

Looking for a needle in a haystack – Good strategies for test case selection

Tutorial

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About us

- Our references in 30 years of industrial experience
 - medical engineering
 - pharmacy
 - automotive
- Expertise:
complex and safety critical systems

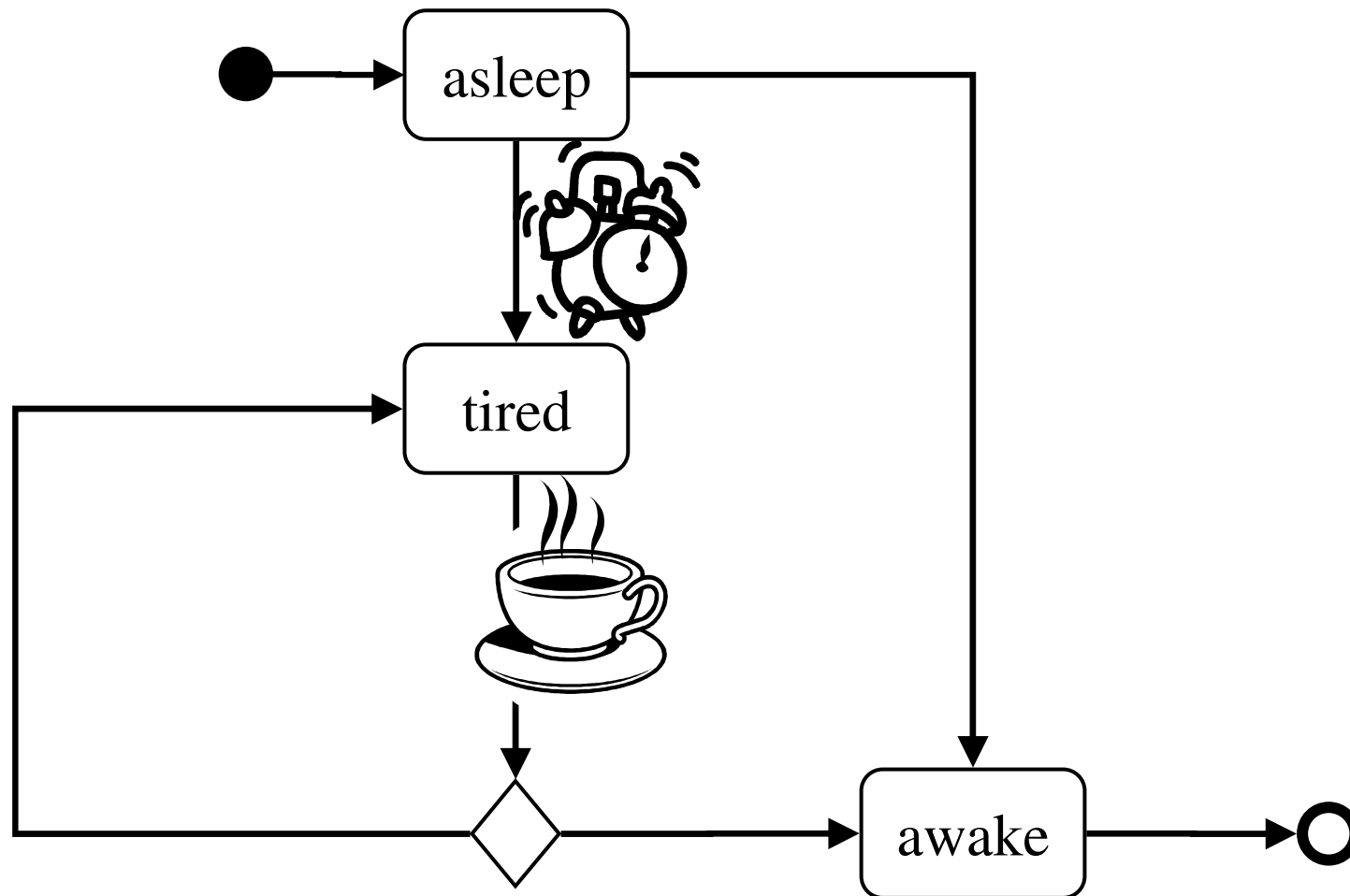




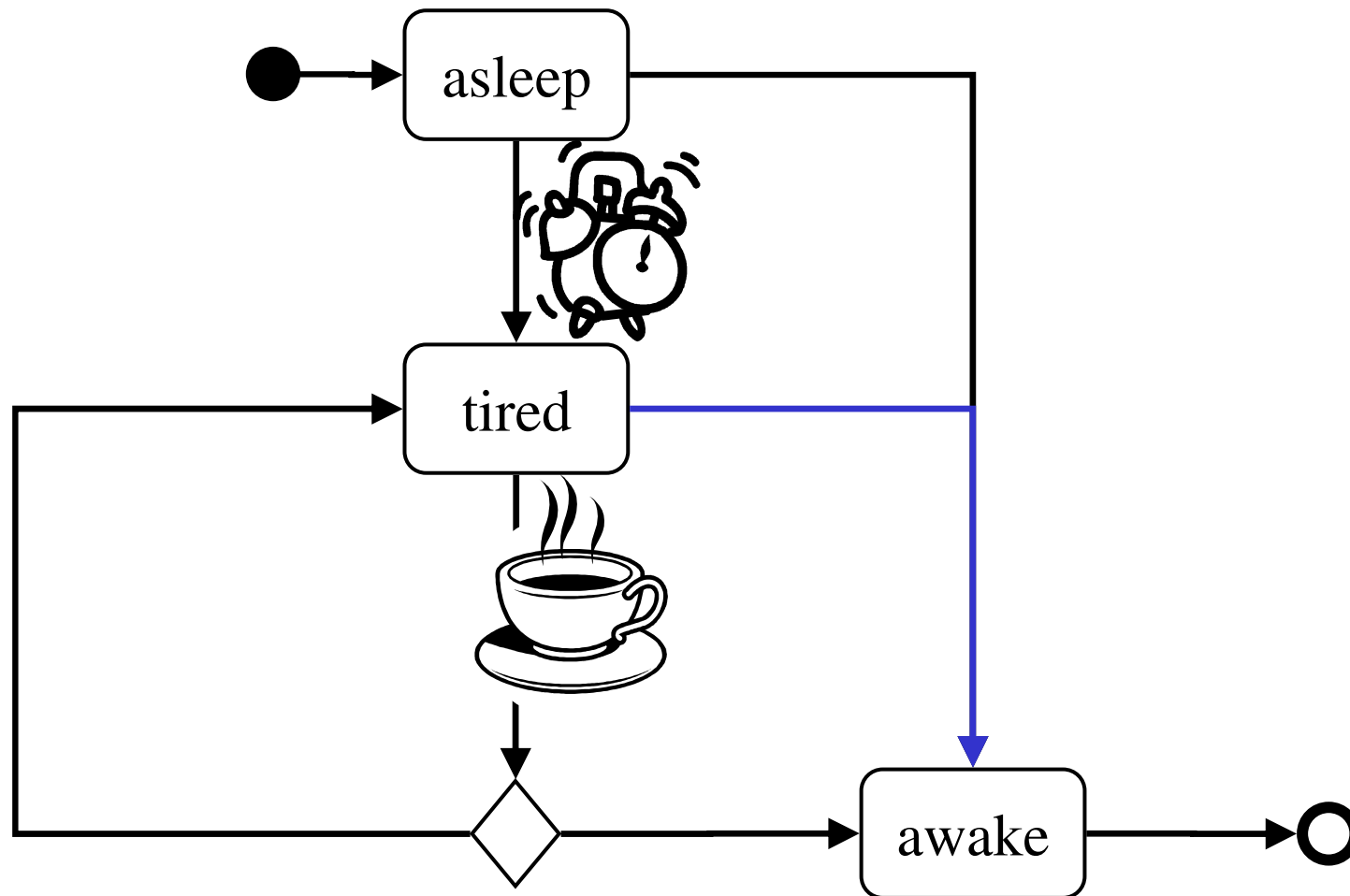
Agenda

- Presentation of the challenge (ca. 20 min)
- The example model (10 min)
- Interactive discussion (45 min)
- Output generation presented live (10 min)
- Summary and conclusion (5 min)

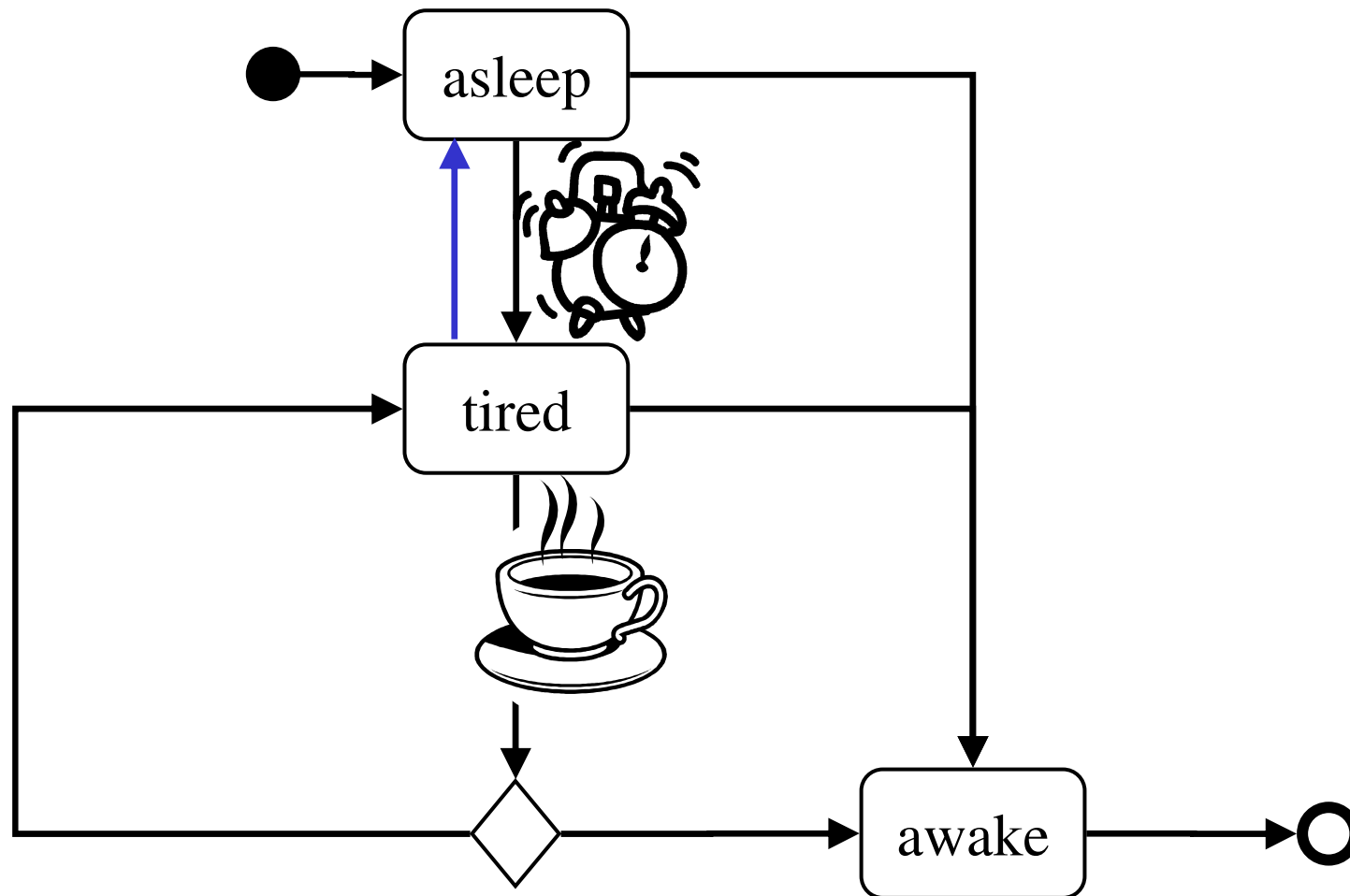
At half past six in the morning...



At half past six in the morning...



At half past six in the morning...





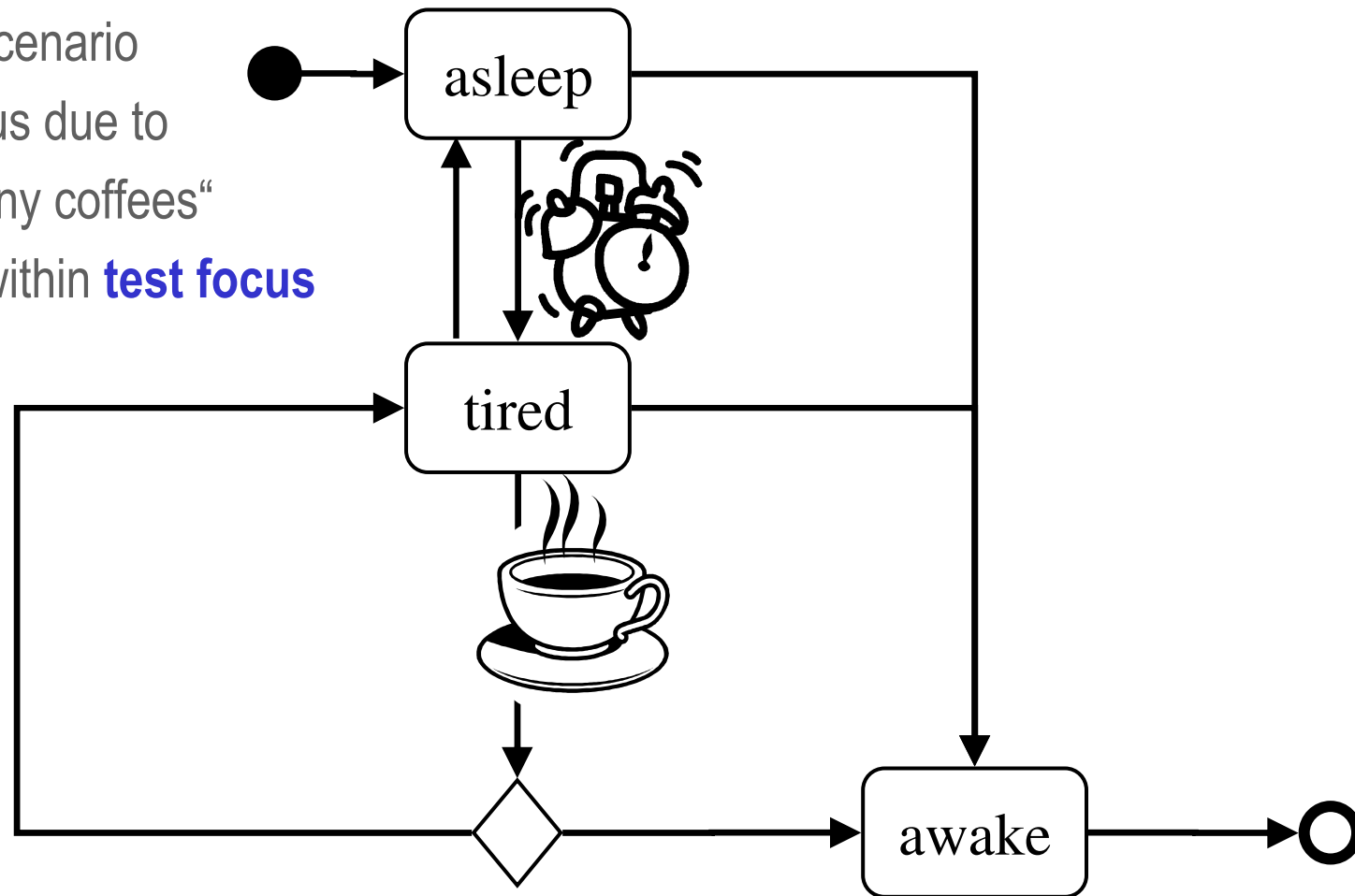
The challenge

Select the “ideal” set of TCs

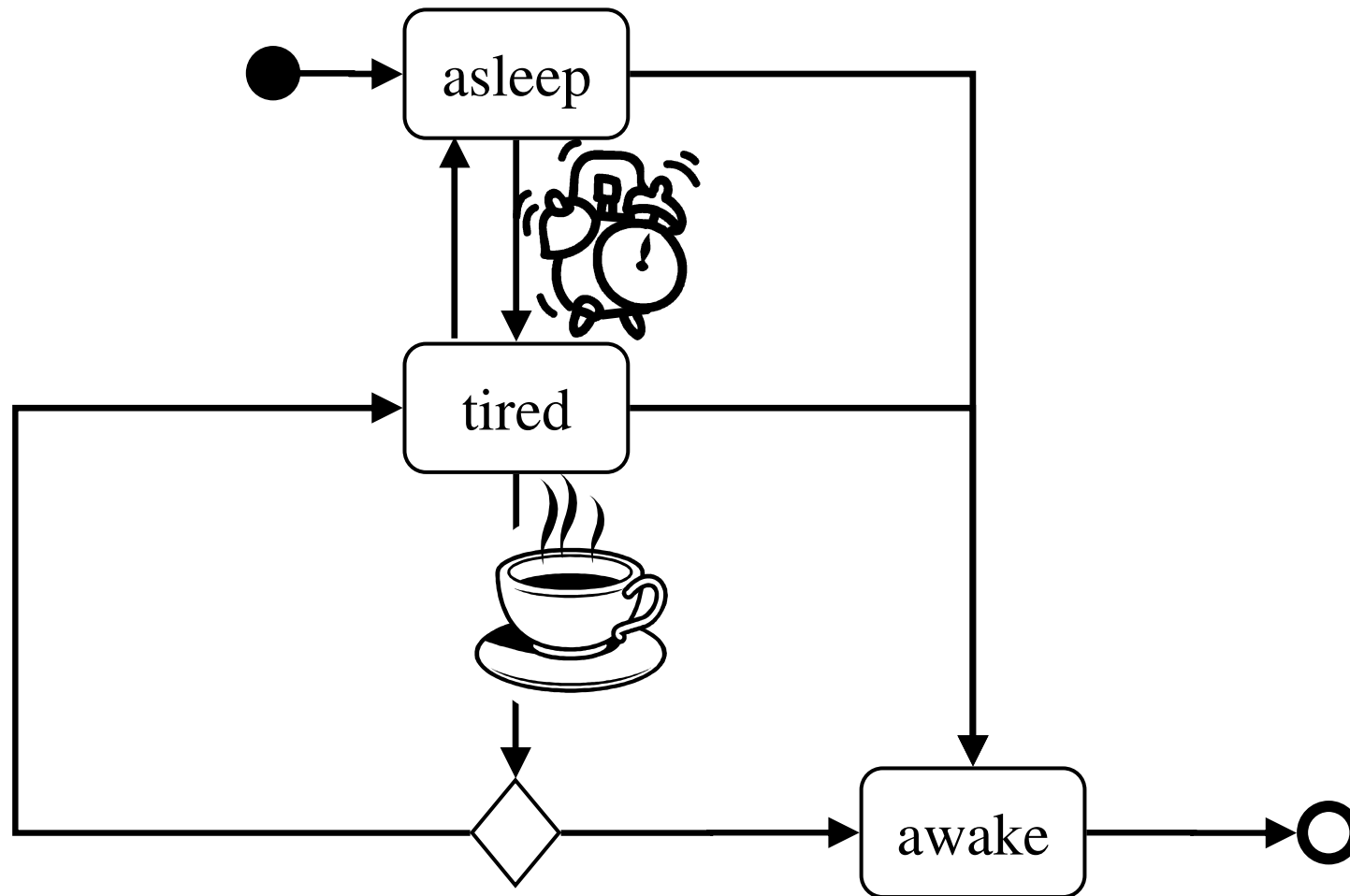
- ... but “ideal” for what?
- preliminary thoughts
 - Test focus: What do I want to test ?
 - workflow / functionality / non-functional requirements
 - nominal behavior / error scenarios⇒ different test focus = different model
 - Test goal: What do I want to obtain ?
 - specific coverage / selected test cases (“happy path”)⇒ different test goal = different test of “ideal” test cases

At half past six in the morning...

Error scenario
„nervous due to
too many coffees“
is not within **test focus**



Manual test case selection



Manual test case selection (conclusion)

- We are used to select the paths (order of test steps) in a way...
 - ...we think fits the test goal
- The selection (test design) is influenced by...
 - ...the order in which ideas come to our mind.
- Already with a very simple model, it is difficult ...
 - ...to keep the overview
 - ⇒ We rather do not change the selected paths (test specification).
 - ⇒ We test more than necessary for the defined test goal.
(or too few...)



Test case selection

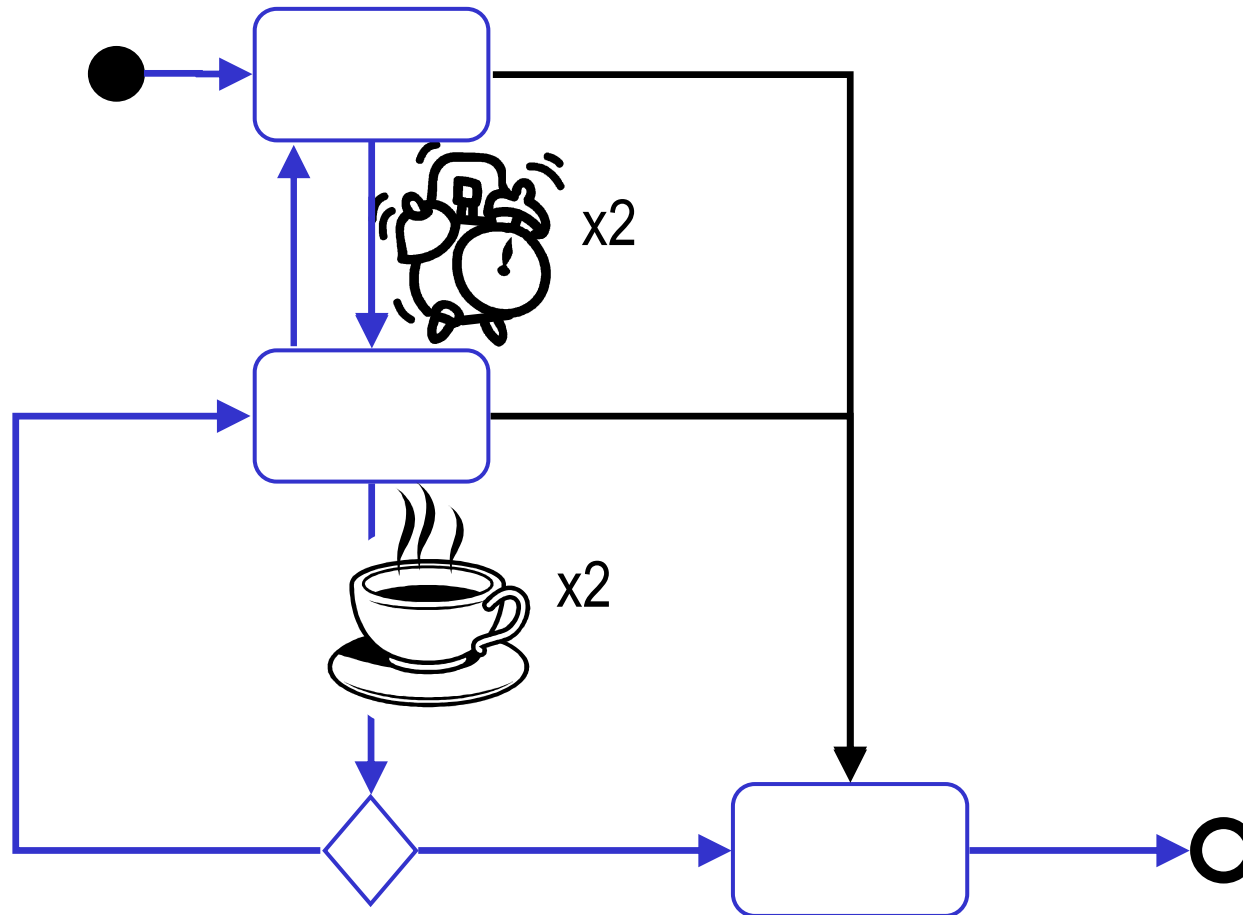
**Now imagine the same task without a model...
...and for a complex system !!!**



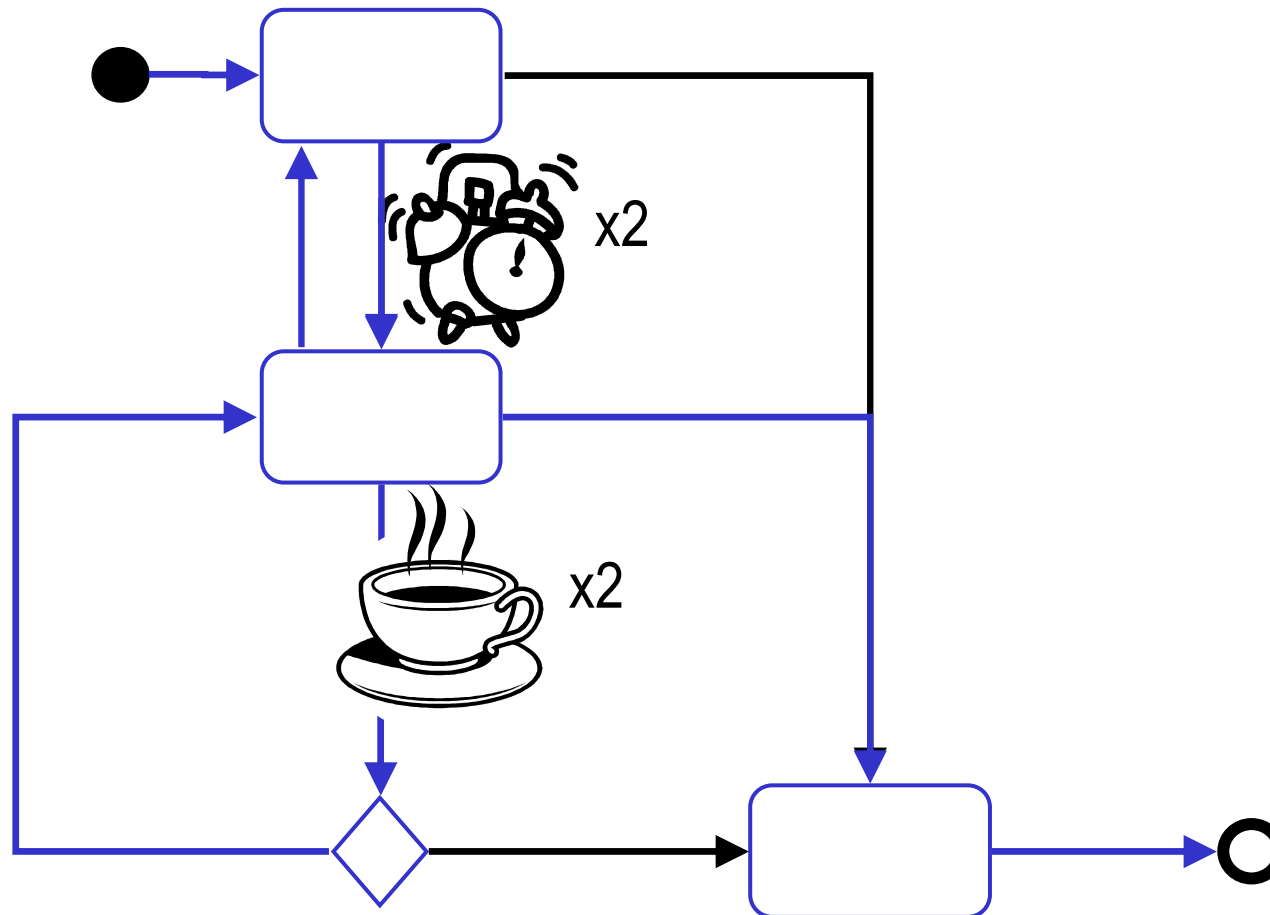
Automatic test case generation

- Full path coverage with maximum number of loops = 1
 - 24 test cases generated
- Edge coverage (MBTsuite)
 - 3 test cases left
- Full path coverage with maximum number of loops = 2
 - 88 test cases generated
 - ⇒ test case explosion

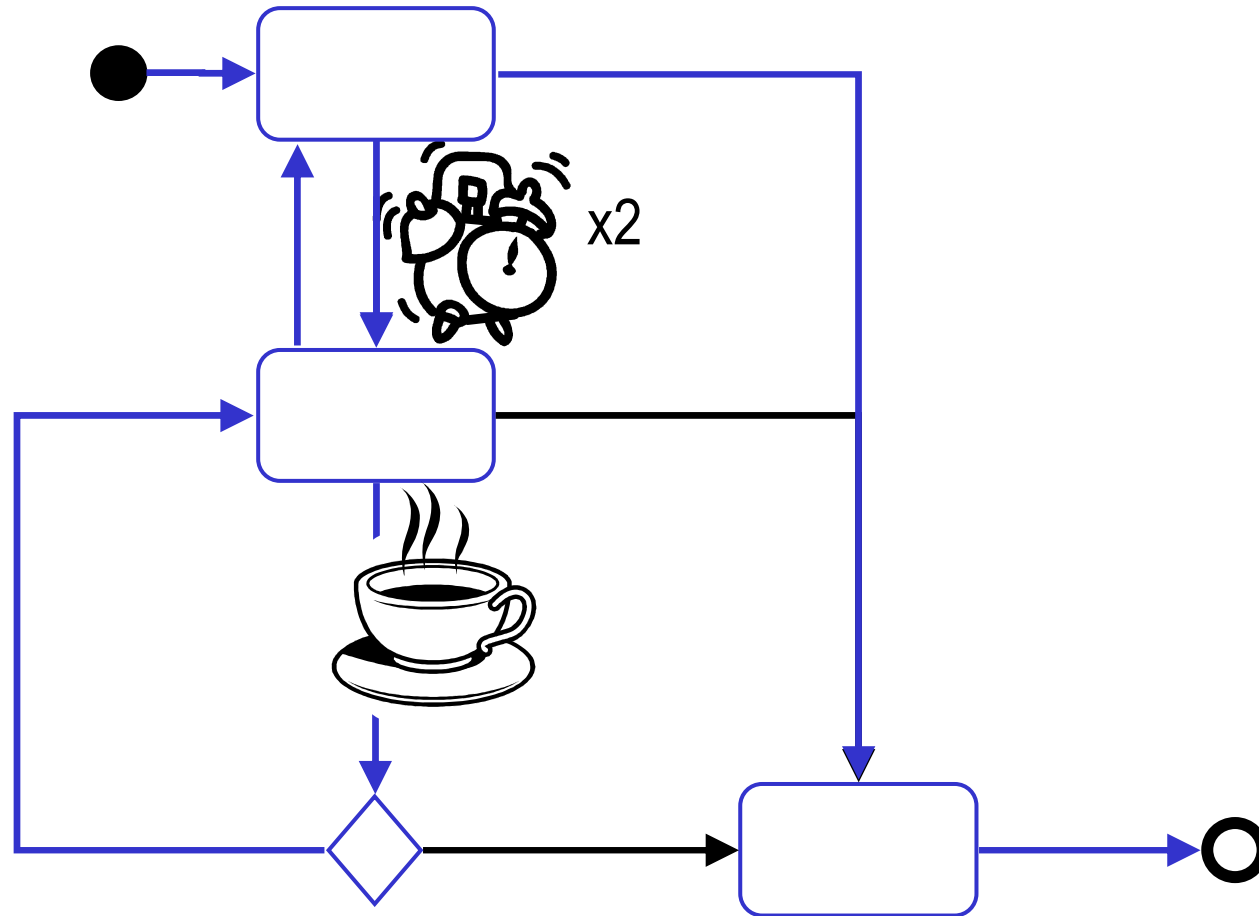
Test Case 1



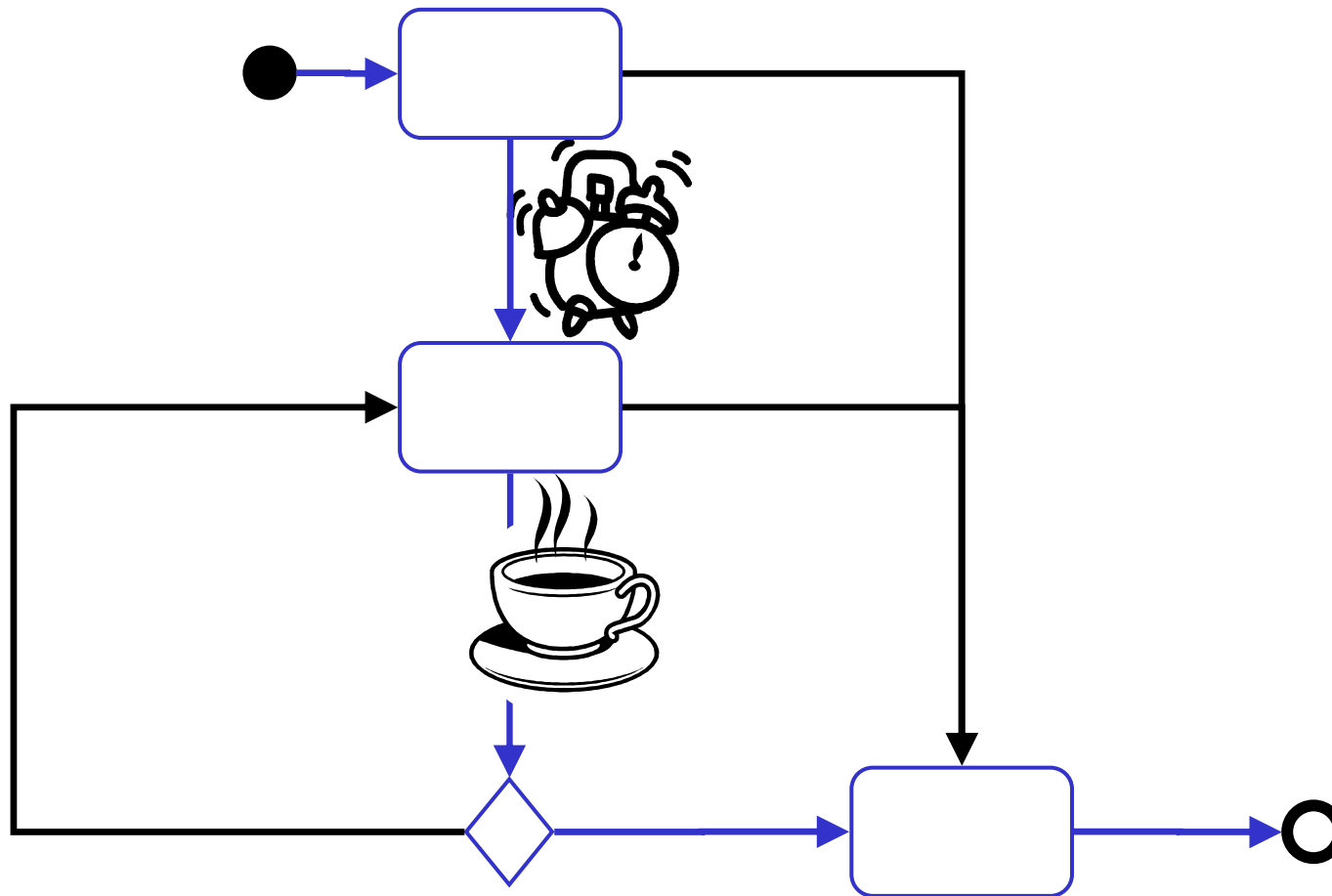
Test Case 2



Test Case 3



“Happy path” is missing



Automatic test case generation (conclusion)

- Full path coverage...
 - provides a set of all test cases that **could** be useful
 - rapidly leads to test case explosion
 - due to loops and combinatory paths
- Tools help to reduce these test cases to a manageable amount
- Edge coverage is a good minimum criterion...
 - to ensure a defined coverage
 - but often not sufficient to reach the test goal
- The generated TCs are often not the ones you have expected !

Test case generation settings

Generation strategy

- Full Path
- Named Path
- Guided Path
- Random Path

Coverage Filter

- Node coverage
- Edge coverage
- Decision coverage
- Requirement coverage

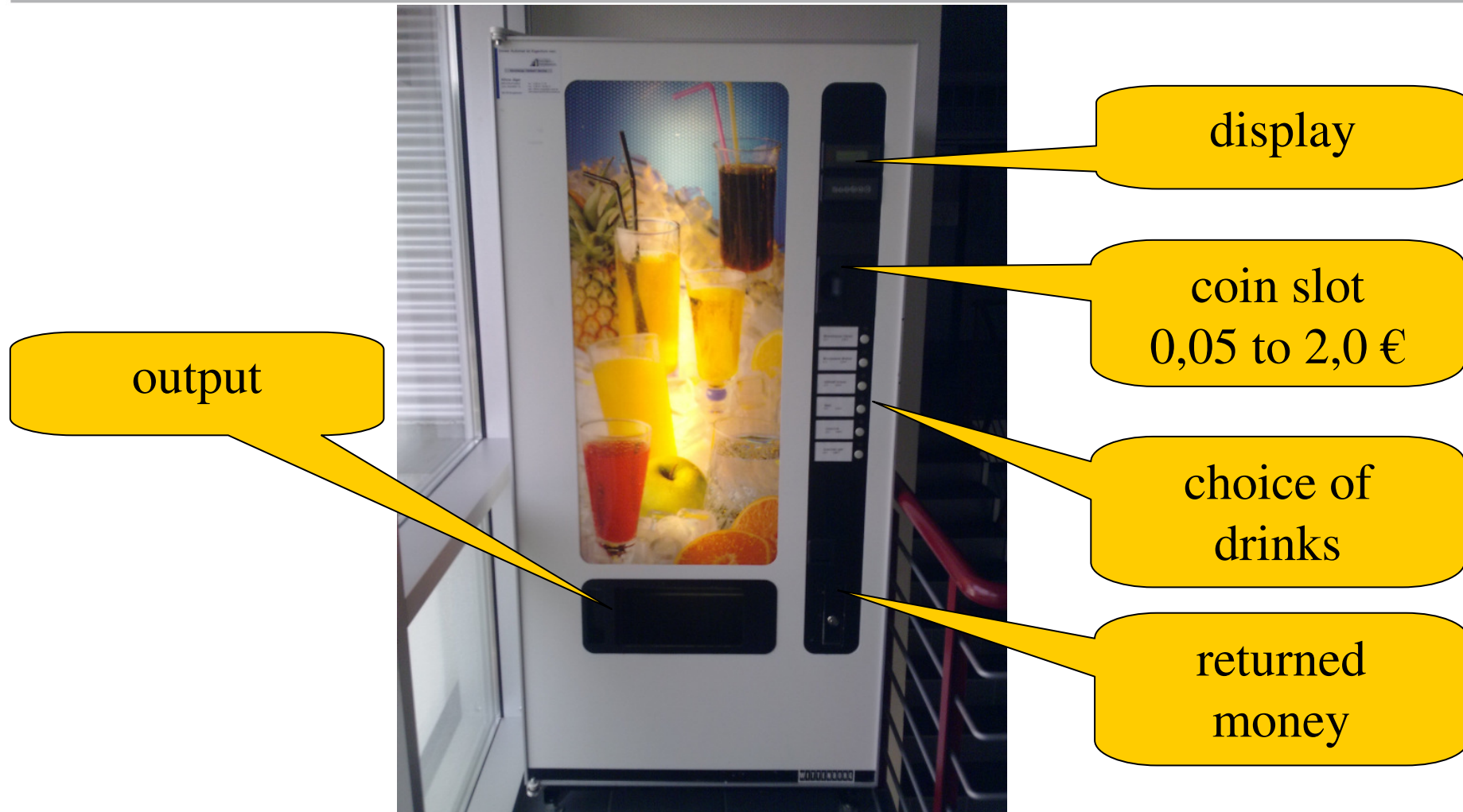




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The system under test





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Summary and conclusion

- Think differently !
 - Automatic test case generation is a paradigm change.
 - Do not impose your choice of test cases.

- Be pragmatic !
 - The way the model is written determines the number of test cases.
 - A test case model is NOT a design model.

- Use different generation settings !
 - Depending on the test goal, different settings are useful.



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Discussion

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