

Intellect Wireless Council

The Initial Views of Intellect on the Independent Audit of Spectrum Holdings

Background

Several members of Intellect met with Professor Cave and Ms Helen Watson (seconded from the Treasury) at Ofcom's offices on Friday 1st April 2005. There was a wide ranging discussion of the audit timescales, planned consultation stages, IASH terms of reference and of some suggested questions & topic areas that had kindly been provided in advance at Intellect's request.

The following paper has been drafted in the light of these discussions and comprises Intellect's formal response to Professor Cave's 'Initial Consultation Letter'.

Intellect has no concerns about the contents of this paper being made public, however we are not specifically requesting that if this is seen as inappropriate or even possibly unhelpful at this time by the IASH team.

We would also wish to confirm here the proposal made by Professor Cave during the latter meeting, namely that 'If Intellect wishes to make representations to Ofcom and to Professor Cave re the release of particular spectrum, then Intellect should do so'. Intellect is grateful for this advice, which has been circulated to its membership.

Foreword

Intellect supports the objectives and Terms of Reference of the Independent Audit of Spectrum Holdings.

In making a contribution, Intellect feels it is useful to have in mind at least one specific objective that could be served through action resulting from the audit in the event that additional spectrum could be identified. This approach helps to keep the discussion focused on a real, tangible potential benefit for the whole of the UK.

To fulfil this, Intellect chooses the subject of the possible release of large amounts of spectrum that could be used in the Next Generation Access Network (referred to throughout the remainder of this paper as the “access network”).

Intellect considers it may be inappropriate to contribute to the identification of major spectrum holdings or to the audit of the use and operational need for major spectrum holdings¹. However, we believe we can make a useful contribution to both the Strategic Approach and at a later stage, the treatment of shared bands and meeting the needs of some public sector spectrum users in specific cases.

Access to Services

Today and even more so in the future, the use of the radio spectrum to provide interactive communications facilities and indeed all forms of connectivity to users in the mobile, nomadic or portable environments will deliver the greatest value. Today's basic mobile voice telephony service is considered essential by very large numbers of the population. It is foreseen that as the capability of mobile services (including all forms of mobility) increase, the citizen consumers and enterprise users will find the new services, applications and content similarly essential.

Technology is advancing to the point where wireless communications devices are becoming capable of extremely high data rates². Additionally, it is considered safe to assume that as the numbers of such devices increase through supplying unit volumes on a world-wide scale, the price seen by the end users will drop because they will be offered the benefit of the economies of scale. These two factors combined could be the winning combination that forces a resolution to many current access-network issues.

Intellect looks forward to the results of the research confirmed in the Ofcom Annual Plan leading to the Report on the Digital Consumer in this regard, as it will provide independent evidence on the uptake of such services and at the same time inform decisions on the issues surrounding next generation broadband. However, it is generally recognized that the needs for these kinds of services will rise significantly.

¹ Parts 1 & 2 of the Terms of Reference

² ITU-R WP 8F 'Beyond 3G' definition adopted for 'IMT-2000 and Beyond' was to deliver multimedia service in licensed IMT-2000 spectrum at rates in excess of 22 MB/s. Other technologies are already becoming available able to deliver data rates very significantly higher than that.

There is a large volume of evidence (most recently the 'FMS'/EC demand study on Future Mobile Communications Markets & Services) already available supporting the future need for very much improved communications services to support the delivery and uptake of ICT. This is available on various EU Commission websites and includes documentation ranging between linking ICT uptake to the economic growth of the Community³ through to plans under the new i2010 initiative which seeks a much more aggressive implementation of measures to achieve the goals than ever before.

The future vision for communications services in the UK is as follows:

1. The uplink and downlink data rate capability is "sufficient" to allow innovation in applications, services and content to develop unhindered.
2. Interconnection/interface/interoperability issues are resolved sufficiently to allow media to "flow" across platforms to the desired destination.
3. The geographical coverage is adequate to make the services truly valuable.
4. The management of content rights is under a single coherent scheme to facilitate applying the rights at the periphery of the network.
5. The systems are easy and "safe" to use and maintain privacy.

As can be seen, any wireless scheme supporting access to services will have to directly follow these principles. If the wireless connectivity does not support the user demand (through lack of available spectrum) then its value to the citizen consumer is very questionable.

Intellect maintains that the services that can be delivered do not represent a continuum of gradual user-value increase as the data rate also increases. Thus the statement that if the communications network doubles the data rate the value to the end user is also doubled is considered simply untrue. Intellect believes that the value achieved by the end user is more strongly influenced by the *type* of services he can receive and by the *QoS/Quality of Service* that can be delivered by the service providers. These effectively go in large jumps, at least as far as data rate is concerned, as follows:

Example: Web browsing can be done (slowly) at 10kB/s
Audio reception at 100kB/s (say - depending on quality)
Slow moving image, video reception on screen at 300kB/s (approx.)
Digital TV 4MB/s,
.....i.e. there is a big gap between these.

³ Large number of documents now exist. See COM(2003) 729 Final - The EU Economy: 2003 Review - Summary and Main Conclusions. See also Facing the Challenge, The Lisbon strategy for growth and employment; Report from the High Level Group chaired by Wim Kok; November 2004.

Key Point 1: The need of mobile and nomadic or portable devices by users for high-value content and services is expected to rise significantly.

Key Point 2: Wireless communications has a significant role to play in the access network and must sustain the same level of service for the end user (QoS related) as for fixed access.

Top Level Spectrum Requirements

The delivery of high value services, applications and content (in mobile and nomadic or portable environments) to the UK population and enterprises depends both on technological improvements to ensure increased spectral efficiency over existing wireless networks and also on new spectrum availability to support the deployment of new networks⁴. Analysts have already developed a set of assumptions about the services that are likely to be required, in various market studies. Depending on the level of utilization of the service and the mobility of its users, it is possible to calculate the amount of spectrum needed to accommodate the new services assuming current modulation techniques. On the basis of the latter techniques, the amount of spectrum that will be required will be very large. Some companies are currently developing alternative radio technologies which are designed to occupy significantly less spectrum, and when these are both demonstrated and proven then it might be possible to accommodate these advanced applications with a somewhat lesser need for additional spectrum. Having said that, the 'Radio Spectrum variant of Parkinson's Law' can be expected to apply, namely that applications will always arise to fill the available spectrum space!

Documents are available from Intellect providing examples of relating service assumptions to data rates and finally to spectrum required to support the communications⁵.

The main use for the spectrum is generally accepted to be in the access network. This places constraints on the choice of spectrum due to propagation effects. It is no use trying to achieve connectivity using bands located too high in the radio spectrum as they simply don't travel far enough to provide an economically sustainable solution. Equally, locating the services too low in the radio spectrum will mean the necessary bandwidth cannot be achieved. These are constraints imposed by the laws of physics and cannot be overcome.

Key Point 3: Intellect believes that the Report on the Digital Consumer (if it is constructed to address the issue) will show significant demand for new services and that

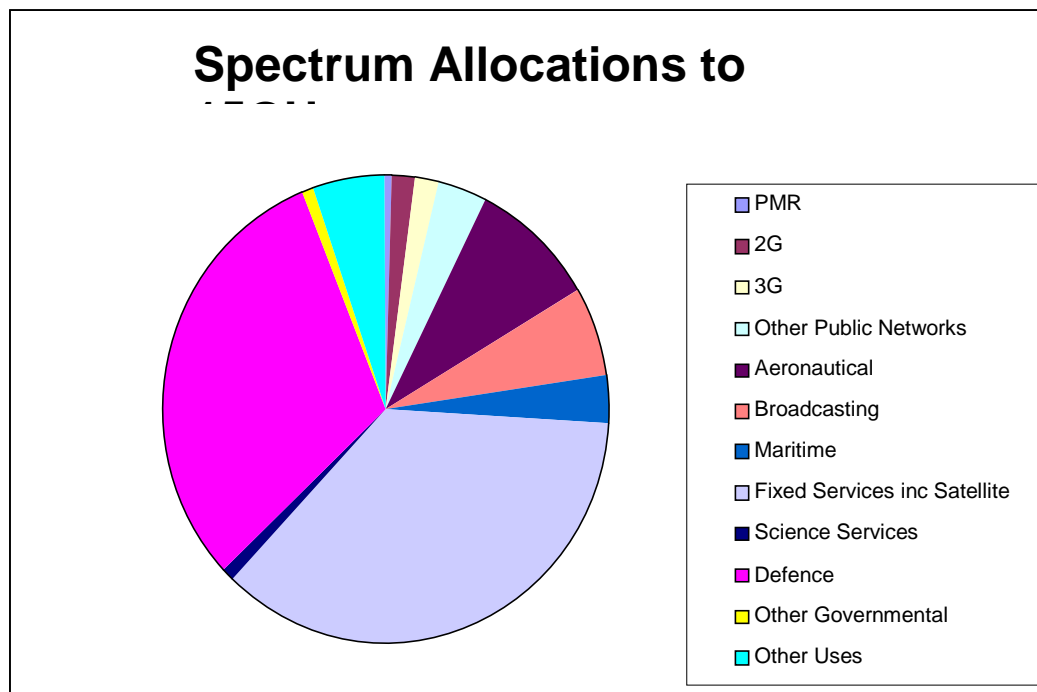
⁴ It is fairly simple to develop a set of assumptions on the services that will be required, the utilisation and the mobility of the users and on the basis of these, calculate the spectrum required to sustain that level of service. Whilst the exact answer depends on the assumptions made, it is clear that the amount of spectrum indicated will be very large.

⁵ Intellect IWC Document 'IWC_05_2_Intellect_Broadband_example-final.pdf' is supplied along with this Response. (It has already been provided formally to Ofcom).

these will translate to spectrum bandwidth requirements that cannot be met within the current bands available for such use. We probably need a lot of spectrum somewhere between 2 and 10GHz.

Comments on the Current Spectrum Arrangements

Referring to the diagram below, it can be seen that the current holdings up to 15GHz are very considerable⁶.



Source: Review of Radio Spectrum management and the Strategy for the Future Use of Radio Spectrum; Radiocommunications Agency; Nov 2003.

From the figure it is clear that the majority holders are the fixed service and Defence/Governmental users. We would further note that under the Liberalisation regime that is being introduced in phases, the utilization of the bands becomes critical because it dictates the nature and quantity of the services that can be introduced and to what degree the current arrangements need be perturbed. So if the band has a large sector which is not currently used it is obviously easier to introduce a totally different service than if several smaller bands have to be consolidated to create a useful harmonized or non-harmonised band for a valuable new service. (N.B. some such services can be expected to be 'imported' into the UK from other countries worldwide where they might already utilize bands that are to some extent harmonized geographically.)

⁶ The exact usage is difficult to characterise accurately. In cases where ambiguity exists, the primary holder is recorded even though other users may share the band. This particularly affects the dividing line between Other Governmental and Defence where coordination appears to give precedence to the Defence side.

Intellect also stresses (as noted above) that the availability of suitable equipment to exploit the bands may be heavily influenced by the international position in the band. This derives from the fact that even today, the most expensive and difficult part of the equipment may be the frequency dependent parts and so frequency harmonization has a direct and causal impact on the price seen by the citizen consumer as a consequence of the benefit achievable through the economies of scale.

Key point 4: The benefits delivered to the citizen-consumer may be strongly influenced by International harmonization and so Intellect especially welcomes the focus this aspect has in the Terms of Reference.

The Strategic Approach

Intellect believes the magnitude of these issues requires a fully coordinated approach to ensure that the maximum spectrum is released for civil use such as for the next generation broadband access networks outlined above while at the same time making sure government spectrum requirements are properly addressed. We therefore support the approach of the independent audit.

Recognising the early stage of the audit, we contribute lists of factors (with explanation) that could be included in the audit. Timescale is considered to be covered by a global statement of “as soon as possible”.

Operational Factors

1. Required Quality of Service (QoS) both if the band is to remain shared, or not.
2. Options not using spectrum. Intellect notes some spectrum is used to connect facilities that could possibly be better served by fibre or other wired scheme.
3. The need for mobility or nomadicity & portability by the government user
4. Transfer of services onto public infrastructure in appropriate cases
5. The need for rapid deployment of services

Financial Factors

In general, Intellect does not consider it appropriate to comment on financial factors in relation to the funding of defence or government-held spectrum. However, there are numerous auxiliary factors that appear relevant:

1. The cost and capability of commercially available equipment continues to improve. This continuously changes the value proposition under the COTS/‘Communications-off-the-Shelf’ military procurement concept for some service types.
2. International considerations (see below) show that equipment made for other markets may allow alternative use of spectrum currently within the UK Government spectrum holdings.

Technical Factors

1. The computational/algorithmic capability of equipment has now increased to such an extent that even quite complex applications can be loaded on standard equipment. This may obviate the need for special equipment to be constructed for some applications.
2. The architecture of apparatus allows different modules to be included. This could, for example, allow different encryption modules to be used compared to standard equipment thus allowing protection with a preferred algorithm to be used.

International Factors

1. The harmonization of spectrum bands is a key consideration for some applications. The commercial value of the spectrum will be heavily influenced by this aspect for many future designated services. There are some bands which are part of the Government holdings in the UK that are used commercially elsewhere, so equipment already exists that could be deployed for some types of service.
2. Some wireless technologies are easier to be adjusted in frequency, and real opportunity can be seen for these in the event that a significant band is located.
3. The need for co-operation with organizations in other countries needs to be reviewed in the light of actual numbers of instances of the operational capability actually being used. The important point is that a perceived need to maintain alignment with other countries may be theoretically desirable *but actually not used*.

In all these matters the greatest attention needs to be taken of the fact that some of the spectrum under consideration may be unique to the UK in terms of civil use. Thus additional considerations may have to be included before stakeholders can be in a position to provide enhanced benefit to citizen consumers or to the enterprise sector.

Key Point 5: Intellect believes that the UK urgently needs a Spectrum⁷ Allocation Plan. This will not only define the current status of the spectrum allocations but the future plans, especially in terms of changes designed to achieve public policy objectives.

Consequences from the Independent Audit in terms of spectrum allocation changes would naturally be reflected well in advance in the proposed Allocation Plan.

Initial Comments on Effectiveness

Intellect is not in a position to comment in detail on the effectiveness of incentives for public sector users to maximize efficient use due to some uncertainty over the exact

⁷ Spectrum allocation Plan is taken to be limited to just the spectrum arrangements thus it would not contain definitions of which services may be used in the band and certainly not which technologies are allowed. The requirement being to meet the spectrum mask and channel arrangements etc.

scope of this work. However we feel we should provide some initial comments in relation to some specific matters.

The Treatment of Shared Bands

Intellect remains firm in the belief that sharing of bands needed by government users must not lead to loss of capability. However, there may be scope for increased utilisation by other users. Assessing this to maximize efficiency may be non-trivial and will entail examination on both economic and technical grounds.

For example, Intellect is aware that there are research projects in progress to provide radars having the ability to search for different types of targets not previously considered and which may have needs for spectrum at lower frequencies, possibly in shared bands.

Key Point 6: Intellect proposes a capability be developed to efficiently undertake objective and credible sharing studies to establish to what extent the band really can be shared, and with what.

New Spectrum requirements of the Public Sector

It is clear that public sector users will need increased facilities and services in the future. However, it is less clear which cases will demand spectrum be dedicated for their use and which ones could actually be met by lower cost public services etc..

Intellect therefore strongly supports the objective of the review to establish exactly this.

Terminology:

‘Nomadic’ – this is mainly used to describe the behaviour of an *Equipment User*. Clearly he/she will tend to want to carry ‘portable’ equipment around with him to the maximum extent and convenience such that whatever needs he has to communicate to the Internet and elsewhere are adequately catered for. The term ‘nomadic’ tends these days to also be applied to be applied to ‘terminal equipments’ that can meet the latter requirements. Obviously, ‘terminal equipments’ capable of mobile telephony already extend to a much wider set of equipments than just simple mobile telephone handsets.

‘Portable’ – this term is specific to *Equipments* and is used for example for radios, televisions and many other equipment types. The term implies *nothing* about the characteristics of individuals/users who might decide to simply carry or move such equipments around, whether frequently or instead on an infrequent or ad hoc basis.

-----end of document-----

Intellect Contact Person: Jim.Munro@Intellectuk.org

Cellphone: 07958-664516