dinero cache simulator & PIN

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dinero IV

- Dinero is a trace driven cache simulator
- Available at
 - http://pages.cs.wisc.edu/~markhill/DinerolV
- 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 \rightarrow r
- Write \rightarrow 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

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

- -IN-Tpfdist U
 - Prefetch distance (in sub-blocks) (default 1)
- -IN-Tpfabort U
 - Prefetch abort percentage (0-100) (default 0)
- -IN-Twalloc C
 - Write allocate policy (a=always, n=never, f=nofetch) (default a)
- -IN-Twback C
 - Write back policy (a=always, n=never, f=nofetch) (default a)
- -IN-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 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