Chapter 64
IoT-Based Big Data: From Smart City towards Next Generation Super City Planning

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ABSTRACT

Recently, a rapid growth in the population in urban regions demands the provision of services and infrastructure. These needs can be come up wit the use of Internet of Things (IoT) devices, such as sensors, actuators, smartphones and smart systems. This leans to building Smart City towards the next generation Super City planning. However, as thousands of IoT devices are interconnecting and communicating with each other over the Internet to establish smart systems, a huge amount of data, termed as Big Data, is being generated. It is a challenging task to integrate IoT services and to process Big Data in an efficient way when aimed at decision making for future Super City. Therefore, to meet such requirements, this paper presents an IoT-based system for next generation Super City planning using Big Data Analytics. Authors have proposed a complete system that includes various types of IoT-based smart systems like smart home, vehicular networking, weather and water system, smart parking, and surveillance objects, etc., for dada generation. An architecture is proposed that includes four tiers/layers i.e., 1) Bottom Tier-1, 2) Intermediate Tier-1, 3) Intermediate Tier 2, and 4) Top Tier that handle data generation and collections, communication, data administration and processing, and data interpretation, respectively. The system implementation model is presented from the generation and collection of data to the decision making. The proposed system is implemented using Hadoop ecosystem with MapReduce programming. The throughput and processing time results show that the proposed Super City planning system is more efficient and scalable.

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1. INTRODUCTION

According to the report published by CISCO (2008), things connected to Internet surpassed the number of people living on earth. It is also added that these things will touch the limit of fifty billion by 2020, taking us to the world of digitization. These things interact and communicate with each other with the help of internet – we call it the Internet of Things. Recent advancements in the domain of IoT have aided human lifestyles significantly, traversing fields of healthcare, automation and transportation, and disaster management and response.

In the domain of IoT where different things are involved in it strengthening the capabilities of different devices. These strengthening capabilities include hearing, seeing, listening and communicating altogether with each other. Thus, IoT transforms those objects from being traditional toward smart by incorporating its ubiquitous and pervasive computing, embedded devices (e.g., actuators, smartphones, tablets, and other networked enabled devices), communication technologies, sensor networks, Internet Protocols and applications, revolutionize the way of human beings. The Internet will be no longer considered as the network of computers. Rather, it will be involved with billions of smart devices along with the embedded systems. As a result, Internet of Things (IoT) will greatly increase its size and scope, providing a new way of opportunities as well as challenges (Zeng, Guo, & Cheng, 2011). The majority of the countries have put forward longstanding national strategies for the implementations of IoT after completing the intangible stage of service level. For instance, Japan's broadband access is providing the facility of communication between people, people and things, and things and things (Srivastava, 2004). Similarly, S. Korea's smart home enables its people to access things remotely (Giroux & Pigot, 2005). Singapore's next generation I-Hub (Han, 2005) intends to comprehend the next generation "U" type network through a secure and ubiquitous network (O'droma & Ganchev 2010). The stated initiatives laid the foundation of IoT (Xia et al., 2012). Also Now IoT tends to the Web of things that's aiming to develop smart societies (Ahmad et al., 2016). Thus, a growing need for standardization for sustainable cities rises (ITU-T Focus Group on Smart Sustainable Cities, 2015). In the literature, extensive research work performed on the smart technology has been observed (Dixit & Prasad, 2007). Similarly, the idea of the smart home is also extended towards the Smart Community and Smart Society where Home Domain, Community Domain, and Service Domain are integrated to provide benefits to mankind.

Due to the incorporation of ubiquitous and pervasive computing, the trend of living has now changed. It is predicted that by 2050, seventy percent of the world population will live in cities (Jin et al., 2014). Moreover, a rapid increase in population migration towards cities has been seen. Therefore, it results in enhancing the number of things to be interconnected with each other over the internet, which results in generating a massive volume of data with heterogeneous properties (termed as Big Data). To enrich the smart technology, such as Smart and Super City, the better analytics of Big Data could play a vital role in the advancement of Information and Communications Technologies (ICTs). Such of Big Data analysis provides a better understanding and useful information about the future as well as planning and development, while showing us a deeper insight of Big Data. Hence, by analyzing such data based on the user needs and demands, the cities can be built smarter. Thus, the enabling technologies and the data analytics made the IoT to come out of its primary phases.

Traditionally, for urbanization, it is an extreme important factor to realize the desires for service profiling to enrich the efficiency and bring the recent advancement in the city administration. Currently, few organization are working on their platforms for live monitoring of various process parameters. Such activities are followed by huge amount of data collection, Data filtration and processing, data analytics,