



Harsh deployment environments and uncertain run-time conditions create numerous challenges for postmortem time reconstruction methods. Motes reboot and lose their clock state, considering that the majority of mote platforms lack a real-time clock. While existing time reconstruction methods for long-term data gathering networks rely on a persistent basestation for assigning global timestamps to measurements, the basestation may be unavailable due to hardware and software faults. We present Phoenix, a novel offline algorithm for reconstructing global timestamps that is robust to frequent mote reboots and does not require a persistent global time source.

This independence sets Phoenix apart from the majority of time reconstruction algorithms which assume that such a source is always available. Motes in Phoenix exchange their time-related state with their neighbors, establishing a chain of transitive temporal relationships to one or more motes with references to the global time. These relationships allow Phoenix to reconstruct the measurement timeline for each mote. Results from simulations and a deployment indicate that Phoenix can achieve timing accuracy up to 6 ppm for 99% of the collected measurements. Phoenix is able to maintain this performance for periods that last for months without a persistent global time source. Phoenix requires an additional space overhead of 4% and an additional duty cycle of 0.2%.

Publications

Jayant Gupchup, Doug Carlson, Răzvan Musăloiu-E, Alex Szalay, Andreas Terzis. Phoenix: An Epidemic Approach to Time Reconstruction. In proceedings of the 7th European Conference on Wireless Sensor Networks (EWSN 2010), Coimbra, Portugal

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