



## EXAMINATION

Course: **5DV020/Distributed Systems**

Teacher in charge: Yvonne Löwstedt/Daniel Henriksson

Semester: HT-08

Date: 2008-11-03

Time: 09.00–15.00

Name: \_\_\_\_\_

Personal ID number: \_\_\_\_\_

Unique code for this examination: **2**

### Note!

This examination will be graded anonymously. This sheet will be removed before the teacher receives the rest of the examination. The above code must therefore be on all other pages when you submit the examination to the examination supervisory staff. **Memorize** your code since it will be used as reference when the results are published.

Furthermore,

- Write your code and the question number in the **top right corner** of every paper.
- Write the answers on the answers on the same paper as the question (the back of the paper may also be used).
- Mark the questions you have solved with a cross on the next page.
- The solutions should be neatly written. The train of thought should be easy to follow. All non-obvious assumptions must be explicitly stated.

**Till skrivningsbevakaren:** Avskilj detta försättsblad och stoppa i kuvert som skickas till Yvonne Löwstedt, Datavetenskap.



## EXAMINATION

Course: **5DV020/Distributed Systems**

Teacher in charge: Yvonne Löwstedt/Daniel Henriksson

Semester: HT-08

Date: 2008-11-03

Time: 09.00–15.00

Unique code for this examination: **2**

Problem	Solved	Points
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
Sum		
Grade		



**Question 1 (3 + 2 points)**

- a. What are the formal definitions of FIFO, causal, and total ordering of messages?
- b. Show a message ordering that is total, but *neither* causal nor FIFO (a figure might be good for this).



**Question 2 (2 + 4 points)**

- a. Recite Fisher's impossibility result.
- b. Describe at least two distinct methods for working around the impossibility result.



**Question 3 (3 + 1 points)**

- a. Describe how Cristian's method works *and* briefly discuss when and why it is applicable. Figures are good for this, but the figure will need some explanation in text as well.
- b. What modifications would you have to apply to Cristian's method to ensure perfect time synchronization between the nodes?



**Question 4 (4 points)**

Briefly describe the two-phase commit protocol, and explicitly state the steps of the protocol.



### Question 5 (5 points)

Give the five phases of a *general* (as opposed to a specific one) replication protocol, and briefly describe what happens in each phase.



## Question 6 (2 + 4 points)

Give the definitions of the following:

- a. linearization, and
- b. run.

Show, by example (a figure would be *very* good for this), an ordering of events that is a run but not a linearization.





### Question 7 (2 + 2 points)

Explain the following two concepts of SOA design:

- a. service virtualization, and
- b. loose coupling.



### Question 8 (3x1 points)

Give an approximate definition of the \*-property of the:

- a. Biba model,
- b. Bell-LaPadula model, and the
- c. Chinese Wall model.



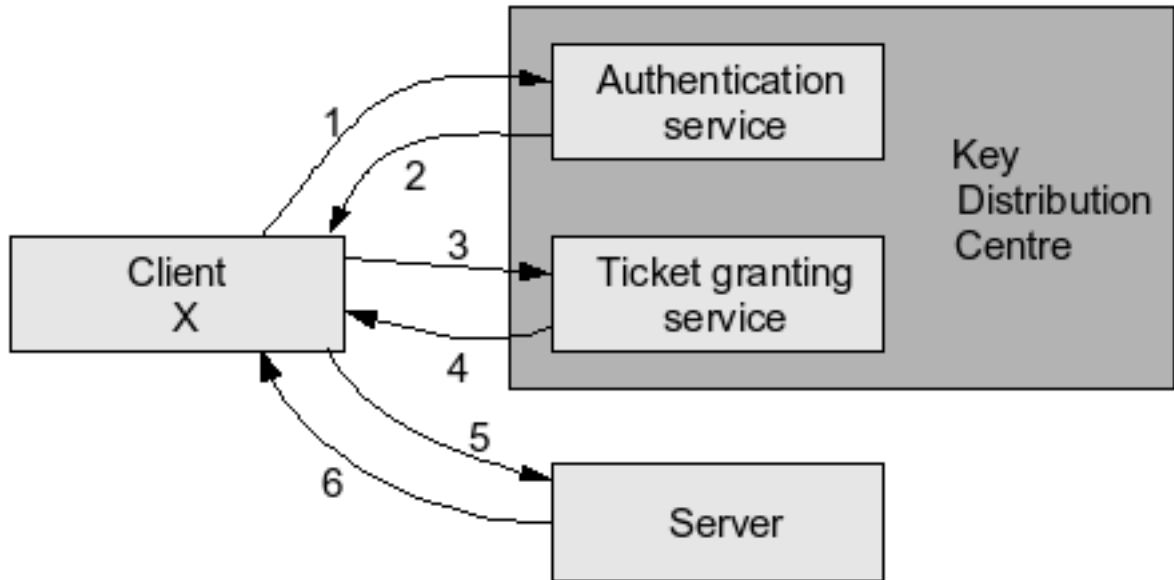
### Question 9 (5x1 points)

For each pair of security related terms below, briefly explain *both* terms and explicitly state if and how they relate to each other:

- a. Cipher Suite and SSL,
- b. Policy and Mechanism,
- c. IDS and Key escrow,
- d. Military security policy and Confidentiality policy, and
- e. DMZ and PKI.

### Question 10 (6 + 2 points)

Kerberos is a system for authentication. The following image shows the six different kinds of messages that is a part of the protocol:



- For each message, describe the contents and the purpose of that message.
- Reason about the advantages and disadvantages of Kerberos.

Use this and the following page for writing your answer.



This page is intentionally left blank.



**Question 11 (2x2 + 3 points)**

a. Describe the following methods of concurrency control:

- (i) locks, and
- (ii) optimistic concurrency control.

b. Suggest a good scheme for concurrency control for a web-based site dealing with concert tickets.

Use this and the following page for writing your answer.



This page is intentionally left blank.



## Question 12 (-3 to 3 points)

The following questions require only a true or false answer. Correct answers give 0.5 points, whereas incorrect answers are penalized with -0.5 points. Note that the total from the question may be negative, and this will impact your final score. No answer is the safest option, and counts as 0 points. Any text besides "true" or "false" will not be taken into consideration.

Evaluating definitely $\phi$ is NP-complete in the general case	
For logical clocks, $e \rightarrow e' \Rightarrow L(e) < L(e')$	
The Bully algorithm uses $\mathcal{O}(N^2)$ messages in the worst case	
SUN RPC uses <i>at-most-once</i> semantics	
Authentication is the binding of an identity to an object	
Read locks can always be upgraded to a write lock	