

TimeTheSat
Measuring Time Accuracy
15th September 2013
Dave Gault

Preamble:-

- The application TimeTheSat¹ runs on an Android Smartphone.
- It uses a NTP and has a list of time servers from which to choose for synchronisation. It's almost always best to choose a time server close to the user's location
- It uses the Smartphone's built in GPS for Geolocation data
- The operator presses the phone's return button (or the volume button) to trigger a time-stamp record, and a beep is sounded.
- Provision is given to save and share the time record, which is uploaded to the Sat-Flare² website

Equipment, Time References and software:-

- For these test a Samsung S3 phone was used.
- I'm located near Sydney, Australia so the NTP time server used was Australia NTP Pool Project³. This server gave TAcc<0.1 sec
- Reference device was GPS-ABC⁴. This device provided audible beeps synchronised to UTC to +/-0.001 sec.
- Audible record was recorded on a ViewSonic laptop computer using Ubuntu 12.04 Operating System.
- Audacity⁵ Software to make and analyse the recording.



Testing schema:-

- In use TimeTheSat timestamps the instant the return button is pressed. In reality, this is a touch screen function and as such there are no electrical contacts to make or break. A beep is sounded to confirm that a timestamp has been made.
- An arrangement was devised so that the laptop body was knocked at the same instant as the Phone's Return button was activated. This was achieved by using two fingers of the one hand and a piece of wood was used to lift the deck of the phone level with the deck of the laptop. This was the operator's input.
- Analysis using Audacity would determine;
 1. the time of the GPS-ABC beeps these should start at the integer second.
 2. the time of the tap laptop's body and hence activation the phone's Return button
 3. the time of TimeTheSat beep.



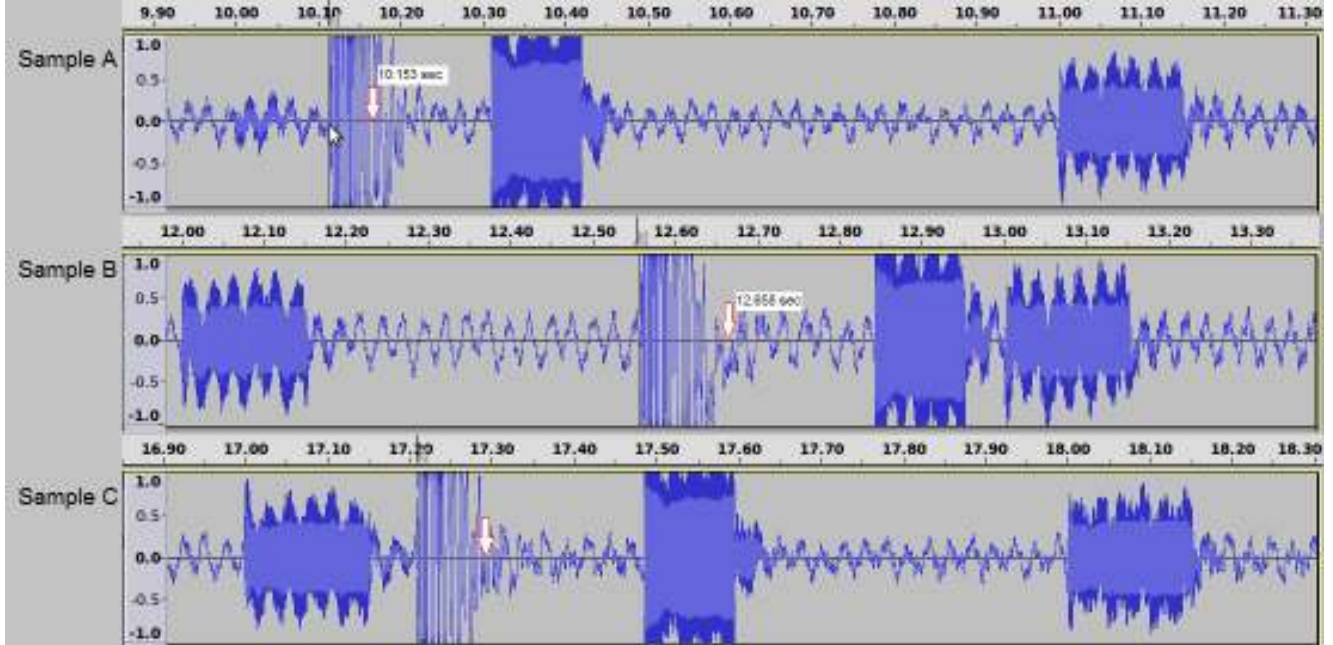
- These time could then be compared to the TimeTheSat Timestamp and the delay if any could be calculated.

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Testing Method:-

- start GPS-ABC and wait for the A-OK LED to light
- start the laptop
- start Audacity and ensure the recording microphone levels are OK.
- start TimeTheSat and obtain a NTP Sync.
- start a recording and make a number of samples.
- analyse the samples.

Samples:-



Analysis:-

Sample	GPS-ABC ¹ (sec)	Knock (sec)	Timestamp (sec)	Delay (sec)	TimeTheSat beep (sec)	Delay (sec)	GPS-ABC ² (sec)
A	10.000	10.12	10.153	0.033	10.31	0.190	11.000
B	12.000	12.55	12.658	0.108	12.84	0.290	13.000
C	17.000	17.21	17.290	0.080	17.48	0.270	18.000
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				0.074		0.250	

- an average delay of 0.074 seconds was observed from the activation of the timing input to the recording of the TimeTheSat timestamp.
- an average delay of 0.250 seconds was observed from the activation of the timing input to the sounding of the TimeTheSat beep.

Conclusion:-

Visual observations using TimeTheSat as the Time-Base are possible, provided a good NTP Sync is obtained from a nearby server and the TAcc is 0.100 sec or less. In addition;

- An observer would have to make allowance for the TimeTheSat timestamp delay. This would be added to their own Personal Equation (PE).
- Reported Observation Accuracy should be 10x the TAcc value.
 - o A TAcc of 0.075 sec means the Observation Accuracy should be reported as +/-0.75 sec.
- The audible beep of TimeTheSat is of little use as a timing function. It's primary use however is to simply confirm that a timestamp function did occur.
- TimeTheSat is NOT suitable to time events using Video methods.

Comment:-

A careful observer should perform their own testing to verify the Time-Base to their own satisfaction.

Notes

1. <https://play.google.com/store/apps/details?id=com.satflare.timesat&hl=en>
2. <http://www.satflare.com>
3. <http://www.pool.ntp.org/zone/au> NTP Server URL= au.pool.ntp.org
4. <http://www.kuriwaobservatory.com/GPS-ABC.html>
5. <http://audacity.sourceforge.net/>