SimpleDB Overview

9/18/2008
What is SimpleDB?

- A basic database system
- What is has
  - Heapfiles
  - Basic Operators (Scan, Filter, JOIN, Aggregate)
  - Buffer Pool
  - Transactions
  - SQL Front-end
- Things it doesn't have
  - Query optimizer
  - Fancy relational operators (UNION, etc)
  - Recovery
  - Indices
Catalog

• Catalog stores a list of available tables, TupleDesc
  – void addTable(DbFile d, TupleDesc d)
  – DbFile getTable(int tableid)
  – TupleDesc getTupleDesc(int tableid)
• Not persisted to disk
DblIterator.java

- Iterator class implemented by all operators
  - open()
  - close()
  - getTupleDesc()
  - hasNext()
  - next()
  - rewind()

- Iterator model: chain iterators together
// construct a 3-column table schema
Type types[] = new Type[]{ Type.INT_TYPE, Type.INT_TYPE, Type.INT_TYPE };
String names[] = new String[] { "field0", "field1", "field2" };
TupleDesc descriptor = new TupleDesc(types, names);

// create the table, associate it with some_data_file.dat
// and tell the catalog about the schema of this table.
HeapFile table1 = new HeapFile(new File("some_data_file.dat"), descriptor);
Database.getCatalog().addTable(table1);

// construct the query: we use a simple SeqScan, which spoonfeeds
// tuples via its iterator.
TransactionId tid = new TransactionId();
SeqScan f = new SeqScan(tid, table1.id());

// and run it
f.open();
while (f.hasNext()) {
    Tuple tup = f.next();
    System.out.println(tup);
}

f.close();
Database.getBufferPool().transactionComplete();
HeapFile.java

• An array of HeapPages on disk
• Javadoc is your friend!
• Implement everything except addTuple and removeTuple
HeapPage.java

• Format
  – Header is a bitmap
  – Page contents are an array of fixed-length Tuples
• Full page size = BufferPool.PAGE_SIZE
• Number of bits in Header = number of Tuples
• Header size + size of tuples = BufferPool.PAGE_SIZE
HeapFileEncoder.java

• Because you haven’t implemented insertTuple, you have no way to create data files

• HeapFileEncoder converts CSV files to HeapFiles

• Usage:
  - java -jar dist/simpledb.jar convert csv-file.txt numFields

• Produces a file csv-file.dat, that can be passed to HeapFile constructor.
BufferPool.java

• Manages cache of pages
  – Evicts pages when cache is full [not lab 1]
• All page accesses should use getPage
  – Even from inside DbFile!

You will eventually implement
  – locking for transactions
  – Flushing of pages for recovery
Compiling, Testing, and Running

• Compilation done through the ant tool
  – Works a lot like make

• Two kinds of tests:
  – Unit tests
  – System Tests

• Demo on debugging using unit tests.