

REGULATORY INTELLIGENCE

Global firms struggle to synch with regulatory-mandated time

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Timestamping trades in compliance with regulatory expectations is deceptively difficult and a bigger problem for markets than is generally acknowledged. Telling the time is assumed to be one of the easiest tasks for traders and compliance officers, but it turns out that setting the clocks to a standard time is complicated, industry officials said.

"The way we talk about time is people assume it is a currency — a given. Once we get people starting to question whether the time they count on and use is actually [Coordinated Universal Time (UTC)], is actually absolute time or it's just a version of time that their clock presents to them — once you start questioning that, it opens up a whole can of worms," said Tim Richards, chief operating officer at Hoptroff, a precision timing company in London that supplies time to financial services firms.

Far from being a monolithic measurement to which market participants are synchronised, time varies. That variation is not solely a function of leap seconds, time zones or daylight savings. It has to do with where market infrastructure providers and trading firms source their time and how stable that time is.

"It is incredibly challenging to put [accurate timestamping] in place, and manage it, unless you have the right skill sets and references to compare your time against. You could have the best clock in the world but not have the right time. Firms are still looking at the infrastructure they have in place or are putting in place and whether it's fit-for-purpose — from a timing perspective anyway," said Leon Lobo, head of the UK's National Timing Centre (NTC), located at the National Physical Laboratory in Teddington.

The UK's NTC programme is developing a terrestrial nationally distributed time infrastructure — a network of optical atomic clocks — to provide more resilient and reliable time and frequency signals. The purpose is to reduce or eliminate reliance on time derived solely from global positioning system (GPS) signals, which are weak and subject to disruption.

In addition to NTC and the United States' National Institute of Standards and Technology (NIST), there are around 80 laboratories worldwide which are developing, or have already developed, similar time infrastructures to contribute to UTC. The UTC time standard is one that regulators increasingly want financial services firms to use.

Sourcing time

The way firms source time and feed it into their servers is not particularly accurate, and drifts. That is partly because firms use time supplied by GPS that comes through an antenna on a data centre roof to atomic clocks, which then feed software. That takes the time feed, corrects the time on the server and maintains it to UTC.

"The problem with this sort of solution is it's quite complicated to manage. Getting an antenna on a data centre roof is expensive, because the data centre companies only have limited room space and they charge a premium to rent it out. Those antennas are also only locked to GPS. GPS is having various issues — it's an area called [Global Navigation Satellite Systems (GNSS)] vulnerability. GPS signals can be spoofed. They can be blocked. There are also an increasing number of space weather solar events coming up over the course of the next few years, that are going to cause GPS to be unavailable," Richards said.

Firms run their own atomic clocks. They seem like a great solution, but they are difficult and costly to maintain and degrade quickly, requiring replacement, Lobo said. Nor are they very practical for time stamping.

"The atomic clock on its own is not the solution. An atomic clock is a stable timing device, but it doesn't have the right time. You have to tell it what the right time is, and because of that, the putting in place an atomic clock — and not considering how you steer it to the global reference that is coordinated universal time (UTC) — is sort of a fruitless affair, unless you're only considering using it to synchronise two locations. But if you're using it for time stamping, you absolutely need to have a source that you can trace all the way back to the global reference that is UTC," Lobo said.

A few UK firms and venues access a cable that delivers NTC's UTC to their servers. The uptake is not universal, however.

Hoptroff takes timing feeds from different GPS satellite constellations which feed its timing hubs in London, New York and Tokyo. From those timing hubs, it can feed any data centre in the world. In addition to the GPS timing feed, Hoptroff has a direct terrestrial connection to the Research Institutes of Sweden (RISE), which is equivalent to the UK's NTC. It will connect to the NTC by the year end, and early next year it will establish a direct feed from NIST in the United States.

This "belt and braces" approach to delivering UTC using GPS — together with terrestrial time systems such as NIST, RISE and NTC — is the future, because multiple feeds offer safety and stability, Richards said.



Flash crash

Regulators want firms to synchronise to UTC to establish an audit trail for trading in secondary markets. Inaccurate clock synchronisation and time variation between firms makes it difficult for regulators to sequence trades — that is, put them in chronological order. That becomes an issue when, for example, regulators investigate market abuse. It is important to see which trades happened when, when trying to determine whether spoofing has occurred.

The issue came to the fore when regulators were unpicking the aftermath of the 2010 flash crash, which saw the Dow Jones Industrial Average drop almost 1,000 points in a few minutes, then rebound rapidly. In response to that event, and to the growth of high-frequency trading (HFT), the UK government's 2012 [Foresight report](#), "The Future of Computer Trading in Financial Markets" recommended that a high-resolution, synchronised timestamp could act as an enabling tool for analysis of financial markets.

"Since [the Foresight report], the work has changed dramatically in ensuring that there's market clarity in the first place, by virtue of everyone who is generating reportable events having timestamps that are actually traceable to the same reference, as opposed to everyone having any random source of time," Lobo said.

Regulatory time change

The International Organisation of Securities Commissions (IOSCO) recommends that national competent authorities require firms synchronise to UTC to timestamp all transactions.

"Accurate and precise time stamps can help regulators reconstruct past events, which may occur on different markets or in different jurisdictions. Regulatory authorities can better use time stamps from synchronised clocks to more effectively monitor and identify instances of potential market abuse and analyse market events for regulatory purposes," IOSCO [wrote](#) in 2019.

In the United States, those contributing to the Consolidated Audit Trail (CAT) must synchronise their business clocks to the time maintained by [NIST](#), which is one of the clocks that contributes to the UTC. Members of self-regulatory organisations (SROs) must also synchronise their business clocks to [NIST](#).

UTC timestamping is required under the European Market Infrastructure Regulation ([EMIR](#)) for trade reporting.

MiFID II timestamping

The Markets in Financial Instruments Directive's ([MiFID II](#)) regulatory technical standard 25 made precise timing a regulatory requirement. Now firms must report to UTC with varying levels of precision, depending on the kind of trading. Trades executed by humans must be recorded to a one-second standard. High-Frequency trading market participants must be time-stamped to 100-microsecond precision. That is one-millionth of a second.

Previously, UK firms could report to local time. There were no requirements to synchronise the business clocks of trading firms and their customers, so that timestamps recorded are standardised across the industry.

Timestamping errors come up frequently in Financial Conduct Authority (FCA) bulletins describing common errors observed in MiFID II transaction reports.

"The time when the transaction was executed should be reported in Coordinated Universal Time (UTC). We continue to see errors ... when UK clocks transition to and from British Summer Time, as well as errors driven by inaccurate clock synchronisation. Firms should have arrangements in place to ensure consistent and accurate reporting of trading date and time, " the FCA [said](#) in 2019.

"It all falls back to what happened when. Being able to trace the time that is on your server all the way back to a stratum zero atomic clock is absolutely critical. That's ultimately what being able to prove that you're operating at UTC does. It says, 'I have an unbroken chain of comparisons back to UTC, so I can prove exactly what happened, and when'. That's what the regulator is seeking," Richards said.

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