



GENiC: Energy Optimization of Data Centers

Using Building Modeling Method

(IBM, ATOS, Acciona, UTRC, TU/e, UCC, CIT)

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Background

Data center (DC) energy consumption has doubled between 2000 and 2005 and grew by 50% from 2005 to 2010 consuming 1.5% of global energy with continued rapid growth. Nodayway high demand on data processing require novel and sustainable solution of DC design and operation.



Figure 1 – Data Center Scales for Design and Operation

The PhD project called Energy Optimization of Data Centers Using Building Modeling Method is included in a larger project named GENiC (Globally Optimised Energy Efficient Data Centers), which focuses especially on the operational efficiency optimization of a data center (DC). The main goal of the overall project is to develop and validate a novel control platform which should fill crucial research gaps such as a lack of coordination between IT workload, thermal management and power management. It will also seek to develop a cost-effective tool chain for the integration RES and Heat Recovery in DCs. The GENiC consortium will also develop support for multi-datacenter management for efficient allocation of computing on the cloud level.

Project GENiC is funded by the Framework 7 European program and belongs to a wider group of research projects dealing with sustainable computing.

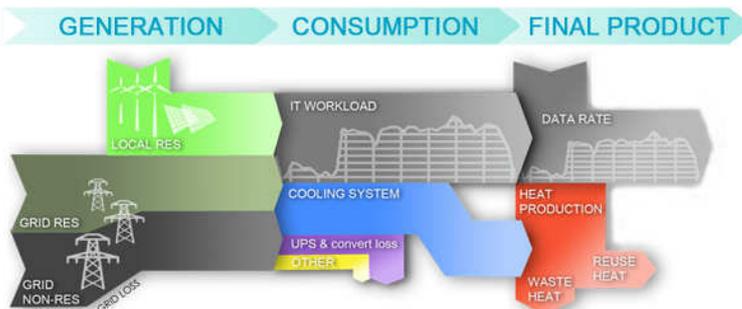


Figure 2 – Sankey Diagram: Energy Path in Data Center

Aim of project

GENiC is a typical multi-disciplinary project where IT, cooling, power and control system specialists co-operate in order to develop a supervisory model-based control and monitoring platform. The Building Performance Simulation group at TU/e, as an energy modeling specialist, is responsible for the energy modelling included in the project

Since the possibilities to execute tests of the GENiC platform in a real DC in practice are extremely limited, one of the main goals of the PhD project is the development of virtual data center environment (VDCE). The VDCE provides a tool to develop and test the whole GENiC platform. Building Modeling Methods and tools such as TRNSYS, Matlab or MODELICA will be used to develop VDCE. The next phase is the development of a series of power and thermal energy surrogate models for real time operation for the purpose of control and fault detection and diagnostic (FDD) support.

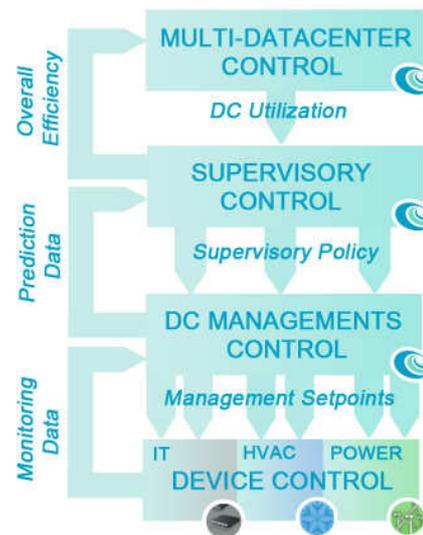


Figure 3 – Overview of GENiC Levels of Control

Validation and demonstration

The GENiC platform will be validated and demonstrated in two DCs in Cork, Ireland on the campus of CIT. The GENiC Platform should prove an increase in DC energy efficiency and sustainability and should increase renewable energy penetration to 80% with a return on investment of less than 5 years.