

# CSCE 5610 – Computer System Architecture

## Assignment 4

Due: 11/21/2024 11:59PM on Canvas  
(100 points)

This assignment is to evaluate the impact of different cache configurations on the execution times of applications. You will run three benchmark traces provided for you. [Trace1.din](#), [Trace2.din](#) and [Trace3.din](#).

You specify these file names along the path name as the input to Dinero IV. You will evaluate L1 and L2 misses when adjusting the cache configurations of L2 by adjusting L1 configuration. Both L1 and L2 use write through and use LRU replacement algorithm.

First, you should evaluate just L1 cache, below are the L-1 configurations you must vary.

Size of L1-I and L1-D is fixed to 16KB. Block sizes should be configured as 32 Bytes and 64 Bytes. Associativity as 1-way, 2-way and 4-way.

Then, add L2 Cache of size 128KB, repeat above tests. The block sizes and associativity should match the L1's

OR follow the table for all the combinations you should be testing:

L1 size	Associativity	Block size
16 KB	1	32 B
16 KB	2	32 B
16 KB	4	32 B
16 KB	1	64 B
16 KB	2	64 B
16 KB	4	64 B
L1 & L2 size	Associativity	Block size
16 KB & 128 KB	1	32 B
16 KB & 128 KB	2	32 B
16 KB & 128 KB	4	32 B
16 KB & 128 KB	1	64 B
16 KB & 128 KB	2	64 B
16 KB & 128 KB	4	64 B

### Cycles on Hit and Miss

The table below indicates the number of processor clocks for a hit in each of the L2 cache configurations. L1 hit takes 1 cycle. If there is no L2 cache, L1 miss penalty is 60 cycles. L2 miss penalty is also 60 cycles.

Size \ Associative	1-way	2-way	4-way
128 Kbyte	4	5	6

Use the cache simulator to get the L2 & L1 miss rate and compute the CPI for each benchmark-cache configuration combination (CPI equation can be found in class notes and textbook). Use the cycle count for hits and misses of the L2 & L1 and determine which cache configuration will give the best performance (i.e., the lowest CPI) for each benchmark.

You are required to make a shells script in order to easily run all possible configurations, submit this shell script with your results.

Use the **CELL machine** for this assignment, and the cell machine tutorial can be found under Start Here Module.

**Supplied materials:**

**All the supplied materials are in the Assignment4.zip file.**

**Dinero IV:**

Tutorial:

1. DINERO IV Trace Preparation.pdf
2. 5610-Dinero-Tutorial.pptx

Here is an example command:

```
./dinerolV -l1-isize 16K -l1-ibsize 32 -l1-isbsize 32 -l1-iassoc 8 -informat d < Trace1.din
> outfile.txt
```

**Submissions:**

A zip file contains all the following information:

- A WORD/PDF file with the results (miss rate and CPI) of all the configurations (12 configurations). At lease two screenshots to show the execution result in the output files.
- A readme file shows how to execute your code.
- The shell scripts in order to easily run all the configurations.