

Dataset: Wireless Link Quality Estimation on FlockLab – and Beyond

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Andreas Biri

Romain Jacob

Reto Da Forno

Roman Trüb

Lothar Thiele

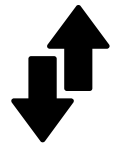
ETH zürich

Wireless links - an **elusive resource**



Interference

unknown



Volatility

short & long-term



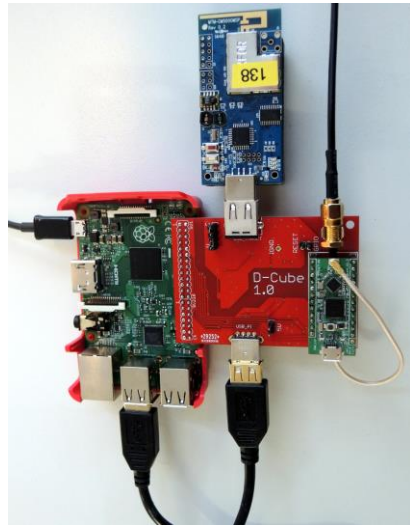
Unpredictability

difficult to monitor

How can we compare experimental results?

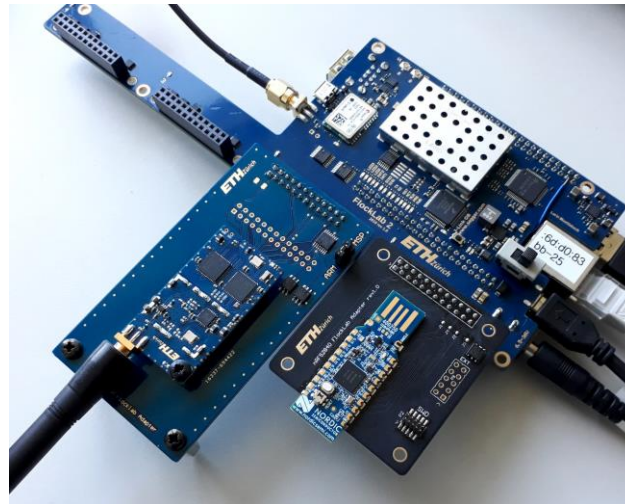
Wireless sensor **testbeds**

Enabling realistic and reproducible research



D-Cube

TU Graz



FlockLab

ETH Zurich



Indriya

NU Singapore



IoT-Lab

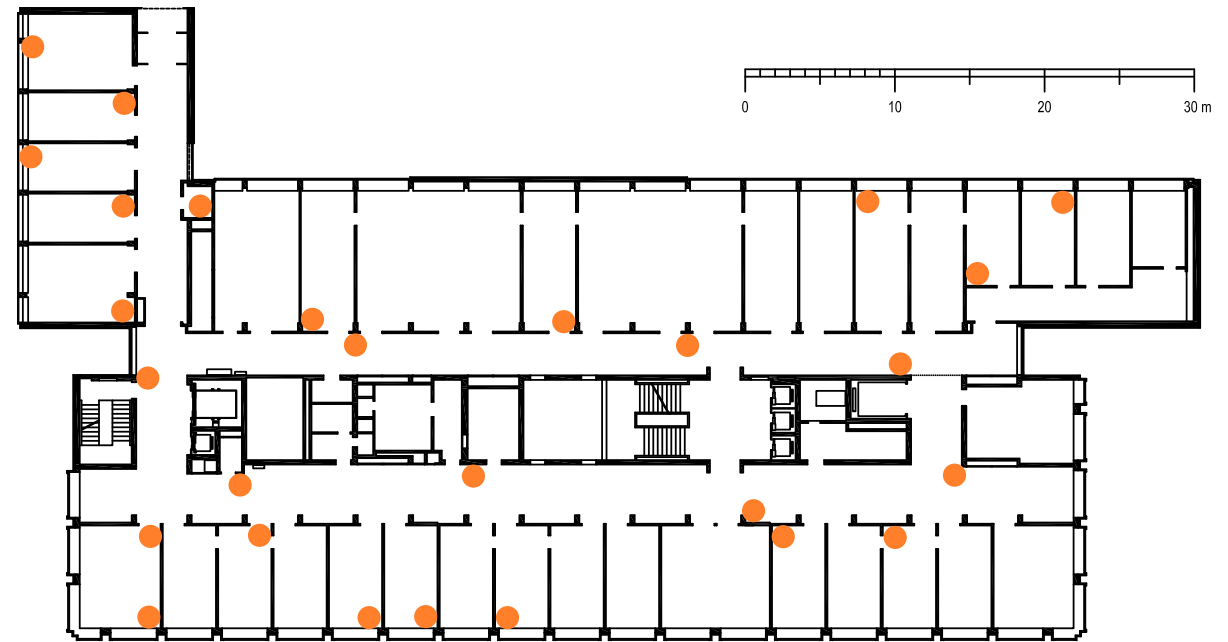
FIT, France

FlockLab – synchronized tracing & profiling

27 nodes inside network

3 targets available per node:

Target	Frequency band	PHY
TelosB (sky)	2.4 GHz	PSK
DPP (cc430)	868 MHz	FSK
DPP2 (LoRa)	868 MHz	LoRa



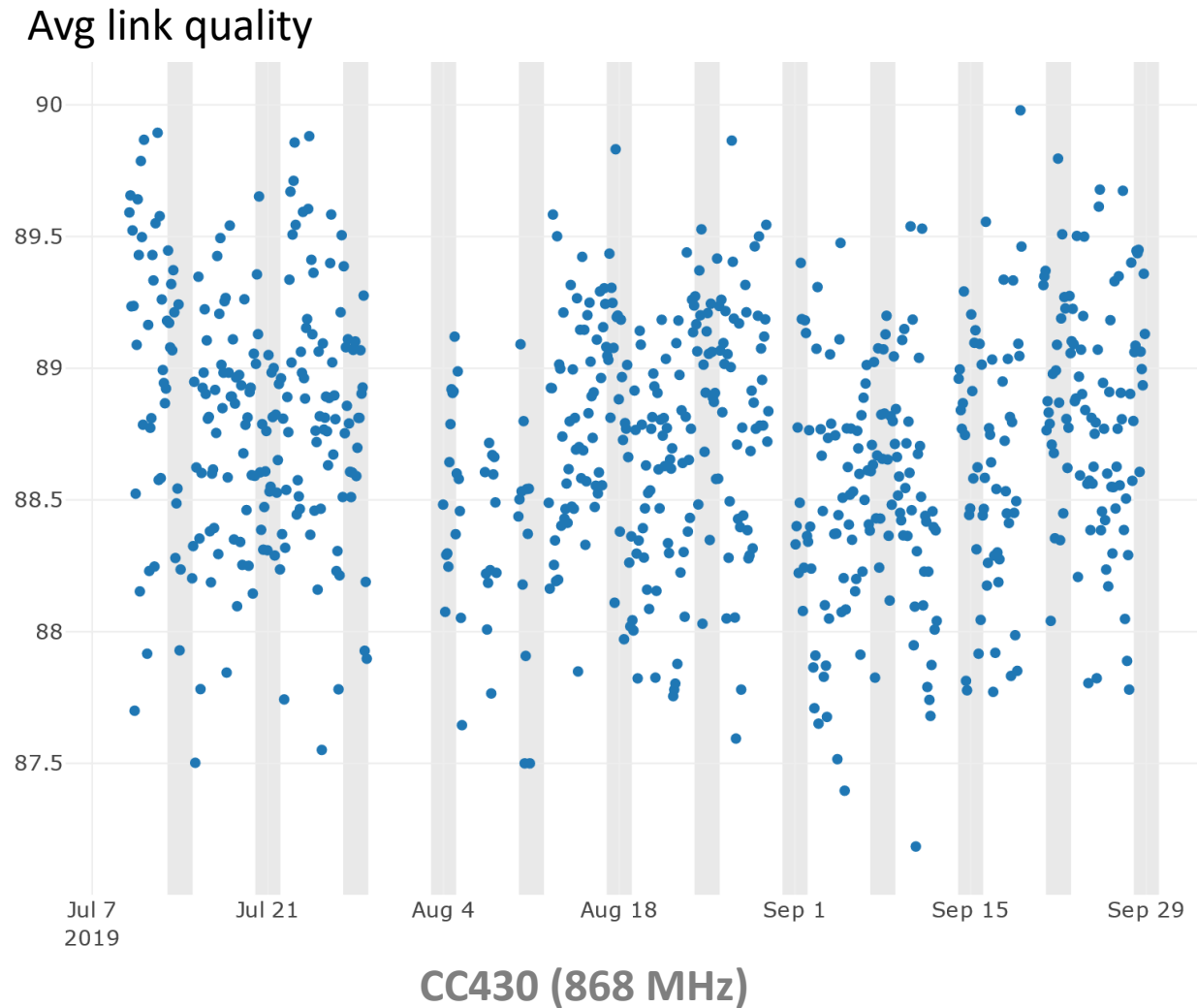
Dataset: Pairwise link quality over time

100 broadcasts by each node on **2** frequency bands

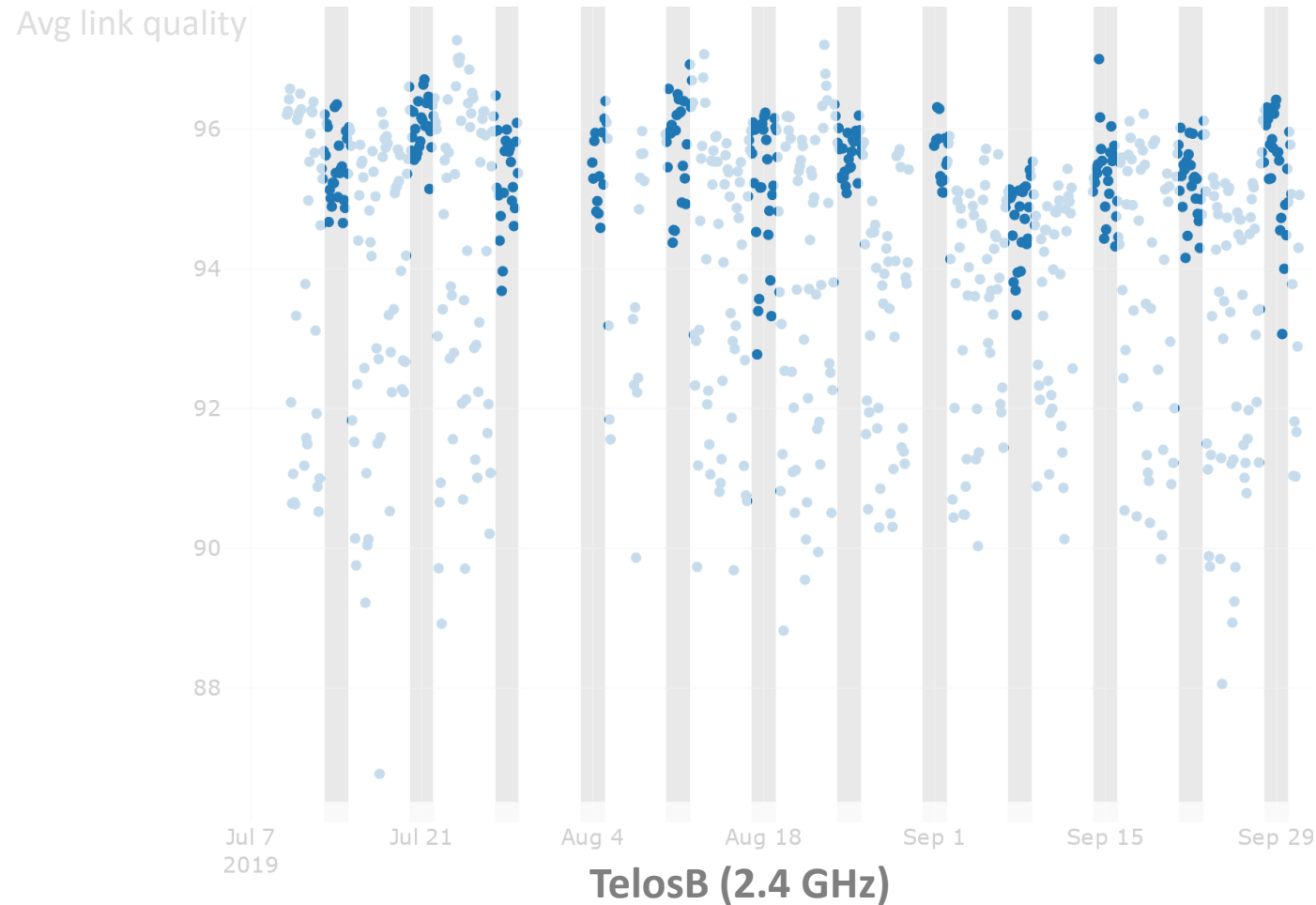
Every **2** hours we sampled over **3** months (and continuing)

date_time	Test date and time in UTC
rf_channel	Radio frequency channel
payload	Payload size [bytes]
host_id	ID of host node used for time synchronization
snd_id	ID of sending node
rcv_id	ID of receiving node
rcv_total	# of broadcasts received from snd_id
rcv_stream	Bit-stream indicating packet reception pattern

Wireless links are **temporally unstable**...



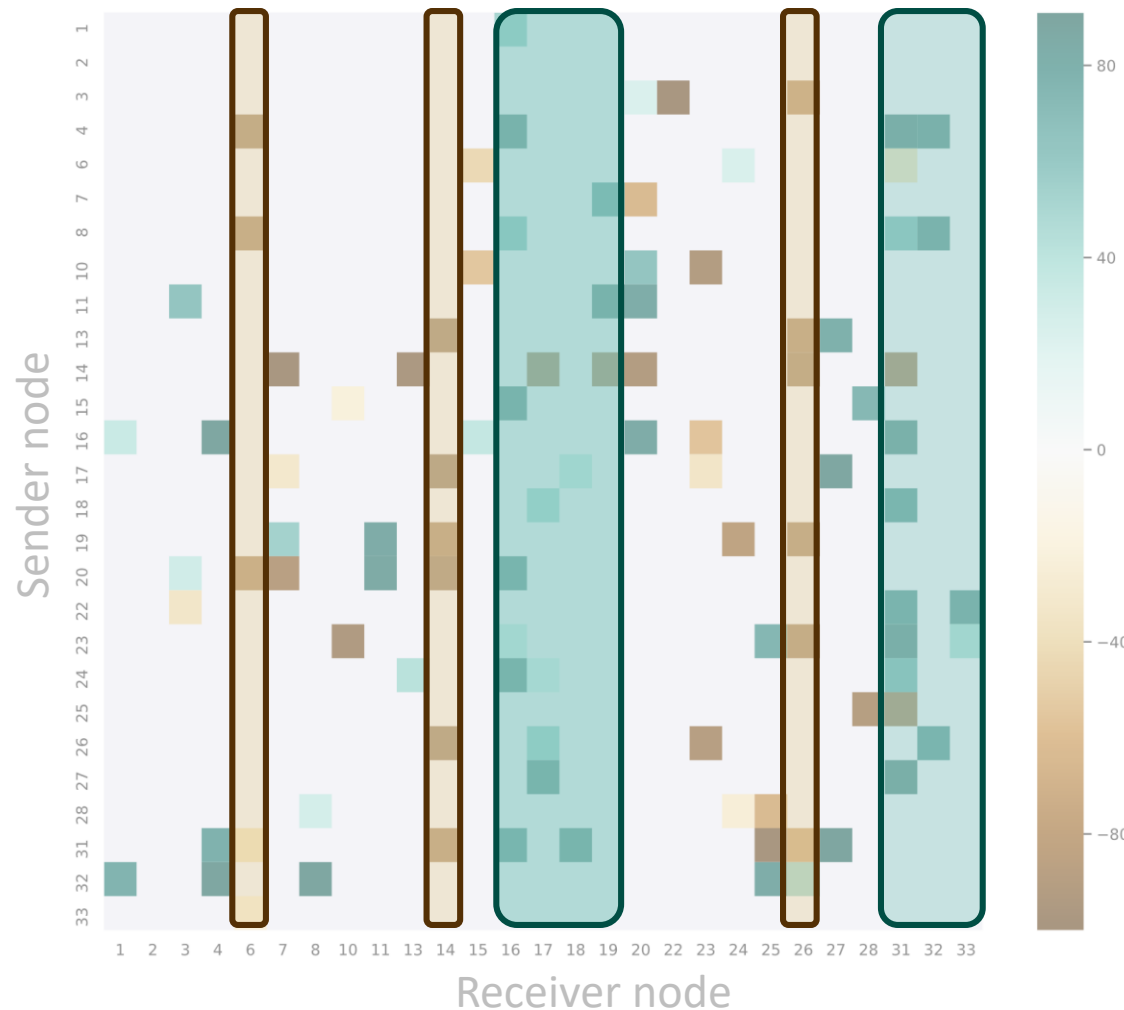
Wireless links are temporally unstable...
but can show **periodic patterns**



2.4 GHz band observes
seasonal interference,
induced by the
presence of people

Weekends observe a
improvement in
successful reception

Wireless links are **channel-dependent**



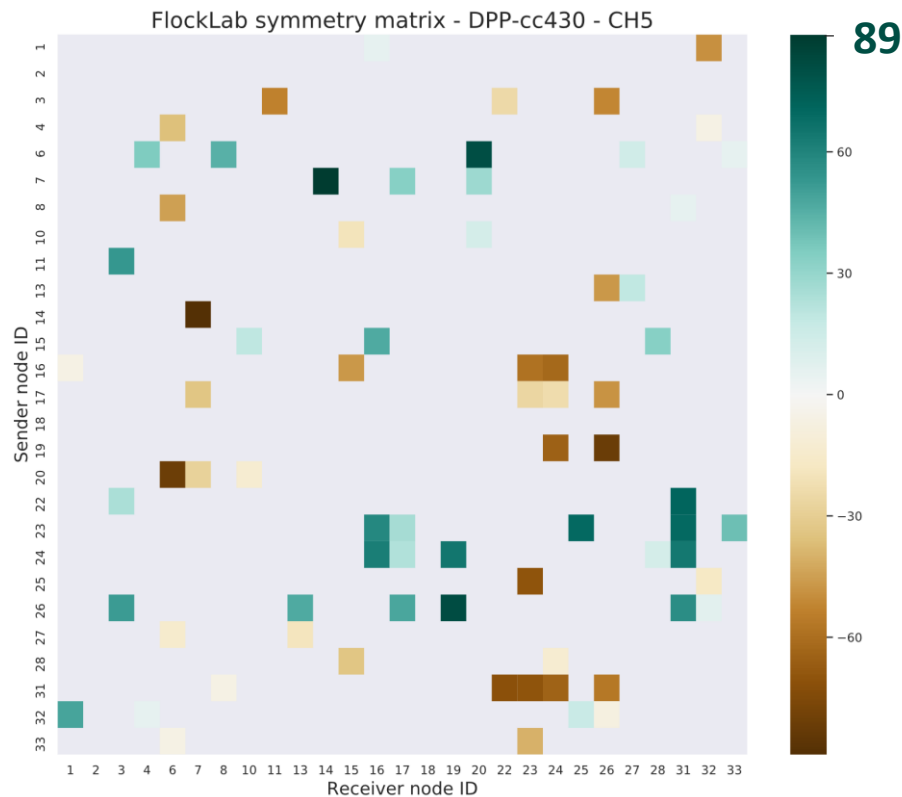
+ : PRR(**2.4 GHz**) higher

- : PRR(**868 MHz**) higher

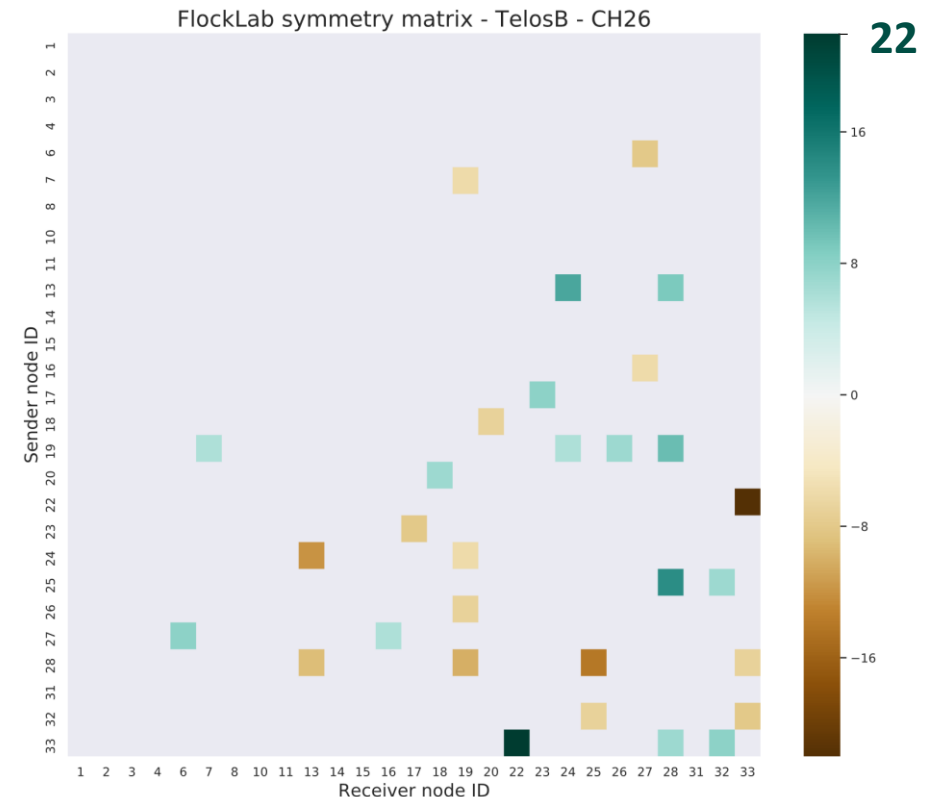
PRR: Packet reception rate

Some links are only available
on either **2.4 GHz** or **868 MHz**

Wireless links are **asymmetric**



868 MHz band is highly **asymmetric**
when comparing same pair of nodes



2.4 GHz band is primarily **symmetric**
when comparing same pair of nodes

A framework designed **to be used by you**



Portable

independent of testbed



Immediately deployable

easily adaptable code base



Ready for analysis

Jupyter notebooks published



FlockLab data will be continuously updated on Zenodo

Outdoor link quality measurements over LoRa are planned

Try it yourself!

DOI 10.5281/zenodo.3531631

<https://flocklab.ethz.ch>



R. Lim et al. “*FlockLab: A Testbed for Distributed, Synchronized Tracing and Profiling of Wireless Embedded Systems*”. IPSN ’13, Philadelphia, Pennsylvania, USA.

Andreas Biri

Romain Jacob

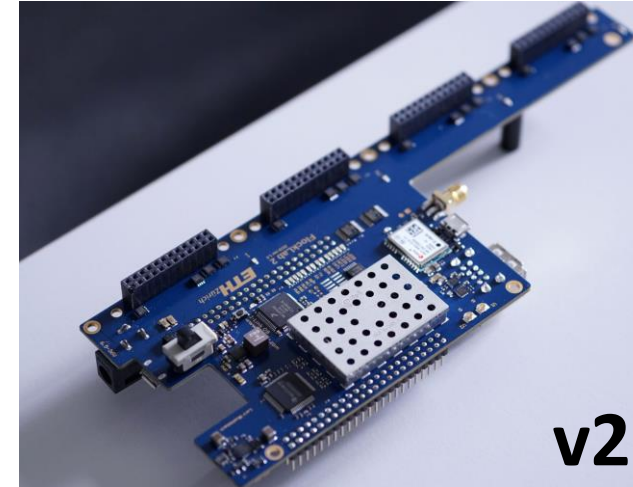
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FlockLab 2 – simultaneous debugging



- + **On-board SEGGER** for debugging
- + **GNSS** for precise time sync
- + **High-precision profiling** using the *RocketLogger*
- + **Outdoor** connections, new observers, ...

