TU Munich, Department of Informatics
Chair XXV: Data Science and Engineering
Prof. Dr. Thomas Neumann

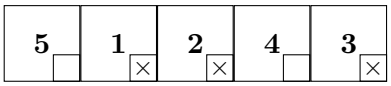
Exercise for Database Systems on Modern CPU Architectures
Summer Term 2019

Philipp Fent, André Kohn ({fent,kohna}@in.tum.de)
https://db.in.tum.de/teaching/ss19/moderndbs/

Sheet Nr. 02

Exercise 1

The following shows the internal state of a buffer manager, which manages its free space using the **Second Chance** buffer replacement strategy. It can hold a total of **five** pages in memory, before it needs to evict another page.



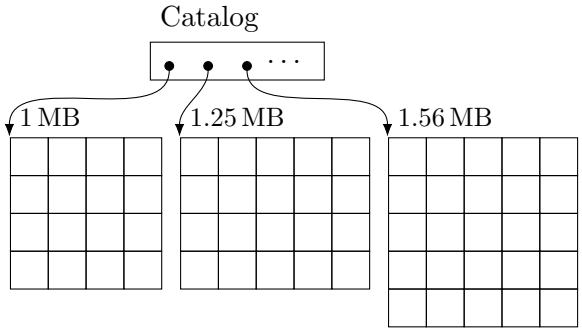
The illustration shows the PageNo in bold with the second chance marker in the bottom right corner of each page. Assume that no pages are fixed in the initial state. Execute the following actions on the buffer manager and trace the internal state.

- `fix(1)`
- `fix(5)`
- `unfix(1)`
- `fix(6)`
- `fix(1)`
- `unfix(1)`
- `unfix(5)`
- `fix(7)`
- `unfix(6)`
- `fix(1)`
- `unfix(7)`
- `unfix(1)`
- `fix(4)`
- `unfix(4)`

How many page faults did this strategy produce?
How often were we successful in caching the correct page?
How does this compare to a random replacement strategy?

Exercise 2

Consider the segment block allocation method of **dynamic extent mapping**. Assume we have a fixed-size catalog that starts with a 1 MB mapping and a growth factor of 1.25.



Estimate how many additional random accesses are needed due to this mapping for a table-scan with 10 million entries of 100 B?
Estimate a size that "ought to be enough for anybody". Are 64 entries enough? 128? 256?