**Notes on Lecture 9: Data Storage and IO Models**

1. Data Storage
2. Disk and Files
3. Buffer Manager – Prelims

**Data Storage**

Architecture of a DBMS

Given a query (*request for data or information from a database table or combination of table*)

**Disks**

* Secondary Storage device of choice
* Data is stored and retrieved in units called Disk Blocks

**Data Base Buffer**

**DBMS**

What is a DB Buffer?

* A buffer is simply a region of physical memory that is used to store temporary data

**Cache**- collection of items of the same type stored in a hidden inaccessible place

For our use, we will consider the buffer located in main memory that operates over pages and files.

Read page from disk if not already in the buffer

Flush (Page): Evict page from the buffer and write to the disk

Release(Page): Evict page from buffer without writing to disk

A Buffer Manager will handle the supporting operations for the buffer:

* Example of uses

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**Buffer Manager**

Buffer Management in a DBMS: Data must be in RAM for a DBMS to operate on it! We can’t keep all the DBMS pages in main memory

The Buffer Manager efficiently uses main memory, memory is divided into “Buffer Frames”; slots for holding disk pages.

The choice of frame is dictated by the replacement policy..

Buffer Replacement Policy

* How do we choose a frame for replacement?
  + LRU (Least Recently Used)
  + Clock
  + MRU (Most Recently Used)
  + FIFO, random, …

LRU

* Use a queue of pointer to frames that have a pin count = 0

Clock

Sequential Flooding

Files and Records

**I/O Layer**

* This layer allows the upper level of the system to create/destroy files, allocate/deallocate pages within a file and read and write pages of a file
* Consisit of two clsses a file and a page class

**DBMS vs OS File System**

Why not let the Operating System Handle Disk Management?

* DBMS is better at predicting the reference patterns
* Can better control the overlap of I/O (Input and Output) with computation
* Can leverage/us multiple disks more effectively