

Solutions to Homework 11

Problem 1

(1) $4\text{KB} * 547 * 31887 * 2 * 14 = 1,953,525,168 \text{ KB} = 1863 \text{ GB}$

(2)

a) In commercial context, the conversion is $1\text{KB}=1000\text{B}$.

b) $(2048\text{GB} - 1863\text{GB}) / 2048\text{GB} = 9.03\%$

Problem 2

(1) $T_{\text{access}} = T_{\text{seek}} + T_{\text{rotation}} + T_{\text{transfer}} = 9\text{ms} + (60000\text{ms}/7200)/2 + (60000\text{ms}/7200)/500 = 9\text{ms} + 4.17\text{ms} + 0.017\text{ms} = 13.19\text{ms}$

(2) $T = T_{\text{seek}} + T_{\text{rotation}} + T_{\text{transfer}} = 9\text{ms} + (60000\text{ms}/7200)/2 + (60000\text{ms}/7200)/(500/20) = 9\text{ms} + 4.17\text{ms} + 0.33\text{ms} = 13.5\text{ms}$

(3) File system tends to place big files into continuous blocks on disk, while for multiple small files it may not. Reading continuous blocks will reduce the re-search time. (2) accesses 19 more blocks but just spends 0.3ms more compared to (1).

Problem 3

Organization	r	c	br	bc	max(br, bc)
16(cells)× 1(chips)	4	4	2	2	2
16 × 4	4	4	2	2	2
128 × 8	16(8)	8(16)	4(3)	3(4)	4
512 × 4	32(16)	16(32)	5(4)	4(5)	5
1024 × 4	32	32	5	5	5

The idea here is to minimize the number of address bits by minimizing the aspect ratio $\max(r, c) / \min(r, c)$. In other words, the squarer the array, the fewer the address bits.