

Solutions to Exercise 4

Problem 1. See document “Sol 4 (P1)” on the course website.

Problem 2. The snapshot does not need to be atomic. Even if a non-atomic snapshot is used in the scan routine (i.e., the process epochs were never simultaneously equal to their values in the the node epoch vector), this cannot cause a node to be incorrectly reclaimed (freed when some process still holds references to it).

Problem 3. See the original Hazard Pointers paper:

<https://www.research.ibm.com/people/m/michael/ieeetpds-2004.pdf>

In particular, see the Scan algorithm in Figure 3. Essentially, the idea is to add all hazard pointers in the system to a hash map (which takes $O(n)$ time) and then check for every node in the limbo list if it is protected by searching for that node in the hash map (m queries that take $O(1)$ time each).