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# Advanced Approach for Secure Data Sharing in Fog Computing

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**ABSTRACT:** The fog computing or networking is an architecture that uses edge devices to connect and carry out a substantial computation, storage and communication locally and routed over the internet backbone. Defines a medium-sized computer structure between clouds and data-generating devices. This flexible structure enables users to place resources; including applications and the data they produce, in logical areas to improve performance.. But currently lot of challenges are being located regarding the security and privacy of the data users. So in this paper we review the schemes and design a new scheme for the efficient sharing and control of data. In this paper, we have discussed FC-MCPS(fog computing supported MCPS), F-RANS(Fog computing based Radio Access Networks), Foggy Clouds and Cloudy Fogs architecture, Securing fog computing for IOT applications, Fog computing dynamic load balancing mechanism. We have studied different schemes and reviewed their limitations and designed a new scheme.

**KEYWORDS**: Cloud computing, cloud storage, fog computing, Internet of Things, security, privacy.

## I. INTRODUCTION

Day by day the use of technology has been increasing worldwide. Various remote and edge devices are being connected with each other for the secure sharing of data. With this comes many challenges and limitations regarding the security and privacy concerns. This needs to be overcome so that a new scheme can be implemented in future.

There are five different schemes discussed in this paper which are : FC-MCPS(fog computing supported MCPS), F-RANS(Fog computing based Radio Access Networks), Foggy Clouds and Cloudy Fogs architecture, Securing fog computing for IoT applications, Fog computing dynamic load balancing mechanism.

These several schemes are being used to provide the required Security and data sharing using fog computing to the users.

But these schemes have some drawbacks in them, so to overcome the limitations a new improved method, “Advanced Approach for secure data sharing in Fog computing. This schemes helps to achieve all the limitations of the previous schemes and provides increased security for the confidential data sharing in cloud.

## II. BACKGROUND

Many studies have been done on the schemes available and their results have been analysed. These schemes are given by different authors. The various schemes discussed over here are : The FC-MCPS scheme is the integration of the fog computing with the Medical Cyber Physical Systems. It provides a seamless and intelligent interaction between the computational elements and medical devices. [1]. F-RANS(Fog computing based Radio Access Networks is a promising scheme for the fifth generation wireless communication system to provide high and energy efficient system. It takes full advantage of the local radio signal processing which decreases the total burden on the large scale radio signal processing [2]. Foggy Clouds and Cloudy Fogs architecture embeds the technology from both the fog and cloud computing. Thus embedding the capacities such as storage or processing etc. for the coordinated management of Fog-to-Cloud(F2C) computing systems [3]. Securing fog computing for IoT applications reviews the fog assisted IoT applications based on different fog nodes Thus the security and privacy threats to IoT applications are discussed [4]. Fog computing dynamic load mechanism researches on the framework of fog computing and adopts the Cloud Atomization Technology to turn physical nodes into virtual machine nodes. This scheme uses the graph partitioning theory for the load balancing mechanism [5].

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This paper introduces five different methods for the secure sharing of data in fog and cloud computing. These are : FC-MCPS(fog computing supported MCPS), F-RANS(Fog computing based Radio Access Networks), Foggy Clouds and Cloudy Fogs architecture, Securing fog computing for IoT applications, Fog computing dynamic load balancing mechanism.

These are organized as follows.
**Section I** Introduction. **Section II** discusses Background. **Section III** discusses previous work. **Section IV** discusses existing methodologies. **Section V** discusses attributes and parameters and how these are affected on mobility models. **Section VI** proposed method and **VII** outcome result possible. Finally **section VIII** Conclude this review paper

## III. PREVIOUS WORK DONE

In the previous research papers discussed here, various schemes have been discussed for the efficient sharing and access of data in fog computing. This enables to share and access data in various different applications.

Lin Gu et al. [1] proposed the FC-MCPS(fog computing supported MCPS). It is implemented in the Medical Cyber Physical Systems in which the cloud resources are usually explored to process the sensing data from the medical devices. This helps more and more smart devices penetrate into peoples's life to promote the life quality. Mugen Peng et al. [2] presented the F-RANS(Fog computing based Radio Access Networks) scheme gives a promising technology for the fifth generation wireless communication system. It takes full advantage of the local radio signal processing, radio resource management and distributed storing capabilities in edge devices which can decrease heavy burden on the radio signal capacity. Xavi Masip-Bruin et al. (2016) [3] proposed the Foggy Clouds and Cloudy Fogs architecture for the coordinated management of Fog-to-Cloud computing systems. In this for the edge devices ,embedding storage and processing capabilities including data collection are used in the fog to cloud computing systems. This includes a layered F2C architecture with all its benefits and strengths. Jianbing Ni et al. (2017) [4] has given the Securing Fog computing for IoT application. To provide the required features, the fog computing is integrated into IoT to extend computing, storage and network resources to the network edge. Various security and privacy threats have been discussed in this method. Song Ningning et al. (2016) [5] proposed the Fog computing dynamic load mechanism that adopts the Cloud Atomization Technology to turn the physical nodes into virtual machine nodes. It uses the graph partitioning theory to build the load balancing algorithm based on dynamic graph partitioning.

## IV. EXISTING METHODOLOGIES

There are various schemes available which are being used for providing while sharing confidential and time-sensitive data on the cloud. Also these methods are being used for providing security and enabling sharing of data securely in the cloud. These methods discussed over here are :
FC-MCPS(fog computing supported MCPS), F-RANS(Fog computing based Radio Access Networks), Foggy Clouds and Cloudy Fogs architecture, Securing fog computing for IoT applications, Fog computing dynamic load balancing mechanism.

### 4.1 FC-MCPS(fog computing supported MCPS) :

Nowadays with the recent development in the Information and Communication technology(ICT), more and more smart devices penetrate into daily life of people to improve the quality of life. In the growing healthcare trend, the , Medical Cyber Physical Systems(MCPS) gives the seamless integration between computational elements and medical devices. To overcome the unstable long delay links between cloud data center and medical devices. We thus integrate the fog computing into MCPS to build fog computing supported MCPS. In this a linear programming based two phase heuristic algorithm. Thus it gives a high cost efficiency of our algorithm and it provides a nearly optimal solution .[1].

### 4.2 F-RAN (Fog computing based Radio Access Networks), :

The F-RAN (Fog based Radio Access Networks) provides a promising paradigm for the fifth generation wireless communication to provide high spectral and energy efficiency. The main idea in this program is to make full use of local radio signal processing, radio resource management and stored distribution capabilities. To achieve these goals, a cloud radio access network (C-RAN) has been proposed as a combination of emerging technologies from both wireless and cloud-based information technology industries incorporating cloud computing into radio access networks (RANs). This can automatically decrease the heavy burden on the unit pool. This implementing system model is designed to implement four kinds of cloud.[2].

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**4.3 Foggy Clouds and Cloudy Fogs architecture :**

This architecture is implemented as a real need for coordinated management of fog to cloud computing systems. Nowadays, the edge devices are becoming richer in functionality and smarter, embedding capacities such as storage or processing, as well as new functionalities, such as decision making, data collection, transfers, and sharing, are a real need for systematic control of computer systems for fog-to-cloud (F2C). This now introduces a layered F2C architecture, its benefits and strengths, as well as the arising open and research challenges, making the case for the real need for their coordinated management [3].

**4.4 Securing Fog computing for IoT applications :**

Internet of Things(IoT) allows billions of physical objects to connect with each other and exchange data for various applications in day to day life.There are various IoT applications like home traffic lights, home automation, etc. To support these features, the fog computing is now integrated into IoT to extend computational capabilities and storage and network resources. From this it confronts security and privacy risks, to handle a new framework is designed which combines both the features from fog computing into the IoT applications [4].

**4.5 Fog computing Dynamic Load Balancing Mechanism :**

In this method, a main research is made on the framework of fog computing system and adopts the Cloud Atomization Technology that turns physical nodes in different levels into virtual machine nodes. This further uses the graph partitioning theory to build the fog computing load balancing algorithm. This algorithm is based on dynamic graph partitioning. The results of simulation shows that framework of fog computing after the Cloud Atomization can make the system network flexible and dynamic load balancing mechanism can configure the system resources along with reducing the consumption of node migration brought by system changes. [5].

## V. ANALYSIS AND DISCUSSION

The FC-MCPS(Fog computing supported MCPS) is being implemented in the Medical Cyber Physical Systems. It allows the intelligent and seamless integration of the computational elements and medical devices. Thus the fog computing combined with MCPS provides a high cost efficiency solution for the medical systems [1]. The F-RAN(Fog computing based radio access networks) is provided as a promising technique for the fifth generation wireless communication system to give high spectral and energy efficiency services. It takes full advantage of the local radio signal processing, radio resource management and distributed storing capabilities which can decrease the heavy burden on the radio signal processing. [2]. The Foggy Clouds and Cloudy Fogs architecture is given nowadays, as edge devices become richer in functionality and smarter, embedding capacities such as storage or processing, as well as new functionalities, such as decision making, data collection, forwarding, and sharing, a real need is emerging for coordinated management of fog-to-cloud (F2C) computing systems. This article introduces a layered F2C architecture, its benefits and strengths, as well as the arising open and research challenges, making the case for the real need for their coordinated management. [3]. Securing Fog computing for IoT applications is provided to combine the fog computing and the IoT devices. To support these features, fog computing is integrated into IoT to extend computing, storage and networking resources to the network edge [4]. The fog computing dynamic load balancing mechanism improves the resource utilization efficiency of the edge devices and also solves the problem of service computing. This adopts the Cloud Atomization Technology to turn physical nodes into virtual machine nodes [5].

**TABLE 1: Comparisons between different security schemes**

| Mobility scheme | Advantages | Disadvantages |
|---|---|---|
| FC-MCPS (Fog computing supported MCPS) | This scheme supports both the fog computing and medical devices. | .The implementation is a bit complicated. |
| F-RAN(Fog computing based Radio Access Networks) | This scheme is efficient in the wireless communication network. | There are computations included which can take a bit longer. |

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|---|---|---|
| Foggy clouds and Cloudy Fogs | This scheme is embedded with capacities of both fog and cloud. | The scheme is time consuming for large operations. |
| Securing fog computing for IoT applications | This method supports large scale IoT applications to extend networking resources. | The complexity increases with the amount of data. |
| Fog computing dynamic load balancing mechanism | This method improves the resource utilization efficiency of the edge devices. | The implementation is complicated. |

## VI. PROPOSED METHODOLOGY

Several different schemes are available for data sharing in the cloud environment. The fog computing is used to integrate in the cloud computing. But nowadays with the increased use of technology, comes a lot of challenges like security and privacy threats. To handle this, we have reviewed schemes which are used in fog computing for sharing of data. But there are certain limitations in these methods. To overcome these drawbacks, we have designed a new method which is "Advanced Approach for secure data sharing in Fog computing". This scheme manages to overcome the drawbacks in the previous schemes and provide new advantages. In this scheme the data is collected and shared on the fog network. Then the F-RAN(Fog computing based Radio Access Network) scheme is implemented in the network. It takes advantage of the local radio signal processing and it provides high storing capabilities. Thus it can decrease the heavy burden on the centralized baseband pool. Then the securing fog computing for the IoT applications is used. Hence the fog computing is integrated into IoT to extend the support. The fog computing dynamic load balancing mechanism that uses the graph partitioning theory is implemented. It reduces the load on the network thus reducing the network traffic. Hence the data can be securely shared in the fog computing network balancing the traffic. This also addresses the security and privacy issue faced.
The algorithm given below defines the flow of the proposed scheme :

Basic steps of algorithm:
Step 1: The user shares the confidential data in the fog computing environment among the users worldwide.
Step 2: Then the F-RAN technology is applied to it .
Step 3: Then the secured data is considered using the securing fog computing for the IoT applications is used.
Step 4: Finally the dynamic load balancing mechanism is implemented to balance the load in the network.
Step 5 : The other users in the cloud and fog computing can securely access the data in the network.
Diagrammatic representation of proposed method is shown as follows:

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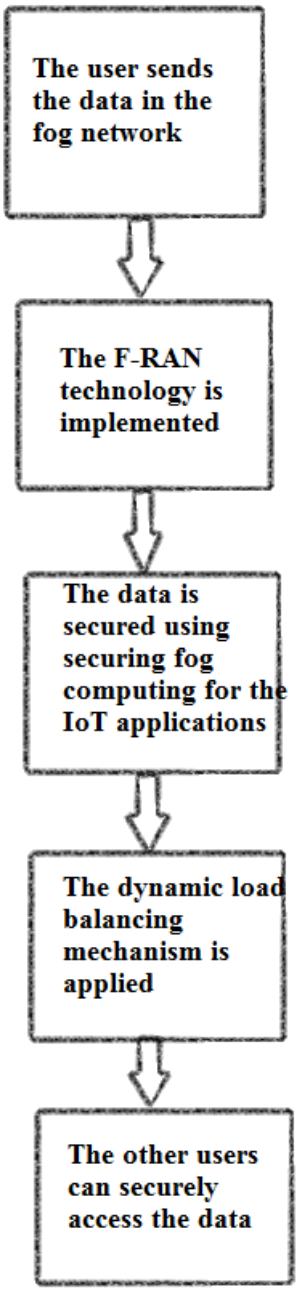


**Fig 1: Flow of the Algorithm showing the proposed scheme**

## VII. OUTCOME AND POSSIBLE RESULTS

In this way, the proposed scheme provides an improved approach for sharing and accessing the data in the fog computing environment. The F-RAN technology takes advantage of the radio signal processing and thus decreases the burden on the network traffic. The secure fog computing using the IoT applications is used . Finally the dynamic load balancing mechanism is applied to balance the load in the computing environment.

## VIII. CONCLUSION

This paper focused on the study of different methods which are being used for sharing data securely in the cloud computing environment .These are : FC-MCPS(fog computing supported MCPS), F-RANS(Fog computing based Radio Access Networks), Foggy Clouds and Cloudy Fogs architecture, Securing fog computing for IoT applications,

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Fog computing dynamic load balancing mechanism. These schemes are implemented but they have certain limitations in it. So to overcome this we have designed "Advanced Approach for secure data sharing in Fog computing". This method being implemented using the various techniques is designed to address the load balance and increase the efficiency of the network.

## IX. FUTURE SCOPE

From the observations of the proposed scheme, we can further improve it with less number of complications with less overhead and increased speed.

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