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|----- MODULE JupiterSerial -----|
| Specification of serial views used by AbsJupiter and CJupiter. |
| EXTENDS JupiterCtx |
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VARIABLES
  serial, serial[r]: the serial view of replica  $r \in \text{Replica}$  about the serialization order established at the Server
  cincomingSerial, sincomingSerial

serialVars  $\triangleq \langle \text{serial}, \text{cincomingSerial}, \text{sincomingSerial} \rangle$ 
commSerial  $\triangleq$  INSTANCE CSComm WITH  $\text{Msg} \leftarrow \text{Seq}(\text{Oid})$ ,
   $\text{cincoming} \leftarrow \text{cincomingSerial}$ ,  $\text{sincoming} \leftarrow \text{sincomingSerial}$ 
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tb(oid1, oid2, sv)  $\triangleq$  Is oid1 totally ordered before oid2 according to the serial view sv (of some replica)?
  LET  $\text{pos1} \triangleq \text{FirstIndexOfElementSafe}(\text{sv}, \text{oid1})$  0 if oid1 is not in sv
       $\text{pos2} \triangleq \text{FirstIndexOfElementSafe}(\text{sv}, \text{oid2})$  0 if oid2 is not in sv
  IN IF  $\text{pos1} \neq 0 \wedge \text{pos2} \neq 0$  at the server or at a client but both are remote operations
      THEN  $\text{pos1} < \text{pos2}$ 
      ELSE IF  $\text{pos1} = 0 \wedge \text{pos2} = 0$  at a client: both are local operations (may happen in AbsJupiter)
          THEN  $\text{oid1.seq} < \text{oid2.seq}$ 
          ELSE  $\text{pos1} \neq 0$  at a client: one is a remote operation and the other is a local operation
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TypeOKSerial  $\triangleq$ 
   $\wedge \text{serial} \in [\text{Replica} \rightarrow \text{Seq}(\text{Oid})]$ 
   $\wedge \text{commSerial!TypeOK}$ 

InitSerial  $\triangleq$ 
   $\wedge \text{serial} = [r \in \text{Replica} \mapsto \langle \rangle]$ 
   $\wedge \text{commSerial!Init}$ 

DoSerial(c)  $\triangleq$ 
  UNCHANGED serialVars

RevSerial(c)  $\triangleq$ 
   $\wedge \text{commSerial!CRev}(c)$ 
   $\wedge \text{serial}' = [\text{serial} \text{ EXCEPT } ![c] = \text{Head}(\text{cincomingSerial}[c])]$ 

SRevSerial  $\triangleq$ 
   $\wedge$  LET  $\text{cop} \triangleq \text{Head}(\text{sincoming})$ 
      IN  $\wedge \text{serial}' = [\text{serial} \text{ EXCEPT } ![Server] = \text{Append}(@, \text{cop.oid})]$ 
         $\wedge \text{commSerial!SSendSame}(\text{ClientOf}(\text{cop}), \text{serial}'[Server])$ 
   $\wedge$  UNCHANGED sincomingSerial
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\ * Modification History
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