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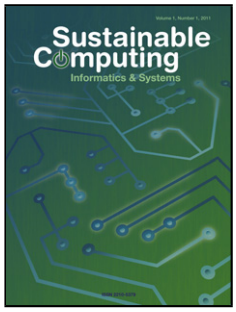

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Author: Mar Callau-Zori Lavinia Samoila Anne-Cécile Orgerie Guillaume Pierre

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An experiment-driven energy consumption model for virtual machine management systems

Mar Callau-Zori[a], Lavinia Samoila[a], Anne-Cécile Orgerie[b,*], Guillaume Pierre[a]

[a] *University of Rennes 1, IRISA, Rennes, France*
Email: {mar.callau-zori, lavinia.samoila, guillaume.pierre}@irisa.fr
[b] *CNRS, IRISA, 263 avenue du Général Leclerc – 35700 Rennes, France*
Email: anne-cecile.orgerie@irisa.fr

Abstract

As energy consumption is becoming critical in Cloud data centers, Cloud providers are adopting energy-efficient virtual machines management systems. These systems essentially rely on "what-if" analysis to determine what the consequence of their actions would be and to choose the best one according to a number of metrics. However, modeling energy consumption of simple operations such as starting a new VM or live-migrating is complicated by the fact that multiple phenomena occur. It is therefore important to identify which factors influence energy consumption before proposing any new model. We claim in this paper that one critical parameter is the host configuration, characterized by the number of VMs it is currently executing. Based on this observation, we present an energy model that provides energy estimation associated with VM management operations, such as VMs placement, VM start up and VM migration. The average relative estimation error is lower than 10% using the transactional web benchmark TPC-W, making it a good candidate for driving the actions of future energy-aware cloud management systems.

Keywords: Green computing, Cloud computing, Virtual Machine Management, Energy model, Virtual Machine migration.

*Corresponding Author: Anne-Cécile Orgerie

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