A New Edge Computing Based Cloud System for IoT Applications

Vijayalakshmi V., Vimal S

Abstract: The mobile internet and the internet of things (IoT) has emerged out with various applications were centralized cloud computing has faced several challenges over the past years. Challenges include high latency and low Spectral Efficiency. Nevertheless, these challenges can be faced using a novel technology which is now emerging out as a major trending technology that supersedes centralized cloud computing with edge devices of networks. Well, this technology will reduce the latency and will enhance spectral efficiency and will also support massive machine types of communication. A detailed description of this trending technology deals with mobile edge computing, cloudlets and fog computing. In addition, the functioning process of each computing technology is also included. The different characteristics of mobile edge computing and fog computing have been focused. However the most significant part of how these technologies work under the discussion of telecommunication network is also briefly explained.

Keywords: Edge Computing, Cloud Computing, DataCenter, IOT, Software Defined Networking

I. INTRODUCTION

The notions of the connected objects of physical internet are abridged and well explained in IOT which is indeed points of computation. This is used to find where they are connected. In order to communicate between the devices in this radio access network, sensor technologies are used. RFID plays a significant role and provides the best means of communication. Other technologies, wireless technologies and QR codes are also used.

A. Three Major Challenges Facing IOT:

The physical data in the cloud are delivered to businesses and industries through things are which are connected universally called IOT. The industries utilize this data for further processing and their future products and services. Any trending technology or IOT based projects thrive to overcome three challenges so called **technology, business and society.**

B. Brass tacks of Edge Cloud:

Edge computing takes the control of computing applications, by optimizing cloud computing systems. Data and services are moved away from core nodes to other extreme nodes of the internet which makes contact with the physical world.

Power at the edge of the network is processed by a method called edge computing. Edge computing has several pros such as power production, smart traffic, lights or manufacturing as all these are based on Internet of Things (IOT).The edge devices area also capable to identify the defects in a product and also is able to protect a part from failing and optimize the production.

Edge computing very much closely related to **"fog computing,"** which also entails data processing from the edge to the cloud.

Edge computing according to research firm IDC is a mesh network of very small data centers that process or store all critical data locally and push all the received data to the cloud storage. In general in IoT use case scenarios edge devices would collect huge amounts of data, it is then send to a data center or cloud for processing. Edge computing orders and processes the data locally reducing the backhaul traffic to the central repository.

C. Nitty Gritty of Cloudlet:

The critical challenges in the cloud computing is point to point connection between the mobile devices which is associated with the [1-5] cloud. To overcome the challenge the mobility-enhanced DataCenter is located at the edge of the internet is proposed. A cloudlet is a cluster of computers that are uses the internet and are available for use to the nearby mobile devices .The main purpose of the cloudlet is to support by providing resources in the nearby cloudlet through a one-hop high-speed wireless LAN. In the three tier architecture the cloudlet represents the middle tier response time.

D. Avail of Cloudlet:

To customize software on a cloud the nomadic users exploit the VM technology.

Cloudlets use the approach of VM synthesis for rapid provisioning and VM handoff, The cloudlet (Figure 1) expands the overlay applies it to the base virtual machine to the derived virtual machine and finally creates a instance from that VM. A VM encapsulating the personal desktop environment of a user is run on a cloudlet, and the user connects to it through a remote desktop protocol.

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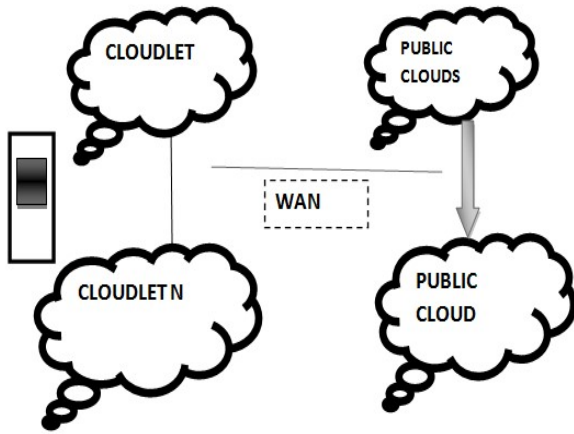*& Sciences Publication*

Figure 1: Avail of Cloudlet

II. EDGE COMPUTING OF MOBILE CONNECTION:

The   Mobile Edge Computing is considered as the most disparate [6], [7], [8] one that involves the consideration and key concept of 5G technology emergence .The key theme of focuses on the introduction of cloud computing facility .This architecture provides the dynamic access to all its users. Due to the deployment of various services the network traffic gets diminished so that it provides a fast access to all its customers. The nodes can be placed anywhere it means that it can be placed both in indoor or outdoor. So that it will be very easy for the users or customers. The servers for these networks should be deployed in a   LTE base station .third parties are also allowed to access the MEC radio access network. There are several applications that use this technology. Here the detailed explanation of MEC (Figure 2) video is shown in this figure given below. In this diagram the video from different cameras combine together and reached the MEC server which is situated in the LTS base station.
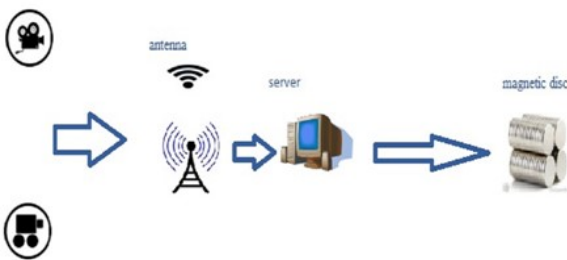

Figure 2: **Detailed Explanation of MEC Video**

Clips are passed through the antenna .in this antenna the videos with high quality gets filtered and it is passed to the MEC server. The server then again passed it to a storage block called magnetic disc ,floppy disc ,hard disk drive etc. It stores those results in any of the storage structure. This data are retrieved later whenever required. the data or video signal transmission varies or transmitted from high bandwidth signal to a low bandwidth signal .The high bandwidth signal gets transmitted first and the   low bandwidth signal and so on. If we want to deploy it then the data has to be authenticated so that the safer transmission of data may occur otherwise they result in error or the data will not reach the indented user.

III.   CENTRAL OFFICE RE- ARCHITECTURED AS A   DATABASE:

CORD focuses mainly on the wire line network. The important goal of Central Offices used to change the integrated NFA and SDA for different service providers. CORD projects a huge representation of "everything as a service for the future reference. The high level services running on open stack are managed by XOS. There are n number of trials that shows the concept of virtualization of CPE, OLT, BNG and can able to work with fast and high speed technologies. CORD (Figure 3) needs a network level security assurance. There shows the perfect diagram for CORD architecture well as authentication.
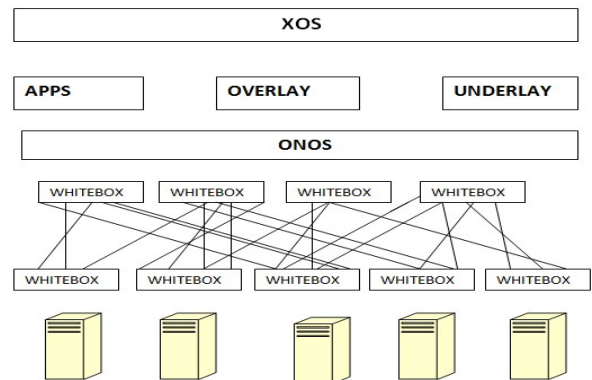

Figure 3: CORD ARCHITECTURE

After undertaking n number of trials cloud is now became a most flexible one. So it is a rapid change in CORD.

A. NEBULA:

Nebula is the one of the cloud computing environment, which is used to maintain the large number of data in the data centre. It focuses on the infrastructure to build the different cloud implementations like public, private and hybrid. The figure shows the Nebula system architecture. At the middle of the architecture we can able to find the nebula specific components. The category of nebula specific architecture includes the compute pool master, data master, storage master, nebula central and monitor. In order to process in data intensive [14] application all those components in nebula must cooperate and work together. For example if you want to use any services or resources we can able there is no particular service infrastructure for nebula and it is acceptable even though when the node ends in failure to get the services from the service engine.
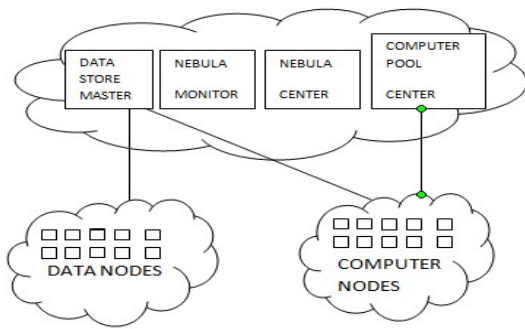
Figure 4: NEBULA

Nowadays the OpenNebula is broadly used by the different industries. It includes the services of super computing, research lab, information systems, internet providers, Nebula (Figure 4) users ,data node, master node, etc are connected together in order to communicate with each other.

B. Femto Cloud:

Femto cloud is just the modification of the cloudlet concept. The main goal of the femto cloud is to group all the nodes in a network are combined together in order to work as a cluster. The cluster can be formed by sharing the resources from each mobile device in a network. Each mobile device is managed by the centralized controller .the responsibilities of all the mobile devices in a network. Such devices are used in coffee shops, theatre, etc,

IV. EMERGING TECHNOLOGIES AND RESEARCH:

1) Nfv And Sdn In Edge Cloud:

a) NFV (Network Function Virtualization):

The above vision can be overcome by using the NFV. This is being implemented in various new technologies like Augmented Reality, Face Recognition, and Video Monitoring.
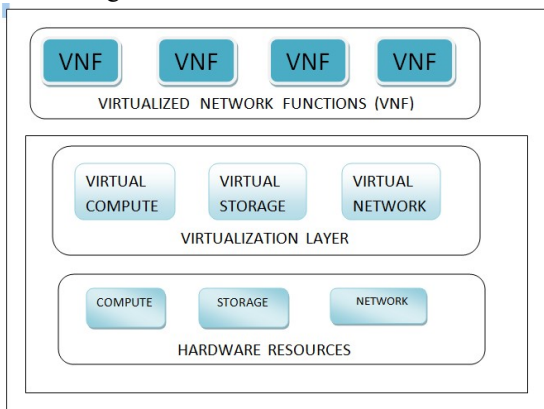

Figure 5: Network Function Virtualization

As seen in the above diagram NFV is build on top of Hardware Resources to create a VNF. The VNF can be used for complicated Applications. If NFV is used it generates intensive data or require low latency.

b) SDN (Software Defined Networking):

SDN is used in NFV to manage VNF's in a more effective way. SDN is cost efficient and flexible. NFV (Figure 5) and SDN are highly complementary to each other.SDN runs on

top of the NFV .The conjunction of NFV and SDN creates innovation and reduces cost for the deployment of the applications. In future the 5G networks will be addressed by the NFV and SDN.

2) Cloud Orchestration And Runtime Unloading:

A) Cloud Orchestration:

There are many barriers which still exist and researches related to IoT applications are still in the early stages. One such challenge is Cloud Orchestration. Automation is derived and it is a part of orchestration, which means that orchestration provides coordination among and across many automated activities. However, the current automation technologies (Figure 6) available are not applicable for the IoT applications. They highly rely on decision making methods which is complicated. Most of the automation methods are applicable only to certain applications therefore using these methods lead to various disadvantages.
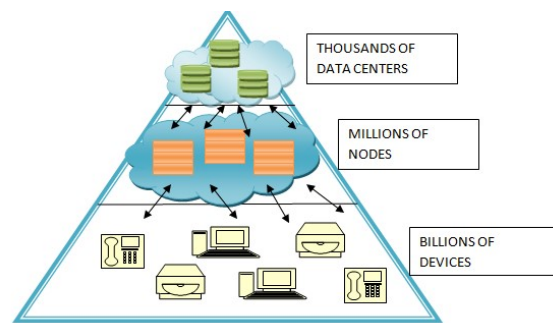

Figure 6: Cloud Orchestration

B) Runtime Unloading:

In edge cloud the person doing automation must work with several IoT devices to unload the information to the devices working under the cloud. Virtual machine based unloading is easier to control and manage for specific IoT applications and with higher reliability.

V. BARRIERS, PERSPECTIVES AND SOLUTIONS:

NFV and SDN coherency. On gathering Network Function Virtualization (NFV) and Software Defined Network (SDN) for the utilization in the corner of the cloud big strength, the rest in a primitive position on account of Network Function Virtualization and Software Defined Network technologies independently are still not advanced and research on successful collaboration between them is a good starting point.

1) 4G/5G Mobile Networks vs Internet:

The boundary of virtualization method and cloud are networks exchanging all over. Forthcoming Internet of Things operations can be displayed in numerous networks accommodates popular networks. This network cloud utilization is been in the mobile tower ranges to offer work near to the cellular device applicant for good user practice or latest operation. In information highway, Central office framework stores the closely accessing point of the smart home.

2) Strategy of IoT equipment with Edge:

The major importance of edge operation is to get accessed with the help of Internet of Things devices using the edge servers. It focuses on coordination of things and the edge with each other to get target of important procedures. The normal offloading and foraging methods separate the detailed content. In spite, they normally create difficulties in the programming and add an additional difficulty to the creators of application. Instead of preparing the operations differently to be understandable, an entire Virtual Machine is been powerfully started at the edge cloud and the operational works will be completed in the Virtual Machine to be an aggregate as far as the conclusion is recovering behind at the "things". Virtual Machines are been started and erased powerfully at the demand. Similar procedure could facilitate the creators 'task and in addition to that it decreases the difficultly. Reasonably, like an application can implicate additional time during the Network Function Virtualization floor maintains the Virtual Machines. Anyhow the better message is to be that for maximum of the supply in-depth works are implicating the offloading, the gain generally based the money. This Virtual Machine stationed process has also been initiated by the Virtual Machine live migration methods that has been nearly well examined.

3) SBIs and NBIs:

Accommodating the Network Function Virtualization and Software Defined Network is a problematic work as it accommodates various partners that may operate the approaches in a contrasting manner. The partners will not be inspired to implement in well-organized and May not undoubtedly hand over sufficient and available interfaces to move with alternative software merchant. Southbound Interfaces and Northbound Interfaces will be the two various classifications of interfaces to generate all to appear constantly and energetically. This type of interfaces usually assigning the different implementation area and rule of Northbound Interfaces, Southbound Interfaces assign to interfaces bounded by the rule plane and information plane. Although the Southbound interfaces bas been regularly known by the modules like Open Flow, the Northbound Interfaces will not. As reported to a latest message on the ONF message, furthermore twenty Software Defined Network investigators and thus fundamental Northbound Interfaces are still accessible to the Software Defined Network in the forum. Rarely the Northbound Interfaces will be regulated by the abbreviation that has the option to suppress modernization. The access for submitting and hand over the ascendable and exchangeable for later implementation on the change of Network Function Virtualization and Software Defined Network frameworks, convenient Northbound Interfaces are most necessary and extra research achievements is required. An illustration growing achievement is that the Open Networking Foundation NBI Access Point Internet implementing team is implementing on the progress an intent-based Northbound Interfaces system.

4) Software Defined Network various-cloud schemes:

In distinction to the analysis on the different National Science Foundation studio, Software Defined Network is emerging to Software Defined Exchange. The classical Software Defined Network approach is internal a network link, although Software Defined Exchange assign for implementing the approach to internal department networking. Software Defined Exchange targets to activate the intermediate connections in the large industries of SDI purchased and implemented through numerous institutions although profiting same gain in adaptability and practicability as in Software Defined Network for a unique network. Furthermore, with Software Defined Exchange, a sequence of advanced appearance will be issued, counting utilization-peculiar peering, drive through the network operations, closing the DOS and load-balancing. Implementing Software Defined Network in the interval concept scheme, alike at specific Internet Exchange Point, could gain thousands of workers without setting up advanced instruments. The Software Defined Exchange viewpoint can disturb edge cloud implementation. In some cases, according to what the Software Defined Network in the regional edge cloud better connect and same will be with the Software Defined Exchange in the advanced internet for furthermore gains and appearance? Large fascinating research headings can link together.

5) Encryption:

Encrypting will be one of the major necessary objections of this cloud frameworks and implementation. Expected the evidence of the advanced cloud edge may implicate various methodologies, encrypting involvement will be of diversified. Initially as a result of acceptance of virtualization method in edge cloud, encryption involvement with all the historic cloud operating modules (Virtual Machines Encryption) may retain for the edge cloud. Followed by that as a result of edge cloud servers are quietly placed and will be near to the consumer's bounds, they can be furthermore delicate natural aggression. Followed by the above scenario encryption problems for a unique methodology like Network Function Virtualization, Software Defined Network and Internet of things may extend to current in the edge clouds. Energetic training and total of the technologies can have a corresponding aspects, extra encryption problem can be grown through the interfaces or through the communication with them. Fourth, various implementation can run on the equalized frameworks of edge clouds, because it is necessary to represent the implementation-stage encryption problem like approximate operation confinement and mutual service and input entry for various implementation. Finally, software encryption will be objections. Although the advanced edge clouds can start furthermore practicability and the extended field can access large unauthorized merchants to measure in and supply, it will be necessary to regulate and monitoring strength hazard admits with various consumers.

Also A3 methodology can be provided to access and encrypt the honored users and characterize from the possible venomous charge and exploitation.

VI.   SUMMARY:

The edge computing systems are used with SDN and NFV technologies to monitor the challenges of cloud computing framework with present IoT field. In this paper, we discuss about the motive, research carried out in this field, different technologies and the upcoming development of edge computing environment. At the end we plan to bring the entire image of the discussion in the edge computing.

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