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- Module AbsJupiter -
 1 1
     Abstract Jupiter, inspired by the COT algorithm proposed by Sun and Sun; see TPDS'2009.
 5 EXTENDS JupiterSerial
 6 |
    VARIABLES
                    copss[r]: the state space (i.e., a set) of Cops maintained at replia r \in Replica
     vars \triangleq \langle intVars, ctxVars, serialVars, copss \rangle
10
11
     TypeOK \triangleq
12
                TypeOKInt
13
                TypeOKCtx
14
                TypeOKSerial
15
                Comm(Cop)! TypeOK
16
                copss \in [Replica \rightarrow SUBSET \ Cop]
17
18
     Init \; \stackrel{\scriptscriptstyle \Delta}{=} \;
19
          \wedge InitInt
20
          \wedge InitCtx
21
          \land \mathit{InitSerial}
22
          \land Comm(Cop)!Init
23
          \land copss = [r \in Replica \mapsto \{\}]
25 1
    RECURSIVE xForm(\_, \_)
26
     xForm(cop, r) \triangleq
27
          LET ctxDiff \stackrel{\Delta}{=} ds[r] \setminus cop.ctx Theorem : cop.ctx \subseteq ds[r]
28
               RECURSIVE xFormHelper(\_, \_, \_)
29
                 xFormHelper(coph, ctxDiffh, copssr) \triangleq copssr: state space generated during transformation
30
                      IF ctxDiffh = \{\} THEN [xcop \mapsto coph, xcopss \mapsto copssr]
31
                       ELSE LET foph \stackrel{\triangle}{=} CHOOSE \ op \in ctxDiffh: the first op in serial
32
                                                     \forall opprime \in ctxDiffh \setminus \overline{\{op\} : tb(op, opprime, serial[r])}
33
                                     fcophDict \triangleq \{op \in copssr : op.oid = foph \land op.ctx = coph.ctx\}
34
                                     fcoph \stackrel{\triangle}{=} CHOOSE \ op \in fcophDict : TRUE \ THEOREM : Cardinality(fophDict) = 1
35
                                      xcoph \triangleq COT(coph, fcoph)
36
                                      xfcoph \triangleq COT(fcoph, coph)
37
                                      xFormHelper(xcoph, ctxDiffh \setminus \{foph\}, copssr \cup \{xcoph, xfcoph\})
38
                xFormHelper(cop, ctxDiff, copss[r])
39
     Perform(cop, r) \triangleq
41
         LET xform \stackrel{\triangle}{=} xForm(cop, r) [xcop, xcopss]
42
                 \land copss' = [copss \ EXCEPT \ ![r] = xform.xcopss \cup \{cop\}]
43
                 \land SetNewAop(r, xform.xcop.op)
44
45
     DoOp(c, op) \stackrel{\Delta}{=} Client \ c \in Client \ processes \ a \ locally \ generated \ operation \ op.
46
            LET cop \stackrel{\Delta}{=} [op \mapsto op, oid \mapsto [c \mapsto c, seq \mapsto cseq'[c]], ctx \mapsto ds[c]]
47
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\land Perform(cop, c)
               IN
48
                       \land Comm(Cop)! CSend(cop)
49
     Do(c) \triangleq
51
             \wedge DoCtx(c)
52
             \wedge DoSerial(c)
53
             \wedge DoInt(DoOp, c)
54
     Rev(c) \triangleq
56
             \land Comm(Cop)! CRev(c)
57
             \land Perform(Head(cincoming[c]), c)
58
             \land RevSerial(c)
59
             \wedge RevCtx(c)
60
             \land RevInt(c)
61
     SRev \triangleq
63
           \begin{array}{l} \wedge \; Comm(\mathit{Cop}) ! \, SRev \\ \wedge \; \text{LET} \; \mathit{cop} \; \stackrel{\triangle}{=} \; \mathit{Head}(\mathit{sincoming}) \end{array}
64
65
                       \land Perform(cop, Server)
66
                       \land Comm(Cop)!SSendSame(cop.oid.c, cop)
67
           \land \ SRevSerial
68
           \land SRevCtx
69
           \land SRevInt
70
71
     Next \triangleq
72
           \forall \exists c \in Client : Do(c) \lor Rev(c)
73
           \vee SRev
74
     Fairness \stackrel{\triangle}{=}
76
          WF_{vars}(SRev \lor \exists c \in Client : Rev(c))
77
     Spec \stackrel{\triangle}{=} Init \wedge \Box [Next]_{vars} \wedge Fairness
79
80
     Compactness \; \stackrel{\scriptscriptstyle \Delta}{=} \;
81
           Comm(Cop)!EmptyChannel \Rightarrow Cardinality(Range(copss)) = 1
82
     Theorem Spec \Rightarrow Compactness
84
85 L
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