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A Review of Fog Computing In Cloud Enterprise for Data Security and Privacy Management

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***Abstract:** Fog computing is the extension of cloud computing. The fog computing proceeds the security scenario of extended technology. Now a day's internet on things is demanded technology for the connection of home network to another network. The interpretability of cloud computing through other network is face some problem of data sociability. The data scalability is major issue in fog computing. The privacy of data and location privacy is also major issue. The location of fog server is also major issue. In this paper present the review of fog computing for the extension of cloud computing for the process of transportation and some other things.*

***Keywords:** cloud computing, Fog computing, scale, Privacy, security*

I. INTRODUCTION

Cloud computing frees the enterprise and the end user from the specification of many details. This bliss becomes a problem for latency-sensitive applications, which require nodes in the vicinity to meet their delay requirements. An emerging wave of Internet deployments, most notably the Internet of Things (IoTs), requires mobility support and geo-distribution in addition to location awareness and low latency. They argue that a new platform is needed to meet these requirements; a platform they call Fog Computing, or, briefly, Fog, simply because the fog is a cloud close to the ground. They also claim that rather than cannibalizing Cloud Computing, Fog Computing enables a new breed of applications and services, and that there is a fruitful interplay between the Cloud and the Fog, particularly when it comes to data management and analytics [1].

Figure 1.1: Diagram of Fog Computing

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This implement is organized as follows. In the second section they introduce the Fog Computing paradigm, delineate its characteristics, and those of the platform that supports Fog services [2]. The following section takes a close look at a few key applications and services of interest that substantiate their argument in favor of the Fog as the natural component of the platform required for the support for the Internet of Things. In the fourth section they examine analytics and big data in the context of applications of interest. The recognition that some of these applications demand real-time analytics as well as long-term global data mining illustrates the interplay and complementary roles of Fog and Cloud [3]. The rest of paper describe as section II discuss the nature of fog computing in section III describe the related work of fog computing, in section IV discuss the problem formulation of FOG computing and finally discuss conclusion & future.

II. CHARACTERIZATION OF FOG COMPUTING

Fog Computing is a highly virtualized platform that provides compute, storage, and networking services between end devices and traditional Cloud Computing Data Centers, typically, but not exclusively located at the edge of network. The following figure presents the idealized information and computing architecture supporting the future IoT applications, and illustrates the role of Fog Computing. Cloud and Fog are built around the same basic services. "Edge of the Network", however, implies a number of characteristics that make the Fog a non-trivial extension of the Cloud. Let us list them while pointing to motivating examples [4].

- Edge location, location awareness, and low latency. The origins of the Fog can be traced to early proposals to support endpoints with rich services at the edge of the network, including applications with low latency requirements.
- Geographical distribution. In sharp contrast to the more centralized Cloud, the services and applications targeted by the Fog demand widely distributed deployments.
- Very large number of nodes, as a consequence of the wide geo-distribution, as evidenced in sensor networks in general and the Smart Grid in particular.
- Support for mobility. It is essential for many Fog applications to communicate directly with mobile devices, and thus support mobility techniques, such as the LISP protocol, decoupling host identity from location identity, and requiring a distributed directory system.

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- Real-time interactions. Important Fog applications involve real-time interactions rather than batch processing.
- Predominance of wireless access.
- Heterogeneity. Fog nodes come in different form factors, and will be deployed in a wide variety of environments.
- Interoperability and federation. Seamless support of certain services requires the cooperation of different providers. Hence, Fog components must be able to interoperate, and services must be federated across domains.
- Support for online analytics and interplay with the Cloud. The Fog is positioned to play a significant role in the ingestion and processing of the data close to the source.

In this section discuss the related work in the field of FOG computing. The FOG computing play an role of extension of cloud computing but faced a problem of security and privacy.

III. RELATED WORK

Author Name	Title	Approach	Demerits	Year
Jürgo S. Preden and Kalle Tammemäe, Axel Jantsch, Mairo Leier and Andri Riid and Emine Calis	The Benefits of Self-Awareness and Attention in Fog and Mist Computing	In the implement they present that how the different measurements complement one another to allow for a precise assessment of typical activities, and how attention can streamline data collection and processing to make the system more lean and efficient.	They observed that a system that is aware of its self-state can overcome dependable and robust, even with radical environmental changes and drastically diminished capabilities.	2015
Mohammad Abdullah Al Faruque and Korosh Vatanparvar	Energy Management-as-a-Service Over Fog Computing Platform	The implementation over fog computing platform provides the flexibility, interoperability, connectivity, data privacy, and real-time features required for energy management.	To perform the energy management-as-a-service over fog computing platform in different domains, two proto-types of HEM and micro-grid-level energy management have been implemented	2016
Fatemeh Jalali, Kerry Hinton, Robert Ayre, Tansu Alpcan and Rodney S. Tucker	Fog Computing May Help to Save Energy in Cloud Computing	They present that the best energy savings using nDCs is for applications that distribute and produce a large amount of data in end-user premises	It is not frequently accessed like as video surveillance in end-users homes	2016
Mugen Peng, Shi Yan, Kecheng Zhang and Chonggang Wang	Fog-Computing-Based Radio Access Networks: Issues and Challenges	They concluded that greater attention should be aimed on transforming the F-RAN paradigm into edge caching, SDN, and NFV	To understanding further intricacies of key methods, they shown transmission mode selection and interference suppression	2016
Amir Vahid Dastjerdi and Rajkumar Buyya	Fog Computing: Helping the Internet of Things Realize Its Potential	The further development of fog computing could thus help the IoT reach its vast potential.	it produced unprecedented amounts of data that are difficult for traditional systems, the cloud, and even edge computing to handle	2016
Flavio Bonomi, Rodolfo Milito, Jiang Zhu and Sateesh Addepalli	Fog Computing and Its Role in the Internet of Things	They have outlined the vision and defined key characteristics of Fog Computing, a platform to deliver a rich portfolio of new services and applications at the edge of the network	Cloud Computing model is an efficient alternative to owning and managing private Data Centers (DCs) for customers facing Web applications and batch processing	2012
Luis M Vaquero and Luis. Rodero-Merino	Finding your Way in the Fog: Towards a Comprehensive Definition of Fog Computing	This article has provided a broad overview of this convergence and what are the common points that link all these technologies together, creating a new paradigm that some have already named as "fog" computing	the information and communication technologies (ICT) community typically takes time to agree on the real meaning, reach and context of the new terms that appear associated to new technology trends and their associate buzz/hype	2014

IV. PROBLEM FORMULATION

In this section discuss the issue related to fog computing in processing of data for the hashing and indexing of data for task reduction. The aggregation of independent virtual machine data creates huge amount of traffic overload on the given network and processing of data speed is slow. Some point related to data aggregation mention here [12].

1. Data scalability
2. Cluster utilization
3. Nonsupport for non-map data
4. Lack of programming language
5. Iterative algorithm
6. Auditing
7. Access control Privacy issue

V. METHODS USED FOR FOG COMPUTING

In this section discuss some algorithm for the processing of fog computing in extension of cloud computing. The model of fog computing used in different manner of communication model for the process of privacy preservation in location of data center for the security purpose.

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Algorithm 1. Smart HVAC Control-as-a-Service

```
Input: Set Points T_c, T_h
Input: DR Signal DR
Input: Room Temperature T_r
Input: HVAC Mode mode
Output: Set Points T_c, T_h
Output: HVAC Status
 // define threshold for turning on/off the HVAC
Threshold = 1
 // limit set points when DR signal is triggered
if DR == true then
    T_c = 79
    T_h = 65
 /* turn on/off the HVAC based on temperature, set points, and operation mode */
if mode == heater then
    if T_h − T_r > Threshold then
            status = on
    else
        if T_r > T_h + Threshold then
            status = off
if mode == cooler then
    if T_r − T_c > Threshold then
        status = on
    else
        if T_r > T_c − Threshold then
            status = off
return status, T_c, T_h
```

Algorithm 2. Smart EV Charger Control-as-a-Service

```
Input: Departure Time t_d
Input: Current Time t_c
Input: Battery Status SoC
Output: Charge Rate I
 // define the battery total capacity
Capacity = 60KWh
 // define start and end time for off − peak hours
t_os = 22
t_oe = 11
 // define the maximum charge rate possible
max_I = 4KW
 // evaluate capacity remaining to charge
Capacity_rem = (100 − SoC)/100 * Capacity
 // the time interval when there is off − peak hours
Time_off = (min(t_oe, t_d) − max(t_os, t_c))%24
 // the charge rate during off − peak hours
I_off = min(max_I , Capacity_rem/Time_off)
 // the charged capacity during off − peak hours
Charged_off = I_off * Duration_off
 /* evaluate capacity remaining after charging during off − peak hours */
Capacity_rem = Capacity_rem − Charged_off
 /* the time interval remaining to charge subtracting the off − peak hours */
Time_rem = (t_d − t_c − Time_off) % 24
 // the charge rate during on − peak hours
Ion = min(max_I, Capacity_Remaining/Time_Remaining)
 // deciding the current charge rate based on time
if t_c ∈ Duration_off−peak then
    I = I_off
else
    I = I_on
return I
```

VI. CONCLUSION

The importance and effectiveness of fog computing process impact the performance of cloud traffic reduction process using big data based programming model and application. the reduction of traffic during the data aggregation used various technique such as index hashing, partition, global variable allocation and some other technique. Traditionally, a hash function is used to partition intermediate data among reduce tasks, which, however, is not traffic-efficient because network topology and data size associated with each key are not taken into consideration. In this paper, we study to reduce network traffic cost for a Map Reduce job by designing a novel intermediate data partition scheme. Furthermore, we jointly consider the aggregator placement problem, where each aggregator can reduce merged traffic from multiple map tasks.

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