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1  |----- MODULE JupiterSerial -----|
   | This module contains definitions and operators for Jupiter protocols, i.e., AbsJupiter and CJupiter, which utilizes the serialization order at the Server to guide OTs. |
7  | EXTENDS JupiterCtx |
8  |-----|
   | tb: Is cop1 totally ordered before cop2? This can be determined according to the serial view (sv) of any replica. |
13 | tb(cop1, cop2, sv)  $\triangleq$ 
14 |   LET pos1  $\triangleq$  FirstIndexOfElementSafe(sv, cop1.oid)
15 |   pos2  $\triangleq$  FirstIndexOfElementSafe(sv, cop2.oid)
16 |   IN  IF pos1  $\neq$  0  $\wedge$  pos2  $\neq$  0 at the server or both are remote operations
17 |       THEN pos1 < pos2 at a client: one is a remote operation and the other is a local operation
18 |       ELSE pos1  $\neq$  0
19 |-----|
20 | VARIABLES
21 |   serial, serial[r]: the serial view of replica r  $\in$  Replica about the server
22 |   cincomingSerial, sincomingSerial
24 |   serialVars  $\triangleq$   $\langle$ serial, cincomingSerial, sincomingSerial $\rangle$ 
25 |   commSerial  $\triangleq$  INSTANCE CSComm WITH Msg  $\leftarrow$  Seq(Oid),
26 |       cincoming  $\leftarrow$  cincomingSerial, sincoming  $\leftarrow$  sincomingSerial
27 |-----|
28 | TypeOKSerial  $\triangleq$ 
29 |    $\wedge$  serial  $\in$  [Replica  $\rightarrow$  Seq(Oid)]
30 |    $\wedge$  commSerial! TypeOK
31 |-----|
32 | InitSerial  $\triangleq$ 
33 |    $\wedge$  serial = [r  $\in$  Replica  $\mapsto$   $\langle \rangle$ ]
34 |    $\wedge$  commSerial! Init
36 | DoSerial(c)  $\triangleq$ 
37 |   UNCHANGED  $\langle$ serialVars $\rangle$ 
39 | RevSerial(c)  $\triangleq$ 
40 |    $\wedge$  commSerial! CRev(c)
41 |    $\wedge$  serial' = [serial EXCEPT ![c] = Head(cincomingSerial[c])]
43 | SRevSerial  $\triangleq$ 
44 |    $\wedge$  LET cop  $\triangleq$  Head(sincoming)
45 |   IN   $\wedge$  serial' = [serial EXCEPT ![Server] = Append(@, cop.oid)]
46 |        $\wedge$  commSerial! SSendSame(cop.oid.c, serial'[Server])
47 |    $\wedge$  UNCHANGED  $\langle$ sincomingSerial $\rangle$ 
48 |-----|
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