International Journal of Fog Computing
Volume 4 • Issue 1 • January-June 2021

Evolution of Fog Computing Applications, Opportunities, and Challenges:
A Systematic Review

Hewan Shrestha, Madanapalle Institute of Technology and Science, Madanapalle, India
https://orcid.org/0000-0003-3901-2212

Puviyarai T., Madanapalle Institute of Technology and Science, Madanapalle, India

Sana Sodanapalli, Madanapalle Institute of Technology and Science, Madanapalle, India

Chandramohan Dhasarathan, Madanapalle Institute of Technology and Science, Madanapalle, India
https://orcid.org/0000-0002-5279-950X

ABSTRACT

The emerging trend of internet of things in recent times is a blessing for various industries in the world. With the increasing amount of data generated by these devices, it makes it difficult for proper data flow and computation over the regular cloud architecture. Fog computing is a great alternative for cloud computing as it supports computation in devices over a large distributed geographical area, which is a plus for fog computing. Having applications in various domains including healthcare, logistics, design, marketing, manufacturing, and many more, fog computing is a great boon for the future. Evolving fog computing in various domains with different methods and techniques has shaped a clear future for it. Applicability of fog computing in vehicular communications and storage-as-a-service has made the term more popular these days. It is a review of all the possible fog computing-enabled applications and their future scope. It also prepares a basis for further research into fog computing domain-enabled services with low latency and minimum costs.

KEYWORDS

Edge Computing, Internet of Things (IoT), Low Latency, Storage as-a-Service (SAAS), Vehicular Communication

DOI: 10.4018/IJFC.2021010101

1. INTRODUCTION

Fog computing, also called fog networking, is basically an extension of cloud computing. Fog computing, more precisely is an architecture that uses edge devices to carry out adequate computation, storage and communicate locally and over the internet backbone. It is hence derived from Edge Computing, which is intended to extend the distributed computing including numerous devices by connecting them to the cloud. The term 'fog' in 'fog computing' refers to the cloud's edge. All the operations and computations are performed at the vicinity of the IoT devices and sensors along with the storage and networking required throughout the computation.

All the computations in fog computing are decentralized and geographically distributed. Increasing number of IoT devices and sensors have given a rise to the increase in the prospects of fog computing. Fog computing provides the same services as cloud computing such as containers and virtualization, etc. to ensure the efficient use of resources.

2. LITERATURE REVIEW

Zeeshan Ali et al. (2020), Fog computing, abbreviated as FC, is simply an infrastructure which contains distributed computing, where all the computing resources such as storage, applications and data are distributed among the cloud and the data source. All the security and privacy issues such as authentication and key management issues, which were seen in cloud computing are also observed in fog computing as fog computing is just an extension to the traditional cloud computing. The scheme SAKA-FC, used for authentication key exchange for fog computing may suffer from extreme vulnerabilities according to the analysis performed. There is something called BAN logic which validates the formal security analysis of the proposed scheme. Meanwhile, automated formal scheme security verification takes place by the use of AVISPA tool. Some sort of non formal security analysis is performed to manifest that the proposed scheme can encounter some known attacks. With the proposed scheme, we get same communication costs as SAKA-FC, with a small difference in computation cost of 24%.

B.V. Natesha et al. (2021), Simply to be said, fog computing is the cutting edge technology used for handling, processing and computation of huge amount of data received from edge devices and sensors such as IoT devices. Some common networking devices like router and gateways are also used for as nodes to host and provide services to the connected devices as a result of IoT applications. The major problem in fog computing is finding a perfect node and deployment and running of IoT services because this devices might be geographically distributed and have a number of limited resources with them. Two-level resource provisioning framework has been designed in this paper with the help of dockers and containerization. With the two-level resource provisioning framework, service placement platform has been formulated as a multi-objective optimization problem for minimization of service time, cost, and energy consumption of IoT applications. The multi-objective optimization problem has been