

Tentamen i kursen
Distribuerade System- TDDB 37
2006-03-11, kl. 8-12

Hjälpmedel:

Engelsk ordbok.

Supporting material:

English dictionary.

Poänggränser:

Maximal poäng är 40.
För godkänt krävs sammanlagt
21 poäng.

Points:

Maximum points: 40.
In order to pass the exam you need a
total of minimum 21 points.

Jourhavande lärare:

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Good luck !!!

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Du kan skriva på svenska eller engelska!

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

(3p)

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

(2p)

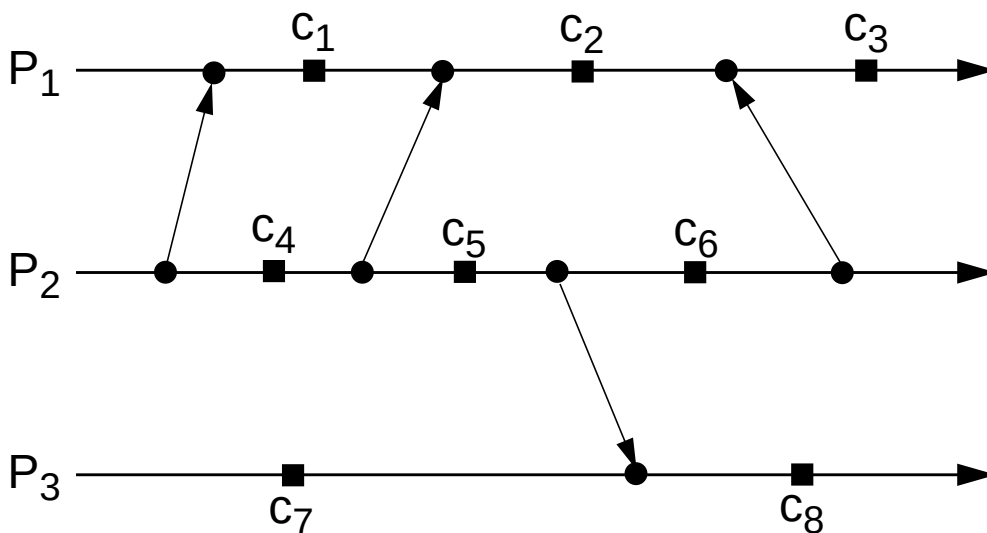
3. What are potential problems with client-server systems?
 How are they solved with peer-to-peer systems?
 What are key issues and problems with peer-to-peer systems?

(3p)

4. Remote Method Invocation: trace the way of a request and of the reply from the client to a remote server and back. Illustrate with a figure.

(3p)

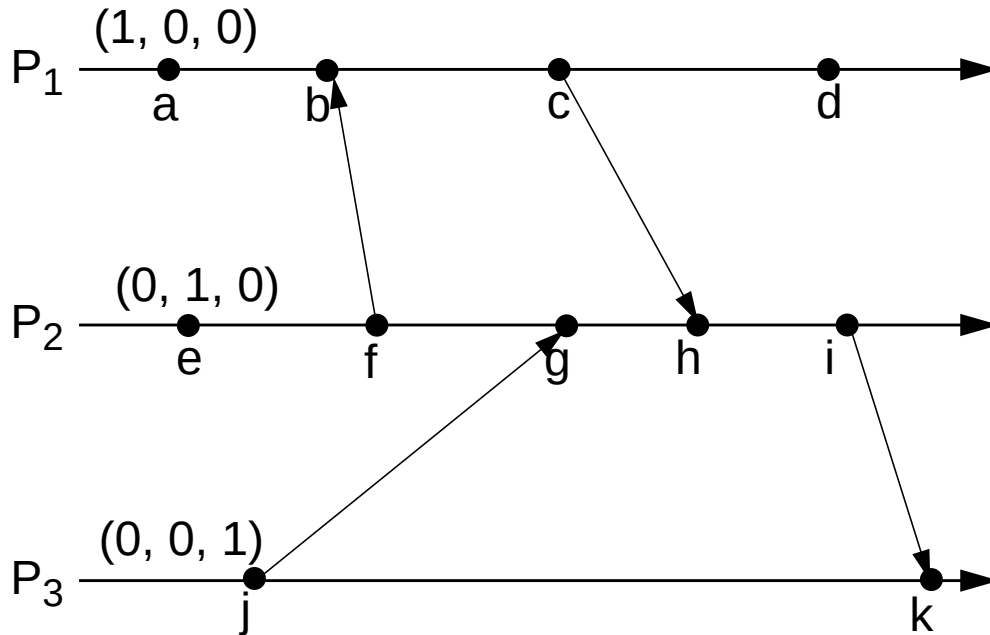
5. What is a cut of a distributed computation? What means a consistent and a strongly consistent cut? Consider the following set of events:



Determine for each of the following cuts if it inconsistent, consistent or strongly consistent:
 $\{c_2, c_6, c_8\}$, $\{c_1, c_4, c_7\}$, $\{c_1, c_5, c_7\}$, $\{c_1, c_6, c_8\}$, $\{c_1, c_6, c_7\}$, $\{c_3, c_6, c_8\}$.

(3p)

6. Consider the following set of events:



Assign the missing vector clock values to the events.

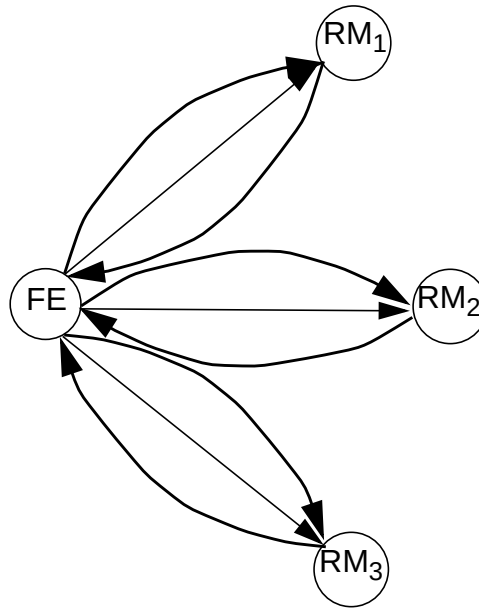
(3p)

7. What is the basic idea behind the token based distributed mutual exclusion algorithm by Ricart-Agrawala (the second algorithm)? Consider how mutual exclusion is guaranteed and how the token is passed after a process has left the critical section. How many messages are passed in order a process to get permission to a critical section? Compare to the first algorithm by Ricart-Agrawala (which is not using a token).

(3p)

8.

- Define total and causal ordering of requests. Illustrate by an example.
- How can total ordering be implemented using a central sequencer?
- Consider total ordering based on distributed agreement (no central sequencer); consider one front end and several replication managers, like below:



Three messages have to be exchanged by the FE with each RM. Explain. What do these messages contain?

(3p)

9.

- a. Define *majority voting* for forward recovery.
Illustrate by two examples: one with strict equality and the other with non-strict equality.
- b. Illustrate by examples *k-plurality voting* and *median voting*.

(3p)

10. Define a *k*-fault tolerant system.

How many components do you need in order to achieve *k*-fault tolerance with byzantine faults:

- for agreement?
- with a majority voting scheme?

(2p)

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11. The Byzantine Generals Problem: show how agreement is not or is possible for three and for four generals respectively, in the case one of the generals (not the commander) is a traitor (illustrate the exchange of messages with figures).
(3p)
12. Cristian's algorithm for clock synchronization. Describe how it works. How does it estimate the time at the receiver? What is the accuracy of this estimation?
(3p)
13. Adjusting drifted clocks: T_{curr} is the time shown by the clock and T_{new} is the value we have to change the clock to.
a) What is the main problem and how is it solved in principle?
b) Concrete solution with mathematical discussion.
(4p)
14. Compare the Ethernet protocol and the CAN protocol from the point of view of predictability. Explain.
(2p)