CSE4411 fall 2007

Assignment #3: Due December 3, 2007 1:30 pm

Weight 15%

You can do this assignment in groups of up to 3 students per group.

In this assignment you will investigate and design a new structure, the B+R (B+ RAID) tree. The B+R tree is intended to be a B+ tree for systems that feature RAID technology.

As described in class, there are several RAID levels:

- Level 0: striping, no mirroring.
- Level 1: two-disk mirroring.
- Level 10: striping and two-disk mirroring.
- Level 3: striping plus parity disk, byte chunk.
- Level 5: striping plus parity (which is also striped), disk block chunk (most recommended RAID level).

Your task is to design a B+ tree structure that takes advantage of a RAID system. For example, if you choose RAID level 0, the sequence set of the B+ tree could be striped – with one node per disk. And the index set could itself be striped, or simply be stored on one disk. In doing so you would have to decide and describe how the main B+ tree operations (search, insert, delete) would be performed and what is their cost, in terms of I/O, time and space. As another example, if you choose a RAID level with parity (e.g., level 3 or level 5) then you would also have to describe how the parity is maintained and used.

Where do I start?

1) Get a good knowledge of the RAID alternatives and their characteristics. In doing so, besides the class lectures, it is a good idea to find and read more on RAID by looking for papers and books that describe the RAID technology.

2) Decide what RAID level you would use for your structure. It should be obvious that to adapt the B+ tree for RAID level 5 is more complicated that adapting it for level 0 (and as a result you will be rewarded more in doing do).
3) Describe how your B+ tree nodes would be stored using the RAID level of your choice.
4) Describe how the 3 main operations (search, insert, delete) are performed and what is their cost in terms of IO, time and space. Provide examples for each operation.
5) If you chosen RAID level includes parity, describe how parity is used and how it is updated upon inserts and any modifications in the tree.

What do I hand in?

- A **typed report** of your assignment in MS Word format. Include a table of contents in your document. Include a list of references in your document – even if some of the references are web sites, books, or personal communications with peers.
- A **ppt (powerpoint) file containing your class presentation** of the project.
- A "**contribution report**". This is a file to be individually submitted by each group member, in which you indicate the individual contribution of each member within your group toward the completion of this project. If a group worked harmoniously with roughly equal contribution from all its members then each member would obviously have equal percentage of contribution, but otherwise this would be your chance to express your opinion on the individual effort of each member within your group. These reports will be read by the instructor and will be taken in consideration when evaluating your project and assigning marks to individual group members.
- Submit the above in form of both hard copies (dropped in the 4411 drop box outside the CSE main office) and also by email.
- **Class presentations**: each group will have to present your project toward the end of the term -- November 26 (Monday), November 28 (Wednesday) and December 3 (Monday). Design your presentation to be no more than 20 minutes. If you are to make your presentation before December 3, you do not have to have the full report completed by then, but you will have to have the presentation ready already.

If fail to hand in.

If, for whatever reason, you fail to submit this assignment within the deadline, your weight of this assignment will be automatically transferred to your final exam, minus 7% (i.e., 8% will be transferred to the final exam and 7% will be lost permanently). If you submit this assignment, but receive a failing or otherwise undesired mark, the mark that you receive will remain.