Reading Report: Neville-Neil16

Albert Bausili

March 5, 2023

Upload your report in PDF format.
Use this LaTeX template to format the report, keeping the proposed headers.
The length of the report must not exceed **5 pages**.

1 Content

1.1 Identify the genre[1] of the document, its purpose, and its target audience.

The document is an article. Its target audience computer scientist or other people closelly related to the distributed system field, however, its purpose is to inform and explain the concept of time in computers, specifically, distributed systems.

1.2 Summarize the document, indicating the key concepts[2].

In summary, clocks in computers are not perfect and as we, as humans, usually need to use or measure time (for example for ordering of events) there need to be some techniques in order to solve the possible drifting or skewing. There are solutions at hardware level such as better crystals to keep a precise track of time, and there are others at software level such as NTP or PTP.

Firstly, time is kept in computers using quartz crystals, that in an ideal world would perfectly keep record of time, however, in reality this crystals are affected by many different external agents such as heat. To solve this, the operating system usually have a set of routines defined to intervene when the clock is running too slow or too fast. However this measures must be applied gently to avoid pushing the system into hysteresis (a condition when the clock oscillates wildly around proper syntonization).

As it can be deduced, the OS needs some sort of reliable check in order to know if the clock is in fact running too fast or too slow. This can be achieved with an injection of high quality 10MHz signal, however, this solution scales terribly, it can also be achieved with better crystals and/or GPS-based clock with stable oscillator. So normally OS implement some sort of algorithm (normally NTP or PTP) to allow them to receive the correct time from a remote better

[1] Genres: book, article, essay, report, review, manual, white paper, data sheet, weblog, etc.
[2] The summary should help you to answer the questions about the reading in the exam.

clock.

Besides this, once the we have an OS with a proper clock using any of the aforementioned techniques, we need to pass this information to the requesting programs, and this can be achieved trough the use of syscalls. These syscalls present our second problem, or more properly said as trade-off, as accuracy in the given time cannot be achieved at the same time as speed. Therefore, time syscalls in OS usually have "FAST" and "PRECISE" variants. In recent years, the modern CPU's have an on chip Time Stamp Counter, used to measure the time between to local events.

NTP vs PTP:

In the one hand, NTP is a protocol that has been used since its creation in 1985. This protocol has been the best solution to synchronization to network clocks for many years, although because of its age, there is a design decision that makes it unusable for some high precision purposes. This happens as the minimum polling rate is of 16 seconds, and the default one is 64 seconds.

In the other hand, PTP is a protocol designed to be used under high precision requirements, as it can operate at nanosecond level. In spite of being a higher precision protocol it is not suited to all use cases as it is not conceived to be deployed in multiple networks with switches or routers. And that it assumes a symetric connection between the grandmaster (the one who keeps the time and distributes it among the slaves) and the slaves. PTP is that precise that even the slightest jitter in connections may inpact in its performance, so it usually needs an independent network in order to operate without having the impact of the rest of the network traffic. Besides this, it also needs speciallised equipment that keeps the timestamps in the NIC (network interface controller) itself in order to avoid crossing all the software layers.

2 Assessment

2.1 Rate the readability of the document: easy, readable, difficult, unreadable.

Readable

2.2 Give your opinion of the reading assignment, indicating whether it should be included in next year's course or not.

I think is a good paper to be read although its structure is a little bit confusing.