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1  |----- MODULE CJupiter -----|
   | Specification of CJupiter; 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       $\wedge DoSerial(c)$ 
51   $Rev(c) \triangleq$ 
52       $\wedge RevInt(ClientPerform, c)$ 
53       $\wedge RevCtx(c)$ 
54       $\wedge RevSerial(c)$ 
56   $SRev \triangleq$ 
57       $\wedge SRevInt(ServerPerform)$ 
58       $\wedge SRevCtx$ 
59       $\wedge SRevSerial$ 
60  |
61   $Next \triangleq$ 
62       $\vee \exists c \in Client : Do(c) \vee Rev(c)$ 
63       $\vee SRev$ 
65   $Fairness \triangleq$ 
66       $WF_{vars}(SRev \vee \exists c \in Client : Rev(c))$ 
68   $Spec \triangleq Init \wedge \Box [Next]_{vars} \wedge Fairness$ 
69  |
70   $Compactness \triangleq$  Compactness of CJupiter: the CSSes at all replicas are the same.
71       $Comm!EmptyChannel \Rightarrow Cardinality(Range(css)) = 1$ 
73  THEOREM  $Spec \Rightarrow \Box Compactness$ 
74  |
    
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