

**Panel:**

# Energy Efficient Computing: hype or science?

Moderator: Feng Zhao, Microsoft Research

Panelists:

Chuck Thacker, Microsoft Research

Fred Chong, UC Santa Barbara

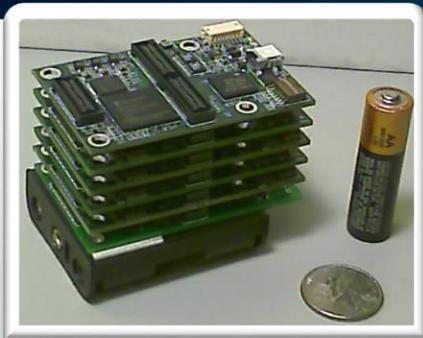
Rajesh Gupta, UC San Diego

Philip Levis, Stanford University

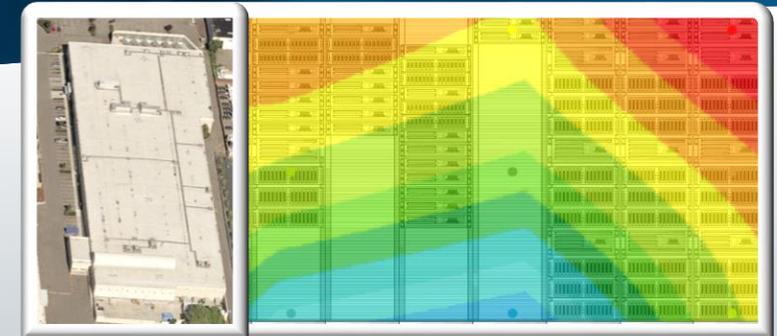
Trishul Chilimbi, Microsoft Research

# Computing and Energy

Computing on a dime  
 $10^{-2}$  W



Computing in a warehouse  
 $10^7$  W



9 orders of magnitude in power difference



Tradeoffs in energy and performance across the scale

# Issues to ponder

- Systems vs components
  - If all the components are energy proportional, would the system automatically do the right thing?
- Software vs hardware
  - What is the role of software in optimizing for energy efficiency?
- Visibility and accounting
  - Do we know where the joules go?
- Energy vs performance
  - Just another proxy? Run as fast as possible?
- Science vs engineering
  - Deeper roots of energy and power as related to computing?

# Panelists

- Chuck Thacker, MSR
- Fred Chong, UC Santa Barbara
- Rajesh Gupta, UC San Diego
- Philip Levis, Stanford University
- Trishul Chilimbi, MSR