Motivation

- Data Centre (DC) energy consumption doubled between 2000 and 2005 and grew by 50% from 2005 to 2010, consuming 1.5% of global primary energy.
- Computing typically consumes 60% of total energy while cooling consumes 35%.
- Computation and cooling typically operate without coordination or optimisation, missing a potential 40% energy reduction.
- The integration of renewable energy sources (RES) has received limited interest from the data centre community.

No single system exists to jointly optimise and control computing, cooling, energy generation, energy storage, and waste heat recovery.

Objectives

- GENiC develops and will demonstrate a novel, scalable integrated energy management and control platform and services that target improved operational performance of data centres (<1.3 PUE) and energy reduction of 25% through data centre wide optimisation of primary data centre energy producing/consuming components.

GENiC Architecture and Components

- Use of system-level technologies that monitor energy consumption and automatically optimise power, cooling, computing, storage, and data transmission operations of a data centre in terms of energy consumption, environmental impact, and cost policies.
- Integration of renewable energy sources for powering data centres.

Figure 2 shows the component groups of the GENiC architecture, including Workload Management, Thermal Management, and Power & RES Management.

- The GENiC platform integrates the distributed components with a robust communication middleware.
- A supervisory control concept coordinates optimisation and actuation components of the individual management groups.
- Design tools include decision support tools and simulators.

Validation and Demonstration

The GENiC demonstration data centres at Cork Institute of Technology are shown in Figure 3:

1. IT Building DC
   - mixed server, communications, storage and simulation equipment,
   - instrumented with temperature, humidity, airflow sensors and electricity meters.

2. C130 DC
   - servers and communications equipment,
   - instrumented with temperature, humidity, airflow sensors and electricity meters,
   - demonstration of supervisory control and heat recovery.

To demonstrate data centre powering by renewable energy, GENiC will use an ACCIONA micro-grid installation located at ACCIONA R&D department in Madrid (see Figure 4), and ACCIONA Generation plant installation located in Seville.

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