

Bill Davis

605.411 Problem Set 8

	Instruction	Max Cache With Align	Max Cache No Align	Max Page Faults With Align	Max Page Faults No Align
1.	lw \$t8,4,(\$t0)	32	64	1	2
	lb \$t8,4,(\$t0)	32	32	1	1

2. (a) See attached diagram.
- (b) Since there are 64,000 bits per second, with an interrupt happening every 10 bits, there are 6,400 interrupts per second.  $\frac{2Ghz}{6400} = 312500$  clock ticks between interrupts. Since the CPI is 4, this means that 78125 instructions could execute between interrupts.
3. Since this machine needs 16 bytes every clock cycle to avoid a stall, it requires a 32,000 million bytes per second bus.
4. (a) There are  $\frac{2^{32}}{16384} = 262144$  page table entry each containing 8 bits plus a 30 bit frame id, rounding up to a 40 bit page table entry for a total of  $262144 \times 40 = 10485760$  bytes in the page table.
- (b) There are  $\frac{1.5 \times 2^{29}}{16384} = 49152$  entries in the inverted page table. Each entry contains 8 bits plus a 32 bit page id, rounding up to a 40 bit page table entry for a total of 1966080 bytes in the inverted page table.

	RAID 3	RAID 5
5. (a)		
I	Possible	Possible
II	Possible	Possible
III	Possible	Possible
IV	Not Possible	Not Possible
V	Not Possible	Possible

- (b) You could successfully update stipe 23 as follows.
  1. Read strips 20,21,23, P5. This can all happen at the same time.
  2. XOR the strips together to recreate strip 22.
  3. XOR that result with strips 20, 21, and the updated 23 to create an updated P5
  4. Write P5 back to the disk.
  5. Write updated strip 23. These two writes can happen at the same time.