



Cloud-native mobile core networks: operator maturity index

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Executive summary

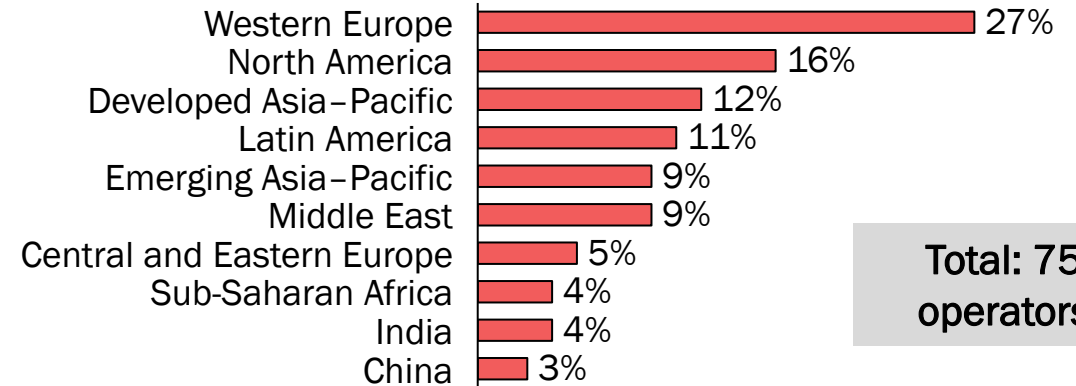
A cloud-native approach allows operators to realize network functions as granular microservices which will ideally run on a horizontal network cloud platform with high levels of closed-loop automation. This approach enables operators to implement loosely coupled systems that are scalable, resilient, manageable and observable.

VMware by Broadcom commissioned Analysys Mason to investigate the state of adoption of cloud-native technologies as applied to the mobile core network domain. As part of this research, we explored key drivers and challenges for operators implementing cloud-native technology and operators' progress towards their cloud-native aspirations. In addition, we examined the approaches that operators are taking to their cloud-native transformations, including their different approaches to cloud-native mobile core automation. We then produced an index that benchmarked operators' cloud-native mobile core adoption progress in terms of their commercial and technological maturity.

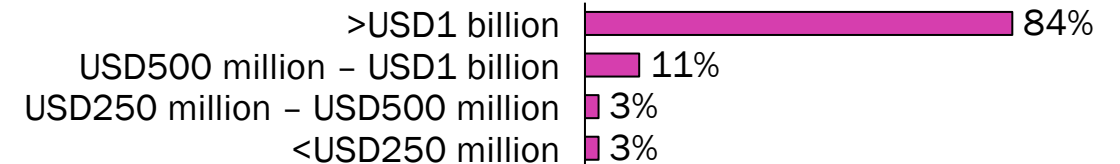
This report showcases key findings from a worldwide online survey of senior decision makers at 75 operators which have already implemented a cloud-native mobile core or are planning to implement one within the next 3 years. It also provides information from complementary interviews with a further ten operators.



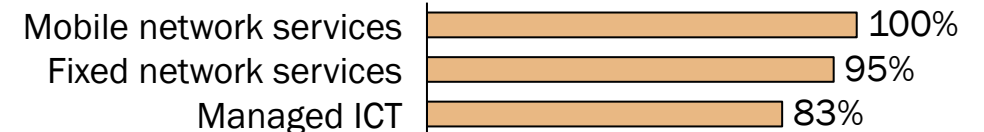
Geography¹



Annual revenue



Services provided



¹ Note that in this report, India and China are excluded from the emerging Asia-Pacific totals.

Key findings



Commercial maturity

- Operators are targeting a range of benefits with their investments in cloud-native mobile cores; for our respondents, the most important drivers were improved operational efficiency and the ability to create/co-create new services.
- The index leaders¹ have managed to solve internal hurdles to their cloud-native transformation and have achieved high levels of organizational alignment with cloud-native principles. Index laggards continue to struggle with internal hurdles such as a lack of C-suite support and operational complexity.
- External challenges such as vendors' network functions, and the 3GPP specifications they are based on, not being cloud-native enough remain barriers for operators attempting to implement cloud-native mobile cores.
- There is no killer app use case for cloud-native mobile core networks; instead, operators plan to support a broad portfolio of use cases as well as monetizing network APIs.

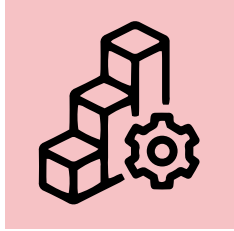


Technological maturity

- Only the index leaders can truly be called “cloud native” – having already adopted both a microservices architecture and a horizontal cloud platform. However, 88% of operators plan to adopt this model within the next 3 years.
- Operators are deploying cloud-native legacy, 5G non-standalone (NSA) and 5G standalone (SA) mobile core networks, although only a small proportion of operators will have made nationwide deployments within the next 3 years.
- Operators' cloud-native maturity is directly correlated with their investment in the automation of their mobile core network. Operators with the highest cloud-native maturity are generally the most automated and exhibit operational benefits as a result.
- Even the most automated operators struggle to maximize benefits from their automation such as deploying software into production more rapidly and reducing the server-to-admin ratio.

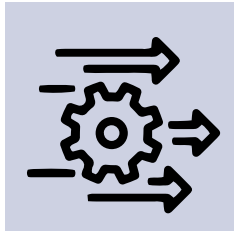
¹ The index leaders are the operators with the most mature implementations of cloud-native technologies for the mobile core domain. Index laggards are the least mature operators with respect to cloud native.

Recommendations



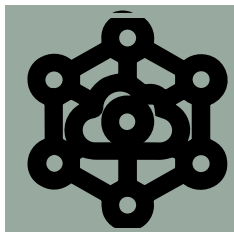
Operators need to accelerate their adoption and scaling of cloud-native mobile cores to realise benefits from this technology; this will require operators' internal executives to align with cloud-native principles.

88% of operators plan to adopt cloud-native mobile cores within 3 years, however, this timeline will be challenging to achieve for the 39% of operators that currently have neither a microservice architecture or a horizontal platform for network functions. In addition, once operators have deployed cloud-native mobile cores, they will need to rapidly scale deployments nationwide to begin generating a return on their investments. Therefore, all operators will require strong internal cloud-native leadership.



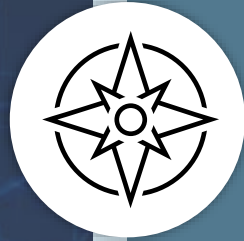
Operators need a common horizontal cloud-native platform for the hosting and automation of mobile core networks to maximize operational efficiencies.

Using a horizontal cloud-native platform for networks functions that is common to all network domains and has built-in automation will be essential for delivering the lower operational costs and improved agility promised with cloud-native technology. Cloud specialists with significant R&D resources will be best placed for providing a vendor agnostic platform with these capabilities.

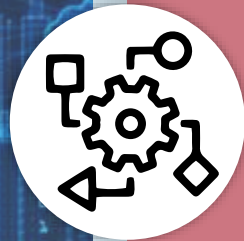


Operators should maximize the potential of their cloud-native mobile cores to support a broad range of revenue generating services.

To maximize their return on investment (ROI) from cloud-native mobile cores, operators should aim to support a comprehensive portfolio of enterprise- and consumer-focused use cases. Implementing a common cloud-native horizontal platform will streamline how operators configure their networks to support numerous use cases. Additionally, operators will need to make available network APIs that will allow third parties to configure networks and provision network slices on demand.



The state of cloud-native adoption in the mobile core domain



Automating cloud-native mobile core networks



Commercializing cloud-native mobile core networks



The state of cloud-native adoption in the mobile core domain



Automating cloud-native mobile core networks



Commercializing cloud-native mobile core networks

Only 21% of operators have adopted the minimum properties needed for their mobile core networks to be considered cloud native

Question: When are you planning to adopt the following properties of cloud-native technology for the mobile core domain?

- No operator is “truly” cloud native yet, as no operator has currently adopted all the properties of cloud-native technology.
- Operators that have implemented both a **microservice architecture** and a **horizontal platform for network functions** meet our minimum requirement to be considered cloud native. Operators that met this minimum definition were also more likely to adopt other properties associated with cloud-native technology.
- Only 21% of operators have adopted both minimum properties while 39% of operators have adopted neither property.
- Most operators have concrete plans to become cloud native soon. 52% of operators will have adopted the minimum properties needed to be considered cloud native within a year and 88% within 3 years.

Minimum properties needed to be considered cloud native

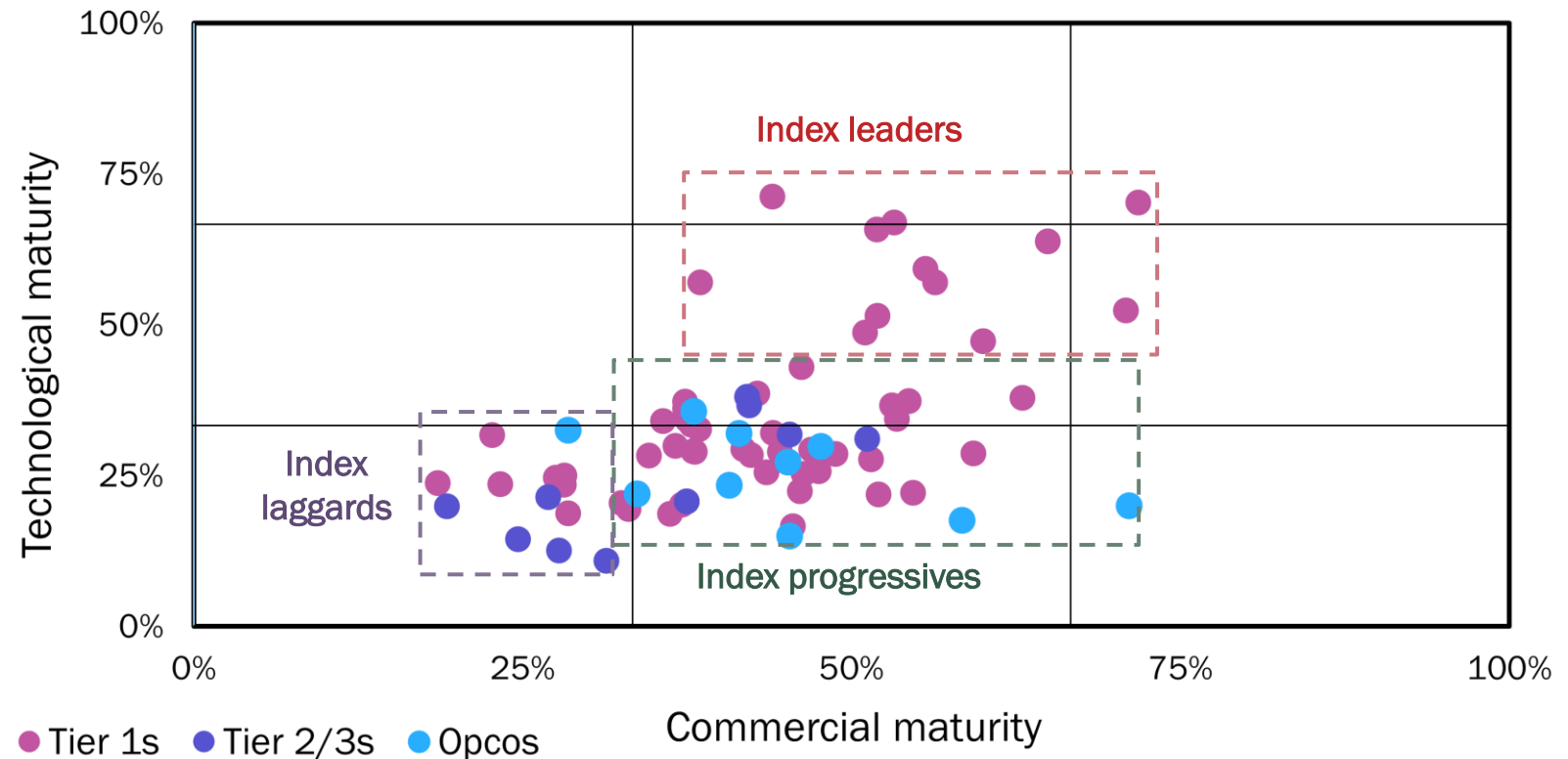
Property	Already implementing	Within the next year	Within the next 3 years
Microservice architecture	45%	81%	96%
Horizontal platform for network functions	37%	59%	91%
Use of containers	48%	79%	95%
Observability	36%	71%	97%
Cloud/hardware-agnostic	35%	73%	97%
Closed-loop automation	32%	67%	92%
Multi-vendor CI/CD pipeline	39%	71%	91%

Percentage of respondents, cumulative total

Index leaders have already commercially deployed cloud-native mobile cores but still have room to improve their maturity

- The index leaders are all Tier-1 operators. These operators have already begun deploying cloud-native networks but need to scale deployments and introduce more automation to improve their technological maturity. From the commercial side, these operators already support a broad range of use cases with their cloud-native mobile cores such as eMBB and URLLC.
- Index progressives currently lag behind the index leaders in terms of technological maturity but have strong plans to deploy cloud-native networks in the next 3 years.
- Index laggards have limited cloud-native ambitions. Their commercial and technological maturity is low because of the low priority they attribute to introducing cloud-native technologies.

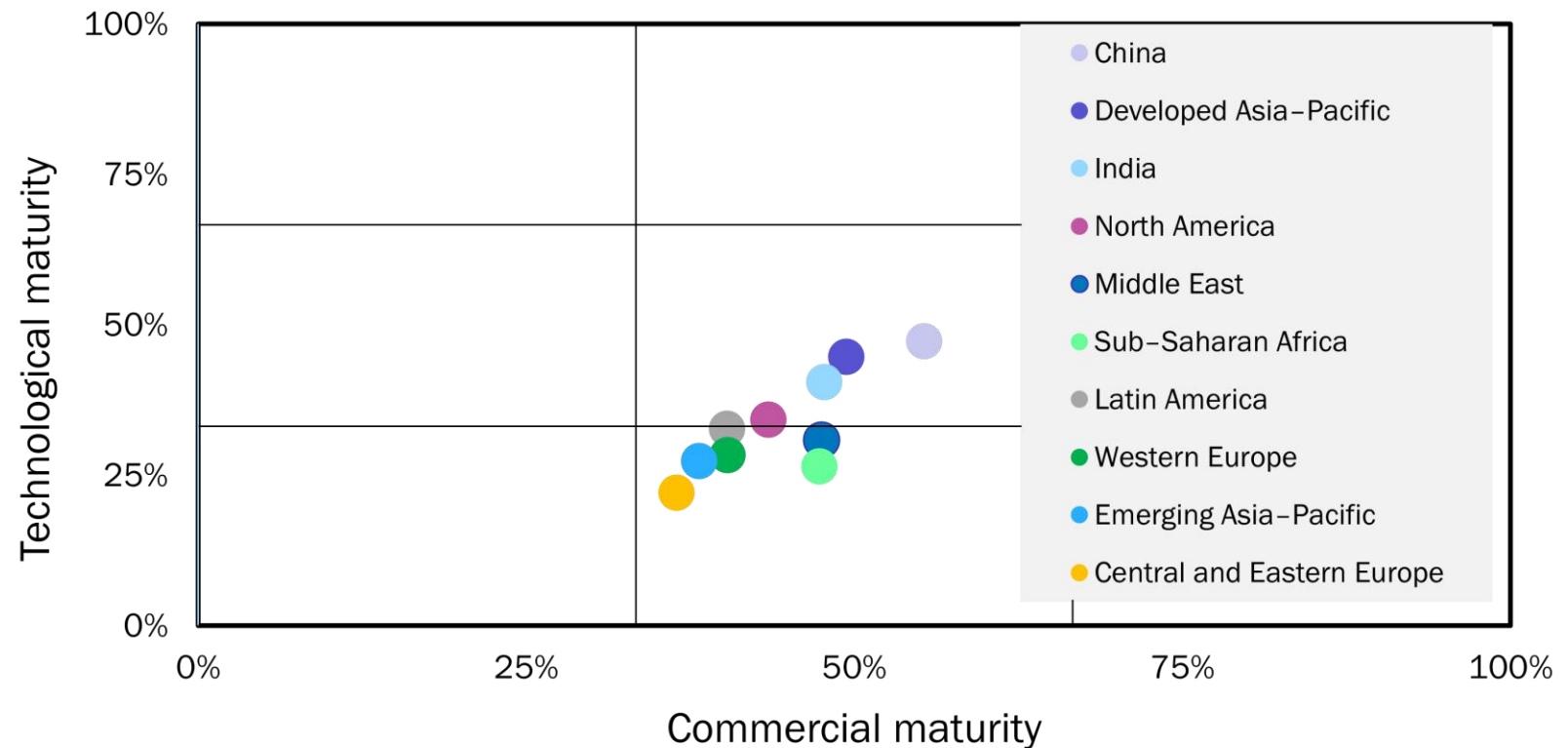
Analysys Mason's index for operators' commercial and technological maturity regarding the adoption of cloud-native mobile cores, worldwide, 2024



Operators from China and developed Asia–Pacific are trailblazers for cloud-native mobile core adoption

- The index leader was a North American operator. However, the high maturity levels of both Chinese operators that participated in the survey resulted in China being the region with the highest average maturity score.
- Operators from developed Asia–Pacific were among the index leaders. These operators are generally more agile and less risk averse when it comes to new technologies. Operators from India are following closely behind.
- Despite their rhetoric about becoming cloud-native, operators from Western Europe were the third-least mature in our index, only just ahead of operators from Central and Eastern Europe and emerging Asia–Pacific (excluding India and China). Western European operators have been hindered by their slow-moving organizational pace and traditional mindsets.

Analysys Mason's index for operators' commercial and technological maturity regarding the adoption of cloud-native mobile cores, average by region, 2024¹

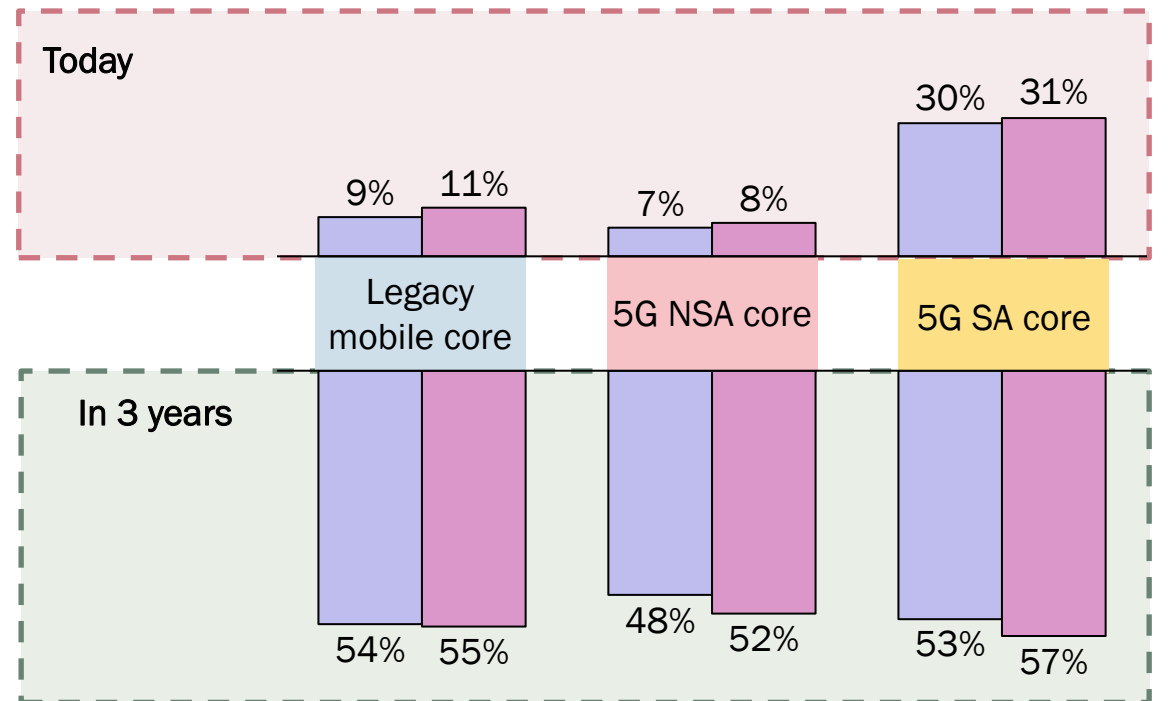


¹ Note that the region average for emerging–Asia Pacific excludes India and China.

Operators are adopting a cloud-native approach for all mobile core network domains

- 16% of operators have already commercially deployed a cloud-native legacy mobile core, 11% a cloud-native 5G NSA core and 15% a cloud-native 5G SA core.¹
- The scale of commercial deployments varies significantly between operators. Some operators have managed nationwide deployments while other operators have deployments that are little more than field trials.
- Marginally more progress has been made in the cloud-native transformation of enterprise cores than consumer cores.
- Operators generally start with making control plane functions cloud native as data plane functions have stricter performance and latency requirements.

Question: At what scale has your cloud-native mobile core between deployed today and at what scale of deployment do you anticipate in 3 years time?
 [Showing the average percentage for respondents that meet our definition of cloud native.]



Percentage of total traffic/subscribers supported by a cloud-native mobile core

Consumer Enterprise

¹ These values are for Analysys Mason's definition of cloud-native. Operators' own definitions of cloud-native may not consider both a microservices architecture and a horizontal platform. According to their own definitions, 56% of operators have already commercially deployed a cloud-native legacy mobile core, 25% a cloud-native 5G NSA core and 35% a cloud-native 5G SA core.

Index leaders have been quick to solve internal hurdles to cloud-native mobile core adoption but continue to face external challenges

- Index leaders have developed the capabilities to deploy and operate cloud-native networks.
- They have also been able to win buy-in for the cloud-native business case from their C-suite executives. These operators especially recognize the ability to create/co-create new services and improve revenue growth as key drivers for adopting a cloud-native mobile core.¹
- Operators at all maturity levels face major external challenges that will remain hurdles until the cloud-native ecosystem matures.

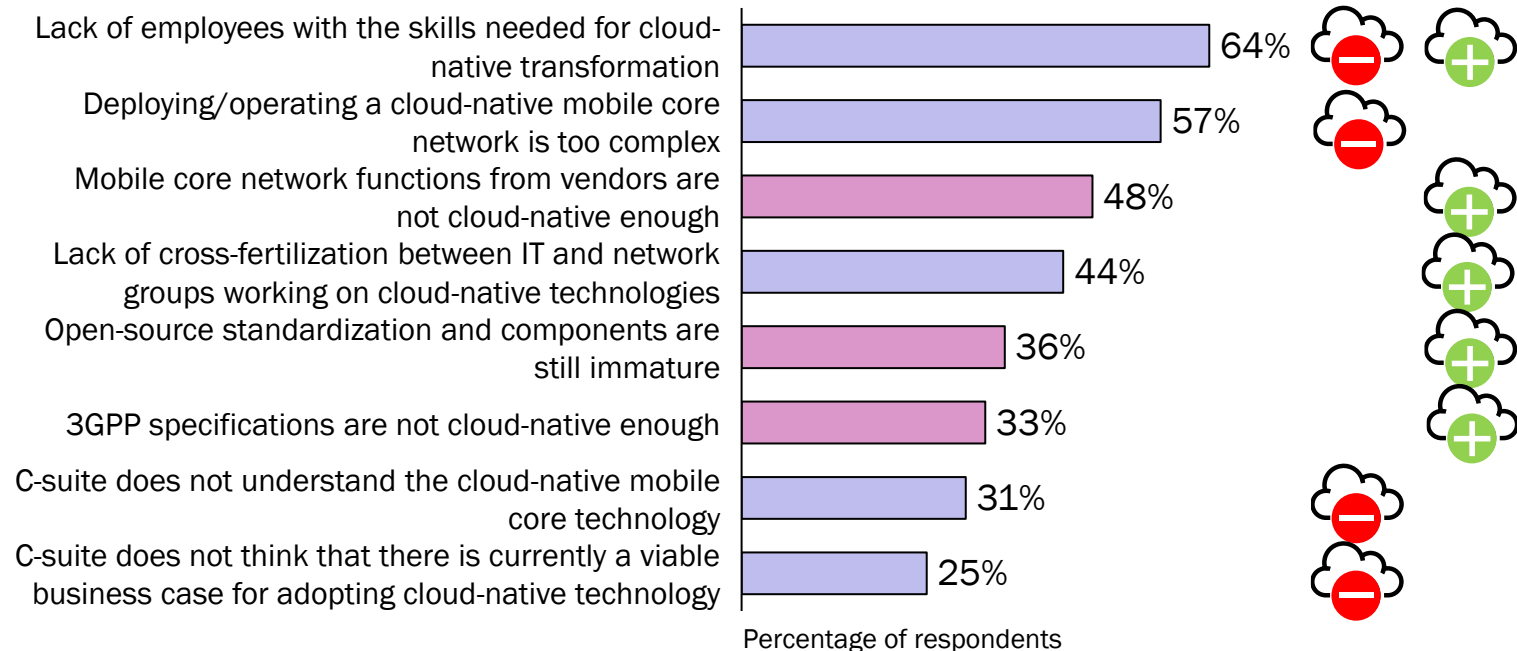
“ The cloud-nativeness of CNFs depends on the vendor and even on the product teams within vendors. We see a lot of things that are not cloud-native at all.

Principal Cloud Architect, Western European operator

Question: Rate the impact of the following adoption hurdles on your progress towards implementing a cloud-native core.

Percentage of respondents rating hurdle as having a high impact, that is, rating the impact as 4 or 5 out of 5

Which operators struggled with each challenge?



Index laggards



Index leaders



Internal challenges



External challenges

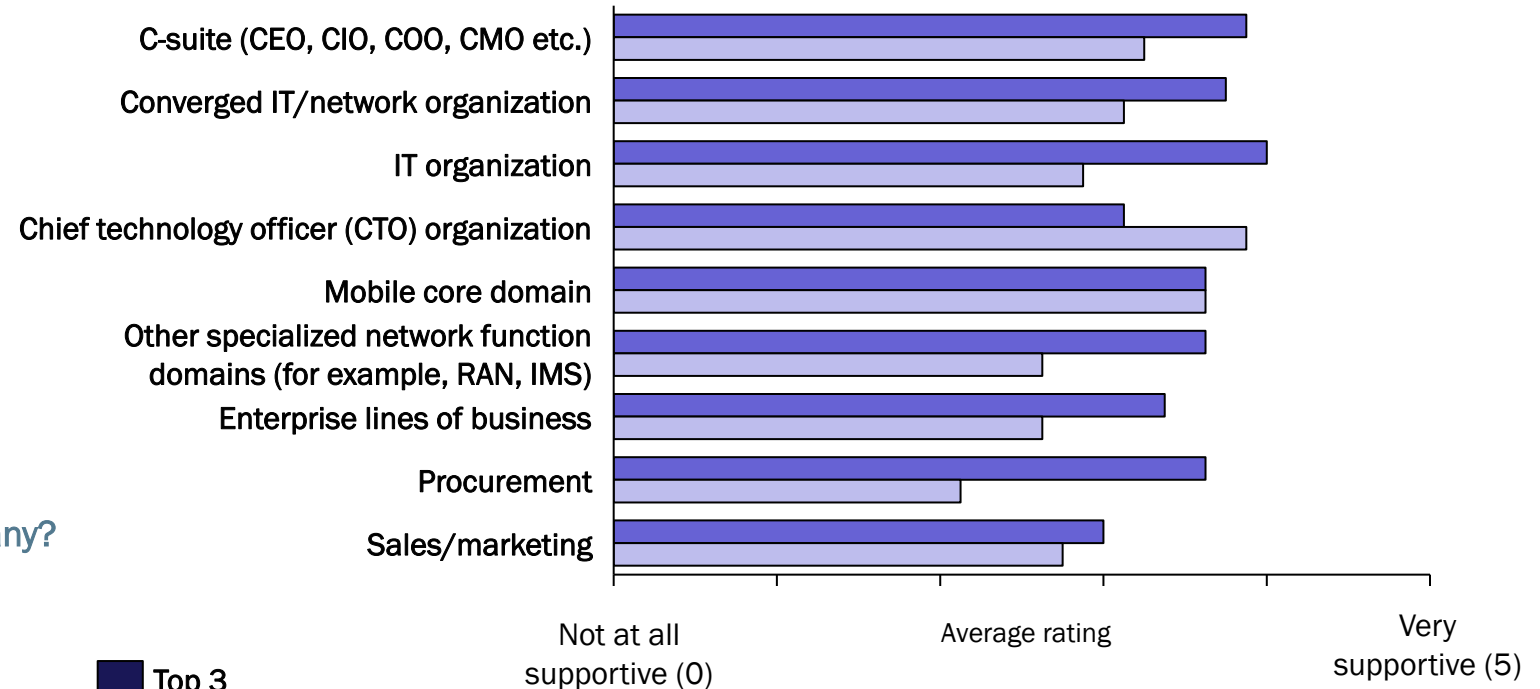
¹ The appendix of this report includes additional information on adoption drivers for cloud-native mobile cores.

Index leaders have been able to gather organization-wide support for their cloud-native transformation efforts

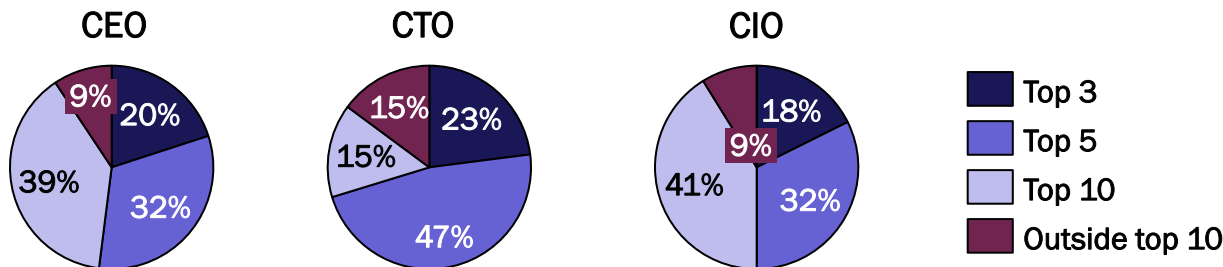
- 45% of respondents said that acquiring cloud-native capabilities was a top 3 strategic priority for at least one of their C-suite organizations.
- Cloud-native transformation begins to move down operators' priority lists once they have successfully deployed a cloud-native mobile core network.
- The index laggards attributed low strategic priority to and struggle to garner support for their cloud-native transformation journeys.

Question: How supportive are each of the following organizations of your adoption of cloud-native technologies in the network?

Average rating attributed to the support offered by each organization

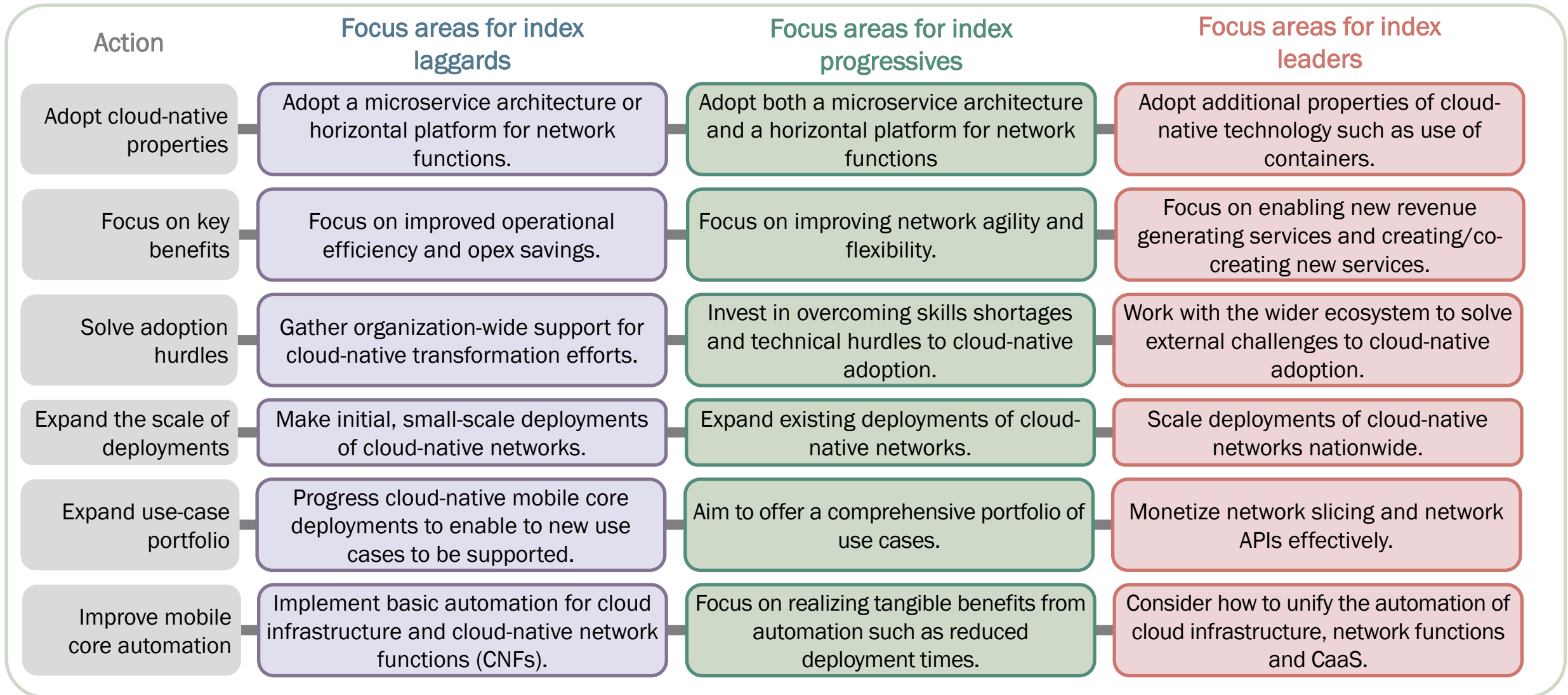


Question: Is the acquisition of cloud-native network capabilities a top 3/5/10 strategic priority for the company?



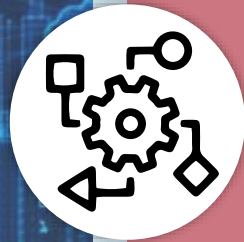
All operators can take steps to improve their cloud-native maturity

How can operators improve their cloud-native maturity?





The state of cloud-native adoption in the mobile core domain



Automating cloud-native mobile core networks

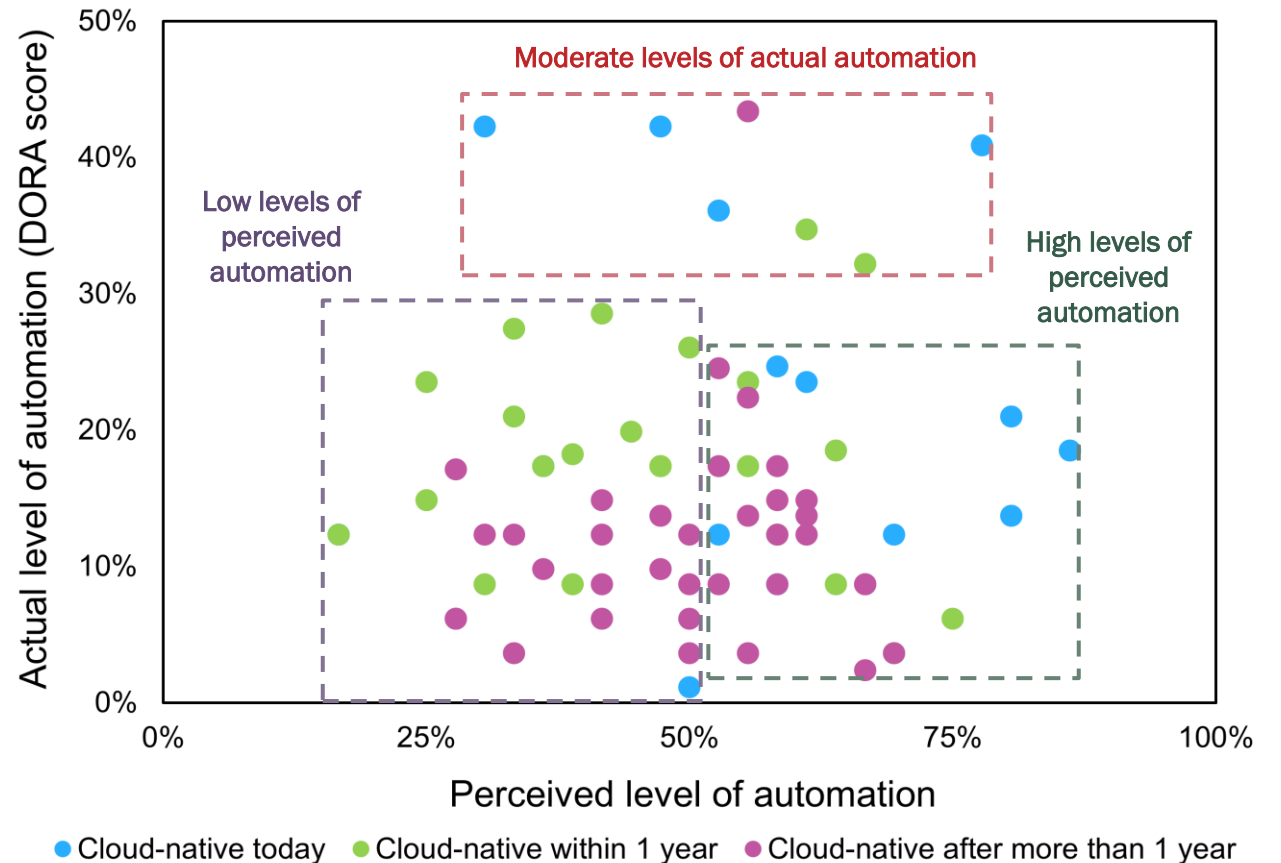


Commercializing cloud-native mobile core networks

Operators have yet to unlock the full potential of mobile core automation

- On average, operators claimed to have automated 45% of cloud infrastructure and 50% of network function day 0/1/2 operational processes for the mobile core domain.
- To determine operators' actual levels of automation, we asked about their performance on the following DORA (DevOps Research and Assessment) metrics:
 1. Deployment frequency
 2. Lead time to changes
 3. Change failure rate
 4. Time to restore service
- Operators' actual levels of automation were generally much lower than their perceived levels of automation. Averaged across all DORA metrics, no operator achieved more than half the maximum possible value for our survey.

Operators' perceived level of automation for cloud infrastructure and network functions versus actual level of automation



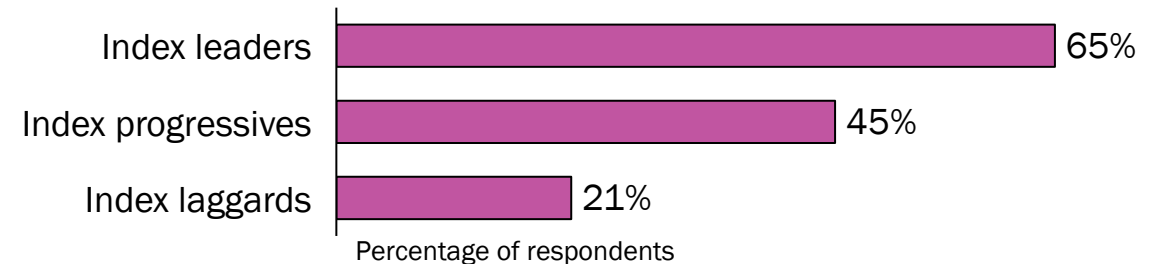
In this chart, operators are classified based on our minimum requirements for cloud-native.

Cloud-native operators are the most automated and therefore derive the greatest benefit from their cloud-native transformation

- Respondents that are already using a microservice architecture and a horizontal platform for network functions have, on average, automated a greater portion of operational processes and use a greater portion of observability data to drive closed-loop automation. They also have greater levels of automated testing in their multi-vendor CI/CD pipelines.
- Consequently, operators adopting the minimum two properties required for cloud-native tended to perform better on operational (and DORA) metrics such as deployment frequency, lead time for changes and time to restore service.
- The index leaders tracked the most operational metrics related to cloud-native automation activities; measuring these metrics is key to improving them.

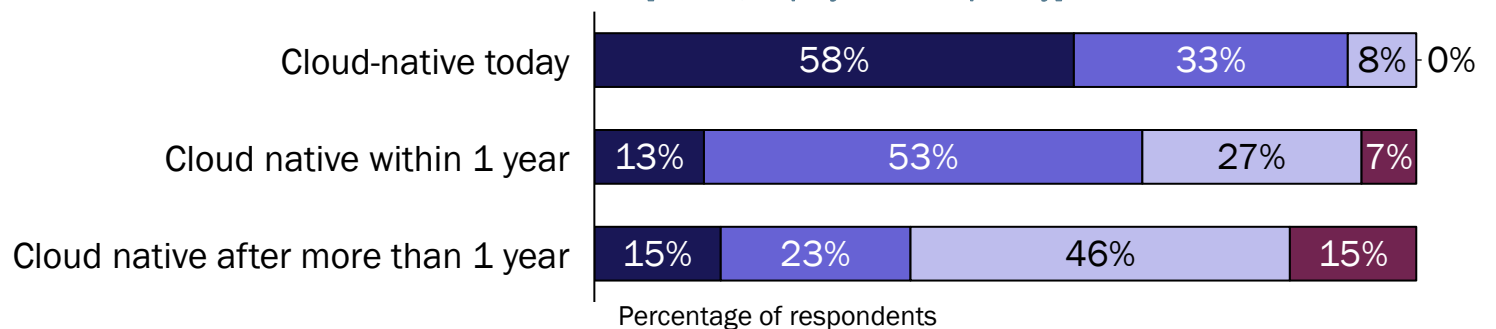
Question: What proportion of observability data is used to drive closed-loop automation for each component of the mobile core?
 [Showing average across cloud-native network functions, cloud infrastructure and CaaS]

[Showing average across cloud-native network functions, cloud infrastructure and CaaS]



Question: How often does your organization successfully release code to production?
 [that is, deployment frequency]

[that is, deployment frequency]



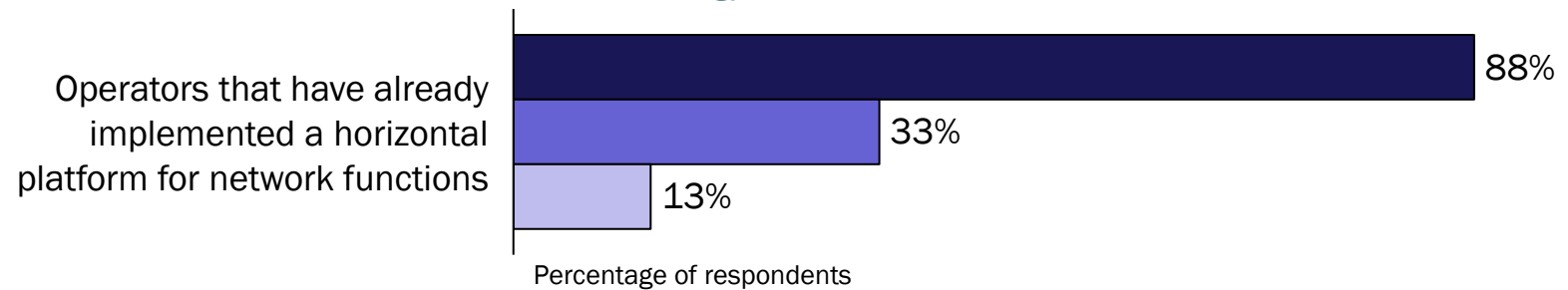
Adopting a horizontal platform for network functions enables operators to achieve higher levels of automation

- Operators with the highest DORA score, that is, the highest actual levels of automation, were most likely to have implemented a horizontal platform for network functions. They were also more likely to be using platforms from software only cloud platform vendors, presumably as operators frequently sourced their horizontal cloud platforms from these vendors.
- The DevOps practices of operators that are more advanced in the adoption of horizontal platforms, including those from software-only cloud platform vendors, are more successful as these operators are best positioned to benefit from cloud-native properties such as observability and automated CI/CT/CD.

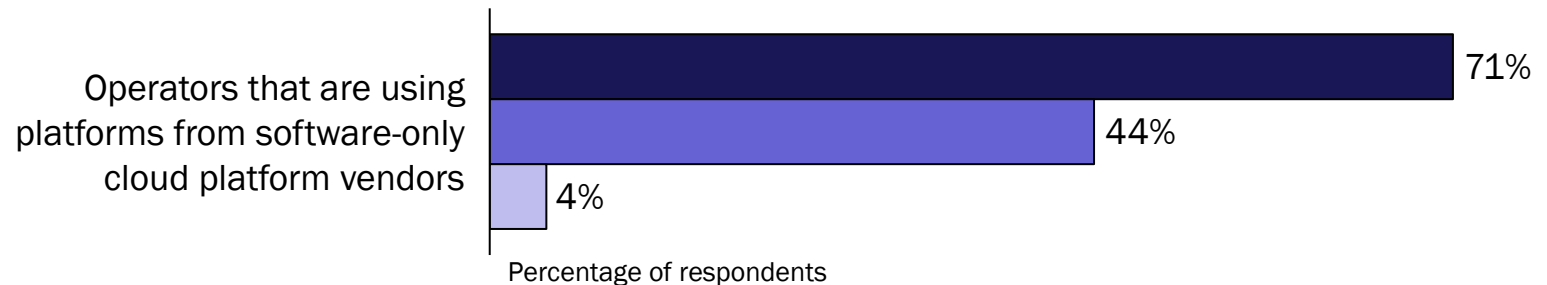
“ Having a common platform across not just our cores, but the RAN as well, has unlocked significant automation capabilities for us.

VP of Technology Development, North American operator

Question: When are you planning to adopt the following properties of cloud-native technology for the mobile core domain?



Question: Who are/will be your cloud-native network infrastructure providers for your cloud-native mobile core?



Legend for both charts:

- Operators with highest DORA score
- Operators with mid-range DORA score
- Operators with lowest DORA score

The mobile core automation landscape is fragmented with no single favored approach to automating cloud-native mobile core networks

- Operators are combining multiple tools and approaches to automate their mobile core networks.
- This is because operators' approaches to the automation of cloud infrastructure, network functions and CaaS are siloed and often rely on different tools.
- In addition, operators are adopting new ways of automating cloud-native mobile core networks, such as using Kubernetes-based declarative automation, while also continuing to rely on the approaches used for previous generations of network clouds, such as ETSI MANO.
- There is clear opportunity for the market to provide a common automation platform that will replace siloed approaches to automation and enable operators to unify the automation of cloud infrastructure, network functions and CaaS.

Question: What approaches are you using/planning to use for the automation of your mobile core?

Approach/tool	Operators with the highest DORA score	Operators with mid-range DORA score	Operators with the lowest DORA score
ETSI MANO	33%	16%	8%
Public cloud infrastructure vendor-proprietary (AWS, Azure, Google Cloud)	46%	31%	25%
Scripting tools (Ansible)	46%	29%	13%
Kubernetes-based declarative automation	38%	36%	0%
In-house grown solution	46%	38%	46%
Network-function vendor-proprietary	42%	47%	29%
OSS/orchestration vendor-proprietary	21%	18%	8%
Cloud Infrastructure vendor-proprietary	13%	13%	0%
Percentage of respondents			
Average number of approaches/tools per operator	2.8	2.3	1.3



The state of cloud-native adoption in the mobile core domain



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Commercializing cloud-native mobile core networks

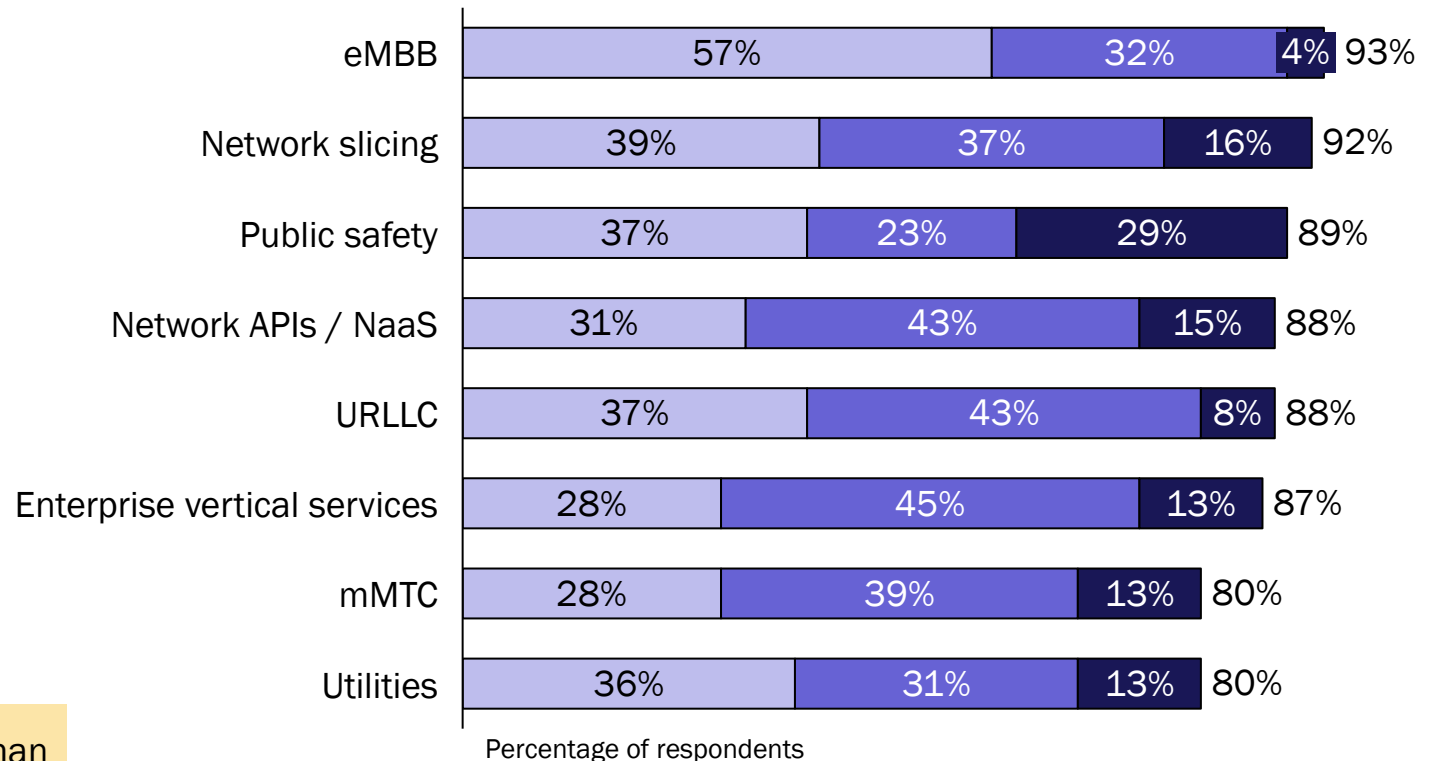
Operators will support a wide variety of use cases to generate a return on their investment from their cloud-native mobile cores

- 57% of operators already support three or more use cases with the cloud-native mobile core with operators that already meet our minimum definition of cloud native supporting the most use cases on average.
- Operators of all maturity levels already support consumer-focused use cases. However, index leaders are also supporting enterprise-focused use cases such as enterprise vertical services, public safety, mMTC and utilities, today. Many index leaders already offer comprehensive portfolios of both consumer- and enterprise-focused use cases.
- Automation will be key to supporting many of these use cases.

“Enterprises require higher reliability and lower latency than they are getting from our rivals ... we need to make sure our network is indisputably better, which we believe it is, thanks to our automation.”

VP of Technology Development, North American operator

Question: What use cases do you currently support with your cloud-native mobile core and what use cases do you plan to support in 3 years?



- Currently support
- Plan to support in 3 years
- Plan to support after more than 3 years

Operators plan to quickly capitalize on cloud-native mobile core-supported network APIs

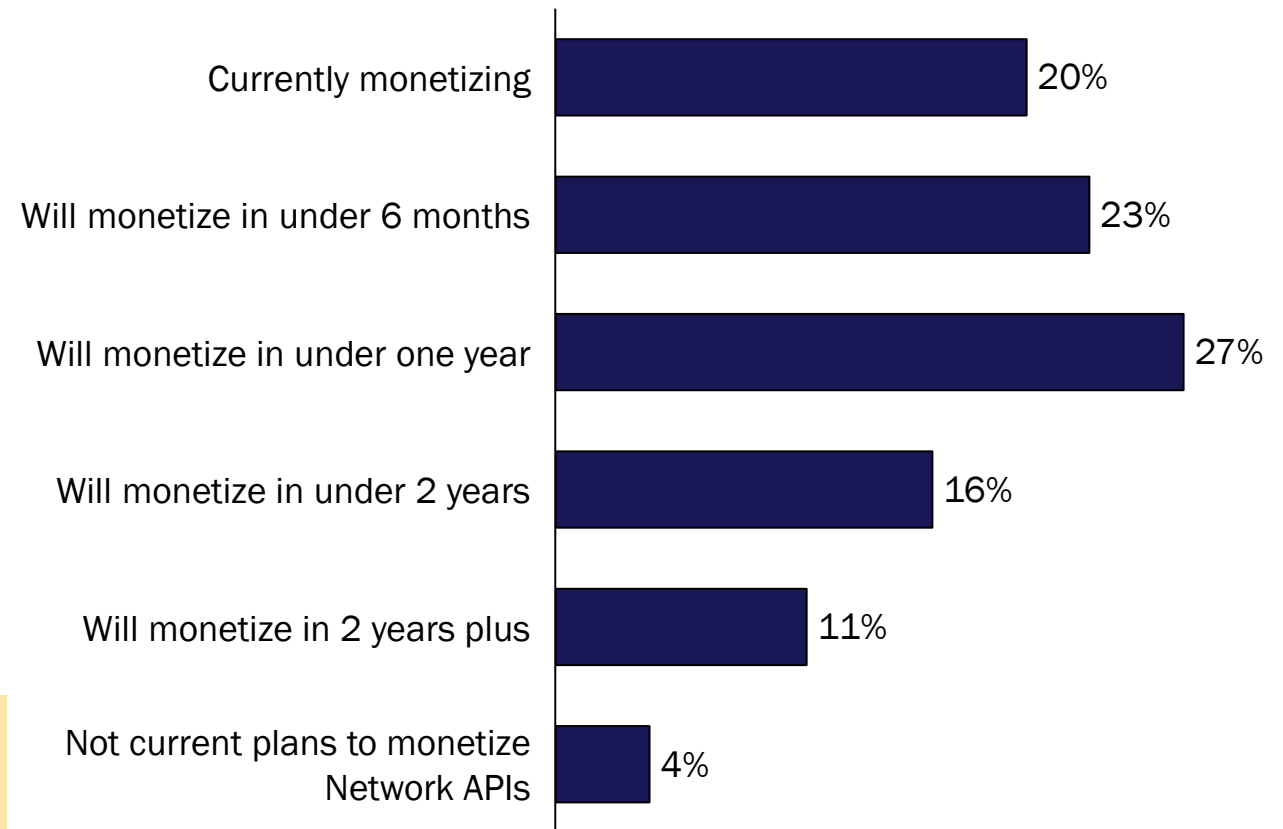
- Cloud-native mobile cores will support open network APIs by design. Operators have plans to expose these network APIs to internal engineers and application developers, both internally and externally.
- Operators' plans to monetize network APIs that are exposed externally are already quite advanced for operators of all maturity levels: 85% of operators plan to monetize these API in the next 2 years.
- Offering network slices to customers/enterprises will go hand-in-hand with exposing network APIs to external applications. This is because applications will need to be able to use API calls to configure network slices on-demand.

“

We want to expose cloud-native network APIs to third-party developers, mainly in a private 5G context, to offer enterprises greater flexibility.

Director of Cloud Strategy and Architecture, Western European operator

Question: What is your planned timeline for monetizing network APIs that act on the mobile core?



% of respondents



Appendix

1.

Drivers for cloud-native mobile core adoption

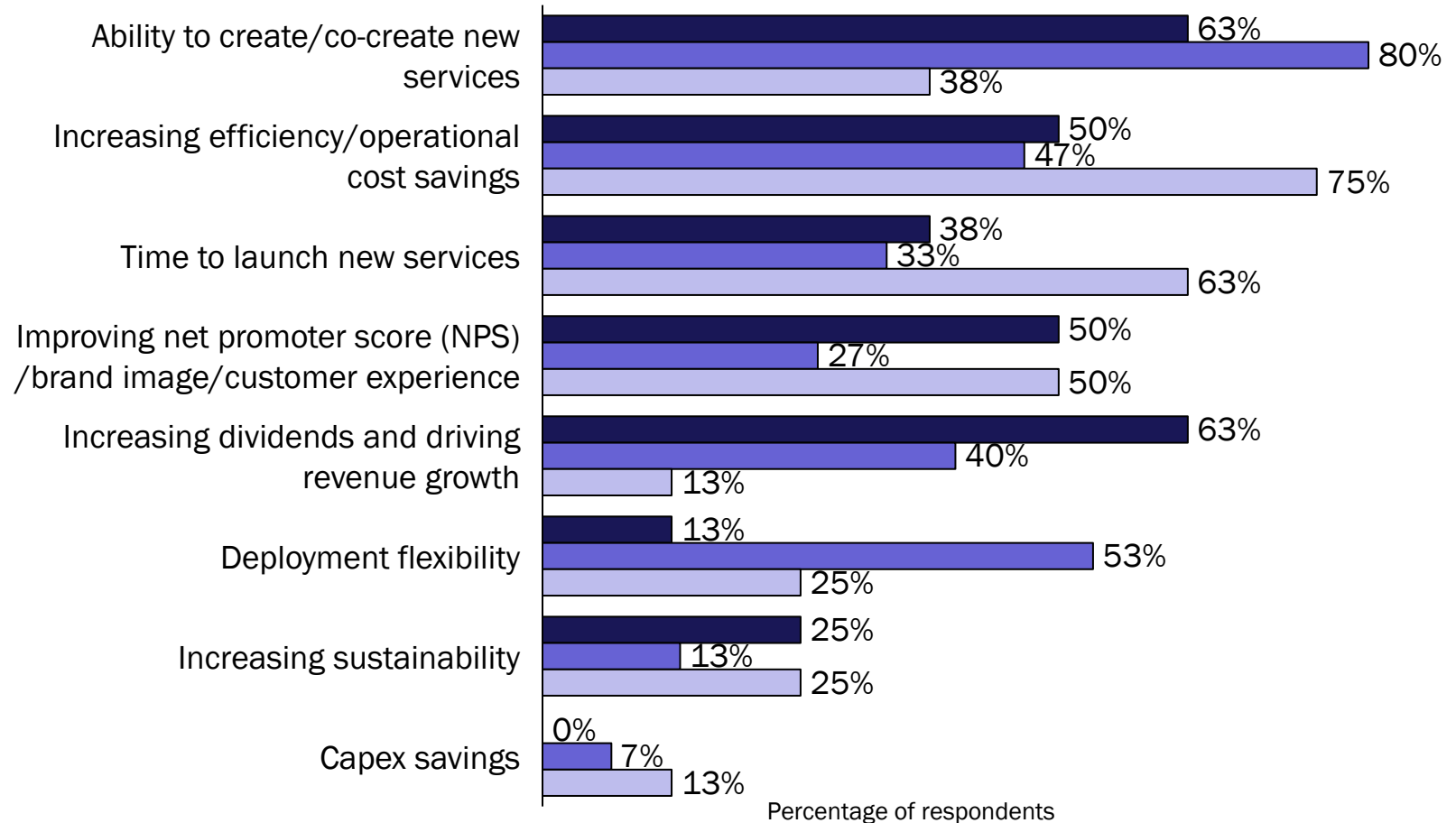
2.

Deployment models for cloud-native mobile 5G SA cores

Index leaders consider the ability to create/co-create new services and drive revenue growth as key drivers for adopting cloud-native

- 63% of index leaders considered driving revenue growth as a top-3 driver for the introduction of a cloud-native mobile core, compared to just 13% of the index laggards.
- In addition, compared to other operators in our index, there was significantly less interest from the index laggards in the ability of cloud-native networks to enable them to create or co-create new services.

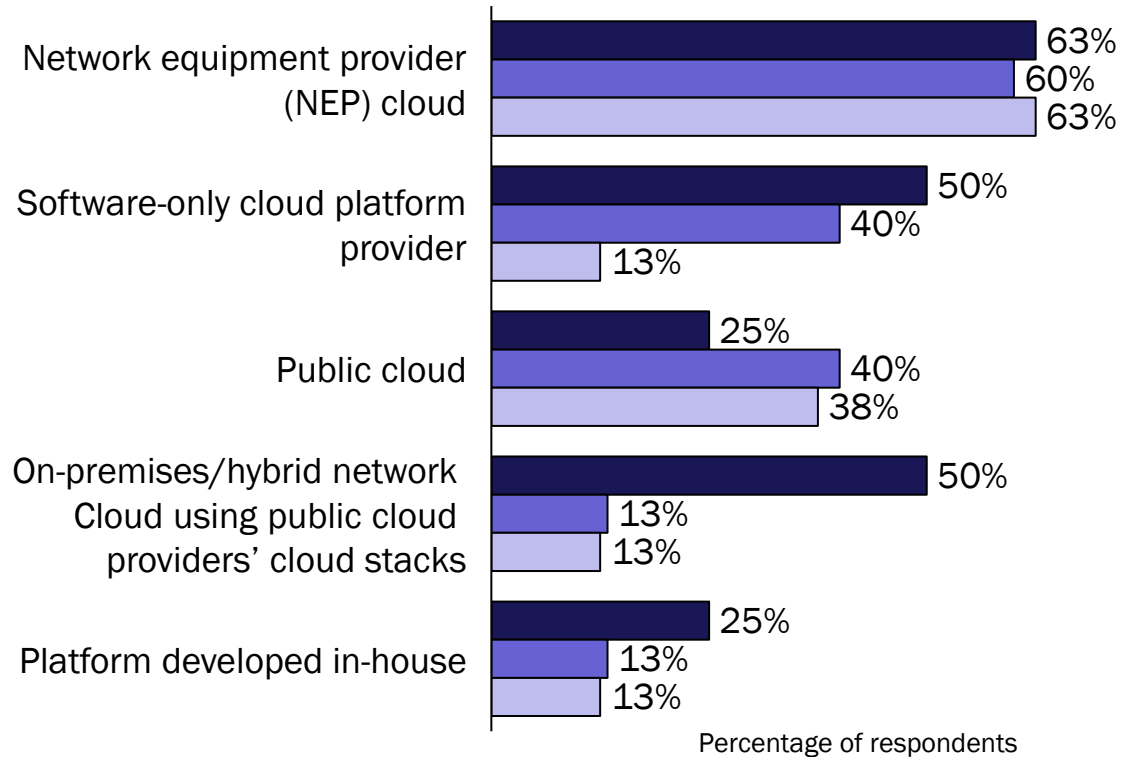
Question: Rank your top-3 drivers for introducing a cloud-native mobile core.



■ Index leaders ■ Index progressives ■ Index laggards

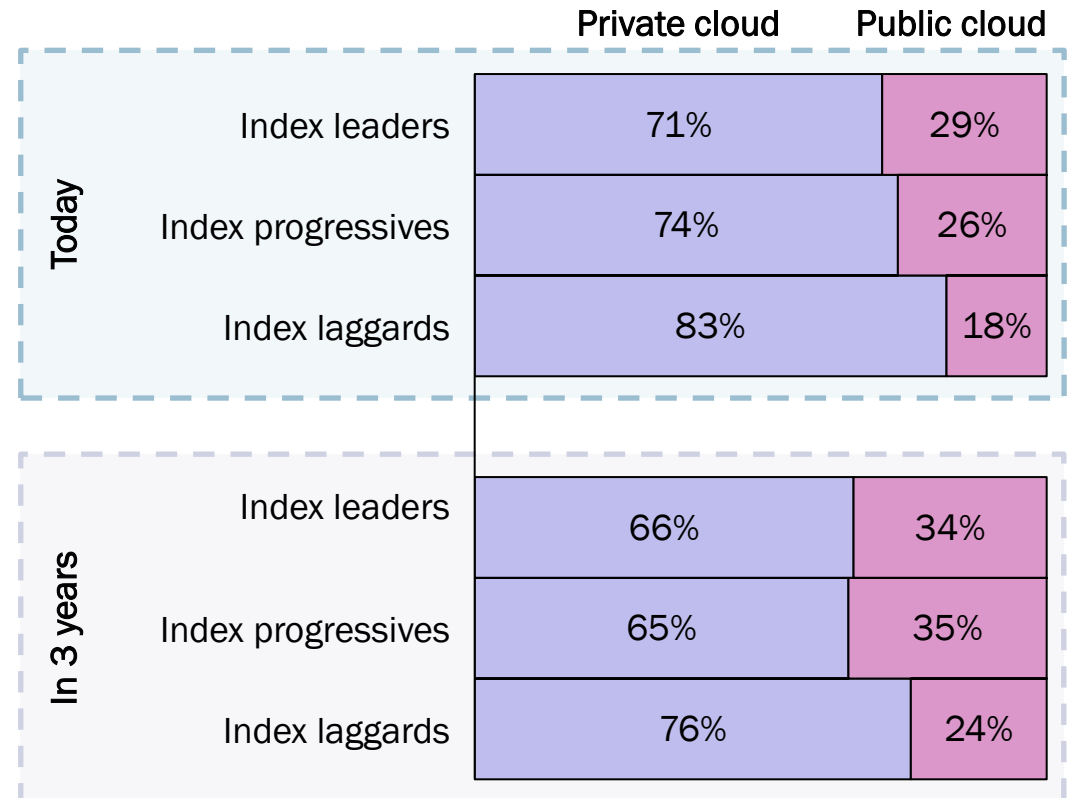
Operators' multi-cloud ambitions will result in them needing a common platform to stitch together their different clouds

Question: Who are/will be your cloud-native network infrastructure providers for your cloud-native 5G SA core?



Values do not sum to 100% for each segment as operators are experimenting with different models for different cores (for example, using public clouds for secondary or enterprise cores).

Question: Which of the following cloud environments do you plan to use for deploying your cloud-native 5G SA mobile core network functions today and in the next 3 years?



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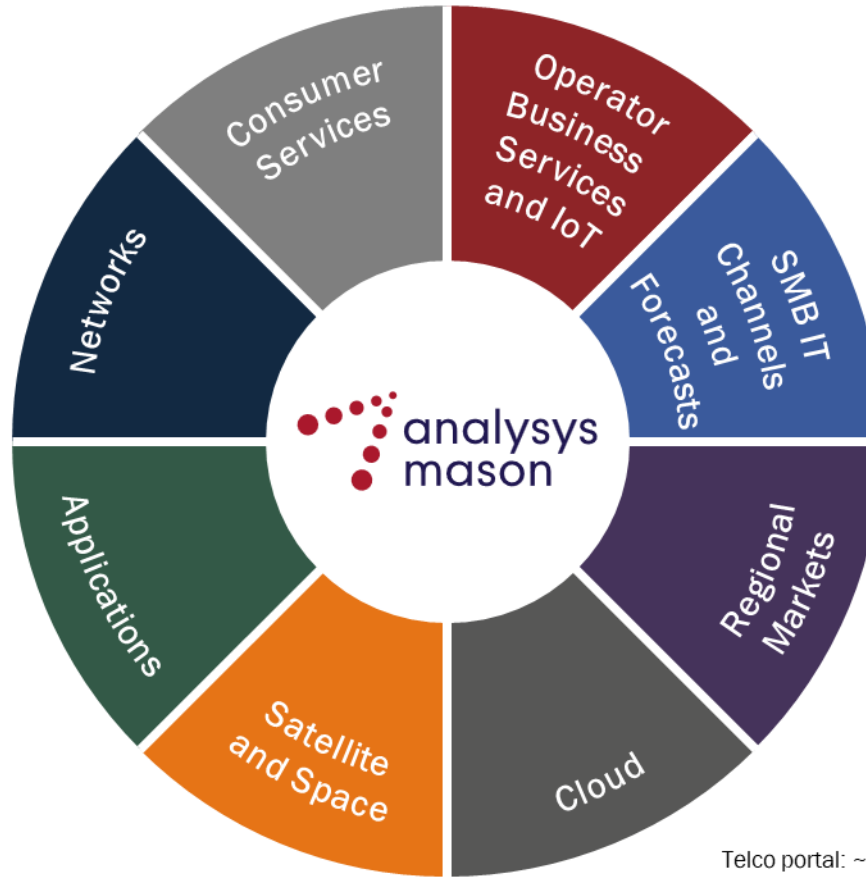
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Applications
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 Digital Experience
 Automated Assurance
 Service Design and Orchestration
 Telecoms Software Market Shares
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Satellite and Space
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 Satellite Capacity
 Satellite Infrastructure
 Satellite Mobility



Operator Business Services and IoT

- Enterprise Services
- SME Services
- IoT Services
- Private Networks
- Cyber Security

SMB Technology Forecaster

Regional Markets

- Global Telecoms Data and Financial KPIs
- Americas
- Asia-Pacific
- Middle East and Africa
- European Core Forecasts
- European Telecoms Market Matrix
- European Country Reports

Cloud

- Cloud Infrastructure Strategies
- Data, AI and Development Platforms
- Edge and Media Platforms
- Multi-Cloud Networking

DataHub

- Forecast data for 80 countries
- Telco portal: ~2800 forecast and ~320 historical metrics
- SMB Technology Forecaster portal: ~120 000 forecast metrics

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Our areas of expertise



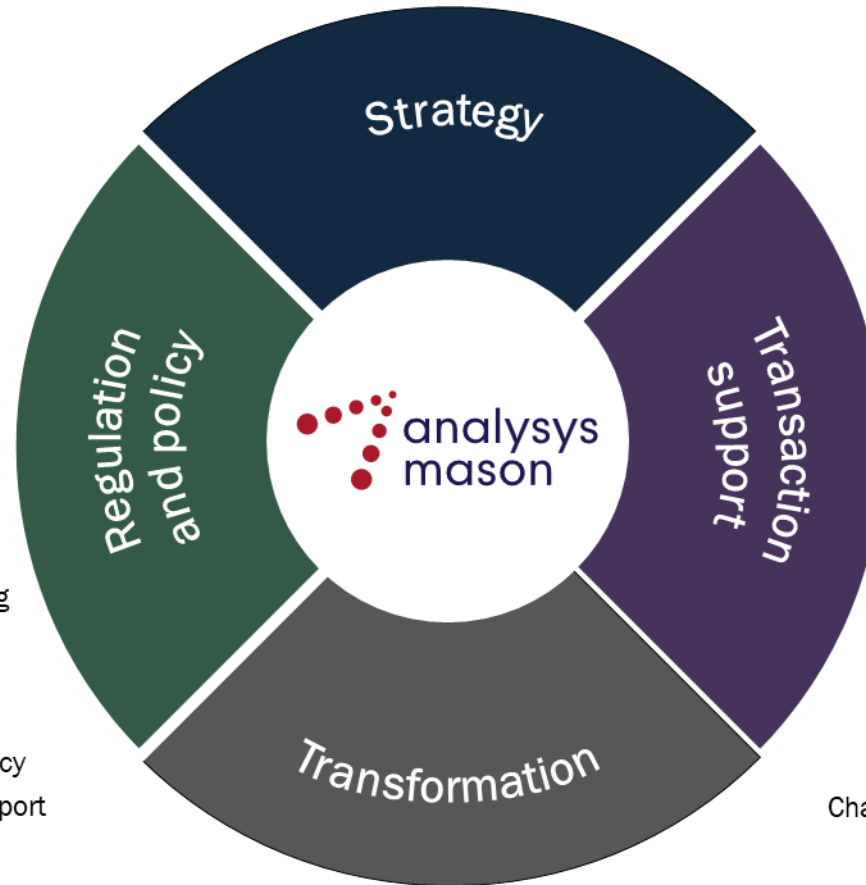
Strategy


- Corporate growth strategy
- Business unit strategy
- Infrastructure strategy



Regulation and policy

- Network and platform
- Public sector broadband intervention
- Accelerating digital transformation of society
- Price controls and cost modelling
- Regulatory accounting
- Regulatory benchmarking and analysis
- Spectrum management and policy
- Expert witness and litigation support
- Postal regulation and policy



- ## Transaction support
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- Commercial due diligence and market review
 - Technical due diligence
 - Post-merger integration
 - Periodical business monitoring and loan technical advisory
 - Opportunity scouting and pre-deal support

- ## Transformation
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- Business transformation
 - Digitalisation
 - Operational excellence
 - Data, BI, steering and insights
 - Change and programme management
 - Sustainability

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