ISG Provider Lens™

Networks – Software Defined Solutions and Services

Nordics 2021

Quadrant Report

A research report comparing provider strengths, challenges and competitive differentiators

Customized report courtesy of:

June 2021

About this Report

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The research and analysis presented in this report includes research from the ISG Provider Lens™ program, ongoing ISG Research programs, interviews with ISG advisors, briefings with services providers and analysis of publicly available market information from multiple sources. The data collected for this report represents information that ISG believes to be current as of March 2021 for providers who actively participated as well as for providers who did not. ISG recognizes that many mergers and acquisitions have taken place since that time, but those changes are not reflected in this report.

All revenue references are in U.S. dollars ($US) unless noted.

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ISG Provider Lens™

ISG Provider Lens™

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EXECUTIVE SUMMARY

Networks and software-defined solutions and services encompass many technological topics, business coverage areas, organizational functions and business processes and methods and are closely tied to the overall digital business transformation and cloudification trends of enterprises globally. This ISG Provider Lens™ study examines the different kinds of network offerings related to software-defined networking (SDN) in the Nordics. These include SD-WAN (managed and non-managed) and associated core and mobility service offerings related to those segments, including transformation services, and the increasingly crucial edge technologies and enterprise 5G solutions. This study accounts for the changing market requirements and provides a consistent market overview of the segments. It also gives concrete decision-making support to help user organizations to evaluate and assess the offerings and performance of providers.

Enterprises are evaluating various means to increase their agility, flexibility, competitiveness, delivery structures, and remote working and continuity practices due to the impacts of the COVID-19 pandemic. A large part of this challenge is not just related to technology but also has to do with how to transform established processes and traditional management practices. Enterprises are facing challenges in achieving a sufficient degree of flexibility, speed and collaboration internally and across boundaries to benefit their customers, users (ever more mobile) and themselves, including at the edge of the business and traditional network.

Enterprise agility goes beyond traditional network abilities and provisioning capabilities, particularly in a constantly changing competitive environment. This adjustment and the speed at which it is realized are relevant and critical for the whole enterprise organization and value stream.

CEOs and chief technology officers (CTOs) should understand that SDN works hand in hand with cloudification, intelligent edge, mobility strategies and advanced digital business transformation areas, such as artificial intelligence (AI), the Internet of Things (IoT), automation and collaboration. Collectively, the technology has a high influence on agility, flexibility, productivity and profitability.

In the Nordics, the following trends are driving rapid changes in enterprises:

The SD-WAN market has expanded during the pandemic and use cases have increased, with the most prevalent one being the remote working model. However, the WAN architecture for enterprises is continuing to be a challenge that restricts backhauling of all cloud-enabled applications to the data center. The challenges are often due to the security postures in the enterprise. In addition, the WAN architecture is evolving to support more connectivity choices — a key value proposition considered by SD-WAN vendors. The vendors, as a result, are enabling enterprises to use any kind of transport actively or on standby.

There is a greater focus on automation, analytics and further movement towards the implementation of AI. From an automation perspective, enterprises are expressing interest in the concept of network as a code, where changes in the network infrastructure can be handled as a code and frameworks such as NetDevOps play an important role. Service providers are accordingly leveraging automation tools and integrated tool stacks to manage the entire ecosystem, bringing in visibility from the cloud to the data center and WAN.

There is a proliferation of equipment at the branch and remote sites that have routers firewalls, application controllers and session border controls. These appliances are often difficult to manage since they are from different vendors. Enterprises are thus seeking to use SD-WAN for driving automation, reducing such equipment and consolidating all functionalities.

With the spike in adoption of IoT networks, enterprise clients are seeking end-to-end connectivity to analyze data at the edge. Accordingly, service providers and system integrators are exploring ways of fast forwarding these capabilities through Wi-Fi 6, long-term evolution (LTE) or fifth-generation (5G) networks. They are also readying their customers for bigger public 5G rollouts, wherein the bandwidths and frequencies would be chunked into allocating a certain spectrum for enterprises. It may be expected that the new technologies will fuel the way for Industrial IoT (IIoT) to scale up and edge computing to grow. Thus, to support this, a more inclusive ecosystem is required for the cloud. The cloud model, which was predominantly a storage-related or application-related concept in the past, has evolved into a holistic cobweb of technologies in the network side with components of SDN such as WAN, LAN and WiFi6 management..

The need for change in transport has been shepherded by the transformation to cloud and software as a service (SaaS). Enterprises have been experiencing more Internet-heavy traffic patterns, which necessitated a change in the way different industries look at connectivity. Instead of a conventional hub-and- spoke model, enterprises are gradually considering an any-to-any connectivity model and cloud-oriented traffic patterns that require a breakout-based approach. This challenge can be addressed by hybrid WAN-like architecture that can eliminate significant transport costs.

Within this report, ISG has divided the market into the following six quadrants by analyzing specific regional markets and identifying the current market leaders and the strongest among them.

Managed (SD) WAN Services

Many enterprises see managed WAN services as an approach to outsource IT functions and purchase them along with consulting and professional services to assess, design, implement and operate their enterprise networks. Managed SD-WAN provides the benefits of SDN technology over traditional hardware-based networking. It is an overlay architecture with a networking foundation that is much easier to manage than legacy WANs. It essentially moves the control layer to the cloud and then centralises and simplifies network management. This overlay design abstracts software from hardware, enabling network virtualisation and making the network more elastic. Suppliers have been increasingly active as managed service providers, supplying complete managed SD-WAN solutions, including hybrid MPLS/IP or MPLS/SDN or SDN through cloud to edge, to enterprises and offering them as white-label services that telco providers or integrators offer to clients as part of broader strategic implementations.

Market leaders in this quadrant include BT, Deutsche Telekom, HCL, IBM, Orange Business Services, TCS, Tech Mahindra, Telia, Verizon, Wipro, and the Rising Star is Infosys.

Transformation Services (Consulting and Implementation)

MIn order to become competitive with SDN and associated strategies, including technologies, methods and processes, enterprises should align their vision for the future state by creating a business case for change and deciding on the right roadmap. It also involves defining, planning and leveraging leading technologies to dramatically transform enterprise network operations and customer experiences while streamlining processes to ensure a lasting change. In-depth knowledge of both the enterprise and its industry, as well as the technologies and solution capabilities, is mandatory.

Transformation services help companies to formulate their strategy and implement it to enhance their performance through SDN. Advisors analyze the company's business structure and intents, network technologies and infrastructure, processes, methods, people and organization to both strengthen its short-term performance and plan the transformation of the network to deliver and maintain sustainable long-term improvement.

Transformation service providers, from initial advisory to full or partial solution implementation and operations, have become mature in this field and leverage successful use cases, integrated designs, predefined processes and technology. They can also advise on suitable partner products and services as well as implementation possibilities. Suppliers have been active in directly selling SD-WAN advisory, planning, transition and implementation solutions to enterprises for their DIY (enterprises' own and non-managed) deployments and are increasingly partnering with licensed telco/service providers for their delivery packages in this space.

Market leaders in this quadrant include BT, Deutsche Telekom, HCL, IBM, Infosys, Orange Business Services, TCS, Tech Mahindra, Telenor, Verizon, Wipro, and the Rising Star is GTT.

SD-WAN Equipment and Service Suppliers (DIY)

SD-WAN is still one of the fastest-growing areas of technology and innovation in enterprises, allowing for innovative service rollouts and provisioning them in a much easier and cost-effective manner. It eliminates vendor lock-in and associated risks unlike the earlier hardware-based networks. It also enables cloud-based and one-click management as well as potential cost reduction, often requiring fewer technical staff for its operation. SD-WAN has become essential for enterprises that are already exploring intent-based networking (AI/MI based) or are keen on implementing this in the near to mid-term. However, many are not willing to relinquish the management and control of their networks to third parties or even buy managed SD-WAN solutions, preferring to keep such activities in house for various reasons. For these enterprises, many providers have been directly selling SD-WAN solutions for their DIY (enterprise owned and non-managed) implementations. They are also increasingly partnering with licensed telco/service providers to offer delivery packages in this space.

Market leaders in this quadrant include Cisco, Citrix, Ericsson, HPE Aruba, IBM, Nuage Networks (Nokia), Orange Business Services, VMware, Wipro, and the Rising Star is Tech Mahindra.

Technology and Service Suppliers (Core – 4G/5G)

ISD technology is an approach to networking that eliminates the complex and static nature of legacy distributed network architectures by using a standards-based software abstraction layer between the network control plane and the underlying data forwarding plane in both physical and virtual devices. SD technology enables improvements in network agility and automation while substantially reducing the cost of network operations when compared to traditional network deployments. Adopting an industry standard data plane abstraction protocol allows the use of any type and brand of data plane devices as all the underlying network hardware is addressable through a common abstraction protocol. These are considered as core network functions. Additionally, all mobile and wireless components may be managed and dealt with in the same manner as core and SD-WAN components. The software-defined capabilities cover branch and edge functionality as well as associated Wi-Fi networks, access points (APs), edge and 4G/5G connectivity technologies.

This section covers all vendors of SD core and mobile/wireless services that are directly purchased by enterprises or service providers for specific client projects. It also assesses suppliers of solutions that can be integrated into an enterprise-wide SDN strategy spanning from the core to the edge (or beyond with 4G/5G mobile working).

Market leaders in this quadrant include BT, Cisco, Deutsche Telekom, Ericsson, HCL, IBM, Infosys, Nuage Networks (Nokia), Orange Business Services, Tech Mahindra, Wipro, and the Rising Star is Verizon.

Edge Technologies and Services

Edge technologies, services and computing are current trends in IoT and IIoT world. With the localized processing of data, security and privacy have been improved as any breach can be managed locally and not passed onto the WAN or cloud and thus back to central enterprise to defend. In IoT edge computing and networking, the data from various connected devices of the IoT ecosystem is typically collected in a local device, analyzed on the network, and then transferred to the central data center or cloud. As the number of connected devices increases substantially, the volume of data generated is multifold. Interim processing is thus required to ensure cost reduction and increased efficiency. This, in turn, places more emphasis on efficient and software-driven edge capability networks and connectivity capabilities.

Edge components may be managed and dealt with in the same manner as core and SD-WAN components, with software-defined capabilities such as branch and edge functionality. These capabilities also encompass all customer premises equipment (universal or virtual CPE) and associated software-defined mobile networks (SDMNs) and software-defined local area networks (SD-LANs) that include both wireless (SD-WLAN) or mobile (SD-WMLAN), as well as Internet-of-Things (IoT) and Industrial Internet-of-Things (IIoT) sensors and devices or control/security devices.

Market leaders in this quadrant include BT, Cisco, Deutsche Telekom, HCL, HPE Aruba, Juniper Networks, Nuage Networks (Nokia), Orange Business Services, Tech Mahindra, Versa Networks, VMware, and the Rising Stars are Wipro and Verizon.

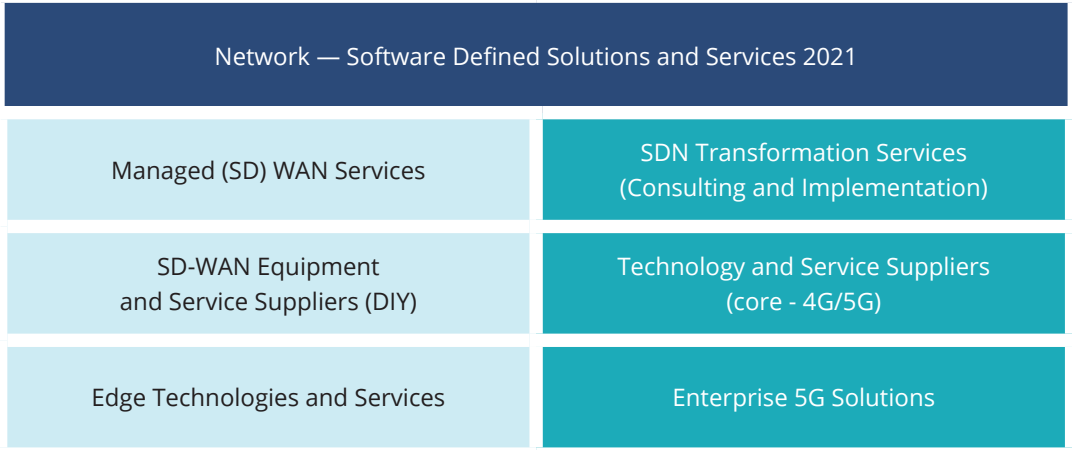
Enterprise 5G Solutions

Fifth-generation mobile networks or wireless systems (commonly known as 5G) are the next telecommunications standards after the current 4G/LTE technology and are designed to provide higher capacity than the current 4G/LTE. They allow a greater density (10s to 100s of times greater) of mobile broadband users or devices connected at higher transfer speeds and support more device-to-device, reliable and massive machine communications. 5G is also aimed at lower latency and battery consumption than 4G equipment. This segment covers specifically private 5G, referring to 5G deployments in campus (also known as 5G campus network) or other land or building areas that are generally not open to the public without specific access. Private 5G is targeted at flexible connectivity, mobile high-speed data and IoT. It will be connected to a local control and management system that, in turn, can be integrated within the overall enterprise network and management systems if there is a need to overarch integrated control and management. It also grants access to the public in a 5G campus (by either Wi-Fi or other wireless connection or by 5G GSMA data connection used as a LAN).

Market leaders in this quadrant include Cisco, Ericsson, HPE Aruba, Nokia, Telia and Telenor, and the Rising Stars are Tech Mahindra and Wipro. .

Introduction

Simplified illustration



Source: ISG 2021

Definition

This ISG Provider Lens™ study examines the different kinds of global network offerings related to SDN. These include SD-WAN, (consulting, implementation and managed services), SD-WAN (DIY), equipment and service supply to enterprises for their own operations. It also assesses core-to-edge/branch providers, including those that deliver via mobile and 4G/5G technologies and the service offerings related to those segments. The study additionally includes edge technologies and services, including IoT, u/vCPE and SD-LAN, with a focus on the rapidly growing area of enterprise 5G solutions within private and campus network environments.

Existing MPLS managed WAN services have been evolving over the last few years toward SD-WAN and hybrid plus cloud-enabled networks from their previous dominant position. These new networks account for a large portion of the revenues generated and most of the customer deployments by telcos and

Definition (cont.)

service providers worldwide. However, this is still an ongoing process. SDN segments are evolving and rapidly growing in market share and presence, as are several other related network services such as cloudification, hybrid networks (MPLS/IP), mobility delivered (LTE/4G/5G) enterprise services (including beyond enterprise network edge), and branch/edge technologies and services, including SD-LAN and u/vCPE. This is driven significantly by the ongoing digital transformation of business processes, organizations and business models to meet the requirements of a dynamic, globalised world in real time (including issues brought about by changes due to the pandemic) by increasing agility and flexibility, boosting customer experience (CX) and opportunity, enhancing network security, strengthening competitive positioning for the enterprise, and reducing the overall network costs for the services delivered.

ISG aims to deliver a comprehensive but defensible research program with clear and extensive evaluation criteria, covering the developments and deliverables of service providers and equipment suppliers in this dynamic marketplace. This study accounts for changing market requirements and provides a consistent market overview for the segments, along with concrete decision-making support to help user organizations evaluate and assess the offerings and performance of providers.

The ISG Provider Lens™ study offers IT decision makers:

- Transparency over the strengths and weaknesses of relevant providers;
- Differentiated positioning of providers by segments;
- Focus on several markets, including Australia, Germany, U.K., U.S. and the Nordics.

This study serves as an important decision-making basis for positioning, key relationships, and go-to-market considerations. ISG advisors and enterprise clients also use information from these reports to evaluate their current vendor relationships and potential new engagements. monitoring and reporting; on-the-ground CPE installation and hardware support to ensure CPE software is up-to-date and configured correctly; and overall lifecycle management.

Definition (cont.)

Scope of the Report

The ISG Provider Lens™ quadrant study introduces six quadrants under the "Network — Software Defined Solutions and Services 2021" study as follows:.

Scope of the Study – Quadrant and Geography Coverage

	USA	Germany	Nordics	UK	Australia
Managed SD WAN Services	✓	✓	✓	✓	✓
Transformation Services (Consulting and Implementation)	✓	✓	✓	✓	✓
SD-WAN Equipment and Service Suppliers (DIY)	✓	✓	✓	✓	✓
Technology and Service Suppliers (core – 4G/5G)	✓	✓	✓	✓	✓
Edge Technologies and Services	✓	✓	✓	✓	✓
Enterprise 5G Solutions	✓	✓	✓	✓	✓

Provider Classifications

The provider position reflects the suitability of IT providers for a defined market segment (quadrant). Without further additions, the position always applies to all company sizes classes and industries. In case the IT service requirements from enterprise customers differ and the spectrum of IT providers operating in the local market is sufficiently wide, a further differentiation of the IT providers by performance is made according to the target group for products and services. In doing so, ISG either considers the industry requirements or the number of employees, as well as the corporate structures of customers and positions IT providers according to their focus area. As a result, ISG differentiates them, if necessary, into two client target groups that are defined as follows:

- **Midmarket**: Companies with 100 to 4,999 employees or revenues between US$20 million and US$999 million with central headquarters in the respective country, usually privately owned.
- **Large Accounts**: Multinational companies with more than 5,000 employees or revenue above US$1 billion, with activities worldwide and globally distributed decision-making structures.

Provider Classifications

The ISG Provider Lens™ quadrants are created using an evaluation matrix containing four segments (Leader, Product & Market Challenger and Contender), and the providers are positioned accordingly.

Leader

The Leaders among the vendors/providers have a highly attractive product and service offering and a very strong market and competitive position; they fulfill all requirements for successful market cultivation. They can be regarded as opinion leaders, providing strategic impulses to the market. They also ensure innovative strength and stability.

Product Challenger

The Product Challengers offer a product and service portfolio that provides an above-average coverage of corporate requirements, but are not able to provide the same resources and strengths as the Leaders regarding the individual market cultivation categories. Often, this is due to the respective vendor's size or weak footprint within the respective target segment.

Market Challenger

Market Challengers are also very competitive, but there is still significant portfolio potential and they clearly fall behind the Leaders. Often, the Market Challengers are established vendors that are somewhat slow to address new trends due to their size and company structure, and therefore have some potential to optimize their portfolio and increase their attractiveness.

Contender

Contenders still lack mature products and services or sufficient depth and breadth in their offering, but also show some strengths and improvement potential in their market cultivation efforts. These vendors are often generalists or niche players.

Provider Classifications (cont.)

Each ISG Provider Lens™ quadrant may include a service provider(s) which ISG believes has strong potential to move into the Leader quadrant. This type of provider can be classified as a Rising Star. Number of providers in each quadrant: ISG rates and positions the most relevant providers according to the scope of the report for each quadrant and limits the maximum of providers per quadrant to 25 (exceptions are possible).

Rising Star

Companies that receive the Rising Star award have a promising portfolio or the market experience to become a leader, including the required roadmap and adequate focus on key market trends and customer requirements. Rising Stars also have excellent management and understanding of the local market. This award is only given to vendors or service providers that have made significant progress toward their goals in the last 12 months and are expected to reach the Leader quadrant within the next 12-24 months due to their above-average impact and strength for innovation.

Not In

The service provider or vendor was not included in this quadrant. There might be one or several reasons why this designation is applied: ISG could not obtain enough information to position the company; the company does not provide the relevant service or solution as defined for each quadrant of a study; or the company did not qualify due to market share, revenue, delivery capacity, number of customers or other metrics of scale to be directly compared with other providers in the quadrant. Omission from the quadrant does not imply that the service provider or vendor does not offer this service or solution, or confer any other meaning.

Networks – Software Defined Solutions and Services - Quadrant Provider Listing 1 of 4

	Managed (SD) WAN - Services	SDN Transformation Services (Consulting & Implementation)	SD-WAN Equipment and Service Suppliers (DIY)	Technology and Service Suppliers (core - 4G/5G)	Edge Technologies and Services	Enterprise 5G Solutions
ADVA	Not In	Not In	Contender	Not In	Not In	Not In
Allied Telesis	Not In	Not In	Market Challenger	Not In	Not In	Not In
Altran	Not In	Contender	Not In	Contender	Not In	Not In
Apcela	Product Challenger	Product Challenger	Product Challenger	Product Challenger	Product Challenger	Product Challenger
AT&T	Product Challenger	Product Challenger	Product Challenger	Product Challenger	Product Challenger	Product Challenger
Atos	Contender	Contender	Not In	Not In	Not In	Not In
BT	Leader	Leader	Product Challenger	Leader	Leader	Product Challenger
Cancom	Not In	Not In	Not In	Contender	Product Challenger	Not In
Cisco	Not In	Not In	Leader	Leader	Leader	Leader
Citrix	Not In	Not In	Leader	Not In	Product Challenger	Not In
Cognizant	Not In	Market Challenger	Not In	Not In	Not In	Not In
Colt	Product Challenger	Product Challenger	Not In	Not In	Not In	Not In
Conscia	Market Challenger	Market Challenger	Not In	Not In	Not In	Not In
Deutsche Telekom	Leader	Leader	Product Challenger	Leader	Leader	Product Challenger

Networks – Software Defined Solutions and Services - Quadrant Provider Listing 2 of 4

	Managed (SD) WAN - Services	SDN Transformation Services (Consulting & Implementation)	SD-WAN Equipment and Service Suppliers (DIY)	Technology and Service Suppliers (core - 4G/5G)	Edge Technologies and Services	Enterprise 5G Solutions
DXC	Contender	Contender	Not In	Not In	Not In	Not In
Elisa	Market Challenger	Not In	Not In	Market Challenger	Not In	Market Challenger
Enea	Market Challenger	Not In	Not In	Not In	Not In	Market Challenger
Ericsson	Not In	Not In	Leader	Leader	Not In	Leader
Fatpipe	Not In	Not In	Not In	Contender	Contender	Not In
Fortinet	Not In	Not In	Not In	Not In	Product Challenger	Not In
GTT	Product Challenger	Rising Star	Not In	Not In	Not In	Not In
HCL	Leader	Leader	Product Challenger	Leader	Leader	Product Challenger
HPE Aruba	Not In	Not In	Leader	Not In	Leader	Leader
Huawei	Not In	Not In	Contender	Not In	Not In	Not In
IBM	Leader	Leader	Leader	Leader	Product Challenger	Product Challenger
Infosys	Rising Star	Leader	Product Challenger	Leader	Product Challenger	Product Challenger
Itera	Not In	Not In	Not In	Not In	Market Challenger	Not In
Juniper Networks	Not In	Not In	Product Challenger	Product Challenger	Leader	Not In

Networks – Software Defined Solutions and Services - Quadrant Provider Listing 3 of 4

	Managed (SD) WAN - Services	SDN Transformation Services (Consulting & Implementation)	SD-WAN Equipment and Service Suppliers (DIY)	Technology and Service Suppliers (core - 4G/5G)	Edge Technologies and Services	Enterprise 5G Solutions
Lumen	Product Challenger	Product Challenger	Product Challenger	Product Challenger	Market Challenger	Not In
Mavenir	Not In	Not In	Not In	Not In	Not In	Contender
Microland	Not In	Not In	Not In	Product Challenger	Product Challenger	Not In
NetNordic	Market Challenger	Market Challenger	Not In	Not In	Not In	Not In
Nokia Networks	Not In	Not In	Not In	Not In	Not In	Leader
NTT	Not In	Product Challenger	Not In	Product Challenger	Not In	Not In
Nuage Networks	Product Challenger	Not In	Leader	Leader	Leader	Not In
Nuvias	Not In	Not In	Not In	Market Challenger	Not In	Not In
Open Systems	Product Challenger	Product Challenger	Not In	Not In	Not In	Not In
Orange Business Services	Leader	Leader	Leader	Leader	Leader	Product Challenger
Pica8	Not In	Not In	Not In	Contender	Contender	Not In
Prodapt	Not In	Product Challenger	Product Challenger	Not In	Not In	Not In
Sierra Wireless	Not In	Not In	Not In	Not In	Not In	Contender
SonicWall	Not In	Not In	Contender	Contender	Contender	Not In

Networks – Software Defined Solutions and Services - Quadrant Provider Listing 4 of 4

	Managed (SD) WAN - Services	SDN Transformation Services (Consulting & Implementation)	SD-WAN Equipment and Service Suppliers (DIY)	Technology and Service Suppliers (core - 4G/5G)	Edge Technologies and Services	Enterprise 5G Solutions
Talari Networks	Not In	Not In	Not In	Product Challenger	Not In	Not In
Tata Communications	Product Challenger	Product Challenger	Not In	Not In	Not In	Not In
TCS	Leader	Leader	Product Challenger	Product Challenger	Product Challenger	Product Challenger
Tech Mahindra	Leader	Leader	Rising Star	Leader	Leader	Rising Star
Tele2	Not In	Product Challenger	Market Challenger	Market Challenger	Market Challenger	Market Challenger
Telefonica	Product Challenger	Contender	Not In	Product Challenger	Not In	Not In
Telenor	Market Challenger	Leader	Market Challenger	Market Challenger	Market Challenger	Leader
Telia	Leader	Product Challenger	Product Challenger	Product Challenger	Not In	Leader
Telstra	Not In	Product Challenger	Not In	Not In	Not In	Not In
Verizon	Leader	Leader	Product Challenger	Rising Star	Rising Star	Product Challenger
Versa Networks	Not In	Not In	Product Challenger	Not In	Leader	Not In
VMware	Not In	Not In	Leader	Product Challenger	Leader	Not In
Wipro	Leader	Leader	Leader	Leader	Rising Star	Rising Star

Networks – Software Defined Solutions and Services Quadrants

ENTERPRISE CONTEXT

Managed (SD) WAN Services

This report is relevant to enterprises across all industries in the Nordics for evaluating service providers of enterprise WAN (primarily, enterprise SD-WAN or hybrid MPLS/IPWAN), which delivers managed solutions and associated services.

In this quadrant report, ISG highlights the current market positioning of providers of managed SD-WAN services for enterprises in the Nordics, and how each provider addresses the key challenges faced in the region. ISG observes a growing demand among enterprises for managed SD-WAN solutions and services to outsource IT functions and purchase them, as well as consulting and professional services to assess, design and implement their enterprise networks, along with ongoing operations. These service providers offer a wide range of value-added services, which include configuration management, operations, monitoring, alerts, troubleshooting, equipment installation, hardware and software support, zero-touch deployment and centralized management, and AI-based autonomous healing.

Enterprises in Nordics are successful in terms of identifying the network pain points to move forward with robust network transformation strategies. Enterprises in this region are largely looking at global providers to develop their networks. Due to the closed market nature in the region, enterprises are slightly tilting towards local teams of global companies, which provide strong product capabilities and with higher quality of service. A few enterprises in this region are going for end-to-end transformation of their networks to meet their operational strategies. Also, the demand for partnered solutions that combines telecom service providers, and SDN partners are gaining popularity in the region owing to the demand for future building ready dynamic networks.

The following can use this report to identify and evaluate different service providers:

IT and network management leaders should read this report to understand the relative positioning and capabilities of providers that can help them effectively consume managed SD-WAN services. The report also shows how the technical and integration capabilities as well as partnerships of service providers differ from the rest in the market.

Digital transformation professionals should read this report to understand how providers of managed SD-WAN services fit their digital transformation initiatives, and how they compare to one another.

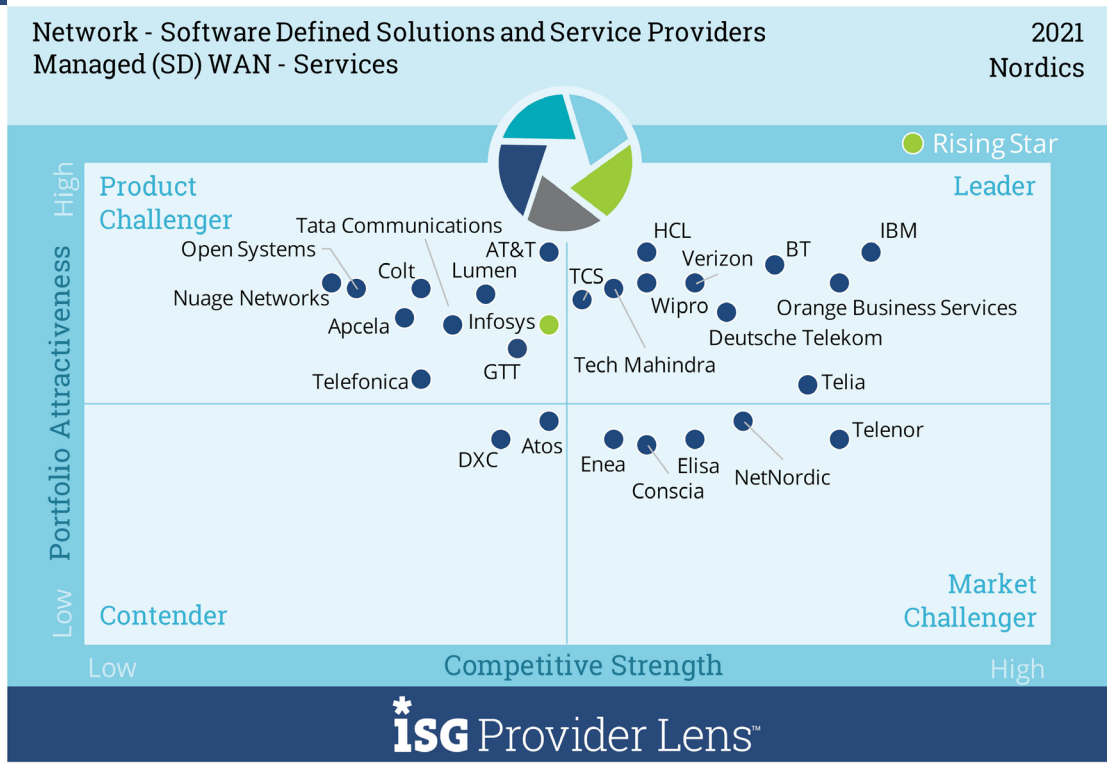
Procurement professionals should read this report to learn more about managed SD-WAN service suppliers, as payment schemes for such services are often based on SLAs and KPIs being met and/or levels of service/QoS. Some providers also offer pay-as-you-consume or similar payment arrangements, rather than traditional payment models.

MANAGED (SD) WAN SERVICES

Definition

This quadrant examines the providers of enterprise WAN (primarily enterprise SD-WAN, or hybrid MPLS/IP WAN) that deliver completely managed solutions and all associated services to enterprise customers.

SD-WAN provides more benefits of SDN technology than traditional hardware-based networking. It is an overlay architecture with a networking foundation that is much easier to manage when compared to legacy WANs. It mainly moves the control layer to the cloud, centralizing and simplifying network management. This overlay design abstracts software from hardware, enabling network virtualization and making the network more elastic. SD-WAN architecture reduces recurring network costs, offers network-wide control and visibility, and simplifies the technology with zero-touch deployment and centralized management. The key aspect of SD-WAN architecture is that it can communicate with all network endpoints without the need for external mechanisms or additional protocols. Suppliers have been as active as managed service providers, supplying complete managed SD-WAN solutions to enterprises, including hybrid MPLS/IP or MPLS/SDN offerings, as well as offering these solutions as white-label products for telco providers or integrators as part of their broader strategic implementations.



Source: ISG Research 2021

MANAGED (SD) WAN SERVICES

Eligibility Criteria

- Product/service managed WAN portfolio coverage, completeness and scope;
- Ability to deliver and manage all hardware and software aspects;
- Ability to rearchitect the existing MPLS-based WANs into hybrid WAN systems as required;
- Management capability for the needed orchestration and control of the overall architecture;
- Flexibility and ease of introduction of new services and deployments;
- Stability and roadmap planning of the provider;
- Reference customer/site volume in deployment;
- Competitiveness of offering and commercial terms

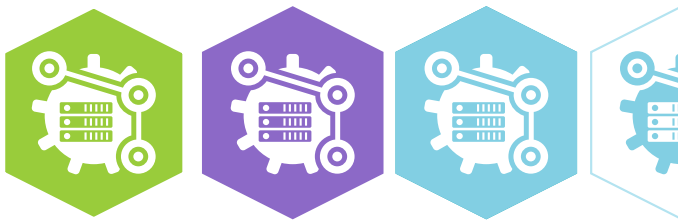
Observations

- **BT's** focus has been on the multinational segment of the Nordics, which is a part of its global market penetration strategy.
- **Deutsche Telekom (DT)** has integrated the T-Systems offerings under a single DT brand and has developed a more focused strategy.
- **IBM** combines in-house technologies with domain knowledge to identify enterprise pain points associated with the network.
- **HCL** has a focused, productized approach towards capturing the Nordics market with an extensive footprint.
- **Orange Business Services** takes an inorganic growth-based approach to tap the regional market, serving both private and public sector clients.
- **TCS'** proprietary TCS Network as a Service (TNaaS) is a holistic solution that spans all the elements of network management.

MANAGED (SD) WAN SERVICES

Observations

- **Tech Mahindra** has successfully tapped the vibrant Nordics market, showcasing some large engagements in the manufacturing sector.
- **Telia** is one of the regional incumbents with the necessary scale to meet enterprise requirements.
- **Verizon** has expanded in the Nordics, progressing from one account to another based on its industry credibility.
- **Wipro** has established a separate region-specific business unit for driving growth in the Nordics.
- **Infosys** (Rising Star) has an extensive portfolio of software-defined anything (SDx) offerings and effectively addresses the intrinsic details of client requirements.



DEUTSCHE TELEKOM

Overview

Deutsche Telekom (DT) is a telecommunications company headquartered in Bonn, Germany, and the largest communications services provider in Europe in terms of revenue. The company has established specialized cells and solution design centers in the Nordics to work on technologies such as open telecom cloud. DT has been reportedly moving corporate telecoms clients from its IT and digital services unit, T-Systems into the main company.

Strengths

Proprietary LUCI methodology to enhance cost benefit: Deutsche Telekom's migration approach, LUCI (creating value proposition around Layout, Upgrade of sites, Creation of network segments and Implementation of SD-WAN), facilitates an end-to-end SD-WAN implementation journey from consulting to deployment. This intrinsic methodology pays special attention to the design, up to the level of architecture. A router, for instance, could be engaged as per the location's communication architecture, for example the hub and bespoke architecture or a full-measure architecture. The latter involves hardware, including the related costs and requisite licenses, thus accounting for significant costs. The LUCI framework drives cost effectiveness by normalizing such instances.

Structuring SD-WAN roadmap for digitally conservative clients: MPLS is the foundational technology for T-Systems' IntraSelect SD-WAN (now a part of the overall DT portfolio), which is integrated with Cisco IOS devices. DT provides configurations as per client requirements for consuming their own network and managing the Internet/MPLS/hybrid model and partners all under one SLA. These offerings are appropriate for enterprises that need some assistance in digital advances when compared to those that are digitally mature.

All-inclusive SD-WAN solution to accelerate enterprise digital transformation: DT has used the Versa Networks' Secure SD-WAN solution to deliver comprehensive SD-WAN services. In addition to the inherent security features of the Versa offering, its analytics and monitoring engine provides insight into both data center and cloud traffic. These all-encompassing attributes enable DT clients to drive digitalization within their business environment, delivering security and stability while accessing cloud applications.

Caution

Clients may find the combination of T-Systems and DT portfolios under a single brand confusing and question the future-readiness of their roadmap with DT.

2021 ISG Provider Lens™ Leader

DT has a mature and robust portfolio of SD-WAN offerings that meet the requirements of most Nordic-based enterprise clients.

ENTERPRISE CONTEXT

SDN Transformation Services (Consulting and Implementation)

This report is relevant to enterprises across all industries in the Nordics for evaluating service providers of software-defined networking (SDN) transformation services that involve consulting and implementation.

In this quadrant report, ISG highlights the current market positioning of providers of SDN transformation services for enterprises in the Nordics, and how each provider addresses the key challenges faced in the region. ISG observes an increasing demand for SDN transformation services from third parties to transition from traditional networking to SDN. Established equipment providers, consultants and service providers offer a wide range of value-added services, which include planning, solution design, project management and implementation.

Enterprises in the Nordics are strengthening their network architectures with next-generation networks. This trend is enabling them to move toward a cloud-first strategy with strong deemed for multi-cloud SD-WAN to access dynamic network management tools, promote security, and automate event management process. A strong set of enterprises are moving toward non-Europe-based global service providers for network transformations, and they are looking for strong consulting offering with matured offering that serve their business-critical needs. Network security is gaining more momentum among banking and financial service enterprises to support time-sensitive applications. Also, a strong consultive-led service wrap around a strong transformation offering with a future-proof network strategy is in demand among most enterprises in the region.

The following can use this report to identify and evaluate different service providers:

IT and network management leaders involved in strategy, architecture, operations and procurement should read this report to understand the relative positioning and capabilities of providers that can help them effectively consume SDN transformation services. The report also shows how the technical and integration capabilities of service providers differ from the rest in the market.

Digital transformation leaders should read this report to understand how providers of SDN transformation services fit their digital transformation initiatives, and how they compare to one another.

Cybersecurity leaders should read this report to understand the current state of capabilities around security associated with the providers of consulting and other SD-WAN transformation services. Also, all enterprises need to be aware of and concerned about their service providers' approaches toward security, mainly because networks are the conduits for many security attacks that are becoming more frequent and sophisticated.

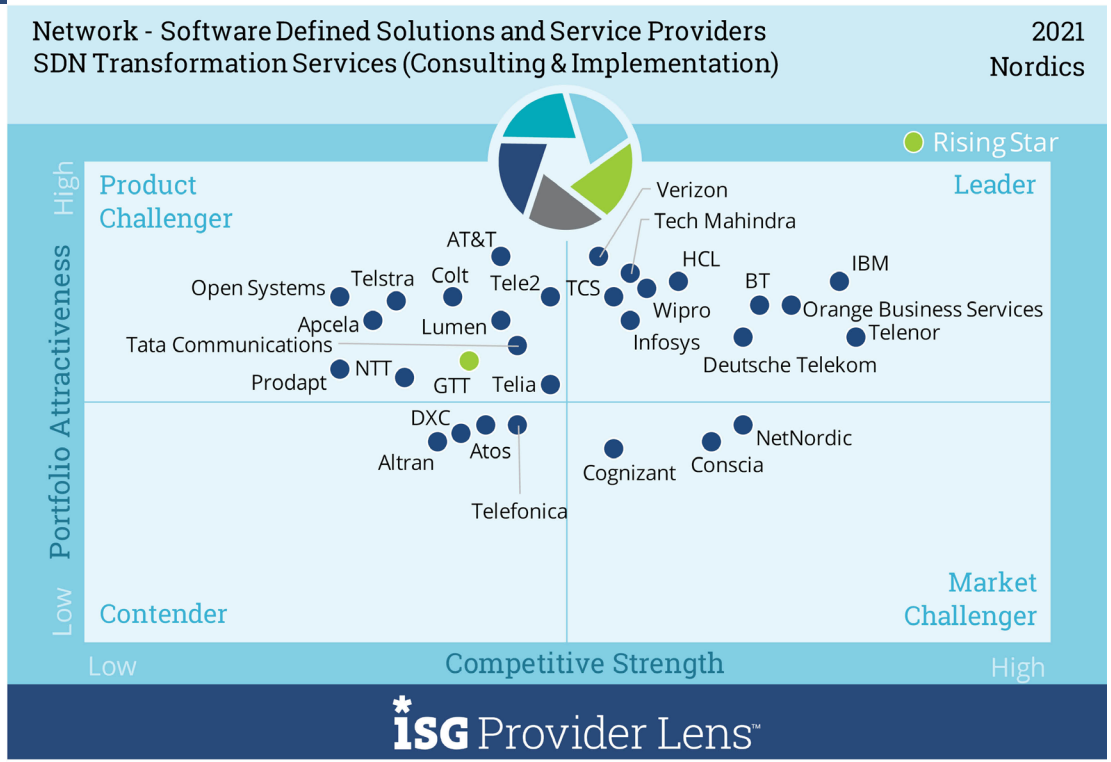
Procurement professionals should read this report if they are dealing with consulting and advisory services, and not just equipment.

SDN TRANSFORMATION SERVICES (CONSULTING AND IMPLEMENTATION)

Definition

This quadrant analyzes all providers of all advisory/consulting and services associated with delivering SD-WAN to enterprises (from the initial advisor consulting through to services delivery and roll-out).

Traditionally, modifications or new installations of IT devices in a data center and its external WAN networks involved making changes to each network component, which could take days or longer. This traditional, rigid architecture is unworkable and challenged by today's business requirements for more agility, flexibility, automation and rapid security enhancements. Private, public, hybrid and multi-cloud networking, explosive mobile application usage in the workplace, IoT, Industry 4.0, big data, infrastructure/anything as a service (XaaS), and intent-based AI and ML networking solutions require a flexible network environment that can accommodate changes quickly and with minimum human intervention. Software defined networking provides many of these benefits compared to traditional hardware-



Source: ISG Research 2021

SDN TRANSFORMATION SERVICES (CONSULTING AND IMPLEMENTATION)

Definition (cont.)

based networking and acts as a foundational enabler for cloudification strategies, ISEN and digital transformation undertakings. SD-WAN is an overlay architecture with a networking foundation that is much easier to manage when compared to legacy WANs, essentially moving the control layer to the cloud and, therefore, centralizing and simplifying network management.

Suppliers in this area have been increasingly active as advisors/ consultants and are also working as implementation enactors, supplying complete or partial solutions to enterprises or acting as brokers and project managers to ensure combined coalition deliveries occur as planned. Consulting companies, large vendors and managed network services providers have also been actively involved in offering SD-WAN packages in this area (independently or as part of partnership/ consortium deals).

Eligibility Criteria

- Product/service portfolio coverage, completeness and scope;
- Ability to deliver consulting, from strategy through to technology/tactical levels and all integration and implementational areas;
- Understanding of the overall market area and contributions to that area;
- Scope of partnerships and offerings and management capability for the needed orchestration within a customer project;
- Stability and roadmap planning capabilities of the provider;
- Reference customer/solutions in post pilot/commercial deployment;
- Competitiveness of offering and types of commercial terms.

SDN TRANSFORMATION SERVICES (CONSULTING AND IMPLEMENTATION)

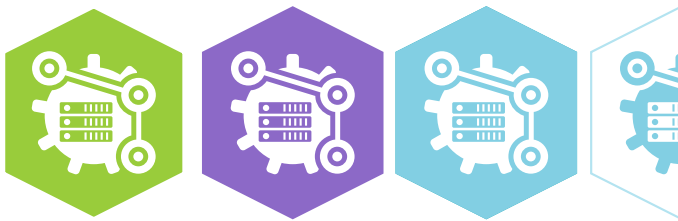
Observations

- **BT** has experienced significant traction in the Nordics and its change to a vertical-oriented strategy from a regional one is expected to accelerate growth.
- **Deutsche Telekom (DT)** has a strong portfolio of technology offerings and expertise across various platforms, which drive value proposition.
- **GTT** partners with multiple technology vendors to deliver solutions that can be scaled up and down to solve business challenges and address a range of application needs.
- **HCL** has a wide spectrum of in-house offerings that span every layer of the transformation and managed services ecosystem.
- **IBM** has an effective strategy of taking up network transformation as part of its digital transformation services for enterprises in the region.
- **Infosys** provides end-to-end services associated with migration and transformation, overarching the foundational network build and deployment across the nuances of system integration, system testing, application development, configuration and inventory management.
- **Orange Business Services (Orange)** has a unique strategy of penetrating the Nordics, leveraging the pillars of business consulting, technology consulting and implementation and managed services.
- **TCS'** network services, governed by its strong portfolio of IT support services and solutions, makes it a partner of choice for enterprises.

SDN TRANSFORMATION SERVICES (CONSULTING AND IMPLEMENTATION)

Observations (cont.)

- **Tech Mahindra's** SDN/NFV-oriented transformation strategy is based on its theme of "network fosters digital," leveraging automation along with device and edge consolidation.
- **Telenor** has a presence in the network ecosystem across the Nordics. It combines its partner capabilities with its own to deliver transformation services.
- **Verizon** is a strong participant in the region and is considered a formidable competitor by industry peers due to its proficiency in cloud, networks and engineering.
- **Wipro's** ambitious growth plan across the Nordics and significant adoption of offerings such as network automation as a service make it a go-to partner for network-related services.



DEUTSCHE TELEKOM

Overview

Deutsche Telekom (DT) is one of the prominent service providers in the Nordics, driving end-to-end secure SD-WAN deployment from consulting to managed services for network enhancement. DT has developed consulting and transformation frameworks from SD-WAN Tool selection to the effective migration path and operations, including on request the management of third-party underlay networks.

Strengths

Consulting-led approach to migration ensuring future-proof and holistic service: DT has structured an ambitious roadmap for integrating itself in the SD-WAN value chain, driving end-to-end projects with a professional service wraparound. It leverages its consulting and management services to structure a long-term vision for clients with respect to enterprise network transformation. The company also aligns appropriate modules with them to deliver the right solution and architecture.

Extensive partnership and research-driven product conceptualization: DT's Smart SD-WAN solution is built through exhaustive research, which is propelled by engaging project-based partners such as Silver Peak, Juniper Networks and VeloCloud. A unified research-based approach enables the company to look beyond the technology stack, consider the various functional aspects, and drive a synchronized approach toward delivering the business intent.

End-to-end SD-WAN deployment governed by proof-of-concept (POC) outcomes: DT has showcased several instances of transition from MPLS and VPN- based WAN infrastructure to its Smart SD-WAN solution, transforming and enhancing the network access and connectivity performance. In addition to bandwidth savings, the company reduces the turnaround time for the deployment and installation of sites from months to days, usually demonstrated as a proof of concept prior to the migration.

Caution

DT's steadfast progress in the Nordics has proven to be sustainable. However, the company would need to strategize its partnerships, organizational restructuring, and new offerings to identify voids in the market and craft solutions to bridge the gap.

2021 ISG Provider Lens™ Leader

DT offers extensive, advisory-driven professional functions, together with an expansive portfolio of end-to-end solutions to global as well as regional, Nordic-based enterprises.

ENTERPRISE CONTEXT

SD-WAN Equipment and Service Suppliers (DIY)

This report is relevant to enterprises across all industries in the Nordics for evaluating suppliers of software-defined networking wide-area network (SD-WAN) equipment and services.

In this quadrant report, ISG highlights the current market positioning of suppliers of SD-WAN equipment and services for enterprises in the Nordics, and how each supplier addresses the key challenges faced in the region. The enterprises not handing over management and control of their SD networks to third parties can buy SD-WAN solutions to implement on their own in do-it-yourself (DIY) manner. These solutions include hardware and software, management and reporting tools, as well as applications and services associated with delivering SD-WAN.

Enterprises in the Nordics are moving toward vendor-agnostic, cost-optimized, SD-WAN services that include integration architecture. WAN optimization and deployment flexibility are two driving factors for enterprises and features like zero-touch provisioning, built-in security and deployment flexibility are driving the purchase decision of enterprises. Also, enterprises in the region are looking for site-to-site connectivity through integration of their SD-WAN solution with hyperscalers. Enterprises seem to be moving toward price flexibility and cost-effectiveness including pay-per-usage modularity.

The following can use this report to identify and evaluate different service providers:

IT and network management leaders involved in strategy, architecture, operations and procurement should read this report to understand the relative positioning and capabilities of SD-WAN equipment and service suppliers. The report also shows how suppliers collaborate with licensed telco providers to offer enterprise DIY solutions.

Digital transformation leaders should read this report to understand how SD-WAN equipment and service suppliers fit their digital transformation initiatives, and how they compare to one another.

Cybersecurity leaders should read this report to understand the current state of capabilities around security associated with the direct suppliers of SD-WAN equipment and services. Also, all enterprises need to be aware of and concerned about their suppliers' approaches toward security, mainly because networks are the conduits for many security attacks that are becoming more frequent and sophisticated.

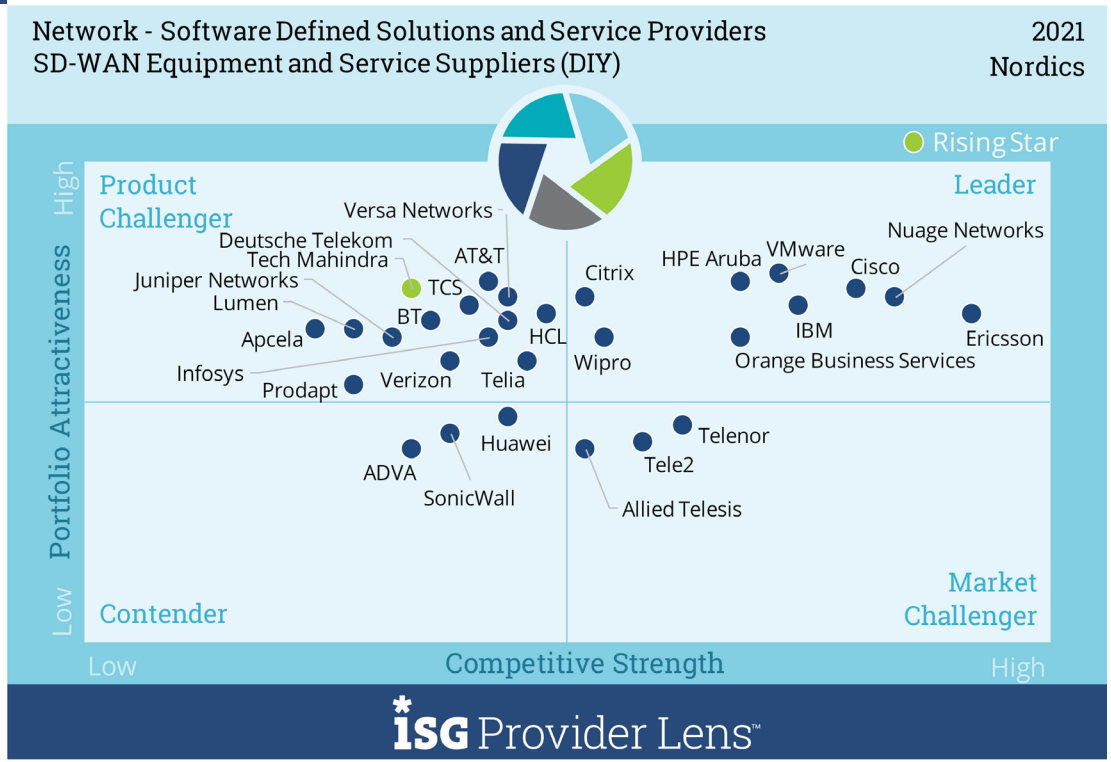
Procurement professionals should read this report to learn more about SD-WAN equipment and service suppliers, as packaging and pricing models deviate from traditional networking solutions.

SD-WAN EQUIPMENT AND SERVICE SUPPLIERS (DIY)

Definition

This market is characterized by providers delivering hardware and software, management and reporting tools, applications and services associated with delivering SD-WAN for enterprises and enterprise's own operations, and enterprise's co-managed operations (increasingly in some regions).

SD-WAN is a virtual WAN overlay that allows enterprises to bundle multiple WAN technologies and connections, such as MPLS, broadband internet, IP, LTE and Ethernet and provision them as overall bandwidth, using various underlay network options available for transmission. SD-WAN determines the path for transmitting data packets and the medium to be used. If a connection has excess load, another path is taken automatically. The virtual connections consist of multiple paths that are used in parallel.



Source: ISG Research 2021

SD-WAN EQUIPMENT AND SERVICE SUPPLIERS (DIY)

Definition (cont.)

SD-WAN provides the benefits of SDN/NFV technology over traditional hardware-based networking. It is easier to manage when compared to legacy WANs, which mainly centralizes and simplifies network management and eases deployment by having an overlay (often) cloud-based control layer. This overlay design abstracts software from hardware, enabling network virtualization and making the network more elastic. One of the key aspects of the architecture is that it can communicate with all network endpoints without the need for external mechanisms or additional protocols. Suppliers have been active in directly selling SD-WAN solutions to enterprises for their DIY (enterprises' own and non-managed) implementations and are increasingly partnering with licensed telco/service providers in their delivery packages in this space, as well as offering co-managed solutions, wherein the enterprise retains control and management of only those network parts it deems critical to retain in-house while effectively giving management control and responsibility for many other parts of the network solution to its provider partner, often sharing an orchestration and management interface platform for both parts.

Eligibility Criteria

- Product/service portfolio coverage, completeness and scope;
- Ability to deliver equipment and service to customer, inclusive of prerequisite training to allow enterprise take over the operation smoothly;
- Understanding of overall market area and contributions to that area;
- Scope of partnerships and offerings and management capability for the needed orchestration within a customer project;
- Openness of offering to avoid vendor lock-in;
- Ability to offer full customer support and assistance after delivery;
- Reference customer/solutions in post pilot/commercial deployment;
- Competitiveness of offering and types of commercial terms.

SD-WAN EQUIPMENT AND SERVICE SUPPLIERS (DIY)

Observations

- **Cisco** has a large and comprehensive portfolio of SDx products and services that can address various client requirements.
- **Citrix** presents strong capabilities in security integrated SD-WAN, remote workplace solutions and multi-cloud transition technologies.
- **Ericsson** is proficient in network equipment associated engineering and supplies services directly to enterprises as well as through channels.
- **HPE Aruba** has effectively integrated Silver Peak offerings to deliver a holistic portfolio.
- **IBM** has leveraged the Red Hat capabilities to streamline network complexities.

Observations

- **Nuage Networks** has an evolving portfolio of services that promise high-growth momentum.
- **Orange Business Services** uses its telco heritage to drive network virtualization for enterprises from an equipment engineering perspective.
- **Vmware** has numerous comprehensive solutions to address different enterprise needs.
- **Tech Mahindra** (Rising Star) combines engineering and network services to drive cost effectiveness and flexibility in SDx projects.
- **Wipro** (Rising Star) has strong engineering capabilities across all network areas.

ENTERPRISE CONTEXT

Technology and Service Suppliers (Core to 4G/5G)

This report is relevant to enterprises across all industries in the Nordics for evaluating suppliers of SDN core services. These services are purchased directly by either enterprises or service providers for specific projects, including 4G/5G mobility-targeted services, solutions, applications or management systems.

In this quadrant report, ISG highlights the current market positioning of suppliers of SDN technology and related services for enterprises in the Nordics, and how each supplier addresses the key challenges faced in the region. The enterprises purchase either directly or via service providers.

Enterprises in the Nordics have moved to multi-cloud environments, and they are digitally advanced compared to the U.K. and Germany. And the increasing use of enterprise applications and their security challenges when users access from remote locations is one of the key driving factors for enterprises to invest in non-core 4G/5G services. This is driving the enterprises to build a highly programmable network fabric that spans the data center, SD-WAN and branch networks to strengthen their core mobile technology spaces. Also, as mobile usage at workplace increases, the need for enabling device security is gaining traction among enterprises, and enterprises are largely demanding device authenticity and data privacy to ensure secured mobile connectivity.

The following can use this report to identify and evaluate different service providers:

IT and network management leaders involved in strategy, architecture, operations and procurement should read this report to understand the relative positioning and capabilities of SDN technology suppliers. The report also shows how suppliers are partnering to support an enterprise-wide SD-WAN strategy with remote offices.

Procurement professionals should read this report to learn more about SDN technology suppliers, as packaging and pricing models deviate from traditional networking solutions.

Digital transformation leaders should read this report to understand how SDN technology suppliers fit their digital transformation initiatives, and how they compare to one another.

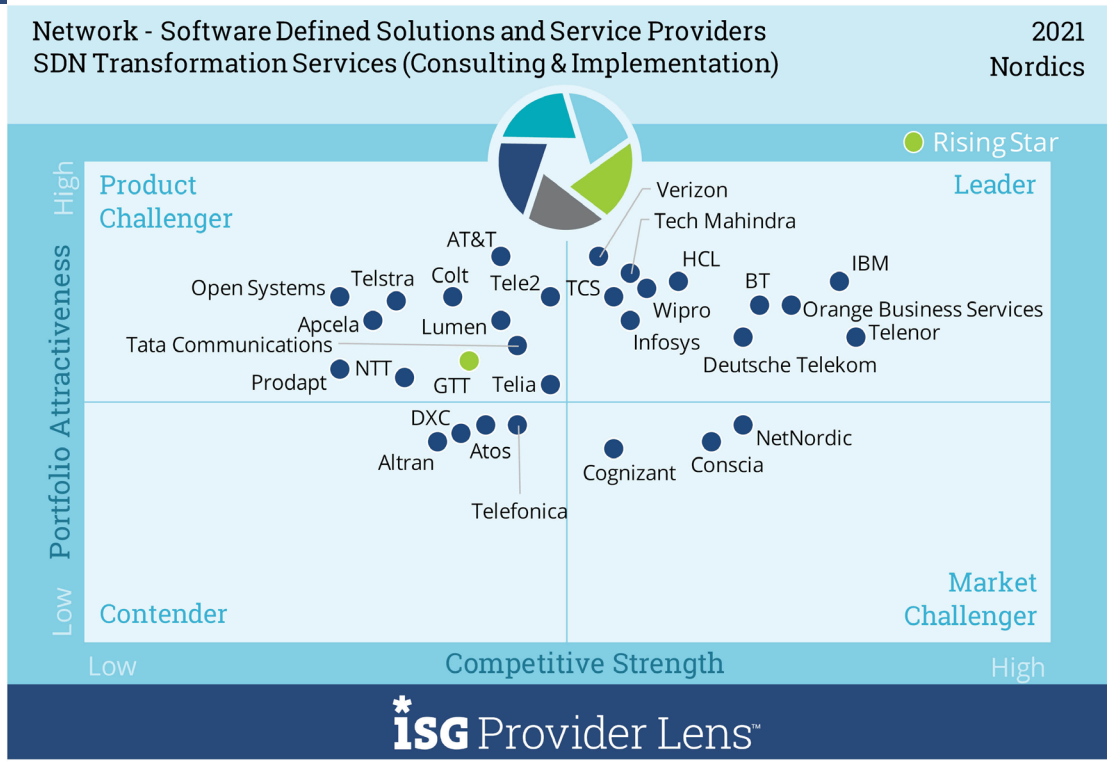
Cybersecurity leaders should read this report to understand the current state of capabilities around security associated with SDN technology suppliers. Also, all enterprises need to be aware of and concerned about their suppliers' approaches toward security, mainly because networks are the conduits for many security attacks, which are becoming more frequent and sophisticated.

TECHNOLOGY AND SERVICE SUPPLIERS (CORE – 4G/5G)

Definition

This quadrant analyzes all providers of SDN core services that are purchased directly by either enterprises or service providers for specific enterprise projects. It also includes specific 4G/5G mobility-targeted services or solutions, applications, management systems and methods, and SDN end-device control and management and related services that can integrate into an enterprise-wide SD-WAN strategy from the major enterprise location to the branch or remote office locations.

SD technology is a networking approach that eliminates the complex and static nature of legacy distributed network architectures by using a standards-based software abstraction between the network control plane and underlying data forwarding plane. It enables improvements in network agility and automation while substantially reducing the cost of network operations when compared to traditional network



Source: ISG Research 2021

TECHNOLOGY AND SERVICE SUPPLIERS (CORE – 4G/5G)

Definition (cont.)

deployments. Adopting an industry standard data plane abstraction protocol allows the use of any type and brand of data plane devices, as all the underlying network hardware is addressable through a common abstraction protocol. Such a protocol allows for both physical and virtual networking devices. These are considered as core network functions.

In addition to the core, the use of mobile or wireless access technologies are ever increasing in importance to the enterprise for communications and functional operations. 5G is designed to provide higher capacity than the current 4G/LTE, allowing a greater density of mobile broadband users at higher transfer speeds and supporting more device-to-device, reliable and massive machine communications. It is expected to have lower latency and battery consumption than 4G equipment and is targeted at the mobile high-speed data and the IoT.

Eligibility Criteria

- Product portfolio coverage, focus areas, completeness of modular delivery and integration into broader solutions;
- Ability to deliver equipment and service to customer, including prerequisite training;
- Ability to deliver as a value-added service within a 4G/5G environment using SD methods;
- Understanding of overall market area, technology environment and evolutions and contributions to that area;
- Scope of partnerships and offering and, management capability for the needed orchestration within a customer project;
- Openness of offering to avoid vendor lock-in;
- Reference customer/solutions after proofs of concepts or pilots moving into commercial deployment;
- Competitiveness of offering and types of commercial terms such as shared risk models.

TECHNOLOGY AND SERVICE SUPPLIERS (CORE – 4G/5G)

Observations

- **BT** has been bolstering its cloud networking capabilities with designated offerings.
- **Cisco** has a range of products and associated services in the entire network area across every technology cross section.
- **Deutsche Telekom (DT)** has extensive engineering service capabilities that enable it to deliver use case-specific services.
- **Ericsson** uses its proficiency in 5G networking to align networks with new configurations.
- **HCL** leverages its templatized and productized portfolio to minimize the time to market.
- **IBM** has invested significantly in open-source technology to reduce hardware dependency.
- **Infosys'** capabilities with product design, development, verification and management, engineering and support, lab management and testing give it an edge over competitors while working with the elements of the core network.
- **Nuage Networks** has adopted a highly segmented approach and integrated security components in every element of the network.
- **Orange Business Services (Orange)** has penetrated new market segments with its technology capabilities and in-house offerings.
- **Tech Mahindra** is one of the preferred system integrators for SDx projects with a highly telecommunication-focused approach.
- **Wipro** has numerous robust, productized offerings and a large client base.
- **Verizon** (Rising Star) has been expanding its capabilities in cloud and open-source technologies to drive network virtualization.

DEUTSCHE TELEKOM

Overview

Deutsche Telekom (DT) addresses industry challenges in the Nordics with its extensive portfolio on SDN. It has strengthened its offerings through strategic partnerships with network and best-of-breed technology, product, service and solution providers.

Strengths

Involvement in the public blockchain ecosystem through hosting of nodes and staking services: DT's recent involvement with games specialist Dapper Labs around execution nodes for the Flow blockchain portrays the company's ambitions with blockchain-powered business models. Furthermore, it intends to disrupt telecommunication segments with attributes of the Flow blockchain for example, delivering digital ownership, direct end-user engagement and rich ecosystem consonance.

Distributed network prowess fortified by industrial engineering DNA: DT has a legacy of helping hundreds of manufacturing clients in establishing SD-LAN infrastructure and expediting their shift to a virtualized campus.

Automation-heavy "canned" offerings configured for specific verticals with challenging environments: DT has a plethora of ready-to-deploy offerings that are built on successful use cases around predictive maintenance, automated guided vehicles, automated loading processes and augmented reality-enabled maintenance. An intrinsic professional services-led approach and a network of cutting-edge labs and centers of excellence provide the benefits of reduced latency, increased peak data speed and higher connection density to clients.

Holistic 5G campus network solution to align clients with upcoming business models: DT has a comprehensive 5G campus network solution that helps clients and other partners become more stable and aligned to an appropriate commercialization model. The technical viability is enhanced by the company's heavy investments in 5G for licenses and other research efforts. Furthermore, the recent partnership between T-Systems and Ericsson underlines the ambition of DT to leverage the full potential of digital core technologies for software solutions on 5G networks.

Caution

The Nordics market is being gradually explored and penetrated by system integrators, offering holistic and productized solutions in a cost-competitive manner. This can challenge the cost effectiveness of telco-native service providers such as DT in the region.

2021 ISG Provider Lens™ Leader

With its expertise spanning every segment of the core network, DT is considered as a go-to partner by Nordic-based enterprises for impelling digital elements.

ENTERPRISE CONTEXT

Edge Technologies and Services

This report is relevant to enterprises across all industries in the Nordics for evaluating providers delivering hardware and software technologies as well as management or reporting tools and applications, along with services associated with edge network technology.

In this quadrant report, ISG highlights the current market positioning of providers of edge technologies and services for enterprises in the Nordics, and how each provider addresses the key challenges faced in the region. ISG observes a growing demand among enterprises for edge computing and networking, thus offloading more compute and decision making to the edge of network, ensuring increased efficiency and business benefits. This is particularly prevalent in IoT and industry 4.0 IIoT-focused enterprises, but also across many other industries.

Enterprises in the Nordics are transforming their edge as a part of their overall network transformation. As network security is gaining its importance and securing the edge is becoming a key point of focus for most enterprises as they would require to deploy virtual firewalls onto the SD-WAN solution. A few enterprises are co-innovating with clients to provide custom built client-centric edge technology implementations; this looks to be one of the revenue realization strategies for many providers because they can directly address industry painpoints that can bring out new use cases. Also, the demand for AI and ML based solutions is gaining traction in the region to improve edge efficiency and capabilities.

The following can use this report to identify and evaluate different service providers:

IT and network management leaders involved in strategy, architecture, operations and procurement should read this report to understand the relative positioning and capabilities of providers that can help them effectively consume mobile network services. The report also shows how the technical and integration capabilities of service providers differ from the rest in the market.

Digital transformation leaders should read this report to understand how providers of mobile network services fit their digital transformation initiatives and how they compare to one another. They can also learn about the partnership ecosystems designed to help enterprises integrate 5G into their digital transformations.

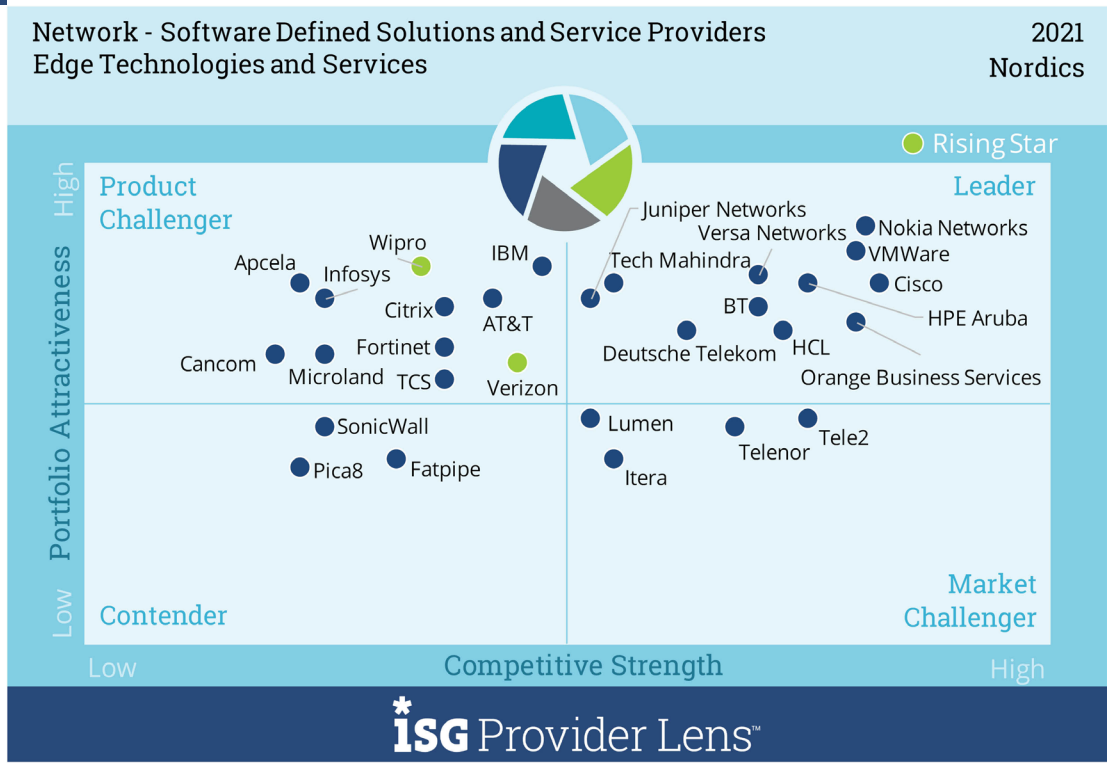
Cybersecurity leaders should read this report to understand the current state of capabilities around security associated with the providers of mobile network services. Also, with the addition of sensors and other connected devices to enterprise infrastructures, all enterprises need to be aware of and concerned about their service providers' approaches toward security.

EDGE TECHNOLOGIES AND SERVICES

Definition

This market is characterized by vendors delivering technologies across the hardware and software areas, management/reporting tools and applications and services associated with delivering edge network technology and services in and across multiple industry verticals to enterprises.

Edge technologies, services and computing are current trends in the IoT and IIoT world. With the localized processing of data, security and privacy are improved because any breach can be managed locally and therefore not requiring to be passed onto the WAN or cloud and, thus, back to central enterprise to defend against. In IoT edge computing and networking, the data from various connected devices of the IoT ecosystem is typically collected in a local device, analyzed on the network, and then transferred to the central data center or cloud. As the number of connected devices increases exponentially, the data



Source: ISG Research 2021

EDGE TECHNOLOGIES AND SERVICES

Definition (cont.)

volume generated is multifold. Interim processing is, thus, required to ensure cost reduction and increased efficiency. This, in turn, places great importance on efficient and software-driven edge capability networks and connectivity capabilities.

Edge components may be managed and dealt with in the same manner as core and SD-WAN components, with software-defined capabilities to include the branch and edge functionality, as well as all customer premises equipment (uCPE or vCPE) and associated software-defined mobile networks (SDMNs) and software-defined local area networks (SD-LANs that include both wireless (SD-WLAN) or mobile (SD-WMLAN), as well as IoT or IIoT sensors and devices or control/security devices.

4G/LTE in public spectrums together with wired connectivity locally (where appropriate) has been found to be able to supply significant speed and bandwidth at low cost for most industrial applications under the Industry 4.0 initiative, functioning with IoT/IIoT devices. In conjunction with wireline connectivity as required, the versatility of mobile connectivity offered has been demonstrated to serve up to 85 percent of all Industry 4.0 requirements. Additional recent work on in-built security has allayed many concerns by executives regarding its introduction. This is seen in many applications to be sufficient for lower scale edge network deployment in the near term, with longer term needs being met by 5G private or public networking as they come online to the edge.

EDGE TECHNOLOGIES AND SERVICES

Eligibility Criteria

- Product portfolio coverage, focus areas, completeness of modular or area solutions, together with integration into broader solutions;
- Ability to deliver prerequisite training and education to client, if required with proofs of concepts or studios;
- Understanding of overall market area, technology environment and evolutions and contributions to that area, including enterprise industry-specific knowledge and experience;
- Scope of partnerships and offerings and management capability for the needed orchestration of disparate providers and solutions within a customer project;
- Reference customer/solutions in proof-of-concept/pilot deployments or commercial deployment;
- Competitiveness of offering and types of commercial terms.

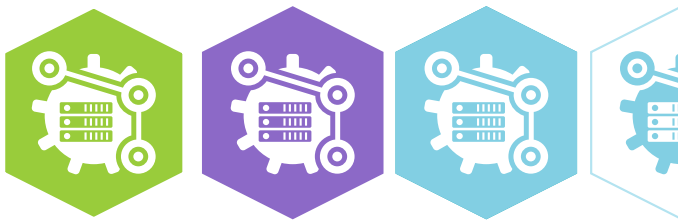
Observations

- **BT** focuses on edge as a part of its overall network transformation proposition.
- **Cisco's** portfolio has significant breadth and depth, aligning with all customer usage segments.
- **Deutsche Telekom's (DT)** extensive partnership ecosystem enables it to offer a multitude of edge services.
- **HCL** takes a productized, in-house tool driven approach to explore opportunities with edge technologies.
- **HPE Aruba** delivers its offerings in a single operational model for LAN, WLAN, WAN and security across campus networks and branches.
- **Juniper Networks'** products have extensive capabilities and a high degree of automation.
- **Nuage Networks (Nokia)** has robust offerings that are sold through service provider partners.
- **Orange Business Services** is well recognized in the industry for driving joint innovation with clients to provide edge technology designs.

EDGE TECHNOLOGIES AND SERVICES

Observations (cont.)

- **Tech Mahindra** takes a collaborative approach in driving value proposition on edge computing.
- **Versa Networks** has grown exponentially, outpacing the market in delivering network edge solutions with secure, scalable and reliable enterprise-wide networking solutions.
- **VMware** has strong capabilities to address the requirements of large-scale clients.
- **Wipro** (Rising Star) has partnered with several niche providers, which can directly or indirectly drive its success with edge technologies.
- **Verizon** (Rising Star) is experienced in numerous relevant use cases for various industries.



DEUTSCHE TELEKOM

Overview

Deutsche Telekom (DT) provides a wide range of services and solutions in the software-defined and cloud networking arena, spanning from core components and solutions to edge platforms. DT provides high-quality services in the area of SD and cloud networking, ranging from core components and solutions, through to edge platforms and functionality. The company integrates the edge-cloud ecosystems of hyperscalers such as AWS, Microsoft and Google. Enterprise customers of DT benefit from an end-to-end ecosystem consisting of connectivity, cloud-edge, and digital solutions while DT is able flexibly tailor, integrate and operate the ecosystem – to any degree with customer specific systems and infrastructure.

Strengths

Integrated campus solution to vitalize low latency, high volume on-site data processing and security: This can facilitate enterprise use cases that require combining public and private wireless connectivity in manufacturing plants, logistics centers, airports, ports, oil rigs and power plants. DT has combined different packages to address this shortcoming, extending the value proposition to 5G. The full-stack ICT solution, including sensors, applications, the required computation power and the network, packaged in a comprehensive suite of offerings enables customers to improve production and reliability through real-time insights.

Embracing the OpenStack with EdgAIR wireless edge platform: DT's proprietary OpenStack-based EdgAIR solution facilitates seamless connectivity to IoT applications through off-the-shelf connects. The applications are independent of the underlying infrastructure and run as virtual machines or in docker containers as microservices. The enables administrators to control the microservices individually in case of an anomaly without shutting down the entire system, providing enhanced operational modularity to customers.

Caution

With its significant investments in edge capabilities, DT should carefully strategize the roadmap from concept to commercialization.

2021 ISG Provider Lens™ Leader

A strong IT infrastructure backbone has enabled DT to become a prominent player in the edge technologies segment in the Nordics market. Its edge framework and partner-friendly solution architecture allows the integration of solution partners, which can benefit from DT's market reach and hyperscaler integration.

ENTERPRISE CONTEXT

Enterprise 5G Solutions

This report is relevant to enterprises across all industries in the Nordics for evaluating providers of 5G enterprise networks (private or campus networks) such as network equipment providers (NEPs), technology and service providers, and systems integrators as a part of a larger partner ecosystem.

In this quadrant report, ISG lays out the current market positioning of providers of 5G solutions, mobility targeted or wireless connected services/solutions, and 5G campus networks in the Nordics.

Enterprises in the Nordics are rapidly implementing a large number of private 5G proof-of -concept solutions compared to the U.K. and Germany. Europe-based providers are highly popular among enterprise clients in the region. Enterprises are looking for high-performance and agile private networks to support multiple use case scenarios on a single network, with speeds, bandwidth and larger numbers of connected devices greater than those currently possible utilizing 4G/LTE solutions. This is particularly prevalent in manufacturing or large-scale IoT situations, requiring real-time connections and flexibly placed connected devices and sensors. Open RAN solutions, business critical 5G use-cases and low complex 5G solutions are some of the popular 5G related services Nordics enterprises are seeking.

The following can use this report to identify and evaluate different service providers:

IT and network management leaders involved in strategy, architecture, operations and procurement should read this report to understand the relative positioning and capabilities of providers that can help them effectively consume mobile network services. The report also shows how the technical and integration capabilities of service providers differ from the rest in the market.

Digital transformation leaders should read this report to understand how providers of mobile network services fit their digital transformation initiatives and how they compare to one another. They can also learn about the partnership ecosystems designed to help enterprises integrate 5G into their digital transformations.

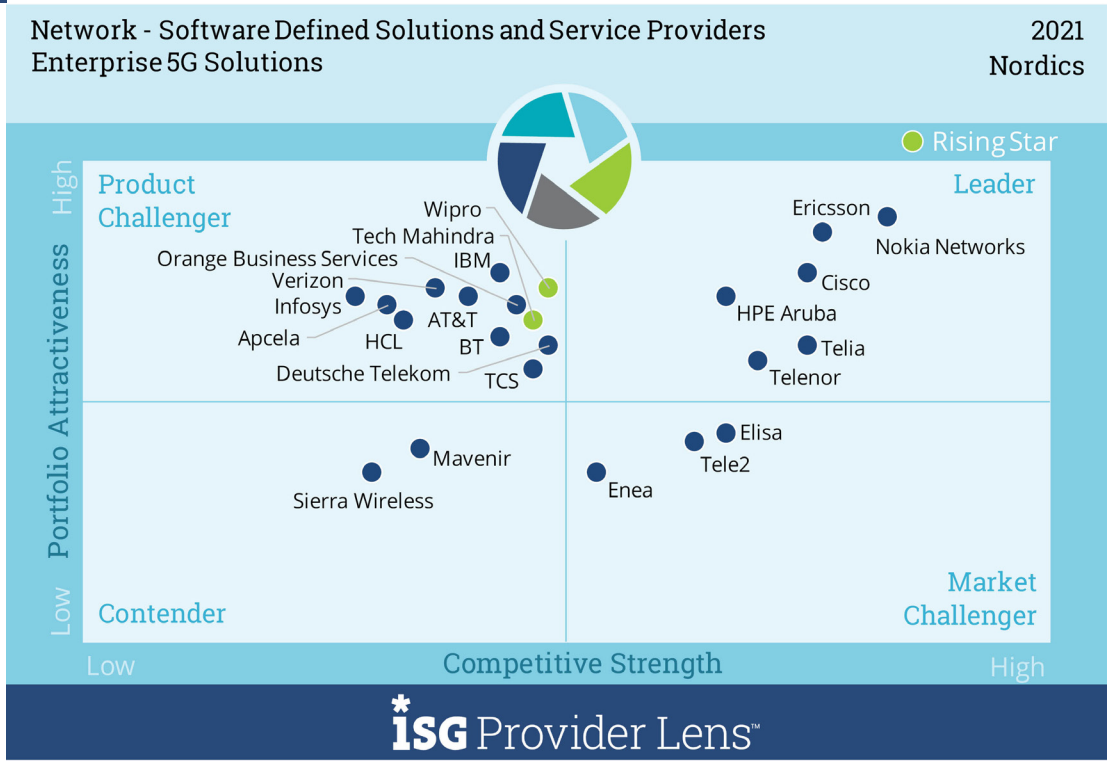
Cybersecurity leaders should read this report to understand the current state of capabilities around security associated with the providers of mobile network services. Also, with the addition of sensors and other connected devices to enterprise infrastructures, all enterprises need to be aware of and concerned about their service providers' approaches toward security.

ENTERPRISE 5G SOLUTIONS

Definition

This quadrant analyzes those 5G enterprise networks (private or campus networks), which are offered by network equipment providers (NEPs), technology and service providers, and systems integrators acting as part of a larger partner ecosystem. They may be proof-of-concept solutions moving into pilots, or have already moved through those stages, with longer term intentions of phased commercial deployments based upon initial results.

Fifth-generation mobile networks or wireless systems (commonly known as 5G) are the next telecommunications standards after the current 4G/LTE technology and operate in the millimeter wavebands (28, 38 and 60 GHz). 5G is designed to provide higher capacity than the current 4G/LTE, allowing a greater density (tens to hundreds of times greater) of mobile broadband users or devices connected at higher transfer speeds and supporting more device-to-device, reliable and massive machine communications. It is also aimed at lower latency and battery consumption than 4G equipment and is targeted at flexible connectivity, mobile high-speed data and IoT.



Source: ISG Research 2021

ENTERPRISE 5G SOLUTIONS

Definition(cont.)

This segment covers specific mobility-targeted or wireless connected services or solutions, applications, management systems and methods, end-device control and management and related services in the enterprise, operating under "private"/campus network considerations. "Private" 5G refers to 5G deployments in use on campus (5G Campus Network) or other land or building areas that are generally not open to the public without specific access being granted. Private 5G is targeted at flexible connectivity, mobile high-speed data and IoT. It may encompass allowing access to the public who are present within a 5G Campus (by either Wi-Fi or other wireless connection, or by 5G GSMA data connection used as a LAN). They are not public licensed networks but can be used in some cases as tributary feeds or access points to public licensed networks (for example, connectivity inside the campus to a VPN/WAN or public licensed WAN connection for outside of campus transport). They have licensed (where required by regional regulators) or allocated 5G spectrum usually in the 3.7-3.8GHz band, specifically for industrial use in local deployments, possibly limited in some regions to 100MHz of spectrum.

Eligibility Criteria

- Product portfolio coverage, focus areas, completeness of both modular (partial) solutions and fully integrated broader solutions linking to data center or external WANs;
- Ability to deliver training and provide both POC/Studio simulations and testing for client;
- Understanding of overall market area, technology environment and evolutions and contributions to that area, together with national regulations as required;
- Enterprise industry-specific knowledge and experience;
- Scope of partnerships and offerings and management capability for the needed orchestration within a customer project;
- Reference customer/solutions in POC/pilot moving into commercial deployment;
- Competitiveness of offering and types of commercial terms.

ENTERPRISE 5G SOLUTIONS

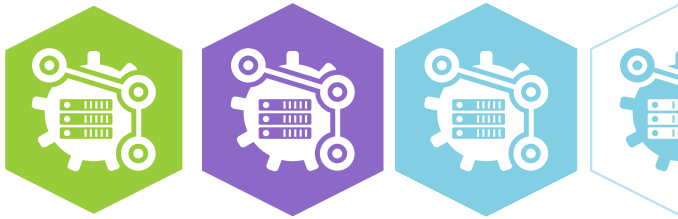
Observations

- **Cisco** is one of the biggest global network equipment providers with activities mostly centered on the associated ecosystem of solutions and services around 5G.
- **Ericsson** has been a key industry participant in 5G networks and associated edge technologies.
- **HPE Aruba** is an innovation-heavy solutions provider and is expected to witness market growth with its innovative solutions.
- **Nokia** has won many deals associated with 5G implementation and is a partner of choice for many telcos.
- **Telia** is gaining traction on the transformation consulting front for 5G network services for enterprises.
- **Telenor** is one of the biggest incumbents in the region and is one of the key stakeholders for 5G developments in the region.
- **Tech Mahindra** (Rising Star) had a meteoric rise with connectivity technology innovations and associated solutions. It is presently one of the most prominent players in the Nordics.
- **Wipro's** (Rising Star) ready-to-deploy solutions and research-driven innovation policy give it a competitive edge over its peers in this market.

Methodology

METHODOLOGY

The research study "ISG Provider Lens™ Networks – Software Defined Solutions and Services 2021" analyzes the relevant software vendors/service providers in the Nordics market, based on a multi-phased research and analysis process, and positions these providers based on the ISG Research methodology. The study was divided into the following steps:



1. Definition of Networks – Software Defined Solutions and Services 2021 market;
2. Use of questionnaire-based surveys of service providers/vendor across all trend topics;
3. Interactive discussions with service providers/vendors on capabilities and use cases;
4. Leverage ISG's internal databases and advisor knowledge and experience (wherever applicable);
5. Detailed analysis and evaluation of services and service documentatio based on the facts and figures received from providers and other sources.
6. Use of the following key evaluation criteria:
   - Strategy and vision;
   - Innovation;
   - Brand awareness and presence in the market;
   - Sales and partner landscape;
   - Breadth and depth of portfolio of services offered;
   - Technology advancements.

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Lead Analyst

Avimanyu Basu brings over 9 years of extensive research experience to handle telecommunication and engineering and R&D services specific research deliverables for the program called ISG Provider Lens™ that is designed to deliver research on service provider intelligence. He is responsible for authoring reports on software defined networks and network function virtualisation (SDN/NFV) and engineering services. He is also responsible for key vertical-oriented reports and thought leadership papers for manufacturing along with whitepapers revolving around specialized technologies showcased by different cross-section of enterprises.

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Enterprise Context and global summary Analyst

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Director & Principal Analyst

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ISG Provider Lens™ | Quadrant Report
June 2021

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