

Simulation Environment Documentation

This document explains the simulation environment for the project, including directory structure, configuration systems, automation scripts, and results handling.

1. Overview

The environment supports:

- Running SimpleScalar benchmarks
- Running ChampSim traces
- Configurable cache parameters
- Versioned experiments
- Automatic results/csv generation
- Extensibility for new cache designs

2. Directory Structure

```
Project/
  env.sh
  scripts/
  config/
  results/
  traces/
  simplesim-3.0/
  ChampSim/
  docs/
```

Key components:

- `env.sh` - Sources environment
- `scripts/` - SS and ChampSim automation
- `config/` - User-editable experiment settings
- `results/` - Tagged output directories
- `traces/` - Benchmarks and inputs
- `docs/` - Documentation

Run Tagging

The environment allows for run tagging to track simulations and runs.

Usage:

```
RUN_TAG=baseline
source env.sh
```

This will automatically set

```
SS_RESULTS = results/ss/baseline  
CHAMPSIM_RESULTS = results/champsim/baseline
```

Each experiment or run can be assigned its own tag to organize results

4. Configuration Files

Configuration files are located in `config/`

4.1: SimpleScalar Cache Geometry - `ss_cache.sh`

```
export SS_IL1_CONFIG="il1:32768:64:1:l"  
export SS_DL1_CONFIG="dl1:32768:64:1:l"  
export SS_UL2_CONFIG="ul2:262144:64:4:l"
```

4.2: SimpleScalar Benchmarks - `ss_benchmarks.txt`

```
test-fmath:test-fmath  
test-llong:test-llong  
test-lswlr:test-lswlr  
test-math:test-math
```

4.3: ChampSim Runtime Settings - `champsim_run.sh`

```
export CS_BINARY_NAME="champsim"  
export CS_WARMUP_INS=1000000  
export CS_SIM_INS=10000000
```

4.4: ChampSim Trace List - `champsim_traces.txt`

```
600.perlbench_s-210B.champsimtrace.xz  
602.gcc_s-216B.champsimtrace.xz  
429.mcf-184B.champsimtrace.xz
```

To change a workload, only these files need to be edited. The scripts themselves do not need to be edited.

5. Automation Scripts

SimpleScalar

- `run_ss_cache.sh` - run a single benchmark
- `run_ss_sweep.sh` - run all benchmarks in config list

Outputs:

- per-benchmark logs
- `ss_baseline.csv` summarizing miss rates and CPI

ChampSim

- `run_champsim.sh` - run a single trace
- `run_champsim_sweep.sh` - run all configured traces

Outputs:

- per-trace logs
- `champsim_baseline.csv` with L1I, L1D, LLC miss rates

6. Results Directories

All results are stored by a tag: Example:

```
results/
  ss/
    baseline/
    victim/
  champsim/
    baseline/
    victim/
```

7. Using the Environment

Example usage:

```
RUN_TAG=example_tag source env.sh
ss_sweep
cs_sweep
```