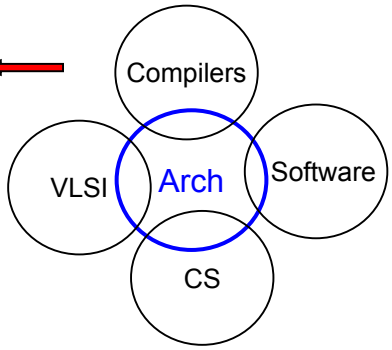
Computer Architecture @ Purdue ECE

- Focus: Architecture
  - Prof. Yung-Hsiang Lu
  - Prof. Vijaykumar
  - Prof. Mithuna Thottethodi
- Productive Collaborations
  - Within ECE
  - CS Department



Prof. Thottethodi's Research Interests

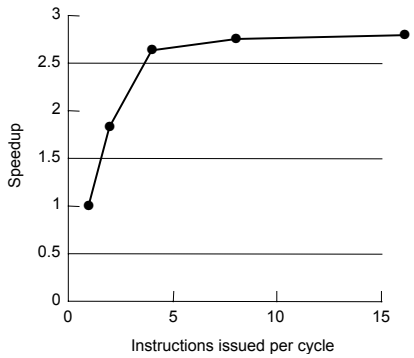
- Distributed Micro-architectures (DMAs)
- Communication fabrics for DMAs
  - How do distributed elements communicate/co-operate?
- Uniprocessor Micro-architecture
  - Exposing intra-instruction communication
  - Energy efficiency
  - Fault-tolerance
- Education/research tools
  - Animated micro-architecture simulators

Motivation

(Source: Intel)

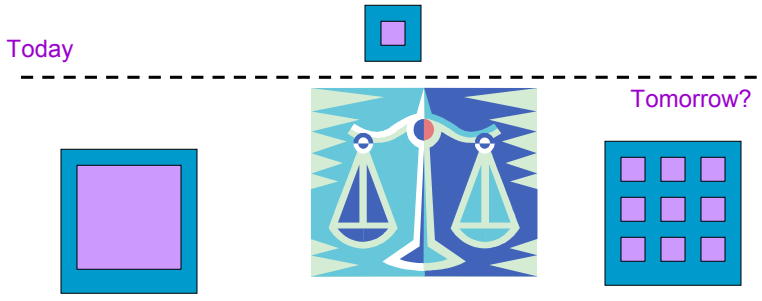
- Why worry about hardware organization and/or architecture?
  - Consistent performance growth (technology + architecture)
  - End of the road?

Diminishing Returns



- Technology constraints: Wire delays, Pipeline limits
- Challenge
  - New growth path

Distributed Micro-architectures



- Bang for the buck
- Extras
  - Redundant computation (fault tolerance)
  - Increased throughput
  - Energy efficiency

Yung-Hsiang Lu

low-power, design automation, architecture, distributed systems

- Automatic computers design
  ⇒ make computers design themselves
- Fault-tolerant sensor networks
  ⇒ balance robustness and energy consumption
- Distributed mobile robots
  ⇒ create a group of intelligent robots that can work together
- Image processing in handheld devices
  ⇒ bring high-quality images / videos everywhere

Prof. Vijaykumar's Projects At a Glance

Power-related (with Prof. Roy, Mike Powell)

- leakage, dynamic power, power density, di/dt noise

Fault Tolerance (with Prof. Pomeranz, Mohamed Gomaa, Chad Scarbrough)

- Using simultaneous multithreading & chip multiprocessors

Network Processors (with Jahangir Hasan)

- Memory bandwidth optimizations

Java/Garbage collection (with Prof. Hosking, Kailash Agrawal)

- Memory/architecture support for garbage collection

Prof. Vijaykumar's Projects At a Glance

Speculation/speculative threading (with Il Park, Chong Ooi)

- For future billion-transistor chips
- With Prof. Eigenmann: Compiler techniques

Security (with Prof. Brodley, Ankit Jalote)

- Hardware support to stop buffer overflow attacks

Software Reliability (Prof. Bagchi, Yen Shue, Jin-Yi Wang)

- Architecture support for improved software reliability

Architectures for future VLSI technologies (with Zeshan Chishti, Ethan Schuchman)

- Technology scaling issues