Understanding the Benefits of 5G-Advanced

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5G is now middle-aged. This might be surprising to many who are not closely involved in the mobile industry, but 5G-Advanced is the midpoint in the range of 5G specifications that are together branded as 5G. Every few years the 3GPP, the key standards organization, publishes a new set of specifications. The first 5G standard was Release 15, and with 5G-Advanced, which was finished earlier this year, we have reached Release 18.

5G-Advanced will be the umbrella name for all the standards for the second half of the 5G decade, starting with Release 18. As such, 5G-Advanced provides a natural milestone for operators to relaunch and reposition 5G services. It even has its own logo!

With 5G-Advanced there are three main reasons for operators to deploy Release 18:

1. New services become possible. Examples here include use of smaller spectrum channel sizes and for RedCap offerings aiming to replace narrowband 4G-era offerings such as NB-IoT. Positioning is another area of interest.

2. New technologies materially improve previously possible services. Examples here include services based on

network slicing and non-terrestrial network (NTN) connectivity. There has also been further talk of mobile extended reality and cloud AI support too.

3. Improved efficiency. Release 18 brings technologies that help with better coverage and uplink performance, especially at the cell edge or in high-speed trains. There's also the potential for 5G-Advanced networks to be more energy-efficient.

To deploy 5G-Advanced, an operator must have a 5G core network and be able to offer 5G standalone (SA). At CCS Insight, we've seen renewed momentum for 5G SA in 2024, which we believe is because operators now see the attraction of 5G-Advanced features as a sizeable step up from what was possible with non-standalone. All operators launching 5G SA will move ahead with 5G-Advanced in time.

At the end of November 2024, 151 operators in 63 markets were investing in 5G SA — this reflects 31% of operators investing in any form of 5G. Of these, 30 operators are currently deploying 5G SA. All regions now have operators that have launched SA, notably including:

- Asia–Pacific: Dito (Philippines), Hong Kong Telecom, KDDI (Japan), M1 (Singapore), Optus (Australia), NTT Docomo (Japan), Singtel (Singapore), Smart (Philip-

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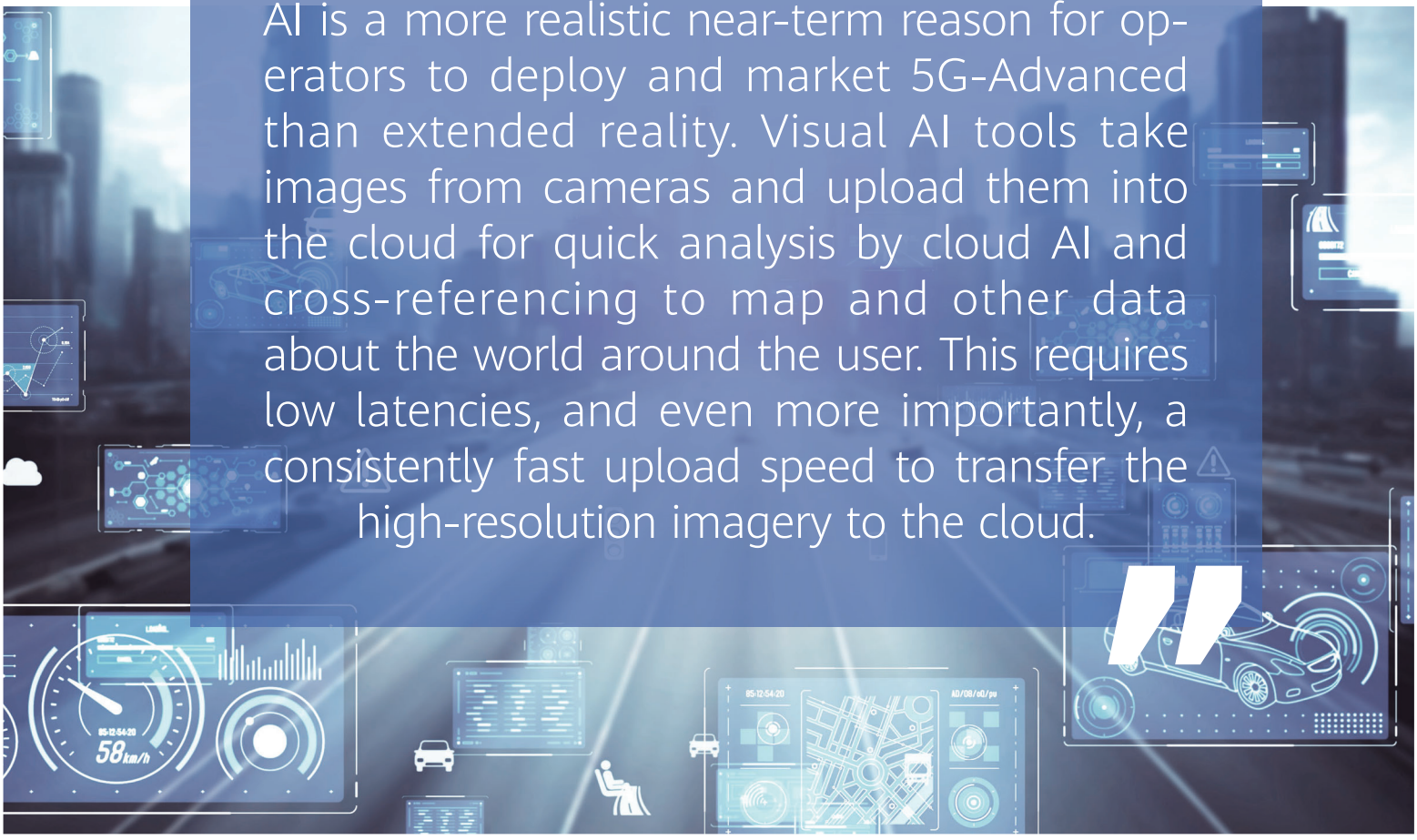

pines), Starhub (Singapore), Taiwan Mobile, Telstra (Australia) and TPG (Australia)
- China: China Mobile, China Telecom and China Unicom
- Europe: Three Austria, Deutsche Telekom (Germany), Elisa (Finland), Free (France), Cosmote (Greece), NOS (Portugal), Orange (Spain), TDC (Denmark), Telefonica (Spain), TeliaSonera (Finland), Virgin Media O2 (UK), Vodafone (Germany, UK) and Yettel (Hungary)
- Middle East and Africa: e& (United Arab Emirates), du (United Arab Emirates), Rain (South Africa), stc (Saudi Arabia, Kuwait, Bahrain) and Zain (Saudi Arabia)
- North America: AT&T (US), Boost Mobile (US), T-Mobile (US), Rogers (Canada), US Cellular and Verizon (US)
- South Asia: Jio (India)
- South and Central America: Claro (Brazil), Telecom Argentina, Vivo (Brazil) and TIM (Brazil)

In the rest of this piece, I will look at a selection of 5G-Advanced features and analyse the degree of importance to operators. The timing and degree of benefit of each area may differ between a public network operator offering services to smartphone users on a macro network and a private 5G network using a dedicated core network for specific machines or users.

Growing the Internet of Things with 5G-Advanced

Before Release 18, 5G technology needed a minimum channel size of 5 MHz. This was not a problem for re-using 4G spectrum bands or for new spectrum allocated specifically for 5G use. However, for low-band spectrum, especially for IoT, the amount of spectrum allocated was smaller and so 5G wasn't an option. Smart grids in the US are one example. Another is the 3 MHz channels common on GSM-R, used for railway communications. 5G-Advanced removes this limitation and makes 5G a viable upgrade path.

RedCap can also address new markets with 5G-Advanced. Although RedCap products arrived with Release 17, they targeted broadband services. With 5G-Advanced, RedCap modules can become even simpler and cheaper to target even less demanding IoT areas and replace NB-IoT.

Slicing and NTN Enhancements

5G-Advanced improves the flexibility with which operators can manage network slices, allowing these to be tailored for specific applications, for example, for augmented reality or to support autonomous vehicles. Other slicing improvements will be a long-term benefit because they rely on developments such as cross-operator slicing, where each operator will need to have deployed 5G-Advanced or NTN integration.

Improvements in orchestration to dynamically match changing traffic patterns or to ensure slice resources across core, transport and access domains will be more immediately useful for operators. Similarly, speedier slice deployment will make short-lived slices for events more practical.

AI Is Now a More Significant Driver for 5G-Advanced Than Extended Reality

Network suppliers and technologists have long positioned 5G as the ideal network to support all kinds of extended reality, from fully immersive virtual reality to smart glasses featuring augmented reality. Many of the early 5G demos back in 2016 to 2018 showed off virtual reality headsets. However, use of virtual reality is limited to a single location where Wi-Fi is good enough. Even now, many years on, there are no widely available 5G virtual reality headsets; they all continue to use Wi-Fi.

Symptomatic of this trend is SK Telecom's recent decision to close its virtual reality metaverse offering. In December 2024, the company announced it would stop taking on new customers and would close its Ifland service in

March 2025. At the same time, SK Telecom continues to drive forward as a leading member of the Global Telco AI Alliance and a range of AI-powered services.

Smart glasses are a different proposition. Wi-Fi isn't sufficient for a great experience because such lightweight glasses are a fully mobile product, moving between locations where cellular support exists but Wi-Fi doesn't — they need to work everywhere. For now, they rely on an accompanying smartphone, but this isn't ideal.

However, smart glasses are not a near-term reason for operators to deploy 5G-Advanced because of the challenges of creating compelling smart glasses hardware now. Existing devices either have a screen but no camera, such as Xreal's Air2, or a camera but no screen, such as the Ray-Ban Meta. Including both components with good enough onboard computing power and sufficient battery life would make the device too large to be a mobile offering. Apple's Vision Pro is a state-of-the-art example of this approach.

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Release 18 improves Massive MIMO for uplink connections, improving spectral efficiency and beamforming accuracy. The impact is greater in difficult conditions at the edge of a cell. There are also enhancements in latency that benefit uplink performance, for example, improved scheduling reduces the impact of congestion on throughput, and on greater deterministic communication, which improves low-latency reliability.

Private Networks Benefit from Improved Positioning and Timing

5G networks rely on accurate positioning to enable network performance. They are also able to pass on timing information to client devices. With 5G-Advanced, a network will be able to maintain timing if a satellite service is interrupted, and use terrestrial atomic clocks and timing signals relayed by fibre links. This is a large opportunity. Already, there are 737 companies deploying private 5G networks globally.

Many private networks are indoors, such as in smart factories or warehouses, where automated machinery is managed by 5G networks. Here, precise timing and positioning is often needed and yet satellite signals do not penetrate. 5G-Advanced provides enhanced positioning, aiming at precision of less than 10 cm. Because private 5G networks are often greenfield, soon 5G-Advanced will be the norm for these deployments. CCS Insight forecasts global private network revenue will increase by a compound annual growth rate of 13% to reach $6.6 billion in 2028 (see Forecast: Private Mobile Networks, 2024-2028).

Making 5G-Advanced Work Is Critical for the Future

This represents just a selection of the many enhancements and new features in the Release 18 standard. Operators that wish to maximize their return on existing 5G investments in spectrum and networks can use 5G-Advanced to drive new revenue lines and make their network more efficient.

As a mid-life upgrade, 5G-Advanced may seem like a small step, but it's an opportunity to relaunch and reposition 5G as a far superior offering to older network technologies. It's an essential upgrade for any that wishes to expand its revenue opportunities or to expand its customer base into new industry sectors such as manufacturing, agriculture, automotive and public safety.