2018 North American Location-based Services Enabling Technology Leadership Award
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Background and Company Performance

Industry Challenges

Location-based services (LBS) consist of a range of services that incorporate location information with other data to provide a value-added experience to a mobile user. Location services combine terrestrial, satellite, and software-based measurement technologies to pinpoint the user’s location, which then integrates with contextual data to provide a value-added experience to a mobile user. In contrast to the more passive fixed Internet, users in the mobile environment are demanding personalized, localized, and timely access to content and services. Thus, LBS have emerged as an ample opportunity for a variety of stakeholders to provide a means of differentiation, a way to build customer loyalty, and a new revenue stream in an increasingly competitive mobile environment.

Location-aware mobile services are driving innovation in use cases up and down the value chain in telecommunications, mobility, and advertising. With modern consumers carrying a smartphone nearly every minute of every day, and the Internet of Things (IoT) increasingly connecting devices and objects to the cloud, the depth and breadth of data now available open up a new universe of opportunity for brands and service providers. The ability of a platform to dynamically synthesize real-time, location-based data with relevant content and services is a fundamental requirement to support these emerging applications.

In the case of a location-based application, the service is premised on location or relies heavily on location information for its core function(s). In other words, location comprises the key value proposition of the service. In the case of location-enhanced offerings, location is a peripheral or add-on capability that enriches the experience but is not necessarily an absolute requirement. Increasingly, retail, marketing, supply chain, and a plethora of digital services are incorporating a real-time location or mapping aspect into their applications to enhance the customer experience. The first wave of LBS primarily revolved around navigation and retail. LBS powered marketing tools allow services to deliver context-aware information based on the targeted marketing information to potential customers nearby. ¹

Future applications in manufacturing, autonomous vehicles, and the IoT depend on context-rich mapping. For example, autonomous vehicles and augmented reality systems will depend on rapidly updated or near real-time context-aware maps to traverse the landscape and maintain service cohesion. Autonomous vehicles especially, require accurate location-based data beyond what stand-alone global positioning systems (GPS) can provide. Such vehicles, and other use cases, require richer context accuracy to preemptively react to conditions and correct positioning within existing features in the world such as street layouts, landmarks, fuel stations, and lanes. ²

¹ IT; Computing and Communications Technology Alert. Dimensions of LTE-A; Location-Based Services are Transforming the Retail Sector; Semantic Search techniques enable Contextual Search Engines, (Frost & Sullivan, March 2015).
² High Definition Maps for Automated Driving; Map Suppliers Expect Highly Autonomous Driving Maps to be Adopted to Power Level 3+ Features, (Frost & Sullivan, June 2016).
Filling out the context-aware background for such content-rich applications requires mountains of data, rapidly refreshed. A primary issue arises in how to gather and make sense of this data because programs with requirements to opt-in or tightly held “walled garden” platforms fail to deliver the necessary data amount and quality. Similarly, closed platforms struggle to meet the needs of fast-evolving use cases and new application developments. Vendors in this emerging segment should focus on providing solutions that will help marketers and service providers capitalize on connections to the social web and tools that enable services to monetize data streams effectively.\(^3\)

**Mapbox’s Technology Leverage and Customer Impact**

The origins of Mapbox derive from consulting projects for non-governmental organizations in need of tools for real-time data visualization, such as elections observers in Afghanistan and Doctors Without Borders. Founded in current form in 2010, Mapbox creates the building blocks developers need to integrate highly accurate and rich location data for maps, search, and navigation tools into their applications (apps) and software.

**Highly Accurate Maps—Lighter, Faster, with Greater Detail**

Mapbox leverages the inherent reciprocity of its platform, to send anonymized data from user devices into an aggregate data pipeline, which generates a feature-rich map available to users. Currently, there are 300 million end users each making the map more accurate by the information they provide. Collecting over 200 million miles of road data each day, Mapbox harnesses an impressively vast volume of information, continuously refreshing. When the user of an app built with Mapbox’s platform opens the program, it shares a select set of sensor data (GPS, latitude/longitude, and timestamp) anonymized and aggregated into the Mapbox platform. The continuously updated platform creates real-time traffic results and fills out the geography of the mapping program when alternative methods omit hidden streets or neglect other data features.

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\(^3\) *2016 Big Data & Analytics Vendor Directory: Mobile, Retail, and Location Analytics*, (Frost & Sullivan, September 2016).
Mapbox’s intelligent solutions create a multi-layered world of roads, building levels, and water bodies, where each feature can be interacted with in the underlying raw data to control the style and create unique use cases. The layers of detail derive from Mapbox’s vector tile approach, a format for integrating layers of data and detail at a high frame rate that allow the live processing and editing rather than presenting as a static canvas. The Mapbox platform ships the data, style, and vector tiles to render on the client side, enabling impressive layers of detail and insertion of significant amounts of information. The proprietary map rendering technology maintains high performance, similar to a video game, and redundant data centers in 10 geographic regions across the globe ensure high availability. Significantly lighter and faster than traditional raster graphics, Mapbox’s vector maps enable high performance even in low-bandwidth areas. With the level of detail relayed through Mapbox’s platform, apps can understand details as fine as center lines dividing a freeway.

*Highly Detailed Maps Derived from Millions of Data Points*

Source: Mapbox
An Exceptionally Flexible and Configurable Platform

Mapbox’s decision to offer open source libraries makes it the most flexible and customizable building blocks on the market. The vector tile and layering format of Mapbox’s design creates an exceptionally flexible and versatile tool for developers. Mapbox provides the building blocks, enabling app developers and companies to customize the consumer-facing angle and own the customer relationship. Mapbox’s highly customizable platform streams layers of raw data (features such as streets, parks, terrain, and satellite imagery) and via its application program interfaces (APIs) developers can add their proprietary data or code on top, creating a unique map. The company provides open source software development kits (SDKs) and maintains libraries that support iOS, Android, Qt, Unity, Web, React Native, and Node.js., and moreover, with open sourcing the Mapbox developer community makes available macOS SDKs, and compatible libraries for Cordova, NativeScript, and Xamarin. With Mapbox Studio, developers have complete freedom to change the look and feel of maps in real time. Frost & Sullivan recognizes the remarkable flexibility provided to create custom experiences.

Commitment to Transparency and Developer Driven Open Sourcing

Mapbox’s open source libraries offer a rare level of transparency, cultivating a base of support and creativity from its customer base. Even beyond the open source libraries, Mapbox allows developers to look under the hood, to copy the code and create an entirely new tool for themselves. Mapbox encourages external contributors to add to the repository of templates and styles. Moreover, the company maintains many small libraries of products designed for companies for specific purposes, representative of the tiers of users. The open source libraries are available for free, up to 50,000 views per month threshold. Thus, the majority of users are self-service. Above that, Mapbox offers commercial pay-as-you-go and negotiated enterprise-grade packages to include greater support and expanded capabilities. Mapbox’s popular developer’s blog spreads the word about capabilities utilizing the existing building blocks. The broad user base serves as a growth market and is an evangelizing force all its own; Mapbox encourages developers to grow and become paying customers for mutually beneficial success. Mapbox innovates and targets engineering solutions for industries, working collaboratively with a community of open source developers as well as specific features for major customers.

Customizable Data Layering

Source: Mapbox
Building Blocks for Unbounded Applications

The essential building blocks for location-based mapping services flow through Mapbox’s platform to support use cases and applications across industries and sectors, enabling greater accuracy and a host of new potentials. Ranging from uses as diverse as precision agriculture, drones, government, logistics, business analytics, travel, healthcare, mobility, social media, and telecommunications, Mapbox data processing and map making technology serve current applications and enable future environments. While the use cases and consumer-facing presentation may differ significantly, the solutions build on top of the foundational aspects of flexible development kits, and real-time, vector-based data. For example, social media app Snap uses the geographic component to customize the map style as well as using location to target the feel of interactions. Further, the Weather Channel uses Mapbox’s high-quality rapid rendering maps (which refresh at gameplay speeds of 60 frames per second) to visualize highly accurate and detailed weather projections and information.

The real-time nature of the data and information introduces high definition location and mapping into new spaces, which is why Mapbox spearheads future developments through engineering verticals for mobility, interactions, and augmented reality (AR). Innovations in these areas will fuel creativity across different sectors and populate future use cases. Prototypes in the AR and mobility areas, for example, presaged similar programs by Apple and Google, but Mapbox remains on the bleeding edge of development.

In addition to maps, Mapbox provides tools for embedding turn-by-turn navigation into mobile applications and enterprise navigation APIs for logistics use cases such as finding the shortest route through multiple point and distance matrix calculations. Mapbox’s data platform of over 300 million endpoints generates live traffic in over 50 countries, and the company develops data tools for autonomous driving customers making HD maps.

Global Reach and Commercialization Success

Frost & Sullivan recognizes Mapbox’s effective processes for launching products and solutions as well as the proven success in bringing technology to market for commercial success. The company develops solid revenue growth out of its open source and tiered user base. Originally bootstrapped, Mapbox was already profitable with 25 employees when it accepted its first round of external funding. Continuing to scale-up aggressively since its Series A funding in 2013, the company now counts more than 300 team members, 180 engineers, and 10 global offices including Minsk, Helsinki, and Detroit. Consistent growth in revenues and users continue past the over 900,000 developers registered with the platform and nearly 90,000 monthly active developers on API traffic by Summer, 2017. From the over 60 global edge points and 10 data centers, the regional infrastructure ensures high availability and speed. Moreover, Mapbox has secured entrée to the crucial Chinese growth market, with a local partnership, making it possible to service travelers in China and Chinese travelers abroad through in-country data centers. While the company continues to grow, it demonstrates a commitment to its core values of transparency and functionality in how it relates to its customer base of developers.
Conclusion

As location-based services enable new levels of context-aware detail and features for software and mobile applications, Mapbox delivers the building blocks for essential mapping, search, and navigation uses. The Mapbox platform draws data from nearly 300 million endpoints to inform highly accurate vector tile-based maps, updated in near real-time. The company makes its data and platform available in an open source format and adds on services for commercial and enterprise clients, cultivating a loyal and devoted base of developers with its transparency and engineer focus. Dedicated to cutting-edge development, Mapbox is already working on the next generation of augmented reality, mobility, and interactive applications. Enabling application developers to customize and layer their data on top, Mapbox remains true to its core focus on developers’ needs while scaling up fast.

With its technical innovation, commitment to transparency, and strong performance, Mapbox earns Frost & Sullivan’s 2018 North America Enabling Technology Leadership Award for location-based services.
Significance of Enabling Technology Leadership

Ultimately, growth in any organization depends upon customers purchasing from a company and then making the decision to return time and again. In a sense, then, everything is truly about the customer—and making those customers happy is the cornerstone of any long-term successful growth strategy. To achieve these goals through enabling technology leadership, an organization must be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

Understanding Enabling Technology Leadership

Product quality (driven by innovative technology) is the foundation of delivering customer value. When complemented by an equally rigorous focus on the customer, companies can begin to differentiate themselves from the competition. From awareness, to consideration, to purchase, to follow-up support, best-practice organizations deliver a unique and enjoyable experience that gives customers confidence in the company, its products, and its integrity.
Key Benchmarking Criteria

For the Enabling Technology Leadership Award, Frost & Sullivan analysts independently evaluated two key factors—Technology Leverage and Customer Impact—according to the criteria identified below.

Technology Leverage
- Criterion 1: Commitment to Innovation
- Criterion 2: Commitment to Creativity
- Criterion 3: Stage Gate Efficiency
- Criterion 4: Commercialization Success
- Criterion 5: Application Diversity

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

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.
**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 practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

<table>
<thead>
<tr>
<th>STEP</th>
<th>OBJECTIVE</th>
<th>KEY ACTIVITIES</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monitor, target, and screen</td>
<td>Identify Award recipient candidates from around the globe</td>
<td>Pipeline of candidates who potentially meet all best-practice criteria</td>
</tr>
<tr>
<td>2</td>
<td>Perform 360-degree research</td>
<td>Perform comprehensive, 360-degree research on all candidates in the pipeline</td>
<td>Matrix positioning of all candidates’ performance relative to one another</td>
</tr>
<tr>
<td>3</td>
<td>Invite thought leadership in best practices</td>
<td>Perform in-depth examination of all candidates</td>
<td>Detailed profiles of all ranked candidates</td>
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<tr>
<td>4</td>
<td>Initiate research director review</td>
<td>Conduct an unbiased evaluation of all candidate profiles</td>
<td>Final prioritization of all eligible candidates and companion best-practice positioning paper</td>
</tr>
<tr>
<td>5</td>
<td>Assemble panel of industry experts</td>
<td>Present findings to an expert panel of industry thought leaders</td>
<td>Refined list of prioritized Award candidates</td>
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<tr>
<td>6</td>
<td>Conduct global industry review</td>
<td>Build consensus on Award candidates’ eligibility</td>
<td>Final list of eligible Award candidates, representing success stories worldwide</td>
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<tr>
<td>7</td>
<td>Perform quality check</td>
<td>Develop official Award consideration materials</td>
<td>High-quality, accurate, and creative presentation of nominees’ successes</td>
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<tr>
<td>8</td>
<td>Reconnect with panel of industry experts</td>
<td>Finalize the selection of the best-practice Award recipient</td>
<td>Decision on which company performs best against all best-practice criteria</td>
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<tr>
<td>9</td>
<td>Communicate recognition</td>
<td>Inform Award recipient of Award recognition</td>
<td>Announcement of Award and plan for how recipient can use the Award</td>
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<tr>
<td>10</td>
<td>Take strategic action</td>
<td>Upon licensing, company is able to share Award news with stakeholders and customers</td>
<td>Widespread awareness of recipient’s Award status among investors, media personnel, and employees</td>
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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.