



Mobile Networks for Verticals: Spectrum Best Practice Q&A

GSMA Public Policy Position

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1. What is a vertical?

- We define verticals as companies, industries and public sector organisations operating in a specific sector. These range from manufacturing (e.g. a factory building cars); construction (e.g. building site comms and management); public transport (e.g. trains); retail (e.g. a shopping mall); utilities (e.g. electricity and gas); public safety (e.g. police and ambulances); shipping (on-board ships and at ports); and aviation (e.g. ranging from designing planes to airlines tracking plane and customer data in the air and at airports), among others.
- There can be significant crossover such as at airports where various verticals may be involved including retail, air traffic control and airlines tracking plane data, baggage and dealing with customers.

2. Why might verticals want mobile networks?

- Numerous verticals have relied on mobile and other wireless networks for some time principally for voice and low speed data services. For example, Private Mobile Radio (PMR) networks have been used to support voice communications on construction sites and to connect taxis and for private security. Public transport and the emergency services typically rely on private mobile networks while all manner of businesses use Wi-Fi for their connectivity needs.
- The evolution of mobile technology means it can now provide greater capabilities for these users as well as support swathes of new verticals. Most notably mobile technology has evolved to provide verticals with highly reliable broadband data access – including in targeted geographic areas, such as inside buildings, with small cells.
- Some verticals also want newer cellular features such as low power wide area IoT connectivity (e.g. for smart meters and sensors), or very low latencies (e.g. for advanced manufacturing including robotics). Crucially, often verticals may want several of these requirements simultaneously which can represent a spectrum management challenge (see question 5).

3. Who provides networks for verticals and do they need dedicated spectrum?

- Vertical mobile networks have traditionally been deployed by a variety of different companies including specialist vertical equipment providers, mobile operators and systems integrators.
- Traditionally these have used a variety of spectrum bands. Mobile operators use widely internationally harmonised mobile spectrum but specialist mobile networks used for verticals often use dedicated spectrum that is set-aside in different bands. In several cases there is sufficient spectrum available this can continue (e.g. for public safety networks and public transport) should the verticals wish to.
- However, due to demand for lower cost equipment and wider bands to support faster data services, there is growing interest in using the bands planned for commercial public mobile services. A key challenge for regulators is that there is only a finite amount of harmonised mobile spectrum in these and there is already huge demand for this from commercial mobile operators who support billions of consumers as well as many millions of businesses worldwide.
- One way to meet this challenge is for mobile operators to install networks for verticals – especially as the mobile market is typically competitive which helps ensure verticals receive a good service at a fair price. Where verticals want to use an alternative provider, mobile operators could sub-lease spectrum to them to ensure their needs can still be met.

4. Should spectrum be set-aside for verticals in priority mobile bands?

- A few countries¹ have started to set-aside spectrum for verticals for local usage in priority mobile bands. The key challenge is that this restricts the amount of spectrum available for commercial public mobile services thus resulting in slower services for the many consumers and businesses that rely on them.
- Such set-asides are often being considered in priority 5G spectrum bands and can make it impossible for operators to secure 100 MHz each in 5G mid-bands (e.g. 3.5 GHz) and around 1 GHz each in millimetre wave bands (e.g. 26/28 GHz) which enable an optimum 5G user experience.

¹ e.g. Germany has set-aside such spectrum in the 3.5 GHz band


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- Set-asides also create scarcity at mobile spectrum auctions which can result in very high prices being paid. High spectrum prices are linked to slower mobile networks and worse coverage by limiting network investment.
 - Another central concern is that precious mobile spectrum that is set-aside for verticals or local usage may be inefficiently used. For example, vertical industries are only likely to use their spectrum in fixed locations (e.g. factories, ports etc) leaving the spectrum unused in most areas.
 - There are also technical challenges imposed by spectrum set-asides in 5G bands. Almost all new bands made available for 5G will use TDD (i.e. the band arrangement uses Time Division Duplexing). This means all networks in the band will typically need to be synchronised to avoid interference (i.e. base stations cannot transmit at the same time as devices).
 - This synchronisation imposes limitations on the types of vertical use cases that can be supported in the band (e.g. you cannot support very low latency applications at the same time as very fast speeds in the same area). Public mobile operators can overcome these limitations by using their wider spectrum assets.
 - Verticals would either need to accept the limitations, work with public mobile operators on a hybrid solution or coordinate their deployments with their neighbours, which would limit where networks can be deployed².

5. What is the alternative to set-asides in priority mobile bands and how can we be sure the needs of verticals are met?

- A mobile operator can deploy a network³ for a vertical following a competitive tender. Where verticals would rather use an alternative provider then operators can sub-lease spectrum to that provider. This ensures that the needs of verticals can be met without harming 5G more widely and leading to inefficient use of the spectrum (see question 4).
- Licence obligations can be used to ensure mobile operators do sub-lease the spectrum on fair and reasonable terms. For example, in Finland the mobile operator licensees in the 3.5 GHz band are obliged to either participate in tenders for vertical contracts in localised

² For example, studies show that a separation distance of around 14km would be needed between unsynchronised 5G networks in the adjacent spectrum and 60km for co-channel network.

³ Mobile operators can offer all sorts of networks including private small cell networks that are entirely separate from the public mobile network and that features quality of service guarantees



areas or else sub-license their spectrum to the vertical so they can build their own network.

- This preserves the benefits of market-based spectrum awards while also supporting a secondary market where verticals can sub-license spectrum from operators. Most importantly, it avoids the many consumers and businesses who rely on commercial public networks from suffering from slower networks and worse coverage.



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