Distributed Snapshot

EECS 498– Lecture Notes
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Section 5.3 Tanenbaum (informal description)
Section 4.13 Mullender (formal description - recommended reading)

Remember Consistent Cuts!

(a) A consistent cut
(b) An inconsistent cut
Distributed Snapshot

- Goal: construct a consistent global state in a distributed fashion without freezing the participating processes
- Original DS algorithm proposed by Chandy & Lamport 1985
- Assume FIFO delivery through strongly connected unidirectional point-to-point communication channels between processes

- System State:
  - Local state of a process (application dependent)
  - Channel state between a pair of processes: msgs sent but not received

(a) Organization of a process and channels for a distributed snapshot
Algorithm

1. Any process can initiate the algorithm.
2. Initiating process P starts by recording its own local state. Then it sends a marker along each of its outgoing channels.
3. When a process Q receives a marker through an incoming channel C:
   a) If Q hasn’t already saved its local state, Q first records its local state and then sends a marker along each of its own outgoing channels.
   b) If Q has already recorded its state earlier, the marker on channel C is an indicator that Q should record the state of the channel. The channel state is the sequence of messages that have been received by Q since the last time Q recorded its local state and before it received the marker on C.
4. A process is done when it has received a marker on each of its coming channels. The local state of the process and the state of each of its incoming channels are sent to the initiating process.

Note: any process can initiate the algorithm. So several snapshots may be in progress concurrently. How?

Distributed Snapshot Algorithm

b) Process Q receives a marker for the first time and records its local state

c) Q records all incoming message

d) Q receives a marker for its incoming channel and finishes recording the state of the incoming channel