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1 |----- MODULE XJupiterImplCJupiter -----|
2 | EXTENDS XJupiterExtended |
3 |-----|
4 | VARIABLES
5 |   op2ss,   a function mapping an operation (identifier)
6 |             to the 2D state space created during it is transformed
7 |   c2ssX    c2ssX[c]: redundant (eXtra) 2D state space maintained for client c ∈ Client
8 |
9 |   varsImpl  $\triangleq$   $\langle \textit{varsEx}, \textit{op2ss}, \textit{c2ssX} \rangle$ 
10 |-----|
11 | TypeOKImpl  $\triangleq$ 
12 |    $\wedge$  TypeOKEx
13 |    $\wedge \forall \textit{oid} \in \text{DOMAIN } \textit{op2ss} : \textit{oid} \in \textit{Oid} \wedge \textit{IsSS}(\textit{op2ss}[\textit{oid}])$ 
14 |    $\wedge \forall c \in \textit{Client} : \textit{IsSS}(\textit{c2ssX}[c])$ 
15 |
16 | InitImpl  $\triangleq$ 
17 |    $\wedge$  InitEx
18 |    $\wedge \textit{op2ss} = \langle \rangle$ 
19 |    $\wedge \textit{c2ssX} = [c \in \textit{Client} \mapsto \textit{EmptySS}]$ 
20 |
21 | DoImpl(c)  $\triangleq$ 
22 |    $\wedge$  DoEx(c)
23 |    $\wedge$  UNCHANGED  $\langle \textit{op2ss}, \textit{c2ssX} \rangle$ 
24 |
25 | RevImpl(c)  $\triangleq$ 
26 |    $\wedge$  RevEx(c)
27 |    $\wedge$  LET cop  $\triangleq$  Head(cincoming[c])
28 |   IN   c2ssX' = [c2ssX EXCEPT ![c] = @  $\oplus$  op2ss[cop.oid]]
29 |    $\wedge$  UNCHANGED op2ss
30 |
31 | SRevImpl  $\triangleq$ 
32 |    $\wedge$  SRevEx
33 |    $\wedge$  LET cop  $\triangleq$  Head(sincoming)
34 |    $\wedge$  c  $\triangleq$  ClientOf(cop)
35 |    $\wedge$  xform  $\triangleq$  xForm(NextEdge, Server, cop, s2ss[c])  TODO: performance!!!
36 |   IN   op2ss' = op2ss @@ cop.oid :> xform.xss
37 |    $\wedge$  UNCHANGED c2ssX
38 |-----|
39 | NextImpl  $\triangleq$ 
40 |    $\vee \exists c \in \textit{Client} : \textit{DoImpl}(c) \vee \textit{RevImpl}(c)$ 
41 |    $\vee$  SRevImpl
42 |
43 | FairnessImpl  $\triangleq$ 
44 |    $\text{WF}_{\textit{varsImpl}}(\textit{SRevImpl} \vee \exists c \in \textit{Client} : \textit{RevImpl}(c))$ 
45 |
46 | SpecImpl  $\triangleq$  InitImpl  $\wedge$   $\Box[\textit{NextImpl}]_{\textit{varsImpl}} \wedge \textit{FairnessImpl}$ 
47 |-----|

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48   $CJ \triangleq$  INSTANCE  $CJupiter$ 
49      WITH  $cincoming \leftarrow cincomingCJ$ ,  $sincoming$  needs no substitution
50       $css \leftarrow [r \in Replica \mapsto \text{IF } r = Server$ 
51          THEN  $SetReduce(\oplus, Range(s2ss), EmptySS)$ 
52          ELSE  $c2ss[r] \oplus c2ssX[r]]$ 

54  THEOREM  $SpecImpl \Rightarrow CJ!Spec$ 
55  ───────────────────────────────────────────────────────────────────────────────────
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