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MODULE CausalNetwork
EXTENDS Network, Naturals

VARIABLES
  vc

Cvars ≜ ⟨incoming, lmsg, vc⟩

Vector ≜ [Replica → Nat]
InitVector ≜ [r ∈ Replica ↦ 0]

CInit ≜ ∧ NInit
        ∧ vc = [r ∈ Replica ↦ InitVector]

CBroadcast(r, m) ≜ ∧ NBroadcast(r, m)
                  ∧ vc' = [vc EXCEPT ![r][r] = @ + 1]

SetMax(a, b) ≜
  IF a > b THEN a ELSE b

CDeliver(r) ≜
  ∧ incoming[r] ≠ EmptyBag
  ∧ ∃ m ∈ BagToSet(incoming[r]) :
    ∧ ∀ s ∈ Replica :
      ∨ m.vc[s] ≤ vc[r][s]
      ∨ s = m.r
    ∧ m.vc[m.r] ≤ vc[r][m.r] + 1
    ∧ vc' = [vc EXCEPT ![r][m.r] = SetMax(@, m.vc[m.r])]
    ∧ lmsg' = m
  ∧ UNCHANGED ⟨incoming⟩

CDo ≜ UNCHANGED Cvars

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/* Last modified Sat Jun 08 00:48:19 CST 2019 by xhdn
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