

## A Modern, Software-based Solution for Accurate Time Sync & Infrastructure Monitoring

Deploy in Minutes. Sync Anywhere. Gain Visibility Across Systems.

**Tick Tock** is inspired by the Huygens system devised at Stanford University, and has been further designed and developed as an enterprise solution for ultra-accurate time sync and infrastructure performance monitoring. It's tested and deployed in many environments. The sync accuracy can be as low as **5 - 10 ns** when using hardware timestamps, and 100s of ns - 5  $\mu$ s when using software timestamps. This is typically one or more orders of magnitude higher than PTP/NTP solutions.

### Tick Tock Clock Sync v1.0.5: Features and Capabilities

#### High Accuracy. Work with a Variety of Clocks

- For electronic trading: nanosecond-level accuracy using NIC hardware timestamps.
- For enterprise apps: microsecond-level accuracy using host and VM software timestamps

#### High Performance, Scalable, & Resilient

- Support 1,000 nodes per reference clock and can scale up to 10s of 1,000s of nodes in a single installation.
- Built-in redundancy and auto-failover. Works well even under high network and CPU loads

#### Easy to Deploy and Manage

- Deploy in minutes with modern NICs and OSES
- Built for on-prem, cloud and hybrid environments

#### Unparalleled Visibility and Insights

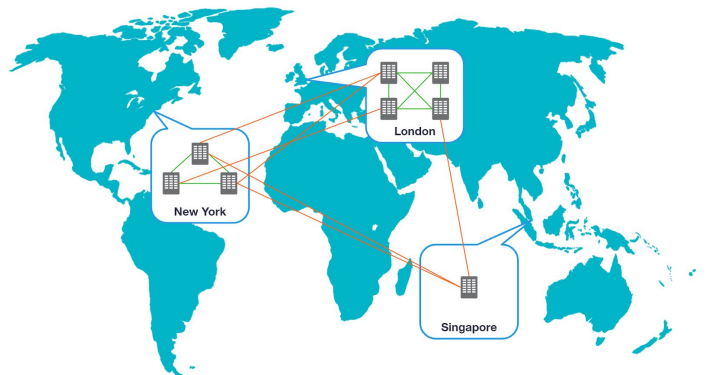
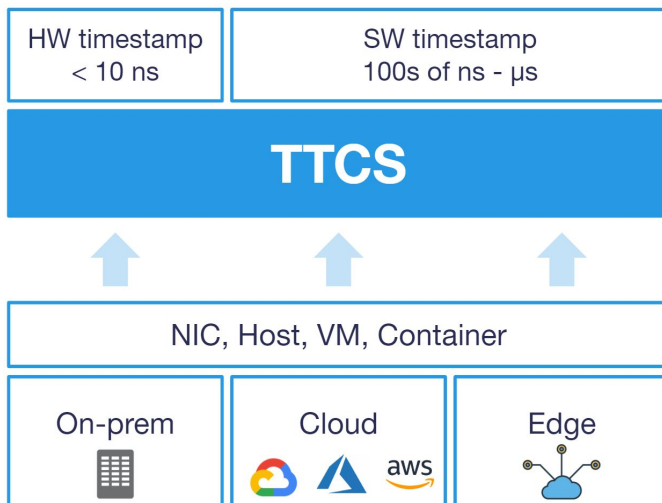
- Monitor and visualize clock sync performance. Correlate with network measurements to pinpoint and fix issues.
- Identify and analyze network path asymmetry and path delay changes.

#### Flexible Use Cases

- Observation mode: record and log corrections. An independent tool to monitor PTP/NTP performance.
- Correction mode: discipline NIC clock and optionally sync host clock.

#### Support Single Site & Multi-site

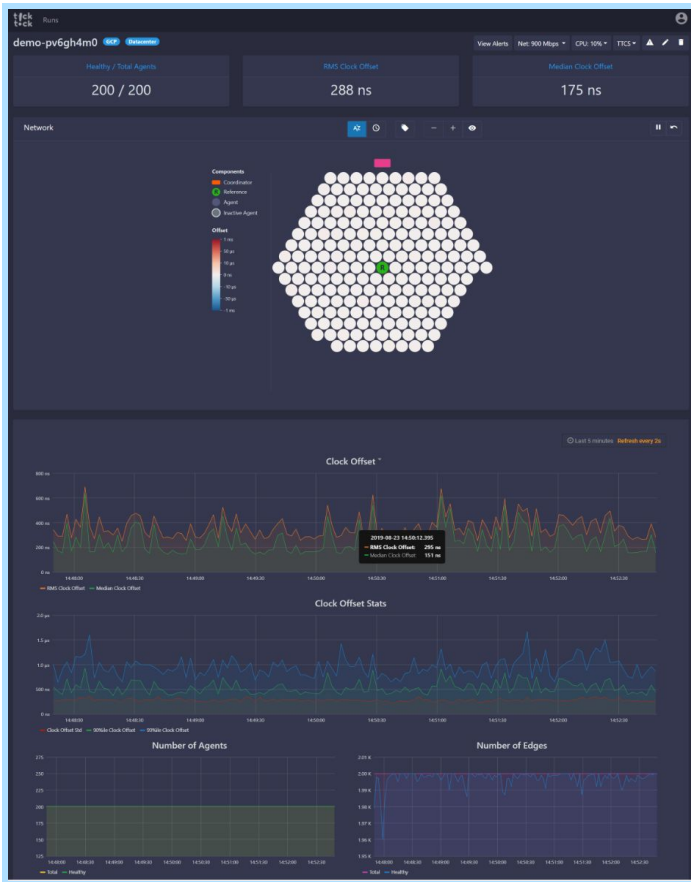
- Sync clocks in a single site to a local reference clock.
- Sync clocks across many sites in a region or globally.



# Clock Performance and Infrastructure Monitoring Dashboards

\*Example Run in Google Cloud with SW timestamp. Setting: 200 agents, 45% network load, 10% CPU load.

## Cluster-wide Metrics and Analysis



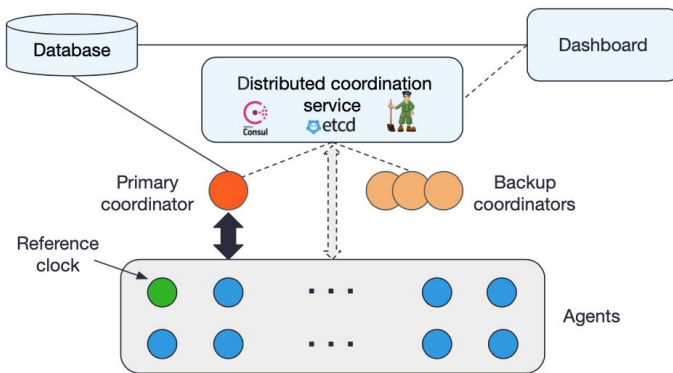
## Individual Clock Performance



## Network Connectivity and Measurements



## How It Works



**Agents:** A network of nodes to be synchronized. Each node runs a Tick Tock agent and send/receive probe packets.

**Coordinator:** Orchestrates the synchronization process and informs the agents of time corrections with respect to the reference clock.

**Reference Clock:** Can work with any source of time, GPS, atomic clock, PTP grandmaster, etc.

**Auto-failover:** On failure, it automatically elects a new primary from the pool of backups and notify all agents.

## Learn More

Exploiting a Neural Network Effect for Scalable, Fine-grained Clock  
<https://www.usenix.org/system/files/conference/nsdi18/nsdi18-geng.pdf>

Time Split to the Nanosecond is Precisely What Wall Street Wants  
<https://www.nytimes.com/2018/06/29/technology/computer-networks-speed-nasdaq.html>

Please contact [hello@ticktocknetworks.com](mailto:hello@ticktocknetworks.com) for demo and trial of Tick Tock software

nsdi'18

The New York Times