Volume: 4, Issue: 12
Page: 53-61
2020

ISSN 2520-4750 (Online) & ISSN 2521-3040 (Print)

International Journal of Science and Business

State of Art Survey for Significant Relations between Cloud Computing and Distributed Computing

Yousif Sufyan Jghef & Subhi R. M. Zeebaree

Abstract:
Cloud computing plays a significant role in the world of computers. It is a modern technology that provides a fast access mechanism, expandable, reliable, and provides user specific-facilities such as software services and infrastructure. Through the Internet, the user can access resources wherever they are, so this technology is beneficial in their daily lives. Cloud services provided by the cloud (SAAS, PAAS, IAAS) enable the user to access programs and the platform. Security is the main problem facing the cloud, so people think that using the cloud and its services is not safe, as there is no guarantee of stored information. Distributed computing is a computer division that explores distributed systems, and a distributed system is a system. That exists on computers connected to the network to be communicated through messages passed between each other. Using distributed computing systems has increased due to lower hardware costs and advances in computer network technologies. Distributed computing systems provide the potential for better efficiency and sharing of resources. This article will give a brief overview of cloud history computing, its evolution, advantages, and security aspects, as well as the history of distributed computing, its structure, applications, benefits, and disadvantages.

IJSB
Accepted 01 November 2020
Published 03 November 2020
DOI: 10.5281/zenodo.4237005

Keywords: Cloud Computing, Distributed System, SAAS, PAAS, IAAS.

About Author (s)

Yousif Sufyan Jghef (corresponding author), College of Engineering and Computer Science - Lebanese French University.
Subhi R. M. Zeebaree, Duhok Polytechnic University Presidency.

Corresponding author's E-mail: subhi.rafeeq@dpu.edu.krd

1. Introduction

These days, cloud computing has started gaining strong popularity, has moved global, and has begun to attract the attention of the commercial and academic communities. Performance enhancement using the technique of load balancing. We can spread the process and balance between servers for job processing and enhance the efficiency of our distributed system by using load balance between servers (Rashid et al., 2018). Despite all this, its development did not reach the required level until this hour, and searches for it are continuing. Using ERP systems provides the customer with accountability in the entire creation of the company, from which all departments can access recorded information to ensure that the correct procedures are carried out (*Google and IBM Announce University Initiative to Address Internet-Scale Computing Challenges*, 2007; SUBHI R.M. Zeebaree, Salim, et al., 2020). Cloud computing allows hardware and software programs managed by a company for users to use elsewhere and store data, share information and customer applications, as it provides its services to the user via about the Internet. Hadoop, Dryad, and another map reducing framework are the most common technologies used in the cloud system. There are also several instruments, such as Cap3, HEP, and Cloudburst, used to optimize the cloud system's efficiency. In distributed systems, the Hadoop Distributed File System is used to store and calculate the number of words in a large database. Compared with other applications used for the same reason, Hadoop's performance in distributed systems is obviously very good. Cloud providers need to give customers a good asset to extend their QoS The computations-over-Internet situation refers to the location of the sign-in of multiple customers, taking into account that Internet resources have to be allocated animatedly to concentrate on the cost composition (Alzakholi et al., 2020; Haji et al., 2020; Subhi et al., 2020). Cloud computing has attributes that distinguish it from others, in addition to that it reduces the material cost of the user, reduces management and saves the user from the burden of purchasing and maintaining the infrastructure, all these features have made it an important name in information technology during the current era. Due to over-provision and under-provision issues, the process of supplying clients with shared virtualized resources (hardware, applications, and platform) is a major challenge for the cloud provider (Gowda & Subramanya, 2015; Shukur et al., 2020).

Consequently, the emergence of cloud computing made enterprises feel comfortable that they contributed greatly to their development and to improve their investment in the field of communications and Informatics Applications. Technology has changed our lives and the way we work, but in Small and Medium Enterprises (SMEs) technology has influenced other working methods. Some major corporations use HRMS, but there is a lack of use of cloud technologies (Abdullah et al., 2020). In recent years, cloud computing has become an important value as a specific solution for enterprises all over the world, and its use has increased with the increase cloud computing and the use of the Internet of Things applications, which require huge storage spaces, so the user is looking for great computing power. For practically every small or large industry across the globe, developments in information and communication technology (ICT) have become the means of communication. This technology has changed business practices and contributed to the development of a new concept called Electronic Business (E-Business) (Vouk, 2008; Zeebaree et al., 2019). Also, it saves time and money as it can allocate and release networks, services and applications quickly and with minimal administrative work. The three applications compose the cloud, which are (Software as a Service SAAS, Platform as a Service PAAS and Infrastructure as a Service IAAS). It also consists of five characteristics (Self-service upon request, Network Access, Collecting Resources, Material Transparency and Measured Service). Therefore,

during the implementation of their system, businesses should consider the flexibility aspect, as different consumer demands should not be delayed or postponed for another period (Kumar et al., 2017; Zebari et al., 2019). It consists of four templates for deployment (Private Cloud, Community Cloud, Public Cloud, and Hybrid Cloud). Despite the many advantages that cloud computing possesses, its security is a major concern. The topic of security is discussed in this paper. As for distributed computing, it is a technology that has existed for more than three decades, in which information is exchanged between multiple computers to improve efficiency and performance (Mell & Grance, 2011).

Computing takes place distributed via independent computers that communicate over either Local Area Network (LAN) or Wide Area Network (WAN). Internet users have increased steadily over the last decade, and most of them rely on the World Wide Web (WWW) service for everyday routine achievement. Internet access, particularly WWW, is often difficult for users due to various security issues (Zeebaree et al., 2020). Computers share a shared memory for communication between processors, and multiple computers are used to solve a problem. Moreover, due to the growth of parallel systems and the advancement of programming skills in parallel implementation, access to parallel resources in enormous quantities has recently been facilitated (Alijani et al., 2014; Haji et al., 21, May). The problem is divided into components, and one or more computers solve each component. Thus, the distributed system will appear as a single interface for the end-user. The goal of all this is to increase resources and information while preventing faults. Even if one of the systems fails, this will not affect the availability of the service (Vaquero et al., 2008). The main objective of this paper is to provide the comprehensive comparison among cloud computing and distributed systems. Also, to demonstrate different technologies development, applications, services, advantages/disadvantages and characteristics.

2. Cloud Computing

The word cloud means a carrier that offers Internet services. However, the word computing implies that a machine provides computation. The computation in the cloud began to provide its programs as a service (SAAS), which is the software that is published over the Internet. develop and operate the application, and the base service(IAAS), which began in 2006, which provides the customer with the service of renting servers as shown in figure 1.

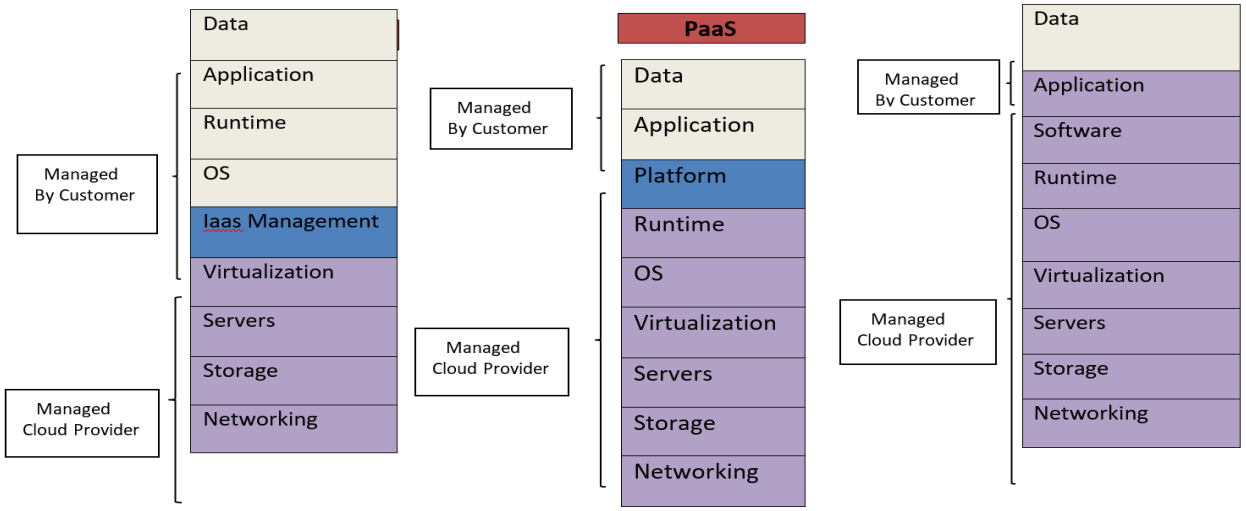

Fig. 1: Various cloud infrastructure models and management of services by cloud providers and clients.

Also, the (PAAS) service, which offers a forum for clients to build, operate and manage applications without the need to construct and maintain applications infrastructure to Cloud computing is one of the technologies in this era that has great applications , especially when it is complemented by distributed computing and parallel processing, then its advantages would be increased (Rashid et al., 2019). Cloud computing continued to evolve from previous technologies, so it includes the following:
Utility computing: In 1960, prices were high, so the idea of sharing computing resources was reached, with the goal being to integrate distributed applications and servers around the world to be shared with multiple users and thus the user could pay for the period in which he used the Just Utilities. Computing on the grid: is the method of distributing tasks among different devices on a network, that is, dividing the problem into smaller problems and solving them on simple computers to obtain a solution to the big problem. Cloud computing: In that era, in terms of technology, cloud computing has grown a lot to please; everybody needs. However, without an abundance of challenges and problems, Cloud Computing and IoT in FI will not be applied (Ghosh, 2014; Haji et al., 2020.).

2.1. Development of Cloud Computing

Cloud computing developed in five most important aspects that were adopted by (Ma, 2012). First aspect related to the advantages of using cloud computing. It helps organizations make many innovations on the technological capabilities of their enterprise, and thus helps them grow their businesses to obtain a greater benefit. The second one focused on Hybrid Cloud Computing. Public cloud computing should be used even in special cases to obtain compatibility between different services in cloud computing. Third one addresses the Mobile cloud services. Cloud services began with the support of mobile phones, so the user, through mobile phone applications, can store his data and can access it at any time he wants. While, fourth aspect considering the Cloud Security. Despite the many uses of cloud computing, but there is a fundamental problem, which is data security despite the existence of encryption techniques to protect data, but due to the rapid development of technology, the process of breaking some encryption techniques has become somewhat easy, but work continues to find new security protocols in the future. Finally, there is the Cloud design aspect. Organizations that use the cloud have several advantages when compared to traditional organizations because their services are suitable for the younger generation.

Cloud computing allows enterprises to move their resources to a place with more processing power and thus helps reduce the waste of resources. and there are five basic characteristics considered by (Sultan, 2010). Sequencing of these characteristics starts from Self-service upon application, then Network access. After that, Collecting resources, then go through Material transparency. Finally, considering the Measured service. Cloud computing can be split into three services levels (Kavis, 2014): Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). Also, the following considered as a cloud models (Hsu et al., 2014): Public Cloud: Enables users to access services via the Internet, as it is available to everyone. Private cloud: In this type of cloud, enterprises maintain their infrastructure within their networks. Besides, thereby reducing the cost of usage in the long term, to being more secure. Public Cloud: This cloud type is somewhat similar to a private cloud, but many organizations share it. Model of Hybrid cloud deployment: The customer will use more than one model to achieve his company's goals.

2.2. Cloud Applications

Cloud computing development depends on applications used in cloud services (Garg et al., 2013): Software development and testing: Over the past two years, cloud computing has had a major impact on software development and testing. Software development: There are different explanations for the major impact of information engineering and technology on cloud computing growth environment, and among these reasons: Applications must be compatible with the cloud. The application must be ready to serve a large number of users who carry a large amount of data. The services provided via the Internet. The application must be equipped with a high percentage of security that helps it stand up to attacks and protect its data. The user must be able to use the data from any platform. Software testing: Tools for analyzing applications and work patterns need to change according to the many changes that have occurred in software development. Cloud storage: It is a data storage system with cloud computing management. Cloud computing and big data: There is a large number of data that is difficult to process on one device, we can process it either by distributed processing method or by using cloud computing as it can provide the required amount of resources to process this data. Games: Cloud-based games will be approved and become effective as they save money for users switching between multiple games. The Internet of Things (IoT): It is the process of understanding between the interconnected devices, and among these devices: tools, sensors, sensors and others.

2.3. Cloud Security

The issue of cloud security has become an imperative with the adoption of cloud computing, because if it is not protected then the user will be exposed to attacks, and among steps taken to ensure cloud security (Orea, 2011): Password: You must use a complex password and stay away from the one that was used on other sites, and that it has nothing to do with their aforementioned data, and this makes it difficult for the attacker to reveal the password. Recover access: The user must answer the data questions correctly so that he does not forget them in the event that they are asked to answer them when forgetting the password. At the same time, his answers to the questions should be no one else knows so that the attacker cannot access the password through His answers to these questions. Encryption: The encryption technology provided by cloud services is a good way to secure and protect customer data. Multi-factor authentication: The user needs other factors instead of using the cloud service, the username and password, such as random text sent to the phone or another password, and this adds another layer of security to access the services, meaning even if there is someone who has factors that help him penetrate He will not be able to access other factors. Logon monitoring: The user must monitor his devices connected to the cloud service, through which he can identify if someone tried to log in in order to quickly change the password. Personal devices: The user should avoid logging into the cloud using someone else's device, because they may have programs that save the keys that were pressed while the program is running. Viruses, malware and Trojans: The user must have good applications on his devices that help him detect spyware and anti-virus programs.

3. Definition for Distributed Computing

Its origins go back to the design of the operating system that was studied in the late sixties, and the local area network that was discovered in the seventies is one of the most popular distributed /networks that have spread widely. Parallel processors are computer systems consisting of multiple processing units linked by a certain network of interconnections and the software required to work together with the processing units. In general , two main sides (Client and Servers) are installed on any hybrid parallel processing system (Subhi, 2011;

Subhi, 2013). In the late 1970s, distributed computing became a branch of computer science, several conferences on principles of distributed computing were held in the early 1980s (Lynch, 1996).

3.1 Distributed Computing Architecture

Distributed computing is distinguished by its diverse structure, whether on hardware or software, the CPU must at least be connected to a network. The area of parallel processing deals with architectural and algorithmic methods for improving digital computers' efficiency or other characteristics (e.g., cost-effectiveness, reliability) through various types of competition (Rashid et al., 2018). While the CPU must be connected to a particular communication device at the highest level. Therefore, several contributions have been presented in recent years to resolve cache problems and improve the performance of distributed systems (Shukur et al., 2020). Distributed programming has multiple architectures, including. Both software and hardware components are required for each electronic device. Having two different types of computers is favored. Server-side computers have to be faster than client-side computers. Client-server, is the structure in which the user connects to the server in order to obtain data. Three-tier architecture, is the structure that simplifies application. n-tier, is most responsible application for the performance of application servers. Peer-to-peer, is the architecture in which responsibilities are distributed between all devices, such as the Bitcoin network (Ibrahim et al., 2019; Jader et al., 2019).

3.2 Distributed Applications

Distributed applications: They are applications that run on several computers within the network at the same time, but this does not mean that the use of a single computer is unacceptable, but that the use of the network is more practical to obtain greater efficiency, reliability and lower cost. Distributed applications work on multiple systems simultaneously for one task, unlike traditional applications that only work on one system. It is possible to compose a distributed system of computational and heterogeneous nodes connected through a communication network. All the resources of any node should be accessible transparently and conveniently from other nodes (Dino et al., 2020). The distributed applications are divided into two parts: the client and the server. Such processors have several full execution cores instead of one, each with an individual front-side bus interface (Subhi et al., 2020). The server program runs and manages shared resources such as disks and printers on a shared device such as Unix or VMS and has the ability to process applications. As for the client program, it is the interface that the user sees, such as receiving input and displaying it on the screen. If one part of the distributed application crashes, it can continue to work with the remaining parts. In distributed applications, multiple users can access the applications simultaneously. Information technology researchers prefer to store distributed applications in the cloud, due to their flexibility, great scalability, and their ability to deal with large applications and bear the workload. An example of distributed applications are web browsers. In recent, the high available internet access was the main demand of most people. However, due to different threats and assaults, online resources sometimes become unavailable (Papadimitriou, 1994; Zeebaree et al., 2020). Advantages of distributed systems can be summarized by: Reliability, Flexibility, Scalability, Fast calculation speed, openness, and High performance. While their disadvantages are: Difficulty detecting errors and fixing them, Less program support, High network infrastructure costs, and Safety issues (Thain et al., 2005). Distributed Computing Examples can be summarized as: Telecommunications networks including mobile networks and the Internet, for instance. Applications for the

network, such as the World Wide Web, Internet sports, distributed databases, and applications for processing information, such as banks and airlines. Process Management in Real-Time, which covers industrial control systems. Finally, Parallel computation that implemented in computer graphics, distributed rendering. (Bentaleb et al., 2018):

4. Comparison

Table 1 shows the detailed comparison between cloud computing and distributed computing in terms of the definition, characteristics, types, goals and disadvantages.

Table 1: comparison between cloud and distributed computing.

	Cloud Computing	Distributed Computing
Definition	It is a new way of computing that takes place over a network such as the Internet, and it consists of a set of programs, devices and Internet infrastructure	They are multiple computers that work together as a single system
Characteristics	1- Provides a common set of configurable computing resources. 2- Use an on-demand network form so he can access. 3- The Service Founders make withdrawals. 4- It helps with broadband access to the network.	1- The problem is distributed to multiple devices at the same time. 2- For distributed calculations, remote call technology is used.
Types	1- Clouds of the public. 2- Private Clouds. 3- The Clouds of Culture. 4- Clouds of hybrids.	1- Computing Devices Distributed 2- Distributed networks of information 3- Ubiquitous Structures Distributed
Goals	1- Reduced Initial Investment and proportional 2- Scalability Improved 3- Higher availability 4- Heightened reliability	1- Resource Sharing 2- Openness 3- Transparency 4- Scalability
Disadvantages	1- It is not well controlled, especially in the case of a public cloud 2- Available services may face some limitations as they are cloud-based	1- A higher degree of node failure than a parallel dedicated computer. 2- Some algorithms cannot accommodate slow networks 3- Too much overhead might be the essence of the computer work.

5. Conclusion

Cloud computing is, in short, a modern computing system that has developed a lot in recent years and has become adopted due to its flexibility, scalability, and low cost. It takes place over a network such as the Internet and consists of programs and devices and has many forms, such as (public, private, community, hybrid). It has several uses, such as software development, the Internet of things, and ample data storage. As for distributed computing, it's a community of computers working together as a single system to improve performance and have the ability to develop where the user can add other devices according to work requirements, in which the problem is distributed on multiple computers at the same time. It offers good efficiency and reliability despite its limitations and aims to achieve openness and scalability, making large organizations that contain big data use it to solve their problems.

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Cite this article:

Yousif Sufyan Jghef & Subhi R. M. Zeebaree (2020). State of Art Survey for Significant Relations between Cloud Computing and Distributed Computing. *International Journal of Science and Business, 4*(12), 53-61. doi: https://doi.org/ 10.5281/zenodo.4237005

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