A Study Of Role Of FOG Computing In IoTs

Mr. Patki U.S.
Department of Computer Science
Science College
Nanded (MS) India

Dr. Kurhe A.B.
Department of Computer Science
SGBS College
Purna(Jn) Dist Parbhani

Dr. Satonkar S.S.
Department of Computer Science
ACS College
Gangakhed Dist Parbhani

Abstract— IOTs in an emerging branch of Information technology that includes transfer of data over a network through the different objects without requiring human to human or human to computer interaction. It was evolved from the concept of Machine to machine communication which is commonly known as M2M. This M2M communication uses clouds for transferring data. But due to the rapid data transfer in the cloud for IOT devices, the density of cloud will be increased that leads to increase in bandwidth and decrease in the processing speed. This problem was solved by a new concept known as "fog computing" or "fogging". Fog computing acts as a intermediate layer between the cloud and the hardware. This paper studies the role of Fog computing in IOTs.

Keywords— IOTs, M2M, fog computing, cloud, fogging.

I. INTRODUCTION

Internet of Things is a concept based on the capability of various devices connected in the network to sense and collect the data from the surroundings and distribute them across the internet. This data might be further utilized for further purposes as per the user's interest. The basic concept of IoTs is to generate and share the information among machine to machine through

cloud computing without intervention of human beings. [2] The main intention of IoTs was to minimize the human interaction for data collection and data entry. It was achieved by using different types of sensors in the machines that has capability to collect the data from surrounding environment and transmit it over the network. Hence this is also referred as M2M communication. The basic idea of IoT is shown in the figure bellow.

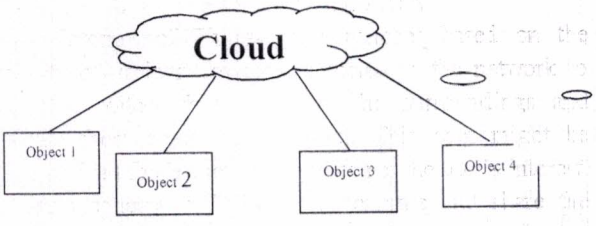

Fig1. Internet of Things(IoTs)

When IoTs and Cloud computing is combined together, it is also known as Cloud of things.

It is very clear that the IoT applications generate massive amounts of data from sensors and other devices. There for to distribution this huge amount of data over a cloud causes many problems such as bandwidth speed of computation etc. Hence there was a need intermediately computations of the data generated by different devices in IoTs, pre-process it and then distribute it over a network. Here comes the role of Fog computing.

Fog computing which is also referred as "fogging", is a distributed infrastructure in which different preprocessing and computation are performed at the edge of the network by smart devices. These devices have capability of data processing, data analysis, data storage capability before distributing the data over a cloud. Thus the purpose of fog computing in the IoT is to improve efficiency, performance and decrease the amount of data transferred to the cloud for processing, analysis and storage. The fig bellow shows an idea of fog computing.

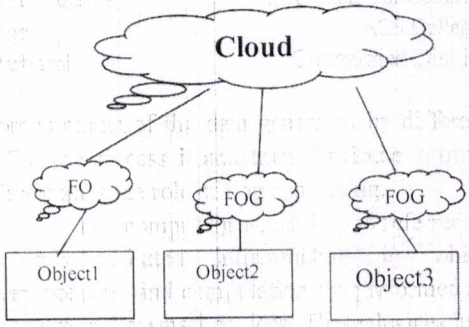

Fig.2 Fog Computing

II. IoTS AND FOG COMPUTING

[3] The general architecture of IoT system consists of five different layers. These layers are

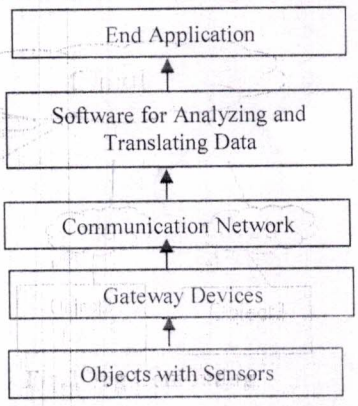

Fig3. Layered Architecture of IoT

i) **Sensors or controllers:** Sensors or controllers are the intelligent devices that are built-in the different objects that are connected to IoTs. These objects are termed as "Things". Sensors are the devices that

capture the data from the objects. The captured information is given to the upper layer called Gatway Devices.

ii) **Gateway devices:** An IoT device passes the data generated by sensors to an IoT gateway or other edge device where data is either sent to the cloud for analysis.

iii) **Communication Network:** It consists of Communication channel used for data transmission.

iv) **Data analyzing and translation software:** This is cloud computing layer where different computations on data are performed. It includes data analysis, data abstraction etc. Many times this is also termed as "Edge Computing".

v) **End application service:** Finally this analyzed data is handover to the end application for further usage.

In the era of Information technology, millions of devices are becoming intelligent and have capability of transmitting information over a network. Thus in IoTs millions of Objects are connected over a network and transmitting information. This leads to information Flooding.

It will cause number of problems such as bandwidth, speed of transmission, data computations etc. Hence the data should be analyzed and summarized before it is transmitted over a network. It leads to perform computations at the edge of a network. This concept is referred as Fog Computing or fogging. Fog computing increase the flow of the data and processing speed. It also results into low-cost installation and integration for complex data processing and deployment.

The fig bellow elaborates the position of Fog in IoTs architecture.

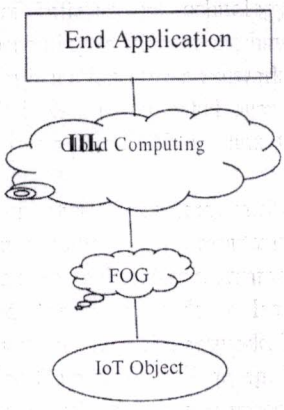

Fig. 4 Position of Fog in IoT

[4] The concept of fog computing is to bring networking resources near the objects that are generating the data. Fog computing term is many times used for an alternative to cloud computing that puts some kinds of transactions and resources at the edge of a network, instead of establishing channels for cloud storage and utilization. In fog computing data is stored temporary basic for intermediate computations. It is permanently stored in cloud storage. Hence once the data is transmitted to cloud storage it is removed from fog storage. As shown in the fig above Fog resources are placed between the information generating objects and the cloud layer. Fog computing can be implemented in three different steps. First by adding process and memory resources to Edge devices. Then Pre-processing collected data at the Edge and finally sending aggregated results to the cloud.

III Role of Fog Computing in IoTs

Fog computing provides an efficient way to overcome shortcomings found in cloud computing and IoTs. Fog computing acts as a middle layer between "Things" and "cloud".

Fog computing filters the data by prior computations before it is send to the cloud. Hence it will improve the performance of IoTs. Fog computing uses much less bandwidth as less that transmission is carried out. It implements real time computations as the data analysis is performed as soon as it is generated by IoTs. As Fog computing sends only summary data to the cloud, data becomes more secure. Fog computing helps create low-latency network connections between devices and their analytics endpoints.

The different examples of fog computing is healthcare systems, vehicle automation, smart cities services such as public safety, sanitation, traffic congestion, high-energy utilization and municipal services.

In smart home there are different devices that use IoTs and sensors. These devices work on different platforms and hence produce heterogeneous data. It is very difficult to integrate this data together for processing. Fog computing efficiently resolves this issue. Fog computing provides a combined interface to integrate all different independent devices that improves the performance of the IoT system.

IV Conclusion

An integration of Fog computing with cloud computing and IoTs make a revolution in human life. The goal of fog computing is to improve efficiency and reduce the amount of data transported to the cloud for processing, analysis and storage. It acts as a middle layer between IoT devices and cloud computing environment. It has capability of computing heterogeneous data analyze it and send it to cloud network.

V References

[1] Ravi Tiwari Vandana Sharmal, "A review paper on "IoT" & Its Smart Applications," *International Journal of Science, Engineering and Technology Research (IJSETR)*, vol. V, no. 2, pp. 472-476, February 2016.

[2] Robert J.Walters Hany F. Atlam and Gary B. Wills, "Fog Computing and the Internet of Things: A Review," *Big Data Cogn. Computing*, pp. 1-18, April 2018.

[3] Ahmed El Hakim, "Internet of Things (IoT) System Architecture and Technologies," *ResearchGate*, March 2018.

[4] Sherali Zeadally Mohammad Aazam and Khaled A. Harras, "Fog Computing Architecture, Evaluation, and future research directions," *IEEE Communications Magazine*, pp. 46-52, May 2018.

[5] R. Ramaswamy Somayya Madakam and Siddharth Tripathi, "Internet of Things (IoT): A Literature Review," *Journal of Computer and Communications*, vol. 3, pp. 164-173, May 2015.

[6] Mung Chiang and Tao Zhang, "Fog and IoT: An Overview of Research Opportunities," *IEEE Internet of Things Journal*, pp. 1-12, April 2016.

[7] "Internet of Things: Architecture and Research Challenges," *CSI Communications*, pp. 21-25, June 2016.