Chapter 38
IoT Data Compression and Optimization Techniques in Cloud Storage:
Current Prospects and Future Directions

Kaium Hossain
Department of Computer Science & Engineering, Green University of Bangladesh, Dhaka, Bangladesh

Mizanur Rahman
Department of Computer Science & Engineering, Green University of Bangladesh, Dhaka, Bangladesh

Shanto Roy
Department of Computer Science & Engineering, Green University of Bangladesh, Dhaka, Bangladesh

ABSTRACT

This article presents a detailed survey on different data compression and storage optimization techniques in the cloud, their implications, and discussion over future directions. The development of the smart city or smart home systems lies in the development of the Internet of Things (IoT). With the increasing number of IoT devices, the tremendous volume of data is being generated every single day. Therefore, it is necessary to optimize the system's performance by managing, compressing and mining IoT data for smart decision support systems. In this article, the authors surveyed recent approaches with up-to-date outcomes and findings related to the management, mining, compression, and optimization of IoT data. The authors then discuss the scopes and limitations of present works and finally, this article presents the future perspectives of IoT data management on basis of cloud, fog, and mobile edge computing.

DOI: 10.4018/978-1-6684-7132-6.ch038

1. INTRODUCTION

Being called the future of the Internet, IoT is the most popular approach for the business application sector Tan and Wang (2010). It connects physical objects like sensors or devices through the Internet. IoT devices collect data from the environment by using sensors, cameras, radio frequency identifier (RFID) etc. A few basic features of IoT are connectivity, uniqueness, sensing/actuation capability, embedded intelligence and inter-operable communication capability. The concept of the smart city has emerged after IoT took over the scenario with industrial automation process as with utilizing this technology, city life can be smarter and efficient than before Khare and Khare (2018). IoT technology is used almost everywhere like industrial manufacturing Mourtzis et al. (2016), IoT enabled healthcare Roy et al. (2016), smart home Stojkoska and Trivodaliev (2017), smart transportation Whaiduzzaman et al. (2014), smart agriculture Channe et al. (2015) and other smart city approaches.

Every day tremendous volume of data is being generated with the increasing number of IoT devices. Generally these devices have limited processing power and storage capacity which are unable to process or store this big data. Therefore, at this point, a problem has arisen regarding processing power and storage capacity. Another problem for IoT big data is the mining of the data. Because it is quite a big challenge to figure out the actual meaningful data from the large data. The problems are not finished here, the IoT data that are increasing very fast need to be managed more efficiently and requires a more effective storage management system as well. To reduce the required storage space, data need to be compressed with much more compression ratio. And lastly, one of the major challenges is to reduce the energy consumption during processing and transmitting the big data through the IoT-Cloud ecosystem network.

A unified architecture of IoT system is defined in Lv et al. (2017), which contains the brief description of IoT node model, virtual things, the basic service of things and overall hierarchical model of services. To implement a complete IoT system, IoT nodes need to be connected directly to the Internet, and started from the base services, built the IoT application system with the middle layer of the Internet-based services and the base services of things. IoT architecture has seven layers, from bottom to top, the bottom is IoT hardware devices which are divided into two sub-layers, sensing and act device layer and intelligent device layer; the next layer is concerned with the information of things which are physical information layer and logical information layer. After that, the service layer comes up that divided into the IoT basic service layer and service middle layer. At the top is the application layer. A layered architecture of IoT System is shown in the Figure 1.

In this article, we have studied the related researches about the Integration of IoT and Cloud, IoT data storage management, Data mining for IoT, Data compression in IoT and Data Optimization and Energy Consumption in IoT. Therefore, we have discussed some scopes limitations for each section. After that, we have compared the existing works in every section and at last, we have shown some future directions for each and every section.

The main objective of our research work is to show a path to the researchers so that they can get scopes of more research. We have found out the challenges that cannot be solved by the existing research works. Through this paper, we are provoking the researchers to conduct more research works in some particular sectors. We have shown some points where more researches need to be conducted. From this article, researches can get some future directions about that where they should concentrate more on their research.

The rest of the paper is organized as follows: Section 2 discusses the technical advancements on the integration of IoT and Cloud. Section 3 addresses a literature review of IoT data storage management. In Section 4, several data mining techniques for IoT data are presented. Section 5 investigates recent ap-