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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)
15   pos2  $\triangleq$  FirstIndexOfElementSafe(sv, cop2)
16   IN IF pos1  $\neq 0 \wedge pos2 \neq 0$  at the server or both are remote operations
17     THEN pos1 < pos2
18     ELSE IF pos1 = 0  $\wedge pos2$  = 0 at a client: both are local operations (not happen in CJupiter)
19       THEN cop1.seq < cop2.seq
20       ELSE pos1  $\neq 0$  at a client: one is a remote operation and the other is a local operation
21 └──────────────────┘
22 VARIABLES
23   serial, serial[r]: the serial view of replica r  $\in$  Replica about the Server
24   cincomingSerial, sincomingSerial
26 serialVars  $\triangleq$   $\langle serial, cincomingSerial, sincomingSerial \rangle$ 
27 commSerial  $\triangleq$  INSTANCE CSComm WITH Msg  $\leftarrow Seq(Oid)$ ,
28   cincoming  $\leftarrow cincomingSerial$ , sincoming  $\leftarrow sincomingSerial$ 
29 └──────────────────┘
30 TypeOKSerial  $\triangleq$ 
31    $\wedge serial \in [Replica \rightarrow Seq(Oid)]$ 
32    $\wedge commSerial!TypeOK$ 
34 InitSerial  $\triangleq$ 
35    $\wedge serial = [r \in Replica \mapsto \langle \rangle]$ 
36    $\wedge commSerial!Init$ 
38 DoSerial(c)  $\triangleq$ 
39   UNCHANGED  $\langle serialVars \rangle$ 
41 RevSerial(c)  $\triangleq$ 
42    $\wedge commSerial!CRev(c)$ 
43    $\wedge serial' = [serial \text{ EXCEPT } ![c] = Head(cincomingSerial[c])]$ 
45 SRevSerial  $\triangleq$ 
46    $\wedge$  LET cop  $\triangleq Head(sincoming)$ 
47   IN  $\wedge serial' = [serial \text{ EXCEPT } ![Server] = Append(@, cop.oid)]$ 
48    $\wedge commSerial!SSendSame(cop.oid.c, serial'[Server])$ 
49    $\wedge$  UNCHANGED  $\langle sincomingSerial \rangle$ 
50 └──────────────────┘
  \ * Modification History
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