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A Comprehensive Approach to Energy Efficiency in Data Centers for High-Performance Computing

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High-performance computing (HPC) data centers are here to deliver simulation capabilities as tools for scientific discovery. Supercomputers comprise the most capital-intensive part of this infrastructure and are thus receiving most of the attention. However, with power consumption of these systems jumping from the typical hundred kilowatts a decade ago to several megawatts in recent years, and with projected future increases to tens of megawatts, the energy cost of HPC data centers has become a major concern for the scientific community. In this presentation I will give an overview of how we have been containing growth of energy costs within the Swiss initiative for HPC and Networking (HPCN). The initiative began in 2009 with a three-pronged strategy: (1) develop a new data center for CSCS in Lugano with particularly innovative cooling technology; (2) buildup of new supercomputing systems that employ novel and efficient architectures; and (3) invest in a Swiss network of competence in algorithm and application software development. Four years into this initiative, we have promising results in all three areas that I will summarize in a quantitative report from an energy efficiency point of view.

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