FSMLabs
Enterprise Real-Time®

TimeKeeper®: Time Synchronization for Cloud, EC2 and Virtual Hosts

TimeKeeper time synchronization client, server and management softwareefficiently handles the unique environment of The Cloud and virtual hosts. Legacy time synchronization solutions fail to synchronize time properly on virtual systems because they cannot cope with an environment where the clock is virtualized and may show discontinuous gaps in time. As a result applications depending on legacy time synchronization technology in the cloud see time jump, lurches, and divergences. TimeKeeper recognizes this environment and is designed to synchronize the clock properly - always. With proper configuration it's possible to have near bare-metal hardware accurate time.

Typical cloud problems - TimeKeeper solutions

It's not unusual to see 10 minutes/day drift with non-TimeKeeper synchronization technology. Precise time, given the harsh environment for time sync in the cloud requires the sophisticated algorithms, filters, and network timing model TimeKeeper provides .

✓ No access to the local hardware clock

TimeKeeper uses direct register access of time resources that are on-chip instead of relying on operating system access to a virtualized clock like most solutions. That allows it to track time much more tightly and model the behavior in the virtual environment properly while also reducing the overhead of reading the time.

### ✓ Correction not aggressive enough

TimeKeeper will aggressively but smoothly correct any time skew. That provides applications a steady clock that tightly tracks true time. This "controlled slew" is necessary in order to deal with time offsets caused by a virtual machine running and then being paused by the hypervisor. Legacy solutions don't model cloud VM behavior let alone correct for it so time errors accumulate astronomically very quickly.

✓ Poor upstream time

Time servers in most cloud environments, if they are even available, provide very poor accuracy. TimeKeeper filters out the network caused time jitter, the skew caused by the virtual environment and any possible poor performance of the upsteam time in order to create a clean and reliable time. Other solutions do

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Typical Cloud Deployment

Maintains wall-clock time but sync between servers may not be ideal

GPS Antenna

Time sync clients running Timkeeper
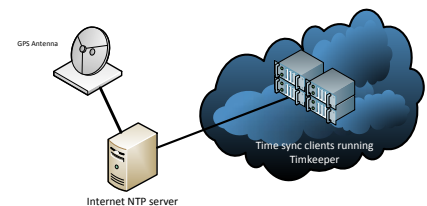
Internet NTP server

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nothing more than assume the remote time is good and the local clock hardware is perfectly stable – both of which are incorrect assumptions when running in the cloud.
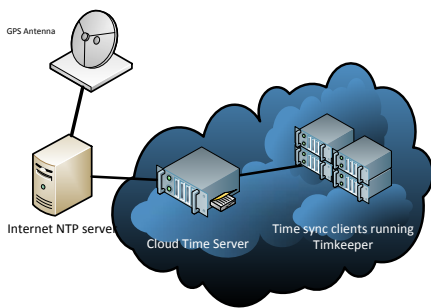
✓ No cross-check

In all environments, but especially in the cloud, one needs to check that the time one is being fed is accurate. A single bad network segment or bad time server should not cause you to have bad time and TimeKeeper won't allow that to happen. TimeKeeper is able to track multiple time sources at the same time and monitor the primary time source for quality and alert when there is a problem and optionally to take corrective action immediately- even in the presence of jamming or spoof attack.

✓ Relying on OS

The operating system typically does not have the capability of providing good time in virtual environments. Providing time is a hard task that the operating system isn't designed to carry out when running on top of virtualized hardware and using a virtualized clock. TimeKeeper is able to detect a virtual environment, use the on-chip time to model the system time and provide corrections based on a sophisticated model and dynamic data analysis..

Preferable Setup

When no internal time server is available to track wall-clock time but keep all systems very tightly synchronized to one another

GPS Antenna

Internet NTP server

Cloud Time Server

Time sync clients running Timkeeper

✓ Migration awareness

TimeKeeper detects when a virtual server instance is migrated or restarted and keeps time consistent for all applications. This means that timestamps, log files and application output are correlated throughout the network as images move around.

✓ Time jumps

TimeKeeper will not "jump" the time to make corrections. It smoothly speeds and slows the clock to adjust time via a controlled slew. Traditional and non-VM aware time synchronization tools will allow VM introduced errors to accumulate and then adjust the error all at once, then allow more error to accumulate. Applications are often not tolerant of time jumping, lurching and making abrupt changes. Logs will show incorrect times and multiple servers tracking the same time source will show wildly varying times. TimeKeeper makes time predictable and stops that behavior.

✓ Absolute time vs. same time

The most common need in cloud environments is to keep a group of servers as tightly synchronized as possible with that time then being reasonably close to UTC (wall-clock time). TimeKeeper can handle these competing requirements by tracking an absolute time source (UTC) and providing that time to peer systems in the cloud. This allows a collection of servers to be managed as a single unit

✓ No monitoring

Ideal Setup

Time server/grandmaster in the cloud environment itself
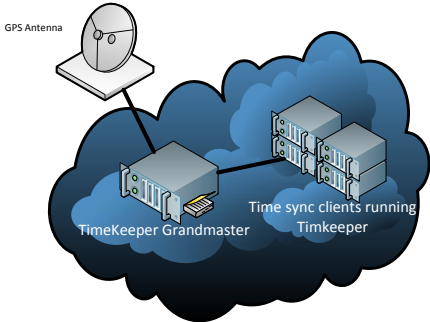
GPS Antenna

TimeKeeper Grandmaster

Time sync clients running Timkeeper

TimeKeeper® provides monitoring tools for upstream sources, downstream clients, alerts on problems and time quality violations through SNMP, email, and a web GUI that can show the behavior of your entire network with a "single-pane-of-glass". When managing time on a small or large scale cloud deployment knowing what your time infrastructure is doing is key to getting quality time – and TimeKeeper provides that.

✓ No failover

TimeKeeper provides monitoring tools for upstream sources, downstream clients, alerts on problems and time quality violations through SNMP, email, and a web GUI that can show the behavior of your entire network with a "single-pane-of-glass". When managing time on a small or large scale cloud deployment knowing what your time infrastructure is doing is key to getting quality time – and TimeKeeper provides that.

How to purchase

TimeKeeper, TimeKeeper Server Software, and TimeKeeper Client Software are all available from FSMLabs and FSMLabs' resellers. For purchase information or for a live demonstration of TimeKeeper please contact FSMLabs at sales@fsmlabs.com.

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