# Consultation response form

## Your response

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| **Question 1**: What is the market opportunity for D2D services? What is the nature of the benefits that could be delivered to people and business in the UK and what do you estimate the magnitude of the benefits to be? | Confidential? – N<br><br>Satellite IoT presents a significant market opportunity for D2D services, as it can greatly enhance efficiency and effectiveness in industries like maritime, agriculture, and logistics. These sectors benefit from IoT applications, which demand connectivity, available anywhere.<br><br>While the Shared Rural Network aims to achieve 95% landmass coverage in the UK by 2025, the remaining 5% will still lack coverage, limiting applications that depend on connectivity. Additionally, D2D services can provide valuable coverage across surrounding seas, an area not addressed by the Shared Rural Network, supporting use cases such as asset tracking and maritime operations.<br><br>Due to the resilience and robustness of satellite connectivity, satellite IoT could act as a critical backup for terrestrial networks during outages. It also provides vital data to disaster relief agencies, enabling better planning and response. |
| **Question 2:** Are there any wider citizen or societal benefits that D2D services could deliver that the market might not deliver? What is the nature of these benefits and why might the market fail to deliver them? For example, what role could D2D have in improving the availability of 999 services in the UK? | Confidential? – N<br><br>Inheriting features from NGSO systems, such as seamless coverage including seas and enhanced resilience during disaster scenarios, alongside new advancements in 3GPP for interoperability between terrestrial mobile and satellite networks, will bring significant benefits and opportunities to UK citizens by enabling new use cases and availability of network. Achieving 100% coverage of land mass and seas through terrestrial mobile networks is not feasible due to investment and revenue considerations and technical constraints. Moreover, existing proprietary satellite solutions tend to have higher costs for customers and lack interoperability with terrestrial networks, resulting in coverage gaps, particularly urban areas and |

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| | indoors. Interoperability with terrestrial networks and complementarity to these networks are key targets that have not been fully realized with current proprietary solutions. |
| **Question 3:** Subject to suitable regulatory frameworks being in place, do you have an interest in offering D2D services or expanding an existing service, in the UK? Which customer segments, devices and use cases would be served? Would your D2D service complement or compete with services delivered over existing mobile? | Confidential? – N<br><br>We are interested in offering narrow-band D2D services in the UK for industrial IoT applications in areas where traditional or terrestrial networks and connectivity options are either unavailable or limited. Our target use cases primarily include, but are not limited to, smart agriculture, logistics, maritime transportation, asset tracking, energy production and distribution, environmental monitoring, climate tracking, smart cities, disaster detection and management, and individual IoT applications.<br><br>We plan to provide IoT services in the MSS band for terminals supporting 3GPP Release 17 and beyond. Our approach will involve mainly complementing services delivered over existing networks. |
| **If you have considered launching or expanding a D2D service in the UK:**<br><br>**Question 4:** What technology and network architecture do you consider appropriate to use to deliver D2D services? For example, what altitude and how many HAPS, LAPS or satellites would be required to deliver an initial service?<br><br>**We're aware that different technologies and network architectures will have different costs, performance, and spectrum efficiency trade-offs**. | Confidential? – Y<br><br>{✂} |
| **Question 5:** What capacity (e.g., Mbps/$Km_2$/MHz) and quality of service (e.g., latency) could be delivered with the D2D service you are proposing? What percentage of the UK landmass could be covered, and would coverage be provided indoors? | Confidential? – Y<br><br>{✂} |

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| **Question 6:** To inform our future policy development, which spectrum band would you like to deploy the service in? How much bandwidth would be required to provide the service at launch? | Confidential? – Y<br>{✂} |
| **Question 7:** What take-up profile do you assume in your planning? For example, the number of active devices, monthly calls made, and data transferred per device. What is the roadmap for enhancing your network to meet anticipated future growth? What additional infrastructure and/or spectrum would be required? When? | Confidential? – N<br>Exact figures will be available after the design phase, but we anticipate that various vertical sectors will benefit from our satellite IoT network. These insights will be crucial for our planning, particularly regarding constellation size and spectrum bandwidth requirement. Depending on the total capacity needs and user demands in terms of both data rate and latency, we may require additional spectrum and the deployment of more satellites than initially projected in our plan. |
| **Question 8:** What are the use cases and the benefits these services would deliver? What technology, network infrastructure and frequencies would be required to deliver the service? What are the advantages of using this MSS spectrum compared to other bands? | Confidential? – N<br>NB-IoT technologies, based on 3GPP Release 17 and beyond, operating in the MSS band (e.g., L-Band MSS, 2 GHz MSS band), offer a more suitable solution. This is due to their ability to complement mobile networks by providing interoperability, seamless coverage, and resilience, while also benefiting from economies of scale after the inclusion of n255 and n256 in the 3GPP standard.<br>Using MSS spectrum provides significant advantages for satellite network design. It simplifies antenna design and reduces overall complexity, especially compared to satellite networks operating in MS spectrum, which require more complex antennas to avoid interference with mobile networks in adjacent bands, co-band frequencies in neighboring countries, or other adjacent services. The deployment cost of a satellite network using MSS spectrum is lower than that of MS spectrum-based networks, making it a cost-effective and reasonable solution for providing low-cost satellite IoT services. |
| **Question 9:** What current, or future, technology developments will offer the opportunity for more efficient use of MSS spectrum? E.g., more spectrally efficient, or greater ability to share spectrum. | Confidential? – N<br>With current technology, frequency sharing is not feasible for co-location and co-time scenarios. However, since IoT services do not require real-time data exchange and have limited availability in time in specific regions, time-sharing among NGSO satellite operators can be utilized to enhance spectrum efficiency. This may be achieved through a centralized database that manages NGSO satellites' transmission and reception based on their pass times over a particular |

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| | location, or by bilateral/multilateral coordination of NGSO operators based on their licenses. |
| **Question 10:** Could your existing, or proposed, service coexist with other users of the same frequencies within the MSS spectrum bands? If so, how is coexistence achieved? If not, please explain why sharing is not possible. | Confidential? – N<br><br>Please look at the Answer 9 for our view regarding spectrum sharing for NB-IoT based on 3GPP.<br><br>Our current IoT satellite network, based on LoRaWAN technology, applies duty cycle, power limit, and FHSS in the uplink, and employs LoRa modulation and maximum PFD limit in the downlink to ensure coexistence with both other NGSO operators using LoRa technology and terrestrial operators in the frequency band 862-870 MHz. Additionally, since IoT services do not require real-time data exchange and have limited availability in time in specific regions, it is unlikely that two or more transmissions will overlap in time regardless of the technology applied. |
| **Question 11;** Do you expect D2D services to be available prior to WRC-27? What services and benefits do you think an authorisation prior to WRC-27 might bring to UK consumers and businesses? | Confidential? – N<br><br>As there are no significant regulatory hurdles for implementing D2D services in the MSS bands, aside from existing licenses, satellite IoT services in these bands should commence prior to WRC-27 to boost efficiency across sectors such as asset tracking, maritime, agriculture, and more. Our plan is to launch D2D services based on NB-IoT technology in 2026. If there is a sufficient device ecosystem supporting 3GPP Release 17 and beyond, we will begin operating this service starting in 2026. |
| **Question 12:** Are there any mobile bands that should be prioritised for satellite based D2D? | Confidential? – Y / N |
| **Question 13:** Are there existing systems that you consider could be subject to an increased risk of harmful interference from the introduction of satellite based D2D using mobile bands? If yes, are there specific mobile bands that you consider should be avoided to reduce this risk? | Confidential? – Y / N |

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| **Question 14:** Do you have any views on how spectrum for D2D services should be authorised? Does this vary by band, or type of NTN? Please explain the reasoning behind your preference. | Confidential? – N<br><br>Considering the market demand for IoT, the higher development costs associated with IoT solutions in MS bands, which can be a barrier due to the lower cost expectations of IoT customers, that D2D services for real-time applications such as voice, broadband, etc. can be implemented in MS bands without requiring changes to handsets, and that the available spectrum for IoT in MSS bands is limited, we believe that a portion of spectrum is dedicated for IoT applications on a shared basis without exclusion any technology as currently implemented in Australia and considered by RSPG in the document titled "*RSPG Opinion on assessment of different possible scenarios for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz by the Mobile Satellite Services beyond 2027*". This approach will promote the efficient use of spectrum, encourages innovation, expands service offerings, and promotes competition, ultimately benefiting all citizens.<br><br>Additionally, we advocate for a differentiated authorization regime based on frequency bands. In MS bands, satellite operators may be required to negotiate agreements with MNOs and take measures to prevent interference with existing terrestrial systems in both domestic and neighbouring countries. On the other hand, considering low service cost requirement of IoT applications, some portion of spectrum in MSS band can dedicated for IoT satellite operator and this can be assigned on a shared basis. Moreover, there should be distinction between NTN types such as LEO and GEO as these features such as their availabilities and requirements have already been considered by 3GPP differently so far. |
| **Question 15:** Are there any other points that you think would be useful in our considerations? In providing your response, please provide as much evidence as possible. | Confidential? – N<br><br>The 862-870 MHz frequency band offers a similar opportunity for D2D services in MS bands, as it is currently allocated to mobile services and used by terrestrial operators, mainly for LPWAN systems. Utilizing this band for satellite LoRaWAN networks enables interoperability with terrestrial LoRaWAN networks, enhances coverage, and creates new opportunities for both terrestrial and satellite LoRaWAN networks. This approach is expected to significantly increase customer satisfaction by improving overall service availability and performance. Discussions on the use of 862-870 MHz band for satellite downlinks have been conducted within ECC, and ECC Report 357 has been published to address the feasibility of such links and their coexistence with other services. |