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Fog Computing For IoT

Muskan Bhavsar

Faculty of Computer Science Engineering and Technology
Parul University , *Vadodarai*,India
muskanbhavsar988@gmail.com

Abstract- It's incredible however much data we generate on a daily basis. We anticipate and observe tremendous quantity and varieties of data now that we have a defined management of IOT (things (iot). Fog Computing enables a new generation of software and systems by extending the Cloud Computing concept to the network's edges. [1] We used to look for a solution that could manage and calculate such a large amount of data. Consider how quickly edge devices that are using IoT really have to access data. As a result, the logical location of this data must be nearer to the machine than the cloud. We began to consider fog computing. The goal of fog computing in the Internet of Things is to enhance efficiency, performance, and reduce the number of parameters sent to the cloud data center, analysis, and storage. As a result, instead of sending data to the cloud, data sensing devices will be routed to edge devices for interpretation and temporary storage, lowering internet traffic and latency.

Keywords- Internet-of-Things, Fog computing, application area.

I. INTRODUCTION

A. What is IOT?

A lot of people online of things enjoy listening to music. The Internet of Items (IoT) is a worldwide network of billions of objects or things that access the web and to one another via a wireless network. Wearable technology, high-resolution video streaming, self-driving cars, smart environments, e-health care, and other IoT-centric concepts. [2]

Although the term "internet of things" may be unknown, you may be more familiar with the term "smart homes" or "connected homes," which refers to a connected ecosystem that comprises various IOT gadgets that make your home life easier. However, IoT devices can also be found outside of the home. Any device that can access the internet and contains a sensor that transmits data qualifies as an IOT device.

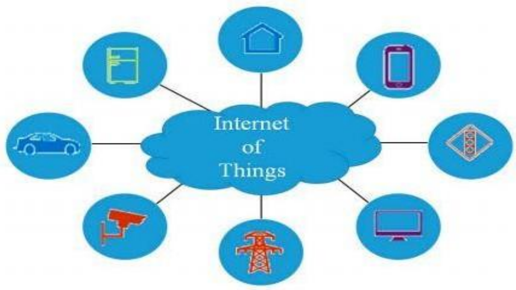

Fig 1: The internet of things

B. How do IOT devices works?

Devices and objects with built-in sensors are converted to digital signals of have around, which collects data from various collect and analyses to share the most important data with apps designed to meet specific requirements.

These strong IOT platforms can pinpoint precisely which information is important and which information may be safely ignored. This data can be used to identify trends, make recommendations, and identify potential issues before they arise.

If you own a car fabrication shop, for example, or you want to discover which extra components are most popular, you can use IOT technology to: - Use a monitor to determine which areas of a showrooms are the busiest and where clients spend the most time. Examine the relevant sales data to see which parts are selling more quickly. So that popular products don't run out of stock, constantly match sales data with supply.

I can make educated decisions over which item to hoard dependent on real-time data thanks to the data generated by connected devices, which helps us save money and time. By offering insight, big data gives you the ability to improve operations. Smart devices and systems can automate some tasks, especially those that are repetitious, time-consuming, or even hazardous. Examples of IOT in the real world include IOT in a home, IOT for transportation, and more.

C. What is fog computing?

Fog computing is a term coined by Cisco and is frequently used interchangeably with edge computing. Fog nodes is an alternative to cloud computing that is also complementary, therefore you might be wondering what the difference is between cloud applications and fog nodes.

Since this storage area is nearer, the distance is shorter, and the data transmission process is done locally, fog computing, unlike cloud computing, does not use the cloud to store data. Instead, its structure is stored at a decentralized place nearer to the gadgets where the data is produced from.

Fog computing is less complex, which enables data transfer faster and easier than cloud computing. Cloud computing may have concerns with internet access, security, bandwidth constraints, and latency, while fog computing avoids these issues.

For instance, the expansion in the number of internets connect items in smart cities such as homes, vehicles, meters, and much more. Fog computing for tens of millions or even billions of gadgets across a linked city allows all of the data to be swiftly processed and analyzed, allowing these systems to run even more efficiently in areas such as road traffic, public safety, waste management, and air quality.

Fog computing is thought to be a good platform for IOT technology use cases including connected cars, smart cities, and wireless sensors, among others. However, SDK is used for backend tasks such as URL wrapper, location tracking, content tagging, and behaviors monitoring.

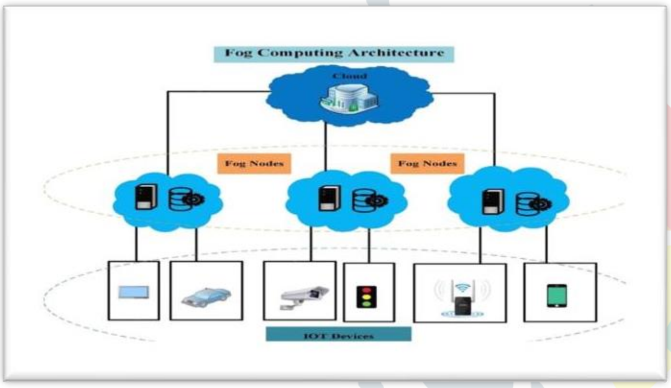

Fig 2:Architecture of fog computing

Fog computing operates by clustering fog nodes across your network. Fog nodes include controllers, switches, routers, and video cameras.

Such nodes can now be placed in specific locations, for as on an apartment floor or inside a car. When Connected devices generate data, it can be evaluated on one of these nodes instead of being transported all the way to the cloud.

Transporting data through fog computing has following steps-

IoT device signals are routed to an automation controller, which runs a control system programmed to automate the devices.

Data is sent from the control system programmed to an OPC servers or protocol gateway.

The information is then transformed into a format that internet-based services can understand. (This is usually a standard like Https or MQTT).

Eventually, the data is transferred to a fog node or an IoT gateway, which stores it for later analysis. This one will filter the information and, in some situations, preserve it for eventual uploading to the cloud.

D. Compare fog computing, cloud computing and edge computing

Fog computing	**Cloud computing**	Edge computing
-In fog computing data is processed within fog node or IOT gateway which is situated within the LAN.	-In cloud computing data is transmitted and store an remote storage system where it is maintained, management, backup and made available to users over a network typically the internet.	-In edge computing the data is processed on the devices or sensor itself without being transferred anywhere.
-Location awareness.	*-No location awareness.*	-Location awareness.
-Less latency.	-High latency.	*-Low latency.*
-Service location at the local network, especially if it has to be processed in real time.	-Service location in cloud is within a network	-In the edge computing service location's edge network.
-Also supported mobility.	-Limited mobility support.	-Also supported mobility.
-Geographical distribution's decentralized and distributed.	-Geographical distribution is centralize.	-Geographical distribution is decentralized and distributed.

E. Application Area of fog computing in IOT

1. Connected cars-

The most recent trend on the road is autonomous vehicles. Software enables the installation of autonomous steering, making it practically "hands-free" for the vehicles to operate. Start by testing with and releasing driverless, self-parking technology. Fog computing will be the best option for internet-connected cars because it enables real-time interactions. A win-win situation will come from the car entry and traffic signal simply being able to communicate with one another. In the future, connected cars will start to save life by lowering traffic accidents.

2. Health care system-

The healthcare system has long been a contentious topic since health datasets contain private and sensitive information. The data produced includes sensitive and private information. Increasing instability and latency in telemedicine and healthcare applications can cause a number of problems. Fog computing may be an adequate paradigm in such cases for healthcare applications. Fog computing plays a vital part in emergency services since it has no latency restrictions associated with implants, ambulance radio, or handheld transmission of patient medical files. The proposed method makes use of cloud computing to identify, anticipate, and stop stroke sufferers from falling. The results of the suggested system were contrasted with those of other techniques. Compared to cloud-based solutions, this one responded faster and used less energy.

3. Smart building control-

Cordless sensors are mounted to measure temperature, humidity, or amounts of different vapors in the building atmosphere as part of decentralized smart building control. As a result, data may be shared among all the floor-mounted sensors, and readings can be merged to create accurate measurements. Having the fog devices respond to data via distributed decision-making. The systems awaken in order to cooperate in bringing in fresh air, reducing temperature, and extracting dampness from the air. When there is movement, sensors react by turning in or out of the light.

II. LITRATURE REVIEW

Obtain information on current works by conducting a survey from a variety of papers. What the Internet of Things is and which types of IOT devices are used are explained in paper [1]. Numerous publications have examined the fog paradigm's current state of development and have covered the exciting IoT applications in a range of fields, including smart cities, industrial automation, smart healthcare, and smart grids. Fog networking, computation offloading, and resource management were some of the potential problems Yi et al. [2] identified in the context of fog computing. They also tried to introduce several reflective application scenarios, such as media distribution and prefetching, real-time video analytics, and mobile big data analytics. They also discussed the meaning of fog computing. According to the paper [5], IOT can be characterized as a global network that connects people and objects from many fields. Wireless sensor networks are used by IOT-based systems to collect and send data to the cloud. There are many different kinds of sensors, including temperature sensors, humidity sensors (which gauge the quantity of water vapor in the air or other gases in the atmosphere), strain gauges, gas sensors, and others. The distinctions between edge computing, cloud services, and fog computing are described in paper [4]. It defines the privacy concerns as well. Networks are used by fog computing to function. It can therefore be said that network privacy has become a very serious issue. It has been noted that the network administrator frequently creates configurations by hand. However, the sensitive information may be harmed by the fog nodes that may be damaged as a result of inadequate protection. Hackers can readily gather the private information is stored on a network for the aim of sabotaging operations. Consequently, it is simple to run into these problems while using an encryption approach. How to encrypt sensor readings between end-user devices and the fog network is discussed in paper [5]. Brief solutions for data security, ethical hacking, regulating asset access policy, user authentication, and encryption are provided in the literature. In study [5], it was shown that fog does have its own storage, processing, and network services and is situated at the channel's edge. When comparing computing to cloud computing, Khan claims that fog systems have limited processor, memory, and storage capabilities. introduced that privacy, security, and application area in paper [6]. IOT has emerged as a noteworthy technology, according to Husamuddin Mohammed, and in Data sets are broadcast from sensors or RFID tags hold critical information that is guarded against unauthorized access.

III. PROPOSED WORK

For IOT, we suggested fog computing. This research paper defines the terms Internet of Things (IoT), how IoT devices operate, and fog computing, as well as its use cases. IOT links countless numbers of devices to the internet and to one another via wireless networks. IOT devices have a sensor and a small computer processor that use machine learning to process the data gathered by the sensor. IOT in your house, on the road, and other real-world applications are examples. Fog computing is a type of computer architecture where a network of nodes continuously collects data from IOT devices. With millisecond response times, these nodes process data in real-time as it comes in. Among IOT devices and nodes, high speed connectivity is necessary. Fog computing can be compared to cloud technology and edge computing. It functions in a variety of application areas, including vehicles, healthcare, and smart building control, among others.

CONCLUSION

Here, the topic of fog computing and its applications has been covered. The flood of data generated by IOT at the network's edge can be managed using fog computing. IOT uses g=fog computing in connected autos, healthcare, smart buildings, and other areas. The future of fog computing is promising because it has the potential to reduce operational expenses. Additionally, fog computing offers a platform for intelligence that combines the dispersed and real-time components of developing IOT infrastructure.

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