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White paper

Using public cloud to tackle the top telecoms challenges in managing data and analytics

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1. Introduction

This paper looks at the key challenges that telecom operators face when using data and analytics within their organizations and the advantages of using public cloud solutions in solving them. Data is the new 'oil' in a digital world, but telecom operators are challenged with processing, refining, and using data efficiently. Critical telecoms processes and metrics already enable operators to manage their operations and resources, but to advance operators must improve their ability to use the data they have more effectively. Advances in data and analytics have become central to operators as they implement transformation projects to deliver new capabilities that include:

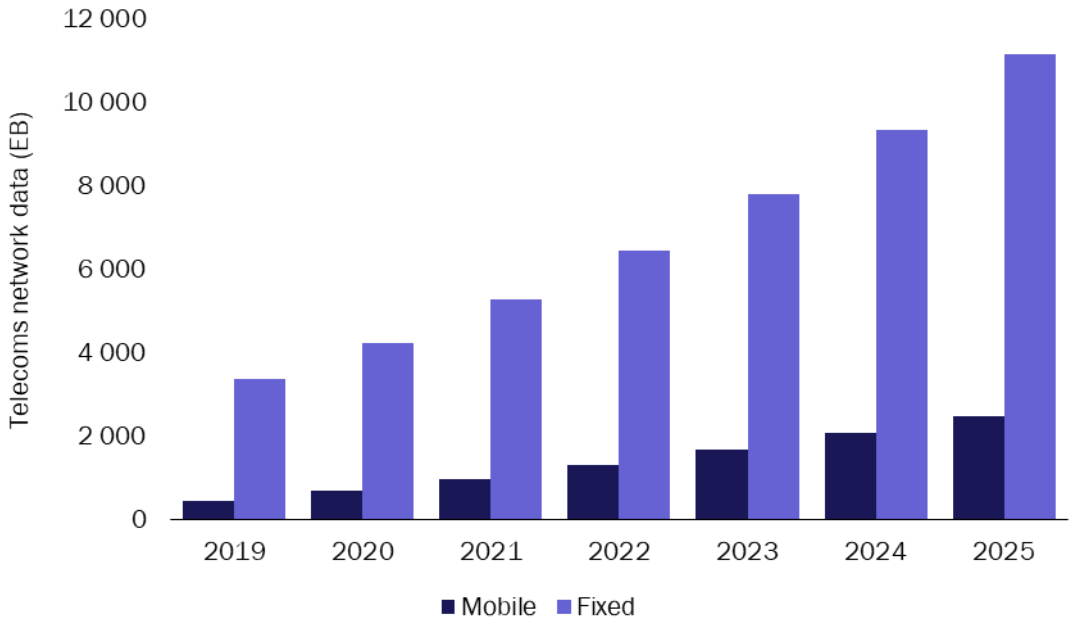
- hyper personalization to create more compelling offers to drive up average revenue per user (ARPU)
- tracking the impact of network errors, customer service interactions and competitive products on each customer's experience over time to predict their likelihood to churn and take proactive actions.
- extreme automations to create an efficient and 'lights-out' operations, helping to reduce costs and provide faster and more reliable services for telecoms service providers.

Telecom operators already have their own massive scale data storage and compute infrastructure but have significant challenges to right-size their infrastructure and deploy the latest tools and technologies. New transformational projects that use machine learning (ML), for example, may need temporary support for large data sets and infrastructure to develop new algorithms. Such data sets will no longer be required when the project is completed, so building infrastructure for this peak requirement is not efficient. An ability to quickly experiment or create ad hoc reports also drives the need for infrastructure for a short period of time.

Data and analytics infrastructure need to be continuously refreshed as data requirements change and data volumes grow. Data volumes are growing worldwide at 20% CAGR (see Figure 1), driven by the rise in digital services, increasing device numbers and a growing population of subscribers who are willing and able to embrace online digital services. Smartphones account for more than 60% of all handsets worldwide and are expected to account for nearly 80% by 2024 adding yet more data about consumers and their habits on which telecom operators can act.

Enterprise services are also driving up data usage. New 5G services focused at supporting enterprise solutions along with IoT and edge devices will add dramatically to data volumes and connections that telecom operators may wish to use to gain insights to inform the creation of new service offerings. Complex new service offerings and the need for high levels of self-care and automation will drive new applications and requirements for data and analytics.

Figure 1: Telecoms network data traffic by type, worldwide, 2019–2025



Source: Analysys Mason

Telecom operators have always strived to increase the levels of automation in their business processes. Current digital transformation projects are aimed at reducing or containing costs, improving resource utilization, and helping to deliver better customer experiences. 5G networks have been rolled out in over 100 operators worldwide. A high level of automation is needed to prevent increased operational costs introduced in using new disaggregated components and in supporting new services. The challenge for operators is to quickly scale their data infrastructure while trying to save costs.

Data is central in ML training of new data models that are increasingly needed to build sophisticated automation. Telecom operators are now looking to processes and systems run by web hyperscalers as examples for their own operations to support this capability, as opposed to their established methods and capabilities. Operators are using web hyperscale tools and approaches to help to support their transformation projects and to future-proof themselves against further technology refreshes.

This report describes the three key challenges for operators and how cloud addresses them.

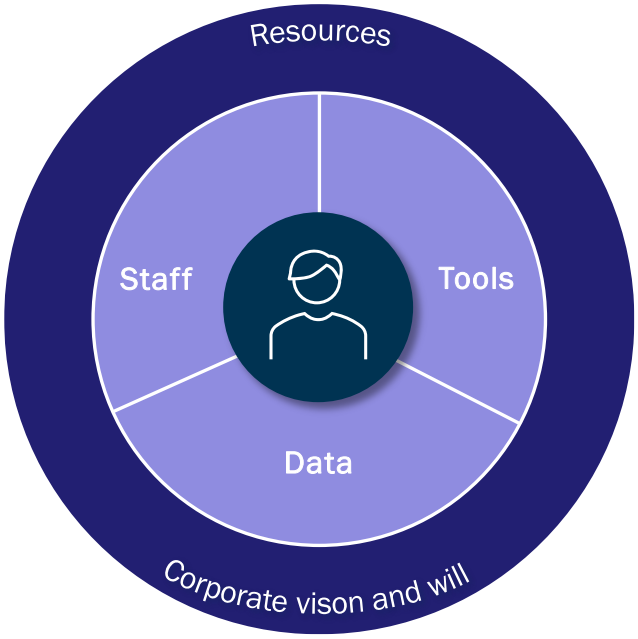
- Section 2: Challenges in developing new insights for operational excellence.
- Section 3: Challenges in implementing real-time data insights.
- Section 4: The scaling of infrastructure for development and deployment workloads
- Section 5: Summary

2. Challenges in developing new insights for operational excellence.

Telecom operators have a huge amount of data available to them both from internal systems and external sources such as weather, social media, location information, search engines or credit scores. There are key issues that need to be addressed in gaining the best insights and acting on this data. These include having the right resources available, having the corporate will and vision to transform using data-driven insights. The three key challenges to address are:

- ensuring the right staff are available.
- having the right resources and tools
- getting timely access to good-quality data.

Figure 2: The three key challenges



Source: Analysys Mason

Although meeting these challenges is critical to business success, they are not unique to telecom operators. All enterprises need to respond to evolving business needs. However, what is unique to the telecoms industry is the scale and breadth of available data and the amount of data that is and can be streamed in real time. Data volumes are much larger than in most other industries, which puts significant pressure on staff and data infrastructure. These problems can be addressed by using highly scalable public cloud offerings and their flexible consumption-based pricing models.

2.1 Staff challenges

A data scientists' average base salary in the USA is USD113 000 according to Glassdoor. Telecom operators must compete with financial institutions, large technology companies and others for the top talent who

potentially demand much higher salaries. Finding data scientists who also have telecoms-related skills is even more difficult. Some operators, such as Verizon, have established programmes to train current staff, but this takes time to implement and may not stop them wanting to leave the business.

Many operators outsource high-cost data science and data mining specialists to vendors, to overcome staff shortages. However, where telecom operators want to use data insights as their competitive edge, retaining skills in-house is viewed by many as a strategic necessity. In addition, where projects are outsourced, internal staff are often left on systems and processes that rely on legacy tools that were harder to outsource and therefore become even more likely to leave.

The situation is often exacerbated when systems, integrations and processes have been built-up over multiple system generations. They effectively become highly proprietary, so only a few staff understand them, which increases the risk for the operator.

Organisational change and re-training take time and will often require staff having to learn on-the-job as new data and analytics approaches will need support of broader development skills and tools. These could include: the use of DevOps tools, creating agile development pipelines and lean software development processes.

How cloud-based services can help operators.

- *Retaining current data scientists and analysts by offering them training on leading-edge tools and technologies, keeping them by giving them new technical skills.*
- *Gaining access to a wide pool of trained personnel and a large ecosystem of partners from which to get support.*
- *The adoption of more self-service and automated data and analytics tools offered by cloud providers, enables the training of more staff who do not then require such deep data science skills.*
- *Support simplification of the incumbent data and analytics solutions into a fully integrated and highly automated infrastructure means current staff can focus on analytics and data issues, not systems administration activities, and are therefore able to be more productive. These include tools where telecoms operators can manage and optimize all their resources and instances in a single pane of glass, e.g., Google Cloud Anthos enabled by Intel.*

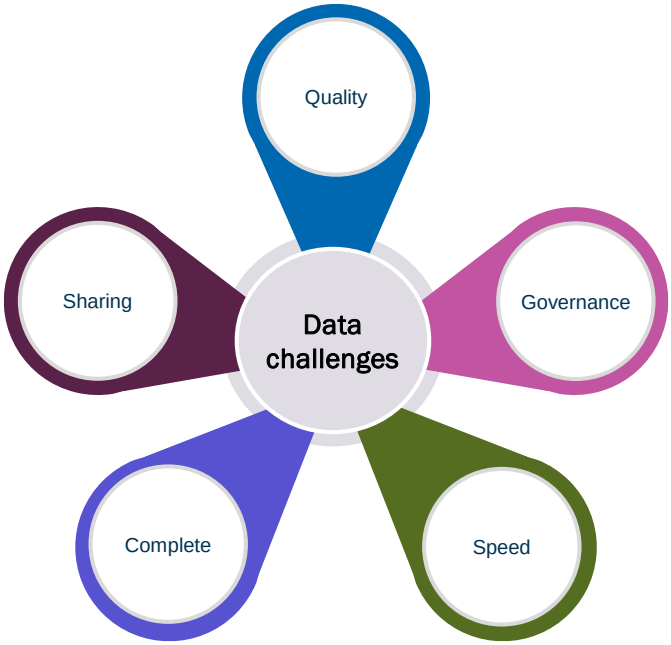
2.2 Data challenges

Data is the critical ingredient in driving automations and intelligence. Supporting large volumes of data is a familiar challenge to telecoms operators, but as volumes increase and more data features are added to be shared from distributed data users and sources, operators must be able to share high-quality data in real time.

The complexity of 5G is driving new requirements, such as the network data analytics function (NWDAF), to support automation. These require high-speed low latency data to support network operations.

New data regulations and subscriber data protection rights are being added, increasing potential costs for operators.

Figure 3: The main challenges related to data.



Source: Analysys Mason

Data quality is widely accepted as essential for building reliable insights. In more complex models or for the discovery of fainter data signals, data quality becomes even more important. Poor data quality results in poor business decisions. For example, poor data quality may lead to not spotting churning customers or offering discounts to customers that were not likely to churn. Data quality is tied to larger issues around data management and governance, that help to create and maintain data quality.

How cloud-based services *can* help operators.

- *Data quality issues can be addressed by data consolidation to create a single version of the operational data, avoiding data synchronization and versioning issues.*
- *Enabling the use of advanced data preparation using automated ML techniques to improve data quality.*
- *The use of pre-built solutions for data ingestion from applications and template-based data wrangling that help to improve data quality through the creation of data pipelines using online platforms to increase reliability.*
- *Data quality can be addressed with access to new tools such as score carding, data profiling, standardization, fuzzy matching, and the use of embedded ML to support their technicians*

Data governance is difficult for telecom operators, managing multiple data sources and large quantities of streaming data while ensuring privacy and other regulations are adhered to while maintaining the integrity of data. Sensitive personal information about subscribers that operators hold, process or request needs to be

managed and secured, which is complex in a fragmented data architecture and an increasingly regulated environment.

How cloud-based services can help operators.

- *Providing robust logging as data passes through different data tools in their integrated data platforms, enabling clear oversight and management of data sources and its manipulation.*
- *Security to support access across the whole organization, with access rights management to control compute clusters, APIs and data sources.*
- *Providing a comprehensive toolset to provide a highly automated set of administration functions to ensure low operational effort, provide alerts and ensure best practices are used. Where data needs to reside across hybrid cloud or multi-cloud environments, solutions such as Google Cloud's BigQuery Omni powered by Anthos, can provide a consistent data analysis and infrastructure management experience across deployment environments.*
- *Google Cloud Anthos enabled by Intel Select Solutions allows customers to manage all applications deployed to Anthos edge locations. Whether operators are connecting their data centre or providing edge compute, the Intel reference architectures helps ensure workloads run optimally.*

Data speed is critical in operational systems requiring real-time decisioning. The ability to capture, transform and load data in real time, when operators have many legacy systems in place, is hard to achieve. Streaming data can quickly stretch in-house, on-premises systems as they quickly fill data storage devices. Where multiple data groups need to integrate or exchange real-time data streams, new tooling is often needed. This requires a new approach to data storage and management. Real-time data streaming when used to develop new data insights will need additional support to provide real-time testing and debugging for example.

How cloud-based services can help operators.

- *Support of real-time end to end streaming data pipeline (ingest, prepare, analyse, act.) for big data analytics is supported in public cloud services without operators needing to deploy new tools or infrastructure.*
- *Streaming data can be analysed without manually scaling infrastructure to support it. Tools such as Google Cloud's Dataflow enables ingestion of batch and streaming data within the same tool.*
- *Comprehensive data migration services and tools that are available to extend on-premises Kafka or Spark solutions to integrate current data streams. A suite of software development and deployment tools are ready to support streaming data requirements.*
- *Accelerate deployment to meet telecom operators' requirements using Google Cloud instances delivered on compute power running Intel's Xeon Scalable processors.*

Incomplete data results in poor data insights. To build effective data models, a complete set of data features is needed. Restrictions on the support of new data sources due to its volume, variety, speed, or structure will limit which data can be included when building a data model.

How cloud-based services can help operators.

- *Enable access to complete datasets from across an organization and internationally between multiple operational companies to build a data lake regardless of volume, variety or velocity.*
- *Create an open universal single standardised data source, which promotes wider use by users and helps to build more complex data repositories for analysis.*
- *Utilizing tools to transform raw data into actionable information to help data mode accuracy can be improved with hardware tools that include Intel® DPDK, Intel® Distribution of OpenVINO™, Intel® MKL, and the Data Analytics Acceleration Library.*
- *Amdocs has developed a cloud maturity model for communications and media service providers. It provides a detailed framework for understanding the three major aspects of the move to cloud, while enabling service providers to assess where they are in the journey and the benefits, gained from progressing further.*

Sharing data at scale is not only a challenge between different departments and between different operating companies, but at a more local level. Where there are large data sets, for example, development and deployment teams may need to use live operational data sets because they are unable to scale infrastructure to support duplication of data on deployed and development systems.

Telecoms groups with many country-level operations are aware of the advantages of being able to consolidate data at group level to share insights, build best practices and act at scale. However, the cost, complexity, and organizational differences in data sources and uses at country level have prevented such data sharing.

How cloud-based services can help operators.

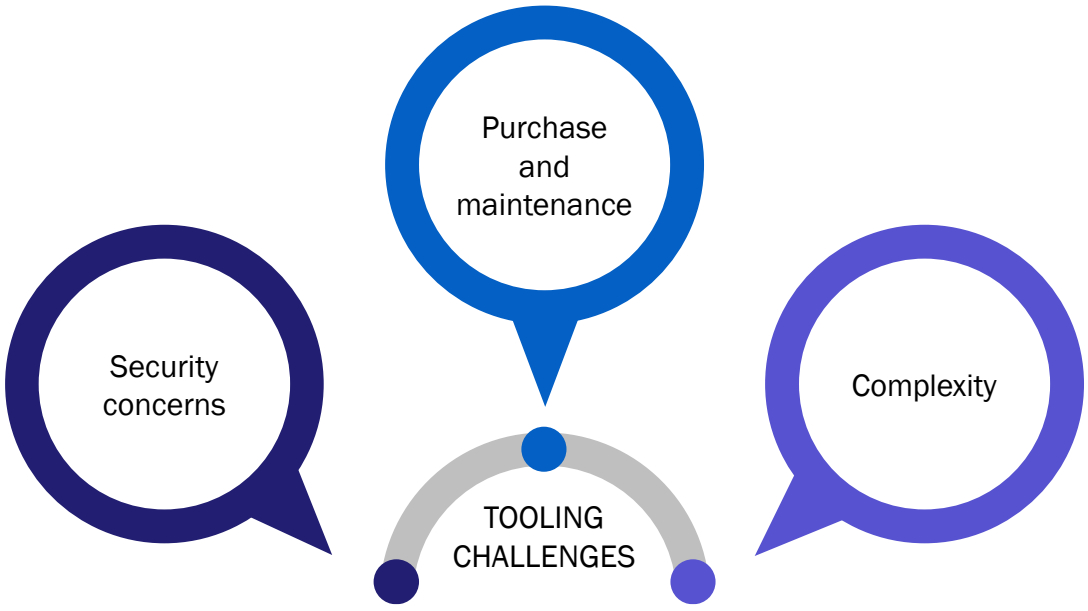
- *Consolidation of different data sets into a single repository and making it available securely from any location. Vodafone, for example, has consolidated data from 11 countries into a single repository cloud platform for its Neuron real-time data analytics platform.*
- *Enable a simplified path to adopt the same tools across an organization and/or opcos, helping them to access data in a consistent way. Adopting a cloud-based approach pushes the complexity of data sharing on to the cloud provider. It also provides new commercial models that may be more suitable for specific regional operating subsidiaries or departments that could not justify their own on-premises solutions.*
- *The traditional telecom operator method of performance optimization and sharing data has been to accelerate the hardware and software at each point in the network. This also applies with cloud. The Data Plane Development Kit (DPDK) can be used to optimize the performance of packet processing software on general purpose hardware. Workloads can be further accelerated with hardware-assisted cryptography or compression, by using Intel® QuickAssist Technology, for example.*

2.3 Tooling challenges

Operators are faced with a highly fragmented and complex set of changing software tools and platforms for supporting their data needs. The growing volume and variety of data has forced them into adopting new technologies at pace, overlaying older data tooling. This complexity has reduced operators' ability to support change, added costs to their tooling and added to a more complex security structure.

Creating a unified and simplified framework for data within an organization, while supporting current processes and systems, is hard. Public cloud solutions offer tools that can be scaled as required, can come fully managed and pre-integrated without the added overhead of needing to purchase and install separately nor of needing to be maintained in-house.

Figure 4: Challenges related to tools.



Source: Analysys Mason

Complexity is having a negative impact on operators' agility. Over time as new data management and data analytics tools are added the resulting complexity of systems and integrations between them, where each application stack uses different data tools, makes changes slow and expensive. In addition, where different tools are selected within teams, divisions or for different operating companies, an operator's ability to share and rapidly roll-out new insights will be reduced or take much longer to implement.

How cloud-based services can help operators.

- *Public cloud providers offer telecoms operators access to advanced data and analytics tools with rich functionality that are available through platform as-a-service or software as-as-service business models.*
- *The popularity of public cloud services ensures that web hyperscalers, because they interact with many partners, offer a wide range of pre-integrated tools enabling operators to adopt more standardised data tools that support a wider variety of use cases and are more open to new requirements.*
- *Public cloud solutions are available on a global basis enabling telecoms groups to consolidate and simplify their tools across their whole organisation.*
- *In addition, cloud-based tools also help to resolve integrations between different tools and maintain the integration as each tool is updated, helping to reduce proprietary implementations.*

Purchasing and maintaining software and technology requires telecoms operators to evaluate, procure and implement each tool. Technology adoption tends to be slower where point-based solutions are used, even if these are implemented using a SaaS-based service.

How cloud-based services can help operators.

- *Public cloud providers are constantly adding functions and new software applications to their portfolios. Telecoms operators have faster access to these tools through the public cloud provider on an as-a-service basis rather than through a procurement process to purchase as a discrete new tool.*
- *The task of integrating new tools into operators' current frameworks is potentially partly removed by public cloud providers. For example, new tools for data visualization, such as Google Cloud's Data Studio and Looker are integrated with BigQuery and other data connectors owned by Google and its partners within the community.*

Security is a major concern for every telecom operator. Tooling to ensure data security and privacy requires constant reviews as new hacks and breaches are attempted to gain access to sensitive data. As telecoms operators develop new services and offerings, such as IoT, they will encounter new threats that need to be addressed making older tools redundant.

How cloud-based services can help operators.

- *Cloud providers are faced with the same threats as telecom operators and have built up tools to address them, in many instances providing greater security than telecoms operators currently offer. Compliance with ISO/IEC 27001, 27017, 27018, SOC 1/2/3, PCI DSS and CSA STAR for example.*
- *The scale of cloud platforms means hundreds of staff are dedicated to security and privacy issues. Google Cloud for example provides a multi-layered approach to data security tooling in an integrated approach. These include tools for operational data, data storage encryption, fine-grained data privacy and security controls, data masking, user management, access management as well as hardware infrastructure management.*

3. Challenges in implementing real-time data insights.

The implementation phase of data analytics is most challenging when applied to processes and systems that require real-time actions. These include use cases such as automation that ensures networks are running in their optimized configurations, fraud detection to quickly minimize financial or data losses, location-based offers that can be issued to customers while still on location, and IoT data that can be quickly acted upon.

Real-time data analytics is critical in supporting specific business cases, however in nearly all case it provides additional value to any business process. This can include dynamically tailoring responses, augmenting human interactions or fine-tuning operations to help to optimize operational processes to deliver more desirable outcomes.

Implementing real-time processes is a challenge for operators, ensuring the response times for processes are maintained, supporting real-time processes to update them, and dealing with the complexity of solutions that are needed to support real-time solutions.

3.1 Real-time response

Query latency is a key challenge to overcome if an application requires instant response times. Data warehouses are typically good at supporting non-real-time analytics such as reports where queries can take minutes. However, they cannot support interactive or ad hoc analytics requests or support large numbers of users.

Localization of servers can help in reducing latency issues; however, this creates additional management and control challenges for telecom operators, just as they seek to simplify their infrastructure and try to increase operational automations that require real-time responses.

Data latency is the limiting factor in how fast an insight can be delivered. It covers the delivery of data to a warehouse, its storage and query time before an insight is derived. This is a challenge where large data lakes are created from hundreds of data sources, each of which must be transformed to support a data feature in a data model. Each step needs to be done in near-real time and may require new tools and solutions. For example, data

streaming for IoT video surveillance requires different new tools from those required to support batch mode upload of video footage.

How cloud-based services can help operators.

- *Understanding the requirements of real-time data as they use it themselves and have developed their own technology to support it. Telecoms demands can be met with the scale provided by cloud services. Google Cloud, for example developed Dremel, a technology leveraged in BigQuery that dynamically identifies the number of compute nodes needed for a given query and petabyte-scale of data queries.*
- *Providing data exchange capabilities through publish and subscribe or APIs to support secure and straight forward access for applications.*
- *Cloud providers also support the localization of compute deployments on premises. Google Cloud's Anthos, enabled by Intel for example, helps customers to take advantage of the same support, security, and management as other cloud resources, but with lower latency.*

3.2 Model management and validation

Real-time use cases require an action to take place based on changes in streaming data, which predicts or signifies a fresh action. The use of machine learning enables real-time feedback to help to optimize models using tools such as TensorFlow model optimization toolkits, without which models can quickly degrade.

How cloud-based services can help operators.

- *Public cloud enables monitoring of live log data and the management of new models into the operations systems through APIs or management platform. Operators can deploy new ML built models into the production framework with the appropriate validation, testing and governance enabling models to be updated seamlessly in production.*
- *Cloud providers support the best-in-class analytics model builders that enable support for codeless creation using machine learning or AutoML technologies. Models can be trained using these technologies for streaming data and to help to maintain their integrity and accuracy.*
- *Access to accelerated AI inference, Google Cloud instances with the 2nd Generation Intel® Xeon Scalable processors with Intel® Deep Learning Boost to improve 30 times.*

3.3 Integrations and solutions

Creating business solutions requires integration of data, development of data models and implementation of the logic into a process or application. Typically, these are created through customized project-based approaches that require ongoing maintenance costs and added complexity if applications or processes need to be changed.

How cloud-based services can help operators.

- *Public cloud providers will not resolve all these challenges but through their larger ecosystem of partners, such as Amdocs DataONE and IntelligenceONE that provide pre-integrated or simplified engagement models for operators, helping to productize their approach.*
- *In addition, as vendors all begin to use public cloud resources and common platforms, there is the possibility of de facto standards and solutions being created, so interoperability for development and production becomes easier to achieve.*

4. The scaling of infrastructure for development and deployment workloads

Some telecom operators have concluded that they would rather someone else run their data centres. Verizon acquired Terremark in 2011 and sold its data centres to Equinix in 2017; AT&T sold its data centres to Evoque; CenturyLink (now Lumen) sold to Cyxtera; and Telecom Italia floated off its data centres as Inwitt. In addition, some operators have publicly stated that they are shifting some or all their IT systems to the public cloud, these include significant operators such as AT&T, BT Group, Vodafone, and Orange.

The drivers behind the decision for telecoms operators to adopt a cloud-based infrastructure are complex, but at their heart is a desire to reduce operational and capital costs.

4.1 Right-sizing of infrastructure to increase utilization.

Telecom operator will always have times when workloads are higher than others on a daily or annual basis, such as usage spikes on New Year's Eve. Building to maximum capacity that is only used once a year is not an efficient use of capital, creating poor return rates on it. In addition, there are workloads that are not predictable and may fluctuate from day to day, or even during a day, making it hard to predict exact requirements. To overcome this uncertainty, a level of contingency is always added allowing for expansion where needed but it adds to costs.

Utilization rates are critical in running your own data centres cost effectively. Where there are constant predictable workloads there is less incentive to adopt cloud, but where workloads are variable, such as running large queries and running ad hoc analytics for use in creating logic or reports, there is a stronger motivation to adopt public cloud approaches. Rapid scaling up and down, and at times autoscaling, is not possible with in-house systems and careful scheduling is needed to resolve contention for fixed resources.

How cloud-based services can help operators.

- *Cloud infrastructure is run more efficiently, it is faster to implement, and much more flexible in scaling to meet demands, than in-house on-premises solutions. Public cloud solutions offer an ability to expand and shrink capacity when and where it is required. Higher utilization rates help to reduce costs.*
- *Cloud-based analytics deliver processing power efficiently and mean operators do not have to invest in expensive data servers to support peak workloads but can grow capacity when required.*
- *Cloud providers support native implementation of DevOps processes, which ensure that operators can natively support greater operational efficiencies.*

Rightsizing infrastructure has an important environmental implication for operators. Running underutilized data centres and older software systems and hardware increases CO_2 emissions at a time when operators are committing to a reduction in such emissions. They are looking for sustainable technology that cuts energy consumption.

How cloud-based services can help operators.

- *Some cloud providers have advanced environmental considerations. For example, Google Cloud is focusing on delivering carbon-free energy data centres by 2030.*
- *Customers can take advantage of Intel and Google Cloud's long-standing commitment to environmental leadership to reduce greenhouse gas emissions, lower energy usage and generate less in waste This is also applied to the Internet of Things technologies that help combat environmental challenges such as climate change and water conservation.*

4.2 Scaling speed (agility)

Procurement of new capacity typically takes months within most operators; this limits the ability for a telecoms operator to react to changes or support a transformation of their infrastructure.

Scaling-up of new hardware may be required in support of ad hoc queries or development of new use cases where new data infrastructure needs to be added because demand for more CPU, memory, I/O resources, or storage is needed in support of an application. This typically takes months before new hardware can be installed so must be predicted ahead of time. In many cases this is possible, especially with predictable workloads, however ad hoc queries cannot be predicted. Of course, if the original requirement subsequently is no longer required, the scaling down rarely takes place.

Increased agility to support dynamic workloads requires different underlying hardware to support different workload types. Most AI inference today already runs on Intel® CPUs—specifically, Intel® Xeon® processors in the Google Cloud data centres globally. For example, Intel Xeon Scalable processors were enhanced specifically to run AI applications alongside the data centre and cloud-scale applications they already run.

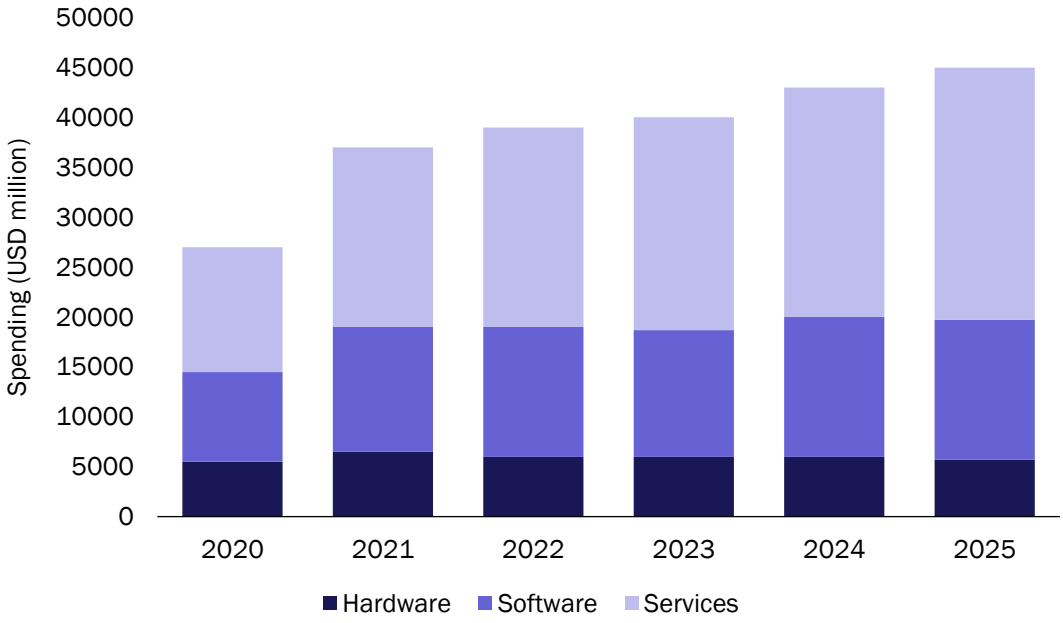
How cloud-based services can help operators.

- *Cloud infrastructure through autoscaling of its infrastructure can support applications, containers or functions that require more scalable and flexible computation support, through adding or reducing of virtual machine instances. Even manual procurement of new instances only takes minutes.*
- *Cloud-based services can help by allowing telecom operators to remove risk from experimentation and by enabling data scientists to test solutions before having to commit to purchasing resources - either hardware in-house or public cloud infrastructure - for production use cases.*
- *Depending on the type of workload, Cloud infrastructure can help telco operators to accelerate agility and interconnect core applications to edge needs.*
- *The speed of deployment and business value are much faster with cloud-based infrastructure. Vodafone built and deployed its Neuron platform, its AI and business intelligence tool for its global business and replaced 600 servers across 11 countries in 9 months using a public cloud-based approach.*

4.3 Total cost of ownership

Telecoms IT and software capex are expected to be near USD45 billion by 2025. Opex for IT is expected to be over double this figure over the period. These costs are set to rise as network functions shift to general-purpose IT hardware and as operators support new digital services and growing data volumes.

Figure 5: IT capex spending, conventional and digital, by category, worldwide, 2020–2025



Source: Analysys Mason

How cloud-based services can help operators.

- *Public cloud services run at scale and afford efficiencies that are harder to achieve in any one operator's own data infrastructure.*
- *Public cloud providers ensure that hardware is updated, maintenance schedules performed, and integrations provided to partnerships.*
- *Cloud providers help remove performance risk through such as Intel Select Solutions for Google Cloud Anthos that has certified a use of CPU, memory, and network that guarantees performance.*
- *A pay-as-you-grow model ensures that costs are more aligned to revenue within the business. Although volume-based pricing can be more complex than traditional licensing and purchases, hybrid pricing approaches based on reserved instances and volume-based pricing enable the best of both worlds, and link usage and business needs better with the growth of a telecom operator or in support of the services that it is offering.*

5. Summary of the role that cloud plays in resolving challenges.

Cloud providers offer a compelling transformation option for telecoms operators wishing to transform their data and analytics. Cloud providers offer a broad range of internally built and partner tools for the consolidation of data, deployment of new data management and analytics tools. Best practices and methodologies ensure data can be securely migrated to and run-in cloud infrastructure.

18 out of the world's top 20 telecom operators have announced cloud partnerships with public cloud providers either in shifting their IT workloads over to public cloud or through joint edge compute offerings. All top 20 operators offer direct connect services to one or more public cloud providers. There is a growing list of major operators that are shifting data analysis to the cloud, including AT&T, KDDI, SK Telecom, Verizon, Vodafone and many others. There is a consensus of the benefits of data analysis being run on public cloud infrastructure and an inevitability about the migration of telecoms data on to them.

The migration of workloads to a public cloud has led to the development of a telecoms-specific data model helping to transfer workloads and business processes. Telecoms-specific tools and data models help operators to adopt best practices and help to enable the support from ecosystem partners. Public cloud providers are now supporting telecoms data models to support this approach.

Cloud providers are supporting operators in migrating their applications into their cloud platforms. This support is not only from a technology perspective but also in providing training to ensure that enterprise-wide support is in place for the transformation journey.

Figure 6: Summary of the benefits of public cloud for operators

Telecom operators' Infrastructure	Public cloud solution
Utilisation is poor on storage and compute infrastructure	Infrastructure on demand
Slow or difficult to scale infrastructure to meet business demand	Near instant scaling
Development, data management and analytics tools based on legacy requirements	Access to newest tools
Investment in in-house frameworks to support processes and integration of tools	Integrated suite of tools
Resource contention causes scheduling challenges or delays	Resource isolation and support on-demand resources
Significant duplication of data in many data siloes in each operations company and across the group	Creation of a group-wide data platform, supported for local operators with centralised governance
Limited talent pool of staff because of proprietary approach and specialist tools	Large talent pool of staff to draw on for support, including partner ecosystem solutions
Investment needed to maintain systems to support the latest privacy regulations and governance needs	Support provided an inherent functionality of the solution

Source: Analysys Mason

Telecom operators are shifting workloads, tooling and their data into public cloud services. The move will take years to complete. Underlying the shift to cloud are economic benefits for telecom operators. However, beyond cost reductions, the move promises to help operators to respond more quickly to market changes through better data insights and therefore to become more competitive in their market.

6. About the author

Justin van der Lande (Principal Analyst) leads the *Data, AI and Development Platforms* research programme, which is part of Analysys Mason's Telecoms Software and Networks research stream. He specialises in business intelligence and analytics tools, which are used in all telecoms business processes and systems. In addition, Justin provides technical expertise for Analysys Mason in consultancy and bespoke large-scale custom research projects. He has more than 20 years of experience in the communications industry in software development, marketing and research. He has held senior positions at NCR/AT&T, Micromuse (IBM), Granite Systems (Telcordia) and at the TM Forum. Justin holds a BSc in Management Science and Computer Studies from the University of Wales.

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