State of the art electronics: Panel discussion

R. Ho, S. Borkar, P. Chiang, K. Banerjee
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The connections, the connections, the connections. It will in the end be these details that give the product its life.

Charles Eames (1907-78), American designer

God hangs the greatest weights upon the smallest wires.

Francis Bacon (1561-1626), English philosopher

Man, wires suck.

Anon (2010), computer systems designer
State-of-the-Art Electronics: Panel discussion

• Moderator / Instigator / Argument creator
  – Ron Ho, Oracle Labs

• Panel
  – Shekhar Borkar
    • Intel Fellow and Director, Extreme-Scale Technologies
  – Kaustav Banerjee
    • Professor ECE, UC-Santa Barbara
  – Patrick Chiang
    • Asst. Professor ECE, Oregon State University
The obligatory “life has been good” slide

- Cumulative annual growth rate of 35%
  - But maintaining this performance trend will not be easy…
Frequency scaling is dead; energy limits are king

- To get more performance we must push parallelism
  - Multi- and many-core processors
A braver, newer world?

- Lots of cores → lots of wires!
  - Message passing
  - Task migration
  - Cache coherence and sharing
  - DMAs and scratchpad data
Question 1

NoCs: What’s the point?

• What is the role of NoCs in future manycore systems?

• What topologies are most promising (energy, perf)?

• How heavily utilized are NoCs for practical applications?
Question 2

Any low-hanging fruit?

• What physical technology offers good technology ROI?

• Where should we be investing our own energy?

• [applied to both on-chip and chip-to-chip wires]
Question 3

Resilience: is this just “bend but don’t break”? 

• What is interconnect’s role in overall system resilience?

• Must interconnects change to maintain or enable large-scale resilience? How?
Question 4

Packaging for on-chip and for chip-to-chip wires

- What enabling role is played by packaging/packages?
- Where should we be making direct research investment?
Question 5

Only the paranoid survive

• What keeps you up at night about interconnects?

• Is cost (NRE, complexity, design time) a factor?
SOFTWARE. HARDWARE. COMPLETE.