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1  |----- MODULE JupiterInterface -----|
   | This module declares the parameters and defines the operators that describe the interface of a |
   | family of Jupiter specs. |
6  | EXTENDS SequenceUtils, OT |
7  |-----|
8  | CONSTANTS |
9      Client,      the set of client replicas |
10     Server,      the (unique) server replica |
11     Msg,         the set of messages |
12     Char,        the set of characters |
13     InitState    the initial state of each replica |

15 | ASSUME We assume that all inserted elements are unique. |
16      $\wedge$   $Range(InitState) \cap Char = \{\}$  due to the uniqueness requirement |
17 |-----|
18 | VARIABLES |
19     aop,          op[r]: the actual operation applied at replica  $r \in Replica$  |
20     state,        state[r]: state (the list content) of replica  $r \in Replica$  |
21     cincoming,    cincoming[c]: incoming channel at the client  $c \in Client$  |
22     sincoming,    incoming channel at the Server |
23     chins         a set of chars allowed to insert; this is for model checking |

25 | intVars  $\triangleq$   $\langle aop, state, cincoming, sincoming, chins \rangle$  |
26 |-----|
27 | Comm  $\triangleq$  INSTANCE CSComm |
28 | |
29 | Replica  $\triangleq$  Client  $\cup$  {Server} |
30 | |
31 | List  $\triangleq$  Seq(Char  $\cup$  Range(InitState)) | all possible lists |
32 | MaxLen  $\triangleq$  Cardinality(Char) + Len(InitState) | the max length of lists in any state |
33 | |
34 | ClientNum  $\triangleq$  Cardinality(Client) |
35 | Priority  $\triangleq$  CHOOSE  $f \in [Client \rightarrow 1 \dots ClientNum] : Injective(f)$  |
36 |-----|
   | The set of all operations. Note: The positions are indexed from 1. |
40 | Rd  $\triangleq$  [type : { "Rd" }] |
41 | Del  $\triangleq$  [type : { "Del" }, pos : 1 .. MaxLen] |
42 | Ins  $\triangleq$  [type : { "Ins" }, pos : 1 .. (MaxLen + 1), ch : Char, pr : 1 .. ClientNum] | pr: priority |
43 | |
44 | Op  $\triangleq$  Ins  $\cup$  Del | Now we don't consider Rd operations |
45 | |
46 | SetNewAop(r, aopr)  $\triangleq$  |
47 |     aop' = [aop EXCEPT ![r] = aopr] |
48 | |
49 | ApplyNewAop(r)  $\triangleq$  |
50 |     state' = [state EXCEPT ![r] = Apply(aop'[r], @)] |
51 |-----|

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52  TypeOKInt  $\triangleq$ 
53       $\wedge aop \in [Replica \rightarrow Op \cup \{Nop\}]$ 
54       $\wedge state \in [Replica \rightarrow List]$ 
55       $\wedge chins \subseteq Char$ 
56
57  InitInt  $\triangleq$ 
58       $\wedge aop = [r \in Replica \mapsto Nop]$ 
59       $\wedge state = [r \in Replica \mapsto InitState]$ 
60       $\wedge chins = Char$ 
61
62  DoIns(DoOp(–, –), c)  $\triangleq$  Client c  $\in$  Client generates an “Ins” operation.
63       $\exists ins \in Ins :$ 
64           $\wedge ins.pos \in 1 .. (Len(state[c]) + 1)$ 
65           $\wedge ins.ch \in chins$ 
66           $\wedge ins.pr = Priority[c]$ 
67           $\wedge DoOp(c, ins)$ 
68           $\wedge chins' = chins \setminus \{ins.ch\}$  We assume that all inserted elements are unique.
69
70  DoDel(DoOp(–, –), c)  $\triangleq$  Client c  $\in$  Client generates a “Del” operation.
71       $\exists del \in Del :$ 
72           $\wedge del.pos \in 1 .. Len(state[c])$ 
73           $\wedge DoOp(c, del)$ 
74           $\wedge UNCHANGED chins$ 
75
76  DoInt(DoOp(–, –), c)  $\triangleq$  Client c  $\in$  Client issues an operation.
77       $\wedge \vee DoIns(DoOp, c)$ 
78       $\vee DoDel(DoOp, c)$ 
79       $\wedge ApplyNewAop(c)$ 
80
81  RevInt(ClientPerformInt(–, –), c)  $\triangleq$  Client c  $\in$  Client receives and processes a message.
82       $\wedge Comm!CRev(c)$ 
83       $\wedge ClientPerformInt(c, Head(cincoming[c]))$ 
84       $\wedge ApplyNewAop(c)$ 
85       $\wedge UNCHANGED chins$ 
86
87  SRevInt(ServerPerformInt(–))  $\triangleq$  The Server receives and processes a message.
88       $\wedge Comm!SRev$ 
89       $\wedge ServerPerformInt(Head(sincoming))$ 
90       $\wedge ApplyNewAop(Server)$ 
91       $\wedge UNCHANGED chins$ 
92

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\ * Modification History
\ * Last modified Wed Jan 02 18:56:22 CST 2019 by hengxin
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