Politecnico di Milano – V Facoltà di Ingegneria

089081 e 075274 - Sistemi distribuiti (Ord. 270 e Ord. 509)

Prof. G. Cugola - February 25, 2011

Rules:

- **You are not allowed to use books, notes, or other material.**
- **You can answer in Italian or English.**
- **Total time for the test: 2 hours.**

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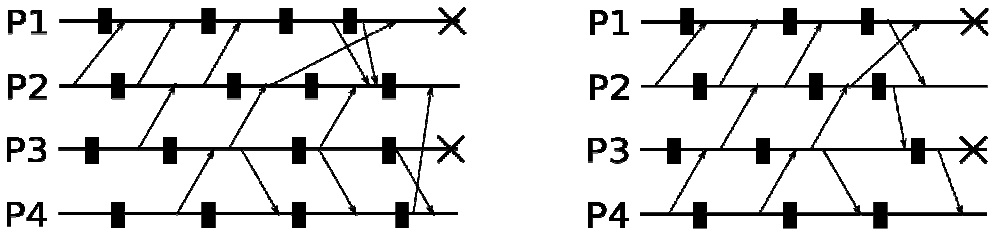
1. Implement a `SoftSyncArray` class in Java. The size of the array must be specified at creation time. Method `put(Object value, int pos, int lease)`, puts an element into the specified position for the given time (in seconds). Method `get(int pos)` returns (but not removes) the value associated at pos if it is available and it has not expired yet, otherwise it suspends the caller until a value is added. Each instance of the class must instantiate a garbage collector, which periodically frees expired elements. Maximize parallelism.

2. Calculate the recovery line for the two diagrams below using the rollback-dependency graph for the first on, the checkpoint dependency graph for the second one.



3. Describe the different mobile code paradigms. Which one is implemented by the RMIClassLoader?

4. Provide a formal definition of a "cut" and a "consistent cut". Make an example of a consistent cut and a non-consistent one.

5. Consider the following schedule (notice that it contains two different variables, X and Y)

P0:	W(X)1	R(Y)2	R(X)1
P1:	W(Y)1	R(X)1	W(Y)2
P2:	R(Y)2	W(X)3	
P3:	R(X)3	R(Y)1	

a) Do NOT consider process P3. Is the schedule composed of processes P0, P1, and P2 consistent with a sequential / causal / FIFO consistency model?
In the case it is not consistent with the sequential model, is it possible to make it consistent by removing a SINGLE operation?

b) Consider also process P3. Is the schedule composed of processes P0, P1, P2, and P3 consistent with a sequential / causal / FIFO consistency model?
In the case it is not consistent with the sequential model, is it possible to make it consistent by removing a SINGLE operation?

Motivate your answers.

6. a) Describe the Diffie-Hellman protocol.
   b) Which problem does it try to solve?
   c) Why is it only a partial solution?
   d) Which other solutions have been proposed to solve the same problem? Which are their benefits and limitations?

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