Consultation response form

Organisation name	Apple Inc., Broadcom Inc., Cisco Systems Inc., Hewlett Packard Enterprise, Intel Corp., Meta, Microsoft Corp.

Your response

Question	Your response
Do you have any comments on our proposals?	Yes. The organisations listed above (further on referred to as 'the undersigned companies') appreciate the opportunity to provide comments to Ofcom's Work Programme 2022/23. Please see our responses to Ofcom's stated Goals and Priorities, and to specific items as presented in Annex A.2- Project Work for 2022/2023.
Investment in strong, secure networks.	Confidential? –N The undersigned companies commend Ofcom for taking action to define strategic goals and priorities that will enable the digital society of the future to the benefit of UK citizens and businesses. We fully concur with Ofcom that making reliable, affordable broadband internet and access to high-quality services available for everyone is of fundamental importance for the future digital society of the UK, and that gigabit-capable networks, based on fibre but also other access technologies such as satellite, cable, and FWA will play a crucial role. We further agree that a world-class digital infrastructure will require that radio spectrum is managed in an efficient and effective way. An essential element of the future gigabit network that needs particular consideration is the final link that connects the user to the access network. If this link is weak, the network cannot be strong. The undersigned companies would like to highlight that this final link is increasingly realized by wireless connections, and

	specifically by Wi-Fi connections. According to the Wi-Fi Alliance, there are more than 16 billion Wi-Fi devices in use globally. Millions of consumers and businesses in the UK rely on Wi-Fi and they expect the performance of their Wi-Fi connections to evolve with, and provide comparable performance to, that offered by the broadband access network. To ensure that also in the future Wi-Fi, or RLAN in general, function as expected and users will be able to enjoy the possibilities brought about by future gigabit networks, a sufficient amount of licence-exempt spectrum must be made available. The undersigned companies call on Ofcom to give due consideration to this important aspect in their Plan of Work 2022/23 and their strategy for realizing the UK gigabit society.
Enabling wireless services in the broader economy.	Confidential? – N Ofcom's stated goals to enable more flexible and efficient use and increased sharing of spectrum are fully in line with positions of the undersigned companies. Licence-exempt technologies such as Wi-Fi have successfully demonstrated their ability to share spectrum with other users. As the studies preceding the opening of the 6 GHz band for licence-exempt use in many countries showed, licence-exempt technologies can not only share spectrum but even enable growth for existing spectrum users. When licence-exempt spectrum was made available for wireless LANs almost 20 years ago, this sparked a wave of wireless innovation which benefited not only consumers but also business in many different domains. Wi-Fi, for instance, is widely deployed in health care, hospitality, logistics, transport, public venues, and industrial locations, including ports, factories, and agriculture. With the various improvements introduced with the latest generation of Wi-Fi (Wi-Fi 6/6E), such as increased bandwidth, lower latency, and lower power consumption, to name just a few, citizens and enterprises can benefit from more

	efficient network architectures and improved QoS. The next generation of Wi-Fi (Wi-Fi 7), which is scheduled for introduction in 2024, will bring further improvements which, to provide maximum benefits to UK consumers and businesses, will require a sufficient amount of spectrum. For instance, the innovation that is expected to happen in the field of AR/VR/XR technologies, based on very high throughputs and very low latencies, will require both Wi-Fi 6E and Wi-Fi 7 and 5G. The significance of Wi-Fi for UK consumers and businesses has been acknowledged by Ofcom in several studies including Improving Spectrum Access for Wi-Fi, July 2020, and the 2021 Mobile Matters Report.
Mobile strategy.	Confidential? – N The undersigned companies share Ofcom's view that high-quality connectivity and innovation are essential for delivering good outcomes for consumers and citizens. We recommend that when defining its mobile strategy, Ofcom take into account the important role licence-exempt technologies, and specifically Wi-Fi, are playing for providing connectivity for mobile devices. The majority of traffic to and from mobile devices is transferred over Wi-Fi and not the cellular network. Without sufficient spectrum for Wi-Fi, mobile network deployments will have to become much denser to cope with the ever-increasing amounts of traffic, resulting in significantly increased capital and operational expenditures for MNOs which in turn will have to be recuperated through higher consumer prices. At the same time the increasing cost of living puts UK household budgets for communications services under pressure, making it increasingly difficult for many users to spend more on (cellular) broadband services.
Database approach to spectrum management	Confidential? – N

	The undersigned companies welcome the Ofcom's initiative to consider innovative spectrum sharing techniques. We believe that systems such as Automated Frequency Coordination (AFC) can be very efficiently used to enable licence-exempt standard power RLAN to share a band with incumbent users. Given the additional complexity of database systems, their application should be carefully considered and limited to standard power RLANs only. Low-power indoor (LPI) and Very Low Power RLANs, for instance, are generally able to coexist with other users and hence do not require coordination through a database. Imposing a database requirement on these device classes would result in increased product complexity, unnecessary delay, and cost, to the disadvantage of enterprises and consumers, in particular those less affluent. The undersigned companies are looking forward to providing detailed comments and suggestions to the dedicated Ofcom consultation planned for Q3 2022/23.
Mobile spectrum demand.	Confidential? – N The undersigned companies appreciate Ofcom's approach to take a long-term view and assess mobile spectrum demand beyond 2030. We concur with Ofcom's view that when assessing the future demand for mobile spectrum the needs of consumers and businesses for local connectivity must be carefully considered. While making a sufficient amount of spectrum available for national mobile use (5G/6G) is important, the characteristics and requirements of local connectivity must be considered. Studies showed that people in developed countries spend more than 90% of their time indoors. In line with that, more than 90% of data traffic is consumed or generated indoors. Typically, the final link between the access network and the user ('local connectivity') is established via Wi-Fi. For users to be able to

	enjoy the benefits of future gigabit access networks, this final link must be adequately resourced, i.e., it must be able to utilize a sufficiently large amount of spectrum. This does not only apply to very high bandwidth applications such as AR/VR/XR which require large channels widths but also to lower bandwidth, high-density use cases such as IoT with thousands of communicating devices. Studies conducted by Quotient Associates, Qualcomm, and Intel showed that in order to extend the data rates provided by future gigabit access networks to the user, Wi-Fi needs an additional 1.2-1.8 GHz of spectrum. The undersigned companies appreciate that by opening the 5925-6425 MHz band for licence-exempt use, Ofcom already made a portion of the required spectrum available. To close the remaining gap, the undersigned companies recommend that Ofcom makes also the upper 6 GHz band (6425-7125 MHz) available for licence-exempt use.
Upper 6GHz band.	Confidential? – N The undersigned companies commend Ofcom for pro-actively studying options for opening the 6425-7070 MHz band for additional uses. As pointed out above, we believe the most efficient use of the 6425-7125 MHz band can be made by opening it for licence-exempt use. Given the similarities of the upper and lower 6 GHz bands w.r.t. usage by incumbent systems, we are confident that licence-exempt RLANs can be deployed in the 6425-7125 MHz band without affecting incumbents' operations. In acknowledgment of future capacity and performance requirements, numerous countries in all three ITU regions, including the United States, Canada, Brazil, Chile, Peru, Saudi Arabia, and South Korea already opened the entire 6 GHz band (5925-7125 MHz) for licence-exempt use. By joining these nations, the UK could benefit from a vibrant ecosystem and economies of scale. The undersigned companies would like to highlight that additional licence-exempt

	spectrum would not only benefit consumers but also, and very much so, businesses of all sizes, from SMEs to large corporations. The 6425-7125 MHz band is the only remaining piece of spectrum that could reasonably used by licence-exempt RLAN. If this band was identified and eventually allocated to IMT, as envisaged in WRC-23 AI 1.2, there would be no spectrum available for RLAN when it will be needed. As Ofcom considers its future plans for WAS/RLAN in 6 GHz, the ultimate objective should be a sustainable, robust ecosystem for Wi-Fi and other WAS/RLAN devices throughout the 6 GHz band. Finally, we would like to express our concerns about considerations for sharing the 6425-7125 MHz band, or parts thereof between licensed and licence-exempt technologies. One of the issues we see is that to avoid interference between systems using different technologies, comparatively large separation distances might be required which could result in a highly inefficient use of spectrum. While it is clear that a large and robust ecosystem for Wi-Fi equipment in the 6425-7125 MHz band has formed and continues to grow rapidly, and that 3GPP has defined 5G New Radio-Unlicensed (NR-U) to operate in this band on a licence-exempt (i.e., LBT) basis, there is currently no evidence of a licensed 3GPP ecosystem forming for this band.