RPM: RISC-V Performance Model

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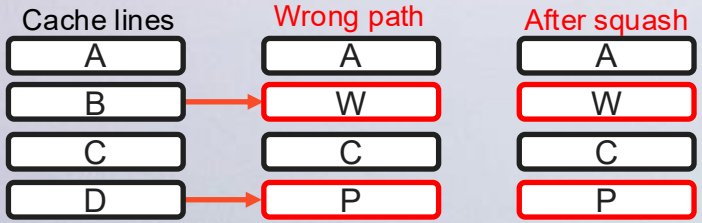
An Open-source, Modular Framework for RISC-V Microarchitecture Modeling

Execution-Driven Simulation with True Wrong-Path Speculation

- Whisper ISS and the Sparta timing model advance together through **PerfAPI** – no full ISA in the timing model
- Executes every fetched instruction – true wrong-path speculation with real pollution and contention
- Hundreds of KIPS of simulation speed

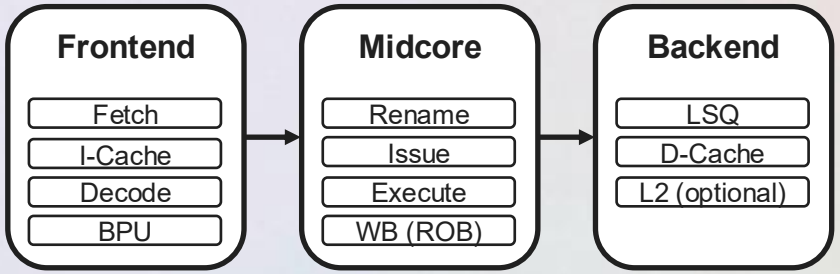
Timing & functional state advance in lockstep

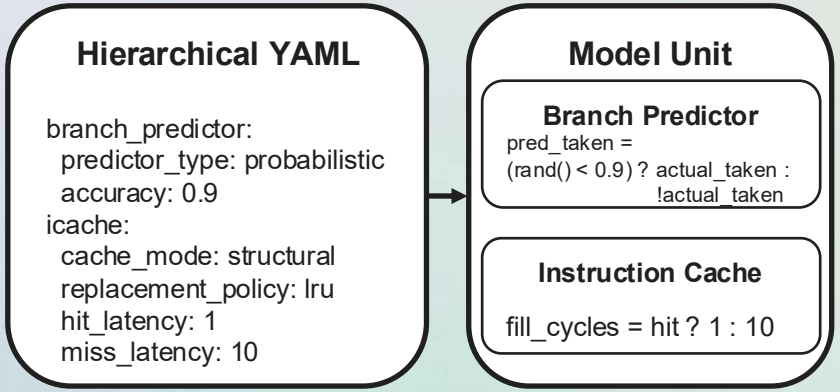


Cache pollution due to wrong-path speculation

Modular Interfaces for Design-Space Exploration

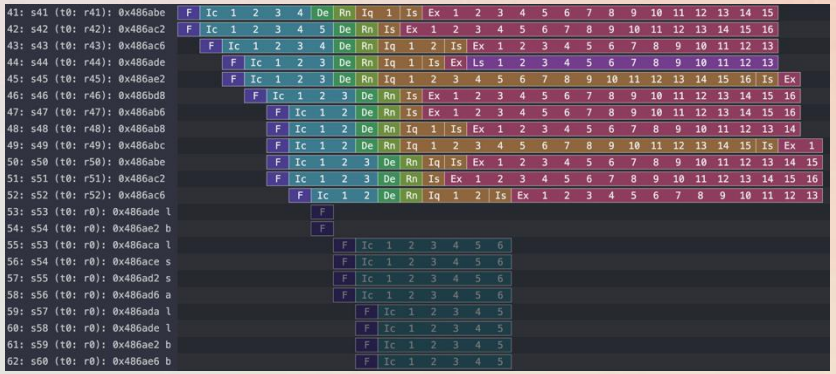
- Self-contained Sparta units linked by typed message ports
- Swap whole stages or drop in “perfect” models to isolate bottlenecks





An Ecosystem of Debugging Tools

- AI-friendly structured logs
- Pipeline visualizer: per-cycle traces in popular formats (e.g., Kanata)
- Parallel sweeps on Slurm / AWS spot



Open-source on Github!

tenstorrent

**work done while interning at Tenstorrent*