dinero cache simulator
&
PIN

MO801

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dinero IV

- Dinero is a trace driven cache simulator
- Available at
  - http://pages.cs.wisc.edu/~markhill/DineroIV
- What is a trace?

Basic idea

- The basic idea is to simulate a memory hierarchy consisting of various caches connected as one or more trees, with reference sources (the processors) at the leaves and a memory at each root.

- The various parameters of each cache can be set separately (architecture, policy, statistics).

- During initialization, the configuration to be simulated is built up, one cache at a time, starting with each memory as a special case.

- After initialization, each reference is fed to the appropriate top-level cache by a single simple function call.

- Lower levels of the hierarchy are handled automatically.

Limitations

- Dinero IV is not a timing simulator. There is no notion of simulated time or cycles, only references.

- Dinero IV is not a functional simulator. Data & instructions do not move in and out of the caches; in fact they don't exist! The primary result of simulation with Dinero IV is hit and miss information.

- Dinero IV isn't multi-threaded. If you have a multiprocessor with enough memory, you can run multiple independent simulations concurrently.

Trace format

- Each line is a trace record
- Each trace record consists of three things
  - Access type
  - Address
    - Hexadecimal value
    - No limitations, typically platform dependent (32/64 bits)
  - Size
    - No alignment restrictions
    - May span multiple sub-blocks or blocks
    - Available in Dinero III format. Defaulted to 4 in Dinero IV

Access types

- Read → r
- Write → w
- Instruction fetch → i
- Miscellaneous → m
  - Work as reads but never generate prefetches
- Copy back → c
  - No invalidation implied
- Invalidate → v
  - No copy-back implied

Command Line Options

- -lN-Tsize P
  - Size
- -lN-Tbsize P
  - Block size
- -lN-Tsbsize P
  - Sub-block size (default same as block size)
- -lN-Tassoc U
  - Associativity (default 1)
- -lN-Trepl C
  - Replacement policy (l=LRU, f=FIFO, r=random) (default l)
- -lN-Tfetch C
  - Fetch policy (d=demand, a=always, m=miss, t=tagged, l=load forward, s=subblock) (default d)

- -lN-Tpfdist U
  - Prefetch distance (in sub-blocks) (default 1)
- -lN-Tpfabort U
  - Prefetch abort percentage (0-100) (default 0)
- -lN-Twalloc C
  - Write allocate policy (a=always, n=never, f=nofetch) (default a)
- -lN-Twback C
  - Write back policy (a=always, n=never, f=nofetch) (default a)
- -lN-Tccc
  - Compulsory/Capacity/Conflict miss statistics

Command Line Options

- -skipcount U
  - Skip initial U references

- -flushcount U
  - Flush cache every U references

- -maxcount U
  - Stop simulation after U references

- -stat-interval U
  - Show statistics after every U references

Trace example

- Consider the trace file

```
r 0
r 4
r 8
r b
r 10
```

- And the command

```
./dineroIV –l1-dsize 2K –l1-isize 2K –l1-ibsize 16 –l1-dbsize 8 < test.din
```

PIN

- Binary instrumentation
- Available for x86 platforms
- http://www.pintool.org