

Green Computing

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Emissions from the world's data centers exceed those from air travel. Even when renewable energy sources are used, a lot of waste heat is generated that heats up the environment. Consequently, energy efficiency is of paramount importance. There are three main areas of energy efficiency or Green IT: data center efficiency, computer architecture efficiency, and last but not least, algorithm efficiency.

The presentation will cover all three aspects. We have developed a new and patented data center architecture that has the highest operational efficiency. One of its realizations is the GSI Green-IT Cube. The operating principles and efficiencies are presented. In the context of computer architecture, there are a variety of ways to configure a computer, which also affects its energy requirements. This includes not only the choice of CPUs and GPUs or FPGAs, but also the operating conditions of the computer. Several of the systems constructed by the speaker have achieved a top-10 ranking in the world wide green500 energy efficiency rankings. Although compilers try to optimize the algorithms they translate, there are many areas where the compiler can no longer help. There are algorithms that are inherently slow. The power saving potential in algorithm development and optimization is very high. Performance improvements of several orders of magnitude have often been demonstrated without a significant increase in the power consumption of the computer. Various examples and aspects of energy-saving algorithms are presented.