Politecnico di Milano

090950 – Distributed Systems

Prof. G. Cugola – Februaty 5th, 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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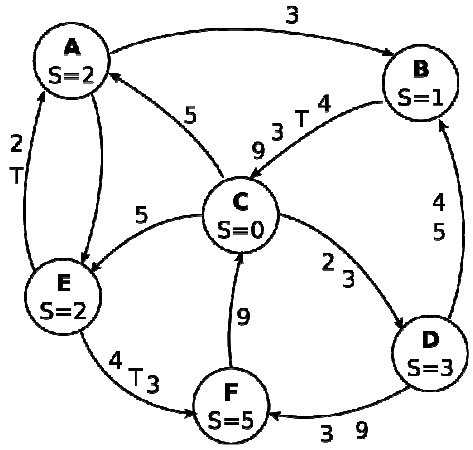
1. Describe and compare the different mobile code paradigms making appropriate examples.

2. Describe the various approaches to remove unreferenced entities in a distributed system.

3. Consider the system in figure, which is running a distributed snapshot. Suppose that every process works by adding the value held by the received messages to its internal state S. Process A started the snapshot, recording state 2 and sending the tokens to processes B and E, which already processed them and sent out their own tokens. Assuming that channels exiting from B and E are much faster than others, and that no other operations occur apart those required to end the snapshot, show the state captured by every node at the end of the snapshot (local state and messages recorded for each link).



4. Can agreement be reached in presence of process failures? Under which conditions? Describe an algorithm and prove its correctness..

5. Consider the following schedule over 2 variables (both initialized at zero):

   P0 W(x)2 R(y)1 W(y)2 R(y)3
   P1 R(x)0 W(y)1 R(y)1 R(y)2
   P2 W(y)3 R(x)2 R(x)3 R(y)3
   P3 W(x)1 R(y)1 W(x)3 R(y)3

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

6. Describe the client-centric consistency models..

7. Describe the problem of trust when designing and using the layers that build a distributed application (from the network up to the application itself). What is a Trust Computing Base? Where should the security mechanisms be put?