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Overview of Edge Computing With Software Defined Networks

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Abstract- Cloud Computing is a technology, which involves sharing the resources of both hardware and software to the customers through the Internet with the reduced cost and time. But still it has many security and time related issues. To overcome the difficulties faced by the cloud many new technologies are found. In that the new technology named Edge computing most over satisfy the customers need with secured manner and within the time constraint given by the customer. In Edge the data are not accessed in the main server of the cloud instead they process it in the nearby data centres, so the time saved and security is also maintain only in the prescribed range resources. This paper includes the architecture and functions of the Edge computing, which gives new ideas to the researchers in the Edge filed

Keywords: Cloud Computing, Edge Computing, Data centre

I. INTRODUCTION

Cloud computing technology is used in various fields for various purposes, for example Email reading, commercial Purposes, business fields etc.[1] Now a days its usage make tremendous help for the customers, in the meantime more connections are needed to solve the customer need within the time. To solve this problem a technology introduced called Edge computing. There is no standard architecture for Edge computing. This paper analyses the edge architecture and its Functionalities and it gives new ideas to the researchers

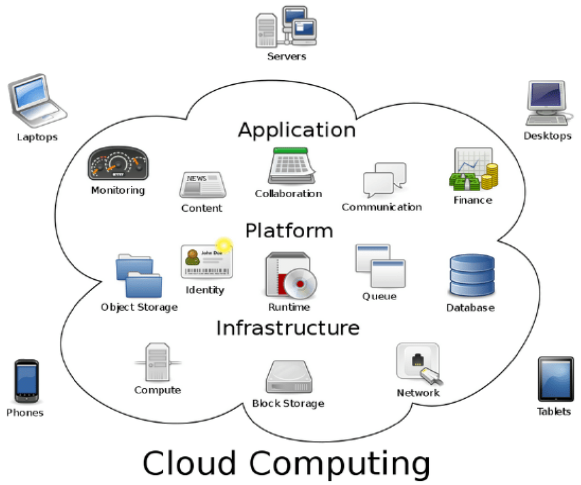

Fig 1 Cloud Computing

Fig 2 Cloud with end devices

II. STRUCTURE OF EDGE COMPUTING

Edge Computing allows computations to be performed at edge of the network. Here the Edge devices not only request the data but also provide the content to other users. It is a two way devices.

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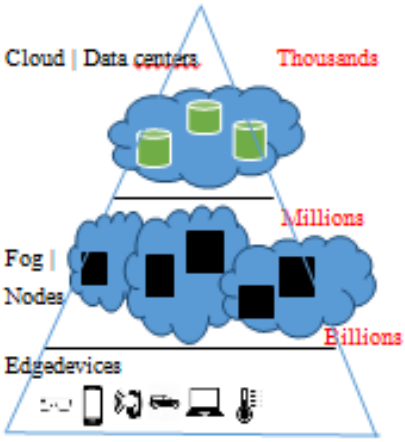

Fig 3. Cloud / Fog / Edge

SDN in Edge Computing

To overcome the difficulties in cloud computing Edge computing come with the solution, that is Software Defined Network (SDN)[2]. SDN contains multi controllers instead of the single controller in the cloud architecture. SDN is a programmable hardware device which controls overall network[3] [16] It reduces the complexity in accessing the server, and quality of Service Performance also increased.

The Bottom Layer contains the edge devices like Mobile, Car watch etc they seek services from the server. [4] An Intermediate layer contains the controller and openflow switches. The Upper layer consists of customized and virtualized North bound applications that define the behaviour of the mechanism.

In the SDN architecture there are layers, they are

- NorthBound Applications
- SDN Infrastructue
- Edge Layer

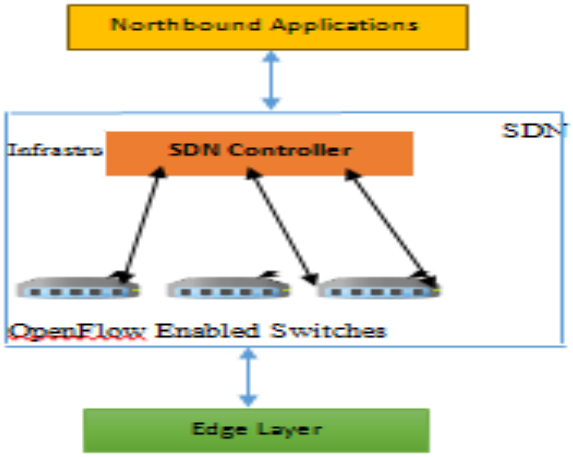

Fig 4 SDN architecture for Edge computing

All operations of SDN and the flexible communication between the controller and the switches are carried out with theOpenFlow protocol [6], [7] which is currently developedby Open Networking Foundation (ONF) [8]. OpenFlow representsthe main functionalities of SDN such as managing theflow tables on the forwarding nodes, populating them, definingflow rules, gathering statistics and many other managerialoperations [9].

IV. LITERATURE REVIEW OF EDGE PARADIGMS

Nasir Abbas [17] make a survey on mobile edge computing and conclude that MEC has a great potential to be the future edge technology offering bandwidth, battery life and storage to the resource-constraint mobile devices. MEC trends to provide elastic resources at the end of the network towards applications demanding computational-intensive tasks with high bandwidth and ultra-low latency, especially in 5G networks. MEC deployment can build an ecosystem involving third party partners, content providers, application developers, OTT players, network vendors and multiple mobile operators. This paper has presented a thorough study on the recent research and technological development in the area of MEC and its application domains, research challenges and open issues.

Wei yu[7] presented the importance of Edge computing for the IOT technology with cloud. He summarized his work, as Compared with the cloud computing paradigm, edge computing will migrate data computation and storage to the "edge" of the network, nearby the end users. Thus, edge computing can reduce the traffic flows to diminish the bandwidth requirements in IoT. Furthermore, edge computing can reduce the transmission latency between the edge/cloudlet servers and the end users, resulting in shorter response time for the real-time IoT applications compared with the traditional cloud services. In addition, by reducing the transmission cost of the workload and migrating the computational and communication overhead from nodes with limited battery resources to nodes with significant power resources, the lifetime of nodes with limited battery can be extended, along with the lifetime of the entire IoT system.

In his survey he also describe three different communication models for IoT.
1) Machine-to-Machine Communication
2) Machine-to-Cloud Communication
3) Machine-to-Gateway Communication

V. ADVANTAGES OF EDGE COMPUTING

There are many advantages in implementing this Edge computing technology, they are

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1**Flexibility and Low Barrier over Innovation**: The old-styleinfrastructure of the network is limiting for innovationsbecause there is a small area for innovation when thehardware has the accountability of both control and sending layers [10]. By decoupling the control and forwarding layer, SDN provides flexible programmable interface that enablesinnovation. As the combination of cloud and edge serversdemands high flexibility because of the increasing number ofdevices, SDN can treat network as aelastic software [11].With the help of centralized controller and user-implementednorthbound applications, the large scale environment can bemanaged in every level of transposition

2. **Virtual Machine Mobility**: Virtual machine (VM) relocationis a technique that is normally employed in data centres for effective operation in terms of energy consumption andload distribution [12]. Within the context of Edge Computing,ability to roam VMs over the edge infrastructure wheneverneeded provides fine control and optimization possibilitiesover the whole system. VM movement can be activated bythe user movement, energy conservation, reducing the traffic load or service replacement [13].

3. **Interoperability**: As the interest in IoT increases, thereare and will be many players and vendors around. In orderto support interoperability between the devices belonging todifferent vendors and mitigate the complexity caused by theheterogeneity of Edge Computing, there should be a vendorindependentenvironment.[15] As a result of the immense workon the standardization by ONF, SDN leads to a networkenvironment which eradicates dependency on vendors [14].Since SDN is able to manage the heterogeneous environments,distinct Wireless Sensor Network (WSN) and Body AreaNetwork (BAN) setups with different types of sensors canoperate in a single environment without any complications.

4. Lower Cost Solutions: Keeping pace with the increasednumber of mobile devices requires a large number of networknodes to be installed at the edge. In addition to the edgeservers, network functions that are provided by each middle boxare also essential for managing and operating the immensemobile traffic generated at the edge. Traditional networkdesign introduces hardware based solutions for managing the network and executing network functions which are expensiveand difficult maintain. The smooth collaboration of NFV andSDN does not only improve the service orchestration, butalso eliminates the requirement for updating the forwardingdevices and integrating new protocols. These operations withinthe traditional network infrastructure, where the control planeis also hardware-based, result in high costs for the serviceproviders.

CONCLUSION

Edge computing is a term bringing the computational resources to the closeness of the end devices. The end devices needed the closest network to serve their need within short duration, the Edge computing solve the need of these devices. To overcome the technical barriers in the network programmability we have the solution SDN. This paper review the concept Edge Computing with SDN, its architecture and the functionalities clearly. This paper gives more ideas to the researchers to create innovative programs in this field.

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