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1 |----- MODULE XJupiterImplCJupiter -----|
2 | EXTENDS XJupiterExtended    XJupiter extended with JupiterSerial |
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 |    $\wedge \textit{TypeOKEx}$ 
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 |    $\wedge \textit{InitEx}$ 
18 |    $\wedge \textit{op2ss} = \langle \rangle$ 
19 |    $\wedge \textit{c2ssX} = [c \in \textit{Client} \mapsto \textit{EmptySS}]$ 
20 |
21 | DoImpl(c)  $\triangleq$ 
22 |    $\wedge \textit{DoEx}(c)$ 
23 |    $\wedge \text{UNCHANGED } \langle \textit{op2ss}, \textit{c2ssX} \rangle$ 
24 |
25 | RevImpl(c)  $\triangleq$ 
26 |    $\wedge \textit{RevEx}(c)$ 
27 |    $\wedge \text{LET } \textit{cop} \triangleq \textit{Head}(\textit{cincoming}[c])$ 
28 |    $\text{IN } \textit{c2ssX}' = [\textit{c2ssX} \text{ EXCEPT } ![c] = @ \oplus \textit{op2ss}[\textit{cop.oid}]]$ 
29 |    $\wedge \text{UNCHANGED } \textit{op2ss}$ 
30 |
31 | SRevImpl  $\triangleq$ 
32 |    $\wedge \textit{SRevEx}$ 
33 |    $\wedge \text{LET } \textit{cop} \triangleq \textit{Head}(\textit{sincoming})$ 
34 |    $\textit{c} \triangleq \textit{ClientOf}(\textit{cop})$ 
35 |    $\textit{xform} \triangleq \textit{xForm}(\textit{NextEdge}, \textit{Server}, \textit{cop}, \textit{s2ss}[c])$   TODO: performance!!!
36 |    $\text{IN } \textit{op2ss}' = \textit{op2ss} @ @ \textit{cop.oid} :> \textit{xform.xss}$ 
37 |    $\wedge \text{UNCHANGED } \textit{c2ssX}$ 
38 |-----|
39 | NextImpl  $\triangleq$ 
40 |    $\vee \exists c \in \textit{Client} : \textit{DoImpl}(c) \vee \textit{RevImpl}(c)$ 
41 |    $\vee \textit{SRevImpl}$ 
42 |
43 | FairnessImpl  $\triangleq$ 
44 |    $\text{WF}_{\textit{varsImpl}}(\textit{SRevImpl} \vee \exists c \in \textit{Client} : \textit{RevImpl}(c))$ 
45 |
46 | SpecImpl  $\triangleq \textit{InitImpl} \wedge \Box[\textit{NextImpl}]_{\textit{varsImpl}} \wedge \textit{FairnessImpl}$ 
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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