

GeFIN



Microarchitecture Level Fault Injector for ARM, Intel and AMD CPUs

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Product overview

GeFIN is a complete microarchitecture level reliability evaluation framework for high performance and embedded computing systems. It is based on state-of-the-art statistical fault injection and built on ACE analysis on Gem5 full-system simulator, providing accurate results for the entire CPU and all its components.

Supported Architectures

- ⇒ ARMv7, ARMv8, x86, Alpha
- ⇒ Comes with ARM Cortex-A15, Cortex-A9 and Intel Haswell presets
- ⇒ **Most commercial embedded and high performance** microarchitectures

Target Components

- Physical Register File (Int, FP, CC)
- All fields of caches (L1 data and instruction, L2, L3)
- Prefetchers of L1 data, L1 instruction, L2
- Load/Store Queue (all data fields)
- Instruction Queue (all data fields)
- ROB (active list)
- Rename map
- TLB (Instruction and data)
- Branch Predictors, RAS, BTB
- Main memory

Extensions & Tools

- **Fully automated** interface
 - ◇ Benchmark profiling and checkpointing
 - ◇ Fault-injection campaign
 - ◇ Result classification
- Extension with x86 Translation caches
- Graphical **web interface**
 - ◇ Live status monitoring
 - ◇ Early result classification

Supported Fault Models

- ⇒ **Transient** } any multiple combina-
- ⇒ **Intermittent** } tion of model, compo-
- ⇒ **Permanent** } nent, entry and cycle

Measurements

- AVF/FIT, HVF
- **Fault effect classification:**
 1. Masked
 2. Silent Data Corruption (SDC)
 3. Crash
 4. Assert
 5. Timeout
 6. DUE

Flexible user extensible parser.
Measurements in **any unmodified workload.**

"100 to 1000 times faster microarchitecture level reliability assessments for Intel/AMD x86 and ARM processors"

- Computer Architecture Lab

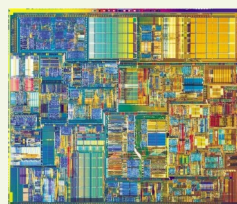
Acceleration with efficient driven simulation

Intelligent **acceleration features:**

- **Workload analysis** - Initial analysis to effectively drive fault injection only to crucial parts - Introduces a novel grouping technique.
- **Simulation speedup** - Runtime simulation speedup with several acceleration techniques.
- Up to **1000x faster** compared to baseline fault-injection.



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