Distribuerade system fk
Tentamen 2008-08-25

Dag, Tid, Sal: August 25th 2008, 08:30-12:30, V

Kursansvarig: Philippas Tsigas (Tel: 772 5409)

Hjälpmedel: Inga

Totalt Poängtal: 60

Betygsgränser:

CTH: 3:a 24 p, 4:a 36 p, 5:a 48 p

GU: Godkänd 28p, Väl godkänd 48 p

Instructions

- Please answer in English, if possible.
  If you have very big difficulty with that, though, you may answer in Swedish.
- **Do not forget to write your personal number and if you are a GU or CTH student and at which "linje"**
- Please start answering each assignment on a new page; number the pages and use only one side of each sheet of paper.
- Please write in a tidy manner and explain (briefly) your answers.

LYCKA TILL !!!!

1. *30 marks*

   (a) What are the properties that a reliable Broadcast (multicast) must satisfy? Explain the properties after stating them.

   (b) Is it possible to implement a reliable and totally-ordered multicast in asynchronous distributed systems in general (i.e. without group-membership services)?

   (c) Does the Ensemble library support a reliable and totally-ordered multicast? If yes, how can the library support such a multicast? Does this constradict the previous question? Explain your answer.

2. *15 marks*

   (a) Which type of faults are called Byzantine faults?

   (b) Prove that it is impossible to reach agreement in a system with three processes if one of them is Byzantine faulty.

   (c) How can the above proof be generalised for a system with n processes?

   (d) Is it possible to reach agreement in a system with three processes if one of them is Byzantine faulty by using authentication (unforgeable signatures)? If your answer is yes, describe an algorithm. If your answer is no give a proof to support it.

3. *15 marks*

   (a) Describe an algorithm that processors of an asynchronous network $G=(V,E)$ can use in order to broadcast information. The processors of the network are the nodes of the graph $G=(V,E)$ and the physical links that connect the processors are the edges of $G=(V,E)$.

   (b) What is the time and communication complexity of your algorithm? Prove it.

   (c) Give the definition of the time and communication complexity of a distributed algorithm.