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Fog Computing: Helping Realize the Power of the Internet of Things

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Abstract:- Cloud is very important because IoT devices, sensors, and different types of devices process a tremendous amount of information and finally that information has been processed and that is the reason that cloud came into existence. All this information will be sent to the cloud for further refinement and so on. The main issue with the cloud in the IoT environment is the information transmission speed. Let us say there is a cloud and there are different IoT devices deployed. Each of these devices sends all these data to the virtual cloud for further refining and storage. Now, that becomes a problem because these IoT environments have constraints concerning bandwidth, degree of processing, memory utilization, energy consumption, etc. This processing can be handled with the help of the cloud but what about the bandwidth what about the energy consumption because what is going to happen in this sort of scenario of the use of cloud in the IoT context is a lot of data is going to float all around. Over the network, a lot of information is going to be dispatched to the cloud and that will unnecessarily consume the bandwidth and the limited energy that is resident in all these devices. IoT devices have to sense the physical phenomena occurring around them and send the data to the cloud and get an action or comment back. There is a need for fog computing to reduce latency. cloud servers might be physically located in different continents, cities. This physical limitation also introduces a large latency in communication.

Keywords:- *Cloud Computing, Fog Computing, IoT.*

I. INTRODUCTION

The fog was introduced by cisco and it was like an idea to bring the facilities that are provided by the cloud close to the operating IoT devices because all these data sent to the cloud will not only take the limited bandwidth that is there in this kind of environment but also that is going to take a lot of time. In this particular case, the time that is required will be the time from when that piece of data is sent to the cloud. let t1, t2, t3 be the time for processing and finally, that response will be sent back with time t4 for maybe for activation or any other reason. The total time finally becomes t1+t2+t3+t4. This is the total time that it takes until when the receiving device gets a signal about what to do and by this time in most of the real-life applications of IoT most of the unwanted events can take place as there is a lot of latency involved in this process. For example, if it is a surveillance application and because of latency that is involved maybe the intruder might have already intruded into the territory. If it is a medical emergency scenario for the time it takes to send it to the cloud, cloud processing, getting a response back, etc. The patient might even die. This situation has arisen because of the high latency. Thus, there is a need to reduce latency for effectiveness which can be done through fog computing. The whole idea is to bring the cloud facilities, the attractiveness of the cloud closer to the IoT device layer, to solve the problems that are faced by cloud computing, to reduce the latency. This entire time can be reduced by the use of fog computing. In IoT, there is a device layer where all these IoT devices, the physical devices operate, there is a cloud where all the data is sent for processing and storage. Fog acts like middleware where some of the mathematical computation, data processing, information storage is going to take place before the data is collected by these devices and sent to the cloud. Before it is dispatched to the cloud for some intermediate processing, the repository for making quicker decisions is the primary aim of fog computing. Fog Computing takes the model of Cloud Computing to another level in the field of networking. Various applications and services are also permitted because of fog computing. Some trivial features of the Fog Computing are as follows: a) Decreased latency and knowledge of that particular place; b) Extensive Geographical allotment; c) mobility; d) More numbers of clients; Nodes, e) Wireless access central position, f) Solid Presence of applications for live streaming; g) Non-uniformity. We emphasize in this journal that the above features make fog computing an integral part of networking.

There are a lot of clients that face Web applications and batch processing in real-time. For them the Cloud Computing model is an important substitute for possessing and operating private data centers. Several factors bestow to the mega DC scale economy: greater predictability of massive aggregation, which makes for greater usage of power, storage, and various components of the network.

Cloud computing makes the business and the clients free from the specifications of IoT. It becomes a concern for applications that are sensitive to latency, nodes in the vicinity. The evolving wave of deployments of the Internet, The Internet of Things (IoT) needs improvement for mobility, location sensitivity, low geo-distribution, and latency of services.

There is a need for a new platform to reach These criteria; a network that is called Fog Computing. Fog Computing, has given rise to new applications and services. The interaction between the fog and the cloud is fruitful, especially when it is related to Data analytics and processing.

II. UTILITIES

Fog Computing is a highly dematerialized plan of action that, usually but not exclusively situated at the extremity of the net work, provides data computing, processing, storage, and networking assistance between user devices and t raditional cloud computing data centers.

2.1 Healthcare and monitoring

In healthcare, where processing and event response is important in real-time, Fog computing may be useful. One suggested device uses fog computing to track, predict, and avert stroke victims from dropping. The learning algorithms for fall-detection are spontaneously distributed over edge devices and cloud assets.Observations have shown that this system has a shorter responsiveness and less power than cloud-alone outlooks.. A smart-healthcare system based on proposed fog computing allows low latency, support for mobility, and awareness of geographic location and data privacy.

2.2 Intelligent Services

Fog computing can be preowned for smart utility systems, whi ch concentrate on raising energy production, distribution, and billing. In such settings, edge systems can report more fine-looking en ergy usage information e.g., hourly and regular readings instea d of monthly readings) to users' mobile tools than conventiona l smart resources.

2.3 Augmented reality

In latency-sensitive augmented-reality systems, fog computing plays a vital role. For instance, an online brain-computer-relation game, the EEG Tractor Beam augmented multiplayer, based on electroencephalogram readings gathered by sensors. On fog modules, it carries out “continuous real-time brain-state classification and then tunes cloud servers, classification models”[1]. A wearable method of cognitive assistance that uses Google Glass technology assists individuals with impaired mental acuity perform multiple activities, including asking them the names of individuals they encounter but don't remember. For Delay-tolerant tasks like reporting errors and logging, devices interact with the cloud in this application. For “time-sensitive activities, the computer streams video from the Glass Camera to the fog processing units. The scheme shows how” [1] end-to-end latency is significantly reduced by using nearby fog instruments.

III. CHALLENGES

To realize the full potential of fog computing, there are several threats, including Managing load distribution among edge and cloud services, monitoring and sharing of APIs and services, and SDN communications.

3.1 Enabling real-time analytics

In fog environments, to reduce latency and optimize throughput,resource management services are intended to determine dynamically which analytical activities are being transferred to which cloud or edge-based asset.. These systems must also take into account other requirements, such as the data protection laws of different countries, including, for instance, medical and financial data.

3.2 Programming models and architecture

For fog and IoT environments, most stream and data processing systems, including Apache Storm and S, do not provide adequate scalability and versatility because their design is focused on static configurations. Fog environments need the potential to increase and decrease assets spontaneously because transforming nodes are usually mobile appliances that constantly enter and exit the web.

3.3 Security, Reliability, Fault Tolerance

It is a key challenge to implement safety in fog atmosphere because they have many service suppliers and end-user, as well as dispersed resources. It is difficult to develop and enforce authentication and authorization techniques that can operate with several fog nodes with discrete computational capabilities. Possible remedies are public-key infrastructures and trusted implementation environments. Fog deployment clients often have to prepare for individual sensors, networks, service platforms, and applications to fail. To assist with this, protocols, such as the SCTP i.e., Stream Control Transmission Protocol, could be introduced that trade-in with packet and event authenticity in wireless sensor networks.

3.4 Power Consumption

Fog ecosystems are made up of multiple nodes. Therefore, the measurement is distributed and can be less economically viable than that of a centralized cloud structure. Efficacious filtering and sampling methods, and joint computation and network asset management will reduce energy utilization in fog atmosphere using powerful communication protocols such as CoAP.

IV. CONCLUSION

The seamless integration of edge and cloud resources is enabled by Fog computing. It supports the decentralized and smart processing of unparalleled IoT sensor-generated data volumes deployed for smooth physical and cyber-environment integration. This will bring many advantages to society by, for instance, allowing smart applications for healthcare. In this way, the further enhancement of fog computing could assist the IoT to achieve its enormous potential.

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