Cool programs save energy

Greener software can play a significant role in saving the environment

The pressing need for green computing

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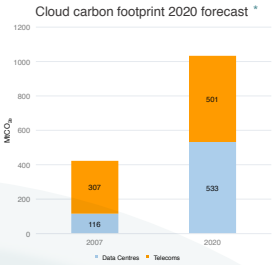
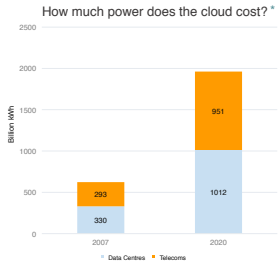
The energy consumed by the Information Technology (IT) sector is much larger than previously estimated. The “cloud” of online services is rapidly growing to serve billions of mobile devices. The IT carbon footprint is becoming a threat to the environment. More than 10% of the world’s energy consumption is spent on computing. IT consumes 50% more than the aviation sector. **Computing needs to become more energy efficient.**



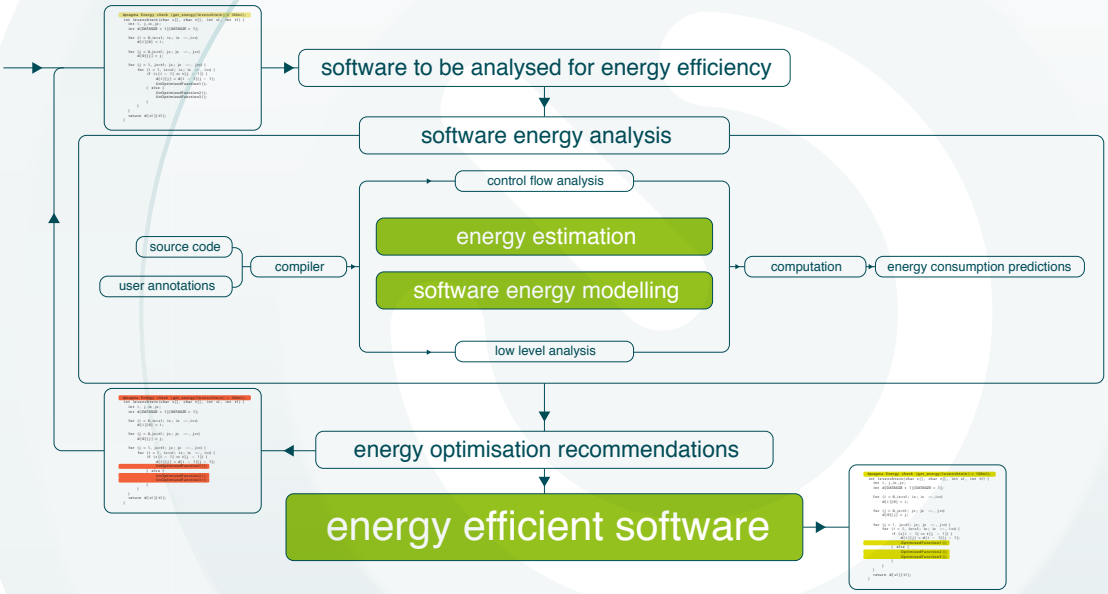


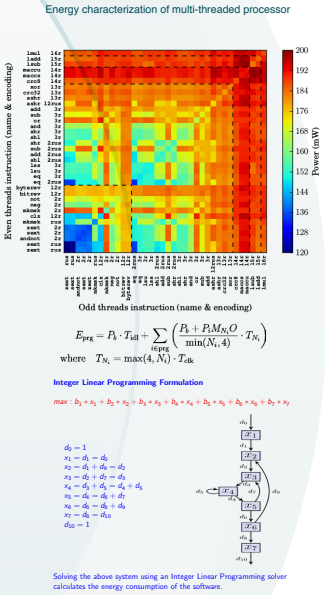
Optimizing hardware is not enough

- The UK is the world leader in designing energy efficient hardware.
- Until now the target for energy efficient computing has been the hardware but energy efficient hardware is only half of the story.
- **Even with the most energy efficient hardware, much of the potential for energy savings is wasted by inefficient software**.

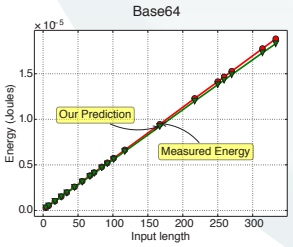
The focus should be on **software**

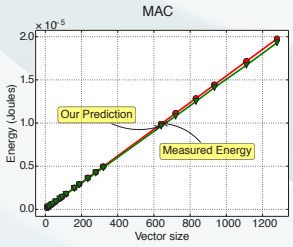
- Our research allows the energy consumption of programs to be predicted based on analyzing the machine code.
- Making the energy consumption of programs visible to developers enables them to write more energy efficient code.
- **20-50% energy savings can be achieved by optimizing software.**

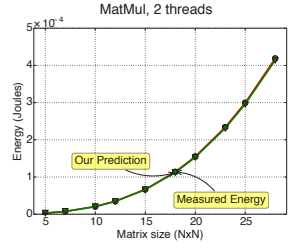


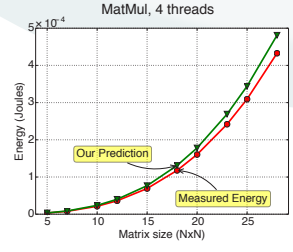


Results for typical applications









Hardware measured energy consumption

Our analysis energy consumption prediction

Looking ahead to a **greener future**

- Energy efficient system design means optimizing the entire system stack from hardware to software.
- Our research enables energy transparency from hardware to software.
- Energy transparency allows software developers to assess the energy consumption of their code and to optimize for low energy.
- We must educate the next generation of programmers to write **greener software** and **cool programs**.

University of BRISTOL

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement no 318337, ENTRA - Whole-Systems Energy Transparency.

Greenpeace report*, “Make IT Green: Cloud Computing and its Contribution to Climate Change”, March 2010.