

Ph.D. Preliminary Oral Defense

Thursday, April 27th, 2017
223 Atanasoff Hall at 8:30 p.m.

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Network-Aware Energy Saving Techniques in Cloud Data Centers

Currently, data centers tend to have tens to hundreds of thousands of servers to provide massive and sophisticated services, such as web searching, cloud storage, online social services, and scientific computing. As data centers become more popular, the importance of their energy saving will also increase. How to save data centers energy while maintaining performance has become one of the important issues in cloud computing research.

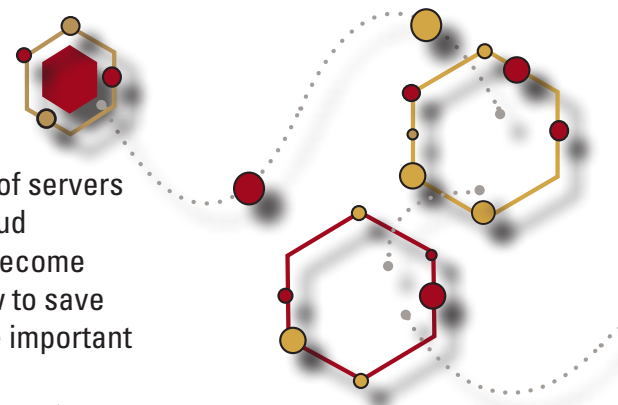
In this report, we propose two preliminary models for saving energy in data centers:

The first model focuses on saving data center network energy while preserving network performance. The idea is to use route consolidation to switch traffic to a small number of network devices and turn off unused devices and links. To maintain network performance, safety thresholds for links utilization and valiant load balancing on active switches are used. The model was evaluated using GreenCloud simulator and achieved a considerable amount of energy saving with minimal effect on network performance.

The second model discusses the energy-saving problem for the server side of the data center. The model uses dynamic placement and live migration of virtual machines to save energy while taking into account the current status of the network. The model migrates virtual machines to a subset of servers and put unused servers into standby mode. At all times, the resource requirements for all virtual machines are maintained and the overhead introduced to the network by live migration is minimized. The evaluation of the model was conducted on a real testbed data center proving that the model is applicable, efficient, and can save a considerable amount of energy. Based on these preliminary models, we will propose, implement, and evaluate a new model that combines server and network sides to maximize energy saving while preserving network performance.

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