Enabling Interface Validation through Text Generation

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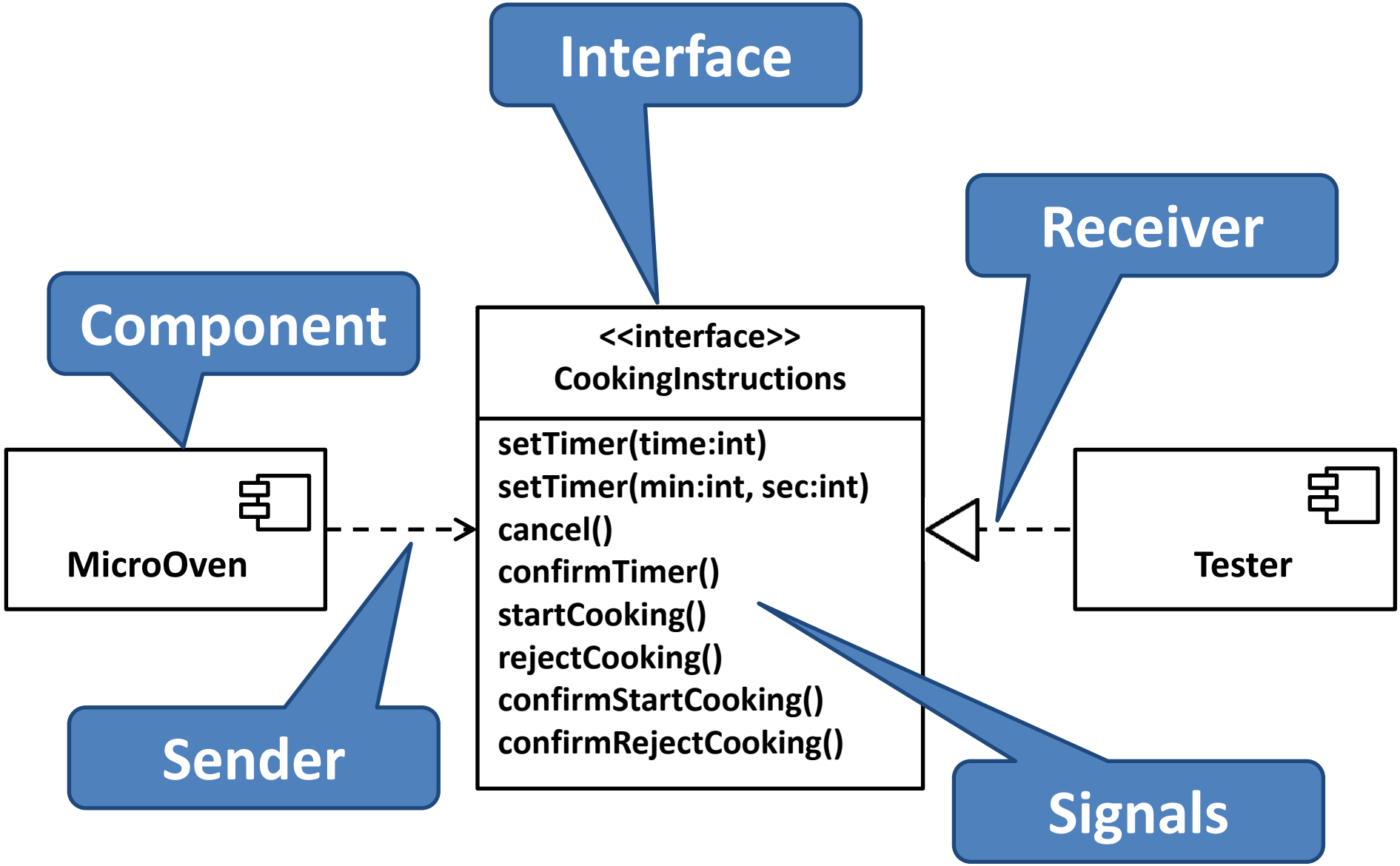
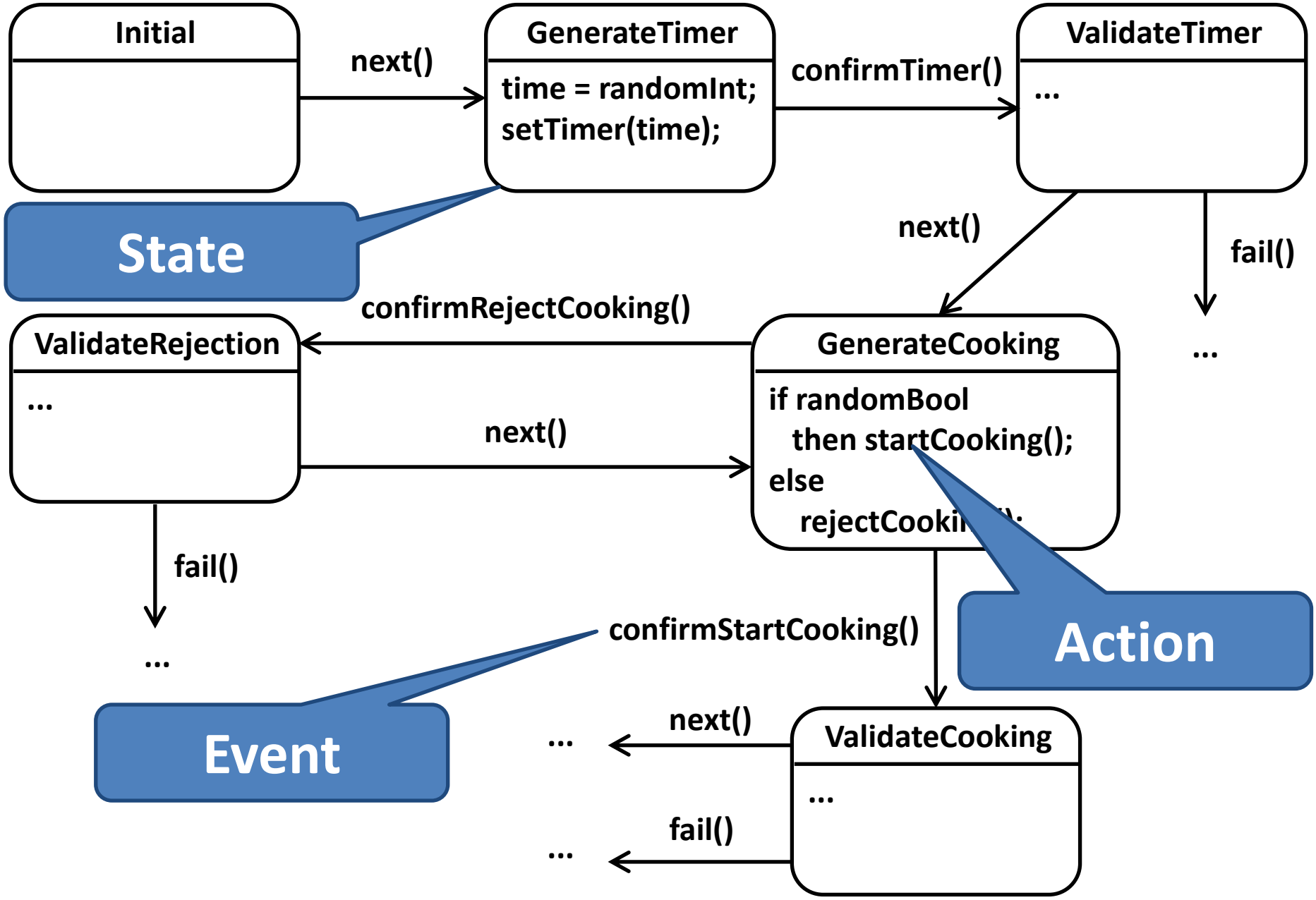
How to validate an interface?


Interface
Receiver
Component
<<interface>>
CookingInstructions
setTimer(time:int)
setTimer(min:int, sec:int)
cancel()
confirmTimer()
startCooking()
rejectCooking()
confirmStartCooking()
confirmRejectCooking()
MicroOven
Tester
Sender
Signals

How to validate an interface?

Use a state machine!
(It’s formal - It’s UML)


Initial
next()
GenerateTimer
time = randomInt;
setTimer(time);
confirmTimer()
ValidateTimer
...
State
next()
fail()
...
confirmRejectCooking()
ValidateRejection
...
GenerateCooking
if randomBool
then startCooking();
else
rejectCooki
next()
fail()
...
confirmStartCooking()
Action
Event
next()
...
ValidateCooking
...
fail()
...

Not always that easy

1. Competence in tools
2. Competence in models
3. Competence in paradigm

Arlow, Emmerich and Quinn, 1999,

"Literate Modelling

– Capturing Business Knowledge with the UML"

Even software developers struggle

- **25 interviews at Ericsson, Volvo Cars and the Volvo Group**

***Q*:** “So do you overload the interface? Throw in a signal just in case?”

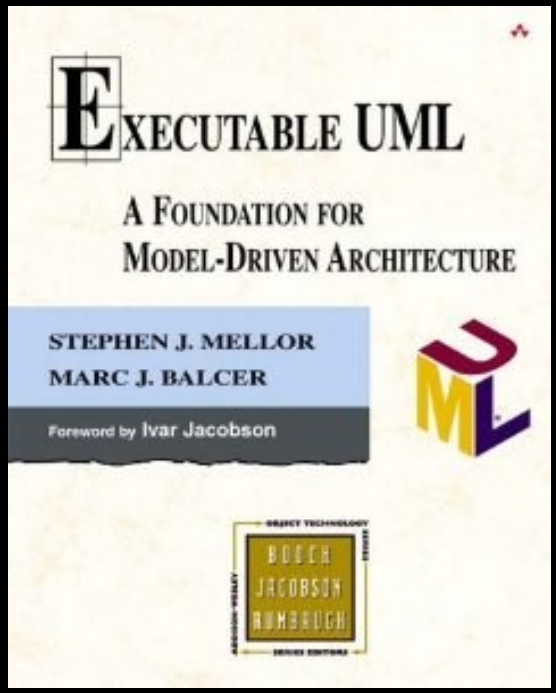
***A*:** “Yes, that is what we do. At least I do it … and then you end up with the problem of not knowing which signal it is you should actually use.”

“The tools are too unintuitive … the threshold for learning how to use them is high”

Prototype solution

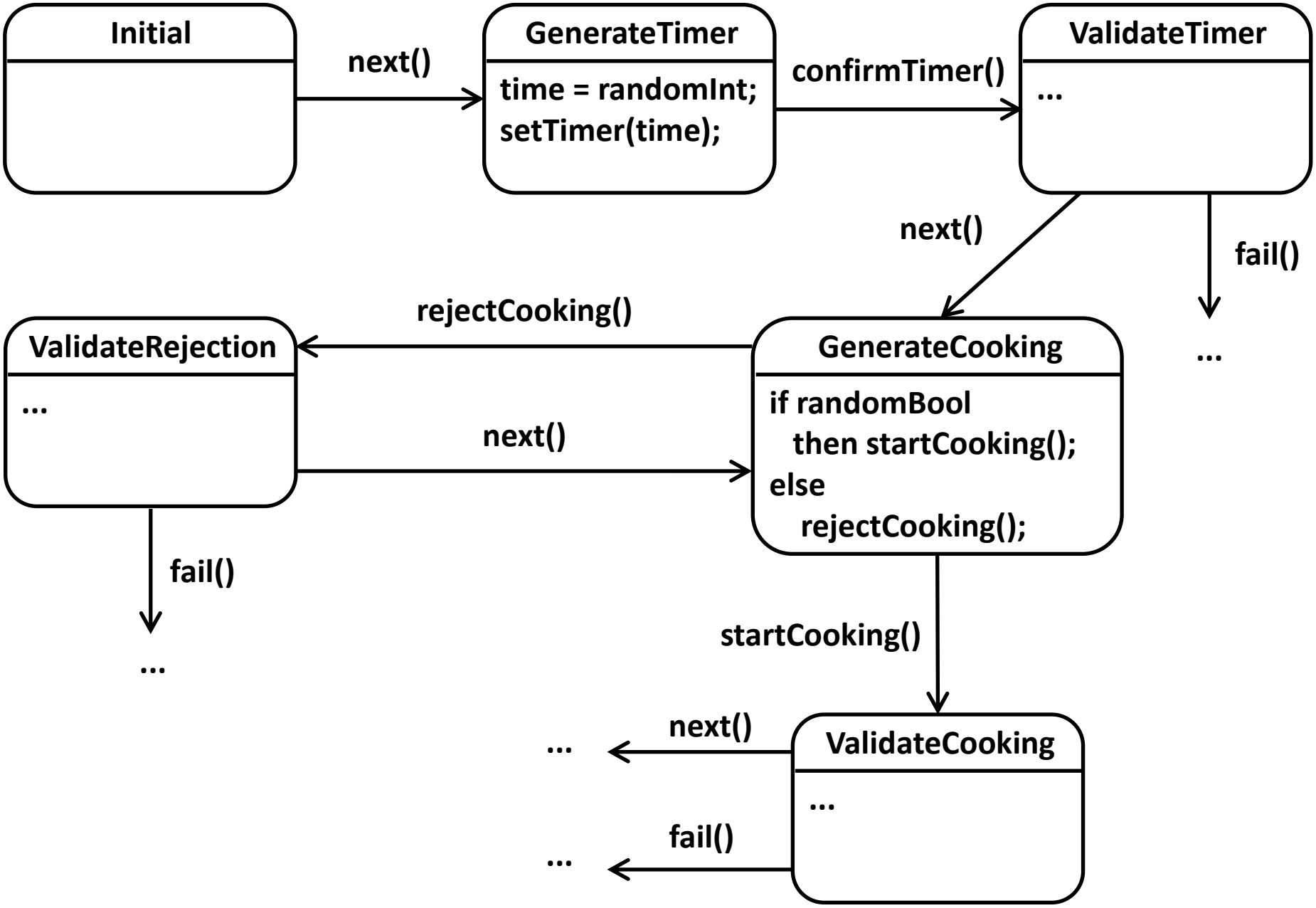
Bridgepoint UML tool:

- Components
- Interfaces
- State machines
- **Model transformation language**



Natural Language Generation

"everybody knows how to consume text"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fail()
...

NLG with the Rule Specification Language

```
01 .select many definedSignals
02     related by interface -> C_EP[R4003] -> C_AS[R4004]
03 <table border="0">
04 <hr>Unused signals in MicroOven:</hr>
05 .assign unusedSignals = definedSignals - usedSignals
06 .if (not_empty unusedSignals)
07   .for each signal in unusedSignals
08     .invoke paramText = GetParamData
09     <tr><td><i>${signal.name (paramText)</i></td></tr>
10   .end for
11 .else
12   <b>All defined signals are used.</b>
13 .end if
```

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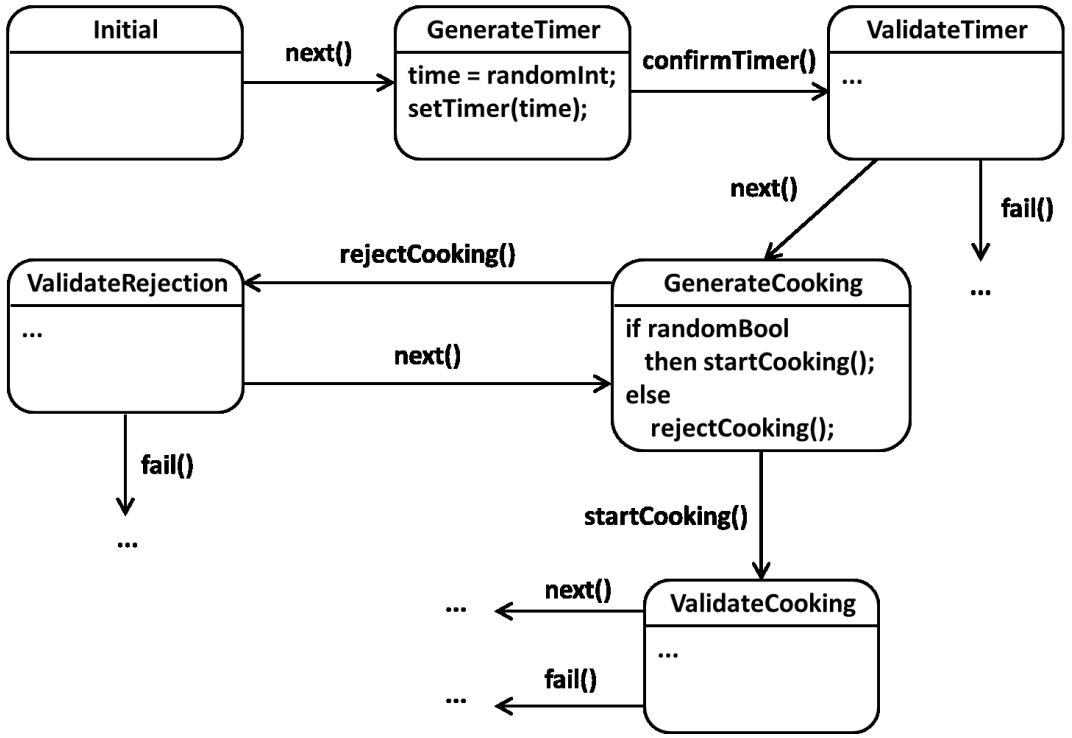

Intended usage of MicroOven:

1: **Tester** sends *setTimer(time:int)*
MicroOven responds with *confirmTimer()*

2: **Tester** sends *startCooking()*
MicroOven responds with *confirmStartCooking()*

2: **Tester** sends *rejectCooking()*
MicroOven responds with *confirmRejectCooking()*

Unused signals in MicroOven:

setTimer(min:int, sec:int)

cancel()

Conclusions

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MicroOven responds with *confirmStartCooking()*

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MicroOven responds with *confirmRejectCooking()*

Unused signals in MicroOven:

setTimer(min:int, sec:int)

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Models and tools challenging for SE

Prototype: NLG from interfaces

Future Work

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MicroOven responds with *confirmRejectCooking()*

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Richer text vs Effort?

Industrial evaluation?!