

## Building Energy Modeling for Networks of Data Centers

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**Abstract :** The objective of this article was to create a modelling framework that exposes the marginal costs of shifting workloads across geographically distributed data-centers. Geographical distribution of internet services helps to optimize their performance for localized end users with lowered communications times and increased availability. However, due to the geographical and temporal effects, the physical embodiments of a service's data center infrastructure can vary greatly. In this work, we first identify that the sources of variances in the physical infrastructure primarily stem from local weather conditions, specific user traffic profiles, energy sources, and the types of IT hardware available at the time of deployment. Second, we create a traffic simulator that indicates the IT load at each data-center in the set as an approximator for user traffic profiles. Third, we implement a framework that quantifies the global level energy demands using building energy models and the traffic profiles. The results of the model provide a time series of energy demands that can be used for further life cycle analysis of internet services.

**Keywords :** data-centers, energy, life cycle, network simulation

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