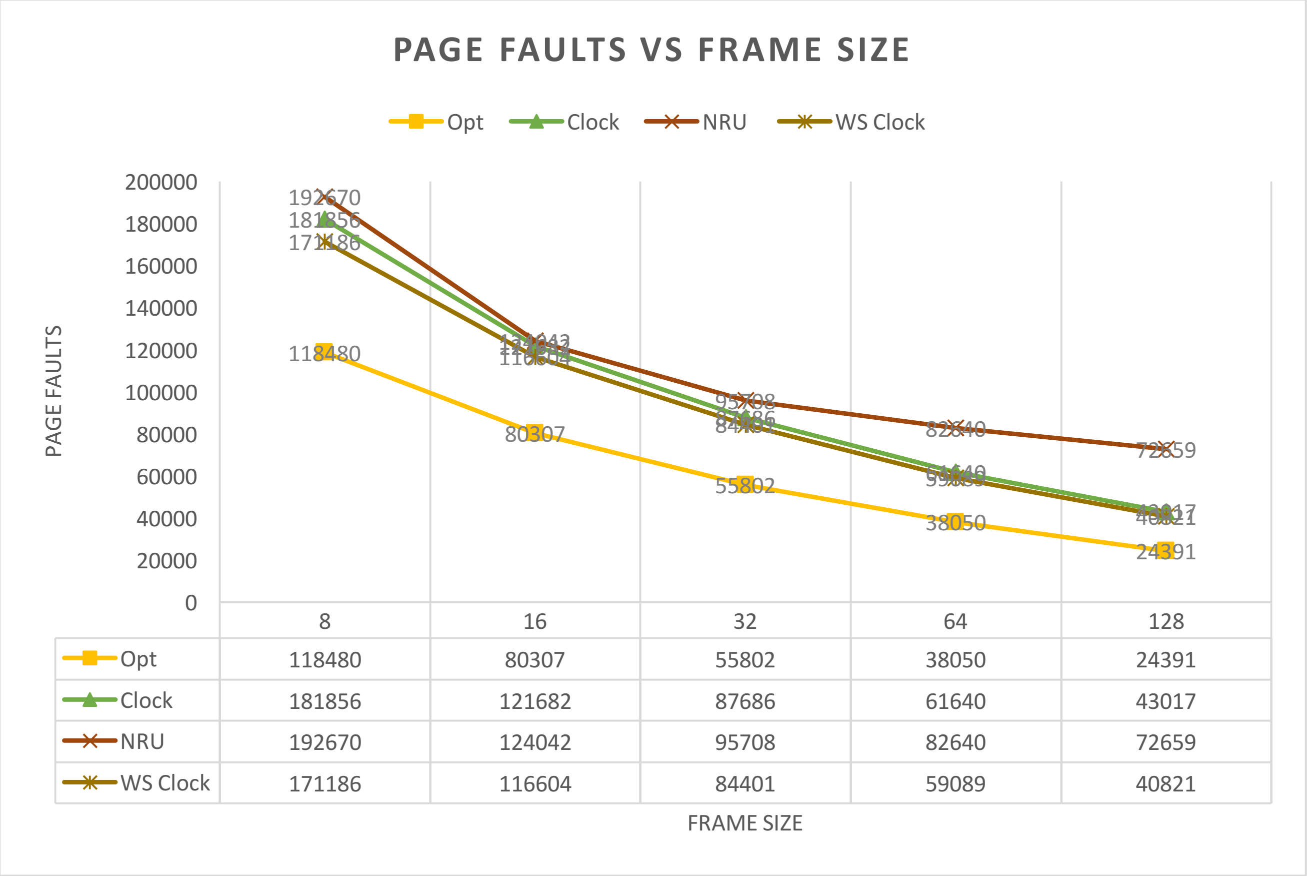
CS1550: Project 3-VM Simulation (Trace File: GCC.Trace)

By Charlotte Chen

Page Faults vs # Frames for **gcc.trace**:



	8	16	32	64	128
Opt	118480	80307	55802	38050	24391
Clock	181856	121682	87686	61640	43017
NRU	192670	124042	95708	82640	72659
WS Clock	171186	116604	84401	59089	40821

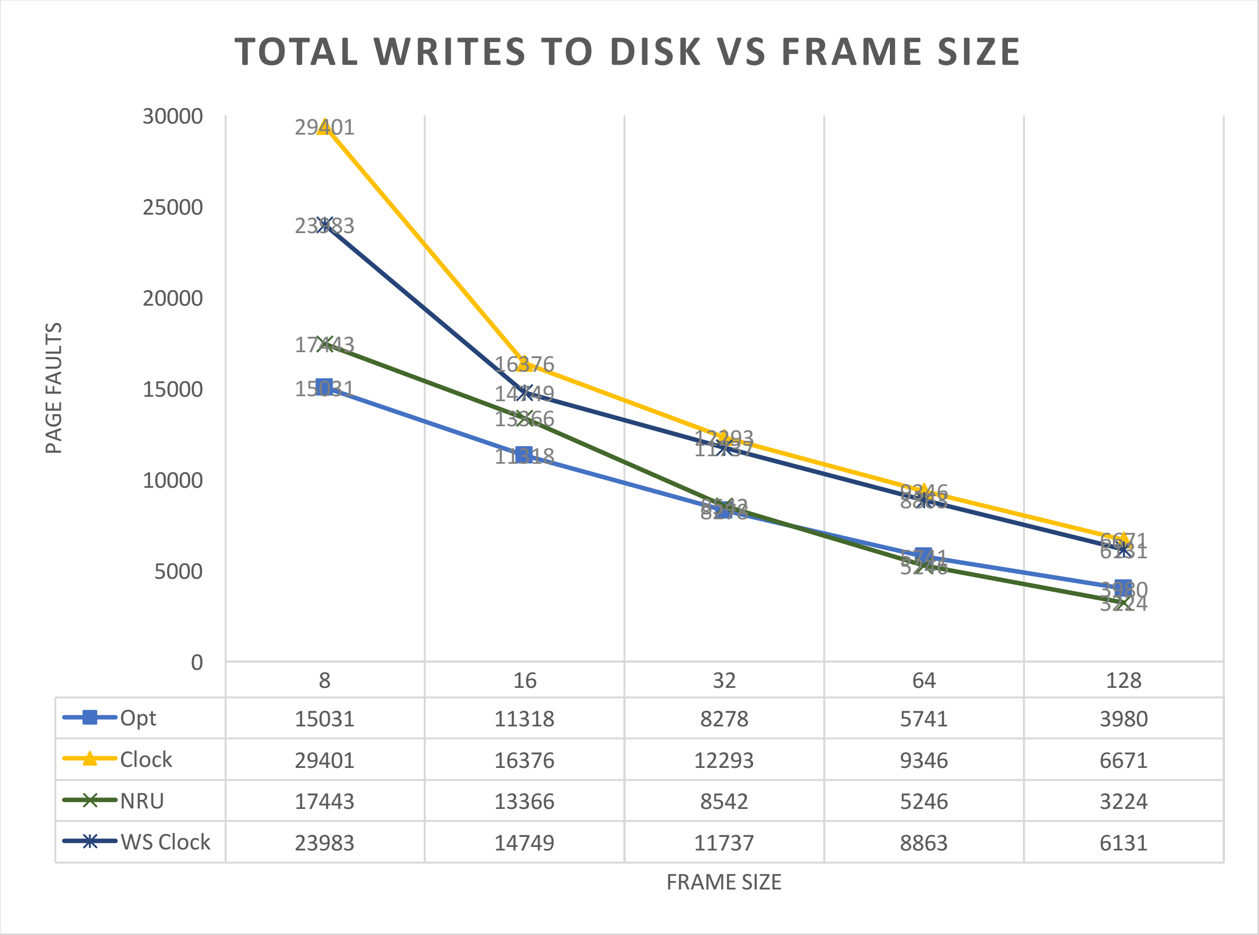
* WS Clock: Refresh = 1,000,000. Tau = 70
* NRU: Refresh = 100

I set NRU's refresh rate to 100 because as I was tuning the refresh rates for NRU (shown on page 3), I found that the page fault trend resembles a parabola. So I estimated the best refresh rate with lowest amount of page fault, which is 100.

Similarly, for WS Clock, I controlled tau and changed refresh rate, and found the trend to be downward sloping, so I think best refresh rate is 1,000,000 (no refresh). Then I controlled refresh rate and changed tau, and found the tau that results in the lowest amount of page fault to be approximately 70.

From the resulting graph that compares all 4 algorithms, opt results in the lowest amount of page faults as expected. However, for real life OS, optimal won't be unrealistic, as it will require the OS to predict the future. Therefore, out of the remaining 3 algorithms, working set consistently results in the least amount of page faults regardless of frame sizes. The implementation is also nice because it uses a circular queue. So I think the best algorithm for real OS out of the 4 algorithms will be working set clock.

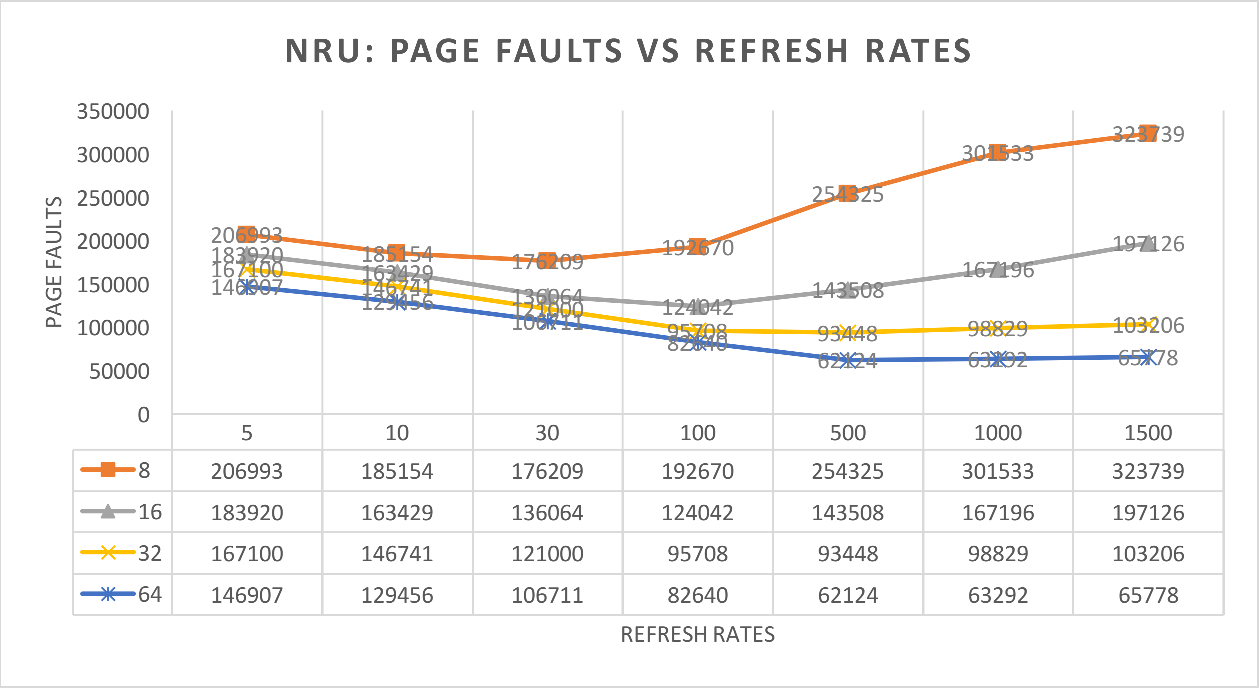
Disk Writes vs Frames for **gcc.trace**:



	8	16	32	64	128
Opt	15031	11318	8278	5741	3980
Clock	29401	16376	12293	9346	6671
NRU	17443	13366	8542	5246	3224
WS Clock	23983	14749	11737	8863	6131

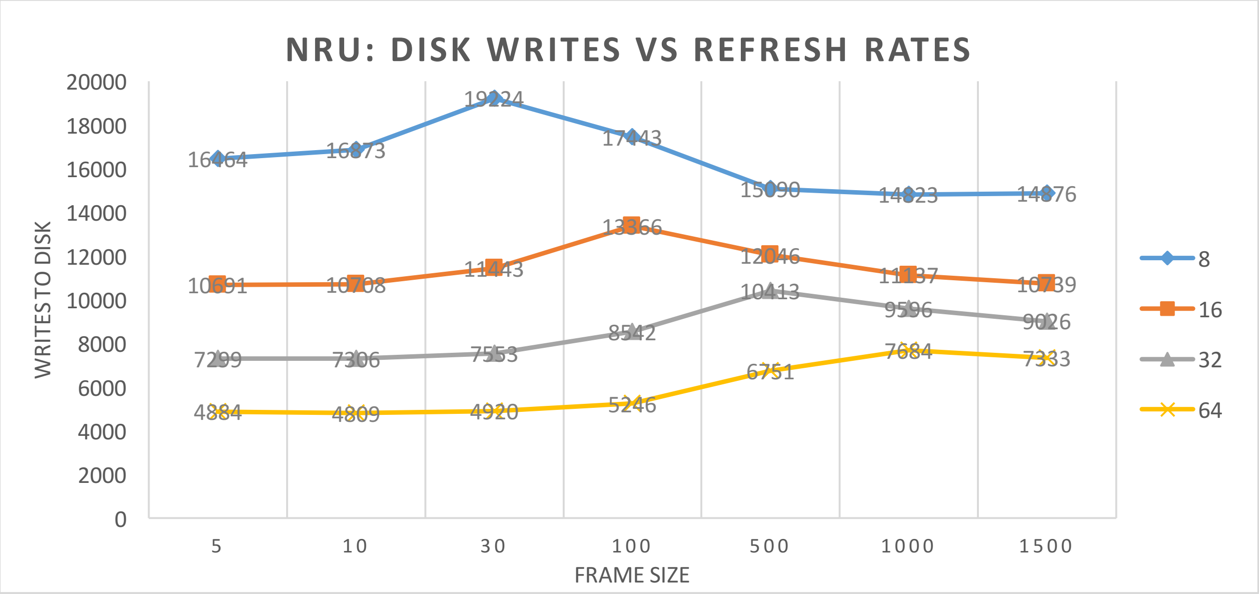
Tuning Parameters for NRU:

NRU: Page Faults vs Refresh Rates for Different Frame Sizes:



	5	10	30	100	500	1000	1500
8	206993	185154	176209	192670	254325	301533	323739
16	183920	163429	136064	124042	143508	167196	197126
32	167100	146741	121000	95708	93448	98829	103206
64	146907	129456	106711	82640	62124	63292	65778

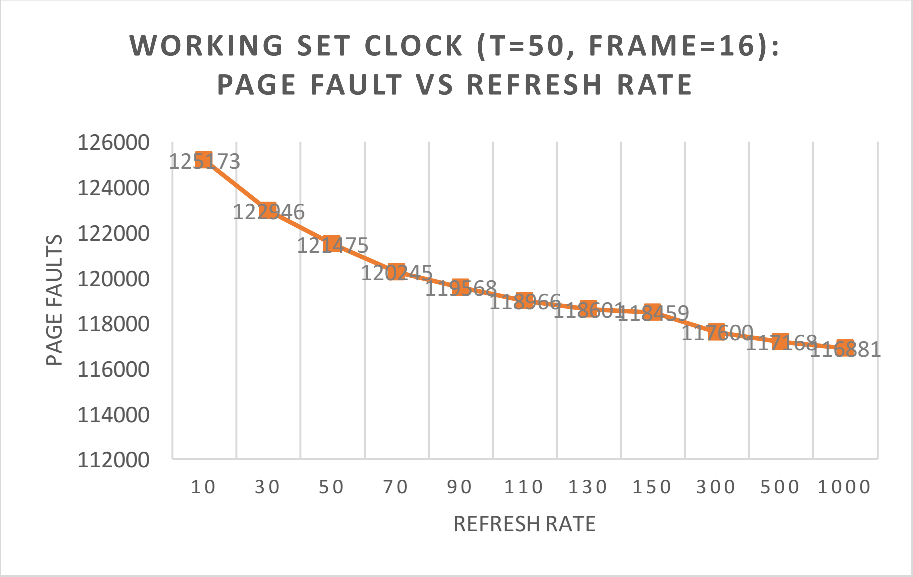
NRU: Page Faults vs Disk Writes for Different Frame Sizes:



The correlation between page faults and refresh rates for NRU resembles a parabola. Page faults starts relatively high when refresh rate is low and decline when refresh rate is around 100, then it increases again. After examining the parabola, I determined the best NRU refresh rate for gcc.trace to be approximately 100.

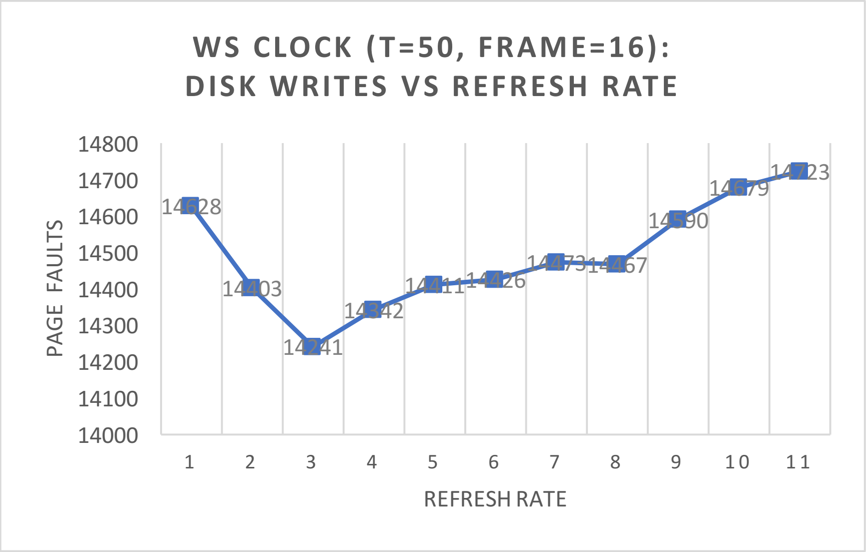
WS Clock: Page Faults vs Refresh Rates (Frame = 16, Tau = 50)

Refresh Rates	Page Faults
10	125173
30	122946
50	121475
70	120245
90	119568
110	118966
130	118601
150	118459
300	117600
500	117168
1000	116881



WS Clock: Page Faults vs Disk Writes (Frame = 16, Tau = 50)

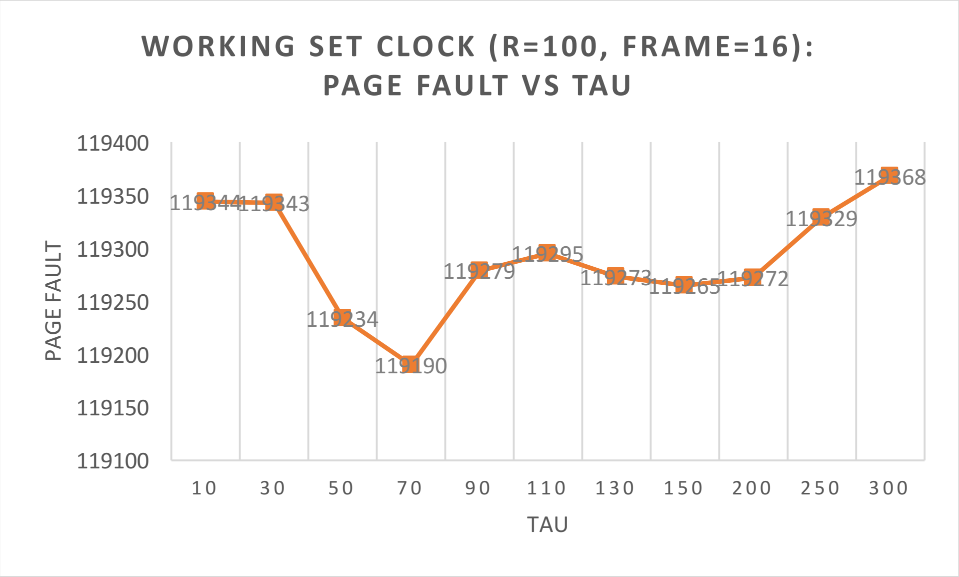
Refresh Rates	Disk Writes
10	14628
30	14403
50	14241
70	14342
90	14411
110	14426
130	14473
150	14467
300	14590
500	14679
1000	14723



The correlation between page faults and refresh rates for working set when I control the value of tau is a consistent downward sloping curve. Therefore I think the best refresh rate (refresh per line) for gcc.trace is 1,000,000, which mean there will be no refresh and everything is always inside the working set.

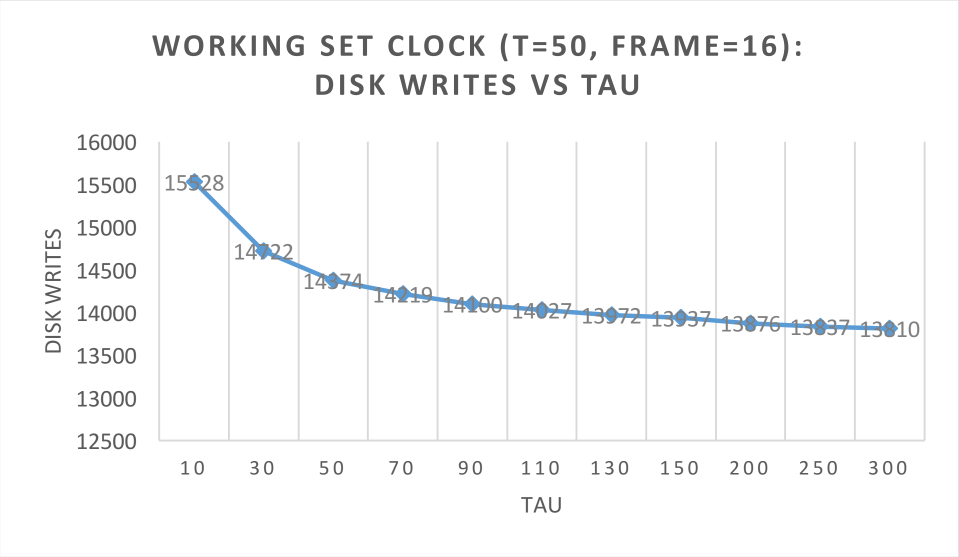
WS Clock: Page Faults vs Tau (Frame = 16, Refresh: 100)

Tau	Page Faults
10	125173
30	122946
50	121475
70	120245
90	119568
110	118966
130	118601
150	118459
200	117600
250	117168
300	116881



WS Clock: Disk Writes vs Tau (Frame = 16, Refresh: 100)

Tau	Disk Writes
10	15528
30	14722
50	14374
70	14219
90	14100
110	14027
130	13972
150	13937
200	13876
250	13837
300	13810



The correlation between page faults and the value of tau for working set algorithm shows a distinctive minimal amount of page faults when tau is around 70. Amount of disk writes gradually decreases as tau increases.