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Muhammad Babar, Fahim Arif

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Smart Urban Planning using Big Data Analytics to contend with the Interoperability in Internet of Things

Muhammad Babar, Fahim Arif

National University of Sciences and Technology, Islamabad, Pakistan

babar.phd@students.mcs.edu.pk, fahim@mcs.edu.pk

Abstract

The recent growth and expansion in the field of Internet of Things (IoT) is providing a great business prospective in the direction of the new era of smart urban. The insight of the smart urban is extensively preferred, as it improves the excellence of life of citizens, connecting several regulations, that is, smart transportation, smart parking, smart environment, smart healthcare, and so forth. Continuous intensification of the multifaceted urban set-up is extensively challenged by real-time processing of data and smart decision capabilities. Consequently, in this paper, we propose a smart city architecture which is based on Big Data analytics. The proposed scheme is comprised of three modules: (1) data acquisition and aggregation module collects varied and diverse data interrelated to city services, (2) data computation and processing module performs normalization, filtration, processing and data analysis (3) application and decision module formulates decisions and initiates events. The proposed architecture is a generic solution for the smart urban planning and variety of datasets is analyzed to validate this architecture. We also tested reliable datasets on Hadoop server to verify the threshold limit value (TLV) and the investigation demonstrates that the proposed scheme offer valuable imminent into the community development systems to get better the existing smart urban architecture. Moreover, the efficiency of proposed architecture in terms of throughput is also shown.

Key Words: IoT, Interoperability, Big Data Analytics, Smart City

1. Introduction

In recent times, the notion of connecting objects via the internet has been advanced with the emergence of the incredible growth of smart devices. This major penetration introduced the idea of Internet of Things (IoT) as one of the most important waves of the web [1, 4]. IoT has been matured and turn out to be the focus of consideration among manifold concern groups due to the innovation of embedded device technology and a hasty increase in its number that is resulting in the productive applications of smart city, smart health, smart home, and so forth [5–7]. The perception of the smart city is primarily thought up with intend to increase the quality of services (QoS) accessible to the society by making use of public services and resources proficiently [8]. In fact, the services including healthcare, transportation, smart home, electricity, parking, and so forth, are optimized with the independent data collection. It is important to process and deal with a large quantity of data in real-time to offer real time services to the society. After the gigantic increase in data volume, traditional processing and analytical procedures turn out to be incapable to suit the real-time data processing requirements.

Big Data analytics can take out information than traditional data analytics up to large extent. Therefore, the integration with Big Data analytics is painstaking to be the idyllic initial stair in the direction of a smarter city. In addition, there are several efforts have been made by both industry and academia to comprehend the belief of smart city. However, several works are also presented based on the individual effort which cover parking management, garbage management, water management, and so forth [9–10]. Thereupon, analyzing and computation of the immense amount of data become a necessity. For the insight of the smart city, the urban IoT is incorporated with Big Data analytics. For example, sensors or cameras deployed on the highway gathers the traffic information that is compared with the already defined threshold limits of number of cars on the highway and based on real time processed results the current situation is sent to traffic control department. Simultaneously, the user is notified regarding the selection of highway lane to avoid congestion. Thus, inclusive and elastic smart city architecture has turned into an essential demand, as short of reliability declines the achievability. In addition, it should make the possible independent performance, real-time data computation, and real-time decision management. However, there are a number of challenges are faced by IoT and Big Data. The use of heterogeneous devices brings interoperability issues which are a very challenging task to deal with. The heterogeneous environment augments the problem of