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BEST PRACTICES

AWARDS

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2020 BEST PRACTICES AWARD



**2020 GLOBAL
EDGE OPTIMIZING SOFTWARE
PRODUCT LINE STRATEGY LEADERSHIP AWARD**

Contents

| | |
|--|----|
| Background and Company Performance | 3 |
| <i>Industry Challenges</i> | 3 |
| <i>Product Line Strength and Customer Impact</i> | 3 |
| <i>Conclusion</i> | 6 |
| Significance of Product Line Strategy | 7 |
| Understanding Product Line Strategy Leadership | 7 |
| <i>Key Benchmarking Criteria</i> | 8 |
| Best Practices Award Analysis | 8 |
| <i>Decision Support Scorecard</i> | 8 |
| <i>Product Line Strength</i> | 9 |
| <i>Customer Impact</i> | 9 |
| <i>Decision Support Matrix</i> | 10 |
| Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices | 11 |
| The Intersection between 360-Degree Research and Best Practices Awards..... | 12 |
| <i>Research Methodology</i> | 12 |
| About Frost & Sullivan | 12 |

Background and Company Performance

Industry Challenges

Legacy network architectures lack versatility as data transactions occur between the end-user device and a centralized network core, resulting in high latency that limits the rollout of web applications which in turn were also centralized. In response, distributed web caching systems were employed to address latency challenges for content delivery. However, with many webpages moving from Hyper Text Transfer Protocol (HTTP) to HTTPS — nearly 80% of all current network traffic is encrypted— coupled with the increased usage of live form and collaborative video applications, caching was rendered useless. Frost & Sullivan observes how the rise of the Internet of Things (IoT) and Industrial Internet of Things (IIoT) further compound latency challenges due to the large-scale deployment of connected devices, sensors, and modules, as well as the use of analytics and artificial and machine intelligence (AI/ML). Edge computing technologies have been developed to enable previously high latency networks to enhance the performance of existing applications and support sophisticated and demanding applications. However, accommodating the near-exponential rise of connected devices is quite challenging for solution providers. Specifically, an adequate edge computing solution will provide computing and storage functions at the edge location, connect across different types of radio access networks, and allow for significant economic outcomes for the entire value-chain.

Frost & Sullivan research reveals that the cost-effective deployment of advanced edge computing technologies is paramount based on the rise of 5G-based immersive applications and IoT use cases. Since low latency is critical to enabling immersivity as well as machine to machine functionality on 5G, it is necessary for enterprises and network operators to scale up their edge deployments before 5G network adoption. However, commercial deployment of a 5G network is costly-and often the largest operational expenditure for an enterprise. Coupled with a lack of opportunity to monetize on edge computing deployments, business owners and operators can be reluctant to invest in updating their networks.

Product Line Strength and Customer Impact

Founded in 2014, AlefEdge's key value proposition is delivering the power of 5G-based Edge Internet to network programmers and application developers through easy-to-use technologies that enable rapid adoption without the need for costly upgrades. AlefEdge provides a Programmable **Software Defined Mobile Edge** (SD-ME) platform to orchestrate applications, devices and network services seamlessly, thereby delivering on the promise of a distributed Internet and the power of this new high-speed Edge Economy to Application Developers and Enterprises through open Edge APIs.

Based in New York, the start-up was founded by Dr. Ganesh Sundaram, a fellow of Bell Labs and thought leader in the global telecom industry. With over 50 industry patents to his credit alone, Dr. Sundaram is an active contributor to the development of mobility and cloud technologies for 2G, 3G, 4G, and 5G as well as WiFi. Collectively, the company's team reflects over 150 years' worth of expertise in the mobile technology and cloud computing industries and has created foundational innovation for the Edge industry. The company has

raised almost \$40 million in private market funding since its founding and serves over 14 million users globally. To enhance the openness of its Edge platform, AlefEdge works with a number of leading system integrators. AlefEdge also partners with multiple hyper-cloud providers like Microsoft using their cloud functionality, and hyper-scale data center providers to deploy Edge solutions. These partnerships and AlefEdge's innovation renders their distributed platform with Programmable Edge API's cloud neutral, cloud native, and ready to use - thereby enabling rapid integration with enterprises and operator networks, for business owners to take advantage of immediately. Additionally, AlefEdge's SD-ME platform approach is connectivity neutral and is interoperable across all hardware vendors including: Cisco, Huawei, Nokia, Dell, HP, and Ericsson. In addition, AlefEdge is part of important industry alliances such as Facebook's Telecom Infra Project, the Linux Foundation, the GSMA 100 companies, and Intel Network Builders. These alliances are quite important as they help the company gain significant market recognition and traction in the telecom industry. Moreover, AlefEdge's distributed Edge Computing Network is extremely scalable and can interconnect within any access network in an overlay fashion within minutes (not months!). With AlefEdge, networks are efficiently architected and utilized to provide Edge computing services to any application as well as third party microservices enabled through APIs.

Technology Leverage

Unlike other competitors, AlefEdge's general architecture is modular, Software-Driven and cloud-native; at the base, the edge gateway of the software stack interconnects into any access network—3G, 4G, 5G, or even Wi-Fi and networks based on Citizens Broadband Radio Service (CBRS) spectrum. Complementing that is a unique edge cloud layer that essentially abstracts, automates, and coordinates distributed compute infrastructure within the computing, storage, and switching devices through a cloud native environment.

The Edge Applications Layer, consisting of open APIs, is on top of the stack. Frost & Sullivan notes that one of the major constraints hindering the development of Edge computing is the inability for end users to monetize it. AlefEdge enables application developers and enterprises to leverage the company's APIs at the intersection of networking, applications, and computing. AlefEdge's Edge Applications Layer allows developers to create a custom service environment for their application — thereby maximizing economic outcomes. For instance, gaming developers can leverage the Edge Applications Layer to create a service that identifies user demographics, including location information, network conditions like bandwidth, and latency requirements, among many others, to improve gaming experiences for end-users while creating product placement and in-game advertising environments for game developers.

Network Programmers and Application Developers can also leverage AlefEdge's APIs across a range of verticals, including telecommunications, advertising, media streaming, computer vision and enterprise solutions. Finally, the ease with which the Edge Applications layers can be incorporated into end-user ecosystems is a key factor distinguishing AlefEdge's solution from the rest of the pack.

Scalability

The AlefEdge platform is a programmable end-to-end SD-ME solution built with open APIs which is built at the intersection of network functions and application functions. The AlefEdge platform efficiently brings computation, storage, and delivery closer to end users. Unlike other edge solutions on the market, AlefEdge is plug-and-play and can deploy on both public and private network deployments in a very short period of time. Additionally, the company's open API ecosystem allows existing underlying hardware to be re-farmed for new use cases and implementations. As a result, end users can easily incorporate major 5G upgrades without disrupting an existing network's functionality.

Breadth

AlefEdge's SD-ME and Open Edge API based solution's customers hail from a spectrum of industry verticals due to its ability to enable personalized content and applications to end-user's audiences. The platform includes some initial solutions, including:

- Alef Media Streaming, which can stream high-definition content and immersive applications from the edge;
- Alef AdVision, which brings real-time, targeted yet privacy amplified, advertising to life on connected screens through Machine Vision plus AI;
- Alef Gaming, which can render and stream games to the end-user devices;
- Alef Advertising, which is used for next generation of real-time advertising exchanges for existing as well as new immersive creative;
- Alef Boost, which is used for optimizing video traffic and inter-connection across multiple layers of the stack at the edge of the network.

Each of these solution offerings leverage AlefEdge's unique capability to provide personalized solutions to end users across private radio access and public networks, as well as custom network bandwidth settings without the wait and costs of upgrades. The versatility with which network settings can be modified leads to a whole set of use cases, e.g., gaming, advertising, and marketing. Specifically, the company enables adequate bandwidth for applications such as video analytics, facial recognition, customized marketing and advertising, and augmented and virtual reality (AR/VR). Frost & Sullivan notes that, despite being a single platform, AlefEdge empowers a breadth of use cases. In 2020, AlefEdge further expanded its offering with the launch of AlefEdge AdVision, the first of many solutions to be deployed on Microsoft Azure, bringing targeted advertising to life utilizing the power of Computer Vision and Artificial Intelligence.

Supply Chain Reliability

As a software-based company whose solution can deploy across multiple cloud environment, AlefEdge's SD-ME Platform acts as a glue to hold different components of the edge ecosystem together. The company's powerful value proposition is evidenced by its broad partner network, including network equipment manufacturers, data center and tower edge specialists, and system integrators.

AlefEdge plans to operate over 3,500 edge locations globally to meet the demands of enterprises and application developers. However, deploying, automating, monitoring, and managing the edge nodes require a robust set of managed services. AlefEdge's partners include leading global managed services providers, like Tech Mahindra, NTT Data, and Wipro and continues to work to forge partnerships with other global providers like IBM and Accenture—who build and manage end-to-end professional services frameworks for the Edge and thus recognize AlefEdge's vital role in enabling deployments across their broad end-user base. Frost & Sullivan also appreciates that the company is the industry's first edge platform to be offered as a service and, thus, sourced directly to the end user.

As Frost & Sullivan's own research confirms that no single vendor can deliver an end-to-end Edge computing solution for the end user, companies require channel partners that have complementary technologies. Due to AlefEdge's robust partnerships, the company has a streamlined supply chain—making it less capital intensive and thus more efficient. By partnering with important OEMs, end users also reduce the probability of running into an interoperability issue.

Conclusion

The proliferation of immersive applications the Internet of Things (IoT) spurs a massive surge in connected devices and modules. At the same time, these immersive and IoT applications require high network bandwidth and low latency. Edge computing technologies alleviate the bandwidth crunch for many IoT technologies. However, end users are constantly challenged by efficient deployment, management, and monetization of edge compute technology.

AlefEdge addresses this issues with the industry's first SD-ME based solution. Given its unique plug-and-plug characteristics, ability to interconnect with different private radio access and public networks, and multiple embedded open APIs, AlefEdge's cloud native offering is the industry's first solution to address the inherent challenges associated with the widespread rollout of edge computing.

With its thought leadership, technical excellence, and ease-of-use, AlefEdge earns the 2020 Frost & Sullivan Global Product Line Strategy Leadership Award.

Significance of Product Line Strategy

Ultimately, growth in any organization depends on 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, critical to a company's long-term retention efforts. To achieve the dual goals of customer value and product line strength, an organization must be best in class in 3 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 critical roles 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 Global Product Line Strategy Leadership Award, Frost & Sullivan analysts independently evaluated 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

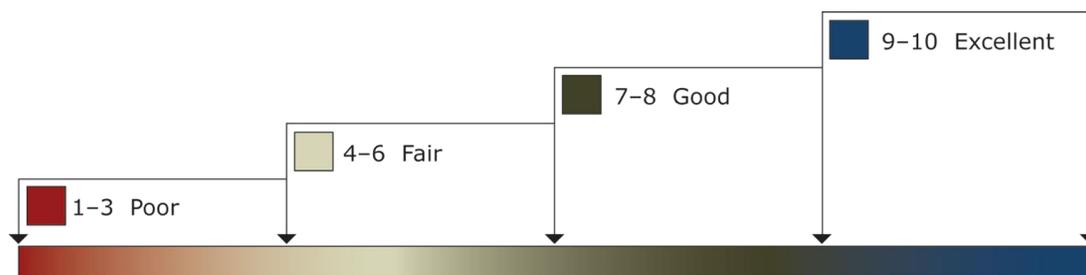
- Criterion 1: Price/Performance Value
- Criterion 2: Customer Purchase Experience
- Criterion 3: Customer Ownership Experience
- Criterion 4: Customer Service Experience
- Criterion 5: Brand Equity

Best Practices Award Analysis for AlefEdge

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 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 considers Product Line Strength and Customer Impact (i.e., 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 has chosen to refer to the other key participants as Competitor 2 and Competitor 3.

| <i>Measurement of 1-10 (1 = poor; 10 = excellent)</i> | | | |
|---|------------------|------|-----------------------|
| Product Line Strategy | Product Strength | Line | Customer Impact |
| | | | Average Rating |
| AlefEdge | 9.3 | | 9.2 |
| Competitor 2 | 8.4 | | 8.4 |
| Competitor 3 | 7.7 | | 7.8 |

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 products and components.

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

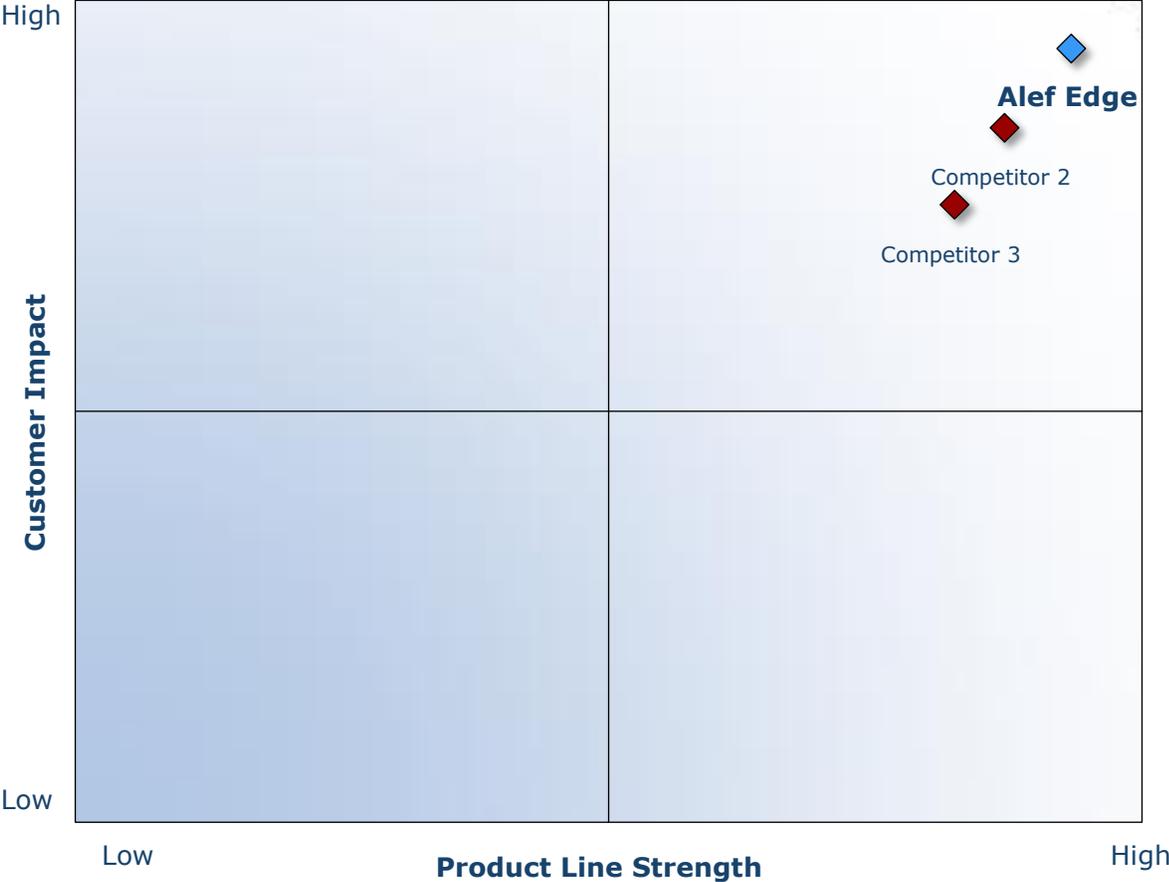
Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity

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

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 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 | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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 | <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 practices 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 practices 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 practices criteria |
| 9 Communicate recognition | Inform Award recipient of recognition | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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.



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>.