Enea: The Tale of a Data Management Trailblazer

In 5G networks, the need for a best-in breed trusted data management partner has never been greater

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Key Takeaways

The migration to 5G networks requires radical changes in the deployment and implementation of networking infrastructure based on SDN (Software Defined Networking) and NFV (Network Functions Virtualization). As a key subset, data management beyond just the management of subscriber data, is a critical component of communications service providers' (CSPs) network architecture, necessary to capture new revenue streams from the plethora of expected 5G uses cases. Put another way, CSPs' data is the new oil that requires a new open multi-vendor core architecture based on an independent network data layer (NDL) and separate data management functions.

In a June/July 2020 CSP survey about 5G core service-based architecture (SBA) conducted by LightCounting, UDM was found to be the most tested and deployed network function this year. A growing number of CSPs favoring a multi-vendor approach was another key finding. As a result of this robust 5G core activity, LightCounting expects the 5G data management market—including NDL, UDM, AUSF—to grow at a 94% CAGR in 2020-2024 and surpass the $2B bar by 2024. The portion of multi-vendor sales starts at 5% in 2020 but will rapidly rise to 53% in 2024.

Dominated by wireless infrastructure vendors Ericsson, Huawei, Nokia and ZTE who control 80% of the current 4G subscriber data management market (SDM), the increasing demand for an open multi-vendor approach opens the door to challengers such as the 55-year old Sweden-based specialist Enea. Equipped with a solid SDM offering resulting from a series of recent acquisitions such as Openwave Mobility (2018), Atos Convergence Creators (2019), and Aptilo (2020), Enea quickly reinvented itself and is emerging as a formidable trusted SDM and 5G data management contender. During the first 9 months of 2020, Enea scored 2 major 5G data management wins, including Tier 1 CSPs in North America and Europe. The reason for this success comes from Enea's high ratings in each of the CSP's 7 purchasing criteria.

Enea's cloud native 5G data management architecture includes an NDL that interfaces to frontend control plane functions to manage data across all 5G core and edge functions and supports multi-vendor 4G/5G interworking. Consequently, as market data indicates, Enea is rising as a formidable 5G data management neutral and independent vendor, and as 5G rollouts continue to ramp up, will incrementally increase its share of this "new oil" multi-billion dollar market that is just taking off.

5G data is rapidly becoming the new oil, and requiring a new open multi-vendor core architecture

Remember media mogul Summer Redstone who famously proclaimed, “content is king.” In telecoms, “data is king” and with analogy to our world’s insatiable appetite for oil that is crucial for the global economy, data (e.g., subscribers, Internet of Things, all sorts of network data…), owned and controlled by communications service providers (CSPs) is the new oil[1]. The CSPs have an opportunity to leverage their data as a valuable asset with the best-of-breed technology their suppliers have to offer (while ensuring GDPR compliance and data privacy of course!). And with 5G taking off, harvesting tsunamis of data to offer a large variety of tailored services that address 5G use cases will determine CSPs’ success. For this to happen, the introduction of a common network data layer (NDL) as proposed by subscriber data management (SDM) specialists has never been greater.

DATA MANAGEMENT FUNCTIONS ARE THE KEY INGREDIENTS FOR THIS NEW OIL

The 5G core design is an evolution of the 4G evolved packet core (EPC) in which the home subscriber server (HSS) is split between the unified data management (UDM), the user data repository (UDR), and the authentication server function (AUSF). To meet performance and data integrity requirements, the databases associated with these NFs must be capable of being fully distributed, and agile to dynamically scale and rebalance their information stores.

The NDL consists of the UDR and the unstructured data storage function (UDSF) functionality. The NDL provides a common mechanism for access to diverse legacy data, subscriber data and fast changing session/state, subscription, policy, configuration and subscriber profile data. Data management functions handle all types of CSPs’ network data including:

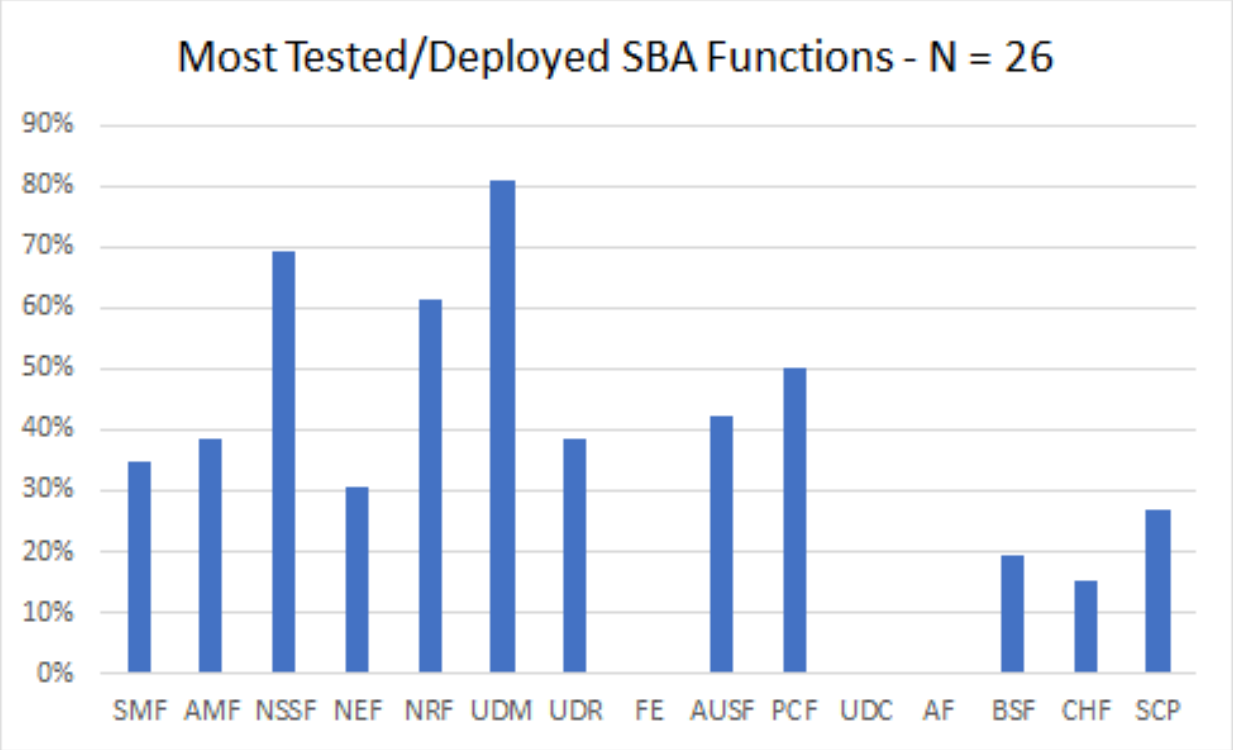
- Subscription data: CSPs need to store the type of services each subscriber or device is allowed to use in the network, including identity information
- Policy data: CSPs have to set the priorities, rules and constraints assigned to the access and use of each service
- Session data: As subscribers and devices connected to the network use different services, there is a specific context to each of them that CSPs need to manage
- Application data: Each app generates its own data that is stored in the Network Repository Function (NRF)
- Configuration data: CSPs may need optional data to configure specific NFs

[1] Data is new oil’ quote by Clive Humby, 2006

CSPS ARE ACTIVELY TESTING DATA MANAGEMENT FUNCTIONS

In June and July 2020, LightCounting Market Research surveyed 26 CSPs about their 5G standalone (SA) migration and core service-based architecture (SBA) plans. All together, these service providers account for almost half of the world's total mobile communications capex, revenue, and subscribers. They also operate 30% of the total commercial 5G networks as of June 30, 2020 and are all actively either testing and/or deploying 5G SA core and SBA functions. When asked about their ongoing work in testing and/or deploying SBA network functions (NFs) this year, data management functions such as UDR, UDM and AUSF were getting considerable attention.

Figure 1: SBA NF tested and/or deployed this year



Source: LightCounting

A GROWING NUMBER OF CSPS FAVOR A MULTI-VENDOR APPROACH

As the novel 3GPP 5G SBA architecture is open and service based by design, it allows CSPs to maximize agility and avoid vendor lock in and therefore, not recreate the monolithic functions that have created data silos with different interfaces. In addition, the SBA's cloud native nature and its standardized NFs that communicate over standardized APIs simplify and lower the risk of the multivendor approach.

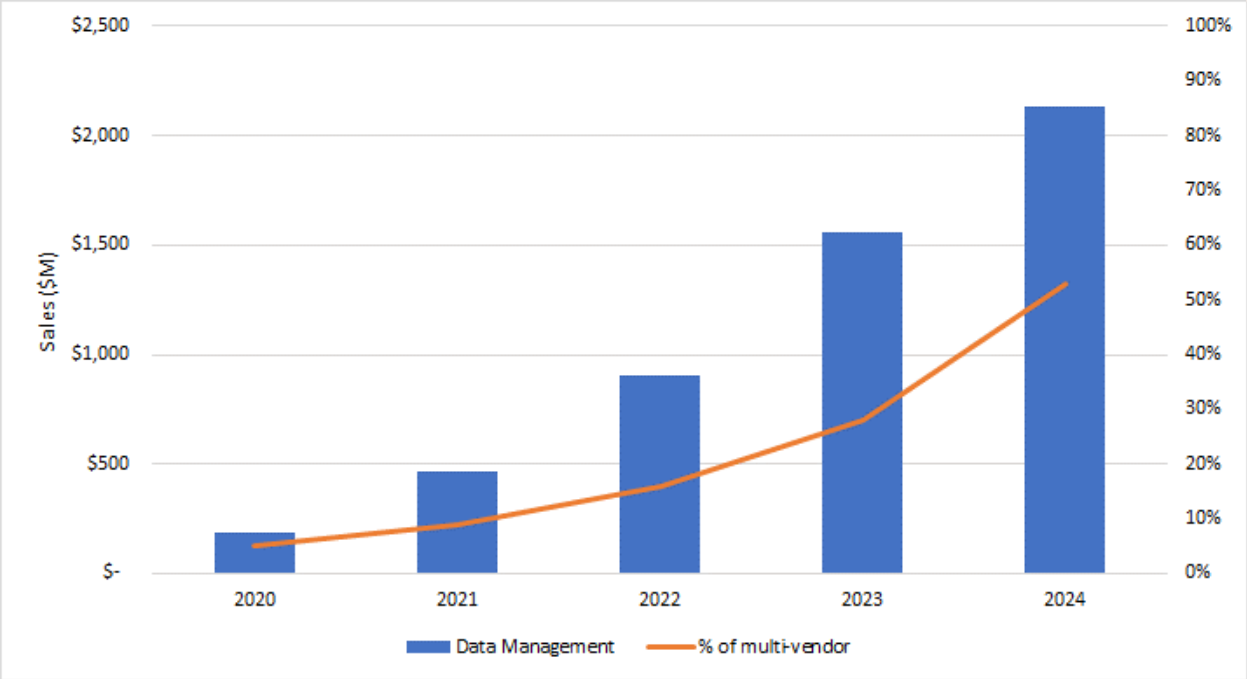
As data management implementation deserves some serious considerations and meticulous actions, LightCounting asked CSPs how they are building their 5G data management platform and found that among the 3 distinct approaches described below, the multi-vendor one is the most common:

1. Stick with traditional telecom network equipment vendors such as Ericsson, Huawei, Nokia and ZTE
2. Do it yourself (DIY) like AT&T for example but ask Amdocs, HPE and/or Oracle to help; Rakuten Mobile is another DIY example, working with NEC only to build its whole core
3. Take a modular mixed/hybrid approach consisting of assembling a multi-vendor 5G NF core SBA in the lab with the best-and-breed NFs available and test specific use cases before the commercial rollout

THIS NEW OIL IS SHAPING UP AS A MULTIBILLION-DOLLAR MARKET…

LightCounting built a model that uses ITU statistics as a foundation to analyze historical regional cellular subscriber data, typical migration rates to each G from which assumptions about the shift to 5G are made, and average regional software and service cost per subscriber to produce each network function, all augmented by the CSPs June/July 2020 survey. Figure 2 shows the global 5G data management market opportunity. LightCounting's model produced a 2020-2024 CAGR of 94% that propels the market above the $2B bar by 2024. Multi-vendor sales start around 5% in 2020 and quickly grow to 53% in 2024, which reflects the increased adoption of multi-vendor 5G SDM platforms.

Figure 2: Global 5G Data Management market opportunity (UDM, AUSF, UDR and UDSF) in $M



Source: LightCounting

…DRIVEN BY DATA MIGRATION TO 5G WITH INTERWORKING WITH 4G

Although the promise of 5G and its plethora of use cases is around the corner, 4G is and will remain CSPs' cash cow for a few years. As a result, no one is ready to cut the 4G cord yet even if 5G is taking off faster than 4G did a decade ago, and UDM deployments have already started in 2020. This is reflected in Figure 2 that shows 2020 as the year early deployments start. One of the findings of LightCounting's survey was that service providers cannot immediately migrate their subscribers from their HSS to UDM and therefore need solid interworking between 4G and 5G. As a result, early 5G front runners in China, the U.S. and South Korea are actively building their UDM with a backward bridge from 5G to 4G to provide flexibility, adaptability, and a logical data path through the network for authentication information. When the promise of 5G truly materializes in the next few years, this smooth migration process will achieve significant capex savings.

In this new oil ecosystem, Enea rises as an independent, trusted data management specialist

In this mobile 4G world that is swiftly migrating to 5G, the 4 major SDM vendors are the same as in the wireless infrastructure market that is dominated by Huawei, Ericsson, Nokia and ZTE. They all provide end-to-end network elements from radio access to core networks including home location register (HLR) and 4G HSS and all together command a combined SDM revenue market share of more than 80%. Long time HLR and HSS supplier HPE comes next with less than a 4% sales share. Enea, along with OSS/BSS leader Amdocs, and IT software relational database management system (RDMS) powerhouses IBM and Oracle made the rest of the list.

This static vendor ecosystem depicts the old SDM world that is rapidly changing with the advent of 5G. Consequently, SDM is becoming a self-contained domain for which openness and a multi-vendor approach are CSPs' chief requirements.

THE FIRST 9 MONTHS OF 2020 SAW THE RISE OF ENEA IN 5G DATA MANAGEMENT

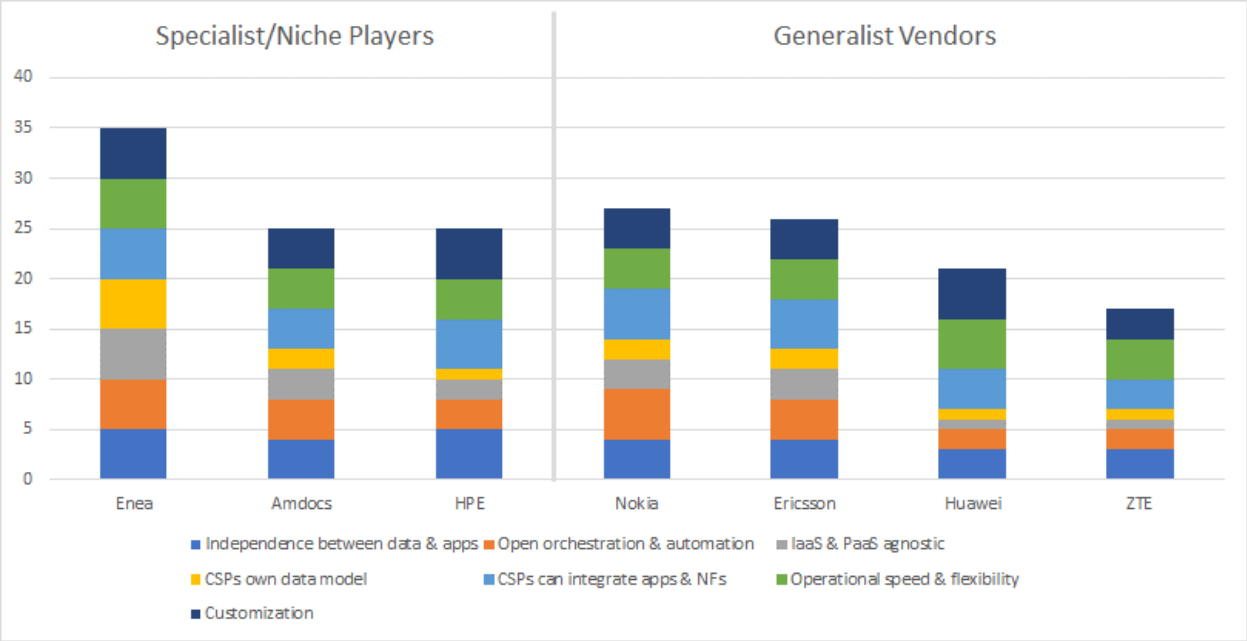
While conducting its survey, LightCounting found an increasing number of SDM tenders. Enea's scored 2 major wins during the summer, including Tier 1 service providers in North America and Europe. According to CSPs, Enea's flexibility, fast execution, and ability to meet openness and multivendor SDM requirements explained the 2 major wins and suggests Enea's emergence as a serious contender with the capability to shake up the established vendor ecosystem.

ENEA RANKS FIRST IN ALL TOP CSP PURCHASING CRITERIA

LightCounting collected anecdotal feedback about what CSPs see as important 5G data management purchasing criteria and identified 7 that are listed in Figure 3. Matching these criteria with the key vendors' value proposition and ranking each criterion on a 1 to 5 scale with 1 meaning weak and 5 indicating strong, Enea emerged as the sole vendor highly rated for each criterion. The 2 criteria that make the difference between Enea and Ericsson and Nokia are:

- IaaS & PaaS agnostic: CSPs want to articulate their own strategy and stay away from cloud native vendor lock in; there is no shortage of attractive hybrid on-premise/public cloud offerings, but their flexibility is questionable. Enea provides standard open interfaces with flexible licensing in terms regarding where the software is deployed and will not supply the infrastructure itself
- CSPs own the data schema/model: this is a key asset for them to control and drive the business in a flexible way; effectively they own the new oil, the ability to extract it and to refine it

Figure 3: Vendor comparison on 7 purchasing criteria



Source: LightCounting

WELL EXECUTED KEY ACQUISITIONS BUILT ENEA'S TECHNICAL LEADERSHIP

Enea is a 55-year old Swedish company that has data storage and operating systems in its DNA. Seizing the new oil moment, Enea reinvented itself and started to focus on open, software based SDM, and within 3 years, made 2 decisive acquisitions that paved the way to the 5G data management vendor leadership board.

- 2016: Centered Logic (network management system and service orchestration) and Qosmos (network intelligence software)
- 2018: Openwave Mobility (mobile traffic management)
- 2019: Atos Convergence Creators (policy management, authentication and SDM)
- 2020: Aptilo (policy and access control for carrier Wi-Fi and IoT)

OPENWAVE MOBILITY BROUGHT THE SDM FOUNDATION

Enea acquired Openwave Mobility in April 2018. Its mobile traffic management platform provides best in class video and transport optimization for encrypted and unencrypted traffic, enabling mobile operators to manage and monetize over 80% of the encrypted traffic in their data paths. At the time of the deal, the platform was deployed by 7 of the world's top 20 mobile operators. Moreover, it's Openwave Mobility's extensive portfolio of cloud-native solutions for SDM that cemented Enea's strategy in this domain because service providers own the

subscriber relationship, and Openwave Mobility's solution helped tier one operators worldwide to monetize subscriber data.

AND ATOS CVC (FORMELY SIEMENS) AND APTILO DELIVERED THE FINAL SDM TOUCH

Acquired by Atos from Siemens Convergence Creators Holding GmbH (CVC) in January 2018, the CVC team who established leading positions in policy management, authentication, and SDM was sold to Enea in March 2019. In addition, with its roots in Nokia Siemens Networks, this CVC business unit brought 20+ years of expertise in delivering telco grade software to Tier 1 operators.

With this acquisition, Enea quickly beefed up its 5G data management portfolio, including UDM, UDR, AUSF, and PCF offerings as well as 4G SDM with mobile core network elements such as PCRF and AAA (Authentication, Authorization, and Accounting). The resulting offering can be summed up as follows:

- Unified Data Manager that provides UDM functions, supports interworking with HSS, and can also perform the 5G EIR function and be collocated with the AUSF function
- Stratum Cloud Data Manager: an open cloud-native 5G network data layer that aggregates, consolidates and manages all service provider data onto a decentralized, resilient data store
- Digital Identity: a smart digital identity manager that helps share subscriber data with over the top (OTT) partners in a secure real-time environment
- Equipment Identity register (EIR) that authenticates mobile and IoT devices in the network to prevent misuse and abuse of paid services

And finally, with the acquisition of Aptilo in October 2020, Enea adds a unique vision of leveraging 5G core for all wireless access and all mobile endpoints:

- Policy and access control for cellular and Wi-Fi
- Management of both mobile phones and IoT devices

ENEA'S UDM ABSTRACTION AND INTERACTION WITH THE NDL SETS IT APART

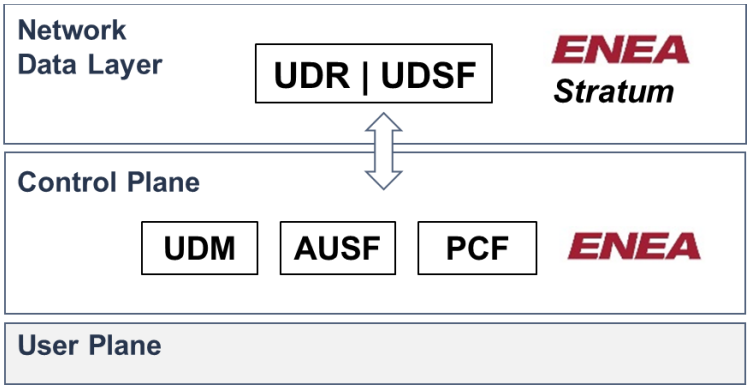
Assembling all the acquired pieces together, Figure 4 illustrates Enea's control plane functions (e.g., UDM, AUSF, PCF) and data layer (e.g., UDR, UDSF) in the 5G SBA. Regardless of the architecture, the UDM sends data to network functions for verification, and both the UDM and the UDR can send and store information. Cloud native by design, the UDR stores and retrieves the data, sends it to other network functions, and manages it.

The UDM function is then abstracted from the UDR and applied evenly throughout several UDRs in the mobile network. Overall, the UDM manages data for access authorization, user registration, and data network profiles. Subscriber data is provided to the session management

function (SMF) that allocates IP addresses, and manages user sessions on the network. The SMF acts as a gateway from the user plane function (UPF) on the user plane to the control plane.

The AUSF authenticates the servers and provides keys for encryption; the UDM stores and manages the data itself, becoming an abstracted software function on the network. This abstraction separates the storage from the management function and gives the UDM accessibility to other functions across the network.

Figure 4: Key elements of Enea's 5G data management portfolio



Source: Enea

ENEA'S SDM ARCHITECTURE MAKES 4G HSS-5G UDM INTERWORKING EASY

UDM abstraction with the data layer provides great flexibility to address all common situations in today's mobile networks worldwide. Figure 5 summarizes interworking between 4G and 5G, either based on the 4G diameter interfaces or on the new 5G SBA.

Figure 5: HSS-5G data management interworking options

Option	Principle
1. UDM-HSS Interworking via SBA	This option, standardized in 3GPP's proposed interworking approach, is based on service-based architecture (SBA). It requires an HSS upgrade to add SBA support. The UDM UDICOM option supports Nudm and Nhss for 4G interworking with a 3rd party HSS.
2. UDM-HSS Diameter Interaction	This option, also discussed in 3GPP's proposed interworking approach, avoids changes to legacy HSS by utilizing interfaces already available in HSS. The 5G vendor provides 4G interfaces to the HSS, and the UDM acts as a gateway.

Source: Enea

AND FINALLY, ENEA IS A NEUTRAL VENDOR

Storing, managing, and handling subscriber and network data is an extremely sensitive task that can easily put a vendor on the spot if something goes wrong. Headquartered in Sweden, Enea is in a unique position of being a trusted partner equipped with solid track records of managing and securing sensitive subscriber information. Openwave has long had experience with Tier 1 SDM deployments notably in North America, and Atos CVC, with its roots in Nokia Siemens Networks, has a strong historical presence in Germany, Central and Eastern Europe, and the U.S.

BOTTOM LINE: ENEA IS RISING AS A FORMIDABLE 5G DATA MANAGEMENT CONTENDER

Given the consolidated nature of the global wireless infrastructure market that led to the predominance of traditional network equipment vendors, little was changing in the vendor data management ecosystem until geopolitics kicked in. With no signs of abating anytime soon, the need for a strong reliable and trusted alternative has never been greater. Consequently, Enea is in a sweet spot at the right time to pick up the slack, taking off on the 5G data management wave that is just starting to shape up and will continue to swell as more and more CSPs join the 5G bandwagon. But this could not have happened without designing the right product that addresses CSPs' 5G data management needs and purchasing criteria.