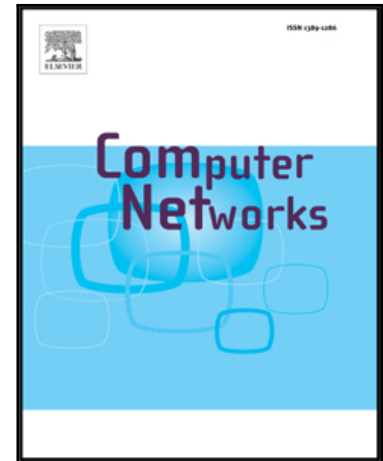


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On Trustworthy Federated Clouds: A Coalitional Game Approach

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Abstract

The demands for cloud-based applications are expected to increase in such a way that current Cloud Providers' (CPs) resources may become insufficient. This promotes the need to outsource some of the requested Virtual Machines (VMs) to other CPs. A Cloud Federation (CF) provides an effective platform that enables CPs to upgrade their resource scaling strategies. Several CF approaches have been proposed, but they suffer from the hazard of working with untrusted (malicious or not) CPs, resulting in performance degradation. To address this problem, we introduce a trust-based framework for CF formation. Our model enables a CP to evaluate other CPs' trustworthiness by considering two approaches: objective and subjective trust evaluations. In the former, Bayesian inference is used to compute trust values based on previous interactions. In the latter, the Dempster-Shafer Theory (DST) integrated with the Bayesian inference is used to compute trust values in the absence of previous interactions. Thereafter, a novel decentralized algorithm is devised, based on coalitional game theory, that allows heterogeneous CPs to establish their coalitions in such a way that maximises the trust of the formed federations. Experimental results show that our proposed algorithm enhances throughput, response time and availability of federated CPs compared to the QoS-based and Grand formation models.

Keywords: Cloud federation; trust; virtual machines; game theory

1. Introduction

Cloud Computing enables Cloud Providers (CPs) to rent out space on their infrastructures, platforms and services to many consumers. This becomes possible thanks to virtualization that enables the easy migration of applications and services from one node to another. Many companies, organizations and governments are expected to transfer, if they have not already, all or parts of their IT solutions to the cloud [1] [2]. This transfer is profitable from an economic point of view since it allows them to streamline technology infrastructure expenses and capital costs.

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