

Assignment 1

Issue Date: October 24, 2018

Due Date: October 30, 2018, 10:00 a.m.

Σ 15 Points

Database System Architecture and Implementation
INF-20210
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Database and Information Systems
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Disk Storage

General Notes

Please observe the following points in order to ensure full participation in the lecture and to get full credit for the exercises.

- Register for this course in **ZEuS**, in **StudIS** (to be admitted to the exam), and in **Ilias** (to submit exercises).
- Assignments are to be solved in pairs of **two** students. Write your **names** and **group number** (after you've received one) in all files that you submit. For the **first exercise only** you are also allowed to submit individually.
- The use of external code libraries is **not** permitted, except if they are explicitly provided by us.
- Submit your solutions through **Ilias before the deadline** published on the website and the assignment. For written assignments, only **PDF documents** are accepted. Other formats, such as plain text, hand-written, and Word will not be graded. For programming assignments, submit a ZIP archive that only contains the **relevant** files. All code must be submitted in a format that **can be compiled and executed**, e.g., *.java files rather than *.class files.

Exercise 1: Hard Disks

(5 Points)



Suppose we have a hard disk with sectors of 512 bytes. Each track has 512 sectors, each platter surface has 4096 tracks, and the disk has 5 double-sided platters. The average seek time is 10 ms.

- a) How many bytes can be stored on the hard disk?
- b) What is the total number of cylinders?
- c) If the hard disk rotates with 7200 rpm (revolutions per minute), what is the maximum and the average rotation delay (in ms)?

Exercise 2: Parities

(3 Points)



Assume that we are using a RAID-3 system with four hard disks. The following eight bits are stored on the first three data disks.

Disk 1: 10101010, Disk 2: 11001100, Disk 3: 11111111

- a) How will the parity sequence look like on the fourth disk?
- b) If Disk 2 gets damaged, how can the lost eight bits be restored?

Exercise 3: Creating and Reading Files with Java

(7 Points)



Please download and unzip the file assignment01.zip from the course website.

- Implement the methods `IO#create()` and `IO#read()`. Write the most efficient code you can think of!
- Did you expect the resulting performance? If yes/no, why (not)? Write a couple of sentences to explain the (sub-)optimal performance of your implementation.