13 April 2006
Michael Walfish
Handout for 6.033 Recitation 17

Topics for today and next week: Databases, Logging and Recovery, ARIES

MOTIVATION

1. Introduction to databases (five minute version)

2. DBs in the context of 6.033

   --For today, imagine that only one writer ever writes to the database
   --In that world, the important question is: How can the DB recover
     from crashes?
   --The high-level answer is: With atomicity.
   --More specifically: committed transactions must appear after the
     crash and uncommitted transactions must NOT appear after the crash.
   --The DB implements this notion of atomicity with logs and transactions

3. Perspective: why are we as computer scientists so careful about recovery?

TRANSACTIONS AND LOGGING

4. Review transactions and logging but in context of DBs

   Easiest to picture two copies of the data on two different disks:
   (a) an authoritative unstructured copy (the log)
   (b) the "cell storage" or "backing store", which is well-structured.

   Remember, always ask yourself (sometimes this question is painful to think
   about), "What happens if the system crashes _here_?"

5. Why do we believe that the DBMS can write a log record atomically?

6. When does the DBMS read the log? How does the DBMS use the log?

7. Why do we need the cell storage at all? Why not just use the log, like
   in LFS?

8. What kinds of failures can this system tolerate?

9. What does this crash recovery business have to do with databases?
   (Observe that the crash-recovery techniques we are using in fact apply
   to any kind of data, so why was a lot of this work done in the databases
   community?)

IN MORE DETAIL

10. Undo, redo, fantasy, and reality

    Good luck on the quiz!