COMP3221   Lab 6

Exercise 1: Sequential consistency

Consider the following multithreaded program with p_0 and p_1 running concurrently, in which initially $x = y = 0$.

```
x = 1;                          y = 1;
if (y==0)                       if (x==0)
  print "only p0";                 print "only p1";
```

Write a distributed execution (with time that increases from left to right) of this program that outputs:

1 **only p1**
2 **only p0**

Is this execution sequentially consistent? Why?

List all possible outputs for the sequential executions of this concurrent program.

Duration: 15 min
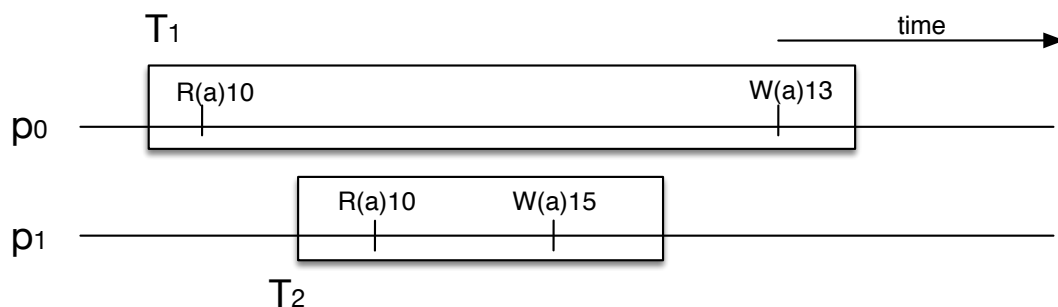
Exercise 2: Transactions

Figure 1: A distributed execution of two concurrent transactions T_1 and T_2

Consider a transaction service implemented by a distributed system with replicas p_0 and p_1 as depicted in Figure 1. Two transactions execute concurrently, one credits \$3 to account `a` whereas the other credits \$5 to the same account `a`. Is there any problem with such an execution? Draw the arrows indicating the conflicts between these two transactions.

Is there an equivalent sequential execution?

Is this execution serializable?

Is this execution linearizable?

Duration: 20 min

# Exercise 3: Linearizability

Consider two participants, each executing successively a read and a write on two objects x and y part of two transactions. Would the executions presented in Figure 2(c) where x and y have initial value 0, be linearizable? Indicate whether each of these executions is linearizable.
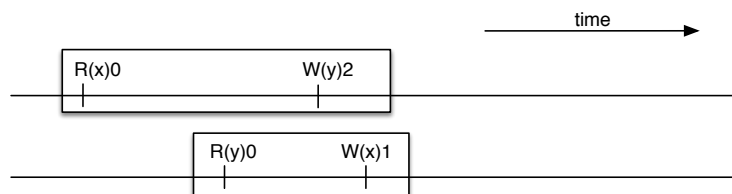
(a) A distributed execution involving two participants, each executing a group of two operations.
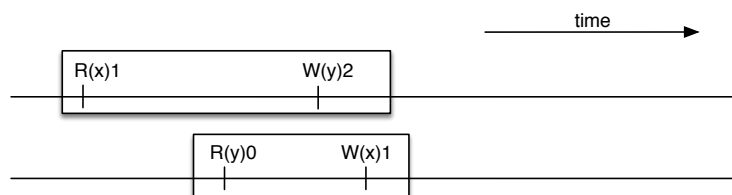
(b) A distributed execution involving two participants, each executing a group of two operations.
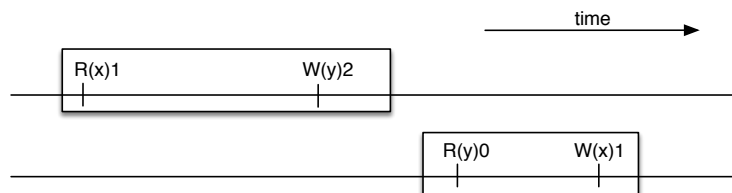
(c) A distributed execution involving two participants, each executing a group of two operations.

Duration: 15 min