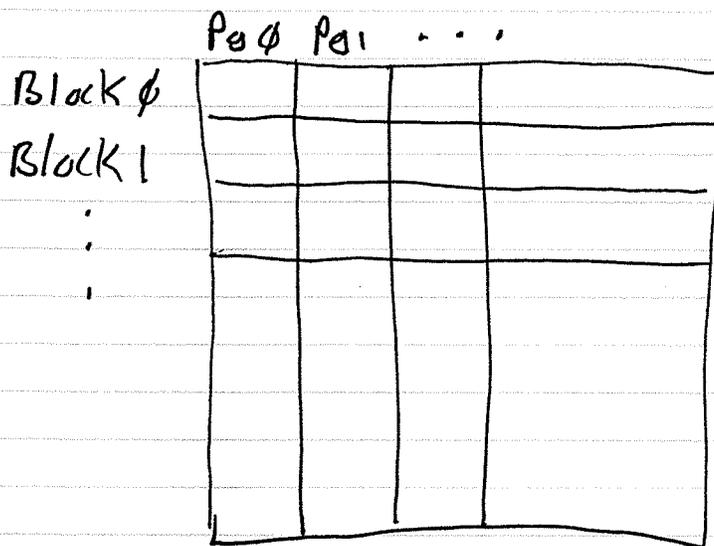


CS 411 SSPs

(1)

Flash storage has interesting properties...

Let's start with organization:



Operations:

Read a page (50 ns)

Erase a block (3 ms) (ALL pages within block)

Program a page (750 ns)

Each page can be erased 10K-100K times before it becomes unusable

②

Naive way to modify a single page

- 1) Read all pages in the block within which the page is stored
- 2) Modify the page
- 3) Erase the block
- 4) Program all pages in the block

Issues :

- 1) Performance
- 2) Write amplification
- 3) Flash wear (File system metadata)

Addressing these issues

An SSD consists of :

- 1) some # of Flash chips
- 2) Flash Translation Layer

- Control logic which serves as the SSD's hardware interface
- Maps logical blocks to physical blocks

3

When a page is modified by the OS's filesystem:

FTL operations:

- 1) Find an unprogrammed page
- 2) Program this page with new page data
- 3) Mark old page unused

When "enough" pages in a block are "unused" erase the block

→ "Garbage Collection" at FTL level

TRIM → "Garbage ~~Collection~~ Collection" at file system level

Wear-leveling of long-lived data