

## **ANOTHER LEAP SECOND : KEEP SYNCHRONIZED**

**On December 31<sup>st</sup> 2008, at 23:59:59 based on the universal time scale (known as Universal Coordinated Time or UTC), one 'leap second' will be added to the last day of the year. In other words, instead of switching from 23:59:59 to 00:00:00 as is usual, accurate clocks will sequentially display 23:59:59, then 23:59:60, and finally 00:00:00.** This extra second will re-synchronize the international atomic time scale based on atomic clocks spread all around the world (which serve as reference for UTC) and the exact position and attitude of the Earth on its orbit, which is subject to numerous tiny perturbations that cumulate over time. Without the leap seconds adjustments that take place at irregular intervals every few years, the Sun would eventually rise at midnight and set at noon...

### **The base unit for time keeping -**

The second is scientifically defined through the physical properties of cesium atoms, which never change over time. This is the basis for the extremely accurate measurement of time provided by cesium atomic clocks, which are so good that the Bureau International de l'Heure (BIH) decided in 1972 to use a mean atomic time scale based on about 300 atomic clocks spread all around the world as the universal time scale. On the other hand, the astronomical time scale, which our ancestors have been using for centuries, and which is based on the position of the Earth in the universe relative to fixed stars, is subject to various perturbation, one important of which being the gradual slowdown of the Earth's daily rotation time. Because these two time scales are equally relevant but tend to gradually differ from each other, leap seconds must be added to keep the international atomic time in sync with the Earth's actual position.

### **The leap second -**

To synchronize atomic clocks with the Earth's observed rotation, the decision of adding a leap second is left to the International Earth Rotation and Reference System Service (IERS) based in Paris. According to the Observatoire de Paris, 23 leap seconds have been added to the world's official time since the practice was first mandated by the IERS. The latest offset was made in 2005, and the next one is expected for 2012 or 2013, explained Daniel Gambis, Head of Director of the earth's rotation at l'Observatoire de Paris in an AFP Release.

### **The importance of accurate, precise and stable time -**

Even though telephony, computer systems and Internet networks are intertwined with everyday life, few of us do understand the wide variety of technology that makes them work with the reliability we have come to expect. One of the most essential technologies used in these communications systems, and paradoxically one of the least expected, is time keeping. Equipment and systems generate and





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distribute high-precision Time & Frequency signals “behind the scenes” 24 hours a day and 7 days a week, anywhere on the network to allow critical applications to operate trouble-free with millionth of a second accuracy.

Coordinating the leap second across millions of computers worldwide on different networks worldwide at the same exact instant is provided by the same protocol used to normally synchronize these computers. Network Time Protocol (NTP) is a robust clock synchronization protocol built into most computer operating systems to eliminate time-based errors due to expected clock drift. Spectracom NetClock® NTP time servers support all NTP server standards. It provides a leap second indicator to warn users, computers and operating system of the upcoming change.

Users can rest assured that a timing system based on a Spectracom NetClock offers synchronize through even one-time single second events such as the leap second.



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