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Fog Computing Applications in Cloud

Akhija Lakshmi R
PG Student
Department of Computer Science and Engineering
Mount Zion College Of Engineering, Kadammanitta,
Pathanamthitta, Kerala

Smita C Thomas
Research Scholar
Department of Computer Science and Engineering
Vels University,
Chennai

Abstract

Fog computing is a paradigm that expands cloud computing and services to the edge of the network. Similar to cloud Fog computing implement data, compute, storage, and relevance services to end users. In this paper elaborate the advantages of Fog computing and analyze its relevance's of real scenarios, such as smart traffic lights in vehicular networks, smart grid etc. The state-of-the-art of Fog computing and parallel task under the same umbrella. Security and privacy issues are further impart according to current Fog computing paradigm. As example a typical barrage, man-in-middle barrage in Fog computing.
Keywords: Fog computing, Internet of things, Cloud computing, Smart street lights

I. INTRODUCTION

CISCO delivered the vision of fog computing to enable relevance's on linked devices, already linked in Internet of Things (IoT), to run directly at the network edge. Internet of Things (IoT) is the merging of connecting people, things, data and processes is to mold our life, business and everything in between. The term Fog computing is also termed as edge computing , which essentially means that somewhat than hosting and working from a centralized cloud, Fog systems operate on network ends. That concentration referred that data can be processed locally in smart devices rather than being sent to the Cloud for processing. It's one access to dealing with the Internet of Things (IoT).

Fog computing places a few of transactions and resources at the edge of the Cloud, rather than establishing channels for Cloud storage and utilization, it lessen the need for Band width by not sending every bit forepart bygone Cloud channels, and instead aggregating it at certain connection points. By using this kind of distributed scheme, we can lower costs and improve efficiencies. In Fog computing, services can be hosted at end devices such as set-top-boxes or connection points.

The infrastructure of this distributed computing allows relevance's to run as close as available to notice actionable and massive data, coming out of people, processes and thing. Such Fog computing thought, actually a Cloud computing essentially the 'ground', creates automated response that drives the value. Both Cloud and Fog provide data, estimation, storage and relevance services to end users.

Fog can be distinguished from cloud by proximately to end users, the dense geographical distribution and its support for portability. As Figure 1 Each smart thing is linked to one of Fog devices. Fog devices could be linked and each of them is linked to the Cloud.

II. NEED OF FOG?

Cloud computing has provided many opportunities for enterprises by subscription their customers a range of computing services. Current "pay-as-you-go" Cloud computing exemplary becomes an efficient substitute to owning and managing private data centers for customers front web relevance's and batch processing.

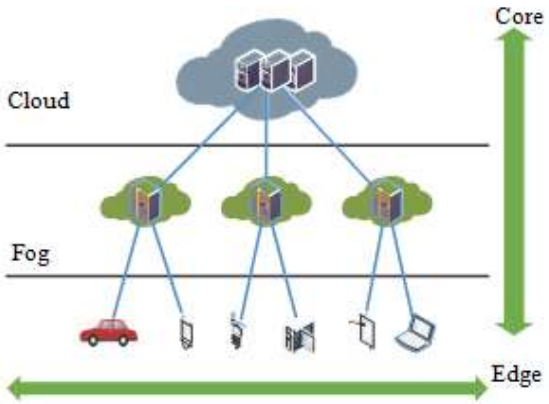

Fig. 1: Fog between edge and cloud

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Cloud computing reciprocal the enterprises and their end users from the detail of many details, such as storage resources, computation drawback and network communication cost. When techniques and devices of IoT are getting more tangled in people's life, current Cloud computing paradigm can barely delight their requirements of portability support, location awareness and low latency.

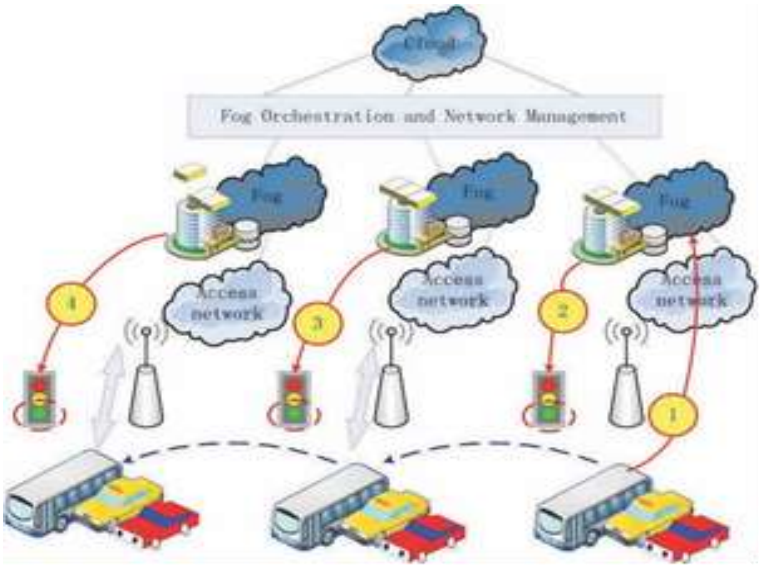

Fig. 2: Fog computing in smart traffic lights and linked vehicles.

As Fog computing is implemented at the edge of network, it implement low latency, location awareness, and improve quality-of-services (QoS) for cascade and real time relevance's. Typical cases include industrial automation, transportation, and grid of sensors and actuators.

This infrastructure supports heterogeneity as Fog devices include end-user devices, connection points, edge routers and switches. Fog paradigm is well positioned for real time big data analytics, backing densely distributed data collection points, and implement advantages in entertainment, broadcasting, personal computing and other relevance's. Fog computing expands the Cloud computing paradigm to the edge of the backing to address relevance's and duty that do not fit the paradigm of the Cloud including:

- Relevance's that desire very low and predictable latency.
- Geographically appropriated relevance's.
- Fast mobile relevance's.
- Large scale appropriated control systems (smart traffic light systems, smart grid, linked rail).
- Backing for portability.
- Real-time synergy.
- Control of wireless access.
- Heterogeneity.
- Desire for on-line analytic and interplay with the Cloud.

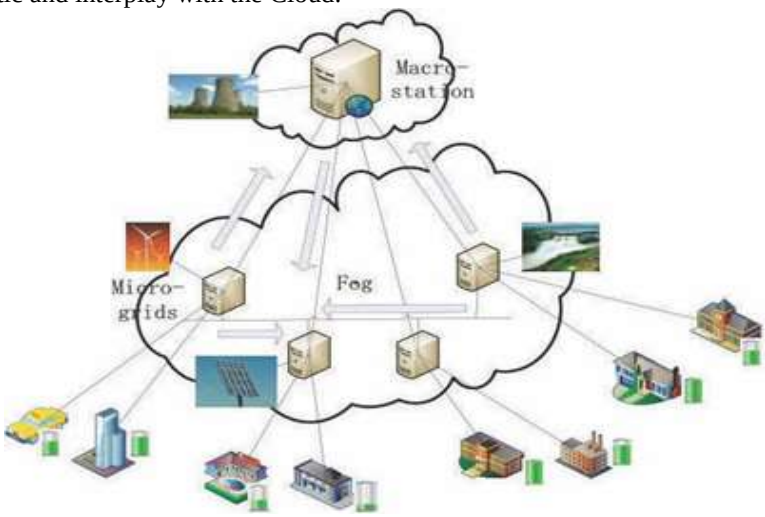

Fig. 3: Fog computing in smart grid.

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A. User Behavior Profiling

User behavior profiling is a reputable technique that is used to determine when and how frequently the user accesses their data on the Cloud. The way of access to a user's information on the cloud is predictable. This behavior of the user is checked continuously to detect an abnormal activity. The profiles maintain a count of the number of times a file is accessed. If there is any diversion in the user behavior profile which is earlier stored in database then an barrage is detected.

III. FOG COMPUTING APPLICATIONS

The advantages of Fog computing delight the requirement of relevance's in these scenarios.

A. Smart Traffic Lights and Linked Vehicles

Video camera that feel an ambulance flashing lights can naturally change street lights to open lanes for the vehicle to pass through traffic. Smart street lights connect locally with sensors and detect presence of pedestrian and bikers, and measure the distance and speed of coming vehicles. As shown in Figure 2 , intelligent lighting turns on once a sensor identifies migration and switches off as traffic passes. Nearby smart lights serving as Fog devices correlative to create green traffic wave and send cautioning signals to approaching vehicles. Wireless connection points equal Wi-Fi, 3G, road-side units and smart traffic lights are used along the roads. Vehicles-to-Vehicle, vehicle to connection points, and connection points to connection points synergy enrich the relevance of this scenario.

B. Smart Grid

Energy load adjust relevance's may run on network edge devices, such as smart meters and micro-grids. Placed on energy appeal, availability and the lowest price, devices naturally switch to substitute energies like solar and wind. As shown in Figure 3, Fog collectors at the edge process the data developed by grid sensors and devices, and issues control commands to the actuators. They also filter the data to be consumed locally, and send the rest to higher tiers for visualization, real-time reports and transactional analytics. Fog backing lasting storage at the lowest tier to semi-permanent storage at the highest tier. Global converge is provided by Cloud with business intelligence analytics.

IV. SECURITY AND PRIVACY IN FOG COMPUTING

There are security solutions for Cloud computing. Yet they may not suit for Fog computing because Fog devices work at the edge of networks. The working atmosphere of Fog devices will face with many threats which do not exist in well managed Cloud.

A. Man-in-the-Middle Barrage

Man-in-the-Middle barrage has potential to become a typical barrage in Fog computing. In this barrage, gateways serving as Fog devices may be settled or replaced by fake ones. The connection between 3G and WLAN needs a gateway to translate the data of different protocols into the suitable formats. Therefore , all the communication data will firstly appear at the gateway and then be forwarded to other receivers.

V. CONCLUSIONS AND FUTURE WORK

Fog computing devices are geographically distributed over heterogeneous platforms. Service portability across platforms need to be optimized. Traffic light control can also be assisted by Fog computing concept. Fog computing concept , actually a Cloud computing essentially the 'ground', creates automated response that drives the value.

Future work will expand on the Fog computing paradigm in Smart Grid. Independent Fog devices consult directly with the Cloud for periodic updates on price and demands, while interdependent Fog devices may consult each other and create coalitions for further enhancements.

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