The Wisconsin Multiscalar Project

Jim Smith and Guri Sohi

University of Wisconsin-Madison

UNIVERSITY OF WISCONSIN MADISON

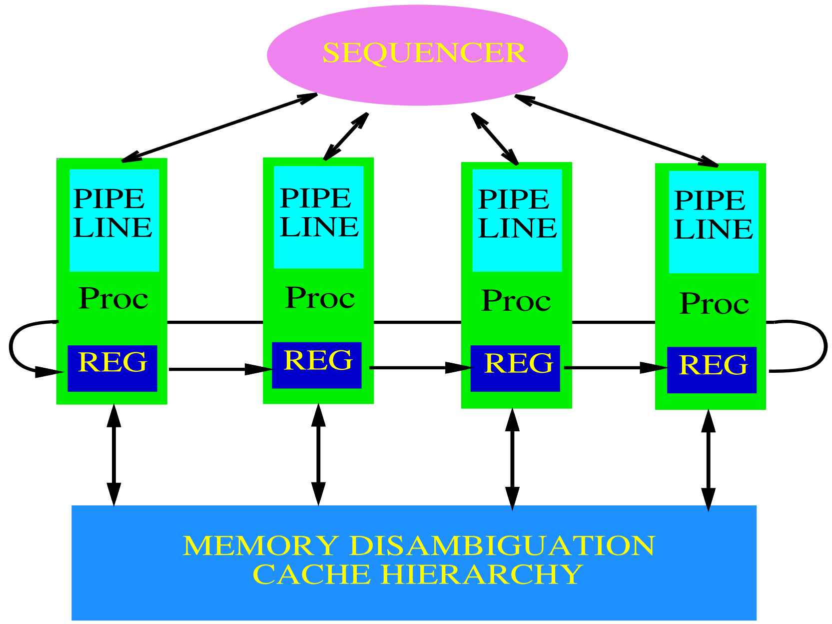
Objectives

- Develop new microarchitectural paradigm for next decade
  - exploit next-decade semiconductor technology
  - execute conventional serial (non-numeric) programs in parallel
  - exploit parallelism in new ways: heavy data and control flow speculation
  - provide scalable ILP growth path

=> Multiscalar Processors

- Assess viability of multiscalar paradigm

Multiscalar Paradigm



- Partition program into *sequential* tasks
- Initiate tasks according to *predicted* order
- Use *multiple* PCs to sequence through program
- Hardware support for data speculation

Approach

- Develop hardware design and software
  - provide accurate cost/performance evaluation
- Multilevel simulation (for hardware design)
  - High level performance model
  - Verilog behavioral models for selected units
  - Verilog structural model for multiscalar-specific
  - Spice level for selected circuits
- Software (Wisconsin and Minnesota)
  - integrate front end (SUIF) to back end (GCC)
  - develop multiscalar-specific compilation methods and optimizations

Impact

- New paradigm for next-decade processor implementations
  - hardware designs for multiscalar processors
  - compilers to exploit potential
  - accurate simulation results to validate paradigm
- Transfer of research results to microprocessor industry
  - maintain and develop industrial contacts
  - annual research forum

UNIVERSITY OF WISCONSIN MADISON