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# Virtual machine migration based algorithmic approach for safeguarding environmental sustainability by renewable energy usage maximization in Cloud data centres

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## Abstract

Data centres are reckoned as global connectivity hubs for networking. Cloud computing has emerged as a paradigm of paramount importance for fulfilment of need of networking which is expanding at an enormous magnitude. For attainment of this objective more data centres are required and their swelling number finally translates into enhanced environmental pollution. The energy-efficient metrics contribute a major role for attainment of desired objective of safeguarding the environment. These metrics address the enhancement of the system's proficiency. An increased energy-efficiency results into reduced consumption of energy resources since these energy resources are mostly non-renewable in nature and are the main source of carbon and heat emissions from operational data centres. As a matter of fact, any individual metric is not capable of achieving enhanced energy-efficient performance in a data centre. Therefore a collective utilization of selected metrics pertaining to power, performance and network traffic can improve the energy-efficient capability of data centre communication systems. The server related energy-saving is the right choice solution for minimizing data centre related carbon emissions. The issue of maximisation of green energy usage along with issue of operating cost minimization and reduced carbon emissions can be suitably addressed by judiciously exercising virtual machine migration. Thus dynamic virtual machine migration stands out as a convincing solution for optimized resource utilization with minimized energy consumption in data centres. The virtual machine migration process is associated with enhanced network related traffic hence constraint network capacity presents as a challenge to it while inter-data centre virtual machine migration reveals network capacity constraints which in itself is a NP-Hard problem. On the basis of bin-packing algorithm the identification of most appropriate target host is executed for segregation of hot-spot hosts in Cloud platforms which is followed by identification of virtual machine related resource loads with respect to hot-spots in descending order. The resource loads related with non-hotspot loads are identified in ascending order. The most appropriate target host for migration is identified by exercising a traversing manoeuvring in non hot-spot queue. This research work highlights a novel carbon conscious and energy efficient approach for optimal virtual machine migration based on bin-packing strategy signifying an improvement pertaining with minimized energy-consumption and carbon footprint together.



## Availability of data

Datasets used in the research work are duly mentioned in the reference list.

## References

1. Armbrust M, Fox A, Griffith R, Joseph AD, Katz RH, Konwinski A, Lee G, Patterson DA, Rabkin A, Stoica I et al (2009) Above the clouds: a Berkeley view of cloud computing. Technical report UCB/EECS-2009-28, EECS Department, University of California, Berkeley