Modern Operating System Exercise 5

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Problem 1

The moving sequence and total movement of the magnetic head under different scheduling algorithm are as follows.

- FCFS: **421 in total.** $100 \to 23 \to 89 \to 132 \to 42 \to 187$
- SSTF: **273 in total.** $100 \to 89 \to 132 \to 187 \to 42 \to 23$
- SCAN: **287 in total.** $100 \to 89 \to 42 \to 23 \to 0 \to 132 \to 187$
- C-SCAN: **366 in total.** $100 \to 89 \to 42 \to 23 \to 0 \to 199 \to 187 \to 132$
- C-LOOK: **296 in total.** $100 \to 89 \to 42 \to 23 \to 187 \to 132$

Problem 2

1) 252 bytes needs $\lceil \frac{252}{32} \rceil = \lceil 7.875 \rceil = 8$ blocks. The block diagram is as follows.

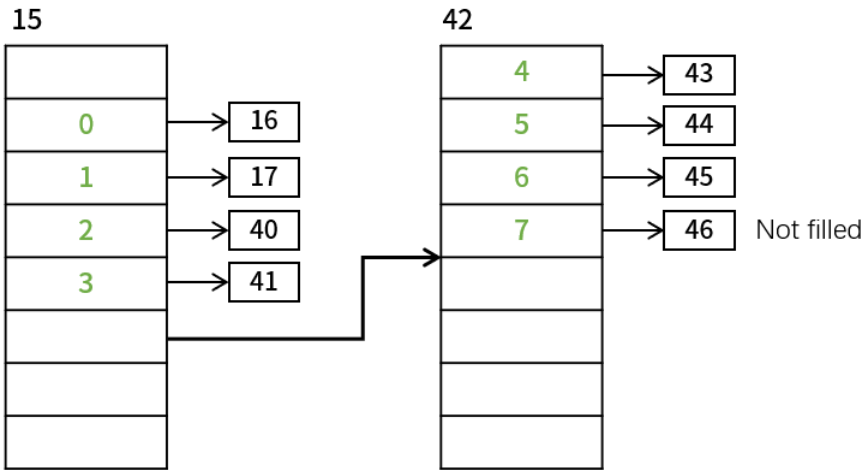

Fig. 1. Initial State

Physical block 46 is not filled.

2) Append 416 additional bytes needs another $\lceil \frac{416}{32} \rceil = 13$ blocks. Now the block diagram is as follows.

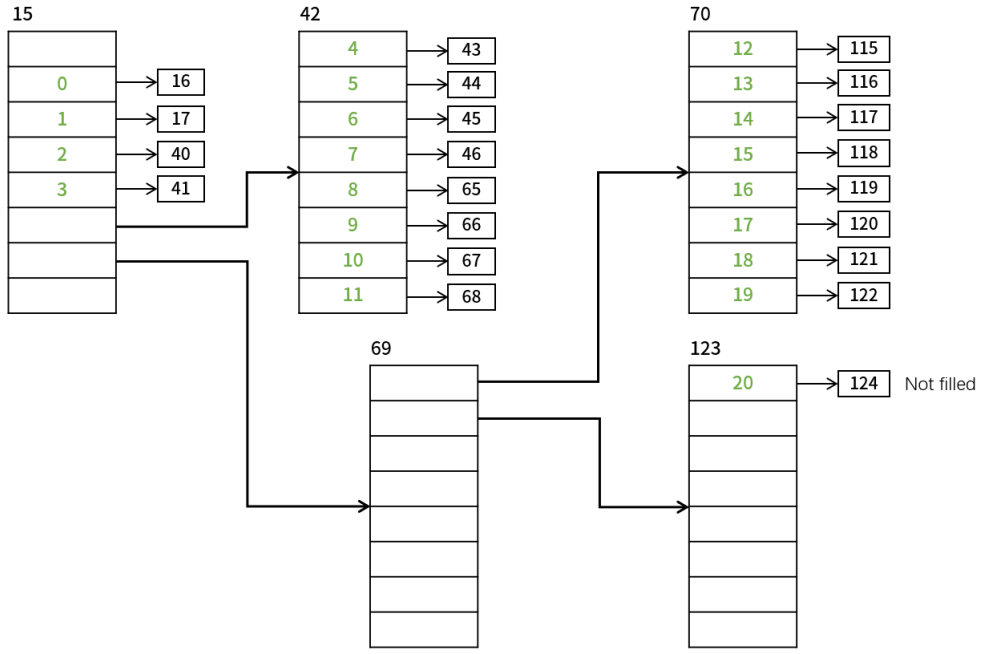

Fig. 2. State After Addition

Physical block 124 is not filled.

3) The I-node has 4 direct blocks pointing to 4 blocks, 1 single-indirect pointing to 8 blocks, 1 double-indirect to 8^2 blocks, 1 triple-indirect to 8^3 blocks. A total of 588 blocks with a total size of **18816 bytes** can be stored.

4) The block access sequence from problem is:

$$0, 1, 2, 6, 7, 8, 9, 13, 20, 16, 17, 18, 11, 12, 10, 3, 4, 14, 15, 19, 5$$

From **Fig. 2** we can know that the physical block access sequence is (index blocks are buffered once accessed):

$$\mathbf{15}, 16, 17, 40, \mathbf{42}, 45, 46, 65, 66, \mathbf{69,70}, 116, \mathbf{123}, 124, 119, 120, 121, 68, 115,$$
$$67, 41, 43, 117, 118, 122, 44$$

So the track access sequence is:

$$\mathbf{1}, 2, 2, 5, \mathbf{5}, 5, 5, 8, 8, \mathbf{8,8}, 14, \mathbf{15}, 15, 14, 15, 15, 8, 14, 8, 5, 5, 14, 14, 15, 5$$

Remove duplicated track numbers:

$$1, 2, 5, 8, 14, 15, 14, 15, 8, 14, 8, 5, 14, 15, 5$$

As we use FCFS scheduling algorithm, the sequence above is the head movement sequence. **Total head movement distance is 67.** The disk scheduling diagram is shown as **Fig. 3**.

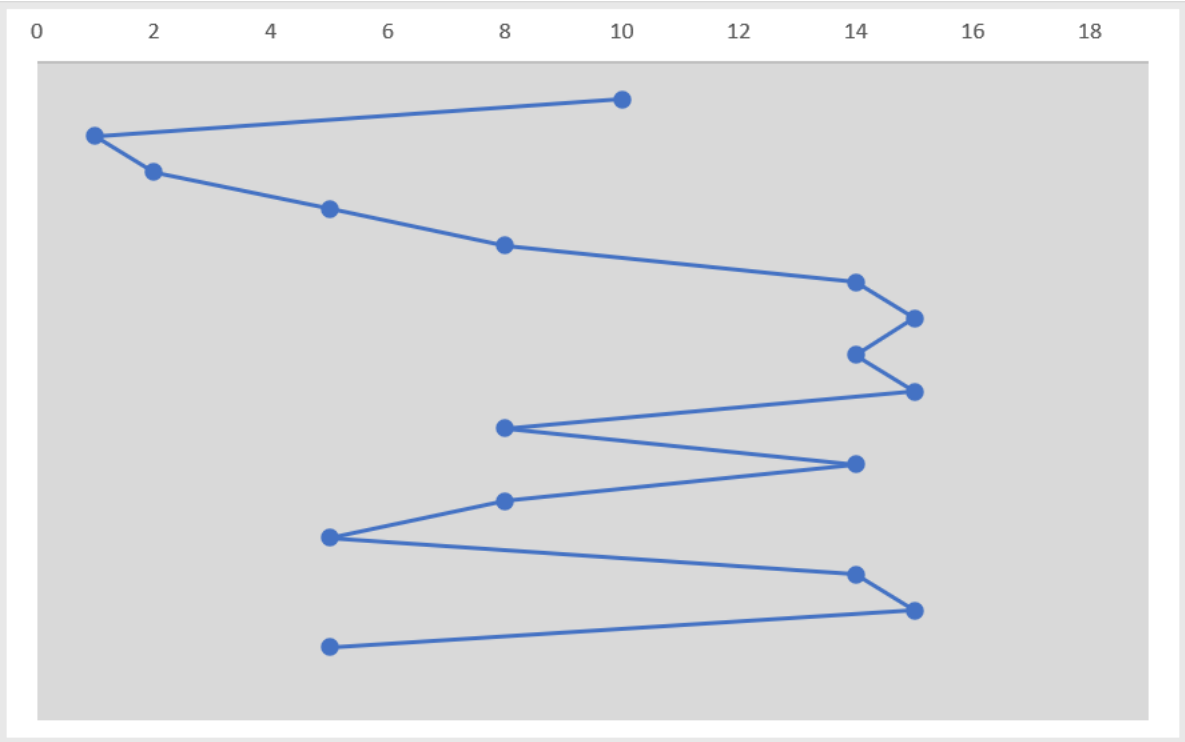

Fig. 3. Disk Scheduling Diagram