

## Motivation

### 1. The need for green computing

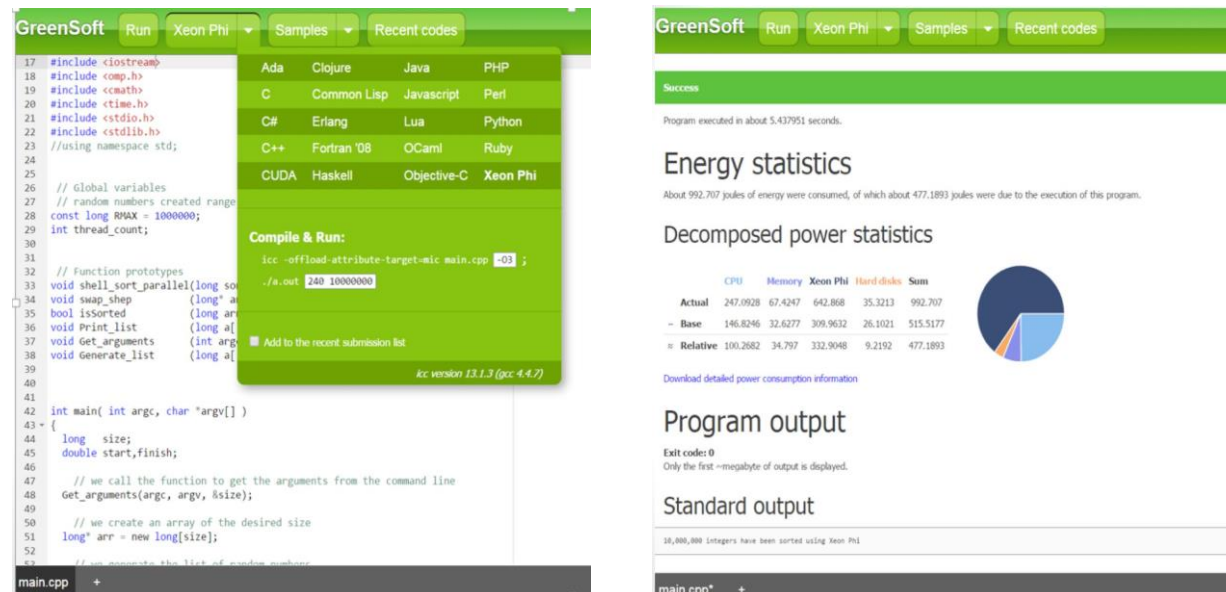
- Carbon footprint of ICT expected to reach 1.5 gigatons by 2020.
- Data centers use approximately 3% of US electricity.
- Annual data center power consumption projected to grow over 50%.
- Average power consumption of the top 10 supercomputers growing from 4MW in 2012 to 7.8 MW in 2017.
- Mobile devices have growing computing demand but with very limited battery capacity.

### 2. The need for energy efficient software

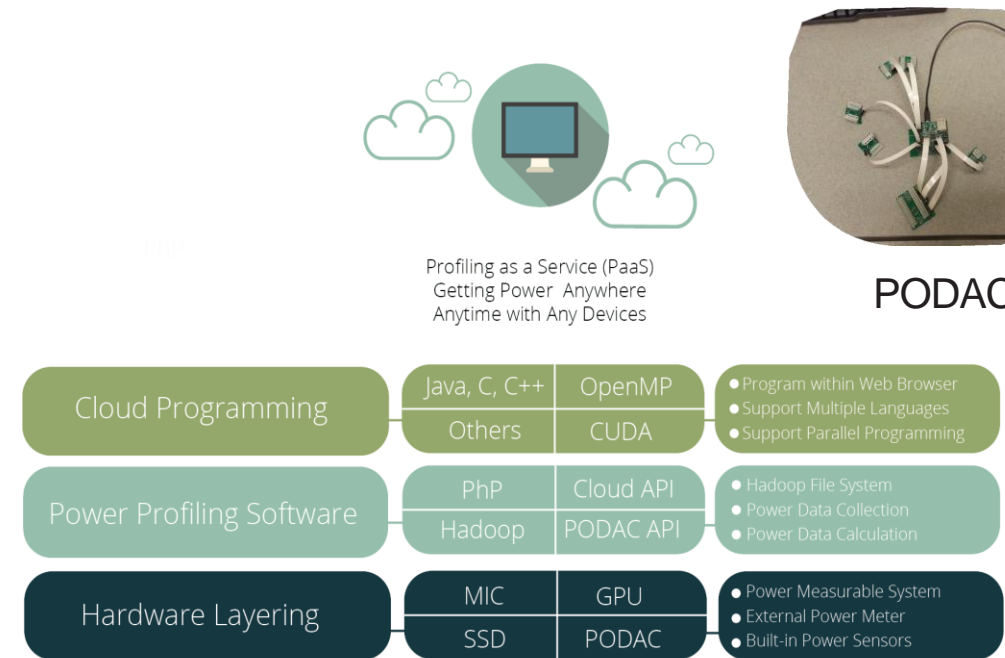
- Gate's Law: the speed of software halves every 18 months.
- Data is exploding and bloated software abounds.
- Code written in the 1970s is highly efficient due to severe limitations on memory and disk space. Every byte and clock cycle count. Today's software includes much more lines of code but less efficient in general, which wastes significant amount of energy.
- Improving the energy efficiency of software helps reduce power cost of both hardware and cooling.

## Marcher User Interface

Web-based coding and compilation with detailed energy report and categorization. Supporting green computing research and education by making power profiling as a service and enabling code sharing.



## Marcher System Overview



## Marcher System Configurations

The Marcher system consists of two computer clusters located at Texas State University and Clemson University respectively.

### Compute node hardware

- Dual Intel Xeon E5-2670 8-core processors
- 32GB DDR3 DRAM
- Intel Xeon Phi + NVidia K20 GPU
- 160GB SSD, 1TB HDD

### Power measurement support

- Component level physical measurement with Power Data Acquisition card (PODAC)
- Component level software-based power estimation with Softmeter
- Power data collection from embedded sensors available on CPUs, GPUs, coprocessors, and DRAMs
- System power measurement

### Supported programming models

- Pthreads, OpenMP, MPI, CUDA
- MapReduce and SPARK

## Marcher System Users

The Marcher system received approximately 15,000 code submissions since Nov. 2015. for energy efficiency analysis. It supports the Green Computing courses at Texas State University and approximately 60 graduate and undergraduate students and 12 K-12 students used the system to conduct green computing related research projects.

## Interested in Using the Marcher System?

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### Marcher Web Interface:

<https://greencode.cs.txstate.edu>

Green Computing Research - Texas State University

<http://www.txstate.edu/discover/green-computing>

### Youtube Video:

<https://www.youtube.com/watch?v=tTFqcVei1Ew>

## Marcher Project Objectives

