

IMPROVEMENT OF ENERGY – EFFICIENCY IN HIGH-PERFORMANCE

COMPUTING (HPC): The case of the HPC Facility at the Dar es Salaam Institute of Technology (DIT)

BY DAMAS MAKWEBA(2020)

ABSTRACT

Power continues to be the challenging problem facing institutions which are deploying High-Performance Computing facilities in developing countries including Tanzania. Institutions like the Dar es Salaam Institute of Technology (DIT) face high operational costs due to the high energy consumption caused by the computational operation of HPC systems. Because of the exceedingly high energy cost, diminishing energy consumption has become a major concern in deploying HPC systems. An Empirical Modeling (EM) to predict the trends of power and cost operations of DIT for the years 2018 and 2019 on running the HPC system was applied. The performance of the Giga Ethernet switch and InfiniBand were compared in this study. Several algorithms of energy efficiency in HPC were reviewed and their performance on energy saving was compared. It was noticed that in addition to optimizing the system configuration, the proposed hybrid algorithm can minimize completion time while increasing output as a result of decreasing energy consumption and maximizing resource utilization. The experimental results showed that the InfiniBand switch can save energy up to 10.7% and the proposed hybrid algorithm can reduce time up to 25% as a result of energy reduction.

This study recommended the use of a hybrid algorithm to minimize energy consumption during computing tasks. It proposed that future work should integrate other factors like storage, communication, applications and memory which have significant contributions on energy consumption.

Key words: task execution, computational task, high performance computing. Energy consumption.