Model-Based Testing

(DIT848 / DAT261)

Spring 2016

Lecture 12

Revision

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Revision request…

- Go through a previous exam

Exam MBT Disclaimer!

- Note that the following is only a sample of a previous exam!
- The precise content or format of the incoming exam might be slightly different!

Exam MBT (General issues)

- ALLOWED AID:
  - **One** book on testing
  - Only **one** piece of paper (both sides)
  - English dictionary
  - NOT ALLOWED: Any form of electronic device (dictionaries, agendas, computers, mobile phones, etc), nor any other kind of material!
- Remember: Long exam (7.5 HEC) vs Short exam (4.5 HEC)

Exam MBT (General issues)

- PLEASE OBSERVE THE FOLLOWING:
  - Motivate your answers (a simple statement of facts not answering the question is considered to be invalid);
  - Start each task on a new paper;
  - Sort the tasks in order before handing them in;
  - Write your student code on each page and put the number of the task on every paper;
  - Read carefully the section below "ABOUT THE FORMAT OF THE EXAM"
    - Available from the course homepage (under "Examination" tab)

Exam MBT – May 21, 2012

- MBT-exam-2012-05-21.pdf
  - Available from the course homepage:

    http://www.cse.chalmers.se/edu/year/2016/course/DAT261/examination.html

Task 1 -Test in general
Part 1

Solution

1. F – testing is always dynamic

2. T

3. F – debugging is testing + correcting the errors

4. F – This is the less advisable way to do it since identifying the source of the error becomes difficult when considering the full tystem. Bottom-up or Top-down are more suitable (depending on how you build your system)

5. F – No, you don't need a full implementation (you might use some mock code – stubs and drivers)

10 min

Task 1 -Test in general
Part 2

Solution:

1. Acceptance test (g) (also during system test - e)

2. stress/system test (e) and also acceptance (g)

3. Combination of coverage analysis (c) and unit tests (b)

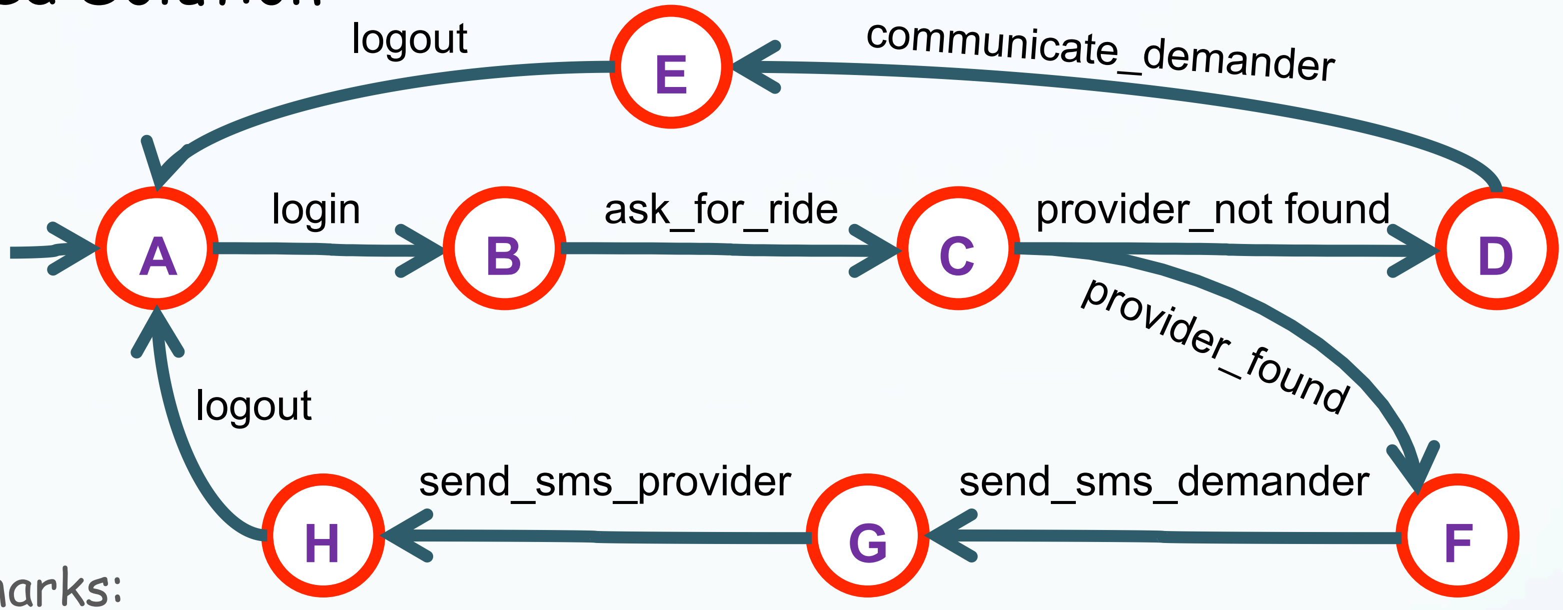
4. timing response test (system test - e)

5. configuration test (system test - e)

10 min

Task 2 -State Machines Part 1

Proposed Solution



Some remarks:

- Many other solutions depending on how much do you abstract
  - A "good" solution should be abstract enough as to capture the informal description (but not too much as to be useless)
- "logout" could be eliminated (as it is automatic)
- No check on whether login is correct or not (not in the specification)
- Implicit loop in state "C" on "look_for_provider"

10 min

Task 2 -State Machines Part 2

Proposed Solution

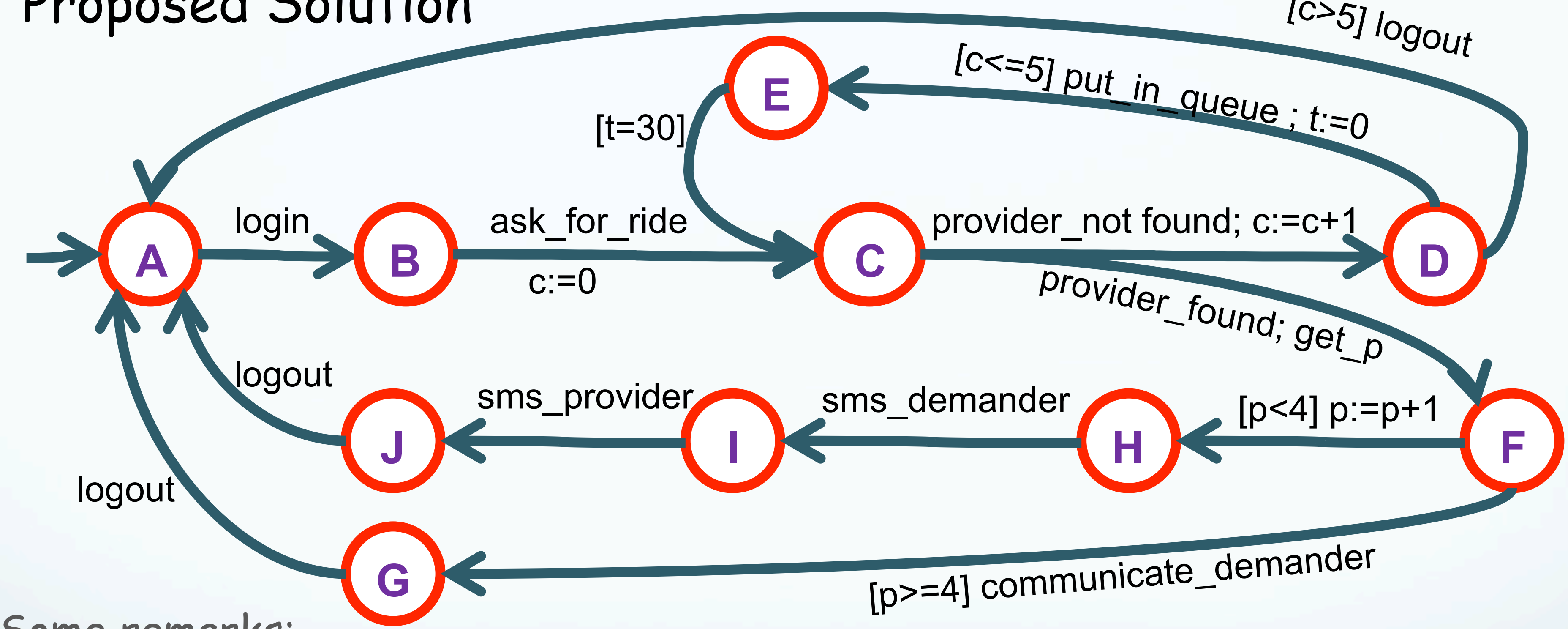
- Test cases you can extract:
  1. After login if there is provider then the demander gets an sms indicating that.
  2. If no provider exists for that ride then the user is logged out after getting a notification.

- Test cases you cannot extract:
  1. If a provider does exist for the ride, the user may still not get the guarantee of a ride due to overbooking.
  2. Any timing constraints in what concerns how much time to wait for getting a confirmation of a ride.

5 min

Task 2 -State Machines Part 3

Proposed Solution



Some remarks:

- Brackets ("[.]") are used as a short for "If … then …"
- t: timer; c: number of times a demander may request a ride; p: nr of passengers (stored in the DB; get using "get_p")
- Assumption: the timer is automatically incremented (implicit loop in state E)

15 min

Task 3 -White box testing and coverage Part 1

Solution

a. a-b-g (not finishing in the final state though -> a-c-d-e)

b. (Considering the state as being between the transitions)
s1: d-a, d-e
s2: a-b, a-c
s3: c-d, g-d
s4: e-g, e-f, b-g, b-f, f-f, f-g

c. e,
a-b

NOTE: The definition doesn't allow to repeat a configuration (state) so any other sequence is not included as they must pass through S1

d. Add to the above visiting "f" too

e. a-b-g-d-e-f,
a-c-d-e

15 min

Task 3 –White box testing and coverage Part 2

Solution

a. Deterministic (i), initially connected (ii), minimal (iii), strongly connected (iv)

b. Add copies of transitions a, g, d (e.g: a-c-d-e-f-g-d'-a'-b-g'-d'')

c. Transform the graph using de Brujin's algorithm (dual graph) and then "Eulerize" it (see lecture 7)

15 min

Task 4 -MBT / ModelJUnit

Solution

1. F – you should aim at least at a 100% transition coverage
2. F – You might use transformation and adaptation.
3. F – you might need to change the code
4. F – this is the case for the transformation, not the adaptation
5. T
6. T
7. T
8. T
9. F – It doesn't as there might be many branches in the SUT abstracted away in the EFSM
10. F – Transition-based is control oriented, while pre/post is data-oriented.

15 min

Task 5 – Property-based test. and QuickCheck Part 1

Solution

a.
```
prop_delete1 x t =
              delete x (delete x t) == delete x t
```

b.
```
prop_delete2 x t = not (member x t) ==>
     flatten (delete x (insert x t)) == flatten t
```
(Note that the it is not necessarily true that you get the same tree!)

c.
```
prop_delete3 x t = (member x t) ==>
      (flatten (insert x (delete x t)) == flatten t)
```
(Note that the it is not necessarily true that you get the same tree!)

d. (The statement should be read as "Write a property that checks that 2 BSTs are not equal if they don't contain the same elements.")
```
prop_equal t1 t2 =
 not (flatten t1 == flatten t2) ==> t1 /= t2
```

20 min

Task 5 – Property-based test. and QuickCheck Part 2

Solution

a. F – you write properties, not necessarily a full model.

b. T

c. F – There is no guarantee of getting the same tree. You should write:
prop_merge1 x y t1 t2 = flatten (merge (insert x t1) (insert y t2)) == flatten (insert x (insert y (merge t1 t2)))

d. F - The problem is that the symbols < and > are interchanged. You should make the following change:
"&& all (<y) (flatten lt) && all (>y) (flatten rt)"

20 min

Exam

- **June 1st, at 08:30**
  - "Maskin"-salar, M-Huset - Johanneberg