FROST & SULLIVAN

FROST & SULLIVAN BEST PRACTICES AWARD

NEXT GENERATION 9-1-1 - NORTH AMERICA

Product Line Strategy Leadership 2019

COMTECH TELECOMMUNICATIONS CORP.®

FROST & SULLIVAN

2019 BEST PRACTICES AWARD

Contents

Background and Company Performance

Industry Trends

Next Generation 9-1-1 (NG9-1-1) represents an industry transformation, proactively enhancing public safety by acknowledging and catering to the rapidly evolving demands, products, lifestyles and technologies of citizens. Driven by high-tech innovation, consumer behavior and the public's expectations, these elements create a variety of unique challenges for the U.S. public safety sector. In particular, Frost & Sullivan observes how the proliferation of next-generation networks and devices led to a dramatically more diverse set of consumer communication exchanges beyond traditional voice calling.

NG9-1-1 introduces an array of modern features and functionalities that will significantly expand public safety capabilities and allow end-users to efficiently relay text, data, video and Internet Protocol (IP)-based voice calls to public safety answering points (PSAPs) in emergency situations.

Approximately 85 Percent of Emergency Calls Now Originate From Mobile Devices

Frost & Sullivan's independent research indicates that nearly 90 percent of the U.S. population now owns a smartphone. By 2023, Frost & Sullivan expects this metric to surpass 95 percent. Furthermore, the National Emergency Number Association (NENA) estimates that 240 million calls are made to 9-1-1 each year. Frost & Sullivan research suggests that nearly 85 percent of these calls currently originate from a mobile device and that this number will only continue to increase.

Evolving User Behaviors Drive Diversity in Communications Exchanges

With a U.S. population of approximately 75 million, Millennials represent the largest generation since the Baby Boomers and are re-shaping traditional communications norms. Millennials differ from previous generations in many ways, including a general increase in the use of, and familiarity with, mobile communications and digital technologies. The associated growth in these new forms of communication exchanges is ushering in new requirements and new opportunities for the public safety sector.

A Framework for Public Safety Entities to Support IP-Based Communications

To address these industry trends, NENA approved a framework of core technical guidelines known as the "i3 architecture" for the implementation of an NG9-1-1 system. An i3 system is, by design, an IP-based "network of networks" for all public safety and emergency service entities. NENA i3 envisions a future where individual jurisdictions, regions and states may deploy a network to support their individual areas, while linking to a broader network that provides critical and more robust information to 9-1-1. In contrast to existing legacy, voice-centric enhanced 9-1-1 (E9-1-1) networks, NG9-1-1 systems

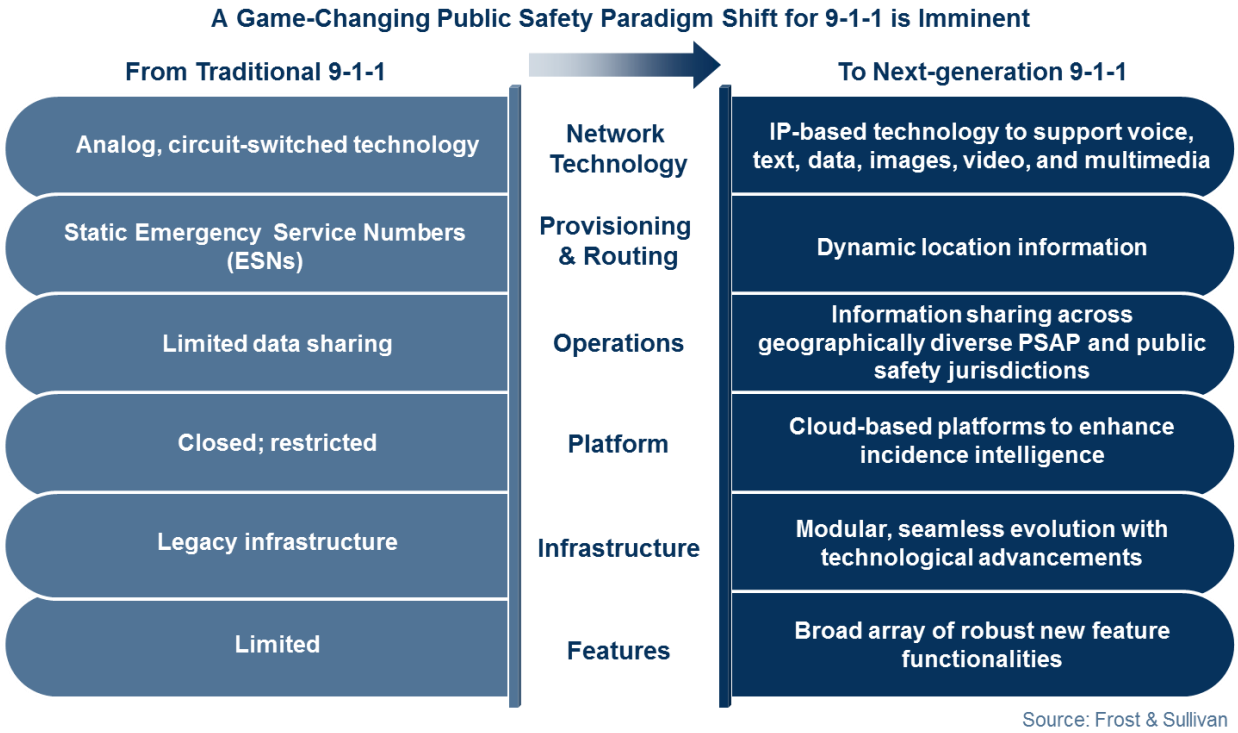
support a diverse set of IP-based communications, including text, data, photos, and video exchanges that improve the speed, accuracy and preparation of first responders.

Public Safety Rising to the Challenge

While the public safety market has traditionally been characterized as slow adopters in a rapidly changing technological landscape, this is no longer the case. With the development of NG9-1-1, public safety is embracing evolving industry standards, dynamic customer demands, and new product and service introductions. Public safety entities have long been challenged to keep up with the pace of technological innovation, but NG9-1-1 provides the basis to match the speed of innovation in today's modern society. To implement the features NG9-1-1 supports, Frost & Sullivan stresses that it will be critical to improve the speed-to-market, performance, and reliability of public safety products, services and solutions as the demands of the market evolve.

The increased safety, reliability and features offered by NG9-1-1 are critical for supporting the life-saving work performed by telecommunicators and first responders. The public safety sector must implement modern communication methods by replacing legacy systems with new and versatile NG9-1-1 solutions. These solutions will significantly expand public safety capabilities and allow 9-1-1 callers to efficiently and reliably relay text, data, video, and IP-based voice calls in emergency situations.

Exhibit 1.0 The Future of Public Safety: A Paradigm Shift for 9-1-1



Product Line Strength and Customer Impact

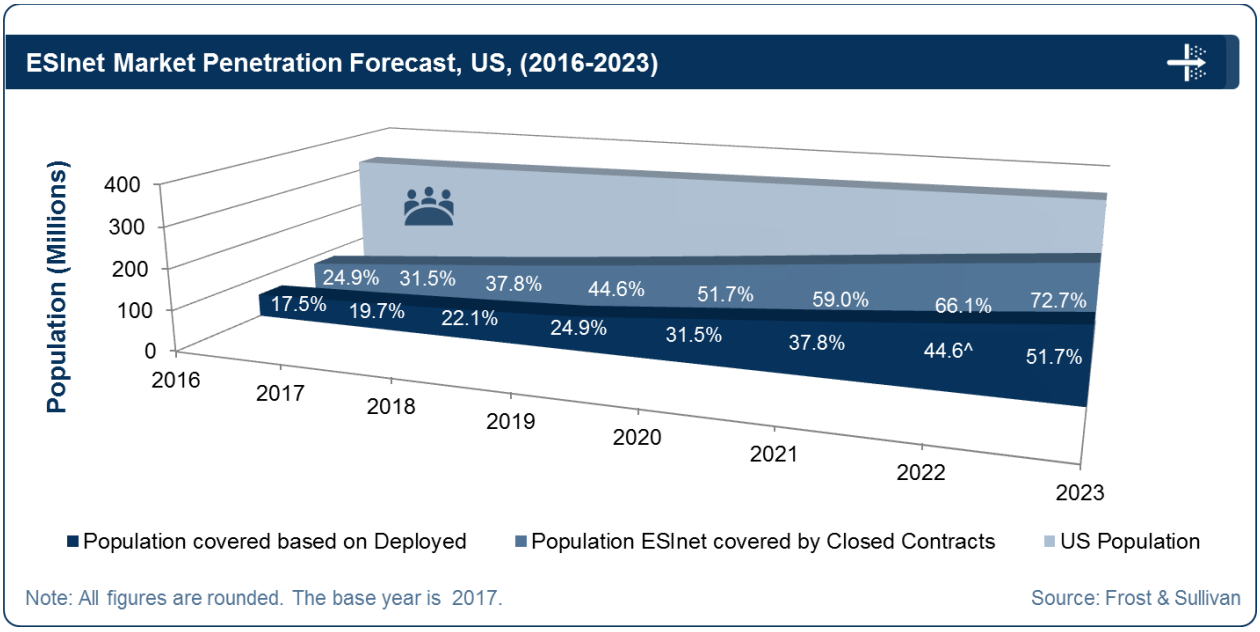
Product Line Breadth

Requirement: Product line addresses the full range of customer needs and applications.

Multiple jurisdictions, regions and states currently benefit from NG9-1-1. With the industry embracing standards and deploying standards-aligned solutions, future adopters are well positioned for success. As expected at this stage of adoption, there are significant increases in the number of regional and statewide NG9-1-1 requests for proposal (RFPs). Frost & Sullivan expects the next 12-24 months to be a critical period for regional and state 9-1-1 administrators to identify and secure the appropriate implementation partners to ensure a successful transition.

As part of our annual research, Frost & Sullivan measures NG9-1-1 growth opportunities by tracking emergency services IP network (ESInet) contracts closed by year's end. Simply put, the ESInet is the managed IP network supporting the NG9-1-1 solution. Whereas an ESInet serves as the transport layer, the routing intelligence that sends 9-1-1 payloads across the ESInet is provided by a series of applications, collectively known as Next Generation Core Services (NGCS). A closed ESInet or NGCS contract constitutes a legal agreement between the purchasers of NG9-1-1 systems — generally, counties, regions or states that control PSAPs — and the primary NG9-1-1 service provider. Frost & Sullivan's research suggests that ESInet market penetration, based on the U.S. population covered by ESInets under contract, will grow from approximately 37.8 percent in 2018 to approximately 72.7 percent by 2023, as depicted in Exhibit 2.0 below.

Exhibit 2.0 ESInet Market Penetration Forecast

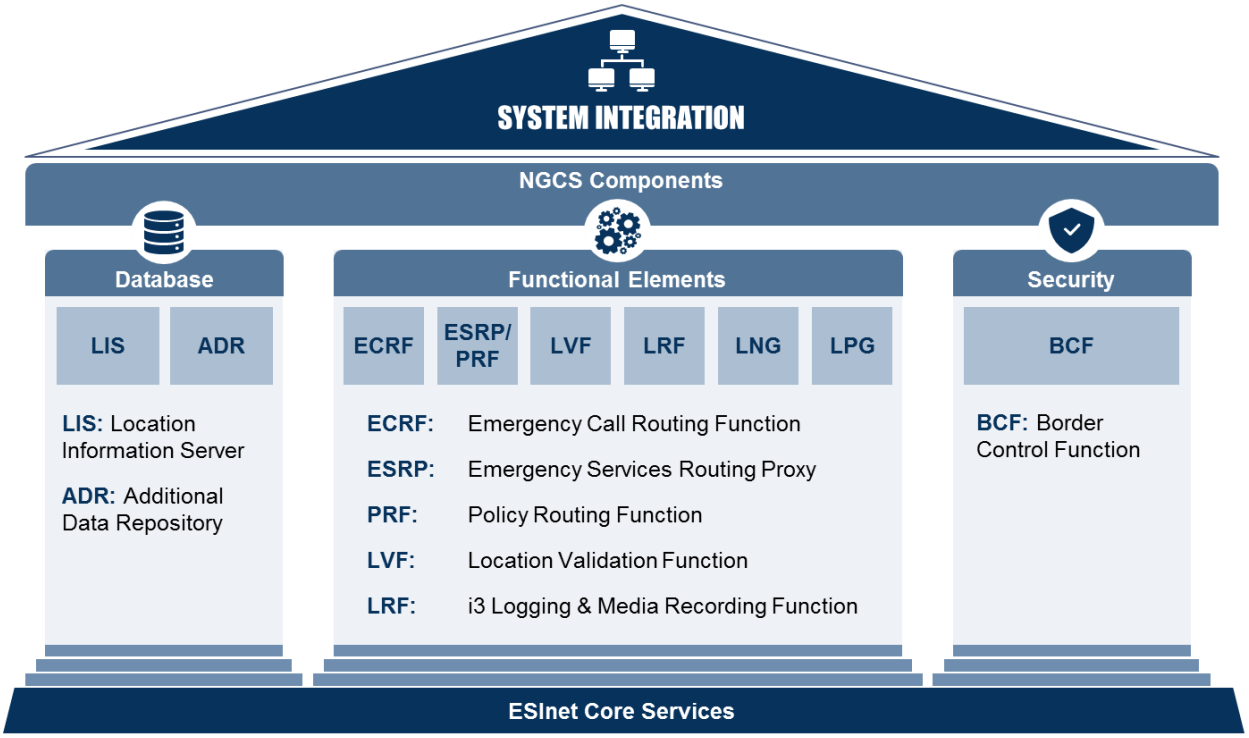


Note: All figures are rounded. The base year is 2017. Source: Frost & Sullivan

In general, regions or states purchase NG9-1-1 systems on behalf of the PSAPs they manage. Many states centrally organize their PSAPs to conduct coordinated statewide NG9-1-1 upgrades, while others choose to purchase upgrades on a PSAP-by-PSAP basis or through regional coalitions. This mix of local, regional and statewide deployments makes choosing a flexible and adaptable NG9-1-1 service provider extremely important, since there is no "one size fits all" approach to NG9-1-1.

In this environment, reducing the complexity of NG9-1-1 deployments while increasing its flexibility has emerged as a critical differentiator in the vendor selection process. Many NG9-1-1 deployments involve a primary service provider (or integrator) that partners with an NGCS provider to supply the desired NG9-1-1 system. An integrator often holds the NG9-1-1 contract and licenses technology from a specialized provider to offer the ESInet and NGCS, ultimately bringing together the component sub-systems, including the ESInet, geographic information system (GIS), NGCS, and customer premises equipment (CPE), into one functioning system.

Exhibit 3.0 Overview of an i3-compliant NG9-1-1 System



Source: Frost & Sullivan

While many providers license their technology to large integrators to manage the ESInet and NGCS, Comtech Telecommunications Corp.'s comprehensive in-house capabilities allow the company to serve as both the service provider and the end-to-end integrator for NG9-1-1 deployments. This factor eases the burden of implementation and communication as Comtech is responsible for the entire deployment process.

Comtech's portfolio offers an end-to-end approach to NG9-1-1 and includes:

- NGCS: The technology and services that intelligently obtain, manage, control, store, validate, and route IP-based data and processes in the NG9-1-1 services-oriented architecture.
- CPE: Provides IP-based PSAP call-handling user interfaces, ESInet connectivity, and enhanced functional elements for voice and data.
- GIS: Provides PSAPs with real-time location data that can be synchronized across local, regional and state levels to optimize PSAP operations and improve emergency response times.
- Integration Capabilities.
- ESInet Services: Includes the design, implementation, operation, and communication regarding the transport layer of an NG9-1-1 deployment.
- Network Operations Center (NOC): The hub of all monitoring and management of the NG9-1-1 system.

As such, Comtech is uniquely equipped to offer NG9-1-1 solutions both directly and via its channel partners.

Technology Leverage

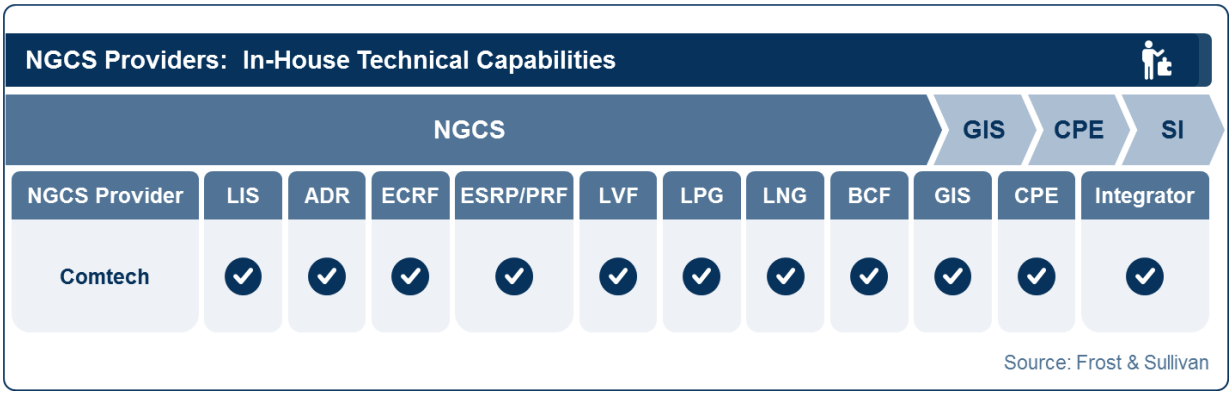
Requirement: Demonstrated commitment to incorporating leading-edge technologies into product offerings results in greater product performance and value.

Comtech continues to invest in public safety and the 9-1-1 realm. In February 2016, Comtech acquired TeleCommunication Systems, Inc.—a world leader in secure and highly reliable wireless communications technology—and consequently secured notable 9-1-1 assets. In February 2019, Comtech acquired Solacom Technologies, Inc., a pioneer in next-generation call-handling solutions and regional NG9-1-1 systems. In April 2019, Comtech continued its strong commitment and its investment in public safety and 9-1-1 with its acquisition of the state and local government NG9-1-1 business unit from General Dynamics Information Technology (GDIT).

Comtech's skilled and highly dedicated public safety organization includes more than 400 experts, a seasoned team that supports the largest wireless and Voice over IP (VoIP) providers in the United States, as well as providing cities, counties, states and federal agencies with a variety of 9-1-1 services.

While Comtech's name is relatively new to public safety, its core technologies have come through the acquisitions of multiple, highly regarded companies, each of which has many years of experience in 9-1-1 and public safety. Consequently, Comtech offers the most comprehensive end-to-end in-house technical capabilities in the market and a full portfolio of service, system and integration capabilities, as shown in Exhibit 4.0.

Exhibit 4.0 Comtech In-House Technical Capabilities



Inherently tied to the ESInet, the Comtech NGCS solution includes the key functional elements and services that complete an NG9-1-1 system:

- An ESInet, a primary NG9-1-1 element.
- Geo-spatial routing capability via the emergency call routing function (ECRF), allowing a jurisdiction to move away from legacy location management and instead embrace a fully GIS-oriented system.
- A NENA i3-aligned solution enabling end-to-end IP call routing to the PSAP.
- Location Database functionality, based on IP protocols yet supporting legacy functionality, for the replacement and advancement of legacy automatic location identification (ALI) systems.
- Multiple deployment models (cloud, hosted, in-network, and hybrid).
- Transitional elements such as the legacy network gateway (LNG)/legacy selective router gateway (LSRG), enabling simultaneous operation of legacy and NG9-1-1 services during the transition of service.
- Call-handling equipment interoperability.
- Message session relay protocol (MSRP) Text to 9-1-1 support.

Customers benefit from Comtech's flexible deployment models. Each model supports different customer needs and requirements for the management of the system. For example, the in-network model means the jurisdiction receives a dedicated system for

their 9-1-1 calls. In contrast, the hosted model leverages Comtech-owned assets to deliver NG9-1-1 services. Comtech's cloud and hybrid solution designs combine the advantages of both in-network and hosted solutions, and they maximize the efficiencies of both the hosted infrastructure as well as local services within the jurisdiction.

Customer Purchase Experience

Requirement: Customers feel they are buying the most optimal solution that addresses both their unique needs and their unique constraints.

Comtech's continued NG9-1-1 market traction demonstrates and validates the customer purchase and ownership experience. With its recent acquisitions, Comtech has emerged as one of the largest NGCS providers and the second-largest primary NG9-1-1 contract holder in the country. In addition to its direct contracts, Comtech also serves as an NGCS subcontractor for various channel partners. Comtech's NGCS solution, implemented at regional and state levels, supported more than 33 million people nationwide as of the end of 2017.

Comtech remains committed to providing multiple flexible deployment models, outfitting customers with a solution specifically designed to meet their needs, and advancing the adoption of NG9-1-1 nationwide.

Conclusion

As the public safety sector continues to replace legacy systems with new and more versatile solutions, Frost & Sullivan recognizes how Comtech assembled and introduced a comprehensive NG9-1-1 product line that truly addresses customer needs, reduces complexity, and accelerates progress in the widespread adoption of NG9-1-1.

With its strong overall performance, Comtech has earned the 2019 Frost & Sullivan Product Line Strategy Leadership Award.

Significance of Product Line Strategy

Ultimately, growth in any organization depends upon customers purchasing from a company and then making the decision to return time and again. A full, comprehensive product line that addresses numerous customer needs and preferences is, therefore, a critical ingredient to any company's long-term retention efforts. To achieve these dual goals (customer value and product line strength), an organization must be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

Understanding Product Line Strategy Leadership

Driving demand, strengthening brand, and differentiating from the competition all play a critical role in delivering unique value to customers. This three-fold focus, however, must ideally be complemented by an equally rigorous focus on building a superior and comprehensive product line.

Key Benchmarking Criteria

For the Product Line Strategy Leadership Award, Frost & Sullivan analysts independently evaluated two key factors — Product Line Strength and Customer Impact — according to the criteria identified below.

Product Line Strength

Criterion 1: Breadth
Criterion 2: Scalability
Criterion 3: Technology Leverage
Criterion 4: Features
Criterion 5: Supply Chain Reliability

Customer Impact

Criterion 1: Price/Performance Value
Criterion 2: Customer Purchase Experience
Criterion 3: Customer Ownership Experience
Criterion 4: Customer Service Experience
Criterion 5: Brand Equity

Product Line Strength

Criterion 1: Breadth

Requirement: Product line addresses the full range of customer needs and applications.

Criterion 2: Scalability

Requirement: Product line offers products at a variety of price points and functionality levels.

Criterion 3: Technology Leverage

Requirement: Demonstrated commitment to incorporating leading-edge technologies into product offerings results in greater product performance and value.

Criterion 4: Features

Requirement: Products offer a comprehensive suite of features to serve customers at multiple levels of functionality, ease of use, and applications.

Criterion 5: Supply Chain Reliability

Requirement: There is sufficient control over the supply chain to ensure availability of key components and thereby the availability of products in the product line.

Customer Impact

Criterion 1: Price/Performance Value

Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience

Requirement: Customers feel they are buying the most optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience

Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

Criterion 4: Customer Service Experience

Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity

Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

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

Frost & Sullivan analysts independently 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• Present 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	• 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 participants 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.