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| **TITLE** | AN ONTOLOGY-BASED BROKER SYSTEM FOR THE INTEROPERABILITY OF MULTI-CLOUD COMPUTING PLATFORMS |
| **KEYWORDS** | CLOUD COMPUTING, CLOUDONTOLOGY, INTEROPERABILITY OF MULTI-CLOUD COMPUTING PLATFORMS, CLOUD PLATFORMS, CLOUD INFRASTRUCTURE AS A SERVICE |
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# ABSTRACT

This thesis is a brokerage system using ontology for the interoperability of multi-cloud computing platforms that is capable of allocating the cloud infrastructure resources of more than two different platforms to meet the requirements of Infrastructure-as-a-Service (IaaS) users through the broker system.

To develop the ontology, we engaged an ontological engineering principle so that the ontology can support interoperability among three specific cloud computing platforms, OpenStack, Apache CloudStack and VMware Esxi, by using Protégé as a development tool. The proposed ontology has been composed of four main classes, Physical compute device, Cloud computing platform, Server template, and REST VM life cycle management, and 17 subclasses. The evaluation of the ontology has been conducted through survey forms to obtain user feedbacks. It has been found that the ontology delivered 100 % of precision, 100 % of recall and 100 % of F-measure.

The ontology has been employed to develop the broker system that operates based on a newly proposed algorithm for deciding the selection of IaaS from the available cloud computing

platforms. The algorithm measures similarity based on a vector space model between available server templates and the user requirement for cloud infrastructure resources. The evaluation of the proposed algorithm relied on 3 user queries and 18 server templates. It has been found that the first question has delivered the cosine similarity of 0.951 choose OpenStack , the second question has delivered the cosine similarity of 0.942 choose VMware Esxi and final question has delivered the cosine similarity of 0.942 choose OpenStack. To connect with the ontology, we utilized Jena Ontology API, while interfacing with the three cloud computing platforms engaged REST technology. The evaluation of the broker system engaged the data set of IaaS user requirement to measure the performance of the broker system in two following testing cases. First, users specified the input requirement data set of IaaS via the graphical user interface of the broker system. The system has taken a maximum average latency to create a REST command for virtual machine provisioning equal to 809 milliseconds whereas a minimum average latency to create a REST command for virtual machine provisioning equal to 670 milliseconds. The other testing case was the input scheduling of a predefined user requirement data set. The system has taken average latencies to create REST commands for virtual machine provisioning that are proportional to the increasing number of workload sets.