University of Stuttgart
Institut für Energiewirtschaft und Rationelle Energieanwendung (IER)

Student research project/Master thesis

Experimental investigation of the thermal behaviour of server components using thermography

Background

In a data center, the electrical energy supplied is almost completely converted into heat and released into the environment. Currently, in most situations, there is no utilization of these waste heat sources. Today's CPUs (cent*ral processing unit*) and GPUs (*graphics processing unit*) can reach thermal power losses of several hundred watts and up to 100 °C. Experimental investigations will be carried out to estimate the quantity and quality of the waste heat generated for different load scenarios. The thermography method is to be used for this.

Task

It is planned to carry out measurements of power consumption and waste heat generation depending on the application and the operating status of the hardware. Various benchmark programmes will be used for this purpose. In addition to measuring the total power consumption with an intelligent PDU and taking into account the measurement results of the internal sensors for temperature and power, a thermographic camera will be used to determine the temperature distribution across the relevant main components. A "waste heat map" is developed from the power consumption and the temperature measurement depending on the operating status of the hardware.

- What are relevant benchmark programmes and reasonable load scenarios?
- What is the electrical power consumption and temperature development of the hardware components depending on the load scenario?
- How can a waste heat map be created using thermography?

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