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FUZZY HYBRID OPTIMIZATION TECHNIQUES FOR LOAD BALANCING IN FOG COMPUTING

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ABSTRACT

The rising volume of data and data-generating equipment in healthcare institutions, health monitoring systems started to have problems with latency and efficient processing. With the help of cloud-based wireless sensor networks (WSNs), fog computing, and the Internet of Things, several health monitoring systems have been created (IoT). The architecture of cloud computing has been used to construct the majority of health monitoring systems. Large-scale deployments of latency-sensitive medical applications

Key words- decentralized, latency, cloud

are prohibited by the excessive latency generated by cloud architecture while processing enormous volumes of data. Fog computing is a type of decentralized computing infrastructure where data, compute, storage, and applications are distributed between the data source and the cloud. By bringing the servers closer to the users, fog computing reduces latency and increases resource availability and on-demand scaling.

INTRODUCTION

Data, compute, storage, and applications are dispersed between the data source and the cloud in a decentralized computing environment known as fog computing. The advantages and power of the cloud are brought closer to where data is created and used through fog computing. It's comparable to edge computing.

A computing, storing, and communicating architecture known as fog computing employs EDGE devices to perform a sizable portion of the computation, storing, and messaging locally before transferring it over the Internet backbone.

A considerable amount of computation (edge computing), storage, and communication are carried out locally by edge devices in an architecture known as fog computing or fog networking, sometimes known as fogging, while being routed through the Internet backbone.

OBJECTIVE

Fog Computing is a layer that exists between the cloud and the edge. Fog nodes receive and process the massive volumes of data that edge computers deliver to the cloud.

The vital data is transferred via fog nodes to the cloud to be stored, while the unimportant data is deleted or retained on the fog nodes themselves for analysis. Here is how fog computing transfers critical data rapidly while conserving a lot of space on the cloud.

Although genetic-based optimization is frequently employed in distributed systems, the distinctive characteristics of fog computing call for fresh designs, investigations, and experiments.

Challenges in Fog Computing:

Load Balancing

Resource Allocation and management

Service Migration and Placement

Task Scheduling

Work flow Scheduling

Figure 1: Fog Architecture

TABLE – 1 GENERAL DETAILS

Table 1

Requirements	Cloud Computing	Fog Computing
Latency	High	Low
Delay Jitter	High	Very low
Location of Service	Within the Internet	At the edge of the local network
Distance between client and server	Multiple hops	One hope
Security	Undefined	Can be defined
Attack on data enroute	High probability	Very low probability
Location awareness	No	Yes
Geo-distribution	Centralized	Distributed
No. of server nodes	Few	Very large
Support for Mobility	Limited	Supported
Real time interactions	Supported	Supported
Type of last mile connectivity	Leased Line	Wireless

Source: Cloud Vs Fog Computing

Hierarchical Fog Computing Architecture

1.Terminal Layer

The fundamental layer of a fog architecture is called the terminal layer, which contains things like smartcards, readers, mobile phones, sensors, and intelligent vehicles.

This layer contains the gadgets that can detect and record data. The places where the devices are located are spread out and far apart from one another.

The layer primarily handles data collection and sensing. On this layer, the majority of devices are from various platforms and architectures.

The ability to operate in a setting with devices from various technologies and communication methods is a feature of the devices.

2. Fog Layer

Fog nodes, also known as fog layer components, are things like routers, gateways, access points, base stations, certain fog servers, etc.

At the edge of a network are fog nodes. A hop can separate an edge from the end device. The Fog nodes are positioned between cloud data centers and endpoints.

Fog nodes can be stationary (like those found in a bus terminal or coffee shop) or moving (like those installed inside a moving vehicle).

Services are provided to the end devices through fog nodes. The data can be computed, transferred, and momentarily stored by fog nodes.

The IP core networks enable fog nodes and connections to cloud data centers, enabling communication and collaboration with the cloud to improve processing and storage capacity.

3. Cloud Layer

Cloud layer consists of machines (servers) with high performance and big storage capabilities. This layer carries out compute analysis and permanently saves data for users' backup and access.High storage and potent computing are features of this layer.

A cloud layer is composed of enormous data centres with powerful processing capabilities. Users can access all the fundamental elements of cloud computing through the data centres. The data centres offer scalable compute resources and do so on an as-needed basis.

At the very edge of the entire fog architecture is the cloud layer. In a fog architecture, it serves as a backup and offers persistent storage for data. Data that isn't needed close to the user is typically stored on a cloud layer**.**

CASE STUDY

Fog nodes are essential to how fog computing functions overall since they gather data from many sources for further processing. According to forecasts by Markets and Markets, the fog computing market, which was valued at $22.3 million in 2017, would increase at an explosive rate to $203.5 million over the following five years. FOG/Cloud computing is the way of the future for businesses and might be the IoT's next big thing.To manage a cloud environment with several cloud architectures, the FOG application can be improved.

CONCLUSION

The IoT's data processing problem is turning out to be amenable to fog computing as a solution. Applications' latency is decreased by relying on network edge devices that are more potent than end devices and situated closer to them than more potent cloud resources.

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