QMUL spectrum sandbox: Stakeholder workshop held on 11 June 2024

Workshop summary

1. Introduction

Queen Mary University London (QMUL), Telet, Federated Wireless and Aetha Consulting held a stakeholder workshop on 11 June 2024 at QMUL's Robin Brook Education Centre to introduce the aims and approach of the spectrum sandbox project being undertaken by the consortia. The main aims of the workshop were to inform stakeholders of the work and gather any use ideas/inputs/data that could be useful to the analysis at this initial stage of the project. These aims were achieved as seen in the questions asked during the presentations and further reinforced by the lively debate during the panel session. A further workshop will be held in late 2024/early 2025 to present the results of the work.

The workshop was attended by around 45 participants including representatives from DSIT, Ofcom, two of the national mobile network operators, smaller mobile providers, equipment providers, industry analysts and consultants and the consortium members. Also in attendance were representatives from the two other spectrum sandboxes and presentations were given by the sandbox consortium led by Real Wireless.

The agenda for the workshop comprised:

1:00pm Introduction to the spectrum sandboxes programme by DSIT
1:10pm QMUL sandbox objectives
1:30pm Overview of measurements workstream
1:40pm Overview of technical modelling workstream
1:50pm Overview of economic modelling workstream
2:10pm Coffee break
3:00pm Introduction to Real Wireless-led sandbox
3:00pm Panel session
4:00pm Wrap-up.

This note provides a summary of the main discussion points raised during the workshop. It should be read in conjunction with the slides presented by the consortium at the workshop which are also being made available since, for reasons of brevity, the detailed information on the slides is deliberately not being reproduced in this summary.

2. Introduction from DSIT

Laura Iglesias (DSIT) gave a presentation which explained why DSIT (in conjunction with Ofcom) is undertaking the sandbox projects, the three work packages approach to each sandbox and an overview of the three winning consortia.

3. QMUL spectrum sandbox

3.1   Overview of sandbox

Professor Yang Hao (QMUL), James Body (Telet) and Alistair Braden (Federated Wireless) gave a joint presentation introducing the QMUL sandbox. Yang introduced the consortium and gave an overview of the work being undertaken. James Body highlighted the benefits and commercial impact that the adoption of dynamic spectrum access for providing access to spectrum used by the national mobile network operators would have. Alistair Braden further explained the concept of dynamic spectrum access, including the CBRS model adopted in the USA. Following this presentation, there were discussions on whether a dynamic approach could be applied to shared access licence bands as well as local access licence bands, how the project team would make use of data collected in the modelling workstream in the measurements workstream, and the project team also confirmed that FDD technologies were being considered as well as TDD technologies.

3.2   Measurements workstream

James Body and Alistair Braden then presented more details of the measurements workstream, including the benefits and drawbacks of different spectrum bands, further details of how the licence assignment process would work and the protocols being developed by Federated Wireless to facilitate real-time access to local access licensed spectrum in the UK. Again, there was a lively discussion following the presentation, including the extent to which the other bands in the list initially proposed by DSIT were being considered as part of the study – such as the upper 6GHz band and the additional interference challenges associated with spectrum users applying different uplink/downlink profiles as a result of the traffic profiles arising from the different applications that they use.

3.3   Technical modelling workstream

Professor Yang Hao and Alistair Braden then provided further details of the simulation and modelling framework and how this would be used to estimate overall spectrum availability across the UK. At the end of the presentation, Professor Hao presented a list of example areas in relation to the modelling in which stakeholder input would be particularly welcomed. Discussions following the presentation included a discussion of how different technical parameters (e.g. relating to antenna tilts) could be considered in the project and a further discussion of how data from the measurements workstream should be incorporated into the modelling so that the modelling is not just based on algorithmic predictions. One of the mobile operators highlighted that some of their initiatives in the future would require full national use of their spectrum licences.

3.4   Economic modelling workstream

Razvan Todoran (Aetha) gave a presentation outlining the consortium's proposed approach to assessing the economic benefits of adopting a dynamic approach to spectrum assignment, including the use cases that the consortium has identified and the use of scenarios given uncertainty over the future demand for the spectrum. Discussions following the presentation highlighted the need to ensure that the economic analysis does not double-count any benefits or costs, and how the analysis will account for government initiatives for widening broadband access (e.g. Project Gigabit) and mobile coverage (e.g. the Shared Rural Network). The ability of smaller organisations to more cost-effectively address some of the niche opportunities was also discussed in the context of the question of why, if the underlying economic benefits/demand levels are so high, are the mobile operators not already addressing the opportunities. Furthermore, the economic analysis should also consider whether the costs faced by providers might change with the volumes of sites deployed. The consortium also

confirmed the consideration of NTN (non-terrestrial network) sharing was outside the scope of this sandbox's technical assessment and, therefore, outside the scope of the economic assessment.

4. Real Wireless spectrum sandbox

Dr Abhaya Sumanasena (Real Wireless) presented details of the sandbox being undertaken in conjunction with Digital Catapult, Freshwave and Qualcomm. This is investigating the scope for sharing between Wi-Fi and mobile services in the upper 6GHz band using an indoor/outdoor split and is also investigating sharing in the 3.8-4.2GHz band (upper part of Band n77). The measurements workstream includes deployments on two sites in Farnborough, whilst the modelling workstream includes detailed Monte Carlo simulations. Discussions following the presentation considered what regulatory methods could be used to facilitate sharing and how the modelling could take account of systems that require spectrum and transmit in lines (e.g. roads, railways).

5. Panel session

Professor William Webb then chaired a panel session to further discuss the issues raised during the workshop. Each panel member started by making some opening remarks:

Andy Sutton (BT) highlighted BT's use of a wide range of radio systems requiring spectrum and highlighted the continuing importance of fixed links in the 6GHz band and also in the 7-8GHz range and indicated that any sharing solution needed to take account of this important existing use. He also highlighted the changing environment (e.g. new building and demolition of old building in central Manchester) as an illustration of the fast-changing radio propagation environment. Andy also highlighted that mobile network operators need certainty of access to spectrum before investing large amounts for national licences.

Dr Charles Turyagyenda (Digital Catapult) highlighted the Digital Catapult's role in the Real Wireless-led sandbox including the provision of outdoor test environment facilities in Hammersmith & Fulham.

Mike Kennett (Freshwave) started by discussing Freshwave's role in the Real Wireless-led sandbox. He then moved on to highlight the limitations of theoretical propagation models/analysis with overly conservative assumptions, which led to overestimations of the required sizes of sterilisation areas around transmitter sites, and the importance of using real-world data to inform these models. He highlighted how Ofcom has now updated its shared access licensing model to reflect such inputs. He also highlighted how shared access licence numbers have been falling and the reasons behind this.

Discussions following these introductory remarks were wide-ranging:

- How to get the balance when setting sharing criteria between being too conservative over sharing criteria leading to underuse of spectrum versus the risk of actually causing harmful interference e.g. to critical users of the spectrum e.g. emergency service communications.

- How quickly any interference instances can be fixed (e.g. how quickly can an interfering transmitter be turned off) including the importance of 'fail-safes'. This moved into a discussion of how mobile operators monitor for interference issues and whether such reporting could be an input feed into a dynamic spectrum assignment system. The importance of understanding and classifying different sources of interference so the right decisions can then be made by the spectrum access system when acting on interference cases was also discussed. This then led to a discussion about what the role of machine learning and AI could be in running mobile networks, including whether enough

data is available to train these models. This then also led to a discussion on whether the mobile operators could provide (non-personalised) data for use in the sandbox projects.

- How spectrum historically dedicated to an individual industry sector and, therefore, used in certain locations could be made more widely available. One example is that of GSM-R spectrum assigned for exclusive use by the railways.

- The timescale over which full self-management/self-optimisation of mobile networks might occur, including the potential role of the RIC (RAN Intelligent Controller).

- How to ensure that any developed solution is not too UK-specific so it can be adopted more widely/internationally in order to provide the necessary economies of scale. This, in turn, led to a discussion of the need for an ecosystem of devices to be available (or a clear path to them becoming available) as being key to the success of any dynamic spectrum assignment initiative – which is a big benefit of the spectrum used by the national mobile operators.

6. Closing remarks

Amit Nagpal (Aetha) thanked the audience for attending and for their many contributions to what were very interactive and lively discussions. He welcomed the many suggestions that had been made – including offers of support – and said that the consortium would take all points raised into consideration. A follow-up workshop will be held when the results of the project will be presented.