



Politecnico di Milano

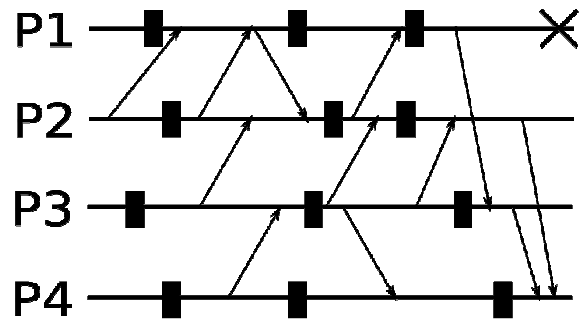
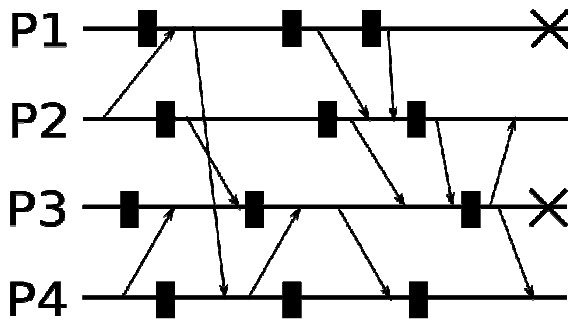
090950 – Distributed Systems

Prof. G. Cugola – September 10<sup>th</sup>, 2014

**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. Describe the various mobile code paradigms and the type of technologies that support them.
2. Describe structured naming in general, then explain in details how the organization of the name space can be profitably used to efficiently implement the name server in a distributed way.
3. Calculate the recovery line for the two diagrams below using the rollback-dependency graph for the first one, the checkpoint dependency graph for the second one.



4. Describe how scalar clocks can be used to guarantee mutual exclusion in accessing a resource. Highlights the assumptions that must hold for the protocol to operate correctly.
5. Consider the following schedule over 2 variables (both initialized at zero):

P0 R(x)2 W(y)2 R(x)2 W(y)3  
P1 W(y)1 W(x)2 R(y)1 R(y)2  
P2 R(x)2 R(y)3 W(x)3 R(x)3  
P3 W(x)1 R(y)2 R(x)3 R(y)2

Is it FIFO/causal/sequential consistent? If not, can you remove just one operation and make it consistent?

6. Describe the approaches of "active replication" and "quorum-based replication", underlying the best and worst configurations that can be designed for both.
7. a) What is a Certification Authority? Why there are also different approaches to the same problem (i.e., the "Web of trust")?  
b) Why Kerberos is able to use a simplified Needham-Schroeder implementation?