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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
25     CHOOSE e ∈ ss.edge :  in n-ary ordered space ss at replica r.
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 Sat Jan 12 15:11:38 CST 2019 by hengxin
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