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Internet of Things (LOT) for Smart Cities-The Future Technology Revolution

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Abstract

Today the world is becoming connected. The number of devices that are connected are increasing day by day. Many studies reveal that about 50 billion devices would be connected by 2020 indicating that Internet of things have a very big role to play in the future to come. The applications of IoT are immense which include Energy, Healthcare, and Agriculture to name a few. IoT is an emerging technology that works with the integration of many other present day technologies. There are many threats to the environment today among them urbanization is one. The growing needs of the uraban population across the world are posing a serious threat to the environment. We need to act fast and meet these needs by developing technologies that cater the world problems. One such solution is to develop a smart world. The most important application of IoT is smart cities. Smart city represents one of the most promising, important and difficult Internet of Things (IoT) applications. In the last few years, the smart city concept has played an important role in both scholastic and industry fields, with the advancement and operation of various middleware platforms and IoT-based infrastructures. This paper talks about the role of IoT in developing smart cities for a smarter world.

Index terms— nternet, cloud, big data, smart cities, smart healthcare.

1 Introduction

mart city is a terminology that we are going to hear a lot more in the future years. It's predicted that by the year 2020 about 50 billion devices would be connected around the world. Internet of Things (IoT) is a recent communication idea that visualizes a near future, where the objects or devices used in everyday life will be equipped with sensors, microcontrollers, trans-receivers for digital communication, and suitable protocol stacks and network models will make these devices to communicate with each other and with the users, becoming an essential part of the Internet.

The initiative of the IoT (Internet of Things) was developed in parallel to Wireless Sensor Networks, and refers to distinctively identifiable objects in the environment and the object's virtual representations in II.

2 SMART CITIES

Smart City: A smart city is one that has mobile technology rooted across all functions of the city. A Smart City usually consists of basic infrastructure in an order to provide a good quality of life and a clean and lively environment for a smart living.

Smart Cities uses the mobile technology and information and communication technologies (ICT) to improve the quality and performance in order to connect with its people in an more active and efficient manner.

The components of a smart City includes smart government services, efficient transport system, smart traffic monitoring, sustainable energy, smart health care, improved water and waste management. As per the report

released by Juniper Research in 2015 Barcelona is named the world's smartest city. The research inspected several aspects like technologies used, transportation systems, buildings, utilities etc. The study also predicted that there would be more number of smart cities coming up in the near future.

3 III. ROLE OF IOT IN BUILDING SMART CITIES

Until now, the Internet has been used primarily as a medium for the transmitting and collecting the data and information. Experts of the industry now believe that the next chapter in the "Internet devised for the People" is opened by the rise of the Internet of Things (IoT).

IoT is leading to a change in the culture as a huge number of devices, sensors, actuators, and other objects are being interconnected to each other and to next level systems. The connectivity of a huge number of devices that are programmed to collect the data gave rise to an entirely new services and features which form the basis of some important concepts like the "Smart Cities".

IoT and big data are both technology-driven developments. The applications of IoT for Smart City will bring huge market opportunities and will make lives of the people smarter. Today the devices around us are day by day becoming more intelligent. Further more, these developments are bound to change our behaviour and the way we use them.

We are in the middle of an era where we are trying to discover new opportunities brought to life by new software and hardware designed to take advantage of the flow of new personal and global data. Cities are likely to invest about $41 trillion on IoT technologies in the next 20 years. In order to make cities smarter, the governments have started promoting several startups and other industries in order to work on the IoT technologies so that they can be implemented in several spheres of urban living. Here are some of the areas that the governments must work to achieve their goal of building smart cities. 1. Smart Grids: Creating smart energy sources to meet the need of the increasing urban population is an important step in building a smart city. Thus to achieve this we implement the concept of smart grid. A smart grid is one of the most successful IoT technologies that are being used. A smart grid simply means computerizing the existing power grid. Additionally it has two way digital communication technologies embedded for communicating directly with the grid. Each device on the network consists of a sensor to collect data, two way communication between the device in the field and the grid's main network operations center.

A key feature of the smart grid is computerization technology that lets the grid to adjust and control each individual device or millions of devices connected to it from a single location.

4 Smart Environment:

The governments these days are planning to deploy sensors that collect the climatic data at several parts of the cities. This data collected by these devices will be continuously monitored by research institutes, so that they can predict the patterns in the changes of the climate and make predictions about the local issues like congestion. Further this data is made available to the public, so that they can know more about the surrounding environmental issues.

5 KEY TECHNOLOGIES FOR SMART CITIES

The key enabling technologies that must be used along with IoT to achieve the goals of the smart cities are as follows: 1. Big Data Analytics: In smart cities, large amount of sensors will be installed so as to collect huge amounts of data. Hence this will create large amounts of data that should be stored and managed in order to achieve the goals of smart cities. Hence big data analytics forms a key technology for building smart cities. The data collected is analyzed and suitable predictions are made to attain p 2. roper governance. Some of the advantages of embedding big data analytics with IoT for smart cities are as follows: ? Big data can help in traffic and vehicle management. It helps in reducing the emissions from the vehicles. Sensors fitted on roads at various parts of the cities can help us by collecting data about the traffic at different times of the data and the volume of vehicles and their emission levels.

This data collected at central server can be used by traffic cops to control the traffic and divert them accordingly to prevent congestion. ? Smart parking system can be easily implemented using data collected from different parts in the nearby locality. ? Keeping a track of the daily energy consumption and giving a detailed analysis of the areas using high energy utilities and areas using lower energy utilities can be balanced if proper data is collected. ? Huge amounts of citizen data should be organized properly. This make governance easy as the entire citizen database is made available to the government in an organized manner. Apart from the above points there are several applications of big data analytics in IoT for building smart cities, as huge amounts of data collected must also be efficiently organized and used. 3. Cloud Computing: Cloud computing solutions provide a good solutions for the cities to have a strong physical architectural platform. Cloud computing represents a new paradigm for delivering both software and hardware resources to its users. Today Internet of Things is one of the most important concepts of ICT. By using cloud computing technology, the delivery of the software and hardware resources are made available on demand as a service over the internet. Further the IoT concept envisions modern devices like the sensors, actuators and other mobile devices will be connected to each other through Internet and provide different services and data to its users. The data collected from various IoT devices can be easily

managed and handled by implementing the decentralized cloud model. Usually in a cloud based approach, the government provides technological platform for gathering, mining the data and provides this data over the public internet platform to a third party cloud vendors. Doing so will reduce the burden for the government and also helps cutting the unnecessary cost of having excess storage for the data. The data collected from the sensors can be transmitted to each other via Internet and hence cloud architecture will be the most apt model by providing both the hardware and software services over the internet. These devices enable the user to access the information from any point of the globe on a simple device and take necessary actions. These mobile devices include our smart phones, wearable etc. 5. Social: The social platform is yet another technology that educates people about the usage of their mobile devices and the current changes occurred as a part of developing a smart city. By using a social platform communication between the government and common public would become even easier.

V.

6 Challenges Faced for Developing Smart Cities

Though IoT provides immense opportunities to improve efficiency of governance, public safety and support development, it also offers some challenges for the cities to overcome in order to build the dream smart cities. Some of the challenges are: 1. Security and Privacy: Maintaining privacy and security for the data being collected is one of the biggest concerns. Since the entire data is being collected over the internet, cyber security is a very important aspect. Ensuring the privacy of the citizen's data is the most difficult deed for the governments. Hacking a single smart device can cause a huge loss to the city. Hence following a strict cyber security policies and implementing high level security protocols is very important. 2. Using the right technology: This is another challenge. Cities already have lots of data in their existing data base systems but lack the skills of implementing the right technology necessary for handling it. Hence cities must ensure that they deploy proper data gathering systems along with analytics, so that data can be analysed and used properly. Further people with proper technical skills must be employed for handling the citizen data.

VI.

7 CONCLUSION

In the future, all cities will be smart cities .With smart and forward-looking governance and management, IoT has the possibility to create a revolution in urban organization and development. By implementing the true potential of IoT, governments can improve services to its citizens, increase sustainability, and make the existing cities a better and more livable place for all its citizens. Our future life in smart cities is full of promise. All the discussed technologies will develop and there will also be many new innovations coming up as well. In other words, we would be witnessing some exciting times soon. With more than one-half of the world's population living in cities pioneering new IoT solutions, such as smart healthcare, smart parking, smart energy, connected waste, and traffic management, holds great promise for fighting the major challenges of high end urbanization. We are likely to see many smart cities of the future coming to life overnight. However, like in the past with the adoption of revolutionary technologies such as electricity, traffic lights, green buildings and the Internet, governments will gradually execute IoT solutions to save money, shape the future and make the cities a smarter and a better place to live. [1]

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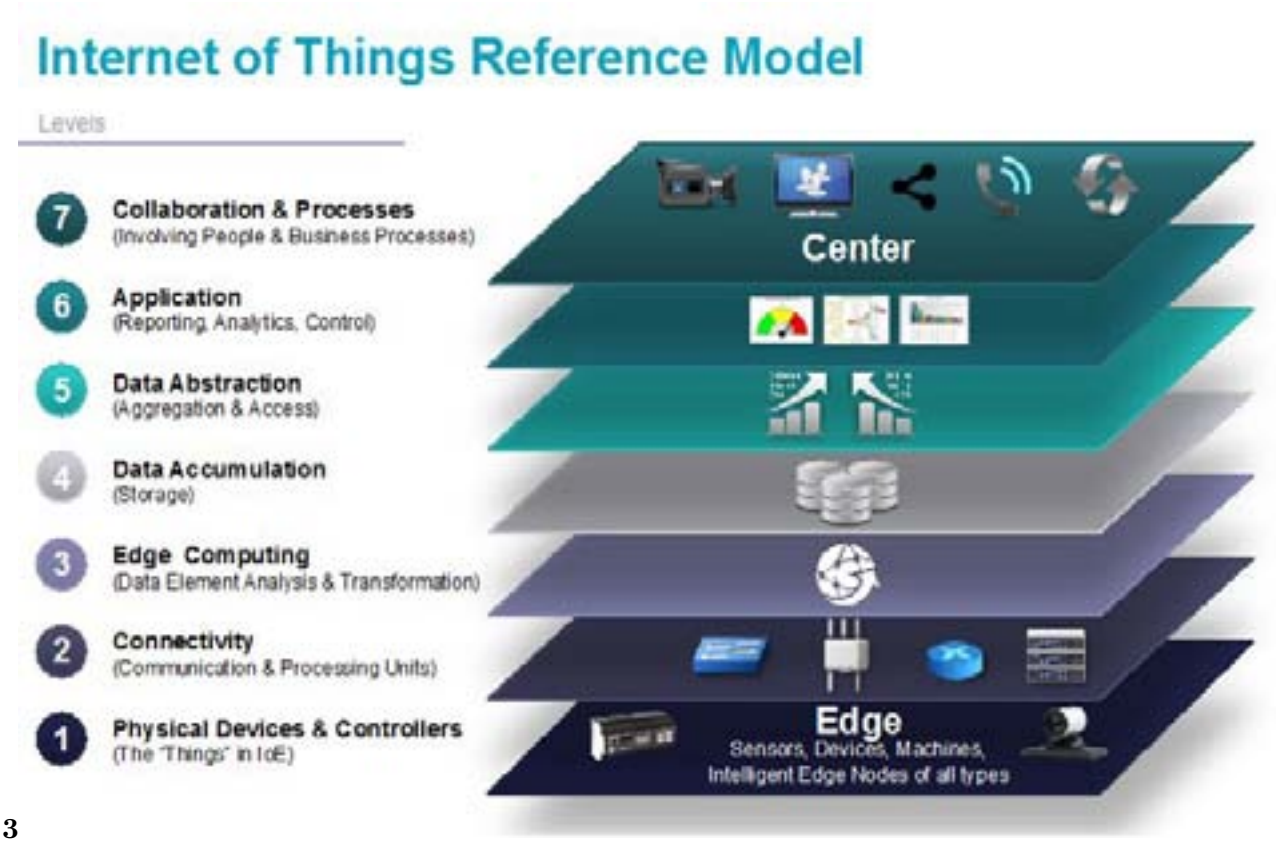
Figure 1: Fig. 2 :



3

Figure 2: Fig. 3 :


Smart Diamond to Define Smart City
Smart Governance
Smart Citizen
Smart Energy
Smart Healthcare
Smart Building
4G
Smart Technology
Smart Mobility
Smart Infrastructure

Figure 3:

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