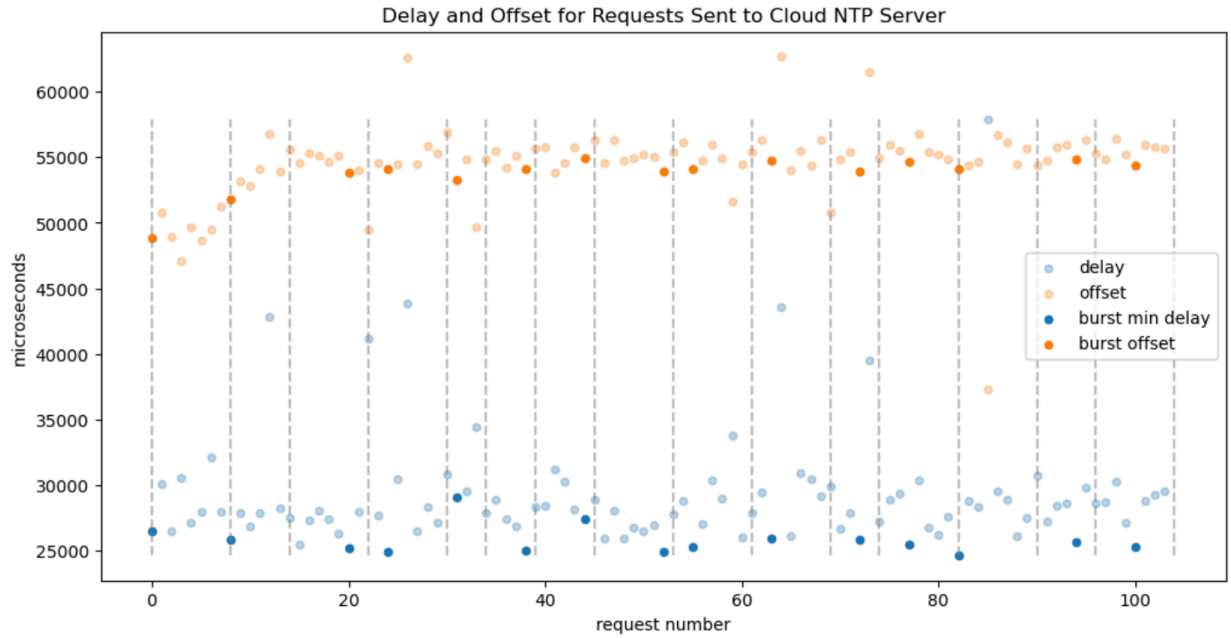

Fig 1. The delay and offset for each request sent to the NTP server running on the cloud, measured in microseconds. <delay, offset> pairs are aligned vertically. Dashed vertical lines separate bursts. The dark points within a burst represent the request that had the lowest delay within that burst.

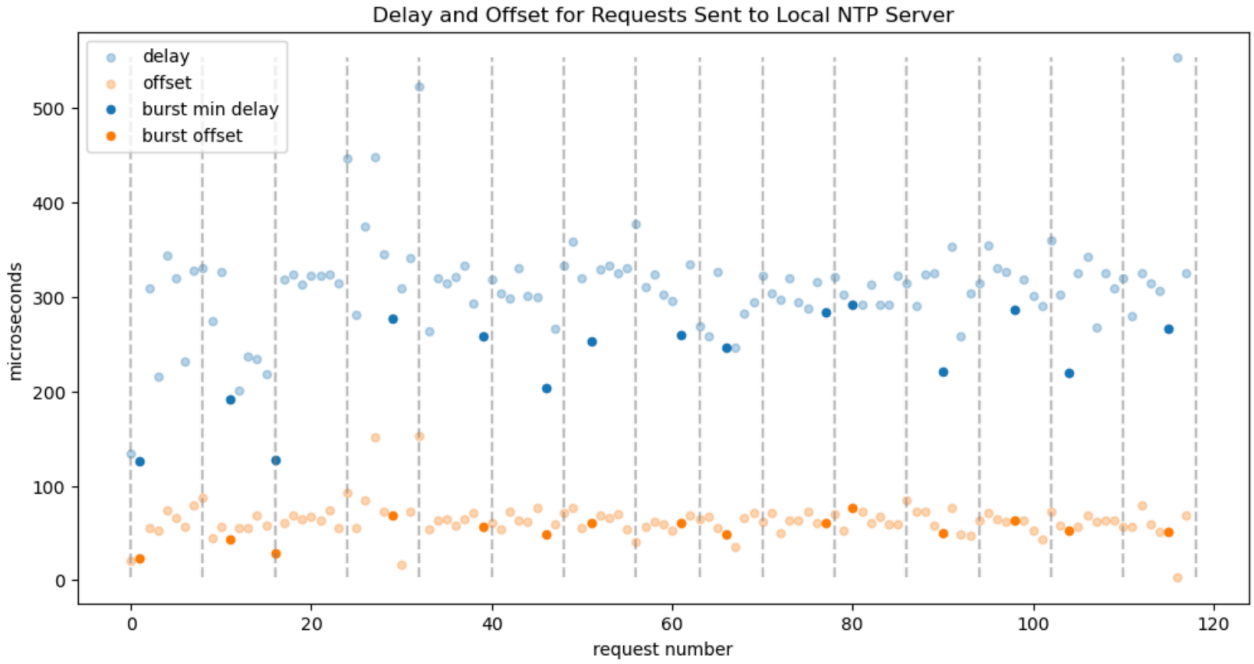

Figure 2. The delay and offset for each request sent to the NTP server running locally, measured in microseconds. <delay, offset> pairs are aligned vertically. Dashed vertical lines separate bursts. The dark points within a burst represent the request that had the lowest delay within that burst.

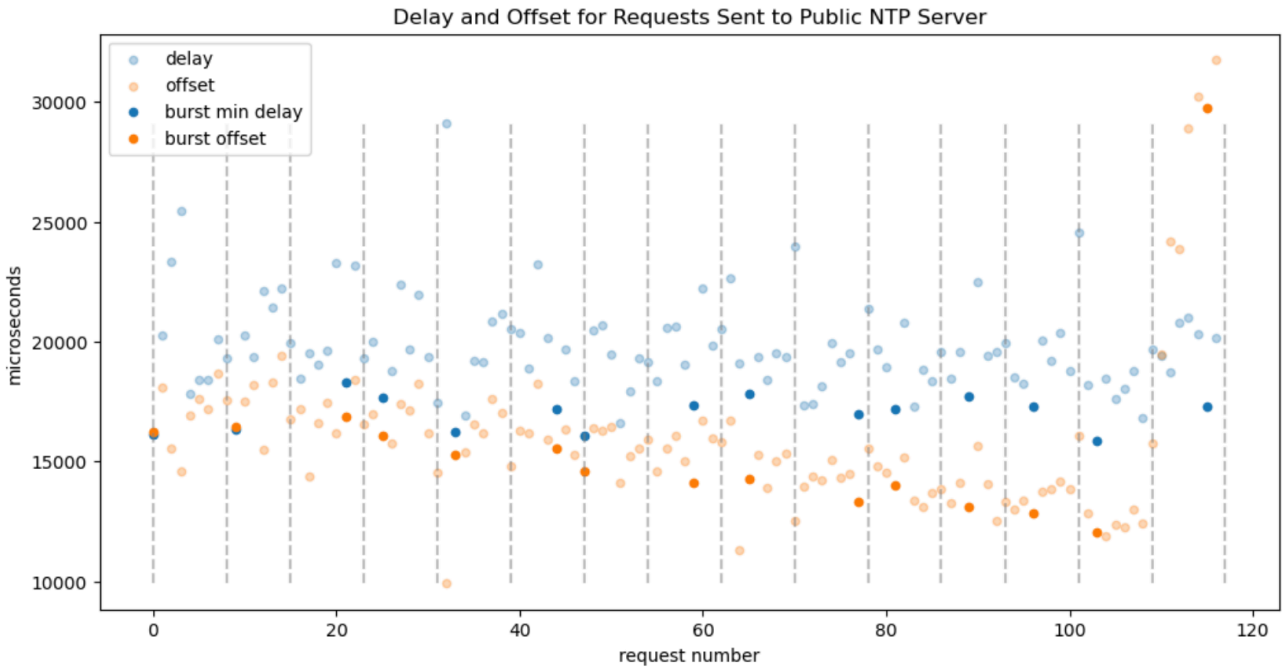

Figure 3. The delay and offset for each request sent to the a public NTP server, measured in microseconds. <delay, offset> pairs are aligned vertically. Dashed vertical lines separate bursts. The dark points within a burst represent the request that had the lowest delay within that burst.

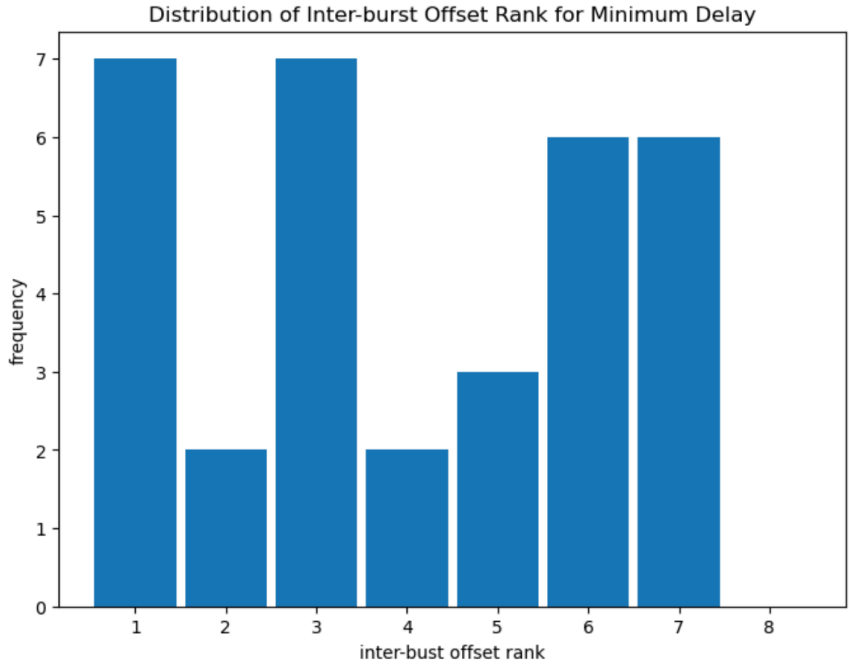

Figure 4. Distribution of the inter-burst rank of the offset for the request with the minimum inter-burst delay for requests sent to all servers.

Analysis

The data shows that inter-burst variation is roughly constant for each of the three servers, with the exception of a few outliers that have high variance. That said, the inter-burst mean offset and delay shifts. Most notably, for requests made to the public NTP server, Figure 3 shows requests having a lower offset for later bursts, while the mean delay stay roughly the same.

Predictably, the further away the server is from the client, the lower the absolute delay and offset are. Note that the cloud NTP server was located in Iowa while the public NTP server is in Boulder. All NTP clients were in Boulder. The requests sent to the public NTP server, however, had a higher variance in delay and offset than requests sent to the cloud server. One explanation for this is that the public NTP server has a variable load, since it serves requests from users other than myself, which the cloud NTP server is only serving requests from one user.

The analysis in the previous paragraph points to the idea that lower the delay is, the lower the offset will be. This is shown by the fact that the offset is lower when the reference clock is closer to the client, with the caveat that public NTP server serve multiple clients and thus have variable load. That said, Figure 4 shows that just because a given request had the lowest delay within its burst does not mean that the offset will be the lowest, relative to the other offset measurements within that same burst.