Homework #6

Course: CSE4010-01 Computer Architecture

Professor Juho Kim

June 4, 2021

1. Submission

- Submission Deadline: **June 10, 2021, 11:59 pm (Submit at Cyber Campus)** (20% deduction per day. No credit after 3days)
- Write solving processes and answers on a blank white paper, scan it and submit it as a **PDF file.**
- The filename should be **HW6_STUDENT-ID_NAME.pdf**

  (ex. HW6_20219999_홍길동.pdf)
- **WARNING**:
  - Students who copy other's homework will get zero point for this assignment.
  - Submission without any solving processes will get zero points.
  - Submission with another form rather than pdf will have a 3 points reduction of the total score.
  - Submission with the wrong file name will have 3 points reduction of total score.
  - Before submission, please check whether your solving processes and answers are clear enough to read. (No credit will be given if your work is illegible)
  - All works must be hand-written.(50% reduction for typed submissions)

2. Reference

- Lecture notes

- Patterson and Hennessy, Computer Organization and Design 4th (ARM Edition), Morgan Kaufmann, 2010

1. Average and minimum times for reading and writing to storage devices are common measurements used to compare devices. Calculate values related to read and write time for disks with the following characteristics.**(20pts)**

Average Seek Time	RPM	Disk Transfer Rate	Controller Transfer Rate
10ms	7200	32MBytes/s	500Mbits/s

1-1 Calculate the average time to read or write a 2048-byte sector for each disk listed in the table.

1-2 Calculate the minimum time to read or write a 1024-byte sector for each disk listed in the table.

2. What is the average time to read and write a1024-byte sector for a typical disk rotating at 12000RPM? Assume that the disk is idle so that there is no waiting time**.(10pts)**

-The average seek time = 5ms

-The transfer rate = 200MB/s

-The controller overhead = 0.3ms

3. RAID 3, RAID 4, and RAID 5 all use parity system to protect blocks of data. Specifically, a parity block is associated with a collection of data blocks. Each row in the following table shows the values of the data and parity blocks.**(20pts)**

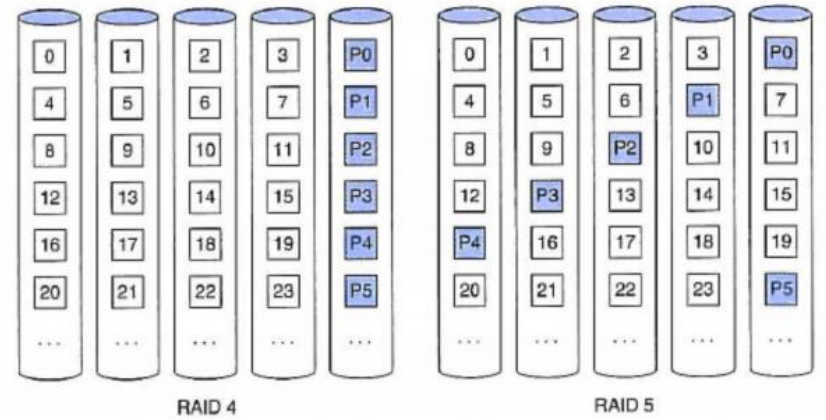
New D0	**D0**	**D1**	**D2**	**D3**	**P**
AB9C	**F456**	**0098**	**00FF**	**2FFF**	**A389**

3-1 Calculate the new parity P’ for RAID 3

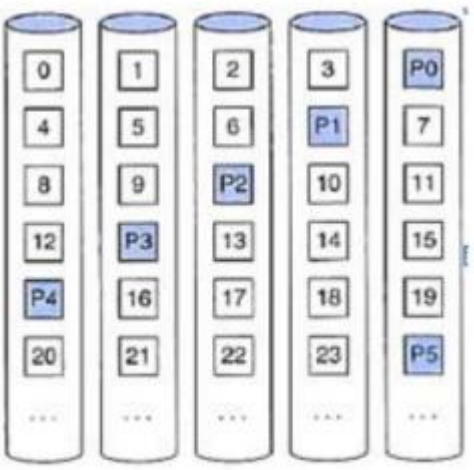
3-2 Calculate the new parity P’ for RAID 4

4. If you write data at RAID4 and RAID5 disk according to below block sequence, how long does it take?(1 access = 1 second) **(10pts)**

< Write : 9 -> 2 -> 14 -> 5 -> 3 -> 12 -> 4 >



5. (20pts)



[RAID 5]

Disk 1	Disk 2	Disk 3	Disk 4
D_1 = 54	D_2 =	D_3 = 4F	P_1 = 82
D_4 = 6E	D_5 =	P_2 = 9D	D_6 = 38
D_7 = 75	P_3 =	D_8 = 7B	D_9 = 93
P_4 = 2A	D_{10} =	D_{11} = D8	D_{12} = C3

When the Disk 2 breakdown, we can restore Disk 2 data. Write data in Disk 2.

6. (20pts)

6-1 Draw the SSD Architecture.

6-2 Summarize the location of the Memory Hierarchy on the hardware and how data is stored and moved by the SSD.