Tentamen vid Institutionen för Datavetenskap, Linköpings universitet

TENTAMEN  TDDD36 Säkra mobila System (Systemprogramvara)

Datum:  2011-01-10

Tid:  8 - 12

Lokal:  TER1

Jourhavande-lärare:
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Hjälpmedel:  Miniräknare, Lexikon

Poängantal:  40p

Betyg:  F, 3, 4 and 5:
  U:  - 19 p
  3:  20 - 26 p
  4:  27 - 32 p
  5:  33 - 40 p

INSTRUCTIONS:
Write your anonymous ID number on each sheet of paper that you hand in. Further, pages should only contain one answer per page (answers to sub-questions can be on the same page). You are asked to only answer on the front page of the paper. Sort all the sheets that you hand in with respect to the number of the question.

Your answers can be presented in Swedish or English. But the questions that are presented in English can be corrected by non-Swedish speaking teachers.

Make sure your answers are presented clearly and precisely. Your answers shall provide the motivation or method for the solution. A correct answer without any explanation will not be given any credits. Incorrect answers embedded in a partially correct one reduce the points given for that answer. Points will not be given to answers that cannot be read due to bad handwriting.

Hints: Try to dispose of your time on each question in proportion of the assignment points. In those cases where you are in doubt about the question, write down your interpretation and your assumptions, and answer the question based on the interpretation. Figures can be of help when describing but should be accompanied by a text description.

Results are reported no later than January 21st, 2011.

Good luck!

Simin Nadjm-Tehrani
Examiner TDDD36, Systems Software
Q1:

a) Describe what is the role of the data structure "Process Control Block" and what it holds.

(4 points)

b) Ange tre ansatser för att hantera baklås (en. deadlocks) och för varje ansats ange en metod som motverkar baklås.

(6 points)

c) Använd semaforer för att implementera ömsesidig uteslutning i följande program som består av tre processer. Kommentera din lösning med avseende på hur lång tid dina kritiska sektioner låses. Motivera varför ömsesidig uteslutning kan behövas i detta fall.

Process P1 {
    ...
    X = X+1;
    Y = W*X;
    ...
}

Process P2 {
    ...
    Z = Y^2;
    Write (Filename, Z);
    ...
}

Process P3 {
    ...
    if X > 0 then
        Y = W*X;
        M = 2*M+1
    else
        M = Z
    ...
}

(6 points)

d) Processes P1 and P2 share a common resource using a monitor. At time $t_0$ process P1 performed a wait operation on a condition variable BufferFull. At time $t_1$ ($t_1 > t_0$) process P2 performed a signal operation on the same condition variable. Assume there are no other processes ready to run in the system. How does the program execution proceed after $t_1$ according to the original semantics of monitors?

(4 points)

Q2:

a) Which one of the two standards Intserv and Diffserv provides a per flow end-to-end guarantee for soft real-time requirements?

(2 points)

b) Give two reasons for (advantages of) adding QoS mechanisms to a network infrastructure.

(4 points)

Q3:

a) Ge tre exempel på tidsberoende fel ("timing failures") i distribuerade system.

(3 points)
b) Vad menas med begreppet ”reliable communication”? Förr克拉 mha två egenskaper av kommunikation mellan två noder i ett distribuerat system. 

(2 poäng)

c) Förklara begreppet ”latency” i meddelandehantering inom ett distribuerade system. Ge två exempel på element som fördöjningen inom meddelandehantering kan bestå av.

(3 poäng)

Q4:

a) Identify the causal chain of fault-error-failure in the following scenario, including whether the fault was permanent, transient or intermittent.

On 7th October a newspaper in Colorado reported that real-time alerts had ceased for a number of persons being electronically monitored instead of being in jail. BI Inc., a company that provides electronic monitoring services for several nationwide agencies, experienced a problem with one of its offender monitoring servers at 7:29 a.m., temporarily disabling the server's notification system and delaying violation notifications to customers. The technical glitch happened when one of BI’s servers exceeded its threshold of 2.1 billion records. “The offenders and suspects on the monitoring system did not know their devices were down at the time, the company officials said, and there were no major problems reported as a result of the technical failure.”

(4 poäng)

b) A group of software development faults cause “software aging” i.e. progressive reduction in performance eventually leading to total failure. Give two examples of such faults.

(2 poäng)