Chapter 46
Unique Fog Computing Taxonomy for Evaluating Cloud Services

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ABSTRACT

Fog computing has the potential to resolve cloud computing issues by extending the cloud service provider's reach to the edge of the cloud network model, right up to the cloud service consumer. This enables a whole new state of applications and services which increases the security, enhances the cloud experience, and keeps the data close to the user. This chapter presents a review on the academic literature research work on fog computing, introduces a novel taxonomy to classify cloud products based on fog computing elements, and then determines the best fit fog computing product to choose for the cloud service consumer.

INTRODUCTION

The primary objective of Fog computing is to ensure the user data stays as close to the user by employing geographically distributed computing infrastructure at the Edge of the cloud-user network. This involves virtualized platforms, smart devices, sensors and nodes that provide storage, computing and network services located at the Edge of the cloud network. Yet Fog computing is not a replacement for Cloud computing. Cloud Computing, Internet of Things and Fog Computing are discussed in this section.

Cloud Computing organizes a pool of shared infrastructure of hardware and software stack hosted inside a centralized data center for delivering service layers over the Internet. These performs compute,

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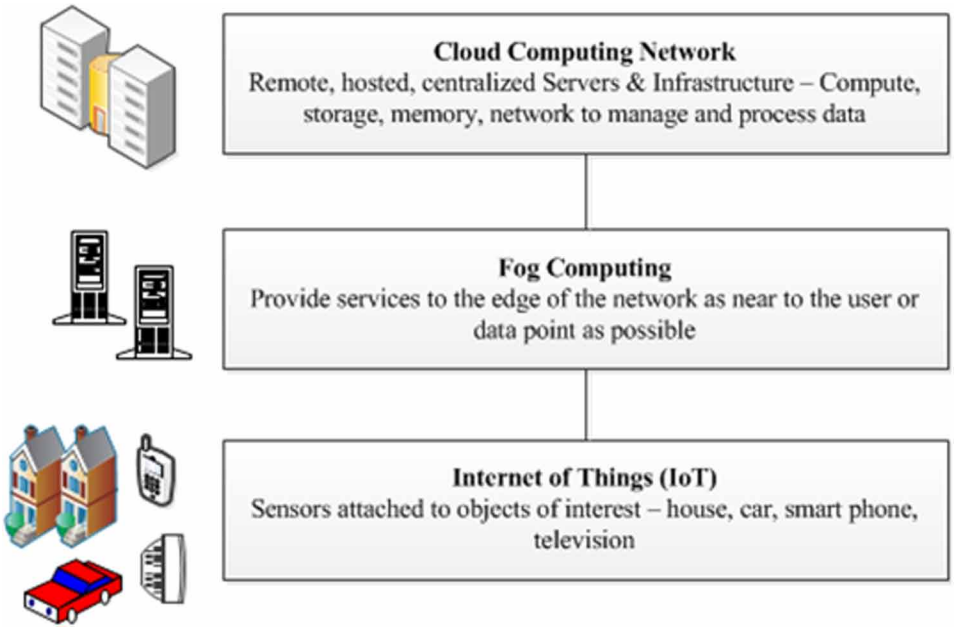
Figure 1. Cloud Computing, Fog Computing and Internet of Things Architecture



storage and networking functions to receive, process and respond to user requests. Cloud computing services are related to applications, platforms and infrastructure, delivered to the Cloud service consumers. The hosted resources are shared by the Cloud service consumers as per different commercial models. Current market examples include Google Docs, Sales Force, Microsoft Office 365 and Amazon Web Services (AWS). Internet of Things or IoT is an internetworked connection of physical devices, buildings, vehicles and smart systems. These are implanted with sensors, actuators over existing network to act as nodes for collecting and exchanging real time data. Examples of IoT include Kolibree Smart Toothbrush, Samsung Smart Things Hub, Nest Smart Thermostat and WeMo Switch Smart Plug as per Internet of Things (2018)[1].

Fog Computing refers to a distributed, decentralized system level architecture that extends the reach of Cloud computing, storage, networking and access control right up to the Edge of the network near the user and devices involved. This involves the use of smart devices, nodes, data hub and sensors configured as near to the IoT data collection point. The IoT data is processed by a smart hub locally, as close to the sensor that is generating the data, unlike Cloud architecture which is has centralized computing. Fog network works at two levels – data level and control level. The data level plans for data management, processing and configuration of the computing resource devices (nodes). The control plane decides the network overview, routing protocols and the control architecture. This leads to low latency, faster, efficient management for collaboration and accessibility with Edge node devices using wireless networks. An IDC study by Yoko Ono (2016)[2] estimates that in 2020, over 10% of the user data would be processed by smart Edge devices involving use of Fog computing.

For Computing empowers the smart hub and nodes to carry out computing and processing functions that would otherwise be performed at a far off centralized data center –