

Försättsblad till skriftlig tentamen vid Linköpings universitet



Datum för tentamen	2016-06-09
Sal (1)	<u>TER2</u>
Tid	14-18
Kurskod	TDDD25
Provkod	TEN1
Kursnamn/benämning Provnamn/benämning	Distribuerade system Skriftlig tentamen
Institution	IDA
Antal uppgifter som ingår i tentamen	14
Jour/Kursansvarig Ange vem som besöker salen	Petru Eles
Telefon under skrivtiden	0703-681396
Besöker salen ca klockan	16:00
Kursadministratör/kontaktperson (namn + tfnr + mailaddress)	Elin Brödje, 4767, Elin.Brodje@liu.se
Tillåtna hjälpmedel	Engelsk ordbok
Övrigt	
Antal exemplar i påsen	

LINKÖPINGS TEKNISKA HÖGSKOLA
Institutionen för datavetenskap
Petru Eles

Tentamen i kursen
Distribuerade System- TDDD25
2016-06-09, kl. 14-18

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. 0703681396

Good luck !!!

Tentamen i kursen Distribuerade System -TDDD25, 2016-06-09 kl. 14-18
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. Synchronous and asynchronous distributed systems. What are their main features and what are the consequences of these features?

(2p)

3. Publish-Subscribe systems:
 - a) Draw a figure in which you illustrate the three players (publishers, subscribers, and notification service) and their interaction.
 - b) Explain the filtering function and illustrate by an example.

(3p)

4. How can *exactly once semantics* be achieved in the case of lost messages (assuming the server never crashes)?

(2p)

5. We have identified an important limitation of Lamport's logical clocks (the other one, related to the lack of total ordering is not so important).
 - a) What is that limitation? Illustrate by an example.
 - b) Show, using the same example, how vector clocks solve that problem.

(3p)

6. 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)

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?

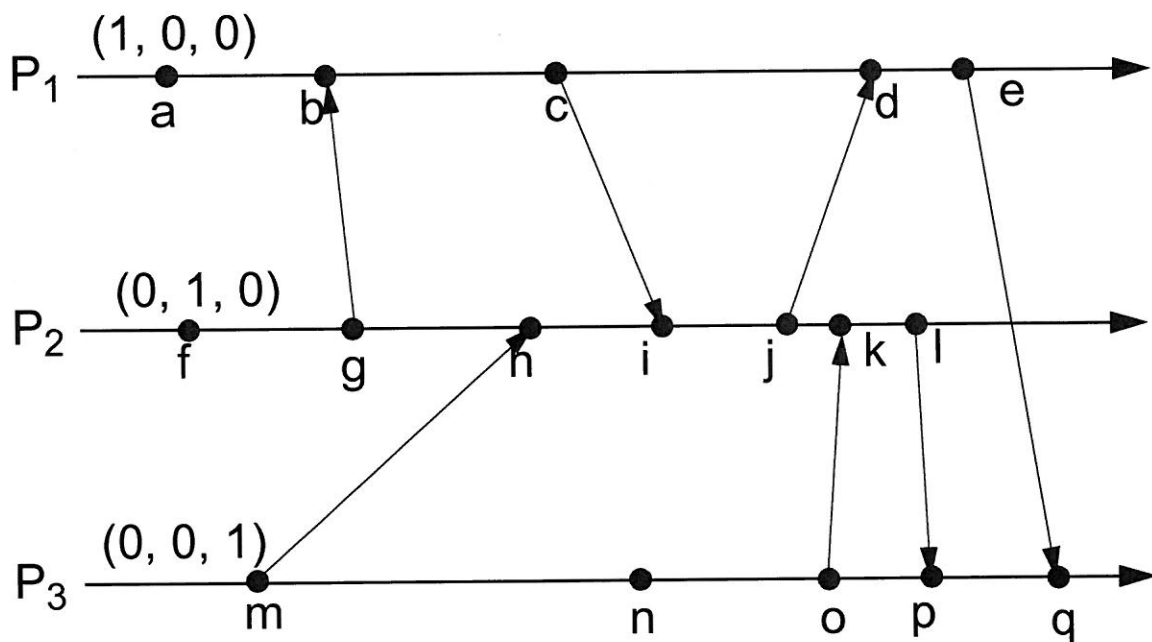
(3p)

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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 this number of messages with those needed with the token ring based algorithm. In what circumstances would you prefer Ricart-Agrawala-second and token ring, respectively (think at how frequently processes need the resource)?

(3p)

9. Consider the following set of events:



Assign the missing vector clock values to the events.

(3p)

10. Explain the following types of redundancy:

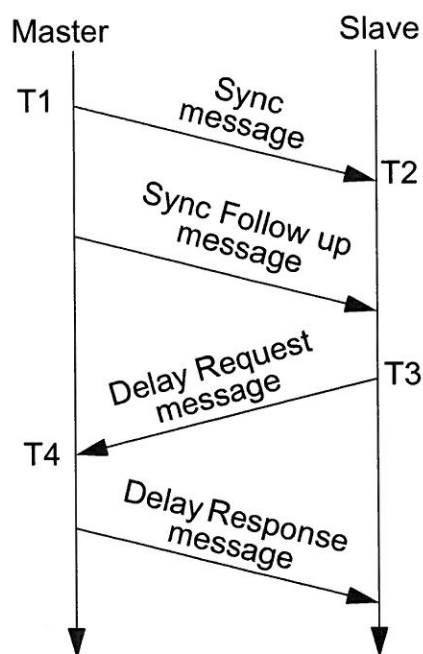
- Time redundancy
- Hardware redundancy
- Software redundancy
- Information redundancy

(3p)

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11. What is the basic idea with voting protocols for updating replicated data? How do they work? Consider a set of 12 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)
12. The Byzantine Generals Problem: show how agreement is not or is possible for three and for four participants respectively, in the case one of the generals (not the commander) is a traitor (illustrate the exchange of messages with figures). (3p)
13. 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? Consider both the case when after synchronisation the clocks are perfectly aligned and the case when after synchronisation there exists an offset Φ between the clocks. (3p)



14. The figure shows the message exchange performed for clock synchronisation in the Precision Time Protocol (PTP). (3p)
- a) What is the role of the "Sync Follow up message"? Why is it needed?
 - b) What information is the "Delay Response message" carrying?
 - c) Once the values T1, T2, T3, T4 are known, how is the clock update performed?

