International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 08, 2020
ISSN: 1475-7192

FOG ENVIRONMENT

[1]S.Harika,[2]Dr.B.Chaitanya Krishna

ABSTRACT-- *As there is an increase in number of profiles of individuals there was an increase in data storage, which leads to the insufficiency of the storage space. Cloud computing is the traditional method of securing and storing the data . The cloud computing is having the flexibility, scalability, efficiency and multi-portability. There are some disadvantages of using Cloud burst. Fog computing addresses all these difficulties and provides elastic resources and services till the end of devices to the edge of network. Fog computing supports the Computational demand of real time latency and applications of largely geo-distributed IoT devices/sensors.*

Keywords--*FOGENVIRONMENT*

I. INTRODUCTION

In these days the use of cloud has increased everywhere to store the bulk amount of data for business, organization and personal purpose. In information technology, data is the main commodity, and possessing more data typically generates more value in data driven businesses. Cisco estimates that there will be around 50 billion connected devices by 2020.The connected devices constitute the Internet of Things (IoT) which generates a massive amount of data. There is an increase in investment and shifting strategies by big players and appearance of large number of Small and Medium Businesses (SMBs) in the Cloud space. As cloud computing is growing its popularity and attention in all aspects of life , it is offering many services to the users . It is an ubiquitous, convenient, on-demand network access. This is the main reason behind the software companies for drifting towards this technology. Since there is increased number of users in this arena, the chance of data integrity, data security and confidentiality is at risk. Cloud computing is not a basic model as we know earlier, but it is a combination of number of computing strategies, methodologies,concepts like Software Oriented Architecture ,virtualization and other which are based on internet. Even though cloud is having security mechanisms like identity, authentication, authorization, server roles, password policies, but they are not enough for our security terms.Fog computing is capable of addressing such problems and provides elastic resources and services to the end users residing at the edge of network ,so the cloud could focus more about providing resources distributed in the core network. The term fog computing is given by CISCO as a new technology. In fog computing mobile devices will interact with one another and support the data communication within the Internet of Things.

II. RELATED WORK

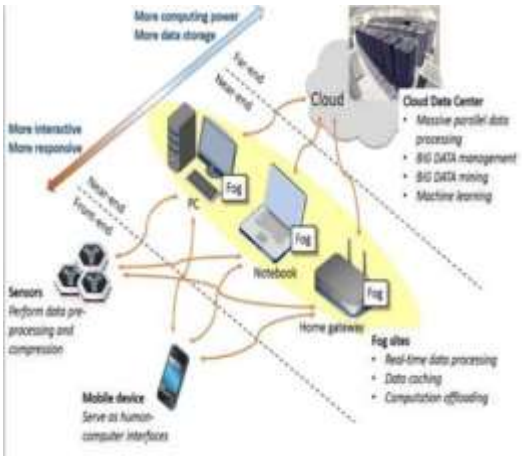
There were many attempts in creating brilliant access towards healthcare function. Like for example, Chen et al. [18] introduced a technology of wireless sensor network flow which it is used for a smart gateway aimed at the

[1] *Research scholar,Department of cse,KL University*

[2] *Assoc. Proressor,Department of cse ,KL University*

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

health care system. The endorsed gateway operating for instance can over pass amongst public communication system and a wireless sensor network. It basically has some exceptional features like having a data with agreement system, very flimsy database plus the usefulness just before declaring the needy persons in case of any tough times. In addition, the gateway generates the request- response message function which creates a process of shrinking a distant server's fatigue. Mohapatra et al. proposed semi-hybrid architecture by using a sensor cloud which is needed in distant patient monitoring with working network flow [19]. Advantages were taken by utilizing the sensor cloud for patient's health condition which can be monitored and can be shown in their proposed system. The writers did present a cloud computing with a solution intended for patient's data collection in healthcare organizations. Sensors are used in various systems which are adhered to medical equipment's for assembling patient data then sent the data to cloud to provide restricted permit. Yang et al. presented health monitoring gateway system based on Smart phones [21]. The recommended requirements for a gateway in a Bluetooth console to upload gathered data and send them to remote servers. In [22], the sensing servers are used as gateways in the system which is handled by the sensor network system. But, the proposal is exaggerated the insufficient and extensible as well as inefficient for many applications. In many organizations [23], authors have researched and proposed an idea with an example of a lively IPv6. Less powered wireless with area network (6LoWPAN) is a signal router which was established on Hidden Markov Model. This model was used for developing settlement in the health status. In [24], the researchers have already designed a mobile gateway for pervasive healthcare system used for ZigBee and Bluetooth. The gateway which favours the feebleness with many services such as investigation of the medical data etc. are efficient, though the gateway can be ineffective within terms of actual power utilization which cannot be recommended for practical use. Zhong et al. presented an alternative way centered on a mobile phone which is used to connect sensor network system nodes along with the devices promoting CDMA or Bluetooth [25]. In a relative work [26], the recommended design can achieve data through many individual health gadgets. USB and ZigBee along with Bluetooth can be considered as a communication process. Subject including body area sensor network systems can be used to attract the attention among a lot of researchers during the past few years. Specifically, in the healthcare domain numerous amount of work has exponentially expanded various undiscovered stepping stones with only one intention for betterment of healthcare monitoring system. As few works seek the newer systems along with further methods besides number of services although some other researchers approached to suggest new way or else new approaches. Still, some narration in the above explained examples, a great quantity of systems are specifying along with ZigBee though it can be tough for guarantying the characteristics of service done in ZigBee while observing streamed bio-signals like ECG, EMG etc, with the extreme data rate nearly at 250 kbps of ZigBee. Oppositely, Bluetooth Technology can be used to



Edge and Fog Computing in Healthcare solve problems of ZigBee which is lesser data speed and other small-range communication protocol. In spite of this, maybe it is tough for depicting a gateway for supporting mobility as well as employing data through multiple targets with utilizing Bluetooth Technology. The above systems fundamentally use simple gateways from node so collect data and transmit these data for remote servers. Further, sometimes any of these workings had been accounted completely taking advantages of the computing paradigm about fog and contributing insightful to the gateways. The target of the section is used to uplift the IoT-based health monitoring system utilized among different surroundings like among family also in hospital just by imparting the smart gateway [27] along with fog layer consists an extra advanced services. Fog computing conception is actually the elaboration of pointing applications from the cloud computing paradigm along with a vision and province where the full support of the prototype from the cloud is not achieved. Few among them includes fast response employed containing video conference applications, besides Voice over Internet Protocol (VoIP) which requires very less latency for the reason that QoS might get reduced by unusual delays. • An Enormous data solicitation which is assembled in a huge load with data taken from countless sensors after which it transmits the data via the networks essential for the availability to achieve high bandwidth [28]. • Observing the applications, which can be controlled constantly, needs no interruption during data connection because of connectivity loss takes place among the cloud then monitoring systems [29]. Features use din the presentations are mentioned above which were indistinguishable along with the features of health monitoring systems in real-time. These network that have massive quantity of collected data commencing a variety of environmental along with bio sensors. Later this massive volume of data transmits above the network which is ultimately monitored remotely through end users like care-taker or doctors. Hence, fog computing stands on these systems effectively and is appraisable that instead of removing before lessening the importance of the cloud in IoT applications, from the facet of location awareness,less latency, scalability, real-time interactions, heterogeneity and inter operability that fog computing technique is completely cooperated as well as compatible by the cloud to enhance the existing IoT applications, rather than replacing or lessening the importance of the cloud in IoT applications.As the majority of today's systems are mostly cloud centric, the basic characterization used with these system is " Device-to-Cloud" communication and Analysis is completely with the cloud(e.g. unless analysis on the cloud is made ,the

information is not processed/retrieved).Fog computing or Fogging or Fog Networking is the word coined by the CISCO in January2014, which refers to extending the Cloud Computing to the edge of the company's network. It is an architecture which uses one or more end-user clients or near user edge devices collaboration to function substantial storage amount. Fog figuring is the arena which renders cloud-like services to the network edge or the system edge. It uses the cloud along with the edge assets for its own foundation, as Figure 1 appears. So the devices at the end users use the data, process it and hence gets retrieved back at the edge network itself. To have the clear idea about the edge devices and cloud network figure1 can be referred. Therefore instead of fetching the data from very far above the sky(i.e. here cloud is meant) the data is directly brought up to the clients using from the nearby devices on the ground(i.e. here fog devices are meant) sometimes hazardous if the third party is from unknown source. MALICIOUS INSIDERS- sometimes we don't have an idea when a second person passively attacks by knowing our credentials of login.

III. FOG COMPUTING

Fog Computing is a distributed platform that provides computing, storage and also networking services between the IoT devices and conventional Cloud Computing. Data Centers that present at the edge of network or internal nodes of the distributed environment. Fog Computing is a scenario where a several ubiquitous and decentralized devices are capable to perform various tasks. Fog computing, networking, storage and other domain with particular services are handed over to the IOT system by Fog computing layer. The Healthcare domain differentiates it from the other Iot applications by having the most used feature of remote monitoring which require high degree of reliability. The protection and personal aspects towards the health care were highly essential and should be implemented along with the Fog layer focussing on the health care. Fog computing is a paradigm of distributed computing that extend its services given by the cloud data centres at the IoT devices of the network. Fog computing will also give facility like automating management of computing, as well as networking and storing of data in between the cloud data centres and IoT devices. Fog computing consists of several components of such applications which can run both on the cloud as well as in edge devices between sensors and the cloud. Fog computing features are mobility, computational resources, network and communication protocols, interface heterogeneity and connectivity to the cloud as well as data analytics of distributed network which takes care of many requirements of many applications having demands like low latency along with wide as well as dense geographical distribution.

IV. A COMPARISON OF FOG COMPUTING AND RELATED COMPUTING PARADIGMS

This section focuses on the comparison of fog computing and related computing paradigms to demonstrate the value of fog computing in a variety of use cases. Moreover, this section provides a better understanding of how these computing paradigms can benefit the current and future landscape of connected devices.

Cloud computing has been instrumental in expanding the reach and capabilities of computing, storage, and networking infrastructure to the applications. The National Institute of Standards and Technology(NIST)defines

cloud computing as a model that promotes ubiquitous, on- demand network access to shared computing resources[16].Cloud data centres are large pools of highly accessible virtualized resources that can be dynamically reconfigured for a scalable workload; this reconfigurability is beneficial for clouds services that are offered with a pay-as-you-go cost model[17].The pay-as-you-go cost model allow users to conveniently access remote computing resources and data management services, while only being charged for the amount of resources they use. Cloud providers, such as Google, IBM, Microsoft, and Amazon provide and provisional are data centres to host these cloud-based resources.

Table 1: FOG Vs CLOUD

Table 1

Requirements	Cloud Computing	Fog Computing
Latency	High	Low
Delay Jitter	High	Very low
Location of Service	Within the Internet	At the edge of the local network
Distance between client and server	Multiple hops	One hope
Security	Undefined	Can be defined
Attack on data enroute	High probability	Very low probability
Location awareness	No	Yes
Geo-distribution	Centralized	Distributed
No. of server nodes	Few	Very large
Support for Mobility	Limited	Supported
Real time interactions	Supported	Supported
Type of last mile connectivity	Leased Line	Wireless

V. COMPARISION OF FOG COMPUTING AND CLOUD COMPUTING OVER IOT

Even though fog computing gives great advantages to the IoT infrastructure, however cloud computing is one of the emerging solution and it is already in use in many different areas. Also lot of research and development had already happened into cloud computing compared to fog computing. Fog and cloud are both good solutions but they are complement of each other in the form of providing service. Table 1 shows comparison of Fog and cloud computing.

Operation:

Operated in a fully controlled environment with technical expert teams by large companies.

Operated in environment where it primarily depends on user demands. They are not operated directly by a person. It can be operated by any size of company.

Applications

It can support predominantly cyber-domain applications. The applications mainly suffer high latency.

Can support cyber-domain, cyber-physical applications. It suffers very less latency and hence useful for time critical applications.

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

Fig. 3 Fog Applications

Network requirements :

Require clients to have network connectivity until the user wants to access its services. Bandwidth requirement grows with the increase in total amount of data generated by all the clients.

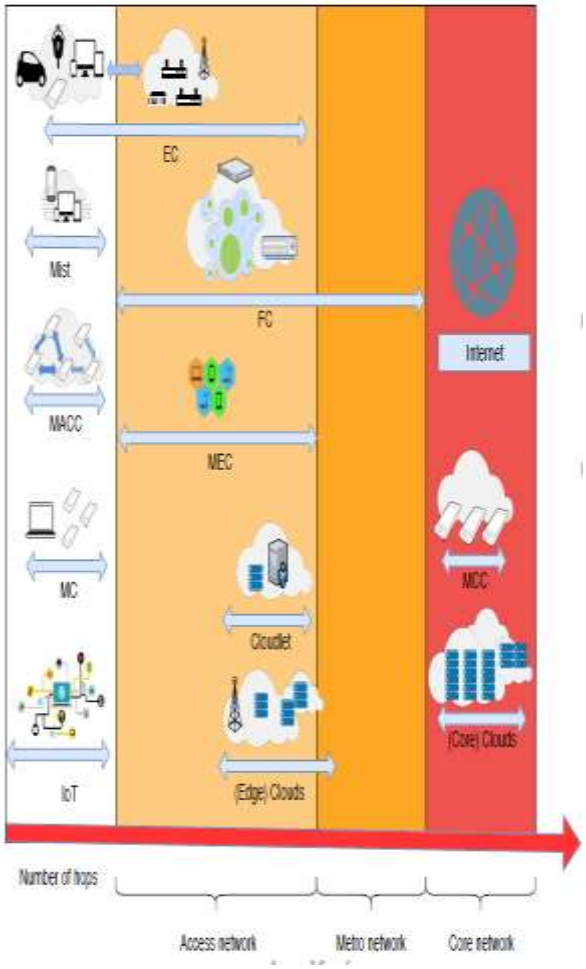
Can operate autonomously to provide uninterrupted network services even with no or intermittent network connectivity. Bandwidth requirement depends on the total amount of data need to be sent to cloud after filtered by fog.

Comparison of Fog and cloud :

Fog Computing: Fog computing bridges the gap between the cloud and end devices (e.g.,IoT nodes) by enabling computing, storage, networking, and data management on network nodes with in the close vicinity of IoT devices.Consequentially,computation,storage,networking,decisionmaking,anddatamanagementnot

Only occur in the cloud ,but also occur along the IoT-to-Cloud path as data traverses to the cloud (preferably close to the IoT devices).For instance ,compressing the GPS data can happen at the edge before transmission to the cloud in Intelligent Transportation Systems(ITS)[20].Fog computing is definedbytheOpenFogConsortium[6]as"ahorizontalsystemlevelarchitecturethatdistributescomputing,storage,control and networking functions closer to the users along a cloud-to-thing continuum." The "horizontal" platform in fog computing allows computing functions to be distributed between different platforms and industries,whereasaverticalplatformpromotessiloedapplications[21].Averticalplatformmayprovidestrongsupportfora singletypeofapplication(silo),butitdoesnotaccountforplatformto

-platform interaction in other vertically focused platforms. In addition to facilitating a horizontal architecture, fog computing provides a flexible platform to meet the data-driven needs of operators andusers. Fog computing is intended to provide strong support for the Internet of Things.



***Fog vs. Cloud**:*

A common example that is often used to distinguished fog and cloud computing is whether latency-sensitive application scan be supported while maintaining satisfactory quality of service(QoS).Fog nodes can be placed close

to IoT source nodes ,allowing latency to be noticeably reduced compared to traditional cloud computing. While this example gives an intuitive motivation for fog, latency-sensitive applications are only one of the many applications that warrant the need for fog computing. Nodes in fog computing are generally deployed in less centralized locations compared to centralized cloud data centers. Fog nodes are wide-spread and geographically available in large numbers. In fog

computing, securitymustbeprovidedattheedgeorinthededicatedlocationsoffognodes, asopposedtothecentrally-developed.

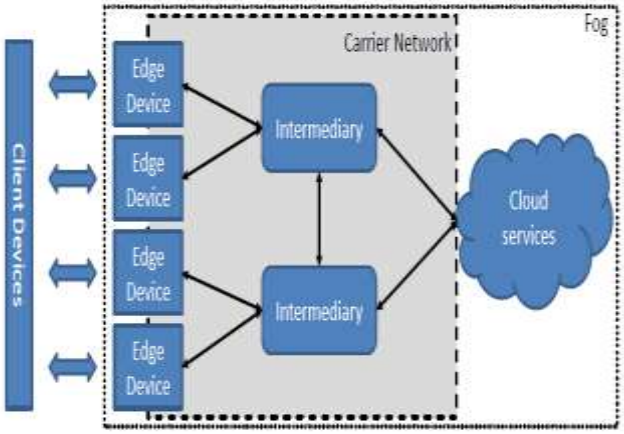


Fig. 1. Deployment Overview of Fog Computing

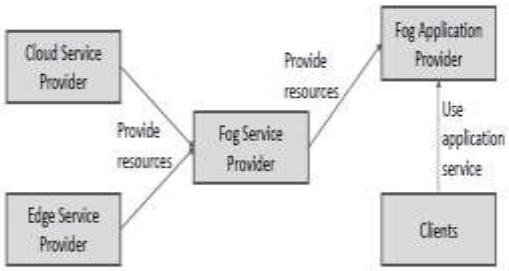


Fig. 2. Overview of Roles in Fog Computing

EXISTING SYSTEM: A THREATS IN CLOUD: DATA BREACHES- security of the data is led to risk when any theft occurs during processing.

ACCOUNT OR SERVICE TRAFFIC HIJACKING- for instance,if the login are lost then the account is at risk. DATA LOSS- the data can be sometimes lost,if it is found to the intruder.

ACCOUNT OR SERVICE TRAFFIC HIJACKING- for instance , if the login are lost then the account is at risk. DENIAL OF SERVICE- sometimes the server is so overloaded that when many millions of people try accessing the same service and it could be caught hand by the hacker. INSECURE API's- API, otherwise called as Application Programming Interface controls most of the third party applications and verifies user ,this can be

sometimes hazardous if the third party is from unknown source. MALICIOUS INSIDERS- sometimes we don't have an idea when a second person passively attacks by knowing our credentials of login.

ABUSE OF CLOUD SERVICES- by trying all the services to unblock an account or database the attacker somehow breaksthe encryption in very less time.

SHARED TECHNOLOGY- knowing or unknowingly the firms get into Cloud then without their knowledge they would be in partner to some other web site.

CONNECTIVITY- an assumption is made that a device is always connected to the cloud.

Areas[9]	**Cloud**	**Fog**
Location and model of Computing	Centralized in a small number of data centers	Distributed along large Geo-graphical areas and it is closer to the user. Fog nodes and systems can be controlled by a centralized node or in
Size	High Each cloud data center is very large in size consisting of at least	Each fog node can be equivalent to a single server machine. It's designed to meet the user demands
Deployment	Require sophisticated deployment planning	Depends on the environment. Majority of them don't require intense planning.
Operation	Operated in a fully controlled environment with technical expert teams by	Operated in environment where it primarily depends on user demands. They are not operated directly by a
Applications	It can support predominantly cyber-domain applications. The applications mainly	Can support cyber-domain, cyber-physical applications. It suffers very
Network requirements	Require clients to have network connectivity until the user wants to access its services. Bandwidth requirement grows with the	Can operate autonomously to provide uninterrupted network services even with no or intermittent network connectivity. Bandwidth requirement depends on the total amount of data

OTHERS- connectivity cost, latency, bandwidth and delay jitter are also some cloud centric assumptions.

So the cloud computing system is a type of computing that depends on sharing resources of computing rather than using the local servers or any kind of personal/edge devices to handle applications .So there is an availability of some other companion to help Cloud to perform better even at the user end and this could be achieved by Fog in few ways.

PROPOSED SYSTEM In this paper we propose a distinct approach to secure data in Cloud which is done by Fogging.

Basic characteristics and key specifications of fog computing:

• Heterogeneity: This says that the Fog nodes can be deployed in a wide variety of environments .e.g. smart cars connected through IoT

• Interoperability: Fog components are interoperable in order to give wide range of services like Streaming etc.

• Real-time communication: It refers to the speedy service also e.g. constant movement observing frameworks, request continuous.

• Geographical distribution: The services and applications objective of the fog is widely distributed.

• Mobility support: Provides mobility techniques like decouple host identity to location identity.

• Prevalence to wireless access : Wireless access focuses and cell versatile door are regular cases for fog organize node.

• Low latency and location awareness: Less delay in accessing data and edge location has low inertness.

• Large-scale sensor networks: This is relevant when checking nature utilizing few circulated frameworks that require suitable assets.

The clear representation of the requirements for cloud computing versus fog computing is as shown in the table below.

Hence with the seamless integration of both the cloud and the fog services, we are ready to improve the involvement by disconnecting client information to live on the edge.

VI. APPLICATIONS

1. The most used application is extending cloud computing.

2. In the field of IoT, in various applications like Smart city, Smart grid, Digital city, keen city , Smart farming, Robotics(with IoT)etc.

3. Fog is user friendly and reliable

4. Enables real-time analytics

5. It is securable, dependable and adaptable

6. Though it enables third party's applications to access user's information, the data is sometimes perceivable to outsiders but still this can be overcome with the use of dependable protocols.

VII. CONCLUSION

In this paper we have proposed an advanced technique for securing data in cloud through fog computing. In this paper we have come up with fog computing and it gave an advancement to the existing methodologies of securing data in cloud.

VIII. FUTURE SCOPE

In this paper we have worked with a new scope of fog computing in future we will come up with more advancement in this technology. No doubt that there is going to be a foggy future ahead.

REFERENCES

1. Fog Computing: Mitigating Insider Data Theft Attacks in the Cloud, USA

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

2. Ben-Salem M., and Stolfo Angelos D. Keromytis, “Fog computing: Mitigating Insider Data Theft Attacks in the Cloud,” IEEE symposium on security and privacy workshop (SPW) 2012.

3. Ben-Salem M., and Stolfo, “Decoy Document Deployment for Effective Masquerade Attack Detection,” Computer Science Department, Columbia University, New York.

4. F. Bonomi, "Connected vehicles, the internet of things, and fog computing," in The Eighth ACM International Workshop on Vehicular Inter-Networking (VANET), Las Vegas, USA, 2011.

5. F. Bonomi, R. Milito, J. Zhu, and S. Addepalli, "Fog computing and its role in the internet of things," in Proceedings of the First Edition of the MCC Workshop on Mobile Cloud Computing, ser. MCC'12. ACM, 2012, pp. 1316.

6. M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica, and M. Zaharia, "A view of cloud computing," Commun. ACM, vol. 53, no. 4, pp. 50-58, Apr 2010.

7. C. Wei, Z. Fadlullah, N. Kato, and I. Stojmenovic, "On optimally reducing power loss in micro-grids with power storage devices," IEEE Journal of Selected Areas in Communications, 2014 to appear.

8. L. Atzori, A. Iera, and G. Morabito, "The internet of things: A survey," Comput. Netw., vol. 54, no. 15, pp. 2787-2805, Oct. 2010.

9. K. Liu, J. Ng, V. Lee, S. Son, and I. Stojmenovic, "Cooperative data dissemination in hybrid vehicular networks: Vanet as a software defined network," Submitted for publication, 2014.

10. K. Kirkpatrick, "Software-defined networking," Commun. ACM, vol. 56, no. 9, pp. 16-19, Sep. 2013.

11. Cisco, "Cisco delivers vision of fog computing to accelerate value from billions of connected devices," Cisco, Tech. Rep., Jan. 2014.

12. K. Hong, D. Lillethun, U. Ramachandran, B. Ottenw¿¿lder, and B. Koldehofe, "Opportunistic spatio-temporal event processing for mobile situation awareness," in Proceedings of the 7th ACM International Conference on International Journal of Engineering Science and Computing, March 2016 2709 http://ijesc.org/ Distributed Eventbased Systems, ser. DEBS'13. ACM, 2013, pp. 195-206.

13. H. Madsen, G. Albeanu, B. Burtschy, and F. Popentiu-Vladicescu, "Reliability in the utility computing era: Towards reliable fog computing," in Systems, Signals and Image Processing (IWSSIP), 2013 20th International Conference on, July 2013, pp. 43-46.

14. K. Hong, D. Lillethun, U. Ramachandran, B. Ottenw lder, and B. Koldehofe, "Mobile fog: A programming model for large-scale applications on the internet of things," in Proceedings of the Second ACM SIGCOMM Workshop on Mobile Cloud Computing, ser. MCC'13. ACM, 2013, pp. 1520.

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020