Improve performance of Cloud Computing by using Fog Computing

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Abstract— Early years of digitization the use of big data, cloud computing for storing the data, securing the data has become the traditional method. In Data storing the cloud is capable but it cannot handle the large set of data with three V's i.e. velocity, variety, and volume. To handle the huge data the new technology is introduced in IoT i.e. Fog Computing. Fog computing is specially used to reduce the computational load of cloud computing. Fog computing is the extension of cloud computing.

Keywords: Fog Computing, Cloud Computing, IoT

I. INTRODUCTION

The "Pay-Per-Use" Cloud computing model is an efficient alternative to owning and managing private data centers for customers facing web applications and batch processing. Cloud computing frees the enterprise and the end user from the specification of many details. This problem becomes latency sensitive application, which requires the nodes in between cloud and IoT devices. In IoT requires mobility support and geo-distribution in addition to location awareness and low latency. We argue that a new platform is needed to meet these requirements; a platform we call Fog Computing. Fog computing is also called edge computing which is developed by CISCO in 2012.fog computing is developed for IoT applications and real-time requirement. Fog is in between cloud and ground. Fog node is very close to the actual devices who generates the data for the cloud. Typical examples of fog nodes include routers, switches, servers, machines, and video surveillance cameras. Cloud is located very far from actual location and connected through the network. Its basic goal is to improve efficiency and reduce the amount of data transported to the cloud for processing and storage. Sensors/devices generate data and transmit the data to the middle layer and it is very close to the data source. These nodes are capable to handle the data and it requires minimum power and fewer resources. fog has the ability to react more quickly for data analysis, and result generation.

A. Existing System:

Cloud computing is traditional computing and data storing technology. Cloud is a centralized system and all the devices are sending the data for storing and computing towards the cloud. These devices are far from the actual cloud so the result of computing totally depends on the network so it generates the delay in the result.

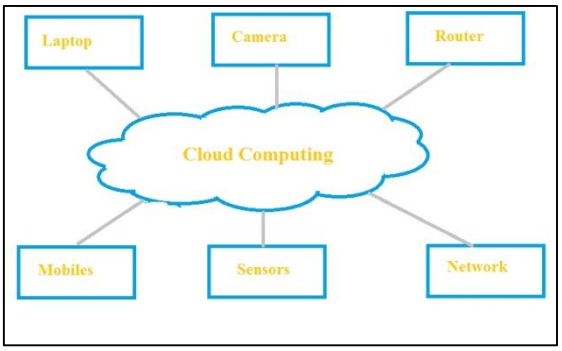

Fig. 1: Actual cloud with end devices.

Cloud server has major security issues are

- Account and services traffic Hijacking.
- Data Breaches: Private information is seen by unauthorized peoples (Hackers).
- Data Loss: The data is very important in these days, sometimes it will be lost, if it found by intruders.
- Denial of Services: if the cloud is overloaded it delays to generate a result.

To overcome these drawbacks the new technology is introduced i.e. fog computing. Fog computing a new breed of new applications and services in IoT, and that there is an interplay between the Cloud and the Fog.

II. FOG COMPUTING

In traditional data centers, fog nodes are distributed over multiple management domains. Cisco has developed mobility across platforms, and technologies that preserve end users and data contents with secured and private domains.fog computing is specially developed for low latency, location awareness, and improves the quality of services and real-time applications.fog nodes reduce the movement of data on the network so automatically it reduces the congestion of the network. It also eliminates the bottlenecks of resulting from a centralized computing system.

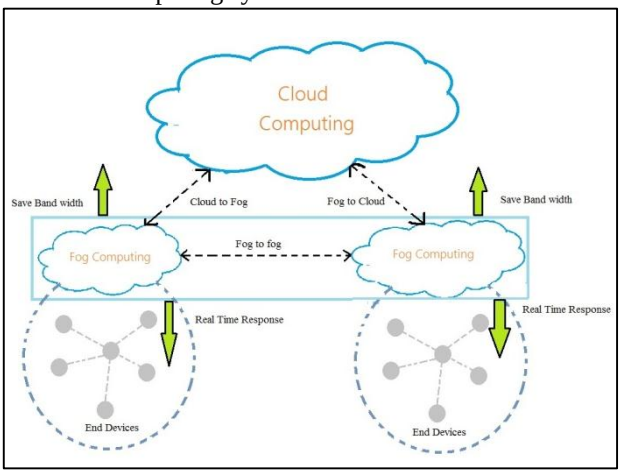

Fig. 2: Fog Computing with IoT System

A simple three-level architecture is shown in the above figure.fog layer is present in between end devices and

cloud server, End devices are connected to fog node here all the devices are sending the data towards the fog node and fog node is computing the data which is coming from end devices.fog node is not permanent data storage it just computes the data and transfers the data towards the cloud.fog is not a replacement of cloud server it just handle the load of a cloud server.

III. THE FOG COMPUTING CHARACTERISTICS.

1) Geographically distribution.
Geographically the all applications and services are distributed for end users.
2) Mobility Support
Using LISP (Locator/ID separation protocol for IP addressing) is used to identify the devices on the network for the mobility support. LISP protocol is map and encapsulate protocol. It finds the host identity on the network by using location.
3) Real-time Interactions is needed for speedy services.
4) Edge Location and low latency
Minimize time period to access the data from the end devices and gives better service at the edge of the network.
5) Handles huge data generation from sensor network with minimum time period.
6) Heterogeneity:
Fog nodes can be used in variety of IoT environments.e.g. Mobile devices are connected through IoT.

IV. ARCHITECTURE OF FOG COMPUTING

The key components of fog architecture are

A. IoT Services.

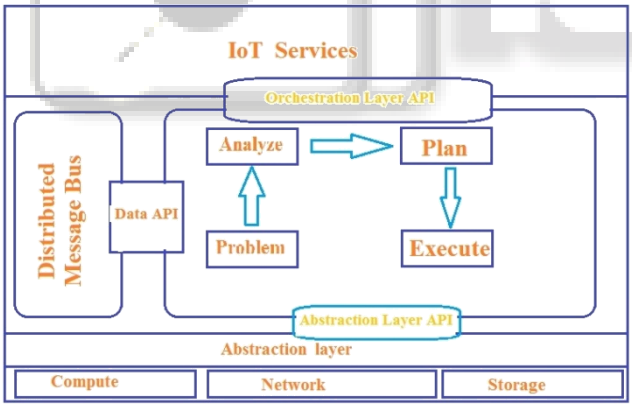

Fig. 3: Fog Computing Architecture.

1) Fog Abstraction Layer
2) Fog Service Orchestration Layer
3) Fog Software Agent.
4) Distributed Database.
5) Policy-Based Service Orchestration.
    1) IoT services: End Devices are in heterogeneous system which is high-speed links which is connected enterprise data center and core to multiple wireless access point.
    2) Fog Abstraction Layer: A programmable interface for connecting multiple devices to single fog node resource management and control. The layer is responsible for monitoring and controlling such as CPU, memory, network and multiple connected devices to the fog.
    3) Fog Orchestration layer: This layer provides life cycle management. It can also services on a large volume of fog nodes.fog software agents can creates and executes the database for web application ,storage and mostly it is used for computation.
    4) Distributed Message Bus: This bus is collect the messages from multiple end devices and transfer the data or message to the orchestration layer.

IV FOG APPLICATIONS.

Following are the few application of fog computing.

1) Fog computing is used robotics in Industrial automations and performance. This application is specially developed for industrial automation and quick response from computational server. Cloud is far from actual location so cloud cannot respond as much fast, in this case, we need computational server is close to the automation machines so we can use fog nodes for data analysis, execution to end user.
2) Fog computing for smart cities: High energy use, traffic control and most public safety these are the problems are present in single IoT network with single or multimode fog. Poor quality of bandwidth and connectivity is big issue of establishing smart cities. Fog node is closely present so it can handle these issues with limited bandwidth. Fog computing addresses security, data encryption and distributed analytics requirements.
3) Healthcare: IoT apps provides structured performance which improves health care services. This is done by presenting and deploying monitoring system and sending collected information to fog devices in real time for diagnosis and then it send to the cloud server. The experimental result suggest presence of fog node achieves low latency and minimum usage of bandwidth.

V. CONCLUSION.

Fog computing is specially developed to reduce the latency and location awareness, works for wide spread geographical area, mobility. Fog is not the complete replacement of cloud computing but it can extend the capability of cloud and reduce the shortcoming in cloud computing like reduce the response time, data analysis etc. fog is near from ground means fog nodes are very close to the IoT devices so it gives quick response with minimum bandwidth. In this paper description is defined the extension, the working capacity of cloud by using fog computing and reduce the computational time with reducing the usage of bandwidth. Fog computing can handle number of devices which are connected through internet Of things services.Applications of fog computing is smart city, smart vehicles, smart grid, connected vehicles through IoT, Wireless Sensors and Actuators Networks.

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