ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 6, Issue 3, March 2017

Smart Urbanization based on Internet of Things (IoT)

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***Abstract*— In the 21st century, we want to be connected with anything anytime and anywhere, which is already happening in various places around the world. The core component of this hyper connected society is IoT, which is also referred to as Machine to Machine (M2M) communication or Internet of Everything (IoE). Over the past few years, the definition of "Smart Cities" has evolved to mean many things to many people. Yet, one thing remains constant: part of being "smart" is utilizing information and communications technology (ICT) and the Internet to address urban challenges. More than 60 percent of the world's population will be living in cities by 2050. As a result, people occupying just 2 percent of the world's land will consume about three-quarters of its resources. Moreover, more than 100 cities of 1 million people will be built in the next 10 years. Today's cities face a variety of challenges, including job creation, economic growth, environmental sustainability and social resilience. Smart cities are urban areas that use digital technologies in a secure fashion to manage the municipality's assets, enhance sustainable economic development, reduce costs and resource consumption, and support the well-being of its citizens. Smart cities have become a global phenomenon.**

Keywords*- Internet of Things, Smart City, Smart Services, *Challnges

I. INTRODUCTION

The digital revolution holds great promise for responding to many of the challenges created by exorable urbanization. IoT in particular offers far-reaching opportunities to change the trajectory of asset and usage to help cities become more efficient and sustainable as demands increase. A key goal of a smart urbanization is to enhance the use of public resources, increasing the quality of services offered to its citizens while reducing operational costs. While this objective cannot be achieved with technology alone, leveraging the deployment of IoT within a city can go a long way to reaching this goal.

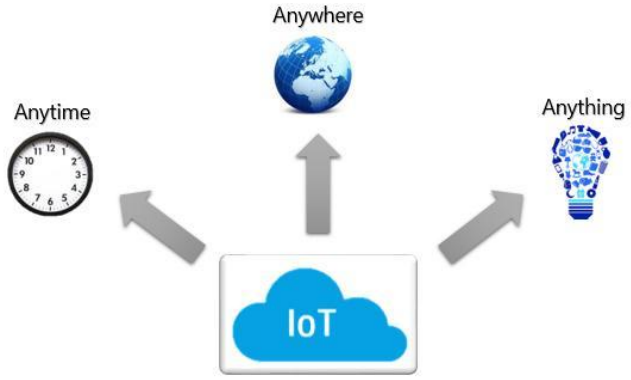

Fig.1 Basic Internet of Things

IoT has the potential to facilitate beneficial decision-making that no stand-alone device could collect and process on its own. Example: merging data from weather, traffic and environment sensors to predict and manage air quality along major roads and networks. The treasure trove of data coming online for the first time is of limited value however unless the devices generating the data can be managed and the data itself can be verified as trustworthy, analyzed and monetized into new revenue streams, cost savings or improvements in user experience. Without all of that, the true value cannot be fully realized. The explosion of connected objects will not only depend on the appropriation of uses, but also on the management of radio frequency congestion, network capacity, and how public and private networks are interconnected. Across a smart city, different use cases will likely require different types of connectivity. For example, an IP surveillance camera requires the high bandwidth available from cellular, Wi-Fi, or fixed-line connectivity, whereas smart parking sensors require long battery life and therefore a low-power connectivity method such as LoRa (or Narrowband LTE as it becomes available)[3].

The term 'smart city' has been variously defined within the literature.The notion of a 'smart city' refers to the increasing extent to which urban places are composed of 'everywhere' (pervasive and ubiquitous computing and digitally instrumented devices built into the very fabric of urban environments (e.g., fixed and wireless telecom networks, digitally controlled utility services and transport infrastructure, sensor and camera networks, building management systems, and so on) that are used to monitor, manage and regulate city flows and processes, often in real-time, and mobile computing (e.g., smart phones) used by many urban citizens to engage with and navigate the city which themselves produce data about their users.

Some of the key expectations, though not exhaustive, from a smart city in World includes[6]:

- Clean and reliable water
- Proper sanitation
- Uninterrupted power (from clean sources)
- Zero waste / Effective solid waste management
- Sewage treatment with a waste to wealth approach
- Eco-mobility
- Last mile connectivity
- Effective use of ICT
- Security
- Participatory governance

II. SMART CITY IOT USE CASES:

Use cases such as smart street lighting where savings can be quickly realized in terms of energy consumption and reduced downtime have become commonplace in many municipalities, as have smart parking, environmental monitoring, and traffic management. Many cities are now looking to expand the use IoT to improve services like waste management, water management and quality, and energy consumption in public buildings. Additionally, the use of contextual analysis to provide real-time information to citizens and authorities are growing in popularity.
HPE has the capabilities and experience to support these use case and more through a combination of the HPE Universal IoT Platform and other products and services.

A] SMART PARKING

The reasons for smart city investments vary by municipality but often begin with the need to reduce operational costs. For many urban residents, improving mobility is of special interest.
Specific goals often include:

- Reduce time and cost of transportation when traveling to and from the workplace
- Avoid traffic jams and incidents while en route
- Have ample parking readily available upon arrival
- Experience less stress and a healthier way of life

Citizen complaints about commute times or parking availability in central business districts can drive investments in real-time traffic information systems and smart parking meters. The car parks sector in Europe and North America is rapidly innovating toward smart systems. In addition to adopting advanced automation solutions and software for the booking and payment of parking, emerging trends include:

- Rapid development of wireless technology (both cellular and LPWA)
- Ability to analyze volumes of data collected from parking and other sensors (such as traffic)
- Short-range communications (NFC) contactless and other payment methods

Smart parking applications enable new revenue streams for cities by making it possible for parking to be sold via connected car applications direct to the vehicle, opening up wholesale partner relationships between car manufacturers and rental companies. Another option is the ability to provide sponsored parking services to local businesses: reserve a parking space when you book a restaurant[3].

B] SMART LIGHTING

With the rising costs of energy, combined with increased environmental and regulatory pressures toward energy efficiency, many local governments are looking to improve their street lighting operations and infrastructure. Street lighting, an important community service that contributes to citizens' sense of safety & security, consumes as much as 40 percent of an operator's energy consumption, they are expensive to manage. Legacy High Pressure Sodium lights and their supporting infrastructure are particularly inefficient & often operate for up to 12 hours a day at full intensity. Even using ambient light sensors to switch individual streetlights on and off, the energy costs of providing this service are high. In addition, lack of monitoring or recording energy consumption within individual lights, operators often pay based on using a few metered lights multiplied by the number of lights within their infrastructure, regardless of actual use. Outages in street lighting have an impact on public safety and public

services liability. With HPS, streetlights often having a short life span—around five years, so it's not uncommon for operators to replace approximately 20 percent of these lights each year. This leads to unpredictable services and maintenance costs. To address these issues, many operators are moving to new, energy-efficient LED-based streetlights which enable lower energy use coupled with providing IP connectivity and IoT sensors into the lighting infrastructure to provide remote management and monitoring. Smart street lighting requires new, smart/connected luminaries and power units (ballasts) to be fitted. Now a smart lighting solution that leverages both HPS lights and new LED-based lights are available. Using traditional HPS lights in a managed environment reduces the investment required to implement the new infrastructure, as much of the existing light can be reused. By using newer, more efficient power units, managing the lights, and improving their use, means adding significant savings to the operator. Given the benefits and relatively low cost of deployment by reusing the existing infrastructure.

In addition, providing IP connectivity to streetlights opens up a large number of opportunities to operators to use that connectivity for additional smart services as shown above. Examples include:

- Using streetlights as access points for a Wi-Fi or small-cell mesh to provide Internet access
- Enabling sensors to manage traffic or parking, such as traffic light controls or smart parking services
- Providing access points or concentrators for home automation services or smart metering connectivity

C] SMART WASTE MANAGEMENT

Waste management is a major issue in urban areas in terms of environmental management, cost and citizen satisfaction. In many cases where waste collection happens on a fixed route at predetermined times, some bins are only partly filled while others are overflowing and should have been emptied earlier. By installing sensors and connectivity in waste bins to monitor the level of the rubbish inside, collection routes can be improved so that the bins are emptied when they need to be, even if that means some bins are emptied twice a day and others only every few days. This delivers cost savings, reduces CO 2 emissions from the collection trucks, and increases citizen satisfaction as waste bins are no longer overflowing. Smart waste management solutions powered by HPE Universal IoT platform and the HPE analytics portfolio can provide real-time insights and monitor the sensor data coming from waste bins.

III. IMPLEMENTATION STATUS OF THE MAJOR COUNTRIES

(1) USA

Since 2012, the Department of Energy established the "Grid 2030 Plan" and have been operating the Domain Awareness System (DAS) that connects the private and public CCTVs and sensors in New York City in order to prevent terrorism. The National Intelligence Council (NIC) selected the IoT as one of the disruptive civil technologies that will affect the national competitiveness and provide national support until 2025.

(2) China

The Chinese State Council build an IoT industrial complex and research center near Shanghai in 2010. The detailed goals of the IoT 12-5 Development Plan include over 500 major research achievements in the sensor, transmission, processing, application, and other technology areas, the establishment of more than 200 standards, and the cultivation of 10 industrial special districts and over 100 core enterprises.

(3) EU

In 2009, the EU announced the IoT Action Plan to invest 76.9 billion Won in the IoT research and development, and the construction of clusters. They selected a "future network basis" as one of the top seven R&D projects for the seventh term since 2009 and now promoting R&D and pilot services according to the action plan with the goal of infrastructure construction to prepare for the connection of several billion population and several trillion things. Since 2005, they have obligated the installation of the vessel monitoring system (VMS) in all ships in Europe.

(4) Japan

They included a plan to develop M2M technologies and services based on the sensor network in the "i-Japan 2015 Strategy" in 2009. In order to create new industries based on the recent ICT convergence, they set the direction of the Internet of Computer (IoC) to Internet of Things (IoT) through digitalization and networking, and released policies and action plans for the cultivation of the top six strategic areas and infrastructure development projects[1].

IV. SMART CITY IMPLEMENTATION MODELS BASED ON IOT

Recently, many local governments have been aiming to implement an IoT-based smart city through the construction of a test bed for IoT verification and an integrated infrastructure.In this, smart city implementation models based on IoT that can be implemented by local governments are described through examples.

Figure 2. Smart City Implementation

A] Smart Traffic Service

Major smart traffic services include smart parking services to prevent illegal parking and facilitate convenient parking, citizen participation-oriented illegal parking prevention services, and smart safe crosswalk services. Smart parking refers to the construction of a platform that enables real-time checking of available space and parking prices in areas that require parking and facilitation of reservation/payment through Web and mobile connections. The citizen participation-oriented illegal parking prevention service is an improvement of the illegal parking crackdown system of the traffic authority by allowing citizens (including victims of illegal parking) to conveniently report such violations through their smartphones[8]. Furthermore, the smart safe crosswalk service can contribute to the prevention of pedestrian accidents and secondary car accidents by detecting pedestrians in children protection zones, and alerting pedestrians and approaching vehicles through electronic display boards.

B] Smart Education Service

This service provides real-time, interactive high-definition lectures that feel like face-to-face meetings at home through high-definition (HD) services and wide-area Internet infrastructure.

C] Smart Healthcare Service

Basically, continuous health care is required regularly or irregularly based on information about biorhythms during the daily life of individuals. This will enable us to reduce unnecessary medical expenses and to discover diseases in early stage, thereby laying the ground for saving medical expenses. Individual biorhythms (pulse, blood pressure, etc.) are automatically registered together with personal information through the basic medical devices installed in every individual household, health center, dong office, etc. The system can be configured in such a way to periodically accumulate health information and send the current health condition through big data analysis via mobile devices or allow users to access the portal and check the health information. In addition, a system for exchanging medical image data (PACS, MRI, CT) between general hospitals and small and medium partner hospitals is needed to save the cost of duplicate image data. The remote home care with such smart healthcare services has significance because it can minimize medical expenses and prevent unexpected accidents of the alienated elderly people such as senior citizens who live alone[1].

V. CHALLENGES

The Smart Cities Challenge is designed to inspire greater creativity from municipal officials and their partners, more involvement and inspiration from citizens, and the development of proposals that will produce concrete benefits in peoples' lives. people every minute from rural areas, the Government has introduced the 'Smart City Challenge', handing over the onus of planned urbanization to the states. In the approach to the Smart Cities Mission, the objective is to promote cities that provide core infrastructure and offer quality of life to citizens, a clean and sustainable environment and application of 'smart' solutions.

Design and analysis together: Cities already have lots of data in their existing systems—the challenge is often that they lack the skills or the technology to use it. In order to make the Internet of Things valuable, cities must ensure that the data-gathering systems are designed together with analytics: the data that is collected should be easily understood and to put to use by the governments that collect it. In addition to enhancing the systems for data collection and analysis, governments must also focus on recruiting tech-savvy leaders who can envision and implement cutting-edge systems.

Privacy and security: Cities must take seriously their role in ensuring the privacy and security of citizen data. Unless citizens trust their governments to ensure privacy, it will become increasingly difficult for cities to get this data at all. Defense from cyberattacks is also a growing concern, particularly with regards to critical infrastructure—hacking smart meters can cost millionsbut a more malicious intruder could compromise safety for residents. In order to successfully implement IoT, cities should make privacy and security a top priority.

Sensor Development and Deployment:
The IoT challenges span multiple hardware and software challenges. (a) major need to build efficient and effective sensors that will best serve the various urban applications (b) major need to provide near optimal and cost effective deployment of sensors (c) major need to provide real time and trusted data capturing. For example, in smart homes, utility companies need to ensure that reported data from smart meters are trusted to provide accurate

pricing signals to customers.

Connection of "Things": The IoT challenge regarding connectivity of things spans multiple networking challenges. (a) major need for seamless diverse wireless technologies to enable extraction of a collection of sensory data that might be placed in dense or sparse topologies.(b) major need for latency, bandwidth and interference management to enable connection of things in crowded and interfering scenarios. (c) major need for context aware connectivity of things to enable energy -efficient networking of devices.

Creation of New Services and Actions: The IoT challenge spans multiple cyber infrastructure challenges including (a) new configurations of computing and networking infrastructures, (b) inclusion of new sensors (c) deployment of new policies and services that will execute and react to decisions and control resulting from comprehension of data analytics and (d) the need to incrementally deploy and test new infrastructure[8].

VI. CONCLUSION

It outlines general information about IoT, such as definition, market size and status of IoT, which has become a hot IoT topic nowadays. The notion of smart cities has gained much traction in recent years as a vision for stimulating and supporting innovation and economic growth and providing sustainable and efficient urban management and development. One significant aspect of the smart cities concept is the production of sophisticated data analytics for understanding, monitoring, regulating and planning the city. As cities have become increasingly embedded with all kinds of digital infrastructure and networks, devices, sensors and actuators, the volume of data produced about them has grown exponentially, providing rich streams of information about cities and their citizens. We hope that more research in this field will be conducted in the future.

REFERENCES:

[1] Jaehak Byun , Sooyeop Kim ,"IoT(Internet of Things) based Smart City Services for The Creative Economy ", *International Journal of Smart Home Vol. 10, No. 7 (2016), pp. 185-192*

[2] JaehakByun, Sooyeop Kim ,"Smart City Implementation Models Based on IoT Technology",*Advanced Science and Technology Letters Vol.129 2016, pp.209-212*

[3]"Smart cities and the Internet of Things", Municipal transformation with the HPE Universal IoT Platform

[4] "Smart Cities, Big Data, and the Internet of Things" IEEE Standards University

[5] Shane Mitchell, Nicola Villa, Martin Stewart,Weeks ,Anne Lange,"The Internet of Everything for Cities" Connecting People, Process, Data, and Things To Improve the 'Livability' of Cities and Communities.

[6] "Smart Cities in India -the role of m2m + iot", Dinesh Kapur and Ryan Christopher Sequeira with inputs from m2mpaper.com

[7] Dr. J. Thirumaran,Dr. T. Santhiya Rani "Smart Cities & Challenges in India - A Vision", IJIET

[8]Klara Nahrstedt, Daniel Lopresti, Ben Zorn, Ann W. Drobnis, Beth Mynatt, Shwetak Patel, and Helen V. Wright "Smart Communities Internet of Things", Computing Community Consortium January 12, 2016,Version 1,