Assignment 1

ECE511

Due 09/07/2017

1 gem5 setup

Follow the tutorial provided in class and online in order to set up gem5. For more details on gem5, refer to this gem5 tutorial. Specifically, the third chapter of the tutorial explains how to add a cache to system, and the fourth chapter gives some insight on the interpretation of the statistics generated when running a simulation.

You will also need to have access to the engineering gitlab, in order to submit your work.

You will use the correlation_medium and fft benchmarks for this assignment.

Run `fft` with `-m16 -p2`.

You will also need to install python-pydot to generate the `config.dot.pdf` file.

2 Baseline Simulation Results

Once you're familiar with changing the high-level architecture of a computer system and adding multiple layers of cache, configure gem5 to simulate a computer system with a dual-core processor and private L1I, L1D, and L2 caches. Use the same system configuration file shown in the given tutorial link.

Run the benchmark under this configuration, and save the statistics. These are the baseline results.

3 Modify the Cache Hierarchy

Now, add a shared L3, using the configuration below. You'll need to modify the `configs/common/Caches.py` and `CacheConfig.py` files.

```
class L3Cache(Cache):
        assoc = 16
        hit_latency = 20
        response_latency = 20
        mshrs = 512
        tgts_per_mshr = 20
        write_buffers = 256
```

Now, configure the simulator to have 8 cores with shared L2s between four cores, and a shared L3. You should have two L2s, each one shared by four cores, and a single L3.

Change the size of each L2 to 512kB, and the size of the L3 to 2MB.

Re-run the benchmarks and compare the results. Then run `fft` with `-m16 -p8` and compare those results.

4 Submission

You are expected to turn in a report, as well as to push your code to the engineering gitlab. You will push your code to a repository created specifically for you within the ece511 group. If you do not yet have access to this group, please request it here. Please push your changes by midnight on the due date.

For the report, detail your findings, and explain why you got the results you did. Be sure to provide detailed analysis of the changes made throughout this assignment, and of how the results were affected at each step of the process. Your report must be uploaded to compass by midnight on the due date.

Although you should compare as much of the statistics as possible, be sure to specifically discuss the ones listed below. Don't comb through the statistics files, use a tool like `diff` on Linux. It's not expected that you be able to understand every difference.

- IPC
- Cache Misses, for each cache level
- Cache Hit Rate, for each cache level
- Simulation Time
- Host Instruction Rate
- Cache Write Backs

Be sure to include the `configs.ini`, `stats.txt`, and `config.dot.pdf`