethora of new application areas for Internet connected automation to expand into, IoT is also expected to generate large amounts of data from diverse locations that is aggregated very quickly, thereby increasing the need to better index, store and process such data. IoT is one of the platforms of today's Smart City and Smart Energy Management Systems.

II.APPLICATIONS

1. Media

In order to hone the manner in which the Internet of Things (IoT), the Media and Big Data are interconnected, it is first necessary to provide some context into the mechanism used for media process. It has been suggested by

Nick Couldry and Joseph Turow that Practitioners in Media approach Big Data as many actionable points of information about millions of individuals. The industry appears to be moving away from the traditional approach of using specific media environments such as newspapers, magazines, or television shows and instead tap into consumers with technologies that reach targeted people at optimal times in optimal locations. The ultimate aim is of course to serve, or convey, a message or content that is (statistically speaking) in line with the consumer's mindset. For example, publishing environments are increasingly tailoring messages (advertisements) and content (articles) to appeal to consumers that have been exclusively gleaned through various data-mining activities.

The media industries process Big Data in a dual, interconnected manner:

- Targeting of consumers (for advertising by marketers)
- Data-capture

Thus, the internet of things creates an opportunity to measure, collect and analyze an ever - increasing variety of behavioral statistics. Cross-correlation of this data could revolutionize the targeted marketing of products and services. For example, as noted by Danny Meadows -Klue, the combination of analytics for conversion tracking With behavioural targeting has unlocked a new level of precision that enables display advertising to be focused on the devices of people with relevant interests.

Big Data and the IoT work in conjunction. From a media perspective, Data is the key derivative of device interconnectivity, whilst being pivotal in allowing clearer accuracy in targeting. The Internet of Things therefore transforms the media industry, companies and even governments, opening up a new era of economic growth and competitiveness. The wealth of data generated by this industry (i.e. Big Data) will allow Practitioners in Advertising and Media to gain an elaborate layer on the present targeting mechanisms used by the industry.

2. Environmental Monitoring

Environmental monitoring applications of the IoT typically use sensors to assist in environmental protection by monitoring air or water quality, atmospheric or soil conditions, and can even include areas like monitoring the movements of wildlife and their habitats. Development of Resource constrained devices connected to the Internet also means that other applications like earthquake or tsunami early-warning systems can also be used by emergency services to provide more effective aid. IoT devices in this application typically span a large geographic area and can also be mobile.

3. Manufacturing

Network control and management of manufacturing equipment, asset and situation management, or manufacturing process control bring the IoT within the realm on industrial applications and smart manufacturing as well. The IoT intelligent systems enable rapid manufacturing of new products, dynamic response to product demands, and real -time optimization of manufacturing production and supply chain networks, by networking machinery, sensors and control systems together. Digital control systems to automate process controls, operator tools and service information systems to optimize plant safety and security are within the purview of the IoT.

But it also extends itself to asset management via predictive maintenance, statistical evaluation, and measurements to maximize reliability.

Smart industrial management systems can also be integrated with the Smart Grid, thereby enabling real - time energy optimization. Measurements, automated controls, plant optimization, health and safety management, and other functions are provided by a large number of networked sensors.

4. Energy management

Integration of sensing and actuation systems, connected to the Internet, is likely to optimize energy consumption as a whole. It is expected that IoT devices will be integrated into all forms of energy consuming devices (switches, power outlets, bulbs, televisions, etc.) and be able to communicate with the utility supply company in order to effectively balance power generation and energy usage. Such devices would also offer the opportunity for users to remotely control their devices, or centrally manage them via a cloud based interface, and enable advanced functions like scheduling (e.g., remotely powering on or off heating systems, controlling ovens, changing lighting conditions etc.). In fact, a few systems that allow remote control of electric outlets are already available in the market, e.g., Belkin's WeMo, Ambery Remote Power Switch, Budderfly, Telkonet's EcoGuard, WhizNets Inc., etc. Besides home based energy management, the IoT is especially relevant to the Smart Grid since it provides systems to gather and act on energy and power -related information in an automated fashion with the goal to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. Using Advanced Metering Infrastructure (AMI) devices connected to the Internet backbone, electric utilities can not only collect data from end-user connections, but also manage other distribution automation devices like transformers and reclosers.

5. Medical and healthcare systems

IoT devices can be used to enable remote health monitoring and emergency notification systems. These health monitoring devices can range from blood pressure and heart rate monitors to advanced devices capable of monitoring specialized implants, such as pacemakers or advanced hearing aids. Specialized sensors can also be equipped within living spaces to monitor the health and general well-being of senior citizens, while also ensuring that proper treatment is being administered and assisting people regain lost mobility via therapy as well. Other consumer devices to encourage healthy living, such as, connected scales or wearable heart monitors, are also a possibility with the IoT. More and more end -to-end health monitoring IoT platform are coming up for antenatal and chronic patients, helping one manage health vitals and recurring medication requirements. Distinct advantages over similar products from the US and Europe are cost-effectiveness and personalization for chronic patients. Doctors can monitor the health of their patients on their smart phones after the patient gets discharged from the hospital.

6. Building and home automation

IoT devices can be used to monitor and control the mechanical, electrical and electronic systems used in various types of buildings (e.g., public and private, industrial, institutions, or residential).

Home automation systems, like other building automation systems, are typically used to control lighting, heating, ventilation, air conditioning, appliances, communication systems, entertainment and home security devices to improve convenience, comfort, energy efficiency, and security.

7. Transportation

The IoT can assist in integration of communications, control, and information processing across various transportation systems. Application of the IoT extends to all aspects of transportation systems, i.e. the vehicle, the infrastructure, and the driver or user. Dynamic interaction between these components of a transport system enables inter and intra vehicular communication, smart traffic control, smart parking, electronic toll collection systems, logistic and fleet management, vehicle control, and safety and road assistance.

III.CHARACTERISTICS

1. Intelligence

IoT comes with the combination of algorithms and computation, software & hardware that makes it smart. Ambient intelligence in IoT enhances its capabilities which facilitate the things to respond in an intelligent way to a particular situation and supports them in carrying out specific tasks. In spite of all the popularity of smart technologies, intelligence in IoT is only concerned as means of interaction between devices, while user and device interaction is achieved by standard input methods and graphical user interface.

2. Connectivity

Connectivity empowers Internet of Things by bringing together everyday objects. Connectivity of these objects is pivotal because simple object level interactions contribute towards collective intelligence in IoT network. It enables network accessibility and compatibility in the things. With this connectivity, new market opportunities for Internet of things can be created by the networking of smart things and applications.

3. Dynamic Nature

The primary activity of Internet of Things is to collect data from its environment, this is achieved with the dynamic changes that take place around the devices. The state of these devices change dynamically, example sleeping and waking up, connected and/or disconnected as well as the context of devices including temperature, location and speed. In addition to the state of the device, the number of devices also changes dynamically with a person, place and time.

4. Enormous scale

The number of devices that need to be managed and that communicate with each other will be much larger than the devices connected to the current Internet. The management of data generated from these devices and their interpretation for application purposes becomes more critical. Gartner (2015) confirms the enormous scale of

IoT in the estimated report where it stated that 5.5 million new things will get connected every day and 6.4 billion connected things will be in use worldwide in 2016, which is up by 30 percent from 2015. The report also forecasts that the number of connected devices will reach 20.8 billion by 2020.

5. Sensing

IoT wouldn't be possible without sensors which will detect or measure any changes in the environment to generate data that can report on their status or even interact with the environment. Sensing technologies provide the means to create capabilities that reflect a true awareness of the physical world and the people in it. The sensing information is simply the analogue input from the physical world, but it can provide the rich understanding of our complex world.

6. Heterogeneity

Heterogeneity in Internet of Things as one of the key characteristics. Devices in IoT are based on different hardware platforms and networks and can interact with other devices or service platforms through different networks. IoT architecture should support direct network connectivity between heterogeneous networks. The key design requirements for heterogeneous things and their environments in IoT are scalabilities, modularity, extensibility and interoperability.

7. Security

IoT devices are naturally vulnerable to security threats. As we gain efficiencies, novel experiences, and other benefits from the IoT, it would be a mistake to forget about security concerns associated with it. There is a high level of transparency and privacy issues with IoT. It is important to secure the endpoints, the networks, and the data that is transferred across all of it means creating a security paradigm.

There are a wide variety of technologies that are associated with Internet of Things that facilitate in its successful functioning. IoT technologies possess the above-mentioned characteristics which create value and support human activities; they further enhance the capabilities of the IoT network by mutual cooperation and becoming the part of the total system.

IV.CONCLUSION

The thought of always being tracked and your data being recorded does bring a fear to a consumer's mind, but we have to move away from it to see the benefits that this great technology is going to bring to us. The above examples were about a 'connected you', making your life seamless, but it brings with it higher benefits like connected cities, better commerce and an improved ecosystem.

As often happens, history is repeating itself. Just as in the early days when Cisco's tagline was "The Science of Networking Networks," IoT is at a stage where disparate networks and a multitude of sensors must come together and interoperate under a common set of standards.

This effort will require businesses, governments, standards organizations, and academia to work together toward a common goal. Next, for IoT to gain acceptance among the general populace, service providers and others must deliver applications that bring tangible value to peoples' lives. IoT must not represent the advancement of

technology for technology's sake; the industry needs to demonstrate value in human terms. In conclusion, IoT represents the next evolution of the Internet. Given that humans advance and evolve by turning data into information, knowledge, and wisdom, IoT has the potential to change the world as we know it today—for the better. How quickly we get there is up to us.

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