Chapter 54
Fog Computing Qos Review and Open Challenges

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ABSTRACT

Internet of Things (IoT) enables inters connectivity among devices and platforms. IoT devices such as sensors, or embedded systems offer computational, storage, and networking resources and the existence of these resources permits to move the execution of IoT applications to the edge of the network and it is known as fog computing. It is able to handle billions of Internet-connected devices and is well situated for real-time big data analytics and provides advantages in advertising and personal computing. The main issues in fog computing includes fog networking, QoS, interfacing and programming model, computation offloading, accounting, billing and monitoring, provisioning and resource management, security and privacy. A particular research challenge is the Quality of Service metric for fog services. Thus, this paper gives a survey of cloud computing, discusses the QoS metrics, and the future research directions in fog computing.

1. INTRODUCTION

Internet of Things (IoT) can be the most debatable topic in the field of industry and it is the collection of physical devices embedded with various resources like sensors, actuators, software's to transfer the information collected through wireless global network infrastructure. IoT establishes connection between living and non-living things, can collect data with the help of sensors, intimate the people about the surroundings and so on. It represents one of the most innovative technologies that enables widespread

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computing scenarios or framework. IoT is no longer a scientific fiction but an essential part in day-to-day life and all the information's collected in real time applications can be communicated through internet at any time from any place to render any kind of services by any network to anyone and everyone (Kaur et al., 2016).

Smart environments will be emerged in near future, by developing applications using IoT technology, and deploying them in real time environment. Services related communication, and storage will be highly distributed and available to the people by establishing wireless connection between people, machines, objects and space through sensors, RFID tags that are interconnected by powerful networks of network (Ezechina et al., 2015). The collection and communication of data between different devices lead to several application domains namely Personal and home, Enterprise, utilities and Mobile. The communication between the objects is based on certain interoperable protocols commonly used in heterogeneous environments and platforms. Since large amount of data are collected from real world application through sensors and other resources, storage becomes a major issue. This leads to concerns related to reliability, performance, security and privacy (Alesiso et al., 2014). These issues can be partially solved by most debated topic "Cloud Computing". Cloud computing has virtual capabilities in terms of storage and processing power which lead to the new concept 'CloudIoT'. The main challenge of hybrid IoT Cloud systems is represented by the fact that they require interoperability, scalability, self-adaption, Quality of Service (QoS), fault tolerance and security (Villari et al., 2014).

Fog computing is related to the edge computing in the cloud. In contrast to the cloud, fog platforms have been described as dense computational architectures at the network's edge. Characteristics of such platforms reportedly include low latency, location awareness and use of wireless access. While edge computing or edge analytics may exclusively refer to performing analytics at devices that are on, or close to, the network's edge, a fog computing architecture would perform analytics on anything from the network center to the edge. IoT may more likely be supported by fog computing in which computing, storage, control and networking power may exist anywhere along the architecture, either in data centers, the cloud, edge devices such as gateways or routers, edge equipment itself such as a machine, or in sensors. Fog computing is extremely virtual platform, which offers network services, storage space, computational services to the cloud servers and the end user devices. Fog computing plays major role in supporting, implementing the IoT. The increasing use of wearable in smart tele-health system led to generation of huge medical big data. Cloud and fog services leverage these data for assisting clinical procedures (Barik et al., 2018).

The main challenges in offloading in fog computing are how to deal with dynamic and the dynamic has three-fold such as radio/wireless network access, nodes in the fog network and resources in the fog (Varghes et al). In the fog ecosystem for maximizing performance Workloads can be offloaded in the following two ways. Firstly, from user devices onto edge nodes to complement the computing capabilities of the device. Secondly, from cloud servers onto edge nodes so that computations can be performed closer to the users.

Section 2 introduces the background of fog computing. Section 3 discusses the related work based on QoS of IoT, cloud computing, Cloud of Things (CoT) and Fog computing. Section 4 explains the Fog computing Quality of Services metrics. Section 5 explains the hindrances in fog computing. The conclusion of the paper is described in Section 6.

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