Test Case for Chandy-Lamport Global Snapshot Algorithm

Test Case: 001

Test Case Name: Snapshot with Three Processes and Two Channels

Description: Simulate a distributed system with 3 processes (`P1`, `P2`, `P3`) and 2 unidirectional channels (`C1->2`, `C2->3`). The snapshot is initiated at `P1` while messages are in transit. Validate the correctness of the captured states of processes and channels.

Input Parameters

1. **Initial State of Processes:**
   - `P1`: Balance = 10
   - `P2`: Balance = 20
   - `P3`: Balance = 30
2. **Messages in Transit (Before Snapshot Initiation):**
   - `M1`: From `P1` to `P2` (Amount = 5) at t1
   - `M2`: From `P2` to `P3` (Amount = 10) at t3
3. **Channel Details:**
   - `C1->2`: Unidirectional channel from `P1` to `P2`
   - `C2->3`: Unidirectional channel from `P2` to `P3`
4. **Snapshot Initiator:** `P1 after send(M1)`

Test Case 002

Test Case Name: Snapshot with Four Processes, Random Events, and Random Snapshot Initiation

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Test Case Description:

Simulate a distributed system with four processes (`P1`, `P2`, `P3`, `P4`), each performing five local events, and two random message exchanges between adjacent processes. Initiate the global snapshot at a random process (`P3` in this case) during execution. Validate the correctness of the snapshot.

Input Parameters:

1. **Processes:**
   - Four processes: `P1`, `P2`, `P3`, `P4`.
2. **Local Events (5 per process):**

- Random updates to process states (e.g., incrementing counters, modifying balances).

3. **Message Passing:**
   - Random message exchanges between processes as follows:
     - `P1` ↔ `P2` (Messages `M1` and `M2`) at t1, t3
     - `P2` ↔ `P3` (Messages `M3` and `M4`) at t3, t4
     - `P3` ↔ `P4` (Messages `M5` and `M6`) at t2, t5
4. **Snapshot Initiator:**
   - Randomly chosen (`P3` in this case)and iniate algorithm at t3.
5. **Initial States:**
   - `P1`: Balance = 100
   - `P2`: Balance = 200
   - `P3`: Balance = 300
   - `P4`: Balance = 400