



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 useful utilization of these waste heat sources. Today's CPUs (*central 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.

Task

This work will start with an examination of the relevant operating systems and benchmark programs as well as the technical possibilities for integrated power and temperature measurement within the hardware. In addition to synthetic load scenarios, the benchmark programs will also be used for application-related load scenarios. In the first step, the investigation will be carried out on workstation PCs and can be extended to servers if necessary. In addition, a thermographic investigation can be carried out if necessary. The following questions will be addressed in detail:

- What are relevant benchmark programs for server (components)?
- What are the options for integrated power and temperature measurement?
- What is the electrical power consumption of the relevant hardware components depending on the load scenario?
- What core temperature do the relevant hardware components reach depending on the load scenario?

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**Student research
project/Master thesis**

**Experimental
investigation of the
thermal behavior of
server components
under load using
benchmark tools**