Politecnico di Milano – V Facoltà di Ingegneria

075274 e 070644 - Sistemi distribuiti (con laboratorio)
Prof. G. Cugola

Appello del 1 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.**

1. Implement in Java an `Executor`. At creation time it takes a `Runnable` as a parameter and, after being started (see below), it invokes the `run` method repeatedly. The `Executor` provides four methods. A method `start` to start invoking the `run` method of the `Runnable` passed at creation time, a method `suspend` to suspend running (after the current cycle of run has completed), a method `continue` to continue after suspending, and a method `stop` to finally halt execution (again, after the current cycle of run has completed).

2. Describe the REST architectural style and its "CREST" variation.

3. Describe how scalar clocks can be used to guarantee mutual exclusion in accessing a resource.

4. Si consideri il sistema in figura sul quale è in corso un distributed snapshot. Si supponga che ogni processo operi sommando il valore dei messaggi ricevuti al valore intero S che rappresenta il proprio stato. Il processo A ha dato inizio allo snapshot mandando un token (già consumato) al processo B.
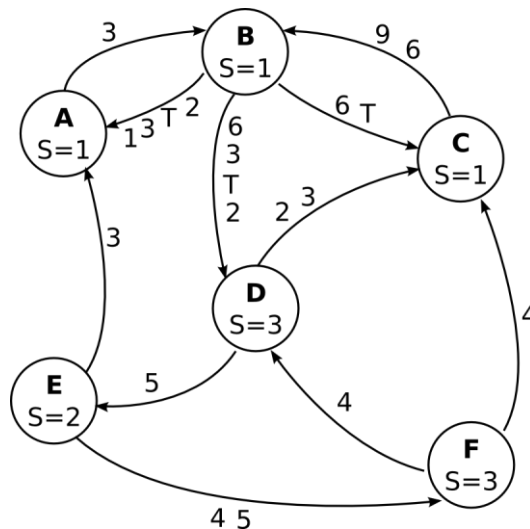
Assumendo che non vi siano altre operazioni nel sistema oltre quelle necessarie a completare lo snapshot e che i canali uscenti da B siano molto più veloce di tutti gli altri canali, si mostri lo stato (stato locale e messaggi per ogni link) registrato da ogni nodo a fine snapshot.

5. Describe pessimistic timestamp ordering to control concurrency in distributed transactions (i.e., to guarantee serializability).

6. Consider the following processes (A, B, C), running concurrently and acting on variables x, y, z. Assume the following initial values: x = 0; y = 0; z = null.

Process A	Process B	Process C

x = 1;
if (y==0) {
  z = 'A';
}
	y = 1;
	if (x==0) {
	  z = 'B';
	}
		Print z;
		Print x;
		Print y;

Complete the following table, showing which sets of values represent a valid output for process C when using a sequential, causal, or FIFO consistency model.
Motivate your answers.

z	x	y	Seq	Causal	FIFO
A	0	0			
B	0	0			
A	0	1			
B	0	1			
A	1	0			
B	1	0			
A	1	1			
B	1	1			

7.
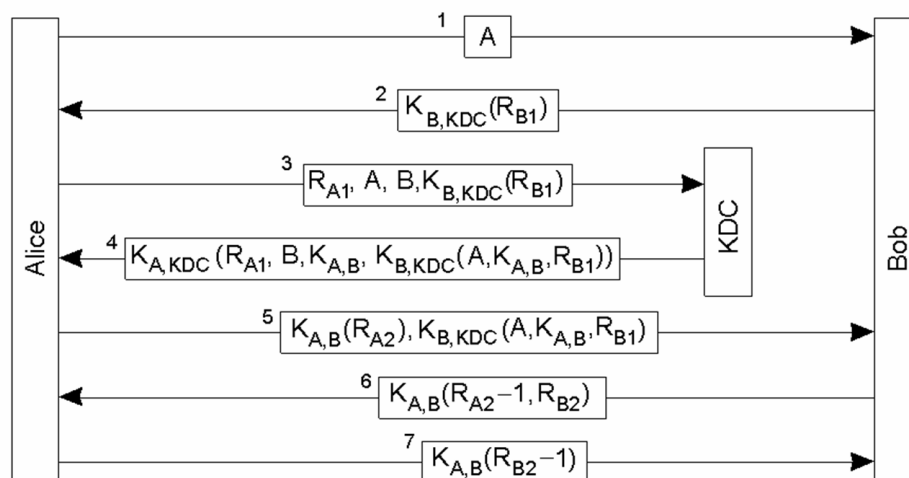
Consider the protocol shown in Figure above:

1. Describe the general aim of the protocol and briefly explain the meaning of each message.
2. Why does Alice need to contact Bob before starting the communication with the KDC?
3. Why does message 4 contains both R_{A1} and B?