International Journal of Engineering and Technical Research (IJETR)
ISSN: 2321-0869, Volume-3, Issue-2, February 2015

Fog Computing:A Better Solution For IoT

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***Abstract*— Fog computing ,also called fogging is a model that enables wide range of applications and services to the end users by extending cloud computing model towards the edge of network. Fog computing plays a vital role in Internet of Things (IoT). IoT has the strength to transfer data over the network via internet without human-human interactions or human-machine interactions. Several features such as mobility support, wide range of geo-distribution, availability of wireless accesses and large number of nodes make fog computing, a better platform for a particular number of IoT services.**

***IndexTerms*—Connected Vehicles, fogging, IoT, Smart Grids, WSAN.**

I. INTRODUCTION

Cloud computing model is an efficient method for holding and managing private data centers, which will help users facing Web related applications and batch processing. It frees the enterprise and customers from the specification of many details, which may create a problem for lateny sensitive applications that require large number of nodes inorder to meet the delay requirements[8]. The Internet of Thing (IoT), is an evolving wave of internet technology requires mobility support and wide range of geo-distribution in addition to location awareness and low latency features. So we need a new platform, to meet all these requirements .Here we use a platform called fog computing, also known fogging ,which delivers a new set of web applications and services to the end-users, by extending cloud platform. Several features of fogging such as heteroginitic nature, mobility support, very low latency and large number of nodes make edge computing, an ideal platform for IoT[2]. Processing of data will be done at the network edge rather than sending it to the cloud. Ginny Nichols (Cisco) developed the term fog computing.

Why fogging?

Fog model is well positioned for data analytics, distributed data collection points, and provide benefits in entertainment, advertising, computing and other applications[2][4]. End services such as, access points and set-top-boxes can be easily hosted using fogging. Proximity to end users, mobility support and wide range of geo-distribution distinguishes fogging from cloud computing. It also improves QoS and reduces latency. Main task of fogging is to provide information nearer to a user, by positioning it at the network edge.

Internet of Things (IoT)

IoT is a situation in which objects, animals or humans are provided with UID's (unique identifiers) and the strength to transfer information over a network without having human-to-human or human-to-machine interaction. It has evolved as a union of wireless tools, micro-electro mechanical systems (MEMS) and the Internet[8]. Things, in the Internet of Thing, can refer to a wide range of devices, which includes heart monitoring implants, biochip transponders on farm animals, vehicles with in-built sensors. Recent market examples include smart thermost at systems and washer/dryers for remote monitoring, with the help of wireless-fidility (wifi)[5]. IoT is closely related with machine-to-machine communication. The term Internet of Things (IoT) was coined by Kevin Ashton[6].

Fig 1.Internet of Things (IoT)

II. FOGGING V/S CLOUD COMPUTING

CLOUD COMPUTING	FOG COMPUTING
Data and applications are processed in a cloud, which is time consuming task for large data.	Rather than presenting and working from a centralized cloud, fog operates on network edge. So it consumes less time.
Problem of bandwidth, as a result of sending every bit of data over cloud channels.	Less demand for bandwidth, as every bit of data's were aggregated at certain access points instead of sending over cloud channels.
Slow response time and scalability problems as a result of depending servers that are located at remote places.	By setting small servers called edge servers in visibility of users, it is possible for a fog computing platform to avoid response time and scalability issues.

III. FEATURES OF FOG COMPUTNG

Some of the features of fogging are mentioned below:
1.Edge location, location alertness, and small latency.
2. wide range of geographical distribution.
3. very large number of available nodes.

Manuscript received February 24, 2015.
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4. moblity maintenance
5. Real-time communications
6. Majority of wireless access.
7. Heterogenitic nature.

IV. ADVANTAGES &DISADVANTAGES

Advantages includes:

1. Fog aplication decreases the amount of data to be moved, distance that data must move and the network traffic, thus limiting cost of transmission, latency and improving the quality of services (QoS)[5].
2. Eliminates the core computing environment, thereby reducing a major block and a point of failure[5].
3. Improves the security, as datas are encoded as it is moved towards the network edge.
4. Ability to virtualize, thereby extending the scalability.
5. Consumes less amount of band width.

Disadvantages include:

Introduces certain demerits on the selections of technology platforms, web applications or other services.

V. APPLICATIONS OF FOGGING IN IOT

Fog computing plays vital role in Internet of Things (IoT).

Connected Vehicles (CV)

The Connected Vehicle distribution displays a rich setup of connectivity and interactions: cars to cars, cars to access points (Wi-Fi, 3G, smart traffic lights), and access points to access points[8].

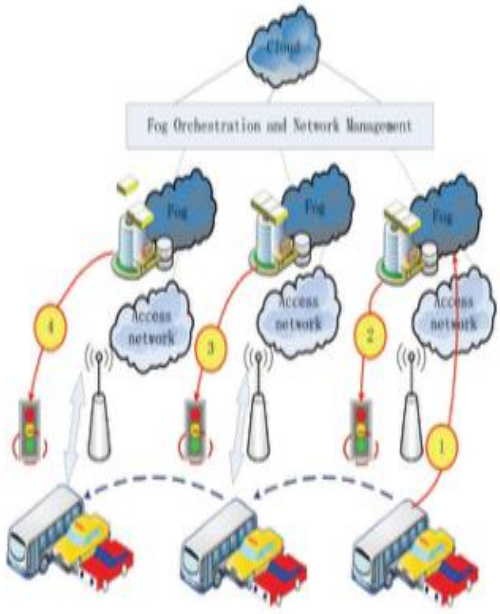

Fig 2.Fog computing in smart traffic lights and connected vehicles.

Smart grids

Smart Grid is another ironic Fog use case. Based on energy demand, obtainability and the low price, these devices repeatedly switch to substitute energies like solar and winds[1].

Fig.3.Fog computing in smart grid.

Wireless Sensor and Actuator Networks (WSAN)

The real Wireless Sensor Nodes (WSNs), were designed to operate at particularly low power inorder to extend battery life or even to make energy reaping achievable. Most of these WSNs involve a large number of less bandwidth, less energy,very low processing power, trivial memory motes, operating as sources of a sink (collector), in a unidirectional fashion[1][8].

Decentralized Smart Building Control

The applications of this development are enabled by wireless sensors positioned to measure temperature, humidity, or various levels of gases in the building atmosphere[4][5]. In this case, information can be exchanged among all sensors in a floor, and their analyses can be combined to form unfailing measurements.

IoT and Cyber-Physical Systems (CPSs)

Fogging based systems are becoming an significant class of IoT and CPSs[8]. IoT is a network that can interrelate ordinary physical objects with identified addresses. CPSs article a constricted combination of the systems computational and physical elements. CPSs also organize the incorporation of computer and data centric physical and engineered systems.

Software Defined Networks(SDN)

SDN concept along with Fogging will determine the main problems in vehicular networks, irregular connectivity, collisions and high packet loss, by supplementing vehicle-to-vehicle with vehicle-to-infrastructure communications and unified control[8].

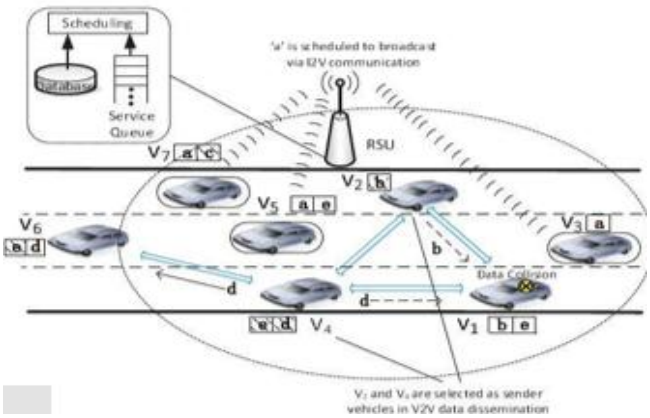

Fig.4.Fog computing in SDN in Vehicular networks

Health Care

The cloud computing market for health care is estimated to reach $5.4 billion by 2017, according to a Markets and Markets report and fog-ging would allow this on a more confined level[6].

VI. FUTURE ENHANCEMENT

Edge computing plays a crucial role in Internet of Things (IoT).Studies related to security, confidentiality and system reliability in the fog computing platform is absolutely a topic for research and has to be discovered. With the of software defined networks and other related technologies, the scope of a software defined edge network is not so far**.**

VII. CONCLUSION

Here the key characteristics of Fog Computing or fogging is outlined and defined. Edge computing can be summarized by defining it as a simple platform for delivering a rich collection of new services and submissions at the network edge. The motivating examples noted throughout the discussion range from theoretical visions to existing point solution examples. Thus Fogging is a unifying platform, ironic enough to deliver new breed of evolving services and enable the development of new applications.

ACKNOWLEDGEMENT

I would like to extend my gratitude to the reference authors, as well as reviewer of my paper**.**

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