

Distributed System 1 - synch 5

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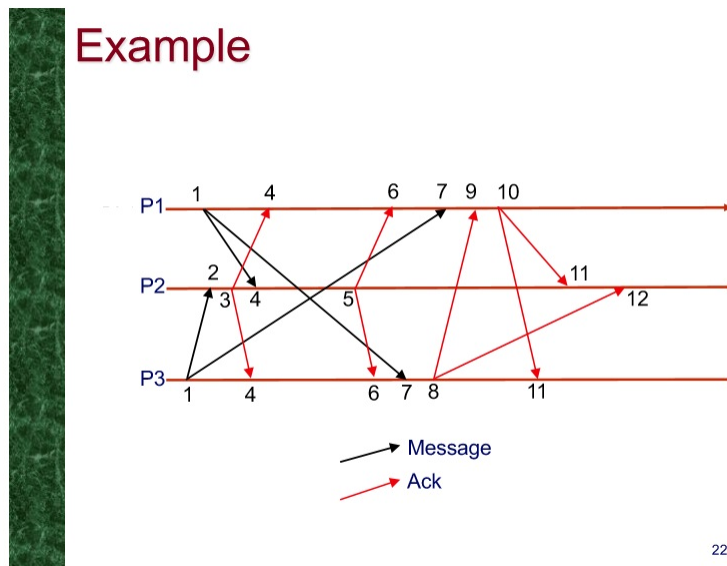
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1 Examples

1.1 synch

Simple Logical Clock



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1.1.1 Distributed Snapshot

Distributed Snapshot algorithm Chandy-Lamport, 1985

1. Assume FIFO, reliable links/nodes, strongly connected graph.
2. Any process can initiate a snapshot by
 - (a) Recording internal state
 - (b) Sending a token on all outgoing channels

- (c) Start recording local snapshot (record messages arriving on every incoming channel).
- 3. Upon receiving a token
 - (a) if not already recording local snapshot, initiate the snapshot (2a, 2b and 2c).
 - (b) in any case stop recording incoming message on channel the token arrived along.
- 4. Recording messages
 - (a) If a message arrives on a channel which is recording messages, record the arrival of the message, then process the message as normal.
 - (b) Otherwise, just process the message as normal.
- 5. Snapshot complete when token has arrived on all incoming channels.
 - (a) Irrelevant how the various data are collected and/or transmitted.

2 Exercises

2.1 synch

2.1.1 Logical Clock

2.1.2 Distributed Snapshot

ex1

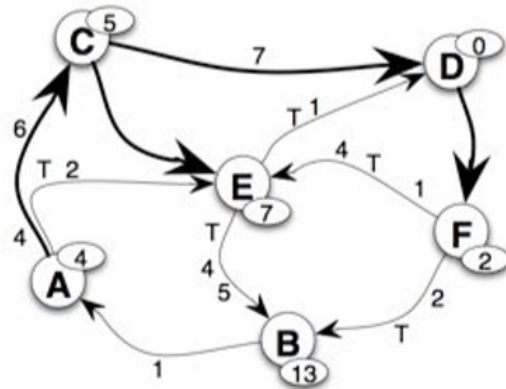
- 1. A 15
- 2. B 22
- 3. C 12
- 4. D 1
- 5. E 13
- 6. F 5

ex 2

- 1. C to E has a T even if it is an already marked link
- 2. E to F: there are two T on the same unidirectional link.
- 3. D to E and D to F: can't have been happened if A was the initiator since D has to receive a mark from anyone before starting sending marks.

B could record all the states but not all the links (not clear question)

Exercise



- The diagram represents a distributed snapshot. Node A is the initiator of the snapshot; the markers already propagated along the thick lines, and the nodes A, C, D, E, F already recorded their local state. None of these nodes has recorded messages from their incoming links. The values in the oval attached to a node denote its current state. The labels on the arches denote the value of the messages exchanged, with the label T denoting the marker. Links are directional, with the direction shown by the arrows
- Assuming that no other message exchange takes place besides those in the figure, show the local state (node and links) recorded by the distributed snapshot at each node

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Figure 2: Distributed Snapshot Exercise 1

Exercise

- The diagram represents a distributed snapshot. Links are unidirectional. Node A is the snapshot initiator. The marker already propagated through the thick lines. The value in the oval attached to a node represents the current value of the node's state. The arc labels denote the value associated to messages, or T for a marker.
- Assuming there are no other messages exchanges besides those shown in the figure:
 - there are at least three “errors” in the figure, i.e., details incompatible with the distributed snapshot algorithm. Identify and describe them.
 - Show and explain all the possible states (node and links) that can be recorded by B as part of the snapshot

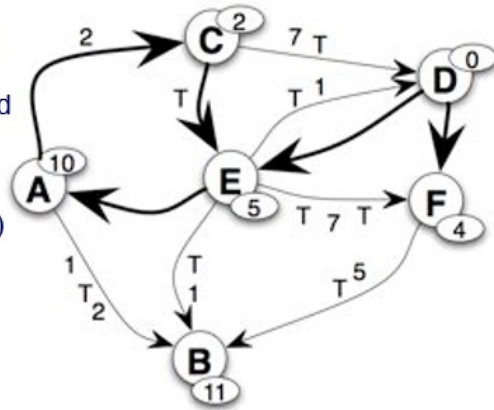


Figure 3: Distributed Snapshot Exercise 2