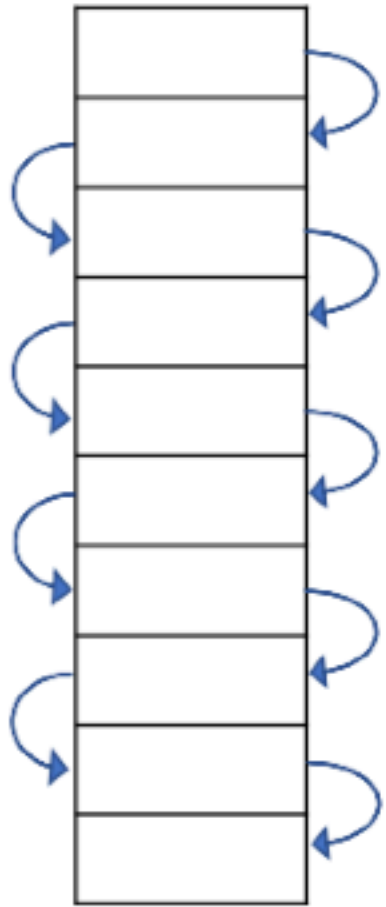
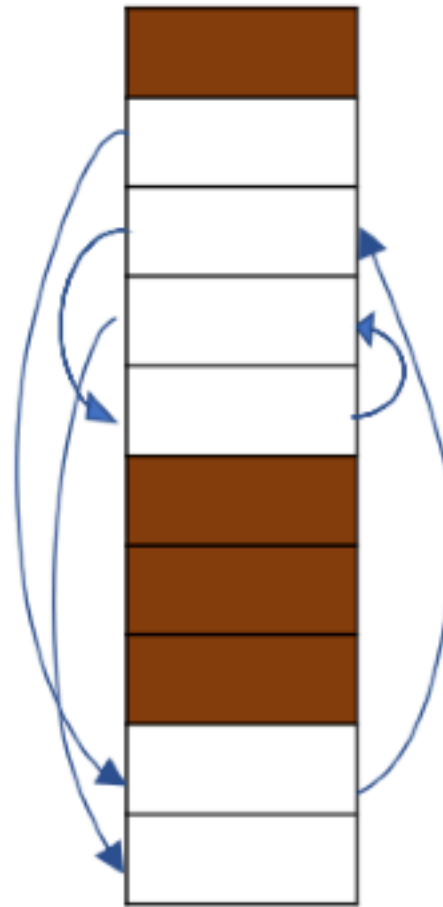


## Problem 2 - Unorganized Freelist



Initial performance good



Get worse over time

### Measurement:

- New FS: **17.5%** of disk bandwidth
- Few weeks old: **3%** of disk bandwidth

● Leads to random allocation of sequential file blocks overtime

# Solution - Bitmaps

Periodical compact/defragment disk

- locks up disk bandwidth during operation

Keep adjacent free blocks together on freelist

- costly to maintain

➔ FFS - bitmap of free blocks (same idea as Indexed File System)

- Each bit indicates whether block is free  
e.g., 1010101111111000001111111000101100
- Easier to find contiguous blocks
- Small, so usually keep entire thing in memory
- Time to find free blocks increases if fewer free blocks

Bits in map	XXXX	XXOO	OOXX	OOOO
Fragment numbers	0-3	4-7	8-11	12-15
Block numbers	0	1	2	3