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1  ┌────────────────── MODULE AJupiterImplXJupiter ───────────────────┐
    │ We show that AJupiter (specifically, AJupiterExtended) implements XJupiter. │
5  └────────────────── EXTENDS AJupiterExtended, StateSpace ───────────────────┘
6  ┌──────────────────┐
7  │ VARIABLES c2ss, s2ss │
9  │ varsImpl  $\triangleq \langle \textit{varsEx}, c2ss, s2ss \rangle$  │
10 └──────────────────┘
11 │ TypeOKImpl  $\triangleq$  │
12 │    $\wedge \textit{TypeOKEx}$  │
13 │    $\wedge \forall c \in \textit{Client} : \textit{IsSS}(c2ss[c]) \wedge \textit{IsSS}(s2ss[c])$  │
14 └──────────────────┘
15 │ InitImpl  $\triangleq$  │
16 │    $\wedge \textit{InitEx}$  │
17 │    $\wedge c2ss = [c \in \textit{Client} \mapsto \textit{EmptySS}]$  │
18 │    $\wedge s2ss = [c \in \textit{Client} \mapsto \textit{EmptySS}]$  │
19 └──────────────────┘
    │ Client c  $\in$  Client issues an operation op. │
23 │ DoOpImpl(c, op)  $\triangleq$  │
24 │   LET cop  $\triangleq [op \mapsto op, oid \mapsto [c \mapsto c, seq \mapsto cseq'[c]], ctx \mapsto ds[c]]$  │
25 │   IN  $\wedge crec' = [crec \text{ EXCEPT } ![c] = 0]$  │
26 │        $\wedge cbuf' = [cbuf \text{ EXCEPT } ![c] = \textit{Append}(@, cop)]$  │
27 │        $\wedge state' = [state \text{ EXCEPT } ![c] = \textit{Apply}(op, @)]$  │
28 │        $\wedge \textit{Comm}(\textit{Msg})! \textit{CSend}([ack \mapsto crec[c], cop \mapsto cop, oid \mapsto cop.oid])$  │
29 │        $\wedge \textit{commXJ}! \textit{CSend}(cop)$  │
30 │        $\wedge c2ss' = [c2ss \text{ EXCEPT } ![c] =$  │
31 │            $\quad @ \oplus [node \mapsto \{ds'[c]\},$  │
32 │            $\quad \quad edge \mapsto \{[from \mapsto ds[c], to \mapsto ds'[c], cop \mapsto cop]\}]$  │
33 │       ] │
34 │    $\wedge \text{UNCHANGED } s2ss$  │
36 │ DoInsImpl(c)  $\triangleq$  │
37 │    $\exists ins \in \{op \in \textit{Ins} : op.pos \in 1 \dots (\textit{Len}(\textit{state}[c]) + 1) \wedge op.ch \in \textit{chins} \wedge op.pr = \textit{Priority}[c]\} :$  │
38 │    $\wedge \textit{DoOpImpl}(c, ins)$  │
39 │    $\wedge \textit{chins}' = \textit{chins} \setminus \{ins.ch\}$  │
41 │ DoDelImpl(c)  $\triangleq$  │
42 │    $\exists del \in \{op \in \textit{Del} : op.pos \in 1 \dots \textit{Len}(\textit{state}[c])\} :$  │
43 │    $\wedge \textit{DoOpImpl}(c, del)$  │
44 │    $\wedge \text{UNCHANGED } \textit{chins}$  │
46 │ DoImpl(c)  $\triangleq$  │
47 │    $\wedge \textit{DoCtx}(c)$  │
48 │    $\wedge \vee \textit{DoInsImpl}(c)$  │
49 │    $\vee \textit{DoDelImpl}(c)$  │
50 │    $\wedge \text{UNCHANGED } \langle sbuf, srec \rangle$ 

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51 |-----|
52  $RevImpl(c) \triangleq$ 
53    $\wedge RevEx(c)$ 
54    $\wedge LET\ m \triangleq Head(cincoming[c])$ 
55      $cBuf \triangleq cbuf[c]$ 
56      $cShiftedBuf \triangleq SubSeq(cBuf, m.ack + 1, Len(cBuf))$ 
57      $xform \triangleq xFormCopCopsSS(m.cop, cShiftedBuf) \quad [lss, xss]$ 
58      $IN\ c2ss' = [c2ss\ EXCEPT\ ![c] = @ \oplus xform.xss]$ 
59    $\wedge UNCHANGED\ s2ss$ 
60 |-----|
61  $SRevImpl \triangleq$ 
62    $\wedge SRevEx$ 
63    $\wedge LET\ m \triangleq Head(sincoming)$ 
64      $c \triangleq ClientOf(m.cop)$ 
65      $cBuf \triangleq sbuf[c]$ 
66      $cShiftedBuf \triangleq SubSeq(cBuf, m.ack + 1, Len(cBuf))$ 
67      $xform \triangleq xFormCopCopsSS(m.cop, cShiftedBuf) \quad [lss, xss]$ 
68      $IN\ s2ss' = [cl \in Client \mapsto$ 
69        $IF\ cl = c\ THEN\ s2ss[cl] \oplus xform.xss\ ELSE\ s2ss[cl] \oplus xform.lss]$ 
70    $\wedge UNCHANGED\ c2ss$ 
71 |-----|
72  $NextImpl \triangleq$ 
73    $\vee \exists c \in Client : DoImpl(c) \vee RevImpl(c)$ 
74    $\vee SRevImpl$ 
75
76  $FairnessImpl \triangleq$ 
77    $WF_{varsImpl}(SRevImpl \vee \exists c \in Client : RevImpl(c))$ 
78
79  $SpecImpl \triangleq InitImpl \wedge \Box [NextImpl]_{varsImpl} \quad \wedge FairnessImpl$ 
80
81  $XJ \triangleq$  INSTANCE  $XJupiter$  WITH
82    $cincoming \leftarrow cincomingXJ, sincoming \leftarrow sincomingXJ$ 
83
84 THEOREM  $SpecImpl \Rightarrow XJ!Spec$ 
85 |-----|
  
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\ * Modification History
 \ * Last modified Sun Dec 30 16:48:09 CST 2018 by *hengxin*
 \ * Created Sat Dec 29 18:36:51 CST 2018 by *hengxin*