5G RAN migration options: economic implications for mobile network operators

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About this report

This report examines the economics of three main approaches to 5G network migration: overlay; modernisation and replacement. We have assessed these technically in other reports, but this study focuses on the financial risks and rewards for mobile network operators (MNOs) of the different approaches and timescales for 5G deployment.

The report does not suggest that one approach is superior to another, but analyses how an operator must choose the solution that best aligns with its own strategy. For instance, the choice of migration path will be different for an operator that is focused mainly on cost containment within conventional business models, compared to an operator that has aggressive revenue growth targets. Attitudes to risk, availability of spectrum, levels of demand for new 5G services and many other factors are relevant in the choice of migration strategy.

It is based on several sources:

- interviews with MNOs and a survey of 84 MNOs, conducted in the last quarter of 2020
- capex data and forecast and cloud infrastructure forecast¹
- several models of different RAN architecture and timelines, with associated cost bases, built around composite case studies.

¹ For more information, see Analysys Mason’s Telecoms capex: worldwide trends and forecast 2017–2026 and Network cloud infrastructure: worldwide forecast 2020–2025.
Executive summary

In the first phase of a new network roll-out, operators have to decide whether to be cautious or bold in their pace of migration, knowing that the right balance will dictate the commercial success of the first phase.

In 5G, the challenge is intensified because the opportunity for swift revenue gains is unproven, and migration applies not only to the RAN, but the whole architecture. There are three broad approaches to RAN migration, each with different pros and cons. **Overlay:** MNOs can spread the capex and risk with a gradual upgrade. **Modernisation:** MNOs can upgrade the RAN gradually but invest in fibre or other assets in parallel, to maximise the impact. **Replacement:** MNOs can replace the legacy network in a short period with either a conventional or cloud-based platform, a bigger investment that may deliver competitive advantage.

**KEY RECOMMENDATIONS**

1. Cost-sensitive operators can avoid being left behind in 5G by deploying a simple overlay, but must ensure they do not end up in a technology or supplier lock-in.
2. An operator that has invested heavily in physical assets can leverage these efficiencies to deploy an overlay quickly while laying foundations for transformation later.
3. RAN replacement and architectural change will deliver the biggest benefits when it is practical to plan them in parallel.

**Figure 1:** Three main options for 5G RAN migration and examples of operators that are pursuing them

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**Source:** Analysys Mason
Challenge: In the short term, the main way to save on 5G roll-out cost is to be conservative, but that may compromise ROI later

The short-term ROI case for 5G remains uncertain for many operators. 4G was a necessary upgrade to address pent-up demand and failed to deliver significant increases in revenue and profit. Many operators have yet to identify an urgent requirement for 5G outside specific hotspots.

This is not to say that commercial benefits will not emerge, but they are not clearly visible yet, while operators still feel pressurised to deploy 5G quickly. That has resulted in an intense focus on making 5G roll-out as cost-effective as possible.

This is challenging in the short term. 5G has specific aspects that add significant upfront cost, and others that promise to reduce it, but the two are not synchronised. According to Analysys Mason’s modelling of the typical capex cost of a 5G network, three main new factors (distinct from 4G) will increase the upfront cost, and four should help to reduce it (Figure 2). It is clear that the ‘cost additives’ are urgently needed well before the ‘cost reducers’ will be mature and deployable.

This situation has made most MNOs cautious and inclined to adopt gradual migration strategies rather than full upgrades, reusing 4G assets as much as possible in order to defer as much spending as possible until new architecture and revenue streams are more tangible. A cautious timescale is assisted by the 5G non-standalone (NSA) standards, which allow for an overlay on 4G networks. NSA has enabled operators to place an early stake in the ground by supporting high 5G data rates at an early stage, even though the 5G capabilities that will support genuinely new applications, such as ultra-low latency, are not yet mature. This issue will start to be addressed when the most recent 3GPP standards, Release 16, become fully supported in commercial products from 2021.

However, by pursuing a cautious first phase, operators risk falling into a vicious cycle – cautious investment that delivers only ‘4G+’ commercial returns, and that, in turn, will reduce the financial ability or confidence to make the bigger leaps, especially to the 5G cloud-native core that will deliver greater returns.
**Solution:** MNOs must move beyond 4G+ results, but their pace and style of migration must align with their assets and commercial drivers

To avoid 5G being only 4G+ in terms of new revenue and experiences, MNOs need to be bolder in defining business cases, and focus on the ROI of deploying a network to deliver those, rather than cost efficiency alone.

MNOs have three main approaches to migration, and within each one, there will be more or less radical approaches.

- **Overlay.** The most conservative option, in which 5G base stations are deployed selectively on 4G infrastructure. MNOs that focus on conventional models can start with this.

- **Modernisation.** Also an overlay strategy, but part of a holistic plan to harness all the MNO’s assets, such as fibre and cloud, to lay the foundation for deploying new architecture later.

- **Replacement.** Replacing existing base stations with single RAN (SRAN) systems delivers performance and opex gains but is more costly and disruptive upfront than overlay. It will often go hand-in-hand with the migration to 5G standalone and to a virtualised RAN (vRAN).

The replacement option can be addressed as a single leap or a multi-stage progression. MNOs can replace the base stations first and then virtualise the RAN later, or address both migrations simultaneously. The latter may delay roll-out as they wait for vRAN, or emerging open RAN platforms to mature.

In all cases, the main influencer of ROI will be the cloud-native core and RAN decisions must be aligned to that migration.

**Figure 3. Pros and cons of the approaches to migration**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Relatively quick and cheap</th>
<th>Holistic network upgrade</th>
<th>Requires extensive assets</th>
<th>High capex before new revenue</th>
<th>Open cloud solutions are immature</th>
<th>Potential dead end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overlay</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Modernisation</td>
<td>+</td>
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<td>+</td>
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<td></td>
<td>-</td>
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<tr>
<td>Replacement</td>
<td>+</td>
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<td></td>
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</tbody>
</table>

Source: Analysys Mason
Recommendations

1. **Cost-sensitive operators can avoid being left behind in 5G by deploying a simple overlay, but must ensure they do not end up in a technology or supplier lock-in.**

MNOs that are unlikely to generate premium fees or new revenue streams in the early stages of 5G can use a simple overlay to take advantage of new spectrum and stake a claim in the 5G market. However, this approach will only support ‘4G+’ experiences, and if the MNOs do not have a clear roadmap to move to 5G standalone, they risk finding themselves in a technology dead end, and losing competitive advantage to more radical deployers.

2. **An operator that has invested heavily in physical assets can use these efficiencies to maximise performance and differentiation from an overlay, while laying foundations for transformation later.**

Another approach, modernisation, focuses less on low cost and more on the cost efficiencies of leveraging a portfolio of network assets such as fibre and cloud infrastructure. For MNOs with the right assets, this approach has the advantage of avoiding a big RAN capex spike, but focuses on laying foundations for a far more capable and future-proofed network that can generate new services quickly and smooth future migration.

3. **Operators must align RAN replacement and RAN virtualisation clearly to the introduction of the 5G core – a co-ordinated strategy for all three will deliver the biggest benefits.**

The second phase of 5G migration has two distinct aspects – implementation of 5G standalone with the cloud-based 5G core, and virtualisation and disaggregation of the RAN. Where these can be implemented in a co-ordinated way, the benefits, such as a fully agile services platform, will be maximised and achieved rapidly. However, current solutions are costly and immature, so some MNOs will choose a two-step approach.
Executive summary

Research overview

Overlays are cost-effective but operators must avoid dead ends

Operators that have invested in physical assets can balance cost-efficiency and future-proofing

5G standalone and vRAN migration need to be aligned with one another

Appendix

About the author and Analysys Mason
About the author

Caroline Gabriel (Research Director) leads Analysys Mason’s Operator Investment Strategies programme, as well as leading many 5G-related research activities across multiple programmes. She is responsible for building and running Analysys Mason's unique research base of mobile and converged operators worldwide. She works directly with Analysys Mason's research clients to advise them on wireless network trends and market developments. She has been engaged in technology analysis, research and consulting for 30 years, and has focused entirely on mobile and wireless since 2002. Her focus is on critical issues and trends related to mobile and wireless infrastructure, particularly operator deployment intentions for 4G, 5G, cloud-RAN and other technologies.
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