Fog Computing:
Applications, Concepts, and Issues

Chintan Bhatt, Department of Computer Engineering, Charotar University of Science and Technology, Anand, India
C. K. Bhensdadia, Dharmsinh Desai University, Nadiad, India

ABSTRACT

The Internet of Things could be a recent computing paradigm, defined by networks of extremely connected things – sensors, actuators and good objects – communication across networks of homes, buildings, vehicles, and even individuals whereas cloud computing could be ready to keep up with current processing and machine demands. Fog computing provides architectural resolution to deal with some of these issues by providing a layer of intermediate nodes what’s referred to as an edge network [26]. These edge nodes provide interoperability, real-time interaction, and if necessary, computational to the Cloud. This paper tries to analyse different fog computing functionalities, tools and technologies and research issues.

KEYWORDS

Applications, Cloud, Fog Computing, Internet of Things

1. INTRODUCTION

At a really generic level of understanding it is said that Internet of Things (IoT) may be the network infrastructure where the physical and virtual objects are all equipped with sensing and communication capabilities in order that they will use the Pervasive Internet for data transmission and other controlling and monitoring purposes. This definition could seem rather dubious at the primary scan. The inferences and the implications of the definition are going to be clearer as we have a tendency to move forward with the content of this text.

To put this simply, “IoT is a scenario in which objects, animals or people are provided with unique identifiers and the ability to automatically transfer the data over a network without requiring human-to-human or human-to-computer interaction”. Explosive growth of Smart Devices and PCs brought the amount of devices connected to the Internet to 12.5 billion in 2010, while the world’s human population exaggerated to 6.8 billion. It is estimated by CISCO that IoT was “born” between 2008 and 2009 (see Figure 1).

‘Fog Computing’ is the computing directly at the edge of the network, which might deliver new applications and services particularly for the longer term of web. This computing relies on the basis that process jobs, which can be executed on edgy nodes (located in between the cloud and user devices) to reduce communication latencies. Thus, fog computing provides higher Quality of Service (QoS).

In fog computing, fog nodes offer resources/services at the edge of the network. They will be devices with limited capability like set-top boxes, access points, routers, switches, base stations, and end devices, or devices with lots of capability i.e. machines like Cloudlet and IOx.
“IOx (product from Cisco) works by hosting applications during a Guest software system (GOS) running throughout a hypervisor directly on the Connected Grid Router (CGR).” Python scripts can be run, own code can be compiled, and operation system can be replaced with their own on IOx platform.

This paper presents a survey on fog computing specializing in its ideas, applications and underlying problems one could encounter in coming up with and implementing fog system.

2. FOG COMPUTING BASICS

There are not any unanimous definitions of fog computing considering it’s in its immature state. This has junction rectifier to several definitions of the fog, relying upon completely different views as follows:

**Definition 1:** “Fog computing is a scenario where a huge number of heterogeneous (wireless and sometimes autonomous) ubiquitous and decentralized devices communicate and potentially cooperate among them and with the network to perform storage and processing tasks without the intervention of third parties. These tasks can be for supporting basic network functions or new services and applications that run in a sandboxed environment. Users leasing part of their devices to host these services get incentives for doing so (Vaquero & Rodero-Merino, 2014)”.

This definition, nonetheless, is still debatable because it fails to address the unique connection to the cloud (S. Yi et al., 2015). Thus, a new definition is introduced:

**Definition 2:** “Fog computing is a geographically distributed computing architecture with a resource pool consists of one or more ubiquitously connected heterogeneous devices (including edge devices) at the edge of network and not exclusively seamlessly backed by cloud services, to collaboratively provide elastic computation, storage and communication (and many other new services and tasks) in isolated environments to a large scale of clients in proximity (Yi et al., 2015)”.

---
Leveraging the Power of the Grid with Opal

Apriori-based High Efficiency Load Balancing Parallel Data Mining Algorithms on Multi-core Architectures