Modelling and simulation of a new cloud computing platform based on the SPEEDOS operating system

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Abstract

Today's society is data-driven. Collecting data from people, actions, algorithms and the web has resulted in large data stores, and accommodating all these data has become a major challenge. 'Big data' tends to grow exponentially each year [1]. To handle these increasing data sizes, the concepts of shared computing, shared memory, and remote storage and access to resources have been developed. Systems such as grid computing systems, where the infrastructure combines computer resources and storage from different locations to reach a common objective; utility computing systems, a business model in which computational resources and demand are packaged as a metered service similar to electricity and the public switched telephone network; and distributed systems, which consist of either physically distributed institutions or logically related projects/groups, are examples of such concepts.

Cloud computing is a relatively recent abstraction, providing functionalities such as computation, and the sharing and storage of data for the users of computer networks. Cloud computing is attracting massive global investment [2] because of the services that it provides. However, security remains one of the top concerns for organisations and customers using cloud computing environments [3]. In fact, some security issues in cloud computing were inherited from previous computing systems, but the others were created because of its unique characteristics and architecture. Conventional security mechanisms are not sufficient to mitigate the threats in cloud systems, and new techniques are needed.

This research presents a new platform for secure cloud computing. The platform allows cloud service providers to host their clients' data in a secure environment and allows them

to operate on the services in a secure manner for transactions. The platform was designed to make the operations relatively secure and safe using a robust structure by building a general software-structuring framework to implement the cloud software resources.

The new platform provides new mechanisms that authorise only legitimate users to access data. The access to data is handled by a third-party service that checks on all of the requests by using the user's ID and authentication/authorisation details. All of the users' details and sensitive data are encrypted during transit and storage. The platform was implemented, evaluated and compared in terms its effectiveness to the existing cloud platforms over a set of criteria. The results showed that this platform worked as expected and fairly quickly as compared to the other security platforms, and provided strong security against an intruder's actions.

Keywords: security, cryptography, cloud computing, architectural model

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Statement of originality

I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision. The thesis contains no material which has been accepted, or is being examined, for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the *Copyright Act 1968* and any approved embargo.

(Ala' Said Mughaid)

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