$\overline{\qquad\qquad\text{MODULE } ReliableCausalNetwork \qquad\qquad}$

EXTENDS $Network,\ Naturals$

VARIABLES
  vc

$Vector \triangleq [Replica \rightarrow Nat]$
$InitVector \triangleq [r \in Replica \mapsto 0]$

$RCInit \triangleq\ \land NInit$
$\qquad\qquad\ \land vc = [r \in Replica \mapsto InitVector]$

$RCBroadcast(r,\ m) \triangleq\ \land NBroadcast(r,\ m)$
$\qquad\qquad\qquad\qquad\ \land vc' = [vc \text{ EXCEPT } ![r][r] = @ + 1]$

$RCDeliver(r) \triangleq$
$\quad\ \land incoming[r] \neq EmptyBag$
$\quad\ \land \exists\, m \in BagToSet(incoming[r]) :$
$\qquad\ \land \neg IfDeliverMsg(m,\ r)$
$\qquad\ \land \forall\, s \in Replica :$
$\qquad\qquad \lor m.vc[s] \leq vc[r][s]$
$\qquad\qquad \lor s = m.r$
$\qquad\ \land m.vc[m.r] = vc[r][m.r] + 1$
$\qquad\ \land vc' = [vc \text{ EXCEPT } ![r][m.r] = @ + 1]$
$\qquad\ \land msg' =\ m$
$\qquad\ \land MDeliver(r,\ m)$
$\quad\ \land \text{UNCHANGED } \langle incoming \rangle$