![FSMLabs Enterprise Real-Time®]

Time Synchronization for AWS and RHEL with TimeKeeper®: a solved problem

Accurate time synchronization in AWS is easy to achieve for those who want it. New financial regulations (MiFID II and FINRA changes) require 1 millisecond and sometimes 100 microsecond accuracy to UTC time. Many social media, gaming and other applications require similar accurate timing. In the past that was not easy since AWS is a virtualized environment where system time does not always match "real time". Getting past that is pretty easy now, though.

Below we show that using the TimeKeeper software on an AWS system using a RHEL AMI demonstrates very clearly that with the proper setup those time accuracy milesstones are easy to achieved.

AWS problems - simple solutions

It's not unusual to see 10 minutes/day drift with non-time synchronized EC2 instances. Precise time, given the harsh environment for time sync in the cloud requires sophisticated algorithms, filters, and network timing models that TimeKeeper provides.

It's also very important to properly setup your clients to get time from a good quality time server. To the right you can see how a typical setup normally works. AWS does not provide internal time servers so one has to get time from the internet. Often that means whatever default time servers a particular version of Windows or Linux defaults to. That's often a very bad choice. GPS time (equivalent to UTC here) is the original time source but there are 3 intermedia time servers that add their

Typical Cloud Deployment

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

Internet NTP server

Internet NTP server

Time sync clients running Timkeeper

own errors before it reaches the final client system. TimeKeeper automatically maps time sources that allows you to visualize this and check for a similar setups.
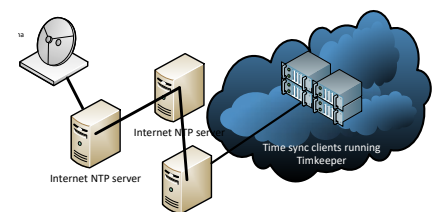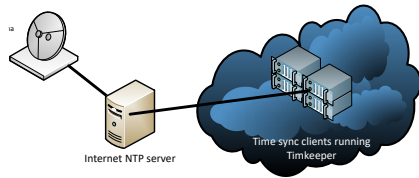
## Better Setup

Single time server

To the left is a better setup. It's not ideal but can provide good quality time. Here time is coming directly from a GPS connected server. This reduces the number of hops before time arrives at the client and results in a much better sync.

Preferable Setup

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

To the right is a far better setup. A single AWS instance is used to track a good time server. That in turn provides time to the other systems within AWS. This will allow close tracking of GPS/UTC time while also allowing for a very tight time sync between instances.
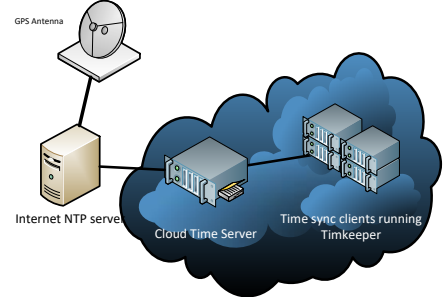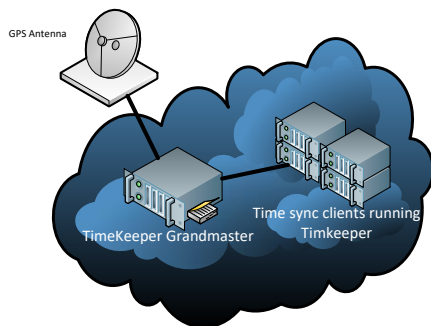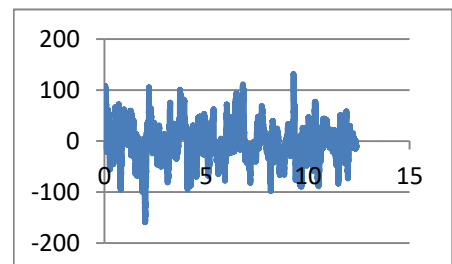
Ideal Setup

Time server/grandmaster in the cloud environment itself

Here is an ideal setup. This is only available when a GPS time server is available inside of your own network. TimeKeeper is configured to source time directly from that system over a DX or other direct link from within AWS.

12 Hour Accuracy

Over 12 hours accuracy of +-100 microseconds

To the right is a graph of time sync over X hours. It shows accuracy well within a milliseconds and very close to 100 microseconds.

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