Are Supercomputers an Endangered Species?
Computerized Infrastructures going to cause an Energy Crisis.

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FPGAs, coming of age as a system development platform, have the potential to turn supercomputer dinosaurs into an endangered species by providing the enabling technology for the cheap desktop personal supercomputer. In a wide variety of application areas massive speed-ups by software to configware migration have been published: by up to 4 orders of magnitude so far.

But by only one of these hundreds of papers also reports a reduction of the electricity bill (by more than 1 order of magnitude - this is just a beginning), as a welcome side effect of speed-up. A recent energy consumption discussion has been kicked off on the International Supercomputer Conference at Dresden, June 2006[2]. Also server farms heavily contribute to the increase of electricity consumption[3]: „Computer equipment power consumption spiraling out of control could have serious consequences for the overall affordability of computing, not to mention the overall health of the planet". A study predicts that til about 2020 the US electricity consumption caused by all computerized cyber infrastructures (PCs, consumer electronics, servers, high performance computing, supercomputers, embedded computing systems, and all other application areas) will eat almost half of the entire electricity production in the USA[4]. From the perspective of rapidly rising energy cost the US senate has recognized this as a national strategic issue and has come up with a first bill.

Currently for many application domains the only viable efficient remedies are Reconfigurable-Computing-based. An opinion is[5]: „It is feared that domain scientists will have to learn how to design hardware. Can we avoid the need for hardware design skills and understanding?" This problem is really a challenge. We need disruptive innovations in system principles and architectures, compilation and programming support, taxonomy of algorithms, and CS education. But also the homogenous multi-core microprocessor scene is not ready to provide a comprehending solution[6]: "You can probably only do four processors before parallelism runs out of steam". We need an all-embracing dual paradigm approach to obtain both: a massively reduced energy consumption, and, dramatic speed-ups for ubiquitous highest performance computing.

1. TU Kaiserslautern, January 2007
2. http://www.supercomp.de/isc2006/index.php?s=programs&s_nav=Conference_show&conference_id=7
3. S. Shankland: Power could cost more than servers, Google warns; CNET Networks, Inc., May 25, 2006
4. M. P. Mills: The Internet Begins with Coal; Environment News, October 1999
5. Tarek El-Ghazawi, panelist at SuperComputing 2006, Nov 11-17, 2006, Tampa, Florida
6. R. Goering: Analyst Gary Smith: top 10 EDA topics for 2007; http://www.garysmitheda.com/ http://www.eetimes.com/showArticle.jhtml?articleID=196702472