A Survey on Structure of Fog Computing

Prof. Sonali Khairnar, Prof. Komal Jagdale, Prof. Sheela Bankar

Computer Engineering/SSPU/ISB&M School of Technology, Pune, Maharashtra, India

ABSTRACT

Cloud computing, the structure of Internet will be depend on this with the rise of the mobile traffic. The transmission of large amount of data to the cloud is not only a tough process for the communication channel bandwidth but also caused delays in transmission. It decline in the quality of services for the end user. The development of cloud computing as a broad methodology for the integrated storage, management and retrieval of information, the successful combination of cloud computing and mobile applications has main task to solve such problems. Fog computing designed by CISCO to extend the cloud closer that produce and act on data benefits. It eludes the need for costly bandwidth by offloading GB's of network traffic from the network. The fog layer involves of geo-allocated servers that are deployed on the network. Each of fog servers is lightweight version of the cloud server, and is prepared with a huge data warehouse.

Keywords: Cloud computing, fog computing, modeling structure, 5G

I. INTRODUCTION

The dynamic expansion of wireless technology and cumulative traffic volumes indicate us to produce all new communication values. Presently most widely discussed the Development of the mobile 5 generation G system [2], [3]. For the implementation of the same need to find in addition to ultra-low latency, high reliability, high throughput, good communication quality as well as coverage. It is suggested to use these technologies as network functions virtualization (NFV), as well as software defined networking (SDN).

After every ten years cellular communication upgrade and define its standard, the summary of the standard 5G can be supposed to be launch by 2020. The first commercial application of 5G will be expected in 2018 [4]. All of them are planned to major sport events. i.e. South Korean mobile operator KT

Corporation assured to launch 5th generation networks at the 2018 Winter Olympics in Pyeongchang.

Edge computing is a new technology has been consider as one of the key technology in the mobile 5G system development.

The idea of Edge Computing technology is to transfer cloud computing to a cellular network boundary in a radio access network (RAN) in one hop from user [3], [5].

The Standardization of edge computing technology is the European Telecommunication Standardization Institute (ETSI) by reassigning the computing assets to the edge of the radio access network, you can find:

- ✓ Unloading the main network - all operations of computer will be perform at the border of the cellular network
- ✓ Proximity - location in one step from user equipment
- ✓ Low system delays
- ✓ High bandwidth

Edge computing is a method of improving cloud computing systems by execution of data processing at the edge of the network, near the source of the data. Edge computing Is based on a virtualized platform and supplements NFV, while NVF focuses on functions of the network. The edge computing platform includes computational applications running on the network edge.

That's why it will be beneficial to use both these technologies on a single platform. It should also be taken into justification that, it may be possible to affect radio networks as well as data in real time. This means improved flexibility and reliability for the end user, other services will be able to react to information from the user very fast.

In the tele-communication market new more adaptive products will emerge. It forecasts fast wireless video transmission of ultra-high accuracy and also the proliferation of multi-player games with the VR effect without signal deferrals. Edge computing will also play a vital role to the implementation and development of the IoT (Internet of things). Thus, edge Computing will positively affect the economy of the telecommunications Industry and the data transmission technologies.

Now a days, the Internet is facing a move towards a structure based on cloud computing. With the growth in mobile traffic, The transfer of an exceptionally enormous amount of data to the cloud not only a difficult task for the bandwidth of the communication channel, but also affected interruptions in transmission and decline in the quality of the service for the end user. However, with the development of the key role of mobile traffic, the support of mobility and geo distribution is not at all less important.

Due to this, the emergence of cloud computing as a widespread approach for the centralized storage, retrieval, management of information, and the successful integration of cloud computing and mobile applications, is a very crucial task.

To solve such issues, Cisco introduced a concept of fog computing, designed & implemented for local processing of other tasks on foggy devices. The fog-layer consists of geo-allocated servers that are organized on the network periphery.

Each of fog servers is lightweight version of the cloud server, and is prepared with a huge data warehouse. It has the ability to compute and transmit wirelessly. The action task is to simulate the working of energy consumption and reduce delay each part of the fog cloud system and validate the task of load sharing. As a final result, using numerical illustrations it's shown that fog computing can significantly progress the cloud computing system by the criterion of reducing transmission delays.

II. SYSTEM STRUCTURE

Edge computing is a innovative trend recognized and established by the cellular network operators to expand the entire network efficiency by divesting its operations to adjacent clouds. The edge computing concerned by the ETSI (European Telecommunications Standards Institute) is one of the main organizations [6]. An Industry Specification Group (ISG) announced by ETSI known as edge computing to standardize and researches the new technology. Basically, MEC can be well-defined as the method of moving cloud computing abilities to the edge of the mobile networks. Affecting cloud computing to the edge of the mobile yields lot of benefits are summarized and listed below [7]:

✓ provide an efficient way for offloading data delivered to the core network,

✓ reduces the round trip latency of communicated data,

- ✓ provides high bandwidth,
- ✓ introduces new services and applications by accessingthe network context information,

Stirring from the inordinate, huge and expensive data centersinto smaller distributed cloud elements based on a small hardwareplatform will exposed the way for reaching the required latencylimitation for tactile realization. The recommended architecture ofthe 5Generation system is based on reduces the round trip latency byaffecting cloud to the edge of the mobile networks. Only one ortwo communiqué hops away from the mobile will beresourceful to accomplish the oneMS latency. Generally, the 5Generation cellularsystem can be viewed as a core mobile network, current Internet, remote cloud, mobile end user and cloud unit. Searching for thegreatest place for the presented cloud unit, researchers go to the different ways. Depending on the ETSI report of edge computing,there are multiple situations for the place of employment of thecloud computing units. There are multiple locations for theedge computing servers such as [6]:

- ✓ Cloud servers are linked to the LTE macro basestation (eNB).
- ✓ Cloud unit may be placed in the 3G/4G radio networkcontroller (RNC).
- ✓ Cloud unit may be connected to multiple sites (multipleeNB).
- ✓ Cloud unit may be at the edge of the core network.

There are a lot of researches for introducing small cloudunits that can be employed in the mobile networks. Some uses the term cloudlet to refer to any secondary and small cloud units. Small cloud units are such as Nebula [8] and Wang etal.'s micro clouds [9].
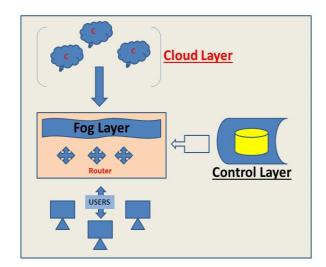

Figure 1. Layers of cloud computing

The fog computing model announced by Cisco has been extended to the edge of the wireless networks and can beworking in the cellular networks [9]. Obviously, cloudcomputing is the main base to form the 5G and Tactile Internetsystem [10]. Figure 1 provides a system structure based onfog computing

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

III. MODEL NETWORK

During the work we simulate the work of the network nodesin terms of fog computing.

For work we needed:

- ✓ Switch
- ✓ SDN controller (B4N)
- ✓ traffic generator (50 * Raspberry pi 3)
- ✓ zabix server network monitor
- ✓ KVM
- ✓ Remote clouds

The principle of the application of fog computing to allocate the tasks of remote cloud services amongst network nodes data communications network which allows:

- a) Reduce inactivity in the network,
- b) Make better use of network paraphernalia
- c) Sharing of computing power of cloud servers for extra tasks.

Algorithm for the process of fog computing like in the cloud system, calculation is accomplished for the client task X and every time Delta-t sends the status and the present end result of the task to the client. The cloud transmits the task to the close looser network node or to several more unrestricted nodes. This facilitates distributed multiplication performance.

The exemplary action of fog will be calculating to the ratio of one communication node.

Assume we have a network node which functions the transit segment of the system. From the time when different times of the day the CPU load of the node are dissimilar, you can use this in resolving other complications. In view of that, for the computing power of the equipment doesn't stand futile, a definite distributed computer system is overloaded into it.
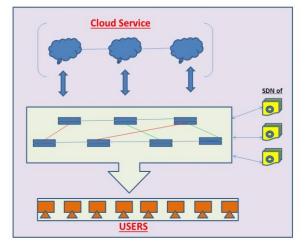

Figure 2. Structure of Model network

Most favourable CPU utilization, we chose90%, that's mean while the CPU load is a lesser amount of than 90%, surplus tasks are encumbered for calculation. To be defined, the non-performing is attained from external cloud networks which allows us to localize the way out of computational problems on a certain segment of the network. Affect the delay of certain tasks of this part use effectively due to these advantages.

SDN will allow you to appropriately share & monitor surplus tasks. Solutions are well appropriate for SDN networks to establish on NFV nodes. NFV permits to use the hardware part of the equipment for multi tasks. 5G technology theories are based on the use of this system up to the access networks: Software defined radio (SDR) and even subscriber equipment & Base stations. Fog will fulfill computing tasks is easily implemented in all sections of 5^{th}Generation communication networks within the framework of above concept.

IV. CONCLUSIONS

Fog computing system resolves different issues of inactivity with the realization of 5th Generation telecommunication network & its applications. Edge computing also provides a method for offloading computation from the core ofthe cellular network future. Centralized large data centers moving to distributed micro-cloud units will no doubt be the key feature of the 5Generation.

V. REFERENCES

[1]. Abdukodir Khakimov, Ammar Muthanna, "Study of Fog Computing Structure" 978-1-5090-4865-6/17/$31.00 ©2018 IEEE

[2]. 5G PPP Architecture Working Group white paper, "View on 5GArchitecture," July 2016.

[3]. S. Singh, Y. Chiu, Y. Tsai and J. Yang, ". Mobile Edge Fog Computingin 5G Era: Architecture and Implementation", IEEE InternationalComputer Symposium (ICS), pp. 731-735, Dec. 2016

[4]. Muthanna, A., Masek, P., Hosek, J., Fujdiak, R., Hussein, O.,Paramonov, A. and Koucheryavy, A., 2016, September. AnalyticalEvaluation of D2D Connectivity Potential in 5G Wireless Systems.InInternational Conference on Next Generation Wired/WirelessNetworking (pp. 395-403).Springer International Publishing.

[5]. Taleb, T., Samdanis, K., Mada, B., Flinck, H., Dutta, S. and Sabella, D.,2017. On Multi-Access Edge Computing: A Survey of the Emerging5G Network Edge Architecture & Orchestration. IEEECommunications Surveys & Tutorials.

[6]. Mobile Edge Computing A key technology towards 5G," ETSI WhitePaper, No. 11, September 2015.

[7]. B.P. Rimal, D.P. Van, and M. Maier, "Mobile edge computingempowered fiber-wireless access networks in the 5G era", IEEECommunications Magazine, 55(2), pp.192-200, Feb. 2017.

[8]. M.Ryden, K.Oh, A.Chandra, and J. Weissman, "Nebula: DistributedEdge Cloud for Data-Intensive Computing," IEEE InternationalConference on Cloud Engineering (IC2E), 2014.

[9]. S. Wang et al., "Mobile Micro-Cloud: Application Classification,Mapping, and Deployment," Proc. Annual Fall Meeting of ITA(AMITA), New York, NY, Oct. 2013.

[10]. Guenter I. Klas, "Fog computing and Mobile Edge Cloud GainMomentum Open Fog Consortium, ETSI MEC and Cloudlets", Nov.22,2015.

[11]. A. Ateya, A. Muthanna, I. Gudkova , A. Vybornova and A.Koucheryavy, "Intelligent core network for Tactile Internet system,"International Conference on Future Networks and Distributed Systems,ACM, P.15, Cambridge, Jul.2017.