TEKNISKA HÖGSKOLAN I LINKÖPING
Institutionen för datavetenskap
Petru Eles

Tentamen i kursen

Distribuerade System- TDDA 67, TDDB 67, TDDI78

1999-04-13, kl. 09-13

Hjälpmedel:

Inga.

Poänggränser:

Maximal poäng är 30.
För godkänt krävs sammanlagt 16 poäng.

Resultat anslås:

Senast 1999-04-26 på IDAs anslagstavla för tentamensresultat.

Jourhavande lärare:

Petru Eles, tel 28 13 96

Good luck !!!

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Du kan skriva på svenska eller engelska!

1. What means transparency in a distributed system? We have defined four aspects of transparency. Enumerate and explain at least three of them.

(2p)

2. One of the problems with client-server communication is addressing. Describe and compare *machine independent addressing with broadcast* and *machine independent addressing with name server.*

(2p)

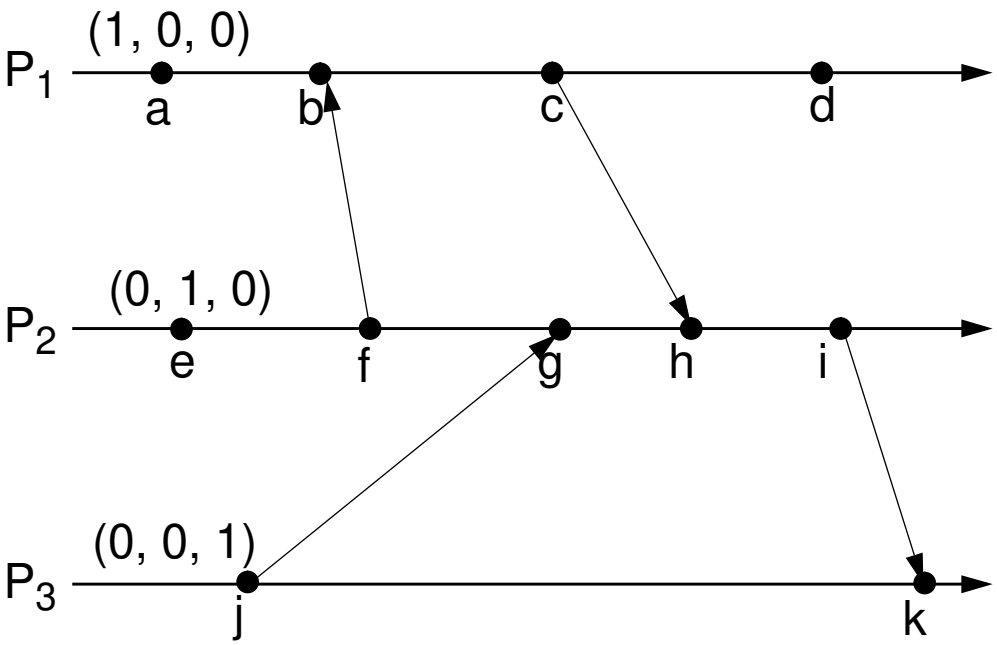
3. The Object Request Broker (ORB): what is its role in an object oriented distributed system? Illustrate also by a figure. (The question is not related directly to CORBA, but if you want to refer to the CORBA ORB it's fine).

(2p)

4. What is an Interface Definition Language. What is its function in the context of Middleware.

(2p)

5. Consider the following set of events:



Assign the missing vector clock values to the events.

(3p)

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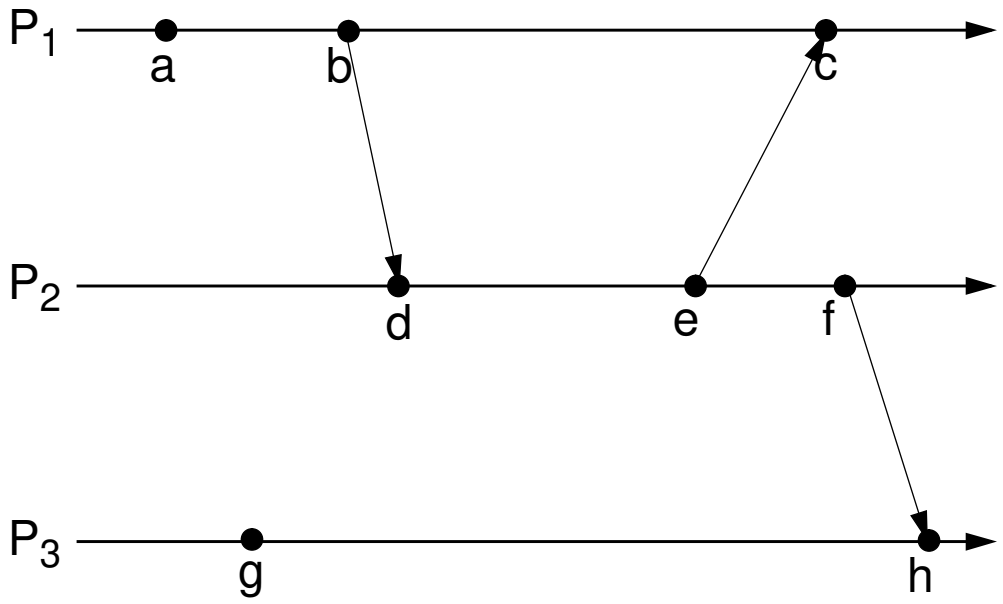
6 Illustrate by an example that it is not possible to derive the causal ordering of events using Lamport Logic Clocks. Show, using the same example, that with vector clocks the problem can be solved.

(3p)

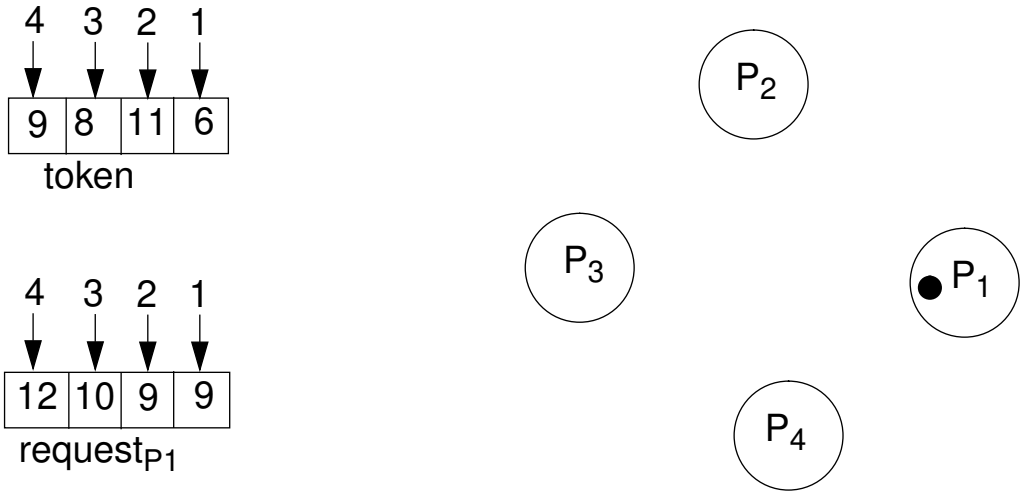
7 Define the *happened before* relation (Lamport).
When are two events concurrent?



What is the relation between events a - b, a - d, b - g, g - e, d - c, b - c, a - g, f - g, e - h, a - h?

(3p)

8. Consider the four processes in the picture below. Mutual exclusion relativ to a shared resource is solved using the Ricart-Agrawala - second algorithm (the token-based one). P_1 is ready to give up the resource. Which process will get the resource? Why?



(2p)

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9. Consider a bully election with 6 processes, P_1, ..., P_6. P_6, the current coordinator, fails and P_3 starts the election. Illustrate the sequence of messages exchanged (use figures).

(3p)

10. What is the basic idea with voting protocols for updating replicated data? How do they work? Consider a set of 11 replica managers. Define two voting protocols. One for a situation when the number of writes is relatively large compared to that of reads, and the other for the reverse situation. Give examples of read and write quorums (use figures).

(3p)

11. The Byzantine Generals Problem: show how agreement is not or is possible for three and for four generals respectively, in the case the commander is a traitor (illustrate the exchange of messages on figures).

(3p)

12. How many processors do you need in order to achieve *k*-fault tolerance with byzantine faults:
    - for agreement?
    - with a majority voting scheme?

(2p)