Fogging As Middleware of Io T-----Fog Computing-----

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Abstract—In this paper we will discuss about fogging or fog computing a use it acts as crucial decentralized middle layer between IoT device and centralized cloud data centre by enabling local data processing, storage and networking at the edge of the network, it minimizes the latency, reduce band with usage enhance security, and improve the efficiency for time-sensitive IoT application. it extends cloud computing to the edge. Processing information closer to where it is generator, it acts as proxy for the cloud, handling task such as data aggregation, protocol translation ang security enforcement. Fogging bridge, the gap between IoT and end points and the cloud offering more responsive efficient and service infrastructure.

Index Terms—Iot, Wi-Fi, Jdbc, Odbc, Mangoose.

I. INTRODUCTION

The fog computing serves as a critical middleware layer in the internet of things (IoT)acting as a inter mediatory infrastructure between data- generating end devices(sensor/actuator) and centralized cloud computing. This centralized architecture extends cloud capabilities to the edge of the networks, bringing computing, storage. and network resources closer to the data sources, the heterogeneous integrating brides the gap between diverse IoT devices, protocol and networking offering a uniform interface for management. the fog node these are intermediate decentralized device such as router, switches, gate way and edge server the process of data near the edge. it facilitates immediate loT-latency processing and decision –making for time- sensitive IoT application (example automata driving, smart grids) bridging IoT cloud. it acts as a middleware layer that manage data flow allowing only necessary or summarized data to be send to the cloud. thus, optimization network usage .so because fogging as middleware of IoT. in between IoT devices its sitting between edge devices and the cloud to process data locally.

II. MIDDLE WARE MEANS

the middle ware that acts as hidden connective layer,enabling communication data management and interoperability between disparate application, tools and database. often called "software glue'. It bridges gap between different system such as linking old legacy system to new application or connecting frond-end under inter face to the back-end database. Commonly include the database middleware were application server message –oriented middleware (MoM)and API gateway .it manage authentication, transaction processing, data formatting and messaging in web development middle ware runs between receiving and request and sending response handling task like validate logging and parsing. Middleware act as a versatile (multi) bridge in the software development connecting disparate application and enabling seamless communication. it is invisible glue that hold together complex system allowing different software component ti interact and exchange information effortlessly.

III. DATABASE MIDDLEWARE

It is act as a intermediary's layer facility communication, data management and connectivity between application and database system often supporting feature like connection policy and transaction management.
Example

IV. JDBC, ODBC, MANGOOSE

Jdbc: enable java application to interact with database
ODBC: open database connectivity API for accessing data management system
Mangoose: connect mango database with node.js environment, allowing pre/post query hooks.

Cloud Middleware: the cloud middle ware act as essential "GLUE or hidden inter mediatory software layer bridging application data and infra structure in distributed cloud environment. it enables seamless communication data management and interoperability between disparate system key function include the message querying API management application runtime support and authentication.

Interoperability connects the diverse application and system allowing then to exchange the data regardless of under lying OS or Network,

Plumbing Services: act as a connector between application and database enabling feature like API navigator and application run time environment.\

V. WEB MIDDLEWARE

it is software layer called plumbing that is sit between the operating system and application facilitate communication, data management and service integration I t act as intermediately, processing, filtering, and validating request and response (authentication and logging) in web frame work before their reach the final application middleware operation in pipeline when each computing performs a task and passes the request to the next unit making it essential for modern web application,

VI. IoT MIDDLEWARE

It act as a middleware "software glue" between heterogynous hardware device network protocol and application layer facilitating services data exchange device management and interoperability it provide essential services laky security.(authentication) data processing and scalability allowing developer to focus an application logic rather than infrastructure complexity by service using as an abstract layer IoT middleware and protocol allowing developer to create robust inter-operability and scalable Io " between heterogynous hardware device network protocol and applications layer facilitating services data exchange device management and interoperability it provide essential services likely security.(authentication) data processing and scalability allowing developer to focus an application logic rather than infrastructure complexity by service using as an abstract layer IoT middleware and protocol allowing developer to create robust inter-operability and scalable Io T application .
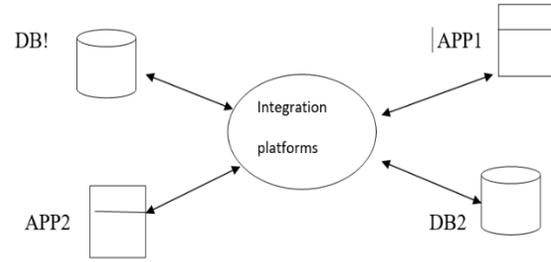
VII. FOG COMPUTING MEANS

It is decentralized infra structure that bring data processing, storage, and application closer to the source (IoT device, sensor) rather than relying solely in centralized cloud data centre by processing data locally at FOG NODES (router, switches) it reduces the latency improve the efficiency and conserve bandwidth. it operates as a layer between edge devices and the cloud fog computing is often used inter changeably with edge computing through the specifically refer to the network of localized node whereas edge computing often referred to processing directly on the device

All the storage capability computational capability data along with the application are placed between the cloud and the physical host all these functionalities are places more towards host. this make processing faster as it is done almost all the places where data created.

VIII. IoT MEANS

Internet of things (IoT)refer to network of physical object "thing" embedded with the sensor, software and technology that enables then to connect, collect, and exchange data with other devices and system over the internet. these often-smart devices authenticated task and enhancing efficiency without direct human-involvement the component of IoT system.

Combine sensor (data collection)

Connecting (Wi-Fi, cellular)

Data processing and user interface the IoT transfer every day –disconnected objects into intelligent data sharing assets.

IX. FOG COMPUTING vs EDGE COMPUTING

Fog and edge computing both process IoT data closer to the source then the cloud reduce latency but they differ in location and scope.

Edge computing directly on device and sensor,which fog act as an intermediate layer (gateway/ node) between the edge and cloud, aggregating data from multiple sources for better analysis.

X. PROCESSING LOCATION

Edge computing process data directly on IoT devices or connected sensor (example smart cameras, PLC0
Fog computing process data at local area network (LAN) level such as router or dedicated gateway often aggregating data from multiple edge devices
Edge is the closes to the data sources (on the device itself).
Fog is slightly further away,sitting between edge devices and cloud
Fog computing often considers an extension of edge computing rather than a direct replacement.
In data scope edge computing is single device but fog computing is the multiple devices edge is use instant real-time action but fog is the data aggregation and analysis.
Uses: edge autonomous vehicle wearable health monitor, smart sensor faster for local task.
Fog smart cities (traffic light co-ordinates, smart grid, industrial IoT (IIoT. Fog is better for managing many devices.
Edge computing (on-device process data at the sources. industrial cameras (IoT devices) detect a defect on production line and stop the machine immediately extent near the device generating data
Fog computing (local network nodes) aggregates the data from multiple devices a local factory gateway (fog Cnodes) collects the data from 100 cameras, analysis overall production efficiently and send only summary data to the cloud it is a "local hub". It aggregated from the multiple devices across LAN.

difference between edge and fog computing
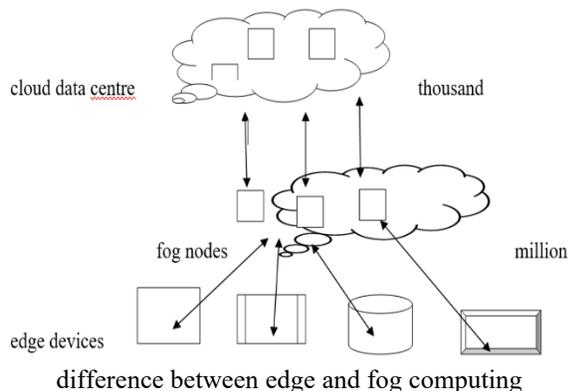
XI. CONCLUSION

This is based on result fogging act as a crucial middleware layer between IoT devices and centralized cloud services functionally as a distributed infrastructure that bring computing, storage and network services to all network edge. fog computing provides near numerous responses solving the high latency problems associated with cloud only architecture which is critical for time-sensitive application like autonomous and smart health care which is used to reduce network traffic and cost. by processing and filtering he local data locally fog nodes only transmitted essential information to the cloud significantly reducing bandwidth usage and data transfer cost. because it is act as a" smart gateway" that handle the heterogeneous of the numerous IOT devices acting as a broker, process and store data, providing more efficiently scalable and manageable architecture for large scale IoT development fogging is middleware is not are placement for cloud computing but rather a complimentary necessary extension that enables the next generation of real time intelligent and secure IoT application.

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