

Topic: Heap File Organization Implementation

Assigned reading: Section 9.5 from Raghu Ramakrishnan's book

A DBMS deals with data files through buffer manager using the abstraction of pages. These pages are mapped to the storage on disk through the disk space manager. In this discussion, we will only focus on implementation details at the abstraction of page level.

A heap file is a series of data pages. Each page has a set of records. At the page level, the file can be implemented either as a list or as a directory. In both the cases, the DBMS keeps track of only the header page of each data file. A heap file has to support three basic operations: insert, search, and delete.

In the list implementation, the data file is divided into two parts: full pages and free pages. Full pages cannot accommodate any new records as they are completely filled. Free pages have some space available to accommodate new records. To insert a new record, we have to traverse through the free page list and find an appropriate page that can accommodate the given records. Otherwise, we have to append a new page to the file. After insertion, if a free page becomes full then it needs to be moved to the full page list. While searching records, we have to sequentially traverse through both lists: full and free. Deletion requires search plus actual removal of the record. If we delete a record from a full page, then it needs to be moved to the free list.

The directory implementation maintains a list of directory pages. In this implementation, we do not separate full and free pages. Each directory page points to a set of data pages. For each data page, the corresponding directory entry specifies the size of record that it can accommodate. Insert, search, and delete operations are performed in similar manner as in the list implementation.