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Theory of Network Communication

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Assignment 7

Problem 17 (5 points)**:**
Prove that when using the cut-and-paste strategy with n units, the location of every object can be determined in at most $O(\log n)$ computations. (Hint: it suffices to show that every object is replaced at most $O(\log n)$ times when increasing the system one by one from 1 to n units; replaying these hops gives the time bound for the computations.)
Also, show that for every perfectly faithful strategy it holds: If the number of units grows one by one from 1 to n, then on average an object has to be replaced $\Omega(\log n)$ times. (Hint: compute the total number of object replacements, and divide it by the number of objects.)

Problem 18 (3 points)**:**
Suggest an algorithm and a data structure for the SHARE strategy that allows it to compute the location of an object in $O(\log n)$ steps.