

Network convergence will be essential if 6G is to address the shortcomings of 5G

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The telecoms, media and technology (TMT) industry needs to make progress with 6G because true digital transformation will not be enabled by a siloed mobile network, but rather by one that is built from the outset around the convergence of various access technologies, and of networks and cloud.

Convergence would also enable many of the use cases initially proposed for 5G. It would support the fundamental need for a network that is architected to handle massive amounts of data, and that can act on that data in a timely, accurate and flexible manner. This will require networks that have edge-native and AI capabilities inherently built in, rather than retrofitted, and that use the various strengths of different access technologies.

6G will integrate edge and AI in order to make significant improvements on 5G

The world is in the midst of a massive digital transformation. The continual quest for improved, but sustainable, standards of living is pushing consumers, businesses and governments to augment normal human and industrial capabilities with more automated tools powered by AI. To enable this, any future network must be able to connect billions of devices, handle massive amounts of data and enable real-time decision making.

Some of this vision of digital transformation driven by AI and mixed reality was inherent in the goals that were set out for 5G during the late 2010s, starting with the NGMN's seminal white paper in 2015.¹ Indeed, the use cases proposed for 6G are essentially the same as those originally suggested for 5G, as seen in NGMN's initial 6G white paper.²

5G technology can enable many of these use cases, but the implementation of 5G by the telecoms industry has so far fallen short of the original goals set for four reasons.

- The build-out of 5G networks has realistically been mostly an extension of 4G (in the sense that it has supported enhanced mobile broadband) and the more-radical architectural elements have rarely been deployed, as the very slow adoption of 5G standalone reveals.
- Some of the enhanced capabilities that lie at the heart of 5G standards, such as ultra-low latency, have limited commercial applicability, and those responsible for defining architecture need to adopt different priorities from those set out in the early 2010s by 3GPP because market requirements have changed.

¹ NGMN (March 2015), *5G White Paper*. Available at: <https://www.ngmn.org/work-programme/5g-white-paper.html>.

² NGMN (April 2021), *6G Drivers and Vision*. Available at: https://www.ngmn.org/wp-content/uploads/NGMN-6G-Drivers-and-Vision-V1.0_final.pdf.

- The use cases set out by NGMN, and by other bodies focused on enabling digital transformation, cannot realistically be supported by a mobile network alone. 5G standards support a multi-access core, but full convergence is on a very small number of operator roadmaps.
- The 5G standards were not initially devised to integrate edge compute or AI as an inherent part of the architecture. These capabilities are essential to the 6G vision, and will facilitate the convergence of fixed, mobile and non-terrestrial networks.

The next wave of 5G standards, 3GPP Releases 17 to 19 (dubbed ‘5G-Advanced’), will address some of the technical enablers that are needed for emerging applications, but they risk being too mobile-centric and requiring cloud and AI technologies to be retrofitted in a sub-optimal way. This is driving interest in a more radical re-architecting of the network, which would accelerate the 6G roadmap.

Traditional telecoms operators may not have a strong business case to invest in another network generation

The key question is who will be prepared to invest in a 6G network. It may not, in many cases, be traditional telecoms operators, given that they have only recently invested in 5G and FTTx roll-outs. Operators will generally favour an evolutionary approach, based on 5G-Advanced, with backwards compatibility and software-defined re-architecting.

This would maximise the return on investment on the 5G network that was originally planned. Many operators envision similar devices, usage and revenue streams as in previous generations because they still have a successful business model based on these. They therefore have chosen not to implement a brand new architecture that unleashes the full potential of 5G and responds to the world’s need for digital transformation.

The instinct for continuity will persist among most operators. However, as mobile network history demonstrates, backwards compatibility comes with trade-offs that may be unacceptable when a radical new architecture is genuinely required. The pent-up demand for mobile broadband was only adequately met when operators accepted, with 4G, the adoption of an IP network, after years of failing to meet modern requirements by tinkering with 3G.

New investors could enable 6G to provide the performance leap that true transformation requires

The roll-out of a fully converged, edge-native network will be jeopardised if most operators cannot find a case to invest in new architecture by 2030, unless new investors support the deployment and can define new business cases.

Many of the best examples we see of 5G rising to the needs of digital transformation are in private enterprise 5G networks, which are often operated by non-traditional providers. Greenfield operators, notably Dish Network, are also providing a glimpse of what 5G could have looked like, with a highly edge-focused architecture.

These examples show that, aside from new radio designs, most of what will be needed for 6G is not new technology, but intensive implementation of edge and AI technologies that are already in development. New spectrum and modulation are important to expand mobile data capacity, but are not enough alone. The performance demands of the new data-intensive experiences will rely on extremely dense, ubiquitous coverage

that cannot be delivered by one network, but will need multi-layered convergence of fibre, 5G/6G, Wi-Fi and non-terrestrial networking.

In this way, 6G will be a network of networks.

Providing this robust network capability will require very-large-scale investments, often via partnerships (as seen for submarine cables). Only a small number of companies may have the wherewithal to make these large investments, but a great many players can exploit the network. Traditionally telecoms operators have made these large investments, but recently, the spend has partly shifted to hyperscalers.

The expectation of generating new revenue is fundamental to 6G. Growth in TMT revenue over the last decade has been almost entirely confined to internet and cloud players. These players would invest in new architecture if they believed that such an investment would lead to new revenue. 6G convergence will come with a new architecture that enables new stages of digital transformation and generates new revenue growth in return. The failure of the 5G vision, then, is likely to accelerate the need for a fundamentally new converged architecture under the 6G banner.