A Note on SimpleScalar

SimpleScalar (SS) is a software tool set used to model a detailed cpu microarchitecture, allowing you to simulate real programs for performance analysis while being able to tweak various architectural parameters. Details may be found at this link: <u>http://www.simplescalar.com/docs/hack_guide_v2.pdf</u>

For our labs we will be using SimpleScalar's PISA instruction set (Portable Instruction Set Architecture). Therefore, you must compile your program for PISA so that it is able to execute on the SimpleScalar architectural model. Since our workstations are x86-64 based, you will need to use a GNU GCC-based cross compiler (sslittle-na-sstrix-gcc) that will compile your .c programs and create a binary to run on SimpleScalar. Detailed statistics will then be generated about your application when the binary is executed on the simulator (also depending on the SS simulator type chosen).

SimpleScalar has a suite of different types of simulators to select from: sim-fast, sim-safe, sim-profile, sim-cache, sim-outorder. Each varies in microarchitectural details depending on the application's statistics you desire from the simulator. Refer to the hack_guide_v2.pdf for further details.

Using SimpleScalar on the EE workstation

- 1. Setup SimpleScalar on your workstation by typing the command SScalarsetup in the terminal. This will create a shadow copy (folder of the simulator and its tools) in your home directory. The line "Simple Scalar Version 3.0d is now setup." ensures that this setup was successful.
- 2. You will now be redirected to the ~/SScalar3.0d folder which was created for you.
- 3. Download a .c benchmark application which you would like to execute on SS to obtain statistics for (i.e. bench.c)
- 4. Compile bench.c using the SS GCC cross-compiler located in the folder ~/SimpleScaler-3.0d/bin/sslittle-na-sstrix-gcc to generate an executable as you would with any standard gcc. Make sure that you point to the correct location of bench.c:

i.e:~/SimpleScaler-3.0d> ./bin/sslittle-na-sstrix-gcc -c ~/Documents/coe818/bench.c

*Note that the above command line will only produce an object file, not an executable.

- 5. Once successful, the binary file (i.e. a.out or equivalent) will be created to run for SS
- 6. The various SS simulators may be found in ~/SimpleScaler-3.0d/simplesim-3.0/ The command ls will list all the simulators (sim-* executables) available in thia directory.
- 7. To execute the binary on one of the available simulators, simply add the simulators name after the directory, while passing the executable as an argument

i.e.:~/SimpleScaler-3.0d> ./simplesim-3.0/sim-safe a.out

This example executes a out on the sim-safe SS simulator. Again, ensure that the correct location of the executable is pointed to. Once executed, the simulator will output a list of statistics about the application's execution (on the SS architecture) to the terminal's screen.

Note that the ~/SimpleScaler-3.0d> ./simplesim-3.0/sim-safe -h option will output a help menu with the many options available to you when using SimpleScalar.