Web Service Composition for Executing Workflows: Open Issues, Challenges, Survey and Future Directions

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Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 20 April 2021

Abstract: Cloud computing has nowadays become a dominant technology to reduce the computation cost by elastically providing resources to users on a pay-per-use basis. More and more data intensive business and scientific web service applications represented by workflows have been moved or are in active transition to cloud platforms. Therefore, efficient web service compositing for executing workflow are in high demand. This paper conduct extensive survey of various existing web service composition technique for executing workflow. From survey it is identified very limited work is done for minimizing workflow execution processing time with minimal energy dissipation considering task deadline requirement under heterogeneous cloud computational environment. This paper identifies open issues and future challenges and presented possible solution in building efficient web service composition for executing workflows under heterogeneous cloud computational environment

Keywords*:* Cloud computing, Evolutionary computation, Web service composition, Workflows.

1. Introduction

The manifold set of resource considered and they are connected within a high-speed network will enable us a new platform for computing in an environment designed for distributed network, called cloud environment (Yu-Kwong Kwok1996). With the advancements in cloud computing will allow users to approach for resources like memory, CPU, storage, bandwidth and many more, it will also have minimal overhead (Tamojit Chatterjee 2014; Aarti Singh, 2017; S. Suresh 2014). Normally cloud service providers will provide their services in three basic forms, such has Infrastructure as a service (IaaS), Platform as a service (PaaS) and Software as a service (SaaS), which is depicted in Figure 1 (Yucong Duan 2015).

Environment for cloud computing is in such a way that the computation process is will not be performed by the computer available locally, but the process of computation is done by the cloud servers available at data centers, these data centers provide software, platform and infrastructure as Internet based service. As a matter of fact cloud computing is aimed to integrate software and hardware as a service provided to users via Internet (Aslanpour MS, 2017; Ghobaei-Arani M, 2016; Ghobaei-Arani M, 2017). The enormous improvements in cloud computing take us to publishing different web services throughout the world (Ghobaei-Arani M, 2019). Recent developments in the software industry show that web services play a vital role. Most of the applications are published by enterprises through web services using World Wide Web.Web service technology is the heart of Service Oriented Architecture (SOA) that meets the interoperability demands of the web application. W3C defines web service as “a software system designed to support interoperable machine to machine interaction over a network.” Web services (K. Kritikos 2009) are self-contained, self-describing, and loosely coupled software applications that can be located, published and accessed across the web using XML-based open standards, namely Simple Object Access Protocol (SOAP) and Web Service Description Language (Wand SDL).

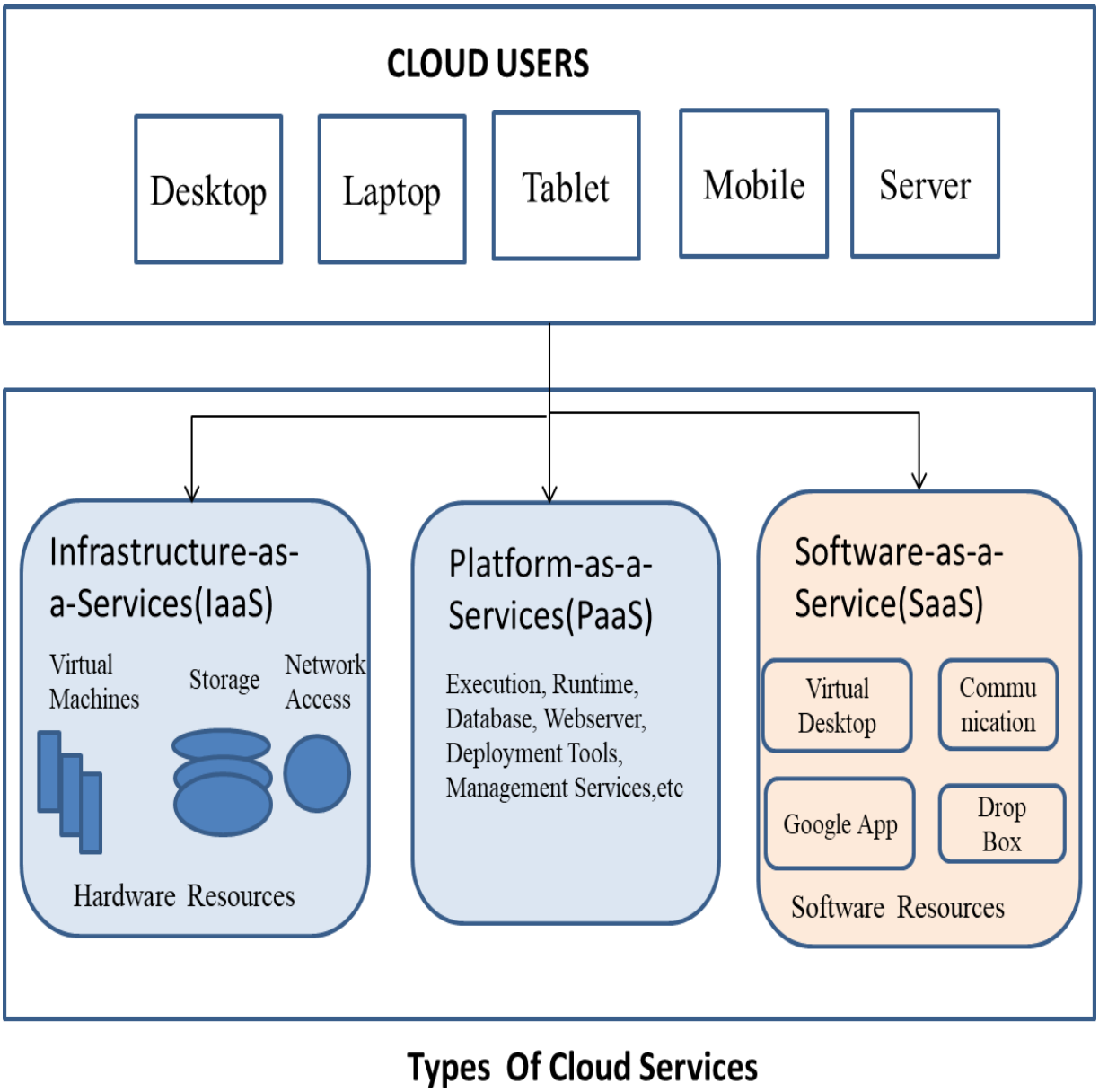

Figure 1. Cloud computational environment service model

The major three components in web service architecture are web service requester, web service provider, and Universal Description, Discovery and Integration ((UDDI) registry (D. Lee, 2011) as given in Figure 2. WSDL file contains UDDI registry details, it is the detail of the web service provider information WSDL of a web service is a machine readable description that indicates the service invocation parameters of the web service. WSDL is an XML-based language that describes the functionality of the web service like location of the service and operations (or methods) of the service. Universal Description, Discovery and Integration (UDDI) is a platform-independent, XML-(Extensible Markup Language-) based registry for businesses worldwide to list themselves on the Internet, used to register and locate web service applications. Web service consumer uses UDDI to discover appropriate services which meet the requirement using the service invocation parameters provided by the web service provider.

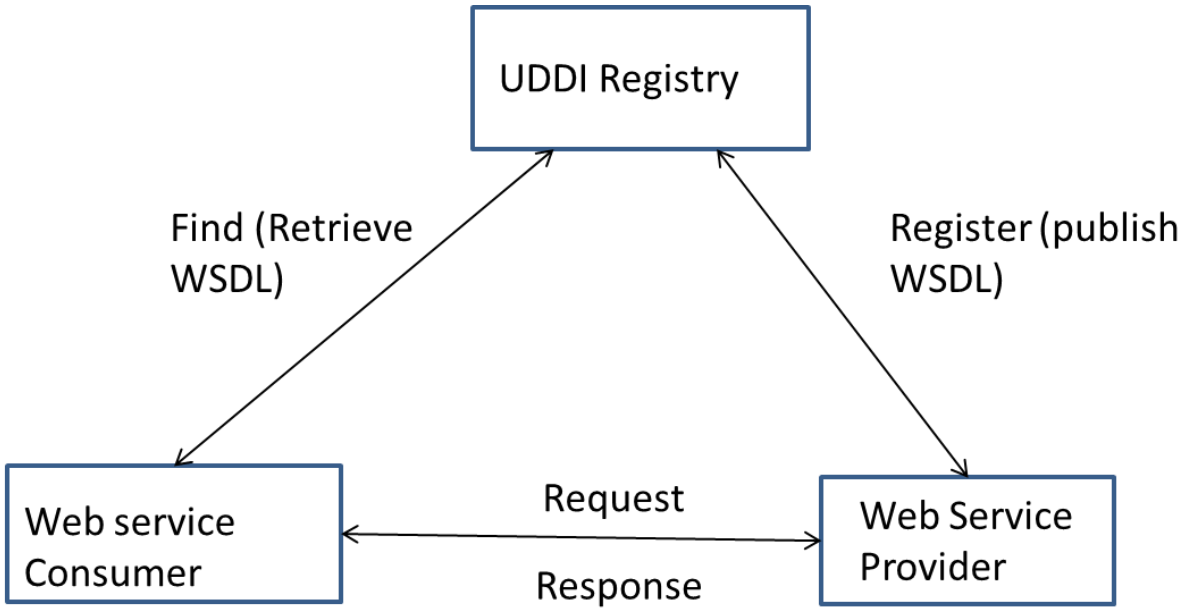

Figure 2. Basic architecture of web service.

Web services research are executing data intensive workload includes selection, web services description discovery, ranking, adaptation, execution, composition, monitoring, and deployment. Services of the web contain all specific information needed to invoke and access a service using web. Discovery of web service is gaining access and process locating to web service capable of satisfying the customer necessities. Web service ranking and selection help to identify web services best suitable and provides suitable service to the users (i.e., scientific applications and data intensive) requirement. Web service composition involves combining a set of compatible atomic web services in order to satisfy the user's requirement, when a single atomic web service could not satisfy the users or data intensive workflow tasks deadline requirement.

Scheduling of work-flow is mainly concentrated on allocation of each task in work-flow to a particular time slot of resource used for computation; this is done to obtain optimization of some specific performance criteria. As a well-known NP-hard problem, it has been extensively investigated in the distributed computing community for decades (Z. Zhu, 2016). High speed cloud resources are normally expensive compared to slower ones, and the users resist with many web services goals of competition including economic cost and make span. So optimization of web service for work-flow scheduling in heterogeneous cloud computational environment have improved research attention (Neelima, P., 2020; Ghobaei-Arani, M., 2018). From extensive carried out in section II we can state that web service composition for executing data intensive workflow is either single or multi objective. However, these models are not efficient in characterizing the cloud resource availability and task requirement.

This paper mainly focuses on survey of web service selection, ranking, and composition from the aspect of quality of service (QoS) for provisioning execution of data intensive application on heterogeneous cloud computational environment. Some of the major challenges in web service composition framework are as follows: (a) How to select the best web service when there are many available web services of similar functionality. (b) What the factors that influence web service selection are. (c) How to meet the various requirements of the user or data intensive and scientific applications. (d) How to compose multiple web services or re-planning automatically when the user's request is not satisfied with a single web service. QoS of the web service is used to distinguish the functionally similar web services. First survey is carried out for establishing challenges considering QoS for web service selection. Second this work study the main QoS properties that influence web service selection are execution cost, availability, average response time, successful execution rate, frequency, reputation, energy efficiency, and user preferences. Finally presents effective solution to build effective solution for web service composition in executing scientific workflows on heterogeneous cloud computing environment.

In summary, we make the following main research contributions in this paper:

- First presented survey of various existing web service composition technique for workflow task scheduling in cloud computational environment.
- The work study, analyses open issues and future challenges in building web service composition for executing parallel workflows.
- Lastly, presented solution in building efficient web service composition technique for executing workflows under heterogeneous cloud computational environment.

The rest of the paper is structured as follows: In section, II carried extensive survey of various state-of-art web service composition for workflow task scheduling in cloud computational environment. In section III, the research

open issues, challenges, and problems is discussed. In penultimate section possible future research direction in overcoming research challenges and problem in building efficient web service composition technique for executing workflows is presented. The conclusion and future work is described in last section.

2.Survey of Web Service Composition Technique for Executing Scientific Workflow on Cloud Computing Environment

This section present the survey of various web service composition technique for executing scientific workflows on heterogeneous cloud computing environment. Here survey is carried out by broadly classifying it into QoS-based, energy-based, and evolutionary computation based web service composition for executing modern workload.

2.1Single and multi-objective QoS Parameter for Web service composition:

Here reviews variety of existing single and various objective QoS functions enhancement-based web service development techniques for executing rigorous data and scientific work flows (SWF's). In [(J. Liu 2019), it demonstrates that huge, complex data scientific applications are interpreted as scientific work flows. In this approach they consider the issue of productive scheduling of a huge scientific work flow in a cloud which is multisite, i.e., a cloud with geographically cloud data centers (sites). The explanations behind utilizing different cloud data centers to run scientific workflows are that the data is distributed, the required resources exceed the limitation at a single site, or the financial cost is less. In a multi-site cloud, metadata monitoring critically affects the efficiency of scientific workflows scheduling as it gives a global perspective on data location and allows task tracking while execution. In this way, it ought to be promptly accessible to the system at random time. While it has been demonstrated that efficient metadata monitoring plays an important role in performance, little exploration has focused on this issue in a multi-site cloud. In this article, we propose to recognize hot metadata (often accessed metadata) for effective scientific workflows scheduling for a multi-site cloud, utilizing an distributed approach

In (Li, C., 2019), appeared with the approach of the period of big data, numerous organizations have made the frequently used noteworthy steps in the hybrid cloud to deal with a enormous data. In hybrid cloud environment (Chunlin, L., 2019), sudden increase of data known has cloud burst technology allows applications to be handled at a minimal cost in a public cloud and burst into the private cloud when the resources of a private cloud are depleted. We have numerous difficulties in cloud condition designed in hybrid way, for example, for the diversified jobs, diverse cloud suppliers and how to deploy another application with least cost. Here efficient work scheduling approach for heterogeneous tasks in private cloud is proposed to guarantee high resource usage. In addition, the scheduling strategy used for task scheduling dependent on BP neural network in hybrid cloud is proposed to guarantee that the jobs can be finished inside the predetermined time of the user. The experimental outcomes show that the efficient tasks scheduling approach can adequately decrease the job response time and improve the throughput of the cluster. The assignment scheduling technique can decrease the response time of jobs, improve QoS rate and limit the expense of public cloud.

In (Zhou, 2018), the major job of cloud service providers is to limit related expense and makespan of executing workflows IaaS cloud. The vast majority of the current methods for cost and makespan minimization are intended for existing computational platforms which can't be applied to the cloud computing environments with novel service-based resource managing techniques and estimating systems. Here they learned about the joint optimization of cost and makespan of planning workflows in IaaS cloud, and modeled workflow scheduling plan. Here a fuzzy dominance sort based heterogeneous based earliest-finish-time (FDHEFT) is created which incorporates the fuzzy dominance sort system with the scheduling heuristic HEFT. Tests utilizing this present reality and engineered work processes show the adequacy of their plan. Their plan can accomplish fundamentally better cost-makespan tradeoff over the state-of-the-art algorithm.

In (L. Mo, 2019) appeared in real-time application areas, in-time approximated results are favored than exact - however too late - results. In this approach, we propose a deployment approach that explores the heterogeneity gave by AMP architectural designs and the approximation resilience gave by the applications, to increment as much as could be expected the nature of the outcomes under given vitality and timing requirements. At first, an ideal methodology is proposed dependent on issue linearization and disintegration. At that point, a heuristic methodology is created dependent on cycle unwinding of the ideal rendition. The got outcomes show 16.3% decrease in the computation time for the optimal methodology compared with the conventional optimal methodologies.

In (Zhou 2019) indicated that thinking about the complexity nature of resources setup and deployment in hybrid cloud technology, existing workflow prioritizing techniques intended for existing computing systems for distributed network are restricted and weak. Subsequently, to benefit driven IaaS (Infrastructure-as-a- Service) cloud, limiting monetary expense and makespan of prioritizing scientific workflows is a basic concern. The proposed work is on two proficient workflow scheduling approaches for hybrid clouds technology that both consider makespan and cost related expense. In particular, first modeled a single-objective workflow scheduling optimization approach called deadline-constrained cost optimization for hybrid clouds (DCOH) used to limit the cost related expense of planning

workflows under cutoff time imperative. Based on, DCOH, they further displayed a multi-objective workflow planning optimization method called MOH (multi-objective optimization for hybrid cloud) for upgrading makespan and expense of planning workflows at the same time. Simulation tests have been directed to approve the viability of DCOH and MOH. Simulation results show that our DCOH method can decrease financial expense for users when compared with the contending algorithms under a similar deadline restriction and MOH approach can accomplish better expense makespan compromises arrangements when compared with the algorithms.

2.2Energy efficiency optimization for Web service composition*:*

In (G. Xie, 2017), demonstrated that energy has evolved as a major question for data and cloud computing ware houses. Limiting complete utilization of energy in any application is far most significant concern of cloud service providers, is to fulfill the constraints of the task is the most significant QoS(quality of service) necessities. Past technique attempted to kill as many processors as possible by tasks to less number of processors so as to reduce the consumption of power on a deadline constrained parallel application in a heterogeneous cloud platform. Nonetheless, they uncovered that killing processors does not really prompt the less energy consumption leads to less total energy utilization. Here the proposed work is a vitality EPM (Energy-aware processor Merging) algorithm to choose a best processor capable of killing from the energy saving point of view, and also QEPM (Quick EPM) calculation to minimize the difficulty of calculation of EPM. Exploratory outcomes on randomly and real produced parallel tasks approve their QEPM and EPM algorithms can reduce much energy consumption than existing strategies at various parallelism, scales and heterogeneity degrees.

In (Wen, 2019), demonstrated that to execute a platform for cloud computing for different applications. Simultaneously, it provides QoS, for example, high throughput as well as accomplishes significant criteria, for example, effective power utilization and suitable cost of execution. To tackle this test, the proposed work is a cost-aware and energy efficient algorithm for planning instance-intensive workflows based on IoT (Internet of Things) with processing done in batch in cloud computing technology, and termed as ECIB and intended to enhance energy proficiency and decrease cost of execution and also fulfilling the time constraint prerequisites. In particular, the developed algorithm will prediction based system so that it will direct and maintain the resources by the existing CPU and data utilization forecasting outputs from the set of physical machines. At that point, the work done proposes two methods to scale down or to scale up the virtual machine resources to improve the utilization of energy for the warehouse cloud servers. Likewise, we receive a batch processing technique to combine some activities of a similar kind to decrease execution cost for the cloud users and improve resource usage for the cloud servers. The ECIB algorithm effectiveness is assessed by broad examinations utilizing four sorts and CloudSim of instance-intensive applications using IoT work flow.

In (Ritu, 2019), indicated that cloud server warehouses expend tremendous measures of electrical energy that brings shoot up of operational cost, diminished quality of the system and carbon dioxide impressions. Hence, arises to make it as profoundly essential for create scheduling methodology which minimizes energy utilization. DVFS (Dynamic voltage and frequency scaling) has been perceived as a productive method for energy minimizing and better utilization. Be that as it may, there is destructive effect on DVFS on the system quality as it builds the transient shortcomings during the execution of the application. Subsequently, this is basic to discuss the issue of reliability used in applications related to critical tasks. Ongoing investigations on workflows planning for condition of distributed types have not thought about dependable while limiting the energy utilization. Here they introduced scheduling algorithm called the energy efficient and reliability workflows planning method which mutually upgrades reliability for lifetime, of utilization and utilization of energy and ensures the user determined QoS limitation. Their methodologies operates in four stages: clustering of jobs, priority calculation, distribution of target time, the other one is assigning out the group to processing component with appropriate voltage/frequency levels. The simulation results got by utilizing arbitrarily produced task charts and Gaussian Elimination task graphs shows that the proposed approach is powerful in joint enhancement of lifetime reliability of system and energy utilization contrasted with existing algorithm.

In (Z. Li, 2018), introduced an expense and energy aware scheduling (CEAS) method for scheduling in a cloud environment that limit the cost of execution of workflows and minimize the energy utilization and also by fulfilling the constraint of deadline. The algorithm based on CEAS will have five sub-algorithms. To begin with, the proposed algorithm utilize the VM algorithm that makes use of the idea of utility cost to map tasks to its ideal virtual machine (VM) types limitation by the sub-makespan. At that point, two tasks combining strategies are utilized to decrease cost of execution and consumption of energy during workflows. Moreover, to make repetative use the inactive VM instance that have been leased, the VM multiple usage strategy is additionally proposed. Furthermore, the plan of slack time reclamation is make use to spare leased energy used in VM instance. They presumed that the complexity of time and each sub-algorithm is polynomial as per the time complexity nature investigation. The CEAS algorithms outperform the related methodologies.

2.3 Evolutionary Computing Technique for Web service composition:

In (Zhu, 2015) indicated that service providing application is esteemed to be emerging answers to develop an application system for enterprises. So it as to provide solution to most requesting needs or transformations of the requirements of services that changes rapidly, composition of service is at presently employed to explore the multi-service abilities in the IT organizations. While web service, which have been autonomously build, would not generally must viable with one another, to choose a optimal service and composition of the service are viewed as complex issue. Here they proposed Cuckoo search algorithm for web service organization issue which is called 'CSA-WSC' that gives web service composition to improve the nature of QoS in the cloud technology. The exploratory outcomes shows that the CSA-WSC contrasted with GS-S-Net (Genetic search Skyline Network) and GAPSO Communicated WSC (genetic particle swarm optimization) decreases respond time and costs, as two significant opportunities behind the decrease of improvement of QoS. It likewise builds supplier accessibility and the reliability, as the two significant QoS standards for improving the QoS.

In, exhibited that the distributed computing gives ensured platforms with large applications and its execution with extremely large computational resources that offer if required. Using a Cloud computing, clients have to pay subscription relying upon utilization based on their needs of resources and the vital QoS details. The way where there are many existing workflows scheduling algorithms in customary scattered or diverse computing conditions, they undergo issues in being straightforwardly pertinent to the Cloud circumstances since Cloud varies from present heterogeneous conditions by its service-based resource management and pay-per-use techniques. Here they included such inconveniences, and model the workflow scheduling issue which optimizes both makespan and cost as a MOP (Multi-target Optimization Problem) for the Cloud innovations. We proposed an EMO (Evolutionary Multi-target Optimization)- based algorithm to handle these workflows planning issue on platform of Infrastructure as a Service (IaaS). Latest design issue explicit coding in an encoding type and introduction of fitness evaluation, population, and genetic operators are developed in this algorithm. Wide preliminaries based on workflows of real-time and subjectively made workflows presents that the scheduling delivered by developmental algorithm present more prominent on most of the workflows with the instance-based IaaS valuing and computing models. The obtained outputs furthermore present their algorithm to achieve basically best arrangements over existing cutting edge QoS advancement scheduling algorithm in a considerable lot of cases.

In (Attiqa Rehman Syed S. Hussain 2018) demonstrated planning the jobs of a workflow of the cloud resource are a known N-P hard issue. Associated partners with a environment available via cloud have various attentiveness in scheduling issues. Additionally, the conventional targets like makespan, cutoff time and budget, improved in scheduling of the workflow, consideration of the green part of cloud, (i.e. Utilization of energy within limits) increment the complications of problem (Sardaraz M, 2020). In addition, the interests of a cloud's stakeholders are satisfying and conflicting every one of these interests at the same time is a major issue. Here they introduced MOGA (Multi-Objective Genetic Algorithm) for workflow planning used in a environment designed for cloud environment. MOGA is observed as the ambiguity of the stakeholders of cloud computing, for enhancement and gave a solution, which may not just limits the makespan under the deadline restrictions and budget additionally gave an energy efficient arrangement utilizing the dynamic scaling of voltage frequency. And furthermore, gave a hole search algorithm, that utilizes to enhance the resource use of the cloud's resource. Contrasted results and genetic algorithm considering about the deadline, energy productivity, and budget exclusively and furthermore with MOPSO (Multi-objective Particle Swarm Optimization) having same objectives likewise in MOGA. The outcomes show that MOGA has essentially improved not just regarding energy, and deadline yet additionally enhance the use of cloud's resource when contrasted with the competitive algorithm.

In (Alnusairi, 2018), demonstrated that in technology of cloud computing, balancing task loading planning is a significant point that straightforwardly influences usage of the resources. Obviously, load balancing scheduling is a genuine aspect that must be considered in the field of cloud research because of the huge effect on both the back end and front end. At whatever point a effective load balance has been accomplished in the cloud then great resource usage will likewise be accomplished. A successful load balance distributing the submitted task at the cloud VMs in a balanced manner, prompting high resource use and high user fulfillment. Here they introduced a load balancing algorithm, Binary Load Balancing – Hybrid Particle Swarm Optimization and Gravitational Search Algorithm (Bin-LB-PSOGSA), which is a bio-inspired load balancing planning algorithm that productively empowers the scheduling process to improve load balance level on VMs. Their algorithm finds the best Task-to-Virtual machine planning that is affected by the length of submitted workload and VM handling speed. Results show that their Bin-LB-PSOGSA accomplishes preferable VM load average than the pure Bin-LB-PSO and other benchmark algorithms in terms of load balance level.

In demonstrated that with the quick improvement of handling and storage technologies and the achievement of the Internet, computing resources have become cheaper, powerful and more pervasively accessible than any other time. This technological pattern has empowered the acknowledgment of another computing model, called cloud computing. In cloud, planning is a significant application. In cloud situations, load balancing planning is a significant issue that directly influences resource usage. Without a doubt, load balancing planning is a genuine perspective that ought to be considered as a result of its huge effect on both the back end and the front end of the

cloud research industry. Great resource use is accomplished at whatever an effective load balance is accomplished in the cloud. Yet, load balancing in distributed computing is a NP-hard optimization issue. So as to achieve this issue, a novel load balancing task scheduling algorithm in cloud utilizing Adaptive Dragonfly Algorithm (ADA) is proposed. The ADA is a combination of dragonfly algorithm and firefly algorithm. Additionally, to achieve the better performance, multi-target work is created dependent on three parameters specifically, completion time, load and processing expenses. At last, the performance of their technique is estimated in terms of various measurements specifically, cost of execution and time of execution. The trial outputs shows that their methodology achieves result with better load balancing compared to other state-of-art approaches.

In next section this work discusses some of open issues and challenges that must be considering in designing efficient web service composition technique for executing scientific workload.

3 Open Issues and Future Challenges

In older sections, many research concepts are highlighted that will address the problems of big data issues and challenges. In spite of all these efforts, some challenges have to solved yet, and some others not investigated. This proposed work focus on key issues of research used in big data work flow automated management.

a) Cross-Cloud Workflow Migration Management:

The vital research problem open is related with management of work-flow in twofold: (1) to find the cases of similar type for cloud computing environment, since the specific equal for instance between original cloud and target cloud may not exist. (2) Moving huge sets of data to the target cloud condition at an event where the data is made to store in original cloud. This will give rise to more complex task of relocation and along the absence of universally acknowledged norms that make the consistent communication with the cloud, and provisioning and overseeing cloud resources represents the necessity to manage with vendor-specific stage at the target cloud.

b) User Perspective:

With the need of accomplishing the necessities of arranging Big data workflows in the cloud, the prerequisites of users for the workflows should also be taken into consideration and achieved. In this manner, different prerequisites and limitations from various users bring about various steps of a workflows waiting to be executed, where the execution of these various advances probably won't be direct as the necessities might be ambiguous.

c) Workflow security:

In spite of the advantages picked up from utilizing cloud computing and Bigdata processing platforms, building up normalized holistic answers for privacy and security issues related with moving Bigdata workflow applications and their data to the cloud are still a significant open issue. Comprehensive security solutions need to coordinate the security of data-intensive tasks associated with workflow applications with the security of the expended, created and delivered Bigdata.

d) Distributed Workflow Execution:

The dynamism of Big data workflow because of data coming in various formats, speed and volumes (Chaochao Zhou2015), represents the requirement for distributed execution of such workflows over cloud to pick up the advantages of both parallel processing and the dynamic idea of the execution condition, accomplishing data preparing efficiencies and better execution. In any case, it complicates the entire execution measure and related cycles, for example, parallelization and scheduling, bringing about y difficulties and problems still open, for example, balancing workloads among clouds or decreasing the expense of moving huge datasets between workflows tasks/fragments

e) Service composition of heterogeneous workflows with deadline:

The application display parallelization inside subtask. In this manner, identifying right sort of resource considering task deadline time with energy limitation considering heterogeneous condition is challenging. This is on the grounds that some tasks are displaying actual energy required for executing workload in heterogeneous computational processing component is complicated. Wrong assessment will prompt to a greater expense of service. For overcoming above mention issues and challenges in next section this work defines the possible solution in building efficient web service composition technique for executing data intensive and scientific workload under Heterogeneous cloud computational environment.

4. Possible Future research direction in Overcoming Research Problem in Building Efficient Web Service Composition Technique for Executing Workflows under Heterogeneous Cloud Computational Environment

The Workflow process has been widely utilized model for huge scale data-intensive and scientific application deployed on cloud infrastructure services environment. These workflows are composed of various jobs and sub-tasks, data dependencies among each sub-task. It tends to be disconnected into a Directed Acyclic Graph (DAG) in which node sets signify sub-tasks sets and edge sets signify the dependency among sub-tasks. Significant benefits of using Cloud for workload execution are available. In general, these services are provisioned with SLA constraint that defines and characterizes the QoS. Finding right kind of methods or web services for allocating task

in multi-core multi-processing framework is a challenging problem. From survey it is seen evolutionary computational algorithm such as Genetic Algorithm (GA), Ant Colony Optimization (ACO) algorithm, annealing, and particle swarm optimization (PSO), Dragonfly etc. provide an efficient way in provisioning workflow execution. Among them, Dragonfly are very efficient in solving various multi-objective parameter optimization problem in different application. However, existing methodology mainly focused in bringing tradeoffs between fiscal budget and execution time for scheduling workload execution. A good web service composition technique for workflow scheduling always improves the CPU utilization, turnaround time and cumulative throughput. However, very limited work is done employing energy constraint prerequisite and meeting QoS constraint of workload scheduling under heterogeneous computing environment. Further, effective re-planning algorithm is needed for effective load balancing of workload and identifying suitable web service s for executing workload in QoS efficient manner. This research work aimed at presenting a solution of building efficient approach of resource provisioning model that consider minimizing processing time and energy consumption by employing energy optimization technique for effectively utilizing system resources in cloud computational environment. Thus, the future work should consider following things. First, present efficient web service composition optimization technique for executing scientific workload on heterogeneous cloud computing environment. Second, the optimization of web service composition will be modeled using dragonfly optimization technique and should be evaluated using real-time scientific workload applications. Third, design efficient re-planning algorithm using linear optimization technique for dynamically scheduling the workload on heterogeneous cloud computing environment and should be evaluated using scientific workload applications. In next section the research work is concluded and future research direction of work is summarized.

5. Conclusion

This conducted survey of various existing web service composition technique for executing scientific workflow on Cloud computing environment. From survey it can be seen these application have parallelization among sub-task. Thus, web service composition is challenging under multicore processing environment considering meeting different QoS parameter such as task deadline and energy efficacy prerequisites. Number of work has been presented to optimize different QoS parameter in recent times. This, work highlights benefit and drawback of existing web service composition methodologies. Further, the research work highlights some research open issues and future challenges in web service composition for workload execution. Then, present possible research direction in building efficient web service composition technique for executing scientific workflow in time and energy efficient manner.

Future work would consider developing web service composition technique adopting evolutionary computing algorithm in bringing time and energy efficiency tradeoffs performance.

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