

F R O S T & S U L L I V A N



2018 Global Network Data Analytics
Visionary Innovation Leadership Award



2018
BEST PRACTICES
AWARDS

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Background and Company Performance

Industry Challenges

Network functions virtualization (NFV), Internet of Things (IoT), and imminent 5G are taking the communications services industry by storm. In particular, virtualization and automation are transforming service providers' networks and disrupting the service assurance probe market. While the evolution towards NFV is ongoing and service providers are struggling to deal with multiple standards on automation, they are operating in a hybrid environment.

At the same time, unlimited data has emerged as a battleground among carriers, and instrumenting their networks the old-fashioned way is simply unaffordable. With unlimited data plan offerings, consumption of video services is exploding and forcing data center upgrades. Concerned with customer churn, service providers are pressured to deliver stellar customer experience but find themselves at a crossroad as they must make the move to pervasive probing yet cannot afford the substantial investments linked to the traditional probe model. In this pivotal moment of digital transformation, re-imagined, innovative solutions from probe vendors are needed to address service providers' resounding cry for a cost-effective approach to leverage IP network traffic.

Focus on the Future and Best Practices Implementation

Focus on Unmet Needs: Network Traffic Data Consumption Made Easy

A leading OEM of service assurance gear used to monitor communications networks, NETSCOUT recognized the disruptive change induced by virtualization and automation and evolved from being hardware-centric to developing a software-based model. Now the company offers a complete software solution with its probe able to run on NETSCOUT appliances, commercial off the shelf (COTS) hardware, or VNF architecture.

Also, NETSCOUT has merged its disparate probes into one, InfiniStream NextGen (ISNG), for which its 1,000+ developers write plug-ins to address existing technologies, including voice over long-term evolution (VoLTE) and 3GPP Release 13, as well as for IoT and 5G. The company provides end-to-end visibility covering the air interface, access and core parts of the network, and application backend by session and subscriber. As a result, customers can enjoy a rich software platform that not only covers all network types (fixed, mobile, and cable) and services (voice, data, video), but is incredibly affordable and scalable.

At the heart of NETSCOUT's market strategy lays its patented adaptive service intelligence (ASI) technology that converts the data from network traffic into smart data. Using network traffic is the ideal solution for customers to gain real-time insight on actual applications and network services whether they run on legacy or virtualized and cloud technology. As applications are becoming disaggregated and smaller with micro-services,

the need for visibility down to the VNF layer but with the perspective of the subscriber sessions is paramount. NETSCOUT's passive monitoring approach with ASI does not impact the application performance in any way as it is operating on duplicated traffic and does not actively instrument the data application code. Cost-effectively converting network traffic into smart data is difficult requiring significant technical expertise. ASI achieves its objective because it is the outcome of 3 decades of experience in this field.

A software-centric model, ASI takes network packets and creates rich meta data that provides insights to users not only into the network but also the application experience including latency, error types, server transactions, and quality of service measurements among other information. Furthermore, ASI enables users to see security threats. With ASI, customers gain visibility into both the impact of applications and security intrusions on their network.

ASI-generated data is then leveraged by NETSCOUT's solutions such as nGeniusONE and nGenius Business Analytics (nBA). These offerings provide more value to customers by unlocking the invaluable data generated by ASI and enable smarter decision-making. nGeniusONE is a visualization tool that provides users with real-time intelligence about their network and applications. From the dashboard, users see the relative health of all of their services and can perform troubleshooting by using Service Monitors, Session Analysis and Packet Analysis. nBA goes a step further by enabling the enrichment of the data generated by ASI with data from other sources- business support systems (BSS) and operations support systems (OSS), subscribers, devices, locations and applications. Using self-describing formats and being format-agnostic, nBA acts as a broker taking the information from NETSCOUT probes and providing it to the user.

NETSCOUT's ASI represents a drastic change in the industry as access to insightful, actionable IP network traffic has been difficult to access, costly and selectively shared. It is based on an open application programming interface (API) framework, making consumption easy. Customers can simply use the KAFKA or representational state transfer (REST) industry APIs to consume the smart data.

All of NETSCOUT probes generate the same format with the same API, based on KAFKA, the most popular open source message bus used in the Big Data industry, and deliver the information in self-describing formats like JSON and Avro. Being simple name value pairs, this information is easily consumed by the user.

Customer Ownership Experience: Invaluable Data for Use at Every Organization Level

NETSCOUT aims to impart the best possible ownership experience of its solutions to its customers. With nGeniusONE, customers can set up dashboards according to the needs of various departments. Based on their roles in the organization, the dashboards can be customized to only provide information of interest to the users such as information on

network nodes (service enablers, firewalls, and load balancers), or end to end service views, or national/regional/market views to network and application engineers.

Similarly, nBA provides rich structured data spanning dimensions such as handset, location, service, and other relevant metrics. It abstracts the complexity of the network and delivers smart data to customers in an easily digestible, streamlined presentation. This information can then be used for a variety of decision-making purposes such as changes to customer care and marketing direction.

nBA features 4 applications: Export, Explorer, Self Service Analytics, and customer experience indicator (CEI) Viewer. It also provides a number of Smart Analytics Modules including voice, over the top (OTT), and radio area network (RAN), among others. The software includes a subscriber control plane, user place, and media data, as well as aggregate application and network information. Additional data sets are available on an optional basis and include subscriber call table, CEI, access, and OTT data.

Ease of Use for Both Programmers and Non-programmers

With nBA, customers can take data directly from the probes through an industry standard API and do with it as they please. Data Export empowers users to cost-effectively export layer 2 through 7 data while Explorer offers users an intuitive way to build custom APIs and dashboards, without any programming work, through simple drag-and-drop actions of data dimensions (e.g., subscriber ID, location, service type, etc.). They can Google-search the data, build their own key performance indicators (KPIs), and place it on a dashboard to be shared with their team or organization.

nBA Explorer has been used in France, for example, by the roaming department of a leading wireless communications carrier to develop a dashboard that displays 12 key indicators it wants its operations to see, in less than 1 hour increments. In the United States, the video-on-demand (VOD) group of a leading television service provider used Self Service Analytics to quickly put together a dashboard depicting the number of customers for which their pay-per-view (PPV) movie aborted and restarted at the beginning of the movie, resulting in bad customer experience. Using highly scalable Big Data columnar technology, NETSCOUT nBA enables fast Google-search expression building.

Contributing to Big Data Projects

While historically rich probe data was only used by engineering and operations departments for troubleshooting purposes, it is now in the hands of a variety of people throughout an organization. This is a powerful step-change as customers can leverage the data from NETSCOUT differently by using their domain knowledge. For instance, they can put applications onto the platform and make significant contributions to ongoing Big Data projects across their organizations. Currently, customer experience management (CEM) is

a key area of interest for customers using nBA since service providers want to look at customer experience and not just the health of network elements.

Also, nBA enables this rich data set to be used at different levels in organizations including the executive team that requires high-level business metrics. Customers are particularly interested in computing KPIs and data from the probes into a limited but meaningful number of customer experience indicators (CEI) that deliver the bottom line to executives. Customers can filter by market, region, handset, and other dimensions as well as customize the calculation to generate CEIs that are most meaningful to them.

Enabling Next-generation Service Assurance

Although NETSCOUT does not pretend to have the domain knowledge its users have in their areas of focus, the company has established significant expertise in its own domain and looks to provide additional value to customers through nBA. For instance, it is releasing a module for VoLTE that automatically ranks cell towers for RAN users to determine which cell tower has the worst subscriber experience.

In an effort to make its customers more efficient, nBA proactively delivers information without requiring the user to enter information or perform call trace work. As the industry evolves and IoT is deployed, machines are not going to call customer care to complain. With nBA, service providers can proactively detect pattern changes and address issues. In simple words, nBA enables next-generation service assurance.

In certain cases, nBA is even able to assist in corrective action. For example, it has been used to watch cell towers to detect congestion and alert the policy server by providing it with a list of subscriber information so that the policy service can make appropriate changes to best serve more consumers. Another use case is emerging with centralized self-organizing network (C-SON) vendors to tilt the cell equipment to improve service coverage.

Each of these cases illustrates to Frost & Sullivan that NETSCOUT increases the decision-making capability of automation solutions providers, be it the orchestrator or policy system, by providing them smart data from the probes whereas in the past they were stuck with relying on less useful data like central processing unit (CPU) and memory.

Growth Pipeline: Pervasive Probe Strategy

With the objective to disrupt itself before its competitors took the initiative to address carriers' dire need for highly cost-effective probes, NETSCOUT adopted a complete software-based model for its probe offering to make probes pervasive. This goal required a novel approach to drastically reduce the price of probes. NETSCOUT thus eliminated the hardware component from the equation and developed ISNG.

The software approach is enabling probes to be placed in spaces they were not put in previously. While the majority of its business is still in the physical network, NETSCOUT is now active in the virtual area with various projects for virtual evolved packet core (vEPC) and virtual IP multimedia subsystem (vIMS) frameworks.

This software move has led NETSCOUT to evolve into a multi-layer, multi-domain solution player as well as to close multi-year agreements with customers. The software model allows full coverage for service providers from day one, and in return customers commit to NETSCOUT for a number of years, keeping direct competitors at bay. In addition, NETSCOUT has been working with the laboratories of various North American and European carriers. Among the dozen deals the company has registered in the software space, its partnership with Vodafone is an impressive one since it includes the coverage of 13 countries with a complete software-based probe approach.

Strategic Partnerships: Customer Base Expansion with Equipment Manufacturers

NETSCOUT leverages nBA to expand its addressable market by playing a complementary role with different participants in the communications ecosystem. For instance, it is partnering with leading CEM vendors who are looking to enhance their value proposition. nBA translates into a win-win situation for all involved with CEM vendors adding invaluable information to their solution without having to become a probe vendor; service providers gain better insights into their customers and leverage the sizeable investments they have made in NETSCOUT probes over the years; and NETSCOUT eliminates its competition and expands its addressable market.

With nBA, the use of probe data is moving beyond traditional engineering and operations personnel into customer care and marketing departments. However, NETSCOUT is not looking at competing directly in those spaces but rather will continue to focus on its traditional customers and act as an enabler in other spaces by providing the smart data to their solutions. For instance, the company is experiencing strong interest from CEM and computing systems providers.

Blue Ocean Strategy: Unmatched Footprint with a Disruptive Spirit

Founded in 1984 and initially focused on servicing the needs of enterprises, NETSCOUT started its expansion into the service providers market in 2000, with the acquisition of NextPoint Networks. Since then, the company has continued to expand its footprint in the service providers market, organically and through strategic acquisitions, most notably with that of Danaher's Communications Business in 2015 that included Tektronix Communications, Arbor Networks, and parts of Fluke Networks; and in September 2016, the Avvasi acquisition brought in invaluable video capabilities.

With its leadership position in the probe market, NETSCOUT has the greatest ability to provide more value to tier-1 service providers and vendors faster than any other competitor. Moreover, NETSCOUT has the largest engineering group in the industry,

resulting in greater functionality: ISNG is the accumulation of decades of experience and innovation from NETSCOUT, Tektronix, and Avvasi in data, voice, and video traffic monitoring.

Conclusion

Continuing on its future-focused strategy to disaggregate hardware from software in its offering, NETSCOUT delivers tremendous value to customers, service providers and network equipment manufacturers. With the development of ASI technology, and solutions such as nGeniusONE and nBA, NETSCOUT enables its customers to cost-effectively convert network traffic into smart data, and facilitate its consumption, providing carrier class analytics and insights. Generating \$1.2 billion in revenue in 2017, NETSCOUT is an incumbent in the probe market that has made significant changes to its market strategy to align with the needs of customers and fuel its future growth by adopting a complementary role with participants in the global tier-1 service provider ecosystem.

For its strategic blending of disparate hardware probes into a single software super probe, ISNG, the development of cost-effective technology to convert network traffic into smart data, ASI, and opening up the data set to third parties, NETSCOUT has earned Frost & Sullivan's 2018 Visionary Innovation Leadership Award.

Significance of Visionary Innovation Leadership

A Visionary Innovation Leadership position enables a market participant to deliver highly competitive products and solutions that transform the way individuals and businesses perform their daily activities. Such products and solutions set new, long-lasting trends in how technologies are deployed and consumed by businesses and end users. Most important, they deliver unique and differentiated benefits that can greatly improve business performance as well as individuals' work and personal lives. These improvements are measured by customer demand, brand strength, and competitive positioning.



Understanding Visionary Innovation Leadership

Visionary Innovation is the ability to innovate today in the light of perceived changes and opportunities that will arise from Mega Trends in the future. It is the ability to scout and detect unmet (and as yet undefined) needs and proactively address them with disruptive solutions that cater to new and unique customers, lifestyles, technologies, and markets. At the heart of visionary innovation is a deep understanding of the implications and global

ramifications of Mega Trends, leading to correct identification and ultimate capture of niche and white-space market opportunities in the future.

Key Benchmarking Criteria

For the Visionary Innovation Leadership Award, Frost & Sullivan analysts independently evaluated two key factors—Focus on the Future and Best Practices Implementation—according to the criteria identified below.

Focus on the Future

- Criterion 1: Focus on Unmet Needs
- Criterion 2: Visionary Scenarios through Mega Trends
- Criterion 3: Growth Pipeline
- Criterion 4: Blue Ocean Strategy
- Criterion 5: Growth Performance

Best Practices Implementation

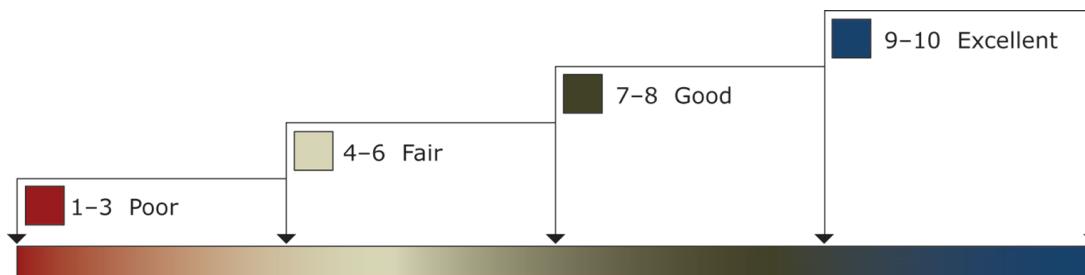
- Criterion 1: Vision Alignment
- Criterion 2: Process Design
- Criterion 3: Operational Efficiency
- Criterion 4: Technological Sophistication
- Criterion 5: Company Culture

Best Practice Award Analysis for NETSCOUT

Decision Support Scorecard

To support its evaluation of best practices across multiple business performance categories, Frost & Sullivan employs a customized Decision Support Scorecard. This tool allows our research and consulting teams to objectively analyze performance, according to the key benchmarking criteria listed in the previous section, and to assign ratings on that basis. The tool follows a 10-point scale that allows for nuances in performance evaluation. Ratings guidelines are illustrated below.

RATINGS GUIDELINES



The Decision Support Scorecard is organized by Focus on the Future and Best Practices Implementation (i.e., These are the overarching categories for all 10 benchmarking criteria; the definitions for each criterion are provided beneath the scorecard.). The research team confirms the veracity of this weighted scorecard through sensitivity

analysis, which confirms that small changes to the ratings for a specific criterion do not lead to a significant change in the overall relative rankings of the companies.

The results of this analysis are shown below. To remain unbiased and to protect the interests of all organizations reviewed, Frost & Sullivan chooses to refer to the other key participants as Competitor 2 and Competitor 3.

<i>Measurement of 1-10 (1 = poor; 10 = excellent)</i>			
Visionary Innovation Leadership	Focus on the Future	Best Practices Implementation	Average Rating
NETSCOUT	9.4	9.0	9.2
Competitor 2	8.2	8.4	8.3
Competitor 3	7.6	8.8	8.2

Focus on the Future

Criterion 1: Focus on Unmet Needs

Requirement: Implementing a robust process to continuously unearth customers' unmet or under-served needs, and creating the products or solutions to address them effectively

Criterion 2: Visionary Scenarios through Mega Trends

Requirement: Incorporating long-range, macro-level scenarios into the innovation strategy, thereby enabling "first-to-market" growth opportunity solutions

Criterion 3: Growth Pipeline

Requirement: Best-in-class process to continuously identify and prioritize future growth opportunities leveraging both internal and external sources

Criterion 4: Blue Ocean Strategy

Requirement: Strategic focus on creating a leadership position in a potentially "uncontested" market space, manifested by stiff barriers to entry for competitors

Criterion 5: Growth Performance

Requirement: Growth success linked tangibly to new growth opportunities identified through visionary innovation

Best Practices Implementation

Criterion 1: Vision Alignment

Requirement: The executive team is aligned along the organization's mission, vision, strategy, and execution.

Criterion 2: Process Design

Requirement: Processes support the efficient and consistent implementation of tactics designed to implement the strategy.

Criterion 3: Operational Efficiency

Requirement: Staff performs assigned tactics seamlessly, quickly, and to a high-quality standard.

Criterion 4: Technological Sophistication

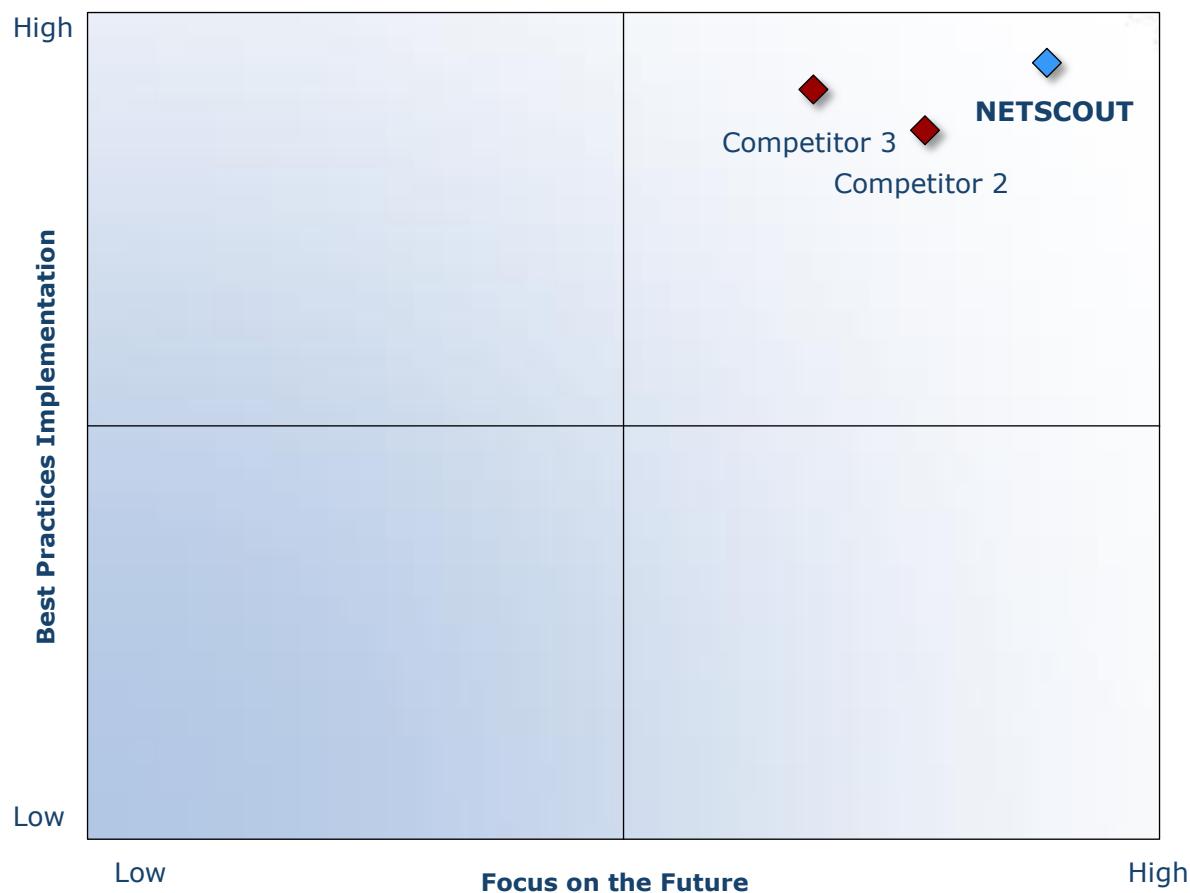
Requirements: Systems enable companywide transparency, communication, and efficiency.

Criterion 5: Company Culture

Requirement: The executive team sets the standard for commitment to customers, quality, and staff, which translates directly into front-line performance excellence.

Decision Support Matrix

Once all companies have been evaluated according to the Decision Support Scorecard, analysts then position the candidates on the matrix shown below, enabling them to visualize which companies are truly breakthrough and which ones are not yet operating at best-in-class levels.



Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan Awards follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 Monitor, target, and screen	Identify Award recipient candidates from around the globe	<ul style="list-style-type: none"> Conduct in-depth industry research Identify emerging sectors Scan multiple geographies 	Pipeline of candidates who potentially meet all best-practice criteria
2 Perform 360-degree research	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> Interview thought leaders and industry practitioners Assess candidates' fit with best-practice criteria Rank all candidates 	Matrix positioning of all candidates' performance relative to one another
3 Invite thought leadership in best practices	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> Confirm best-practice criteria Examine eligibility of all candidates Identify any information gaps 	Detailed profiles of all ranked candidates
4 Initiate research director review	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> Brainstorm ranking options Invite multiple perspectives on candidates' performance Update candidate profiles 	Final prioritization of all eligible candidates and companion best-practice positioning paper
5 Assemble panel of industry experts	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> Share findings Strengthen cases for candidate eligibility Prioritize candidates 	Refined list of prioritized Award candidates
6 Conduct global industry review	Build consensus on Award candidates' eligibility	<ul style="list-style-type: none"> Hold global team meeting to review all candidates Pressure-test fit with criteria Confirm inclusion of all eligible candidates 	Final list of eligible Award candidates, representing success stories worldwide
7 Perform quality check	Develop official Award consideration materials	<ul style="list-style-type: none"> Perform final performance benchmarking activities Write nominations Perform quality review 	High-quality, accurate, and creative presentation of nominees' successes
8 Reconnect with panel of industry experts	Finalize the selection of the best-practice Award recipient	<ul style="list-style-type: none"> Review analysis with panel Build consensus Select recipient 	Decision on which company performs best against all best-practice criteria
9 Communicate recognition	Inform Award recipient of Award recognition	<ul style="list-style-type: none"> Announce Award to the CEO Inspire the organization for continued success Celebrate the recipient's performance 	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10 Take strategic action	Upon licensing, company is able to share Award news with stakeholders and customers	<ul style="list-style-type: none"> Coordinate media outreach Design a marketing plan Assess Award's role in future strategic planning 	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry players and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS



About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit <http://www.frost.com>.