

# FOG COMPUTING: INTRODUCTION

Rubi<sup>1</sup>, Sunita Rani<sup>2</sup>,

<sup>1</sup> Student, M.Tech (CSE), B.P.S.M.V., Khanpur Kalan, Sonipat (131305), Haryana, India

<sup>2</sup> Assistant Professor, Department of CSE & IT, B.P.S.M.V., Khanpur Kalan, Sonipat (131305), Haryana, India

**Abstract:** In present scenario discussion has been made regarding scope of fog computing. There have been several organisations that are using cloud computing. In last few years the fog computing has gained a huge popularity. Fog computing is edge computing. Here focuses on the need and scope of such infrastructure in cloud computing. It is known that Fog computing is inheriting capabilities of cloud. This research reviews the fog computing along with its characteristics, benefits and disadvantages. The challenges related to security and implementation in case of fog computing has been also discussed here. Scheduling algorithm is also discussed here. The main motive of scheduling is to optimize utility of resources. Another objective is to increase throughput and reduce response time. Its also improve the quality of service.

**Keywords:** Fog computing, Internet of Things, EDGE, Network, Security.

## 1. INTRODUCTION

Fog computing has been considered as a platform which is extending services of cloud computing. These services are extended at the network edge. Fog computing is also doing its working at edge of network. In this way it has improved the quality of service. Fog computing is consisting several characteristics. These characteristics are minimum response time and awareness to location. Other features of fog computing are wide spread distribution geographical level. It is mobile and consists of huge number of nodes. It is playing significant role in case of wireless transmission [1]. Fog computing is having strong presence of streaming. It supports real time applications that are heterogeneous in nature. It is providing small latency and increases the service quality. Fog computing is providing better end user experience. Fog computing is also providing operation among end user as well as edge of the network. These operations consist of computation, storage, and network based services [2]. Scheduling means the arrangement of those processes which will help in the procedure of post execution. The aim of scheduling is to maximizing the output by CPU. Hence by this process CPU remains busy. Available resources can be used efficiently by Scheduling [3]. Gang scheduling may be termed as estimating multi programming. Its main drawback comes into light in the case of a system's power breakdown. In this case it is useless up to the time it is prepared again to perform. Various types of parameters are to perform in Scheduling. By this overall performance of the cloud is increased. Resource utilization maximization is the major objective of scheduling. It also aims at minimizing the waiting time. The working of Scheduling may be at task level or resource level or at the level of workflow. The gang scheduling algorithm is explained here [4]. By using a good scheduling algorithm utilization of CPU can be improved. The turnaround time and cumulative throughput also can be made efficient. They may be statically distributed to many resources at compile time. It also may be allocated at runtime dynamically.

## 2. Fog computing

Fog computing is needed to increase cloud computing to edge of the business network. Such type of computing is getting characteristics of cloud computing. These types of services are bringing benefits to edge of network. It is also bringing power of cloud. It is to redirect where information has been generated and acted upon. The main features of fog computing is to enhance efficiency. It also focuses on the decrease of data capacity Information is sent to cloud for processing, analysing and storage. All these have been performed to develop efficiency [5]. This could be used for security and agreement reasons. Mostly processing occurs in information hub under Fog computing. The processing is made on a smart mobile device. It is also working on edge of the network in gateway device. Such methods are beneficial in case of Internet of Things. This is because amount of data raised by sensors is immense. Latency issue could be annoying. It is annoying in several cases. These cases are gaming. Huge distributed control system in case of rail travel is possible. Fog computing may be differentiated from cloud by it's +proximity for end users. The decentralised computing means strong geographical distribution. It is superior support. Low latency is provided by fog computing. It increases quality of services. It also improves real time application [6].

## 2.1. FOG COMPUTING ADVANTAGES

Fog computing considers the enhancement of efficiency. Its objective is to decrease amount of information that desires to be transferred over cloud. It is transferred for processing as well as analysis and storage [7, 8].

There are lot of benefits of fog computing. There are discussed below:

1. Minimizes amount of information transferred. It supports cloud to tackle issues related to network bandwidth.
2. Fog computing helps in improving system response time.
3. Fog computing plays important role in supporting mobility
4. It minimizes network and internet latency.
5. Fog computing also provides better quality of service (QOS).
6. Fog computing provides the better system performance and also provide high efficiency.

## 2.2. LIMITATIONS OF FOG COMPUTING

Along with benefits there is several limitation of fog computing too. The major issues related to fog computing is its security [9].

1. Attacks using man in middle concept
2. Spoofing IP address
3. Privacy issues
4. Trust and authorization issues at various stage of gateway in fog.
5. Security issues related to Wireless network.
6. Physical location takes away from anytime, anywhere, any information benefit of cloud

Another limitation of fog computing is that it requires lot of technical skill for implementation.

## 2.3. CHARACTERISTICS OF FOG COMPUTING

The characteristics of fog based cloud computing is proximity to end users. Fog Computing is providing better support for developing applications. It requires real-time/predictable latency. Fog computing has many characteristics; some of characteristics are discussed below [10, 11]:

1. Fog computing is used for computation as well as storage. It is also used in networking services among end devices. It plays significant role in traditional cloud computing data centers. Heterogeneity in fog computing has been considered virtualized platform at high level.
2. Application and service objective of the fog has been scattered widely.
3. Huge -scale sensor networks to view and control such environment there is require of distributed computing and storage resources.
4. Fog devices give mobility method. The examples are decoupling host identity to location and identity using protocol.
5. Calculation, storage location, and networking resources. These are known as building elements of both Cloud and Fog. It consist lot of nodes as there is huge wide geo-distribution.
6. Fog computing supports end points. It takes them with support of finest services also at edge of network.
7. Fog computing reduces the burden of the centralized processing.
8. Fog computing helps in addressing the scalability challenges.
9. It requires real time interaction in case of speedy services.

## 2.4. CHALLENGES TO FOG BASED CLOUD COMPUTING

However the implementation of fog based system is itself a big challenge. But In this paper the major focus is on the security threats to fog based cloud from intruders and hackers. Information is kept secure in case of fog based cloud computing but there

are could be denial of service threats to fog based cloud computing. Such threats are from hackers as well as Account and service hijackers. Some of those threats have been discussed below [12]:

### 1. Service traffic hijacking

If login credentials are theft Account could be hacked.

### 2. Lack of security Application Programming Interface

Application Programming Interface is going to control third party. The user is also verified by it.

### 3. Ping of death or Denial of service

In this type of attack the hacker prevents others to access the services.

### 4. Malicious insiders

Person one knows secret login credentials, performs this type of attacks.

### 5. Misuse of cloud services

Misuse of clouds server could lead to violation of security in less time.

## 2.5. COMPARISON BETWEEN CLOUD AND FOG COMPUTING

The following chart represents the difference between cloud computing and fog computing.

CLOUD COMPUTING	FOG COMPUTING
In cloud computing everything is operates on a centralized cloud. That's why it takes maximum time for large data.	In Fog computing everything operates on network edge instead of displaying & working from a centralized cloud. Thus it requires minimum duration.
In case of cloud computing no need to create the wireless access of bandwidth to transmit the data over cloud.	In case of minimum sending distance in fog computing, bandwidth wireless access is created on transmit the data on the network edge.
Issues related to minimum lead time and scalability because servers have been situated at remote location.	It has been feasible in case of fog computing platform to avoid lead time and scalability problems. It is done by setting mini servers known as edge servers are shown to users.

**Table 1:** Difference between Cloud computing and Fog computing [13, 14]

## 3. Gang scheduling

The scheduling algorithm which is used for parallel systems is known as Gang scheduling. Its schedules are associated with those threads or processes which are used to execute at the same time on many processors. Many threads or processes are used to communicate with each other in Gang scheduling. It provides ability to communicate at the same time. In case of not using the gang scheduling, then one thread will wait for sending or receiving the message to another thread. It may be that another thread is sleeping and vice versa [15]. Gang scheduling means to estimate multi programming. Its most disadvantages are that if there is a power breakdown in the system then it will be waste unless it is again prepared to complete the process. Time-sharing is combined with space-sharing by Gang scheduling. It is performed to make sure a very short response time for interactive tasks. This is also performed for high overall system throughput [16]. Gang scheduling is the process for executing the same work at the same time. The performance of compute-bound processes of communication gets increased. Therefore I/O-bound processes become the reason for freedom of the CPUs for a long time period. There are many other processes or threads which are ready to run. Due to the I/O-bound processes the CPU gets busy. On the other hand compute-bound processes finish the task [17].

## 4. Scope of Research

In this research the scope of Fog computing has been discussed. Fog computing is going to provide fine quality of service. It is in form of delay, usage of power, and minimized traffic of information over internet. However there are some limitation and

challenges in implementation of FOG BASED CLOUD COMPUTING. Mainly security issues restrict users to make use of fog computing frequently. But in future these problems would be resolved as the technology is getting advanced day by day. And the scheduling algorithms are discuss for improve the CPU performance. Gang scheduling algorithm leads to better performance of CPU.

## REFERENCES

- [1].A.L.R, S.C.Thomas, "Fog Computing Applications in Cloud", IJSTE - International Journal of Science Technology & Engineering | Volume 2 | Issue 05 |, pp.97-99, Nov. 2015.
- [2].M. Verma, N. Bhardawaj, A. K. Yadav, "An architecture for Load Balancing Techniques for Fog Computing Environment", IJCSC | Volume 6 | Number 2 |, pp. 269-274, April - Sep 2015, DOI: 10.090592/IJCSC.2015.627.
- [3].T. Mathew, K.C. Sekran, J. Jose, "Study & Analysis of Various Task Scheduling Algorithms in the Cloud Computing Environment", International Conference on Advances in Computing, Communications and Informatics (ICACCI), pp.658-664, 2014.
- [4]. K.Bala, S.Vashist, "A Comparative study of Resource Scheduling in Cloud Computing", International Journal of Advanced Research in Computer Science & Software Engineering [Volume 4| Issue 7|,pp.227-231, July 2014.
- [5].T. B. Dhore, S. S. Chandankhede, A. Todsam, "FOG Computing", International Journal of Research in Science & Engineering, ISSN: 2394-8299, pp.65-68, 2016.
- [6].S.Agarwal, S.Yadav, A.K.Yadav, "An architecture for elastic resource allocation in Fog Computing", IJCSC, pp.201-207, Sep. 2015, DOI: 10.090592/IJCSC.2015.615.
- [7].M. N. murthy , P.B. Kavitha , P. Kasana , S.N. Vishnu, "Research Study on Fog Computing for Secure Data Security", International Journal of Science Technology and Management, [Volume 5| Issue 01|, pp.221-228, Feb 2016.
- [8].M. Chiang, T. Zhang, "Fog & IoT: An Overview of Research Opportunities", IEEE, pp.1-12, April 2016, DOI: 10.1109/JIOT.2016.2584538.
- [9]. I.Stojmenovic, S.Wen, "The Fog Computing Paradigm: Scenarios and Security Issues", Proceedings of the 2014 Federated Conference on Computer Science and Information Systems, IEEE, ACSIS,| Volume 2|, pp.1-8, 2014, DOI: 10.15439/2014F503.
- [10].S.Kumari, S.Singh and Radha, "Fog Computing: Characteristics and Challenges", International Journal of Emerging Trends and Technology in Computer Science (IJETTCS), [Volume 6| Issue 2|, pp.113-117, April 2017.
- [11].P.Dhiman, "Fog Computing Shifting from Cloud to Fog", International Journal of Engineering Science & Computing,| Volume 7| Issue 3|, pp.4993-4995, March 2017.
- [12].J.Khandagale, D.Fodse, P.Sul, P.Patil, "Fog Computing", International Journal of Engineering Science & Computing,| Volume 6| Issue 3|, pp.2705-2709, March 2016, DOI:10.4010/2016.634.
- [13].P.V.Patil, "Fog Computing", International Journal of Computer Applications (0975 – 8887), pp.1-6, 2015.
- [14] W.Shi, J.Cao, Q.Zhang, Y.Li and L.Xu, "Edge Computing: Vision and Challenges", IEEE Internet of Things Journal, pp1-10, 2016, DOI 10.1109/JIOT.2016.2579198.
- [15]. Sawati, Nikita, "Enhancing Capability of Gang Scheduling by Integration of Multi Core Processors & Cache", IJSRE, pp.5631-5633, Aug. 2016, DOI: <http://dx.doi.org/10.18535/ijrsre/v4i08.06>.
- [16]. A. Seth, V. Singh, "Types of Scheduling Algorithms in Parallel Computing", International Research Journal of Engineering and Technology (IRJET) , [Volume 03| Issue 05|,pp.521-526, May-2016.
- [17].Sridhar, P. Sharon, "Comparative Study of Ant Colony Optimization and Gang Scheduling", International Journal for Trends in Engineering & Technology, [Volume 3| Issue 2|, pp.1-6, Feb. 2015.