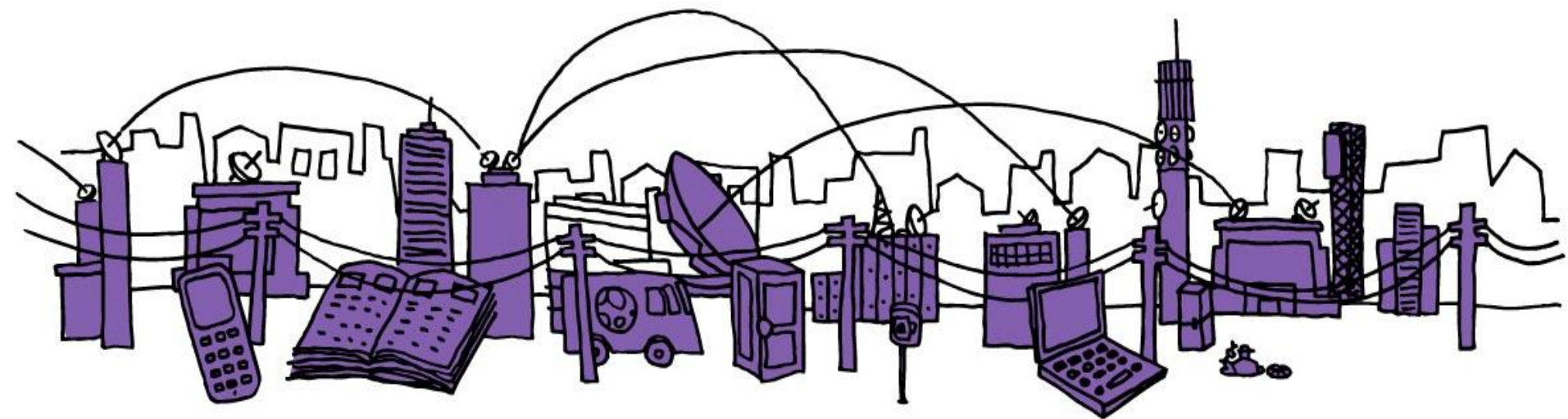


Open Air Interface experience and aspirations

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BT Technology, Services and Operations
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Content

- BT Hackathon
- Experience with OAI
- Our aspirations for OAI in the future

BT acquired a quantity of Lime SDR radios for a 'hackathon', which we gave away to universities and research institutions



Aim was to demonstrate short development times.
Traditionally large engineering Companies produce specialist hardware with long development cycles

BT SDR hackathon to change the landscape of communications....

- BT has partnered with Lime Microsystems for the hardware, and OAI, Amarisoft and Quortus for wireless protocol stacks and EPC, to search for innovative teams who were prepared to explore the art of the possible at the leading edge of technology.
- A competition is currently running with three categories
 - Cat A: Short development / implementation of existing features
 - Cat B: Solving a known problem (list follows)
 - Cat C: Most imaginative and effective use of programmability of SDR

Category B scenarios

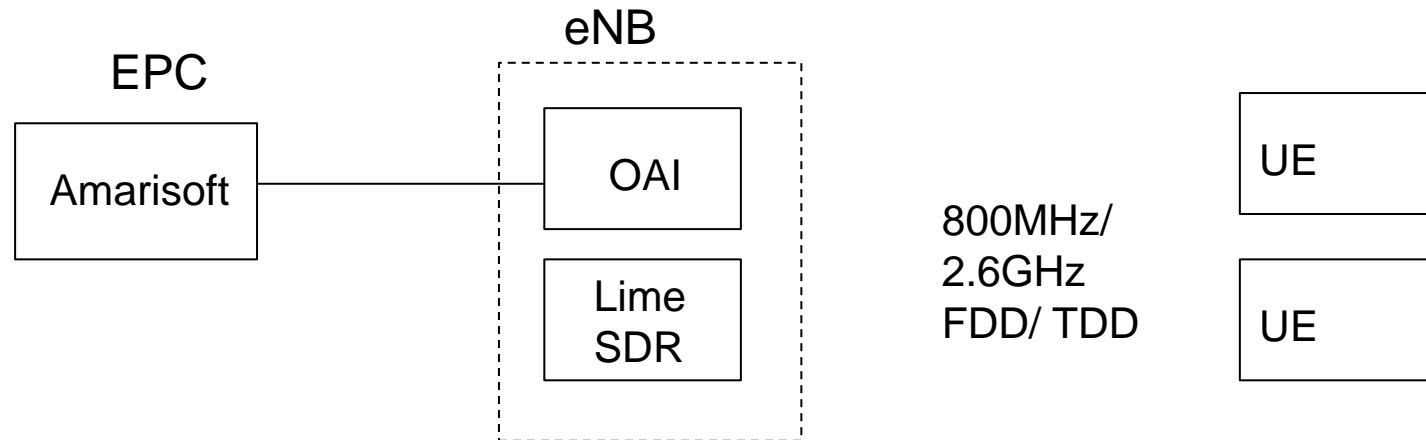
- Disaster recovery
 - Autonomous ad-hoc networks
 - Self-Healing networks
 - Search and Rescue
- Remote connectivity
 - Improve Indoor Coverage / “Last Mile” innovation
- Tethered Drone
- Remote coverage
- Device to Device
- Internet of Things,
 - In home,
 - Gateway
 - Remote monitoring

Category B scenarios

- Enterprise Network as a Service
- Cloud RAN
 - Converged networks
 - Ethernet Interfaces
- Entertainment
 - Large-scale TV delivery
 - 4G to 5G Broadcast and multicast evolution
 - Dynamic use of multicast
- Details of the 9 finalists and their work can be found at <https://www.btplc.com/btinfinitylab/LimeMicro/>

Experience with OAI (1)

We attempted to construct a simple LTE system:

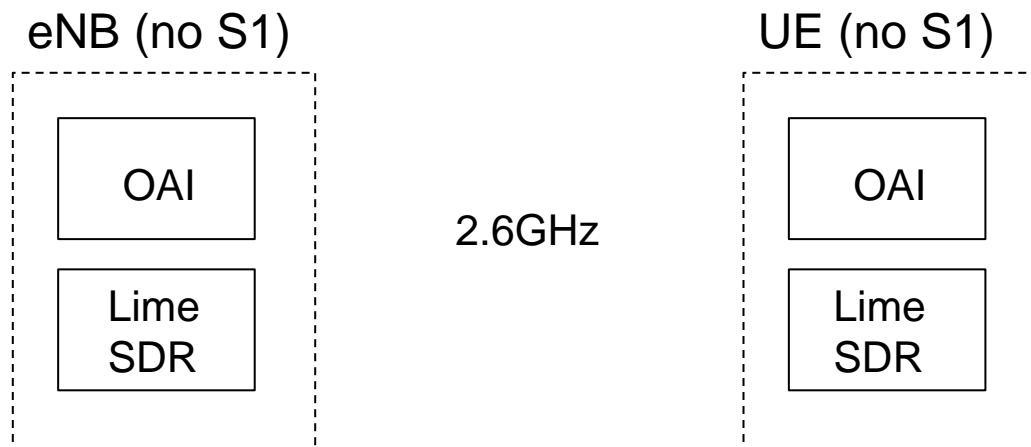


Experience with OAI (1)

- We used single eNB with OAI stack, and an Amarisoft EPC
We couldn't get OAI emulated EPC to run, it would initialise and then crash with little information
- We wanted to put the eNB and EPC onto a single PC, but this was not recommended. It may have been possible to use two VMs on the same machine, but this would have needed a more powerful PC than the ones we had.
So we ran an Amarisoft EPC on one PC and OAI eNB on another one, and packet transfers on S1 looked ok on Wireshark, but the SDR would not transmit any RF
- In the end we ran out of time, but we will have another stab over the next few weeks – any advice would be welcome!

Experience with OAI (2)

We attempted to construct a simple LTE system:



Experience with OAI (2)

- We built OAI eNB without S1 interface¹
Following the instructions it built OK
- We built OAI UE¹
Following the instructions it built OK
- To get these components to run with the LimeSDR appeared to require the addition of rf-config-file²
The eNB and UE run and display scopes
However, the channel scan fails on the UE
Not convinced either component is working correctly
- Currently don't have any further information to assist in getting it working
Any help appreciated!
- In general, there is a fair bit of information, but not clear where to start and very little of it is LimeSDR focussed³

¹ <https://gitlab.eurecom.fr/oai/openairinterface5g/wikis/HowToConnectOAIENBWithOAIUEWithoutS1Interface>

² <https://gitlab.eurecom.fr/oai/openairinterface5g/wikis/how-to-setup-oai-with-lmsdr>

³ <https://gitlab.eurecom.fr/oai/openairinterface5g/wikis/OpenAirUsage>

Our aspirations with OAI

- To use OAI for EPC and eNB stacks on the same PC – or ‘no S1’
- No compatibility or stability issues with Lime SDRs
- The ability to use multicast/broadcast
- Lightweight 3/4G for drone use (more info follows)
- Flexibility going forward to 5G NR
Frame structure, numerology, HARQ, carrier aggregation...

Drone use-cases

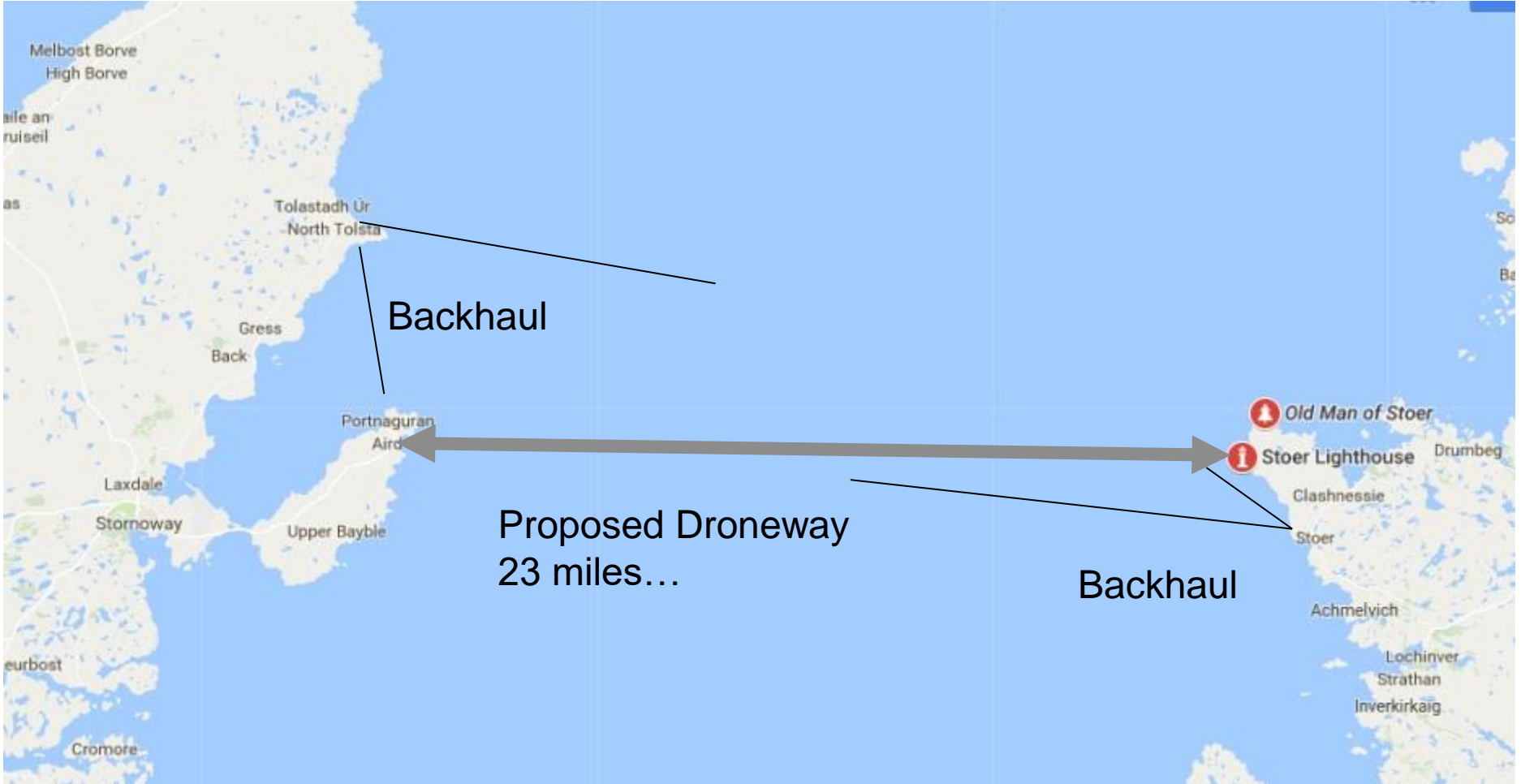


- Coverage in remote areas
- Use in emergency response
- RF coverage surveys
- LoS surveys for Transmission links
- Inspection of telecommunication equipment, eg telephone poles
- Delivery of spare parts & equipment

Scottish Innovation Program Lighthouse project - Droneway



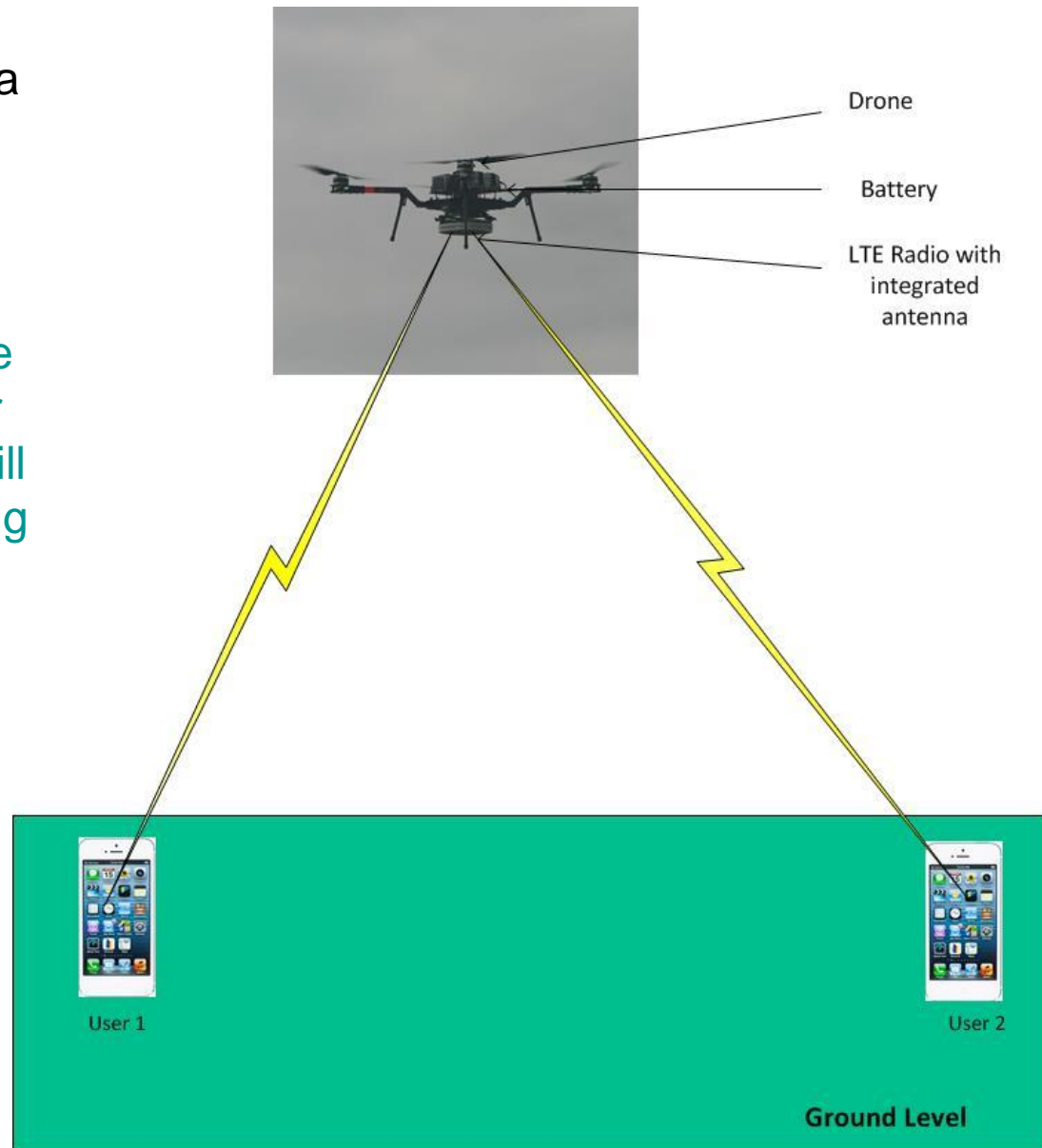
Droneway between Stoer and Portnaguran lighthouses in Scotland



uVue drone and small cell

- Quadcopter drone from uVue
- SDR radio and integrated antenna
- 2.6 Kg Payload
- Li-Po battery
- 30 mins flying time

The main challenge was to have the correct drone configuration as larger motors & props = more thrust, but will require larger batteries, thus reducing available payload



Droneway progress

- Sites have been selected for survey
- EE/BT, Parallel Wireless and Scottish Futures Trust to survey site for installation.
- Drone vendors have been approached for participation
- We plan to use OAI + SDR (preferably Lime – lightweight and low power)
- “Droneway” monitoring software is being discussed
- Trials scheduled to begin next year...