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Framework for a smart water management system in the context of smart city initiatives in India

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Abstract

The Internet, invention of the century, has completely revolutionized the world and brought people closer to each other than ever before. The advancement in technologies of computing, communication brings the next generation of Internet, Internet of Things. As the population and urbanization increases, the cities have to transform to Smart Cities which can be achieved with the help of Internet of Things. Water is one of the vital resource for existence of human life and so Smart water management system has a key role in smart city. The paper reviewed different technologies and platforms that are required for a smart environment. An architecture design for Smart water management is proposed and an implementation detail of Smart water monitoring system is discussed.

1.Introduction

The Internet, invention of the century, has completely revolutionized the world and brought people closer to each other than ever before. The introduction of mobile devices and the influence of internet not only changed the way we do business but changed our lifestyle too.

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Internet of Things, can be considered as the next generation of Internet. There has been drastic advancement in technologies of computing, mobile communication, wireless communication, ubiquitous computing and this opens the door for Internet of Things. Internet of Things is a network of connected devices, where the devices can be a sensor, cell phone, actuator, RFID systems or anything that can transmit and receive information, over a communication channel. The device can be stationary or transit and are uniquely identified by their address and will be communicated either by wired or wireless technology. This connected objects and accessibility from anywhere at any point of time and value added services provided by them brings a better world for human being. The Internet of Things advances to the extent that number of 'Things' connected is far more than the total population of the world. As these many devices are connecting and sharing information, massive amount of data will be generated. This data will be meaningful only if we are able to draw insights from it. There comes the importance of analytics. The Internet of Things along with predictive analytics helps to realize the concept of Smart City.

Smart City initiatives in India: As per the Census report in 2011, 63% of India's GDP comes from the urban areas and only 31% of India's population is residing there. Population residing in rural areas started shifting to urban area for a better lifestyle. By 2030, country is expecting 40% of population will be there in cities and that will contribute 75% of India's GDP. For accommodating this urbanization, development in infrastructures in terms physical, economic and social are mandatory. Both government and private sectors already initiated some program by investing in this areas [1].In 2014-15 Budget, Government of India allotted 70.6 billion for smart city projects. Smart Solutions for a Smart city can be categorized based on the service sectors. Water and Energy management are the key areas of focus. Smart Meters (which can monitor and manage the consumption and distribution), water quality monitoring, leakage identifications etc. are few challenging solutions in Indian scenario. Smart grids, renewable source energy management, green building etc. are some solutions coming under Energy management. Smart Parking, intelligent traffic management, integrated multi-modal transport can bring Smart transportation to the city. Smart waste management, air quality monitoring and noise monitoring system can add more values to smart environment.

Smart Water Management: Water is one of the vital resources for human life. The dramatic change in climate and increase in the population made water insufficient compared to demand. As the consumption of water is increasing, water management becomes a big challenge for both the government and water companies. The challenge also includes providing quality water at minimum cost and energy use. Water management have role in many aspects of human lives like water consumption, agriculture, food production, environment etc. [2]. Water is required for generating energy and energy is needed to provide water.

Existing systems spend more time for gathering data and concentrate less on insights that can be drawn from data. The water level in tanks has to be collected manually. In a delivery system, reading from flow meter and pressure meters are taken manually. Water quality is checked by taking samples which is then tested from labs and also this will take few days to get the result. Smart water analytics can bring a change for this by bringing the real-time data in front so that the analyst can spend time on analysis and actions in short time and at low cost. Smart water management systems include real-time monitoring of water levels, identifying leaks in distribution systems, monitoring and maintaining water quality.

The rest of the paper is organized as follows. Section 2 discuss the literature survey in which different architecture and technologies used in Internet of Things, various cloud platforms for IoT, and components for IoT. Design of the proposed system is discussed in section 3 and section 4 briefs the implementation details and the results. Conclusion and future enhancement is discussed in section 5.

2. Literature Survey

Smart Water Management is mainly concentrating in reducing the challenges facing in the water sector. Information and communication Technologies (ICT) plays a major role in Smart Water Management (SMW) [3]. SMW can maximize the social and economic welfare by integrating ICT products and can be effectively used for continuous monitoring, finding anomalies and the data can be used for optimizing the water distribution network. SMW includes data acquisition and integration using sensor networks or smart meter, data distribution using WiFi or internet, data processing and storage using cloud technologies, modelling and analytics and visualization and