

Tentamen i kursen
Distribuerade System- TDDB 37
2006-06-07, 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:

Petru Eles, tel. 281396, 0703681396

Good luck !!!

Tentamen i kursen Distribuerade System - TDDb 37, 2006-06-07, kl. 8-12
Du kan skriva på svenska eller engelska!

1. Synchronous and asynchronous distributed systems. What are their main features and what are the consequences of these features?

(3p)

2. Define the following three possible semantics for remote procedure calls:
 - a. At least once semantics
 - b. At most once semantics
 - c. Exactly once semantics.

Is it possible to achieve *exactly once semantics* in the case of lost messages? But in the case of server crashes? Explain.

(3p)

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)

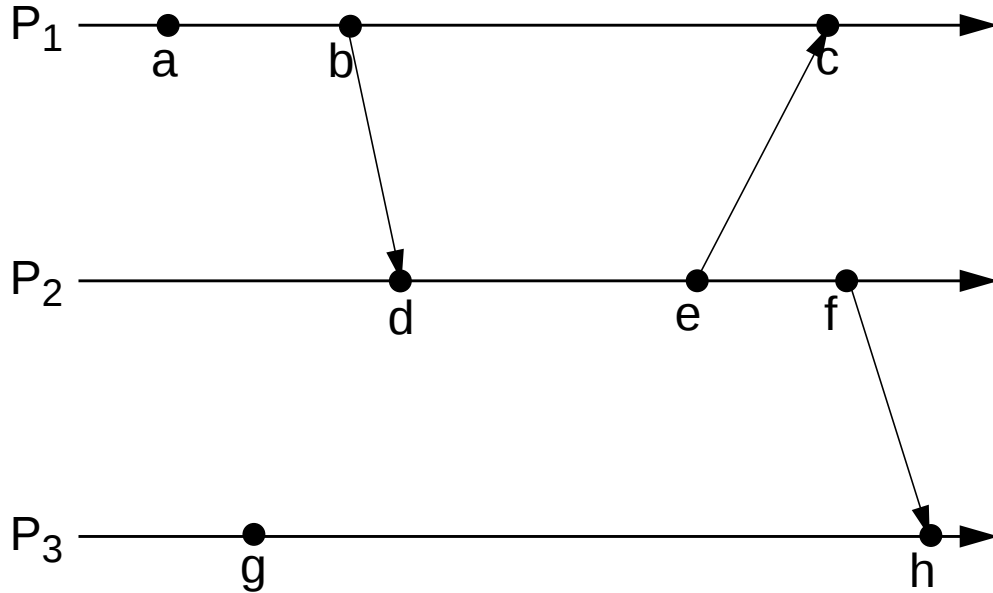
4. Remote Method Invocation: trace the way of a request and of the reply from the client to a remote server and back. Illustrate with a figure.

(3p)

5. Group communication.
 - a. What is it?
 - b. Describe the two main features of group communication: atomicity and ordering.

(3p)

6. 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)

7. Consider mutual exclusion with the Ricart-Agrawala algorithm (the first algorithm, not using a token). Imagine three processes: P_0 , P_1 , and P_2 . P_1 and P_2 are requesting the same resource, and the timestamp of the requests is (6, 1) and (5, 2) respectively. Illustrate the sequence of messages exchanged (use figures). Who gets the resource first?

(3p)

8. 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)

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

(3p)

Tentamen i kursen Distribuerade System - TDDb 37, 2006-06-07, kl. 8-12
Du kan skriva på svenska eller engelska!

10. Give a short description of how the following update protocols for replicated data work and compare them:
read-any - write-all protocol, available-copies protocol, primary-copy protocol, voting protocols.
(3p)
11. 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)
12. You know the maximum drift rate of the clocks on two processors and the maximal allowed skew between them. How do you determine the maximum interval between two successive synchronizations between the clocks?
(2p)
13. 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)
14. What does it mean by external and internal synchronization of physical clocks?
What does it mean by centralised and distributed synchronisation algorithms?
(3p)