
Software Design, Modeling, and Analysis in UML

<http://swt.informatik.uni-freiburg.de/teaching/WS2012-13/sdmauml>

Exercise Sheet 6

Early submission: Monday, 2013-01-28, 12:00 Regular submission: Tuesday, 2012-01-29, 10:00

Exercise 1

(9/20 Points)

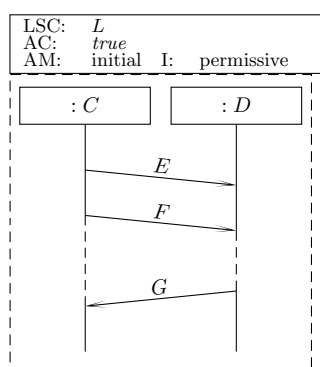


Figure 1: Requirements in form of interactions.

Consider the LSCs in Figure 1.

(i) Provide the mathematical representation of L . (2)

(ii) Give one example each for

- universal chart,
- hot location,
- cold condition,
- simultaneous region,
- co-region,
- hot inclusive local invariant,
- activation mode, and
- pre-chart

in Figure 1 (use the terms of task (i), to be more precise).

If there is no example in Figure 1, make up an (as small as possible) own LSC. For your own example, the mathematical representation is not necessary. (2)

(iii) What does L (formally) mean? (2)

(iv) Provide a non-trivial UML model which is *not* consistent with L . (As usual: convince your tutor of the claimed non-consistency). (3)

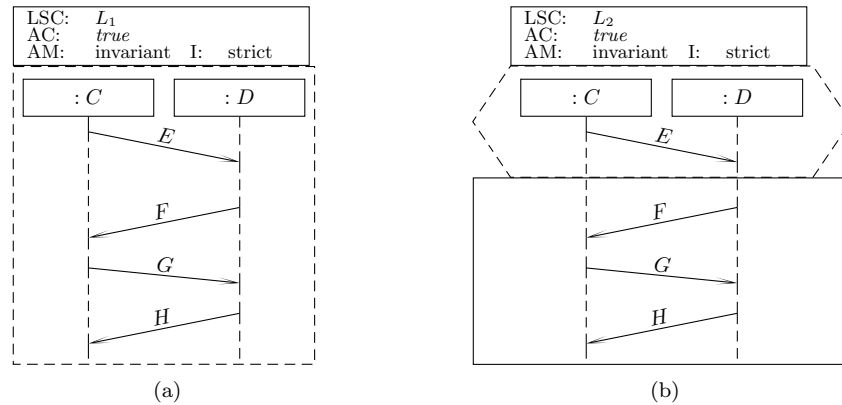


Figure 2: Requirements in form of interactions.

Exercise 2

(4/20 Points + 5 Bonus)

Consider the LSCs in Figure 4. They could be result of the following development process:

- LSC L_1 was captured in an interview with the customer. At least this scenario shall be possible at least once in the system.
- In later interviews with the customer, it was understood that the desired behaviour is actually a response. A D -object shall respond to requests of a corresponding C -object. This was formalised by adding a pre-chart to L_2 .

- (i) **Bonus:** Make up a nice story. Who is the customer? What are C and D modelling (maybe some controllers (controlling what kind of hardware?), maybe some software sytem)? Which communications are the messages modelling?

Provide a corresponding renaming of C, D, E, F, G, H to more intuitive names. (5)

- (ii) Provide a UML model which is consistent with L_1 .

Is your model also consistent with L_2 ? (2)

- (iii) Please change your state machine \mathcal{SM}_C such that it sends *two* E events in a row to the D object. Is your model still consistent with L_2 ?

If not, can you provide a fix? Note that the requirement may be wrong! So you may also propose a change to the requirement (and discuss it with the customer). (2)

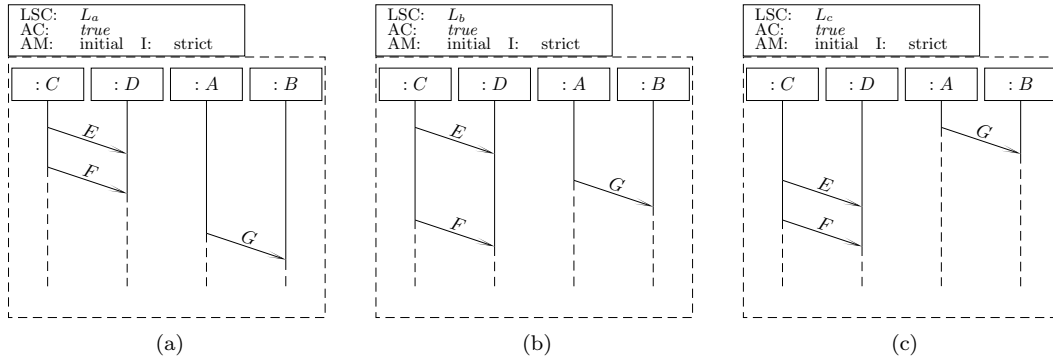


Figure 3: Partial order.

Exercise 3

(3/20 Points)

- In the semantics of the lecture, LSCs L_a , L_b , and L_c have the same meaning. If we view L_a , L_b , and L_c as Sequence Diagrams recorded with Rhapsody, they have three different meanings. Explain. (2)
- How would you change the semantics definition of the lecture to represent the “Rhapsody recorded SD” interpretation? (1)

Exercise 4

(4/20 Points)

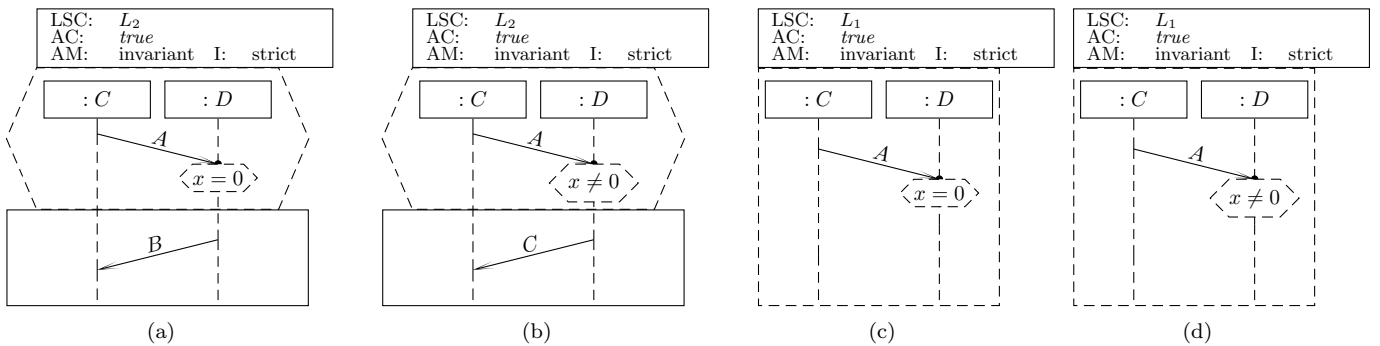


Figure 4: Requirements in form of interactions.

- What requirement is stated by LSC 4(a) alone? (1)
- What requirement is stated by LSC 4(a) and 4(b) together? (1)
- What requirement is stated by LSC 4(a), 4(b), 4(c), and 4(d) together? (1)
- Assume \mathcal{M} is a UML model which satisfies the requirement stated by LSC 4(a), 4(b), 4(c), and 4(d) together. Does \mathcal{M} need to ever send A ? And B ? And C ? And A , B , and C ? That is, does \mathcal{M} need to have a computation path with *Snd*-sets comprising A (B ; C ; all three, A , B , and C)? (1)