FROST & SULLIVAN

FROST & SULLIVAN BEST PRACTICES AWARD

SUPPLY CHAIN VISIBILITY PLATFORM
NORTH AMERICA

New Product Innovation
2019

CLOUDLEAF®
Accelerating the Visible Supply Chain

FROST & SULLIVAN

2019 BEST PRACTICES AWARD

Contents

Background and Company Performance

Industry Challenges

Today's companies, whether pharmaceutical, manufacturing and distribution, or food and beverage, operate in an Amazon-influenced world where they expect real-time responses to product location, condition, dwell time (how long it has been sitting), and expected arrival status. This is because increased visibility featuring real-time views and insights into product location, condition, and flow across the end-to-end supply chain network (from suppliers through production and distribution to customers) are directly linked. Creating end-to-end supply chain cohesion is paramount in reducing operational material losses, increasing productivity, adhering to regulatory compliance, enhancing operational reliability, increasing cost savings, as well as for unlocking value and new revenue opportunities.

Therefore, every company, despite the many moving pieces of a supply chain ecosystem (factories, distributors, and everything in the middle), is looking to digitize the entire supply chain in an easy-to-use, scalable, reliable, secure, and inexpensive manner. As digital transformation shifts the status quo, existing technologies that simply register the exit and entry event of a product no longer suffice. Vendors that can offer an end-to-end solution for continuous and complete visibility into all assets and supply chain workflows while addressing the aforementioned challenges are expected to secure leadership positions in the market.
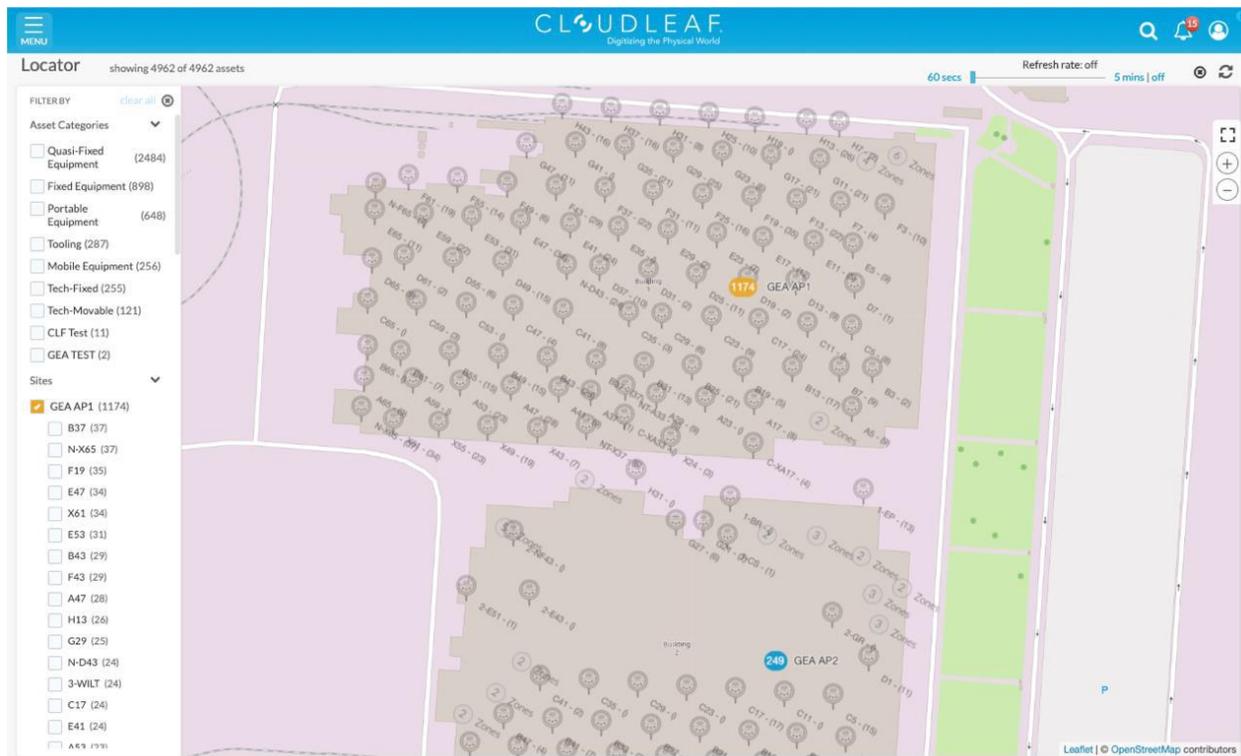
Cloudleaf can easily visualize your assets, whether in a single location, multiple locations or in transit.

New Product Attributes and Customer Impact

Match to Needs

Frost & Sullivan is quite impressed with a company named Cloudleaf who is making a meaningful impact on the supply chain industry by delivering continuous real-time visibility, especially into the location, condition, and flow of objects/assets. Frost & Sullivan's research finds that Cloudleaf is truly transforming supply chain visibility and optimization for enterprises by capturing real-time operations data through its patented approach that leverages sensors, mobile, cloud, and artificial intelligence (AI) as well as machine learning (ML) technologies. To this end, Cloudleaf effectively matches its capabilities to industry needs through a unique combination of its proprietary Sensor Fabric™ (sensors and gateways), cloud, flexible data structure and control center.

Internet of Things (IoT) sensors of all types attached to assets provide continuous real-time coverage throughout the supply chain where contextualized/exact location (i.e., indoors and outdoors as well as in-transit touch points), condition (e.g., temperature, acceleration, shock, vibration, etc.), and flow data of the asset are sent from the sensors to gateways. As assets move, they are hand-offs between gateways and mobile gateways with GPS that give seamless in-transit coverage. Zone sensors, on the other hand, enable micro-location readings at critical workflow areas, and when combined they create travel paths to monitor dwell times and track compliance; they also act as choke points, tracking each entry and exit event at a designated area. Contextualized location, condition, and flow data that are sent from sensors to gateways are then fed to the cloud for visualization and advanced analytics. Cloudleaf has a Spark-based AI/ML processing engine in the cloud that processes the streaming data from the Sensor Fabric and provides actionable insights as the data comes in. As such, customers can monitor the data either using Cloudleaf's purpose-built dashboards or by feeding the data into other enterprise applications (e.g., SAP systems or any sales and operations planning systems) that they are using via API for further analysis. Finally, a control center monitors the health of the Sensor Fabric, checking the battery life and identifying any faulty sensors, to manage the entire network from one place.

The Cloudleaf Digital Visibility Platform (DVP) delivers unprecedented real-time visibility, efficiency and responsiveness to different aspects of the supply chain including Capital Asset Tracking, WIP as well as Materials and Logistics in pharmaceuticals, industrial manufacturing and food and beverage. The Cloudleaf DVP delivers real-time, actionable intelligence and is proven in the field today. Product quality is improved, waste is reduced and profitability significantly increased. Cloudleaf customers have achieved improvements in supply chain visibility of as much as 10x in the first-year; return-on-investment of as much as 70x and annualized value in the tens of millions of dollars. Frost & Sullivan sees this technology as a a game-changer for the global supply chain industry because it creates actionable visibility, insights and massive value across the end-to-end networked supply chain.
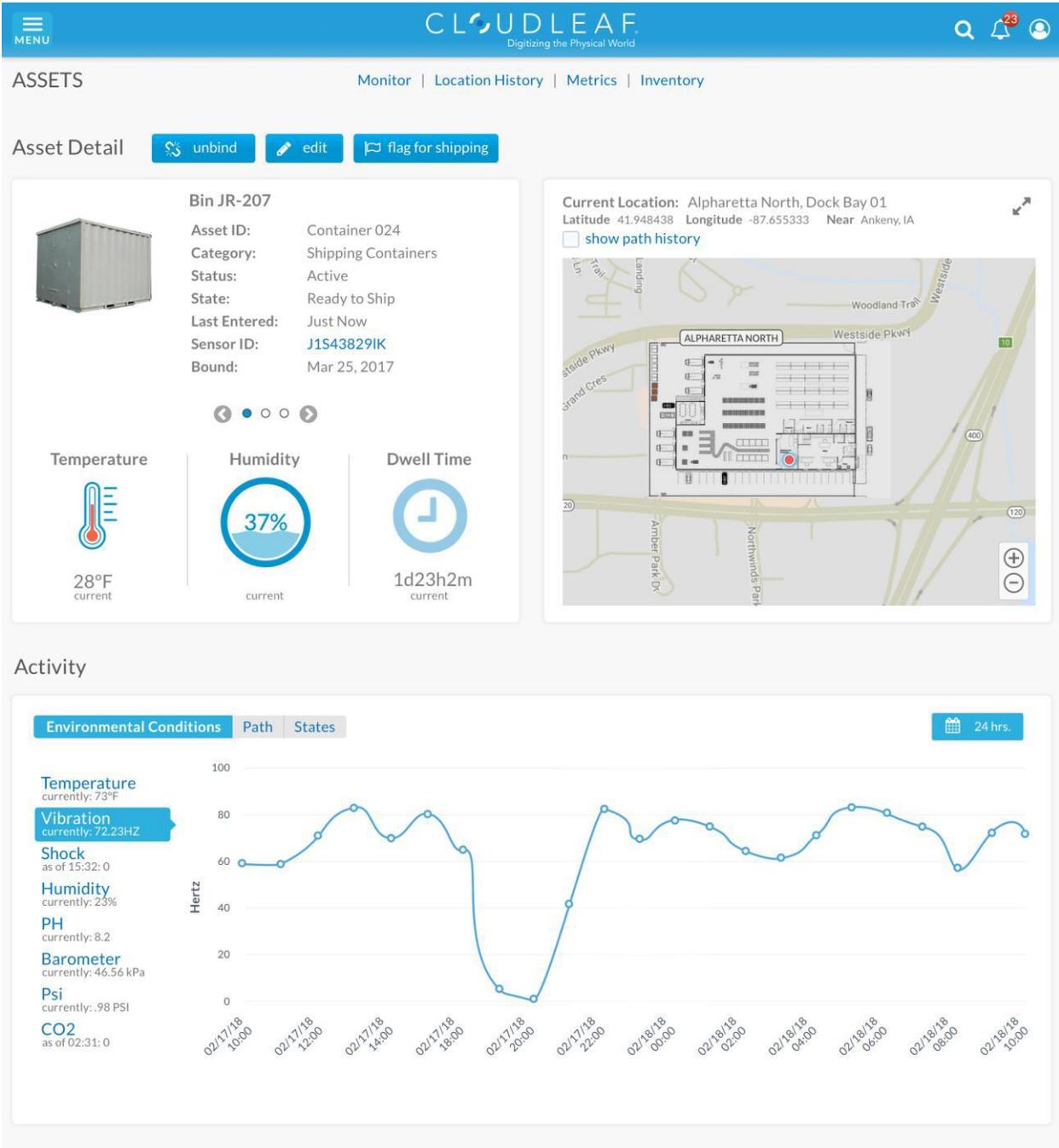
The Cloudleaf dashboard enables a real time and historical view into the health of your asset including location, temperature, shock, vibration and dwell time.

Frost & Sullivan is convinced that Cloudleaf is the innovation leader in this space, based on 4 major fronts:

End-to-end Solution: Customers are looking for a single solution that will enable tracking of their assets in real-time, continuously. They are fed up with expensive, complex, and time-consuming choke-point-based technologies where an asset has to pass through a

reader or human check mechanism (where somebody has to physically scan the asset). With antiquated bar codes, customers will not receive continual condition information, meaning no data is available between scans. Contrariwise, when a Cloudleaf sensor is mounted on an asset, it is continuously pushing/streaming information and data to the cloud, with zero human intervention. Cloudleaf, therefore, is strikingly different as it offers not just the hardware but cloud services, connectivity, and the required desktop or mobile applications, making it a genuine, end-to-end solution that can provide continuous asset coverage for real-time visibility into every aspect of the customer's supply chain (assets and workflows) to enable more insightful and accurate business decisions.

Extended Battery Life: Cloudleaf has patented technologies (40-plus patents filed) that deliver a 3-to-5-year battery life, which makes digitizing the supply chain operationally viable. In addition, Cloudleaf gateways provide 70,000 square feet (sq. ft.) of coverage and track 250 sensors every second. Both gateways and zone sensors can be powered directly via Ethernet or by battery. Eliminating the hassle of installing cables and wires and adding an extended battery life means low infrastructure cost. Therefore, considering the battery life and the impact it has on supply chain, both indoors and outdoors, makes it very cost effective for companies to adopt Cloudleaf as opposed to using expensive RFIDs or barcode readers. Moreover, a 3-to-5-year battery life makes it possible for one solution to track all processes and assets at scale, and therefore Cloudleaf suits companies and operations of all sizes and types. In fact, Cloudleaf has customers with facilities that measure up to 2 million sq. ft., and since the information is stored, processed, and organized together in the cloud, operational costs are reduced significantly. (Note: 100% visibility was achieved at this facility and saved the company over $70 million in the first year.)

Quick & Easy Deployment of Sensor Fabric: Today's companies, operating in an era of digital transformation, expect a fast and measurable return on investment (ROI); they are also looking to avoid lengthy and complicated processes often associated with other existing technologies. Cloudleaf customers can deploy Sensor Fabric expeditiously (i.e., 1 or 2 days depending on the volume), after which they can be up and running. A quick set-up enables customers to immediately begin tracking and collecting data both indoors and out. In addition, users can gain actionable real-time insights into their operations through Cloudleaf's purpose-built dashboards.

Digital Visibility Platform: Cloudleaf's Digital Visibility Platform, using AI and ML, can capture and process the huge amount of data coming in from the edge. The flexible data structure, rapid application development, ability to create a digital profile of an asset and the integration with legacy systems of records and workforce communications tools such as chatbots and Slack, are all features of the Digital Visibility Platform. Stakeholder communication across internal and external stakeholders is vastly improved as is decision making due to ubiquitous access to the same real-time data.

Technology has become critical in supply chain visibility, and Frost & Sullivan applauds Cloudleaf as it redefines the way enterprises work by offering an end-to-end technology solution that combines IoT sensors, cloud, AI/ML, and advanced analytics for delivering

comprehensive, real-time, end-to-end, continuous visibility into all assets and workflows. The end result is unrivaled value and cost savings for customers through recovered pallets, unspoiled inventory, reduced material loss, improved production scheduling, and increased communications across the supply chain.

Positioning & Design

Cloudleaf's cloud services and control center are designed to deliver a superior user and ownership experience, employing all the business rules a customer desires. Cloudleaf's platform enables users to create a digital twin, or model, of their entire end-to-end supply chain workflows and processes. An example of digital twins could be pallets, spaces, trucks, planes or machines. Each object or digital twin captures detailed attributes of the object, user defined meta-data, dynamic data from sensors attached to the object, contextual data around the object, and business rules associated with the object. The digital twin gives a 360 degree view of the object in the physical world at any given moment.

With its digital twin capabilities, it's easy to plan, strategize and optimize your supply chain in cyberspace without disrupting the physical.

In addition to defining rules and triggers, customers can configure alerts, notifications, and monitoring to keep track of shortages and dwell times to optimize their supply chain using Cloudleaf's business rules engine. For example, alerts that start going off through the cloud can be configured in such a way that if a pallet is sitting in the sorting area for more than 1 hour, a message is sent to supervisors, and if it crosses an hour and a half and threatening to reach infraction, then an alarm is sent to a wider workforce to ensure appropriate actions are taken. Getting early warnings can save considerable production loss across industries, from food processing to pharmaceuticals as well as ensuring complete FDA compliance.

Cloudleaf understands that in today's world, visual representation of a plan and system performance is a key element of success. The platform, therefore, was designed so users can easily compare multiple scenarios, visualize the metrics and trends fully, and understand the merit. The advanced, dynamic, and interactive dashboards, graphics, and detailed reports seamlessly enable data discovery and visualization. Users can also personalize the dashboards to fit their needs. To this end, the control center features visually appealing graphics that make it easy to monitor the health of the supply chain.
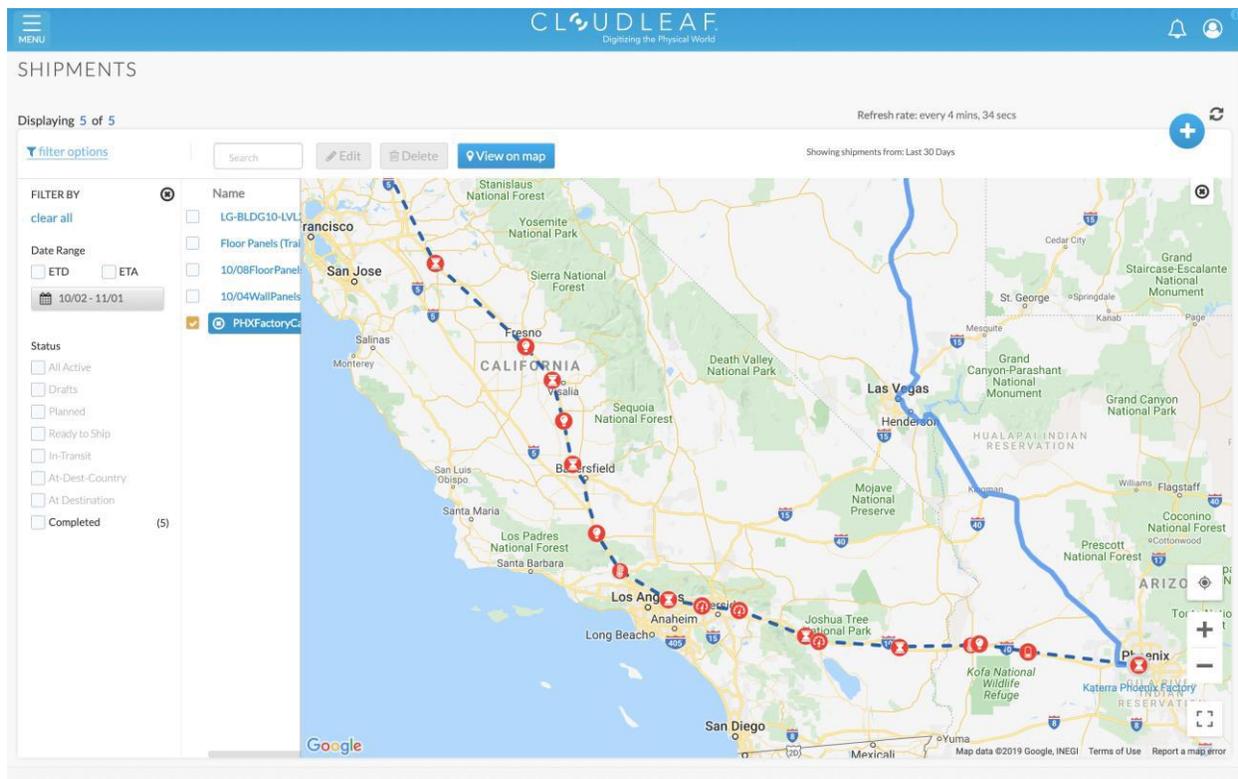
Cloudleaf's technology neutral strategy allows for the rapid and easy integration of multiple sensor types and contextual and conditional data streams, enabling exception-based management, actionable insights and a real-time, end-to-end view of your supply chain.

With the growing use of tablets and other mobile devices, Cloudleaf reports and dashboards are made compatible with the latest mobile platforms, hand-held tablets, and other types of connected devices (accessible through Android and iOS applications). Such mobility and responsiveness enable users to not only remotely gather relevant information impacting their day-to-day operations but also monitor business performance anytime, anywhere and make the right decisions at the right time, be it identifying connectivity lapses or reconfiguring a sensor.

Customer Purchase, Ownership, and Service Experience

Cloudleaf is transforming supply chains across diverse industries and it focuses on high-value manufacturing, such as the aerospace and high-tech sectors where the asset value is steep; it also focuses on the pharmaceutical and food processing verticals where

regulatory concern looms large. The company started focusing mostly on indoor applications (e.g., factory warehouse distribution centers where there is a lot of incoming material, outgoing material, and a process or workflow that happens within the 4 walls). However, since numerous Fortune 100 companies have many sites and distribution centers, Cloudleaf now covers both intra- and inter-site applications, connecting between the sites as well. Some customers include GE Aviation, GE Appliances, and Shire.

To Frost & Sullivan, the greatest value point derived from Cloudleaf's solution is the cost savings it enables; Cloudleaf's customers have already realized savings of over $100 million. This is because continuous supply chain coverage (i.e., bringing all the assets and workflows into real-time visibility) enables a company to predict disruptive events before they happen, and that consequently unlocks new revenue opportunities and value creation in the form of reduced waste, increased productivity, and up-to-date regulatory compliance.

Tracking Dwell Times for Time-sensitive Material to Avoid Waste: Pharmaceutical, biotech, and life sciences companies work with time-sensitive samples that need to be maintained under strict environmental conditions. For instance, one of Cloudleaf's early customers, a large pharmaceutical company, processes 8 million liters of blood plasma every year to manufacture a life-saving drug. The plasma must be kept at negative 20 degrees; staying in ambient temperatures for more than an hour is unacceptable. The customer found it challenging to manually manage millions of bottles, and existing technology solutions (e.g., RFID) also did not work; therefore, the company was losing millions of dollars in material loss due to lack of insight and visibility throughout the plasma handling process. Cloudleaf automated the facility's plasma handling process to accurately monitor the location, dwell time, condition, and product transit history that resulted in capturing the complete movement history of the plasma, which ensures easy compliance with FDA regulations and avoids spending on compliance-incident fees.

Ultimately, companies find Cloudleaf appealing for its incredible applicability, such as ensuring product quality and safety; increasing productivity in manufacturing; monitoring real-time location for raw materials, assets, and goods; managing product quality by monitoring environmental conditions such as temperature in supply and beverage applications; and optimizing inventory levels in distribution. Investors are equally impressed. The company recently secured $26 million in Series B funding bringing its total institutional funding to $39 million. Frost & Sullivan expects the financial support to further enhance Cloudleaf's team size, working capital, and customer engagement going forward.

Cloudleaf User Experiences:

"Our limited visibility into tooling led to challenging internal audits. Even with software systems to track those tooling inventories, we often could not find tools and as a result, suffered millions of dollars in write-downs. We implemented Cloudleaf and gained 100% accurate visibility into 32,000 tools. The solution paid for itself extremely quickly."

-Major discrete equipment manufacturer

"Today's always-on IoT sensing capabilities can deliver enormous value, but only if companies make sense out of what they sense. Turning vast quantities of data into useful intelligence is a multi-faceted challenge. There are now supply chain-specific application sets designed to do that. They draw on an IoT sensor network to deliver visibility in the context of the end-to-end supply chain. Selecting and instrumenting key points to feed into such a system enables sensible sensing."

- Prof. Hau Lee, Ph.D. Operations, Information and Technology at Stanford University

"We build housing and needed a seamless flow from the factory to the job site. Gaining visibility through the critical elements of that process has lowered our operating costs by 30% and saved us $20M in energy, which is cost we won't need to keep on our books and a better environmental footprint."

- Multi-Unit Building Manufacturer

Conclusion

Today's companies are in dire need of an end-to-end solution for continuous visibility into all of their assets and workflows across the supply chain. Cloudleaf achieves this through its IoT sensors, cloud, AI, ML, advanced analytics and integration with legacy systems of record, which provide continuous asset coverage through contextualized location, condition, and flow data of the assets in motion.

Frost & Sullivan is impressed with how Cloudleaf's patented approach is transforming supply chain visibility and redefining the way enterprises work by enabling them to digitize their end-to-end supply chain. With Cloudleaf, customers can now make faster and more insightful business decisions based on real-time data. The company delivers unmatched customer value by helping companies to reduce waste, increase productivity, meet regulatory compliance, and unlock new revenue streams as a result of reliable, real-time data and supply chain visibility. Quick and easy deployment, extended battery life, low infrastructure costs, easy connection to the cloud, configurable alerts, intuitive visualization, and advanced analytics with actionable insights further enhances customer value. For its strong overall performance, Cloudleaf is recognized with Frost & Sullivan's 2019 New Product Innovation Award.

Significance of New Product Innovation

Ultimately, growth in any organization depends on continually introducing new products to the market and successfully commercializing those products. For these dual goals to occur, a company must be best in class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

- Acquire competitors' customers
- Increase renewal rates
- Increase upsell rates
- Build a reputation for value
- Increase market penetration

- Earn customer loyalty
- Foster strong corporate identity
- Improve brand recall
- Inspire customers
- Build a reputation for creativity

DEMAND

BRAND

New Product Innovation Leadership

COMPETITIVE POSITIONING

- Stake out a unique market position
- Promise superior value to customers
- Implement strategy successfully
- Deliver on the promised value proposition
- Balance price and value

Understanding New Product Innovation

Innovation is about finding a productive outlet for creativity—for consistently translating ideas into high-quality products that have a profound impact on the customer.

Key Benchmarking Criteria

For the New Product Innovation Award, Frost & Sullivan analysts independently evaluated two key factors—New Product Attributes and Customer Impact—according to the criteria identified below.

New Product Attributes

Criterion 1: Match to Needs
Requirement: Customer needs directly influence and inspire the product's design and positioning.

Criterion 2: Reliability
Requirement: The product consistently meets or exceeds customer expectations for consistent performance during its entire life cycle.

Criterion 3: Quality
Requirement: Product offers best-in-class quality, with a full complement of features and functionalities.

Criterion 4: Positioning
Requirement: The product serves a unique, unmet need that competitors cannot easily replicate.

Criterion 5: Design
Requirement: The product features an innovative design, enhancing both visual appeal and ease of use.

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 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 follow a 10-step process to evaluate award candidates and assess their fit with select best practices 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 world	• Conduct in-depth industry research • Identify emerging industries • Scan multiple regions	Pipeline of candidates that potentially meet all best practices 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 practices 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 practices 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 practices 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 practices award recipient	• Review analysis with panel • Build consensus • Select recipient	Decision on which company performs best against all best practices criteria
9	**Communicate recognition**	Inform award recipient of 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 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 the 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, resulting in 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, helps clients 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 practices models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages nearly 60 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on 6 continents. To join Frost & Sullivan's Growth Partnership, visit http://www.frost.com.