REAL WORLD APPLICATIONS OF CLOUD COMPUTING: ARCHITECTURE, REASONS FOR USING, AND CHALLENGES

Research Article

i-PROCLAIM .my

Asia Pac. j. energy environ.

Samuel Koehler[1], Harshith Desamsetti[2*], Venkata Koteswara Rao Ballamudi[3], Sreekanth Dekkati[4]

[1]College of Engineering and Computer Science, University Of Central Florida, USA
[2]Software Engineer, MedAllies, Inc., NY 12524, USA
[3]Sr. Software Engineer, HTC Global Services, USA
[4]Assistant Vice President (System Administrator), MUFG Bank, Arizona, USA

[*]Email for Correspondence: harshithdesamsetti9@gmail.com

Manuscript Received: 27 October 2020 - Accepted: 15 December 2020 - Published: 31 December 2020

Abstract

Cloud computing is a significant IT innovation. It is one of the most remarkable ways to manage and allocate internet-wide information and resources. Cloud computing involves accessing IT infrastructure over a computer network without installing anything. Cloud computing lets businesses adjust resource levels to meet operational needs. Cloud computing reduces infrastructure costs for businesses. With improved administration and less maintenance, organizations can test their applications faster. Cloud computing lets the IT team respond to unexpected needs. Applications in numerous contexts show that cloud computing is part of daily life. Cloud computing architecture, attributes, types, service models, advantages, and challenges will be covered in this essay. In this article, we have explored the fundamental ideas of cloud computing, its architecture, the reasons for employing cloud computing, and the obstacles that cloud computing faces.

Key words

Cloud Computing, Community Cloud, Cloud Architecture, Cloud Security, Cloud Challenges

INTRODUCTION

Cloud computing has transformed the IT industry. Cloud computing lets us test better IT services for less money. Cloud computing has changed IT hardware development and procurement, making software as a service more prevalent. It provides on-demand access to server-stored data through the Internet. Customers only pay for the service they utilize because it is pay-as-you-go. Cloud computing offers massively scalable IT-enabled capabilities to many clients. It uses internet-based computer technology for storage, processing, commercial applications, and components. This set of network-enabled services provides scalable, guaranteed, personalized, inexpensive, and easy-to-use services. Cloud computing delivers massively scalable IT services through the Internet to external consumers (Bahwaireth et al., 2016). This IT service paradigm demands hardware and software across a network without a device or location. The National Institute of Standards and Technology (NIST) defines cloud computing as a model for ubiquitous, accessible, shared pools of customized computing resources and services that can be quickly provided and deployed with minimal administrative labor or service contact. Cloud computing has four types: private, public, communal, and hybrid. Three cloud computing service models are prominent. Areas include: Services include platform, infrastructure, and software as a service. All are cloud computing examples. Choosing a solution presents obstacles but also tremendous opportunities and rewards. This study will cover cloud computing architecture, features, and service models, including their pros and cons (Kaur & Kaur, 2018).

Cloud computing is the on-demand access to information technology resources via the internet. It provides the customer with a variety of services, all of which are delivered over the Internet. Cloud computing offers users access to three primary categories of service models: platform as a service (PAAS), infrastructure as a service (IAAS), and software as a service (SAAS). Public cloud, private cloud, hybrid cloud, and community cloud are the four primary categories that comprise the cloud deployment paradigm (Bodepudi et al., 2019). These categories are differentiated based on how users access and utilize cloud computing services. The global market for cloud computing is expanding at the same rate as the demand for cloud services, which is growing at an extremely rapid pace (Chen et al., 2019). As a result of the many advantages cloud computing offers, an increasing number of companies and businesses operating in various markets are opting to use cloud services in the present day. Various organizations are using cloud computing for a wide range of reasons. In response to this demand, cloud service providers are developing different apps for multiple industries.

REAL-WORLD APPLICATIONS

Cloud Service Providers (CSPs) are currently offering a wide variety of cloud services. Suppose cloud computing has already entered every industry by providing several cloud apps. Because cloud computing makes sharing and administering resources simple, it has quickly become one of the most essential subfields in the computing world (Desamsetti & Mandapuram, 2017). Because of these qualities, it has become integral to various industries. Now that we have that out, let's discuss some practical cloud computing applications.

Cloud computing stores files, photos, audio, and movies online. The company need not install expensive physical storage systems to store much business data. Technology increases data generation over time, making storage a concern. Cloud storage allows data storage and access at any time.

Cloud companies offer data security by storing and having backup facilities available. They offer several data recovery programs. Traditional data backup is complicated and often impossible to retrieve. Cloud computing makes backup and recovery easy without worrying about running out of media or losing data.

Extensive data analysis indicates that typical data management systems cannot store large amounts of big data in organizations (Dekkati & Thaduri, 2017). Thanks to cloud computing, businesses may now keep their vast amounts of data in the cloud without worrying about physical storage. Analysis of raw data and obtaining insights or usable information is complex and requires high-quality data analytics technologies. Cloud computing offers enterprises the most considerable data storage and analysis.

Setting up the development platform and conducting testing to ensure product readiness before delivery involves various IT resources and infrastructure. By leveraging IT resources, cloud computing makes development, testing, and deployment easy and cheap. Organizations benefit from scalable and adaptable cloud services for product creation, testing, and deployment.

Cloud-based e-commerce enables quick response to developing opportunities. Traditional e-commerce and users respond fast to market opportunities and difficulties. Cloud-based e-commerce offers a new way to do business with less resources and time. Cloud infrastructures manage customer, product, and operational data.

Cloud computing revolutionizes education by offering e-learning, online distance learning platforms, and student information portals. It's a new education trend that attracts students, academics, and researchers to learn, teach, and experiment. Each field worker can access their organization's cloud for data and information.

Cloud computing is employed in medical fields to store and access data remotely, eliminating need for physical setup. It simplifies information sharing between medical professionals and patients. Cloud computing allows offsite buildings and treatment facilities like labs, doctors making emergency house calls, and ambulances to access and update their information remotely without waiting for a hospital computer.

E-Governance Application: Cloud computing supports several government tasks. Expanding the environment's scalability and customization can help the government migrate from traditional management and service providers to sophisticated ones. It can assist the government in saving wasteful costs in administering, installing, and upgrading apps using cloud computing and public service money.

Antivirus Applications: For protection against cyber dangers, corporations, and individuals have installed antivirus software in their systems. However, cloud computing now offers antiviral software remotely monitoring your system/organization. Antivirus software finds and fixes security vulnerabilities. The software download option is sometimes available.

Cloud computing is ideal for addressing a diverse user base through entertainment applications, as many individuals access entertainment online. A multi-cloud strategy helps various entertainment sectors contact the intended audience. Cloud-based entertainment offers online music/video, gaming, video conferencing, streaming services, and more on any device, including TVs, mobiles, set-top boxes, and others. On-demand entertainment is new. As a cloud, the market is growing swiftly and offering more daily services. Cloud computing has additional uses, including social, management, business, art, and others. Thus, cloud computing will expand its applications and services to different industries.

TYPES OF CLOUD

Cloud computing can be divided into three primary categories: private, public, and hybrid. These are categorized according to the network size, level of security, and number of users.

Personal cloud: Although a single company may be the primary private cloud user during its development and maintenance phases, the administrator may also grant access to the cloud to other businesses. Thanks to the private cloud, activities can be carried out on-site or offsite. The private cloud offers advantageous cost management and control, protecting users' privacy and optimizing their energy use. Private clouds have a finite storage capacity and are only accessible inside a specific geographic region.

Public Cloud: This cloud computing service is available for purchase or use by the general public or anybody else. A third party makes it available to users via the general Internet. Customers who use this kind of service are only charged for their services. Suppose the company has access to the Internet. In that case, every employee in the firm can utilize the application from any office or branch using whatever device they choose, provided that they have access to the Internet (Mandapuram, 2016).

Community Cloud: A community cloud is hosted by several institutions or organizations with similar goals. Universities make extensive use of both in the classroom and research settings. Businesses can operate the cloud system on- or offsite or contract with another organization to manage daily system operations. Both of these options are available to them through outsourcing.

Hybrid Cloud: A hybrid cloud comprises multiple cloud computing systems (Lal et al., 2018). In most cases, it will include two or even three separate clouds. For instance, a company might store less sensitive data in its own data center while using the public cloud for its day-to-day business operations. Using a cloud that combines public and private components could confer various benefits (Lal & Ballamudi, 2017). Large and well-known companies are more likely to make significant expenditures in the infrastructure required to offer resources on the company's premises. The issue of safety is a further consideration.

ARCHITECTURE OF COMPUTING IN THE CLOUD

There are three distinct categories for cloud computing's output in the form of services. The beginning and the finish of the sentence. The front and back end are linked together by a network, which is usually just the network (Gutlapalli, 2017a). The client, often known as the user, interacts with the system's front end while the system cloud does the system's administrative tasks. The client's computers, servers, and data storage are on the back end. System administration, traffic monitoring, and client requests are all managed by a single centralized server. It does this by utilizing specialized software called protocols and by adhering to preset standards. The following is a list of the levels and services included in cloud computing architecture. The customer, the application, the platform, the infrastructure, and the server all make up the system. A customer of the cloud is a set of computer hardware and software that uses cloud computing to offer applications developed expressly for delivering cloud services (Gutlapalli, 2017b). Following is a list of the three distinct types of cloud computing. A wide variety of applications, such as web-based back-office bulk processing systems, utilize architectures that are hosted in the cloud. These are only a few examples among many **(**Raj, 2013).

- Processing pipelines for document processing to optical character recognition (OCR): This translates thousands of documents from Microsoft Word to PDF and millions of pages and photographs into text that can be searched.
- Pipelines for image processing that have the capability of encrypting MPEG or AVI movies. Creating an index for web crawlers to use. Through data mining, millions of records are searched for information.
- Batch processing systems are back-office programs expected in the retail, banking, and insurance industries. Log analysis is utilized in the process of producing daily and weekly reports.

- Darkness thickens nightly, and parallel automated builds of the source code repository should be carried out. Functional, quality, and load testing on various configurations are carried out by deployment testing and automated unit testing.
- Online Portals Included in this category are websites that scale naturally during the day but become redundant at night. Instant websites have been developed explicitly for events such as conferences. Seasonal websites are only active during specific times of the year, such as holidays or tax season. A model for providing cloud computing services In addition to these five characteristics, the following three service models are utilized to classify cloud computing services.

REASON FOR USING CLOUD COMPUTING

In today's technology-driven environment, success requires the capacity to develop new products, assess their market acceptance, and roll out the winners while eliminating the losers. Automation in the cloud boosts innovation. It works with low-code and no-code applications to let more people establish new digital services. By scaling and adapting enterprises, cloud computing accelerates innovation, agility, operations, and cost reduction (Gutlapalli, 2017c). This may help firms survive the crisis and prosper in the long run. Amazon Web Services (AWS) and Elastic Compute Cloud (EC2), launched in 2006, allow businesses and individuals to rent virtual computers to run their programs and applications. The same year, Google Docs was released to save, modify, and transfer documents online. IBM, Google, and several colleges created a research server farm in 2007. In the same year, Netflix launched its cloud-based video streaming service, bringing movies and other material to thousands (and later millions) of people worldwide (Jiong, 2016).

Cloud computing adoption has increased significantly in the past decade among consumers and enterprises (Desamsetti, 2016a). Microsoft, Oracle, and Adobe have made substantial efforts to convince on-premises software users to move to their cloud-based, subscription-based software. Meanwhile, cloud-native providers like Zendesk, Workday, and ServiceNow offer SaaS services that have always been cloud-only. SaaS, PaaS, IaaS, BaaS, and DRaaS have evolved. Google and Microsoft, which provide extensive resources, now offer everything as a Service (XaaS). "A small majority of enterprise workloads will run on off-premises IT systems by 2019, and more than one-third will run in public clouds." According to IDC, in 2018, cloud computing will account for half of all IT spending, rising to 60% of IT infrastructure and 60%–70% of software, services, and technology spending. To remain competitive, CIOs and CTOs should consider cloud computing a crucial component of their business and assess which services, operations, and offerings could benefit from moving to the cloud (Gutlapalli, 2016a).

Edge Computing is the future of cloud computing in this age of creativity and technology. Edge computing can evaluate data closer to the source before it is centralized in the cloud to address the exponential increase in devices and data volume. Edge computing will save data processing time and help turn data into insights using AI and machine learning (Gutlapalli, 2016b). While edge computing enhances data privacy and latency bandwidth, cloud computing offers various benefits. Cloud computing offers flexibility, analytics, and more.

Avoids capital investments in hardware/software infrastructure purchase, installation, administration, and maintenance, lowering overhead expenses.

- Easily scale storage, computational power, and bandwidth with a single button.
- Monitoring, controlling, applying security fixes, setting up backups, and recovering from disasters are easier with system-wide security.
- Easily integrate technologies using future platforms, allowing customization and modular software use.

Cloud computing helps firms scale quickly, innovate, streamline processes, and minimize expenses. This may help firms survive the crisis and prosper in the long run. Future cloud computing forecasts are below.

Advanced storage: With data generation at an all-time high and rising, ensuring its safety is challenging. Most companies store company and consumer data in physical data centers, providing cloud server services (Dekkati et al., 2019). More organizations can offer cheaper cloud-based data centers as they adopt cloud technologies. Prices will be competitive because so many cloud service providers benefit corporations. Data storage will be smooth and space-efficient with this technology.

Superior Internet performance: Cloud computing could boost Internet use. Cloud computing and IoT can save data for subsequent analysis, interpretation, and reference (Deming et al., 2018). Customers and companies desire fast, high-quality applications and service loading. Thus, network download and upload speeds will increase.

Prioritizing modular software: As programs become more complex and vast (Kalyvas et al., 2013), cloud computing will require advanced system thinking. Most system software requires extensive customization. Therefore, even commercial cloud computing solutions need primary usefulness and security customization. The new program should be user-friendly and flexible to accommodate future applications stored outside the cloud. Software development can be addressed from several viewpoints. This may include modules, cloud service servers, and software and storage savings. It means these software solutions will be faster and more agile, saving time and money.

Cloud advanced services: Cloud services are varied. PaaS, SaaS, and IaaS are the most popular. These services are essential to the company's success (Desamsetti, 2016b). Many studies predict cloud computing will soon dominate, with SaaS solutions accounting for over 60% of the workload.

Improved Security: Cloud servers store partially secure data. Smaller cloud service providers may need to understand or provide more data security. Future cloud services will include more robust cybersecurity and safety measures to prevent cyberattacks. Thus, firms may focus on more vital activities than data security or alternate data storage methods.

Cloud computing and safer collaboration: Many companies need global cooperation, and cloud computing makes it fast, simple, and reliable. Team members can examine, update, or receive feedback on cloud files anytime.

Future of cloud computing: As more firms use cloud-based IT solutions, cloud computing's future is bright. Companies may use multi-cloud methods to prevent vendor lock-in and take advantage of alternative cloud providers. With IoT and 5G networks, edge computing power will increase. Cloud companies may offer edge computing to fulfill demand. To balance cost, security, and performance, companies will continue to employ hybrid cloud models combining public and private cloud environments. Serverless computing, which lets developers run code without servers, is growing (Anand, 2017). Cloud providers may offer additional serverless computing alternatives. Cloud providers invest extensively in AI and ML to provide AI-powered services that help businesses automate processes, acquire insights, and make better decisions. Cloud computing will likely become more flexible, scalable, and accessible, with cloud providers offering various services to satisfy company demands.

Cost Cutting: Cloud computing providers profit from consumer fees. However, enterprise customers are excited about possibly cutting expenses because cloud computing providers deliver these services "in-house".1, 5, 6, 7. Another perk of cloud computing is paying for what we use. The tagline suggests that computing customers pay per service. Additionally, consumers no longer need to invest heavily in IT infrastructure. They can use provider-sold computer utilities whenever they want. Cloud servers can multitask, so customers get results quickly, 11. One way to lower cloud computing costs is to pay per resource, as applications vary in computing, storage, and network bandwidth. Some programs are CPU-bound, while others are network-bound and may overuse one resource while underutilizing another.

Flexible: Cloud computing services can be relaxed by allowing access from any device. It does not matter what hardware and software providers use due to provider isolation of consumer devices from infrastructure1. First-time company growth will enable providers to increase infrastructure like hardware without notifying customers (Gutlapalli et al., 2019). Providers employ multiple compute resource interfaces, architectures, and consumer implementation technologies to speed up their services. Users can easily adjust the level of computing resources and services based on their needs.

Reliability: Cloud computing providers prevent site failures and provide redundancy and reliability by deploying their systems worldwide. Using numerous clouds in multiple locations saves effort and improves consumer reliability (Prantosh et al., 2013).

Scalability: Most cloud interfaces are user-friendly. Thus, computing infrastructure expansion allows scalability. Platform-centered application content will enable users to tailor content to their needs.

Cooperation: Cloud computing providers collaborate due to architectural and facility similarities and flexibility (Lal, 2016). Collaboration also involves controlling cloud computing provider computer resources uniformly. Consumers using cloud computing services can share their documents without worrying about outsiders accessing them and discussing any issue with the correct application.

Efficiency: Cloud computing is efficient when using email services like Yahoo.com, MSN Hotmail, Windows Live Hotmail, and Gmail. The organization can use mail providers to receive professional mail, reducing the need

to purchase mail server infrastructure for staff. The company can construct a mail server without buying software. These are done by cloud mail providers 5, 10. Since users can access all services regardless of machine kind or storage, efficiency is realized.

Nearly: VMs let consumers install their apps. To align with cloud computing infrastructure, consumer applications must be virtual for processing, storage, and communication (Lal, 2015). Virtual cloud computing allows users to share virtual resources without service knowledge.

Availability: Cloud service providers handle infrastructure. Cloud computing companies control all study content and make it available to users upon request. Developers construct a new app to access these contents. Consumers can access cloud-based social media, file sharing, websites, and video streaming services (Thodupunori & Gutlapalli, 2018). Each application type has various composition, configuration, and deployment needs. By replicating data across huge geographic distances, major cloud computing providers with data centers throughout the world can provide excellent fault tolerance.

CHALLENGES FACES BY CLOUD COMPUTING

Cloud computing technology presents several issues for various industries regarding managing data and information (Mushtaq et al., 2017). As a result, if we decide to use cloud infrastructure services, we can run into the following challenges and threats.

Security: When considering an investment in cloud services, one's primary concern should be the safety of cloud computing. Without our knowledge, a third-party service stores and processes your data behind your back. We acquire new information about a particular company's faulty authentication, compromised credentials, account hacking, data breaches, and so on, which makes the user even more wary of the company in question (Mandapuram & Hosen, 2018). Thankfully, cloud computing providers have expanded their efforts to improve their security capabilities. We can take additional precautions by determining whether the service provider possesses a safe user identity management system and access control processes (Mandapuram et al., 2018). This is another method for protecting ourselves. In addition, check to see that it adheres to the established database privacy and security standards.

Password Security: When additional people utilize the same cloud account, that account's security is compromised. Anyone who knows the password for one user or successfully hacks into the cloud will have access to the sensitive data of that user (Thaduri & Lal, 2020). In this scenario, the company needs to implement several different levels of authentication and ensure that credentials are kept in a safe place. Altering passwords consistently is another critical security measure, particularly if an employee resigns or otherwise departs the company. It is essential to exercise extreme caution when granting access to usernames and passwords.

Cost Management: Cloud computing enables customers to access application software over a quick internet connection while saving money on costly computer hardware, software, management, and maintenance (Mandapuram, 2017a). This results in a cheaper total cost. On the other hand, adapting the third-party platform to the company's specific requirements takes time and effort. Another expenditure is transferring data to a public cloud, which can be highly expensive for a small business or project.

Internet Connectivity: Cloud services require users to have a connection to the Internet that is quite fast. Therefore, companies with relatively minor problems connecting to the Internet should, as a best practice, invest in a reliable internet connection to avoid downtime because disruptions to internet service could cause severe financial losses.

Lack of Expertise: The ever-increasing demand for cloud technologies and the continuously developing capabilities of cloud-based solutions have combined to make management more difficult. An educated labor force capable of coping with the tools and services provided by cloud computing has been in high demand. Consequently, firms must provide training for their IT personnel to reduce the risk.

Compliance: Another significant risk associated with cloud computing is maintaining compliance. We describe compliance as a collection of rules that regulate what data can be transmitted and what data must be preserved in-house. This helps us to ensure that compliance is maintained. The compliance requirements that the various government bodies have developed must be adhered to and respected by organizations.

Interoperability and portability: Cloud computing presents several challenges, including the requirement that applications be movable between cloud service providers without being tied in for an extended period

(Fang and Xiao-Chun, 2016). The amount of freedom available when switching from one cloud provider to another is constrained by the level of sophistication necessary. Monitoring data flow and constructing a secure network from the ground up are two new challenges due to recent improvements in cloud computing. Another problem is that customers cannot access it from anywhere; however, this can be fixed by the cloud provider so that customers can use the cloud safely from anywhere in the world (Mandapuram, 2017b).

Legal issues: Utilizing cloud resources as a service has given rise to many legal worries. The placement of the data is the central issue. A wide variety of laws and regulations govern where, how, and for how long data should be stored across the world's various areas and authorities. Compliance obligations may differ regarding the disclosure of data in general and sensitive data in particular, for example, data from the financial industry and data from the health sector. In addition to the problems associated with defining identities, such as users versus systems, and issues related to authentication and authorization, another critical challenge is the need for comprehensive regulation regarding liability in the cloud.

Economic Challenges: When assessing the financial feasibility of a company from an economic point of view, the cost of the physical infrastructure and the administrative expenditures associated with it are critical factors to consider. This problem is connected to the cost-benefit analysis of cloud computing. Companies that provide cloud services must devise effective monetization plans to generate a satisfactory return on their efforts. The strategy calls for the creation of workable pricing structures, the execution of strategies for licensing, and the organization of resources. Because different suppliers handle invoicing and payments, it may be difficult for the consumer to determine the type, quality, and availability of the services they are paying for. Therefore, conducting financial benchmarking and evaluations of various service providers takes much work.

Data Management: Because cloud computing makes it possible to run more data-intensive applications at larger scales, there is a growing demand for data management solutions that are both effective and efficient. This category includes things like file storage and backups. Numerous components comprise data, including data segmentation, recovery, location, authenticity, anonymization, and blockage. The retrieval and processing of data are additional challenges presented by cloud computing, which is performed across multiple data centers.

Service Management: The cloud-based information technology approach presented several challenges for the service management department. Another challenge is providing more customized services and being attentive to the surrounding environment. The management of the service life cycle, as well as the service registry, has proven to be challenging for a variety of different reasons.

Quality: The formulation and execution of service-level agreements constitute the primary challenge in the sector of cloud service quality (Paul et al., 2015). The absence of a service-level contract between cloud providers makes adopting cloud computing more challenging. This lack of a contract undermines user confidence in the dependability and availability of cloud services. Due to the absence of a distinct set of service level targets and quality of service evaluations, negotiating and benchmarking can take time and effort. The quality of the user experience, particularly in multimedia, live video streaming, and internet gaming.

Control of Governance: Cloud computing raises several ethical concerns, including maintaining appropriate asset management and maintenance control. The assets that supply cloud services should align with the agreed-upon policies and procedures, and a specialized team should be established to check this. Our firm must correctly preserve the assets and make use of them so that it can work toward achieving its goals.

Creating a Private Cloud: Establishing a private cloud environment is a desirable goal. This is because every information is kept safe within the company itself. The problem is that the IT staff has to develop and maintain Everything from scratch. This is a challenge. In addition, the team is responsible for ensuring that the cloud operates without any problems (Thaduri et al., 2016). They are tasked with automating as many manually performed tasks as possible. Jobs must be finished in the correct order. To this point, it is difficult to build up a private cloud all by one's lonesome. Despite this, many organizations have this goal for the foreseeable future.

Performance: When Clint migrates its business applications to the cloud or a third-party provider, the performance of the business becomes reliant on the vendor's performance. Locating the most suitable cloud service provider is yet another critical challenge associated with cloud computing. Before making any investments, we need to look for service providers with cutting-edge technology. The effectiveness of business intelligence

tools and other cloud-based solutions also depends on the provider's systems. When choosing a service, use caution and check that the company has plans to handle issues as they arise in real-time (Yang et al., 2015).

High availability and reliability: In cloud computing, two of the most pressing concerns are high availability, sometimes known as HA, and reliability. The term "reliability" relates to the likelihood that a system will be up and running at any given time. In contrast, "availability" describes how likely the system will be up and running at any given time. Cloud solutions must be reliable and secure because most businesses rely on services provided by outside parties. Cloud services have yet to be available round-the-clock, resulting in frequent disruptions. It is necessary to employ in-house or external solutions to monitor service quality. It is essential to have plans for tracking SLAs, utilization, robustness, performance, and the degree to which businesses rely on these services.

Hybrid cloud complexity: Typically, a hybrid cloud system is a jumbled mess of diverse cloud application development and cloud service providers, in addition to private and public clouds, all of which are operating simultaneously for any one company. These intricate cloud ecosystems must provide organizations with a standardized user interface, consistent data, or analytical benefits. Concerns of cloud computing, such as scalability, integration, and disaster recovery, become more significant when applied to a hybrid cloud environment.

CONCLUSION

Cloud computing is a new Internet hosting and delivery model. It has numerous benefits for business owners but is still young and has many issues to address. Service quality and commercial competitiveness depend on application cloud configuration. A wrong cloud configuration can cost 12 times more for the same performance. Effective cloud architecture saves more for recurrent operations with similar workloads. Choosing the optimal cloud architecture is difficult due to the need for high accuracy, low overhead, and versatility for multiple applications. Cloud computing refers to the internet-based provision of computing resources. Cost reductions, scalability, high performance, economies of scale, and other benefits are offered. Cloud migration is often linked to data and IT transformation in enterprises. Cloud computing architecture uses numerous components to provide internet services to clients. The cloud comprises several components: Client Infrastructure, Application, Service Runtime Cloud, and Storage.

In past years, cloud computing has gained popularity, with companies like Microsoft and Oracle encouraging users to upgrade and more providers offering services like SaaS, PaaS, and IaaS. Edge computing also allows data to be evaluated closer to the source before being consolidated in the cloud. This can minimize data processing time and help turn data into insights using AI and machine learning.

Security, cost management, internet connectivity, lack of expertise, compliance, governance control, creating a private cloud, performance, interoperability and portability, high availability and reliability, and complexity in hybrid cloud environments are all risks and challenges of investing in cloud services. When investing in cloud services, firms should consider cost reductions, scalability, and flexibility. Cloud computing provides storage, processing power, databases, networking, analytics, AI, and software applications through the Internet. Outsourcing computing resources lets companies get them when needed without buying and maintaining a physical IT infrastructure. This provides adaptive resources, faster invention, and scale economies. Many firms link cloud migration to data and IT transformation.

REFERENCES

Bahwaireth, K., Tawalbeh, L., Benkhelifa, E., Yaser Jararweh, Y. & Tawalbeh, M. A. (2016). Experimental comparison of simulation tools for efficient cloud and mobile cloud computing applications. *EURASIP Journal on Information Security*, Article number 15. https://doi.org/10.1186/s13635-016-0039-y

Bodepudi, A., Reddy, M., Gutlapalli, S. S., & Mandapuram, M. (2019). Voice Recognition Systems in the Cloud Networks: Has It Reached Its Full Potential?. *Asian Journal of Applied Science and Engineering*, *8*(1), 51–60. https://doi.org/10.18034/ajase.v8i1.12

Chen, S., Thaduri, U. R., & Ballamudi, V. K. R. (2019). Front-End Development in React: An Overview. *Engineering International*, *7*(2), 117–126. https://doi.org/10.18034/ei.v7i2.662

Dekkati, S., & Thaduri, U. R. (2017). Innovative Method for the Prediction of Software Defects Based on Class Imbalance Datasets. *Technology & Management Review*, *2*, 1–5. https://upright.pub/index.php/tmr/article/view/78

Dekkati, S., Lal, K., & Desamsetti, H. (2019). React Native for Android: Cross-Platform Mobile Application Development. *Global Disclosure of Economics and Business*, *8*(2), 153-164. https://doi.org/10.18034/gdeb.v8i2.696

Deming, C., Dekkati, S., & Desamsetti, H. (2018). Exploratory Data Analysis and Visualization for Business Analytics. *Asian Journal of Applied Science and Engineering*, *7*(1), 93–100. https://doi.org/10.18034/ajase.v7i1.53

Desamsetti, H. (2016a). A Fused Homomorphic Encryption Technique to Increase Secure Data Storage in Cloud Based Systems. *The International Journal of Science & Technoledge*, *4*(10), 151-155.

Desamsetti, H. (2016b). Issues with the Cloud Computing Technology. *International Research Journal of Engineering and Technology (IRJET), 3*(5), 321-323.

Desamsetti, H., & Mandapuram, M. (2017). A Review of Meta-Model Designed for the Model-Based Testing Technique. *Engineering International*, *5*(2), 107–110. https://doi.org/10.18034/ei.v5i2.661

Fang, Y., and Xiao-Chun, S. (2016). Research of Digital Library Construction Based on Cloud Computing Chinese Full Text. *Journal of Library and Information Sciences in Agriculture, 28*(9), 24-27. https://doi.org/10.13998/j.cnki.issn1002-1248.2016.09.006

Gutlapalli, S. S. (2016a). An Examination of Nanotechnology's Role as an Integral Part of Electronics. *ABC Research Alert*, *4*(3), 21–27. https://doi.org/10.18034/ra.v4i3.651

Gutlapalli, S. S. (2016b). Commercial Applications of Blockchain and Distributed Ledger Technology. *Engineering International*, *4*(2), 89–94. https://doi.org/10.18034/ei.v4i2.653

Gutlapalli, S. S. (2017a). Analysis of Multimodal Data Using Deep Learning and Machine Learning. *Asian Journal of Humanity, Art and Literature*, *4*(2), 171–176. https://doi.org/10.18034/ajhal.v4i2.658

Gutlapalli, S. S. (2017b). The Role of Deep Learning in the Fourth Industrial Revolution: A Digital Transformation Approach. *Asian Accounting and Auditing Advancement, 8*(1), 52–56. Retrieved from https://4ajournal.com/article/view/77

Gutlapalli, S. S. (2017c). An Early Cautionary Scan of the Security Risks of the Internet of Things. *Asian Journal of Applied Science and Engineering*, *6*, 163–168. Retrieved from https://ajase.net/article/view/14

Gutlapalli, S. S., Mandapuram, M., Reddy, M., & Bodepudi, A. (2019). Evaluation of Hospital Information Systems (HIS) in terms of their Suitability for Tasks. *Malaysian Journal of Medical and Biological Research*, *6*(2), 143–150. https://mjmbr.my/index.php/mjmbr/article/view/661

Jiong, G. (2016). Thoughts on the Application of Cloud Computing in LibraryChinese Full Text. *Journal of Library and Information Sciences in Agriculture, 28*(7), 71-73. https://doi.org/10.13998/j.cnki.issn1002-1248.2016.07.016

Kalyvas, J. R., Overly, M. R., Karlyn, M. A. (2013). Cloud Computing: A Practical Framework for Managing Cloud Computing Risk-Part I. *Intellectual Property & Technology Law Journal. 25*(3), 7-18.

Kaur, A., & Kaur, R. (2018). Cloud Computing: A Focus on Security Issues in Cloud Computing Region. *International Journal of Advanced Research in Computer Science, 9*(2), 267-269. https://doi.org/10.26483/ijarcs.v9i2.5556

Lal, K. (2015). How Does Cloud Infrastructure Work?. *Asia Pacific Journal of Energy and Environment*, *2*(2), 61-64. https://doi.org/10.18034/apjee.v2i2.697

Lal, K. (2016). Impact of Multi-Cloud Infrastructure on Business Organizations to Use Cloud Platforms to Fulfill Their Cloud Needs. *American Journal of Trade and Policy*, *3*(3), 121–126. https://doi.org/10.18034/ajtp.v3i3.663

Lal, K., & Ballamudi, V. K. R. (2017). Unlock Data's Full Potential with Segment: A Cloud Data Integration Approach. *Technology & Management Review*, *2*(1), 6–12. https://upright.pub/index.php/tmr/article/view/80

Lal, K., Ballamudi, V. K. R., & Thaduri, U. R. (2018). Exploiting the Potential of Artificial Intelligence in Decision Support Systems. *ABC Journal of Advanced Research*, *7*(2), 131-138. https://doi.org/10.18034/abcjar.v7i2.695

Mandapuram, M. (2016). Applications of Blockchain and Distributed Ledger Technology (DLT) in Commercial Settings. *Asian Accounting and Auditing Advancement, 7*(1), 50–57. Retrieved from https://4ajournal.com/article/view/76

Mandapuram, M. (2017a). Application of Artificial Intelligence in Contemporary Business: An Analysis for Content Management System Optimization. *Asian Business Review*, *7*(3), 117–122. https://doi.org/10.18034/abr.v7i3.650

Mandapuram, M. (2017b). Security Risk Analysis of the Internet of Things: An Early Cautionary Scan. *ABC Research Alert*, *5*(3), 49–55. https://doi.org/10.18034/ra.v5i3.650

Mandapuram, M., & Hosen, M. F. (2018). The Object-Oriented Database Management System versus the Relational Database Management System: A Comparison. *Global Disclosure of Economics and Business*, *7*(2), 89–96. https://doi.org/10.18034/gdeb.v7i2.657

Mandapuram, M., Gutlapalli, S. S., Bodepudi, A., & Reddy, M. (2018). Investigating the Prospects of Generative Artificial Intelligence. *Asian Journal of Humanity, Art and Literature*, *5*(2), 167–174. https://doi.org/10.18034/ajhal.v5i2.659

Mushtaq, M. F., Akram, U., Khan, I., Khan, S. N., Shahzad, A., Ullah, A. (2017). Cloud Computing Environment and Security Challenges: A Review. *International Journal of Advanced Computer Science and Applications (IJACSA), 8*(10), 183-195. http://dx.doi.org/10.14569/IJACSA.2017.081025

Paul, P. K., Senthamarai, R., Dangwal, K. L., Chatterjee, B. K. D. (2015). Cloud computing and requirement of cloud analytics system: an overview. *International Journal of Applied Science and Engineering. 3*(2), 55-62. https://www.proquest.com/docview/1815408743/A35A7F201B844613PQ/22

Prantosh, P. K., Govindarajan, S., Chatterjee, D. (2013). Cloud Computing: Emphasizing Hybrid Cloud Computing on Android Computing Platform-An Overview. *International Journal of Applied Science and Engineering, 1*(1), 21-27.

Raj, M. (2013). Cloud Computing: A Journey towards its Security Issues. *International Journal of Advanced Research in Computer Science, 4*(3), 71-76. https://www.proquest.com/docview/1443745678/284AB792D18B4CB6PQ/1

Thaduri, U. R., & Lal, K. (2020). Making a Dynamic Website: A Simple JavaScript Guide. *Technology &Amp; Management Review*, *5*, 15–27. https://upright.pub/index.php/tmr/article/view/81

Thaduri, U. R., Ballamudi, V. K. R., Dekkati, S., & Mandapuram, M. (2016). Making the Cloud Adoption Decisions: Gaining Advantages from Taking an Integrated Approach. *International Journal of Reciprocal Symmetry and Theoretical Physics*, *3*, 11–16. https://upright.pub/index.php/ijrstp/article/view/77

Thodupunori, S. R., & Gutlapalli, S. S. (2018). Overview of LeOra Software: A Statistical Tool for Decision Makers. *Technology & Management Review*, *3*(1), 7–11.

Yang, J. N., Yang, J. K., & Lin, K. (2015). The Cloud Computing and the Application of Cloud Computing in the Telecommunication Enterprise. *Applied Mechanics and Materials, 729*, 195–198. https://doi.org/10.4028/www.scientific.net/amm.729.195

--0--