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CS487
Homework 1

1)
   a. Pin Count: This represents the number of processes using the page in the buffer pool. Count starts at 1 when page is loaded into the pool for the first process. As new processes use the page they “pin” the page causing the count to increase. When process is done using the page it “unpins” the page decreasing the count by 1. When the count reaches 0 it is signifies that the page is no longer needed and can be removed from the pool if needed.
   b. Dirty Bit: This bit gets set when the page is updated by a process. It tells the disk manager that the page will need to be written to disk before it is removed from the buffer pool.
   c. Referenced Bit: Used in the clock algorithm initialized to 0. When clock checks page it looks at the pin count bit. If the pin count >=1 it sets referenced to 1. When clock hands come back around to page if the pin count = 0 then it sets referenced bit to 0 and moves to next page. If the clock looks at page and both he pin count and the referenced are 0 then the page is evicted from pool if needed.
2) The flag allows the pool to know what pages are still needed to be kept around for access by queries. If you didn’t have this pin/unpin feature you would not know which pages were being used and could possible evict a page from the pool that is needed, requiring another call to the disk to load the page back into the pool, slowing down query execution
3) FIFO works well in a case where a single instance is doing a file scan. A situation where this model doesn’t work is when you have multiple instances that are doing a file scan where the number of pages is greater than buffer pool. After the first instance finishes its last page the next instance will then request the first page and that will replace the next page in the pool. This will result if every page having to be fetched again for the 2nd instance and again for any other instance after that.
4) State 1:

Frame: 1	Pin Cnt: 1		Frame: 2	Pin Cnt: 0		Frame: 3	Pin Cnt: 0
Dirty Bit: 0	Ref: 1		Dirty Bit: 0	Ref: 0		Dirty Bit: 1	Ref: 0
Page: 58			Page: 42			Page: 46	

State 2:

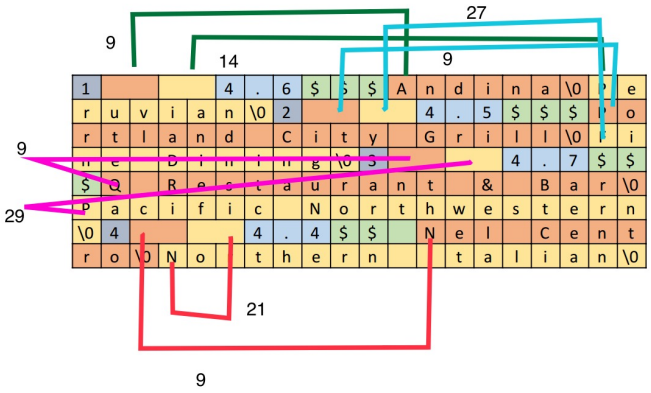
Frame: 1	Pin Cnt: 1		Frame: 2	Pin Cnt: 1		Frame: 3	Pin Cnt: 0
Dirty Bit: 0	Ref: 1		Dirty Bit: 0	Ref: 1		Dirty Bit: 1	Ref: 0
Page: 58			Page: 73			Page: 46	

State 3:

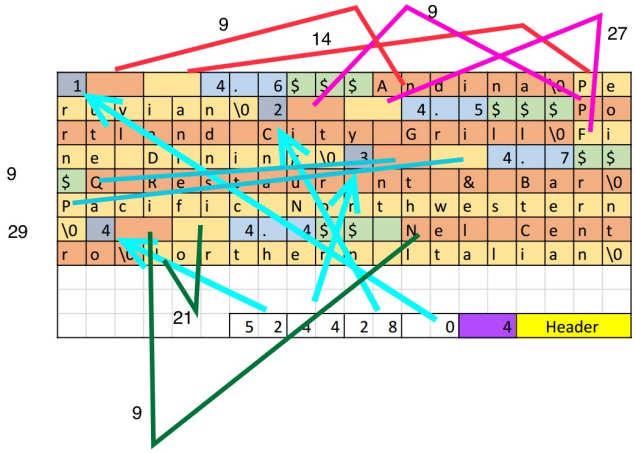
Frame: 1	Pin Cnt: 1		Frame: 2	Pin Cnt: 0		Frame: 3	Pin Cnt: 1
Dirty Bit: 0	Ref: 1		Dirty Bit: 0	Ref: 1		Dirty Bit: 0	Ref: 1
Page: 58			Page: 73			Page: 82	

To pin page 82, page 46 was written to disk before it was replaced.

5)



6)



7)

8) Schema: Movies(id, Name, GenreID, StudioID, Release, ProducerID)