Powering Data Centres With Surplus Renewable Energy

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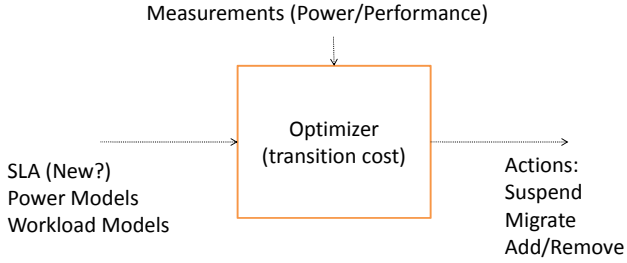
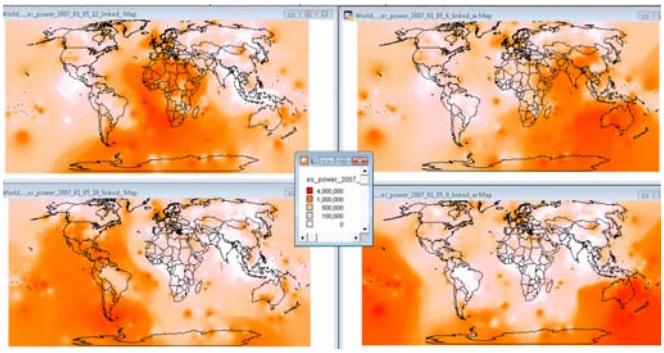
Generation capacity from renewable energy sources varies according to environmental conditions. By moving computing jobs around the globe, we can make use of surplus energy which could otherwise be lost. We consider wind and solar power worldwide to build a simulator. This simulator includes a model for internet as communication infrastructure to move data. We design load optimizer (balancer/un-balancer) that takes into account power fluctuations, different workload characteristics and SLA guarantees.

ICT is guilty of producing relatively large CO_2 emission worldwide due to its ever increasing energy consumption in all areas especially in data centres. This number is comparable to the aviation industry although not getting the same media coverage.

Renewable energy can be used to power data centres if the infrastructure design addresses the power fluctuations. Job migration is an enabler technology where computing jobs can be moved where energy is available. Scheduling and optimizing modules governs this process according to power fluctuations, different workloads characteristics and SLA guarantees while considering transition cost.





The optimizer selects the best action from suspending low priority jobs, migrating some/all workload to another data centre, concentrating processes on few machines while shutting down the rest to save power, or frequency/voltage scaling for processors under low utilization mode.

Simulation is worldwide scale. It takes into consideration solar and wind power actual readings to model renewable energy fluctuations. It also includes communication infrastructure and different work load characteristics such as lived HTTP web requests, long lived audio/video streaming and batch

Getting simulations results and comparing them with emulation testbed are next.

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