Huawei response to the Radio Spectrum Policy Group public consultation: "A Spectrum Roadmap for IoT"

Summary

Huawei welcomes the opportunity to provide feedback on this very important consultation on a spectrum roadmap for IoT. This document describes our views on the proposed draft Opinion on the spectrum aspects of the Internet of things (IoT) including machine-to-machine (M2M) communications.

In the context of the proposed roadmap, we specifically highlight two aspects which relate to a) cellular V2X (C-V2X) communications for intelligent transport systems (ITS) and b) the deployment of the NB-IoT technology in spectrum harmonised for electronic communication services (ECS), respectively.

In relation to C-V2X, we encourage the RSPG and Member States to consider alternatives to the general authorisation model in spectrum harmonised for ITS for vehicle-to-vehicle, vehicle-to-pedestrian, and vehicle-to-infrastructure[1] (so-called V2V/I/P) communications. Such alternatives are particularly important for safety-related ITS, and would enable the owners of the spectrum usage rights to control the access to the spectrum and to better manage scenarios potentially resulting in harmful interference.

In relation to NB-IoT, we believe it is evident that – at least for its in-band and standalone modes of operation – the existing European regulatory technical conditions for spectrum harmonised for ECS are appropriate to manage any risk of harmful interference. We encourage the RSPG and Member States to ensure that – if at all needed – any amendments to the relevant EC/ECC Decisions are expedited, as any undue delays in the deployment of NB-IoT would have severe implications in disadvantaging EU industry verticals, citizens and consumers.

[1] Note that vehicle-to-infrastructure (V2I) refers to roadside infrastructure and is distinct from vehicle-to-network (V2N) communications which will use existing/future spectrum harmonised for ECS and licensed to mobile network operators.

RSPG Opinion on IoT

1. IoT is heterogeneous, encompassing multiple applications and operational requirements. There is no single solution for access to spectrum that fits all these possible use cases since their technical requirements differ dramatically, for example regarding data rate, reliability, range and output power.

We agree.

2. Although the availability of frequencies is not currently constraining the growth of IoT, the continued growth of IoT applications creates an increased demand for access to spectrum. However, the quantity and type of spectrum access required will depend on the operational requirements and use cases. Therefore, there is work underway to make further spectrum bands accessible for IoT. For these reasons, the RSPG does not foresee a scarcity of spectrum for IoT, but will continue to review the evolution of spectrum demand for IoT.

We agree.

3. Global economies of scale are important for emerging technologies, and Europe can benefit from these in three principle areas where spectrum is already widely available: bands for Short Range Devices, Mobile bands and those for WiFi (WAS/RLAN).

We agree.

4. Collaboration by RSPG members can help realise further economies of scale in other bands. Further spectrum harmonisation and intervention is not needed for this – and may be counter-productive – but to guide its members, the RSPG proposes a roadmap for IoT spectrum access in Europe that reflects the various use cases and scenarios. Common focus on the bands in this roadmap could facilitate these further economies of scale, where currently they are only available on a national basis. This roadmap, and some of these bands are discussed further in the Annex.

We welcome the RSPG's proposed roadmap for IoT spectrum access, as outlined in the Annex of the consultation document. In the context of this roadmap, we would like to especially highlight the following two cases:

a) V2X (V2V/V2I/V2P) communications for safety-related intelligent transport systems and appropriate authorisation models in spectrum harmonised for ITS. Please see our response under draft Opinion 5.

b) NB-IoT as a key technology for the support of M2M communications and the efficient use of spectrum harmonised for ECS. Please see our response under draft Opinion 7.

5. A complementary mix of general and individual authorisation for spectrum access will be needed to ensure that IoT has access to spectrum. There is no single authorisation framework and no single set of technical conditions for access to spectrum, which would cater for all possible demands.

We broadly agree with the above Opinion.

Many use cases of the IoT involve delay-tolerant applications. These can be readily supported through licence-exempt (general) authorisation for access to the radio spectrum, whereby equipment belonging to a variety of users operate on a non-interference non-protected basis.

However, certain important use cases of the IoT will involve delay-sensitive applications with high availability requirements. Examples include radio telemetry for the operation of national utility infrastructures (Smart Grid), the remote control of industrial processes (Smart Factory), and safety-related intelligent transport systems. The nature of these applications demands licensed (individual) authorisation for access to spectrum for use by M2M communications, whereby the quality of service can be appropriately guaranteed.

With the predicted explosive growth of the IoT globally, it is important that a sufficient amount of spectrum is available in Europe for M2M communications.

We expect that there will be sufficient harmonised spectrum available for licence-exempt use by the IoT in Europe. These include the 863-870 MHz, 2400-2483.5 MHz, 5150-5350 and 5470-5725 MHz bands.

We also believe that harmonised spectrum that is designated for electronic communication services (ECS) is suitable for licensed use for the IoT. This is because it allows the quality of service to be effectively managed by the network operator, and enables the economies of scale for existing mobile network hardware and infrastructure deployments to be exploited.

In the light of the above, we would like to highlight the special case of ITS, and Cellular V2X (C-V2X) technologies. C-V2X can provide all ITS Day One Services and future end-to-end communication needs, and encompasses two interfaces: (a) a wide area network LTE interface that connects end-user devices and vehicles to eNBs and the core network to provide existing WWAN/Internet, and vehicle to network (V2N) services; and (b) a direct communications interface that connects vehicles (V2V), roadside infrastructure (V2I) and pedestrians and other vulnerable road users (V2P) directly with each other, providing low-latency, high-reliability vehicular (aka V2X or V2V/I/P) services.

Here, V2N services can be supported by spectrum harmonised for ECS and already licensed to Mobile Network Operators. These networks will continue to evolve from LTE to 5G and with that they will use additional licensed spectrum as that becomes available.

The V2V/I/P services, on the other hand, benefit immensely from spectrum harmonised for ITS which allows vehicles, road side infrastructure, and vulnerable road users to directly communicate with each other independently of any MNO relationship and cellular network availability. The 5875-5905 MHz spectrum is harmonised for safety-related ITS across Europe, and is therefore ideal for V2V/I/P services delivered by C-V2X direct communications.

However, this spectrum is available on a license-exempt basis. That is to say, the spectrum is available to all technologies and equipments which comply with the relevant regulatory

technical conditions. As such, the matter of co-channel coexistence between C-V2X and IEEE 802.11p is of particular importance. We are encouraged by the initial coexistence studies by 3GPP and support the development of technical measures to ensure that C-V2X and 802.11p can fairly co-exist in the ITS 5.9 GHz band. Examples of these include "mutual detect and avoid" mechanisms whereby C-V2X and 802.11p detect each other and switch channels accordingly thereby avoiding co-channel operation. It is expected that such mechanisms will be specified at ETSI.

Nevertheless, we would like to highlight that licence exemption (i.e., operation on a non-protected basis in a spectrum *public commons*) is not the only possible authorisation model here, especially in the context of safety-related ITS. This is because while mechanisms such as "detect and avoid" can mitigate the risk of mutual harmful interference between C-V2X and 802.11p, there are still likely to be scenarios where system performance and level of reliability of each technology is degraded.

We encourage RSPG to consider alternatives to licence-exemption/general authorisation regimes for V2V/I/P services in spectrum harmonised for ITS. Such alternatives would allow the owners of the spectrum usage rights to control the access to the spectrum by the ITS technologies and to better manage scenarios potentially resulting in harmful interference for safety-related ITS.

6. IoT encompasses a broader set of applications and use cases than those enabled by 5G. However, new IoT use cases will be enabled by 5G since some specific IoT functionality will be designed into 5G from the start, with features including network slicing, low energy consumption and scalability.

By enabling ultra-reliable/low-latency and massive machine-type communications in a range of deployment scenarios and authorisation models, 5G is expected to support the radio access for all IoT applications and use cases.

For this reason, we do not agree with the premise of the first sentence. We suggest that the first sentence is deleted.

7. Frequencies allocated or identified for ECS (mobile networks) may be used for emerging IoT applications and services. Following the principle of technology neutrality, it should be ensured that the existing harmonised technical solutions fit with those for IoT. In this regard, the RSPG notes that the ECC is assessing whether the current technical conditions of ECS harmonised bands should be adapted to NB-IoT, LTE-based IoT and broadband IoT.

We welcome the RSPG's reference to the work at ECC in assessing whether the current technical conditions in ECS harmonised bands should be adapted to NB-IoT.

We note that NB-IoT is an innovative and powerful technology for the provision of low-cost M2M communications, specified by 3GPP, and optimised for the efficient use of spectrum harmonised for ECS.

We believe it is important for Member States to ensure that regulatory technical conditions do not unduly delay or restrict the deployment of NB-IoT in bands harmonised for ECS, as this can place Europe at a considerable disadvantage at a critical stage in the global growth of the IoT.

There is broad consensus that the technology-neutral European regulatory conditions in bands harmonised for ECS are appropriate for in-band NB-IoT (where NB-IoT carriers substitute LTE resource blocks). Such bands include 700, 800, 2600, and 3500 MHz.

As for standalone NB-IoT in the 900/1800 MHz bands, it is clearly evident that any harmful interference caused by NB-IoT would be no greater than that caused by existing use of the said bands by GSM. As such, the existing European regulatory technical conditions for GSM at 900/1800 MHz are also appropriate for standalone NB-IoT.

The fact that the Commission Implementing Decision 2011/251/EU and ECC Decision (06)13 specify the regulatory conditions for GSM with reference to the ETSI Harmonised Standards for GSM, while NB-IoT is itself addressed in the ETSI Harmonised Standards for LTE, is essentially an issue of regulatory drafting, and is not a substantive issue in the context of any risk of harmful interference.

For this reason we encourage the RSPG and Member States to expedite any required revision of the text of 2011/251/EU and ECC(06)13 to correct this drafting discrepancy, and thereby avoid unnecessary delays in the deployment of NB-IoT which would otherwise result in significant costs to EU industry verticals, citizens and consumers.

8. It is a separate challenge to make IoT stakeholders aware of their options for accessing spectrum, particularly since the heterogeneous nature of IoT means that stakeholders may not be familiar with spectrum management regimes, availability of frequencies and conditions of use. RSPG members will consider their frameworks for spectrum management from the IoT perspective, and seek to explain the opportunities for spectrum access for IoT.

We acknowledge this challenge, and would welcome and support any initiatives by the RSPG and Member States to enhance the awareness of the industry verticals in relation to the various options (and tradeoffs) available to them for the use of the radio spectrum.

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