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A BRIEF SURVEY OF ENERGY-EFFICIENT DYNAMIC WORKFLOW SCHEDULING MECHANISM IN FOG COMPUTING ENVIRONMENTS

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ABSTRACT. In this review article, we present a comprehensive study for dynamic workflow scheduling in fog computing using algorithms with optimization and artificial intelligence approach to minimize the balancing problem with more energy efficient. This review paper recognizes the need for developing a rapid and cost-effective model based on an optimization approach to achieve better performance in fog computing for dynamic workflow scheduling that would facilitate advancements in the cloud by designing intelligence models. So, this paper presents a brief survey of energy-efficient dynamic workflow scheduling mechanisms in fog computing environments.

1. INTRODUCTION

The major problem with the fog computing services is the geographic placement. Because it's very expensive to implement the fog infrastructure, they are deployed on multiple distant locations, which remain in-effective to cut the communication cost or delay. [1], Such a problem can be reduced by performing the tasks near to source, which is almost impossible for standard cloud computing because of its high-cost implementation. For solution, the small scale geo-specific nodes are deployed across various regions across the globe, which works as the smaller segments to process the user data on the cloud, and to effectively reduce the communication cost. The proposed model is designed in

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this thesis to optimize the job scheduling, [2], methodology for quicker and effective processing of the user workflows. The access as per as the demand is facilitated for computing and data storage resources which may be aligned to get particular constraints of the users with less managing overhead. The cloud platform has been utilized in many applications such as sensor data processing, social network data processing [1], healthcare networks, etc. The cloud services' ease of use has been raised recently that made them more fascinating and financially workable for the users with fixed storage resources who can't secure and maintain their own computing set-up. [3], The increasing demand for computing power and storage results in the gradual growth in admiration of those firms which offer cloud services. Users may simply farm out a huge amount of data and computation to secluded places and can run applications directly with the help of the cloud, [4]. The following figure depicts the scheme structural design of the energy used trust-based Stochastic Scheduling.

2. Literature Survey

Here in this fragment, we demonstrate the survey of existing work rooted on Dynamic Workflow Scheduling Mechanism for Fog Computing Environments using different techniques. The research was done by Hina Rafique et al. in [1], on a novel bio-inspired hybrid algorithm (NBIHA) meant for the proficient resource controlling in fog computing. In this study, for the accomplishment of a job the resources are assigned and coped according to the plea of received requirements of the clients. The key purpose of this research was to decrease the model average response time by using an optimization algorithm and to improve resource uses by proficiently planning the tasks and handling offered fog resources.

In 2019, Sidra Razzaq et al. in [2] proposed a high-performance scheduling algorithm for fog computing. In this research, the author's contribution is dived into two different parts. In the first part, the assortment and grouping of scheduling algorithms based on multiple QoS issues similar to output, waiting time, impartiality, directly above, etc. is served. In the second part, the estimating has been done on HPC tenders to forecast the progress level of 2020 and afar but in this research filed, attained consequences are mite drenched, and static accessible enhancement is promising, in which innumerable planning algorithms will

be executed on QoS aspects to attain the chosen fallouts by using optimization and machine learning methodologies.

Dimitrios Tychalas and HelenKaratza in [3] in 2019 introduced an algorithm for arranging the fog system with functional fund functions. This study aims to learn the skills of using all available resources to reduce costs under the Bag-of-Tasks model.

An Effective Load Balancing Strategy (ELBS) for Real-time Fog computing environment with fuzzy and probabilistic neural networks is introduced by Fatma M. Talaat et al. in [4]. This exploration work displayed another ELBS for mist registering condition, which is appropriate for medicinal science applications. ELBS attempts to accomplish compelling burden adjusting in haze processing conditions by means of ongoing scheduling just as storing calculations. Juan Wang and Di Li in [5], have led an examination for task scheduling dependent on a crossbreed heuristic calculation for savvy creation line by mist figuring condition.

Itrat Fatima et al. [6] in 2018, proposed a coordinated mist and cloud-based exemplary is to process the vitality utilization of the private structures in every one of the districts of the biosphere. The intention for this grind was for dealing deal with the vitality prerequisite of structures, while it had been scrutinized before that the vitality the board is substantial for condos, structures and MGs. The proposed arrangement gives the least reaction and preparation time when contrasted with the DR approach. Along these lines, a tradeoff is seen among cost and reaction time. They could optimize their result by using Artificial Intelligence with optimization techniques.

Basically above described literature survey focuses on different solutions to provide a better solution for dynamic workflow scheduling mechanisms with an energy-efficient and balanced pricing approach for fog computing environments. After analysis of existing research work in this era, the following points are highlighted:

- In the existing work, the allocation is used with the concept of energy consumption by the conventional approach and it is a time-consuming process. So that the clustering based mechanisms would be a better solution to achieve maximum job completion rate.

- Researchers proposed the different allocation mechanisms to prevent unbalanced scheduling in fog computing environment but they do not consider load balancing concepts based on artificial intelligence techniques.

After the literature analysis, we present a survey based on the achieved results by the authors in previous years, so we can find out the exact achievements in the range of energy-efficient dynamic workflow arranging mechanism in fog computing environments.

3. Current Challenges and Issues

Energy-efficient dynamic workflow scheduling mechanism in fog computing environments has been considered expansively in the cloud atmosphere, [2, 6–8]. The proposed review on the workflow scheduling mechanism differs from the current approaches in numerous ways:

- The present survey broadsheets only debated the numerous workflow scheduling tactics and the proposed survey not merely discusses the approaches of workflow scheduling but also discussed an energy-efficient workflow management system.
- We also discuss the main structures of workflow scheduling strategies along with the options of using static as well as dynamic.
- The proposed survey paper also discusses numerous static, dynamic, and metaheuristic-based workflow development approaches based on the simulation results that explicitly discuss workflow scheduling strategies in numerous fog computing set-ups.

There are heaps of difficulties are faced for adjusting and executing work processes scheduling on the fog computing environment and the major challenges are given as:

- **Computing challenges:** For logical work processes, overseeing figuring assets in the Cloud is a mind-boggling process. Asset necessity assembling and mapping to the assignment work process ought to be taken care of by thinking about virtualization, adaptation to non-critical failure and shrewd reruns.
- **Security challenges:** Security is a significant and significant concern while embracing the cloud administrations for work process execution.

Cloud specialist co-op utilizes various systems, for example, to get to control. Subsequently verified electronic exchange convention is required.

- **Integration challenges:** Acquiring assets, task mapping to the accessible assets their status and progress, task culmination data is expected to manage client's exemptions.

4. Conclusion and Future Work

In this paper, a brief survey of energy-efficient dynamic workflow scheduling mechanisms in fog computing environments is conducted which shows that economic and efficient execution of scientific workflow can be done. We present a comprehensive study for dynamic workflow scheduling in fog computing using algorithms with optimization and artificial intelligence approach to minimize the balancing problem with the energy-efficient concept. This survey paper perceives the requirement for building up a quick and financially savvy model dependent on a streamlining way to deal with accomplishing better execution in fog computing for dynamic workflow scheduling that would encourage headways in the cloud by planning insight models. Along these lines, this paper introduces a concise overview of energy-efficient dynamic workflow scheduling instruments in fog computing situations. In this survey paper, we have used a manual approach to find out the relevant studies regarding the dynamic workflow scheduling in a fog computing environment. As an outcome of our survey on the basis of the selected 10 research papers for the comprehensive studies. There is a possibility to improve the existing work in the sense of different parameters such as makespan, execution time, total cost, resource utilization rate, service level agreement violation etc.

Therefore, in the future, we would conduct research on the dynamic workflow scheduling using the concept of optimization techniques along with artificial intelligence by including more relevant studies.

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