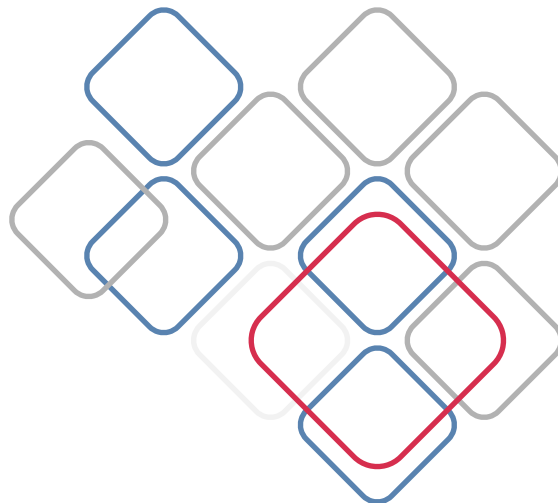


The logo for Telco Republic features the company name in a bold, sans-serif font. The word 'Telco' is partially enclosed by a light gray circle. Below the text are two rows of small gray dots.

Telco Republic

Disrupter Quintant for Next-Generation Telecom Operations and Business Support Systems (NG-TOBS)

Martina Kurth
Norbert Scholz



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Executive Summary

The NG-TOBS market is currently dominated by traditional OSS and BSS vendors capable of leading major innovation initiatives. The top 20 vendors account for approximately 50% of the total NG-TOBS market.

Despite this market concentration, new vendors with agile solutions are emerging as potentially disruptive alternative sourcing alternatives for communications service providers (CSPs). The ability to meet the demanding innovation needs of CSPs in the digital economy will determine the success or failure of established and emerging NG-TOBS players.

Key Takeaways

- Large NG-TOBS vendors mostly **innovate internally** or get involved in CSP innovation initiatives instead of establishing partnerships with startups.
- Vendors have **adopted product innovation across their entire solution stacks**, with a particular focus on technologies such as cloud, embedded AI and autonomous operations.
- All new NG-TOBS products and solutions are **cloud-native** but CSPs are slow to migrate to the public cloud. Most implementations **remain on premise or in the private cloud**.
- Most NG-TOBS vendors have made their solutions available on **multiple public clouds**, including AWS, Google Cloud Platform and Microsoft Azure.
- Transformation leadership across technology, business and organization continues to be a top priority for CSPs as they strive to **scale their innovation initiatives**.
- **Non-technical buyers**, such as CMOs, heads of B2B and CDOs, have a significant impact on OSS and BSS sourcing decisions. The justification for ROI, or return on investment, based on emerging business models, developing partner ecosystems and novel revenue streams, can determine the success or failure of deals.

Executive Summary

Recommendations for CSPs

CSP decision-makers should consider the following recommendations:

- **Start innovating in specific areas** and gradually expand initiatives throughout the organization.
- Don't underestimate the **additional effort** that change management leadership, skillset changes, and organizational transformations demand to realize the expected returns on investments in innovation.
- Pursue an innovation strategy by **building a new cloud-native, cognitive-driven, software-based technology stack from the ground up** instead of creating long-term transformation plans that rely on integrating inflexible legacy systems.
- Develop a comprehensive **five-year investment strategy** for NG-TOBS that drives innovation by incorporating both internal development and external best-in-class innovation.
- Always use well-defined customer- and business-driven KPIs to **benchmark** the effectiveness of your NG-TOBS strategy.
- Ensure that your NG-TOBS infrastructure works seamlessly **in conjunction with your partners' operational innovation requirements**. This entails delivering NG-TOBS in a closed-loop, continuous learning DevOps mode and driven by customer needs.

Introduction

CSPs are in the process of deciding how they will manage the operational paradigm shift from traditional networks to cloud-native and software-driven operations.

This concern requires a complete overhaul of their organizations to enable them to actively participate in the digital economy, digital value chains and partner ecosystems.

Traditional communications services, cloud-native services, as well as external digital content service components must be composed or mashed together into product or service bundles.

In order to remain competitive, these models will need to offer more competitive and personalized services, including digital content and components from third parties.

Finally, CSPs need to manage adequate customer experience across the end-to-end internal and external system environment. In essence, in the new digital world, the customer is the focus while the supporting technology is a given.

As a result of this evolution, the operational complexity has grown exponentially. As a result, CSPs have adopted new sourcing patterns to address these changes.

Instead of developing OSS and BSS internally, CSPs are turning to third-party providers for these solutions to meet their business needs and cover their business processes. This trend is reflected in the vendor landscape.

Telco Republic observes a growing number of new vendors entering the NG-TOBS marketplace, challenging incumbent suppliers with solutions developed from the ground up for the cloud.

Telco Republic's second edition of the *Disrupter Quintant (DQ) for Next-Generation Telecom Operations and Business Support Systems (NG-TOBS)* offers CSPs guidance on how to navigate this emerging market and make informed technology purchasing decisions.

Market Definition

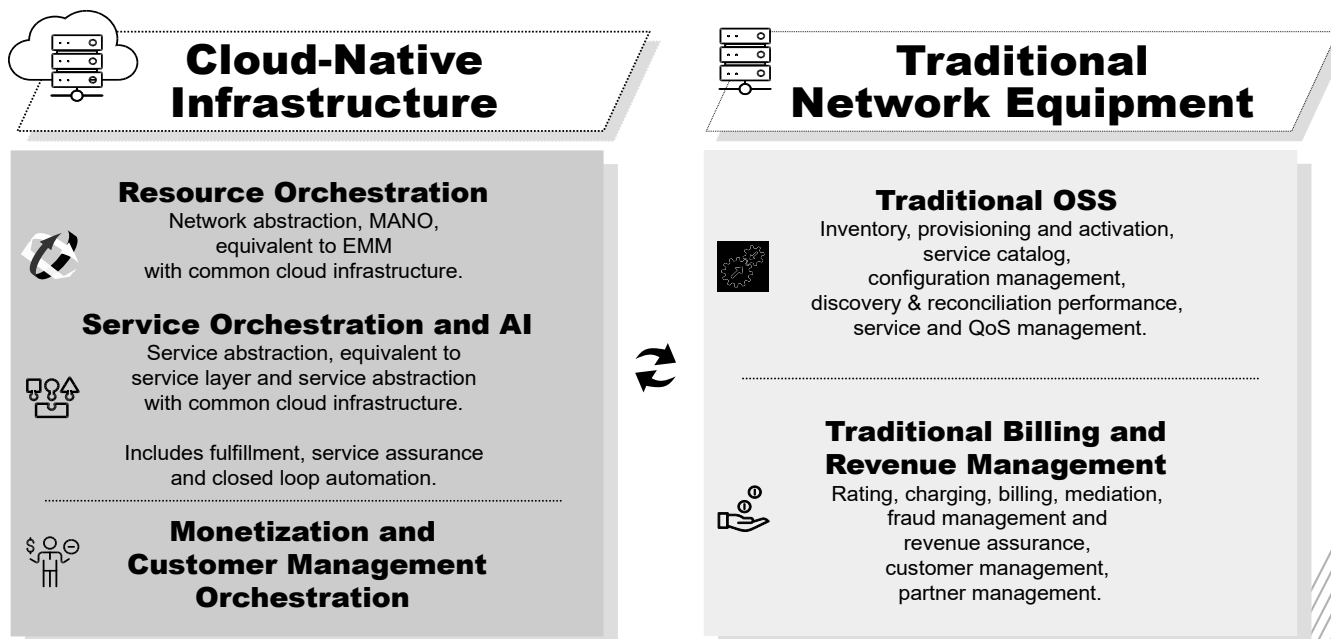
This report examines vendors' ability to disrupt the traditional OSS and BSS market by enabling CSPs to transition to Next-Generation Telecom Operations and Business Support Systems (NG-TOBS) infrastructures.

The evolution of networks to 5G and IoT requires a modernized OSS and BSS architecture. New network architectures, advocated by industry bodies and suppliers and adopted by CSPs, are based on software defined networking (SDN), network function virtualization (NFV) and orchestration, separating the data plane, control plane and application plane.

For OSS and BSS this means that traditional rigid and siloed approaches no longer can meet CSPs' requirements for network scalability and adaptability. An orchestrator is required to allocate physical and virtual resources on different levels – the resource level, the service level and the customer level – to enable autonomous, zero-touch networks.

Telco Republic defines the NG-TOBS market in the above context, drawing a divider between (1) horizontally architected, cognitive, cloud-based operational and business infrastructure; and (2) traditional OSS and BSS.

Figure 1. NG-TOBS Market Model



Source: Telco Republic, 2023

The Disrupter Quintant

The Disrupter Quintant assesses vendors that specialize in innovation and disruption in the emerging market of NG-TOBS, including software and services.

Vendors are grouped into five categories, or “quintants,” based their NG-TOBS capabilities. All vendors included in the Disrupter Quintant are capable of supporting CSPs to meet future challenges. They vary, however, in the scope, breadth and depth of their portfolios, market presence, go-to-market strategies and organizational set-ups.

Disruptor Quintant Categories

Disruptive Leaders

Amdocs, *Ericsson*, *Netcracker* and *Oracle* are positioned in the Disruptive Leaders quintant.

Vendors in this quintant differentiate themselves as follows:

- They have the proven ability to support CSPs in their journey toward NG-TOBS.
- They address all NG-TOBS requirements with a single suite supported by professional services.
- Their solutions are future-proof and incorporate the most cutting-edge technology innovations.
- They excel by their collaborative relationships with CSPs and their ability to guide CSPs toward forward-looking architectures and use cases.

Innovators

Cerillion is positioned in the Innovators quintant.

Vendors in this quintant differentiate themselves as follows:

- They show innovative, cutting-edge NG-TOBS solutions and implementation capabilities.
- CSPs tend to use specific modules – rather than the entire suite – provided by Innovators for their core business.
- Alternatively, CSPs might select Innovators for separate digital business divisions or to explore the potential of new use cases.

Reformers

Nokia is positioned in the Reformers quintant.

Vendors in this quintant differentiate themselves as follows:

- They also have forward-looking NG-TOBS portfolios and strategies, but they have not established a solid leadership position in the market because they often lack proof points of implementation.
- Often, their innovation vision is ahead of market requirements, and they have to convince CSPs of the business benefits of their solutions.
- Reformers might include large vendors that undergo a restructuring process, or startups in advanced funding rounds.

Niche Innovators

Circles, **Hansen**, **Incognito** and **Wavelo** are positioned in the Niche Innovators quintant.

Vendors in this quintant differentiate themselves as follows:

- They have one or more highly specialized NG-TOBS innovation skillset or a specific domain expertise; or they target a discrete subsegment of the CSP market.
- They might closely work with a small number of clients as trusted advisors and mentors, and can act as longstanding extensions of internal IT departments.
- Their technology and services are usually impeccable, but they lack the scale and scope to support large transformational projects.

Transformers

Comarch, **HPE** and **Huawei** are positioned in the Transformers quintant.

Vendors in this quintant differentiate themselves as follows:

- They represent a unique position in the middle cluster of the Disrupter Quintant.
- They share some characteristics with vendors in any of the other four quintants.
- They demonstrate a high degree of pragmatism regarding transformation by enabling CSPs to transition away from legacy solutions.
- However, they still need to develop their execution and strategy capabilities to scale innovation in complex future environments.

Evaluation Criteria

Vendors were evaluated based on the following criteria:

Strategy

Five-Year Innovation

The ability to meet all CSPs' known and emerging requirements within the next five years and guide CSPs in their decision which technologies to adopt.

Product or Service

The ability to evolve the current product and services portfolio to meet all future CSP requirements, or the introduction of new products and services either through in-house development or by leveraging external resources.

Vertical Approach

The ability to extend the product or services portfolio beyond the telecom vertical and a well-defined strategy to support CSPs in their effort to target specific vertical industries.

Sales Strategy

A well-defined target market and an efficient and effective sales force and channel to expand into this market.

Operational Innovation

The support of new delivery models beyond traditional license sales by adjusting the organizational setup and geographic focus to meet customer requirements.

Execution

Product or Service Innovation Capabilities

A comprehensive NG-TOBS product and services portfolio that is well received by end-users in every respect, including usability, total cost of ownership, scalability and integration.

Sales, Channels and Pricing

An effective and efficient sales process that drives overall growth and profitability.

Customer Impact

The demonstrated ability to delight customers in every interactions, including sales, consulting, product capabilities, and support and maintenance.

Standard Compliance

Adherence to specifications developed by standards organizations and active involvement in standards initiatives.

Operational Model

The organization's demonstrated ability to drive long-term growth and profitability in a stable and predictable manner.

Ericsson

Who Should Consider Ericsson

The following CSPs should consider Ericsson:

- CSPs of any size looking for a transformation partner to modernize their end-to-end OSS and BSS.
- CSPs of any size that are looking for a network equipment vendor with strong OSS/BSS domain expertise.
- CSPs with a traditional network-centric focus that are followers in the adoption curve of cloud migration efforts.

Company Facts

Ericsson is a global, publicly traded network equipment, software and service provider. As the largest global mobile network equipment provider and with a global 5G leadership position, it has been able to successfully position itself as a strategic software vendor by cross-selling its OSS and BSS into large NEP accounts.

Ericsson has a long history of acquiring large and small OSS and BSS vendors, among them Telcordia (2004), LHS (2007), ConceptWave (2012) and CENX (2018).

Ericsson has hundreds of CSP customers of all sizes worldwide.

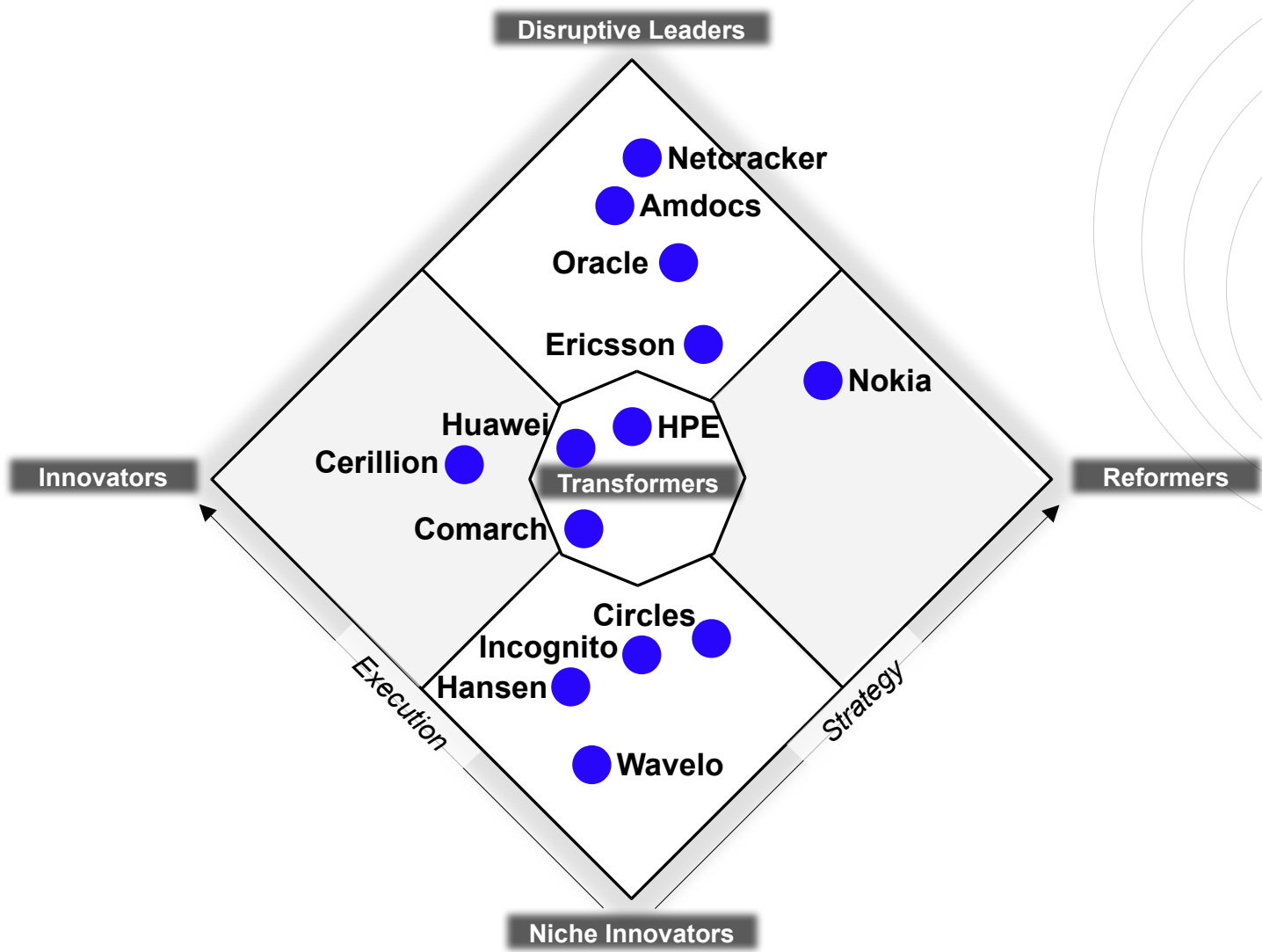
It is headquartered in Kista, Sweden, with subsidiaries on every continent.

Disruptive Differentiators

Ericsson is placed in the **Disruptive Leaders quintant** and differentiates itself as follows:

- Ericsson is the NEP with the most complete OSS/BSS product and services value proposition, catering to complex transformation needs of CSPs in all geographies.
- Continuous product and services innovation with the potential to cross-fertilize NG-TOBS with innovation from other business units.
- The ability to leverage its deep expertise with local conditions, its entrenched position in CSPs' core network operations and its global 5G leadership position.

Figure 2. Disrupter Quintant for Next-Generation Telecom Operations and Business Support Systems (NG-TOBS)



Source: Telco Republic, 2023

Vendor Profiles

Notes on vendor profiles:

Strengths and challenges expressed in the vendor profiles refer to each vendor individually, and should not be considered a comparison across vendors. For example, a challenge for Vendor A might be considered a strength for Vendor B because it is presented in a different context.

Strengths and challenges are headlined by the evaluation criteria outlined above. A headline does not imply that the entire criteria is a strength or a challenge. Vendors might have both strengths and challenges within the same evaluation criteria, since each evaluation criteria consists of multiple subcriteria.

Amdocs

Who Should Consider Amdocs

The following CSPs should consider Amdocs:

- Tier 1 CSPs looking for a transformation partner to modernize their end-to-end OSS and BSS.
- CSPs that prefer to entrust their entire NG-TOBS transformation to a single vendor with a comprehensive product portfolio and an experienced services organization.
- CSPs of any size that intend to maintain a strong vendor relationship over more than a decade.
- Lower tier CSPs, MVNOs and digital brands looking for a SaaS-based digital BSS.

Company Facts

Amdocs is a global, publicly traded software and service provider. From its origins as an Israeli billing software company for phone directory companies in 1982, it established itself as a supplier of BSS and OSS solutions as well as professional services to the largest global fixed, mobile and media companies. It recently added the banking and finance industry as a new target market.

Amdocs has a long history of acquiring large and small OSS and BSS vendors, among them Solect (2000), DST Systems (2005), Cramer Systems (2006), Bridgewater Systems (2011), Comverse (2015), Vubiquity (2018) and Openet (2020).

Amdocs has hundreds of CSP customers of all sizes worldwide.

It is headquartered in Chesterfield, Missouri, with subsidiaries on every continent.

Disruptive Differentiators

Amdocs is placed in the **Disruptive Leaders quintant** and differentiates itself as follows:

- A comprehensive NG-TOBS product portfolio supported by a deep implementation expertise capable to supporting the largest CSPs with the most challenging transformation projects.
- The ability to support CSPs existing OSSs and BSSs, while guiding them to on their transformation journeys with innovative technologies and methodologies.
- Its ability to offer seamless consistent and friction-free engagement to CSPs' B2C and B2B customers in partnership with hyperscalers and generative AI providers.



NG-TOBS Portfolio Overview

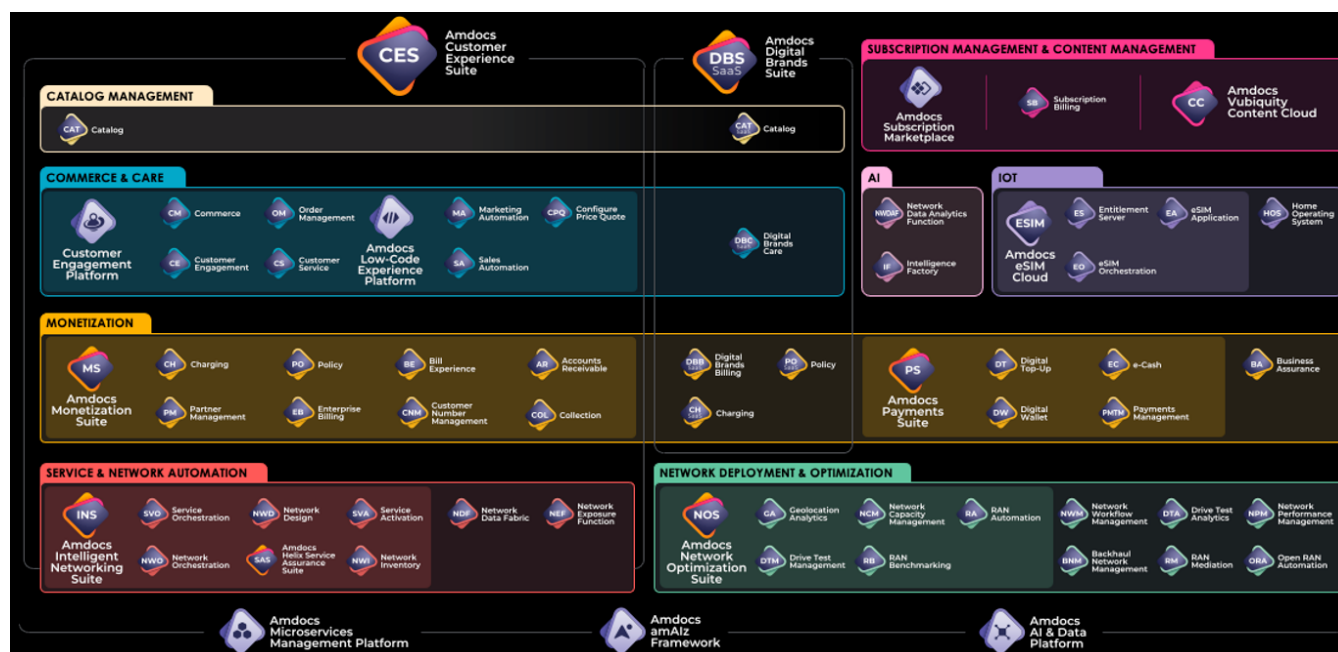
Amdocs offers a comprehensive NG-TOBS portfolio, most of which is housed in its **Customer Experience Suite (CES)**. Amdocs BSS solutions, as part of CES, include the Customer Engagement Platform, developed in partnership with Microsoft and the Monetization Suite, including 5G-native Charging and Policy and Freestyle Billing. Amdocs OSS products in the CES suite are known as the **Intelligent Networking Suite**.

- The **Digital Brands** suite targets MVNOs and smaller CSPs with an out-of-the-box SaaS BSS offering.
- **Subscription Marketplace** (previously MarketONE) enables any company to launch digital subscriptions.
- **eSIM Cloud Platform** enables any CSP to launch digital eSIM on any device and for any segment.

Product categories include: Catalog Management, CPQ, Commerce and Care, IoT, Monetization, Network Deployment and Optimization, Service and Network Automation, OTT and Digital Subscription Partner Management and Low Code Experience Platform.

The portfolio is TMF, GSMA, ETSI, MEF, 3GPP and O-RAN compliant and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (AWS, Google Cloud Platform, Microsoft Azure, VMware and Red Hat).

Figure 3. Amdocs' NG-TOBS Portfolio



Source: Amdocs, 2023



Strengths

Product or Service Innovation Capabilities

Amdocs ensures that its NG-TOBS portfolio remains at the forefront of innovation by investing significant amounts into R&D (\$375 million in FY 2023), and by leveraging innovation coming out of ongoing client projects. Among its innovation highlights are the double-digit growth in its cloud products and services, now surpassing 20% of total revenue. Additionally, it deployed genAI across its product portfolio.

Customer Impact

In addition to its comprehensive and scalable NG-TOBS product portfolio, customers appreciate the domain expertise and experience of Amdocs consultants, who excel in successfully delivering highly complex projects in multi-vendor and multi-solution scenarios.

Sales Strategy

Amdocs' global salesforce executes well based on an effective target segmentation that aligns its product portfolio with customer size (tier 1 to 3) and customer requirements, such as on-premise, cloud, out-of-the-box, customized, monetization, network automation, IoT and others.

Challenges

Vertical Approach

Amdocs historically focused on the telecom and media verticals. Although the company gained several clients in other industries over the years, these acquisitions were impromptu and lacked a coherent vertical strategy. It recently announced finance and banking as a new medium to long-term target vertical to expand its presence outside of telecom.

Sales, Channel and Pricing

Amdocs pricing can be highly complex, partly because of the multi-layered projects it supports. The company typically adheres to a rather rigid legalistic approach when it comes to making adjustments to projects that are not codified in written agreements. This approach can sometimes discourage clients who anticipate adaptable and flexible collaboration terms.

Product or Service

Amdocs remains the primary system integrator for its NG-TOBS products and keeps a relatively small selection of complementary products from third-party developers. CSPs who favor a multi-vendor approach may find Amdocs' exclusivity too restrictive.

Cerillion

Who Should Consider Cerillion

The following CSPs should consider Cerillion:

- CSPs exploring alternatives to the established vendors, especially quad-play providers looking for a best-of-suite solution.
- Digital divisions of operator groups that require cloud-based solutions.
- MVNOs, MVNEs or digital brands that require cloud-based solutions.
- Companies in other industries requiring OSS and BSS capabilities that are more robust than solutions offered by the so-called “subscription billers.”

Company Facts

Cerillion started as a BSS vendor in 1992 as the customer care and billing product division of Logica (FROST). It became an independent company following the management buyout from Logica in 1999.

In 2015, it expanded into OSS with the acquisition of netSolutions, a geospatial location network inventory business.

Cerillion has around 80 customers in over 40 countries.

It is headquartered in London, U.K., with a Global Solutions Center in Pune, India, and operations in Bulgaria, the United States and Australia.

Disruptive Differentiators

Cerillion is placed in the **Innovators quintant** and differentiates itself as follows:

- An early mover in providing telco cloud solutions and featuring “BSS/OSS-as-a-Service” solutions that are pre-configured and purpose-built for specific market segments, providing an all-in-one pricing model.
- A single pre-integrated product suite that can be modularized allowing incremental legacy transformation.
- Support for CSPs and other vertical industries on a single platform on-premise, in the private cloud, the hybrid cloud and the public cloud.



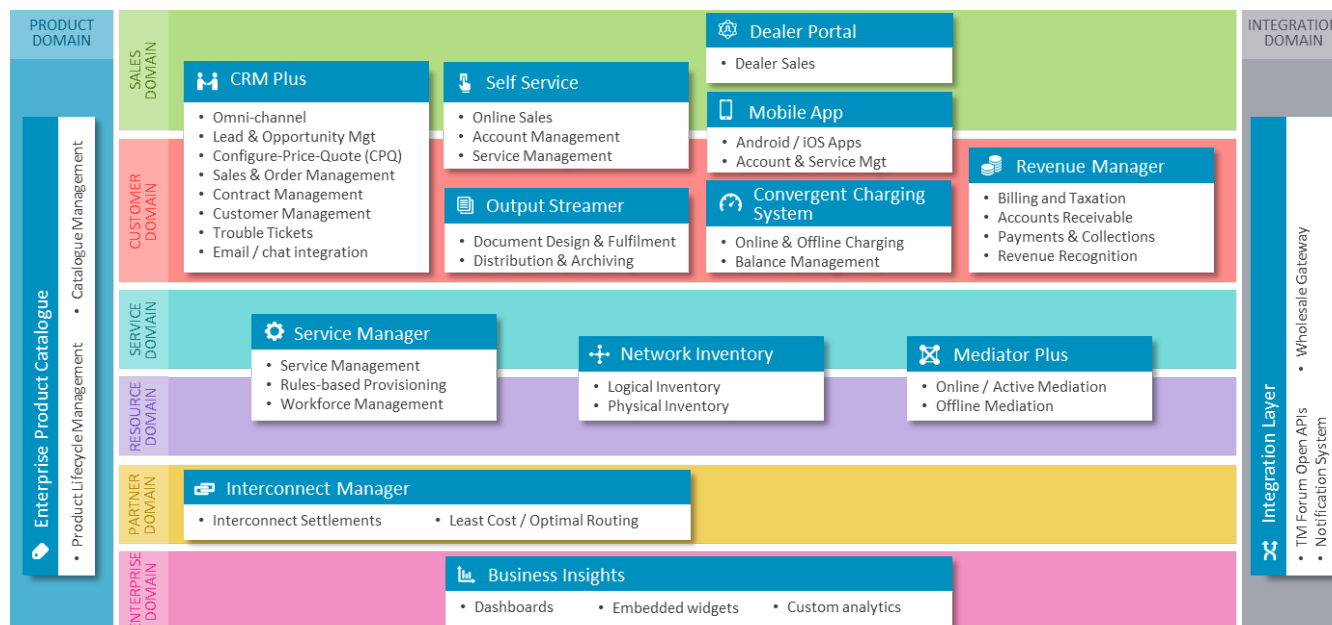
NG-TOBS Portfolio Overview

Cerillion's product portfolio centers on the Monetization and Customer Management Orchestration pillar in the NG-TOBS universe. Resource and Service Orchestration are covered via the Service Manager and Network Inventory modules. All solutions components have been developed in-house, except for two small acquisitions, netSolutions (2015) and an interconnect rating, billing and settlement product (2001).

Depending on user requirements Cerillion offers five variants of its standards-based pre-integrated **BSS/OSS Suite: Cerillion Unify**, a complete digital BSS/OSS solution for quad-play CSPs; **Cerillion Enterprise**, a pre-integrated BSS/OSS solution for B2B telcos; **Cerillion Engage**, a streamlined BSS/OSS platform for digital brands; **Cerillion Metro**, a powerful BSS/OSS solution for smart cities; and **Cerillion Skyline**, a complete billing and charging solution for subscription businesses.

The portfolio is TMF and 3GPP compliant and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (Microsoft Azure, AWS and IBM Cloud).

Figure 4. Cerillion's NG-TOBS Portfolio



Source: Cerillion, 2023

cerillion

Strengths

Customer Impact

Cerillion excels at creating a positive customer experience through agile, proactive and pragmatic project management. Its pre-integrated solution suite is free from red tape and integration overhead commonly encountered by CSPs dealing with larger vendors.

Operational Model

Cerillion is one of the few profitable and growing NG-TOBS vendors, thanks to steady expansion within existing accounts. The company's size facilitates well-managed operations, resulting in double-digit revenue growth over the past four years and double-digit net profit margins for more than a decade.

Vertical Approach

Cerillion's five targeted variants of the BSS/OSS Suite have the potential to expand its market penetration by catering to the specific demands of various CSPs and businesses.

Challenges

Sales, Channels and Pricing

Cerillion emphasizes the technical nature of sales. This approach might need some adjustments, as CSPs' procurement processes are shifting to commercial constituents and purchasing decisions are increasingly driven by the measurable impact of technology rather than the technology itself.

Five-Year Innovation

Cerillion's innovation strategy revolves around incrementally improving its products by surrounding them with new technologies and methods, such as artificial intelligence and machine learning, IoT enablement, low code/no code capabilities, improved standards compliance, cloud agnosticism and digital engagement. For CSPs aiming for a drastic shift away from legacy operations, this approach may seem too slow.

Sales Strategy

As a full-suite vendor, Cerillion maintains a relatively limited lineup of sales partners, consisting of Capgemini, CGI, Netcompany, Nokia, and GE. This strategy may become too narrow to sustain continued double-digit growth as the company expands geographically and in terms of project size.

Circles

Who Should Consider Circles

The following CSPs should consider Circles:

- CSPs of any size that are looking to quickly launch a digital brand without having to make changes to their backoffice systems.
- CSPs of any size requiring a fully integrated BSS solution that can be quickly brought to market and operate at a reduced cost in comparison to incumbent NG-TOBS providers' solutions.
- CSPs of any size that are more concerned about business outcomes than about the underlying NG-TOBS technology.

Disruptive Differentiators

Circles is placed in the **Niche Innovators quintant** and differentiates itself as follows:

- Its innovative approach to positioning its solution as a business and customer experience enabler.
- Its deep understanding of CSPs' requirements based on its heritage as a CSP.
- Its quick acquisition of global tier 1 CSP accounts, which gives credence to its sound business and technology strategy.

Company Facts

Circles provides a cloud-based telco-as-a-service platform, known as Circles X, which enables mobile telecom operators to launch digital brands that operate efficiently and offer personalized digital services. Since 2014, Circles X is the digital platform built to power Circles.Life, a Singapore-based digital CSP that later expanded to Australia and Taiwan.

Circles is an emerging NG-TOBS provider that has partnered with a number of tier 1 CSPs to launch digital telcos in their markets, including KDDI Corporation, Optus and e& international, with whom it has formed a joint venture (JV) in 2023, to tap into its network of CSPs across 16 markets.

Circles is headquartered Singapore.



NG-TOBS Portfolio Overview

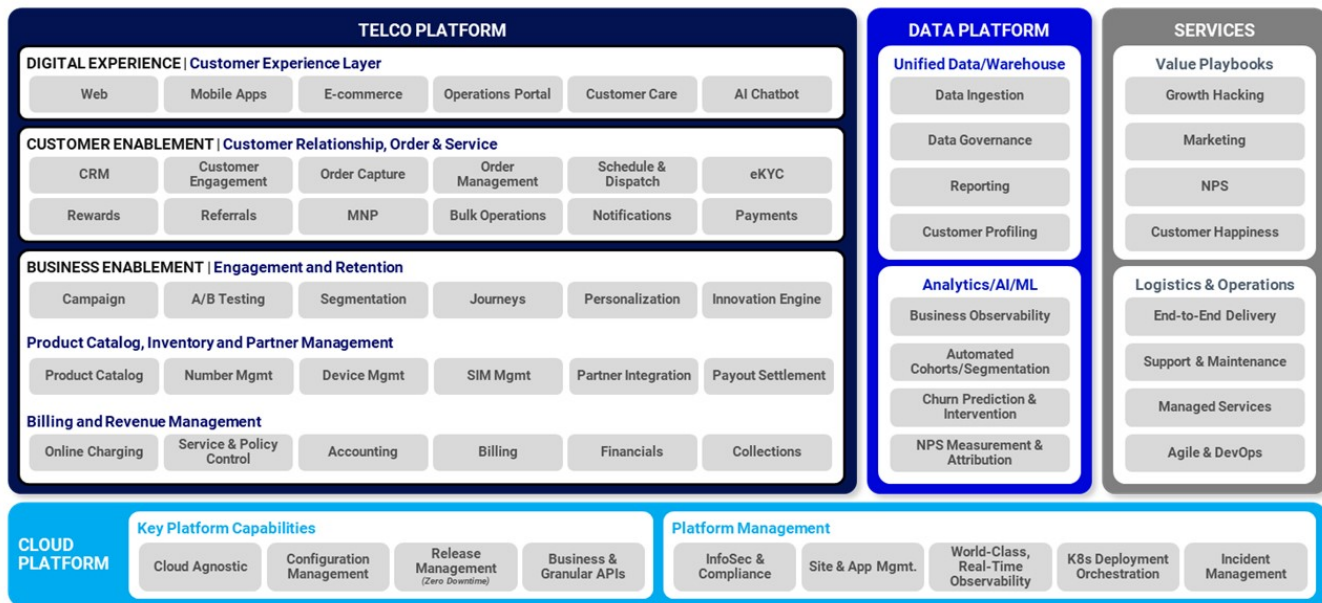
Circles' NG-TOBS portfolio focuses primarily on BSS solutions, complemented by a limited set of OSS functionalities for product catalog and inventory management.

The company's product, called Circles X, consists of four building blocks: The **Telco Platform**, including digital experience, customer enablement and business enablement; the **Data Platform** with unified data and analytics; the **Cloud Platform**; and **Professional Services** including consulting and delivery and operations.

Circles also offers a proprietary testing environment called Sandbox, which is isolated from the main platform, to perform rapid prototyping and experimentation in a controlled setting. This allows CSPs to rapidly test new ideas, quickly discard unsuccessful ones and move forward with successful ones, accelerating the speed of bringing a feature to market.

The portfolio is TMF compliant and can be deployed on-premise, in the private cloud, the hybrid cloud and the public cloud (AWS and Google Cloud).

Figure 5. Circles' NG-TOBS Portfolio



Source: Circles, 2023



Strengths

Five-Year Innovation

Circles has a compelling vision of innovation. The company defines innovation as going beyond technology and providing experiences, benefits and customer satisfaction. Accordingly, it concentrates on harnessing the power of data, increasing organizational agility to adapt to evolving market needs, and finding differentiation outside of core connectivity services by building products, services and experiences tailored to specific customer needs.

Sales Strategy

Circles' sales strategy is targeted and well-defined. It aligns specific buyer personas to its solutions. It partners with CSPs for business outcomes, instead of following a traditional technology sales approach. Additionally, it provides a fully integrated solution stack, eliminating the need for system integrator partnerships.

Sales, Channels and Pricing

Circles' sales value proposition delivers business results for CSPs looking to launch successful digital brands. Leveraging the experience of operating the company's digital CSP, Circles.Life in Singapore, Australia and Taiwan, Circles offers CSP CXOs the playbook to run a telco from day one. Its straightforward pricing model is partially linked to client success KPIs. The added benefit of requiring only a modest number of staff to operate the solution, along with the build-operate-transfer option, enhances its appeal to CSPs launching a digital enterprise.

Challenges

Product or Service

All components of Circles' solution are tightly integrated. This makes it unsuitable for CSPs that prefer to adopt an incremental approach to NG-TOBS by replacing one legacy solution component at a time.

Standard Compliance

Circles' involvement in standards organization is limited to a single certification by Circles.Life: The TMF open API TMF629 – Customer Management.

Vertical Approach

Circles focuses on the telecom industry and CSPs that offer solutions to companies in other industry verticals. Its strategy does not address the potential market of non-telecom sectors that aim to launch digital brands.

Comarch

Who Should Consider Comarch

The following CSPs should consider Comarch:

- Tier 1 CSPs or CSP groups, looking for an alternative full-stack integrated OSS/BSS solution to the incumbent vendors.
- CSPs of any size that prefer to work with a vendor which has equally competent software publishing and system integration capabilities.
- CSPs with a mature business and technology strategy able to take control of their internal IT leadership.

Company Facts

Comarch has been in business since 1993, providing software and services to multiple industry verticals, including banking, finance and insurance, manufacturing, healthcare, government and telecom.

Comarch has hundreds of CSP and customer of all sizes worldwide.

It is headquartered in Cracow, Poland, with subsidiaries on all five continents.

Disruptive Differentiators

Comarch is placed in the **Transformers quintant** and differentiates itself as follows:

- A comprehensive NG-TOBS product portfolio built entirely in-house, coupled with a capable professional services organization, which are positioning the company as a viable transformation partner.
- A long track record of stable, predictable and reliable product development in response to CSPs' requirements.
- Its expertise in other industry verticals, such as finance and healthcare, will play in favor of CSPs vertical industry initiatives.

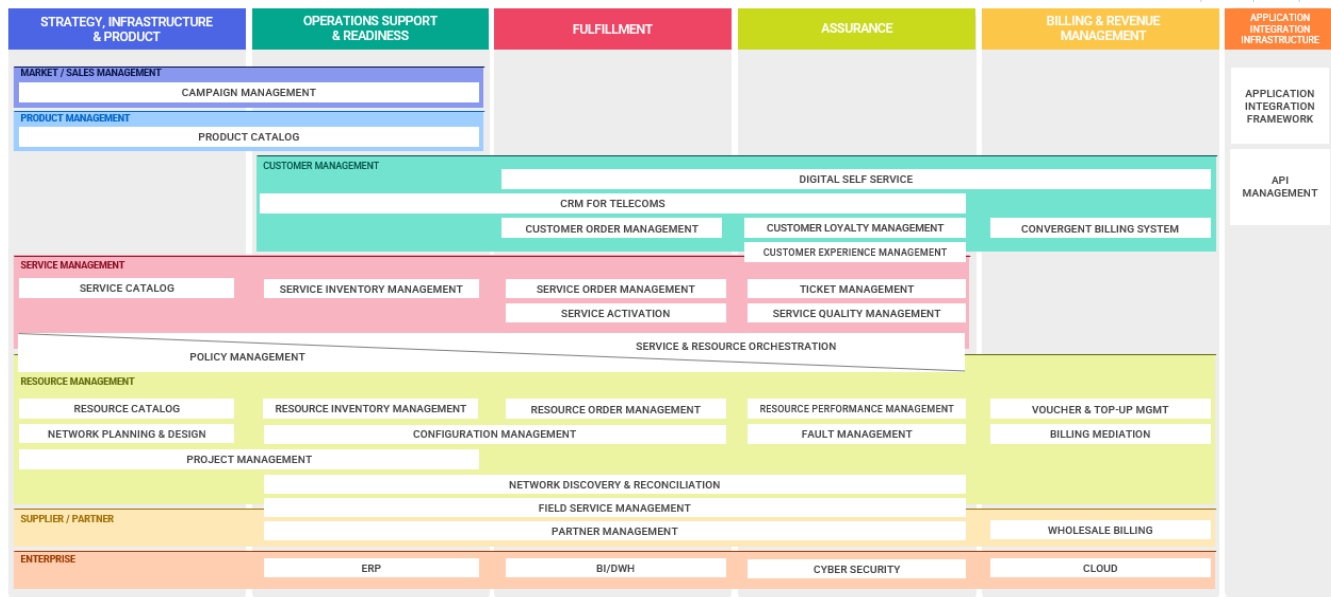
COMARCH

NG-TOBS Portfolio Overview

Comarch's product portfolio covers the entire NG-TOBS universe. All modules are entirely developed in-house, giving the portfolio a high degree of cohesion and interoperability.

The portfolio is TMF, GSMA, ETSI, 3GPP and O-RAN compliant and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (AWS, Comarch Cloud, Google Cloud Platform, Microsoft Azure and Red Hat OpenShift).

Figure 6. Comarch's NG-TOBS Portfolio



Source: Comarch, 2023

COMARCH

Strengths

Customer Impact

Comarch's customers generally appreciate the pre-integrated, cost-effective full-suite solution that is supported by a knowledgeable and responsive services organization. Through its nearshore and offshore capabilities, Comarch has a proven history of supporting CSPs in both Western and Eastern Europe as well as on other continents such as Asia and North America.

Operational Model

The company has earned the trust of clients and prospects through its long-standing reliability and deliberate expansion of innovative solutions into new geographies.

Vertical Approach

Comarch leverages its work with other industries to assist CSPs to support for their own industry clients. Recently, its IoT solution gained traction among CSPs, and Comarch onboarded businesses from diverse verticals for their IoT solution.

Challenges

Product or Service

Comarch's internal product development focus hinders its ability to adopt and expand upon innovations created by startup vendors, such as those related to security, fintech, blockchain, or augmented reality/virtual reality. In addition to technology leadership, CSPs also require organizational change management leadership.

Sales Strategy

Despite having an extensive NG-TOBS product portfolio and a committed team of service professionals, Comarch has not yet secured any transformational mega deals with global Tier 1 CSPs worth hundreds of millions of dollars per annum, which would be pivotal in challenging its primary competitors.

Operational Model

The financial success of Comarch's telecom division heavily relies on Western and Eastern European CSPs. While the company has acquired many clients globally, it has not fully exploited the best practice opportunities with global CSPs.

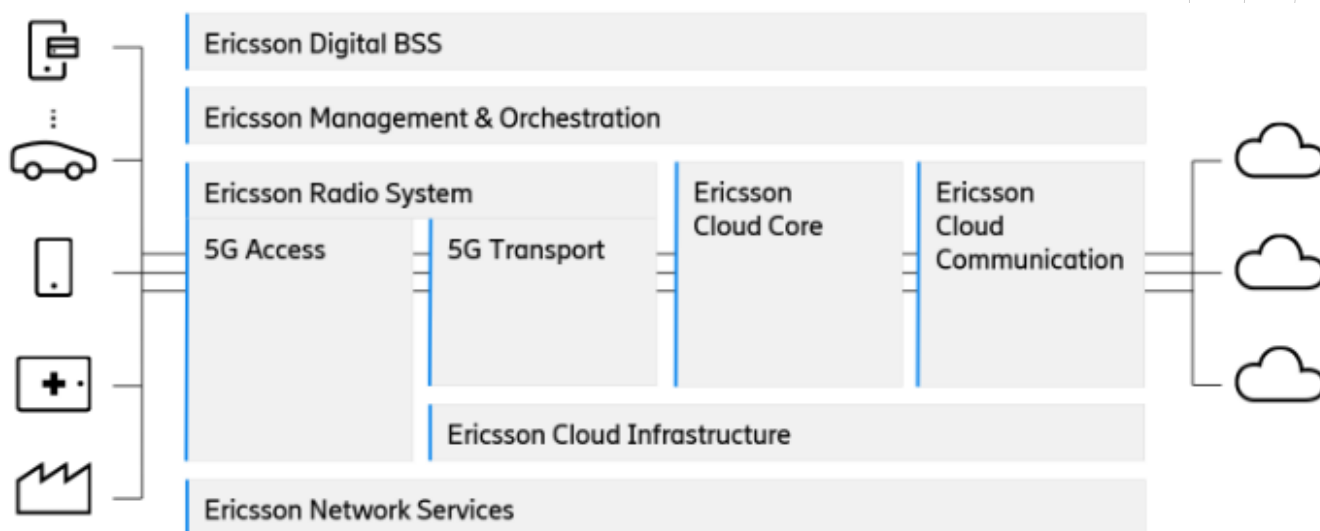


NG-TOBS Portfolio Overview

Ericsson offers a full suite OSS and BSS systems that span across core commerce, orchestration, monetization and data and analytics offering areas.

Its portfolio of products and solutions is supported by open APIs, accompanied by a comprehensive range of services to advise, build, operate and ensure.

Figure 7. Ericsson's NG-TOBS Portfolio



Source: Ericsson, 2023



Strengths

Five-Year Innovation

Ericsson has an extensive and futuristic innovation program that addresses NG-TOBS from a network infrastructure perspective, including 5G, IoT, connected society, cloud, 5G core and ORAN. Its intelligent automation platform helps CSPs to accelerate cloudification of hybrid network cloud-based infrastructures.

Product or Service

Ericsson has one of the largest numbers of deployments of OSS and BSS modules across all CSPs tiers and geographies. It consistently enhances its existing products, with a particular focus on improving the customer experience associated with OSS. Additionally, Ericsson collaborates with selected partners to accomplish these objectives.

Product or Service Innovation Capabilities

Ericsson's research and development organization continuously introduces innovative NG-TOBS features and capabilities. For example, it recently unveiled a new cloud-native Orchestration Center to design, develop, implement and support the life cycle management of cloud-native solutions for customers globally.

Challenges

Operational Model

Throughout 2023, Ericsson significantly reduced its cost base by making over 9,000 redundancies. It is yet to be determined how these changes will impact the capabilities of its NG-TOBS operations.

Sales, Channel and Pricing

Depending on the region, some clients may find it cumbersome to deal with Ericsson across different divisions due to its centralized versus decentralized approach. Improvements in go-to-market orchestration and service delivery could increase streamlining and efficiency.

Vertical Approach

One of Ericsson's weaknesses in NG-TOBS is its enterprise vertical strategy, where it mainly serves enterprises mainly through CSPs. It lost momentum in the enterprise sector with the sale of its Enterprise and Cloud Billing (ECB) business in 2019. However, the company recently increased its focus on vertical industries for connectivity. Enterprise acquisitions such as Vonage address the future of API monetization for CSPs.

Hansen

Who Should Consider Hansen

The following CSPs should consider Hansen:

- Large CSPs looking for a cloud-native solution for accelerating their commercial operations with the help of product catalog, CPQ, order management and provisioning solutions.
- Small CSPs looking for cost-effective and feature-rich integrated NG-TOBS solutions.
- CSPs of any size looking for an alternative vendor that can deliver an agile and integrated lean billing and customer-facing stack.
- CSPs adding utilities to their service portfolios.

Company Facts

Hansen has been operating since 1971, with early origins in the management of customer and organizational data storage solutions and telco billing solutions.

Through a series of acquisitions worldwide starting in the early 2000s, it expanded further into the telecom and utilities sectors.

Hansen has a strong base of CSP and utilities customers of all sizes worldwide.

Headquartered in Melbourne, Australia, Hansen has global business operations in the Americas, EMEA and Asia Pacific.

Disruptive Differentiators

Hansen is placed in the **Niche Innovators quintant** and differentiates itself as follows:

- A robust and scalable product catalog, CPQ and order management solution meeting the requirements of CSPs of any size that want to grow in the B2B segment and support new emerging business models such as digital marketplaces and 5G/IoT solutions.
- Deep domain knowledge, institutional intelligence and decades of experience in the communications and utilities industries.



NG-TOBS Portfolio Overview

Hansen's product portfolio is located at the center of the Resource Orchestration, Service Orchestration and AI, and Monetization and Customer Management Orchestration pillar in the NG-TOBS universe.

Its core products are product catalog, CPQ and order management, as well as portfolio inventory, underpinned by informatics that provides the foundation for data analytics and AI-driven operational processes. With deep roots in providing B2C solutions, Hansen has a particular emphasis and strong value proposition for B2B. These products are complemented by provisioning, billing and customer care. The Hansen suite for communications was developed through multiple strategic acquisitions during the past two decades, most notably the 2019 acquisition of Sigma Systems, a prominent provider of service fulfillment solutions, product catalog management and CPQ.

The suite has strong alignment to TM Forum standards including open APIs and ODA and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud.

Figure 8. Hansen's NG-TOBS Portfolio

HansenSuite
for Communications, Technology & Media

HansenCatalog

HansenCPQ

HansenOM

HansenPortfolio

HansenProvision

HansenCCB

Source: Hansen, 2023



Strengths

Customer Impact

Hansen's customers typically express high satisfaction with both the product and the provided support, placing value on the feature set and reasonable pricing. Additionally, they appreciate the proactive and responsive implementation team.

Operational Model

Hansen is one of the few NG-TOBS vendors that is profitable and growing. Over the past few years, Hansen has been successful in securing several deals with tier 1 CSPs, such as Telefonica Germany, Virgin Media, Dish and Verizon. The potential synergies between Hansen's CSP and utilities businesses could propel the company towards above-average growth in the future.

Product or Service

Hansen's cloud-native product catalog and CPQ solutions, its order management and provisioning capabilities and its support for DevOps practices make it an appealing option for CSPs of any size looking to expand their digital B2B services. Hansen allows CSPs to create and deliver services enabled by next-generation networks, supporting new business models generated by opportunities in 5G and IoT, including platform and partner-based models.

Challenges

Sales Strategy

Hansen's sales strategy targets high-value CSPs individually, either directly or through partners. While this technique may prove successful with CSPs acquainted with Hansen, there is a chance of missing out on opportunities with CSPs unfamiliar with the company due to the lack of a formal strategy based on specific criteria like technology adoption, geography, business requirements or buying persona.

Five-Year Innovation

Hansen defines its product roadmap as pragmatic improvements aligned to customer needs, focused on minimizing disruption and maximizing return on investment. While this approach is effective for CSPs with a conservative approach to digital transformation, it may not be suitable for companies seeking to disrupt the status quo.

Vertical Approach

Hansen's vision of utilizing the top capabilities of its telecom and utilities divisions in various industries has not yet fully materialized. It is uncertain when this vision will come to fruition. Presently, only a few utility companies are making use of Hansen's telecom offerings and vice versa. Accordingly, this market potential is still largely untapped.

HPE

Who Should Consider HPE

The following CSPs should consider HPE:

- CSPs of any size looking for a superior and robust OSS and BSS solution to drive operational efficiency improvements.
- CSP groups aiming to take advantage of HPE's as-a-service offering, allowing them to exploit the high quality, reliability and scalability of its technology and enabling them to gain efficiency benefits as well as cost savings on a group level.
- Tier 1 CSPs or CSP groups, seeking to maximize their B2B earnings potential with an end-to-end customer-driven orchestration solution, augmented with AI/ML-driven assurance.

Company Facts

Hewlett Packard Enterprise (HPE) split off from the Hewlett-Packard company in 2015 as a business-focused organization. It is a global IT Infrastructure player with a strong footprint in the global telecommunications market.

HPE has a long history of being involved in OSS/BSS transformation projects worldwide in some of the largest operators. HPE has global delivery teams specialized in its products, often working in tandem with clients' development and operational teams (such as Swisscom or Verizon) to support the ongoing operational shift toward an agile end-to-end DevOps delivery paradigm.

HPE has numerous of CSP customers of all sizes worldwide.

It is headquartered in Houston, Texas, with subsidiaries on every continent.

Disruptive Differentiators

HPE is placed in the **Transformers quintant** and differentiates itself as follows:

- A demonstrated ability to support next-generation OSS and adjacent BSS with high-quality technology. Its OSS Orchestration is part of its wider OSS Operations Suite that includes adjacent operational tools, service assurance and AI/ML. Intent-based design principles address CSPs' future automation needs.
- Operational innovation to support CSPs' operating paradigm shift toward cloud-native, AI software-driven, closed-loop operations in an agile, DevOps mode. HPE operates according to the same paradigm as customers expect.

**Hewlett Packard
Enterprise**

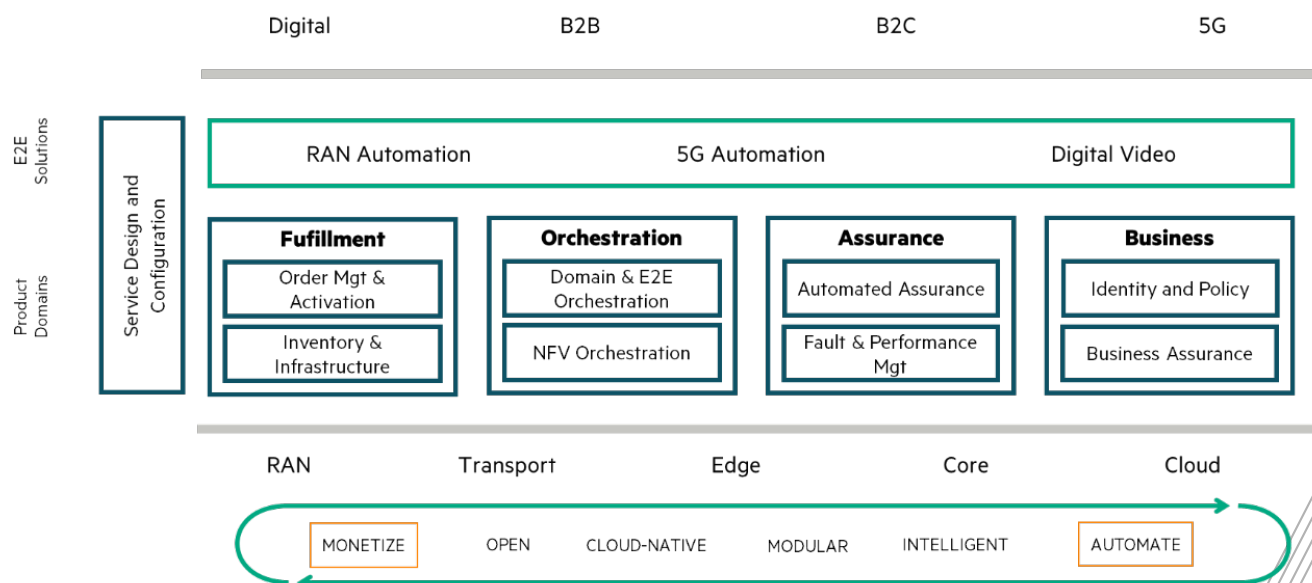
NG-TOBS Portfolio Overview

HPE leverages its combined telco network and IT enterprise expertise that is coupled with a cloud-first approach. The company provides multi-technology domain OSS/BSS orchestration capabilities based on cloud-native design principles. These capabilities allow CSPs to transform incrementally across evolving hybrid architectures. It provides integrated closed-loop operations, enabling AI/ML-driven assurance and big data management. This allows streamlined operations and end-to-end QoS across evolving hybrid operational CSP infrastructures.

HPE's closed-loop OSS orchestration capabilities support CSPs' cloudification initiatives. Its robust flagship products – the NFV Director (network resource abstraction) and the HPE Service Director (OSS orchestrator) – enjoy strong traction among CSPs of all tiers worldwide. HPE continues to drive the evolution of Service Director to help CSPs innovate their OSS toward bimodal service delivery agility in terms of flexibility, speed and quality.

In addition to orchestration and automated assurance, HPE's end-to-end automation suite covers fulfillment, inventory and infrastructure management as well as business function domains, such as digital identity, policy management and business assurance. Pre-built end-to-end solutions for 5G automation, digital video and RAN automation provide business acceleration for customers.

Figure 9. HPE's NG-TOBS Portfolio



Source: HPE, 2023


Hewlett Packard
Enterprise

Strengths

Operational Innovation

HPE excels in terms of its innovation strategy. Digital services, cloud and virtualization are the foundation of its OSS/BSS product strategy. HPE offers its entire portfolio as-a-service via a consumption-based pricing model, including HPE Service Director, the vTeMIP suite, Intelligent Assurance, Digital Entitlement Gateway and the 5G core stack.

Product or Service Innovation Capabilities

CSPs globally perceive HPE OSS orchestration as a robust, mature and scalable solution. End-to-end resource and service modeling drive full automation based on unified data models and intent-driven design patterns. HPE's focus on cloud-native and as-a-service delivery is essential for advancing the maturity of next generation OSS/BSS. HPE is well positioned to gain market share in this evolving market through 2025.

Customer Impact

HPE's OSS/BSS products make a significant impact on customers. The new generation of its OSS Service Director has gained significant traction, especially among large CSPs such as Deutsche Telekom and Verizon. CSPs view HPE as a reliable transformation partner with robust, mature and scalable OSS/BSS solutions. In addition to the high quality of its technology, HPE extends further support for operational paradigm initiatives on a service delivery and professional services level, such as DevOps, agile and closed loop operations.

Challenges

Sales, Channels and Pricing

Due to its emphasis on delivering high-quality technology, HPE has neglected the importance of consultative selling that showcases business outcomes to key business-oriented decision-makers at CSPs. This lack of focus extends to the training and preparation of their global telco sales team regarding new digital business and operating paradigms, as well as the evolving requirements of the uncharted B2B market.

Product or Service

HPE will experience competition from NEPs, who possess proficiency in conventional network domains such as radio, core, transport and 5G, as well as OSS/BSS domain expertise. HPE is likely to face competition from disruptive players and hyperscalers in the future. HPE must transform internally to adhere to the latest scalable cloud-native, autonomous and cognitive-driven architectures.

Vertical Approach

Positioning OSS/BSS as part of HPE's overall infrastructure solutions for its "edge-to-cloud strategy" is a viable approach. HPE aims to leverage OSS/BSS in other industries. However, it has yet to tap into the B2B potential of its solutions. HPE needs to persuade CSP stakeholders how the technical capabilities of its solutions can deliver commercial value and operational benefits.

Huawei

Who Should Consider Huawei

The following CSPs should consider Huawei:

- Large and medium-size CSPs in Asia Pacific, Latin America and the Middle East and Africa looking for technologically advanced NG-TOBS solution suite from a single vendor.
- CSPs that are already using Huawei network equipment and also want Huawei to provide the management and monetization solutions.
- Large and medium-size CSPs in Asia Pacific, Latin America and the Middle East and Africa that lack in-house resources to lead and manage complex transformation projects.

Company Facts

Huawei is a global, private network equipment, software, service, consumer electronics, smart devices and rooftop solar equipment provider. Founded in 1987, it leveraged its position as the largest global 5G equipment manufacturer to position itself as a strategic software vendor to large CSPs and holds a leading position for NG-TOBS software and services in the Asia Pacific and Middle East Africa regions.

Huawei has hundreds of CSP customers of all sizes worldwide.

It is headquartered in Shenzhen, Guangdong, China, with subsidiaries on every continent.

Disruptive Differentiators

Huawei is placed in the **Transformers quintant** and differentiates itself as follows:

- A balanced and comprehensive NG-TOBS product and services portfolio, supported by an experienced consulting and implementation organization that is capable to conduct any transformation project no matter how challenging it might be.
- Its commitment to working with standard organizations and its use open APIs that reduce CSPs' integration challenges.



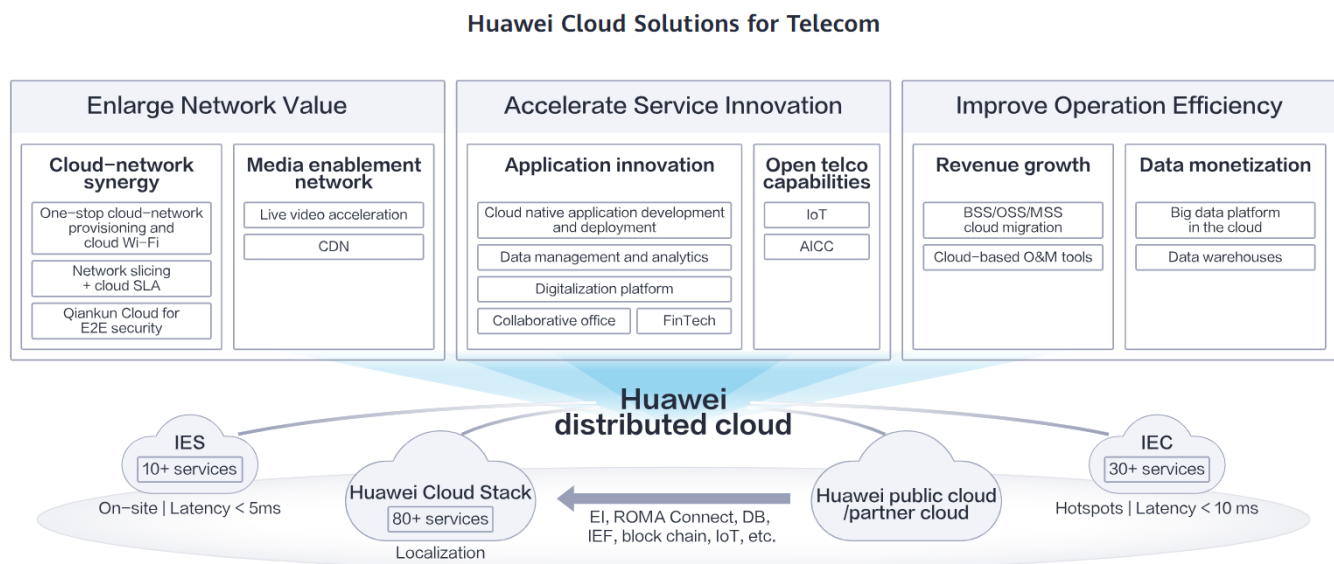
NG-TOBS Portfolio Overview

Huawei offers a comprehensive NG-TOBS products and services portfolio, split into an OSS and a BSS suite. Its **OSS portfolio**, AUTIN, combines solutions for intelligent network and services with network and element management solutions.

Its **BSS portfolio** contains convergent billing and charging, together with CRM, order and offer management, authentication, authorization, analytics and others.

The portfolio is TMF and 3GPP compliant and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (AWS).

Figure 10. Huawei's NG-TOBS Portfolio



Source: Huawei, 2023

Note: Huawei did not provide a shareable solution architecture of its NG-TOBS portfolio.

The graphic is sourced from <https://www.huaweicloud.com/intl/en-us/solution/telecom.html>



Strengths

Product or Service Innovation Capabilities

Huawei offers a comprehensive NG-TOBS portfolio and supports it with an experienced consulting and implementation team that regularly communicates with clients to ensure their needs are met. Both NG-TOBS solutions support TMF open APIs and are available in the public cloud.

Operational Innovation

The company consistently integrates cutting-edge technologies into its NG-TOBS solutions. It founded a pioneering operations and maintenance (O&M) laboratory accessible to all partners to investigate technological advancements in the ICT operations field. At present, it possesses over 1,000 automation rules, 150 AI models, 300 knowledge graphs, 1,000 scenario-based APIs, and 200 atomic capabilities.

Customer Impact

Huawei's clients appreciate the company's extensive experience with major transformation initiatives. They also value the unique blend of custom consulting and implementation services complemented by a flexible, easy-to-integrate solution.

Challenges

Product or Service

Although Huawei is in principle open to engage with technology and services partners, its aims to offer CSPs the complete NG-TOBS solutions set using its own products. Outside of China, the company formally collaborates with a limited set of other vendors, which might be an obstacle to work with CSPs that prefer a multi-vendor approach.

Vertical Approach

Huawei focuses mainly on the telecom industry and supports CSP to target specific vertical industries in B2B2X scenarios. Although it has gained a number of non-CSP customers in China, outside of China has not coherently positioned its NG-TOBS solutions to other industries that have similar functionality requirements as telecom providers.

Sales Strategy

Huawei has difficulty clearly communicating convincing competitive differentiators or a cohesive value proposition for NG-TOBS, beyond technical and procedural specifics. This may pose a challenge for CSPs seeking the business benefits of IT, as they may struggle to recognize the value in Huawei's solutions.

Incognito

Who Should Consider Incognito

The following CSPs should consider Incognito:

- Fixed-line telecom and cable operators of any size looking for a transformation partner to modernize their end-to-end OSS and BSS.
- Fixed-line telecom and cable operators of any size that are looking for a B2B2X solution to offer their products and services to targeted vertical industries.

Disruptive Differentiators

Incognito is placed in the **Niche Innovators quintant** and differentiates itself as follows:

- Its innovative use of an event-driven architecture, no-code abstraction of service provisioning business processes, no-code integration to element and network management systems (EMS/NMS) and use of open APIs to reduce the integration overhead.
- Its longstanding, collaborative customer relationship and forward-looking guidance and advice to help them on their transformation journey.

Company Facts

Incognito is a global software provider that offers service orchestration and device management solutions for fiber, cable and fixed wireless broadband service providers. Incognito is a division of the Lumine Group, a portfolio of Constellation Software, the largest independent software company in Canada.

Incognito was acquired by Lumine in 2014. Before joining Lumine, Incognito acquired a device provisioning solution from BigBand Networks (2008). In 2016, Lumine acquired the OSS assets of Advanced Broadband Networks and made it a business unit of Incognito.

Incognito has over 200 customers of all sizes worldwide.

It is headquartered in Vancouver, BC, Canada.



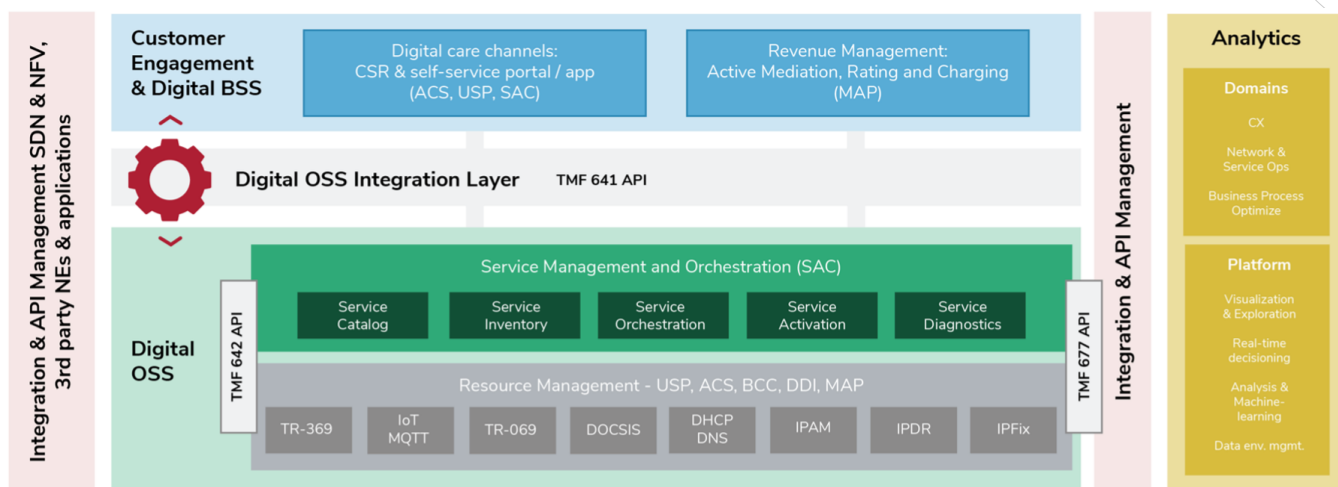
NG-TOBS Portfolio Overview

Incognito's NG-TOBS portfolio consists two segments: **Customer Engagement and Digital BSS** and **Digital OSS**. Both are joined via API by a digital OSS integration layer and enhanced by an analytics module.

Depending on user requirements, Incognito offers seven variants of its NG-TOBS portfolio: Digital Experience Solution, DX Activate Solution, Unified Enterprise IoT Solution, Monetization and Analytics Solution, DOCSIS Provisioning Solution, Metro-Ethernet Services Provisioning Solution and Fiber Service Orchestration Solution.

The portfolio is compliant with TMF Open APIs and is actively engaged in the Broadband Forum, CableLabs, RDK and prpl. Its product portfolio can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud and in the public cloud (AWS, Google Cloud Platform and Microsoft Azure).

Figure 11. Incognito's NG-TOBS Portfolio



Source: Incognito, 2023



Strengths

Five-Year Innovation

Incognito has a solid track record of assisting CSPs in innovating and achieving a competitive edge using its NG-TOBS solutions. It accomplishes this by investing in an event-driven asynchronous architecture, no-code abstraction of service provisioning business processes and no-code integration with element and network management systems (EMS/NMS).

Customer Impact

Customers' experience with Incognito is highly positive. They appreciate their longstanding cooperative relationships, agile and responsive interactions, forward-looking guidance, advice and a stable, mature product portfolio.

Product or Service Innovation Capabilities

Incognito excels in operational agility and digital business acumen. The utilization of open standards-based APIs makes integration simple, decreases expenses and allows for intuitive interfaces for varying user personas. Moreover, Incognito places a priority on generating use cases through brainstorming sessions to educate clients on how to make use of emerging trends and business models.

Challenges

Product or Service

Incognito's solutions serve fixed-line telecom operators, including fiber, cable, Metro Ethernet, neutral host, enterprise IoT and FWA providers. While the solutions also support mobile CSPs, to date they have mostly been deployed for FWA.

Product or Service

Incognito's solutions are cloud-native and can be deployed in the private cloud. It offers public cloud options through hyperscalers such as AWS, GCP and Microsoft Azure. However, its track record for public cloud deployments is limited because most of its customers prefer on-premise deployments.

Vertical Approach

Incognito assists CSPs in addressing their vertical industry initiatives, such as electric vehicle charging or smart mobility. Nonetheless, it has not yet formulated a go-to-market strategy to directly cater to vertical industries without the involvement of a CSP.

Netcracker

Who Should Consider Netcracker

The following CSPs should consider Netcracker:

- Tier 1 CSPs looking for a single vendor to lead their end-to-end OSS/BSS transformation.
- CSPs that lack in-house resources to lead and manage complex transformation projects.
- CSPs that are looking to incrementally move from traditional networking to cloud-based and digital business-driven operations across ecosystems.
- CSPs looking for a reliable transformation partner across their entire value chain and ecosystem.

Company Facts

Netcracker has been a wholly owned subsidiary of NEC since 2008 and a global provider of CSP operational technology software and services. Originally a provider of service and resource management, it became a full-stack OSS/BSS vendor through its acquisition of Convergys' Information Management business unit in 2012.

Netcracker has CSP customers of all tiers, types and sizes worldwide.

It is headquartered in Waltham, Massachusetts, with subsidiaries on every continent.

Disruptive Differentiators

Netcracker is placed in the **Disruptive Leaders quintant** and differentiates itself as follows:

- Netcracker's Generative AI solution for telecom demonstrates the company's innovation leadership position.
- A mature multi-cloud strategy. Its comprehensive deployments with major hyperscalers position the company at the forefront of the fast-growing market for OSS/BSS cloud service delivery, including PaaS and SaaS in B2B2X scenarios.
- A complete best-of-breed solution portfolio coupled with transformation leadership capabilities, supported by a strong professional services methodology, as well as operational KPIs suited for digital business and enterprise service delivery scenarios.
- The ability to support multi-domain and multi-technology orchestration scenarios across all layers of a CSP's (hybrid) infrastructure, from the core and 5G to the edge.

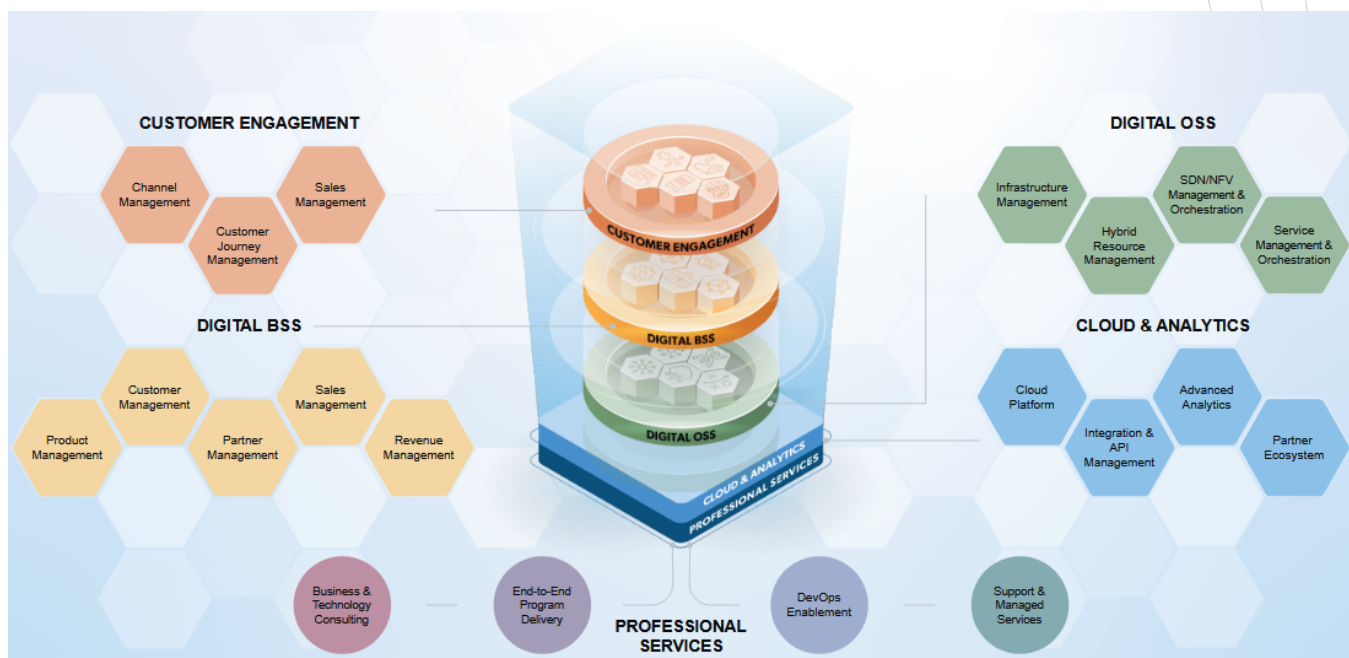


NG-TOBS Portfolio Overview

Netcracker Digital Platform is a complete, mature service fulfillment, assurance and customer management, partner management and monetization product suite. It is based on a modern, highly configurable solution architecture that has been designed from the ground up. It is driven by continuous, solid R&D investments that put it in a prominent industry position as a cloud-native and microservices-based digital platform provider.

The portfolio is TMF, ETSI, MEF, ONAP, OSM and O-RAN compliant and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (AWS, Google Cloud Platform and Microsoft Azure).

Figure 12. Netcracker's NG-TOBS Portfolio



Source: Netcracker, 2023



Strengths

Five-Year Innovation

Netcracker's innovation strategy targets multi-vertical 5G (6G) services, providing NG-TOBS capabilities for automation and monetization across multi-domain 5G, fiber and satellite networks. It provides AI/ML-driven, personalized, digital customer engagement, as well as partner ecosystem and digital marketplace solutions.

Its multi-cloud operations strategy (telco cloud, public cloud and edge cloud) enables CSPs to manage specific services holistically, ensuring OSS/BSS requirements for reliability, scalability and security across the end-to-end infrastructure.

Product or Service

Netcracker's integrated digital platform provides a complete cloud-native, end-to-end NG-TOBS solution. With its business-driven approach, it is well-suited for CSPs that are expanding into new digital business models and partner ecosystems. Its mature solution allows CSPs to tap into connected industries and vertical markets, including those of 5G, IoT and B2B2X, positioning the solution to increase market share in cloud-native NG-TOBS.

Challenges

Operational Innovation

CSPs expect their software vendors to address some of the change management challenges associated with digital transformation, such as interdisciplinary, adaptive end-to-end processes, as well as market requirement driven development and operations (BizDevOps). This requires additional leadership from Netcracker beyond traditional software implementation and demands working in sync with the client service delivery organization.

Sales, Channel and Pricing

Netcracker has successfully created synergies between the customer-facing and network-facing pillars of NG-TOBS. However, its commercial offer comes at a premium price which could be a deal breaker for smaller CSPs as the TCO may be out of reach.



Strengths

Customer Impact

Netcracker has delivered NG-TOBS to early mover digital innovators in the telco industry, such as Du, NTT and Etisalat. Netcracker boasts a robust track record of transformation leadership for large projects, related to modernizing the business and operations environments for telcos such as T-Mobile US, DT and Vodafone. This also includes end-to-end cloud transformations.

Challenges

Vertical Approach

Netcracker has deep roots in the telco industry and has acquired a number of high-profile clients in other industries. However, it could expand its market reach with a more targeted strategy focusing on industry verticals that have similar requirements for functionality and scale as telecom providers. This also requires expanding into new partner ecosystem.

Nokia

Who Should Consider Nokia

The following CSPs should consider Nokia:

- CSPs of any size looking to modernize their OSS.
- CSPs of any size that prefer a single vendor to enhance their NG-TOBS with AI, ML and security.
- CSPs of any size that require a new converged charging or mediation solution.

Disruptive Differentiators

Nokia is placed in the **Reformers quintant** and differentiates itself as follows:

- Its ability to orchestrate all layers of a CSP's infrastructure, from the core network layer to the service layer to the customer layer, all supported by robust in-house AI and ML capabilities.
- Its security orchestration and digital trust modules to manage digital risks.

Company Facts

Nokia has been in business for over 150 years and made multiple acquisitions around its NG-TOBS portfolio. Most of those acquisitions were transacted in the 2000-2015 timeframe. The most notable recent addition is Comptel (2017), a Finnish provider of catalog-driven service orchestration and fulfillment, intelligent data processing, customer engagement and agile service monetization solutions.

Nokia has hundreds of CSP customers of all sizes worldwide.

It is headquartered in Espoo, Finland, with subsidiaries on every continent.

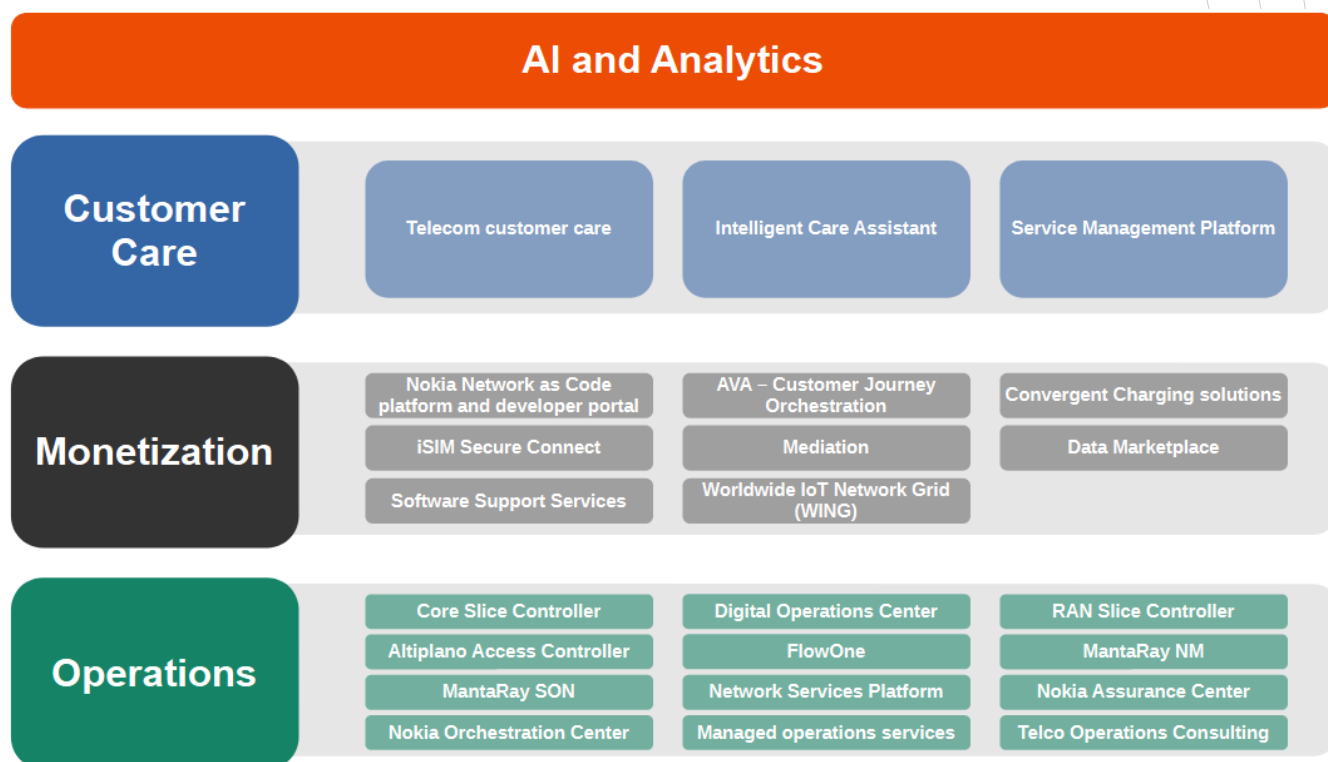


NG-TOBS Portfolio Overview

Nokia's product portfolio is tilted toward the Resource Orchestration, and Service Orchestration and AI pillars in the NG-TOBS universe. The company disposed of most of its underperforming Monetization and Customer Management Orchestration properties in 2012 to Optiva (then Redknee), but re-acquired some functionally through the Alcatel-Lucent and Comptel acquisitions.

The portfolio complies with all common industry standards and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (AWS, Google Cloud Platform and Microsoft Azure).

Figure 13. Nokia's NG-TOBS Portfolio



AI and Analytics includes the following solutions:

AVA AI for Network Performance, AVA AI for video services, AVA Customer and Mobile Network Insights, AVA Customer experience analytics, AVA Data Suite, AVA Energy efficiency, AVA Fixed Network Insights, AVA Network Data Analytics Function, AVA Open Analytics framework, AVA Traffica, Deepfield Cloud Intelligence, Deepfield Operational Intelligence, Deepfield Subscriber Intelligence, Deepfield Video Analytics, Fixed Access Health Index, Nokia AI Maturity Assessment, Predictive Care for fixed networks.

Source: Nokia, 2023



Strengths

Five-Year Innovation

Nokia has a comprehensive and forward-thinking innovation program that covers all aspects of NG-TOBS, including core, operations and user experience. It has made significant investments in a range of pertinent technologies, such as intelligent automation, ecosystems, security, AI and cloud computing.

Product or Service

The company has a complete cloud-native NG-TOBS portfolio including analytics, charging, energy efficiency, security and more. Ten solutions are currently available as SaaS offerings.

Sales Strategy

Nokia maintains an extensive network of services and technology partners that help extend the reach of its products. Specifically, this approach offers significant gains when engaging with large CSPs currently undergoing digital transformation.

Challenges

Operational Model

Nokia is in the process of significantly reducing its cost base by up to 14,000 redundancies within the next three years. The impact of these redundancies on the capabilities of its NG-TOBS operations are yet to be determined.

Sales, Channel and Pricing

There seem to be few practical synergies between the customer-facing and network-facing components of NG-TOBS. As a result, sales of individual solutions are more common than the complete NG-TOBS suite.

Vertical Approach

While Nokia has a track record of targeting vertical industries with its networking solutions, its NG-TOBS solutions (excluding its IoT products) are not as widely deployed outside the telecommunications industry or utilized by CSPs to target vertical industries.

Oracle

Who Should Consider Oracle

The following CSPs should consider Oracle:

- CSPs of any size looking to migrate their NG-TOBS solutions to the public cloud.
- CSPs of any size seeking support and guidance to future-proof their NG-TOBS solutions for yet-to-be-known requirements.
- CSPs of any size that want to maintain the flexibility to work with the system integrator of their choice, including Oracle Communications Consulting.

Disruptive Differentiators

Oracle is placed in the **Disruptive Leaders quintant** and differentiates itself as follows:

- A one-stop shop for all customer-facing and network-facing requirements, including public cloud infrastructure.
- A coherent portfolio that combines all aspects of resource orchestration, service orchestration, service assurance, network assurance and AI and monetization and customer management orchestration.

Company Facts

Oracle has been in business for 45 years and became a notable NG-TOBS provider in the early 2000s through an ongoing series of acquisitions.

The most important acquisitions in the NG-TOBS sector include: MetaSolv (2006), Portal Software (2006), Acme Packet (2013), Tekelec (2013) and Federos (2022).

Oracle has hundreds of CSP customers of all sizes worldwide.

It is headquartered in Austin, Texas, with subsidiaries on every continent.



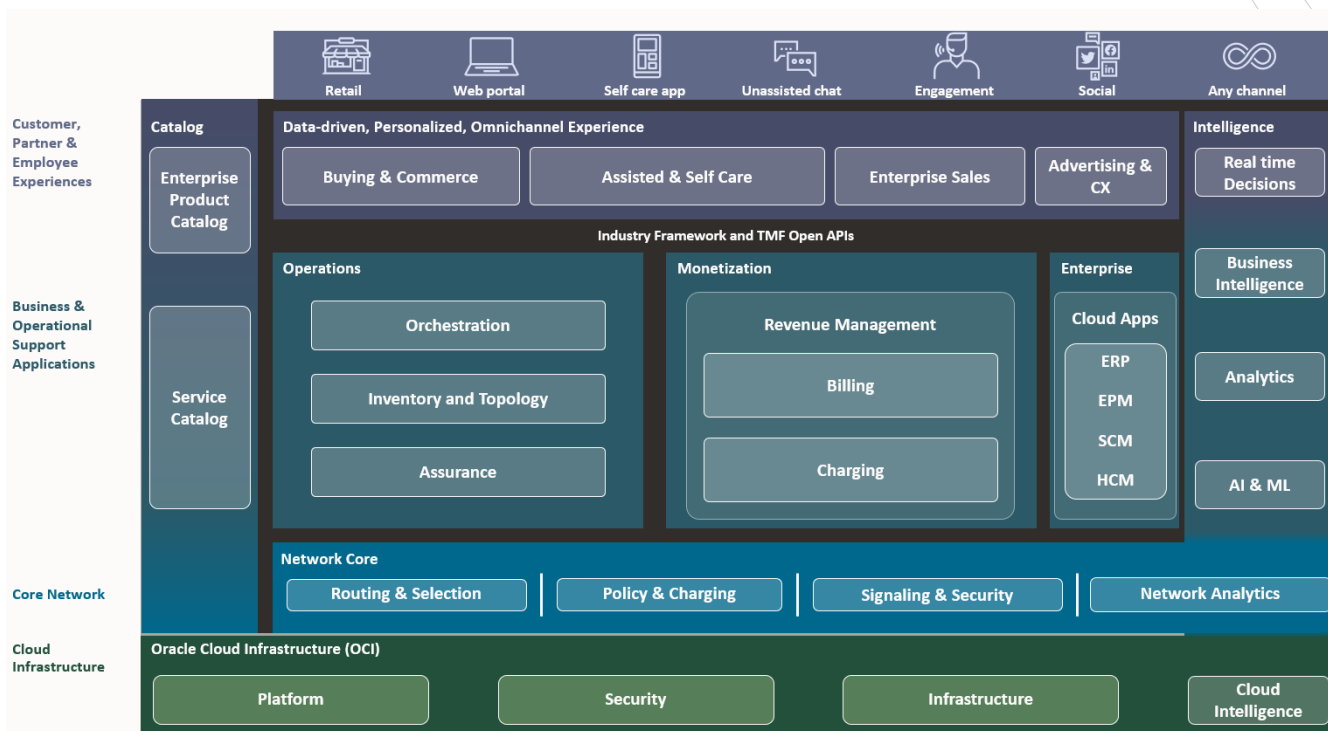
NG-TOBS Portfolio Overview

Oracle's product portfolio is somewhat skewed toward the Monetization and Customer Management Orchestration pillar in the NG-TOBS universe, owing to the company's resources in customer management and enterprise management.

The acquisition of service assurance specialist Federos has moved the balance toward resource orchestration and service orchestration, complementing Oracle's existing orchestration, inventory and activation solutions.

The portfolio complies with all common industry standards and can be deployed in a best-of-suite or best-of-breed fashion on-premise, in the private cloud, the hybrid cloud and the public cloud (Oracle Cloud Infrastructure (OCI) or third-party IaaS).

Figure 14. Oracle's NG-TOBS Portfolio



Source: Oracle, 2023



Strengths

Sales, Channels and Pricing

Oracle boasts one of the most comprehensive sales ecosystems in the NG-TOBS industry, integrating product, implementation and consulting services worldwide. Its sales team utilizes centers of innovation to analyze emerging trends and create effective solutions to tackle them.

Customer Impact

Oracle's NG-TOBS solutions are gaining traction among large CSPs and CSP groups, both on the network-facing and customer-facing fronts. Customer appreciate the interconnection partnership between Microsoft Azure and Oracle Cloud Infrastructure (OCI), along with additional benefits, such as Cloud Lift migration support the option to bring their own license or access a free trial period.

Five-Year Innovation

Oracle's innovation agenda covers all topics that are important to CSPs, furnishing them with practical guidance on prioritizing investments by drawing on suggestions from other lines of business. Noteworthy initiatives encompass innovation around E2E solutions, deepening the integration of BRM with DX4C, cloud-native architecture enhancements and multi-domain orchestration across RAN, core and transport for 5G.

Challenges

Product or Service Innovation Capabilities

Oracle's pricing models can be complicated for customers to understand. Although this complexity is likely due to the diverse range of products and solutions available, many clients and prospects value simplicity.

Vertical Approach

Oracle added vertical industries to its innovation agenda, aware that its NG-TOBS portfolio can benefit verticals and CSPs targeting verticals. Although Oracle has many non-CSP clients using NG-TOBS solutions, it usually acquired them because these enterprises demanded functionality or scale similar to the telecom industry, not because of a targeted vertical strategy.

Product or Service

Oracle is relatively reserved in partnering with innovative NG-TOBS startups. While the company has access to a vast internal intellectual property pool, it may miss out on emerging opportunities in areas such as fintech, security, or artificial intelligence. These capabilities will become more crucial as it positions its NG-TOBS portfolio for vertical industries. Furthermore, the OCI Cloud Marketplace offers fewer NG-TOBS options compared to other hyperscalers' marketplaces.

Wavelo

Who Should Consider Wavelo

The following CSPs should consider Wavelo:

- New fiber-based ISPs and MVNOs in North America that require solutions to automate order-to-activation.
- Small and midsize CSPs in the United States that benefit from CBRS spectrum and government funding.
- Enterprises requiring CSPs to deliver private 5G networks or IoT initiatives and require B2B-centric capabilities.

Disruptive Differentiators

Wavelo is placed in the **Niche Innovators quintant** and differentiates itself as follows:

- Its innovative, cloud-native and modular event-based architecture that lets CSPs select any core components from Wavelo's portfolio and seamlessly integrate them with their own or other vendors' solutions.
- The successful implementation of its solution at DISH Networks and Ting, resulting in tangible operational and process improvements.

Company Facts

Wavelo is an independent division of Tucows, a telecom provider and ISP headquartered in Toronto, Canada. Wavelo was originally built as the cloud-based billing platform for Ting Mobile, an MVNO formed by Tucows in 2012 and acquired by DISH Network in 2020, providing services in the United States over the T-Mobile network. Wavelo was spun off from Tucows as an independent company in 2022.

Wavelo's solutions support DISH Network and Ting Wireless.

It is headquartered in Toronto, ON, Canada.



NG-TOBS Portfolio Overview

Wavelo offers a complete NG-TOBS solution consisting of three modules:

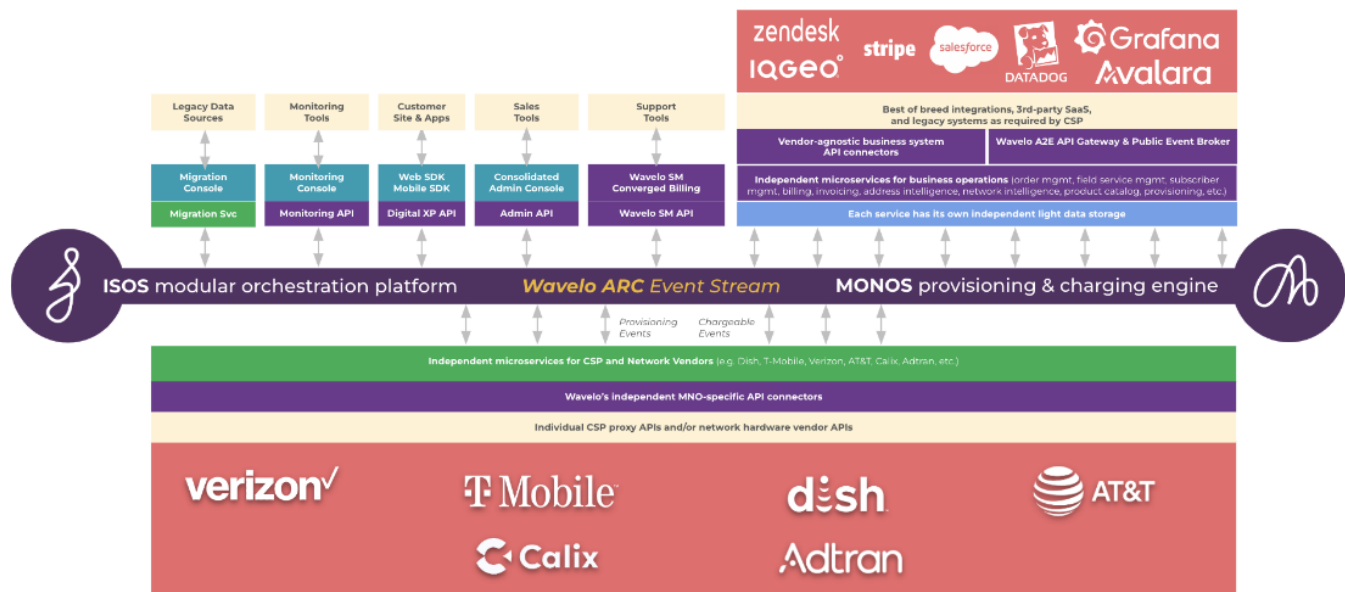
ISOS is the equivalent to a business support system (BSS), connecting essential systems including sales and order management, billing, support ticketing, inventory and field service management, as well as finance and accounting.

MONOS is the equivalent to an operations support system (OSS), orchestrating the provisioning of mobile network service, rates and usage monitoring, account billing preparation and reconciliation, as well as network performance.

Subscriber Management (SM) enables customer support representatives to manage broadband and mobile subscribers, products, plans and invoices in a single, easy-to-use web interface.

The portfolio is not yet TMF compliant but Wavelo is active in a TM Forum catalyst project and is exploring adopting open APIs.

Figure 15. Wavelo's NG-TOBS Portfolio



Source: Wavelo, 2023



Strengths

Product or Service Innovation Capabilities

Wavelo's cloud-native and modular event-based architecture lets CSPs select any core components from Wavelo's portfolio and easily integrate them with their own or third-party solutions. Wavelo supports large and complex implementations by using AWS as a cloud provider.

Five-Year Innovation

Wavelo helps CSPs transition to a platform-based business model, enabling them to monetize large data sets by providing valuable insights, analytics and targeted advertising services to partners and third-party developers within their ecosystem. With Wavelo, CSPs can rapidly expand their service offerings beyond traditional connectivity in days or weeks instead of months while providing a seamless customer experience.

Customer Impact

Wavelo demonstrated its flexible and scalable solution at DISH Network and Ting. The solution enabled DISH to enter new prepaid and postpaid markets quickly and cost-effectively and to bill and provision across its new multi-brand, multi-network digital operations platform. Ting uses Wavelo to orchestrate and synchronize its disparate systems and processes, reducing service fulfillment time, eliminating manual processes and improving customer ordering experience.

Challenges

Sales Strategy

Wavelo does not currently have a formal SI partner ecosystem. It primarily provides professional services in-house but also utilizes third-party professional services when needed.

Standard Compliance

Wavelo is currently in the process of conforming to industry standards. The company recently joined the TM Forum and is collaborating with Verizon and other members to showcase a billing use case.

Vertical Approach

Wavelo lacks a strategy to support industries beyond the telecom vertical. Nonetheless, it aids CSPs with their B2B2X initiatives, including SMB self-service for fiber broadband service ordering, activation and billing.

Research Methodology

Inclusion Criteria

To be included, vendors had to fulfill the following criteria:

- **Global presence** and an active, referenceable customer base of at least 10 CSPs for NG-TOBS, of which at least 10% have to pertain to cloud-based or virtualized deployments.
- Address compelling telco **innovation use cases**, such as 5G, NFV operations, ORAN or digital customer engagement and CPQ.
- Demonstrated innovation transformation **leadership**.
- **End-to-end value proposition** for the emerging market of NG-TOBS, including software and services.
- Products can be offered either internally, or as **full-stack** offerings together with **cloud-based** infrastructure partnerships.
- Receive at least **75%** of their NG-TOBS revenue from CSPs.

Main Data Sources

This report leverages multiple data sources to obtain an unbiased and factually accurate evaluation of the vendors covered, including but not limited to the following:

- 1) **RFIs** – Each vendor had to respond to an RFI with around 60 questions.
- 2) **Briefings** – Each vendor had to provide detailed explanations of their capabilities in a live briefing.
- 3) **Reference Checks** – Phone interviews with references to obtain an understanding of the voice of the customer.
- 4) **Fact Reviews** – Each vendor performed a review of the factual correctness of its profile.
- 5) **Public Sources** – Information available online or in physical form, or obtained in semi-public forums, such as virtual or physical events.
- 6) **Non-Public Information** – Information obtained through professional interactions with representatives from users, suppliers, investors and peers.

Additional Vendors

There are dozens of other established and emerging vendors that provide bits and pieces of NG-TOBS solutions and might fulfill CSP requirements in conjunction with other vendors.

Telco Republic can provide further details on demand.

Vendors that did not meet all inclusion criteria but should be considered as challengers or counterweights on the shortlist for NG-TOBS selection are:

- Beyond Now
- Blue Planet
- Cisco
- MDS
- Rakuten Symphony
- ServiceNow
- Subex
- Suntech
- Tecnotree
- Whale Cloud

Market Trends

The following major trends will drive the adoption of NG-TOBS.

Accelerated Automation

CSPs aim to streamline processes and workflows from the backoffice to the frontoffice to enhance operational efficiency and reduce costs.

Among their available tools are artificial intelligence (AI), analytics and machine learning (ML), which will facilitate self-configuration, self-healing, self-optimizing and self-evolving network infrastructures. The objective is to roll out autonomous networks with novel features, such as zero-touch provisioning, zero-touch partnering, zero-wait and zero-trouble.

Open RAN (ORAN) is an additional component of accelerated automation, providing disaggregated interoperable RAN architecture by using open interface specifications on both 4G and 5G infrastructure. Especially the RAN Intelligent Controller (RIC) and Service Management and Orchestration (SMO) platforms will enhance agility regarding network automation and optimization.

Ubiquitous Intelligence

AI, analytics, and ML will play an increasingly prominent role in any CSPs' NG-TOBS solutions. CSPs will utilize these tools to enable network automation, streamline network planning, achieve zero-touch operations, enhance customer experience, reduce churn, manage risks, and mitigate fraud.

Digital Value Chains and Partner Ecosystems

The growing ecosystem of things, mainly related to B2B2X, will be a major catalyst for 5G infrastructure allowing CSPs to play the role of both producers and consumers of data. There will be a growing number of viable IoT enterprise use cases as 5G networks are deployed.

CSPs will play a progressively significant role in various types of B2B digital marketplaces, whether as owners, orchestrators or participants. This requires additional NG-TOBS capabilities for onboarding ecosystem participants, establishing integrations and monetizing new offers, either directly or in a multitenant environment.

Universal Connectivity

Connectivity has progressed from hybrid virtualized SDN and NFV, distributed cloud and hybrid private and public cloud during the 2010s to ubiquitous connectivity, enabled by a zero-touch programmable network. The future of connectivity is a holistic, microservices-driven, cloud- or virtualization-based, distributed telco infrastructure supported by 5G and subsequent Gs.

Among to tools that CSPs will use during this evolution are multi-cloud networking (MCN), connectivity-as-a-service (CaaS), multi-access edge computing (MEC) and network slicing.

Universal connectivity will be a blend of public and private cloud, achieved through a collaboration between CSPs and hyperscalers. While universal connectivity affects consumers and enterprises, CSPs have the highest expectations for revenue generation from the enterprise sector.

Optichannel Customer Experience Management

CSPs must ensure that they possess adequate coverage and resources to provide digital information, commerce and collaborative services to employees, customers, enterprises, and partners.

It is no longer enough to offer several channels simultaneously. Rather, CSPs must offer the right channel to the right users at the right time and enable seamless transition across these channels through a single, personalized interface. In other words, the customer is at the forefront of all initiatives, with customer success KPIs serving as the ultimate benchmarks throughout the enterprise. AI, analytics and ML will streamline these transactions, optimizing the customer experience while improving workflow and automating NG-TOBS processes.

Ubiquitous Security

The integration of external applications, data sources and new technologies increases security risks for CSPs, jeopardizing business continuity, stability and reliability. CSPs will embed security in their NG-TOBS solutions, or insist on its inclusion from their suppliers. They will pay increased attention to governance to manage risk and security.

Telco Operating Paradigm Shift

A new operational paradigm emerges as legacy network technologies are phased out, with a primary focus on DevOps and SecOps. Cloud-based, digital and cognitive operations necessitate a novel breed of operations and business support architectures that align with the organization's culture and skillsets.

These concurrent trends are driving the demand for increased architectural innovation within OSS and BSS environments, specifically to accommodate high transaction volumes of digital and composite service bundles. Examples include on-demand digital content, multi-tenancy B2B as-a-service, IoT and cloud services.

OSS and BSS infrastructures have to enable convergent services across hybrid technologies and network environments, such as fixed, mobile, broadband, LTE, IMS, IP, cloud and virtual data center resources.

Technology convergence requires more holistic, cognitive, AI/ML driven OSS and BSS. For example OSS and BSS must provide a network and service topology view that enables a cohesive correlation between network technology and services.

Innovation in OSS and BSS will play a critical role in bridging the technology gap between legacy and cloud-based or virtual infrastructures and real-time cognitive, software-driven telco environments. Innovation will arise from more autonomous operations, wherein the business and the customer instantiate end-to-end operational and business processes.

Changing CSP Sourcing Patterns and Decision Making

CSPs typically evaluate innovation investments meticulously, which often involves the departments of CTO, CIO and chief marketing officer (CMO), along with B2B lines of business (LOBs). These teams typically rely on proven ROI when making their decisions.

These changes mandate a much more consultative selling approach from vendors. The landscape has shifted. Although CTIO organizations remain influential, they are gradually losing their influence as technology becomes a commodity. The real differentiator lies in the service layer (OSS and BSS), where commercial constituents, like B2B LOBs, wield more control.

About Telco Republic

We are the go-to, thought-provoking market research and advisory firm for the new telecom software market

Our mission is to track ongoing disruption and innovation related to telecommunications business and operations.

As a boutique firm we focus specifically on emerging management systems and applications that allow operationalization and monetization of emerging technologies, operating models and market value creation ecosystems.

- We advise technology vendors on their strategic positioning and messaging. This includes innovation start-ups.
- We advise communications service providers on their strategic purchasing decisions.
- We advise investor clients regarding their strategic investment decisions.

Our Commitment

Within three months, we can help you define a new strategic technology vision and guide you on initial execution of this vision.

We provide rigorous, in-depth benchmarking analysis of the players in this market. Our services center on rigorous, well-vetted market ranking & capability assessments, based on a proven, fact-based rating methodology of respective companies in a given market. In this context, we advise technology vendors on their strategic positioning and messaging, and we advise communications service providers regarding their strategic purchasing decision making.

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