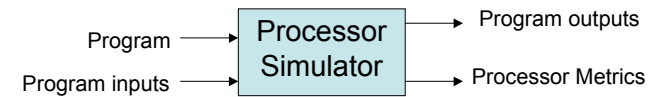


SimpleScalar Primer

CSE 471, Spring 2006

Architectural Simulation

- What is an architectural simulator?
 - A tool that mimics the behavior of a computing device



Why simulate?

- Easier to develop SW than HW
- Only model what you care about
- Control all aspects of execution
- Inspect internal state
 - To learn, as in SPIM
 - To debug, like in Valgrind (vmware?)

Simulation Tools

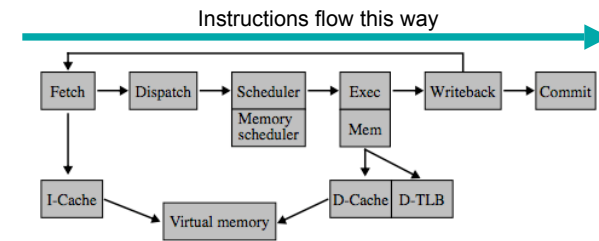
- Simulators
 - Mimic processors, collect stats
- Benchmarks
 - Programs run on simulated processors
 - Chosen for two reasons
 - Representative of real workloads
 - Challenge the processor

SimpleScalar Toolset

- Consists of
 - Several simulators
 - Compilation tools
- We'll use
 - Mostly just one simulator, sim-outorder
 - Maybe some compilation tools

SimpleScalar Architecture

- PISA Instruction Set
 - RISC, Like MIPS
- Simulated Processor Pipeline



SPEC95 Benchmarks

- Benchmarks are programs run when measuring system performance
- SPEC95 benchmarks are good for measuring processor performance
- We'll use 4 of them with SimpleScalar

The Benchmarks

- Compress
 - A data compressor
- Cc1
 - A C compiler
- Go
 - AI program that plays the game of GO
- Perl
 - A perl program interpreter

Finding the Tools

- Any instructional Linux machine
 - /cse/courses/cse471/06sp/simplescalar
 - More details on course web

Running the Simulator

```
sim-outorder <sim-params> program <prg-params>
```

Example:

Running

```
$ sim-outorder -redir:sim HelloWorld.dat HelloWorld.ss
```

Prints “Hello, world!” and produces HelloWorld.dat

HelloWorld.dat contains metrics generated by the simulator while it ran HelloWorld.ss

Simulator Parameters

- Most describe the simulated processor
 - E.g., how many ALUs, what size caches
 - See docs on course web
- Some control simulator output
 - **-redir:sim FILE** puts metrics into FILE
 - **-redir:prog FILE** puts program output in FILE
 - **-dumpconfig FILE** prints config options to FILE
 - **-config FILE** reads config options from FILE

Caveat Simulator

- **sim-outorder is *slow***
 - Around 4000 times slower than a real machine
- **Plan ahead**
 - Simulations in this class might take an hour

Section Today

- Go to one of the instructional labs
- Try to use the simulator
- I'll be in 006 from 2:30 to 3:20 if you have questions