Homework Exercise
Due: March 20, 2002

7. An m-component multi-writer snapshot object is defined as follows. The state of the object stores m natural numbers (i.e. the set of possible states is $\mathbb{N}^m$). There are two operations: $\text{UPDATE}(i, v)$ (where $i \in \{1, ..., m\}$ and $v \in \mathbb{N}$), which changes the ith component of the state to v and returns ack, and
SCAN, which returns the state of the object without changing it.
(Unlike the single-writer snapshot object discussed in class, there is no restriction on which process can update which component of a multi-writer snapshot object: any process can update any component of the multi-writer snapshot object.)

Describe a wait-free linearizable implementation of an m-component multi-writer snapshot object for n processes using m registers. (You may assume each register is unbounded.) Hint: the easiest solution to this problem can be obtained by doing something quite similar to the single-writer snapshot implementation we saw in class.

Explain why your algorithm is correct. How many steps must a process do to perform a snapshot operation using your algorithm (in the worst case), as a function of m and n?