1 Test Runtimes

Test 1: 0.35 s / run
Test 2: 700 us / run
Test 3: 11000 s / run
Test 4: 1000 us / run
Test 5: 0.50 s / run
Test 6: 6000 us / run

2 Specifications

This program is a dynamic memory allocator that uses a very simplistic circular linked list model to keep track of available space. It uses a first fit algorithm for allocation and a greedy coalescing strategy for free.

3 Program Model

Each block, free or used, uses 2 bytes of metadata to store the length and type of block (14 bits for length, 1 for used or free).

Most operations are done by searching through the entire linked list using an indirect jump: the length of the current block is stored and the next block is guaranteed to start at the next block. Calculations use a mod operator to create a circular linked list.

2 extra bytes are used to determine the first free location.

The block is also expanded to 15k bytes.

4 Analysis

It's fairly slow lol

The worst case for both allocation and free is linear wrt the maximum size of the array, as each operation may require several full iterations through the entire linked list. The tests that require randomly selected blocks will repeatedly fail until small lengths are chosen.