Homework 4

Buffer Manager

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Overview

Buffer Manager

Heapfile Manager

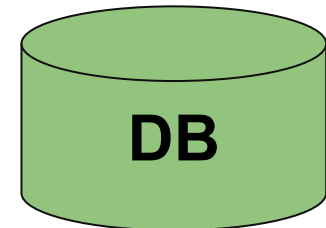**Front - end and database utilities**

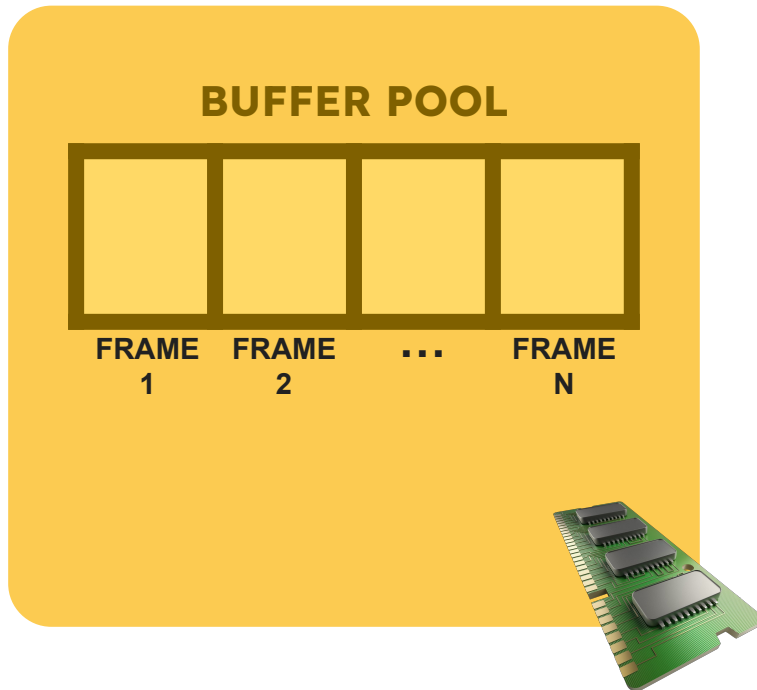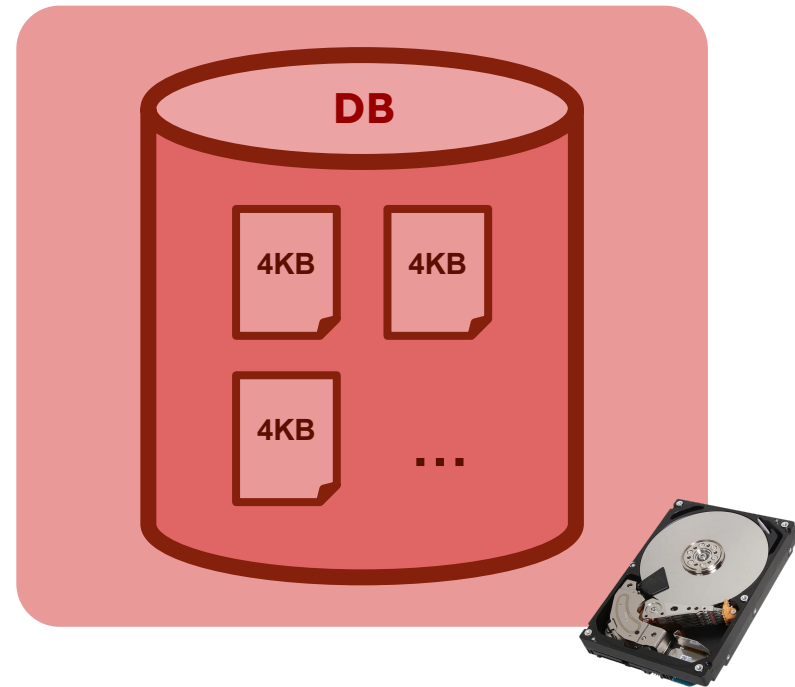**Query and Update Operators**

Memory Hierarchy

Cache

DRAM

Disk

Memory Hierarchy

Buffers and Frames
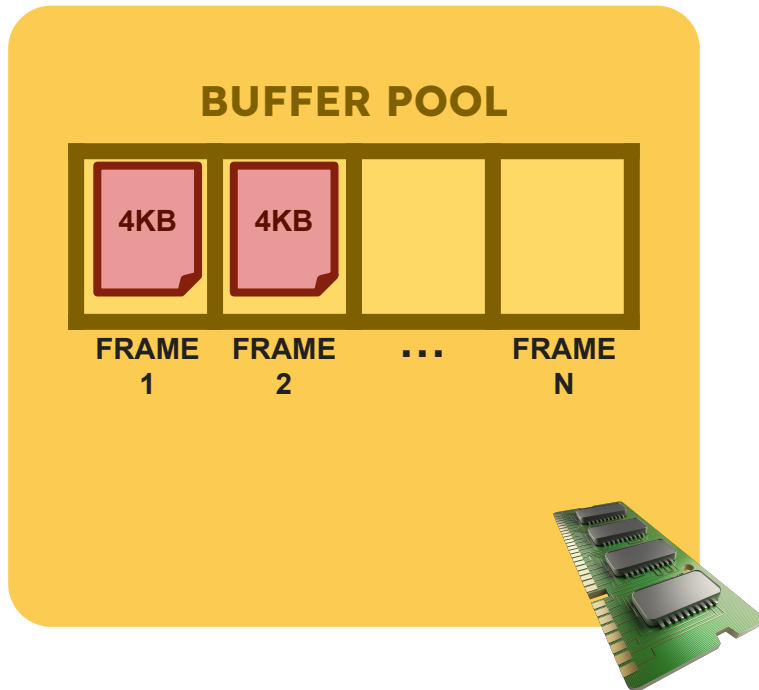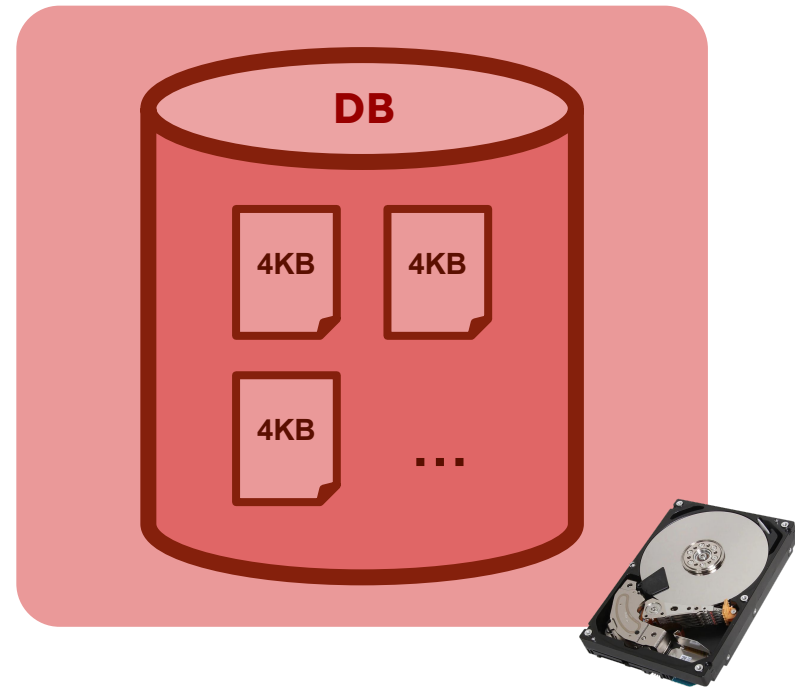
RAM

BUFFER POOL

| FRAME 1 | FRAME 2 | ... | FRAME N |

Disk

DB

4KB 4KB

4KB ...

Buffers and Frames

RAM

BUFFER POOL

4KB	4KB		

FRAME 1   FRAME 2   ...   FRAME N

Disk

DB

4KB   4KB

4KB   ...

Buffer Manager

int numBufs
int clockHand
*Page *bufPool*
*BufDesc *bufTable*
*BufHashTbl *hashTable*
BufStats bufStats

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Main Memory

numBufs = 4

Buffer Manager

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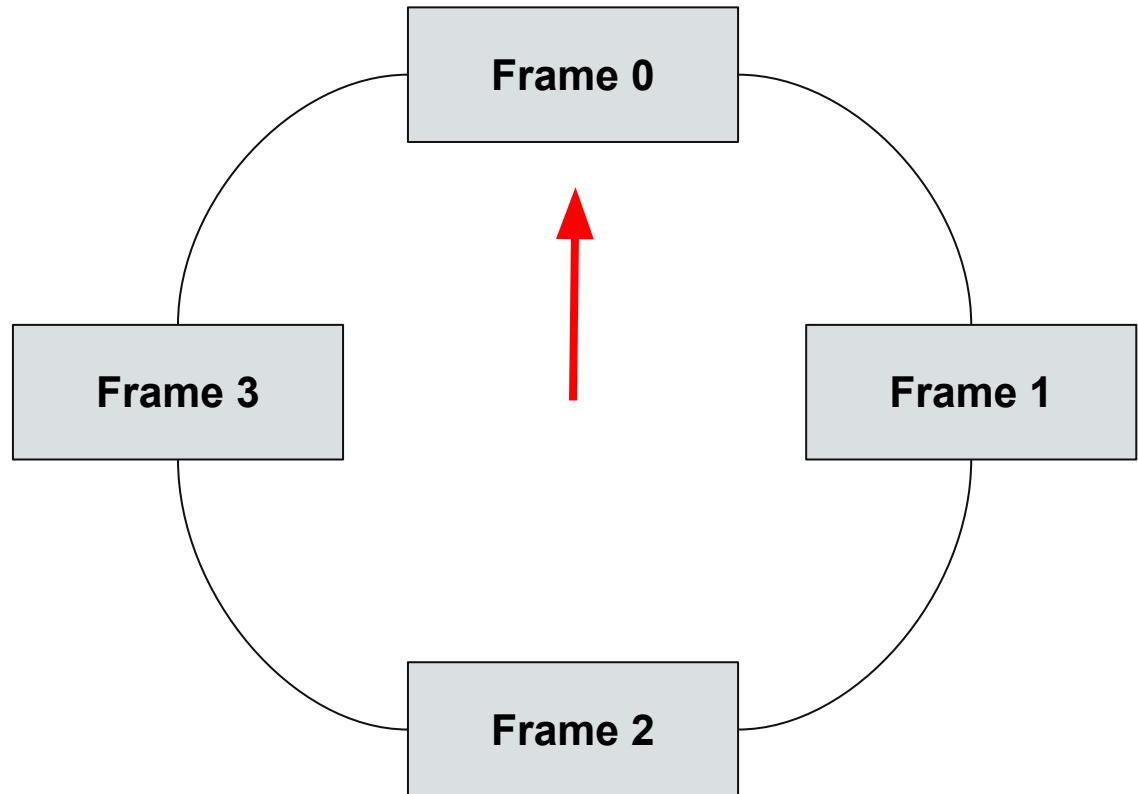
Buffer Manager

int numBufs
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Main Memory

numBufs = 4

Frame 1	Frame 2	Frame 3	Frame 4

Buffer Manager

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Frame 1	Frame 2	Frame 3	Frame 4

BufDesc	BufDesc	BufDesc	BufDesc

Buffer Manager

int numBufs
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Page *bufPool
BufDesc *bufTable
BufHashTbl *hashTable
BufStats bufStats

BufDesc

1. **File* (file address)**
2. **pageNo (eg. Page 10)**
3. **frameNo (index in BufPool)**
4. **pinCnt (active users of page)**
5. **dirty (is out of sync?)**
6. **valid (is there a valid page?)**
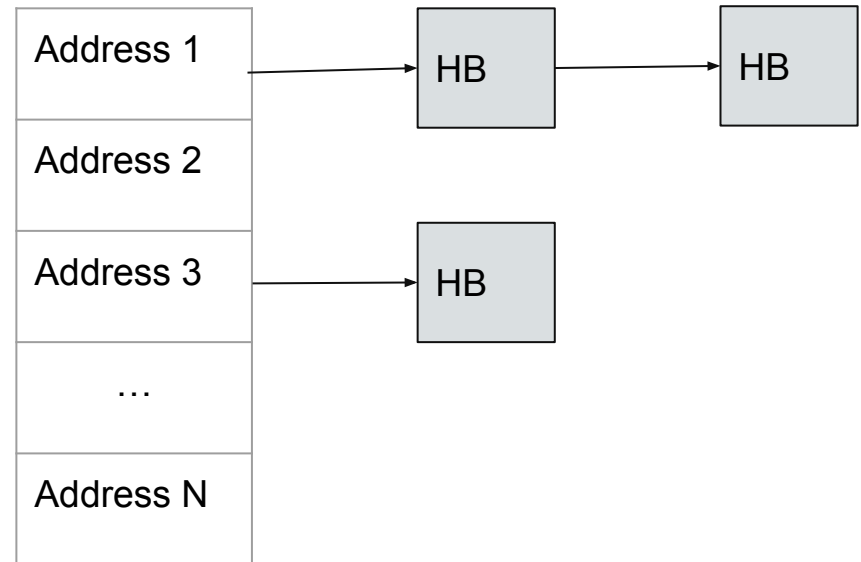7. **refBit (was it referenced recently)**

Buffer Manager

int numBufs
int clockHand
*Page *bufPool*
*BufDesc *bufTable*
*BufHashTbl *hashTable*
BufStats bufStats

Address 1
Address 2
Address 3
…
Address N

Address 1 → HB → HB

Address 3 → HB

Buffer Manager

int numBufs
int clockHand
*Page *bufPool*
*BufDesc *bufTable*
*BufHashTbl *hashTable*
BufStats bufStats

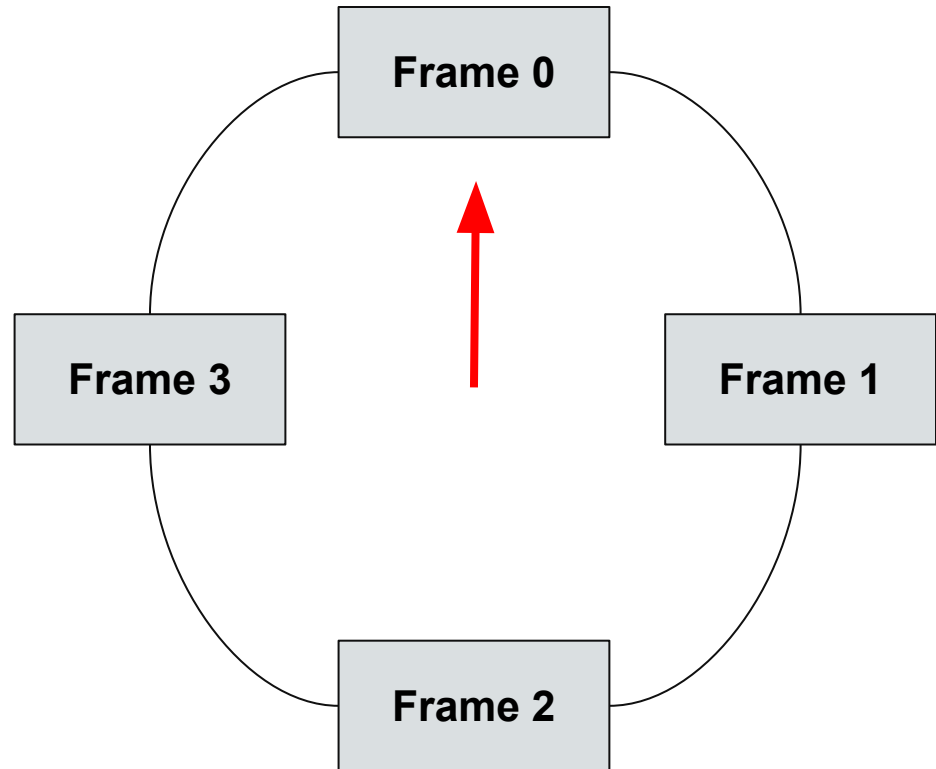- *int accesses;*
- *int diskreads;*
- *int diskwrites;*

Buffer Manager

buf.c

- ***allocBuf*** *(int & frame)*
- ***readPage*** *(File* file, const int PageNo, Page*& page)*
- ***unPinPage*** *(File* file, const int PageNo, const bool dirty)*
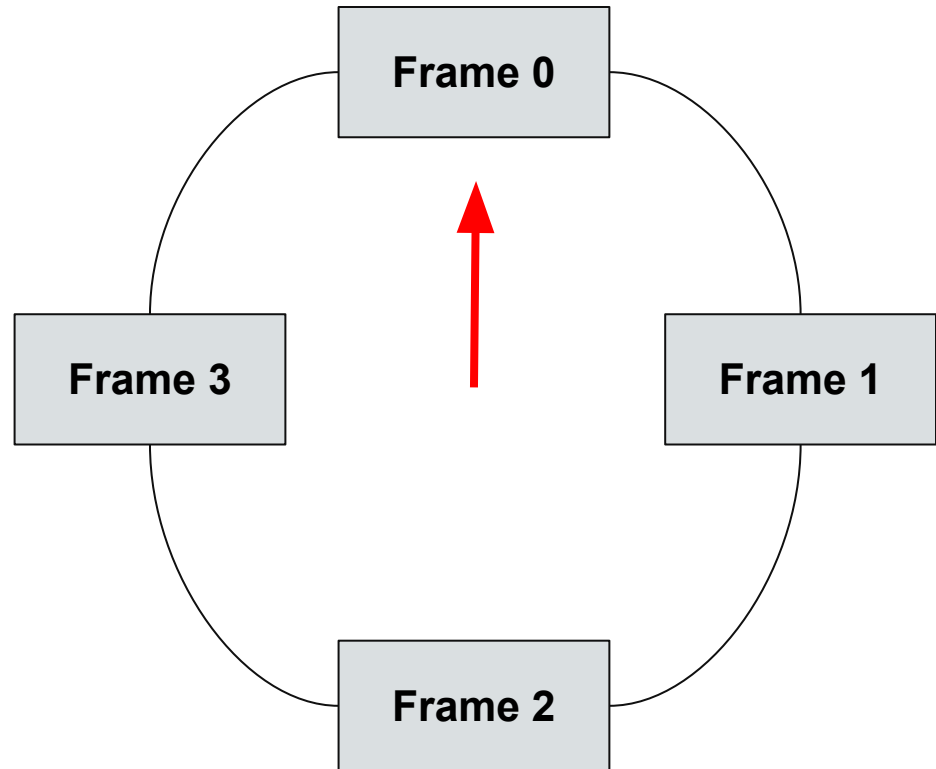- ***allocPage*** *(File* file, int& pageNo, Page*& page)*

Buffer Manager

- ***allocBuf*** *(int & frame)*
- Run clock algorithm
    - valid = False
    - refBit = False
      pinCnt = 0

Frame 0

Frame 1

Frame 2

Frame 3
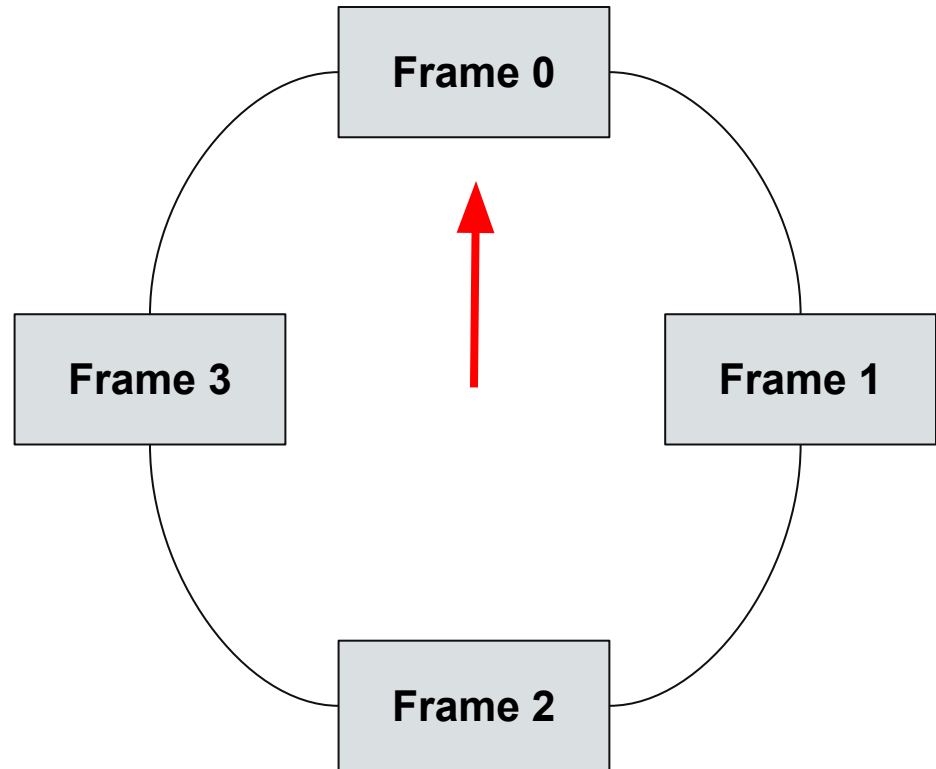
Buffer Manager

__allocBuf__ (int & frame)
- Run clock algorithm **(x2)**
  - valid = False
  - refBit = False

  pinCnt = 0

  - **BUFFEREXCEEDED**

Buffer Manager

allocBuf (int & frame)
- Flush dirty page
  - file -> writePage
- **frame** = clockHand;

Buffer Manager

readPage (File* file, const int PageNo, Page*& page)
- Lookup (file, PageNo) in hashTable
  - if found, update BufDesc
    - refBit = True
    - pinCnt += 1
    - page = frameNo

Buffer Manager

readPage (File* file, const int PageNo, Page*& page)
- Lookup (file, PageNo) in hashTable
  - if not found
    - allocBuf -> frameNo
    - file -> readPage(PageNo, &bufPool[frameNo.])
    - bufTable: BufDesc Set()
    - hashTable -> insert

Buffer Manager

unPinPage (File* file, const int PageNo, const bool dirty)

- Mark page as dirty

- Decrease pinCnt

Buffer Manager

allocPage (File* file, int& pageNo, Page*& page)
- Allocate Page in File: file ->allocatePage
- Allocate Frame: allocBuf()
- Set BufDesc in BufTable: BufDesc, Set()
- Add to HashTable: hashTable ->insert

Do we copy anything to the Page in BufPool?

Questions

Thank You