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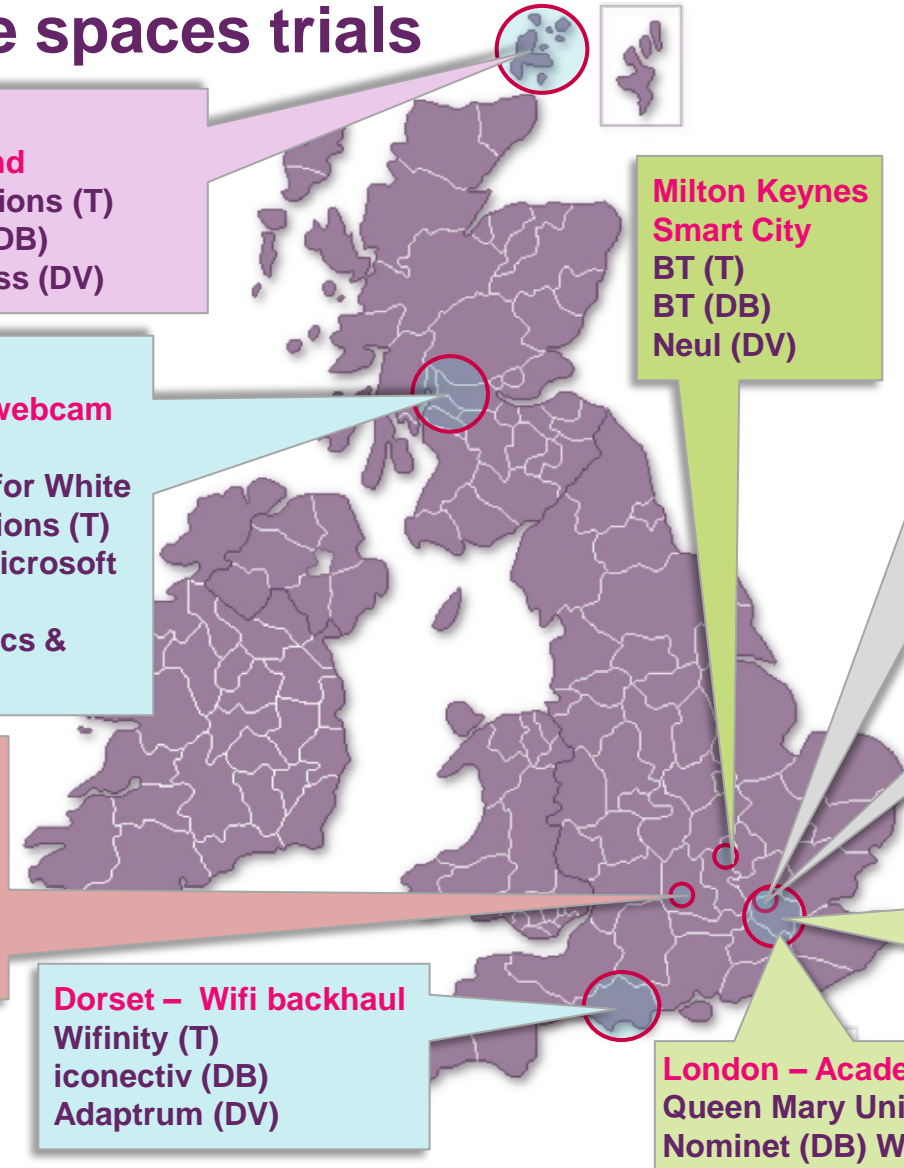
Ofcom TV White Spaces Pilot Update

Cesar Gutierrez, Ofcom
8th July 2014

Ofcom TV White Space Pilot – one year on

- 26 April 2013 Ofcom launched the idea of the pilot
- This received strong stakeholder support
- Pilot's objectives
 - to explore the potential benefits and issues of the new technology
 - to show if this model of spectrum sharing can be made to work
 - to generate new information on coexistence challenges
- Many months of work by Ofcom and stakeholders to make the pilot a reality

TV white spaces trials



Scotland
Rural broadband
 Cloudnet Solutions (T)
 Fairspectrum (DB)
 Carlson Wireless (DV)

Glasgow
External Wi-Fi and webcam backhaul
 Microsoft & Centre for White Space Communications (T)
 Spectrum Bridge, Microsoft (DB)
 Mediatek/6 Harmonics & others (DV)

Oxford – Remote sensor network (flood detection)
 Love Hz (T)
 Nominet (DB)
 Adaptrum (DV)

Dorset – Wifi backhaul
 Wifinity (T)
 iconectiv (DB)
 Adaptrum (DV)

Milton Keynes Smart City
 BT (T)
 BT (DB)
 Neul (DV)

Watford
CCTV content distribution
 Sinecom (T)
 Spectrum Bridge (DB)
 Sinecom/KTS Wireless (DV)

Watford – A/V distribution
 Peerless (T)
 Spectrum Bridge (DB)
 MELD (DV)

London
Academic Research
 King's College & Joint Research Centre of the European Commission & NICT (T)
 Fairspectrum / NICT (DB)
 Sinecom/ KTS wireless, Carlson wireless, Eurecom (DV)

London – Academic Research
 Queen Mary University (T)
 Nominet (DB) WSN Tech (DV)

Pilot Databases

- Databases control the operation of devices and are the key innovation in the TVWS framework
- Databases operation is regulated by Ofcom and a contract has been put in place to do this
- 9 companies have signed a contract for the pilot
- Spectrum Bridge, Fairspectrum, NICT and Nominet having successfully passed the qualification process and their databases are now discoverable by devices
- BT, iconectiv, Microsoft, Sony are going through the qualification process
- Qualification involves self-declaration against specific technical requirements; off-line tests and; simulated online tests



Devices to be deployed in the Pilot

Adaptrum

Carlson Wireless

Eurecom

6Harmonics

KTS Wireless / Sinecom

Mediatek

MELD

Neul

NICT

Wuxi SensingNet Industrialization Research Institute (WSN)

ADAPTRUM **MEDIA**TEK



CARLSON



NICT 独立行政法人
情報通信研究機構
National Institute of Information and Communications Technology



 **WSN** 无锡物联网产业研究院
Wuxi SensingNet Industrialization Research Institute

Testing during the pilot

Framework testing with Databases and Trialists

- We will test the overall framework for accessing TVWS including:
 - End-to-end interactions between devices, Ofcom and Databases
 - Ofcom's business processes for operating the framework

Coexistence testing

- Ofcom is not doing coexistence tests at stakeholder trials
- Separate programme of coexistence testing
 - DTT tests:
 - Subjective observation of video quality in DTT consumer households
 - Measurements of wanted /unwanted power levels in DTT consumer households
 - Laboratory measurements of protection ratios (DTT receiver susceptibility)
 - PMSE tests:
 - We are taking measurements at existing PMSE installations, with a range of WSD technologies.
 - We attempt to replicate PMSE failure modes that we reasonably expect to occur in the presence of WSDs



Pilot next steps

- More licences issued to trialists
- Framework tests scheduled & undertaken
- Finish qualification for remaining databases
- More coexistence tests for DTT & PMSE

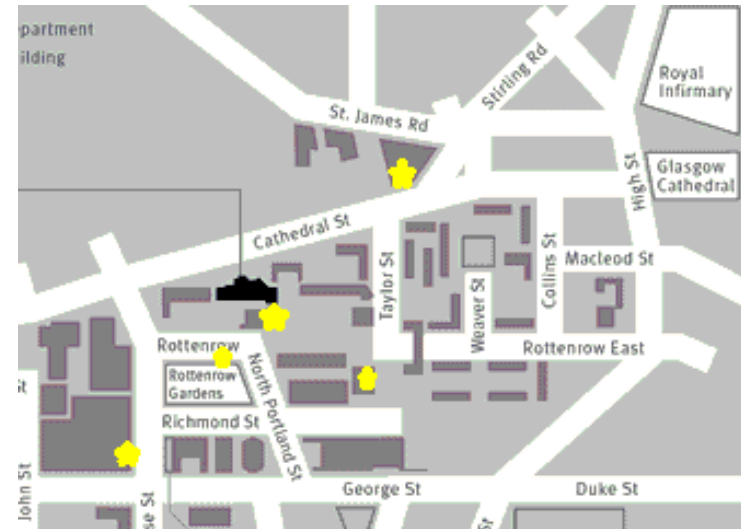
After the pilot

- This autumn Ofcom will take stock on what we have learnt from our testing and the pilot more broadly.
- We plan to publish our decisions on the way forward around the end of the year.

SOME OF THE TRIALS

Glasgow White Spaces Pilot

- 5 sites across the University of Strathclyde campus, with a total of 8 radios from 6Harmonics
- 4 triple-band Wi-Fi devices – including TV white spaces
- These latter units are compliant with the IEEE 802.11af standard
- The trial will to span the campus, including links between buildings which have no line of sight



*University of Strathclyde
City Centre Campus*



Orkney Islands Pilot

Trial applications

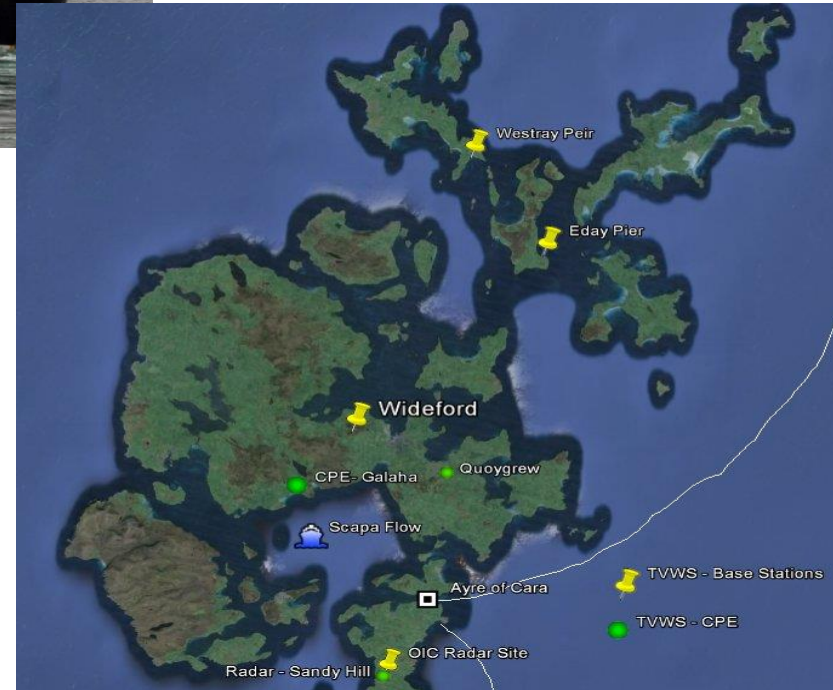
- Marine Services – Inter Island Ferries
 - Travel between islands range from 20 minutes to 3hrs travel.
 - Currently TV only on the boats
- Rural Locations Islands – Broadband

Network deployment

- 4 Base stations
- 3 CPEs in vessels
 - Offering Back Office Integration – Crew, Wi-Fi for Ships Crew, and Public Services
- 3 Land Based CPEs - Baseline Service delivery and QoS
 - Faroese Telecoms Radar: Relay Radar/ AIS Data of Marine Traffic of ships movement around North Scotland to Shetland monitoring the sub-sea fibre cables
 - Two residential locations

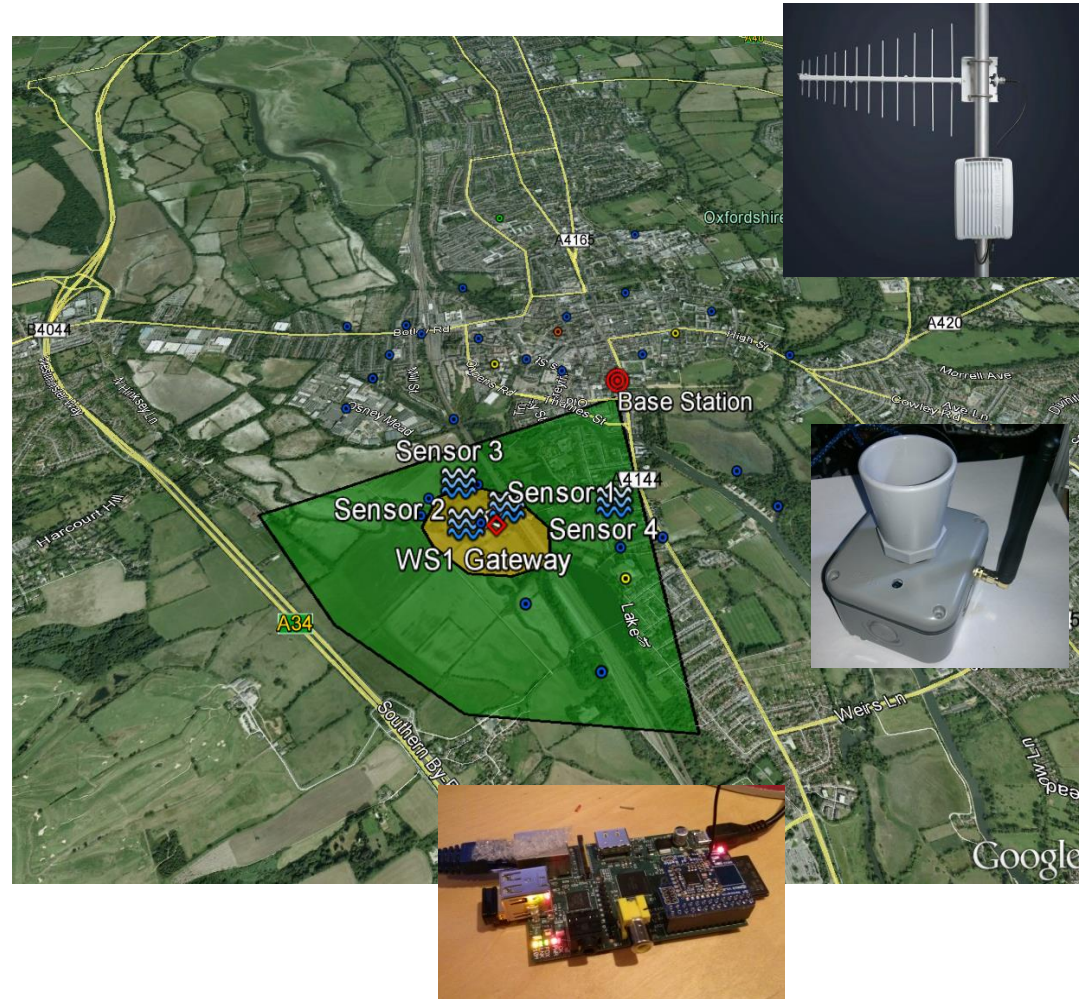


Orkney Islands Pilot



Oxford flood network

- community sensor network
- TVWS for Backhaul to sensor gateway
- 433 MHz ISM for the link between sensor and gateway
- RaspberryPi & Arduino used for the gateway and the sensor



nominet

ADAPTRUM

Some other trials



Backhaul to remote locations



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Verification of databases, devices and performance evaluation

- IEEE 802.11af and LTE devices



To test communications systems and scenarios that may be implemented in TV WS

- Tests with Eurecom, Carlson, KTS and NICT devices



Bringing it all together

MK: Smart Project at Milton Keynes

- Objective is to put in place an city wide data infrastructure to support a range of use cases across several sectors



More information

For information about Ofcom's TV White Spaces Pilot please visit our dedicated pilot webpages

<http://stakeholders.ofcom.org.uk/spectrum/tv-white-spaces/white-spaces-pilot/>

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Independent regulator and competition authority for the UK communications industries.

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TV White-spaces

Planning is now underway for a pilot of innovative white space technology in the UK, among the first of its kind in Europe. The pilot will use the white spaces that exist between airwaves reserved for digital terrestrial TV broadcasting.

The pilot planned for later this year aims to test all interactions between devices, databases and Ofcom; to provide an opportunity for industry to conduct further trials using the proposed framework; and to gain further information on the likely extent of interference to DTT and PMSE users.

A number of companies have expressed an interest in taking part, either as database, device or service providers; providing input and expertise on coexistence testing; offering trial locations; and volunteering as pilot users.

on the TV White Spaces Pilot webpages.

pendence, please email us via our dedicated TV White Spaces [org.uk](http://stakeholders.ofcom.org.uk)

► Consultations and Statements

► TV White Spaces Pilot

► General Information

Consultations Broadcasting Spectrum Telecoms Data and research Enforcement Internet Post

Home / Stakeholders / Spectrum

Spectrum

Ofcom is responsible for managing civilian use of spectrum. Our work involves releasing spectrum for new services as well as developing policies to ensure that the spectrum is used efficiently.

Priorities Strategy Commonwealth Games TV white-spaces UHF: 700 MHz

Given the value to citizens and consumers of services that are enabled by spectrum, managing spectrum is a significant responsibility. To secure maximum benefit is realised for UK

Information

- UK Frequency Allocation Table
- Mobile base station sitefinder
- Licence Exempt Radio Use
- GPS jamming exercises

Technical

- RS&TTE Equipment Compliance
- Interface Requirements
- TFACS
- Co-Ordination Documents

Spectrum Strategy

- Spectrum Framework Review
- Spectrum Trading and Liberalisation
- Spectrum Pricing

Spectrum Awards

- Prospective Awards
- Awards in Preparation
- Awards in Progress
- Awards Archive

Clearance and Coexistence

International Spectrum

Industry Groups

Website survey