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Sony Europe's response to Ofcom's consultation on the Future role of spectrum sharing for mobile and wireless data services

The future role of Wi-Fi in helping to meet the demand for wireless data services

Question 1: How is demand for indoor wireless data connection speeds and capacity likely to develop over the next 5–10 years?

Over the last 10 years Wi-Fi data connection speeds have increased from;
- 2 Mbps (baseline 802.11, 1993)
- 11 Mbps (802.11b, 1999)
- 54 Mbps (802.11g, 2003)
- 300 Mbps (802.11n, 2009 typical maximum connection speed)
- 1.3 Gbps (802.11ac, 2013, maximum connection speed in available products).

Wi-Fi already carries the majority of IP traffic today, including a substantial and increasing share of traffic from mobile devices. For high-end systems, demand is expected to continue to grow in line with these historical trends: a conservative estimate is a 3X increase over each 5-year period. However, with new technology steps such as 802.11ac and IEEE HEW, this will increase further.

The growth in Wi-Fi devices is expected to come from the rapidly expanding segment of portable and mobile devices, characterized by ever-shrinking form factor constraints and stringent power consumption requirements. While such devices are not expected to require or even be able to process sustained transmission at the same very high data rates as high-end systems, they are anticipated to require very high peak data connection speeds.

Question 2: Will an extension of the 5 GHz band be required if Wi-Fi is to play a sustainable role in meeting the growing demand for indoor wireless connectivity?

Sony believes an extension is critical to allow 802.11ac, higher data rate services and their associated use of higher bandwidth channels with wider channels up to 160MHz.

Question 3: Are there other types of indoor wireless applications will require access to alternative spectrum other than that provided by the licence exempt 2.4 and 5 GHz bands used by Wi-Fi?

High rate short range cable replacements are available with WiGig / 802.11ad at 60GHz for high capacity media.

Question 4: What role do you think Wi-Fi will play in providing wireless broadband connectivity outdoors over the coming 5-10 years?

The demand for outdoor Wi-Fi access will accelerate as the growth of mobile Internet devices rapidly expands globally and mobile operators continue to further integrate Wi-Fi offload into their network services. The clear trend among consumers and network operators is toward ubiquitous Wi-Fi access. Advances in hotspot connectivity will simplify network connection and seamless roaming across access points, which will further enhance the outdoor Wi-Fi experience.

Earlier in 2013 IEEE802.11 initiated a new Study Group called "High Efficiency WLAN", or HEW for short which is expected to not only increase the raw throughput of Wi-Fi networks, but to also improve the overall efficiency of how data is sent over the air. This latter goal is particularly important as the number of access points continues to grow while the density of user devices in a particular area also increases. HEW will develop solutions for Hotspot in public places such as Airport, Train Station, Bus

Station, exhibition halls, Shopping centres and outdoor venues such as Park, streets, stadium, special crowded events and Co-location with cellular base stations (small cell deployments) or user equipments (e.g. private mobile APs such as mobile routers) in dense zones

Question 5: Will the increased deployment of Wi-Fi access points outdoors create a risk of reduced quality of service performance over the longer term and, if so, will approaches to co-ordinate access point performance be able to mitigate this risk?

New Wi-Fi technologies will enhance radio resource management and improve the quality of the user experience, particularly in outdoor environments where multiple access points may be present. For example, the 802.11k standard will enable client devices to select the best available network from a range of environmental information.   From a network perspective, this means that traffic will be more appropriately distributed across access points and channels, providing a more consistent user experience. In addition, signal optimization techniques such as beam forming and dynamic power adaptation will also enhance the user experience.

Question 6: Will improved approaches to accessing spectrum in licence exempt bands be needed in the longer term to maintain the quality of service achievable for outdoor public mobile broadband and/or M2M services? If so, which approaches are most likely to be adopted and how likely do you think they are to be successful in improving access to spectrum?

Geo-location database access and advanced sensing technologies (although not currently feasible at UHF bands) could be used to support outdoor broadband access and M2M services, but further investigation and trials are required to address the potential issues associated with propagation and interference.

Increasing spectrum supply and better managing its use

Question 7: Which frequency bands are most likely to be best suited to providing geographical shared access, including via a geolocation database approach, for use by mobile broadband, for example small cells and M2M applications?

From M2M point of view the bands of interest are those below 1 GHz because of their favourable propagation characteristics for wide area use. This is the only way to provide cost effective, ubiquitous wide-area overage for low data rate M2M applications.

In general we support the use of TVWS provided it can be demonstrated that the DTT platform and PMSE can be protected from known interference sources.

We also support current CEPT activities to develop LSA in the 2.3GHz band for mobile broadband and an extension of the 5 GHz band for Wi-Fi (refer to question 2).

Question 8: Would access to these bands best be realised through licensing or licence exemption?

To allow the largest market opportunity to develop, both Licensed (LSA) and licence-exempt shared access (e.g. 5GHz band) will be required.

Question 9: Do you believe that tiered shared access to a range of spectrum bands has a role in meeting demand for mobile and wireless data and, if so, which applications and devices do you think will be particularly suited to this access model?

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Yes, tiered shared access may play a role in helping to meet the future spectrum demands of wireless technology. The concept of tiered shared access with a licence-exempt "bottom" layer could be based on a geolocation approach or even with sensing-only devices (although not currently feasible at UHF bands). The mid-tier should be managed in some fashion, and this may be based on geolocation database administrator coordination, or coordination by some other entity. This mid-tier would deploy techniques such as LSA, and in the case of mobile broadband would be applicable to bands which are already allocated for mobile use and suffer from delays in timely assignment.

Tiered shared access does require benefits of scale to be attractive for the industry. Any bands for shared access should be considered in the international context of ITU and CEPT in order to provide maximum benefit for consumers and industry also in the UK.

Question 10: Do you believe DSA could play an important future role in the future in enabling a better quality of service and low barriers to spectrum access alongside conventional licensed and LE spectrum approaches?

Yes, DSA could play an important future role to assist in meeting market demand for spectrum access when used in conjunction with some guarantee on spectrum availability to attract the necessary investment to establish a viable market.

Question 11: What barriers still remain to the realisation of cost-effective sensing appropriate for low-cost consumer devices and what activities are ongoing to try to address them?

No Comment

Question 12: Over what timescales could DSA become a mass market proposition?

Sony believes that some forms of DSA may be realizable within a five year range. However, for the required technology and business models to reach maturity, it may take 10-15yrs.

Question 13: What role should Ofcom play, if any, to support the development of DSA and relevant technologies?

No Comment

Question 14: Do you have any other views on any of the issues discussed in this consultation?

In 3GPP rel-12, there are 3 models of small cell deployment.

1) Overlapping network deployment being served by macrocell and multiple small cells in case of co-channel use between macro and small
2) Overlapping network deployment being served by macrocell and multiple small cells in case of separate-channel use between macro and small
3) Only small cell network deployment being managed by centralized spectrum manager

Model 2/3 is suitable for spectrum sharing use case as its secondary system.

And its small cell network could be easily enhanced in cooperating existing cellular network operation. Much higher network capacity enhancement will be achievable in comparison with Wi-Fi based offloading scenario with existing cellular network operation.

<u>Supporting innovation through short-term access to shared spectrum</u>

Question 15: What are the frequency bands that would be of most value for R&D purposes?

No Comment

Question 16: What are the potential benefits of using a geolocation database approach for short-term access to spectrum for R&D and how would you see this working from a practical perspective? Are there alternative approaches that could deliver similar benefits?

No Comment

Question 17: What characteristics do you view as important to researchers in arrangements to facilitate temporary access to spectrum for research and development purposes?

No Comment