HOPTROFF TIME

MiFID II timestamping reference guide

Delivering UTC traceable time

Hoptroff London Limited has for many years been delivering the most accurate clocks and watches in the world; we're most well-known for creating the first ever consumer timepiece containing an atomic clock (below, right). We now apply the same horological and atomic miniaturization principles to time stamping and synchronization in finance services through our Hoptroff Time products.

Hoptroff Time is a single integrated solution, combining clock infrastructure and software applications, designed to enable financial institutions to synchronize the clocks in their data centres to microsecond accuracy while minimizing additional expenditure on infrastructure upgrades and interference with the existing flow of data across the network.

Market participants will soon be required under planned MiFID II regulations to synchronize their clocks to a UTC accuracy, in order events can be reconstructed throughout the lifetime of each order in an accurate time sequence.

RTS 25, the regulatory standard applied by ESMA, specifies three levels of compliance, see *MiFID-II Timestamping Requirements* below.

For market participants, the 1s standard applies to human-based trading activity such as voice trading; the 100μs standard applies to high frequency traders; the 1ms standard applies to all other activity. For trading venues, the 100μs standard applies to activities with a latency time of 1ms or less; the 1ms standard applies to all other activity.

Achieving compliance

Hoptroff Time will make any market participant compliant with MIFID II by providing a system that will acquire UTC, distribute it across a server network, typically to an accuracy of 1μs, then continuously monitor that UTC synchronization is being maintained and timestamp the data flow to provide the records that will enable a later reconstruction of events.

Our implementation is non-invasive, steering the system clock on servers so that the trading application and its data flow are undisturbed. Non-invasive techniques developed in-house allow us to measure and calibrate out the variances between true gateway time and the timestamp created by the trading application. To this end, for example, we recently open-sourced our algorithms for FIX message nanosecond timestamp granularity.

HoptroffTime™ applies established high-accuracy technologies to deliver MiFID-II compliance.

What sets HoptroffTime™ apart is its understanding of the specific needs of the finance industry, including timestamping down to the application level and providing compliance validation and business improvement services.

MiFID-II Timestamping Requirements

Gateway to Gateway Latency	Max Divergence from UTC	Timestamp Granularity
Verbal Deals	1s	1s
> 1ms	1ms	1ms (0.001s)
≤ 1ms	100μs	1μs (0.000 001s)

To satisfy article 4 of RTS 25, we ensure:

↗ Traceability to UTC with documentation of system design, functioning and specifications
↗ Identification of the exact time at which a timestamp is applied
↗ Demonstrate that the timestamp is consistent
↗ Test procedures to provide comprehensive annual compliance reviews

Hoptroff time allows you to know, and be able to show others, that your clocks are correct to the required accuracy and to transfer this accuracy to the granularity of your timestamps. Our proposition is differentiated from competitors by a range of features:

- Providing both the clock infrastructure and software applications for UTC time synchronization across multiple servers, plus non-invasive timestamping functionality in one integrated solution.

- Optimized IEEE 1588 (PTP) and/or NTP solutions

- Integrating access to multiple time sources

- Minimal requirement to upgrade of switches or servers in the data centre

- Delivering timing accuracy and verification, with redundancy/failover, comfortably exceeding pending MIFID II regulations

Minimum additional network stress due to timing synchronization protocols

The HoptroffTime™ Solution

Hoptroff Time provides a range of atomic clocks that are designed to work as "Grandmaster" timing sources within the existing data centre infrastructure. They acquire and distribute the correct time (UTC) from a selection of different time sources (GPS, Glonass, NPL, NIST).

Hoptroff time grandmasters will fit in a standard 1U rack space in a data centre. In colocation centres where power and space are restricted, we have ultra-low power credit-card-sized atomic grandmasters that can sit inside existing servers, delivering levels of accuracy better than a 1µs, without requiring extra rack space.

Rack mount Hoptroff London GMC™ atomic clock.

We recommend, where possible, that three clocks are installed in a data centre, each connected to different UTC sources in order to give the system maximum operational redundancy: if one exterior source has a problem, there are two other sources still available. If a grandmaster fails then the system will "Failover" to the best alternative. If all time sources and/or switches fail, the grandmaster clocks will "Holdover" and keep running without reference to an exterior time source to an accuracy of 100µs for up to three weeks.

Time Management Suite™

We implement PTP (IEEE 1588) and/or NTP time distribution, whichever is optimal, and in most cases without the need to replace existing network architecture. The load on the network is measurable, minimized through careful implementation, and ultimately negligible.

The software layer provides the first layer of service support as it reports any drift in timing accuracy or server synchronization outside set parameters. If the fault cannot be corrected at the data centre, then it will be escalated to the service support desk which will provide any necessary software fixes or replacement components to restore the coherence of the timing network without any interruption in service.

Time Management Suite™ contains several unique, patent pending innovations:

- *ResilientPTP*™ time distribution that allows individual trading servers to determine which time source is locally most stable.
- *PacketPrecision*™ determination of the latency between the server's clock and the application timestamp.
- *TraceableUTC*™ timekeeping compliance reporting managed centrally by the Grandmaster Clocks.