

Q1

	t0							t1							t2								
P1	3	3	7	3	7	7	3	7	1	7	3	6	6	7	1	1	6	1	6	6	1	1	1
	WS(t0,6)={7,3}							WS(t1,6)={6,3,7,1}							WS(t2,6)={1,6}								
P2	8	4	4	11	11	4	8	8	8	4	11	8	8	8	8	4	11	4	11	11	11	8	8
	WS(t0,6)={4,11,8}							WS(t1,6)={8,11,4}							WS(t2,6)={8,11,4}								

At t1 WSS1 + WSS2 = 2+3 = 5 = m = 5)

Not trashing at the corner

At t1 WSS1 + WSS2 = 4+3 = 7 > (m = 5)

P1 is shifting to a new locality as the working sets are totally different at t0 and t2
trashing could occur at t1

Q2

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	3	2	5	4	3	5	1	5	2	4	3	3	4	2	5	1	5	3	4	5	2	3
	3	3	3	3	3	3	1	1	2	2	2											
		2	2	4	4	4	4	4	4	4	4											
			5	5	5	5	5	5	5	5	3											
	F	F	F	F			F		F		F											

2 is the longest at t=8

3 is the longest at t=10

1 is the longest at t=15

5 is the longest at t=14

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	3	2	5	4	3	5	1	5	2	4	3	3	4	2	5	1	5	3	4	5	2	3
	3	3	3	4	4	4	1	1	1	4	4											
		2	2	2	3	3	3	3	2	2	2											
			5	5	5	5	5	5	5	5	3											
	F	F	F	F	F		F		F	F	F											

3 is the LRU at t=0

2 is the LRU at t=1

4 is the LRU at t=3

3 is the LRU at t=4

1 is the LRU at t=6

5 is the LRU at t=7

S on t=[0,10] = SR on t=[11,21], thus at t=10, OPT and LRU provide the same result

let's note that LRU produces more page faults on t=[0,10], it is not optimal

< t=10 the stack is 4, 2, 5, 1, 3 > t=10 the stack is 3, 4, 2, 5, 1

Q3

t	0	1	2	3	4	5	6	7	8	9	10	11
	7	3	4	5	7	3	6	7	3	4	5	6
	7	7	7	5	5	5	6	6	6	6	6	6
		3	3	3	7	7	7	7	7	4	4	4
			4	4	4	3	3	3	3	3	5	5
	F	F	F	F	F	F	F			F	F	

9 faults with 3 frames

t	0	1	2	3	4	5	6	7	8	9	10	11
	7	3	4	5	7	3	6	7	3	4	5	6
	7	7	7	7	7	7	6	6	6	6	5	5
		3	3	3	3	3	3	7	7	7	7	6
			4	4	4	4	4	4	3	3	3	3
				5	5	5	5	5	5	4	4	4
	F	F	F	F			F	F	F	F	F	F

10 faults with 4 frames, the belady's anomaly is here

t	0	1	2	3	4	5	6	7	8	9	10
	9	11	7	3	11	13	11	1	4	5	7
	9*	9*	9*	3*	3*	3*	3*	1*	1*	1*	7*
	→	11*	11*	11	11*	11	11*	11	4*	4*	4
		→	7*	7	7	13*	13*	13	13	5*	5
	F	F	F	F		F		F	F	F	

we scan all the buffer and set u=0 and return to the initial position for replacement

P11 is accessed, we set u=1

we go to P7 for replacement, we set u=0 for P11 and loop on the circular buffer

Etc.

P29, we apply clock algorithm in step1 and look for (0,0) the P11 is replaced

P51, we apply clock algorithm in step1 then step2 and look for (0, 1), we set u=0 for P27 and the P33 is replaced

