The Next Generation Cloud technologies: A Review On Distributed Cloud, Fog And Edge Computing and Their Opportunities and Challenges

Ali T. Atieh

EGM- IT Infrastructure Operation,

Etihad Etisalat – MOBILY

ORCID

Abstract

Cloud computing is a 21st-century wonder with applications in nearly every industry imaginable. As a new technology, it has certain shortcomings. There are always attempts for improvements to combat those shortcomings. The next generation cloud technologies is believed to overcome these shortcomings. This research seeks to examine the few next generation cloud technologies, namely, distributed cloud, fog computing, edge computing. The distributed cloud improves worldwide service communications while also allowing for more responsive communications in individual regions. The distributed approach is used by cloud providers to allow lower latency and greater efficiency for cloud services. We find that there are few opportunities in Distributed Cloud such as, Improved security, IoT implementations, Faster content delivery, and cost efficiency. However, it poses some challenges such as data exposure to hackers when transferred from public networks. Fog computing, according to the findings, reduces the amount of time it takes, lowers operational costs, increases the level of security. However, one of the most difficult aspects of fog computing is the substantial reliance on data transit. An edge computing system allows consumer data to be handled at the network's edge, as close to the source as feasible. Several opportunities of edge computing in various areas include Network optimization, Healthcare improvement, and Transportation. The popularity of some of the next generation cloud technologies has been strongly impacted by the growth of the internet of things and the unanticipated surge in data created by IoT-connected devices. It is possible to state that obstacles can be gradually overcome because the benefits of next generation cloud technologies enable solutions that meet a wide range of contemporary company requirements. The adoption of next generation cloud technologies might take some time as businesses consider the benefits and drawbacks, and the transition may be slow.

Full article available at:

https://researchberg.com/index.php/rrst/article/view/18

References

Anderson, D. P., Korpela, E. and Walton, R. (2005) 'High-performance task distribution for volunteer computing', in *First International Conference on e-Science and Grid Computing (e-Science'05).* IEEE, pp. 8-pp.

Atieh, A. T. (2021) 'Establishing Efficient IT Operations Management through Efficient Monitoring, Process Optimization, and Effective IT Policies', *Empirical Quests for Management Essences*, 1(1), pp. 1–13. Available at: https://researchberg.com/.

Bilal, K. *et al.* (2018) 'Potentials, trends, and prospects in edge technologies: Fog, cloudlet, mobile edge, and micro data centers', *Computer Networks*, 130, pp. 94–120.

Coady, Y. *et al.* (2015) 'Distributed cloud computing: Applications, status quo, and challenges', *ACM SIGCOMM Computer Communication Review*, 45(2), pp. 38–43.

Dastjerdi, A. V. and Buyya, R. (2016) 'Fog computing: Helping the Internet of Things realize its potential', *Computer*, 49(8), pp. 112–116.

Durrani, M. N. and Shamsi, J. A. (2014) 'Volunteer computing: requirements, challenges, and solutions', *Journal of Network and Computer Applications*, 39, pp. 369–380.

Endo, P. T. *et al.* (2011) 'Resource allocation for distributed cloud: concepts and research challenges', *IEEE network*, 25(4), pp. 42–46.

Ghazizadeh, A. (2012) 'Cloud computing benefits and architecture in e-learning', in *2012 IEEE seventh international conference on wireless, mobile and ubiquitous technology in education*. IEEE, pp. 199–201.

Goyal, S. (2014) 'Public vs private vs hybrid vs community-cloud computing: a critical review', *International Journal of Computer Network and Information Security*, 6(3), p. 20.

Iorga, M. *et al.* (2018) 'Fog computing conceptual model'.

Jadeja, Y. and Modi, K. (2012) 'Cloud computing-concepts, architecture and challenges', in *2012 International Conference on Computing, Electronics and Electrical Technologies (ICCEET)*. IEEE, pp. 877–880.

Khan, W. Z. *et al.* (2019) 'Edge computing: A survey', *Future Generation Computer Systems*, 97, pp. 219–235.

Khanagha, S. *et al.* (2020) 'Mutualism and the dynamics of new platform creation: A study of Cisco and fog computing', *Strategic Management Journal*.

Krishnaraj, N. *et al.* (2022) 'The Future of Cloud Computing: Blockchain-Based Decentralized Cloud/Fog Solutions–Challenges, Opportunities, and Standards', in *Blockchain Security in Cloud Computing*. Springer, pp. 207–226.

Ludwig, A. and Schmid, S. (2015) 'Distributed cloud market: Who benefits from specification flexibilities?', *ACM SIGMETRICS Performance Evaluation Review*, 43(3), pp. 38–41.

Mahmud, R., Kotagiri, R. and Buyya, R. (2018) 'Fog computing: A taxonomy, survey and future directions', in *Internet of everything*. Springer, pp. 103–130.

Mohammed, C. M. and Zebaree, S. R. M. (2021) 'Sufficient comparison among cloud computing services: IaaS, PaaS, and SaaS: A review', *International Journal of Science and Business*, 5(2), pp. 17–30.

Nguyen, T.-D. *et al.* (2018) 'Mobile Services Meet Distributed Cloud: Benefits, Applications, and Challenges', *Mobile Computing: Technology and Applications*, p. 39.

Oza, N. *et al.* (2013) 'Identifying potential risks and benefits of using cloud in distributed software development', in *International Conference on Product Focused Software Process Improvement*. Springer, pp. 229–239.

Rani, D. and Ranjan, R. K. (2014) 'A comparative study of SaaS, PaaS and IaaS in cloud computing', *International Journal of Advanced Research in Computer Science and Software Engineering*, 4(6).

Rashid, Z. N. *et al.* (2018) 'Distributed cloud computing and distributed parallel computing: A review', in *2018 International Conference on Advanced Science and Engineering (ICOASE)*. IEEE, pp. 167–172.

Sarmenta, L. F. G. (2001) 'Volunteer computing'. Massachusetts Institute of Technology.

Satyanarayanan, M. (2017) 'The emergence of edge computing', *Computer*, 50(1), pp. 30–39.

Shaheen, M. Y. (2021a) 'Adoption of machine learning for medical diagnosis'.

Shaheen, M. Y. (2021b) 'AI in Healthcare: medical and socio-economic benefits and challenges'.

Shaheen, M. Y. (2021c) 'Applications of Artificial Intelligence (AI) in healthcare: A review'.

Shi, W. *et al.* (2016) 'Edge computing: Vision and challenges', *IEEE internet of things journal*, 3(5), pp. 637–646.

Shi, W. and Dustdar, S. (2016) 'The promise of edge computing', *Computer*, 49(5), pp. 78–81.

Singh, S. and Jangwal, T. (2012) 'Cost breakdown of public cloud computing and private cloud

computing and security issues', *International Journal of Computer Science & Information Technology*, 4(2), p. 17.

Uriarte, R. B. and DeNicola, R. (2018) 'Blockchain-based decentralized cloud/fog solutions: Challenges, opportunities, and standards', *IEEE Communications Standards Magazine*, 2(3), pp. 22–28.