COMP 360 — Homework 4

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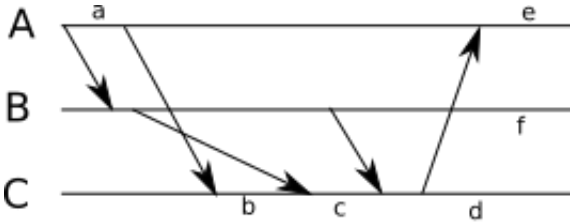
1 Questions

1. The diagram shows messaging events between three machines. Give the state of the given machine's vector clock at points a through e. Each point corresponds to time between message events. Assume that all vector clocks starts at $(0, 0, 0)$.



2. Consider the following two threads, executed in parallel. Assume that all variables are initialized to 0.

Listing 1: Thread 1

```
x = 1
y = x + 1
```

Listing 2: Thread 2

```
y = 4
x = y * 2
```

   (a) Enumerate all the possible final values of `x` and `y`, given arbitrary interleavings of these instructions.

(b) Now assume that the above threads are bracketing by locking instructions. That is, thread 1 acquires a lock before its first instruction and releases it after its last instruction; and thread 2 acquires the same lock before its first instruction and releases it after its last instruction. Which possible final results of the execution are possible, if any?

3. Assume that a read/write lock (also known as a readers/writer lock) always gives access to waiting readers, if the lock is already held by at least one reader. Describe how this policy can lead to starvation.

4. Discuss the factors that affect the performance of a system when considering fine-grained (smaller elements) versus coarse-grained (larger elements) locking.