SimpleDB Overview

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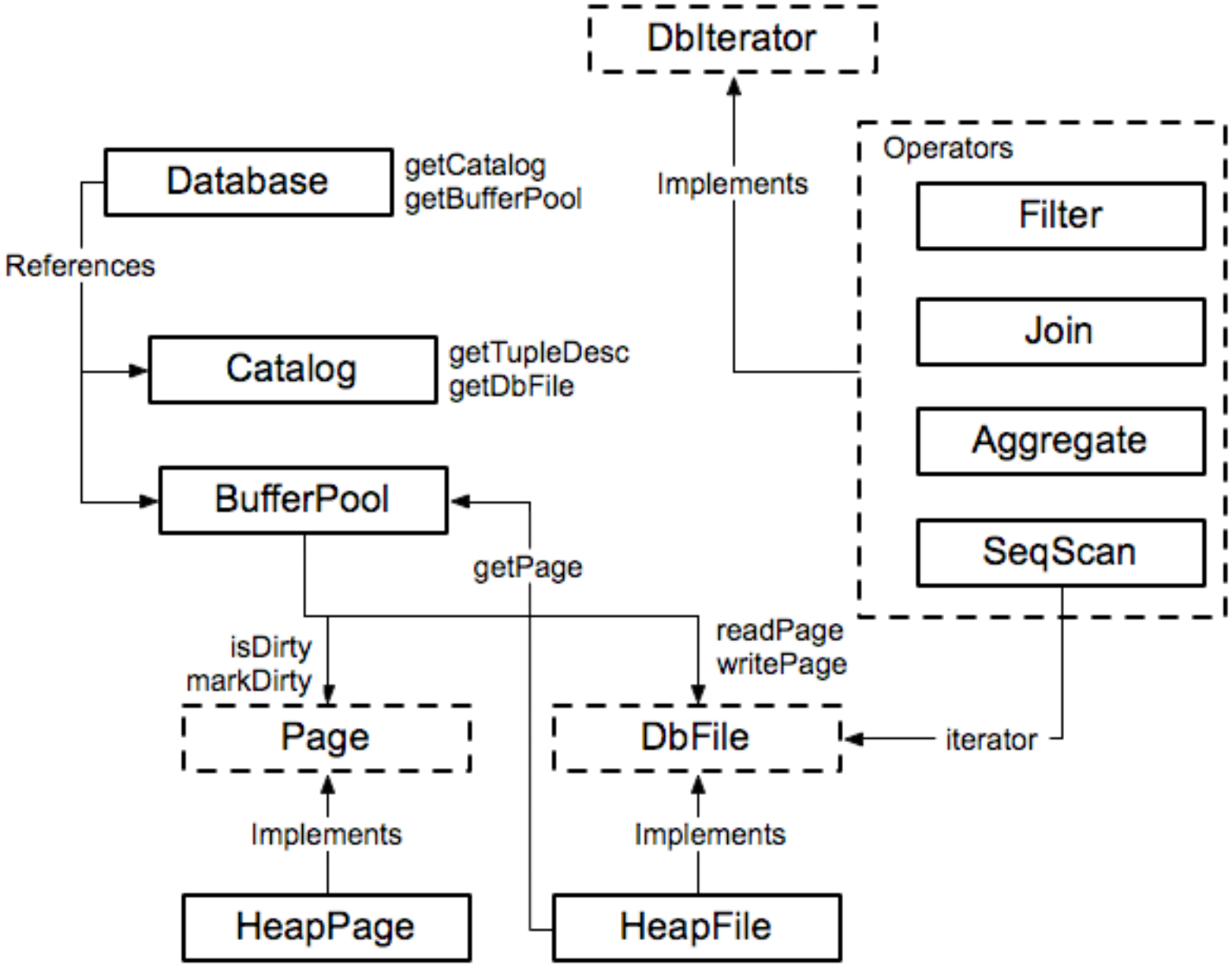
What is SimpleDB?

- 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

Module Diagram



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

DbIterator.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.