```
1  ──────────────────── MODULE Fischer2 ────────────────────
2  EXTENDS FischerPreface
3  ──────────────────────────────────────────────────────────
4  CONSTANTS Gamma
5  ASSUME Epsilon < Gamma
6  ──────────────────────────────────────────────────────────
7  NCS(t) ≜
8          ∧ GoFromTo(t, "ncs", "a")
9          ∧ UNCHANGED x
10
11 StmtA(t) ≜
12     ∧ x = NotAThread
13     ∧ GoFromTo(t, "a", "b")
14     ∧ UNCHANGED x
15
16 StmtB(t) ≜
17     ∧ x' = t
18     ∧ GoFromTo(t, "b", "c")
19
20 StmtC(t) ≜
21     ∧ At(t, "c")
22     ∧ TimedOut(t, lbTimer)
23     ∧ IF x ≠ t THEN GoTo(t, "a") ELSE GoTo(t, "cs")
24     ∧ UNCHANGED x
25
26 CS(t) ≜
27         ∧ GoFromTo(t, "cs", "d")
28         ∧ UNCHANGED x
29
30 StmtD(t) ≜
31     ∧ x' = NotAThread
32     ∧ GoFromTo(t, "d", "ncs")
33
34 TNext(t) ≜
35     ∨ NCS(t)
36     ∨ StmtA(t) ∨ StmtB(t) ∨ StmtC(t)
37     ∨ CS(t)
38     ∨ StmtD(t)
39 ──────────────────────────────────────────────────────────
40 Tick ≜
41     ∃ d ∈ Real :
42         ∧ d > 0
43         ∧ ∀ t ∈ Thread :
44             ubTimer[t] ≠ Infinity ⇒ ubTimer[t] > d
45         ∧ now' = now + d    Where is now used in the spec?
46         ∧ ubTimer' = [t ∈ Thread ↦
47                         IF ubTimer[t] = Infinity THEN Infinity
```

```
                                                    ELSE  ubTimer[t] − d]
        ∧ lbTimer′ = [t ∈ Thread ↦ Max(0, lbTimer[t] − d)]
        ∧ UNCHANGED ⟨x, pc, counter⟩

SetTimer(t) ≜
    ∧ lbTimer′ = [lbTimer EXCEPT ![t] = IF At(t, "b") THEN Epsilon
                                                      ELSE 0]
    ∧ ubTimer′ = [s ∈ Thread ↦
                    IF s = t THEN IF  ∨ GoTo(s, "b")
                                      ∨ GoTo(s, "d")
                                      ∨ GoTo(s, "a") ∧ x′ = NotAThread
                                  THEN Delta
                                  ELSE IF GoTo(s, "c") THEN Gamma
                                                       ELSE Infinity
                             ELSE IF At(s, "a") THEN IF x′ = NotAThread THEN Delta
                                                                        ELSE Infinity
                                                ELSE ubTimer[s]]
    ∧ UNCHANGED now

Next ≜
    ∨ Tick
    ∨ ∃ t ∈ Thread :
        ∧ TNext(t)
        ∧ SetTimer(t)

FSpec2 ≜ Init ∧ □[Next]_vars
```

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THEOREM FSpec2 ⇒ □MutualExclusion
```

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* Modification History
* Last modified *Fri Aug* 06 11:23:27 *CST* 2021 by *hengxin*
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