Alexandria University
Faculty of Engineering
Computer and Systems
Engineering Dept.
Second Year

File Structure
Assignment 3
Assigned: Monday, Mar 31st, 2014
Due: Sunday, April 13th, 2014

Heap Files

Introduction

Welcome to Minibase, a small relational DBMS, structured into several layers. In this assignment, you will implement the Heap file layer. You will be given the documentation for the lower layers (Buffer Manager and Disk Space Manager), as well as the documents for managing records on a Heap file page.

A heap file is an unordered set of records that supports the following set of operations:

1. Heap files can be created and destroyed.
2. Existing heap files can be opened and closed.
3. Records can be inserted and deleted.
4. Each record is uniquely identified by a record ID (RID). A specific record can be retrieved by using its record ID.

This assignment has three parts. You have to do the following:
1. Familiarize yourself with the Heap file, HFPage, Buffer Manager and Disk Space Manager interfaces.
2. Implement the Heap file class. You can ignore concurrency control and recovery issues, and concentrate on implementing the interface routines. You should deal with free space intelligently, using either a linked list or page directory to identify pages with room for records. When a record is deleted, you must update your information about available free space, and when a record is inserted, you must try to use free space on existing pages before allocating a new page. If updated records grow; they may require to be relocated (moved) to a new empty space, else if the updated records shrinked, you should consider the empty space resulted as new slot when inserting new records.
3. Run the provided tests.

You should begin by reading the chapter on Disks and Files (available at MACC), to get an overview of the HF layer and buffer management. This material was also covered in class. In addition, HTML documentation is available for Minibase, which you can read using browser.

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The JAVA documentation for package bufmgr, diskmgr and heap are provided in the zip file. Note that you DO NOT have to throw the same exceptions as documented for the heap package. However, for testing purpose, we DO ask you to name one of your exceptions InvalidUpdateException to signal any illegal operations on the record. In other error situations, you should throw exceptions as you see fit following the error protocol introduced in the Buffer Manager Assignment.

Classes to Familiarize Yourself With First

There are three main packages with which you should familiarize yourself: heap, bufmgr, diskmgr. Note that part of the heap package contains implementation for HFPage. The java documentation of HFPage is provided to you. A Heap file is seen as a collection of records. Internally, records are stored on a collection of HFPage objects.

What to Turn In, and When

You should turn in copies of your code together with copies of the output produced by running the provided tests provided. The assignment is due at 11PM on May 18th. The solution will be made public after that time, and solutions turned in after that time will not receive any credit. So be sure to turn in whatever you have, even if it is not working fully, at that time.

I emphasize that late submissions will not receive any credit. Computers and life! being what they are, expect everything to take longer than you expect, even taking this expectation into account. So start early, and plan on getting things done well before the due date. Nothing short of a nuclear explosion (at your home, not the South Pacific) constitutes a valid reason for an extension.

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