CMSC 412 Final Project

Using the reference string from Homework 6:

Applying it to the algorithm:

Test Read Input

```
Choose next option:
Please enter the reference string.
You can enter in the string as just a row of numbers, or delimited by commas.
1 2 3 4 5 6 7 8 9
Would you like to set the amount of physical frames, by default it is 4.
Continue? ( Y / N ):
Enter value:5
0 - Exit
1 - Read Reference String
2 - Generate Reference String
3 - Display current reference string
4 - FIFO Simulation
5 - OPT Simulation
6 - LRU Simulation
 - LFU Simulation
Choose next option:
0 - Exit
1 - Read Reference String
2 - Generate Reference String
3 - Display current reference string
4 - FIFO Simulation
 - OPT Simulation
6 - LRU Simulation
 - LFU Simulation
Choose next option:
2, 9, 6, 0, 3, 3, 4, 0, 3, 9, 4, 9, 0, 3, 0, 7, 0
0 - Exit
1 - Read Reference String
2 - Generate Reference String
3 - Display current reference string
4 - FIFO Simulation
5 - OPT Simulation
6 - LRU Simulation
7 - LFU Simulation
Choose next option:
```

Test FIFO #1

```
Please enter the reference string.
You can enter in the string as just a row of numbers, or delimited by commas.
17540147365047321
Would you like to set the amount of physical frames, by default it is 4.
Continue? ( Y / N ):
Enter value:4
0 - Exit
1 - Read Reference String
2 - Generate Reference String
3 - Display current reference string
4 - FIFO Simulation
 - OPT Simulation
 - LRU Simulation
 - LFU Simulation
Choose next option:
Reference String
                       1
                                       5
                                                               1
                                                                       4
                       0
Physical Frame 0
Physical Frame 1
Physical Frame 2
Physical Frame 3
Page Faults
Victim Frames
In the FIFO page-replacement algorithm, the victim frame is the oldest frame.
The simulation of the FIFO page-replacement algorithm assumes a hypothetical comput
er having 4
physical frames numbered 0 to 3, which form a FIFO queue. It assumes that the sing
le process that is
running has a virtual memory of 10 frames numbered 0 to 9. The reference string is
1, 7, 5, 4, 0, 1, 4, 7, 3, 6, 5, 0, 4, 7, 3, 2, 1
Continue? ( Y / N ):
```

FIFO #2

Command Prompt - java	FinalProject													- 0	×
hysical Frame 3 age Faults ictim Frames		F	F	1 F	7 F 1	5 F 7	5 F								
irtual frame 4 is r ecause virtual fram othing else needs t o page fault is gen e have no victim fr	ne 4 is a to be don nerated.	lready p	resent i	n the ph	ysical m	emory, i	n physic	al frame							
ontinue? (Y / N):															
eference String hysical Frame 0 hysical Frame 1		7 7 1		4 4 5	0 0 4	1 1 0	4 1 0	7 7 1							
nysical Frame 2 nysical Frame 3 age Faults ictim Frames						4 5 F 7	4 5 F	9 4 5							
ecause there is no ne victim frame is irtual frame 5 is s ontinue? (Y / N):	virtual wapped o	frame 5,	accordi	ng to the	e FIFO s	trategy	e replac used in	ed. this alg	orithm						
eference String															
ysical Frame 0 ysical Frame 1 ysical Frame 2			5 7 1	4 5 7	0 4 5	1 0 4	1 0 4	7 1 0							
nysical Frame 3 age Faults ictim Frames					7 F 1				0 F 4						
irtual frame 3 is r ecause virtual fram ecause there is no he victim frame is irtual frame 4 is s	ne 3 is n more roo virtual	ot prese m in the frame 4,	physica accordi	l memory ng to th	, a fram e FIFO s	e must b	e replac	ed.							
ontinue? (Y / N):															

FIFO #3

Command Prompt - java	FinalProject																	- 0	>
ference String vsical Frame 0	1	7	5 5	4	9	1	4	7	3	6 6	5 5	0	4	7 7	3	2 2	1		
ysical Frame 1		1	7	5	4	0	0	1		3	6	5	ø	4		3			
ysical Frame 2			1		5			0	1		3	6	5	0					
ysical Frame 3																			
ge Faults																			
ctim Frames									4										
rtual frame 2 is mo cause virtual fram cause there is no e victim frame is rtual frame 0 is s	me 2 is n more roo virtual	ot preser m in the frame 0,	physical accordin	l memory,	, a fram FIFO s	e must b	e replac	ed.											
ntinue? (Y / N)																			
ference String																			
ysical Frame 0																			
ysical Frame 1																			
ysical Frame 2																			
ysical Frame 3									0				6		0	4			
ge Faults									F 4					F 6			F 4		
ctim Frames									4					ь			4		
rtual frame 1 is recause virtual frame as there is no e victim frame is rtual frame 4 is the end, a total	me 1 is n more roo virtual swapped o	ot preser m in the frame 4, ut, and \	physical accordin virtual	l memory, ng to the Frame 1	, a fram E FIFO s Ls swapp	e must be trategy ed in.	e replac	ed.											
FO Simulation comp	plete.																		
- Exit - Read Reference S - Generate Referer - Display current - FIFO Simulation - OPT Simulation - LRU Simulation - LFU Simulation	nce Strin referenc																		
oose next option:																			

Test OPT #1

```
Choose next option:

Seference String 1 7 5 4 0 1 4 7 3 6 5 0 4 7 3 2 1

Physical Frame 0

Physical Frame 1

Physical Frame 2

Physical Frame 2

Physical Frame 3

Page Faults

Victim Frame 3

The optimal page-replacement algorithm is an idealized algorithm in which the victim frame is the one that will not be accessed for the longest period of time.

This simulation assumes a hypothetical computer having 4 physical frames numbered 0 to 3. It assumes that the single process that is running has a virtual memory of 10 frames numbered 0 to 9.

The reference string is:

1, 7, 5, 4, 0, 1, 4, 7, 3, 6, 5, 0, 4, 7, 3, 2, 1

Continue? ( Y / N ):

Y

Reference String 1 7 5 4 0 1 4 7 3 6 5 0 4 7 3 2 1

Physical Frame 0 1

Physical Frame 0 1

Physical Frame 1 is not present in physical memory, a page fault is generated. Virtual frame 1 is not present in physical memory, we have no victim frame.

Continue? ( Y / N ):
```

Test OPT #2

Command Prompt - java	FinalProject														_	- 0	×
hysical Frame 3 age Faults ictim Frames		F	F	4 F	4 F 5	4 F	4										
irtual frame 4 is r ecause virtual fram othing else needs t o page fault is gen e have no victim fr	ne 4 is a o be don merated.	lready p	resent i	n the ph	ysical m	emory, i	n physic	al frame									
ontinue? (Y / N):																	
eference String																	
nysical Frame 0																	
ysical Frame 1																	
ysical Frame 2																	
ysical Frame 3				4	4	4											
nge Faults ctim Frames																	
othing else needs to page fault is gene have no victim frontinue? (Y / N):	erated. ame.																
eference String			5	4	0		4		3	6		a	4				
ysical Frame 0	1			1	1	1	1	1									
ysical Frame 1		7	7	7	7	7	7	7									
ysical Frame 2				5	0	0	0	0	0								
ysical Frame 3																	
ge Faults																	
ctim Frames																	
irtual frame 3 is r ecause virtual fram ecause there is no ne victim frame is irtual frame 1 is s	me 3 is n more roo virtual	ot prese m in the frame 1	physica which is	l memory the far	, a fram thest (o	e must b r does n	e replac	ed.		eference	string.						
ontinue? (Y / N):																	

OPT #3



Test LRU #1

Test LRU #2

ctim Frames																
rtual frame 4 is r cause virtual fram thing else needs t page fault is gen have no victim fr	ne 4 is a o be don nerated.	lready p	resent i	n the phy	ysical m	emory, i	n physic	al frame								
ntinue? (Y / N):																
ference String	1		5	4	0	1	4		3	6	5	0	4	3	2	1
ysical Frame 0	1	1	1		0	1	1									
ysical Frame 1																
ysical Frame 2			5	5	5	5	5	5								
ysical Frame 3																
ge Faults																
ctim Frames																
rtual frame 7 is r cause virtual fram thing else needs t page fault is gen	ne 7 is a o be don nerated.	lready p	resent i	n the phy	ysical m	emory, i	n physic	al frame	1,							
cause virtual fram thing else needs t	ne 7 is a to be don nerated. name.	lready p	resent i	n the phy	ysical m	emory, i	n physic	al frame	1,							
cause virtual fram thing else needs t page fault is gen have no victim fr ntinue? (Y / N):	ne 7 is a to be don nerated. name.	lready p e.		n the phy						6		a	4			
cause virtual fram thing else needs t page fault is gen have no victim fr ntinue? (Y / N): ference String	ne 7 is a to be don nerated. came.	lready p e. 7														
cause virtual fram thing else needs t page fault is gen have no victim fr ntinue? (Y / N): ference String ysical Frame 0	ne 7 is a to be don nerated. name.	lready pe.	5 1	4	0	1 1	4									
cause virtual fram thing else needs t page fault is gen have no victim fr ntinue? (Y / N): ference String ysical Frame 0 ysical Frame 1	ne 7 is a to be don nerated. came.	lready p e. 7		4 1 7					3 1 7							
cause virtual fram thing else needs t page fault is gen have no victim fr ntinue? (Y / N): ference String ysical Frame 0 ysical Frame 1 ysical Frame 2	ne 7 is a to be don nerated. came.	lready pe.	5 1 7	4	0 0 7	1 1 7	4 1 7	7 1 7								
cause virtual fran thing else needs t page fault is gen have no victim fr ntinue? (Y / N): ference String ysical Frame 0 ysical Frame 1 ysical Frame 2 ysical Frame 2 ysical Frame 3	ne 7 is a to be don nerated. came.	lready pe.	5 1 7	4 1 7 5	0 0 7 5	1 1 7 5	4 1 7 5	7 1 7 5	3 1 7 3							
cause virtual fram thing else needs t page fault is gen have no victim fr ntinue? (Y / N): ference String ysical Frame 0 ysical Frame 1 ysical Frame 2	ne 7 is a to be don nerated. came.	lready p e. 7 1 7	5 1 7 5	4 1 7 5	0 0 7 5 4	1 1 7 5	4 1 7 5 4	7 1 7 5	3 1 7 3							

Test LRU #3

Command Prompt - java	FinalProject																	- 0	×
Reference String	1	7	5	4	0	1	4	7	3	6	5	0	4	7	3	2	1		1
Physical Frame 0 Physical Frame 1				1 7	Ø 7							0 7	0 7	0 7					
Physical Frame 2				5		5		5	3	6	5	5	5	5		5			
Physical Frame 3																			
Page Faults																			
Victim Frames																			
Virtual frame 2 is r																			
Because virtual fram Because there is no	me Z 15 m	ot prese	nt in pn	ysicai m 1 memory	emory, a a fram	page ta	uit is g	enerated od											
The victim frame is				I ilicilior y	, a	c mase b	c replue												
Virtual frame 3 is s	swapped o	out, and	virtual	frame 2	is swapp	ed in.													
Continue? (Y / N):																			
Reference String	1		5	4	0	1	4		3	6	5	0	4		3	2	1		
Physical Frame 0					0							0	0	ø		2			
Physical Frame 1																			
Physical Frame 2																			
Physical Frame 3				4	4		4			4	4	4	4			4			
Page Faults Victim Frames						F Ø			5		F 6				a		F 2		
VICCIII FFAIIES																			
Virtual frame 1 is r Because virtual fram Because there is no The victim frame is	me 1 is n	ot prese om in the	physica	ysical m l memory	emory, a , a fram	page fa e must b	ult is g e replac	enerated ed.											
Virtual frame 2 is				frame 1	is swapp	ed in.													
In the end, a total	of 13 pa	ge fault	s and 9	victims	were gen	erated.													
LRU Simulation compl	lete.																		
0 - Exit																			
1 - Read Reference S	String																		
2 - Generate Referer																			
3 - Display current		e string																	
4 - FIFO Simulation 5 - OPT Simulation																			
6 - LRU Simulation																			
7 - LFU Simulation																			
Choose next option:																			
																			•

Test LFU #1

```
Reference String 1 7 5 4 0 1 4 7 3 6 5 0 4 7 3 2 1
Physical Frame 0
Physical Frame 1
Physical Frame 1
Physical Frame 2
Physical Frame 2
Physical Frame 3
Page Faults
Victia Frame 3
Victia Frame 3
Victia Frame 4
Physical Frame 5
Physical Frame 6
Physical Frame 7
Physical Frame 7
Physical Frame 8
Page Faults
Victia Frame 8
Victia Frame 8
Victia Frame 9
Victia Frame 9
Victia Frame 9
Victia Frame 1
```

Test LFU #2

Test LFU #3

Command Prompt - java				4	0	1	4	7	-	-	_	0	4	7	3	2	1	- 6	J
ysical Frame 0		7 1	5 1	1	0	1 0	4 0	ø		6 3	5	Ø 3	4	4	3	2 4			
ysical Frame 1						1	1	1	1	6	6	6	6						
ysical Frame 2																			
ysical Frame 3																			
ge Faults																			
ctim Frames																			
rtual frame 2 is m	reference	d.																	
cause virtual fran																			
cause there is no																			
e victim frame is							for the	longest	period o	f time.									
rtual frame 0 is	swapped o	ut, and	/irtual	trame 2	ıs swapp	ed in.													
ntinue? (Y / N):																			
ference String					0					6		0				2			
sical Frame 0					0	0	0												
sical Frame 1						1	1	1	1	6	6	6	6						
sical Frame 2												0	0	0	0				
sical Frame 3																			
e Faults																			
tim Frames																			
rtual frame 1 is m																			
ause virtual fran																			
cause there is no																			
victim frame is							for the	longest	period o	f time.									
rtual frame 4 is	swapped o	ut, and	/irtual	frame 1	is swapp	ed in.													
the end, a total	of 16 pa	ge fault	and 12	victims	were ge	nerated.													
J Simulation compl	lete.																		
r. de																			
- Exit - Read Reference S																			
Generate Referen																			
Display current		e string																	
FIFO Simulation																			
- OPT Simulation																			
- LRU Simulation																			
· LFU Simulation																			
ose next option:																			
nente opezon.																			