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1  |----- MODULE XJupiterImplCJupiter -----|
   | We show that XJupiter (XJupiterExtended) implements CJupiter. |
5  | EXTENDS XJupiterExtended |
7  | VARIABLES |
8  |   op2ss,   a function from an operation (represented by its Oid) |
9  |               to the part of 2D state space produced while the operation is transformed |
10 |   c2ssX   c2ssX[c]: redundant (eXtra) 2D state space maintained for client c ∈ Client |
12 | varsImpl  $\triangleq$   $\langle \text{varsEx}, \text{op2ss}, \text{c2ssX} \rangle$  |
13 |-----|
14 | TypeOKImpl  $\triangleq$  |
15 |    $\wedge$  TypeOKEEx |
16 |    $\wedge \forall \text{oid} \in \text{DOMAIN } \text{op2ss} : \text{oid} \in \text{Oid} \wedge \text{IsSS}(\text{op2ss}[\text{oid}])$  |
17 |    $\wedge \forall c \in \text{Client} : \text{IsSS}(\text{c2ssX}[c])$  |
18 |-----|
19 | InitImpl  $\triangleq$  |
20 |    $\wedge$  InitEx |
21 |    $\wedge \text{op2ss} = \langle \rangle$  |
22 |    $\wedge \text{c2ssX} = [c \in \text{Client} \mapsto [\text{node} \mapsto \{\{\}\}, \text{edge} \mapsto \{\}]]$  |
23 |-----|
   | Take union of 2D state spaces ss1 and ss2. |
27 | ss1  $\oplus$  ss2  $\triangleq$  |
28 |   [ss1 EXCEPT !node = @  $\cup$  ss2.node, |
29 |     !edge = @  $\cup$  ss2.edge] |
   | Ignore the lr field in edges of 2D state space ss. |
33 | IgnoreDir(ss)  $\triangleq$  |
34 |   [ss EXCEPT !edge = |
35 |     {[field ∈ (DOMAIN e \ {“lr”})  $\mapsto$  e.field] : e ∈ @}] |
36 |     {[from  $\mapsto$  e.from, to  $\mapsto$  e.to, cop  $\mapsto$  e.cop] : e ∈ @}] |
37 |-----|
38 | DoImpl(c)  $\triangleq$  |
39 |    $\wedge$  DoEx(c) |
40 |    $\wedge$  UNCHANGED  $\langle \text{op2ss}, \text{c2ssX} \rangle$  |
42 | RevImpl(c)  $\triangleq$  |
43 |    $\wedge$  RevEx(c) |
44 |    $\wedge$  LET cop  $\triangleq$  Head(cincoming[c]) |
45 |     IN c2ssX' = [c2ssX EXCEPT ![c] = @  $\oplus$  op2ss[cop.oid]] |
46 |    $\wedge$  UNCHANGED  $\langle \text{op2ss} \rangle$  |
48 | SRevImpl  $\triangleq$  |
49 |    $\wedge$  SRevEx |
50 |    $\wedge$  LET cop  $\triangleq$  Head(sincoming) |
51 |     c  $\triangleq$  cop.oid.c |

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52       $ss \triangleq xForm(cop, s2ss[c], cur[Server], Remote)$  TODO: performance!!!
53      IN  $op2ss' = op2ss @@@ (cop.oid :> [node \mapsto Range(ss.node), edge \mapsto Range(ss.edge)])$ 
54       $\wedge UNCHANGED \langle c2ssX \rangle$ 
55  |-----|
56   $NextImpl \triangleq$ 
57       $\vee \exists c \in Client : DoImpl(c) \vee RevImpl(c)$ 
58       $\vee SRevImpl$ 
60   $SpecImpl \triangleq InitImpl \wedge \square [NextImpl]_{varsImpl}$ 
61       $\wedge WF_{varsImpl}(SRevImpl \vee \exists c \in Client : RevImpl(c))$ 
63   $CJ \triangleq$  INSTANCE  $CJupiter$ 
64      WITH  $cincoming \leftarrow cincomingCJ$ ,  $sincoming$  needs no substitution
65       $css \leftarrow [r \in Replica \mapsto$ 
66          IF  $r = Server$ 
67              THEN  $IgnoreDir(SetReduce(\oplus, Range(s2ss),$ 
68                   $[node \mapsto \{\{\}\}, edge \mapsto \{\{\}\}])]$ 
69              ELSE  $IgnoreDir(c2ss[r] \oplus c2ssX[r])]$ 
71  THEOREM  $SpecImpl \Rightarrow CJ!Spec$ 
72  |-----|
    \ * Modification History
    \ * Last modified Fri Nov 09 17:25:30 CST 2018 by hengxin
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