Politecnico di Milano – V Facoltà di Ingegneria

075274 e 070644 - Sistemi distribuiti (con laboratorio)

Prof. G. Cugola

Appello del 15 Settembre 2010

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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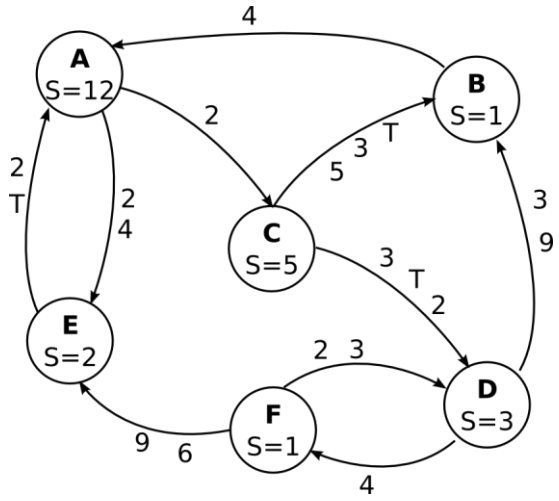
1. **Implement in Java a `PriorityQueue`. The size of the queue is determined at creation time (through the constructor). A single method `void enqueue(int data)` exist to enqueue data. Callers of such method are suspended if the queue is full. As for dequeuing, two methods exist: `int dequeueLowP()` and `int dequeueHighP()`. The callers of the latter, if any, have higher priority in accessing new data (they are waked up before the others when a new item is added to an empty queue).**

2. Describe the mobile code architectural style, highlighting the different form of code mobility that exist.

3. Describe how to use vector clocks to build a causally ordered multicast service.

4. 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 sending the token to processes C and E (already processed).



Assuming that no other operations occur apart those required to end the snapshot and that the output channels of C are much faster than the other channels, show the state captured by every node at the end of the snapshot (local state and messages recorded for each link).

5. Describe the floodset algorithm: its goal, the assumptions it relies on, the algorithm, the proof of correctness.

6. Consider the following schedule:

P0:	W(x) 1	R (x) 2	W(x) 3
P1:	R (x) 1	W(x) 2	R(x) 3
P2:	R (x) K	R (x) ?	

Complete the table below, by showing, for each value of K, the set of values (1, 2, 3) that process P2 can read during its second operation when adopting a FIFO or a sequential consistency model. Motivate your answers.

Value of K	Consistency model	Set of allowed values
1	FIFO	
1	Sequential	
2	FIFO	
2	Sequential	
3	FIFO	
3	Sequential	

7. Describe (briefly) and compare the following mechanisms used to set up secure channels:
   a. Authentication using shared secret key (challenge response)
   b. Authentication using public key
   c. Authentication using a key distribution center

   Which assumptions are required by these protocols? Which are their limitations?