IIT Guwahati - Department of Computer Science & Engineering

CS343-Operating Systems- Quiz#3 [14.10.2021]

Q1: **Long answer [to type in text box], 2 marks.**

Assume there are 64 physical sectors in a track of a hard disk. A very long video file was saved in 60 continuous sectors (1, 2,..60) of a given track of a cylinder. Later it was found that after reading contents of sector 20, instead of reading from sector 21 the data was read from sector 61 followed by sector 22, 23, 24 and so on. Similarly, this deviation from sequential read was repeated after sector 30 and 40 also where reading happens from sectors 62 and 63, respectively (30, 62, 32, 33….. 40, 63, 42, 43..). The reading ends at sector 60. In your opinion what could be the most suitable reason for this variation from sequential reading? Explain whether it could be a malfunction or a specific optimization?

Answer: **[1 mark for mentioning sector forwarding and 1 mark for explanation]**

Sectors that should have been read : 1,2,.. 20,21,22,..30,31,32,..40,41,42,....60.

Sectors ended up being read : 1,2,.. 20,61,22,..30,62,32,..40,63,42,....60.

Out of sequence sectors highlighted.

Probable reason for this behaviour : Sectors 21, 31 and 41 went bad, and sector forwarding technique was used to store data of those sectors in sectors 61, 62 and 64. During writing of the video file the OS sensed the bad sector and redirected the read/write head to write contents in one of the free sectors causing sectors 21, 31 and 41 to be remapped to sectors 61, 62 and 63. It may be regarded as a malfunction of the secondary storage which the OS resolved using Sector Forwarding.

Q2: File Upload [only one page allowed. make sure the scan and the illustrations are clear, 3 marks]

Consider a main memory system with 3 frames. Assuming that all the frames are initially empty, find out the page fault rate in each of the following page replacement algorithms with necessary illustration. (a) FIFO (b) LRU (c) LIFO

Page reference sequence: 3, 4, 8, 3, 8, 5, 3, 4, 5, 6, 5, 7.

Only one page allowed.

(a) FIFO

3	4	8	3	8	5	3	4	5	6	5	7
M	M	M	H	H	M	M	M	H	M	M	M
3	3	3	3	3	5	5	5	5	6	6	6
*	4	4	4	4	4	3	3	3	3	5	5
*	*	8	8	8	8	8	4	4	4	4	7

Page fault Rate = 9/12 =75% **[Marks: 0.5 (illustration) + 0.5 (final answer)]**

(b) LRU

3	4	8	3	8	5	3	4	5	6	5	7
M	M	M	H	H	M	H	M	H	M	H	M
3	3	3	3	3	3	3	3	3	6	6	6
*	4	4	4	4	5	5	5	5	5	5	5
*	*	8	8	8	8	8	4	4	4	4	7

Page fault Rate = 7/12 =58.33% **[Marks: 0.5 (illustration) + 0.5 (final answer)]**

(a) LIFO

3	4	8	3	8	5	3	4	5	6	5	7
M	M	M	H	H	M	H	H	H	M	M	M
3	3	3	3	3	3	3	3	3	3	3	3
*	4	4	4	4	4	4	4	4	4	4	4
*	*	8	8	8	5	5	5	5	6	5	7

Page fault Rate = 7/12 =58.33% **[Marks: 0.5 (illustration) + 0.5 (final answer)]**