

**NAME**

dineroIV – fourth generation cache simulator

**SYNOPSIS**

**dineroIV** [options]

**DESCRIPTION**

The *dineroIV* command is a trace-driven cache simulator based on the *dineroIV* library, documented separately.

The basic operation is to read memory reference trace records from the standard input, process them through one or more simulated caches forming a memory hierarchy, and write statistics on the standard output.

**OPTIONS**

Some options control overall operation, while others specify the basic parameters and arrangement of the caches to be simulated. In the following list of options, *F* is a string, *U* is an unsigned decimal integer, *C* is a single character, *A* is a hexadecimal address, and *S* is like *U*, but with an optional scaling suffix character (one of **kKmMgG**, for multiplication by 0x400, 0x100000, or 0x40000000). *P* is like *S*, but must be a power of 2, *N* is a cache level ( $1 \leq N$ ), where level 1 is closest to the processor, and *T* is a cache type (**u**=unified, **i**=instruction, **d**=data).

Some global options take 0 or 1 argument, while options that specify characteristics of a particular cache typically involve 2 or 3 arguments, with the cache level and type being incorporated into the option name as indicated.

- help** Print a synopsis of all the options and defaults. No simulation is done.
- copyright** Describe copyright terms for *dineroIV*.
- contact** Tell how to get the latest version of Dinero IV and how to contact the authors. This information is also available below, in **AUTHORS** and **COPYRIGHT**.
- dineroIII** Show what *dineroIV* command line arguments correspond to each *dineroIII* argument.
- custom F** Generate and run a customized version of the simulator, with the resulting executable named *F*. Most cache parameters are fixed and made into constants, with a resulting performance boost that is somewhat variable, but generally recommended for lengthy simulations. The fixed options are unsettable in the customized program; run *F* with the **-help** option to see exactly which options are still available. *F* is not removed following simulation, so it can be used for more than one run. The *dineroIV* source code must be available and properly configured for **-custom** to work, with the **D4\_SRC** environment variable naming the directory.
- skipcount U** Disregard the initial *U* memory references from the standard input.
- flushcount U** Flush the cache after processing every *U* references read from the standard input.
- maxcount U** Stop the simulation after processing *U* references read from the standard input.
- stat-interval U** Show statistics after processing every *U* references read from the standard input. This is in addition to the statistics produced at the end of the full simulation.
- informat C** Select the input trace format as indicated by *C* (**D**=extended din, **d**=traditional din, **p**=pixie32, **P**=pixie64, **b**=binary). The exact current list of choices is given by the **-help** option. The default input format is **D**. See **TRACE RECORDS**, below, for more information.
- on-trigger A** Disregard trace records until one with address *A* is seen.
- off-trigger A** Disregard trace records after seeing one with address *A*.
- stat-idcombine** Combine the statistics for separate instruction and data caches.
- lN-Tbsize P** Set the block size of the specified level *N* cache to *P* bytes.

- IN-Tsbsize** *P* Set the sub-block size of the specified level *N* cache to *P* bytes. If not specified, sub-blocks are not used (i.e., sub-block size = block size).
- IN-Tsize** *P* Set the cache size of the specified level *N* cache to *P* bytes.
- IN-Tassoc** *U* Set the associativity of the specified level *N* cache to *U*.
- IN-Trepl** *C* Set the replacement policy of the specified level *N* cache to *C* (**l**=LRU, **f**=FIFO, **r**=random). The exact current list of choices is given by the **-help** option.
- IN-Tfetch** *C* Set the fetch policy of the specified level *N* cache to *C* (**d**=demand, **a**=always, **m**=miss, **t**=tagged, **l**=load forward, **s**=sub-block). The exact current list of choices is given by the **-help** option. Further information on fetch policies is given in *dineroIV(3)*.
- IN-Tpfdist** *U* Set the prefetch distance of the specified level *N* cache to *U* sub-blocks. The default is 1. This option is not valid for the **d** fetch policy, where no prefetching will happen.
- IN-Tpfabort** *U* Set the prefetch abort percentage of the specified level *N* cache to *U* (0–100). The default is 0. The specified percentage of prefetch requests will be randomly chosen to be aborted, i.e., not happen. This option is not valid for the **d** fetch policy, where no prefetching will happen.
- IN-Twalloc** *C* Set the write allocate policy of the specified level *N* cache to *C* (**a**=always, **n**=never, **f**=nofetch). The exact current list of choices is given by the **-help** option. Further information on write allocate policies is given in *dineroIV(3)*.
- IN-Twback** *C* Set the write back policy of the specified level *N* cache to *C* (**a**=always, **n**=never, **f**=nofetch). The exact current list of choices is given by the **-help** option. Further information on write back policies is given in *dineroIV(3)*.
- IN-Tccc** Compute Compulsory/Capacity/Conflict miss rates for the specified level *N* cache.

## TRACE RECORDS

A *dineroIV* trace record, as processed internally, consists of three things: an access type, an address, and a size. The following access types are supported:

- Read.
- Write.
- Instruction fetch.
- Miscellaneous. These references are treated like reads, but they never generate prefetches.
- Copy-back dirty (sub-)block(s), with no invalidation implied. This affects the whole cache if the indicated size is 0.
- Invalidate block(s), with no copy-back implied. This affects the whole cache if the indicated size is 0.

There are no internal restrictions on what constitutes a valid address, except that the size of an address is platform-dependent (generally 32 bits or more). The size value of a trace record indicates the number of bytes affected. *Dinero IV* imposes no size or alignment restrictions on memory references; they may span multiple sub-blocks or blocks.

The following input formats are supported by the **-informat** option:

- d** The traditional “din” format of *Dinero III*. Two fields are examined per line: access type and address. The access type is numeric: 0 for read, 1 for write, 2 for instruction fetch, 3 for miscellaneous, 4 for copy-back, and 5 for invalidate. The address is hexadecimal, beginning with an optional “0x” or “0X”. Fields are separated by white space (space or tab), and everything following the first two fields of a line is ignored. To approximate the behavior of *Dinero III*, addresses are silently rounded down to a multiple of 4 bytes, and the data size for reads and writes is always assumed to be 4 bytes.

- D** An extended version of the traditional Dinero III input format, where each line contains three significant fields. The first field, specifying the access type, is a single letter (**rwimcv**) to indicate one of the access types described above. The second field is the hexadecimal address, and the third field is the hexadecimal size. A leading “0x” or “0X” is ignored at the beginning of each hexadecimal field. Fields are separated by white space (space or tab), and everything following the first three fields of a line is ignored.
- p** The format produced by **pixie -idtrace** on SGI IRIX systems.
- P** The format produced by **pixie -idtrace\_ext** on SGI IRIX systems.
- b** A binary format, consisting of a four byte little-endian address, a 2-byte little-endian size, a 1-byte access type, and a byte of padding.

**FILES**

For the **-custom** option, the location of the Dinero IV source files is given by the **D4\_SRC** environment variable.

**SEE ALSO**

dineroIV (3).

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The latest version of Dinero IV can be obtained from  
<ftp://ftp.nj.nec.com/pub/edler/d4-X.tgz>  
 where X is the latest version number.

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