

WiFi RTT measurements as the GNSS companion for Indoor Positioning



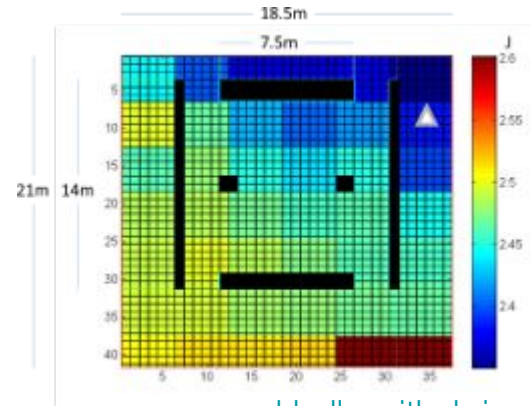
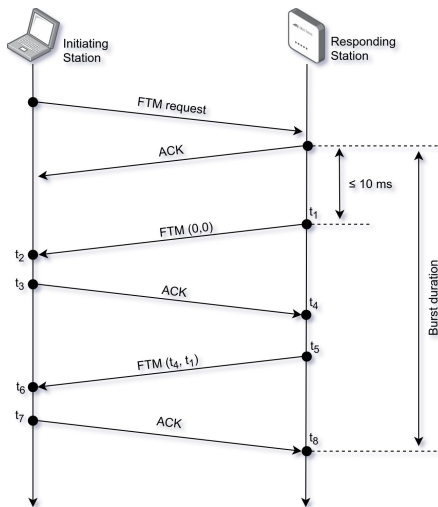
presented by miquel.garcia@rokubun.cat
GSA Task Measurement Workshop, May 28th 2020



What is WiFi RTT?

Current WiFi location based on RSSI and fingerprinting

RTT → Round Trip Time (or Fine Time Measurement),
802.11mc protocol



source: [rkhullar.github.io](https://github.com/rkhullar)

RTT is a peer-to-peer (bidirectional) protocol to measure the time-of-flight between terminals



Availability of range measurements, similar to GNSS!



How to obtain WiFi RTT measurements

Main requirement, need support for WiFi RTT 802.11 mc protocol:

Smartphones: Google Pixel

Access Points: Google WiFi, Compulab WILD router

Chipsets: Intel AC 9260, ublox JODY-W2, ...

Android API contains entry points to fetch the measurements:

[Android: Wi-Fi location: ranging with RTT](#)



Measurement quality

Necessary step to use WiFi RTT for navigation is to assess measurement quality:

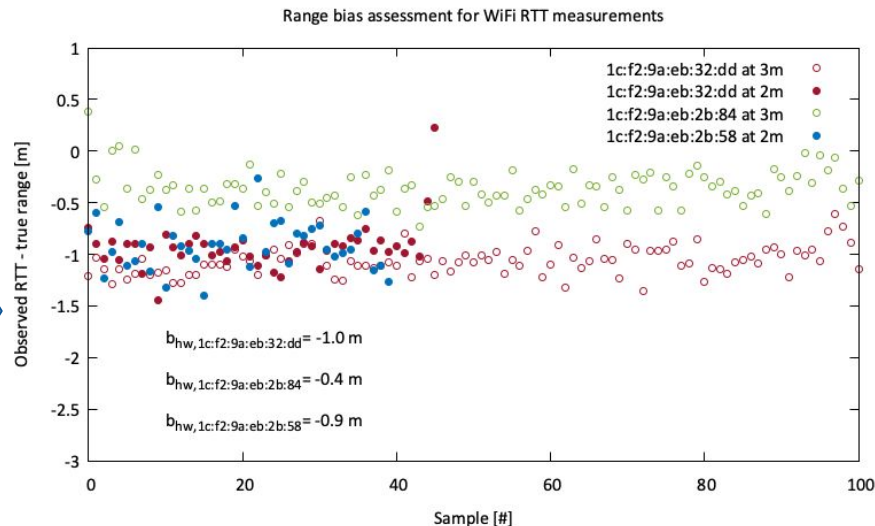
What is the range measurements noise?

Any biases that need to take into account? No clock biases as in GNSS but...



Terminals and AP placed at know, measured locations

Measurement noise ca. 20cm
Heads up! Presence of biases!

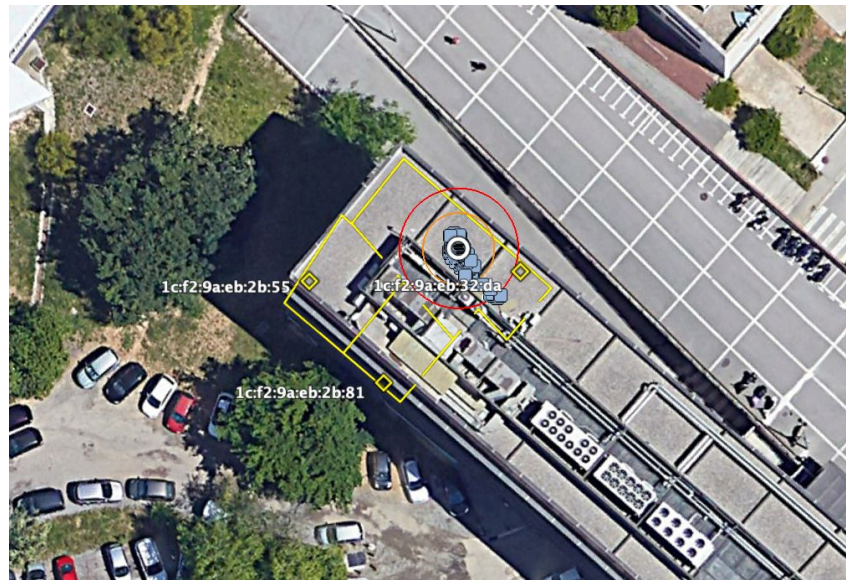
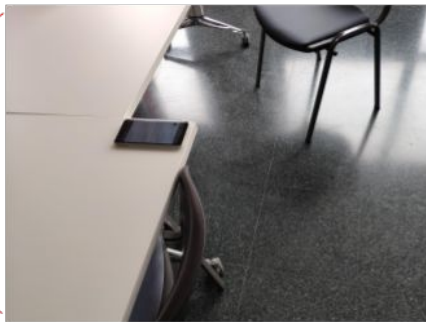
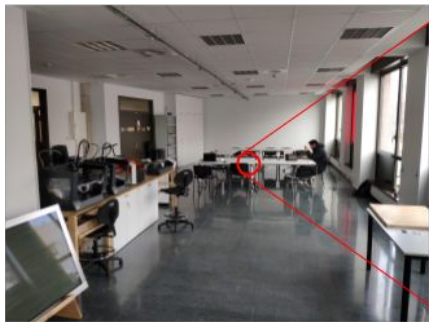




Towards a seamless indoor/outdoor

Being WIFI RTT range measurement,
easy to integrate with GNSS raw meas.

Meter level accuracy achieved in WiFi
only solutions, indoor scenario



... as long as WAP position and
biases are properly estimated and
served to the navigation engine



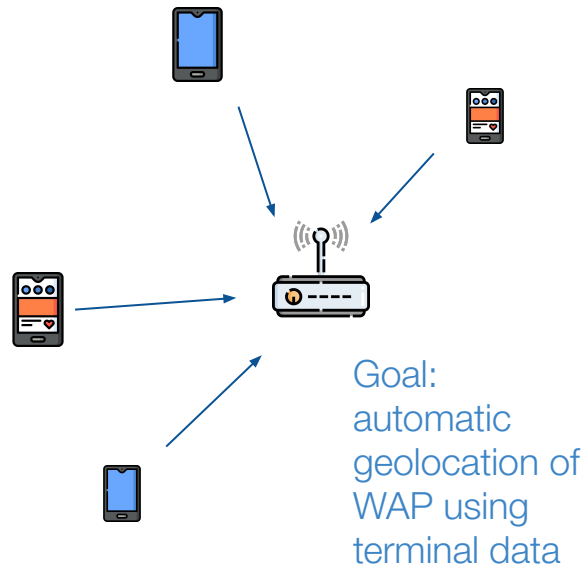
WiFi Access Point Location estimation

WiFi-based proc. engine (hybridized with GNSS or not) will require accurate estimates of WAP positions and hardware biases (similar to GNSS ODS products)

Geotagged RTT measurements from various terminals
→ WAP estimation in mild-indoors → “inverse”
position estimation

Error in geotag → error in WAP estimation

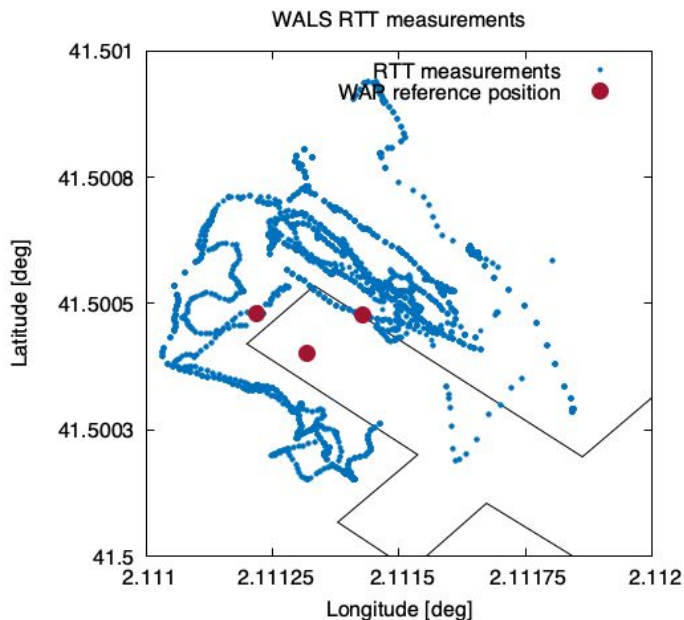
Usage of GNSS raw measurements → PPP, PPK
strategies → meter level accuracy





WiFi Access Point Location estimation

Automatic WAP location service already developed by Rokubun (WALS service, Hansel Testbed ESA contract #4000126230).



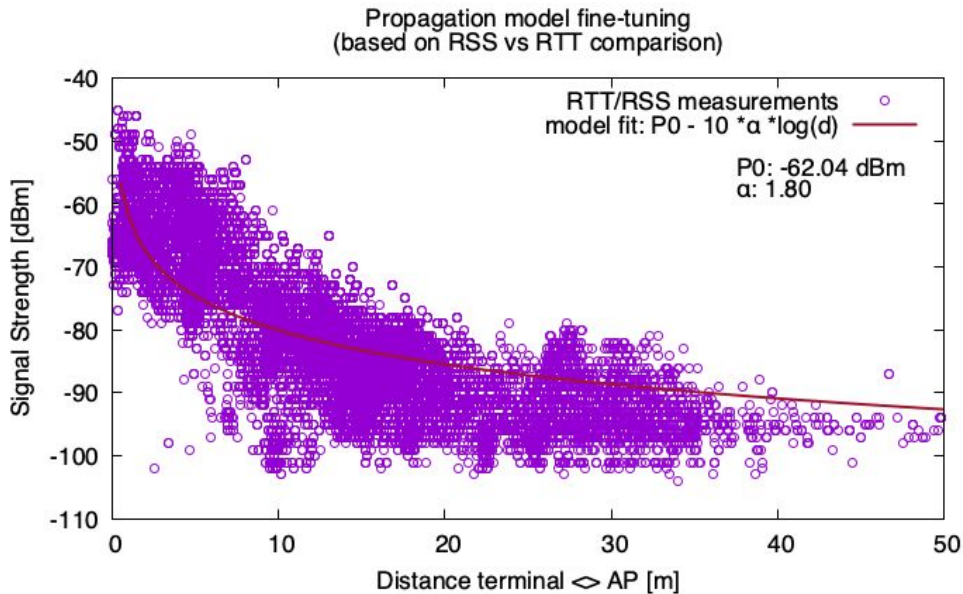


Benefits of RTT measurements

Models of RSS vs RTT and extrapolate to existing infrastructure

Enable seamless indoor/outdoor navigation

Assistance to GNSS in urban canyons, potentially decrease multipath effects (signal diversity) and improve DOP (better geometry diversity)





New updates in Jason PPK service

Jason → Process GNSS raw measurements in the cloud

<https://jason.rokubun.cat>

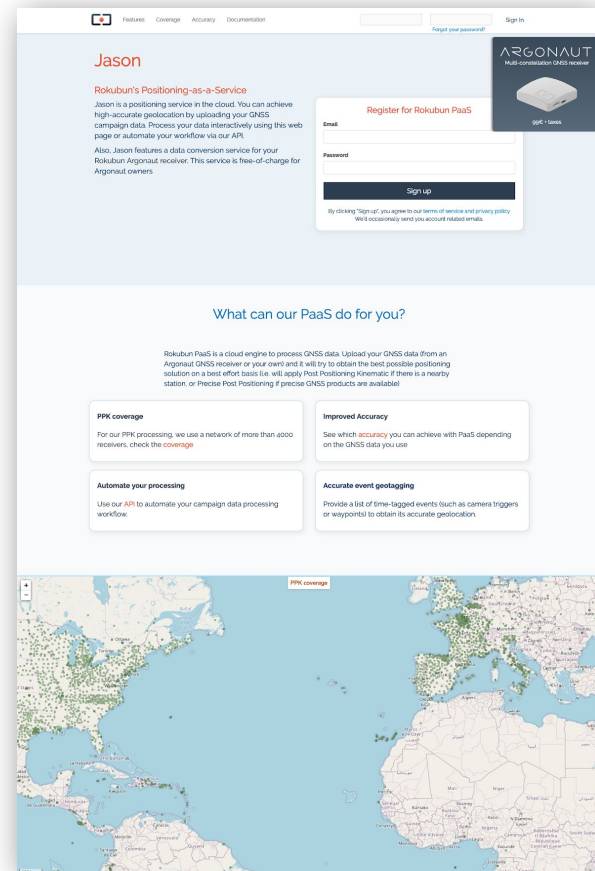
Some recent features:

UI/UX updates

Formats: GNSS logger, Galileo PVT, GNSS Test,...

Geotag events in Android

Online documentation: <https://jason.docs.rokubun.cat>





New updates in Jason PPK service

Python bindings, PyPi package available!

```
# Quick install via PIP
pip3 install jason-gnss

# Process a file (any format supported by Jason PPK)
# You will need the API key / token of your account
jason process gnss_log_2020_01_11_11_09_11.txt
```

Android bindings (embed Jason PPK in your Android App!)



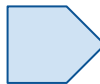
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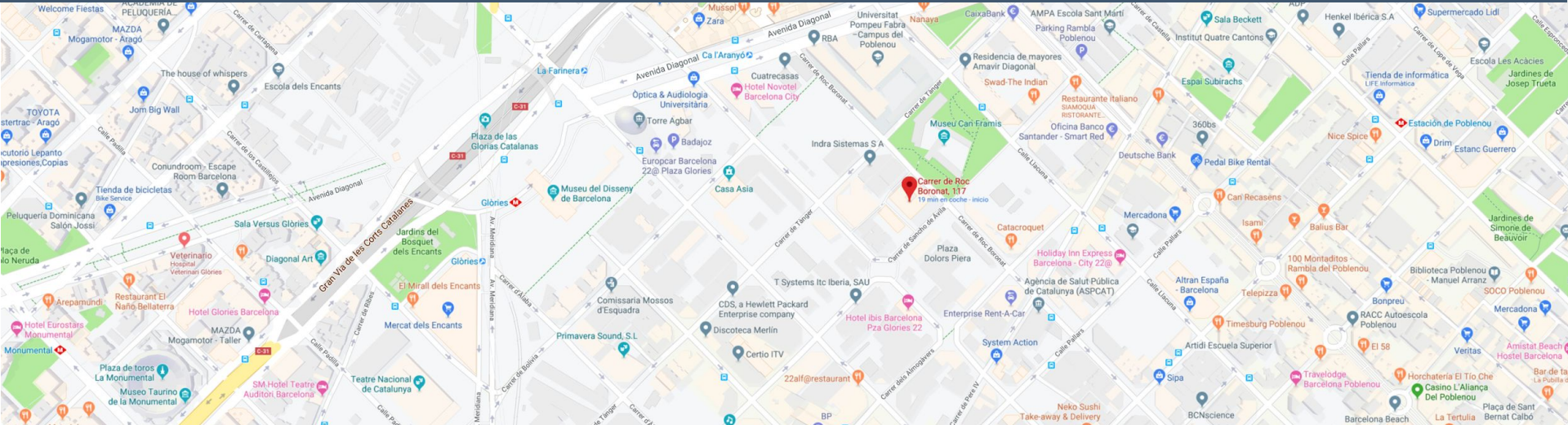
jason-sdk-android

Quicksurv app Jason PPK service in your smartphone!

Available at Google Play Store → scan the code!



Thank you!



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