

UNIVERSITI TEKNOLOGI MARA

**STATISTICAL APPROACH
TOWARD ACHIEVING GREEN
CLOUD COMPUTING IN
VIRTUALIZED SINGLE SERVER
ENVIRONMENT**

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PhD

August 2020

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my work, unless otherwise indicated acknowledge as referenced work. This thesis has not been submitted to any other academic institution for any other degree or qualification.

I hereby, acknowledge that I have supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA regulating the conduct of my study and research.

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ABSTRACT

The rapid growth of trending technologies, such as information technology (IT) and digital electronics is creating a huge demand in cloud computing. This results in the tremendous growth in new data centres, which consequently causes a large increase in power consumption due to the continuous operation of such centres. When power consumption spikes up constantly, it will affect the environment. The aim of this thesis is to create a multiple algorithm, which run on a single server, with a low power consumption and a stable process. The method applied in this thesis was virtualization with a statistical approach. To achieve the research objectives, four main hypotheses were created relating to the main properties of control limit, load balancing, process setting and process capability. Furthermore, the thesis managed to come up with several novel approaches on dynamic threshold setting, best matching of load balancing between VM Selection and VM Placement, and a special step to optimise the process setting via the pre-control method. The thesis aims to create an algorithm that can cater to any type of incoming workload to the server for the entire year, without impacting the power consumed by the single server. Besides focusing on power consumption produced by the single server, the performance stability of the server was also taken into consideration. The process capability theory and pre-control method were applied to monitor and optimise the overall power consumption and stability performance. The result of this research shows that the novel approach of dynamic threshold setting was able to produce a significant reduction in power consumption by the single server. It seemed that the novel dynamics threshold setting is 87.5% better than static threshold setting. In addition to that, load balancing optimisation was proven to be able to achieve green cloud computing with low power consumption where the best load balancing is MU/LRR. This thesis also discovered that as the range of yellow and green region at pre-control setting increased, the desired system become more stable. Lastly, the concept of process capability failed to optimize the stability of the system.

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