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Importance of Edge Computing and Cloud Computing In IoT Technology to Process Real Time and Time Sensitive Data

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Abstract - *Edge computing performs the operation nearer to the source of data generation i.e. it always best to do thing nearer to source rather than central server why because if data is less or data is very sensitive then it is always best to process at edge of network that is closest to data server. So in which some data process locally at local identified and classified node. After processing this time sensitive data only refined data send to cloud without raw data. It helps in Internet of thing and real time data processing and delivery. In poor network area only sending refined data required less transmission bandwidth so it help in data transmission even in poor network connectivity.*

Cloud computing provides the different types of services on-demand services as per need concept of computer system resources, basically storage, computing, operating system environment, processor etc without direct active management by the user. Clouds are spread all over world and user access the services but the locations of cloud are hidden from users.

***Key Words*: cloud, edge, computing, on demand service**

1. INTRODUCTION

In cloud computing users request to cloud provider for required services as per need and after completing the need user left the cloud services and pay for only for that time slot. Now what is this scenario clouds are located across the world same user also spread across the geographically different location. For this different types of devices and equipment located to the edge and server that help to provide cloud services. So the data process at centre level and that delivered to the users and devices at edges not process any request or data. Now question arises that this technology takes some time in request and reply but what in the case of real time data processing and time sensitive data processing which required to take quick decision, to solve this problem edge computing technique use where the data process and compute at the source of data that means at the edge in which the processing done at the identified device node that are connected in network. Smart sensors sense the input data and process own without sending to cloud server. Today's Internet of thing is widely used concept for real time delivery for example in traffic management, healthcare, temperature adjustment etc in which IoT devices use that uses artificial intelligence technology which is time sensitive devices take input process it and take decision to avoid damages or to take some cure.

Whereas in cloud computing data not process at edge level but it process at cloud server. Cloud provides different types of services in the form of storage, computing environment, processor, software, virtual machines etc. through on premise datacenter. The maintenance and management are done by cloud providers.

1.1 Services provided by cloud computing

1. **Infrastructure as a Service (IaaS):** In IaaS, different IT infrastructures like storage, networks, operating systems, servers and virtual machines (VMs), from a cloud service vendor. Using IaaS, we get maximum flexibility by crating virtual machines, but still, we need to put more effort into maintenance.
2. **Platform as a Service (PaaS):** This service provides an on-demand environment for developing, testing, delivering, and managing software applications. The developer is responsible for creating and deploying the application. In PaaS, the management of the environment is taken care of by the cloud vendors and user pay only for services.
3. **Software as a Service (SaaS):** It provides a centrally hosted and managed software services to the end-users or customers. It delivers software on-demand through internet services, and typically on a subscription basis. E.g., Microsoft One Drive, Office 365, Amazon Kindle Dropbox, WordPress,. SaaS is used to minimize the operational cost to the maximum extent.

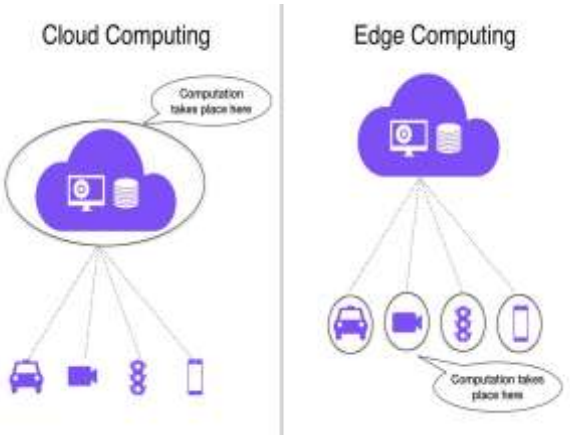

Fig-1:-Processing site difference in cloud computing and edge computing

2. DEFINITIONS AND MOTIVATIONS

Advantages of edge computing and how it upgrade the Internet of Things (IoT) services.

Lesser Network Load-It reduced the network because processing done at node side so less network bandwidth required transferring the data

Zero Latency-latency means time between device send request to clouds server and server give reply. In time sensitive case this time should be minimal to take decision.

Reduced Data Exposure-Less data transfer to cloud because data is process at node level and only set of data transfer.

Computational Efficient-Computational load will be reduced on cloud server because it distributed all over the connected edges

Security and Privacy-data process at edge so before sending to cloud it can encrypt so secure the data and maintain the privacy

2.1 Which One's better? Edge Computing vs. Cloud Computing

If we study about cloud computing and edge computing one thing is clear that both computing are different attributes as both work in same way but at different location. Both Technologies have its own importance. Cloud computing prefer when there is no need of instant decision making and lots of data required to process and store so it required some time in second or in minutes also. Edge computing is used to process time-sensitive and real time data, we can say that it is time driven whereas cloud computing is not time driven

Edge computing is preferred over cloud computing where no connectivity or poor network problem like remote locations or military operations. This operation required all processing technique which is use in cloud computing but in small range or mini data center. Many intelligence devices compute based on some machine learning or neural network technology. These specialized computing devices are intelligent and respond to particular machines in a specific way or defined or undefined way.

2.2 Why Edge Computing technology required in current scenario?

- If there is less connectivity or poor for IoT devices.
- If IoT devices not able to connect with the central cloud in continuous manner.
- The latency factor affect data transmission and delivery of reply in edge computing data does not traverse over a network to a central cloud for processing so effect of latency.
- Reduces the data traversing, as data is produced no need to send over a network; instead, it compiles the data and sends daily reports to the cloud for long term storage, i.e.,.
- Direct access to gateway into the telecom provider's network, which connects to a public IaaS cloud provider that benefits by 5G cellular networks by telecommunication companies

3. CONCEPT AND METHODOLOGY

What is the role of edge computing and how it will be helped in Internet of Thing, It will be clear by taking some IoT devices and its function which takes data and process and take quick decision also it will clear what will be happened if we use cloud computing instead of edge computing

What is the need of Edge Computing When Cloud Computing Is Available?

This is an important question asked by most IT and IT supported professionals. Let's take one example of a machine whose functionality is very crucial for an organization. A delay or a little delay also would results in huge losses for the organization in decision-making process, such problem solved by organizations by using edge computing because smart devices identified as mini data center has power of small amount of processing are placed on the edge of the network. The device continuously monitors a pre-defined parameters set for tolerance levels, if the value of parameter are outside of the accepted level, a

warning signal or decision signal is issued as soon as the machine reaches the failure level, resulting in the shutdown of the machine within microseconds to avoid further losses There is a latency factor in communication means the time it takes sending a query through your device to the network and for a reply to come back is called latency. Smart devices are limited by factors like network speed, bandwidth and even the distance from the server or the database to the devices. Most of the time latency affects the performance of the device. However, in some cases, that latency could potentially damage the devices or situation even human being taking example of self driving car can make collision. Edge Computing allows such devices to compute and make decisions locally, at high speed, without affecting their efficiency.

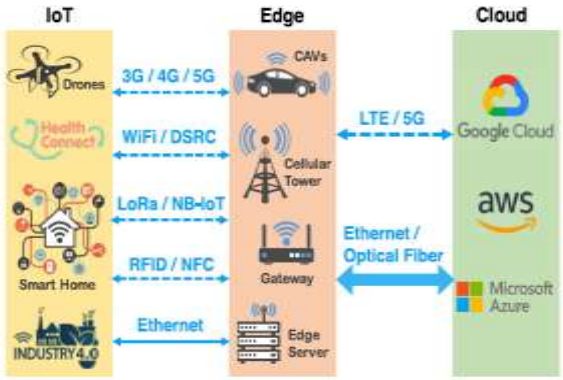

Fig -2: Three tier edge computing model

In above figure three layer of computing shown first one is IoT devices second one is edge and third one is cloud. In first layer that work at user level different devices or say IoT devices work like drones, health devices ,smart home system , alarming system, industry quick action system for technical fault etc. These all connected via Ethernet, wi-fi or different network connectivity to edge where different mini data center like gateway, edge server, cellular tower perform the edge computing after that process data stored at cloud.

Following are some example of real time data processing environment in which time sensitivity is very important factor followed by one case study.

- Traffic management
- Self-driving vehicles
- Fleet management
- Stock market trading
- Safety monitoring in remote oil and gas rigs
- Power management with smart grids & smart meters
- Gaming
- Health sector etc.

Case Study: Edge-Computing Video Analytics for Real-TimeTraffic Monitoring in a Smart City by Johan Barthélemy, Nicolas Verstaevel**,** University of Wollongong, Wollongong, NSW 2522, Australia, explain the project aims to develop and evaluate mobility trackers using CCTV live feeds. In town they deploy twenty sensors to monitor traffic flows. Fifteen of them are already existing CCTVs while five of them will use mobile CCTVs allowing relocation if needed. By this way they tract the real-time data and control the traffic in efficient way. They also prove two main advantages which is aim of edge computing, limited amount of data transmitted to cloud after edge processing so less transmission of data and lowers the network bandwidth requirement as no raw images is transmitted, the device is privacy compliant.

4. CONCLUSIONS

Both of these technologies have equal weightage to get high results. Cloud computing has its own advantages and importance for big dada analysis and computation but have some disadvantages also in regards real time and time sensitive data computation. The drawbacks of cloud computing remove by using edge computing. The combination of edge computing and cloud computing can provide you with the opportunity to maximize their potential and, at the same time, reduce their drawbacks. In IT and AI both can perform excellent job that will change paradigm of thinking towards high performance and accurate decision making system.

IoT devices will be able to run faster and process data efficiently without losing storage capacity and processing power. Now we can say that future of networks lies somewhere between edge computing and cloud computing. Today, both of these technologies remain most relevant and provide data analytics and data processing solutions for various organizations in form of data science.

REFERENCES

[1] "Challenges and Opportunities in Edge Computing" by Blesson Varghese, Nan Wang, Sakil Barbhuiyaar Xiv:1609.01967v1 [cs.DC] 7 Sep 2016

[2] "A survey of edge computing based designs for IoT security" by Kewei Sha *, T. Andrew Yang, Wei Wei, Sadegh Davari Digital Communications and Networks

[3] "Edge-Computing Video Analytics for Real-TimeTraffic Monitoring in a Smart City" by Nicolas Verstaevel , Hugh Forehead and Pascal Perez 2018

[4] "Edge Computing" By WEISONG SHI, Fellow IEEE Guest Editor 2019

[5] "Edge computing: A survey Future Generation Computer Systems · February 2019 Wazir Zada Khana, Ejaz Ahmedb, Elsevier April 2, 2019

[6] "Edge Computing: A Survey On the Hardware Requirements in the Internet of Things World" by Maurizio Capra , Riccardo Peloso ,Future Internet 2019

[7] "Edge Computing: The Fourth Wave Rises Moor Insights & Strategy 2018 "by M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski,

[8] "A Viewof Cloud Computing," G. Lee, D. Patterson, A. Rabkin, I. Stoica, and M. ZahariaCommunications of the ACM, vol. 53, no. 4, pp. 50–58, 2010.

[9] "Cloud Computing and Emerging IT Platforms: Vision, Hype, and Reality for Delivering Computing as the 5th Utility," R. Buyya, C. S. Yeo, S. Venugopal, J. Broberg, and I. Brandic Future Generation Computer Systems, vol. 25, no. 6, pp. 599 – 616, 2009.

[10] "Edge-centric Computing: Vision and Challenges," SIGCOMM Computer Communication Review " by P. Garcia Lopez, A. Montresor, D. Epema, A. Datta, T. Higashino, A. Iamnitchi, M. Barcellos, P. Felber, and E. Riviere, , vol. 45, no. 5, pp. 37–42, Sep. 2015