South London Branch

British Horological Institute

Branch No 25. Founded 1978

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British Horological Institute

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Meetings are held on the 1st Thursday of each month

At The White Hart Barn (Godstone Village Hall)

Godstone Surrey RH9 8DU at 7.30 p.m. for 8 p.m.

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"We must use time as a tool not a couch" ***John F. Kennedy***

Next Month's Meeting at the White Hart Barn

The Beresford Hutchinson Memorial Lecture.

5th September 19.30 for an 20.00 start

Darlah Thomas.

The Condliff Family, four generations of clockmakers. Their Lives and Business.

As this is the Beresford Hutchinson Memorial Lecture, we will be having our customary light buffet of food and clock oil of your choice.

I first met Darlah and Steve Thomas at Lyme Park 2014 with the Manchester Branch of the BHI and the Northern section of the AHS. We had another encounter in 2019 when the Northern section AHS had a full day celebrating 50 years of existence, Darlah giving the closing lecture.

Darlah and her husband Steve are collectors and researchers having published The Gloverstone Clockmakers of Chester, (their hometown), Joyce of Whitchurch, 1690-1965. The Turret Clocks of T Cooke & Sons of York, and many other articles www.inbeat.org

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During Lockdown 20 years of compiling information, in my opinion, the best Skeleton clockmaker James Condliff brings to light a family who were prolific 19th century clockmakers of Liverpool. They not only produced domestic and board room clocks, Skeleton clocks but Regulators and Turret clocks. Researching information on the family has been difficult as they did not advertise or produce catalogues and lived quietly. There emerges more to the story as Dealers, clockmakers, restorers and conservators alike have shared their photographs and information.

Remembering as we do Beresford Hutchinson in our lecture tonight, I am sure there would be many more recollections he would have contributed from his encyclopaedic mind.

Duncan Greig

SLBBHI OPEN DAY

Just a reminder about our Open Day. Tell your friends etc.

Can anyone help this student?

I received this email from one of our younger members, there must be someone out there who could help

"Hello, I was wondering if you have or know about anywhere that I can find technical sheets for watch movements. I am planning to make a scaled up working model of a mechanical watch for my GCSE DT project, and I want to have model the movement (preferably the ETA 6497/8) in CAD, but I cannot find anything over the internet about any sort of technical sheets/ specifications, etc., and I also emailed ETA SA for the same thing but they have not replied yet, so would you know any place to get this information? Thanks" Enes Tanberk.

Any info could be sent to Enes :- tanberkenes@gmail.com

Or me Bill:- electricwilliam@gmail.com

WORKSHOP COURSES

The workshop is going well contact Trevor for info.
07507-142-704

Last Month's Meeting
Richard Steedman
"How Computers tell the time"

Computer clocks which show an incorrect time are not moved forwards or backwards to correct them unless the error is very large because this would cause all sorts of problems with other software on the machine, and in the worst case might cause a breakdown, members were told at the August branch meeting.

Instead, if synchronisation with a time source showed that a clock was running slowly, it was speeded up until it was correct again, and if running too fast was slowed down, said Richard Steedman, secretary of the BHI's Wessex Branch.

The reason for this was that any major jump backwards in time settings would cause difficulties for programs attempting to save or retrieve documents, photographs and other information, all of which is automatically time-stamped.

The major system by which most computers connected to the internet correct their clocks is the Network Time Protocol (NTP), which was one of the first parts of the internet to be standardised, he told the meeting.

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But there was also an alternative – and more accurate -protocol, which was used by specialists such as the financial industry, where extremely accurate time-keeping was required.

The NTP was proposed in 1985, the first official version appeared in the summer of 1988, and it was currently on its fourth version, published in June 2010, Mr. Steedman said.

The way in which a computer determined the correct time from another source over a data network involved the concept of time transfer, and the question of how two entities checked whether their clocks were telling the same time when it took an unknown time to send a message from one to the other.

As a simple example, imagine that two computers with clocks indicating exactly the same time communicated over a link taking exactly one second to send a message from one end to the other. One initiates a time check with the other over the link just as its clock ticks over from one minute to the next:

1/ At hh:mm:00 computer 1 says: 'My clock shows hh:mm:00' (this isT1).

2/ Computer 2 receives this message when its own clock shows hh: mm: 01, as both clocks show the same time and it takes 1 second to deliver the message (this is T2).

3/ Exactly 1 second later computer 2 sends a message to

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than the NTP program.

For example, the distribution known as 'Red Hat' used a program called 'chrony' by default. The authors of chrony say their software is designed 'to perform well in a wide range of conditions, including intermittent network connections, heavily congested networks, changing temperatures, and systems that do not run continuously, or run on a virtual machine'.

The implication seems to be that NTP may not perform so well in such situations. Certainly, chrony allowed for more rapid rate corrections.

There was also an alternative to the NTP called the Precision Timing Protocol (PTP), which allowed computers to synchronise their clocks to a much higher degree of accuracy – less than a microsecond – which made it attractive for applications such as financial trading.

Note: This summary of Mr Steedman's talk is based on an article he wrote on this topic which appeared in the January 2024 issue of the Horological Journal, pages 12-19.

A typical home computer running the Windows operating system would have a clock driven by a crystal oscillator of, say, ± 10 ppm. accuracy (approximately 1 s/day error), and would re-synchronise with a NTP server once a week.

But in many business applications such inaccuracy was unacceptable and computers must continuously adjust their clocks to maintain correct time.

NTP packets contain additional information – designed to help a client computer evaluate the reliability of a particular server as a time source – to assist this process.

Computers using NTP to adjust their clock continuously typically evaluated up to four or more servers at any time to pick the best one to which to synchronise.

One issue which had to be considered was so-called ‘jitter’ – the variation in Theta values from a server over a given period. The higher the degree and frequency of variation, the worse the jitter, and the less suitable the server was for use as a time source for synchronisation.

In recent years, Mr Steedman said, a number of alternative implementations of the NTP had appeared for the Linux operating system, some of which had become the default installation choice for certain Linux distributions, rather

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computer 1 saying: ‘When I received your message, my clock indicated hh:mm:01 and, at the point at which I am replying, my clock is indicating hh: mm:02.’ (This is T3)

4/ Computer 1, when it receives this message, notes the time that its own clock is indicating. This will be hh:mm:03 since the two clocks are indicating the same time and it takes 1 second for the message to be delivered (This is T4).

Computer 1 now has the information it needs to check by how much, if any, its clock differs from that of computer 2.

This formula gives the difference between the two clocks, known as Theta:

$$\text{Theta} = \frac{(T2-T1) - (T4-T3)}{2}$$

A positive value of Theta meant that computer 1’s clock is behind that of computer 2. In the case considered above, (T2–T1) was 1 second and (T4–T3) was also 1 second, so Theta was zero, meaning there was no difference between the clocks.

Now suppose computer 1’s clock was exactly 1 second behind that of computer 2. Using the formula, (T2-T1) would be 2s and (T4-T3) would be 0s giving a Theta value of 1,

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indicating that computer 1's clock was 1 second behind that of computer 2.

To put it another way, if computer 1's clock was behind that of computer 2's by an amount Theta, the time taken to deliver the outgoing message would appear to increase by Theta and the time taken to deliver the reply would seem to decrease by Theta. Subtracting the reply time from the out going time resulted in a value of 2 × Theta.

Thus, Theta could be worked out by calculating the difference between the outgoing and reply delivery times and dividing by two.

This method of time transfer worked only if message transmission times were the same in both directions – if there was any time difference, the calculation of Theta would say this was a difference between the two clocks, even if in fact they were synchronised, Mr Steedman said.

But for the NTP's purposes, any transmission time differences over an internet connection were likely to be only a few milliseconds – a perfectly acceptable magnitude of uncertainty of clock synchronisation for most applications.

However, one application in which transmission time

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asymmetry presented a much greater challenge for time transfer was the calculation of UTC -Coordinated Universal Time, the primary time standard across the globe.

Every month, the BIPM – the Bureau International des Poids et Mesures - published a bulletin called Circular T, which summarised the comparative performance of approximately 260 atomic clocks in more than 50 locations around the globe.

For most of these locations, it was impractical to construct a communications link to another location with sufficient guarantee of bi-directional timing symmetry to enable time transfer. Instead, most locations monitored their clocks' performance relative to a common, globally receivable timing source (such as GPS) and send that data to the BIPM, Mr Steedman said.

Free software such as Wire shark could be used to arrange NTP time transfers from time servers such as the publicly accessible ones provided by the National Physical Laboratory at Teddington.

This involved specifying the network connection – such as Ethernet or Wi-Fi being used, and making sure the software captured only internet packets relating to the NTP protocol.

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