# IP01: Large Scale Wireless Testbeds – Scaling the Experiment

## Does SDR experimentation scale?

### Sofie Pollin
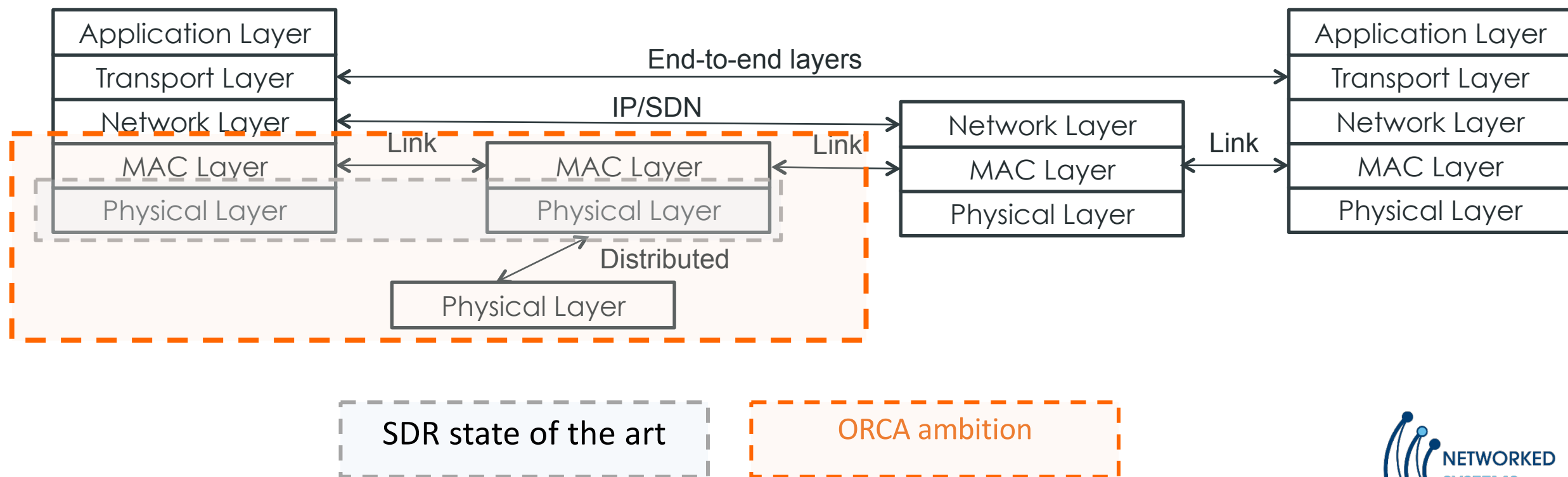
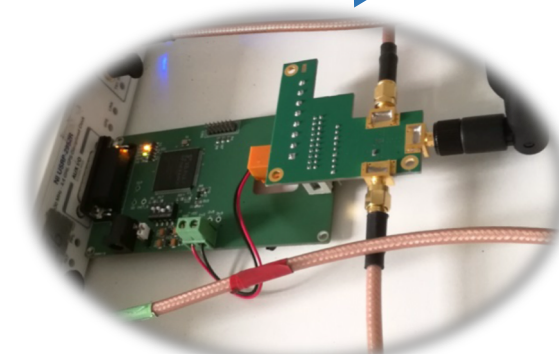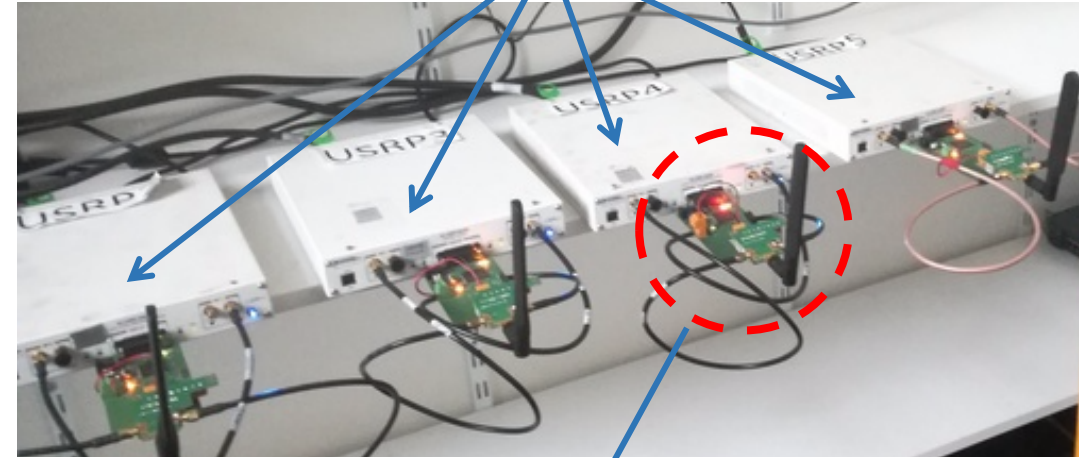# SDR technology scales to *end-to-end*

ORCA ambition:

Enabling end-to-end networking requires the implementation of PHY and MAC functionality on SDR.

# SDR experiments are also becoming 'networked'

- PHY and MAC

- Various MAC protocols
  - Sense and abort
  - Half duplex CSMA or TDMA
  - Full duplex TDMA
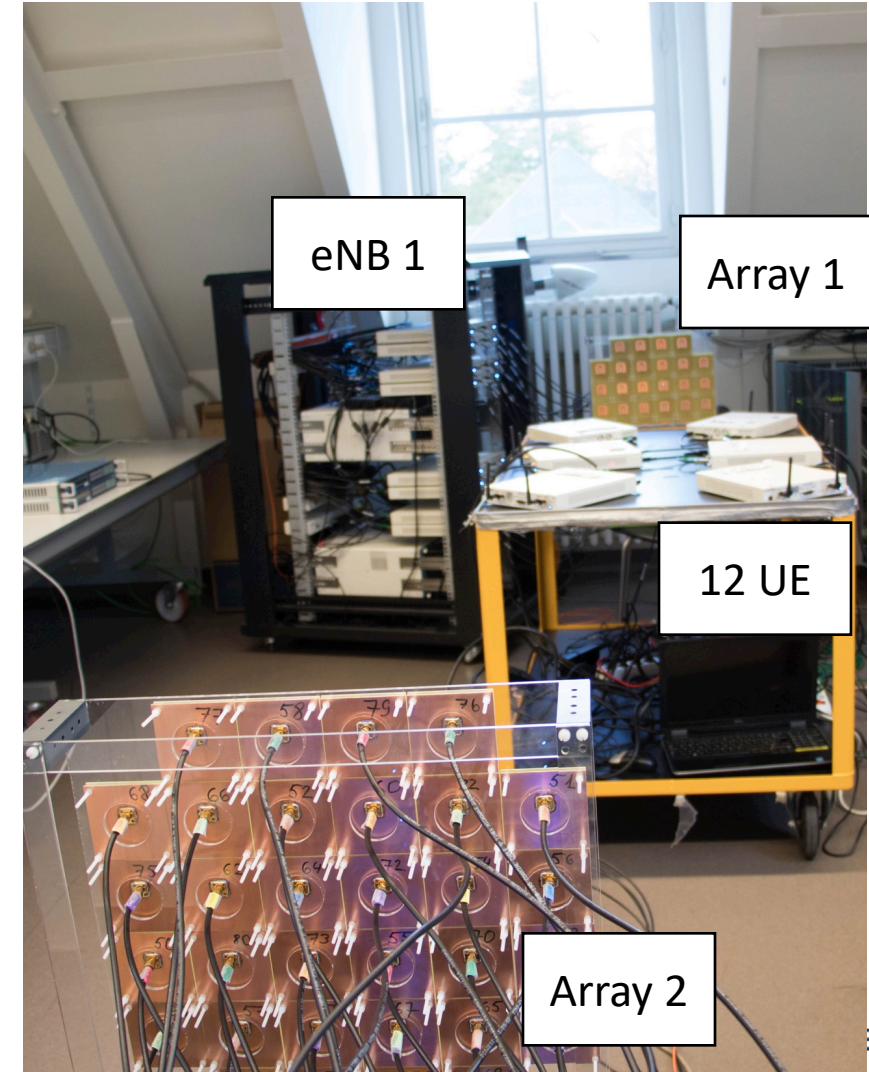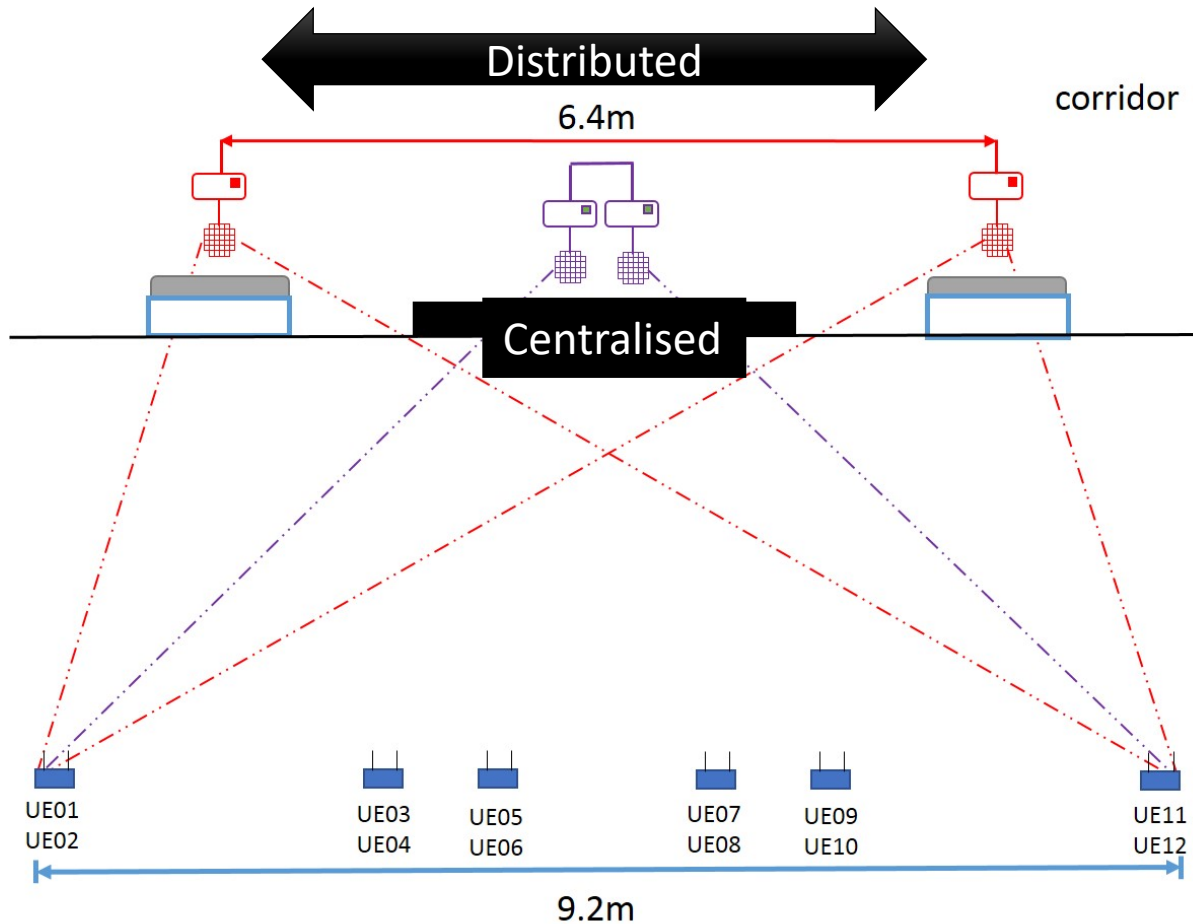


USRPs with Kintex7 FPGA



Analog Self-Interference cancellation by Electrical Balance Duplexer

NETWORKED SYSTEMS

# SDR experiments are also becoming 'dense' > 40 USRPs in a experiment



Distributed
6.4m

corridor

Centralised

UE01 UE02    UE03 UE04    UE05 UE06    UE07 UE08    UE09 UE10    UE11 UE12

9.2m

eNB 1    Array 1

12 UE

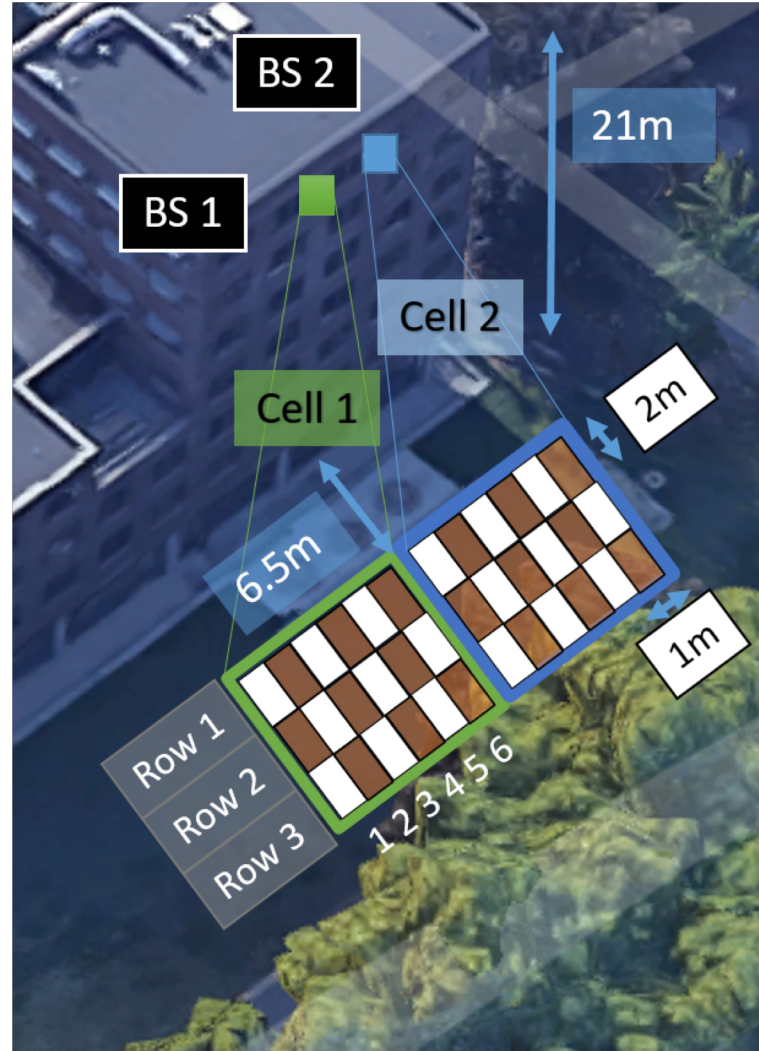Array 2

Video here:
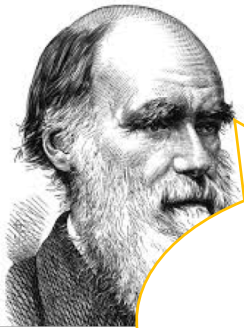https://www.esat.kuleuven.be/telemic/research/NetworkedSystems/projects/massive-mimo

# Two-cells outdoor experimental research





- How good is the focusing?

- Can we use the same frequency in adjacent sectors

NETWORKED SYSTEMS

# But these dense, networked SDRs have to get out of the lab enviornment



Darwin's philosophy for SDR: not the strongest but the fittest

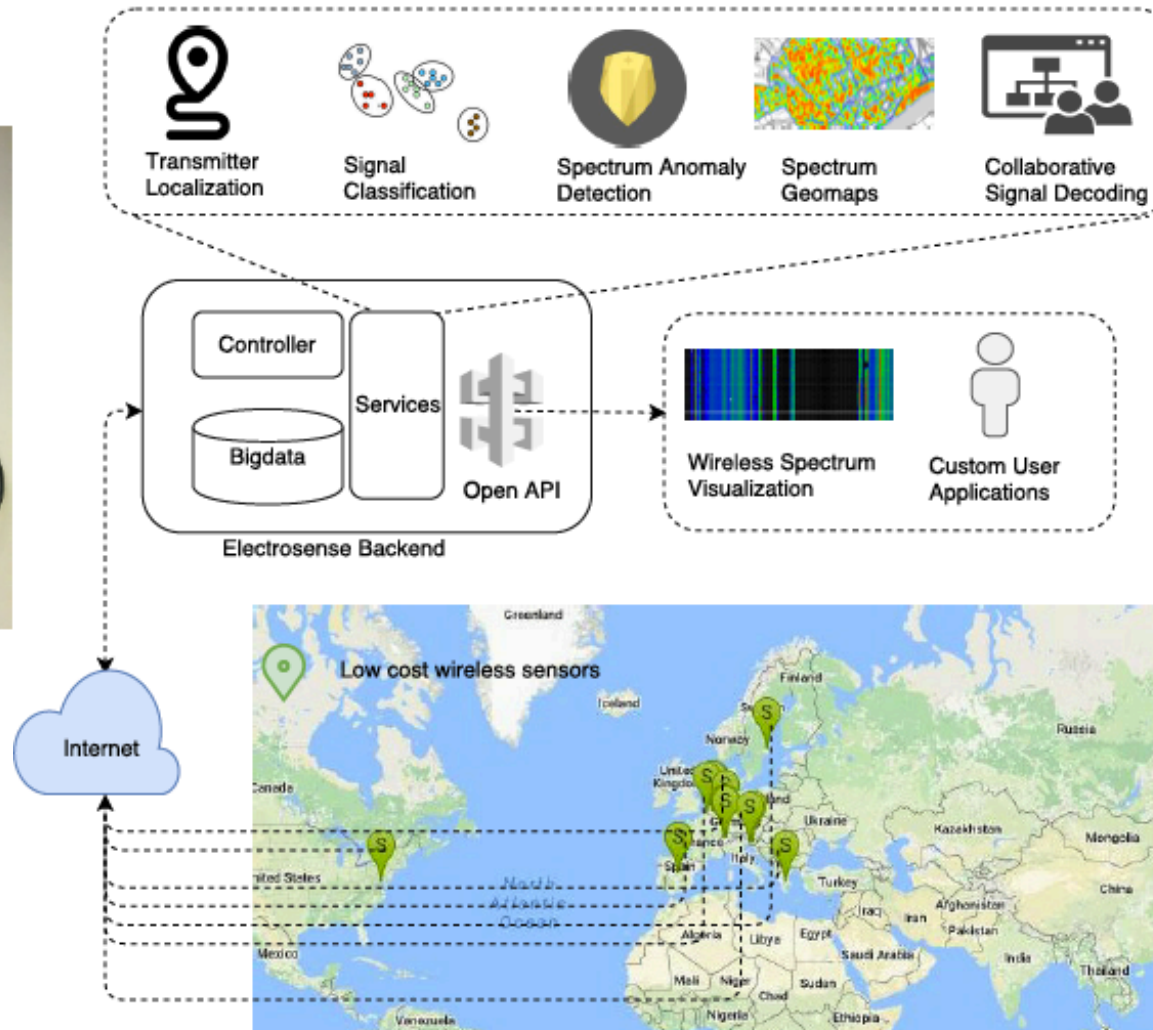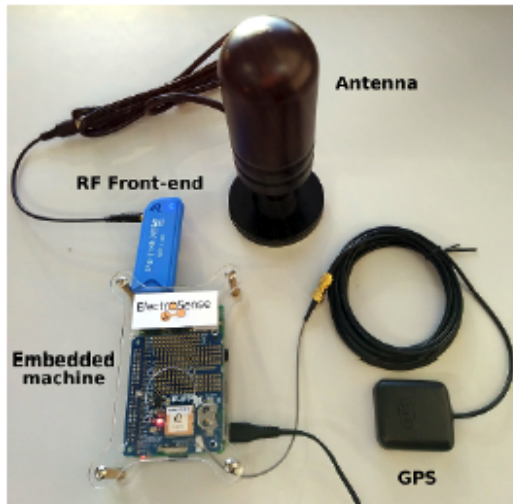Are lab environments demanding enough?

real applications, users and feedback

real environment

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# Electrosense: crowd-sourced spectrum sensing

Sensor:



Deep learning for:
- Anomaly detection
- Spectrum monitoring
- Localisation

# Thanks!

**KU LEUVEN**

NETWORKED SYSTEMS

**TELEMIC**