Dan Herve
CSCD 340

Lab 11

Page reference string: 1, 3, 4, 1, 5, 2, 3, 8, 6, 7, 10, 3, 9, 4, 8, 3, 4, 1, 9, 5, 2, 1, 1, 3, 5, 1, 5, 1, 3, 2, 3, 1, 2, 7, 4, 2, 4, 2, 5, 2, 4, 6

FIFO																																										
Page Ref	1	3	4	1	5	2	3	8	6	7	10	3	9	4	8	3	4	1	9	5	2	1	1	3	5	1	5	1	3	2	3	1	2	7	4	2	4	2	5	2	4	6
First	1	1	1	1	1	2	2	2	2	2	10	10	10	10	8	8	8	8	8	8	8	8	8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2
Second		3	3	3	3	3	3	8	8	8	8	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	7	7	7	7	7	7	7	6
Third			4	4	4	4	4	4	6	6	6	6	9	9	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4
Fourth					5	5	5	5	5	7	7	7	7	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	5	5	5
Miss	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1

FIFO Answer				
Frames #	0	1	2	3
Page Ref	2	6	4	5
Faults	22			

LRU Time Counter																																										
Page Ref	1	3	4	1	5	2	3	8	6	7	10	3	9	4	8	3	4	1	9	5	2	1	1	3	5	1	5	1	3	2	3	1	2	7	4	2	4	2	5	2	4	6
Page 1	1	1	1	1	1	1	1	8	8	8	8	3	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	7	7	7	7	7	7	7	7	6
Page 2		3	3	3	3	2	2	2	2	7	7	7	7	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Page 3			4	4	4	4	3	3	3	3	10	10	10	10	8	8	8	8	9	9	9	9	9	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
Page 4					5	5	5	5	6	6	6	6	9	9	9	9	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5
Miss	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1
Time	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

Page	1	2	3	4	5	6	7	8	9	10
Last Ref	31	39	30	40	38	41	33	14	18	10

LRU Count Answer				
Frames #	0	1	2	3
Page Ref	6	2	4	5
Faults	23			

LRU Stack																																										
Page Ref	1	3	4	1	5	2	3	8	6	7	10	3	9	4	8	3	4	1	9	5	2	1	1	3	5	1	5	1	3	2	3	1	2	7	4	2	4	2	5	2	4	6
First	1	1	1	1	1	1	1	8	8	8	8	3	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	7	7	7	7	7	7	7	7	6
Second		3	3	3	3	2	2	2	2	7	7	7	7	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Third			4	4	4	4	3	3	3	3	10	10	10	10	8	8	8	8	9	9	9	9	9	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
Fourth					5	5	5	5	6	6	6	6	9	9	9	9	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5
Miss	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1

Stack	H									T
Page	6	4	2	5	7	1	3	9	8	10

LRU Stack Answer				
Frames #	0	1	2	3
Page Ref	6	2	4	5
Faults	23			

Stu's Second Chance																																										
Page Ref	1	3	4	1	5	2	3	8	6	7	10	3	9	4	8	3	4	1	9	5	2	1	1	3	5	1	5	1	3	2	3	1	2	7	4	2	4	2	5	2	4	6
First	1	1	1	1	1	2	2	2	2	7	7	7	7	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4
Second		3	3	3	3	3	3	3	3	3	10	10	10	10	8	8	8	8	8	8	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Third			4	4	4	4	4	8	8	8	8	3	3	3	3	3	3	3	9	9	9	9	9	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5
Fourth					5	5	5	5	6	6	6	6	9	9	9	9	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	7	7	7	7	7	7	7	7
Miss	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1
Pointer	2	3	4	4	1	2	3	4	1	2	3	4	1	2	3	3	3	1	4	2	3	3	3	4	4	4	4	4	4	4	4	4	4	1	2	2	2	2	4	4	4	1

	R																																									
First	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
Second	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	0	1	1	0
Third	0	0	1	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0
Fourth	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

2nd Chance Answer				
Frames #	0	1	2	3
Page Ref	4	2	5	7
Faults	22			

Analysis:

Surprisingly, the data does not differ widely between the algoritms. In terms of faults, the Second Chance algorithm and the FIFO algorithm both had 22, while both LRU algorithms were the same in all regards. Between the FIFO and Second Chance algorithms, the FIFO had it's extra fault at the end while the Second Chance had it in the middle. The most significant differences between the reference string approaching the middle and the reference string appoaching the end was that the former varied its pages to a much greater degree than the latter. My initial hypothesis is that FIFO performs better when pages are coming in in a varied sequence while Second Chance performs better when the pages come in in a more consistant manner.

In terms of determining a superior algorithm, I am hesitant to actually recommend the FIFO/Second Change pair to the LRU pair only because the faults are so similar that a larger data set is needed to offer a fair analysis. With the data gathered, however, I would recommend the Second Chance Algorithm because it has the least number of faults and seems to perform better with data that comforms to real world memory use more often; that is, a smaller set of pages being referenced more often.

As a final comment, I will say that Belady's Anomaly does not factor here, since we do not compare different numbers of frame s; however, since the LRU algorithms are stack-based, it is probable that they would fair better at certain frame numbers since they do not exhibit the increase in faults at certain higher frame numbers.