Manually configurable white spaces devices consultation response

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General response

Introduction

About Nominet

Nominet is the private not-for-profit company responsible for running the .uk internet domain name registry. We are a medium sized company employing approximately 150 people in Oxford, London and Cardiff. Nominet's articles of association commit the company to working for the public benefit and since 2008 any surplus generated by the company has been donated to an independent charitable foundation, the Nominet Trust.

We are now starting to use the technical expertise within the company to explore new business opportunities in areas such as cyber security, smart cities and the Internet of Things and are investing heavily in research and development.

Nominet's participation in the TV White Spaces pilot

Over the past two years, Nominet's R&D team has built a TVWS database and qualified for participation in Ofcom's pilot scheme as a TV White Spaces Database (WSDB) provider. The on-going collaboration between Nominet, Ofcom, and the other stakeholders has helped inform Ofcom's development of the TV White Spaces (TVWS) regulatory framework. Our WSDB has been used for academic research, for exhibits (e.g. at the Glasgow Science Centre during the Commonwealth Games), and in two live trial projects.

Most notably, Nominet has deployed prototype TVWS hardware to enable real-time time measurement of Oxford's streams and rivers as part of a local community project called the Oxford Flood Network. This has demonstrated a practical use of TVWS in enabling Internet of Things applications. In Oxford people are installing their own water-level monitoring sensors in order to share local information and knowledge about rivers, streams and groundwater to build a better, hyper-local picture of the flood risk at high-resolution and at street level on the streams, groundwater and the complex basin of the Thames and Cherwell rivers.

Ofcom's decision to limit licence exemption in TV White Spaces

As a foreword to our response to this consultation we want to set out our concern regarding Ofcom's decision to limit the licence exemption for TV White Spaces Devices (WSDs) to only those that are automatically configured with the various parameters that need to be sent to the WSDB. While we understand that this fits with the ETSI standard, as Ofcom note in the consultation, there are no devices on the market that currently meet this standard. We do not consider that Ofcom has provided any compelling evidence to suggest that such devices will be available within the three-year timescale suggested in the consultation. Indeed, it is questionable as to whether a manufacturer will ever see the nascent European market as providing sufficient demand for devices that meet Ofcom's requirements for licence exemption.

We were surprised that Ofcom's February 2015 policy statement was so definitive about this issue and we would have preferred to see an open consultation process prior to the finalisation of Ofcom's policy.

This was particularly surprising given Ofcom's well-deserved reputation for consulting widely on significant policy questions.

We understand that the key concern that Ofcom's proposals for licensing are seeking to address is the possibility of interference caused by misconfigured devices. However, there is no evidence presented by Ofcom as to the likelihood that a user will either deliberately or accidentally input incorrect information, nor the likelihood that such information will lead to interference. There are many types of devices available on the market that if incorrectly configured have the potential to cause interference to both licensed and licence-exempt frequencies, including manually configured devices used without incident by the PMSE industry. We therefore consider the increased likelihood of interference caused by manually configurable WSDs to be negligible and Ofcom's decision to limit licence exemption to automatically configurable devices to be disproportionate.

We note that Ofcom's Voluntary National Specification (VNS), on which the ETSI standard was closely modelled, was developed a number of years ago. In light of the experience of TVWS use around the world, we would question whether the ETSI standard continues to be the correct benchmark for licence exemption as suggested by Ofcom.

We believe that if Ofcom wants to regulate in a way that enables innovation in spectrum management and wireless communications then it should make all WSDs licence exempt. We would therefore encourage Ofcom to reconsider its decision set out in the February 2015 Policy Statement in light of its primary duty to further the interests of citizens and consumers, its duty to promote efficient use of spectrum and the broader interests of the UK economy.

Our position on licence-exemption notwithstanding, we have set out our response to the consultation questions below.

Areas for clarification in Ofcom's proposals

We recognise that misconfiguration of devices has the potential to be a source of interference to primary users which need to be protected over TVWS communications. We do not expect a high number of WSDs to be deployed in the UK in the first few years from the launch of TVWS. In fact, device costs and user interfaces currently represent a high barrier for the consumer market. We therefore expect that WSDs will be deployed by professionals, thus minimising the risk of accidental misconfiguration.

Given the definition of MCWSD provided in the consultation document, we believe that all devices that will be manufactured might require some sort of manual configuration. This means that potentially all the WSDs will in fact be MCWSDs and therefore, according to the Ofcom proposal, will be subject to the proposed licensing regime. We do not believe that this was Ofcom's original intention and it is not the way that Nominet and other companies who have participated in the TVWS trials have understood the direction of Ofcom's regulatory approach.

We highlight some specific concerns below:

- The ETSI EN 301 598 standard requires that devices shall not allow the user to have access to hardware or software settings that relate to the exchange of the parameters. However, this requirement does not specify what part of the hardware or software cannot be accessed.

- If a device has several geolocation methods available and the user is allowed to select which one is the most appropriate, does the device qualify as MCWSD?
- What are the permitted geolocation sources for ACWSDs? The consultation mentions GPS, but not other global navigation satellite systems (GNSSs). Can other geolocation technologies e.g. based on Wi-Fi, iBeacons, and cellular network be used?
- If a geolocation system is fitted into a MCWSD (e.g. a USB GNSS dongle), does the system become an ACWSD (and thus licence exempt)?
- Technically, the position that should be reported to the WSDB is the one of the antenna, not of the WSD. Do Ofcom therefore expect that the geolocation mechanisms would be able to automatically report the position of the antenna (latitude, longitude, altitude)? If so we foresee difficulties in attaching geolocation equipment (e.g. a GPS receiver) to the antenna itself, as well as complex situations for devices using multiple antenna.

Reliability of automatic configuration compared to manual configuration

Automatic configuration is not always more accurate than manual configuration. For example, since different geolocation systems have different accuracy for horizontal geolocation and Ofcom's default location uncertainty value is 0m, we observe that the chosen geolocation method might have an impact on the accuracy of the reported location. For consumer GPS receivers, the vertical error can be +/-23 meters with a dilution of precision (DOP) of 1 for 95% confidence. This might lead to altitude measurement fluctuations leading to potential for interference or, most likely, for reduced white spaces availability, and therefore an inefficient use of the spectrum.

In the February Policy Statement Ofcom does not clearly state whether the "location validity" parameter includes altitude as well as the horizontal location. If the location validity is only bi-dimensional, then there may be concerns where the WSD antenna is moved vertically (for example because it was mounted on telescopic mast). This could lead to interference for other users. Conversely, if location validity does incorporate altitude then, for the reasons set out above, we may see instances of significant fluctuation of a devices' reported altitude which might lead to continuous spectrum availability requests to the WSDB. To avoid this issue the device would require some local suppression of GNSS wandering, thus increasing the hardware costs.

Clarification over antenna gain

We expect that most WSDs will make use of external antennas which can be changed according to the user's need. Radio manufacturers should, and likely will, provide a way for users to provide input to the radios on the gain value of the antenna (and, in future, perhaps also direction, polarisation, etc.).

According to the draft of Schedule 2 (version 1) circulated by Ofcom to stakeholders separately to this consultation, the antenna gain value used in the calculations of the operational parameters for slave WSDs should always be 0dBi and master WSDs are not required to provide antenna gain to the WSDB. This means that antenna gain is not a parameter that would affect the calculations performed by the WSDB and therefore is not required to be automatically configured in order to comply with the ETSI standard. However, antenna gain is cited in paragraph 3.13 of Ofcom's consultation document as one of the values that must be automatically configured by a WSD to qualify for licence exemption.

Given all of these areas of concern regarding the accuracy of the data produced by ACWSDs, there is a risk that the availability of spectrum provided to ACWSDs will be lower than that provided to MCWSDs. Ultimately, this could lead users to preferring MCWSDs. With this in mind and based on the stringent requirements that Ofcom have outlined, it is questionable whether manufacturers will see a commercial benefit in producing ETSI compliant devices, which are more costly to produce.

Alternative proposals

We are concerned that a licensing regime as proposed in the consultation would complicate the regulatory framework beyond the benefits that it might bring and in a manner that is disproportionate to the likelihood of interference to existing users. In fact, we wonder whether other approaches that do not need the introduction of a licensing regime are possible while still ensuring the protection for primary users.

Proposal 1

We believe that in order to take additional precautions against interference but still maintain a licence exempt framework MCWSDs could automatically receive lower maximum transmitted power parameters from WSDBs than the ones ACWSD would. For example, it could be decided that MCWSDs are constrained to 0dBm on all channels whose maximum EIRP is higher than 0dBm. This additional power constraint could serve to further lower the chances of interference with existing users in a case of misconfiguration.

The constraints could be defined per device class, location, channel, etc, simply by communicating these parameters to the WSDBs, which will provide the available spectrum response accordingly.

The power limitations are very easy to set on the databases and would keep the TVWS regulatory framework lightweight while ensuring the possibility to tune the parameters in a more reactive way than having a licensing regime.

Proposal 2

Alternatively, the Ofcom framework could introduce another parameter for devices, MCWSD or ACWSD, which will be added to the available spectrum request message. All MCWSDs that do not have a licence will be subject to a power constraint. They would therefore operate in a very power constrained licence-exempt regime, as presented in Proposal 1.

Owners of MCWSDs which want to use the spectrum as efficiently as ACWSDs will have to obtain a licence, as described in the consultation. We consider that a system like this would complement the licence-exempt framework by protecting primary users while having less potentially negative impact on the emerging market.

Responses to questions

Question 1

Do you agree with our assessment of the likely costs and benefits of our proposal to license MCWSDs as a transitional arrangement? Please provide any available evidence to support your response.

We recognise that MCWSDs if misconfigured may generate interference to primary users and that, if the inputted device location is wrong, they would be difficult to localise for interference management. However, we observe that a market study of the impact on this regime has not been provided and therefore it is difficult to evaluate the benefits of this proposal.

The PMSE sector has operated manually configured devices in TV white spaces spectrum for many years without causing interference to other PMSE users or broadcasters. It is unclear why Ofcom considers that the users of TVWS devices are inherently less trustworthy than the licensed and unlicensed users of PMSE equipment. The benefits of the licensing regime, as opposed to a licence-exempt regime, are therefore unclear.

It is questionable as to whether the proposed licensing regime would actually be a "transitional arrangement". There are no devices on the market that conform to Ofcom's interpretation of the ETSI standard and Ofcom has not provided any compelling evidence to support its assertion that manufacturers will produce automatically configurable devices in three years.

In contrast, the experience of the PMSE sector's use of TV White Spaces spectrum and the recent TVWS pilot schemes provides evidence that the risk Ofcom is apparently seeking to mitigate is either purely theoretical, or very small indeed.

Question 2

If you agree that Ofcom should allow MCWSDs to operate in the UHF TV band within the TVWS framework, how long do you believe that the licensing regime would need to be in place?

According to the definition of MCWSDs provided in Section 3.13 any WSD whose parameters can be manually configured qualifies as a MCWSDs. We argue that without more precise technical specifications, all of the WSDs (or the vast majority) will always belong to the MCWSD category and that therefore the licensing regime will need to be in place permanently unless Ofcom moderates some of the requirements set out in the consultation.

We believe that this is a great pity and a missed opportunity to create a licence exempt regime that could unleash a wide range of innovation and help make the UK the leading player in spectrum sharing.

Question 3

If you agree that Ofcom should allow MCWSDs to operate in the UHF TV band within the TVWS framework, when do you believe it would be appropriated to conduct a review to assess whether there is an on going need to license MCWSDs?

We believe that if the licensing regime is introduced it should be reviewed in three years time and a full assessment should be made as to the opportunity cost that the licensing regime has imposed on the development of TVWS applications and the UK's potential leadership position in spectrum sharing.

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Question 4

Do you agree with the proposed terms of the draft licence as set out in Annex 5 and as discussed below?

Our concerns about some of the terms of the draft licence are set out in our answers below.

Question 5

Do you think it would be beneficial for the licensing regime for MCWDs to cover both masters and slaves?

Yes, as this allows for flexible network configuration. Clearly a licence should cover the licensee for use of both master and slave devices.

Question 6

Do you agree that our licensing regime should only apply to type A devices?

No, we do not agree. Type B (i.e. devices that are intrinsically mobile) will need to have a form of automated geolocation detection and reporting to the WSDB, but there may be other elements of configuration that are set manually. We see no reason to ban Type B MCWSDs from the licensing regime.

Question 7

Do you agree with our approach to allow a number of MCWSDs under the control of a single licensee to be subject to a single licence?

Yes, we believe that this is a very important measure to mitigate the impact of Ofcom's proposals. A licensing regime based on licensing devices rather than individuals would be so expensive and bureaucratic as to be unworkable.

Question 8

Do you agree that the proposal for specific licence terms will mitigate the risks posed by the use of MCWSDs?

We understand that the main risk that Ofcom aims to mitigate is interference to existing users of the UHF TV band. However, no licensing regime can mitigate the risk of all interference. Misconfigured or malfunctioning equipment designed for use at other frequencies has the potential to cause interference to the UHF TV band. It is notable that, to date, the most significant cause of interference to DTT signals has been from use of 4G spectrum.

The whole concept of having a central database providing authorisation to devices is designed to avoid interference. Ofcom's inclusion of the "cease WSD transmissions" function in the WSDB specification allows for rapid action to prevent interference should it occur. This is a more effective measure to mitigate the interference risk posed by the use of any TVWS devices.

It is notable that during the pilot projects there were no cases of interference with other users. Nor have there been interference cases caused by the licensed and unlicensed use of PMSE equipment. Experience therefore suggests that the risks which Ofcom is seeking to mitigate may have been over-estimated.

Question 9

Do you consider the proposed licence terms are appropriate and proportionate?

Yes, subject to our comments above regarding the proportionality of imposing a licensing regime.

Question 10

Do you have any comments on our proposal to require applicants for licences to deploy MCWSDs to supply details of their QA process on application?

We assume that the QA process relates to record keeping for locations of devices. It is unclear why Ofcom consider this to be a proportionate requirement in this licensing regime and we are unaware of any analogous requirements for PMSE licence holders. Furthermore, as the devices will need to report their location to the WSDB, the database provider will have a record of the locations as reported by the licensee.

Question 11

Do you agree with the proposed technical conditions of the draft licence?

We agree with paragraph 5.38 of the consultation in that neither approaches should be precluded. However, we note that in principle there should not be any difference in the way MCWSD and ACWSD will contact the geolocation databases. This is especially true considering that Ofcom are proposing the licensing regime as temporary. Therefore we do not believe that the way device parameters are provided should be regulated - although we encourage standard approaches, e.g. IETF PAWS.

Question 12

Do you have any comments on the proposed duration for this licence?

We found the wording of Section 5.41 a bit unclear. If it means that the application process for the licence is evaluated only once and thereafter only annual payments will be required, then we agree with the approach.

Question 13

Do you have any comments on our proposed licence fee of £1,500?

We were surprised to see the very high level of Ofcom's proposed licence fee when compared to the licence fees charged for PMSE licences, where the most expensive annual fee is £168.

We understand that Ofcom's licence fees are based on its costs so either Ofcom has predicted that this licensing scheme will be very expensive to run compared to other licensing schemes, or Ofcom considers that there will be very few users of the MCWSD licences between whom to share the costs. Given the extensive trials, the many mitigations against interference and the fact that most of the technical work is being carried out by the WSDB providers, it is difficult to see why this licensing scheme would be particularly expensive for Ofcom to operate.

In considering the number of users between whom the costs should be shared Ofcom should consider that the licensing regime is being instigated to benefit all users of the UHF TV band. We would therefore

suggest that Ofcom's costs are distributed proportionately between all of those users. If there are very few MCWSD licensees compared to PMSE licensees then MCWSD licence fees should be lower than those for PMSE licences. This would conform to Ofcom's normal practice for ensuring the efficient use of spectrum by ensuring that licence fees reflect the demand in the market.

We believe that the high annual fee proposed by Ofcom will negatively impact the development of the TVWS devices and applications. There is significant opportunity to cost to the industry and the UK as a whole if Ofcom institutes a restrictive and expensive licensing regime.

Question 14

Do you have any comments on our proposed five-year minimum notice period for revocation for spectrum management reasons?

We believe that five years seems reasonable in terms of allowing a business to find alternative connectivity solutions.

Question 15

Do you believe there is likely to be an on-going need for white spaces devices that allow some level of manual configuration? Please give reasons for your answer.

Yes we do. The on-going need is not based on a particular application but on the ability to use TVWS to create innovative new solutions to wireless connectivity problems. We believe it would be a mistake to not future-proof the regulations to allow the continued use of MCWSDs.

In addition, as set out above, the boundary between what constitutes a manually configurable device and what is an automatically configurable one is not clear in the consultation. We believe that without further specifications the definition provided in Section 3.13 will cover all current and all likely future WSDs.

Question 16

Do you believe there is merit in exploring allowing enhanced operation through a licensing regime in the future and if so what additional capabilities should be allowed?

We recognise that there is merit in exploring "enhanced operation". We are not certain whether the enhanced mode will require a licensing regime or not. However, we agree with Ofcom that at this initial stage of the licensing framework this mode shall not be allowed.