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A Study on Cloud Computing Services

[1]Rakesh Kumar, [2]Dr. Kuldeep Kumar

[1]M.Tech(CSE), Ch. Devi Lal University, Sirsa, Haryana

[2]Assistant Professor, Ch. Devi Lal University, Sirsa, Haryana

ABSTRACT

Cloud computing is a computing model that leverages the Internet to provide IT resources, including infrastructure, applications, and platforms, as a service. It has been widely adopted due to its ability to process and manage large amounts of data, providing flexibility, and processing power. This service-oriented technology has transformed the computing landscape, offering various benefits to businesses. With its capabilities, cloud computing has propelled the IT industry forward, prompting many large enterprises to migrate their processing and storage to the cloud. This paper provides an overview of cloud computing and its services, highlighting its impact and benefits. This study examines the various cloud computing services available in the market and their features. Cloud computing services are becoming increasingly popular due to their scalability, cost-effectiveness, and accessibility. The study analyzes the benefits of cloud computing services for businesses, including reduced infrastructure costs, increased flexibility, and improved collaboration. The study also looks at the security concerns associated with cloud computing and provides recommendations on how businesses can mitigate these risks. Additionally, the study analyzes the future of cloud computing services and their potential impact on the IT industry. Overall, this study provides a comprehensive overview of cloud computing services and their potential benefits for businesses.

Keywords—Cloud Computing, Services, Cloud providers.

I. INTRODUCTION

Cloud computing has revolutionized the way organizations manage their IT resources, enabling them to access a wide range of computing services via the internet. The term "cloud computing" refers to the delivery of IT resources as a service, such as infrastructure, applications, and platforms, over a network. This on-demand access to computing services has become increasingly popular, and has transformed the way organizations approach their IT strategies. One of the most significant advantages of cloud computing is its scalability. With the ability to rapidly provision and de-provision resources as needed, organizations can easily adjust their IT infrastructure to match changing business needs. Additionally, cloud computing provides a cost-effective solution for organizations to manage their IT resources, as it eliminates the need to invest in expensive hardware and software, as well as the ongoing maintenance costs associated with traditional IT infrastructure. Another key advantage of cloud computing is its accessibility. With cloud computing, organizations can access their IT resources from anywhere with an internet connection, enabling them to support remote work and collaborate with teams around the world. This has become particularly important in light of recent events, such as the

COVID-19 pandemic, which has forced many organizations to shift to remote work environments. There are three primary models of cloud computing services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Each of these models provides a different level of abstraction for IT resources, with IaaS providing the most flexibility and control over infrastructure, and SaaS providing the least. While there are many advantages to cloud computing, there are also some challenges and risks to consider. One of the primary concerns with cloud computing is data security, as organizations must ensure that their sensitive data is protected from unauthorized access. Additionally, organizations must carefully manage their cloud computing costs, as they can quickly spiral out of control if not properly monitored. In conclusion, cloud computing has transformed the way organizations manage their IT resources, providing a flexible, cost-effective, and accessible solution for businesses of all sizes. As cloud computing continues to evolve and mature, it is likely to become an increasingly important part of the modern IT landscape [1-12].

II. HISTORY OF CLOUD COMPUTING

Cloud computing has evolved over several decades, with its roots tracing back to the 1950s and 1960s. During this time, mainframe computers were the norm, and accessing computing resources was expensive and complex. However, in the 1960s, the concept of time-sharing emerged, which allowed multiple users to access a single computer simultaneously, making computing resources more accessible and affordable. In the 1970s, virtualization technology was introduced, which enabled multiple operating systems to run on a single computer, further reducing the cost of computing. In the 1980s and 1990s, personal computers became more widespread, and the client-server model emerged, where users accessed resources from a centralized server. The concept of cloud computing started gaining momentum in the early 2000s, with the emergence of Software as a Service (SaaS) providers such as Salesforce.com in 1999, which delivered enterprise applications through a website. In 2002, Amazon Web Services (AWS) was launched, which offered cloud-based services such as storage, computation, and human intelligence through Amazon Mechanical Turk. In 2006, AWS launched Elastic Compute Cloud (EC2), allowing small companies and individuals to rent computers on which to run their applications. Google Apps also emerged in 2006, providing browser-based enterprise applications. The next significant development came in 2008 with the launch of OpenStack, an open-source cloud computing platform, which aimed to provide a standard for interoperability between cloud providers. The arrival of Web 2.0 in the late 2000s led to the rise of browser-based applications, and cloud computing became more widely accepted. Major tech companies like Microsoft and Google started offering their cloud-based services, making cloud computing mainstream.

Today, cloud computing is an essential part of the technology landscape, with a wide range of cloud-based services available for businesses and individuals. Cloud computing has revolutionized the way we use and access computing resources, making it more affordable, scalable, and accessible. It is expected that cloud computing will continue to evolve and transform the way we use technology in the future. Another big milestone came in 2009, as Web 2.0 hit its stride, and Google and others started to offer browser-based enterprise applications, though services such as Google Apps. The most important contribution to cloud computing has been the emergence of “killer apps” from leading technology giants such as Microsoft and

Google. When these companies deliver services in a way that is reliable and easy to consume, the knock-on effect to the industry as a whole is a wider general acceptance of online services. Other key factors that have enabled cloud computing to evolve include the maturing of virtualization technology, the development of universalhigh-speed bandwidth, and universal software interoperabilitystandards.

III. CHARACTERISTICS OF CLOUD COMPUTING

Cloud computing is a computing model that provides on-demand access to a shared pool of computing resources, including servers, storage, applications, and services, over the internet. The key characteristics of cloud computing includes:

[1] On-demand self-service: Cloud computing services can be provisioned and deployed quickly and easily, without the need for human intervention or interaction.

[2] Broad network access: Cloud computing services are accessible over the internet from anywhere and on any device, including desktops, laptops, tablets, and smart phones.

[3] Resource pooling: Cloud computing providers offer a shared pool of computing resources, including servers, storage, applications, and services, that can be dynamically allocated to meet the changing needs of users.

[4] Rapid elasticity: Cloud computing services can be rapidly scaled up or down to meet changing user demand, ensuring that users only pay for the resources they need.

[5] Measured service: Cloud computing providers offer a pay-per-use billing model, allowing users to pay only for the resources they consume. This helps to reduce costs and improve resource utilization.

[6] Resilient computing: Cloud computing providers offer highly resilient and fault-tolerant computing environments that can quickly recover from system failures, ensuring high availability and uptime.

[7] Security and compliance: Cloud computing providers offer advanced security features, including encryption, access controls, and monitoring, to ensure the security and compliance of user data and applications.

Overall, cloud computing offers a highly scalable, flexible, and cost-effective computing model that enables businesses to rapidly innovate, grow, and compete in today's fast-paced digital economy. Cloud computing is a modern distributed computing model that offers users scalable and cost-effective on-demand services, without requiring large up-front investments in infrastructure. One of the key factors driving the success of cloud computing is its ability to eliminate the size of an enterprise as a critical factor in economic success. This is illustrated by the emergence of data centers, which allow small companies to create a global customer base without the need for significant capital expenditure on building their own infrastructure [13-18].

IV. TYPES OF CLOUDS

Cloud computing is an umbrella term that covers different types of cloud services. There are primarily four types of clouds: public clouds, private clouds, hybrid clouds, and community clouds. Cloud computing offers a range of deployment and service models that can be tailored to the specific needs of different users and organizations. The main types of clouds are:

1. **Public Cloud:** Public clouds are owned and operated by third-party service providers, who offer on-demand access to computing resources and services over the internet. Examples of public cloud providers include Amazon Web Services, Microsoft Azure, and Google Cloud Platform. Public clouds offer a cost-effective and scalable computing model, but users must share resources with other tenants, and there may be security and privacy concerns. Public clouds are owned and operated by third-party providers who offer computing resources to users. These cloud services are accessible to the general public and are typically offered on a pay-per-use model. Public clouds are cost-effective and scalable, making them a popular choice for startups and small businesses that require computing resources without investing in their infrastructure. Examples of public clouds include Amazon EC2, IBM's Blue Cloud, and Microsoft Azure.
2. **Private Cloud:** Private clouds are owned and operated by a single organization, and are typically deployed on-premises or in a data center. Private clouds offer greater control over resources and security, but can be expensive to set up and maintain. Private clouds can also be hosted by third-party service providers, in which case they are referred to as hosted private clouds. Private clouds, on the other hand, are owned and operated by an organization that wants to have control over its data and infrastructure. Private clouds offer flexibility, scalability, provisioning, automation, and monitoring, just like public clouds, but are only accessible to a limited number of people within an organization. Private clouds are more secure and reliable than public clouds, making them a popular choice for government agencies, financial institutions, and large corporations.
3. **Hybrid Cloud:** Hybrid clouds combine elements of public and private clouds, allowing users to leverage the benefits of both models. For example, a hybrid cloud might consist of a private cloud for sensitive data and applications, combined with a public cloud for less sensitive workloads. Hybrid clouds offer greater flexibility and scalability than private clouds, but can be more complex to manage Hybrid clouds are a combination of public and private clouds that work together to provide the benefits of both clouds. In a hybrid cloud, an organization can move workloads between public and private clouds, depending on its needs. For example, during peak periods, an organization can use public cloud resources to handle increased traffic. Hybrid clouds provide the flexibility and scalability of public clouds and the security and control of private clouds.
4. **Multi-Cloud:** Multi-cloud refers to the use of multiple cloud providers to deliver services and applications. This approach can help to reduce reliance on a single provider, and can enable users to choose the best cloud for each workload. However, managing multiple clouds can be challenging, and there may be compatibility issues between different cloud providers
5. **Community clouds**: These are designed to meet the needs of a particular community of users who share common interests or requirements. These clouds are a hybrid form of private clouds that are built and operated for a targeted group. Community clouds provide the benefits of public clouds, such as scalability and

cost-effectiveness, with the added level of privacy, security, and policy compliance associated with private clouds. Examples of community clouds include government clouds, healthcare clouds, and telco clouds.

In conclusion, each type of cloud has its advantages and disadvantages, and organizations should choose the type of cloud that best suits their needs. Public clouds are ideal for standardized workloads, testing and development, and collaboration projects. Private clouds are suitable for organizations that require data sovereignty and want to maintain control over their infrastructure. Hybrid clouds provide the flexibility of public clouds and the security of private clouds. Community clouds are designed to meet the needs of a particular community of users who share common interests or requirements [19-23].

V. SERVICES OF CLOUD COMPUTING

Cloud computing has become a popular buzzword in recent years, offering many advantages compared to conventional service providers. IT companies like Google, Microsoft, Salesforce, and Amazon are following this trend. Cloud computing services are used by governments and companies to handle various application and infrastructure needs, including database management, CRM, data storage, and compute. Cloud computing services share several common attributes such as multi-tenancy, elasticity, network access, on-demand provisioning, virtualization, and metering/chargeback. Big companies like Microsoft, Google, and Amazon are joining forces to develop cloud services, with the most common types being Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS).

1. Software-as-a-Service (SaaS)

Software-as-a-Service (SaaS) is a cloud computing model where software applications are delivered to customers over the internet. In this model, users can access software applications as a service, without having to install, configure, or maintain the software on their own devices. The software is hosted on remote servers and the users can access it through a web browser or a thin client. SaaS has gained significant popularity in recent years due to its many benefits. One major advantage of SaaS is that it offers a flexible pricing model. Users typically pay a subscription fee for the service, which can be adjusted based on their usage. This allows companies to scale up or down their software usage based on their needs, without having to invest in additional infrastructure or licenses. Another benefit of SaaS is that it is easy to use and deploy. Since the software is hosted on remote servers, users can access it from anywhere with an internet connection. There is no need to install or configure the software on individual devices, which can save time and resources. SaaS also provides users with automatic updates and maintenance. Since the software is managed by the provider, they are responsible for keeping the software up-to-date and ensuring that it is running smoothly. This reduces the burden on IT staff and allows users to focus on their core tasks.

Some common examples of SaaS applications include email, customer relationship management (CRM), human resources management (HRM), accounting, and project management software. Many well-known companies, such as Salesforce, Microsoft, and Google, offer SaaS solutions. Overall, SaaS has revolutionized the software industry by providing a cost-effective and efficient way for users to access software applications. As cloud

computing continues to evolve, it is likely that SaaS will become even more widespread and essential in businesses of all sizes.

2. Platform-as-a-Service (PaaS)

Platform-as-a-Service (PaaS) is a cloud computing model that provides a platform for developing, deploying, and managing applications without the need for infrastructure management. PaaS is similar to Software-as-a-Service (SaaS) but focuses more on the platform for application development rather than the delivery of a complete software product. In a PaaS model, the cloud provider offers a computing platform that includes an operating system, a programming language execution environment, a web server, a database, and other development tools. Developers can use these tools to create, test, and deploy applications on the cloud platform. One of the main advantages of PaaS is that it provides a scalable and flexible platform for application development. The cloud provider manages the underlying infrastructure, including servers, storage, and networking, allowing developers to focus on application development. PaaS also provides a high level of automation, which can reduce the time and effort required to deploy and manage applications.

Another advantage of PaaS is that it provides a standardized development environment, which can help ensure consistency and reduce errors in application development. PaaS platforms also often provide pre-built templates, libraries, and frameworks that can speed up development time and reduce costs. PaaS can be used for a variety of applications, including web applications, mobile applications, and enterprise applications. PaaS can also be integrated with other cloud services, such as Software-as-a-Service (SaaS) and Infrastructure-as-a-Service (IaaS), to create a complete cloud computing solution. Some examples of popular PaaS platforms include Google App Engine, Microsoft Azure, and Heroku. These platforms provide a range of development tools and services, such as web application frameworks, databases, and analytics tools, that can help developers create and deploy applications quickly and efficiently.

In summary, PaaS provides a scalable, flexible, and automated platform for application development, allowing developers to focus on creating high-quality applications without the need for infrastructure management.

3. Infrastructure-as-a-Service (IaaS)

Infrastructure-as-a-Service (IaaS) is a cloud computing service model that provides users with on-demand access to computing infrastructure, including servers, storage, networking, and operating systems. With IaaS, organizations can outsource the purchase, installation, and maintenance of physical infrastructure to cloud service providers and instead use virtual resources that can be quickly and easily provisioned to meet their computing needs. The IaaS model is often described as the most basic of the three main cloud computing service models, with the other two being Software-as-a-Service (SaaS) and Platform-as-a-Service (PaaS). In comparison to SaaS and PaaS, IaaS provides users with the most flexibility and control over their computing infrastructure, allowing them to create and manage their own virtual machines, networks, and storage resources. One of the key benefits of IaaS is its ability to provide users with a scalable and elastic computing environment. IaaS providers typically offer a pay-per-use pricing model, which allows users to easily scale up or down their computing resources as needed, based on demand. This makes IaaS an attractive option for organizations with

fluctuating computing needs or those that need to rapidly scale up their infrastructure to meet sudden spikes in demand. Another advantage of IaaS is that it allows organizations to avoid the costs and complexities associated with managing their own physical infrastructure. IaaS providers are responsible for maintaining the underlying hardware and ensuring that it is secure, reliable, and available at all times. This means that organizations can focus their resources and attention on developing and deploying their applications, rather than on managing and maintaining their infrastructure.

In terms of use cases, IaaS is well-suited to a wide range of applications and scenarios. For example, organizations may use IaaS to support the development and testing of new applications, to host websites and web applications, or to support data analytics and processing tasks. IaaS is also commonly used for disaster recovery and business continuity purposes, allowing organizations to quickly spin up virtual infrastructure in the event of a disruption to their on-premises systems. Some examples of popular IaaS providers include Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform, and IBM Cloud. These providers offer a wide range of services and features, including virtual machines, storage, networking, security, and management tools, all accessible via web-based portals and APIs.

Other Services are:

A. *Big-Data-as-a-Service (BDaaS)*
B. *Hadoop-as-a-Service (HaaS)*
C. *Data-as-a-Service (DaaS)*
D. *Data-Analytics-as-a-Service (DAaaS)*
E. *Database-as-a-Service (DBaaS)*
F. *Information-as-a-Service (INaaS)*
G. *Business-Process-as-a-Service (BPaaS)*
H. *Integration-as-a-Service (INaaS)*
I. *Security-as-a-Service (SECaaS)*
J. *Testing-as-a-Service (TaaS)*
K. *Anything-as-a-Service (XaaS)*

A. Big-Data-as-a-Service (BDaaS): Big-Data-as-a-Service (BDaaS) is a cloud-based offering that provides organizations with the ability to store, process, and analyze large sets of data in a scalable and cost-effective manner. BDaaS solutions provide a range of data storage options, data processing tools, and data analysis capabilities to support a variety of use cases such as business intelligence, predictive analytics, and machine learning.

B. Hadoop-as-a-Service (HaaS): Hadoop-as-a-Service (HaaS) is a cloud-based offering that provides organizations with the ability to leverage the power of Apache Hadoop without having to manage the underlying infrastructure. HaaS solutions provide a range of Hadoop distribution options, data storage options, and data processing tools to support a variety of use cases such as data warehousing, data processing, and data analysis.

C. Data-as-a-Service (DaaS): Data-as-a-Service (DaaS) is a cloud-based offering that provides organizations with access to a range of data sources and data services. DaaS solutions provide a range of data services such as data cleansing, data normalization, data enrichment, and data integration to support a variety of use cases such as business intelligence, predictive analytics, and machine learning.

D. Data-Analytics-as-a-Service (DAaaS): Data-Analytics-as-a-Service (DAaaS) is a cloud-based offering that provides organizations with the ability to perform data analytics in a scalable and cost-effective manner. DAaaS solutions provide a range of data analytics tools such as data visualization, data modeling, and data mining to support a variety of use cases such as business intelligence, predictive analytics, and machine learning.

E. Database-as-a-Service (DBaaS): Database-as-a-Service (DBaaS) is a cloud-based offering that provides organizations with the ability to leverage a fully managed database solution. DBaaS solutions provide a range of database management systems such as MySQL, Oracle, and MongoDB to support a variety of use cases such as web applications, mobile applications, and IoT applications.

F. Information-as-a-Service (INaaS): Information-as-a-Service (INaaS) is a cloud-based offering that provides organizations with access to a range of information services such as weather data, traffic data, and financial data. INaaS solutions provide a range of information services to support a variety of use cases such as business intelligence, predictive analytics, and machine learning.

G. Business-Process-as-a-Service (BPaaS): Business-Process-as-a-Service (BPaaS) is a cloud-based offering that provides organizations with access to a range of business process services such as HR, finance, and procurement. BPaaS solutions provide a range of business process services to support a variety of use cases such as HR management, payroll processing, and financial management.

H. Integration-as-a-Service (INaaS): Integration-as-a-Service (INaaS) is a cloud-based offering that provides organizations with access to a range of integration services such as API management, data integration, and application integration. INaaS solutions provide a range of integration services to support a variety of use cases such as business process automation, data synchronization, and application integration.

I. Security-as-a-Service (SECaaS): Security-as-a-Service (SECaaS) is a cloud-based offering that provides organizations with access to a range of security services such as threat detection, vulnerability assessment, and identity and access management. SECaaS solutions provide a range of security services to support a variety of use cases such as network security, application security, and data security.

J. Testing-as-a-Service (TaaS): Testing-as-a-Service (TaaS) is a cloud-based service that allows software developers and testers to test their applications using various testing methods without having to invest in hardware, software, and other testing tools. With TaaS, testing is done remotely through the cloud, which eliminates the need for local infrastructure and reduces the cost of testing. TaaS is scalable, flexible, and can be accessed from anywhere with an internet connection, making it an ideal solution for companies that require frequent and extensive testing. TaaS providers offer a range of testing services, including functional testing, performance testing, security testing, and mobile testing. Customers can choose the type of testing they require, and the TaaS provider will perform the necessary tests, provide reports and insights, and ensure the application is performing as intended.

K. Anything-as-a-Service (XaaS): Anything-as-a-Service (XaaS) is a term used to describe a broad range of cloud computing services that provide anything as a service over the internet. XaaS is a catch-all term that encompasses all cloud-based services, including Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS). XaaS is a flexible and scalable model that allows businesses to choose the services they need and pay for them on a usage-based model. XaaS offers a range of benefits, including reduced costs, increased efficiency, and improved flexibility. It allows companies to focus on their core business functions while leaving the management of IT infrastructure and services to the service providers. XaaS providers offer a wide range of services, including storage, computing, networking, security, and analytics. The popularity of XaaS is increasing rapidly, as more and more businesses are moving towards the cloud to reduce costs, increase efficiency, and improve agility [24-36].

VI. CONCLUSION

Cloud computing has become a buzzword in the IT industry globally. The benefits of cloud computing are immense for companies that use it to scale their IT infrastructure for business processes. The adoption of cloud computing services has been increasing across industries, from accountancy firms to zoological societies. Popular online cloud services such as Apple iCloud, Gmail, and Dropbox are being used by millions of customers daily on desktop and mobile devices. The global cloud computing market is estimated to be worth $80 billion and is attracting new startups, increasing competition between cloud and outsourcing providers. As cloud computing continues to rise, developers must consider its potential impact. Regardless of whether a cloud provider sells services at a low or high level of concept, scalability of virtualized resources is crucial for computing, storage, and networking.

In conclusion, the development of cloud computing has revolutionized the way organizations utilize technology. The different cloud models, such as SaaS, PaaS, and IaaS, offer unique advantages to businesses in terms of scalability, cost-effectiveness, and flexibility. Moreover, the emergence of various specialized cloud services, including BDaaS, HaaS, DaaS, DAaaS, DBaaS, INaaS, BPaaS, INaaS, SECaaS, and TaaS, has allowed organizations to focus on their core competencies while relying on cloud providers for other tasks. Cloud computing has enabled businesses of all sizes to access cutting-edge technology without the need for significant upfront investments in hardware and software. Additionally, cloud providers offer continuous support and maintenance, which reduces the burden on businesses to manage and maintain their IT infrastructure. As a result, businesses can now focus on innovation, growth, and improving customer experiences. Overall, cloud computing has become a vital component of modern technology infrastructure, and businesses that embrace this technology stand to gain a significant competitive advantage. However, it is crucial for organizations to carefully evaluate their needs and choose the right cloud model and services that best align with their business goals and objectives.

REFERENCES

[1] N. Sadashiv and S. D. Kumar, “Cluster, grid and cloud computing: A detailed comparison,” 2011 IEEE 6th International Conference on Computer Science & Education (ICCSE), pp. 477–482, 2011.

[2] N. I. of Standards and Technology, "NIST Cloud Computing Program," http://www.nist.gov/itl/cloud/, 2011.

[3] IOS Press, "Guidelines on security and privacy in public cloud computing," Journal of EGovernance, 34, pp. 149-151. DOI: 10.3233/GOV-2011-0271, 2011.

[4] Gartner, "Gartner top ten disruptive technologies for 2008 to 2012. Emerging trends and technologies roadshow," 2008.

[5] Michael Armbrust, Armando Fox, Rean Griffith, Anthony D. Joseph, Randy Katz, Andy Konwinski, Gunho Lee, David Patterson, Ariel Rabkin, Ion Stoica, and Matei Zaharia, "Above the clouds: A berkeley view of cloud computing," University of California at Berkeley Technical Report No. UCB/EECS-2009-28, Feb 2009.

[6] Mohammed Alhamad, "A Trust-Evaluation Metric for Cloud applications", International Journal of Machine Learning and Computing, Vol. 1, No. 4, 2011.

[7] Nezih Yigitbasi, "C-Meter: A Framework for Performance Analysis of Computing Clouds", IEEE/ACM International Symposium on Cluster Computing and the Grid, 2009.

[8] Borko Furht and Armando Escalante, "Handbook of Cloud Computing", Springer, 2010.

[9] Abah Joshua & Francisca N. Ogwueleka, "Cloud Computing with Related Enabling Technologies," International Journal of Cloud Computing and Services Science (IJ-CLOSER), Vol.2, No.1, pp. 40~49, 2013.

[10] NIST Advisory Working Group, "NIST Cloud Computing Standards Roadmap", NIST Special Publication, 2011.

[11] Peter Mell and Timothy Grance, "The NIST Definition of Cloud Computing", NIST Special Publication, 2011.

[12] M. Malathi, "Cloud Computing Concepts", IEEE, 2011.

[13] L. Gonzalez, L. Merino, J. Caceres, and M. Lindner, "A Break in the Clouds: Towards a Cloud Definition", Computer Communication Review, 39(1), 2009.

[14] D. Plummer, T. Bittman, T. Austin, D. Cearley, and D. Smith, "Cloud computing: Defining and describing an emerging phenomenon", Technical report, Gartner, 2008.

[15] J. Staten, S. Yates, F. Gillett, W. Saleh, and R. Dines, "Is cloud computing ready for the enterprise?", Technical report, Forrester Research, March 2008.

[16] P. Mell and T. Grance, "Definition of cloud computing," Technical report, National Institute of Standard and Technology (NIST), July 2009.

[17] M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski,
G. Lee, D. Patterson, A. Rabkin, I. Stoica, and M. Zaharia, "A view of cloud computing," Commun. ACM, 53:50–58, April 2010.

[18] D. Agrawal, A. El Abbadi, F. Emekci, and A. Metwally, "Database Management as a Service: Challenges and Opportunities," In ICDE, 1709–1716, 2009.

[19] http://www.appcore.com/types-cloud-computing-private-public-hybrid- clouds/

[20] Minqi Zhou; Rong Zhang; Dadan Zeng; Weining Qian, "Services in the Cloud Computing era: A survey," 4th International Universal Communication Symposium (IUCS), pp.40–46, 2010.

[21] L. Qian, Z. Luo, Y. Du, and L. Guo, "Cloud Computing: An Overview," in CloudCom '09: Proceedings of the 1st International Conference on Cloud Computing. Springer-Verlag, pp. 626–631, 2009.

[22] G. Lin, D. Fu, J. Zhu, and G. Dasmalchi, "Cloud Computing: IT as a Service," IT Professional, vol. 11, no. 2, pp. 10–13, 2009.

[23] http:// diversity.net.nz/ wp-content/ uploads/ 2011/ 01/ Moving -to-the- Clouds .pdf

[24] Kaiqi Xiong, "Service Performance and Analysis in Cloud Computing", IEEE, 2009.

[25] Ioannis A. Moschakis & Helen D. Karatza , "Performance and Cost evaluation of Gang Scheduling in a Cloud Computing System with Job Migrations and Starvation Handling", IEEE, 2011.

[26] http:// m.zdnet.com/ blog/ forrester /is- the- iaaspaas- line-beginning-to-blur/583

[27] "Data Analytics as a Service: unleashing the power of Cloud and Big Data", Ascent white paper, March 2013.

[28] http:// www.marketsandmarkets.com/PressReleases/ cloud-database-as- a-service-dbaas.asp(accessed in December'15)

[29] Matt Aslett, DBaaS poised to drive next-generation database growth, 451 Research, Aug 2013.

[30] D.S. Linthicum, Addison-Wesley information technology series: "Cloud Computing and SOA Convergence in your Enterprise, A step- by-step guide", India: 2010, first Ed.

[31] http:// www.marketsandmarkets.com/ Market - Reports /business- process-as-a-service-bpaas-market-986.html, Publishing Date: November 2015.

[32] Gartner Says Worldwide Public Cloud Services Market to Total $131 Billion, http://www. gartner.com/ newsroom/id /2352816, February 2013.

[33] www.cloudbric.com/ blog/ 2015 /09 /the- newbies- guide -to-security- as-a-service-secaas/

[34] http:// www.cloudcomputingadmin.com/ articles -tutorials/ security/security-service-cloud-based -rise-part1.html

[35] Ruggero Contu, Kelly M. Kavanagh, Market Trends: Cloud-Based Security Services Market, Worldwide, 2014, 2013.

[36] Gao, J. ; Xiaoying Bai ; Wei-Tek Tsai ; Uehara, T., Testing as a Service (TaaS) on Clouds, IEEE 7th International Symposium on Service Oriented System Engineering (SOSE), 2013, pg. 212 – 223.