Vodafone comments on Ofcom's Consultation on Digital Dividend: Geolocation for Cognitive Access

The digital dividend in the UHF band is the most important spectrum to become available in the UK in at least the last decade, and probably for the decade to come. It falls in the "sweet spot" in the radio spectrum that is suitable for both capacity and coverage, and is therefore attractive for a wide range of applications. It is therefore imperative that all of Ofcom's proposals in the digital dividend review consider the value of this spectrum over the long term.

This is the second consultation by Ofcom on the technical aspects of cognitive access. In Vodafone's response to the first consultation in February 2009[1], we pointed out that cognitive access is only one of several potential future uses for this spectrum, and according to Ofcom's own analysis, probably not the most valuable (i.e. having highest NPV). In order to fulfill its statutory duties[2], Ofcom must consult on the optimal future use of this spectrum before it proceeds towards licence-exemption of cognitive access in this band. We understand that the present consultation may be needed in order for Ofcom to contribution to studies that are now underway in CEPT. However, it does appear that Ofcom is drifting towards the implementation of technical measures for one particular future use of this spectrum without having first considered adequately whether this use is optimal.

INTRODUCTION

The current consultation addresses a number of technical aspects of the implementation of one approach to cognitive access – geolocation. We agree with Ofcom that this approach is more promising in the near term than the alternative – sensing. It is also less likely to preclude future developments to make optimal use of this spectrum. However, we have a concern that many of the consultation questions presume certain technical solutions or business models for geolocation. If Ofcom does not approach these issues with an open mind, there is a risk that its conclusions might not meet its obligations in regard to technology neutrality.

Studies undertaken for Ofcom, the European Commission and others have shown the high value of UHF spectrum for mobile services. This value can best be realized by clearing the spectrum for exclusive use by mobile services. However, Ofcom should anticipate that mobile network operators will also be interested in the potential of cognitive access in UHF spectrum that cannot be cleared. The combination of cognitive

[1] Digital dividend: Cognitive access. Consultation on licence-exempting cognitive devices using interleaved spectrum; 16th February 2009.

[2] Section 7 of the Communications Act 2003

access with a mobile network can overcome some of the shortcomings of cognitive access alone, such as providing a reliable service to users and updating of the database. This is likely to result in more valuable use of the interleaved UHF spectrum.

Question 1: Should we suggest only high level parameters, leaving further work to industry, or should we seek to set out full details of parameters to be exchanged?

Ofcom should certainly not seek to set out full details of the parameters to be exchanged. There are many different ways of doing this (for example, as a set of pixels or as the vertices of a polygon defining a boundary). The optimal solution may different between applications of cognitive access, and new techniques may be developed in the future.

It is likely that standards bodies such as ETSI and IEEE will develop solutions for exchange of parameter values. However, Ofcom should authorise the use of any solution that can be demonstrated to meet the regulatory requirements needed to prevent interference to primary users of the spectrum, whether standardised or proprietary.

Question 2: Should both closed and open approaches be allowed? Should there be any additional requirements on the providers of closed databases?

There is a lack of clarity in the consultation document about the structure of the database. In principle, two different databases are required:

- "raw data" of the location of transmitters whose service need to be protected
- "processed data" of the areas in which cognitive devices can operate without causing interference to these services.

There clearly needs to be a centralised database of raw data, but there could be many different databases of processed data. The data could be processed in different ways, to suit the application or the method by which the data is transferred to the cognitive devices. Open and closed databases may be more suited to different cognitive applications.

The correct operation of the database is as important in preventing interference as is the correct functioning of a radio transmitter. Ofcom will therefore need place obligations on the operators of databases or cognitive systems for the integrity of the database and the transfer of data to devices. These obligations might be greater for providers of open systems (for example, to ensure that devices only interrogate authorised databases).

Therefore, Vodafone believes that both open and closed approaches should be allowed. Both approaches may need additional requirements that do not apply to the other.

Question 3: What information should be provided to the database? Are our assumptions about fields and default values appropriate?

The assumptions and default values are likely to be appropriate for implementation of cognitive access. However, there may be circumstances in which they are not appropriate or not optimum.

Question 4: Should the translation from transmitter location to frequency availability be performed in the database or in the device?

Ofcom should only be concerned that the translation of the data is performed correctly, and not where in the cognitive system this function is located. If there are multiple databases of processed data, then they might be implemented differently.

It is likely that most of the translation will be performed in the database. However, there are some elements of the translation that could be more efficiently performed in the device, such as the use of power control to allow operation in boundary areas.

Question 5: Have we outlined an appropriate information set for the database to provide to the device? Can industry be expected to develop the detailed protocols?

Industry can be expected to develop the detailed protocols, and it is therefore not necessary for Ofcom to define the information set to provide to the cognitive device.

The consultation identifies some of the key parameters for the information set, but it is not appropriate for Ofcom to specify how they should be formatted. For example:

- It might be more efficient to increase the pixel size in order to reduce the data that needs to be transferred to the device (at the expense of some loss of available coverage in border areas).
- It might be possible to simplify the frequency data for cognitive systems with fixed channel bandwidths.
- The geographic area for which data needs to be provided depends on the mobility of the device.

In Question 7, Ofcom asks about data having a period of time validity. This is important for many cognitive applications, and would clearly need to be included in the information set.

Question 6: Is a two-hourly update frequency an appropriate balance between the needs of licence holders and of cognitive device users?

The important regulatory consideration is not the interval between updates but the duration of the validity of the data – which need not be the same for all of the data (see question 7).

The consultation document does not give any rationale for the period of two hours; it seems rather long to deal with reporting of PMSE use for “breaking news”, but rather short for PMSE use for major theatrical productions. The period of validity might therefore be different for frequencies generally used by PMSE for ENG and for theatres.

In assessing the appropriate balance, Ofcom should take into account the different mechanisms that are available to update a terminal. In particular, a device that incorporates a mobile terminal could be updated either on demand or broadcast by individual cells. As well as allowing frequent updates, this would reduce the sizes of both the update and the database that the terminal would need to store.

Question 7: Is there benefit to devices receiving a time validity along with any database request and to act accordingly?

It is clearly essential for the data stored by the terminal to have a duration of validity, and for the terminal not to transmit on combinations of frequency and location for which this validity has expired.

As discussed in Question 6, there are clear benefits in not fixing the period of validity at a single value, but it may not need to be defined separately for each pixel either. If the excluded areas are defined as a polygon (see question 1), then it would be sufficient to have a single period of validity per area.

Question 8: What role could push technology play?

We do not believe that Ofcom should base its regulatory approach on whether or not push technology is feasible. The separation of databases for raw data and processed data would allow the latter to adopt push technology if it is feasible for a particular cognitive application.

The assumption in the consultation document that a device would not be permanently connected to the database may not be valid for devices that incorporate both cognitive technology and a mobile terminal.

Question 9: Do you have any comments on the suggested approach to implementing the database for DTT?

See answer to question 11.

Question 10: Do you have any comments on the suggested approach to implementing the database for PMSE?

See answer to question 11.

Question 11: Do you believe it is practical to implement such a database?

The suggested approaches for DTT and PMSE seem reasonable[3].

We do not see any fundamental difficulty in implementing such a database for processed data. It is important to note that it is not necessary for this database to implement the full complexity of the propagation model, provided that any simplification always produces more conservative results. This would result in a slight reduction in available spectrum for cognitive devices; the operator of a database would be able to

[3] We have not reviewed the proposed propagation models and protection criteria in detail - this is a matter for the stakeholders of these services.

decide the optimum trade-off between the cost of implementing the database and the value of the extra spectrum to its users/customers.

Question 12: Is it appropriate for third parties to host the database? If so should there be any constraints? If not, who should host the database instead?

As discussed in question 2, there are two distinct database functions, for the collection of raw data on spectrum use and the provision of processed data to cognitive devices. It is possible that these functions might be combined, but this would depend on the business model for cognitive devices and applications. Ofcom should therefore proceed on the basis that these functions are separate, as to do otherwise could discriminate unjustifiably between different applications of cognitive devices.

Obviously, for interference to primary users of the spectrum to be prevented, both databases need to operate correctly. The requirements are different for each:

For the database of raw data;

- It must be easy for spectrum users to input information about planned spectrum use (mainly PMSE users, since the broadcast spectrum use is fairly static).
- The data provided to create the databases of processed data must be accurate.

For the database(s) of processed data;

- The raw data used to generate the processed data must be current.
- The algorithms used must be implemented correctly.
- The method used to transfer the data to cognitive devices must have high integrity (including preventing users from modifying the data or accessing bogus databases).

The correct operation of both databases is just as important to prevent interference as is the correct operation of a radio transmitter. It is therefore appropriate for an operator of a database of processed data to require a licence issued by Ofcom, similar to those issued under the Wireless Telegraphy Act 2006. The operator of the database of raw data might be the PMSE Band Manager (see question 14) or, if not, then the contract could be awarded in a similar way.

Question 13: How can any costs best be met?

The operation of the database of raw data needs to be funded centrally. This could be done either through licence fees for operators of databases of processed data or through charges to operators of databases of processed data. There are many ways in which an operator of a database of processed data could cover its costs, depending on the business model of a cognitive application. This is not a matter for Ofcom.

Question 14: What are the difficulties and expected costs to licence holders in providing the necessary information to the database? Could this information be provided in any other way?

The licence users who are most likely to incur costs in providing information are PMSE users. These costs would be minimised if the PMSE band manager is also the operator of the database of raw data.