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Paper Report:
Distributed Snapshots: Determining Global States of Distributed Systems by K. Mani Chandy and Leslie Lamport

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1 Summary

This paper presents algorithms to determine the global state of a system during a computation by a process in that distributed system. Important problems that this determination of a global state helps to solve include ones related to stable property detection, e.g., whether a computation has terminated, whether a system is deadlocked, etc... The key issue in determining a global state is that different processes do not necessarily share clocks or memory. It is important that the global-state-detection algorithm runs concurrently with the underlying computation and not alter it. The essential idea behind the algorithm is that once a global state S is determined, $y(S)$ is computed to check whether the stable property y holds.

2 Strengths of the paper

In the introduction, the analogy succinctly informs the reader about the purpose and challenge in developing a state-detection algorithm. It explains how the vastness of the scene renders a single photograph of it useless in terms of capturing it in its entirety, thereby showing that the algorithm can't just "sweep" some storage to attain the global state. Furthermore, it conveys the "distributed systems" aspect of it by noting how each snapshot to be later pieced together can't be taken at the same time due to synchronization problems. Finally, it highlights how the algorithm must be superimposed on the computation rather than tamper with it directly ("photographers should not disturb the process that is being photographed"). Through this analogy, the reader gains the context within which this problem resides, leading them to appreciate the true novelty this algorithm brings: using the analogy, how do we define what's meaningful, and how do we approach taking the photographs to form the panorama?

3 Weakness of the paper

I wonder to what extent the authors considered the scenario wherein no communicable path exists between two processes, yet both are required to form a global state. Say you have a retailer who uses an inventory system and an accounting system, but needs to input the same data in both systems because they don't talk to each other.

4 Future work opportunities

I doubt whether the weakness I described above is worth much. Obviously, if we introduce a third system that can talk to both, the inventory and accounting systems above, we can simply use it as an intermediary to update each system accordingly. In case this area hasn't been explored and if it's worth doing, it could potentially be a future work opportunity...