A COMPARATIVE STUDY ON DISTRIBUTED COMPUTING AND CLOUD COMPUTING

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Abstract: *Distributed and Cloud computing are useful in heavy workload processing with minimum cost. Distributed computing works in a manner that a task is divided into different subtasks and distributed to various computing nodes. Cloud computing may be considered as extension of distributed computing with added features of providing on demand elastic computing resources usually on a pay per basis. There are so many situations where distributed computing and/or cloud computing can be used. This paper surveys both distributed computing and cloud computing and can be used as a roadmap for researchers, students, and commercial users.*

Keywords: Cloud Computing, Distributed Computing, Scheduling, Resource Management.

INTRODUCTION

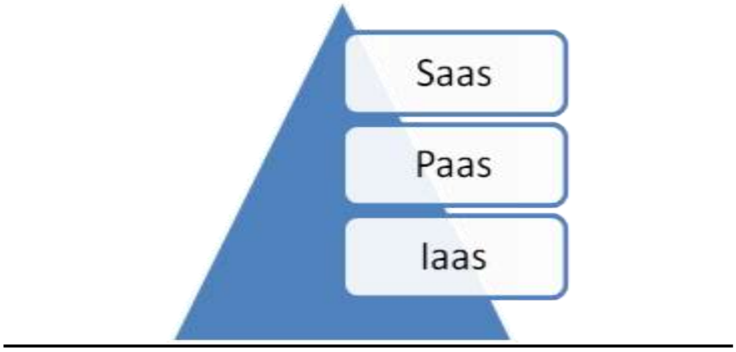
Cloud computing: Cloud computing refers to the collection of hardware, software and remote servers working collectively in a network to provide services like resource sharing, storing, managing and processing of data to the end user [1]. The primary advantage of using cloud computing is cost saving. There are many cloud service provider facilitating hardware and software services. Hardware services enable user to have equipments at remote location where as through software services one can make his application run over the entire network or a company may store its data on server at some other location by service provider. A hybrid computing provides public and private cloud to store public data and sensitive data in respective clouds. The common examples of cloud computing are Google drive, online version of word, spread sheet, presentation etc.

Service model of cloud computing as given in [2]: Fundamental Models for providing service in Clouds are:

Infrastructure as a service: This model manages server, storage and virtualization. It helps in managing application, middleware, data etc. Hardware cost saving is the advantage of this model.

Platform as a service: This model provides platform for computing such as operating system, execution environment for an application. This layer enables to run software without paying for the cost of required underlying software and hardware.

Software as a Service: In this model user may have an access to application software and databases. The applications are installed and operated on cloud service provider and the user can execute them as cloud client. The user needs not to pay licensing fee for the software. One of the common examples of SaaS is online banking.



Distributed Computing: Distributed computing system provide concepts in which multiple client machines are connected on a network to solve a common problem. Each machine has its own task and gives an illusion as if a single computer is working [3]. All client machines are located at geographically different location and communicate through message passing. Distributed computing is also called as distributed system [4].Fast response time, cost effectiveness and incremental growth are some major advantages of distributed systems.

Some challenges in distributed computing in [5, 6] are:

Openness: availability of independent and separated interfaces for easy resource extension.

Security: resources should be accessible to correct user in a secure way.

Scalability: Adding new resources should make the system effective.

Rest of the paper is as follows: section 2 discusses related works of distributed and Cloud computing. In Section 3, conclusion and our contribution is presented.

BACKGROUND

A large body of literature is available on distributed computing and cloud computing. Various research groups are exploring the ways to use distributed and cloud computing as next generations paradigm shift.

Literature on distributed computing and scheduling of resources:

Braun et al. provided study on one even basis for comparison and insights into circumstances where one technique out-performed another. The evaluation procedure was specified, the heuristics were defined, and then comparison results were discussed. It was shown that for the cases studied there, the relatively simple Min–min heuristic performed well in comparison to the other techniques [7].

Casavant et al. proposed one measure of the usefulness of a general-purpose distributed computing system as the system's ability to provide a level of performance commensurate to the degree of multiplicity of resources present in the system. Taxonomy of approaches to the resource management problem was presented in an attempt to provide a common terminology and classification mechanism necessary in addressing this problem. The taxonomy, while presented and discussed in terms of distributed scheduling, was also applicable to most types of resource management [8].

Lee et al. presented a task allocation model that allocated application tasks among processors in distributed computing systems satisfying: 1) minimum inter processor communication cost, 2) balanced utilization of each processor, and 3) all engineering application requirements [9].

Bal et al. described the three main characteristics that distinguish distributed programming languages from traditional sequential languages, namely, how they deal with parallelism, communication, and partial failures. Finally, they discussed 15 representative distributed languages to give the flavor of each. These examples include languages based on message passing, rendezvous, remote procedure call, objects, and atomic transactions, as well as functional languages, logic languages, and distributed data structure languages [10].

Hosseini et al. proposed algorithm that allows for the reentry of repaired or replaced faulty facilities back into the network, and it also had provisions for adding new nodes to the system. Sufficient conditions were obtained for designing a distributed fault-tolerant system by employing the proposed algorithm. The algorithm had the interesting property that it lets as many as all of the nodes and inter node communication facilities fail, but upon repair or replacement of faulty facilities, the system could converge to normal operation if no more than a certain number of facilities remain faulty[11].

Literature on cloud computing and scheduling of resources:

Sotomayor et al. presented a model for predicting various runtime overheads involved in using virtual machines, that allows efficient support advance reservations in [12].

Shrivastava et al. proposed two algorithms 1) Starvation-Removal and 2) AR-to-BE Conversion to solve problems related to resource management. They demonstrated experimentally results of the proposed algorithms to stop starvation of BE leases for resources and effectively improve request acceptance rate [13]. Starvation removal algorithm with improvements was also proposed in [14].

In [15] CBUD Micro, a performance evaluation tool was presented that can be used at both cloud host and consumer side for resource management by supporting scheduling decisions. They also described the vision and architecture of CBUD Micro in detail and and the way in which core components were implemented.

In [16] a new leasing policy named CRI (Consumer Rating Index) and an algorithm for prioritizing consumers on the basis of CRI scores was proposed to manage the cloud host resources properly. This policy and algorithm can be used for efficient functioning at cloud hosts side was also presented.

In [17] mEDF (Modified Earliest Deadline First) algorithm and leasing policy for deadline driven resource management was introduced. This algorithm takes care of minimum capacity expenses at cloud host side. mEDF can be used for deadline driven scheduling with minimizing response time and completion time.

Zhang presented a survey of cloud computing, highlighting its key concepts, architectural principles, state-of-the-art implementation as well as research challenges. The aim of his paper was to provide a better understanding of the design challenges of cloud computing and identify important research directions in this increasingly important area [18].

Beloglazov et al. proposed an energy efficient resource management system for virtualized Cloud data centers that reduces operational costs and provides required Quality of Service (QoS). Energy savings were achieved by continuous consolidation of VMs according to current utilization of resources, virtual network topologies established between VMs and thermal state of computing nodes [19].

Conclusion

Cloud computing and Distributed computing both are useful in their application areas. Scheduling of resources is also a major factor in both paradigms to exploit the full power of both computing paradigms. Various algorithms and policies for the same are discussed in this paper. Algorithms based on discussed problems and their solutions are the foremost research topics and need attention of scientific community.

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