Cutting the cloud computing carbon cost

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Cloud computing involves displacing data storage and processing from the user's computer on to remote servers. It can provide users with more storage space and computing power that they can then access from anywhere in the world rather than having to connect to a single desktop or other computer with its finite resources. However, some observers have raised concerns about the increased energy demands of sustaining distributed servers and having them up and running continuously, where an individual user's laptop might be shut down when it is not in use or the resources utilization of the server is less than the lower threshold , for instance.

Now, writing in the *International Journal of Information Technology*, Communications and Convergence, researchers at the University of Oran in Algeria, have investigated how cloud computing systems might be optimized for energy use and to reduce their carbon footprint. Jouhra Dad and Ghalem Belalem in the Department of Computer Science at Oran explain how they have developed an algorithm to control the virtual machines running on computers in a cloud environment so that energy use of the core central processing units (CPUs) and memory capacity (RAM as opposed to hard disk storage space) can be reduced as far as possible with affecting performance overall.

"Energy consumption is considered as a major problem in computing systems containing servers, data centers and clouds," the team says. "These resources continue to consume a large amount of energy and produce carbon dioxide emissions." The team's study reveals that virtualization of processes and live migration of VMs within the cloud

service using their algorithm of selection and allocation allows different tools and applications to be consolidated to use less CPU and memory capacity. This in turn reduces energy demands on the servers by allowing several virtual machines to be run on a single remote compute accessible to the users without compromising performance.

To optimize the energy consumption of data centers, the proposed approach is divided into two phases. The first one is the selection of VMs using the modified minimization of migration algorithm which takes in consideration the CPU utilization and RAM capacity. The solution is based on upper and lower physical resources thresholds. The second phase is the allocation of the migrated VMs which uses the modified multidimensional knapsack problem. This algorithm must pack in as many items as possible into a bag without exceeding a weight limit and without being forced to leave behind essential items when travelling.

More information: Dad, J. and Belalem, G. (2014) 'Energy optimisation in cloud computing', *Int. J. Information Technology, Communications and Convergence*, Vol. 3, No. 1, p.1

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