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MODULE CJupiter
Specification of our own CJupiter protocol; see Wei@OPODIS'2018.
EXTENDS StateSpace, JupiterSerial
VARIABLES
    css      css[r]: the n-ary ordered state space at replica r ∈ Replica
vars ≜ ⟨intVars, ctxVars, serialVars, css⟩
TypeOK ≜
    ∧  TypeOKInt
    ∧  TypeOKCtx
    ∧  TypeOKSerial
    ∧  ∀ r ∈ Replica : IsSS(css[r])
Init ≜
    ∧ InitInt
    ∧ InitCtx
    ∧ InitSerial
    ∧ css = [r ∈ Replica ↦ EmptySS]
NextEdge(r, u, ss) ≜  Return the first outgoing edge from u in ss at replica r.
    CHOOSE e ∈ ss.edge :
        ∧  e.from = u
        ∧  ∀ ue ∈ ss.edge \ {e} :
             (ue.from = u) ⇒ tb(e.cop.oid, ue.cop.oid, serial[r])
xForm(r, cop) ≜  Iteratively transform cop with a path in the state space at replica r,
    LET rcss ≜ css[r]  following the first edges.
        u ≜ Locate(cop, rcss)
        cops ≜ ExtractCopSeq(NextEdge, r, u, rcss)
    IN  xFormCopCopsSS(cop, cops)
Perform(r, cop) ≜
    LET xform ≜ xForm(r, cop)  xform: [xcop, xss, lss]
    IN  ∧ css′ = [css EXCEPT ![r] = @ ⊕ xform.xss]
        ∧ SetNewAop(r, xform.xcop.op)
ClientPerform(c, cop) ≜ Perform(c, cop)
ServerPerform(cop) ≜
    ∧ Perform(Server, cop)
    ∧ Comm!SSendSame(ClientOf(cop), cop)  broadcast the original cop
DoOp(c, op)  ≜
    LET cop ≜ [op ↦ op, oid ↦ [c ↦ c, seq ↦ cseq[c]], ctx ↦ ds[c]]
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49          IN    ∧ ClientPerform(c, cop)
50                ∧ Comm!CSend(cop)

52  Do(c) ≜
53        ∧ DoInt(DoOp, c)
54        ∧ DoCtx(c)
55        ∧ DoSerial(c)

57  Rev(c) ≜
58        ∧ RevInt(ClientPerform, c)
59        ∧ RevCtx(c)
60        ∧ RevSerial(c)

62  SRev ≜
63      ∧ SRevInt(ServerPerform)
64      ∧ SRevCtx
65      ∧ SRevSerial
66 ├──────────────────────────────────────────────────────────────────────┤
67  Next ≜
68      ∨ ∃ c ∈ Client : Do(c) ∨ Rev(c)
69      ∨ SRev

71  Fairness ≜
72      WF_vars(SRev ∨ ∃ c ∈ Client : Rev(c))

74  Spec ≜ Init ∧ □[Next]_vars  ∧ Fairness
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76  Compactness ≜  Compactness of CJupiter: the CSSes at all replicas are the same.
77      Comm!EmptyChannel ⇒ Cardinality(Range(css)) = 1

79  THEOREM Spec ⇒ Compactness
80 └──────────────────────────────────────────────────────────────────────┘
    \* Modification History
    \* Last modified Tue Jan 08 14:03:12 CST 2019 by hengxin
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