# PRIMARY ISSUES AND CHALLENGES IN CLOUD COMPUTING: A BRIEF NOTE

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*Abstract:* Rapid advancement in the field of Information and Communication Technology has greatly increased the demand for web services. In the present time, web services are used in day-to-day activities such as communication, social media, banking, and e-commerce. This advancement in Information and Communication Technology has given a great momentum to the vision of providing computing as utility, like electricity and telephony. Cloud computing has evolved as a new computing paradigm to provide computing services over the Internet. Present operational model of cloud computing has various obstacles in providing computing as utility in true sense. This paper briefly discusses some of the major issues and challenges in cloud computing.

*Keywords:* Cloud Computing, Security, Interoperability, Quality-of-Service, Service Level Agreements

## I. INTRODUCTION

In the recent past, everything from education to business has come online. Hence, high availability of online computing services is required. This has revolutionized the business of providing computing services over the Internet using the model of cloud computing. Cloud computing [1-3] is an Internet based service delivery model to provide on-demand network access to the computing resources (e.g., servers, storage, and applications) hosted by the datacenter. Cloud computing is evolving with the vision of providing computing as utility, like electricity and telephony. It encompasses a wide range of services broadly classified into three main categories: Infrastructure-as-a-Service, Platform-as-a-Service, and Software-as-a-Service. It follows "pay-as-you-use" model of billing, i.e. consumers need to pay only for the services they use. It leverage the users to use cloud services on short term basis (e.g., to handle peak loads and seasonal hikes). This greatly reduces the cost-of-ownership. Consumers need not to worry about the management and maintenance of Information Technology (IT) resources. Virtualization technology [4] is the key player in the realization of cloud computing technology. It is used to create virtual instances of IT resources in a datacenter to make them remotely accessible by the users over the Internet. Realizing the business potential and future scope of cloud, world leaders in IT (e.g., Amazon, Google, Microsoft, IBM, Rackspace, and Salesforce) have stepped in to deliver cloud based commercial services globally. Amazon revolutionized the commercialization of cloud with its Elastic Compute Cloud. According to Gartner's 2017 report, Amazon remains the king of cloud. Cloud computing provides numerous benefits to both consumers and providers. It reduces the cost-of-ownership and leverage users to focus on their core work rather than worrying about the IT infrastructure needs. Indeed there are still number of obstacles in the path of making computing as a utility in true sense. This paper briefly discusses various issues and challenges in the present operational model of cloud computing.

## II. ISSUES AND CHALLENGES IN CLOUD COMPUTING

Cloud computing has evolved as a business oriented computing model from its very origin. It has various issues and challenges associated with it, such as data confidentiality, interoperability, data lock-in, Internet speed, workload and resource management, energy budget, environmental issues, availability, scalability, and reliability. The most serious issues in cloud computing is the lack of standardization and secrecy of data. This section briefly discusses some of the major issues and challenges in the present model of cloud computing.

### A. *Interoperability*

Interoperability focuses on the creation of standardized Application Programming Interfaces and data formats to facilitate the integration and migration of data and applications among different cloud service providers. In the present scenario there is no standardization of data formats and Application Programming Interfaces, in the field of cloud computing. This hinders the migration of data and applications from one cloud onto another cloud of a different service provider. Hence, vendor lock-in and failure of cloud service provider are big threats to the service consumers. It prevents consumers from adopting cloud as their ultimate source for computing services. Hence, lack of interoperability is a big obstacle in providing computing as a utility service. Organizations (e.g. Cloud Computing Interoperability Forum) are working to establish standardized Application Programming Interfaces and data formats.

### B. *Data confidentiality*

In cloud computing, secrecy of data is one of the major issues which prevent consumers working with sensitive data

from using cloud services. Organizations working in fields, like market research and analysis, feel reluctant to use cloud services because they do not want their data confidentiality to be compromised at any cost. Cloud users face security threats both from outside and inside of the cloud. Virtualization plays a major role in establishing security in the cloud computing environment as it virtually separate the working boundaries of users sharing the computing resources. Multi-tenancy, which is an intrinsic feature of cloud computing imposes serious security threats as same hardware resource is shared by different service consumers.

### C. Auditability

Quality of the cloud services can be measured using parameters such as, availability, scalability, reliability, throughput, and response time. Quality-of-service should adhere to the mutual agreements between provider and the consumer, usually known as Service Level Agreements. Violation of these agreements can lead to penalties which are also defined. To stay in the business of cloud computing where world's top IT companies are competing to sell their web services. Cloud service providers need to provide real good services to the consumers. Companies spend a lot of money to provide quality services using redundant resources, sophisticated computing machinery, and intelligent algorithms. Auditability of the data/operations at the cloud service provider's end is essential to ensure the transparency of cloud services and the credibility of Service Level Agreements. It also helps to ensure the secrecy of consumer's data. There are no proper mechanisms to audit the operations of cloud service providers. This issue needs to be addressed with a sense of urgency.

### D. Software licensing policy

Commercial software development consumes a lot of money and manpower. Software licensing and maintenance subscription are the main source of revenue generation for the commercial software companies. Current software licensing policies restrict the number of computers on which the particular software can be legally run which does not fit good in the multi-tenant and pay-as-you-use model of cloud computing. Hence, many cloud service providers rely on open source software to increase their revenue. Commercial software distributors need to change their licensing policies in order to make them compatible for the pay-as-you-use billing model of the cloud computing architecture. Software companies (e.g., Microsoft and IBM) are changing their licensing policies to charge software usage on per-hour basis.

### E. Workload and Resource management

Cloud service providers e.g., Amazon, Google, Microsoft, IBM, and Rackspace provide web services over the Internet to both individuals and enterprises. Datacenter facilities house massive computing infrastructure and process large amounts of data to effectively deliver the computing services. Efficient utilization of the datacenter resources (e.g., processing power,

memory, bandwidth, and energy) [5,6] and customer satisfaction are important aspects of revenue generation. Inefficient workload and resource management leads to performance degradation and resource wastage which in turn leads to revenue loss. Sophisticated algorithms and machines need to be developed in order to improve performance and resource utilization. In literature, dynamic and adaptive algorithms [7-16] are recommended to effectively handle the constantly changing system and workload behaviors in cloud computing environment.

### F. Environmental issues

Datacenter is the engine of cloud computing. It is a giant building housing large number of servers and other essential components such as, cooling system, communication lines, and networking equipments. It requires a lot of power and a lot of cooling to run these machines/equipments which work together to make cloud function. In the last few decades, power sector has witnessed a drastic increase in electricity consumption. Electricity generation contribute heavily to green house gases in the environment which has adverse effects on the climate such as global warming, climate change, droughts, floods, and famine. This has lead to the emergence of green computing [17-19] which aim to run IT operations in an environmental friendly manner. It promotes the use of renewable sources of energy such as solar and wind energy. It also includes designing sophisticated machines and intelligent algorithms to minimize overall energy consumptions.

### III. CONCLUSION

Consumer base for web services is increasing exponentially. Cloud computing will go huge in the coming future. Evolution and popularity of the cloud computing has significantly reduced the computing infrastructure (software/hardware) from the consumer's end. In this paper, we have discussed some of the major issues and challenges in cloud computing. Lack of de facto standards is the biggest obstacle in providing effective web services to the users. Various issues in cloud computing like data lock-in, data migration, interoperability needs to be resolved in order to provide computing as utility in a real sense.

### IV. REFERENCES

[1] P. Mell and T. Grance, "The NIST Definition of Cloud Computing," National Institute of Standards and Technology, U.S. Department of Commerce, 2011.

[2] M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski, G. Lee, D. Patterson, A. Rabkin, and I. Stoica, "A view of Cloud Computing," Communications of the ACM, vol. 53, no. 4, pp. 50–58, 2010.

[3] B. P. Rimal, A. Jukan, D. Katsaros, and Y. Goeleven, "Architectural Requirements for Cloud Computing Systems: An Enterprise Cloud Approach," J. Grid Comput., vol. 9, no. 1, pp. 3–26, 2011.

[4]  P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A. Ho, R. Neugebauer, I. Pratt, and A. Warfield, "Xen and the art of virtualization," ACM SIGOPS Oper. Syst. Rev., vol. 37, no. 5, pp. 164-177, 2003.

[5]  B. Jennings and R. Stadler, "Resource Management in Clouds : Survey and Research Challenges," J. Netw. Syst. Manag., vol. 23, no. 3, pp. 567–619, 2013.

[6]  L. A. Barroso and U. Hölzle, "The case for energy-proportional computing," IEEE Computer Society Press, vol. 40, no. 12, pp. 33–37, 2007.

[7]  V. R. Chandakanna and V. K. Vatsavayi, "A sliding window based Self-Learning and Adaptive Load Balancer," J. Netw. Comput. Appl., vol. 56, pp. 188-205, 2015.

[8]  J. O. Gutierrez-Garcia and A. Ramirez-Nafarrate, "Collaborative Agents for Distributed Load Management in Cloud Data Centers Using Live Migration of Virtual Machines," IEEE Trans. Serv. Comput., vol. 8, no. 6, pp. 916-929, 2015.

[9]  Z. Wang, H. Chen, Y. Fu, D. Liu, and Y. Ban, "Workload balancing and adaptive resource management for the swift storage system on cloud," Futur. Gener. Comput. Syst., vol. 51, pp. 120-131, 2015.

[10]  Y. Lu, Q. Xie, G. Kliot, A. Geller, J. R. Larus, and A. Greenberg, "Join-Idle-Queue : A novel load balancing algorithm for dynamically scalable web services," Perform. Eval., vol. 8, no. 11, pp. 1056–1071, 2011.

[11]  N. Mohamed, J. Al-jaroodi, and A. Eid, "A dual-direction technique for fast file downloads with dynamic load balancing in the Cloud," J. Netw. Comput. Appl., vol. 36, no. 4, pp. 1116–1130, 2013.

[12]  R. N. Calheiros, R. Buyya, and S. Member, "Meeting Deadlines of Scientific Workflows in Public Clouds with Tasks Replication," IEEE Trans. Parallel Distrib. Syst., vol. 25, no. 7, pp. 1787-1796, 2014.

[13]  F. Farahnakian, A. Ashraf, T. Pahikkala, P. Liljeberg, J. Plosila, I. Porres, and H. Tenhunen, "Using AntColony System to Consolidate VMs for Green Cloud Computing," IEEE Trans. Serv. Comput., vol. 8, no. 2, pp. 187-198, 2014.

[14]  F. Ramezani, J. Lu, and F. K. Hussain, "Task-Based System Load Balancing in Cloud Computing Using Particle Swarm Optimization," Int. J. Parallel Program., vol. 42, no. 5, pp. 739-754, 2013.

[15]  C. Qu, R. N. Calheiros, and R. Buyya, "Mitigating impact of short-term overload on multi-cloud web applications through geographical load balancing," Concurr. Comput. Pract. Exp., vol. 29, no. 12, pp. 1-15, 2017.

[16]  A. N. Toosi, C. Qu, M. A. De Dias, and R. Buyya, "Renewable-aware Geographical Load Balancing of Web Applications for Sustainable Data Centers," J. Netw. Comput. Appl., vol. 83, pp. 155-168, 2017.

[17]  S. Murugesan, "Harnessing green IT: Principles and practices," IT Prof., vol. 10, no. 1, pp. 24–33, 2008.

[18]  N. Garg and M. S. Goraya, "A survey on energy-aware scheduling techniques in cloud computing environment," Int. J. of Comput. Sci. and Inf. Security, vol. 14, no. 10, pp. 523-528, 2016.

[19]  J. Baliga, R. W. A. Ayre, K. Hinton, and R. S. Tucker, "Green Cloud Computing: Balancing Energy in Processing, Storage and Transport," Proc. IEEE, vol. 99, no. 1, pp. 149-167, 2010.