

Low-cost and Robust Global Time Synchronization

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Global Time Synchronization



Global Navigation Satellite Systems



GNSSes as the most practical and cost-effective sources of reference time.



https://www.sidnlabs.nl/

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Network-based Synchronization





Network-based Synchronization

Synchronization over the network as active standby.

A New Fault-Tolerant Algorithm for Clock Synchronization

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We describe a new fault-tolerant algorithm for solving a variant of Lamport's clock synchronization problem. The algorithm is designed for a system of distributed processes that communicate by sending messages. Each process has its own read-only physical clock whose drift rate from real time is very small. By adding a value to its physical clock time, the process obtains its local time. The algorithm solves the problem of maintaining closely synchronized local times, assuming that processes' local times are closely synchronized initially. The algorithm is able to tolerate the failure of just under one-third of the participating processes. It maintains synchronization to within a small constant, whose magnitude depends upon the rate of clock drift, the message delivery time and its uncertainty, and the initial closeness of synchronization. We also give a characterization of how far the clocks drift from real time. Reintegration of a repaired process can be accomplished using a slight modification of the basic algorithm. A similar style algorithm can also be used to achieve synchronization initially. © 1988 Academic Press, Inc.

Any-to-any (A2A) Synchronization

WNB Evaluation

WNB performs at least as well as A2A for the same proportion of initially malicious nodes.

DOSC Evaluation

Linux-based router with offset measurements using chrony.

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Everdeen

- reduces reliance on GNSSes by incorporating network-based synchronization,
- achieves robustness by exclusively synchronizing among neighbors,
- simplifies deployment by leveraging existing infrastructure,
- and operates in a fully decentralized manner.