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MP4

Test Plan

u0 Driver:

This driver is a basic test to make sure a block is allocated and freed. The list starts as empty and only containing the dummy block. The driver requests for an allocation of 16 bytes. The list is empty so a page of memory (4096 bytes or 256 units) is allocated and 16 bytes (or 2 units) is taken from the block in memory. The driver then prints the stats and free list after this allocation showing a 254 block and the dummy block. The memory is then freed and the stats and free list are shown with the dummy block, allocated memory (2 units), and remaining memory displayed (254 units). The driver should display “all memory is in the heap -- no leaks are possible.”

u1 Driver:

This driver is a test to make sure multiple pages can be requested and all of the memory in a free list can be allocated leaving behind an empty free list. The list starts as empty and only containing the dummy block. The driver requests an eighth of a page (32 units), allocates for a page since the list is empty, takes 32 units from allocated memory and prints the stats and free list showing a 224 block and the dummy. The driver then requests a half of a page (128 units) and prints the stats and free list (there should be 96 units left in memory). Next, the driver requests for the remaining memory and prints the free list (which is now empty). The driver then requests for 257 units, 2 pages of memory are allocated, and the free list is displayed leaving behind 255 units of memory. Lastly, all four allocations should be freed and the free list should contain a 255 unit block, 257 unit block, 128 unit block, 96 unit block, 32 unit block and the dummy. The driver should also display “all memory is in the heap -- no leaks are possible.”

u2 Driver:

This driver is a test to compare the differences between the search policies and using coalescing versus the default. The list starts as empty and only containing the dummy block. The driver requests for a fourth of a page (64 units) and a sixteenth of a page (16 units). Since the list is empty a page worth of memory is allocated and 80 units is taken from the memory block.

**Default:**  These two allocations (64 units and 16 units) are then freed, leaving the free list with a 176 unit block, 16 unit block, 64 unit block and the dummy block. The driver then requests a page worth of memory and a block of 256 units is allocated and the request is fulfilled from that block. The next request is for a fourth of a page (64 units) which is taken from the 64 unit block in the free list leaving it with the dummy block, 176 unit block and 16 unit block. The driver then frees the third allocation of 256 units. A fifth allocation is requested having a size of a half of a page (128 units). If the search policy is best fit, the request should be fulfilled through the 176 unit block. If the search policy is worst fit, the request should be fulfilled through the 256 unit block. The driver then frees the fourth (64 units) and fifth (128 units) allocations and the free list contains 2 128 unit blocks, a 64 unit block, a 176 unit block, a 16 unit block and the dummy block. The driver then requests an eighth of a page (32 units). If the search policy is best fit, the request should be fulfilled through the 64 unit block. If the search policy is worst fit, the request should be fulfilled through the 176 unit block. The driver should then free this allocation leaving the free list with a 95 unit block, 33 unit block, 64 unit block, 176 unit block, 16 unit block, 128 unit block and the dummy block. Lastly the stats of the free list should display. The driver should also display “all memory is in the heap -- no leaks are possible.”

**Coalescing:** These two allocations (64 units and 16 units) are then freed, leaving the free list with a 256 unit block. The driver then requests a page worth of memory which is fulfilled by the 256 block in the free list leaving the free list empty. The driver then requests a fourth of a page (64 units) which is taken from an allocated block of memory with size of a page. This leaves the free list containing a 192 unit block and the dummy. The driver then frees the third allocation of 256 units and combines it with the 192 block in the free list leaving a 448 unit block and the dummy. The driver then requests a half of a page (128 units) and takes it from the 448 unit block leaving a 320 unit block and dummy block in the free list. The driver then frees the fourth allocation (64 units) leaving the free list containing a 320 unit block, 64 unit block and the dummy block. The fifth allocation (128 units) is then freed and combined with BOTH neighbors leaving the free list containing a 512 unit block and the dummy (note that this free will test coalescing with two adjacent blocks). The driver then requests for one more allocation of size 33 units and frees it. The final free list should be a combined block of 512 units and a dummy block. Lastly the stats of the free list are displayed. The driver should also display “all memory is in the heap -- no leaks are possible.”

\* The sizes used in these drivers assume the tests are being ran on a 64-bit machine