

Name:

CSCI 460 Operating Systems

Random Pop-up Test 1

Instructions: Write your name above. Relax, attempt the problems below and you are free to use the lecture notes, etc. This is NOT a participation counting and you should try your best — though the grading will be light. (Later, solutions will be posted on the course webpage.) Turn in the sheet at the end of the class.

This question is regarding various allocation algorithms for dynamic partition. Suppose that a list of N free (non-contiguous) memory blocks are kept, and one is to allocate a block to a random incoming job.

(1) If we use best-fit, what is the average number of searches?

Answer. N , as the best-fit algorithm would search over all the N blocks no matter what.

(2) If we use first-fit, what is the average number of searches?

Answer: The first block could be either larger or smaller than the incoming request, so the probability that it fits the incoming request is $1/2$. Likewise, the second block has a probability of $1/2^2$ to fit the incoming job (and the number of searches is 2, as we must fail the first search to have the success ending at the 2nd block). So the average number of searches ending at the 2nd block is $2/2^2$, and this generalizes to the i -th block with an average number of search of $i/2^i$.

The total number is

$$1/2 + 2/2^2 + 3/2^3 + \dots + N/2^N = 2 - O(1/2^{N-1}),$$

which is 2 when N is large enough.