5G: operator network roll-out challenges and opportunities

Roberto Kompany
5G: operator network roll-out challenges and opportunities

About this report

Mobile network operators (MNOs) are under competitive and investor pressure to deploy 5G quickly, but the network technology options and use cases for 5G are more complex than for earlier generations of mobile networks. This report examines the challenges that MNOs will face when deploying 5G and presents a detailed analysis of the technology options that are available to MNOs to accommodate their business models and priorities. We also provide recommendations for senior management within mobile operators, including CFOs, CEOs and CTOs.

This report is based on several sources including Analysys Mason’s survey of up to 92 MNOs worldwide (conducted in October and November 2018), briefings with vendors and operators, internal research and public statements from operators.

GEOGRAPHICAL COVERAGE
- Worldwide

CASE STUDIES
- Overview of early 5G movers and their launch priorities and strategies and planned spectrum, including AT&T, China Mobile, NTT Docomo, SKT, TMO, and VZ.
- 18 one-slide case studies for companies that offer 5G solutions, split by leaders and challengers.

KEY QUESTIONS ANSWERED IN THIS REPORT
- Why is 5G different than previous generations of networks?
- Which use cases are MNOs likely to focus on first to fulfil their market entry strategy?
- What options are available to MNOs for 5G deployment?
- Which technological challenges do MNOs face, and what should they consider as they plan their roll-out strategies?
- What makes each spectrum band distinct, and what are the challenges and opportunities with each?

WHO SHOULD READ THIS REPORT
- Network strategy executives or CTOs within mobile operators that want to understand the drivers and deployment trends of their peers.
- Business and product strategy executives in vendor companies that offer or develop 5G hardware and software.
- Investors in start-ups or listed companies that specialise in these technologies.
- Officials in open-source or standards organisations that focus on these technologies.
Executive summary

Analysis and recommendations

5G is different: why ‘taming’ 5G will be more difficult than previous generations

NSA architecture implications: investment will be leveraged for SA

Future networks: challenges and opportunities for vendors and operators

Appendix

About the author and Analysys Mason
Executive summary

MNOs are under pressure to launch 5G, but there is little clarity on how best to harness the technology to meet business goals. MNOs must define a 5G business strategy, including the use cases that will deliver the strongest business benefits, and then work with vendors to choose the 5G network architecture that will best support the stepwise deployment of these use cases.

Many MNOs are under competitive and investor pressure to deploy 5G networks soon, but few have solid business reasons or investment cases for doing so. MNOs should not underestimate the number of possible deployment options or the associated challenges. The technology needed to deliver all the 5G use cases is far more complex than that for the previous generations of networks, and it is not yet fully available. However, MNOs should not wait until the full end-to-end technology is available to plan their deployment strategies for the 5G use cases that support their wider business strategies.

**KEY RECOMMENDATIONS**

1. MNOs must choose the 5G network architecture to support the use cases that will offer the strongest business benefits.
2. The 5G core will be cloud-native and complex; MNOs must begin planning early to understand the required changes.
3. Vendors should engage their MNO partners to adequately plan their migration roadmaps from an NSA to an SA architecture and to minimise fragmentation and other risks.

![Diagram showing the phases of 5G deployment and the associated risks and benefits.](source: Analysys Mason)
Contents

Executive summary

Analysis and recommendations

5G is different: why ‘taming’ 5G will be more difficult than previous generations

NSA architecture implications: investment will be leveraged for SA

Future network: challenges and opportunities for vendors and operators

Appendix

About the author and Analysys Mason
**Challenge:** MNOs are under pressure to launch 5G, but there is little clarity on how best to harness the technology to meet business goals

4G networks meet current consumer mobile needs, but MNOs are under competitive and investor pressure to deliver 5G soon. They must understand the challenges associated with this new technology and plan according to their business needs.

A change of mobile generation happens nearly every 10 years. 3G services were launched in the early 2000s and 4G in 2010. Compared with previous generations, 4G delivers a significant increase in network capacity and an improved user experience to meet current consumer demands, yet the industry is still quickly advancing its plans for 5G.

To allow a few fast-moving mobile network operators (MNOs) to launch 5G in 2019 instead of 2020, the standards body split Release 15 specifications into two phases. It brought the first release, referred to as ‘non-standalone’ (NSA), forward to December 2017 and completed the second release, the standalone (SA), in July 2018.

To deliver the multi-gigabit speeds promised by 5G, new spectrum in C-band and millimetre-wave (mmWave) will be required and for that, new auctions must take place. In addition, to fully utilise the capacity provided by these new bands, new massive multi-input, multi-output (mMIMO) antennas must also be deployed.

Many MNOs are under competitive and investor pressure to deliver 5G services soon. Nevertheless, many do not yet fully understand how new investment will help them to meet their business goals.

Figure 2: MNOs must choose architecture according to business need

---

**Source:** Analysys Mason
Solution: MNOs must define a 5G business strategy and then choose a 5G network architecture that supports the deployment of prioritised use cases

MNOs must not wait for a full end-to-end 5G roll-out. Delivery of an initial use case, such as eMBB or FWA, will reduce complexity and investment will be leveraged for future use cases.

5G is different from previous wireless network generations: MNOs have the opportunity to embrace new use cases beyond just enhanced mobile broadband (eMBB) to deliver benefits. However, new technologies are more complex to deploy and manage, and automation and virtualisation will be required to increase efficiency and deliver cost savings.

Given the complexities involved (and taking into consideration market conditions and the competitive environment), MNOs must first define the best business strategy for them, and then define a deployment strategy to inform how investment can be phased to meets their business goals.

NSA architecture presents MNOs with a faster time-to-market strategy. It uses a 4G network as an anchor to quickly deliver eMBB or fixed-wireless access (FWA). The technology and spectrum investments needed to support NSA will be leveraged when future use cases are rolled out using SA architecture.

SA architecture. Use cases that require ultra-reliable, low-latency communications (URLLC) and massive machine-type communications (mMTC) will create more demand on the network and will need an SA Phase II architecture and edge computing, and likely network slicing, but these will not be realised until Release 16 or later.

Figure 3: Ability to support a use case depends on MNO choice of architecture

<table>
<thead>
<tr>
<th>NSA</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use existing 4G architecture</td>
<td>Need to deploy 5G core</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Rapid time to market</td>
<td>- Enables full 5G use cases suite, including URLLC and network slicing</td>
</tr>
<tr>
<td>- No need for new core</td>
<td>- Improved network efficiency</td>
</tr>
<tr>
<td>- Services eMBB and FWA use cases</td>
<td>- Reduced network cost per megabyte of data</td>
</tr>
<tr>
<td>- Devices available in 2019</td>
<td>- Cloud-native core</td>
</tr>
<tr>
<td>- Dual connectivity mode</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Full 5G use case suite not available</td>
<td>- Needs 5G core</td>
</tr>
<tr>
<td>- Migration to SA may prove difficult</td>
<td>- Challenging deployment</td>
</tr>
<tr>
<td></td>
<td>- Devices not available until 2020</td>
</tr>
</tbody>
</table>

Source: Analysys Mason
Recommendations

1. **MNOs must choose the right 5G network architecture to support the use cases that will bring business benefits in a timely manner.**

   There are two possible 5G networks architectures: NSA and SA. While SA will fully support all 5G use cases (including URLLC), its implementation is far more involved, and requires the 5G core. MNOs can implement NSA sooner and with fewer barriers and dependencies than SA architectures. This will allow them to make use of the new spectrum to deliver multi-gigabit speeds using eMBB and FWA use cases.

2. **The 5G core will be cloud-native and complex; MNOs must start planning for it early on and ensure that they understand the required changes.**

   The cloud-native 5G core will use software tools to build, test and deploy microservices in order to deliver the new 5G use cases. MNOs must plan ahead and adapt their organisations and business processes to work in a software-oriented way. This transition will require time and investment in skills training if it is to be delivered with minimal risk.

3. **Vendors should engage their MNO partners to adequately plan their migration roadmaps from an NSA to an SA architecture and to reduce fragmentation, as well minimise risks to their services.**

   There are a number of intermediate 3GPP options for implementing an SA option II architecture. Vendors should support MNOs to plan adequate roadmaps with the understanding that each architecture option will support different RAN and core configurations. While MNOs must support multiple devices on their networks, they and the vendors must avoid fragmentation of the options, which can increase complications and limit vendor support.
Contents

Executive summary

Analysis and recommendations

5G is different: why ‘taming’ 5G will be more difficult than previous generations

NSA architecture implications: investment will be leveraged for SA

Future network: challenges and opportunities for vendors and operators

Appendix

About the author and Analysys Mason
About the author

Roberto Kompany (Senior Analyst) is a member of Analysys Mason’s Telecoms Software and Networks research team and is the lead analyst for the Next-Generation Wireless Networks research programme focusing on strategy and market research. He is also a Cambridge Wireless Special Interest Group (SIG) mobile broadband (MBB) champion and a regular speaker at industry events. Prior to joining Analysys Mason, Roberto worked for Dixons Carphone, where he analysed the effect on the business of shifts in the telecoms market – for example, in terms of mergers, operator KPIs and technology – in Europe and the UK. Previous positions included consultancy, where he helped a variety of clients worldwide with mobile-related projects, such as a capex reduction and developing a 5-year strategy for an incumbent’s wireless infrastructure.

If you have any questions about this research or subscription options, please get in touch web_enquiries@analysysmason.com.
Analysys Mason’s consulting and research are uniquely positioned

CONSULTING
We deliver tangible benefits to clients across the telecoms industry:

- communications and digital service providers, vendors, financial and strategic investors, private equity and infrastructure funds, governments, regulators, broadcasters, and service and content providers.

Our sector specialists understand the distinct local challenges facing clients, in addition to the wider effects of global forces.

We are future-focused and help clients understand the challenges and opportunities that new technology brings.

RESEARCH
Our dedicated team of analysts track and forecast the different services accessed by consumers and enterprises.

We offer detailed insight into the software, infrastructure and technology delivering those services.

Clients benefit from regular and timely intelligence, and direct access to analysts.
Research from Analysys Mason

**Consumer services programmes**
- Mobile Services
- Mobile Devices
- Fixed Broadband Services
- Convergence Strategies
- Video Strategies

**Operator investment programmes**
- Operator Investment Strategies
- Network Traffic
- Spectrum

**Telecoms software and networks programmes**
- Software Forecast and Strategy
- Telecoms Software Market Shares

**Network-focused**
- Next-Generation Wireless Networks
- Video and Identity Platforms
- Service Design and Orchestration
- Automated Assurance
- Network Automation and Orchestration
- Digital Infrastructure Strategies

**Customer-focused**
- Digital Experience
- Customer Engagement
- Monetisation Platforms
- AI and Analytics

**Digital economy programmes**
- Digital Economy Strategies
  - Future Comms

**Operator business services and IoT programmes**
- Large Enterprise Voice and Data Connectivity
- Large Enterprise Emerging Service Opportunities
  - SME Strategies
  - IoT and M2M Services
  - IoT Platforms and Technology

**SMB ICT channels and forecasts programmes**
- Managed Service Provider Strategies

**Regional markets programmes**
- Global Telecoms Data
  - Americas
  - Asia-Pacific
  - Middle East and Africa
  - European Core Forecasts
  - European Telecoms Market Matrix
  - European Country Reports

**DataHub**
- ~2500 forecast and 250+ historical metrics
- Regional results and worldwide totals
- Operator historical data
Consulting from Analysys Mason

REGULATION AND POLICY
- Policy development and response
- Ex-ante market reviews, remedies, costing...
- Universal Service Obligation (USO)
- Scarce resources: radio spectrum management, auction support, numbering...
- Ex-post/abuse of dominance
- Postal sector

TRANSACTION SUPPORT
- Commercial due diligence
- Technical due diligence
- Mergers and acquisitions (M&amp;As)
- Debt and initial public offerings (IPOs)
- Joint-venture structuring
- Mid-market financial sponsors

STRATEGY AND PLANNING
- Commercial expertise
- Technology optimisation
- New digital frontiers

analysysmason.com/consulting