

The future for Wi-Fi and private 5G networks for enterprises is complementary, not competitive

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There has been much discussion within the telecoms industry about whether Wi-Fi and private 5G networks represent competing technologies for meeting enterprises' connectivity and business application needs. Analysys Mason recently attended Wi-Fi Now's World Congress in Brighton, UK, where vendors stressed that while the business cases for Wi-Fi and private 5G are moving closer together in terms of the capabilities that they can deliver, the two network architectures **are not in direct competition**. The two wireless options cater to different use cases because of their technical capabilities and price difference.

In some countries, operators and vendors of Wi-Fi and 5G are both targeting the use of the upper part of the 6GHz spectrum to support their technology and deployments. However, the complementary relationship between these technologies should be considered most important. Vendors and operators can pursue deeper integration between these two technologies to provide more-resilient and innovative network solutions and to effectively support a wide range of enterprise connectivity needs.

Wi-Fi and private 5G have different enterprise use cases, determined by the need for specific network functionality

Wi-Fi is a technology that is best suited to small, indoor areas such as offices, buildings and factories. It is ubiquitous across all major enterprise verticals and is supported by a wide range of devices. However, it often does not offer the same levels of security, reliability and coverage as private 5G networks. Wi-Fi runs on unlicensed spectrum, which makes it more susceptible to interference and frequency band saturation compared to private cellular networks, which typically use locally licensed spectrum. Wi-Fi often incurs lower deployment and maintenance costs and is less complex for enterprises to deploy than private 5G, but advanced private 5G networks can provide additional security features, such as more-robust authentication, encryption and threat detection. As a result, Wi-Fi is typically considered to be less suitable for mission-critical applications, such as those seen within manufacturing or transport hubs such as airports.

Private 5G is designed to offer greater reliability, increased security and better coverage over large areas than Wi-Fi, especially when using locally licensed spectrum. It can also offer a range of unique network capabilities, including network slicing, accurate positioning, ultra-reliable, low-latency communication (URLLC) and massive machine-type communication (mMTC). These capabilities can be extremely valuable for emerging industry 4.0 use cases such as IoT sensors, virtual reality/augmented reality (VR/AR) or real-time video analytics. Technologies such as Wi-Fi 7 and Wi-Fi HaLow will increasingly support some less-demanding forms of these use cases, but private 5G will likely be preferred by enterprises in situations where high levels of performance and functionality are required. For example, enterprise applications such as mining or manufacturing may have specific latency, coverage and bandwidth requirements that cannot be facilitated by Wi-Fi alone.

The higher costs, bespoke use cases and relative immaturity of private cellular network deployments means that they are far fewer in number than Wi-Fi deployments, with total deployments of private cellular networks in the

low thousands ([1900 LTE/5G private networks as of 2021](#)). Private 5G is even more immature, but the technology is expected to be increasingly adopted and deployed by enterprise customers over the coming years. However, Analysys Mason does not expect it to encroach substantially on Wi-Fi's market opportunity because their use cases and market positioning are very different.

Vendors of Wi-Fi and private 5G networks are competing for access to parts of the 6GHz spectrum – not for enterprise business

A debate is currently taking place in some countries over the use of the upper part of the 6GHz band (6425–7125MHz), with the two main alternative uses being licensed 5G networks or Wi-Fi. Vendors at Wi-Fi World Congress discussed the need to keep the lower half of the 6GHz spectrum band (5925–6425) open for Wi-Fi use because it is central to Multi-Link Operation (MLO) in Wi-Fi 6E and Wi-Fi 7. MLO allows connected devices to send and receive data across the varying frequency bands of 2.4GHz, 5GHz or 6GHz depending on traffic and interference. Vendors also stated that the upper part of the 6GHz band would bring additional improvements in Wi-Fi's performance and could maximise gains in speed and latency while reducing interference.

However, mobile operators argue that the upper part of the 6GHz spectrum will be required to meet increasing customer demand over the next few years and to prevent congestion and interference in their public networks. The USA, Brazil and South Korea have all committed to keeping the full 6GHz band as unlicensed spectrum, but regulators in many other countries remain undecided. China recently became the first country to announce that it was assigning the upper 6GHz band for mobile use, and regulators across Europe and the Middle East are set to make a decision later this year.

Side-by-side deployments of private 5G and Wi-Fi ensure that the future for the two networks is complementary, not competitive

Despite the competition for new spectrum bands, particularly the hotly disputed upper-6 GHz band, Wi-Fi and private 5G are being increasingly deployed side-by-side to satisfy enterprise needs. Wi-Fi can be deployed 'on top' of a private 5G network, so that both Wi-Fi and 5G are available on a single site, utilising 5G backhaul and core network capabilities. This allows staff and guests to consume Wi-Fi for basic connectivity, while mission-critical applications that require increased security, resilience and mobility operate on the private 5G network. For those functions where Wi-Fi and private 5G can be used for advanced levels of interworking, Wi-Fi can leverage some of the capabilities of the 5G core to improve functionality, security and reliability for the Wi-Fi network. The effective integration of these two technologies also allows more efficient use of network resources and provides additional benefits in terms of redundancy and traffic management.

Although Wi-Fi and private 5G technologies cater to different network needs, both are essential for supporting the connectivity of future industry. Despite the background of spectrum competition and converging use cases, vendors and operators should focus on the increasingly complementary position that the two technologies have. As acknowledged by the Wireless Broadband Alliance (WBA), the future of wireless connections for enterprise are hybrid connectivity platforms, with integrated Wi-Fi and private networks. Operators and vendors that want to make a significant impact in the enterprise space can focus on improving their interworking to provide the most effective and complete connectivity offering for a range of applications.