Description of Lab 4:

Lab 4 handles logging within SimpleDB. For our version of logging, we used undo-redo logging and based it on the Aries protocol. This involves two primary aspects: rollback and recovery. This allows our system to be fault tolerant to a greater degree than it was previously.

To support rollback and recovery, this lab also required adding logging to our `BufferPool` so that the rollback and recovery had all the proper entries to work with.

For rollback, like the Aries protocol we went through and undid all of the update entries in the log by setting the impacted pages from the given transaction back to their before images and clearing the `BufferPool` so that the incorrect values are not read. Unlike Aries, we did not choose to implement compensating log records since they were not necessary to the recovery algorithm.

For recovery, we performed analysis followed by redo and then undo phases. The primary difference was the lack of compensating log records which made us more careful about which entries should be undone since that phase works backwards through the log after everything has been redone. Without the compensating log records we had to make sure that we were not undoing the work of a committed transaction after we went past it.

Design decisions:

- Did not include CLRs since they were unnecessary and it made the recovery implementation more interesting (complicated). To compensate, we kept track of pages modified by committed transactions as we walked backwards through the log for the undo phase. That way, we could avoid undoing pages that were already overwritten by committed transactions later in the log.
- Combine analysis and redo phase. Since we were walking over all of the transactions from the first checkpoint, or the start of the log, we could place transactions into uncommitted/uncommitted bins along the way.

Example of a unit test that could be added to improve the set:

One unit test that could be added to improve the testing suite would be to have test(s) that covers each type of entry in isolation. This would allow students to tell if they were correctly handling each of abort, commit, update, begin, and checkpoint correctly.

Changes you made to the API: No changes outside of `LogFile.java`.

Additional Feedback: None.