# OCP/TIP Meeting

EE Update and Proposals

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# Contents

1. Update on BT / EE Integration and support for OCP / TIP

2. Project 1: Rural Connectivity

3. Project 2: Disaster Recovery and AirMasts

4. Project 3: Edge Computing for users with disabilities

5. Focus on Ultra-Reliable Networks

6. Focus on Open-source and Tunable RAN Hardware

7. Areas for Open discussion with OCP / TIP Members

# A new champion for UK communications...

## Supports the UK

- Best fixed and mobile networks to meet the long-term needs of Digital Britain
- Boosts UK lead in broadband take-up, usage, superfast coverage and 4G networks
- Faster, more reliable and resilient networks
- Cements UK position among leading global internet economies

## Promotes investment

- Largest infrastructure investors in fixed and mobile
- Combined investment of £35bn in last 10 years
- Third largest UK investor in R&D
- A major, socially responsible British employer

## Drives innovation

- Positioned to drive development of 5G
- Pioneering ultrafast speeds
- Advanced networks supporting innovation across the economy
- Building the new generation of smart services

## Enhances competition

- Better value for customers through new packages and bundles
- Maintains four major mobile network providers and more than 50 MVNOs
- Complementary businesses with little fixed/mobile overlap
- BT/EE brings more competition to fixed mobile converged products

Bringing together the UK's largest and best fixed and mobile networks...

BT EE

**62%** increase in data demand per user per year

**68%** of adults in the UK use a mobile device to access the internet

## ...delivering for customers

3

# EE / BT Integration status and support for OCP /TIP

## EE RAN wants to host focused TIP PoCs in the UK

- EE Technical teams (including RAN ) now part of wider BT Group TSO (Technology, Services and Operations) Function

- EE RAN remain strongest sponsor for OCP / TIP

- EE RAN sees key role / opportunity in hosting PoCs in the UK – balancing long-term goals with short-term customer benefit

- The projects proposed for PoC in the UK are based on EE existing activities

- EE will also participate in Core OCP activities (Phil Bridge)

- Areas of BT also show interest (JM Frango / Chris Bilton)

# Rural Connectivity Project

- **Aim**: Create **low-cost** and **sustainable** community-based solutions to extend and improve 4G connectivity in very remote island communities in Scotland

- Embed feedback from remote communities into solution design

- Enable and train local communities to perform basic maintenance (preventive checks, reboot, hardware swap)

- Open-source innovative techniques for HW resilience, anti-corrosion, wind-resistance, into radio, Tx and Civil Works

- Make best use of Nb-IoT and eMTC for remote recovery

- Leverage TIP to remove OSS MNO bottlenecks – eg enable connection to all GNOCs

- 2 island villages and 2 Lighthouses (for coastal coverage) have been selected

- **Project Goal: 1 village PoC + 1 Lighthouse PoC live by Eo2016**

# Rural Connectivity Project- Next Steps

- Strong support received from Scottish Government and Scottish Future Trust (SFT), and other industry partners to plan and execute a PoC

- Project base will be located in the University of Highlands & Islands (UHI) in Inverness

- **Kick-off workshop planned on 6th July**

- Work progressing through EE / Lime but **TIP participation welcome**

- UHI/SFT/EE keen to extend scope to other areas:

  - Connectivity for Scottish Ferries

  - "Droneways" for LTE-connected deliveries to Islands

  - eHealth applications for remote communicaties

  - Closing the rural gap for 4G to 5G migrations

# AirMast / Disaster Recovery project

- **Aim**: Create **affordable , reliable and rapidly deployable solutions for 4G temporary coverage** replacement using airborne solutions

- EE internally funded project kicked off in March 2016

- Open workshops held with UAV/balloon/kite/power tether/battery/antenna/small cells/satcom manufacturers

- Dialog opened for support from OfCom and UK Government as well as Civil Aviation Authority

- Initially tethered solutions with up to 100m height (untethered could be Phase 2)

- 10Km radius 4G coverage target for up to 1 month deployment

- Open Invitation to develop and extend as part of TIP

- **Project Goal: 1 UAV-based PoC + 1 Balloon-based PoC live by Sep/Oct 2016 – location in flood-hit areas from winter 2015**

**Temporary solutions**



Air mast/UAV/Network in a Box

Rapid response Vehicles
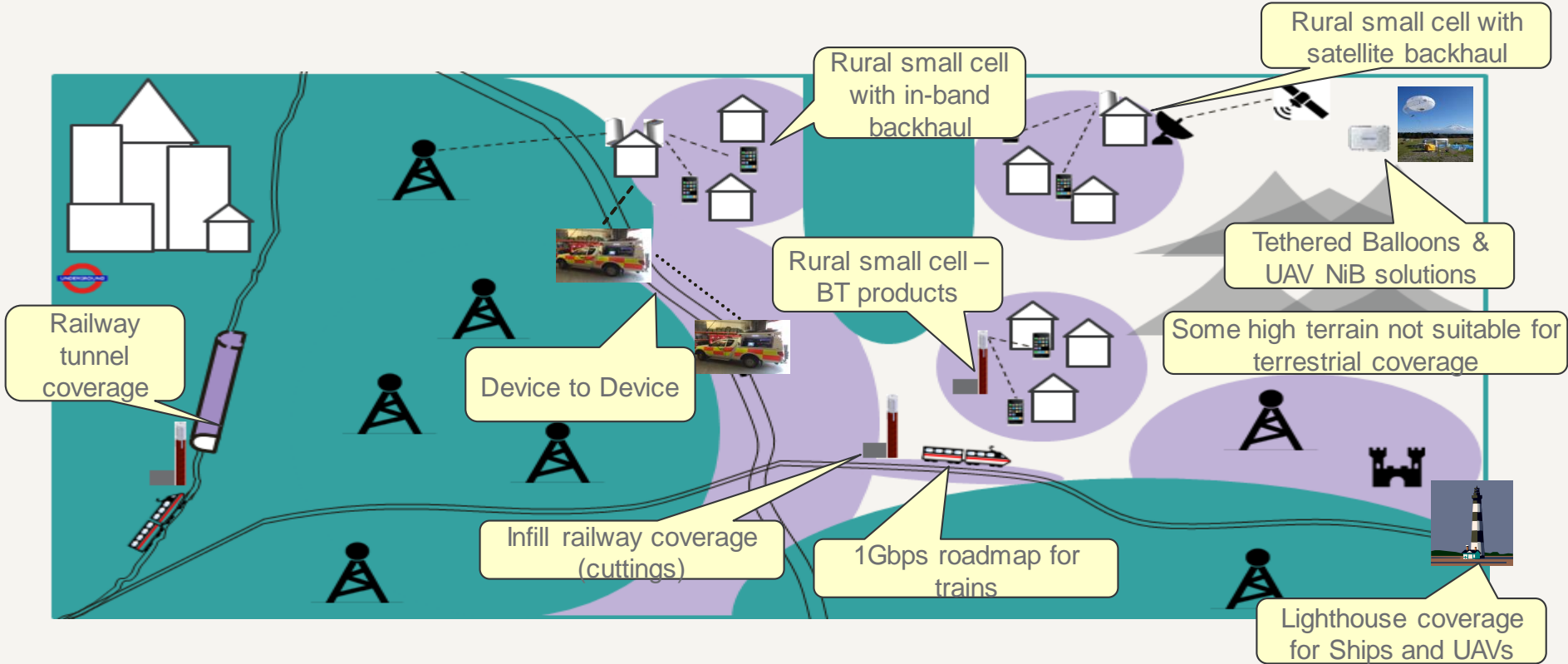(Mobile BTS with Satcom)

Portable Transmission unit

16

# Edge compute for disabilities Project

- **Aim**: Build on existing MEC activity to offer local Augmented Reality services for Users with Impaired eyesight in Railway stations

- EE ongoing cooperation with Nokia on MEC trials

- EE negotiations with major London train stations for MEC trial installation in Summer 2016

- Proposal to add Augmented reality specific content for visually impaired users to local MEC server

- Proposal to modify Oculus or 3rd party headset for use by visually impaired users

- Possible extension to people with imperfect hearing etc

- EE willing to host trial with support of TIP members

- **Project Goal: PoC to go live some time in H2 2016**

# Innovating to Reach 100%



Rural small cell with satellite backhaul

Rural small cell with in-band backhaul

Tethered Balloons & UAV NiB solutions

Rural small cell – BT products

Some high terrain not suitable for terrestrial coverage

Railway tunnel coverage

Device to Device

Infill railway coverage (cuttings)

1Gbps roadmap for trains

Lighthouse coverage for Ships and UAVs

# Characteristics of an Ultra-Reliable Network

**EE is building an "Ultra-reliable" network because we believe every call is Mission Critical**

- Networks should work always and everywhere

- Mobile Coverage:  Close to 100% population coverage, 95% Geographical coverage

- IoT Coverage: Close to 100% (Indoor and Outdoor)

- >4*9s Reliability on system level through layered contingency

- Voice Drops < 0.05%, Data Drops close to 0% in a pervasive seamless multi-RAT environment (LTE/Wifi/LAA/D2D)

- Airborne rapid response within 1 hour/ Terrestrial within 3 hours/Temporary coverage replacement through tethered balloons and UAVs

- QoS prioritisation and capacity on demand

# Building an Ultra-Reliable Network

- **Coverage & Capacity**: new site builds, carrier aggregation, 800MHz deployment + VoLTE

- **Investment**: Battery Backup, Fixed and Mobile Generators, resilient transmission, Flood defences, RRVs

- **Mindset**: Site Access, Preventive maintenance, Mobile Generator pre-positioning. Revised SLAs

- **Regulatory**: Wider powers for site access and planning permission/antenna heights, power protection, access to underground tunnels

- **New 3GPP features**: Security, QoS-Prioritisation, High Availability and Resiliency, MC-PTT, Pro-Se, Nb-IoT, eMTC

- **Innovation**: Sat backhaul, Airborne DR, Amphibian RRV, NiB



Boston Police Dept.
@Boston_Police

CAPTURED!!! The hunt is over. The search is done. The terror is over. And justice has won. Suspect in custody.

49,745 RETWEETS    14,168 FAVORITES

1:58 AM - 20 Apr 13

Community reassurance and crowd sourcing



Predictive policing



Remote health management

11

# Ultra-reliable networks for Business on Land, Sea and Air

## LTE-A Pro Networks: One ring to connect them all

- Unbeatable Coverage and Capacity compared to any dedicated "vertical network"

- New 3GPP features to offer tiered QoS to Businesses (Industrials, Energy, Education, Defence, Broadcast) and Public Services

- Mission-critical command-and-control services for connected cars, UAVs, trains, ships

- Mission-critical IoT with Nb-IoT and eMTC

- A2G + LTE-Satellite Backhaul + Airmasts: Building Hetnets in the Blue Sky

- Mobile Vehicle Gateways + D2D: A moving mesh to reach 100% coverage and reliability
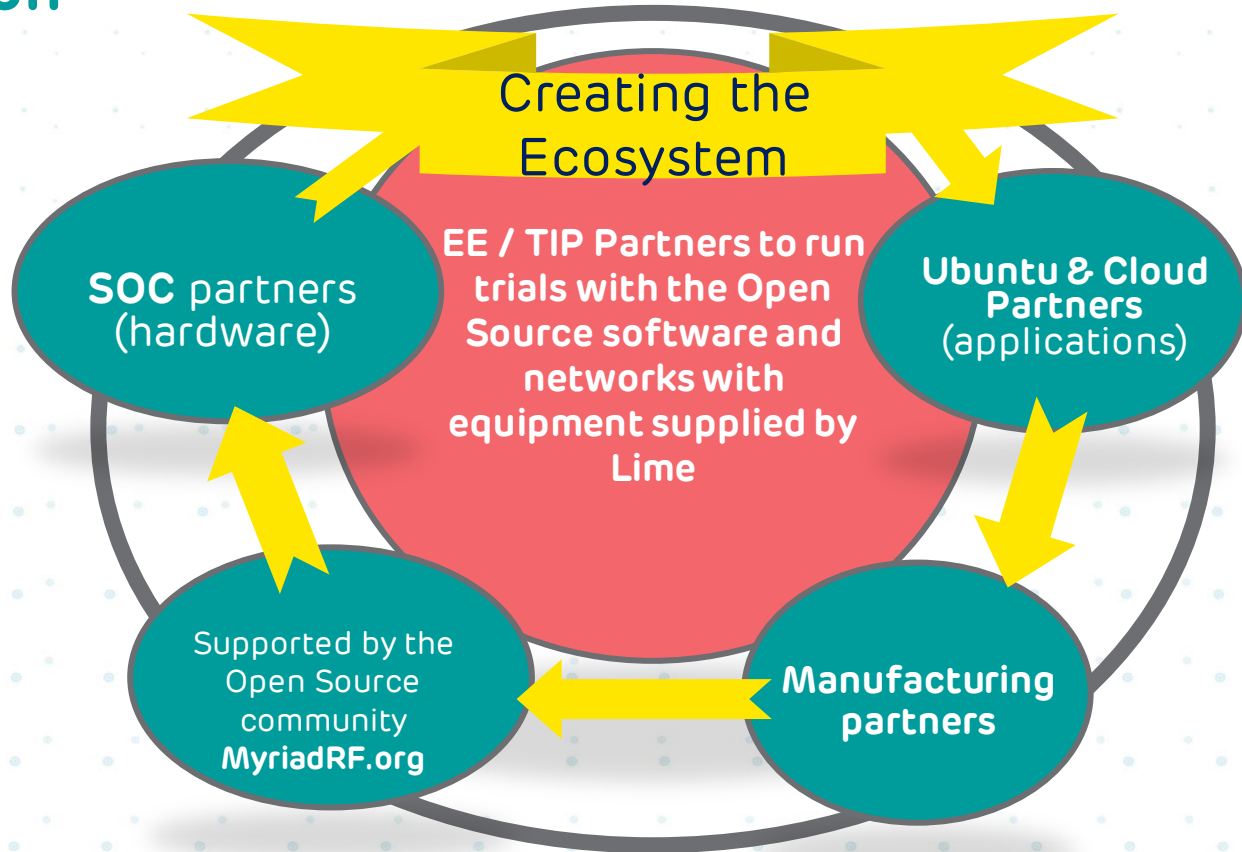
# Accelerating Innovation through open source
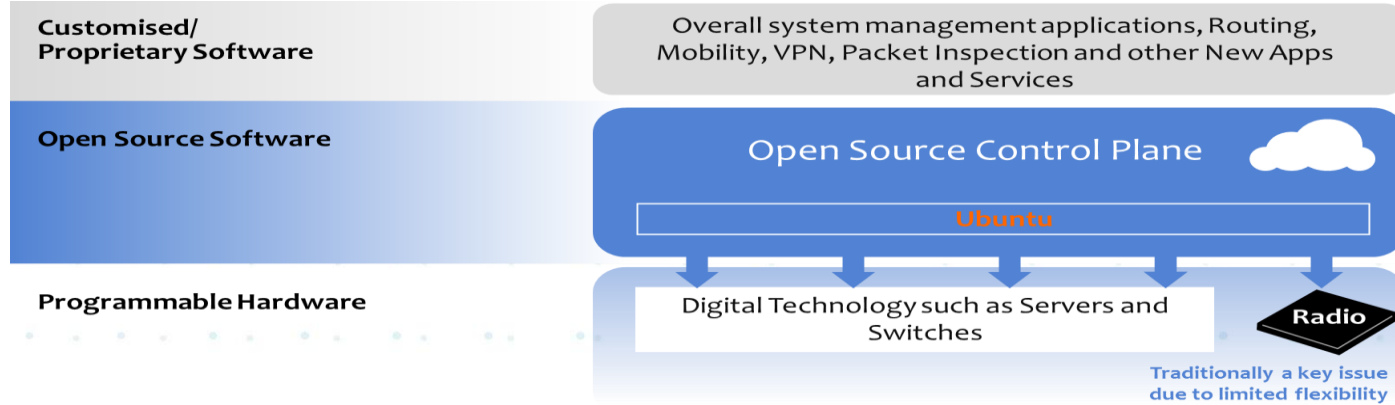


- Field programmable RF is key for a fully flexible radio access platforms

- Highly modular and low cost based on commodity Semiconductors

- Most flexible FPRF Transceiver capable of addressing all mainstream wireless standards and frequencies

- Base Stations are configured as network in a box

- Innovation lead by the crowd and large community of developers

- **https://www.crowdsupply.com/lime-micro/limesdr**

# A clear opportunity for OCP / TIP to accelerate innovation



Creating the Ecosystem

EE / TIP Partners to run trials with the Open Source software and networks with equipment supplied by Lime

SOC partners (hardware)

Ubuntu & Cloud Partners (applications)

Supported by the Open Source community MyriadRF.org

Manufacturing partners

# Areas for Open discussion

• A clear boundary / demarcation between OCP Telco and TIP

• Attitude of OCP members regarding potential cooperation with ONOS Lab and CORD /M-CORD ( we believe most OCP MNO partners are also working on CORD)

• OCP Telco approach to hardware optimisation on the RAN

• Should OCP focus on Hardware reliability improvements for Telcos?

• Should we address the need for tunable RF – especially filters and amplifiers as we face a more varied frequency allocation with 5G looming