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Data Management Using Cloud Computing

Journal of Electrical Systems

Abstract: **-** Through the internet, hosted services are made available via cloud computing. The hardware and software needed to set up a cloud computing platform are referred to as cloud infrastructure. On-demand or utility computing are other names for cloud computing. Data is stored on distant servers rather than local drives. In order to support the cloud computing architecture, businesses must go through drawn-out procurement processes that can take months in order to acquire physical servers and other infrastructure. The installed systems require a physical space, typically a room with adequate air conditioning and electricity. After the systems are configured and put into place, businesses need to hire specialized personnel to manage them. Scaling this laborious procedure when business expands or demand increases is difficult. Companies might buy more computers than they need, which will lead to low rates of utilization. Cloud computing solves these issues by offering computing resources as scalable, on-demand services. Over the past ten years, the cloud computing industry has grown in popularity thanks to its widely adopted "pay as you go" model, which lowers costs and allows businesses to scale up or down their IT capabilities as needed. This paper aims to provide a general overview of the cloud computing model and then go on to describe the key technologies that underpin the development of cloud computing. In addition, this paper addresses current issues and difficulties in this field and the goals of the research aimed at finding a solution to the load balancing problem.

Keywords: infrastructure, laborious, conditioning, procurement, specialized.

Introduction:

Cloud computing has evolved from a new idea to a ground-breaking project over time. Today's cloud computing market is thriving, with businesses and scientists pushing the envelope of what is conceivable and providing fresh approaches to difficult problems. Renting computer resources was the first step toward the introduction of cloud computing in the 1950s. Distributed systems, which were concurrent, scalable, heterogeneous, and failure-resistant, marked the beginning of evolution. The inception of cloud computing dates back to the early 1950s, when the mainframe computer was created to manage massive amounts of data while maintaining a high degree of fault tolerance. The main flaw in the system was that all of the computers needed to be available at the same time and location. In order to address this issue, three new computing paradigms emerged: mainframe, cluster, and grid computing. Mainframes are extremely powerful and dependable devices that were used after distributed computing to increase the system's processing capacity. But these were way too expensive. The utilization of cluster computing has become a cost-effective substitute for mainframes. A strong network connected each machine in the group to the others.Furthermore, if needed, additional nodes could be easily added to the cluster.

As a result, while the problem of regional limits continued, the cost issue was somewhat resolved. Grid computing was suggested as a potential fix for this problem. Grid computing involved the installation of various systems in different parts of the nation, all of which were accessible via the internet. Because these machines belonged to different companies, the grid was composed of heterogeneous nodes. Even though it resolved some problems, other network-related issues, such as inadequate high-bandwidth transmission, surfaced as the distance between the nodes increased. Virtualization is the process of building a virtual layer on top of hardware to enable multiple instances to run simultaneously on a single computer.The user interface that cloud 3 computing providers use to interact with their clients is called Web 2.0. Thanks to Web 2.0, we have dynamic, interactive websites today. It also increases the adaptability of websites. Service Orientation is a reference paradigm for cloud computing. It is compatible with inexpensive, flexible, and upgradable applications. Utility computing is a paradigm for computing that describes how pay-per-use services such as computation, storage, infrastructure, and so forth should be provided. Each of the aforementioned technologies contributed to the evolution of cloud computing.

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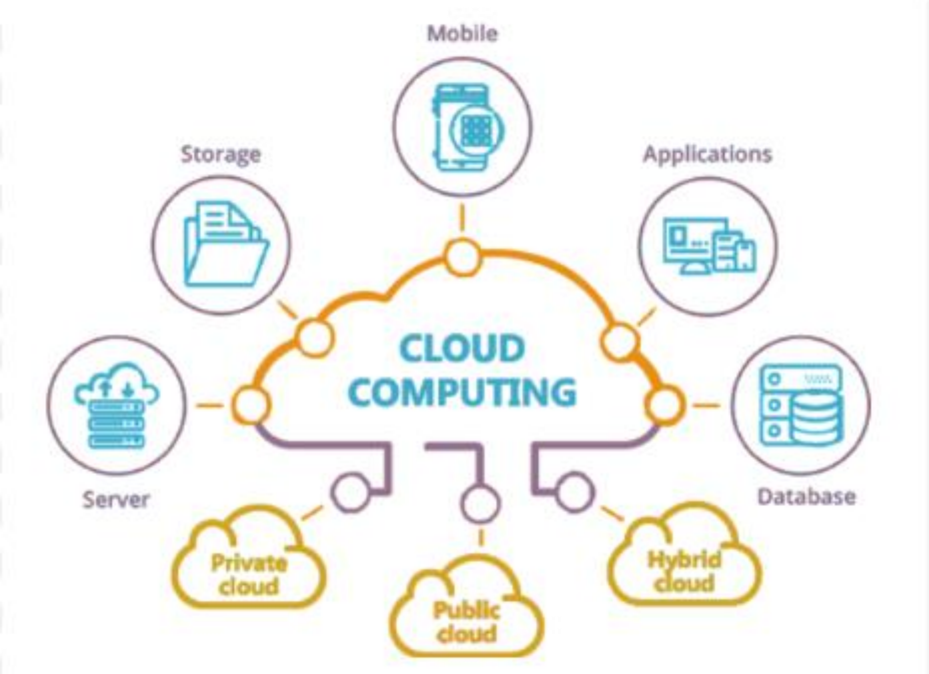


Characteristics of Cloud Computing:

On-demand self-service: Without being a part of the internal IT infrastructure, a user can call upon cloud services as needed. One can acquire computational skills like memory and server time without needing to interact with others.

Virtualization: The ability to simulate an alternate execution environment from the system hosting the applications that are in charge of optimizing performance by making the most of the computer's capacity is one of virtualization's most crucial features.

Resource pooling: The computing resources of the provider are shared by several customers and include storage, processing and network bandwidth.

Broad network access: Client platforms are accessible via a network, including workstations, tablets and mobile phones.

Measured service: By utilizing metering capabilities, resource optimization can be automatically optimized through cloud computing. The user receives billing based on how the services are used.

Rapid elasticity: Users can add and remove capabilities as fast as they'd like when using elastic provisioning. Customers frequently believe that the possibilities are limitless.

High availability and reliability: The chances that any infrastructure will fail is minimized due to the high availability of reliable servers.

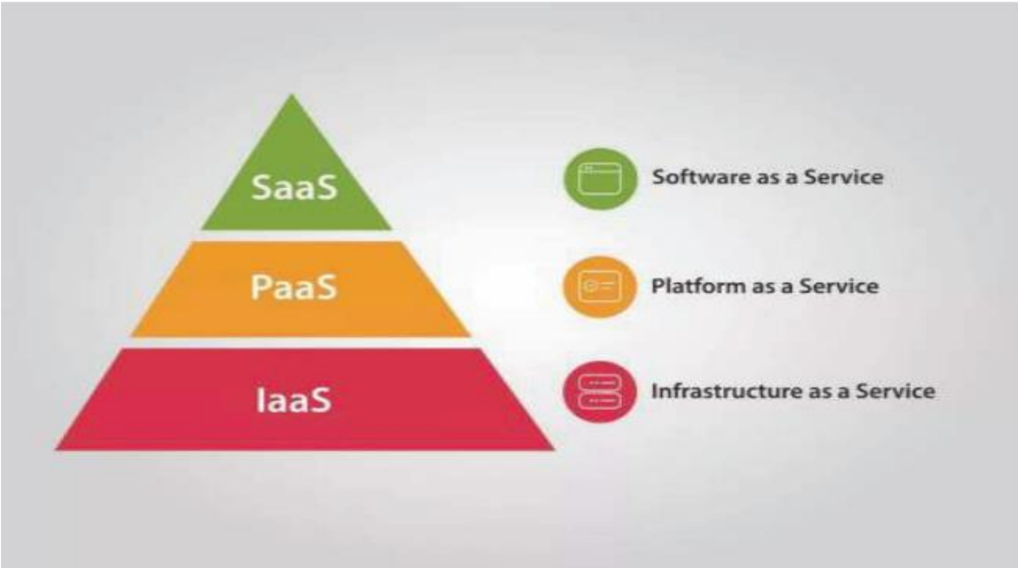
Maintenance: Managing such applications is made easier because each user machine does not need to have the applications installed manually.

Cloud Service Models:

- **i.** Infrastructure- as- a- Service (IaaS) IaaS is indeed termed as Hardware as a Service (HaaS). It's an online computer network that you can manage. The main benefit of adoptingIaaS is that it spares users from having to spend money and effort on purchasing and maintaining hardware resources. This service's scalability, dynamic nature, and flexibility are its main advantages. IaaS comes in three flavors: public, private, and hybrid cloud. The infrastructure of a private cloud is located at the client's site. For instance. Amazon EC2.
- **ii.** Platform- as- a- Service (PaaS) PaaS offers the runtime environment. It facilitates the development, testing, execution, and deployment of web applications by programmers. Users do

not need to worry about managing infrastructure because these applications can be purchased from a cloud service provider based on usage and accessed through an Internet connection. Google App Engine, SalesForce.com, AppFog, and Openshift are a few PaaS providers. PaaS providers offer databases, application frameworks, programming languages, and other tools.

iii. Software as a Service (SaaS) SaaS is sometimes called "On-Demand Software." With this type of software distribution, customers can access services hosted by cloud service providers without having to install any software on their computers. NetSuite, Oracle CRM, Google Apps, Microsoft Office365, and Salesforce.com are a few SaaS providers. These companies offer a range of business services, assist with the creation and management of different electronic documents, and many email providers use software as a service (SaaS) to offer their products. Because SaaS is based on a monthly or annual membership, businesses can access business activities for less money than they would have to pay for copyrighted goods.



Objectives of the Study:

i. To conduct a statistical analysis of cloud-based scheduling techniques based on heuristics.

ii. Compare the various load balancing strategies currently in use using a simulation approach and the pertinent cloud computing parameters.

iii. Create and model a productive load-balancing strategy for cloud environments. To assess how well the suggested strategy performs in comparison to current load balancing techniques on pertinent cloud computing parameters.

Methodology:

LOAD BALANCING - The term "load balancing," which is related to cloud computing, refers to the process of dividing up workloads among several servers or computational resources. Any computing resource, including networking devices, hard drives, and servers, could split the workload. This enhances the system's utilization and response time. From an application standpoint, efficient load balancing is necessary for a portal that receives a lot of traffic in order to maintain business continuity. Load balancing contributes to the preservation of system stability, speed, and breakdown prevention.

CLOUD SIMULATION TOOLS

Most cloud-based simulators are available for free or as open-source implementations, with the apparent advantage that researchers can access the source code and make the necessary modifications and enhancements pertinent to their particular research issue. Additionally, it makes the advancement easily accessible for future generations to expand upon. In cloud computing, a specific simulation tool is used based on the problem domain. For load balancing in the cloud, or scheduling the tasks so that they are evenly distributed across various virtual machines and datacenters in the cloud-based model, main simulation tools are utilized. Its main goals are to minimize the amount of waste material that datacenters produce, increase the energy efficiency of those facilities, and use fewer hazardous materials that harm the environment.

CloudSimPlus

For modeling and simulating cloud computing infrastructure and services, this Java 8 + framework is highly extensible, fully functional, and ready to use. A different research team, Manoel C. et al., expanded on it to produce a more modern and enhanced product, appropriately called Cloud Sim Plus. The open-source project, which can be accessed at http://cloudsimplus.org, is a separate fork of Cloud Sim version 3 that addresses the problem of writing duplicate code for heuristic implementations in Cloud Sim. Because Cloud Sim Plus is compatible with Java 8, lambda expressions can be used to write more 37 succinct lines of code. It adheres to the design principles of software engineering. It also has some unique features that allow heuristics requiring the dynamic creation of virtual machines to be implemented and Cloudlets has built in workload traces.

ANALYSIS OF LOAD BALANCING ALGORITHMS IN CLOUDSIMPLUS

Various algorithms are designed to efficiently balance tasks or workload in cloud-based scenarios. In the task scheduling problem, tasks are scheduled based on their dynamic arrival times since they arrive at different times. While some tasks in the batch or static mode are grouped together and then scheduled together, in the online mode, also known as the dynamic mode, tasks are scheduled to virtual machines for processing immediately upon arrival rather than being kept waiting for other tasks to arrive. They do not have a dynamic schedule. Each strategy has advantages and disadvantages. The main algorithms from the literature are used, and the performance metrics are used to compare the outcomes.

• MCT (Minimum Completion Time)

• MET (Minimum Execution Time)

• SA (Switching Algorithm)

• KPB (K Percent Best)

• OLB (Opportunistic Load Balancing)

Minimum Completion Time (MCT) - When a task is received and is awaiting assignment to a virtual machine, this heuristic looks for the virtual machine that will complete it in the shortest amount of time. The machine's completion time and the task's ready time, which is the amount of time it takes for the machine to get ready for use, are added to determine the overall time. Since the virtual machine that was chosen to carry out the task is now scheduled to carry out this new task, its ready time is updated.

Minimum Execution Time (MET) - This heuristic looks for the virtual machine that will complete a task the quickest when it is received and waiting to be assigned to one for execution. This would usually imply that, given its lowest execution time, the machine (or group of related machines) with the largest processing capacity is ultimately chosen to process every task. This results in idle machines on other machines.

Switching Algorithm (SA) -Each of the two approaches has advantages of its own: MCT distributes the load among the machines, while MET offers the fastest execution speed. Based on this, a strategy of using MET primarily outside of specific thresholds, where the load is too high or too low, can be implemented. When it is more advantageous to do so, MCT can be used to try and balance the load across machines. The goal of the switching algorithm is to combine the benefits of each of these algorithms.

K percent best - Another algorithm that benefits from the combined use of MET and MCT features is this one. It makes use of the crucial component of MET of faster execution times by choosing a subset of faster processing machines (K percent best machines), and it uses MCT for the remaining optimization to obtain a make span value that is shorter than MCT. In contrast to MCT, the machines are probably going to be more idle.

Opportunistic Load Balancing (OLB) -The shortest amount of time needed for a machine to become available to take on the next task is the only focus of this algorithm. It selects a machine at random if there are multiple machines available to take up the next task. In most cases, this is less efficient than other algorithms because it completely omits the execution time component.

Statement of the Problem:

The industry has made extensive use of cloud computing due to its exponential growth, which also causes data centers to expand quickly. Numerous concerns, including load balancing, security, energy management, fault tolerance, and storage management, among others, needed to be addressed. Researchers are working to provide a more scalable, available, flexible, affordable, and secure cloud environment in order to address these issues and guarantee the usage of the cloud. The primary points to be kept in mind when conducting cloud computing research are listed below.

One of cloud computing's most important challenges is the performance overhead. A business using cloud infrastructure may see performance gains as a result of the growing demand for rapid access to data and resources in the system. Unfortunately, a lack of bandwidth, a 19-minute response time, inefficient CPU and memory use, scalability problems, and excessive data center use limit this performance. Therefore, an efficient method is needed to boost performance in the cloud computing environment.

Within a cloud ecosystem, hundreds to thousands of servers can be housed in a single datacenter. Millions of servers can be found in the numerous datacenters owned by the major cloud providers, such as Amazon and Microsoft. Each server can host anywhere from tens to hundreds of virtual machines using the server consolidation technique, which maximizes resource utilization and reduces energy consumption. Because of these different benefits of server consolidation, which vary depending on the kind of decision-making process used to carry it out.

Conclusion of the Study:

Grid computing is the foundation of the well-researched problem of task scheduling onto virtual machines to achieve load balancing in cloud computing. In this study, the mean performance of the heuristics was compared for statistical significance, and the effectiveness of common task scheduling heuristics was assessed within a statistical framework where the cloudlet length and arrival times followed a statistical distribution. On the new cloud simulator Cloud Sim Plus, experiments were conducted with three batch and five online heuristics. Nonparametric hypothesis tests were used to compare the key performance metrics for variations in their means. Researchers in the field have a new method to increase the accuracy of result interpretation. MCT and KPB were found to be better performing heuristics for online mode Cloud models in the simulated scenarios due to their lower make span, better throughput, and faster response times. The model that performed the worst, MET, was obviously unsuitable for cloud-based models.

Regarding future research, this suggested framework for assessing heuristics can be expanded to include many more heuristics that are discovered in the literature in addition to any newly proposed ones. To simulate real-world conditions, different statistical distributions for cloudlet length and arrival times can be taken into consideration. Cloud Sim Plus, which is extensible and supports a variety of scenarios related to cloud computing, can be used to implement simulations. The results of simulations comparing load balancing heuristics in cloud computing can be interpreted in a more robust and trustworthy manner by using the statistical techniques discussed here.

REFERENCES:

[1]. Zhang, Shufen, Hongcan Yan, and Xuebin Chen. "Research on key technologies of cloud computing." Physics Procedia 33 (2012): 1791-1797.

[2]. Padhy, Rabi Prasad, and Manas Ranjan Patra. "Evolution of cloud computing and enabling technologies." International Journal of Cloud Computing and Services Science 1.4 (2012): 182.

[3]. Singh, Manjeet. "An overview of grid computing." 2019 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS). IEEE, 2019.

[4]. Mahmood, Zaigham. "Cloud Computing Technologies for Connected Digital Government." Web 2.0 and Cloud Technologies for Implementing Connected Government. IGI Global, 2021. 19-35.

[5]. Armbrust, Michael, et al. "A view of cloud computing." Communications of the ACM 53.4 (2010): 50-58.

[6]. Mell, Peter, and Tim Grance. "The NIST definition of cloud computing." (2011).

[7]. Gill, Sukhpal Singh, and Rajkumar Buyya. "A taxonomy and future directions for sustainable cloud computing: 360 degree view." ACM Computing Surveys (CSUR) 51.5 (2018): 1-33.

[8]. Stieninger, Mark, and DietmarNedbal. "Characteristics of cloud computing in the business context: A systematic literature review." Global Journal of Flexible Systems Management 15.1 (2014): 59-68.

[9]. Tadapaneni, Narendra Rao. "Different Types of Cloud Service Models." (2017)

[10]. Diaby, Tinankoria, and BabakBashari Rad. "Cloud computing: a review of the concepts and deployment models." International Journal of Information Technology and Computer Science 9.6 (2017): 50-58