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xForm(r, cop)  $\triangleq$  Transform cop at replica r
  LET ctxDiff  $\triangleq$  ds[r] \ cop.ctx calculate concurrent operations
    xFormHelper(coph, ctxDiffh, copssh)  $\triangleq$ 
      IF ctxDiffh = {} THEN [xcop  $\mapsto$  coph, xcopss  $\mapsto$  copssh]
      ELSE LET foidh  $\triangleq$  CHOOSE oid  $\in$  ctxDiffh : the first oid in ctxDiffh
         $\forall id \in ctxDiffh \setminus \{oid\} : so(oid, id, serial[r])$ 
        fcoph  $\triangleq$  CHOOSE fcop  $\in$  copss[r] :
          fcop.oid = foidh  $\wedge$  fcop.ctx = coph.ctx
          xcoph  $\triangleq$  COT(coph, fcoph)   xfcoph  $\triangleq$  COT(fcoph, coph)
        IN xFormHelper(xcoph, ctxDiffh \ {fcoph.oid},
          copssh  $\cup$  {xcoph, xfcoph})
  IN xFormHelper(cop, ctxDiff, copss[r]  $\cup$  {cop})

```