MATHEMATICAL MODEL APPROACH IN CLOUD COMPUTING

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Abstract

As more and more information on individuals and companies are placed in the cloud, concerns are beginning to grow about just how safe an environment it is. It is better to prevent security threats before they enter into the systems and there is no way how this can be prevented without knowing where they come from. The issue of resource allocation and revenue maximization is also equally important especially when it comes to cloud security. Over the years, there is a significant advance in cloud computing technology. It has grown from being a promising business concept to one of the fast growing sector of the information technology organizations. However, customers are still reluctant to deploy their business in the cloud. Security is one of the key factor which hampers the growth of cloud computing. The exponential growth of the internet users has also lead to a significant growth of threats. Mathematical modelling plays as an important tool in analysing and mitigating possible threats or attacks on cloud computing.

Keywords: *cloud security, cloud computing.*

Introduction

Cloud computing systems have become the de facto standard in many areas of advanced information technologies. Companies use clouds to deploy their scientific and business applications. They avoid the costs of creating and maintaining their own data centers. On the other hand, the owners of cloud computing data center by consolidating computing resources and storage systems are able to reduce the total cost of IT infrastructure ownership by serving a larger number of customers. Usage of effective technical tools for scheduling and load balancing, packet routing control and integration of several territorial disparate data center segments are another ways to reduce costs for computing cloud data center owners.

Storing data in the cloud can be considered quite attractive form of outsourcing focused on daily data management. Despite this claim, but the real responsibility for managing the data falls within the company that owns the data. With this in mind, it is important to understand some of the causes of data corruption. Such causes advise keeping the big responsibility of a cloud service, some basic best practices for the use of secure data storage to the cloud, as well as the methods and standards for monitoring the integrity of the data regardless of data storage. In order to achieve higher security and redundancy of the data stored in the cloud at the same time locally. One of the main advantages of storing data in the cloud, is unlimited access to the data, with no limitations lies in the time and place of access. This property is used by firms whose occupation takes place in various remote locations. For such companies it pays to enter into cloud solutions and, therefore, that this eliminates the burden of physical storage devices, use the same computer and multiple access data in real

time (real-time reporting). In this case, it is important to create storage cloud to think about the specialty store. Although there is hundreds of cloud storage, each storage site is oriented to other requirements, such as storing communication by e-mail, store employee profiles, documentation storage projects, etc. Of course, requirement may also store all types of documents.

Modern trends in the design and development of distributed information systems of multifunctional measuring complexes assume, taking into account the proposed advantages of IoT technologies, their construction based on architectural solutions of cloud-based, fog and boundary computing. Cloud computing is the concept of building a distributed system with the provision of network access to a scalable and flexible set of common physical or virtual resources. Fog computing is a structure that is located in the common network architecture between the end devices (sensors and measuring system devices) and data centers, which allows to improve service quality, delay time and reduce traffic volume through public networks. Edge computing is a further development of technologies in which the computing infrastructure is even more close to the end client, and most of the operations are performed in the boundary network of a particular client. If in fog information systems, calculations are performed in a node near the place of data collection, then the boundary ones allow data to be processed in the same place where they are received, which allows for instant response, since in this case, a programmable logic controller is used, which can be part of a production or process control system. It controls the end devices and has the ability to instantly process the received data.

CLOUD COMPUTING

Cloud computing refers accessing application or saving information on the internet rather than on local storage devices. Cloud is synonym to internet or services that we can get over the internet and there is no need to create the infrastructure like storage or high-end processing at local sites. You simply need fast access to the internet so that one feels like accessing the data on local host itself.

If computers like those envisioned by computer scientist John McCarthy become the norm in the future, computing may be set up like the phone system is now: as a public utility "McCarthy says. The author thinks that the computer utility could be the foundation for a new and important company.

Privacy and accuracy of data:

Even though public cloud is less expensive and requires less management of resources, there are still risks to data security. On the other hand, security threats are more likely to affect the cloud computing paradigm than any other type of computer architecture we've seen so far. In the past few years, the number of people and apps that use the cloud has grown by a huge amount. When these things happen, cloud clients are more likely to lose or have their data stolen. If an attack on records and archives works, it's possible that information about everyone who uses the cloud could be accessed without their permission.

Retrieve data and keep it safe:

Because the cloud pools resources and is flexible, it allows users to get the capacity they need when they need it. Some of the resources given to a user may be given to

someone else at a later time. If a malicious user only has a small amount of memory and storage space, he or she could use data recovery methods to get the information of previous users.

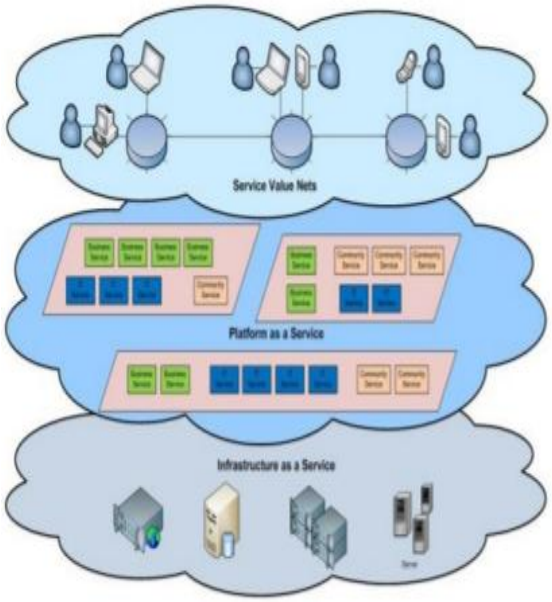

Figure: Cloud Architecture

METHODOLOGY

Modeling the Cloud

Here we need to understand that how to model a cloud in cloudsim simulator. The detailed study is here to describe everything and as shown in figure.

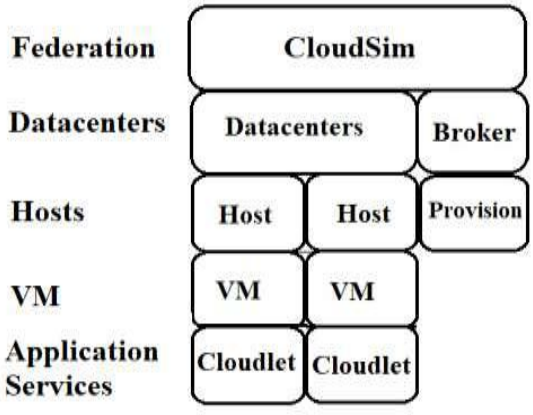

Figure: Modeling the Cloud

Construct Data center Broker or Cloud Coordinator: The agent monitors SaaS providers for them. It selects acceptable cloud service providers by examining the Cloud Information Service (CIS) and requires online enterprises in the merit and profit sector to meet the QoS standards of the framework. This group might be extended to include analysts and system developers responsible for examining and verifying bespoke brokerage regulations.

Cloud Coordinator: The federation has a cloud-based knowledge centre in this abstract category. It regularly monitors the architecture of the knowledge centre and ensures that complex load-shredding choices are performed. During load shredding, this segment's physical implementation includes the necessary sensors and operations to be performed. The update Datacenter () technique maps the capabilities of an information centre using sensors.

Table: Simulation Parameters

Sr. No.	Parameters	Value
1	Cloud Image	Montage-1000
2	No. of Cloudlets	1000
3	No. of Virtual Machines	200
4	Scheduling Algorithms	(a) Round Robin (b) Min Min (c) Minimum Completion Time (MCT) (d) Max Min (e) First Come First Serve (FCFS)
5	Planning Algorithm	HEFT
6	File System	Shared
7	Clustering	No
8	Fault Tolerant Parameters (a) FTC Monitor (b) FTC Failure	(a) Monitor VM (b) Failure VM

Table: Summary of Results

Sl. No.	Algorithm Name	Average No. of Failed Cloudlets	Average Total Cost	Average Total Execution Time
1.	Round Robin	16.55	3984.54	5549.9405
2.	Min Min	13.15	3862.1	5261.283
3.	MCT	21.35	4116.13	6043.3475
4.	Max Min	23.5	4239.27	6136.481
5.	FCFS	16.1	3974.25	5571.493

Figure compares different algorithms to the cumulative number of unsuccessful cloudlets. The MIN-MIN algorithm has the lowest total number of failed cloudlets in this table, whereas the MAX-MIN algorithm has the maximum.

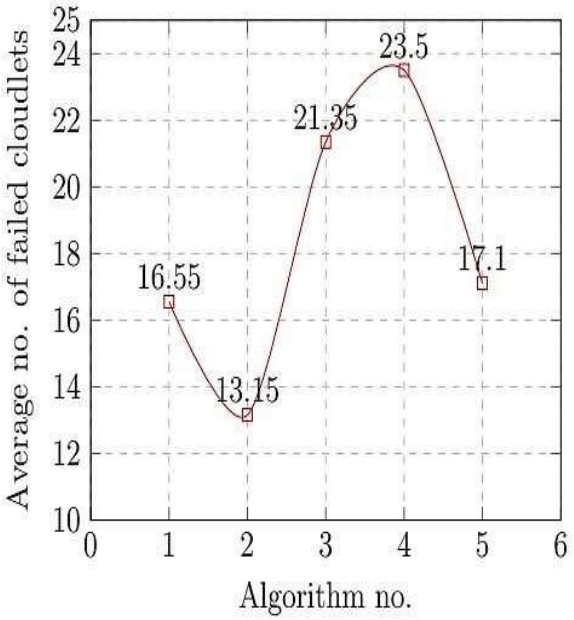

Figure: Evaluation of the failed cloudlets' wise average algorithm

Figure summarises the net cost of both algorithms. The MCT algorithm has the lowest cost of both, whereas the FCFS algorithm has the highest cost value.

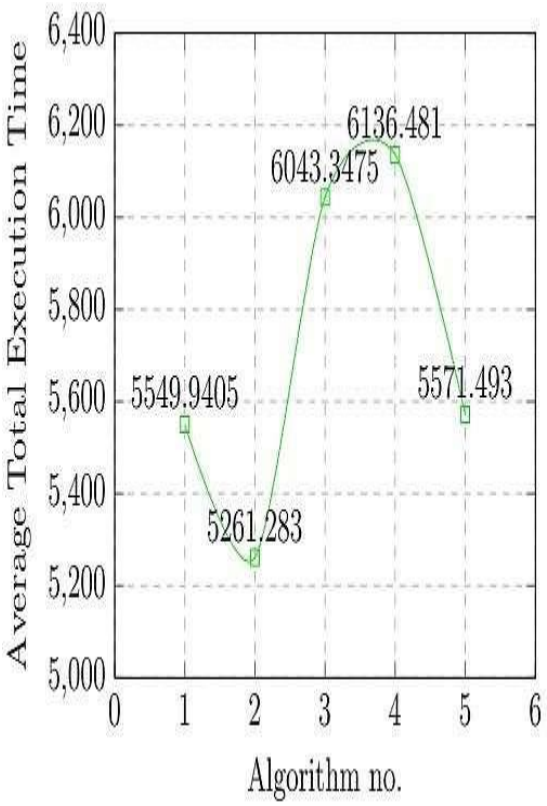

Figure: Comparison of Average Total Execution Time algorithm wise

In this chapter, we have given the detail study of cloudsim tool with proper description of classes and methods as entities. A native tool is also discussed with components and the name of such native tool is WorkflowSim. We have also studied and analyzed various existing scheduling algorithms with proper result analysis. Various existing algorithms are discussed with proper algorithm and advantages & disadvantages.

Conclusion

Cloud computing is quickly becoming a modern, cost-effective way to give customers access to a wide range of services and resources whenever they need them. There are many services available in the virtualized cloud resources. Cloud isn't a new technology in and of itself, and it's either the network or the network. It builds on technologies that are already out there, like parallel computing, grid computing,

etc. Cloud computing is a way to deliver internet services by using an infrastructure and a set of rules that use technology that already exists. The main conclusion is the possibility of using a multi-level representation of the topological structure to determine the optimal architecture of the distributed information system of a multifunctional measuring complex based on cloud, fog and boundary calculations.

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