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Attn: ACMA

## Symb-iot-ech Submission – IFC40 2021

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Exploring the future use of the 1880- 1920 MHz band - Discussion Paper

### Introduction

At Symbiotech, we specialise in wireless mesh technologies (primarily Bluetooth Mesh 2.4Ghz and Wirepas Mesh 2.4Ghz & the new DECT-2020 aka NR+ 5G) for the Enterprise Internet of Things (IoT). We like to call Melbourne home, but the world is our office, as we service both local and international clients in Smart building and Industrial IoT. Our team has expertise in full-stack web development, the design of large-scale distributed systems, and of course wireless mesh radio technologies. We deliver the missing pieces in the massive IoT projects or enhance current suppliers' IoT solutions.

Hereafter our responses to the questions provided for comment. (We will only comment on issues 2 to 5 as issue 1 is not relevant to us).

### 2- What is the interest in the use of new technologies to provide a service?

DECT NR+ is a new, non-cellular license exempt radio standard that fills a big gap in the IoT ecosystem for massive IoT communication, making it ideal for enterprise IoT.

It is a self-healing, decentralized and an autonomous Mesh network, making it easier to add devices and eliminating single point of failure.

By operating on the global license exempt 1.9 GHz band, deployment and maintenance are made possible with very little cost.

Without the need for existing cellular infrastructure, you can create local, private networks with the capabilities vastly exceeding those of comparable 2.4 GHz networks at a minimal carbon footprint.

The physical radio layer in NR+ uses known techniques from cellular radios reaching the same level of reliability that is proven by billions of devices already in the field.

However, it is also designed to reach one millisecond latency between devices. This opens the possibility for low latency systems to consider wireless operations for the very first time even with kilometers of range.

NR+ is extremely scalable.

You can, for instance, build reliable Mesh networks covering one square kilometer, using as little as one hundred devices. At the same time, you can scale the same systems to more than one million devices in the same one square kilometer area and still achieve reliable and low latency communication.

For example,

smart city deployments, can scale gradually in a cost-efficient way and connect many different types of devices using one single network infrastructure.

Many next generation applications are also held back because they need the reliability and low latency of a wired connection but without the physical constraints of wires, that would simply make it impossible to deploy at a massive scale.

With NR+, a factory floor with moving nodes and lots of connected equipment can autonomously solve network congestion problems in high traffic situation since nodes dynamically can switch routing rules and reroute based on needs.

No other licensed exempt and non-cellular wireless technology can meet the future requirements for massive machine type communication or highly reliable low latency operation.

DECT NR+ is made to solve these challenges

### 2- a) How much spectrum is required to provide the service?

The DECT-2020 NR physical layer is capable of utilising the full 1880-1920 MHz frequency band. It is specifically designed to support a wide variety of applications that share the same spectrum. The minimum bandwidth requirement for each radio device is 1,728 MHz, but wider bandwidths can be utilized in order to optimally overlap multiples of this minimum channel bandwidth. In order to ensure reliable communication and avoid interference, each device has the ability to select the least interfered channel from the entire 1880-1920 MHz band. Furthermore,

these devices can share spectrum with other DECT-2020 devices and other systems using modern spectrum sharing mechanisms when operating on the same channels or overlapping spectrum. Using the whole 1880-1920 MHz for services would allow extensive device deployments, and services in future digitalisation.

## **2- b) What Interservice considerations need to be undertaken for the service to be deployed?**

DECT-2020 NR technology supports flexible communication needs by:

- Self-Organizing Local Area Wireless Access Networks following a mesh network topology, which enables to support mMTC use cases.
- Local Area Wireless Access Networks following a star topology as in classical DECT deployment supporting URLLC use cases; and
- Very reliable Point-to-Point and Point-to-Multipoint Wireless Links provisioning (e.g. cable replacement solutions);

DECT-2020 NR can co-exist with legacy DECT shared spectrum operation thanks to similar design principles as in legacy DECT. The radio transmission bandwidths, radio frame lengths, and transmission slot lengths are aligned with legacy DECT to ensure efficient spectrum use and minimize interference. DECT- 2020 NR applies listen before talk (LBT) which enables efficient operation on shared spectrum. Between two independent DECT-2020 NR networks the interference coordination can be done even radio frame level without a need of external control. Especially the inherent feature of automatic interference management allows deployments without extensive frequency planning and improves the spectrum utilization at local level.

## **2- c) What are the deployment scenarios for the service?**

DECT-2020 NR's Mesh networking capability allows for application-driven network topologies and deployments, particularly in IoT and mMTC use cases. This eliminates the link budget constraint of the traditional cellular base station to user equipment constellations, and does not require a separate network infrastructure or high cell towers. Each device can route data, thereby improving both communication reliability and network coverage.

The autonomous and decentralised operation of DECT-2020 NR minimises the network planning and maintenance effort, resulting in a self-forming network that can be deployed by anyone. This capability offers system owners the freedom to consider their own deployment and system integration strategies to fit their existing systems and business needs.

For instance,

a smart city deployment could introduce a self-managed network with a desired number of devices and gateways, where only the gateways are connected to the mobile cellular network for backend connectivity towards any third-party cloud infrastructure. Since DECT-2020 NR systems can be deployed independently of mobile operators, without expensive base station site costs or spectrum licensing fees, it offers greater flexibility and cost savings.

## **3- Are services still using DECT or are they transitioning to DECT-2020 NR?**

Compared to DECT, DECT-2020 NR significantly enhances communication performance and reliability. It is expected that all new designs for existing DECT services will transition to DECT-2020 NR after a few years. Nonetheless, the lifespan of DECT-based designs can be lengthy, and they must coexist during this period. But, DECT-2020 NR and current DECT equipment can operate together in the same spectrum.

## **4- Are there any applicable coexistence scenarios not identified?**

The ability to operate in shared spectrum provides a significant advantage from a business standpoint as it allows for independent use of spectrum in the same geographical area. Without this capability, only one single network could operate in each area, limiting service availability and innovation. As a result, it is essential that technologies operating in this frequency range possess fair spectrum sharing and strong co-existence capabilities. However, as a technology user (not a technology developer), we would not be the best company to comment on any known coexistence interference that would require to be addressed.

But we noted that the draft ECC Report 332 has concluded that DECT-2020 NR operation causes less interference in the 1880-1920 MHz to the adjacent services due to lower operating bandwidths and efficient power control which is limiting the transmitted power level.

## **5- What are the possible planning scenarios and industry views on the overall future use of the 1.9 GHz band and its services?**

### **Scenario 1: Single service/application use of entire band**

Limiting the use of spectrum would have a significant impact on industry applications as access to suitable spectrum would be prohibited. This would affect various applications, such as those related to energy, city-wide deployments, public buildings, and industry facilities in the future. Although these applications can technically operate in a mobile operator system, there are some potential issues about network reliability and prohibitive cost.

**Scenario 2: All services/applications with dedicated, exclusive spectrum**

This may result that exclusive spectrum is underutilized, further reducing the efficient spectrum use.

**Scenario 3: Geographic separation of services**

if this scenario is supported, radio co-existence mechanisms are not sufficiently protecting some mission critical systems.

**Scenario 4: Sharing of spectrum by services/applications**

Shared spectrum operation enables the most flexible use of spectrum and is a future proof solution. However, this spectrum ruling would require that all technologies are capable to automatically comply and mitigate their interference to the adjacent users in this band. This would allow business to develop and deploy local networks for their needs when needed in locations where they need them.

**Scenario 5: Combination or hybrid approach of other scenarios**

No sure how this would be feasible.

**5- a) How much spectrum is required (distinguishing between the minimum viable and desirable) to provide the service?**

To align with Europe's equipment operation, the minimum operating bandwidth for DECT-2020 NR is 20 MHz. From a local and autonomous interference avoidance perspective, it would be advantageous to operate within the maximum 40 MHz band, rather than being limited to smaller spectrum blocks. The latter would result in multiple adjacent band interference issues and reduce efficient spectrum use.

**5- b) Is there a clear geographical delineation for example, metropolitan or regional for the service?**

No. DECT-2020 NR is designed to support a wide range of different applications, including utilities and city-wide services that typically focus on areas with high population density. For instance, future applications such as distributed energy production and industry-related services would require network coverage where the services are needed. However, it is not anticipated that any of these use cases or applications would require nationwide operations instead of local purpose-built networks.

**5- c) Is there or will there be equipment readily available for the service?**

DECT-2020 NR standard, developed in ETSI TC DECT, is the latest IMT-2020 technology. It leverages well-established cellular radio technologies, so existing firmware designs can be re-utilised with slight software modifications. Symb-iot-ech is an expert in that field. Currently, we have noticed that some DECT-2020 NR products are under development and planned to be released before mid- 2023.

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