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Geosci. Instrum. Method. Data Syst. Discuss., author comment AC2
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Reply on RC2

Shane Coyle et al.

Author comment on "The impact and resolution of the GPS week number rollover of April 2019 on autonomous geophysical instrument platforms" by Shane Coyle et al., Geosci. Instrum. Method. Data Syst. Discuss., https://doi.org/10.5194/gi-2020-47-AC2, 2021

The authors thank the reviewer for their comments, and have corrected the minor typos as suggested. We hope to provide here some clarification in response to the reviewer's more detailed comments.

RE: Line 42, "numerous" flights being grounded/delayed,
- At least 30 flights were impacted, but official numbers were never released.

RE: Line 60, the number of flights per site per year,
- The sites do not recieve yearly visits by design, and so caches are only laid on demand and as determined by availability.

RE: Line 69, the availability of sunlight,
- There are ocassionally noted dropouts in sunlight likely due to weather, but on average at such high latitudes we have near constant sunlight during the southern summer.

RE: Line 163, the Iridium network and PGs,
- All of the sytems utilize the Iridium network for communications. PG1 uses a P2P setup, but the other stations, including PG0, utilize the RUDICS network.

RE: Line 188, full capacity,
- At the time of writing, it would not have been expected that the remaining system would have come out of hibernation. Based on such expectation and the success of the SW patch, the array was operating at it's expected operational capacity.

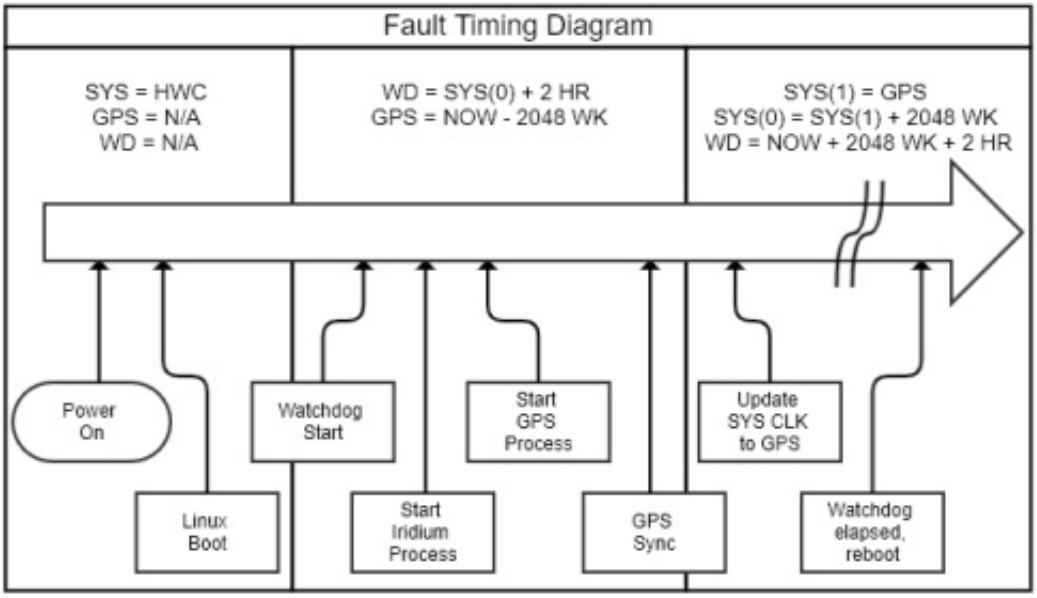
RE: Figure 2 (previously), the subsystem diagram,
- The difference in the figures is more than just an aditional line from Iridium to the system clock. The hardware clock now feeds the watchdog in stead of the system clock as well.

RE: Aditional details and technical information,
- We appreciate the desire for more detailed technical information regarding the AAL-PIP design and operation, specifically as it relates to the fault condition. Much of this information is available in previous work referenced within the manuscript. To answer the question of which GPS module was at fault, the AAL-PIPs described use the Garmin GPS 15xH. However, it appears that the rollover issue has been addressed in later firmware revisions of this module. In fact, one system was unaffected by the rollover because it

wasn't built until several years after the initial deployment and thus benefited from the newer firmware.

The systems as designed are unable to make use of NTPD, as the GPS module is only toggled for 5 minutes once every hour. Similarly, Iridium is only toggled for 5 minutes at a time every half hour. The method by which clocks are adjusted on AAL-PIP is by using the Linux command "adjtimex".

Though we could provide great technical detail for this fault, it remains the intent of the authors to provide a high level summary in order to focus more on general design guidelines. However, because the sequence of timing is critical to the occurence of the fault, we have included a new figure sumarizing the process of clock synchronization on AAL-PIP (new Figure 2, attached).



CAPTION: Diagram showing the process of updating the multiple clocks on an AAL-PIP. After the Linux OS finishes initialization, the AAL-PIP software sets the watchdog (WD) timer and spawns separate processes for communication and GPS synchronization. In this diagram, SYS(0) refers to the value of the system clock after boot, whereas SYS(1) is the system clock value after GPS sync. The fault occurs in block three, where the system clock SYS(1) is set to the erroneously offset GPS time.