CS4231
Parallel and Distributed Algorithms

Solution for Homework 5

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Homework Assignment

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  - Problem 9.5 – Remember to prove that the global snapshot you get is a consistent one

- ## Prove the following
  - If G and H are both consistent global snapshots, then G∩H and G∪H are also consistent global snapshots

Problem 9.5

■ For any event e, define:

cut(e) = { f | f has smaller logical clock value than e}

■ Claim: For any event e, cut(e) is a consistent global snapshot

- cut(e) is a global snapshot: if f2 is in the set and f1 is before f2 in process order, then f1 must be in the set

- cut(e) is a consistent global snapshot: if f2 is in the set and f1 is before f2 in send-receive order, then f1 must be in the set

Aim to prove:

If G and H are both consistent global snapshots, then G∩H is also a consistent global snapshot

- G∩H is a global snapshot:
  - Need to prove that if e2 is in G∩H and e1 is before e2 in process order, then e1 must be in G∩H
  - e2 in G∩H ⇒ e2 in G and e2 in H ⇒ e1 in G and e1 in H ⇒ e1 in G∩H

- G∩H is a consistent global snapshot:
  - Need to prove that if e2 is in G∩H and e1 is before e2 in send-receive order, then e1 must be G∩H

Aim to prove:

If G and H are both consistent global snapshots, then $G \cup H$ is also a consistent global snapshot.

- $G \cup H$ is a global snapshot:
  - Need to prove that if e2 is in $G \cup H$ and e1 is before e2 in process order, then e1 must be in $G \cup H$
  - e2 in $G \cup H$ $\Rightarrow$ W.l.o.g., e2 in G $\Rightarrow$ e1 in G $\Rightarrow$ e1 in $G \cup H$

- $G \cup H$ is a consistent global snapshot:
  - Need to prove that if e2 is in $G \cup H$ and e1 is before e2 in send-receive order, then e1 must be $G \cup H$