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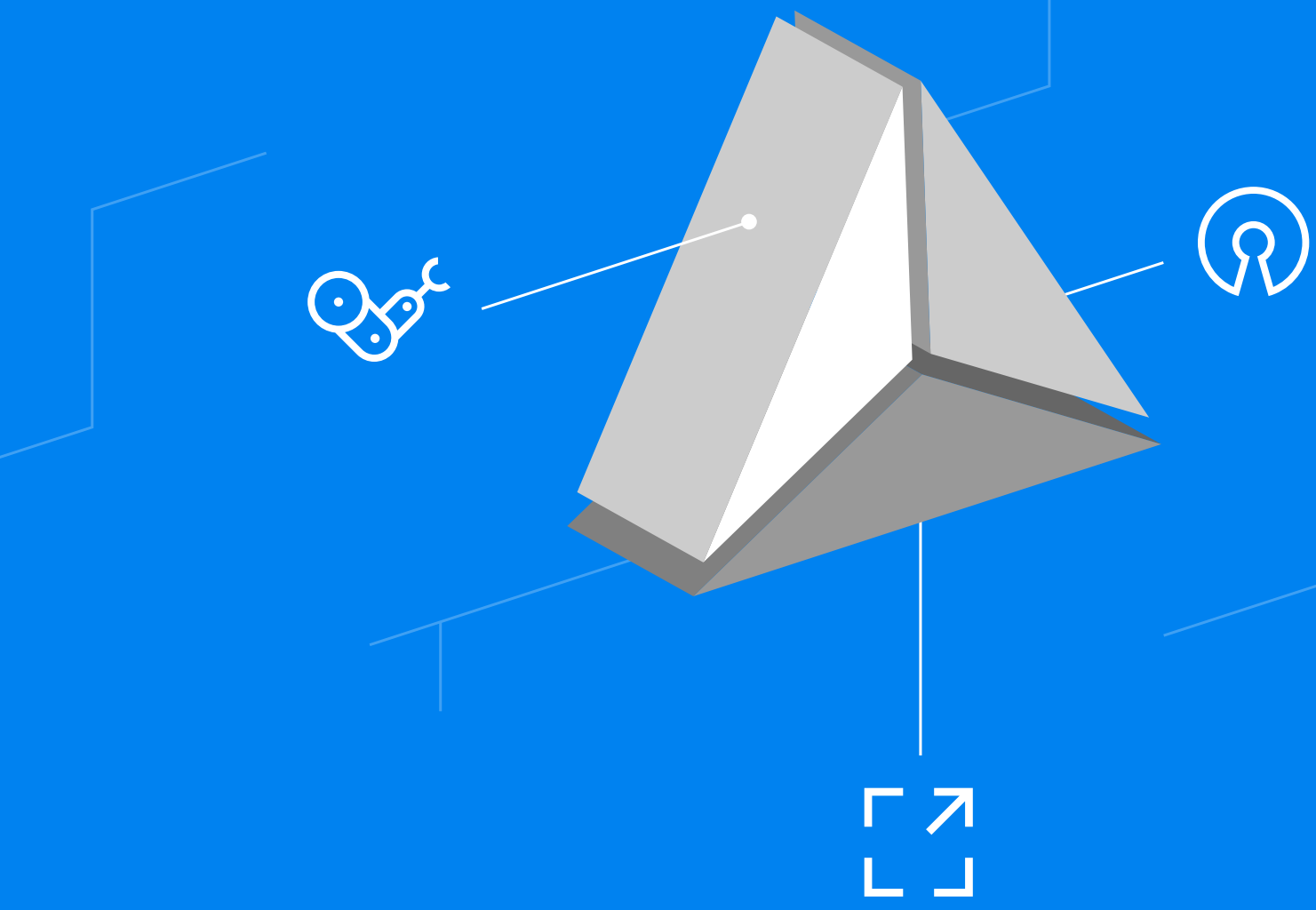
Operations of the future

Reaching for the North Star of zero-touch operations



Reduce costs, improve service

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Almost every industry has the potential to benefit from the power of 5G. Manufacturing, healthcare, logistics, transportation and retail are just a few of the sectors that already have compelling 5G use cases poised to fully leverage 5G technology. This will, in turn, increase expectations on communication service providers (CSPs). Customers will demand support for different business models, faster time to market (TTM) and increased self-service options. To move in that direction, transforming network operations is critical. If correctly executed, new and existing network technologies, partners and business models can be managed more efficiently, leading to both reduced costs, improved revenues and a better user experience.

5G and digitalization provide a host of the tools needed to tackle the many sustainability challenges the world is facing. However, it is also the responsibility of individual CSPs to actively reduce the environmental impact of their networks. Introducing more energy efficient technologies will improve emissions levels in the long term, but the intelligent operation of existing legacy equipment can also contribute to immediate energy consumption improvements.

5G demands automation

CSPs must harness the power of 5G to automate their networks and take a decisive step towards zero-touch operations.

Automating networks to meet expectations

The future of network operations relies on CSPs embarking on a journey towards zero-touch. What do we mean by that? Networks that are automated, open to third parties and flexible enough to accommodate new business models and capabilities. The goal of zero-touch is to create future-ready network operations leveraging new technologies, limiting manual operations and enabling business agility, where the workforce is augmented by artificial intelligence (AI) and operations are data-driven, predictive and proactive.

The North Star of zero-touch

Zero-touch network operations are a directional North Star for CSPs to increase resilience, boost agility and create differentiation. The reality of today's market makes it both a necessity to keep up with competitors and an opportunity allowing for the introduction of new sources of innovation and revenue.

While most industry-leading CSPs are already on a path towards achieving zero-touch, they won't get there overnight. In recent years, CSPs have harnessed technologies like artificial intelligence (AI), machine learning (ML) and edge computing to enable the journey ahead. Over the next 3–5 years, they will need to shore up networks, leaning into the hallmarks of zero-touch: automation, openness and flexibility.

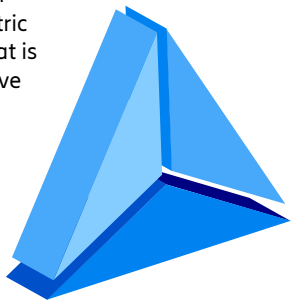
Individually, automation, openness and flexibility are hardly new concepts. Together, they enable an environment that can boost competitiveness and resilience, allowing CSPs to manage previously unimaginable services in both the consumer and enterprise sphere. If complemented with new ways of working, this will enable CSPs to manage 5G complexity, facilitate platform business and mitigate security issues long before a full technology transformation and zero-touch has materialized.

The zero-touch goal: Creating future-ready network operations leveraging new technology, limiting manual operations and enabling business agility, where expertise is AI-augmented and operations are data-driven, predictive and proactive.

Figure 1: Zero-touch requires bringing together automation, openness and flexibility

Automation
Migration away from manual, human-centric operations to one that is data-driven, predictive and proactive

Openness
Network operations serve as platforms, where third parties and internal organizations can create and enable their services



Flexibility
Accommodation of new business models driven by different types of customer segments and capabilities

The journey to zero-touch: technology and organization

Achieving automation will require CSPs to embrace new technologies and ensure their business is ready for zero-touch.

To reach the zero-touch North Star, two dimensions within network operations need to be developed with purpose-built capabilities. The first involves the introduction of new technology, while still operating a substantial amount of legacy equipment in a hybrid environment. The second involves the organization itself and development of the necessary processes and skills to operate the 5G-era networks.

Technology is key

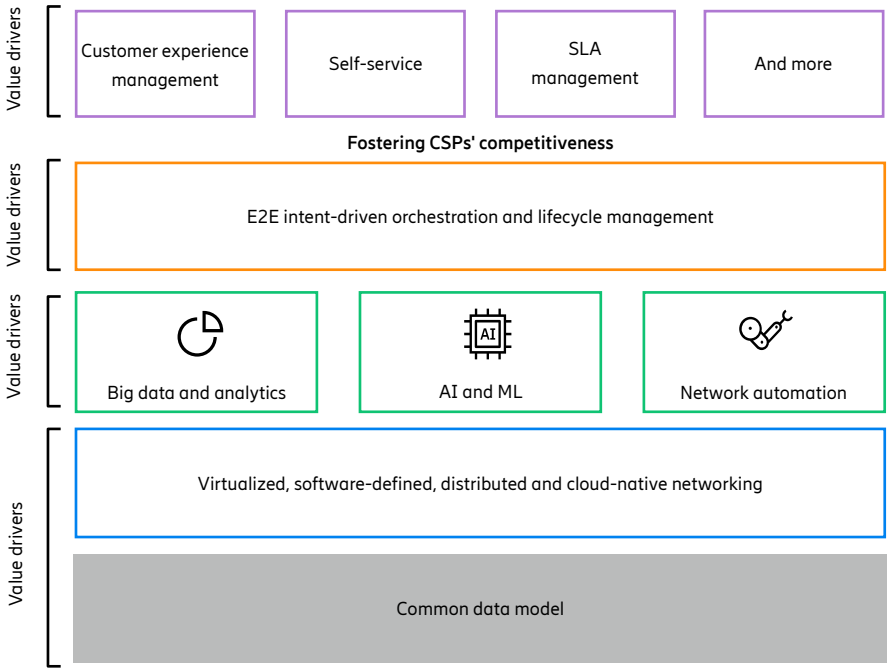
CSPs need to invest in technology domains to enable cost-efficient and agile operations. The goal: Reach a balanced operation of a hybrid environment, supporting end-to-end (E2E) orchestration and lifecycle management. Enabling this requires the following building blocks: applying a high degree of automation, becoming increasingly data driven and introducing AI- and ML-assisted toolsets.

These three enabling building blocks are based on the access of reliable data and need to be supported through a common data model (CDM) across operations. For CSPs, getting data isn't the issue – rather it is how to combine inputs taken from a plethora of sources, such as network data and customer management data. Traditionally, each system in the CSP domain collects its own data in a particular format using different data models, which prevents some data from being directly reusable in other parts of the organization. Typically, costly migrations and integrations are required to use and share data. To overcome this and ensure all data is both accurate and operable by every system and application, sources need to be unified in a CDM format.

A CDM simplifies data management by limiting data duplication, aligning data structures and bridging the gaps between developers (software) and ecosystems. It makes integrations and interoperability easier, providing a data structure that suits current and future use cases. As a result, CSPs can operate and use data insights as one entity rather than as a sum of different sub-units. Knitting together disparate systems can be daunting: CSPs can start this process by assessing the business applications currently in use and the pain points linked to their limited interoperability, then selecting an approach to CDM that best addresses their needs, simplifying future business as well as network operations.

AI, ML and automation will be at the heart of future operations.

Figure 2: Technological building blocks of zero-touch network operations



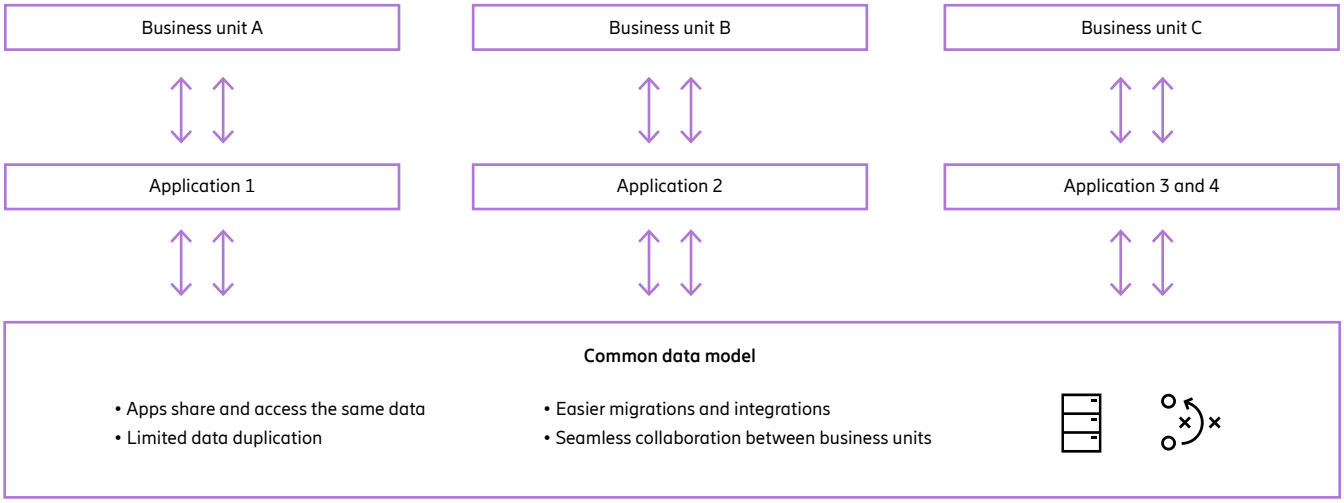
Full E2E orchestration of the network within the technology dimension
Orchestration and lifecycle management to manage complexities.

Enabling intelligent operations
Analytics, AI, ML and automation can be leveraged to improve efficiency and QoS.

Single source of truth
Solutions enabling real-time monetization will require a common data model across operations.

Accelerating the cloud transformation
The network should be virtualized, distributed and cloud native, enabling functions to be managed remotely.

Figure 3: The journey towards zero-touch is enabled by having a CDM



Underpinning all of the above is the network infrastructure layer, which allows for the increased distribution of functions towards the edge and provides support for architecture disaggregation, interoperability and openness. The infrastructure layer is of course also a key contributor of data to the CDM, where data can be exposed to the CSPs own operation, as well as to other partners and ecosystems.

However, the increased distribution of network functions and densification of 5G radios will increase the level of network complexity. Therefore, CSPs need to rethink the network architecture, design and technologies being used. A vital part of the solution is a gradual transition towards cloud-native networks, in combination with an intelligent automation layer "on top".

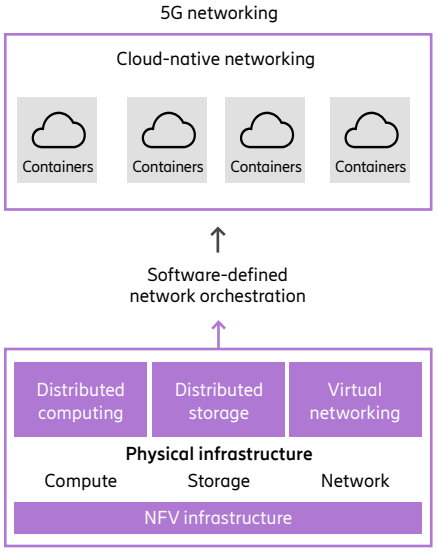
To utilize the full network potential, the underlying network infrastructure needs to be enhanced, both in terms of architecture and the technologies being used. This is typically comprised of three main steps:

- **Define a clear, outcome-driven vision** – seize the full network potential by defining a vision, making clear decisions and putting sturdy structures in place from the start.
- **Tailor the solution with the right approach** – plan the migration with the destination in mind and accommodate individual requirements, service delivery and data sovereignty needs.
- **Focus on people to sustain the right approach** – put people at the heart of the journey to maintain value.

Once infrastructure is upgraded and empowered by the right level of automation, CSPs can also directly benefit from increasing operational efficiency and decreasing TTM for new services. Decomposing the software into smaller components and decoupling it from the underlying hardware also allows faster and automated upgrades; continuous integration and continuous deployment (CI/CD) is the end goal. Eventually, CSPs will be able to lay the foundation to run analytics, adopt AI and automate networks in a pervasive way, leaving behind spotty implementations.

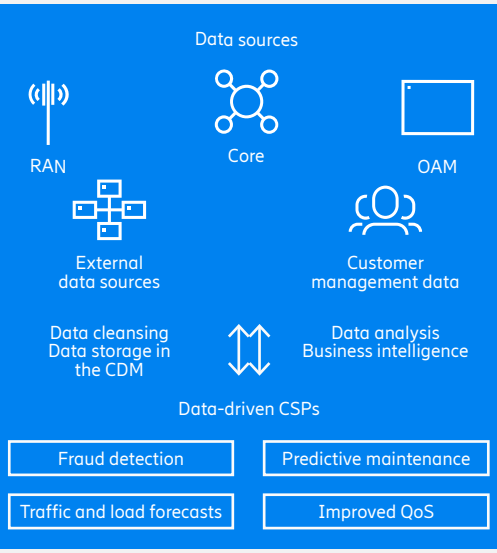
A common data model is the first step in the zero-touch journey.

Figure 4: Accelerating the cloud transformation sets the foundation for applying AI, ML and automation



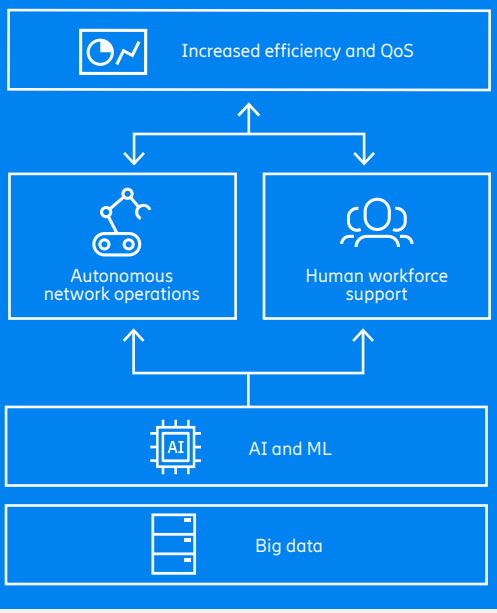
Big data and analytics: Going beyond "store and ignore"

At their command, CSPs have rich data sets which provide invaluable information about their end customers. They also have access to an abundance of technical data collected from their networks. However, for years this data has been stored and has not been utilized effectively. In the competitive 5G climate, leveraging data is a must. Combined with outside input, like crowdsourced data, CSPs can gain insights on things like the probability of network elements breaking down or major traffic events about to happen and take action before issues arise. Through big data and analytics, they can extract value, increasing operational efficiency while maintaining and or increasing quality of service. Some will take a top-down approach, starting from the business problem and finding the relevant data to solve it. Others will opt for bottom-up, using available data gathered and aggregated by a common data model to find and drive efficiencies.



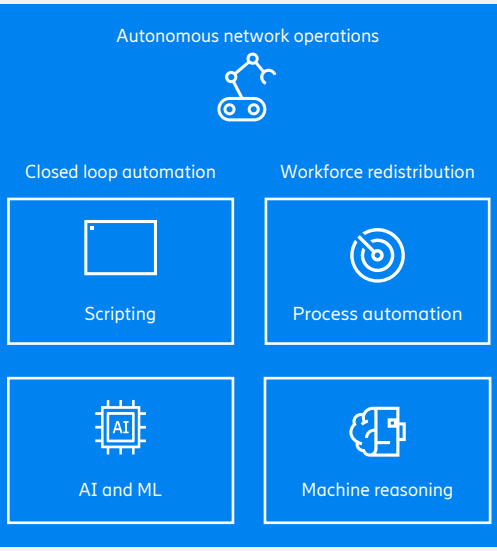
AI and ML: Levelling up decision making

Tackling the challenge of increased complexity in network operations means using tools like AI and ML to increase intelligence and simplify decision-making processes. AI allows the analysis of vast amounts of data in a way that was not possible before. Both AI and ML enable CSPs to augment human expertise and decision-making in the operation of the network and is also a prerequisite for more advanced automation. There are, however, several challenges to reaping the benefits fully. Many so-called AI/ML systems are primarily composed of big data tools and statistical analyses which don't fully utilize their capabilities. This is because data is still unavailable or cannot be trusted, hence the importance of adopting a CDM and big data and drawing from multiple trustworthy sources that can be correctly formatted and modelled. Human trust is another challenge. To realize the full potential of AI, trust needs to be established throughout the development, deployment and use of AI and built-in from the beginning, in everything from explainability and human oversight to security and safety mechanisms.



Network automation: Empowering humans and machines

The traditional processes underpinning network operations weren't designed on for quick adaptation. Additionally, new architecture and design requires streamlining operations through automation because human-based interventions simply cannot keep up with fast and ever-changing business requirements or the vast amount of network events that may require action. Many CSPs have started with scripting and process automation, allowing robots to mimic human actions in rule-based processes. However, by implementing closed-loop automation, the network can adapt and evolve by continuously learning how to better serve changing network conditions and customer needs. Automation unlocks the full value of data-driven and AI-based decision making, allowing redistribution of workforce capabilities to create more value. The net result: the performance of both humans and machines is boosted and customer needs are better served.



Transforming the organization

AI speeds up network operations and processes by taking care of time-consuming, tactical tasks.

Once the building blocks are in place, CSPs will have the foundation to realize E2E intent-driven orchestration that is data-driven – either through managed services or a self-built approach. With competition ramping up, it allows CSPs to first enable and then commercially package whatever drives the most impact. For example, allowing end customers true self-service, where they can select and deselect services in an instant or choose to apply different SLAs, which they can monitor in real time. Driving operations to this level thus creates real business value and enhances the customer experience. Without a high degree of automation, processes are highly manual and time-consuming processes and cannot effectively be exposed to customers, partners or ecosystems.

To unlock these value drivers like self-service, customer experience and SLA management, CSPs can leverage E2E intent-driven orchestration and lifecycle management. Intent-driven networks also enable CSPs to define the behavior they expect from their network, with the system translating it into real-time network action. This approach also aids with the handling of the complexity of legacy and new technology co-existence, gradually moving towards a sunset legacy. The network can then continuously adjust to ensure it is aligned with business intentions, while enabling new enterprise and mission-critical use cases. In this way, CSPs can also extract value from the deployed network, leveraging predictive maintenance to minimize downtimes.

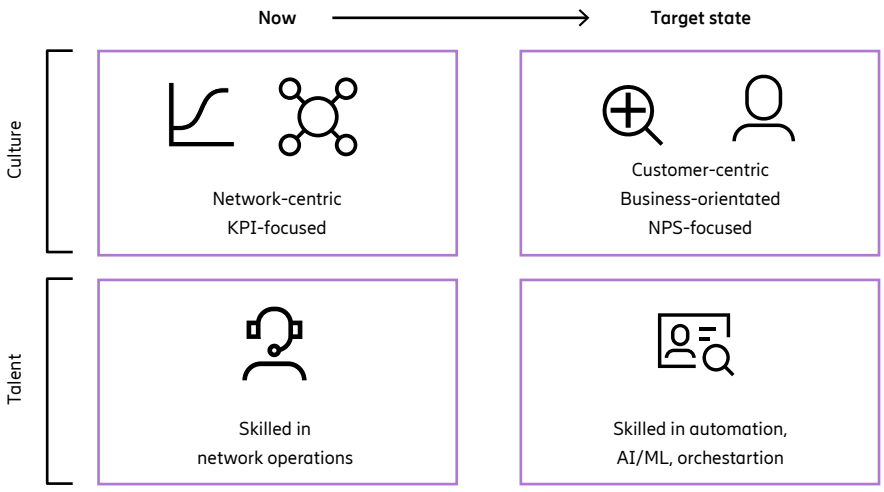
To realize the value from a network transformation, an adjacent organizational transformation is essential. This entails modernizing and aligning culture, talent, organization and new ways of working. Specifically, this means a cultural shift away from a network-centric mindset where the focus is mainly on technology KPIs. Instead, work is focused on the customer and metrics like net promoter scores (NPS) and individual service quality are measured to complement traditional KPIs, ensuring a better service is supported by the network and E2E services.

For the workforce, zero-touch involves moving from more manual operations to using automation and AI to complement and enhance human knowledge. It's a dramatic shift in focus and will require a greater level of collaboration and the joining of processes between network, IT and commercial areas. Additionally, ecosystems and strategic technology partners will assist in finding new revenues and managing costs. This means that collaboration for operations teams will stretch outside the CSP organization in new ways.

Taking advantage of the complexity of networks in the 5G-era, SKT has developed an AI-assisted network operations support system, TANGO, which consolidates network management into one platform and enables better customer satisfaction. The creators expect TANGO to lead to a 40 percent cost reduction compared to the total cost of operating legacy OSSs.

The shift from manual operations to data-driven operations requires a competence shift. Assessing the outcome and providing the correct input parameters to AI and ML algorithms will suddenly be more important than understanding how to individually solve problems or incidents on a specific node in the network. Collaboration with data scientists and introducing them to operations teams will be key.

Figure 5: Shifting culture and talent to support the transformation

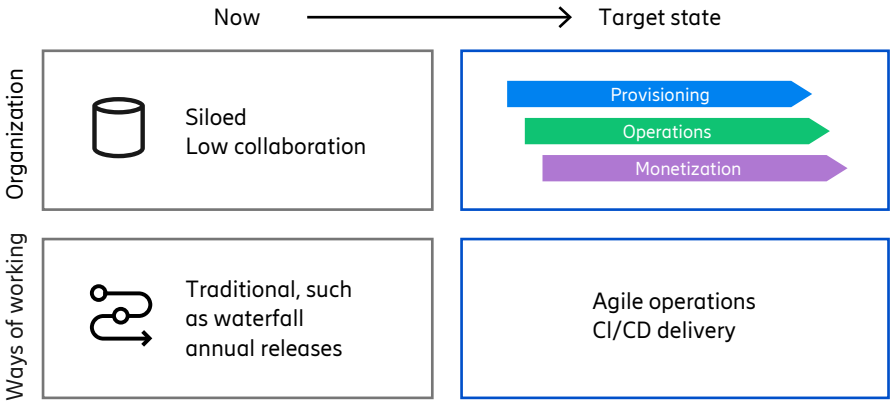


Moreover, to enable the previously mentioned value drivers such as enabling true self-service and individual dynamic SLAs, operations also need to move closer to the commercial and product departments. Operations will be a key in the delivery of these new capabilities and commercial and product departments will require support in packaging the capabilities, as well as shifting management responsibilities from separate departments to the core operations team. Net-net, the "raison d'être" of network operations, needs to shift from maintenance and program management to a proactive enabler of service delivery.

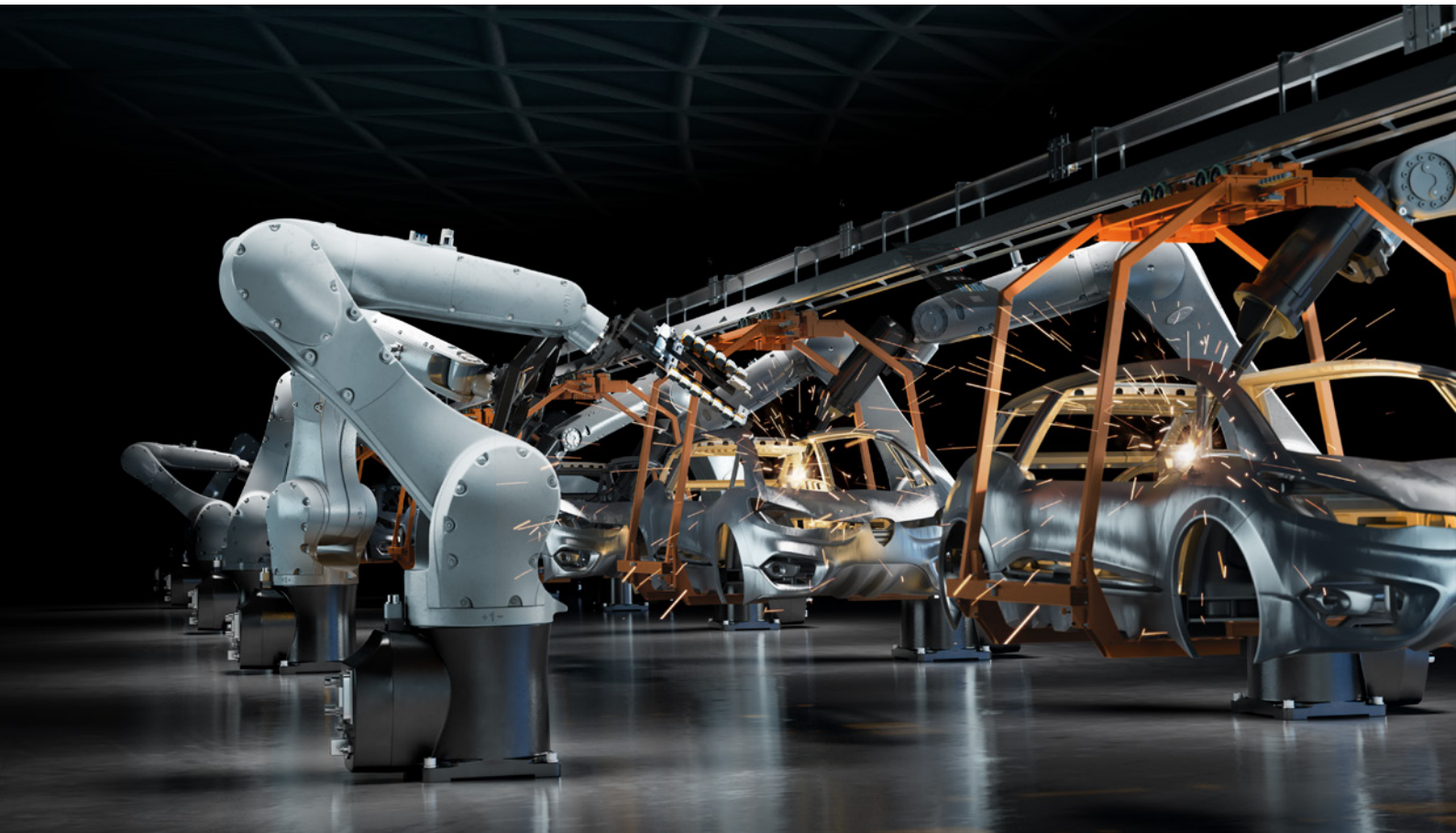
Networks also need to embrace ways of working in IT, particularly with regards to CI/CD and shorter release cycles.[1] By 2023, it's projected that 15 percent of on-premises data center networking activities will be integrated into a CI/CD pipeline, an increase of more than 15 times from early 2020.[2] This increase in demand will require a greater supply of talent – both new and reskilled – supporting automation. The reasons for this shift are multi-fold. Enabling shorter release cycles and increased agility is key in the aforementioned new collaboration areas, moving closer to the business operation and customer dimension. It is also a prerequisite to enable the continuous tuning and use of automation – the tweaking of algorithms cannot come in quarterly releases.

"We introduced continuous delivery into our network during Q2 2020. It allowed us to considerably speed up software validation by trying the functionality in advance, reducing the time substantially from commercial release to customer roll-out compared to earlier releases, even while our staff were working remotely due to COVID-19 lockdowns."
Elio Iacovacci
Head of Mobile Access
Telecom Italia

Figure 6: Organization and ways of working need to transform



[1]Source: Ericsson "CI/CD IT meets networks", 2020.
[2]Source: Gartner: "Automation orchestration", 2020



Zero-touch will help CSPs reduce costs and improve service.

Automate now to get ahead

Most CSPs have started on the path toward zero-touch with varying degrees of commitment and return on investment (ROI). However, more needs to be done.

It may seem safer to wait, but each day that goes by, competitors accelerating their zero-touch journey will gain a real, sustainable and competitive advantage by:

- creating much more resilient network operations which, in turn, will enable new business capabilities
- improving service agility and TTM
- freeing up workforce to focus on more strategic service innovation related activities
- mitigating security issues

5G was originally designed to be orchestrated. Therefore, transformations with the aim of reaching orchestration and automation are indeed needed to be able to implement/benefit from new capabilities such as cloud-native resource orchestration, network slice orchestration, edge sites, API exposure, self-order services and much more.

Figure 7: At the fork – taking different approaches to transformation

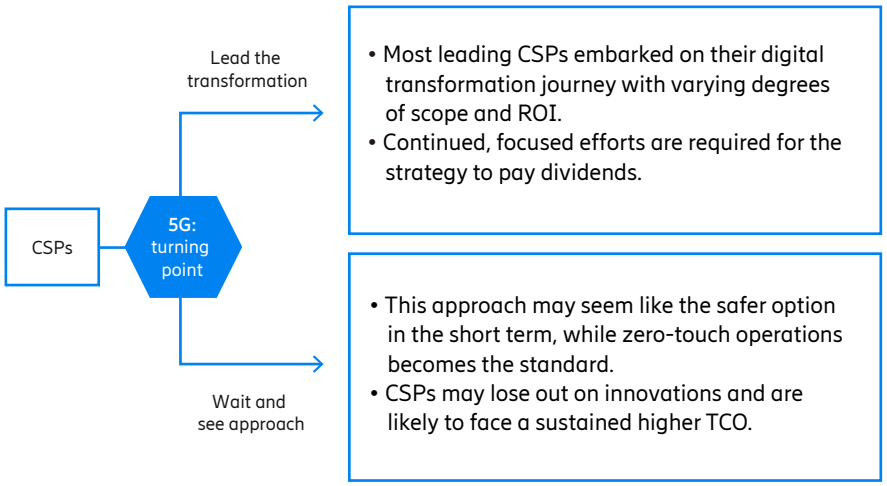
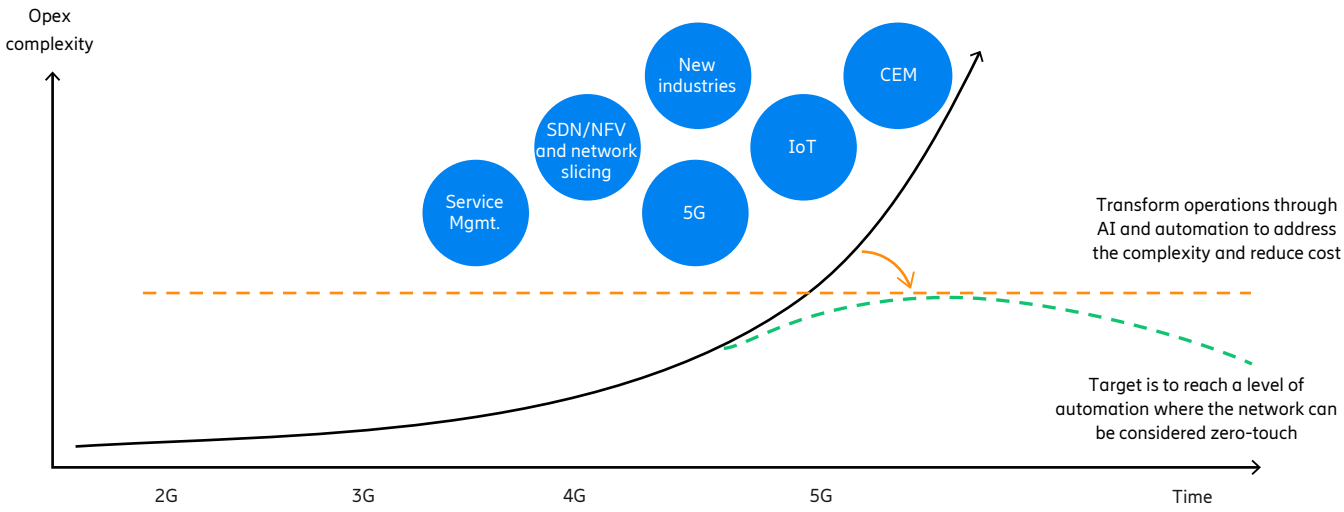


Figure 7: Using zero-touch to break the curve of complexity-driven cost



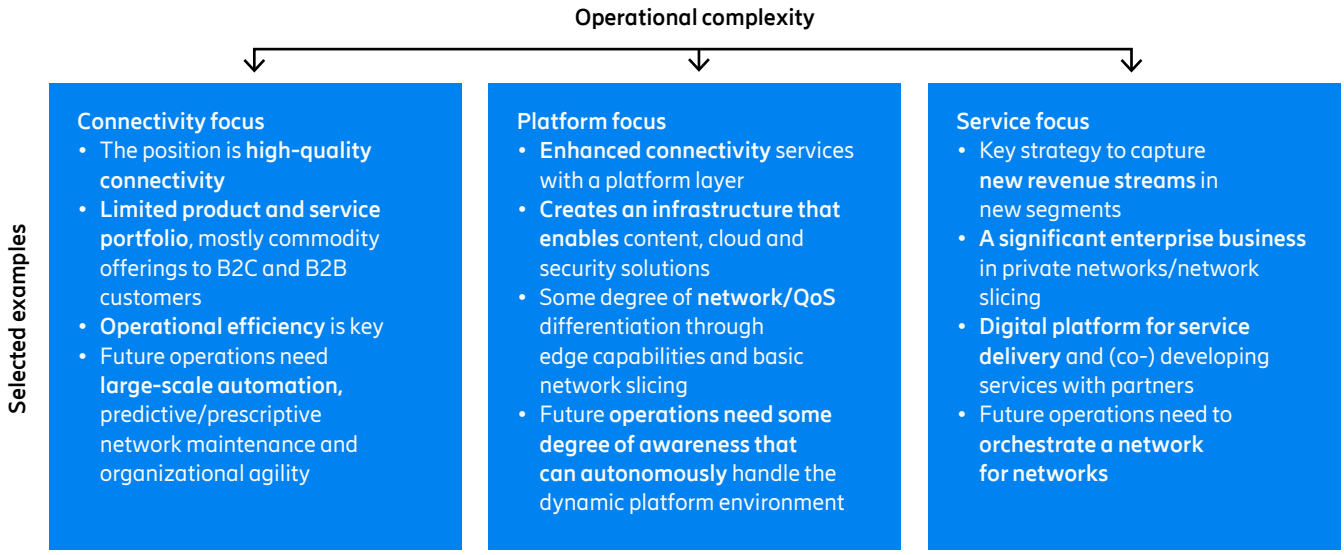
Along with all these advantages comes another crucial benefit: Managing operational cost and complexity growth. Historically, opex and complexity have always increased and the complexity growth has accelerated with each network generation. As previously discussed, 5G and its multiple use cases are no exceptions and are likely to further exacerbate this trend. However, by implementing the zero-touch technology building blocks and adopting the changes required in the organizations, CSPs will be able to invert the trend keeping opex at manageable levels, while tackling complexity by automating processes in closed loops.

Varied journeys toward zero-touch

Each CSP's path towards zero-touch will differ based on their own unique characteristics and business strategies. Even though it is a sliding scale, we've identified three main categories in which CSPs can be placed: connectivity-focused, platform-focused and service-focused. These differences create varied starting points and trajectories for CSPs when it comes to the path toward zero-touch network operations.

Autonomous networks will enable operators to provide the network either as a service or as a platform.

Figure 8: Each CSP's path will differ based on unique characteristics and business strategies



Ericsson can guide CSPs towards zero-touch, multi-vendor operations.

Accelerating the future

Many CSPs have embraced some form of automation agenda and activity, most in pockets where immediate value is relatively easy to realize.

A gradual approach will likely be well-suited for many, and a full 75 percent of CSPs are taking a domain-specific use case approach, whereas just 1 percent go for the full E2E approach from the start.[3]

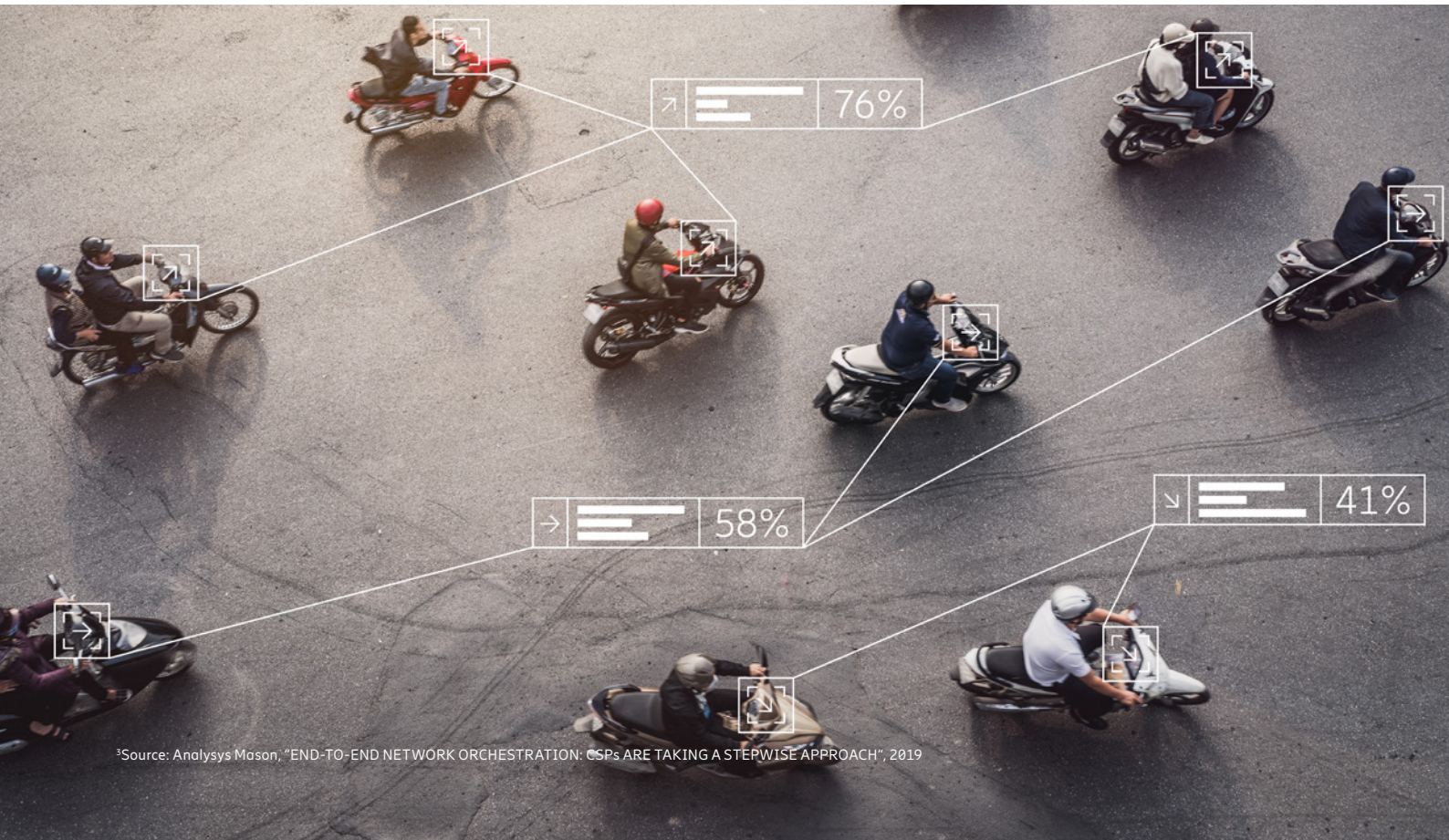
However, without the full E2E intent-driven orchestration and lifecycle management target in mind and lacking the right goals, isolated points of automation won't be enough to reach the target zero-touch network operations. Common hurdles include low network functions virtualization/software-defined networking maturity, a lack of support for automation in operations support systems (OSS) and a shortage of necessary internal skillsets.[3]

Success factors include viewing the change effort as a holistic business transformation and CI/CD integration, both of which require ongoing development. CSPs need to forge the right partnerships to guide them through the transformation. At Ericsson, we embrace the open network approach, and our solutions and services portfolio can be adapted to suit the varying needs of our customers.

Integration costs can easily become prohibitive for CSPs that cannot achieve scale. These risks can be mitigated by finding and collaborating with an experienced partner. The degree of openness established in the network will impact the depth and breadth of partnerships. This is nothing new and showcases how technology vendors can play an increasingly important role by providing and enabling certified software stacks and software delivery pipelines.

The journey towards zero-touch operations is still in the nascent stage for most. CSPs need to consider their approach based on their desired marketplace position. 5G is the future and, as its dominance expands, expectations on CSPs will only rise – as will the opportunities.

We have a heritage of collaboration with a diverse set of ecosystem players and can readily collaborate to create a network operations environment shaped for any strategic need, providing the tools and data to refine and optimize any operational model.



[3]Source: Analysys Mason, "END-TO-END NETWORK ORCHESTRATION: CSPs ARE TAKING A STEPWISE APPROACH", 2019

About Ericsson

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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