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Comparative Review of Cloud Simulation Tools

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ABSTRACT

Because it can provide inexpensive services on a pay-as-you-go basis, cloud computing is growing in popularity. Numerous methods have been explored to enhance services. However, choosing how to compare new approaches based on multiple performance limits is one of the biggest issues in this subject. Real-world experimentation can be difficult and expensive. Therefore, many studies focus on developing cloud modelling tools that can simulate the actual cloud environment. In order to choose the best tool for cloud computing, this study gives a thorough examination of 25 of them. This will give readers tips on how to pick the best instrument to evaluate their approach. Additionally, the review will enable academics to compare the architecture, strength, limitations, and supported model of the most popular cloud simulators.

Keywords-Cloud computing, Cloud simulation tools, Comparative analysis.

INTRODUCTION

Cloud technology has increased in popularity because of its wide variety of services, versatility, reliability, affordability, and performance. To improve services, researchers have designed a variety of strategies. Allocation policies, scheduling approaches, load balancing mechanisms, security and privacy enhancements, and so on are just a few examples. Experimental analysis is necessary to determine the performance of the technique. However, analysing the technique in a real-world environment is highly difficult and expensive. As a result, cloud simulation tools have emerged as an effective and attractive alternative to performance assessment [1, 2].

Cloud users and cloud providers are the two main participants in the cloud environment. Simulation tools will be advantageous to them both. For instance, cloud service companies can create and test innovative methods to enhance their offerings. Cloud users can easily compare the offerings of various cloud providers. Researchers can easily evaluate their approaches before putting them to use [3, 4] as well. The following benefits of cloud simulation tools over a real-world cloud environment:

- The installation and maintenance costs for these tools are lower.
- The workload conditions and input parameters can be changed with ease. As a result, the results can be compared under various conditions.
- The simulated cloud environment is easier to understand than the actual cloud environment.

COMPARATIVE ANALYSIS OF CLOUD SIMULATION TOOLS

One of the main goals of this study is to look at each cloud simulator and discuss the key features that each one offers. Many simulation methods have been developed and used in the literature to assess the technique's efficiency. Table 1, presents a comparative study of various simulation tools based on some important parameters.

Table 1. Comparative Analysis of Cloud Simulators

Simulator	**GUI**	**Application Model**	**Energy Model**	**SLA Support**	**Cost Model**	**N/W Topology Model**	**Congestion Control**	**Traffic Pattern**	**Federation Model**	**Parallel Experimentation**	**Documentation Available**	**Platform Portability**	**eDistributed Architecture**
CloudSim		Y	Y		Y	Y			Y		Y	Y	
Network CloudSim		Y	Y		Y	Y			Y		Y	Y	

AcloudAnalyst	Y	Y	Y		Y	Y			Y		Y	Y	
EMUSim		Y	Y		Y	Y					Y		
CDOSim	Y	Y	Y	Y	Y	Y			Y		Y	Y	
TeachCloud	Y	Y	Y	Y	Y	Y			Y			Y	
DArtSim	Y	Y	Y		Y	Y			Y			Y	
DartSim++		Y	Y		Y	Y			Y		Y	Y	
ElasticSim	Y	Y	Y		Y	Y			Y		Y	Y	
Federated CloudSim		Y	Y	Y	Y				Y		Y	Y	
FTCloud Sim		Y	Y		Y	Y			Y		Y	Y	Y
WorkflowSim		Y	Y		Y				Y		Y	Y	
CloudReports	Y	Y	Y		Y	Y			Y		Y	Y	
CEPSim		Y	Y		Y	Y			Y		Y	Y	
Dyanmic CloudSim		Y	Y		Y	Y			Y		Y	Y	Y
CloudExp	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	
CMCloud		Y	Y		Y				Y		Y	Y	
MR-CloudSim		Y	Y		Y	Y			Y		Y	Y	
UCloud		Y	Y		Y	Y			Y		Y	Y	Y

RESULTS AND DISCUSSION

From Table 2, we have analysed the following:

- Java is the most popular simulation tool language, accounting for 68 percent of all tools, followed by C++, which makes up 28 percent of all tools.
- Only 16 percent of the procedures are still unavailable to researchers, making the majority of them free to employ.
- Only 36% fully support graphical user interfaces.
- Only 28% of tools provide an entire communication model. but only 56% of people have unrestricted access to information.
- To improve green computing, almost 84 percent of the tools support energy modelling.
- Only 36% of the available tools are suitable with SLA requirements.
- 72 percent of the tools support a cost model.
- Only 4% of the tools were created utilising both software and hardware, making software-based tools the majority.
- The majority of the effort is concentrated on performance and energy modelling, as we stated in the paper.
- At this time, there are no technologies that can take into account every aspect of security.
- No tool takes the priority constraint into account. It can simulate actual cloud settings if the technology enables users to select priorities for the work and resources.
- A profit model that takes into account user needs is necessary.

CONCLUSION

Simulation tools are essential for the design and evaluation of methods due to the popularity and sophistication of cloud computing. The number of tools for modelling cloud settings has increased significantly over the past few years, but they all have different levels of efficiency and power. In this work, the characteristics of 25 simulators are studied and analysed. When the results are combined, it seems that none of them are all-encompassing in every way. It is advised to employ a combination of software for different optimization techniques including load balancing and energy efficiency. These technologies can also be enhanced for use with other emerging cloud models, such as Edge, Fog, Mobile Cloud Computing, and others.

FUTURE SCOPE

We examined several cloud simulators, highlighting their salient benefits and shortcomings. Some unresolved research issues that should be considered in next studies include the following:

- All facets of security, including authentication, decryption, and encryption.
- The order of tasks.
- Profit model that takes into account user needs.

Finally, federation across several cloud resource pools enables apps to function in the most suitable infrastructure conditions. Additionally, it makes it possible to distribute workloads globally and transfer data between different systems. Thus, the creation of a tool that can be used to federated cloud systems while still upholding SLAs is required. It should also take into account how to use resources, power, and profit per cloud service provider as efficiently as possible.

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