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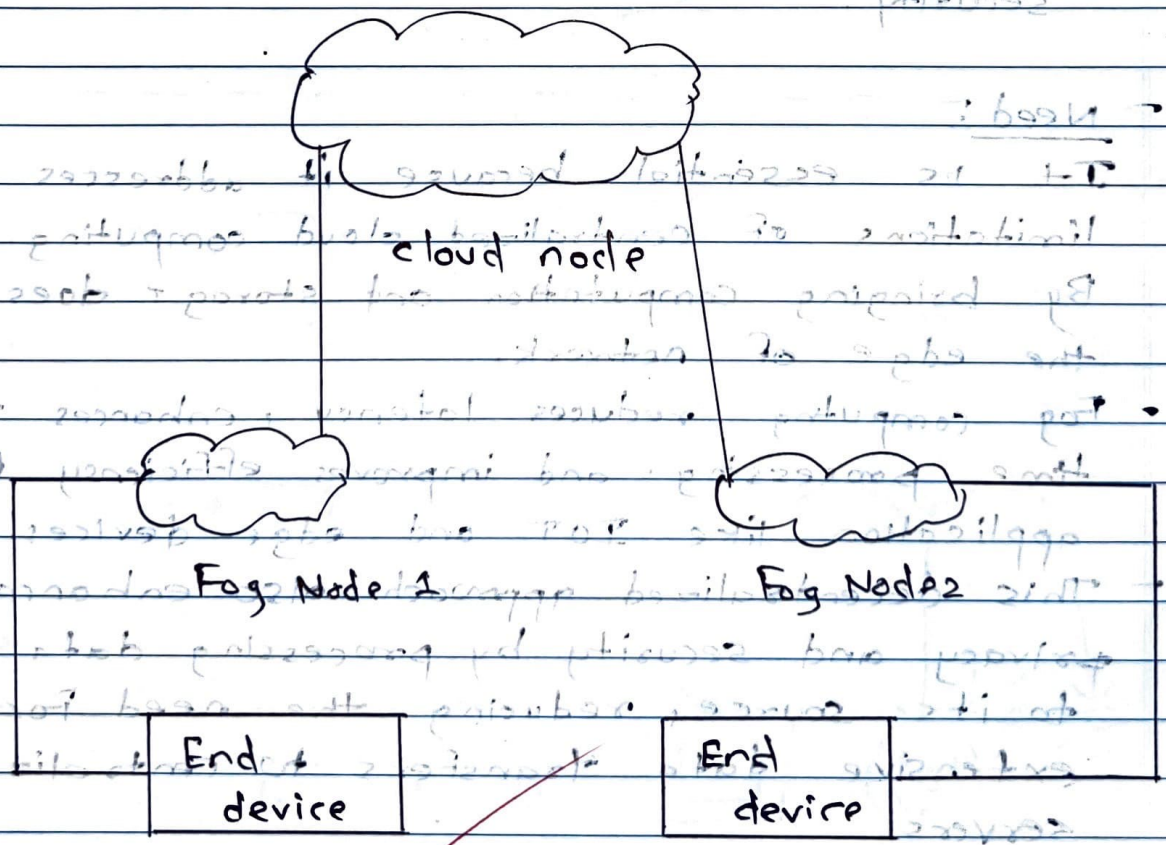
Assignment No : 1

Q.1 What is Fog computing ? and explain the need of fog computing.

⇒ Fog computing is the term coined by Cisco that refers to extending cloud computing to an edge of the enterprise's network.

- Thus, it is also known as Edge computing or Fogging.
- It facilitates the operations of computing, storage, and networking services between end devices and computing data centers.



1) The devices comprising the fog infrastructure are known as fog nodes.
2) In fog computing, all the storage capabilities, computing capabilities, data along with the applications are placed between the cloud and the physical host.
3) All these functionalities are placed more towards the host. This makes processing faster as it is done almost at the place where data is created.
4) It improves the efficiency of the system and is also used to ensure increased security.

- Need:
It is essential because it addresses the limitations of centralized cloud computing. By bringing computation and storage does to the edge of network.
- Fog computing reduces latency, enhances real-time processing and improves efficiency for application like IOT and edge devices.
- This decentralized approach also enhances privacy and security by processing data closes to its source, reducing the need for extensive data transfers to centralized servers

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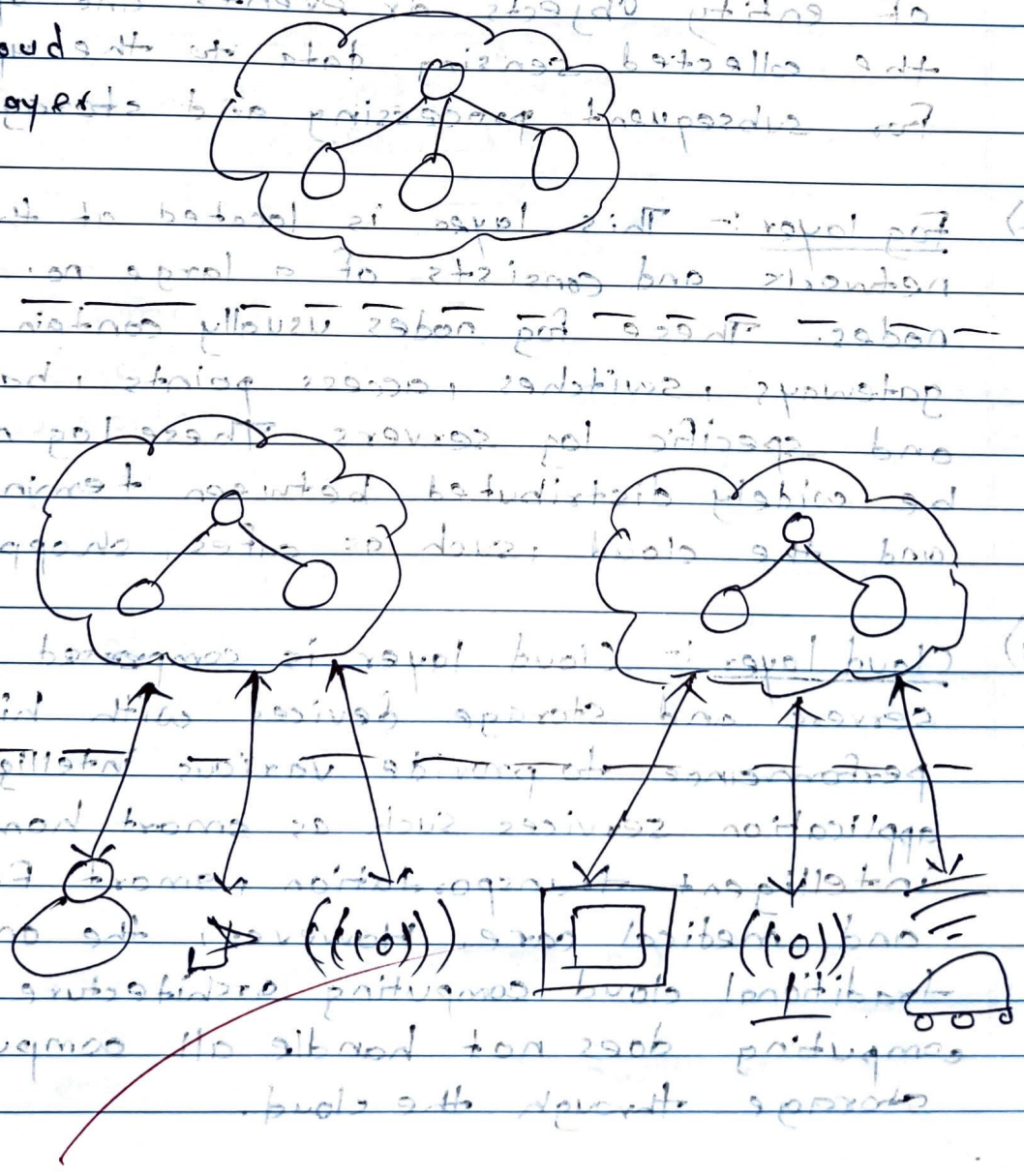
Q.2 Explain the architecture of Fog computing.

⇒ The Fog computing architecture is generally composed of 3 different working layers, namely terminal layer, Fog layer and cloud layer.

The three-layer architecture of Fog computing is as follows:



1) Edge layer :- This layer is closest to end-users and end devices, and consists of various IOT or intelligent devices, such as sensors, mobile phones, intelligent vehicles, smart cards and readers what is special is that although these devices has the capability of computing we usualy only use these devices to carry out intelligent sending of entity objects or events and upload the collected sensing data to the upper layer for subsequent processing and storage.

2) Fog layer :- This layer is located at the edge of network and consists of a large no. of fog nodes. These fog nodes usually contain routers, gateways, switches, access points, base stations and specific log servers. These log nodes can be widely distributed between terminal devices and the cloud, such as cafes, shopping etc.

3) Cloud layer :- Cloud layer, is composed of multiple servers and storage devices with high performance to provide various intelligent application services such as smart home, intelligent transportation, smart Factory and medical care. However, the online traditional cloud computing architecture fog computing does not handle all computing and storage through the cloud.

Q.3 Explain applications of Fog computing.

⇒ Fog finds applications in various domains:-

1) IoT

⇒ Facilitates real-time processing of data from connected devices, reducing latency and enhancing overall efficiency.

2) Smart cities

⇒ Manage and analyzes data from sensors, cameras and other devices to maintain city services, traffic flow, and resource utilization.

3) Healthcare

⇒ Enables real-time monitoring of patient data, supports remote diagnostic and facilitates quicker response time in critical situations

4) Manufacturing

⇒ Enhances operational efficiency by providing real-time analytics for monitoring equipment optimizing production processes and reduce down-time.

5) Retail

⇒ Supports personalized and location-based services, improves inventory management and enhances the overall customer shopping experience.

6) Edge AI
⇒ Facilitates on artificial intelligent processing.

7) Energy Management
⇒ Optimizes energy consumption by analyzing data from smart grids and devices.

Q.4 Compare Fog and Cloud computing.

Fog computing	Cloud Computing
1) Fog computing has a low latency.	1) Cloud computing has high latency compared to cloud.
2) Response time of the system is high.	2) Response time of the system is low.
3) Fog computing has high security.	3) Cloud computing has less security compared to fog computing.
4) Success speed is high even more compared to cloud comput	4) Success speed is high depending on the VM connectivity.
5) Multiple data sources and devices.	5) Multiple data sources can be integrated.
6) Mobility is high.	6) In cloud computing, the mobility is limited.
7) Supported in Fog computing (Location awareness).	7) Partially supported in cloud computing (location awareness).

Q.5 Case study of Fog Computing

⇒

FOG COMPUTING

Introduction:

The IOT connects objects through the Internet without human involvement. IOT include sensors, smartphones, etc.

Cloud computing with its storage and processing power is vital or IOT applications, but it has limitation like centralization. To address this, fog computing bring data and computation closers to users, improving latency and quality of service.

Architecture of Fog Computing

a) Device layer

⇒ Contains different IOT devices and end devices such as mobile phones, smart vehicles cards, etc. These devices are distributed geographically.

b) Fog Layer

⇒ This layer plays an important role in transmission between devices and cloud computing layers.

c) Cloud layer

⇒ It corresponds to cloud intelligence and can store and process massive amounts of data, depending on the capabilities of data center

Characteristics of fog computing

1) Geographical distribution
2) Decentralization
3) Location Awareness
4) Real-time interaction
5) Low latency.

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