

A brief introduction to the Cambridge White Spaces Trial

Broadband access and wireless connectivity are increasingly important to the economy and society – at national, regional and global levels. The European Digital Agenda and similar policy frameworks elsewhere lay down broadband performance objectives that are designed to enable all citizens to participate in the benefits from online services. At the same time, consumers' rapidly growing appetite for accessing online video and other data-intensive services via mobile devices poses a challenge for mobile broadband networks. Meeting this demand and the Digital Agenda objectives depends on using spectrum as efficiently as possible.

Launched in June 2011, the Cambridge White Spaces Trial is the largest of its kind in the world, bringing together fifteen leading companies in the Telecoms, Media & Technology (TMT) sector: [Adaptrum](#), [Arqiva](#), [BBC](#), [BSkyB](#), [BT](#), [Cambridge Consultants](#), [CRFS](#), [CSR](#), [Microsoft](#), [Neul](#), [Nokia](#), [Samsung](#), [Spectrum Bridge](#), [TTP](#) and [Virgin Media](#). The Trial aims to help Ofcom verify innovative regulatory proposals that could enable new services and applications, without disrupting the existing licensed services. The proposals are based on the use of geolocation databases to control shared access to the white spaces. This new sharing mechanism could enable spectrum to be used more efficiently and flexibly, helping to meet the growing demand for wireless connectivity and enabling more rapid exploitation of technology developments.

The Cambridge Trial is focussed on the television broadcast bands, which offer favourable propagation characteristics and could offer, subject to the appropriate controls being put in place, significant capacity and scope for International harmonisation. The geolocation database approach used in the trial could also be applied to sharing spectrum in other bands¹, in the future.

Trial activities

Using a network of nine white spaces base-stations, the trial has taken advantage of the favourable propagation characteristics of the TV white spaces spectrum, to explore the following use cases:

- Enabling broadband access to be delivered to rural areas, where wire/optical fibre-based solutions may not be economically viable
- Providing coverage in city/urban environments – for example, allowing pop-up hotspots to be created and offering potential to offload data traffic from mobile broadband networks
- Facilitating new wide area sensor and control networks, which could help improve life and sustainability, in urban as well as rural areas
- Supporting location-based services and local distribution of digital audio and video content – with potential to enhance indoor service discovery, tourism and public events.

¹ It is anticipated that there will be significant opportunities to share bands with public users, such as the UK's Ministry of Defence, in the coming years. Geolocation databases could facilitate this.



An extensive programme of tests and measurements is being conducted as part of the trial. This programme is supporting Ofcom's work in finalising the regulatory framework to protect existing licensed services and enable efficient use of the spectrum.

The trial's test and measurement programme will provide valuable information on:

- The potential impact from white spaces devices, allowing protection requirements for the existing licensed services to be determined and used to inform calculations of the geolocation database contents. [Coupling loss and receiver impact (DTT and PMSE)]
- The coverage achieved with the five city base-station locations, helping inform regulators about white spaces gap filling potential – in urban settings
- The capacity and reach of white spaces networks in rural areas – dependent on transmission power, propagation characteristics and background noise and interference levels
- The amount of white spaces capacity available in Cambridge, and across the UK, as a function of the possible protection requirements to be laid down by Ofcom.

The trial is also helping industry understand white spaces' potential to enhance broadband access and enable new applications. The network performance is a function of the protection requirements for the licensed services and the prevailing noise and interference level. The latter is mostly determined by signals from distant television transmitters, but could also be affected by adjacent white space devices. Regulators will determine what is needed to protect licensed services, whilst there is scope for industry to innovate to reduce the impact of interference from distant television transmitters and help white spaces radios make the best use of the available capacity.

Protecting the licensed services

The white spaces base stations were commissioned using a process agreed with Ofcom, based on its protection assumptions for the licensed services, to ensure that the risk of harmful interference is minimised. In the future, suitably approved geolocation databases (and algorithms for calculating their contents) will allow this process to be automated and provide immediate clearance for devices, when they need access.

After the base stations were commissioned, geolocation databases have kept the white spaces radios within the ten safe channels available in the Cambridge area and have enabled temporary reservations for wireless microphone use to be made securely.

So far

The trial network has been operated, across urban and rural locations, without any problems being reported by users of the licensed services.

Preliminary results from the trial's test and measurement programme appear to support Ofcom's assumptions on the protection requirements for existing services, required in the new regulations.

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