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Smart City Development Implementing IoT

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Abstract

A smart city is a structure, consisting primarily of Information and Communication Technologies (ICTs), for planning, implementing and promoting sustainable development practices to resolve that urbanization challenges. A large part of this ICT framework is essentially an intelligent network of connected objects and machines that use wireless technology and the cloud to transmit data. Cloud-based IoT applications obtain, evaluate and handle data in real time to help communities, companies and residents make better life-enhancing decisions. The Smart City idea has arisen for good reason. First, since the majority of new jobs in urban areas are being developed, the expansion of these areas is accelerating. Second, a growing number of families in rural regions are moving to urban areas to improve the educational opportunities for their children. In this paper we will explore the roles of smart city and its elements in the IoT.

Keywords: Smart City, IoT, Technology, New jobs, Roles

Introduction

The Internet of Things is an infrastructure that has physical devices, modern vehicles, buildings, and even essential electrical devices which we use on a uniform basis inter-connected to every other over the internet so that they can accumulate and exchange data amongst themselves. These "Things" have the priority and the ability to self-organize and communicate with other things without human intervention [1]. There are quite six devices connected to the web per person [2]. The concept of IoT aims to present the web even more pervasive and even more immersive. The IoT will improve the event of varied applications that make use of the huge amount and variety of knowledge produced by objects to implement further services to companies, citizens, and public administrations. IoT applications are various and delivered to several areas and domains for example: home automation, healthcare via mobile, manufacturing automation, elderly assistance, medical aids, automotive, smart grids and intelligent energy control, traffic management, etc. [3]. The configuration of the IoT is subject to smart and self-configuring objects which are merged into a universal network basis. That will give an addition to new opportunities for the Information and Communication Technologies (ICT) sector, covering the way to different services and applications able to leverage the interconnection of physical and virtual domains. IoT can be defined as 'Objects having virtual personalities and identifications in smart areas employing intelligent interfaces to connect and communicate within medical, social, environmental and user's context. The influence of the IoT on the lifetime of users are often considered as its key feature. This challenge has driven to extend of various and rarely, incompatible projects for the possible recognition of IoT systems. Accordingly, from a system prospect, the notice of an IoT network, commonly with the specified backend network services and devices, still needs a longtime best practice due to its novelty and complexity [5]. Smart cities are people who make the utilization of those smart things to hold out various functions like lighting, control, connecting multiple cities, energy

consumption and pollution control. The main purpose of smart cities can replace the way how we look to the things [6].

Architecture for a Smart City

The effectiveness and applicability of such a system directly correlates with the quality of its building blocks and the way they interact and IoT architecture has different approaches. Our IoT developers will share their hands-on experience in this post, and present their original idea of a scalable and versatile IoT architecture. Our approach to IoT architecture is expressed in the IoT architecture diagram which shows the IoT system's building blocks and how they are linked to capture , store, and process data.

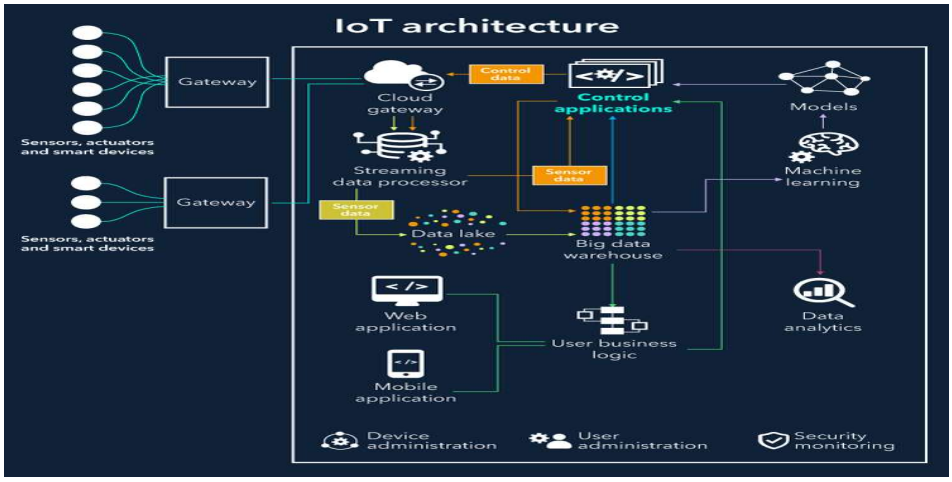

Figure 1

The components of the IoT architecture include:

- ✓ **Devices** embedded with sensors for gathering data and actuators for executing cloud provided instructions.
- ✓ **Gateways** - Data collection, pre-processing and shifting the receiving commands into cloud is performed by gateways and it also perform vice versa operation such as – receiving commands from the cloud system.
- ✓ **Cloud gateways** are used for secure data transfer from field to central IoT servers.
- ✓ **Streaming data processors** is used to distribute sensor data among relevant components of the IoT solution.
- ✓ **Data Lake** is used for storage of all specified and undefined value data.
- ✓ **Bigdata warehouse** is used for obtaining valuable data.
- ✓ **Machine learning** is used to generate the models which control applications.
- ✓ **Data analytics** is used for Manual Data Processing Analysis.

Role Of Smart City And Its Components In The IoT

IoT-enabled smart city usage is applied in many areas: from helping to a safer atmosphere and enhancing traffic to improving public safety and street lighting optimization.

1. **Road Traffic System**

Smart cities make sure their residents are getting as secure and effective as possible from point A to point B. Municipalities are turning to IoT technology to do this, and introducing smart traffic solutions.
Smart traffic solutions use various sensor types as well as collecting GPS data from mobile phones of drivers to determine vehicle number, position and distance. At the same time, smart traffic lights linked to a cloud management platform allow monitoring of green light timings and automatically altering the lights to avoid congestion based on current traffic situation. In addition, using historical data, smart traffic management systems can forecast where the traffic will go and take action to avoid future congestion.

2. **Smart Parking**

Smart parking solutions determine whether the parking spots are occupied or available and create a real-time parking map with the help of GPS data from driver smartphones (or road-surface sensors embedded in the ground at parking spots).

3. **Public Transport**

IoT sensor data may help to uncover trends about how people use transportation. Such data can be used by public transit operators to improve passenger efficiency, to reach a higher degree of health and punctuality. Intelligent public transit systems can integrate several sources to conduct a more complex analysis, such as ticket sales and traffic statistics.

4. **Smart Meters & Billing**

With a smart meter network, municipalities may provide cost-effective access for residents to the IT networks of utility companies. Now smart connected meters can send data directly over a telecom network to a public utility, providing accurate meter readings. Smart metering allows utilities to reliably bill the amount of water, electricity and gas consumed by each household.

5. **Street Lighting**

IoT-based smart cities are making street lamp management and control easier and more cost-effective. The equipping and connecting streetlights with sensors to a cloud management solution helps to adapt the lighting schedule to the lighting zone.

Smart lighting systems gather data on luminance, people and vehicles movement and combine it with historical and contextual data (e.g., special events, schedule for public transport, time of day and year, etc.) and evaluate it to optimize the lighting plan. As a consequence, a smart lighting system "tells" a street light to dim, illuminate, turn on or off the lights depending on the external situation.

6. **Waste Management**

Smart city applications allowed by IoT help improve waste collection schedules by monitoring waste rates, as well as providing route optimization and operational analytics.

Each waste container receives a sensor that collects the data in a container about the waste level. If it is near to a defined threshold, the waste management system receives a sensor log, processes it, and sends a notification to the mobile device of a truck driver. The truck driver empties a complete bag, thereby preventing the emptying of half-full ones.

7. Environment

IoT-driven smart city solutions allow critical parameters to be tracked for a healthy environment to keep them at an optimum level. For example, a city can deploy a network of sensors across the water grid to monitor the water quality and connect them to a platform for cloud management. Sensors calculate the pH level, the volume of oxygen dissolved and the dissolved ions.

If leakage occurs and the chemical water composition changes, a user-defined output is triggered by the cloud platform. For example, if a level of Nitrate (NO_3) exceeds 1 mg / L, a water quality management solution alerts contamination maintenance teams and automatically creates a case for field workers, who then begin fixing the problem.

8. Public Safety

IoT-based smart city solutions deliver real-time surveillance, analytics, and decision taking tools to improve public safety. Public safety technologies can anticipate possible crime scenes by integrating data from acoustic sensors and CCTV cameras installed throughout the city with data from social media feeds and analyzing it. This will help the police to deter or effectively monitor possible suspects.

Conclusion

The prospect of IoT is boundless. IoT lets communities connect and maintain various public and technology resources. Including smart lighting and road traffic to integrated public transit and waste management where there is a wide variety of use cases. Everything they both have in common is the performances. Applying IoT solutions leads to reduced energy costs, optimized use of natural resources, safer cities and a healthier environment. However, municipalities should take a consistent approach to designing functional and scalable smart city architecture to enjoy these benefits. Well-designed, it will the IoT technology investments and speed up the implementation of smart city solutions. Implementation of IoT infrastructures will include numerous and vast opportunities. By sharing a network built on open data, the cloud-based design of IoT applications for Smart Cities is acceptable. Small cities can form a common urban ecosystem. In this way, small and large smart city solutions are networked and controlled through the central cloud platform. Last but not least, a city's size is not an obstacle to being "smart." Cities within each community should take advantage of smart technologies.

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