

Question	Your response
<p>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?</p>	<p>Confidential? – N</p> <p>The global market for D2D services extends to the billions of smartphones that will be deployed with 5G NR-NTN capabilities in the coming years.</p> <p>Since the D2D capability will be native to future versions of smartphones, the capability will have widespread availability.</p> <p>Market opportunities for D2D services globally as estimated by industry analysts reach almost US\$50B/year over the long term¹.</p> <p>In UK, terrestrial wireless coverage, while extensive, still leaves about 7% of the overall landmass, and up to 16% of certain geographies without coverage². D2D services will play an important role in bringing coverage in these areas.</p> <p>The benefit to the UK is expected to be significant and far-reaching and include many segments, such as consumer, business, government, automotive, first responders, etc.</p> <p>The use of mobile applications enabled by wireless networks by businesses and consumers is wide-ranging and brings efficiencies and competitiveness. The key benefit of D2D is the ability to continue to use a smartphone for applications and broadband service even when unable to utilize a terrestrial Network. Continuity of service will enable people and businesses to utilize their choice of applications on their smartphones.</p> <p>Government organizations, including in defence, will benefit from leveraging the economics of commercial D2D for their missions.</p> <p>With the UK having an extensive maritime coastline and numerous islands as well as offshore activities such as fishing and oil and gas production, D2D will provide consumers and businesses in such areas with connectivity tools to support their lifestyle or business operations by providing communication services that urban mobile users take for granted.</p>

¹ Satellite direct-to-device market, September 2023, Analysys Mason/NSR.

² Connected Nations 2023 – UK Report, Ofcom.

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	<p>The benefits could be significant, for example real time updates for navigation systems, weather updates, new applications such as being able to fly drones beyond line of sight. Businesses can maintain contact with employees and improve efficiency.</p> <p>D2D services will also be available (varying by country) to UK citizens when they travel abroad.</p>
<p>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?</p>	<p>Confidential? – N</p> <p>Yes. A robust D2D service has the potential to reduce or eliminate wireless dark spots for UK residents, no matter where they live or travel, with concomitant social benefits. In general, these dark spots exist currently as the market economics of terrestrial tower based wireless coverage is not viable in these areas. However, the economics of satellite-based coverage are different; coverage can be offered on a more sustainable and profitable basis.</p> <p>In addition to business and personal efficiencies as summarized in Question 1, D2D has the potential to deliver broader societal impact, some of which are described below.</p> <p>First responders and public safety personnel will now be able to rely on availability of ready communications no matter the location of emergencies within the UK.</p> <p>In this context, D2D has the potential to improve access to SOS/999 services as it eliminates the potential for coverage gaps and extends service into maritime areas. Additionally, the 999 services themselves will be able to take advantage the same capabilities when responding to calls for help.</p> <p>Government and military will be able to use D2D capabilities to enhance their existing communications networks in providing services and security to the nation.</p> <p>Cost effective monitoring of natural resources, such as forests and rivers, would also benefit from ubiquitous wireless coverage. For example, early detection of wildfires could significantly reduce damages from these incidents.</p> <p>D2D services can also improve precision agriculture. Farm lands are that are outside terrestrial coverage will be connected to sensors to automate data collection and analysis, as well as support for robotic farm equipment and drones that need robust connectivity delivered by D2D services.</p>

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<p>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?</p>	<p>Confidential? – N</p> <p>As we are currently licensed in the UK for the provision of MSS in the S band, we would be expanding the existing service. Our D2D service, as any D2D service is conceived, would complement existing services offered by terrestrial mobility networks.</p>
<p>If you have considered launching or expanding a D2D service in the UK:</p> <p>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?</p> <p>We're aware that different technologies and network architectures will have different costs, performance, and spectrum efficiency trade-offs.</p>	<p>✂</p>
<p>Question 5: What capacity (e.g., Mbps/Km²/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?</p>	<p>✂</p>
<p>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?</p>	<p>Confidential? – N</p> <p>EML currently operates its E21 satellite over Europe. EML holds a European Commission authorization to use the bands 1995-2010 MHz and 2185-2200 MHz for the provision of Mobile Satellite Services (MSS) in the European Union. EML also holds licenses for these same frequencies in the UK, Switzerland, Iceland, Norway, and Lichtenstein.</p> <p>Although we have performed testing for the first 3GPP-NTN-compliant direct-to-smartphone using our E21 satellite, we plan to provide full commercial D2D services with our NTN NGSO system</p>

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	<p>using the same frequency bands we already have authorized in Europe.</p> <p>The NTN NGSO system will be capable of operating in the entire 1980-2010 MHz and 2170-2200 MHz bands (S band global allocation), as well as in the extended Region 2 S band, namely 2010-2015 MHz and 2160-2170 MHz. This will give our system full flexibility to operate in any frequency range depending on the spectrum availability in each country.</p> <p>A key assumption of our plan is the use of 15+15 MHz of global spectrum that enables EML to provide the required service capabilities to the quantity of worldwide subscribers necessary to generate an acceptable return on the plan. Having access to 15+15 MHz is critical to providing a compelling, globally uniform service capability to smartphone users.</p> <p>The use cases for the wideband D2D market, along with the expected volume of devices, will require the use of 15+15 MHz in order to provide the quality of service and the user experience required to meet the high demands of the consumer market in Europe and globally.</p>
<p>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?</p>	<p>✕</p>
<p>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?</p>	<p>Confidential? – N</p> <p>As described in the answer to Question 4, our plan is to construct and develop a wideband LEO satellite system to provide connectivity directly to unmodified consumer mobile handsets based on 3GPP NTN-NR standards.</p> <p>The MSS global and regional allocations in the 2 GHz band (1980-2010 MHz/2170-2200 MHz and 2010-2015 MHz/2160-2170 MHz), as well as the allocations to the terrestrial mobile service (MS) and the identification as International Mobile Telecommunications (IMT) bands, give this frequency ranges a unique advantage making them ideal for the provision of D2D communications. Additionally, the bands 1980-2010 MHz/2170-2200 MHz were</p>

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	<p>included, along with other segments of the L band, in 3GPP Release 17, which introduced for the first time the concept of Non-Terrestrial Networks (NTN).</p>
<p>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.</p>	<p>Confidential? – N</p> <p>Currently, the operation of two different mobility systems in the same spectrum frequencies is feasible only if done by the same operator e. Unlike fixed services (both terrestrial and satellite) that rely on the use of highly directive antennas, the need to use omnidirectional or quasi omnidirectional antennas in mobile user terminals (UTs) makes spatial sharing practically unfeasible. These characteristics are greatly emphasized when such UTs are communicating with NGSO satellite systems, which will rely on interference-free paths from horizon to horizon.</p> <p>These characteristics, based on the physics and basic geometry of the propagation channel, will be difficult to overcome by any foreseen technology developments. Therefore, we expect that any kind of mobility services, like D2D, will continue to rely on the exclusive assignment of spectrum.</p>
<p>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.</p>	<p>Confidential? – N</p> <p>As explained in the response to the preceding question. The provision of mobility services requires the exclusive assignment of spectrum. Any shared use of a certain frequency band, will inevitably require the segmentation of the available spectrum.</p>
<p>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?</p>	<p>Confidential? – N</p> <p>Yes. There are spectrum bands currently allocated to the MSS and the MS, which were also standardized in 3GPP Release 17. As indicated in response to Q8 the global MSS S band allocation, namely 1980-2010 MHz/2170-2200 MHz is ready for D2D. Also as mentioned in response to Q6 we have performed testing for the first 3GPP-NTN-compliant direct-to-smartphone using our E21 GSO satellite operating in the abovementioned band.</p> <p>The early authorization of D2D services will facilitate an introduction of such services in the UK market. Benefits for UK consumers and business are explained in detail in response to Q2.</p>

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<p>Question 12: Are there any mobile bands that should be prioritised for satellite based D2D?</p>	<p>Confidential? – N</p> <p>Bands with a current MSS and MS allocations and included in 3GPP Release 17 should be prioritized.</p>
<p>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?</p>	<p>Confidential? – N</p> <p>No comment.</p>
<p>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.</p>	<p>✂</p>
<p>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.</p>	<p>Confidential? – N</p> <p>No comments</p>

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