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1  ---------- MODULE CJupiter ----------
   Specification of our own CJupiter protocol; see Wei@OPODIS'2018.
5  EXTENDS JupiterSerial, GraphStateSpace
6  ----------
7  VARIABLES
8      css      css[r]: the n-ary ordered state space at replica r ∈ Replica
10 vars ≜ ⟨intVars, ctxVars, serialVars, css⟩
11 ----------
12 TypeOK ≜
13     ∧  TypeOKInt
14     ∧  TypeOKCtx
15     ∧  TypeOKSerial
16     ∧  ∀ r ∈ Replica : IsSS(css[r])
17 ----------
18 Init ≜
19     ∧ InitInt
20     ∧ InitCtx
21     ∧ InitSerial
22     ∧ css = [r ∈ Replica ↦ EmptySS]
23 ----------
24 NextEdge(r, u, ss) ≜  Return the first outgoing edge from u in ss at replica r
25     CHOOSE e ∈ ss.edge :
26         ∧ e.from = u
27         ∧ ∀ ue ∈ ss.edge \ {e} :
28             (ue.from = u) ⇒ tb(e.cop.oid, ue.cop.oid, serial[r])
30 Perform(r, cop) ≜
31     LET xform ≜ xForm(NextEdge, r, cop, css[r])   xform: [xcop, xss, lss]
32     IN   ∧ css′ = [css EXCEPT ![r] = @ ⊕ xform.xss]
33          ∧ SetNewAop(r, xform.xcop.op)
35 ClientPerform(c, cop) ≜ Perform(c, cop)
37 ServerPerform(cop) ≜
38     ∧ Perform(Server, cop)
39     ∧ Comm!SSendSame(ClientOf(cop), cop)   broadcast the original cop
40 ----------
41 DoOp(c, op)  ≜
42       LET cop ≜ [op ↦ op, oid ↦ [c ↦ c, seq ↦ cseq[c]], ctx ↦ ds[c]]
43        IN   ∧ ClientPerform(c, cop)
44             ∧ Comm!CSend(cop)
46 Do(c) ≜
47       ∧ DoInt(DoOp, c)
48       ∧ DoCtx(c)
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49          ∧ DoSerial(c)

51  Rev(c) ≜
52          ∧ RevInt(ClientPerform, c)
53          ∧ RevCtx(c)
54          ∧ RevSerial(c)

56  SRev ≜
57          ∧ SRevInt(ServerPerform)
58          ∧ SRevCtx
59          ∧ SRevSerial
60 ├──────────────────────────────────────────────────────────────────────┤
61  Next ≜
62          ∨ ∃ c ∈ Client : Do(c) ∨ Rev(c)
63          ∨ SRev

65  Fairness ≜
66          WF_vars(SRev ∨ ∃ c ∈ Client : Rev(c))

68  Spec ≜ Init ∧ □[Next]_vars  ∧ Fairness
69 ├──────────────────────────────────────────────────────────────────────┤
70  Compactness ≜  Compactness of CJupiter: the CSSes at all replicas are the same.
71          Comm!EmptyChannel ⇒ Cardinality(Range(css)) = 1

73  THEOREM Spec ⇒ □Compactness
74 └──────────────────────────────────────────────────────────────────────┘
   \* Modification History
   \* Last modified Mon Jan 28 20:08:29 CST 2019 by hengxin
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