Efficiency: locality; caching

COSC 208, Introduction to Computer Systems, 2022-04-11

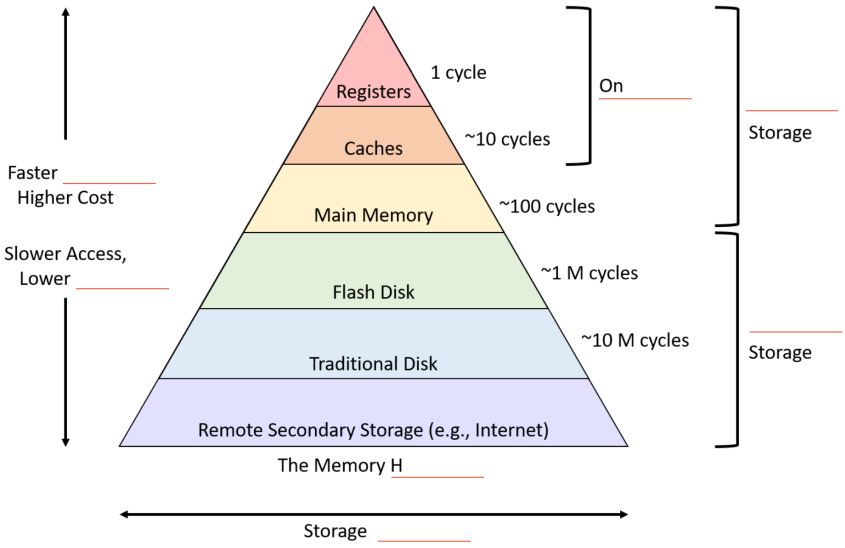
Announcements

- Project 3 due Thursday

Warm-up: reducing data movement

- Q1: *Cross-out unnecessary loads and stores for each of the following snippets of assembly code*

```
000000000000088c <interest_due>:
    88c:    sub    sp, sp, #0x20
    890:    str    w0, [sp, #12]
    894:    str    w1, [sp, #8]
    898:    ldr    w0, [sp, #12]
    89c:    ldr    w1, [sp, #8]
    8a0:    mul    w0, w1, w0
    8a4:    str    w0, [sp, #20]
    8a8:    mov    w0, #0x4b0
    8ac:    str    w0, [sp, #24]
    8b0:    ldr    w1, [sp, #20]
    8b4:    ldr    w0, [sp, #24]
    8b8:    sdiv   w0, w1, w0
    8bc:    str    w0, [sp, #28]
    8c0:    ldr    w0, [sp, #28]
    8c4:    add    sp, sp, #0x20
    8c8:    ret
```



Cache replacement

Q2: Assume a cache can hold 3 entries and the following 15 data accesses occur: 3, 4, 4, 5, 3, 2, 3, 4, 1, 4, 4, 2, 5, 2, 4. Assuming the cache is initially empty, what is the hit ratio for each of the following algorithms?

- *FIFO*
- *LRU*
- *LFU*
- *Optimal*

Q3: *For each of the following instances of caching, indicate whether the caching is motivated by temporal or spatial locality.*

- A CPU caches the first 32 instructions of a function when the function is called
- A CPU caches all of the instructions for a frequently called function
- A web browser caches the Moodle pages for your courses, which you view multiple times per week
- A content distribution network (CDN) caches a video that has gone viral
- A content distribution network (CDN) caches "recommended videos" related to a popular video