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1  ──────────── MODULE XJupiterImplCJupiter ────────────
   We show that XJupiter (XJupiterExtended) implements CJupiter.
6  EXTENDS XJupiterExtended

8  VARIABLES
9      op2ss,      a function from an operation (represented by its Oid)
10                 to the part of 2D state space produced while the operation is transformed
11     c2ssX       c2ssX[c]: redundant (eXtra) 2D state space maintained for client c ∈ Client

13 varsImpl ≜ ⟨varsEx, op2ss, c2ssX⟩
14 ├──────────────────────────────────────────────────┤
15 TypeOKImpl ≜
16     ∧ TypeOKEx
17     ∧ ∀ oid ∈ DOMAIN op2ss : oid ∈ Oid ∧ IsSS(op2ss[oid])
18     ∧ ∀ c ∈ Client : IsSS(c2ssX[c])
19 ├──────────────────────────────────────────────────┤
20 InitImpl ≜
21     ∧ InitEx
22     ∧ op2ss = ⟨⟩
23     ∧ c2ssX = [c ∈ Client ↦ [node ↦ {{}}, edge ↦ {}]]
24 ├──────────────────────────────────────────────────┤
   Take union of 2D state spaces ss1 and ss2.
28 ss1 ⊕ ss2 ≜
29     [ss1 EXCEPT !.node = @ ∪ ss2.node,
30                 !.edge = @ ∪ ss2.edge]
   Ignore the lr field in edges of 2D state space ss.
34 IgnoreDir(ss) ≜
35     [ss EXCEPT !.edge =
36         {[field ∈ (DOMAIN e \ {"lr"}) ↦ e.field] : e ∈ @}]
37       {[from ↦ e.from, to ↦ e.to, cop ↦ e.cop] : e ∈ @}]
38 ├──────────────────────────────────────────────────┤
39 DoImpl(c) ≜
40     ∧ DoEx(c)
41     ∧ UNCHANGED ⟨op2ss, c2ssX⟩

43 RevImpl(c) ≜
44     ∧   RevEx(c)
45     ∧   LET cop ≜ Head(cincoming[c])
46           IN   c2ssX′ = [c2ssX EXCEPT ![c] = @ ⊕ op2ss[cop.oid]]
47     ∧   UNCHANGED ⟨op2ss⟩

49 SRevImpl ≜
50     ∧ SRevEx
51     ∧ LET cop ≜ Head(sincoming)
52           c ≜ cop.oid.c
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53              ss  ≜  xForm(cop, s2ss[c], scur[c], Remote)
54          IN  op2ss′ = op2ss @@ (cop.oid :> [node ↦ Range(ss.node), edge ↦ Range(ss.edge)])
55      ∧ UNCHANGED ⟨c2ssX⟩
56 ├──────────────────────────────────────────────────────────────────────────┤
57  NextImpl  ≜
58      ∨ ∃ c ∈ Client : DoImpl(c) ∨ RevImpl(c)
59      ∨ SRevImpl
60
61  SpecImpl  ≜  InitImpl ∧ □[NextImpl]_varsImpl
62      ∧ WF_varsImpl(SRevImpl ∨ ∃ c ∈ Client : RevImpl(c))
63
64  CJ  ≜  INSTANCE CJupiter
65             WITH cincoming ← cincomingCJ,
66                  css ← [r ∈ Replica ↦
67                             IF r = Server
68                              THEN IgnoreDir(SetReduce( ⊕ , Range(s2ss),
69                                                  [node ↦ {{}}, edge ↦ {}]))
70                              ELSE IgnoreDir(c2ss[r] ⊕ c2ssX[r])],
71                  cur ← [r ∈ Replica ↦
72                             IF r = Server
73                              It SHOULD be that Cardinality(Range(scur)) = 1
74                              THEN CHOOSE n ∈ Range(scur) : TRUE
75                              ELSE ccur[r]]
76
77  THEOREM SpecImpl ⇒ CJ!Spec
78 └──────────────────────────────────────────────────────────────────────────┘
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