Report for Project 4: Caching

Methodology:

To find the best C, B, S, I make a new simulator according to the one provided by Tas.
I use 3 for loops to iterate through C from 0 to 15 and B from 0 to 6 and S from 0 to C – B. These combinations of value of C,B,S represents all the possible combinations of these three. Based on these values, I choose the best AAT among all the AAT from all different CBS combinations. And then I generate a report for a specific trace file with the best AAT as well as best CBS.

Result:

1. astar.trace
The best AAT stats:
Cache Settings
C: 14
B: 6
S: 1

Cache Statistics
Accesses: 501468
Reads: 289766
Read misses: 12229
Writes: 211702
Write misses: 20510
Misses: 32739
Writebacks: 20974
Access Time: 2
Miss Penalty: 100
Miss rate: 0.065286
Average access time (AAT): 8.528632
Conclusion: For this trace, remain SB unchange, C's size increasing increase to a significant aat decrease. Also remain CS unchange, a B's size increasing also increase to a obvious aat decrease. However, the increase of S will lead to a increase of aat. S = 1 seems like a inflection point, because when s = 2 with c = 14 and b = 6, aat = 8.746393, and when s = 0 with c = 14 and b = 6, aat = 9.346231
2.bzip2.trace
This file has two possible CBS to make best AAT stats:
Cache Settings
C: 14
B: 6
S: 3
Cache Statistics
Accesses: 544514
Reads: 369344
Read misses: 456
Writes: 175170
Write misses: 425
Misses: 881
Writebacks: 234
Access Time: 2
Miss Penalty: 100
Miss rate: 0.001618
Average access time (AAT): 2.161796

Conclusion: For this trace, make SB unchanged, It seems like C's increasing will lead to the decrease of miss rate. And when make CB unchanged, the S's increasing will lead to the decrease of miss rate however when s >3or s < 3, it will lead to a increase of miss rate and aat. It seems that 3 is a inflection point. Make CS unchanged, the increase of block size will lead to the decrease of miss rate, and we can see that B is the maximum and also the current best solution.

3.mcf.trace

Cache Settings
C: 14
B: 6
S: 2
Cache Statistics
Accesses: 507700
Reads: 280182
Read misses: 950
Writes: 227518
Write misses: 4962
Misses: 5912
Writebacks: 5555
Access Time: 2
Miss Penalty: 100
Miss rate: 0.011645
Average access time (AAT): 3.164467
Conclusion: For this trace, the increase in C (with SB unchanged) will lead to a significant decrease in aat. Same for B, but different for S, since a increase in s when s > 2 will lead to a decrease of efficiency.

4.perlbench

Cache Settings
C: 14
B: 6
S: 2
Cache Statisticss
Accesses: 507441
Reads: 302052
Read misses: 25712
Writes: 205389
Write misses: 8641
Misses: 34353
Writebacks: 12475
Access Time: 2
Miss Penalty: 100
Miss rate: 0.067699
Average access time (AAT): 8.769851
Conclusion: For this trace, the increase in C (with SB unchanged) and S(with CB) unchanged will make the aat smaller. However, a increase in S when s > 2 will make aat much bigger. Seems that S = 2 is a inflectin point.