

CS 186, Fall 2007
Discussion Section Worksheet
09/10 - 09/14

Disk Access Times

- 1) Disk access time is made up of **seek time**, **rotational delay**, and **transfer time**. Which of these three are affected by the data layout on disk (may be more than one)?

Seek time and rotational delay

- 2) Assume that your disk spins at a rate of 250 revolutions per second, that it takes 2 milliseconds to move the read head to an adjacent track, and that it can transfer 100K per second from the disk into RAM. Assuming that the **1MB of data** you need is laid out sequentially on one track, how long will it take to transfer the data into RAM given the following situations:

- a. The read head is already over the same track, and it is already directly over the start of the requested data.

$$0 + 0 + 1\text{MB}/(100\text{k/s}) = 10 \text{ s}$$

- b. The read head is already over the same track, and the requested data will be under the read head in half of a disk rotation.

$$0 + 1/500 + 10 = 10.002 \text{ s}$$

- c. The read head is one track away from the one holding the data, and right when it reaches the correct track it will be over the needed data.

$$0.002 + 0 + 10 = 10.002 \text{ ms}$$

- d. The read head is three tracks away from the one holding the data, and when it reaches the correct track it will be over the needed data after a full disk rotation.

$$0.002*3 + 1/250 + 10 = 10.01 \text{ ms}$$



Buffer Pool Replacement Strategy

- 3) Assuming you start with an empty buffer pool with **four frames**, what will be the happen given the following sequence of page requests:

A, B, C, D, E, A, B, C, D, E, A, B, C, D, E

with the given page replacement policy? How many page faults will occur (meaning a page has to be brought from disk into the buffer pool)?

- a) **LRU** **15 page faults**

Page being read →	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Frame 1	A	A	A	A	E	E	E	E	D	D	D	D	C	C	C
Frame 2		B	B	B	B	A	A	A	A	E	E	E	E	D	D
Frame 3			C	C	C	C	B	B	B	B	A	A	A	A	E
Frame 4				D	D	D	D	C	C	C	C	B	B	B	B
Page fault?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

- b) **MRU** **7 page faults**

Page being read →	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Frame 1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Frame 2		B	B	B	B	B	B	B	B	B	B	B	C	C	C
Frame 3			C	C	C	C	C	C	D	D	D	D	D	D	D
Frame 4				D	E	E	E	E	E	E	E	E	E	E	E
Page fault?	Y	Y	Y	Y	Y	N	N	N	Y	N	N	N	Y	N	N