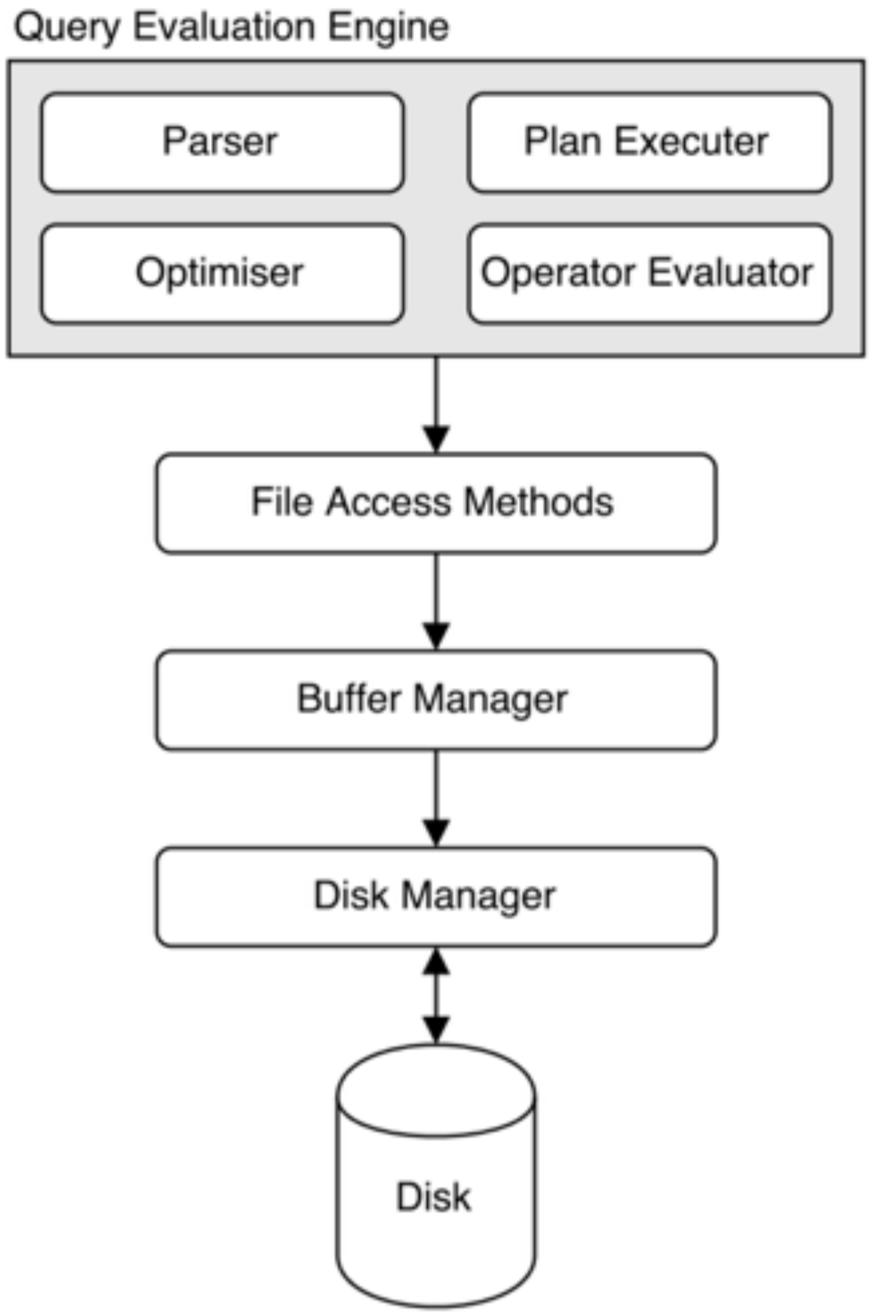
Overview of Java DB

A brief introduction for the code in Week 2

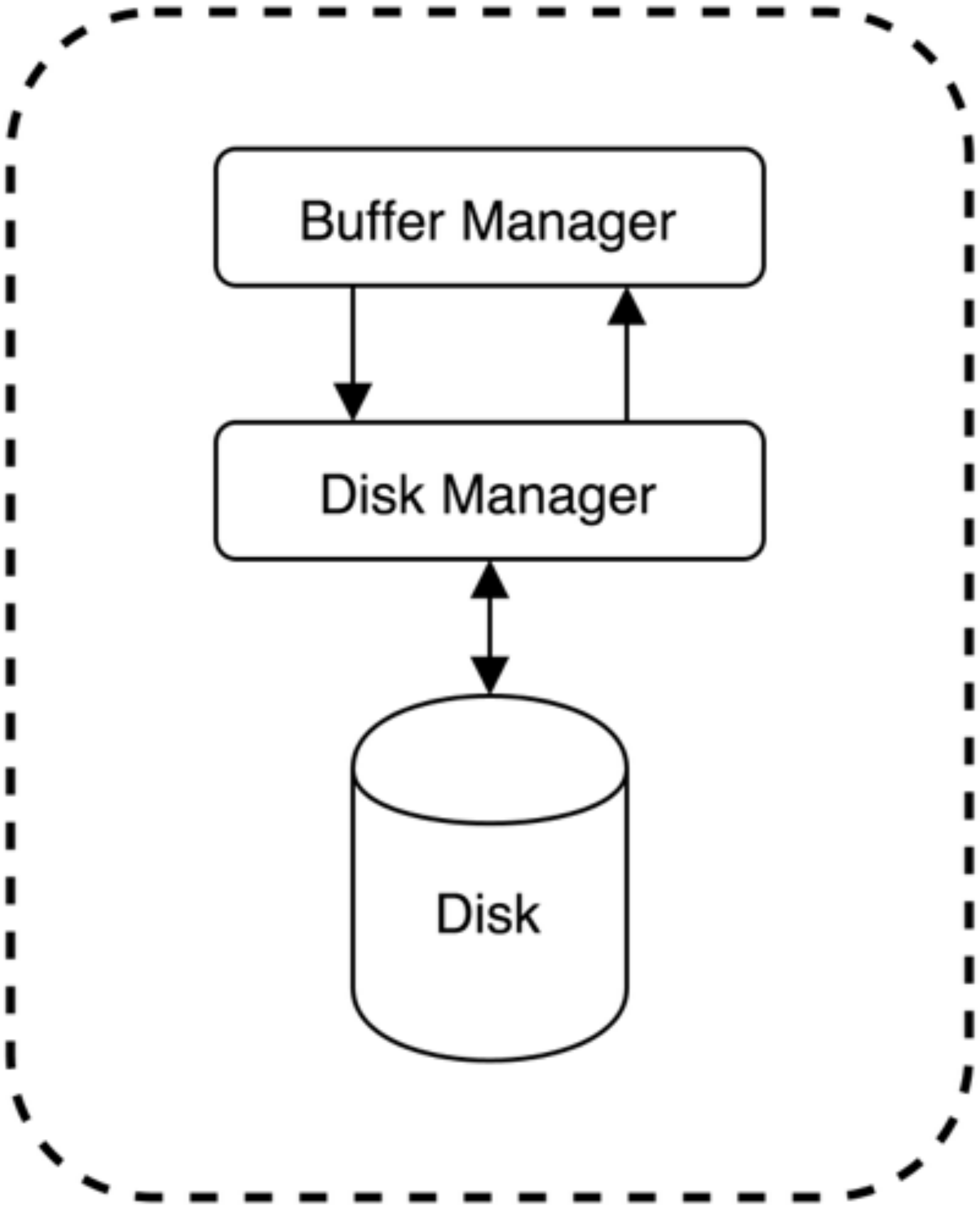
Database Components

- This is an example of a database with no transaction or recovery support
- Throughout this semester you will implement various parts of these components in your weekly homework
- We hope that you can gain a more practical insight into the role of and relationship between each of these components



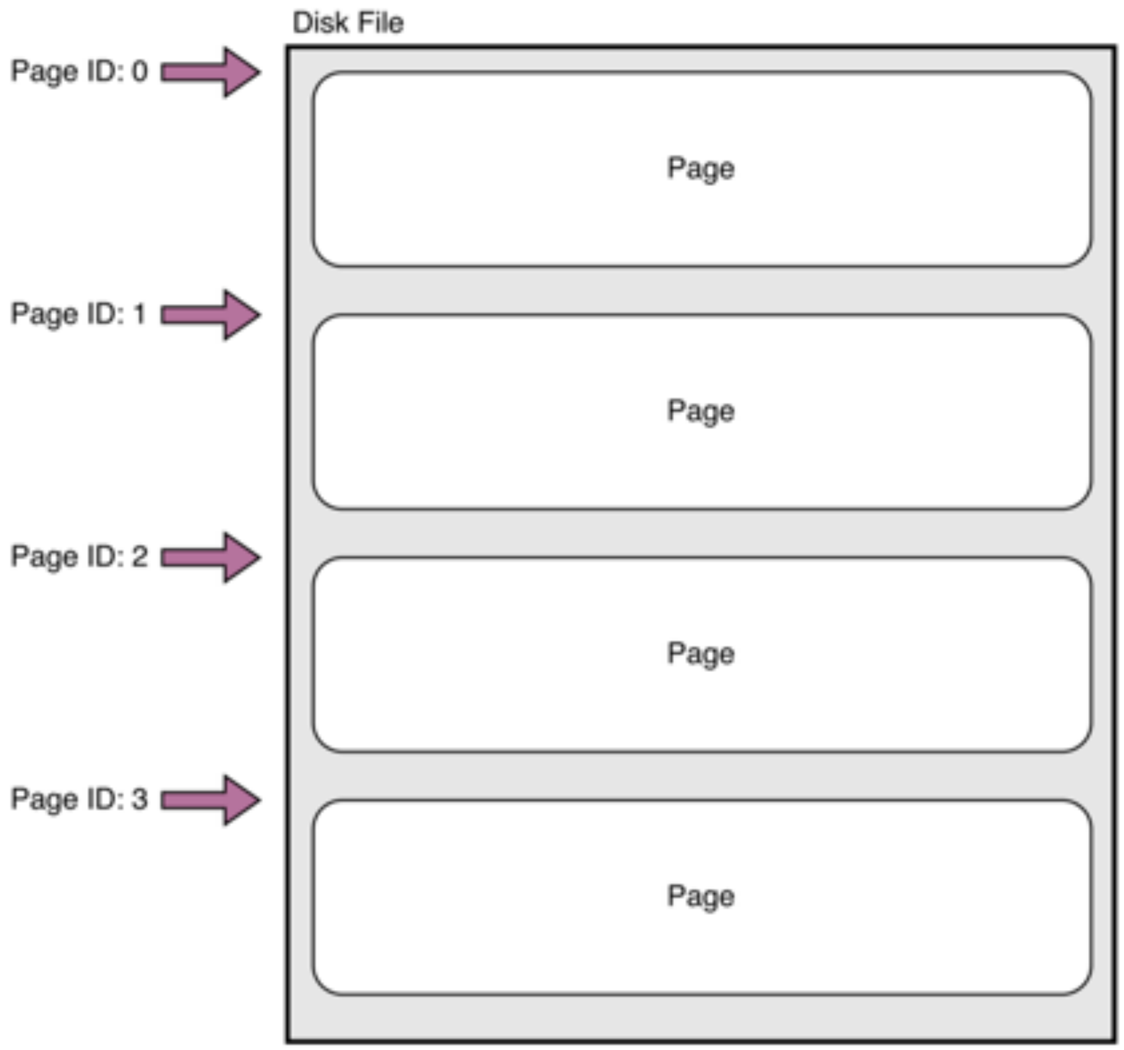
The First Step

This week we will focus only on the interaction between these three components



Disk

- Data is stored on disk in small segments called **pages**
- In our code, we create one big file on disk, which represent a collection of into pages for our application
- A page is identified by a **Page ID**. From this page id we can find the position of the start of the page. Think of it like an index for an array.



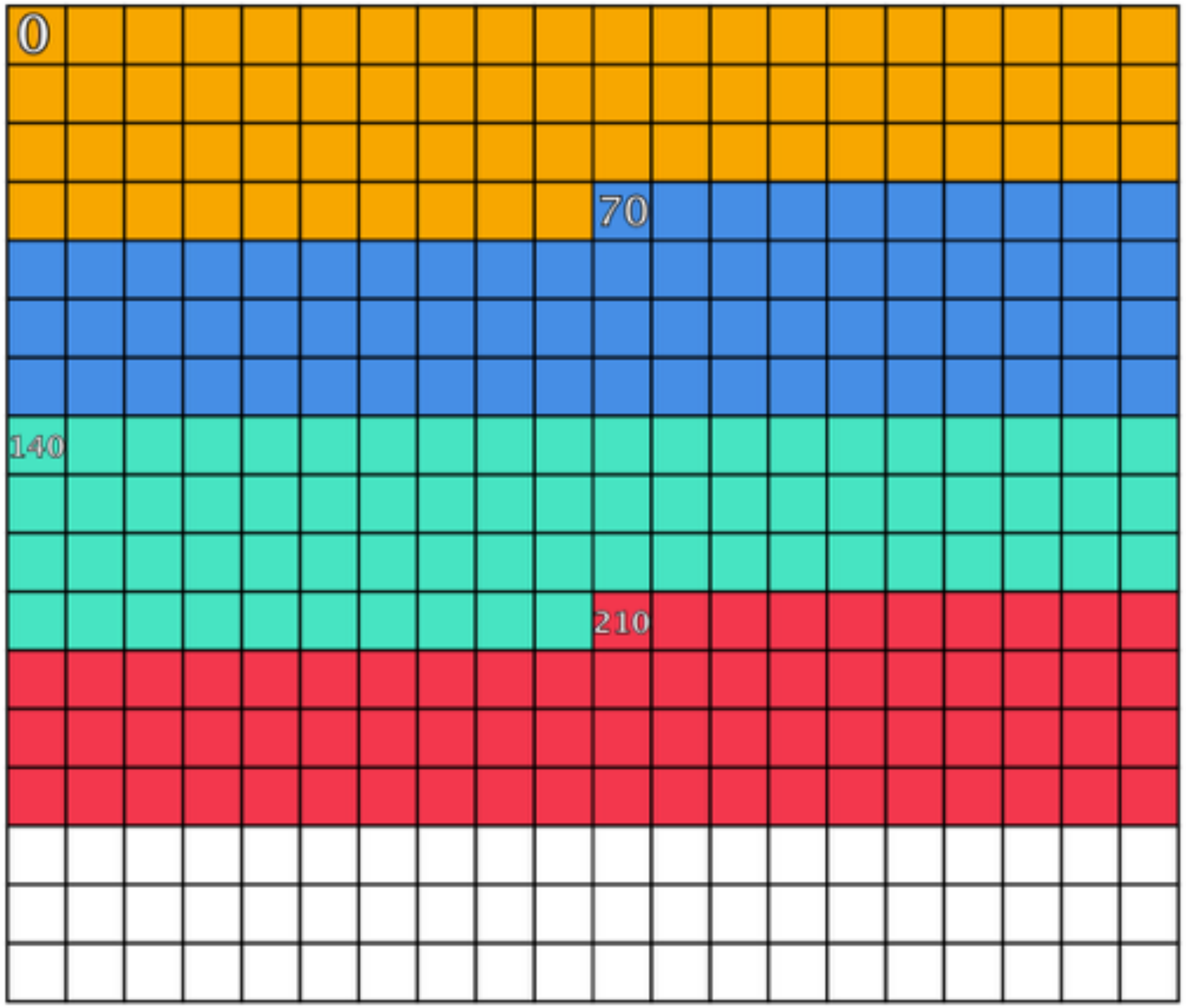
So what is…

Page
A small block of data
(~1024 bytes)

Page ID
Identifies a page/block of data.

How does a Page ID help find a page?

Block Size: 70



Page ID: 0

Offset = 70 x 0 = 0

Page ID: 1

Offset = 70 x 1 = 70

Page ID: 2

Offset = 70 x 2 = 140

Page ID: 3

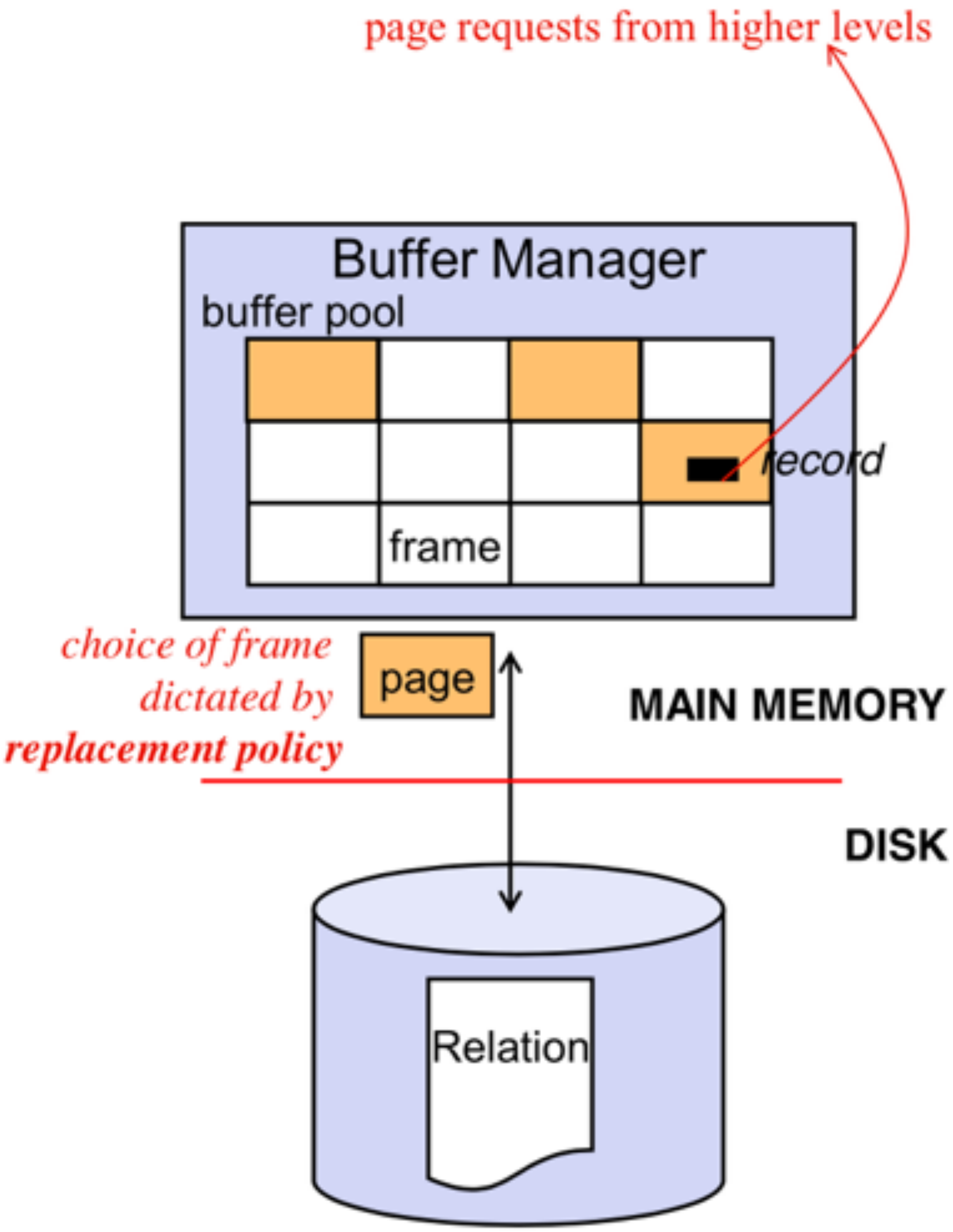
Offset = 70 x 3 = 210

Disk Manager

- Allocates and deallocates pages on disk
- Provides an interface to read and write pages from/ to disk
- Provides an abstraction for accessing pages on disk

Buffer Manager

- Keeps accessed pages in a buffer to reduce the number of disk accesses
- Has a limited size since we hold them in main memory


page requests from higher levels
Buffer Manager
buffer pool
record
frame
choice of frame dictated by replacement policy
page
MAIN MEMORY
DISK
Relation

Buffer Replacement

- Since a buffer has a limited space, we need to decide how to **choose** what frames to replace
  - This is where different algorithms come in
  - MRU / LRU / CLOCK / GCLOCK all take different approaches to choosing which buffer frame to replace

Buffer Replacement Interface

- We have a **notify(List<> pool, BF frame)** method
  - This is called every time a frame is accessed (useful for LRU / CLOCK / GLOCK)
  - Feel free to change the list or update any attributes on the BufferFrame
- We also have a **choose(List<> pool)** method
  - This is called every time the Buffer Manager needs to choose a frame for replacement
  - You need to return the appropriate buffer frame

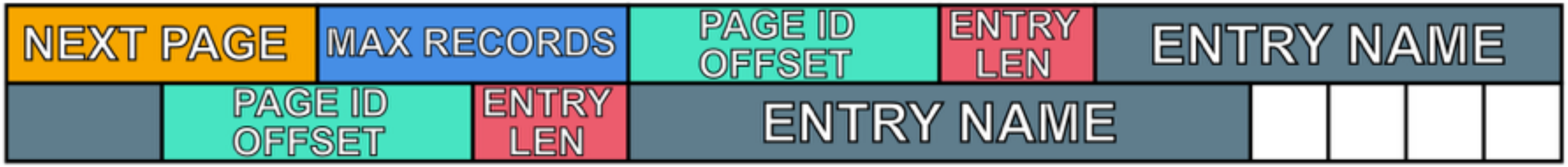
Extra (Just for fun): Header Page

Since this is a simplified DBMS, we don't have a System Catalog. Instead, we have a collection of directory pages which will provide the functionality that we need.

Each directory page stores the Page ID of the next page, to allow for a linked list of pages.

We will use this to store the Page ID of a relation

The format of this file is shown below:



NEXT PAGE | MAX RECORDS | PAGE ID OFFSET | ENTRY LEN | ENTRY NAME

PAGE ID OFFSET | ENTRY LEN | ENTRY NAME