CS622A

Advanced Computer Architecture

ASSIGNMENT 2

GROUP 10

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1 Collection of Traces

Program	Total Machine Accesses
prog1	128990670
prog2	2513363
prog3	9467977
prog4	1064146

2 Access Distance Analysis without Cache Filter

2.1 Cumulative Density Distribution

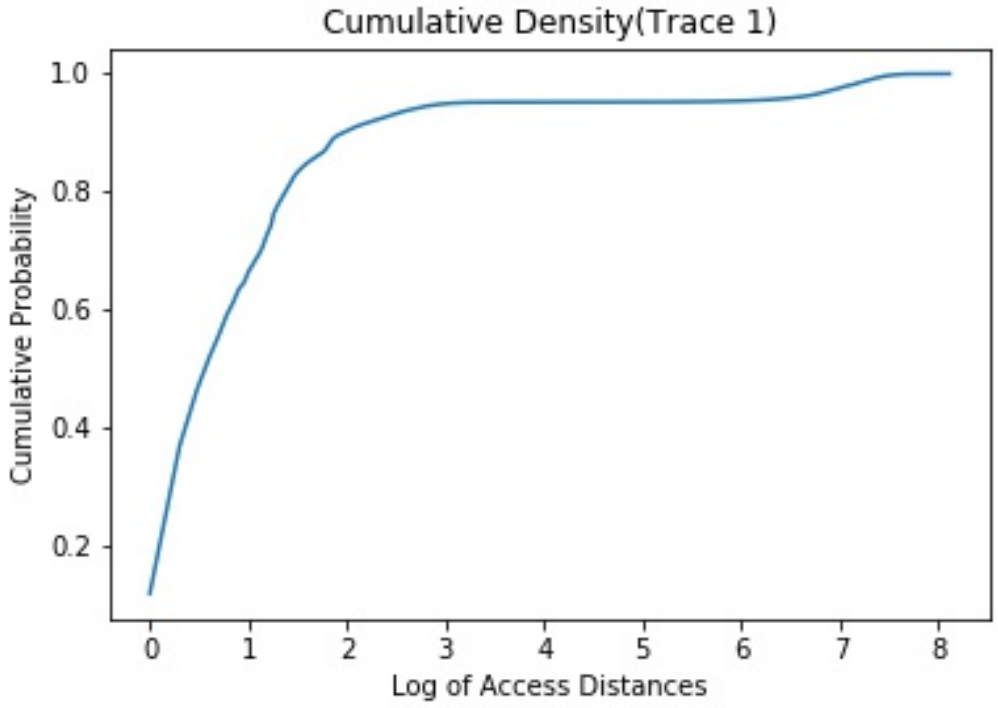

Fig. 2.1.1:Cumulative Density Function for Prog1

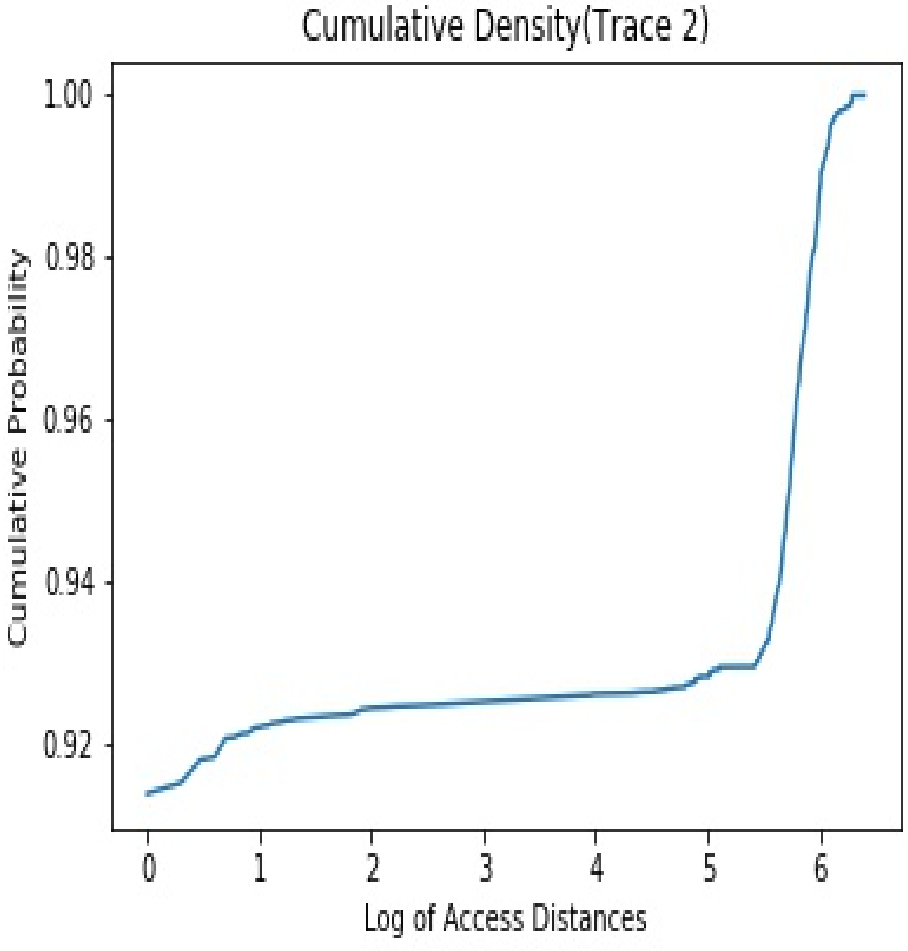

Fig. 2.1.2 :Cumulative Density Function for Prog2

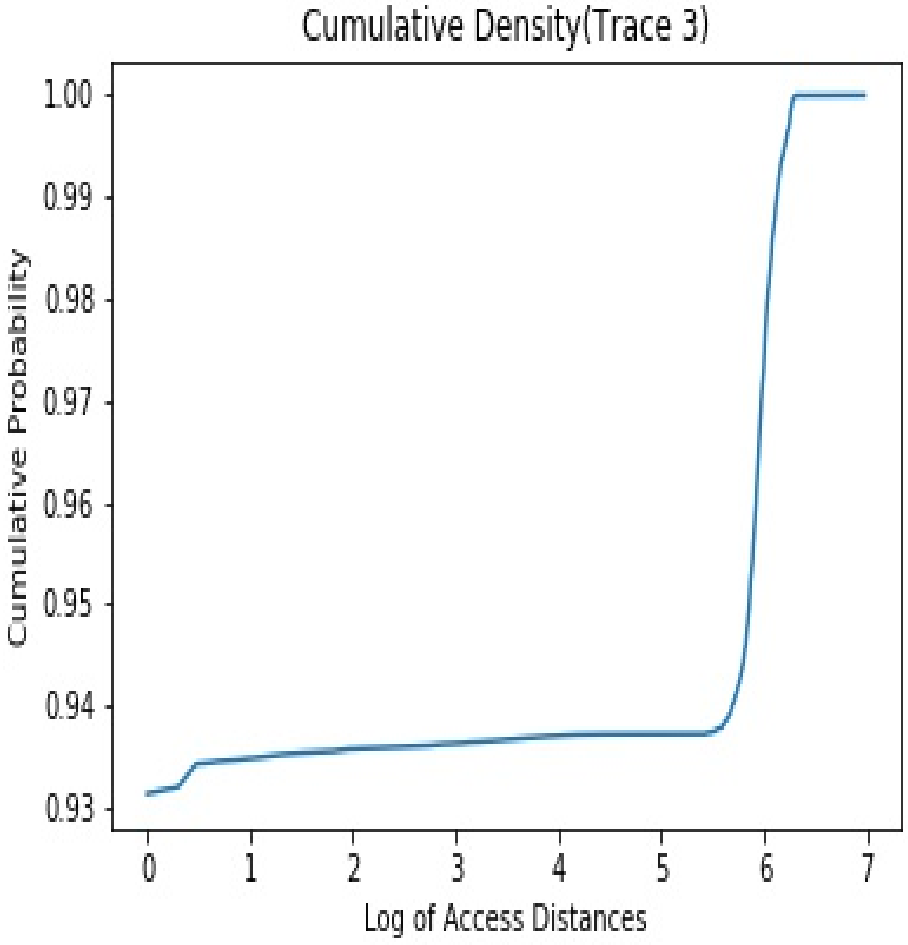

Fig. 2.1.3 :Cumulative Density Function for Prog3

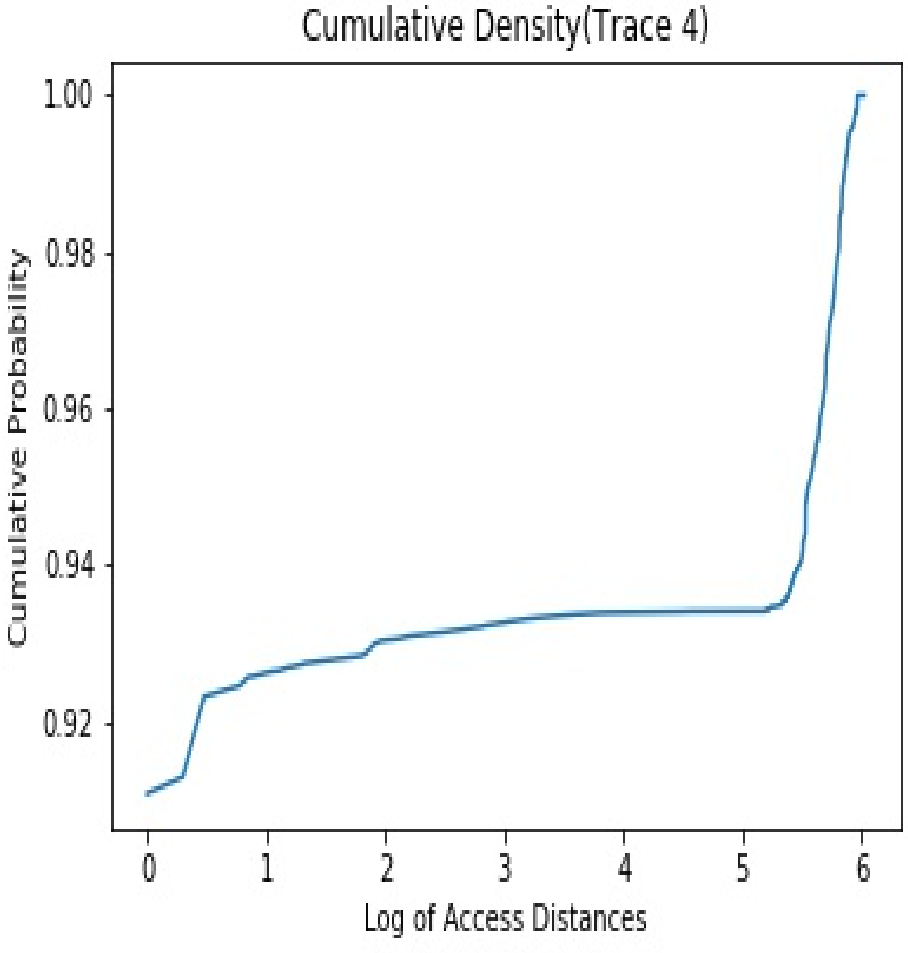

Fig. 2.1.4 :Cumulative Density Function for Prog4

2.2 Analysis

2.2.1 High Amount of Locality in prog2 , prog3 and Prog4

- The access distance of 1(in log-scale corresponds to point 0 on x-axis) have high cumulative probaility,greater than 0.9 in prog2, prog3 and prog4 .
- This indicate the high amount of locality of access in these program.

2.2.2 Less Amount of Locality in prog1

- The access distance of 1(in log scale corresponds to point 0 on x-axis) have very less cumulative probaility,less than 0.1 in prog1 .
- This indicate the less amount of locality of access in these program.

2.2.3 Ideal size of Cache

- All the program have cumulative probability greater than 0.9 if the access distance(in log) is around 2.
- This corresponds to cache containing 256 blocks approximately .
- Therefore, ideal cache size is 256*64B equals to 16KB .
- By providing the above cache size , the program will enjoy atleast 0.9 hit rate .

2.2.4 Rate of change of Cumulative Probability

- In prog1, the rate of change of cumulative probability follows a non-linear tread in range of 0 to 2 (in log) of access distances.
- After,the access distance of 2(in log) ,the cumulative probability start increasing almost linearly.
- In prog2 ,prog3 and prog4 , the rate of change of cumulative probability is almost linear till access distance around 5.5(in log).
- After,the access distance around 5.5 ,the cumulative probability changes rapidly and saturates to its maximum value 1.

3 Access Distance Analysis with Cache Filter

3.1 Cumulative Density Distribution

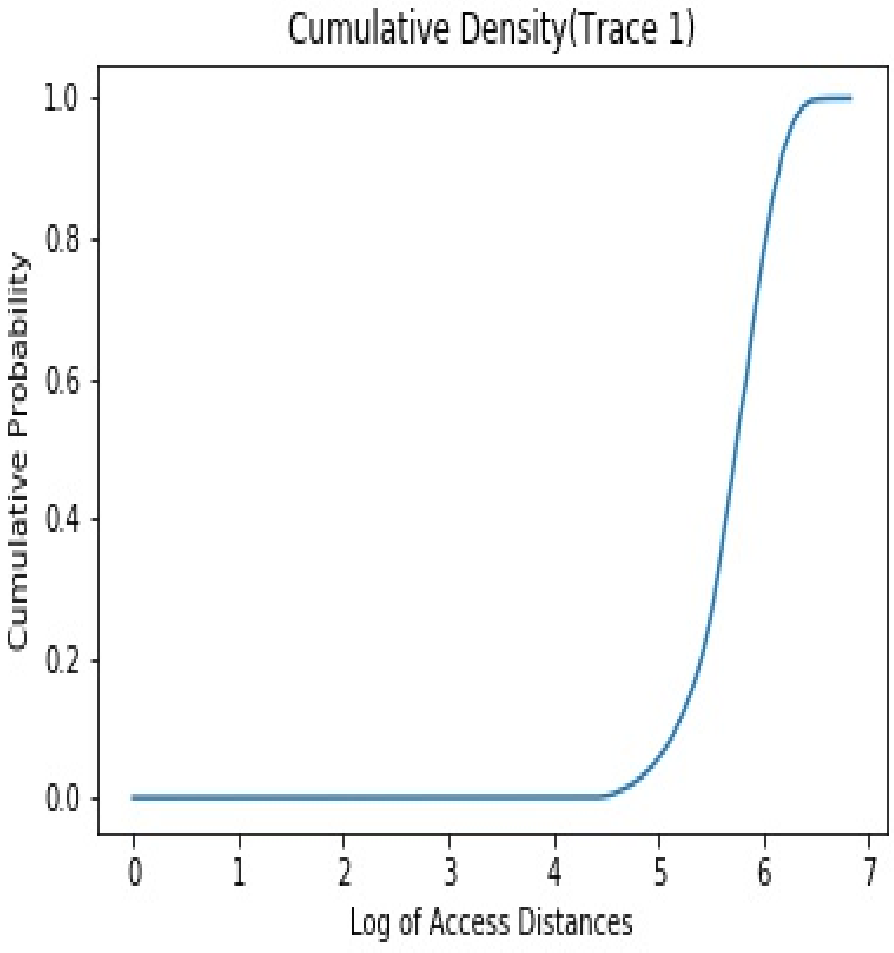

Fig. 3.1.1 :Cumulative Density Function for Prog1

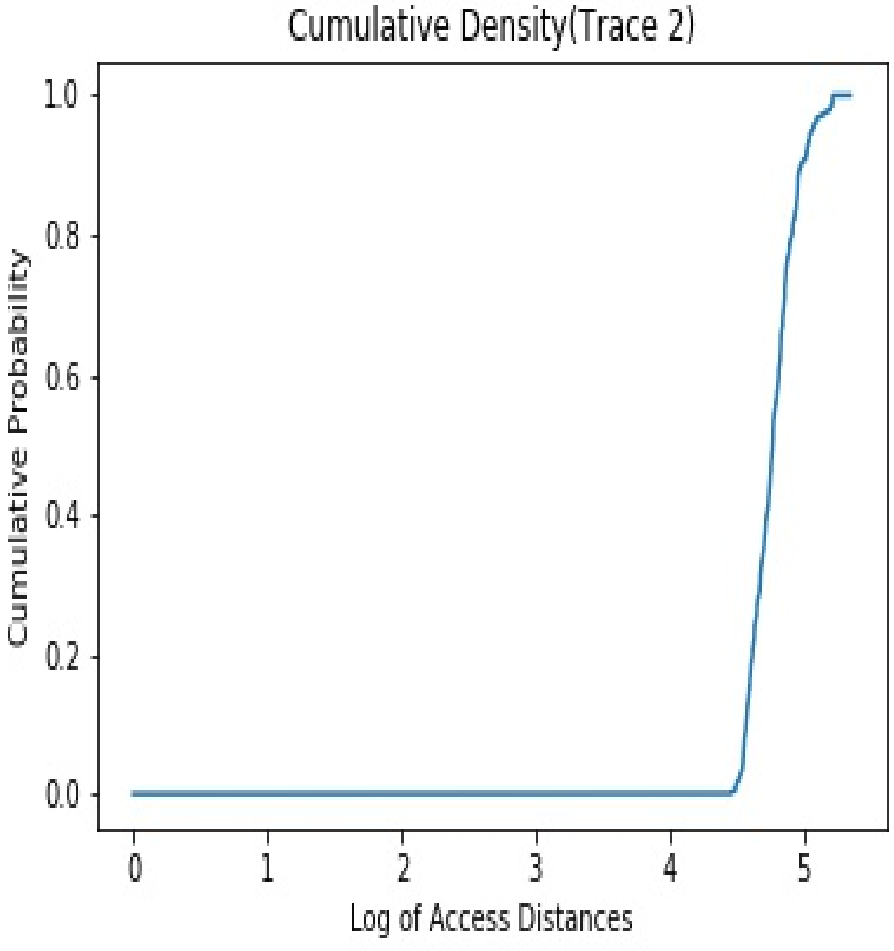

Fig. 3.1.2 :Cumulative Density Function for Prog2

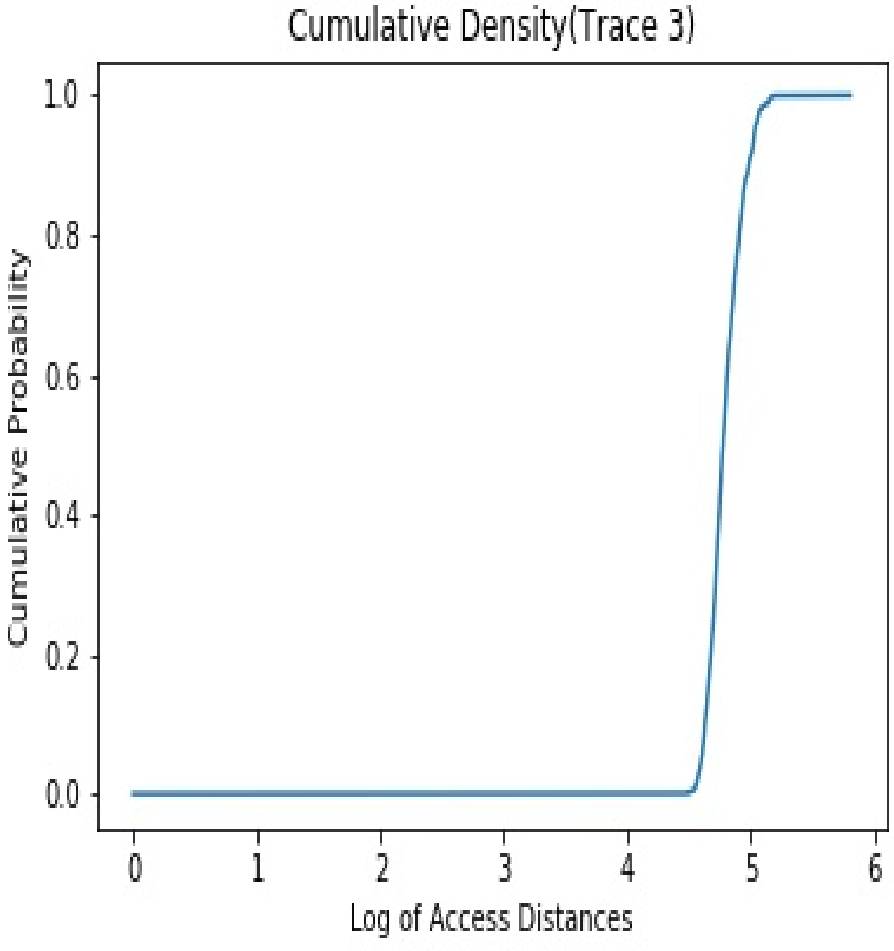

Fig. 3.1.3 :Cumulative Density Function for Prog3

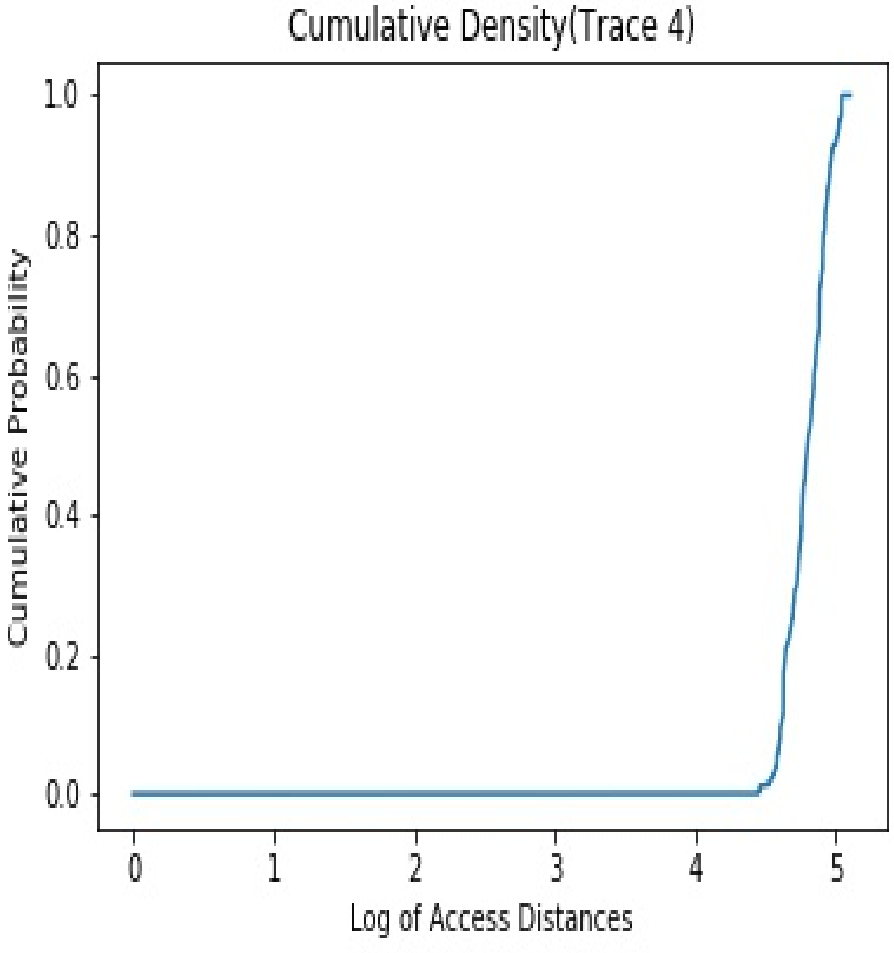

Fig. 3.1.4 :Cumulative Density Function for Prog4

3.2 Cache Result

Program	**LRU**		
Single Level Cache	**Total Access**	**Hit**	**Miss**
prog1	128990671	122291505	6699166
prog2	2513364	2288112	225252
prog3	9467978	8821978	646000
prog4	1064147	937616	126531

Table 3.2.1 :Number of Hit and Miss

3.3 Analysis

3.3.1 Change in CDF before and after the cache filter

- The plot of CDF before and after the cache filter vary significantly.
- The CDF plot for the access distance after the cache filter is approx. 0 till access distance(in log) is around 4.5.
- The CDF plot for the access distance before the cache filter has large amount of access with short access distance.
- The CDF plot vary because the after applying the cache filter ,the shorter access distance enjoys cache hit.

3.3.2 Classification of Misses after applying cache filter

- The CDF plot for the access distance after the cache filter is approx. 0 till access distance(in log) is around 4.5.
- This corresponds to cache containing 32,768 blocks approximately.
- But our cache size is 2MB which can't fit all these blocks .
- Therefore, most of the misses(apart from Cold Misses) classified as Capacity Misses.

4 Sharing Results

Blocks Shared By	Program			
	prog1	prog2	prog3	prog4
Private	403	401	403	8590
2 Threads	63	8255	56	57402
3 Threads	1872	16384	0	6
4 Threads	32455	40957	0	0
5 Threads	143250	4	0	0
6 Threads	244970	0	0	1
7 Threads	173831	0	0	0
8 Threads	124528	10	65546	10
Total	721372	66011	66005	66009

4.1 Analysis

4.1.1 prog1,prog2 and prog3 sharing similarity

- In prog1, prog2 and prog3 have nearly same amount of private cache blocks.These amount is less indicates that there is less amount of computation performed by local variables in these programs.
- In prog1, prog2 and prog3 have high sharing amount of blocks among the threads indicating sharing of computation or variables.

4.1.2 prog4 different trend of sharing

- The amount of private blocks in prog4 is very high as compare to private blocks of rest all 3 programmes.
- This indicate that most of the computation in prog4 is done by local variable and no sharing of these computation.
- Almost all other blocks apart from private blocks are shared by at-most 2 threads.