BASIC DETAILS

Consultation title: Consultation on authorizing higher duty cycle Network Relay Points 870 to 873 MHz

To (Ofcom contact): Steve Jones

Name of respondent: Simon Dunkley

Representing (self or organisation/s): Silver Spring Networks (UK) Ltd

Address (if not received by email):

Silver Spring Networks,
Forsyth Business Centre
1 Eversholt Street
London NW1 2DN

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing	x	Name/contact details/job title	
Whole response		Organisation	
Part of the response		If there is no separate annex, which parts?	

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name Simon Dunkley Signed (if hard copy)

Response to Consultation on authorizing higher duty cycle Network Relay Points 870 to 873 MHz

Introductory remarks

Silver Spring Networks (SSN) would like to thank Ofcom for the invitation to comments on its plans for NRPs and the wider efforts that Ofcom is making in facilitating access to the much needed new UHF SRD bands.

SSN has vast experience of operating licensed exempt operations at these types of powers in countries around the world, connecting over 20 million nodes to IoT (Internet of Things) style networks across four continents. As we have pointed out in previous consultations in this area, where spectrum is available on a licence-exempt basis at reasonable powers, these bands become the connection mechanism of choice for initial M2M networks in sectors such as utilities (Smart Metering and Smart Grid) and lighting.

We anticipate, based on events in other markets, that many companies will use frequency hopping devices, which are shown to be the best way to spread traffic across the band licence-exempt bands, whilst still being compatible with less agile devices (and even fixed channel devices). Nevertheless, such radios are compatible with less agile radios, and have been shown – through studies in CEPT SE24 – to be compatible with devices such as those being developed by the DECC-sponsored sub-GHz ZigBee programme (AKA '868') will similarly occupy the entire band.

We strongly support Ofcom's proposals and look forward to their implementation as quickly as possible, allowing the UK to lead Europe and exploit the vast benefits of the IoT.

Europe is clearly on the same path and, once appropriate updates to Rec 70-03 (that are in train to be finalized very soon) are complete and the ETSI standard (EN 303 204 - that sets out in some detail the way in which NRPs should politely operate) is adopted as a European harmonised standard, should move ahead.

Current indications are that Europe may not allocate the bands to E-GSM R, which should further enhance the attractiveness of this band.

Question 1. Do you have any evidence to inform Ofcom's view on the density of higher duty cycle (up to 10%) NRPs deployments, whether this is likely to exceed 10 NRPs/ km2 and the total number of higher duty cycle NRPs that might be deployed?

In typical metering and sensor networks, two types of NRP-type devices are deployed: Access Points and Relays.

Access Points act as takeout points for networks (commonly referred to as concentrators) and there number is driven by the amount of traffic that is generated in an area. Their density is highest in urban areas and the service area associated with an AP is typically 5,000 nodes or 0.5km^2, equivalent to 2 nodes per km^2 or fewer. In rural areas, services areas can be as wide as 200km^2, equivalent to 0.005 nodes per km^2.

Relays are deployed in areas where the density of end devices is insufficient to form a reliable grid, either because of the average separation of nodes is high (sparse rural areas) or because the local propagation environment is particularly challenging (dense urban areas). Typical sparse rural deployments can, locally, require relays to be deployed at a density of up to 2 nodes per km^2. In urban environments this drops to 0.5 nodes per km^2, but in extremely built-up areas with many concrete high-rise buildings, this has been seen to rise as high as 5 nodes per km2 (for 1-2 km^2).

Typically, therefore, we see total NRP device densities of 2.5 nodes per km2 in rural areas, falling to 1 node per km2 in urban areas, but locally, exceptionally, rising to 5.5 nodes km2. But in these regions, the propagation losses in the environment will be considerable (and likely above that modelled by the CEPT work.

We do not believe that people would abandon the bands even if interference ***were*** occasionally experienced, as the opportunities offered by the higher capacity of these bands are significant. In any case, safe harbour bands have been identified (in 915-918 and, eventually, in this band) to accommodate sensitive applications.

Draft Recommendation 70-03 talks describes licensing in 'areas with high density of NRPs' recognizing problems are only likely to occur in urban areas.

Question 2. Do you have a view on how intra-network interference caused by NRPs deployed in large numbers within a network will be managed?

In the US, Canada and Australasia there is no evidence of a 'tragedy of the commons' in licence-exempt UHF bands, and in these the access rules are rather more relaxed than those proposed in Europe ie there are only DC limits and LBT is not mandated.

The high power 250kHz channel in the 868 band is extremely popular allowing high DCs (10%) even without LBT, and although extremely popular commercially, we do not believe that problems have been encountered.

The original study carried out by CEPT SE24 used very conservative interference susceptibility and deployment assumptions, and even then it was only at a density of 10 devices/km^2 when interference was first hinted at. Furthermore, this was before any form of polite access mechanism proposed in 303 204 was ever considered.

Silver Spring Networks strongly agrees with Ofcom's observation that the traffic through NRPs will self-limit: when end devices experience congestion locally, the traffic available to be conveyed via NRPs will be naturally throttled. And the deployment of a network comprising entirely of devices classified as NRPs would be due to the density limit imposed.

Question 3. Do you have any evidence that networks may fail if the aggregate density of higher duty cycle NRPs reaches or exceeds 10 NRPs/ km_2?

SSN has no such evidence, but in addition to the above (lack of evidence in other parts of the world, no such problems in the 868 band and the self-limiting effect), we observe that there is ample evidence over thirty years of the beneficial effect of polite spectrum access techniques (such as LBT + AFA and RTS/CTS).

SSN's experience in dense urban areas shows that our devices continue to operate, but accept that this does not prove that there is no deleterious effect on other devices. Ofcom might want to carry out studies into any deleterious effects once networks have begun to be rolled out.

Question 4.Do you have any views on whether exchanging NRP deployment information between licensees and developing and using an industry-managed code of practice would be practical and sufficient to manage the risk of some networks failing?

SSN disagrees with the necessity for exchanging deployment information. Such a scheme is likely to be bureaucratic and unworkable, and we do not believe that Ofcom would have the resources to manage.

A code of practice would also be unnecessary, and probably unworkable, because the polite spectrum access techniques envisaged in the ETSI standard (EN 303 204) will protect the band.

Question 5.Do you think CCA as defined by ETSI will be an effective protocol for (a) managing interference between networks? (b) managing interference to short range devices using the 870-873 MHz band?

CCA, as the channel sensing stage of Listen Before Talk, is the principle sharing technique used for accessing licence exempt spectrum in most of the world. Originating in research carried out in the late 1970s (Kleinrock & Tobagi at Stamford University & UCLA), channel sensing combined with a random backoff stage has been shown to provide not only substantial improvements in radio channel capacity by reducing collisions, but also able to support sophisticated QoS mechanisms in WiFi and other very large scale deployed systems. Decades of research and successfully deployed systems provides irrefutable evidence in favour of the benefits of using CCA.

As defined in EN 303 204, the CCA duration is set to a value deemed suitable by the committee but the random access algorithm is left to the manufacturer. SSN agrees that this is the most appropriate choice since the CCA duration is based on spectrum considerations and the multiple access scheme is a product dependent behavior. Each manufacturer must balance the requirements for latency, power consumption and traffic load with the expected use of the spectrum by other devices to determine the most suitable algorithm and parameter values for the random access behavior.

The Harmonised Standard goes further by introducing RTS/CTS and Acknowledgements as Short Control Signalling transmissions which can have highly beneficial effects on hidden terminals which sometimes occur. Acknowledgements prevent unnecessary re-transmissions and a transaction preceded by RTS/CTS also prevents transmissions to devices which are unavailable both of which contribute to more efficient use of the spectrum. NRPs are required to implement CCA and Adaptation giving the manufacturer the

choice of how to defer to a busy channel by random delay or changing to a different channel or any other suitable combination.

SSN considers there is no question on the benefits of requiring CCA & Adaptivity and that these mechanisms are the most appropriate means of enabling multiple networks of SRDs to share the spectrum fairly.

Question 6. Do you have a view on the costs and benefits of adding effective mitigation protocols such as Clear Channel Assessment to higher duty cycle NRPs?

The CCA timing proposed by ETSI in EN 303 204 is very similar to the timing requirements of IEEE 802.15.4-2011 i.e. a listen duration of 160us. ETSI standards TS 102 887-1 and TS 102 887-2 specify PHY and MAC layers suitable for EN 303 204 compliant devices to be used in Utility Networks. These TS's endorse subsets of IEEE 802.15.4 standards amongst others. Consequently, industry standard components manufactured by leading silicon suppliers already provide the necessary timing and channel sampling to satisfy the requirements of the Harmonised Standard and there should not be any additional cost burden on products to meet these conditions apart from the necessary software to exploit the facilities provided by the radio hardware and its associated firmware.

Question 7. Do you agree with our proposals to authorise spectrum for NRPs using non-exclusive, network licences available on demand?

SSN agrees with non-exclusive network licence approach and that periodic reviews should be carried out. This appears to be the most pragmatic approach achieving early roll out but providing protection to the community without unnecessary overhead.

Coordination of devices would be untenable given the number of devices and heterogeneous nature thereof.

We agree that there should be no density restriction at this stage: out experience shows that it is unlikely that individual networks will get close to the limits that the and where they do increase, polite access techniques should mitigate.

Nevertheless, these plans should be implemented now: the UK leads the way in the release of this important spectrum and could set the agenda across Europe (and even around the world). In rural areas (where the chance of interference is minimal) there is a particular urgency. Furthermore, the conservative approach set out includes proposed reviews in 2016, which is appropriate. By that time, multiple co-located networks are unlikely, so planning for a further review after 2016 may also be appropriate.

In order to make sure that the licence mechanism is not abused, Ofcom might insist that licensed entities achieve a set of (minimal) conditions for being awarded a licence, such as a turnover of 100k.

Question 8. Do you agree with the proposed licence conditions for higher duty cycle NRPs?

SSN agrees with the licence conditions set out, but with two caveats:

- We do not believe that licence trading is appropriate in a band in which multiple/unlimited licences might be issued.
- The power restrictions should be set to 500mW ERP (not EiRP), to be consistent with the existing regulations in the band.