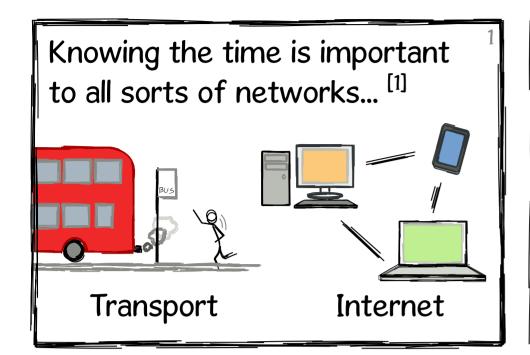
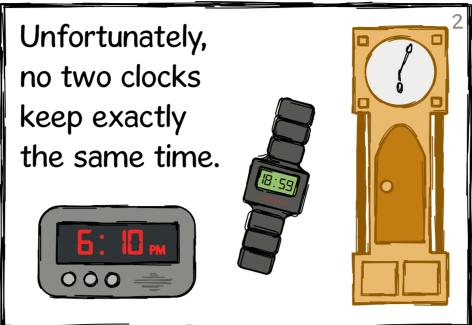
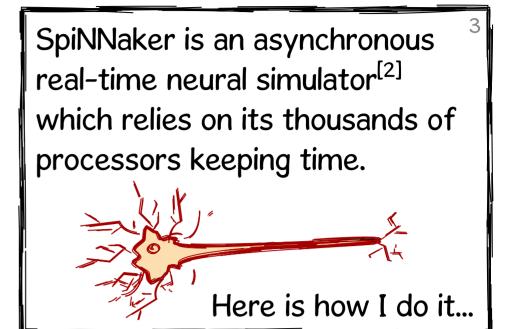
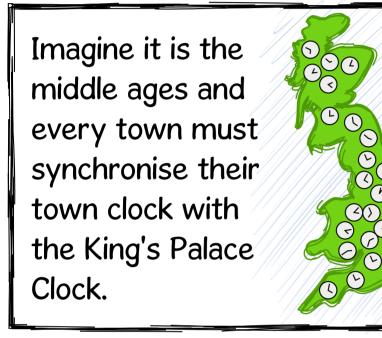


## Synchronising Clocks in an Asynchronous Super-Computer



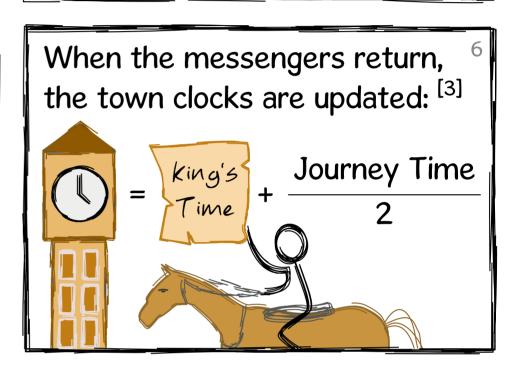


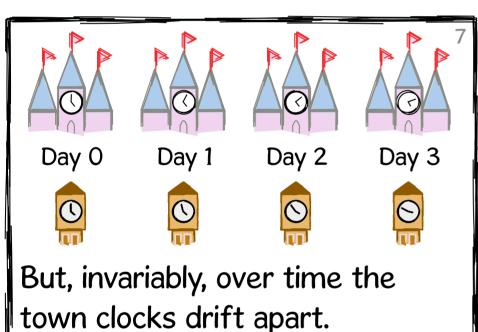


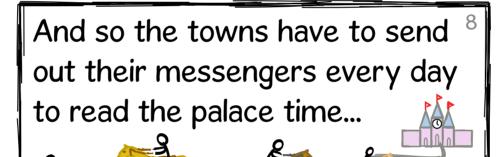




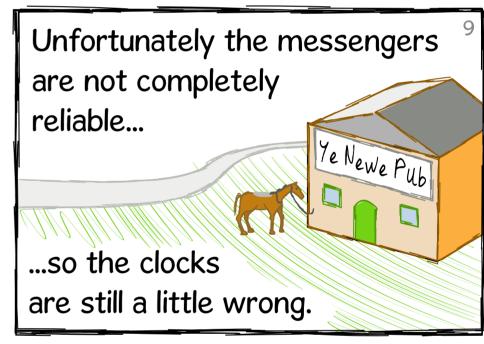
Each town sends a messenger on horse-back to read the palace clock, noting down the time when they left and returned.







...which costs them the use of their messenger and horse!



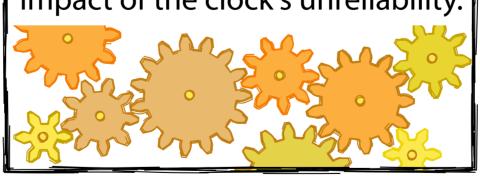
The towns notice that they're adjusting their clocks by roughly the same amount each time... [4]

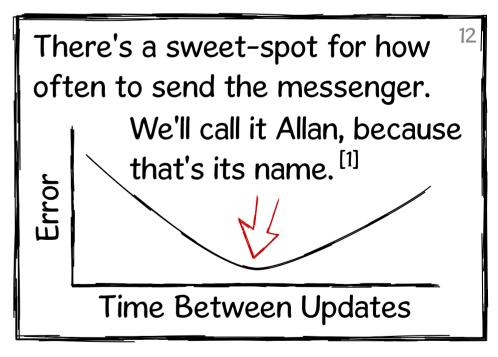


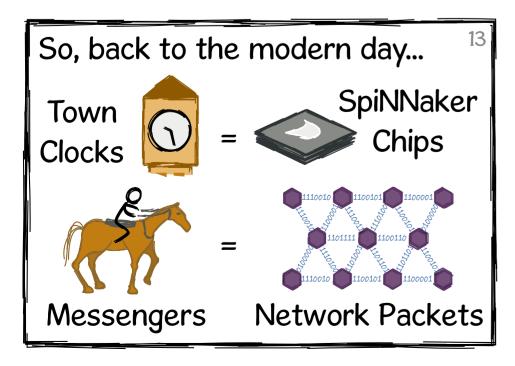
 $\Delta f = \frac{\text{average adjustment}}{\text{time between checks}}$ 

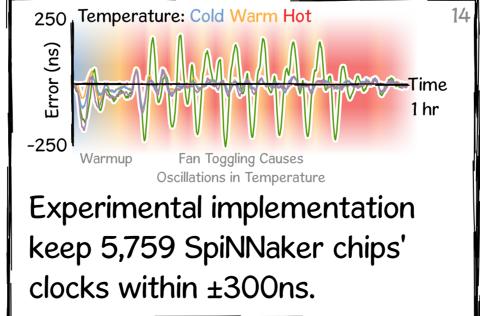
...meaning that they don't always need to send their messengers.

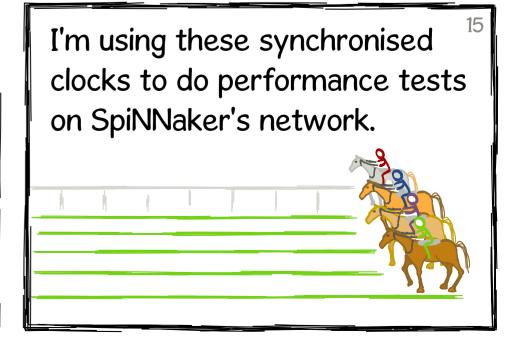
Infrequent checking minimises the errors due to the messengers' unreliability but increases the impact of the clock's unreliability.











## References

[1] David W. Allan. Time and frequency(time-domain) characterization, estimation, and prediction of precision clocks and oscillators. In *IEEE transactions on ultrasonics, ferroelectrics, and frequency control, 1987*, Vol 34.6, p647-654.

on on [4] A

[3] Gusella, Riccardo and Zatti, Stefano. The accuracy of the clock synchronization achieved by TEMPO in Berkeley UNIX 4.3 BSD. In *IEEE Transactions on Software Engineering, 1989*, Vol 15.7, p847-853.