CS 342 - Project 3 Report

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Section: 03

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Experiments

In this report we analyzed the performance of the buddy memory allocation algorithm in terms of inner fragmentation. We ran the algorithm on various uniformly distributed random allocation sizes until there is no available place left for the next allocation. We calculated the average of inner fragmentations for each allocation. We ran tests 5 times each on three cases: any uniformly distributed random value between 128 and 4096, values between 128 and 700 in order to measure the performance for lower alloc sizes; values between 1024 and 4072 We used the minimum fragment sizes 128, 256, 512, 1024 and 2048.

Plots

Allocate amounts	128-700	1024-4072	128-4096
Trial1	211,46	878,83	619,46
Trial2	242,64	815,80	709,33
Trial3	224,83	809,10	441,36
Trial4	219,64	865,73	896,67
Trial5	212,19	874,73	843,18
Average	222,152	848,838	684,62

Table 1: Min fragment size 128

Allocate amounts	128-700	1024-4072	128-4096
Trial1	238,21	673,36	682,09
Trial2	208,71	1051,20	967,50
Trial3	219,36	903,20	843,93
Trial4	223,53	760,73	531,42
Trial5	215,88	984,67	797,18
Average	221,138	874,632	764,424

Table 2: Min fragment size 256

Allocate amounts	128-700	1024-4072	128-4096
Trial1	243,17	801,45	981,91
Trial2	270,96	799,83	681,18
Trial3	298,58	914,30	637,17
Trial4	283,60	779,60	544,46

Trial5	265,43	836,73	808,67
Average	272,348	826,382	730,678

Table 3: Min fragment size 512

Allocate amounts	128-700	1024-4072	128-4096
Trial1	524,00	1201,00	1081,20
Trial2	612,85	910,40	953,82
Trial3	604,36	975,10	587,54
Trial4	593,73	936,73	679,07
Trial5	562,73	976,30	635,00
Average	579,534	999,906	787,326

Table 4: Min fragment size 1024

Allocate amounts	128-700	1024-4072	128-4096
Trial1	1580,59	1127,00	606,91
Trial2	1654,29	777,89	973,00
Trial3	1612,71	1108,10	1322,89
Trial4	1559,18	891,80	976,67
Trial5	1671,41	922,33	1156,71
Average	1615,636	965,424	1007,236

Table 5: Min fragment size 2048

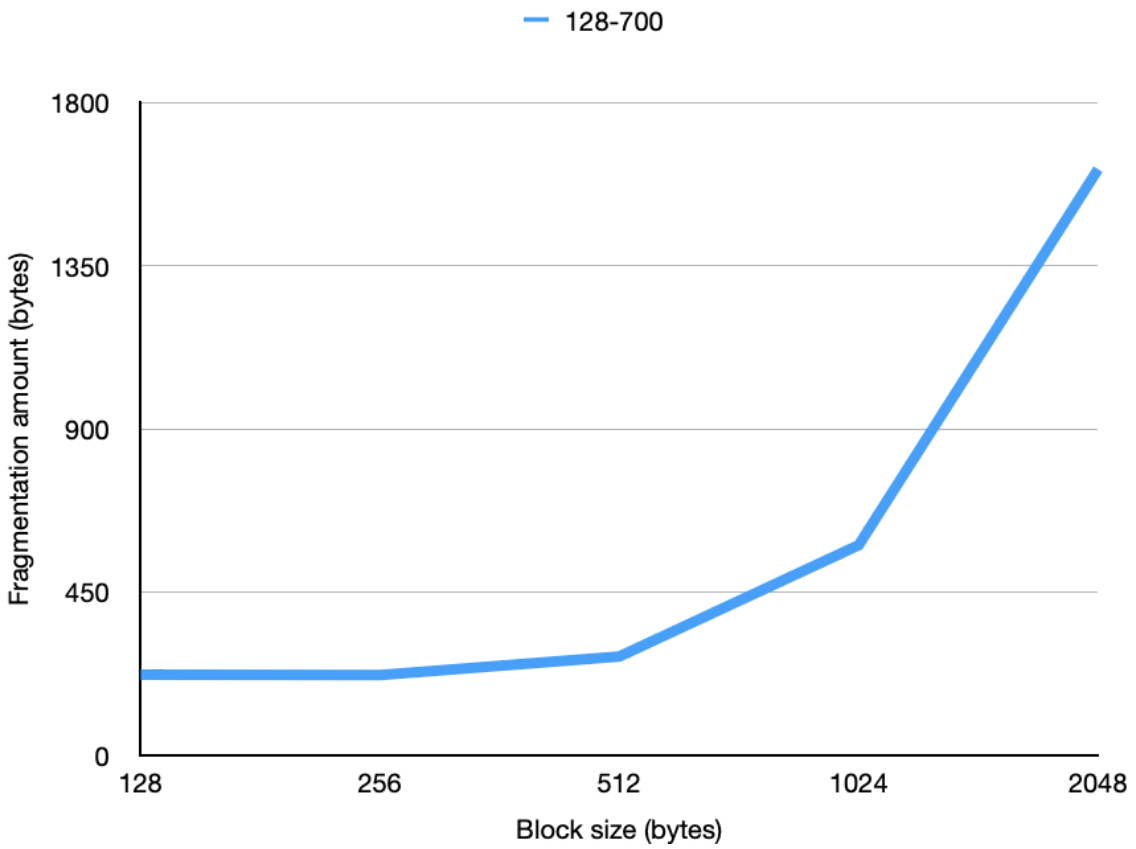

Figure 1: Allocation sizes between 128 and 700

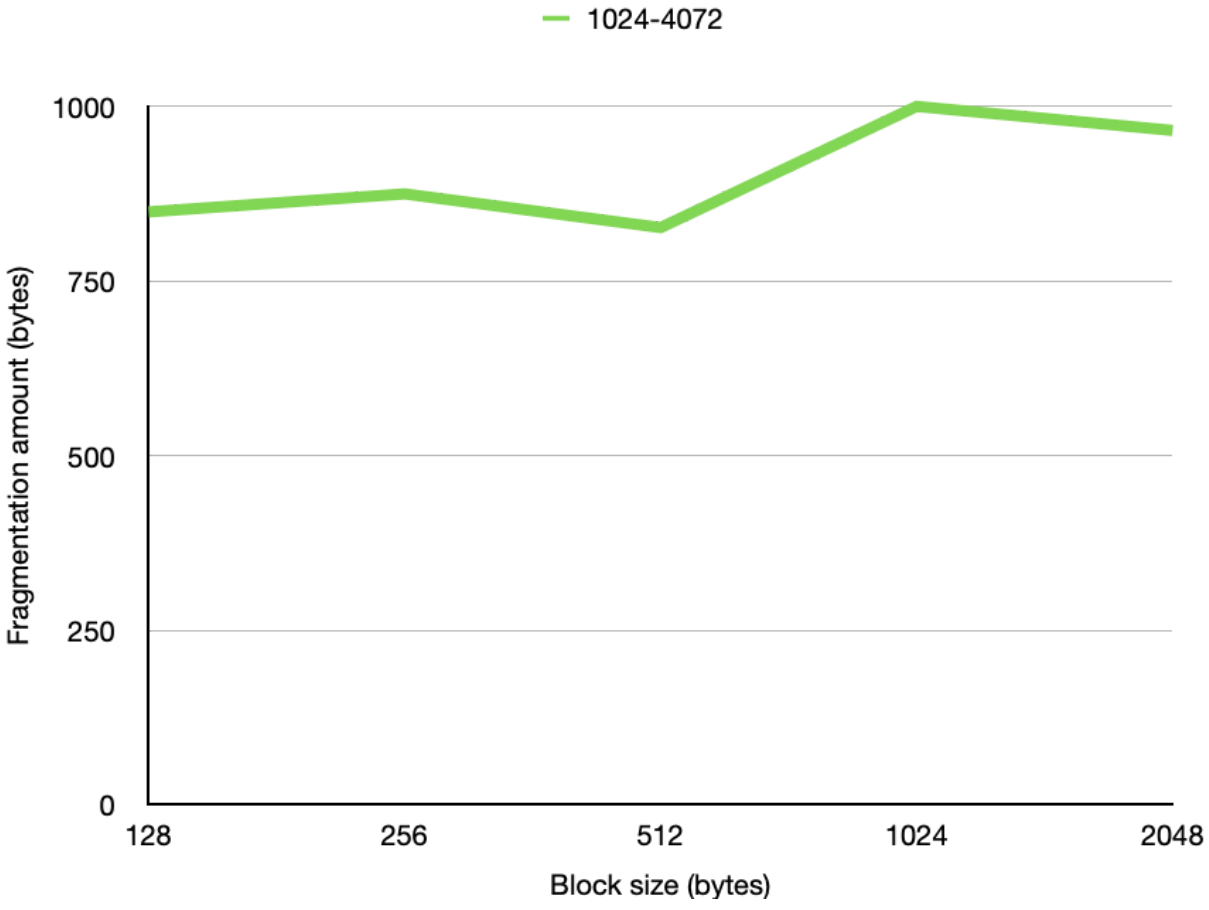

Figure 2: Allocation sizes between 1024 and 4072

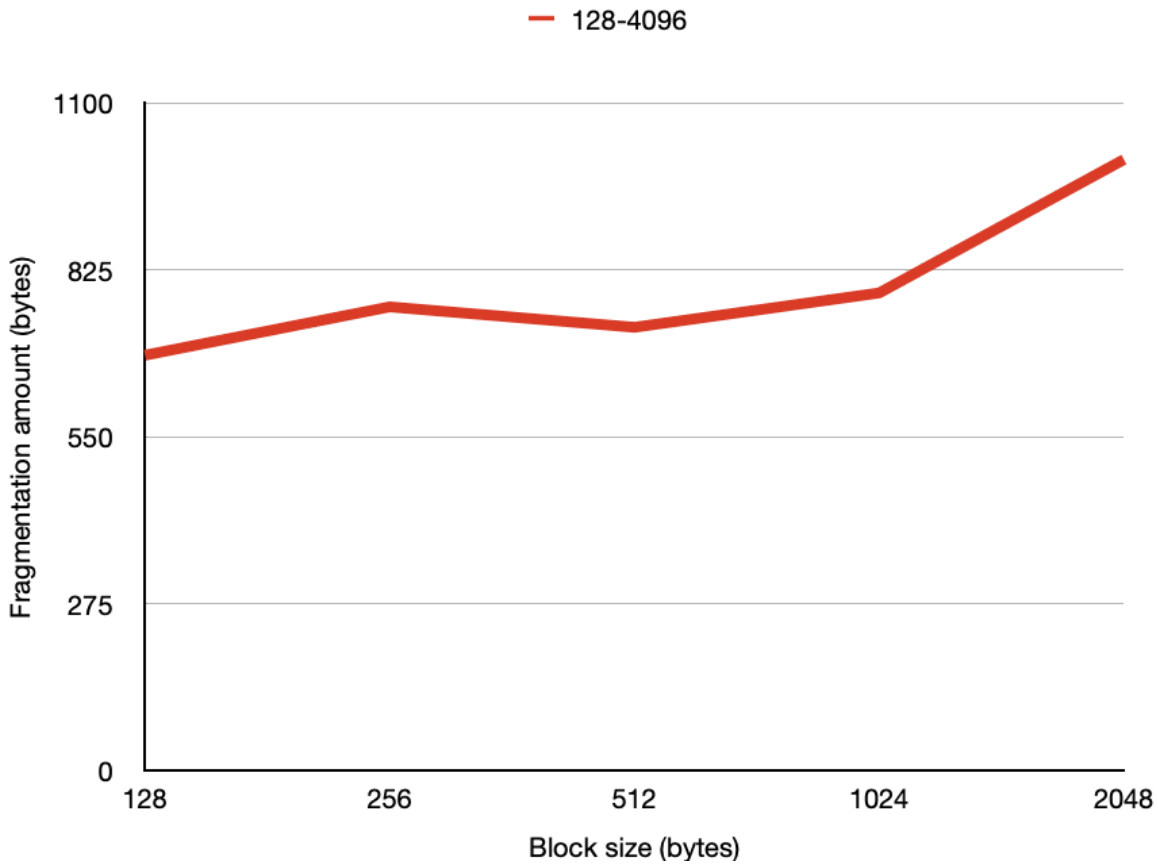

Figure 3: Allocation sizes between 128 and 4096

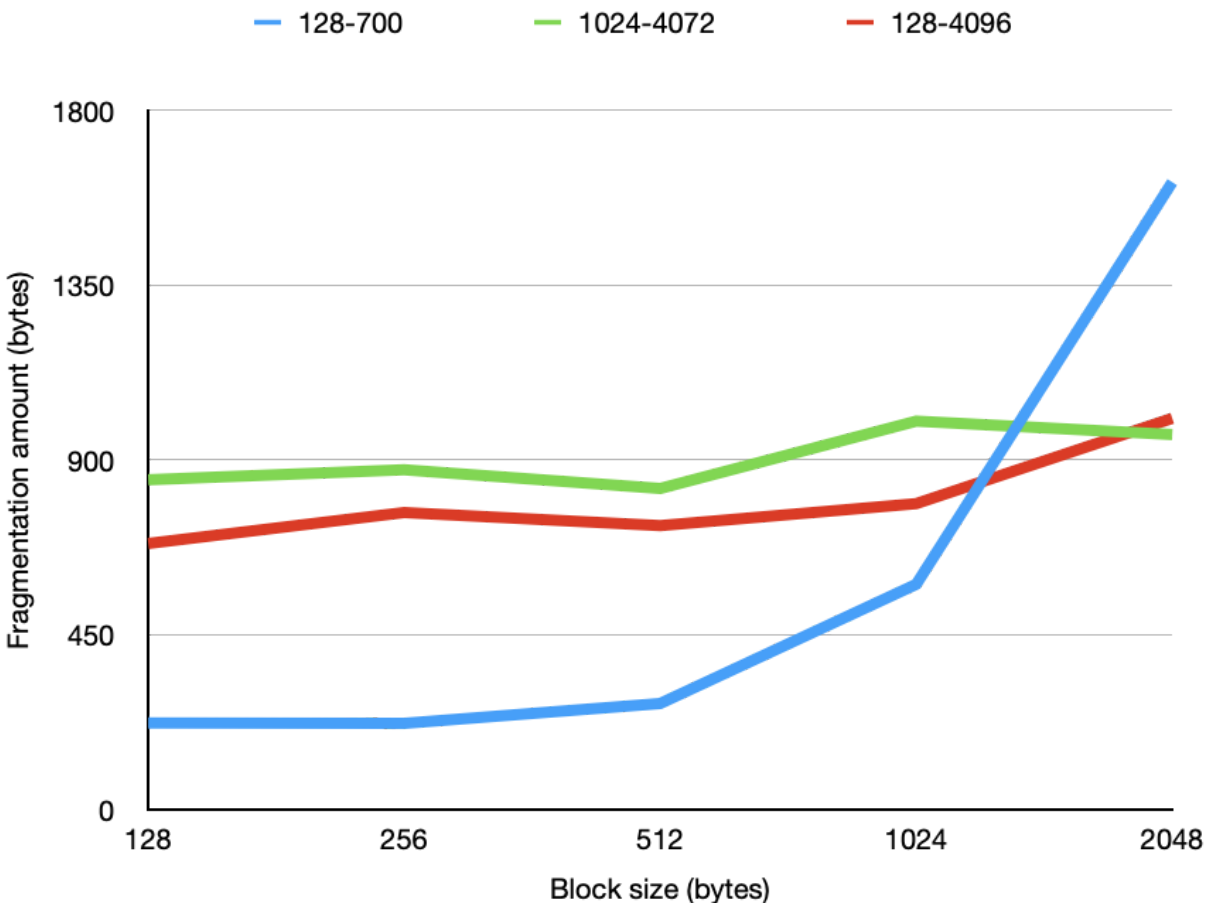

Figure 4: All three figures above combined.

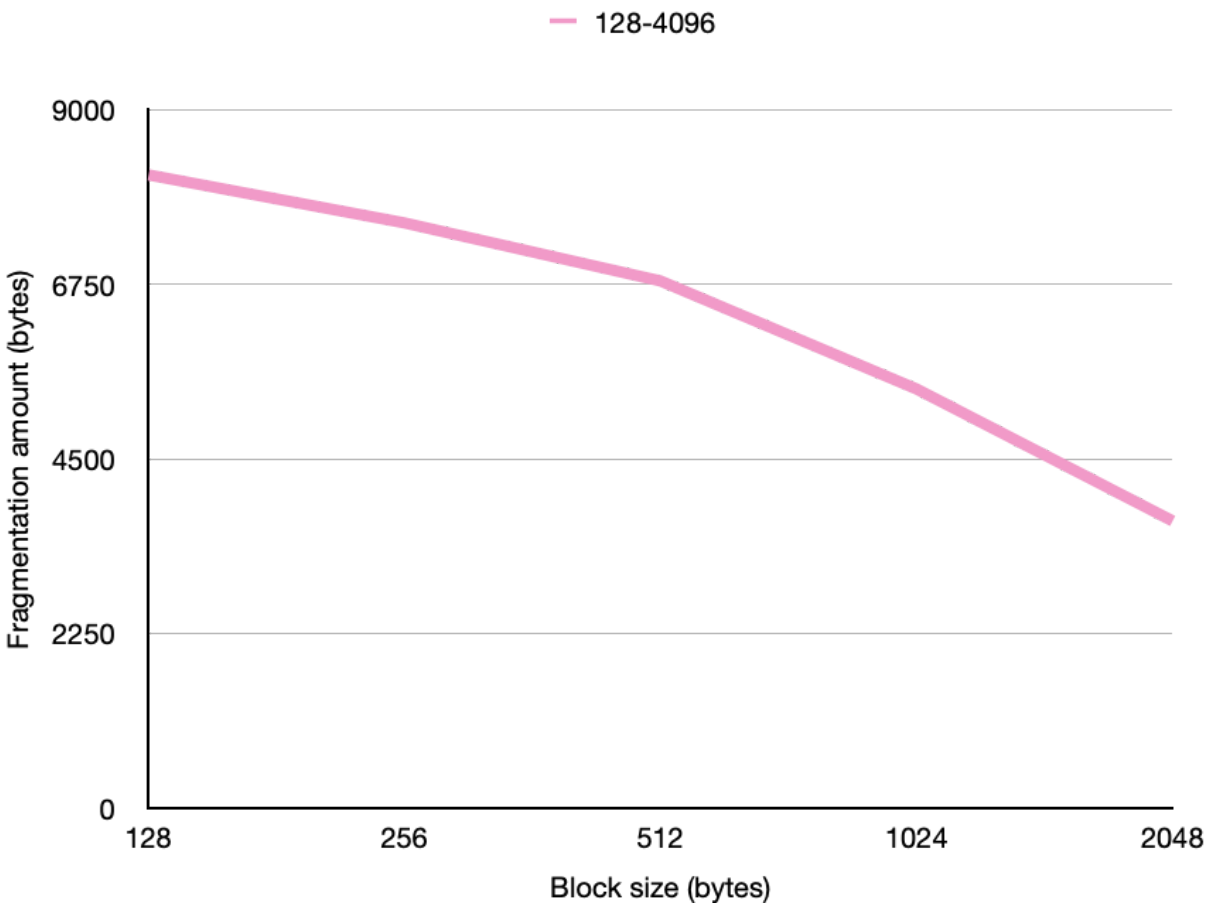

Figure 5: External fragmentation

Conclusions

As it can be observed by the data visualised above, the buddy memory allocation algorithm has smaller inner fragmentation for smaller minimum block(fragment) sizes. In contrast, when block sizes are larger, the inner fragmentation increases significantly especially the increase is larger in smaller request sizes. If the request sizes are smaller than the block size, the fragmentation tends to be greater. For instance, when the block size 2048 is chosen, for request sizes between 128 and 700, the fragmentation is the largest. However, for small block sizes such as 128, 256 and 1024 the smaller request sizes have less fragmentation than the larger request sizes.

The amount of inner fragmentation does not alternate much as the segment size changes. On the other hand, the amount of external fragmentation decreases when the block sizes increase because the amount of small unallocated fragments, which lead to external fragmentation and cannot be combined, decreases.