US Machine-to-Machine (M2M) Communications

Markets

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Introduction to M2M Communications

Machine-to-Machine Communications

Introduction

This Frost & Sullivan research service on the Machine-to-Machine (M2M) communications markets presents an analysis of the key market trends and opportunities in the connected machines space in the United States. It amends and updates the 2012 study on the same topic and presents updated forecasts and other related Information on the key market trends and dynamics. The term "M2M" is quite broad as M2M connections can be used across the wireless and wireline domains, and connectivity for deployed endpoints can be provided via cellular/mobile, satellite, wireline/Internet, and other private and public telecommunication networks. Additionally, both short- and long-range access technologies can be leveraged to provide M2M connectivity. This report is focused on the cellular M2M connectivity space in the United States and identifies the market opportunity from a cellular-enabled connected devices perspective only. Throughout this study, the terms "M2M" and "cellular M2M"; "cellular" and "mobile"; "operators", "mobile operators", "cellular operators", and "mobile network operators (MNOs)" are used interchangeably.

Key Market Definitions

M2M communication refers to digital communication between an endpoint and an enterprise's backend system over cellular networks. A sensor-based tank monitoring system that monitors liquid in a storage tank and sends an automated message to a central monitoring station when the level of the liquid in the tank goes below a certain level is an example of automated M2M communication. An in-vehicle navigation system that communicates with the service provider's backend, in response to specific commands of a human operator, to present the relevant information to the vehicle's driver or passengers, is another example of M2M communication.

According to Numerex Corporation, M2M communications consists of using a device (for example, a sensor and a meter) to capture an event (for example, temperature, inventory level, location, or environment status), which is then relayed through a network (for example, wireless, wired or hybrid) to an application (software program), to translate the captured event into meaningful information (for example, there is a breach, corrosion requires attention, items need to be restocked, or an accident has occurred). This definition can be applied to both one-way and two-way communication scenarios where a device can be remotely monitored, information can be collected and analyzed, and the device itself can perform certain functions based on commands from the enterprise or the service provider's backend.

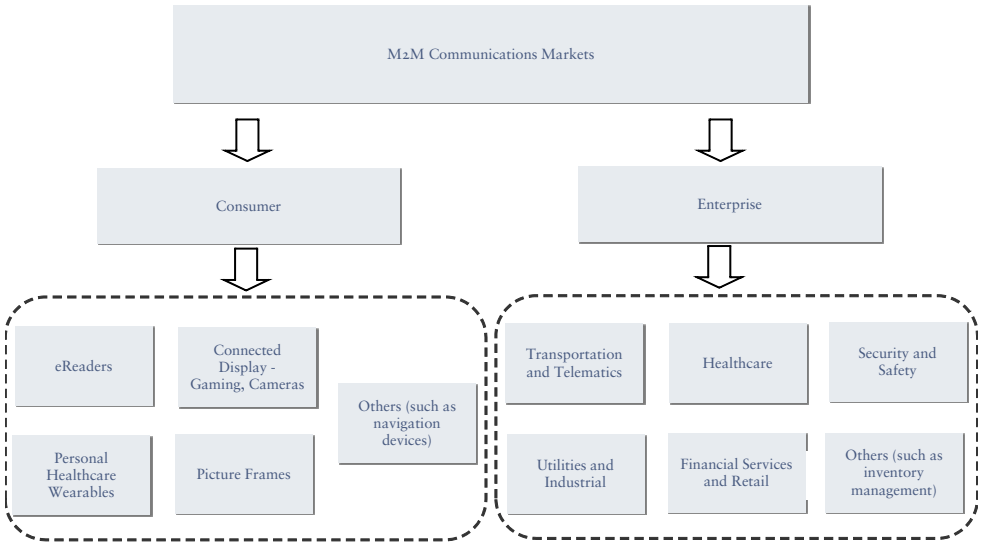
Various "integrated" services, such as smartphone applications that can be used to monitor remote endpoints, are increasingly becoming available. Depending upon the system architecture, some of these applications may (or may not be) classified as M2M. An M2M application is one that sends data to an enterprise backend (i.e, facilitates data exchange between a remote asset and an enterprise backend). A Smartphone application that displays data about the state of a particular endpoint by plugging into that enterprise's backend is not a true M2M communication system, even though it is indirectly communicating with the remote asset or the endpoint. Another criterion for defining M2M could be based on the level of "human involvement". M2M communication services may refer to only those solutions that facilitate digital communication between remote or in-field enterprise endpoints and enterprise backend without human intervention.

Market Segmentation and Forecast Methodology

Exhibit 1 shows the market segmentation in the Total US M2M Communications Markets in 2012.

EXHIBIT 1

Total M2M Communications Markets: Market Segmentation, US, 2012



Note: The industry tends to separate M2M into the "Consumer" and the "Enterprise" categories. The "Consumer" category is not that big overall and the bulk of the market opportunity is really defined by the important "Verticals" which fall under the Enterprise umbrella.

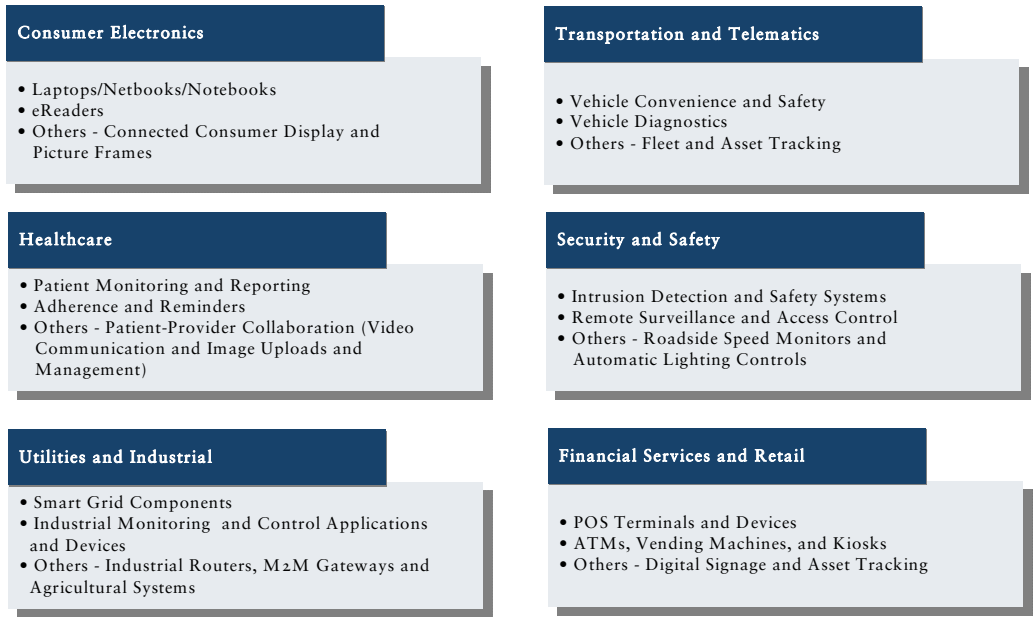
Some operators also include Mobile Computing devices (comprising of Laptops, Netbooks, Notebooks and Tablets) in the Consumer M2M category. However, Frost & Sullivan does not include Mobile Computing devices in M2M and it is not a part of the analysis.

Source: Frost & Sullivan

Exhibit 2 shows the M2M categories and sub-categories in the Total US M2M Communications Markets in 2012.

EXHIBIT 2

Total M2M Communications Markets: M2M Categories and Sub-categories, US, 2012



Note: Frost & Sullivan also has an "Others" category that represents unique connected devices and solutions that may not be included into any other pre-defined categories. The "others" category merely represents any possible new implementations that may arise in M2M and hence, does not contain any analysis.

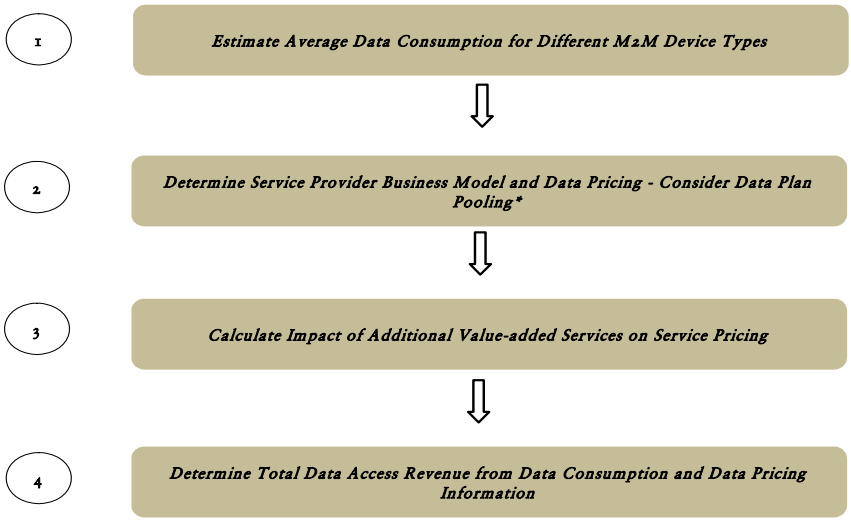
Source: Frost & Sullivan

Frost & Sullivan has estimated the number of M2M connections across different industry segments and has used the average revenue per connected device/unit (ARPU) to establish the market potential. The overall opportunity in the M2M space is largely defined by the service revenues that accrue to the wireless service providers for providing connectivity to the endpoints. Depending upon the business model, mobile operators can also generate more revenue by providing additional service, support, and marketing and distribution services. For example, they could charge a premium in M2M by offering retail solutions (direct to consumers or enterprises); while they may primarily get data access revenue from providing wholesale M2M. In many cases, mobile operators may also charge a fixed minimum price for providing connectivity to M2M endpoints. Mobile operators can sell connectivity services directly to customers (i.e, minimal involvement), or they may also sell solutions through partners (i.e, maximum involvement) where connectivity is bundled along with the M2M solution. The pricing and revenue for mobile operators and M2M service providers depend upon multiple factors, including bandwidth consumed, application and cloud platform resources consumed, number of connections, and ultimately, the business model of the M2M customer.

Exhibit 3 shows the methodology for estimating M2M data access revenue in the Total US M2M Communications Markets in 2012.

EXHIBIT 3

Total M2M Communications Markets: Methodology for Estimating M2M Data Access Revenue, US, 2012



Key: * Data access could be bundled along with service pricing; it is assumed that all the data used is paid for (either by the end user or by the solution provider).

Source: Frost & Sullivan

Summary of Findings and Key Conclusions

Below are some key findings of this research.

- All verticals continue to contribute to the market growth. However, in terms of connections, the Transportation and Telematics market (including fleet and asset tracking) and Utilities and Industrial market—particularly connected (or smart) utility meters—continue to grow at a faster pace than others. The Consumer market, which has been the growth driver for the US M2M communications industry for several years, is likely to remain strong over the forecast period, as well.

- M2M is likely to remain a high-margin, low-cost, and low-ARPU business for mobile operators in the long run. This is particularly true for mobile operators that are heavily dependent on wholesale M2M mobile virtual network operators (MVNOs) that buy bandwidth at wholesale rates and build M2M solutions on top of that. In order to achieve the desired level of scale, automation, and service penetration, mobile operators have to invest in appropriate technical platforms and personnel. Once the initial challenges are addressed, it is only a matter of time before M2M becomes a highly profitable business for US mobile operators.

- Overall, M2M deployments do not yet generate a large amount of data bandwidth. As a result, pure-play M2M data access revenue is relatively small when compared to total mobile data revenue. However, this is expected to change rapidly when Third-generation (3G) and Fourth-generation (4G) cellular networks start to become a common communication medium for M2M applications.

- M2M application platforms are critical for the growth of the industry. These platforms help simplify M2M application development and ongoing management, and are likely to see strong adoption during the forecast period. The challenge for M2M cloud platform providers will be to generate increased revenue, in line with the strong growth of M2M data volumes (or transactions).

- "Minimal" involvement, "moderate" involvement, and "close" involvement in direct sales to M2M customers are the three high-level go-to-market strategies of US mobile operators. It is extremely difficult for mobile operators to work on a one-to-one basis with smaller entities that want to leverage the power of mobility for their connected deployments. This is where dedicated M2M service providers come into the picture. By providing a highly focused set of offerings for M2M, these service providers are likely to emerge as the preferred choice for the small and medium business (SMB) segment.

- The migration of M2M to 3G and 4G networks could happen sooner than initially expected. With AT&T, the present market leader in M2M communications, recently announcing its intention to shut down its slower second-generation (2G) networks over the next five years (by 2017), new M2M customers are likely to adopt high-speed wireless networks to ensure long-term continuity of their connected deployments. On the other hand, other mobile operators, such as Sprint and T-Mobile USA, which are likely to continue to run their 2G networks for a relatively longer period of time, could benefit from AT&T's decision by providing cheaper 2G-based services for M2M.

- M2M application development and management platforms, reporting and management interfaces, M2M test beds and innovation centers, cloud computing, secure M2M connectivity, professional services, industry vertical expertise and mobility experts, and integrated wired/wireless M2M services are likely to be the crucial differentiating factors for mobile operators and their partners in the long run in the US M2M communications markets. Long-term success in M2M communications will also depend on the operators' ability to nurture, develop, and support their wholesale initiatives. Tier-1 mobile operators are also increasingly offering "branded" vertical M2M products in partnership with specialized solution providers. However, mobile operators have to be careful to not compete directly with M2M wholesale service providers.

- A significant amount of data (or transactions) is expected to be generated by the millions of M2M endpoints that are likely to be connected over cellular networks. Storage, analysis, and interpretation of this massive amount of data could easily become a major industry challenge. The threat of network resources getting overwhelmed from this "big data" phenomenon is quite real. The problem will only get worse with time, unless the industry aggressively deploys the necessary storage and computing resources to address this issue. This makes it critical for mobile operators and their partners to provide appropriate platforms, software, and infrastructure components to help in M2M application development, deployment, and management.

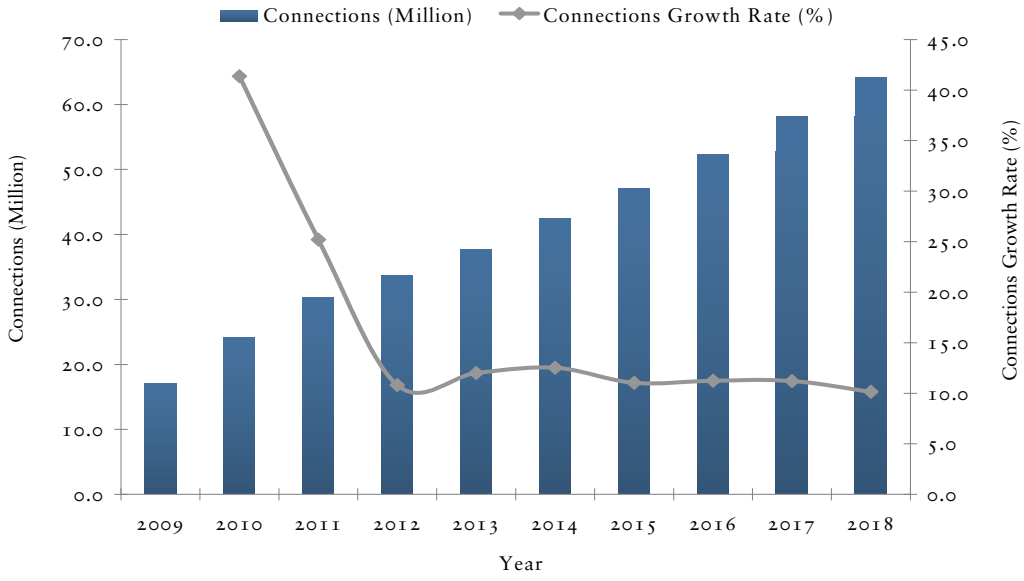
- The full impact of the proposed nationwide high-speed public safety network on M2M communications is still unclear. However, it is fair to assume that certain markets, such as Security and Safety, and Transportation and Telematics, could see growth in M2M connectivity due to deployments on this network. While this may or may not benefit commercial cellular operators in the United States, it will definitely benefit other industry participants, such as M2M application platform providers and M2M hardware vendors.

- The total number of M2M connections in the United States is expected to increase from 33.6 million in 2012 to 64.2 million in 2018. While this is lower than the 2012 forecast from Frost & Sullivan, it does not indicate a lower adoption of wireless in the M2M communications markets. The M2M connectivity architecture of connect-aggregate-transport-monitor leads to multiple connected endpoints supported by a single or a set of gateways. There is no doubt that at some point in future, the number of directly connected machines will outnumber the number of mobile phone connections. However, from a revenue perspective, it will take longer for the pure-play M2M market to generate more revenue that the traditional consumer voice and data services business.

Exhibit 4 shows the connections forecast in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 4

Total M2M Communications Markets: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

2

M2M Device Cloud Platforms

Role and Importance of M2M Device Cloud Platforms

Introduction

Common industry challenges include the lack of a standard set of technologies around which an M2M application can be built, rapid lifecycle of devices and device components, longer time-to-market for new M2M applications, and lack of qualified personnel to develop new M2M applications. By providing access to a standard set of published interfaces or APIs, M2M cloud platforms shorten the time to develop and bring new applications to the market. For example, M2M cloud platforms could take the data flow coming from the M2M endpoint and put it into a reusable object model. This allows companies that want to build M2M applications to use the reusable object model to build their applications (versus just building off data streams). This approach can greatly improve the time taken to develop applications. Frost & Sullivan's research has indicated time savings of more than 60.0 percent, when M2M cloud platforms are used for building M2M applications.

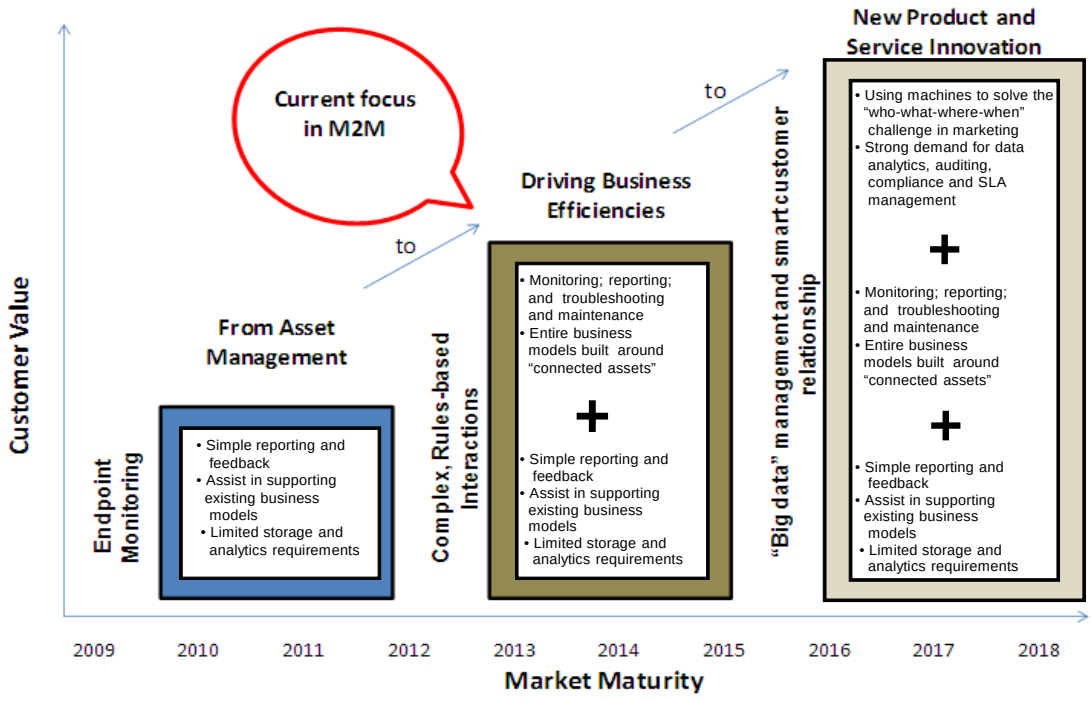
Customers can use the standard set of web technologies to communicate with the M2M cloud platform, which then takes care of the downstream communication to and from M2M endpoints. In order to be used across different industry verticals, the M2M cloud platform has to support different embedded technologies that are used in the industry. This is typically achieved through small software client applications (or "agents") that can be installed/ pre-integrated in different devices (for example, at the micro-controller level) and helps to deliver an "out-of-the-box" connectivity with the M2M cloud platform. These software clients can also be downloaded and installed separately on M2M devices.

Traditional M2M applications are linear and are mostly "devices speaking to applications". The new generation of M2M applications are likely to be collaborative and take advantage of services that are in the cloud. For example, in tracking systems, geo-location can be combined with traffic information and route stops to know exact time of arrival of fleet vehicles. This supplementary information can be provided by the M2M cloud platform, which can, in turn, pull this information from other data sources including other cloud platforms. Adding context, combining multiple data points, and providing enterprise-grade security, availability, and scalability are some additional benefits of M2M cloud platforms.

Exhibit 5 represents the market evolution and roadmap in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 5

Total M2M Communications Markets: Market Evolution and Roadmap, US, 2009-2018



Source: Frost & Sullivan

M2M Cloud Platform Architecture

The M2M cloud platform is made up of the infrastructure and the platform layers, with software applications built on the platform layer and offered as a service if required. Hence, the three layers of a cloud platform can be Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS).

Exhibit 6 shows the three layers of an M2M device cloud in the Total US M2M Communications Markets in 2013.

EXHIBIT 6

Total M2M Communications Markets: The Three Layers of an M2M Device Cloud, US, 2013

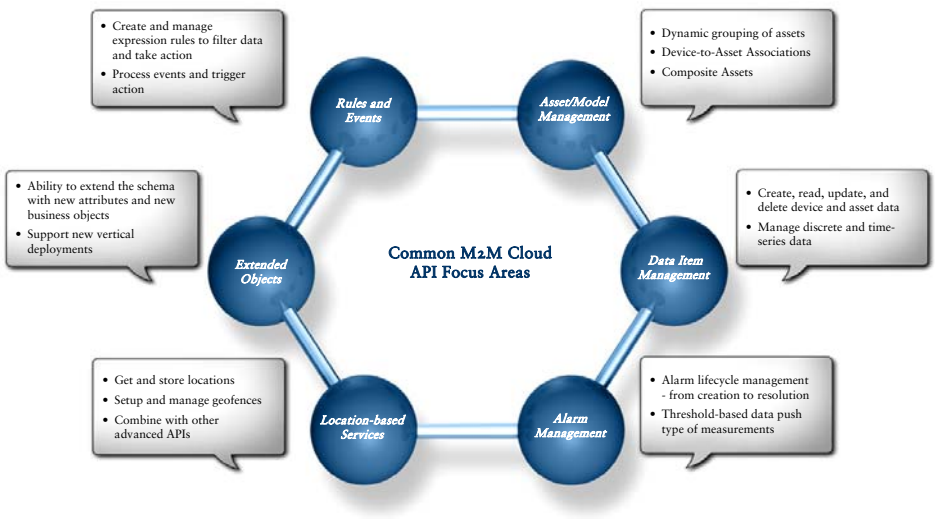
Source: Digi International Inc.; Frost & Sullivan

By offering infrastructure as a service, M2M cloud vendors can help deliver scalable applications. The vast requirements of data storage, date retrieval, and data analysis, along with secure M2M connectivity can be addressed at the IaaS layer. Access to this foundational layer can then be provided through a middleware layer—PaaS—by exposing common software functions through APIs to help with faster custom application development. Then, on top is the SaaS layer, which is usually a software application that can be used to leverage the full power of the PaaS and the IaaS layers to manage connected M2M endpoints. The pricing for this SaaS layer is usually on a monthly subscription basis and the cost of the underlying infrastructure components can be built into this pricing. Leading M2M cloud vendors aspire to provide all three layers of the cloud. However, customers can also develop or purchase different applications that can then leverage the full power of the underlying PaaS and the IaaS layers through published APIs. In the latter scenario (of not using the cloud vendor's SaaS application, if available), the PaaS and the IaaS layers can be monetized separately.

Exhibit 7 shows some commonly used API focus areas for M2M cloud platforms in the Total US M2M Communications Markets in 2013.

EXHIBIT 7

Total M2M Communications Markets: Some Commonly Used API Focus Areas for M2M Cloud Platforms, US, 2013



Source: Axeda Corporation; Frost & Sullivan

Billing and Pricing Models

A variety of billing and pricing models exist for the M2M cloud providers. A SaaS offering can be offered on a 'per active connection' basis, while the infrastructure and the platform can be monetized on a 'per transaction' basis. Other parameters, such as number of connections, amount of data sent (and hence storage required), and time, can also be used to price the M2M cloud platform and the infrastructure. For example, M2M cloud platform providers can separate their offerings into "management service" and "application services". Management services may include managing the connectivity, uptime, software, and firmware of the equipment, while application services may include data collection and analysis. Frost & Sullivan has observed per connection pricing for management services, while data or transaction-related pricing can be used for application services. However, just from an infrastructure perspective (IaaS), a tiered transactions-based pricing structure is generally used for monetization. For example, a cloud platform provider can offer its services for $20,000 per year for up to 25,000 transactions per day and include 30 GB of storage. On the other hand, another cloud provider may charge a fixed, per connection fee for each supported deployment. To summarize, the SaaS providers may collect a fixed fee per connection in a given time period (monthly or yearly), while the platform providers are more likely to charge on a per transaction basis. In many cases, the platform provider and the application provider may be the same. In that case, the software application pricing includes the platform charges. So, the 'per unit' pricing for software usage includes the platform usage charges. M2M cloud providers can also monetize high-demand cloud services, such as long-term storage of time-series data. While the SaaS pricing can include data storage for a short duration of time, long-term storage of time-series data can be offered on a premium basis.

Market Forecasts for M2M Device Cloud Platforms

Frost & Sullivan has estimated the M2M platform opportunity for the IaaS and PaaS providers in the United States.

Exhibits 8 and 9 present the cloud platform revenue from M2M transactions in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 8

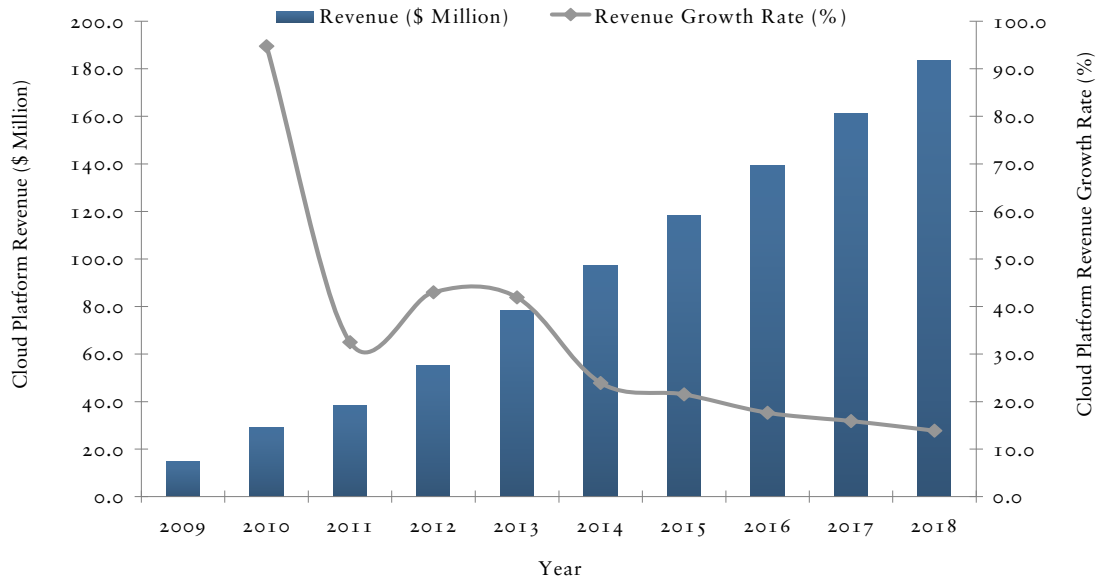
Total M2M Communications Markets: Cloud Platform Revenue from M2M Transactions, US, 2009-2018

Year	Cloud Platform Revenue ($ Million)	Cloud Platform Revenue Growth Rate (%)
2009	15.0	--
2010	29.2	94.8
2011	38.7	32.5
2012	55.3	43.0
2013	78.5	41.9
2014	97.3	23.9
2015	118.3	21.5
2016	139.1	17.6
2017	161.3	15.9
2018	183.7	13.9
Compound Annual Growth Rate (2012-2018): 22.1%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 9

Total M2M Communications Markets: Cloud Platform Revenue from M2M Transactions, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 8 and 9 represent only the transaction-based revenue opportunity for M2M IaaS providers in the United States. Applications can be built on top of available M2M cloud platforms and can then be licensed to customers according to the application pricing model (for example, per user per month). The total opportunity for M2M cloud, which includes IaaS, PaaS, and SaaS, along with other value-added or specific services, could be significantly higher.

The total market opportunity for M2M cloud vendors depends upon the number of supported connections, the number of transactions, and the amount of data that is stored over the long and short-term periods. According to Frost & Sullivan's research report titled "Analysis of the North American Machine-to-Machine Software and Services Market " (code number NB48-10), brand name, reliability, delivery time, pricing, integration capabilities (including integration with enterprise resource management platforms), customer service abilities, and product portfolio are the key competitive factors in the North American M2M application cloud platforms. Frost & Sullivan also believes that a broad connectivity framework, a comprehensive capability set (including multiple APIs to address the common communication needs of different verticals), a success-based pricing, broad support for multiple hardware types, pre-integration with mobile operator systems, and ease of use are some of the other important factors for the success of M2M cloud platform vendors.

3

Total US M2M Communications Markets

Market Dynamics

Industry Challenges

Exhibit 10 shows the impact of the top eight industry challenges in the Total US M2M Communications Markets from 2013 to 2018.

Exhibit 10

Total M2M Communications Markets: Impact of Top Eight Industry Challenges, US, 2013-2018

Challenge	1-2 Years	3-4 Years	5-6 Years
Justifying continued investments in M2M platforms	High	Medium	Medium
Leveraging benefits of mobility	High	Medium	Medium
Nurturing the M2M application development community	High	Medium	Medium
Lack of standardization	Medium	Medium	Medium
Need for integrated M2M solutions	Medium	Medium	Medium
Continued uncertainty around 4G LTE	Medium	Medium	Low
Getting consumers to pay for enhanced connectivity	Medium	Medium	Low
Managing the significant storage and reporting infrastructure requirement in M2M communications	Medium	Medium	Low

Source: Frost & Sullivan

Justifying Continued Investments in M2M Platforms

Mobile operators need to invest in appropriate systems, tools, and service and support capabilities to compete effectively in the US M2M communications markets. For mobile operators, this involves taking a big "leap of faith" in hopes of generating volume (and revenues) from their M2M initiatives. Operators also have to share APIs with their partners in order to allow them to leverage various network capabilities in a secure manner. As LTE is introduced, managing the bandwidth consumption of millions of connected broadband M2M devices will inevitably become a challenge. These and other issues continue to pose challenges to mobile operators who want to see as many M2M connections on their networks as possible. Nevertheless, they may struggle to keep up with the ever-increasing demands of this ecosystem.

Leveraging Benefits of Mobility

M2M deployment can be supported over wireline, wireless, or hybrid networks (such as fixed and short-range wireless network, fixed and private wireless network, and even fixed and satellite networks). It is extremely important for the cellular industry to actively communicate the economic and operational benefits of mobility to their buyers in order to continue to drive the adoption of cellular services. This is especially true for fixed M2M endpoints, such as industrial-grade routers, where being "mobile" is not a key requirement. This does not mean that there is no room for cellular in fixed connected environments. However, it may be harder to achieve good penetration in fixed connectivity environments.

Nurturing the M2M Application Development Community

M2M application development remains a complex and time consuming process, especially when it is done without using an application development platform. The skill sets of an embedded application developer are different from the skill sets of a web developer. Consequently, a web developer cannot easily code for the embedded environment. The need for custom application development is unlikely to be eliminated for M2M communications. Nevertheless, any approach that helps to simplify M2M application development—either by proactive sharing of industry best practices or by providing off-the-shelf tools to help application development—should definitely be a priority. M2M cloud platform vendors and mobile operators are the two likely entities that can help with this initiative in the short term.

Lack of Standardization

Lack of true standardization in M2M communications continues to remain a major industry challenge. M2M solutions have to be customized according to the specific business needs of customers. However, there is no cross-vertical "plug-and-play" architecture that can help improve product integration and implementation time. The true benefits of M2M are likely to be realized only when disparate application types can communicate seamlessly with each other to help businesses improve different aspects of their internal and external processes. Addressing industry fragmentation that occurs at the lower layers (physical, addressing, and transport) is expected to be a long-drawn process. However, it is necessary to usher in the next-generation of M2M communication.

Need for Integrated M2M Solutions

Specialized (or niche) M2M hardware vendors who rely on a "hardware-only" strategy are likely to find themselves at a competitive disadvantage in the long run. M2M hardware providers clearly need to offer additional value (in the form of innovative application development frameworks, for example) to command a premium over simple hardware pricing. A one-size-fits-all approach in M2M is likely to become less effective. The rapidly evolving needs of the M2M ecosystem will be better served by flexible implementations that allow customers to seamlessly integrate various components (such as M2M modules, gateways, and cloud platforms) in a manner that is best suited to their business model. Devising an effective strategy for long-term success in M2M communications is likely to be a challenge for leading hardware solution providers.

Continued Uncertainty around 4G LTE

There is a significant amount of uncertainty over the deployment of 4G LTE M2M solutions, especially in the public safety domain. While public safety agencies have been allocated dedicated spectrum for deployment of a nationwide, inter operable wireless network, deploying such a network is a time consuming and an expensive endeavor. Various approaches, including private-public partnerships and government support, have been proposed to fund deployment of the nationwide public safety network. However, the expectations and requirements of private industry participants from a shared wireless network can be very different to those of public safety agencies. High cost of LTE modules and global spectrum fragmentation in 4G services are some other challenges.

Getting Consumers to Pay for Enhanced Connectivity

It could be a challenge to encourage consumers to pay for enhanced connectivity in their daily lives. For example, while the vision of a connected car is extremely interesting, there is no guarantee that a majority of car owners will be willing to pay a monthly subscription charge for in-car communication services. This could end up making the pay-as-you-go model a necessity in the consumer M2M communications business. Industry participants have to be careful to not end up creating solutions that do not have any practical applicability. It is important for them to clearly understand the value that they offer to consumers and price their services accordingly.

Managing the Significant Storage and Reporting Infrastructure Requirement in M2M Communications

M2M cloud platforms will be expected to support both wireless and wired M2M deployments and will have to be designed to provide the necessary storage, management, analytics, and reporting capabilities for the hundreds of millions (and possibly billions) of connected devices within the next five to 10 years. In many cases, storing and managing data pertaining to user records management, data stream monitoring for threshold alarm applications, other call detail records(CDRs), and other similar data sets, require the use of high quality, high-performance data management platforms. Increasing average data consumption for M2M endpoints also increases the storage requirement across the board for a majority of M2M deployments. All these transaction records have to be archived for a certain time period and analyzed, as required. Providing the appropriate storage and computing resources to manage the transaction data could be a challenge in the US M2M Communications markets.

Market Drivers

Exhibit 11 shows the market drivers ranked in order of impact in the Total US M2M Communications Markets from 2013 to 2018.

Exhibit 11

Total M2M Communications Markets: Market Drivers Ranked in Order of Impact, US, 2013-2018

Rank	Driver	1-2 Years	3-4 Years	5-6 Years
1	Strong support of tier-1 mobile operators	High	High	High
2	Efforts of independent M2M service providers and M2M mobile virtual network operators	High	High	High
3	The connected vehicle opportunity	High	High	High
4	Cloud-based M2M applications platforms	Medium	Medium	Medium
5	High-speed networks and next-generation M2M	Medium	Medium	Medium
6	Public safety networks	Medium	Medium	Medium
7	Strategic partnerships with system integrators	Medium	Medium	Medium
8	Push towards a smarter, greener planet	Low	Medium	High

Source: Frost & Sullivan

Strong Support of Tier-1 Mobile Operators

M2M represents the most attractive opportunity for mobile operators in the United States to increase connections and revenue. Providing dedicated teams, systems, and technologies to simplify M2M communications is at the core of mobile operators' strategy in the United States. Mobile operators have also established various "Centers of Excellence" in M2M communications to facilitate development, deployment, and management of connected endpoints on their networks. Mobile operators are also willing to offer customized service plans to accommodate the unique business models of M2M customers. Overall, operator support remains one of the biggest drivers in the M2M communications markets.

Efforts of Independent M2M Service Providers and M2M Mobile Virtual Network Operators

M2M aggregators and M2M managed service providers, such as KORE Telematics, Numerex Corporation, Wyless, M2M Data Smart, Aeris Communications, RACO Wireless, and others that lease wholesale wireless capacity from MNOs and provide complete airtime/connectivity, development, and professional services solutions, continue to be the key solution providers in the US M2M communications markets. These independent M2M service providers have been particularly successful in providing connectivity to the SMB segment. Other key success factors for independent M2M service providers include offering specialized technologies and features for specific industry verticals and, in many cases, offering more flexible payment terms. Frost & Sullivan's research indicates that in 2012, leading independent M2M service providers have posted more than 30.0 percent growth in connections, which is above the industry growth rate. Independent M2M service providers have made a significant contribution towards the growth of the US M2M communications markets.

The Connected Vehicle Opportunity

The connected car opportunity—defined as embedded and aftermarket M2M solutions that provide intra and inter-vehicle communication to help improve the driver experience, increase vehicle performance, and ensure vehicle, personal, and asset safety services—is expected to help drive the growth of the US M2M communications markets in a big way. The recently announced agreement between AT&T and OnStar LLC, a subsidiary of General Motors Corporation (GM), to wirelessly deliver safety, security, diagnostic, and infotainment services to most Chevrolet, Buick, GMC, and Cadillac vehicles, beginning in 2014, is an indication of things to come in the connected car M2M segment. This market is likely to drive growth in terms of number of connections and in terms of M2M revenue, due to the large amount of bandwidth consumed and transactions generated from in-car services.

Cloud-based M2M Application Platforms

In the past, M2M application providers have had little choice but to develop and manage the entire communication system on their own. However, in-house development, deployment, and management of M2M applications can be a very costly affair and can also lead to issues with application scalability and upgrades. M2M application platforms provide a standardized set of APIs to make it easier to build M2M applications. They also allow for easier access, analysis, and manipulation of the stored transaction data, which helps customers to improve their business operations. Integration with operator-supported wireless subscription management systems, a pay-as-you-go (or a pay-as-much-as-you-use) pricing structure, out-of-the-box applications, and operator support with marketing further help to drive adoption of M2M cloud platforms in the United States.

High-speed Networks and Next-generation M2M

The advent of high-speed 4G LTE wireless networks is expected to support the demands from high-bandwidth M2M applications. Examples include video and multimedia applications for digital signage, remote monitoring, home and in-vehicle entertainment, remote patient monitoring, and secure and robust enterprise data connectivity. Differentiated bandwidth pricing, subsidized pricing of high-speed wireless modules, such as modems and gateways, ready-to-deploy vertical industry solutions, and bundled cloud-based platform solutions are all part of operators' strategy to help drive adoption of LTE for M2M communications.

Public Safety Networks

A nationwide, interoperable public safety wireless network is now closer to reality with the US Government allocating an additional 10.0 MHz of spectrum under the Middle Class Tax Relief and Job Creation Act of 2012. Public safety and law enforcement agencies are likely to use the network for a wide range of secure voice, video, and data communication services, including remote monitoring, security and surveillance, and even sensor-based monitoring of the nation's critical infrastructure. It is also proposed to allow utilities and other critical infrastructure companies to have shared access to the public safety spectrum, although discussions regarding "right to use" and "right to prioritize" are still ongoing. Overall, the rollout of the public safety network is expected to drive deployment of different types of remote monitoring, security, safety, and surveillance M2M solutions.

Strategic Partnerships with System Integrators

M2M Systems integrators help to develop out-of-the-box solutions and provide custom product development and ongoing consulting and support services. M2M application platform providers, hardware vendors, and mobile operators have established preferred partnerships with leading systems integrators to deploy M2M solutions. Partnerships, such as those between Axeda Corporation and Wipro Technologies for simplified M2M deployment and between General Electric (GE) and multiple partners for GE's recently announced "Industrial Internet" initiative, are expected to fuel growth of M2M communications.

Push Towards a Smarter, Greener Planet

Increasing business efficiency, delivering better services to customers and partners, and ensuring sustainable business operations are the three most important benefits of M2M. Automated, effective, and intelligent monitoring of technologies that are used in our daily lives can help reduce dependence on energy sources, reduce pollution, help in improved distribution of wealth, and make the world a better place to live in. Government mandates, aging population, pressure on non-renewable energy sources, increasing pollution, tough economic conditions, low cost of wireless bandwidth, reducing hardware costs, and trends in distributed workspace are all helping to boost the adoption of M2M solutions.

Forecasts for the US M2M Communications Markets

Market Forecasts

Exhibit 12 shows the Market Engineering measurements in the Total US M2M Communications Markets in 2012.

EXHIBIT 12

Total M2M Communications Markets: Market Engineering Measurements, US, 2012

Market Engineering Drives Market Strategy and Planning

Measurement Name	Measurement	Trend
Market Stage	Growth	-
Revenues (2012)	$2.048.5 million	Increasing
Potential revenues (maximum future market size)	$4,483.0 million	Increasing
Base year market growth rate (2012)	18.9%	Increasing
Compound annual growth rate (CAGR)	13.9%	-
Price sensitivity	High	Increasing
Customer type	Enterprises from different industry verticals, including Utilities and Industrial, Transportation and Telematics, Security, Retail, Healthcare, Financial Services, and others	Increasing
Competitors (active market competitors in base year)	100-150	Decreasing
Degree of competition	High	Increasing
Degree of technical change	High	Increasing
Customer satisfaction	8	Increasing
Customer loyalty	9	Increasing
Market concentration (percent of base year market controlled by top 3 competitors)	89.6%	Increasing

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 13 and 14 show the connections forecast in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 13

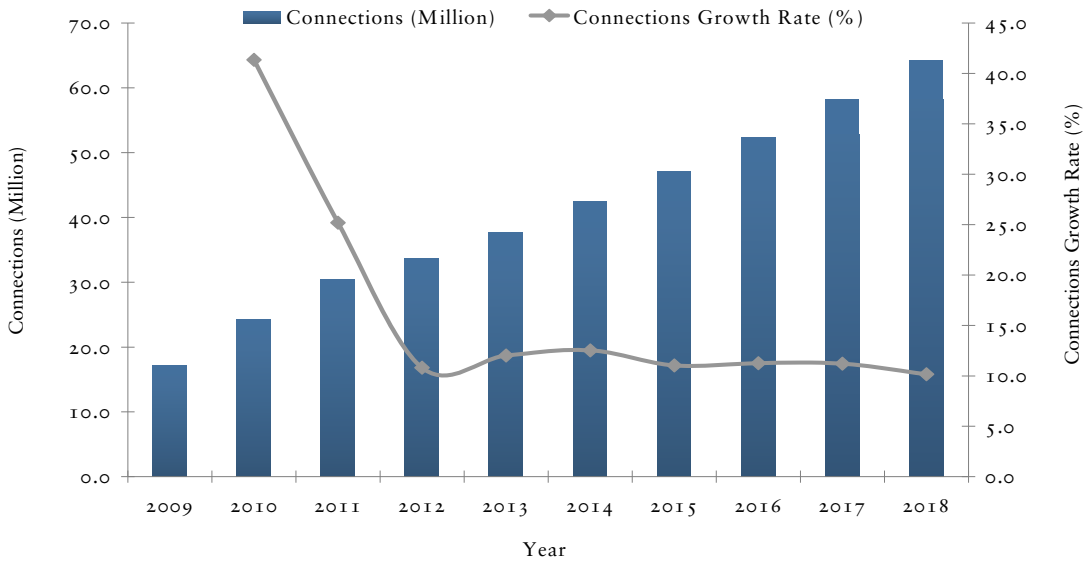
Total M2M Communications Markets: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	17.2	--
2010	24.2	41.4
2011	30.4	25.2
2012	33.6	10.8
2013	37.7	12.0
2014	42.4	12.5
2015	47.1	11.0
2016	52.4	11.3
2017	58.3	11.2
2018	64.2	10.2
Compound Annual Growth Rate (2012-2018): 11.4%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 14

Total M2M Communications Markets: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 15 and 16 show the consumer and enterprise connections forecast in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 15

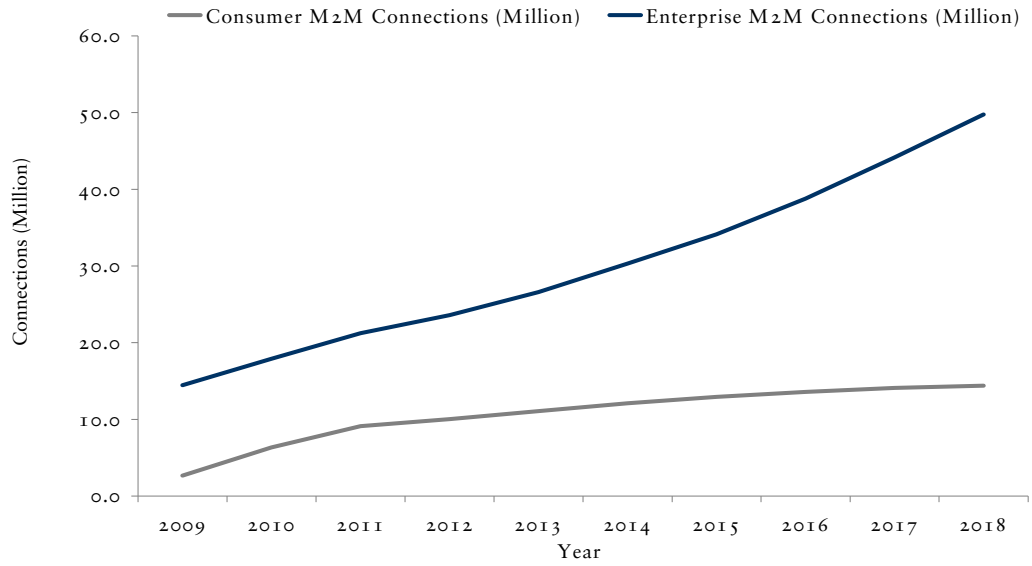
Total M2M Communications Markets: Consumer and Enterprise Connections Forecast, US, 2009-2018

Year	Consumer M2M Connections (Million)	Enterprise M2M Connections (Million)
2009	2.7	14.5
2010	6.4	17.9
2011	9.1	21.2
2012	10.0	23.6
2013	11.1	26.6
2014	12.1	30.3
2015	12.9	34.1
2016	13.6	38.8
2017	14.1	44.2
2018	14.4	49.8

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 16

Total M2M Communications Markets: Consumer and Enterprise Connections Forecast, US, 2009-2018

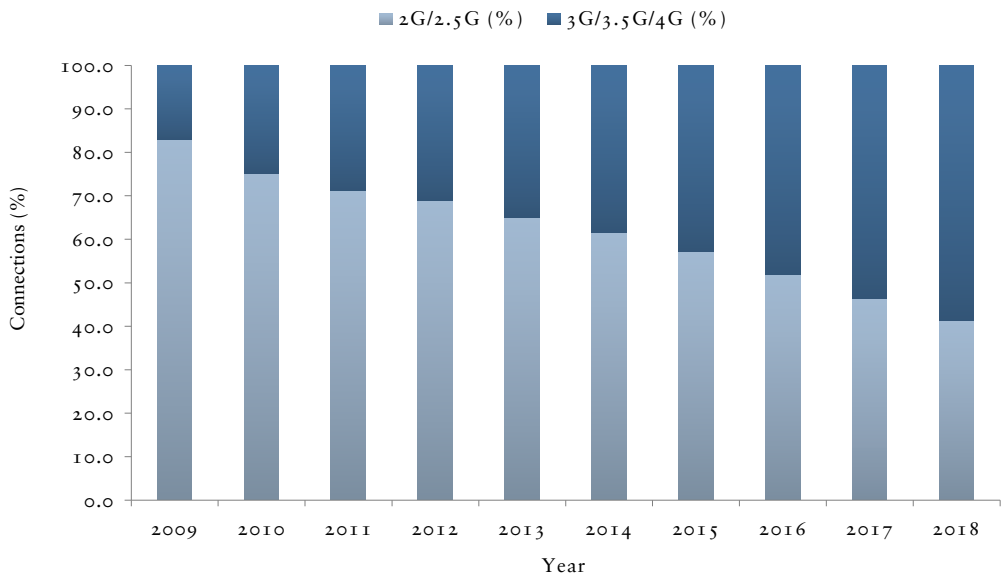


Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibit 17 shows the percent of M2M connections by 2G/2.5G and 3G/3.5G/4G protocols in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 17

Total M2M Communications Markets: Percent of M2M Connections by 2G/2.5G and 3G/3.5G/4G Protocols, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 18 and 19 show the data consumption forecast in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 18

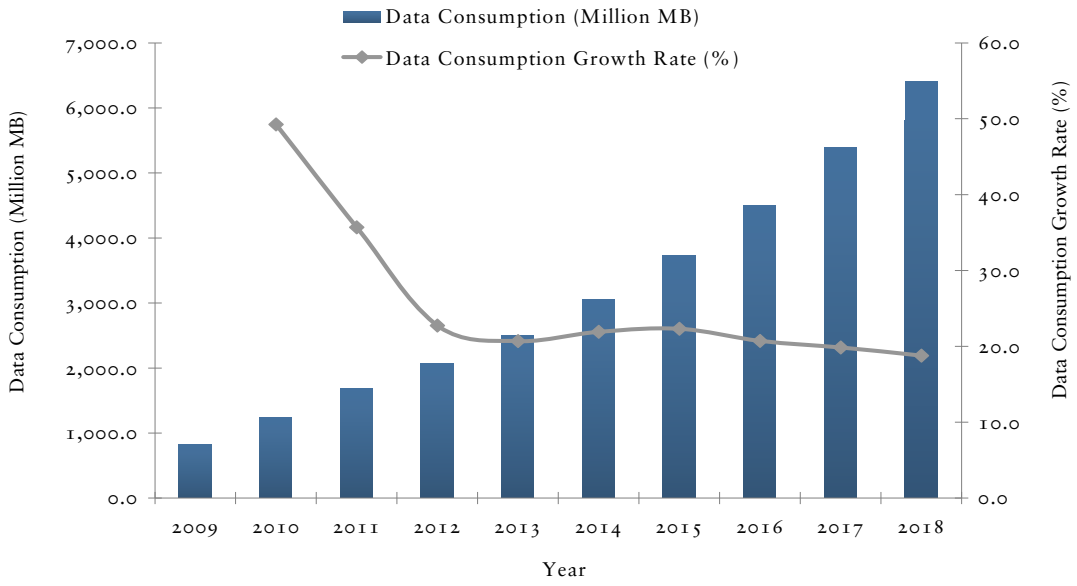
Total M2M Communications Markets: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	833.9	--
2010	1,244.6	49.2
2011	1,688.6	35.7
2012	2,072.5	22.7
2013	2,501.3	20.7
2014	3,049.4	21.9
2015	3,729.8	22.3
2016	4,502.8	20.7
2017	5,396.9	19.9
2018	6,411.1	18.8
Compound Annual Growth Rate (2012-2018): 20.7%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 19

Total M2M Communications Markets: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 20 and 21 show the data access revenue forecast in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 20

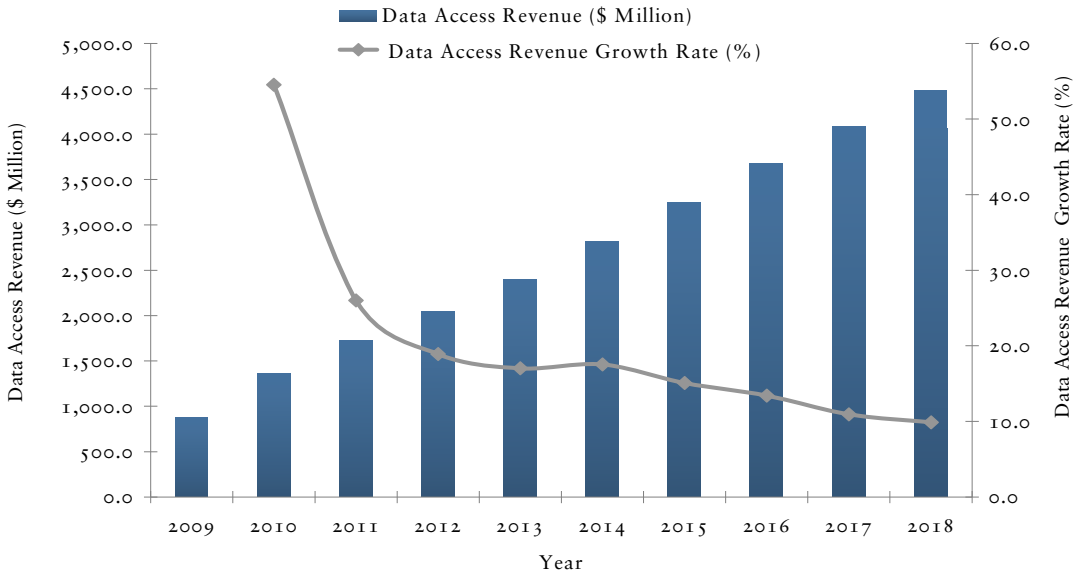
Total M2M Communications Markets: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	884.7	--
2010	1,367.2	54.5
2011	1,722.7	26.0
2012	2,048.5	18.9
2013	2,397.2	17.0
2014	2,817.5	17.5
2015	3,242.4	15.1
2016	3,677.6	13.4
2017	4,080.0	10.9
2018	4,483.0	9.9
Compound Annual Growth Rate (2012-2018): 13.9%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 21

Total M2M Communications Markets: Data Access Revenue Forecast, US, 2009-2018

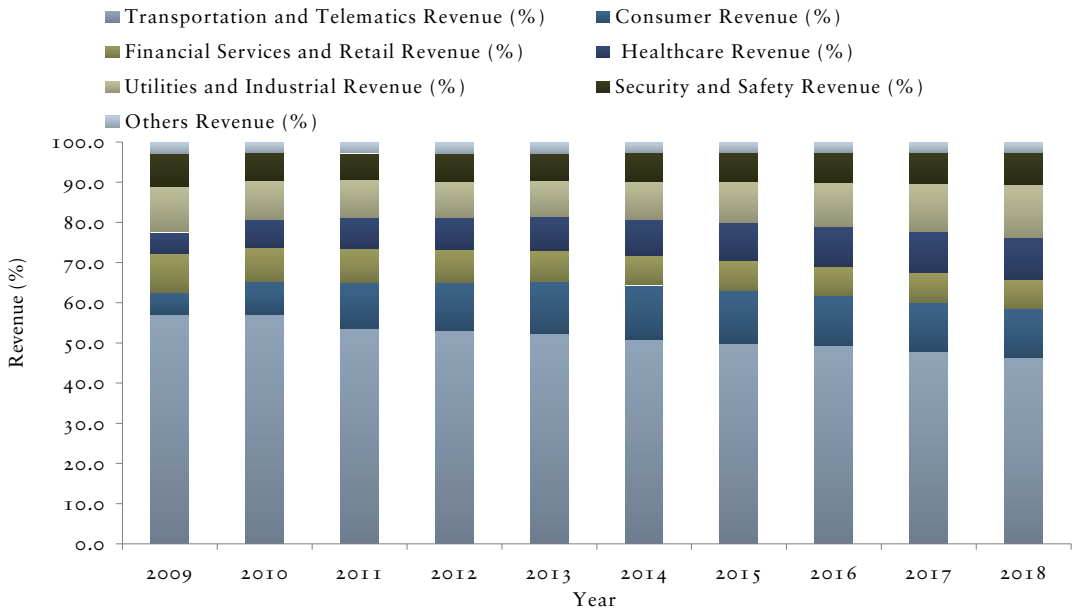


Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibit 22 shows the percent of data access revenue by M2M verticals in the Total US M2M Communications Markets from 2009 to 2018.

EXHIBIT 22

Total M2M Communications Markets: Percent of Data Access Revenue by M2M Verticals, US, 2009-2018



Note: Other revenue opportunities in M2M include ruggedized gateways and routers used in niche industry verticals.

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

The main observations from Exhibits 12 to 22 are as follows:

- The total number of M2M connections in the United States is expected to increase from 33.6 million in 2012 to 64.2 million in 2018. While this is lower than the 2012 forecast from Frost & Sullivan, it does not indicate a lower adoption of wireless in the M2M communications markets. The M2M connectivity architecture of connect-aggregate-transport-monitor leads to multiple connected endpoints supported by a single or a set of gateways. At some point in future, the number of directly connected machines is expected to outnumber the number of mobile phone connections. However, it will take a long time for the pure-play M2M market to generate more revenue that the traditional consumer voice and data services business.
- The share of mobile broadband networks in M2M is expected to increase rapidly during the forecast period. Tier-1 mobile operators, such as AT&T, have announced that they will be switching off the slower 2G networks within the next few years. Frost & Sullivan expects nearly 59.0 percent of M2M connections in the United States to be supported by the high-speed mobile broadband networks in 2018.

- Almost every category is expected to witness increased M2M data consumption on an aggregate basis, as well as on a per unit basis. Total data consumption in the US cellular M2M communications markets is expected to increase from 2,072.5 million MB in 2012 to 6,411.1 million MB in 2018.
- Data access revenue from M2M is expected to increase from $2,048.5 million in 2012 to $4,483.0 million in 2018. These figures are lower than the 2012 forecast from Frost & Sullivan, largely due to the declining base price for M2M connectivity services. It should also be noted that these are just the baseline access revenue. Service providers may be able to levy a "value-driven" pricing, independent of the amount of data consumed as well. Pricing for M2M also depends upon the number of connected units per deployment and per customer, the duration of commitment, the frequency of usage of network resources (such as the number of times a network cloud platform is accessed in a given time period), how a particular M2M application connects/re-connects, need for secure VPNs, static IP, and other technical and business factors.
- Mobile operators can provide wholesale, as well as retail solutions in M2M. The pricing models change accordingly. For example, wholesale M2M data pricing is noticeably more economical than a retail M2M data pricing. However, the wholesale model mandates a higher level of commitment from the entity purchasing the M2M bandwidth.

Competitive and Market Share Analysis

Competitive Analysis

Exhibit 23 shows the competitive structure of the Total US M2M Communications Markets in 2012.

EXHIBIT 23

Total M2M Communications Markets: Competitive Structure, US, 2012

Number of Companies in the Market	100-150—including mobile network operators, M2M MVNOs, M2M hardware providers, M2M cloud providers, application service providers (ASPs), system integrators, professional consulting organizations, M2M platforms providers, and others.
Types of Competitors	Mobile operators, such as Verizon Wireless, AT&T, Sprint Nextel, T-Mobile USA, and U.S. Cellular. M2M virtual network providers/bandwidth resellers-KORE Telematics, RACO Wireless, Numerex Corp, Wyless Inc, Aeris Communications, M2M DataSmart, nPhase, and others. M2M management platform providers-Jasper Wireless, nPhase, Amdocs, and others Application developers and application enablement solution providers-Axeda Corporation, Digi International Inc. Viewbiquity, LLC, and others. M2M Module and Hardware Providers-Sierra Wireless, Telit Communications PLC, Cinterion Wireless Modules GmbH (Gemalto NV), Digi International Inc, and others. M2M Systems Integrators and ASPs
Distribution Structure	Operators can offer M2M solutions directly to the end user (consumer or the enterprise segment) and may also work with partners to offer bandwidth and service management capabilities for M2M connectivity. Third-party hardware providers and M2m application platform providers can also work directly with enterprise customers.
Notable Mergers and Acquisitions	Gemalto acquires Cinterion and SensorLogic. Telit acquires Motorola Solutions' M2M module business unit
Key End-user Groups	Consumer segment-largely for productivity, entertainment, communication, and healthcare applications and services. Enterprise segment-for connecting remote, in-field deployed assets across different industry verticals.
Competitive Factors	Network coverage, ease of M2M solution deployment, availability of vertical solutions and data pricing Asset management and reporting and feedback platforms Strategic M2M MVNO relationships Module and device availability and pricing Long-term strategy for 4G (and ability to overcome the expected 4G challenges of spectrum fragmentation, higher device pricing, and others)

Source: Frost & Sullivan

Mobile Operators

Complexity in M2M solution development and deployment is a major industry challenge. New types of M2M implementations generally need customized support in the form of new device types and form factor, battery management and ergonomics, new pricing models and revenue settlements supported by appropriate rating and mediation capabilities, application support, support for different network and device identifier types, organization training, regulatory requirements, and others. Frost & Sullivan firmly believes that mobile operators that can help address the complexity of M2M solution development and deployment will emerge as the preferred choice for customers in the US M2M communications markets.

Every leading mobile operator has a wholesale and a retail offering for M2M communications, and also has a dedicated team and department focused on generating more business from M2M communications. Tier-1 mobile operators support an array of unique and customized pricing plans for their M2M deployments, which helps to ensure that their customer get a good return on investment from wireless services. For example, data consumption-based pricing may be more suitable for applications that send a predictable stream of packet data, while exception or incident-based pricing is more suitable for certain medical or healthcare solutions. Overall, the five critical "Ps" of M2M include People, Platforms, Pricing, Processes, and Partnerships. These factors are likely to determine which operator will emerge as the leader in the long run in the US M2M communications markets. At present, this position is held by AT&T, in terms of the number of M2M connections. However, other mobile operators are also doing a good job in executing their next-generation M2M strategies and the competitive structure of the US M2M communications markets could look very different in the long-term.

M2M MVNOs

KORE Telematics, Aeris Communications, RACO Wireless, Numerex Corporation, Wyless, and M2M DataSmart are some important M2M MVNOs in the US M2M communications markets. Frost & Sullivan's research indicates that several of these MVNOs support hundreds of thousands (even millions) of M2M connections. Additionally, more than one leading M2M MVNO is known to be growing at a rate higher than the average industry growth rate. It is no coincidence that the SMB segment tends to prefer working with M2M MVNOs for their connectivity requirements. Tier-1 mobile operators also realize the importance of M2M MVNOs in expanding their wholesale M2M business and are actively supporting these entities in any way they can in order to help them in their business.

It is important to note that M2M MVNOs can offer a domestic, multi-network service delivery option to customers. For example, leading M2M MVNOs allow their customers to choose between GSM, CDMA, and LTE technologies and hence select the best option according to their business needs. However, M2M MVNOs have to be "smart" about who they work with to ensure that managing their carrier relationships does not become a challenge for their competitive strategies. In other words, a national and a global coverage should be an asset and not a liability for M2M service providers. For example, any operator that comes on-board has to be fully committed to the success of M2M. It has to be able to provide the required integration, service, and support capabilities to drive the growth of the entire ecosystem. Other parameters, including multiple network technology options, network technology roadmap, cost of roaming, and ability to deliver a unified and integrated global connectivity management service (through cloud-based M2M management platforms) are also important in the context of regional (and global) M2M connectivity.

Market Share Analysis

AT&T remains the leader in the US M2M communications markets with respect to the number of M2M connections. In 2012, it held a share of 48.1 percent. The company ended 2012 with an impressive achievement of nearly 14.3 million direct M2M connections. AT&T continues to significantly expand its product portfolio and has also announced some big wins in M2M communications recently. Other mobile operators, such as Sprint and T-Mobile USA, are also growing at an attractive pace and are preparing their long-term LTE-based M2M strategies. AT&T's decision to stop supporting the 2G network could benefit other operators in the short run. However, the effect is likely to be minimal on AT&T's business and the company is set to usher in its next generation M2M consumer and enterprise solutions.

Exhibits 24 and 25 show the tier-1 mobile operator market share by M2M connections in the Total US M2M Communications Markets in 2012.

EXHIBIT 24

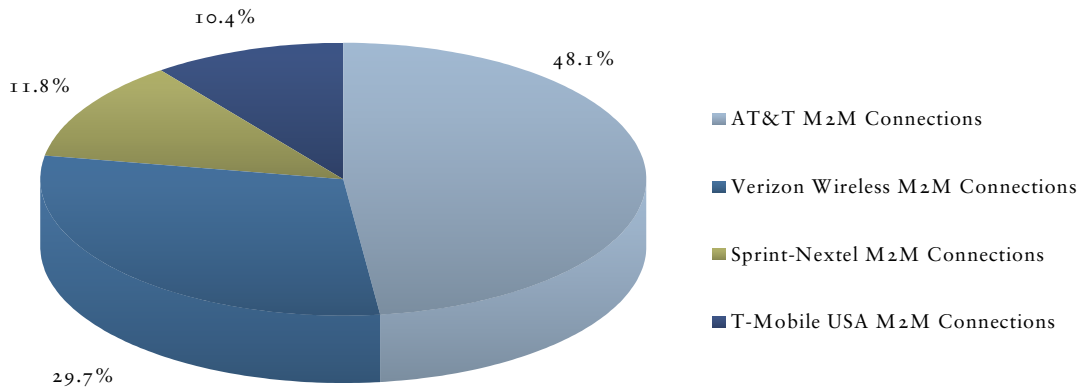
Total M2M Communications Markets: Tier-1 Mobile Operator Market Share by M2M Connections, US, 2012

Company	2012 (%)
AT&T	48.1
Verizon Wireless	29.7
Sprint-Nextel	11.8
T-Mobile USA	10.4
TOTAL	100.0

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 25

Total M2M Communications Markets: Tier-I Mobile Operator Market Share by M2M Connections, US, 2012



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 24 and 25 represent the relative market share by M2M connections (and not by M2M revenue) for tier-1 mobile operators only. Proprietary M2M pricing structure and confidentiality agreements prevent Frost & Sullivan from commenting on mobile operators' market shares by M2M revenue. However, the number of M2M connections are available from financial reports in the public domain and are used to estimate the market shares by connections.

4

Consumer M2M Communications Market

Introduction

Introduction to Consumer M2M Communications

This category consists of direct-to-consumer (or consumer-facing) electronic devices such as eReaders, gaming consoles, connected cameras, picture frames, personal navigation devices, and other specialized communication devices used for serving various communication, information, and entertainment requirements of consumers. Consumer M2M devices tend to have a dedicated rate plan for wireless data services. They may also use an existing M2M rate card. M2M data plans for consumer devices are usually separate from M2M data plans used for the broad category of Mobile Computing devices that include laptops, net books/notebooks, wireless routers, and other similar devices. Mobile operators clearly specify that the data plans applicable to mobile computing cannot be used with any M2M device.

The Consumer market has been a top-performing category for M2M communications. However, it may not be the largest category towards the end of the forecast period. This is not to say that this market will not grow. Innovative devices, such as the connected SAMSUNG Galaxy CameraTM running on AT&T's 4G network, may boost market growth. Moreover, certain consumer devices are grouped with other categories, such as healthcare. This tends to reduce the forecast for this market.

Forecasts for the Consumer M2M Communications Market

Mobile operators have to provide various services to support the business-to-consumer (B2C) and the business-to-business-to-consumer (B2B2C) deployment models that are part of the Consumer M2M communications market. Mobile operators may bill the end customer directly in the case of a B2C model, or work on a wholesale, revenue share, or a fixed amount per month basis for a B2B2C type of service. This also underscores the importance of having appropriate billing and data management systems in the operator's backend to be able to accommodate all these business requirements.

Exhibits 26 and 27 show the connections forecast in the US Consumer M2M Communications Market from 2009 to 2018.

Exhibit 26

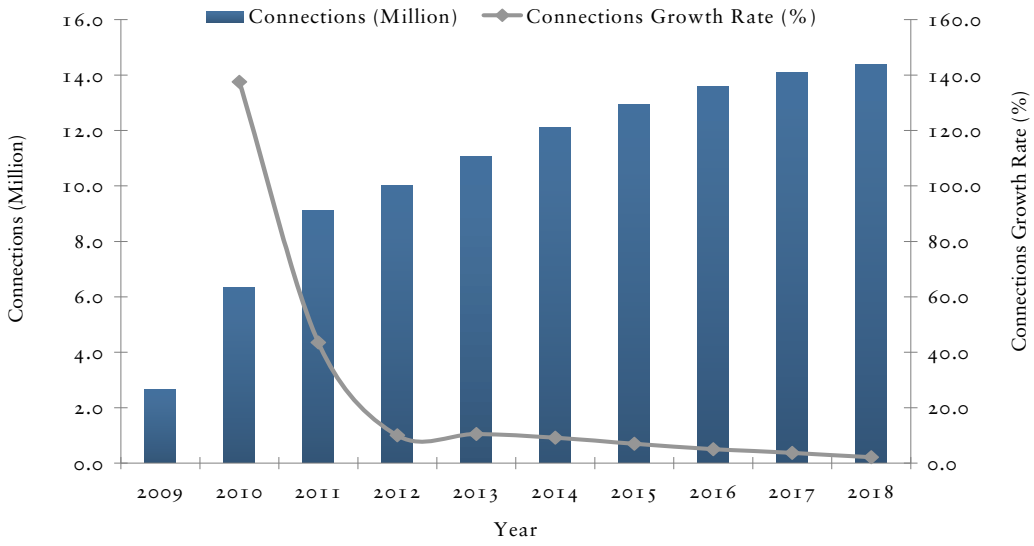
Consumer M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	2.7	--
2010	6.4	137.6
2011	9.1	43.5
2012	10.0	10.0
2013	11.1	10.5
2014	12.1	9.2
2015	12.9	7.0
2016	13.6	5.1
2017	14.1	3.7
2018	14.4	2.1
Compound Annual Growth Rate (2012-2018): 6.2%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 27

Consumer M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 28 and 29 show the data consumption forecast in the US Consumer M2M Communications Market from 2009 to 2018.

EXHIBIT 28

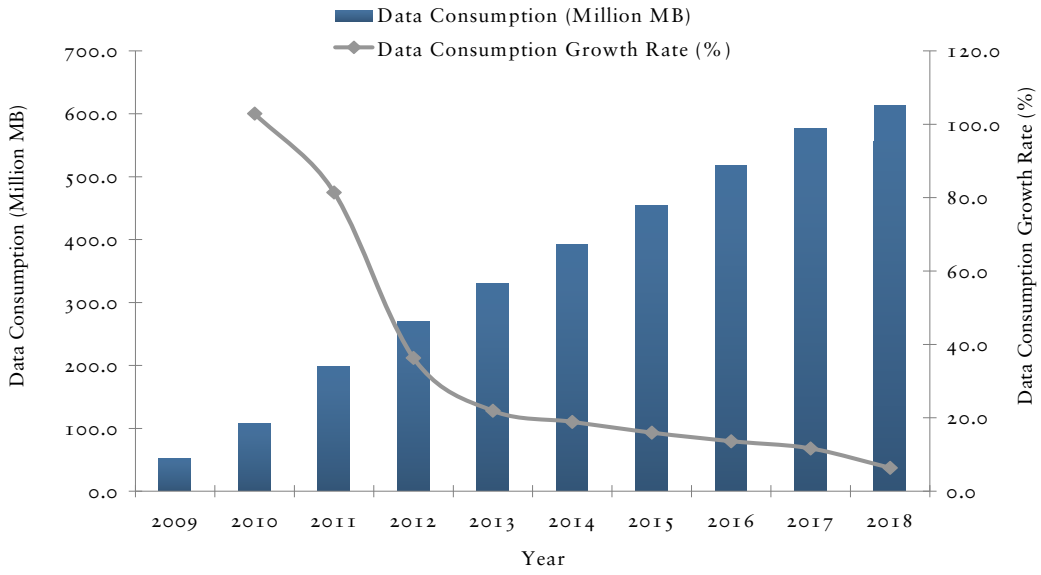
Consumer M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	53.9	--
2010	109.3	102.9
2011	198.4	81.5
2012	270.4	36.3
2013	329.8	21.9
2014	392.2	18.9
2015	454.8	16.0
2016	516.7	13.6
2017	577.1	11.7
2018	613.9	6.4
Compound Annual Growth Rate (2012-2018): 14.6%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 29

Consumer M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 30 and 31 show the data access revenue forecast in the US Consumer M2M Communications Market from 2009 to 2018.

EXHIBIT 30

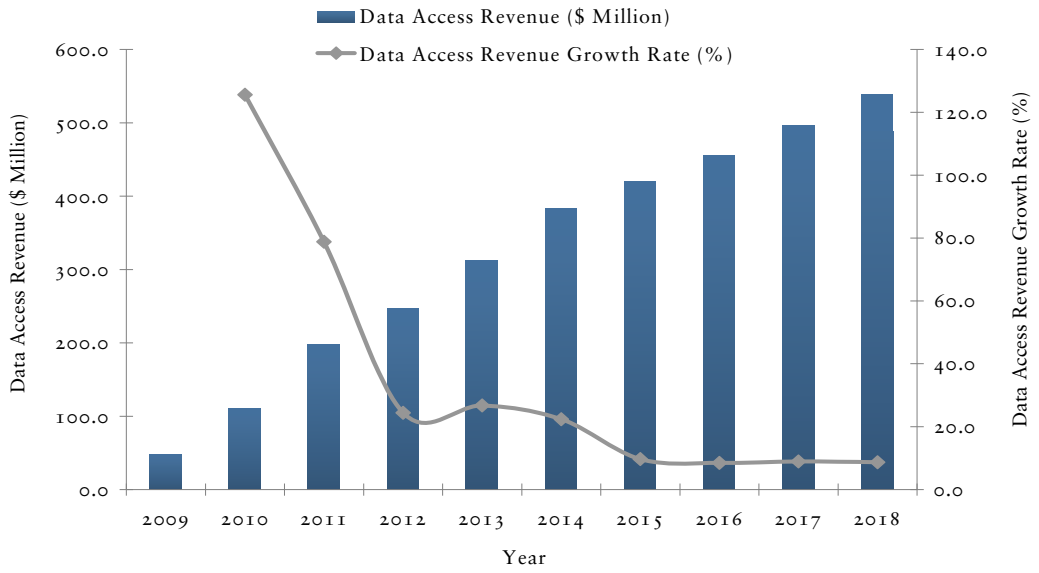
Consumer M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	49.1	--
2010	110.8	125.6
2011	198.2	78.8
2012	246.6	24.4
2013	312.5	26.7
2014	382.5	22.4
2015	419.6	9.7
2016	455.2	8.5
2017	495.9	8.9
2018	538.8	8.7
Compound Annual Growth Rate (2012-2018): 13.9%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 31

Consumer M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 26 to 31 are as follows:

- Total M2M connections in the Consumer market is expected to increase from 10.0 million in 2012 to 14.4 million in 2018.
- Data consumption by M2M devices in the Consumer market is expected to increase from 270.4 million MB in 2012 to 613.9 million MB in 2018.
- Data access revenue from M2M devices in the Consumer market is expected to increase from $246.6 million in 2012 to $538.8 million in 2018.

5

Transportation and Telematics M2M Communications Market

Introduction

Introduction to Transportation and Telematics M2M Communications

Transportation and Telematics is expected to emerge as the largest market in the US M2M communications markets. This market consists mainly of the following types of M2M applications:

- Embedded and aftermarket cellular vehicle telematics for commercial and passenger vehicles—applications include vehicle convenience and safety, vehicle diagnostics, fleet management, vehicle data services (such as in-vehicle WiFi), and others.
- Asset tracking and trace applications, such as package tracking—these may not necessarily be related to a vehicle per-se, but are more related to keeping track of important packages as they are shipped through the supply chain.
- Other related services—these include M2M communications offered to the emerging Electric Vehicle segment.

Forecasts for the Transportation and Telematics Communications Market

Frost & Sullivan firmly believes that Transportation and Telematics M2M communication represents the largest opportunity in wireless M2M. Some key developments and other trends that have an impact on service adoption within this market are as follows:

- Partnership announcement between AT&T and OnStar LLC, a subsidiary of General Motors Corporation (GM)—AT&T has been selected to provide wireless safety, security, diagnostics, and infotainment services to most Chevrolet, Buick, GMC, and Cadillac vehicles, beginning in 2014 in the United States and Canada. The multi-year agreement calls for AT&T to enable millions of GM cars, trucks, and crossovers with 4G LTE mobile internet access, provide the latest wireless technology to power GM's safety and security services offered by OnStar, as well as a new suite of infotainment services, such as streaming audio, web access, applications, and even video for back-seat passengers. AT&T will also enable GM's in-vehicle Wi-Fi hotspots and voice calling services. The partnership will focus on developing new communication applications for the vehicle designed to deliver more efficiency while also enhancing the driving and travelling experience. Frost & Sullivan believes that this is a significant win for AT&T, which will help the company to further consolidate its market leadership position in M2M communications. More importantly, by providing connected car services to entry, mid, and premium passenger car segments, this initiative will help drive adoption of vehicle telematics in the United States. It is also important to note that other leading passenger vehicle OEMs have also adopted a "Connected" strategy and are working with other mobile service providers to embed cellular connectivity within their vehicles. Finally, the availability of various aftermarkets, standards-based solutions also helps to establish wireless connectivity in different vehicles. The embedded, as well as aftermarket segments are likely to see strong demand for replacement sales for wireless modules and other related hardware in order to ensure compatibility with the available cellular network technologies.

- Commercial and fleet vehicles are projected to continue to fuel the demand for connected vehicle services in the United States. Public safety and law enforcement, transportation and logistics, education, construction, railroad, services industry, and various other industry verticals continue to use vehicle telematics to track assets and people and for business process optimization. The usage-based insurance (UBI) segment also continues to grow owing to greater acceptance from consumers. It is no coincidence that solutions for automatic vehicle location (AVL), fleet management, field force management, asset tracking, asset management, and in-vehicle security and surveillance together represent a large percentage of the approved M2M solutions offered by tier-1 mobile operators in the United States. Thus, Transportation and Telematics is one of the fastest growing markets in M2M communications in the United States. This also conforms to the hypothesis that verticals in the M2M industry that have a lot of mobility and movement requirements tend to have higher growth projections.

Exhibits 32 and 33 show the connections forecast in the US Transportation and Telematics M2M communications Market from 2009 to 2018.

EXHIBIT 32

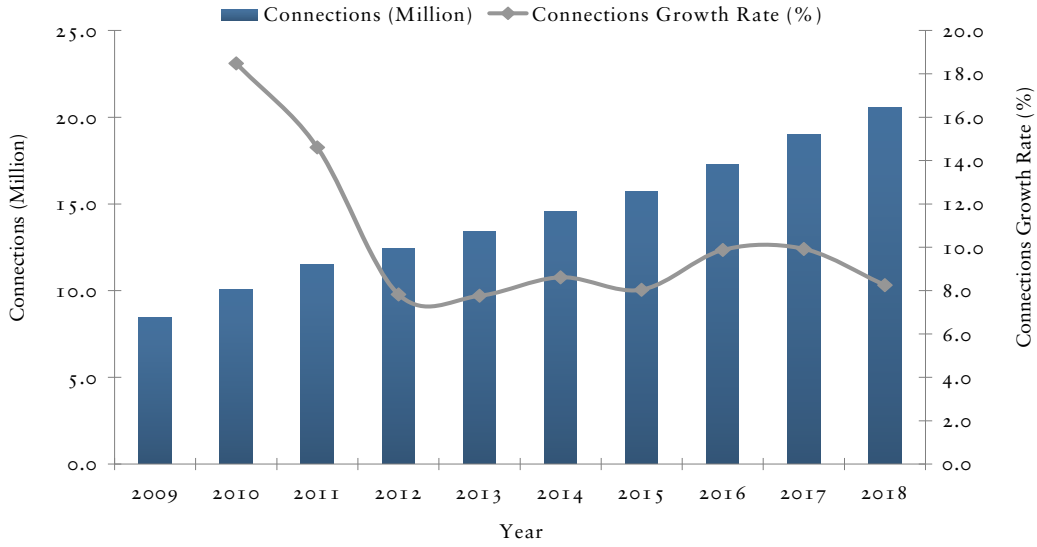
Transportation and Telematics M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	8.5	--
2010	10.1	18.5
2011	11.5	14.6
2012	12.4	7.8
2013	13.4	7.8
2014	14.6	8.6
2015	15.7	8.0
2016	17.3	9.9
2017	19.0	9.9
2018	20.6	8.3
Compound Annual Growth Rate (2012-2018): 8.7%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 33

Transportation and Telematics M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 34 and 35 show the data consumption forecast in the US Transportation and Telematics M2M communications Market from 2009 to 2018.

EXHIBIT 34

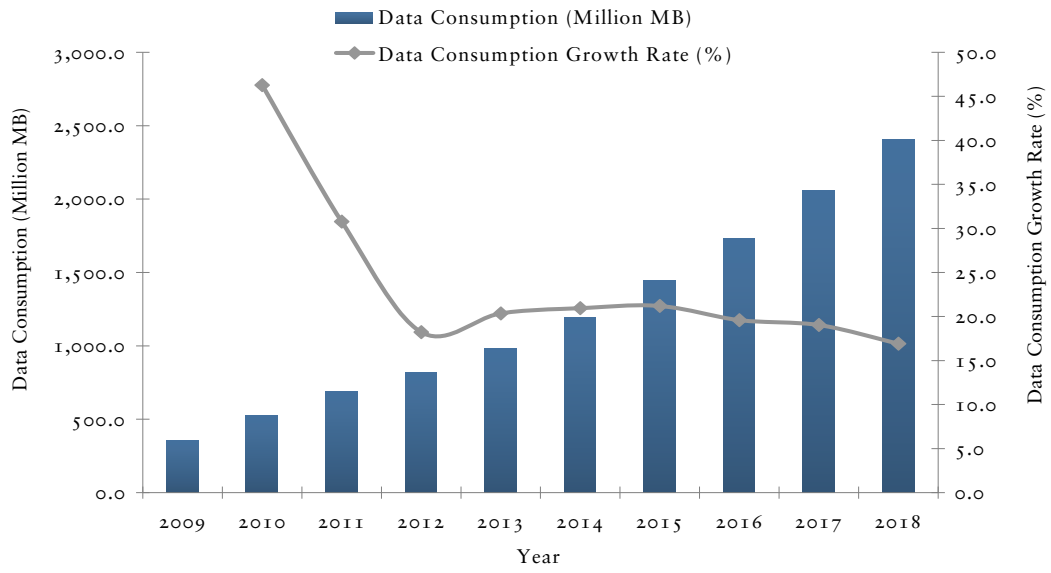
Transportation and Telematics M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	362.1	--
2010	529.6	46.3
2011	692.7	30.8
2012	818.9	18.2
2013	985.5	20.3
2014	1,192.0	20.9
2015	1,444.5	21.2
2016	1,727.4	19.6
2017	2,056.0	19.0
2018	2,403.6	16.9
Compound Annual Growth Rate (2012-2018): 19.7%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 35

Transportation and Telematics M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 36 and 37 show the data access revenue forecast in the US Transportation and Telematics M2M communications Market from 2009 to 2018.

EXHIBIT 36

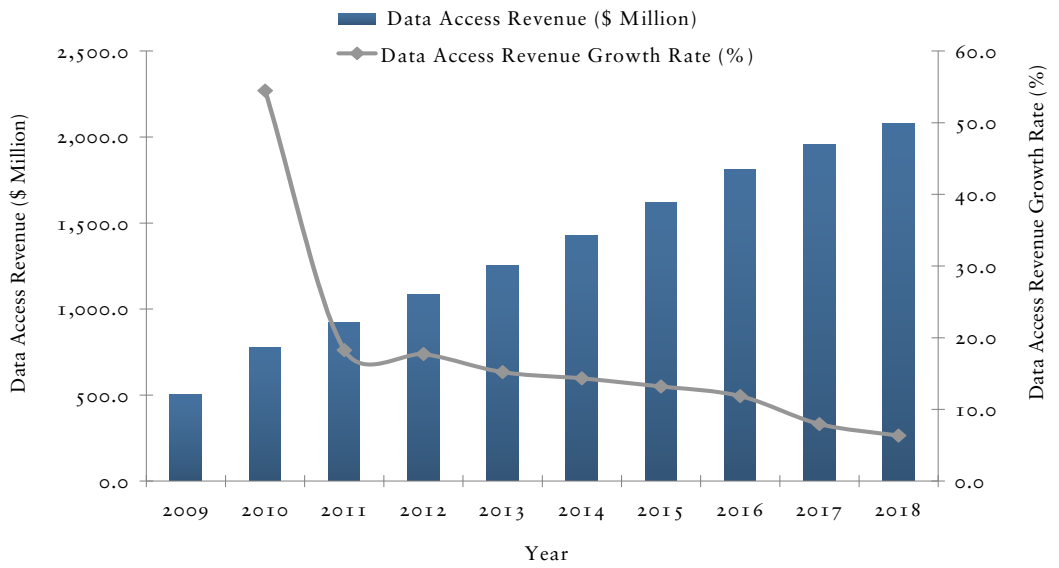
Transportation and Telematics M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	504.4	--
2010	779.3	54.5
2011	921.8	18.3
2012	1,085.3	17.7
2013	1,250.2	15.2
2014	1,429.3	14.3
2015	1,617.9	13.2
2016	1,809.9	11.9
2017	1,954.2	8.0
2018	2,078.3	6.4
Compound Annual Growth Rate (2012-2018): 11.4%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 37

Transportation and Telematics M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 32 to 37 are as follows:

- M2M connections in the Transportation and Telematics market are expected to increase from 12.4 million in 2012 to 20.6 million in 2018.
- Data consumption by M2M devices in the Transportation and Telematics market is expected to increase from 818.9 million MB in 2012 to 2,403.6 million MB in 2018.
- Data access revenue from M2M devices in the Transportation and Telematics market is expected to increase from $1,085.3 million in 2012 to $2,078.3 million in 2018.

6

Financial Services and Retail M2M Communications Market

Introduction

Introduction to Financial Services and Retail M2M Communications

The Financial Services and Retail M2M market is made up of specialized connected devices or solutions that are used for service vending, transaction processing, reporting, authentication, and authorization. Examples of such devices include POS terminals and devices, connected vending machines, kiosks and ATMs, connected coffee brewers and laundry machines, and other self-serve appliances. Digital signage is also included in the retail sub-segment. The Financial sub-segment is generally characterized by low data, high-frequency transactions, while the Retail sub-segment also includes high-bandwidth applications, such as digital signage. In-store video-security deployments are included as part of the Security and Safety M2M market although it can be argued that these should be a part of the Financial Services and Retail M2M market.

Forecasts for the Financial Services and Retail M2M Communications Market

The Financial Services and Retail M2M market continues to grow at a healthy rate. On the financial side, solutions that allow payments to be collected through smartphone devices have become extremely popular, especially in the SMB category. However, such solutions are not considered part of this analysis. From a pure-play Financial Services and Retail M2M perspective, the opportunity in this market will primarily be driven by the large number of specialized wireless-enabled payment terminals and by providing connectivity for vending machines. The migration to cashless vending services is also expected to become a major driver for this market. On the retail side, introduction of nation-wide high-speed 4G LTE networks is expected to support the economical and efficient transfer of large amount of data and boost the adoption of digital signage solutions.

Exhibits 38 and 39 show the connections forecast in the US Financial Services and Retail M2M Communications Market from 2009 to 2018.

Exhibit 38

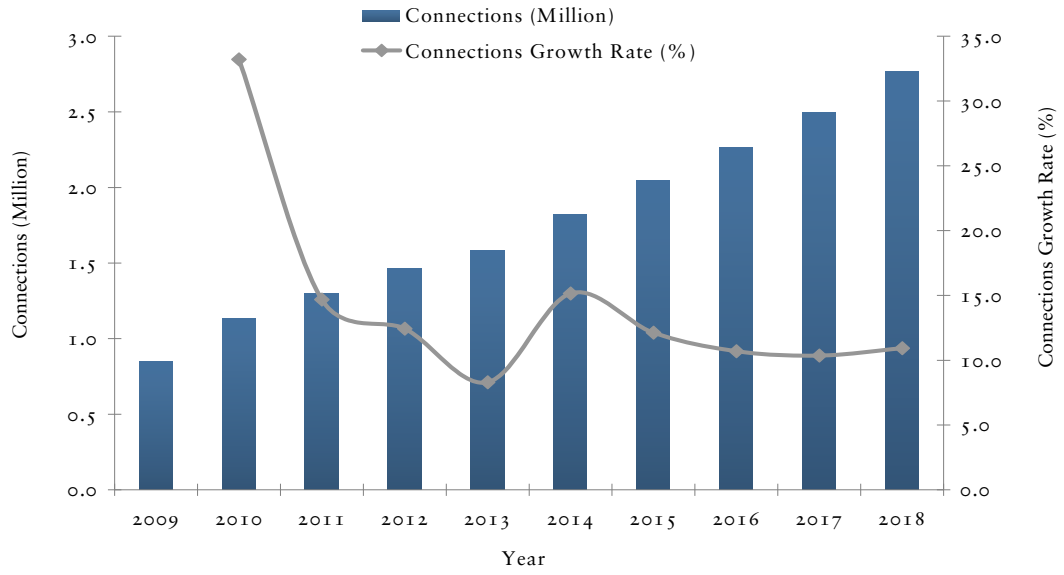
Financial Services and Retail M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	0.9	--
2010	1.1	33.2
2011	1.3	14.7
2012	1.5	12.4
2013	1.6	8.3
2014	1.8	15.2
2015	2.0	12.1
2016	2.3	10.7
2017	2.5	10.4
2018	2.8	10.9
Compound Annual Growth Rate (2012-2018): 11.2%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 39

Financial Services and Retail M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 40 and 41 show the data consumption forecast in the US Financial Services and Retail M2M Communications Market from 2009 to 2018.

EXHIBIT 40

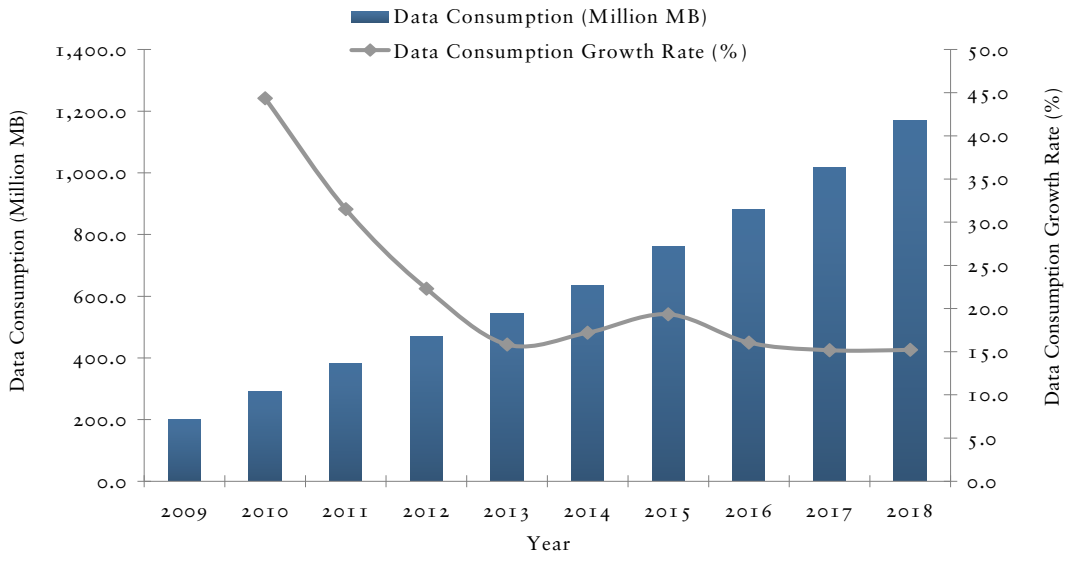
Financial Services and Retail M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	201.9	--
2010	291.5	44.4
2011	383.4	31.5
2012	468.8	22.3
2013	543.1	15.8
2014	636.6	17.2
2015	759.7	19.3
2016	881.7	16.1
2017	1,015.5	15.2
2018	1,170.0	15.2
Compound Annual Growth Rate (2012-2018): 16.5%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 41

Financial Services and Retail M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 42 and 43 show the data access revenue forecast in the US Financial Services and Retail M2M Communications Market from 2009 to 2018.

EXHIBIT 42

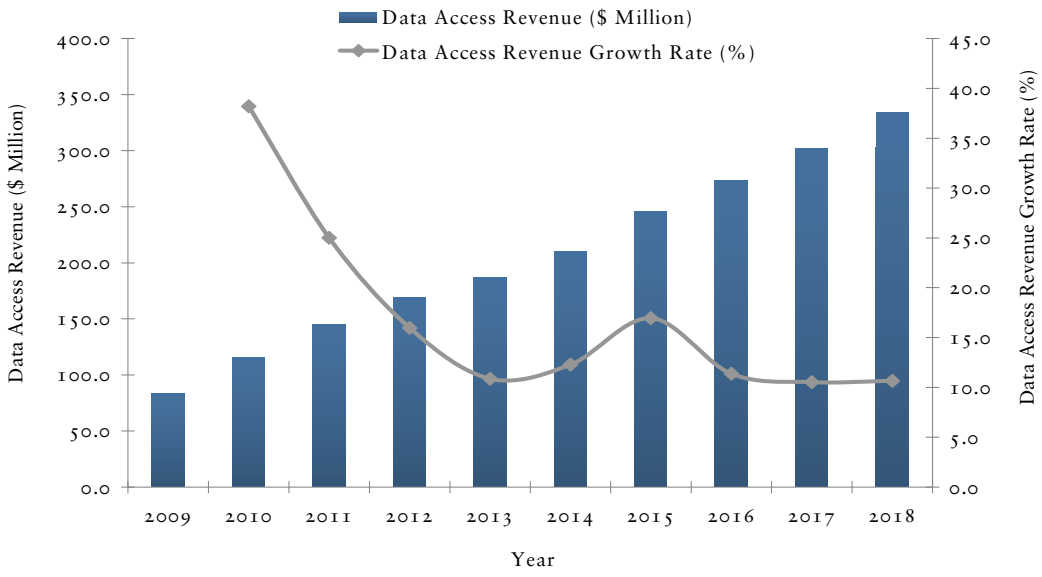
Financial Services and Retail M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	84.2	--
2010	116.3	38.2
2011	145.4	25.0
2012	168.6	16.0
2013	187.0	10.9
2014	209.9	12.3
2015	245.5	16.9
2016	273.4	11.4
2017	302.2	10.5
2018	334.4	10.7
Compound Annual Growth Rate (2012-2018): 12.1%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 43

Financial Services and Retail M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 38 to 43 are as follows:

- Total M2M connections in the Financial Services and Retail market are expected to increase from 1.5 million in 2012 to 2.8 million in 2018.
- Data consumption by M2M devices in the Financial Services and Retail market is expected to increase from 468.8 million MB in 2012 to 1,170.0 million MB in 2018.
- Data access revenue from M2M devices in the Financial Services and Retail market is expected to increase from $168.6 million in 2012 to $334.4 million in 2018.

7

Healthcare M2M Communications Market

Introduction

Introduction to Healthcare M2M Communications

M2M opportunity in the Healthcare market is defined by connected, specialized devices and applications that serve the connectivity and reporting needs of the healthcare providers and patients and are used in the hospitals, pharmacies, private residences, or nursing homes. Examples of such devices include wireless peripherals for patient monitoring (such as Verizon SureResponse Personal Monitor, Cardio Net's MCOT wireless heart monitor system, and Braemar's Cardiac Event Monitors), and dosage monitoring products such as Vitality Glow-caps. Smartphone-based healthcare solutions that provide physical collaboration, patient and equipment monitoring, drug reference and dosage confirmation, and other services are not considered in this analysis.

Market Opportunity and Forecasts

Forecasts for the Healthcare M2M Communications Market

From a mobile operator's perspective, data pricing, fixed pricing over device lifetime, and value-based pricing remain the main revenue opportunities in the Healthcare M2M market. Some healthcare devices can be deployed for a certain time period (for example, to monitor heart rates over a period of 30 days) and the device OEM may reimburse the mobile operator for the network usage. In other words, the person using the healthcare device may not be directly responsible for paying the wireless data charges. In other cases, there may be a monthly service charge for the actual user of the Healthcare M2M solution—either billed by the mobile operator or through a credit card—that can be shared between the M2M solution provider (or the enterprise customer offering that particular solution) and the mobile operator. Certain consumer-oriented healthcare solutions may also be classified into the "Consumer" M2M category.

Several mobile operators consider the Healthcare market to be of utmost importance. The market's data storage, cloud computing, secure communication, and transmission needs make it an ideal choice for providing communication, monitoring, and collaboration solutions. Consequently, Healthcare M2M may be included as a sub-segment within the entire Healthcare Mobility market.

Exhibits 44 and 45 show the connections forecast in the US Healthcare M2M Communications Market from 2009 to 2018.

EXHIBIT 44

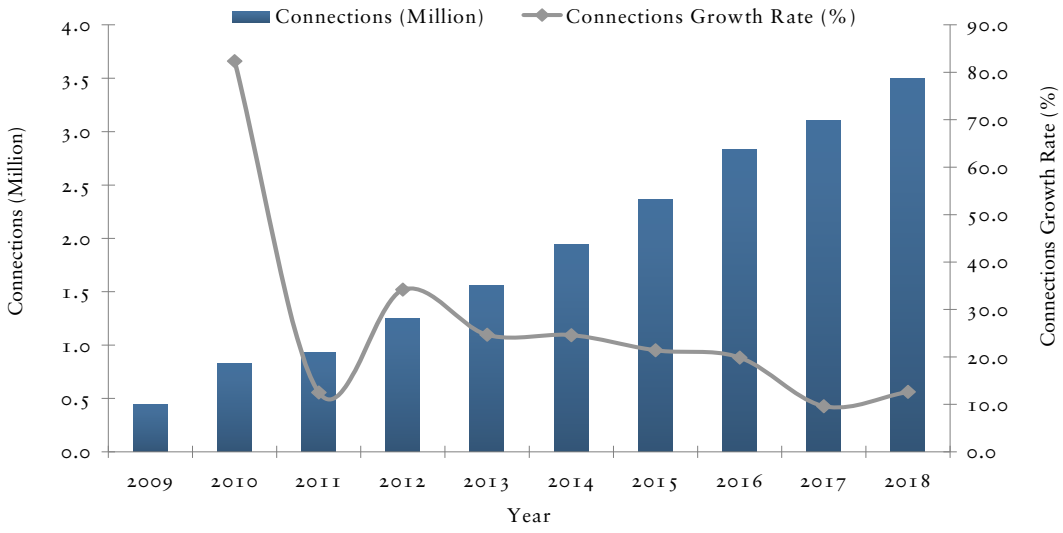
Healthcare M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	0.5	--
2010	0.8	82.4
2011	0.9	12.5
2012	1.3	34.2
2013	1.6	24.7
2014	1.9	24.6
2015	2.4	21.4
2016	2.8	19.9
2017	3.1	9.6
2018	3.5	12.6
Compound Annual Growth Rate (2012-2018): 18.7%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 45

Healthcare M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 46 and 47 show the data consumption forecast in the US Healthcare M2M Communications Market from 2009 to 2018.

EXHIBIT 46

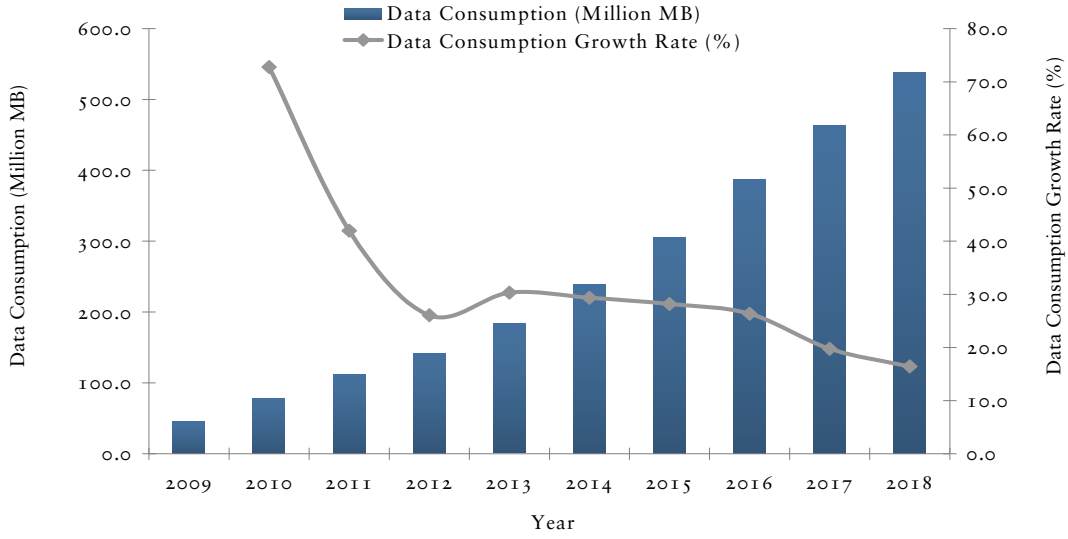
Healthcare M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	45.8	--
2010	79.1	72.8
2011	112.3	42.0
2012	141.6	26.1
2013	184.5	30.3
2014	238.6	29.3
2015	305.8	28.2
2016	386.3	26.3
2017	462.7	19.8
2018	538.5	16.4
Compound Annual Growth Rate (2012-2018): 24.9%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 47

Healthcare M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 48 and 49 show the data access revenue forecast in the US Healthcare M2M Communications Market from 2009 to 2018.

EXHIBIT 48

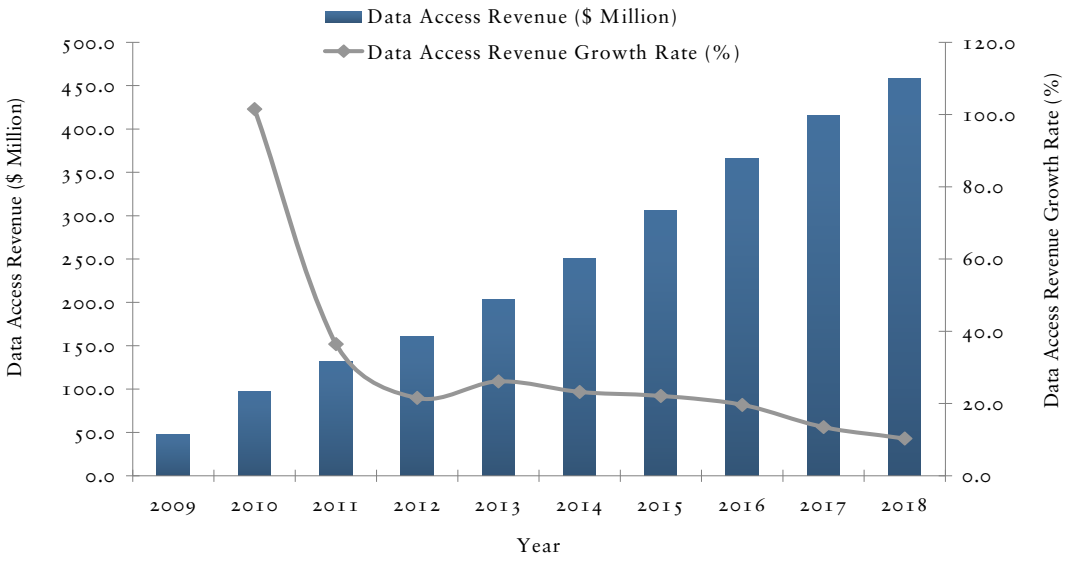
Healthcare M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	48.3	--
2010	97.2	101.5
2011	132.7	36.5
2012	161.2	21.5
2013	203.4	26.1
2014	250.6	23.2
2015	305.9	22.1
2016	366.0	19.6
2017	415.3	13.5
2018	458.1	10.3
Compound Annual Growth Rate (2012-2018): 19.0%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 49

Healthcare M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 44 to 49 are as follows:

- The total number of M2M connections in the Healthcare market is expected to increase from 1.3 million in 2012 to 3.5 million in 2018.
- Data consumption by M2M devices in the Healthcare market is expected to increase from 141.6 million MB in 2012 to 538.5 million MB in 2018.
- Data access revenue from M2M devices in the Healthcare market is expected to increase from $161.2 million in 2012 to $458.1 million in 2018.

8

Utilities and Industrial M2M Communications Market

Introduction

Introduction to Utilities and Industrial M2M Communications

Opportunities in the Utilities and Industrial M2M market consist of providing wireless connectivity to specialized devices and modules for service management, such as monitoring of water, gas, and electricity usage and for industrial use, such as supervisory control and data acquisition (SCADA), building automation, and remote machine diagnostics (enhancing the automation of industrial, infrastructure, or facility-based processes). These could be two separate segments by themselves. However, for the purpose of this research, Frost & Sullivan has combined the utility and the industrial M2M opportunities into one market. The home automation opportunity, which is emerging as a strategic solution for US mobile operators, is also included within this market.

Forecasts for the Utilities and Industrial M2M Communications Market

Various pilot programs are underway in the field of Smart Energy in the United States. This industry continues to work on data traffic "aggregation" model, where the cellular connectivity may or may not extend directly all the way to the endpoint (or device) that is being monitored or controlled. Remote monitoring of assets in the agriculture and energy sectors including oil and gas are also some major application areas for M2M in the Utilities and Industrial market. Mobile operators, such as AT&T, continue to work with strategic partners to bring complete remote monitoring, home automation and smart grid and utility solutions to the market. For example, AT&T's Digital Life is a web-based remote monitoring and automation platform that is targeted at the home automation and home security market. Mobile operators believe that Connected Home solutions can help them increase their ARPU anywhere between $3 and $10 per connected home. Mobile operators clearly believe that their strategic assets, such as cloud platforms, help them to serve the needs of this high-value segment and thereby expand their offerings beyond voice, video, and data to Connected Home services. Discussions have also been held over allowing utility companies to leverage the nationwide public safety LTE network to provide Smart Grid services. However, the final outcome of these initiatives remains unclear.

The Utilities and Industrial market is projected to have one of the highest, if not the highest, number of direct M2M connections. For example, out of approximately 150 million electricity meters presently deployed in the United States, even a 10 percent penetration of cellular connectivity to meters will result in more than 15 million meters being connected. The term Advanced Metering Infrastructure (AMI) is also used to refer to these types of deployments. However, AMI is a subset of the overall smart utility framework that envisions digital communication overlays and interfaces with the utility networks. Within the utility segment, various short-range technologies will continue to co-exist with the cellular networks(that are used to provide long-range backhaul services). Historically, 900 MHz RF Mesh, tower-based smart meter communications and short-range wireless technologies, such as ZigBee and others based on the 802.15.4 standard, have been used for WAN access, neighborhood area networks (NANs), and home area networks (HANs), while cellular connectivity has been largely used for facilitating backend connectivity.

Embedded modules or specialized devices and external wireless gateways and routers are used within industrial, manufacturing, fabrication, and other production environments. Hardware and software solutions exist to connect industrial systems, such as programmable logic controllers (PLC), sensors, and other equipment that use standard industrial communication protocols, to M2M applications over cellular networks. Intelligent M2M gateways that enable communication between reporting agents that leverage different types of machine protocols to the enterprise backend platforms over cellular networks are an example of how wireless M2M can be used within an industrial environment. The main opportunity for wireless hardware providers and MNOs exist in providing connectivity devices to facilitate a wide range of telemetry and SCADA applications to facilitate management of remote assets. These industrial routers are likely to have a separate pricing plan, which may be different from the pricing plan for consumer-oriented wireless routers.

Exhibits 50 and 51 show the connections forecast in the US Utilities and Industrial M2M Communications Market from 2009 to 2018.

EXHIBIT 50

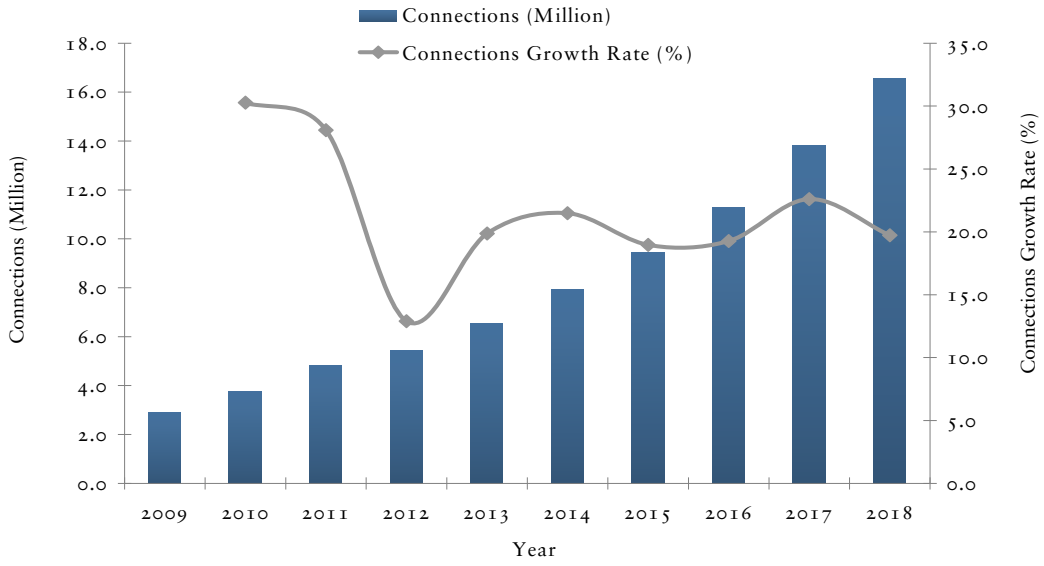
Utilities and Industrial M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	2.9	--
2010	3.8	30.3
2011	4.8	28.1
2012	5.5	12.9
2013	6.5	19.9
2014	7.9	21.5
2015	9.5	19.0
2016	11.3	19.3
2017	13.8	22.6
2018	16.6	19.7
Compound Annual Growth Rate (2012-2018): 20.3%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 51

Utilities and Industrial M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 52 and 53 show the data consumption forecast in the US Utilities and Industrial M2M Communications Market from 2009 to 2018.

EXHIBIT 52

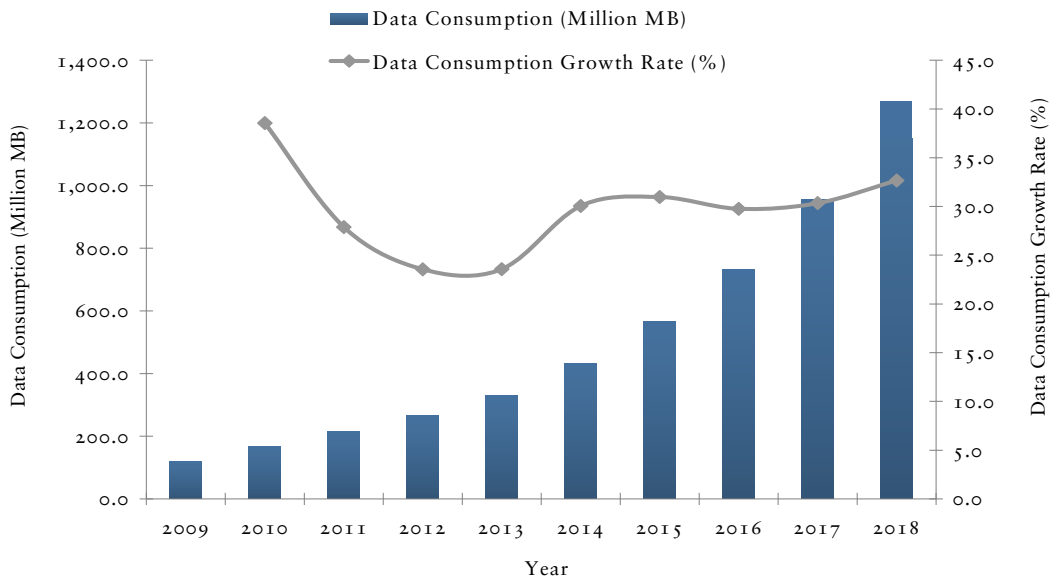
Utilities and Industrial M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	122.6	--
2010	169.9	38.6
2011	217.3	27.9
2012	268.5	23.6
2013	331.8	23.6
2014	431.5	30.0
2015	565.2	31.0
2016	733.4	29.8
2017	955.9	30.3
2018	1,268.2	32.7
Compound Annual Growth Rate (2012-2018): 29.5%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 53

Utilities and Industrial M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 54 and 55 show the data access revenue forecast in the US Utilities and Industrial M2M Communications Market from 2009 to 2018.

EXHIBIT 54

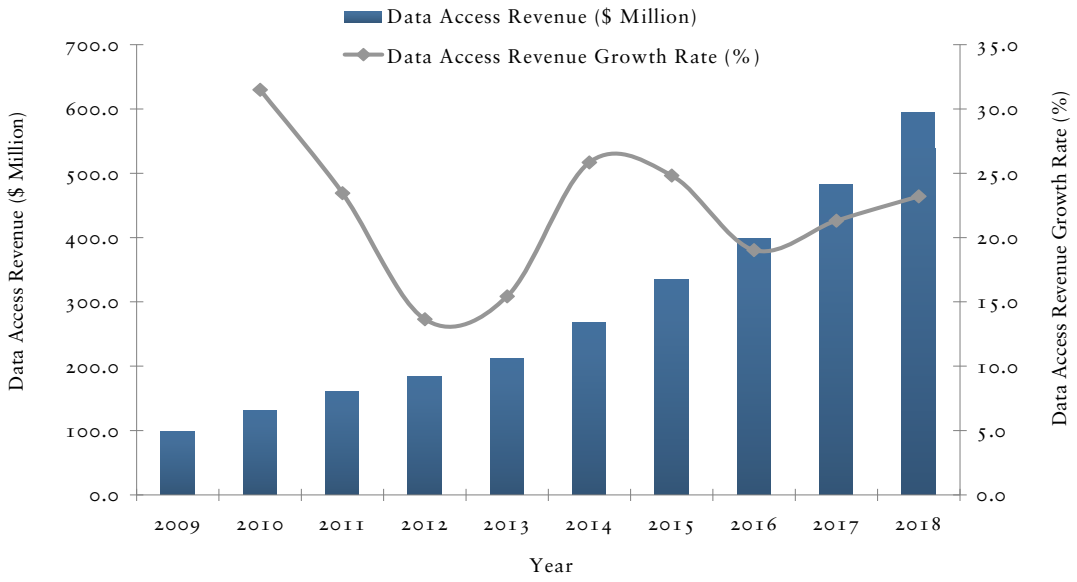
Utilities and Industrial M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	99.9	--
2010	131.3	31.5
2011	162.1	23.4
2012	184.3	13.7
2013	212.7	15.4
2014	267.7	25.8
2015	334.1	24.8
2016	397.7	19.0
2017	482.5	21.3
2018	594.5	23.2
Compound Annual Growth Rate (2012-2018): 21.6%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 55

Utilities and Industrial M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 50 to 55 are as follows:

- The total number of M2M connections in the Utilities and Industrial market is expected to increase from 5.5 million in 2012 to 16.6 million in 2018.
- Data consumption by M2M devices in the Utilities and Industrial market is expected to increase from 268.5 million MB in 2012 to 1,268.2 million MB in 2018.
- Data access revenue from M2M devices in the Utilities and Industrial market is expected to increase from $184.3 million in 2012 to $594.5 million in 2018.

9

Security and Safety M2M Communications Market

Introduction

Introduction to Security and Safety M2M Communications

The Security and Safety M2M market largely includes vertical applications and devices that serve the surveillance and security needs of consumers, enterprises, and law enforcement agencies. These applications and devices are primarily used for intrusion detection, remote surveillance, access control, curfew enforcement, individual/offender monitoring, and even alcohol monitoring and home surveillance. Some of the security applications, such as remote monitoring and surveillance, could be classified as belonging to other verticals, such as industrial and home automation, part of the Utilities and Industrial market, vehicle telematics, or asset tracking and tracing. Consequently, it is important to think of both, the device and application type, as well as the context, when defining the opportunity for this market.

Market Opportunity and Forecasts

Forecasts for the Security and Safety M2M Communications Market

The advent of high-speed 4G LTE wireless networks is expected to support the demand from high-bandwidth security and surveillance machine-to-machine (M2M) applications. The deployment of the National Public Safety Broadband Network (NPSBN)—which is a 4G network—is also likely to drive growth of high-bandwidth video-based security applications. However, there are certain important parameters that should be considered before deploying any wireless/cellular safety and surveillance implementation.

- Bandwidth Limitations of Cellular Networks—at any given point in time, tens (or hundreds) of thousands of devices may be attempting to access the network's resources. Depending upon the network traffic conditions, the amount of bandwidth available for video surveillance can vary widely. An effective understanding of the actual ground situation can only be achieved by delivering clear images in real-time or near-real-time. This makes it critical to leverage advanced solutions that can intelligently shape the data stream to manage the quality of experience according to the prevailing network traffic conditions.

- Situational Awareness—it is impossible to make critical decisions with incomplete information. There is a wealth of enterprise/organization data that resides in the operations center of various surveillance and monitoring implementations. These include, but are not limited to, maps and building plans including the layouts of different building automation systems and utility networks, and the employee list and their personal access codes. Mobilizing all these data sets and providing them in a single interface can help in presenting a complete picture of the ground realities, which is critical for an effective and safe response to incidents.

- Monitoring, Interacting, and Controlling On-site Platforms—Remotely closing the doors of a classroom, to contain a person with a firearm in a school is one example of such a system. Similarly, containing a fire in a building by activating the backup fire extinguishing system from a safe distance can help prevent loss of lives and material. Any solution that can interact with different automated building management systems from a safe distance can be extremely valuable in case of an emergency. Such implementations can also be used by organizations to improve efficiency in daily operations. For example, city authorities could use interactive implementations to re-route traffic according to congestion levels in different parts of a city, thereby improving traffic management.

Alarm and monitoring services can be provided as a package to customers. These services can be bundled into the price of the product or offered on a subscription basis. Certain solutions may use a special-purpose SIM card (or a user identify module) provided by the mobile operator or may already have an in-built connectivity module. The subscriber then needs to pay for usage according to the pricing specified by the solution providers. This is generally true for cellular alarm systems and remote home monitoring solutions. Device OEMs can also provide offender monitoring solutions to appropriate Government or law enforcement agencies that can use these to monitor suspects or convicts. It is generally the device OEM's responsibility to work with the cellular operator to reimburse them for providing connectivity, such as direct data access, location determination services, etc. Tracking devices may also be integrated with smartphone or cell phone-based access and monitoring, which could command a premium.

Exhibits 56 and 57 show the connections forecast in the US Security and Safety M2M Communications Market from 2009 to 2018.

EXHIBIT 56

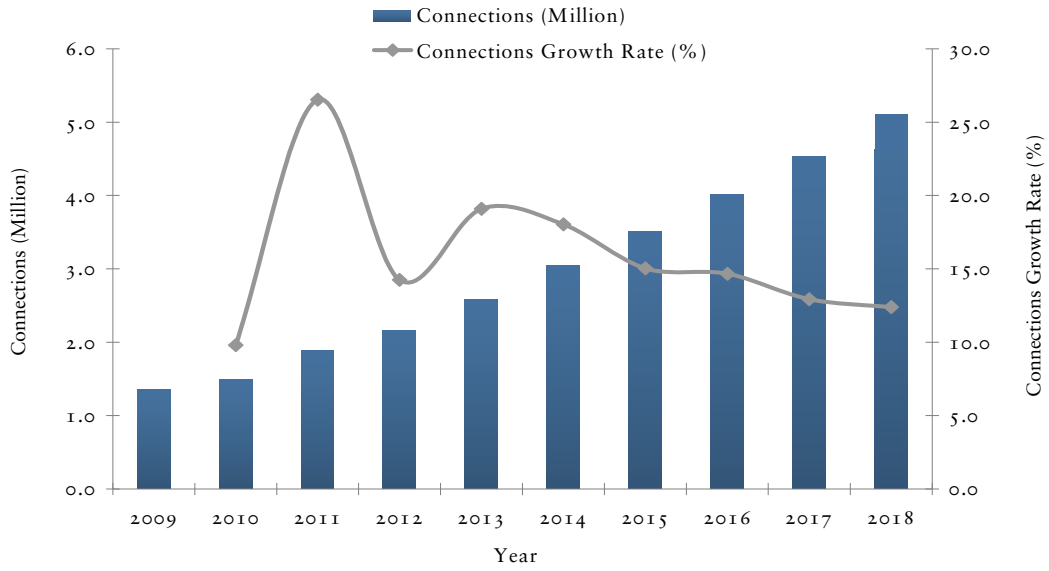
Security and Safety M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	1.4	--
2010	1.5	9.8
2011	1.9	26.5
2012	2.2	14.3
2013	2.6	19.1
2014	3.0	18.0
2015	3.5	15.0
2016	4.0	14.7
2017	4.5	12.9
2018	5.1	12.4
Compound Annual Growth Rate (2012-2018): 15.3%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 57

Security and Safety M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 58 and 59 show the data consumption forecast in the US Security and Safety M2M Communications Market from 2009 to 2018.

EXHIBIT 58

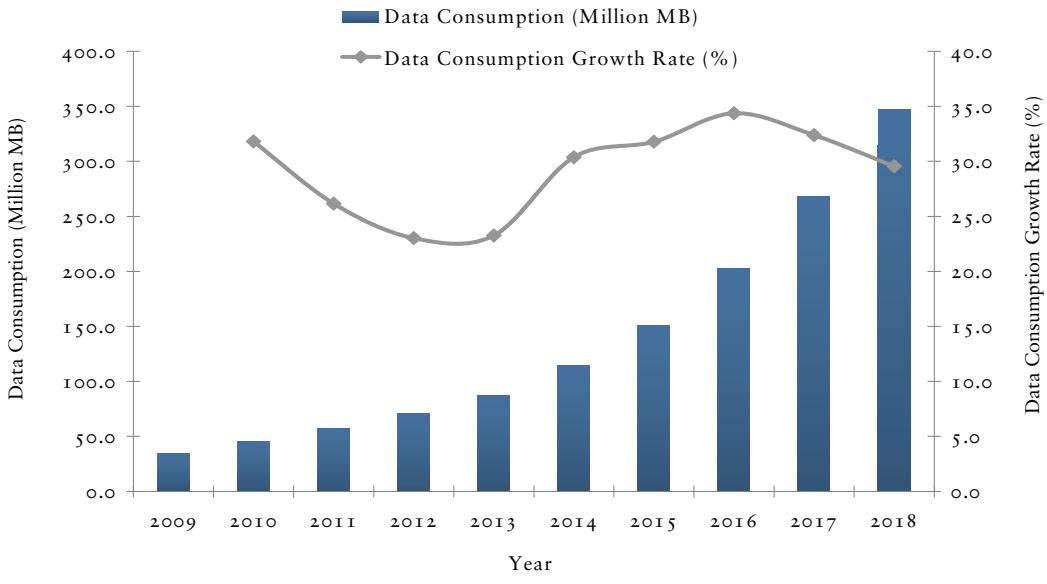
Security and Safety M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	34.8	--
2010	45.8	31.8
2011	57.8	26.2
2012	71.1	23.0
2013	87.7	23.3
2014	114.3	30.4
2015	150.7	31.8
2016	202.4	34.4
2017	267.9	32.4
2018	347.2	29.6
Compound Annual Growth Rate (2012-2018): 30.2%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 59

Security and Safety M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 60 and 61 show the data access revenue forecast in the US Security and Safety M2M Communications Market from 2009 to 2018.

EXHIBIT 60

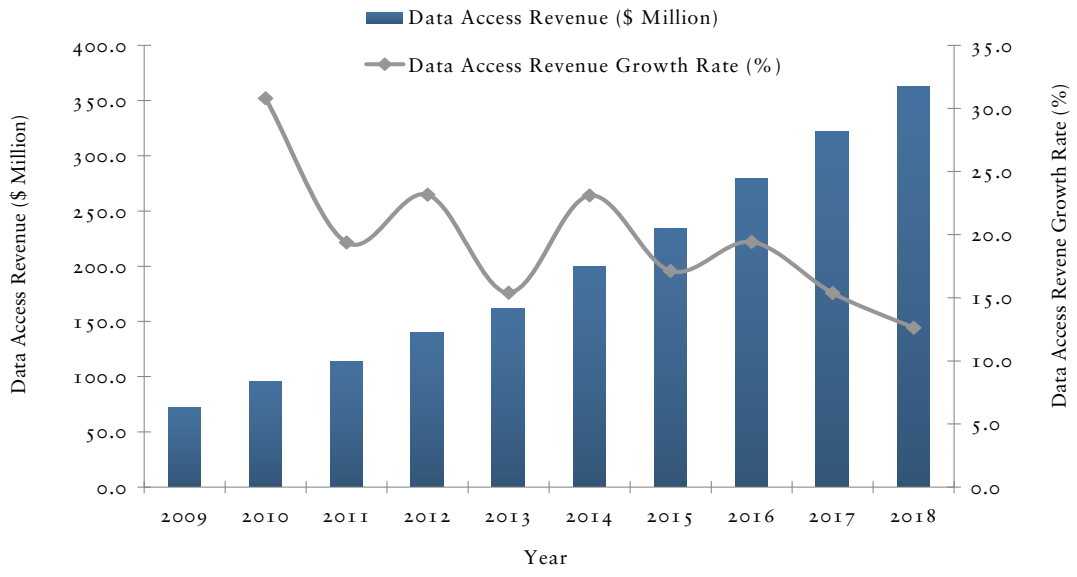
Security and Safety M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	73.1	--
2010	95.6	30.8
2011	114.1	19.4
2012	140.5	23.2
2013	162.1	15.4
2014	199.6	23.1
2015	233.8	17.1
2016	279.1	19.4
2017	322.0	15.4
2018	362.7	12.6
Compound Annual Growth Rate (2012-2018): 17.1%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 61

Security and Safety M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 56 to 61 are as follows:

- The total number of M2M connections in the Security and Safety market is expected to increase from 2.2 million in 2012 to 5.1 million in 2018.
- Data consumption by M2M devices in the Security and Safety market is expected to increase from 71.1 million MB in 2012 to 347.2 million MB in 2018.
- Data access revenue from M2M devices in the Security and Safety market is expected to increase from $140.5 million in 2012 to $362.7 million in 2018.

10

Other M2M Opportunities

Introduction

Introduction to "Others" M2M Communications Opportunities

The "Others" category includes unique M2M devices and solutions that may not be included in any pre-defined category. These are largely used by the enterprise vertical. For example, certain horizontal M2M solutions, such as ruggedized gateways and routers, can be used across different industry verticals, some of which may be quite unique and not easily classified into various markets. This market includes all these deployments.

Market Opportunity and Forecasts

Forecasts for the "Others" M2M Communications Market

The opportunity in this market includes data usage charges, and other associated fees that may be generated when the mobile operator helps with service branding, marketing, and distribution. It may also be a revenue share type of an arrangement, depending upon the service agreement and business relationship between the enterprise and the mobile operator.

Exhibits 62 and 63 show the connections forecast in the US Others M2M Communications Market from 2009 to 2018.

EXHIBIT 62

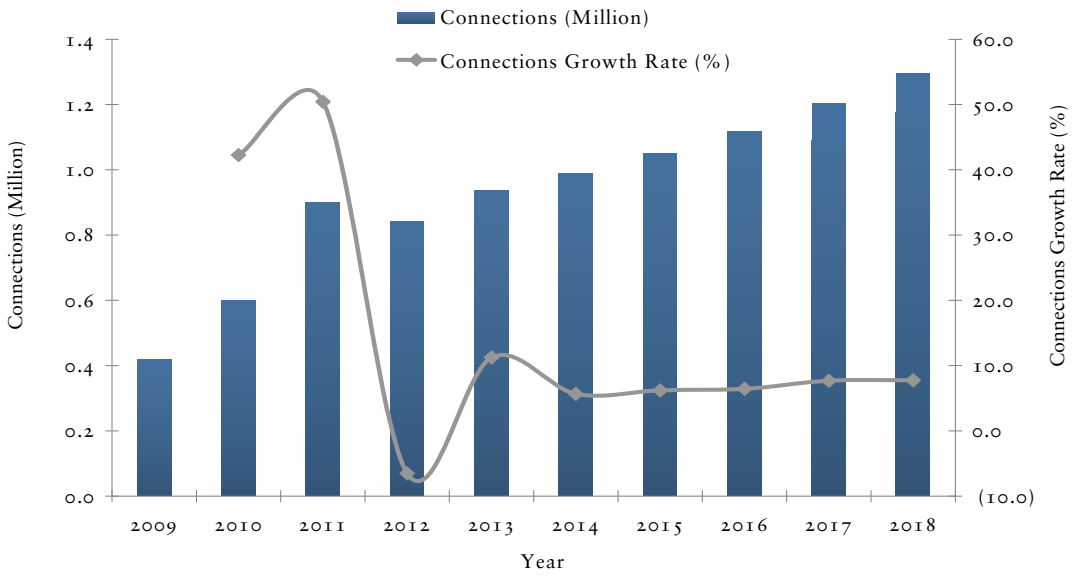
"Others" M2M Communications Market: Connections Forecast, US, 2009-2018

Year	Connections (Million)	Connections Growth Rate (%)
2009	0.4	--
2010	0.6	42.3
2011	0.9	50.4
2012	0.8	(6.5)
2013	0.9	11.2
2014	1.0	5.7
2015	1.1	6.2
2016	1.1	6.5
2017	1.2	7.7
2018	1.3	7.7
Compound Annual Growth Rate (2012-2018): 7.5%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 63

"Others" M2M Communications Market: Connections Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 64 and 65 show the data consumption forecast in the US Others M2M Communications Market from 2009 to 2018.

EXHIBIT 64

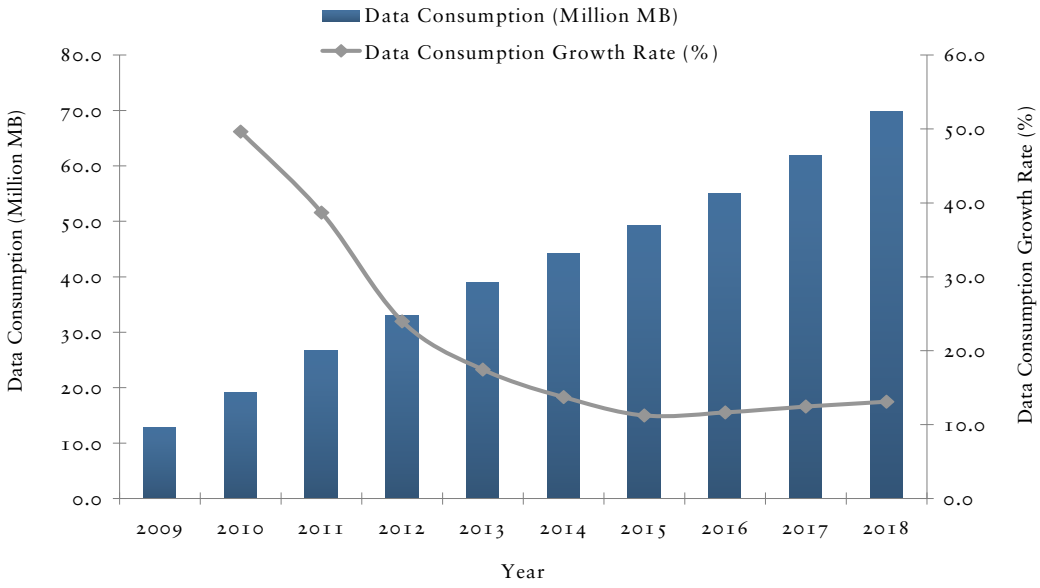
"Others" M2M Communications Market: Data Consumption Forecast, US, 2009-2018

Year	Data Consumption (Million MB)	Data Consumption Growth Rate (%)
2009	12.9	--
2010	19.3	49.6
2011	26.7	38.7
2012	33.1	24.0
2013	38.9	17.5
2014	44.2	13.7
2015	49.2	11.2
2016	54.9	11.6
2017	61.8	12.4
2018	69.8	13.1
Compound Annual Growth Rate (2012-2018): 13.2%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 65

"Others" M2M Communications Market: Data Consumption Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Exhibits 66 and 67 show the data access revenue forecast in the US Others M2M Communications Market from 2009 to 2018.

EXHIBIT 66

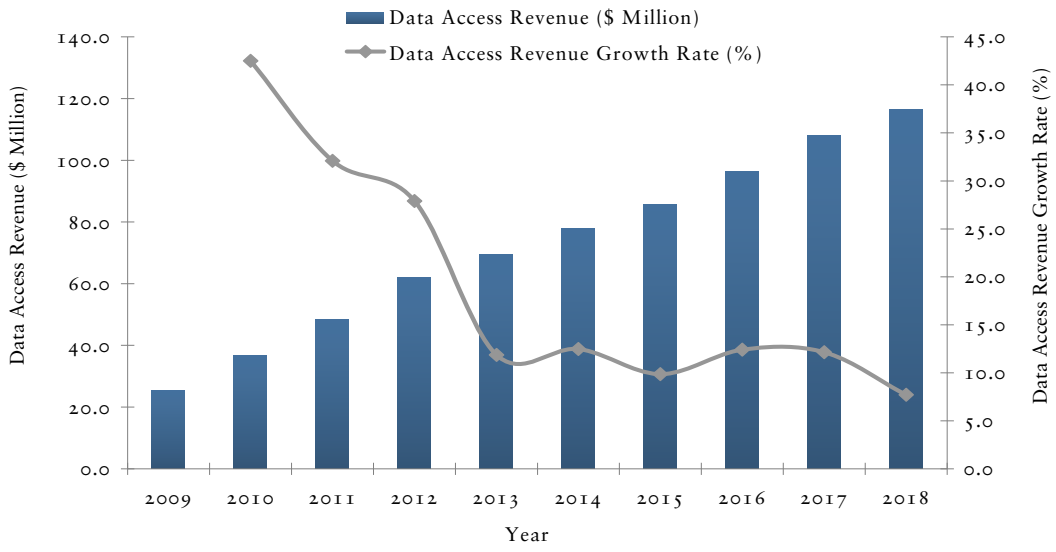
"Others" M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018

Year	Data Access Revenue ($ Million)	Data Access Revenue Growth Rate (%)
2009	25.7	--
2010	36.7	42.5
2011	48.4	32.1
2012	62.0	27.9
2013	69.3	11.9
2014	78.0	12.5
2015	85.7	9.9
2016	96.3	12.4
2017	108.0	12.1
2018	116.3	7.7
Compound Annual Growth Rate (2012-2018): 11.1%		

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

EXHIBIT 67

"Others" M2M Communications Market: Data Access Revenue Forecast, US, 2009-2018



Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan

Key takeaways from Exhibits 62 to 67 are as follows:

- The total number of M2M connections in the Others market is expected to increase from 0.8 million in 2012 to 1.3 million in 2018.
- Data consumption by M2M devices in the Others market is expected to increase from 33.1 million MB in 2012 to 69.8 million MB in 2018.
- Data access revenue from M2M devices in the Others market is expected to increase from $62.0 million in 2012 to $116.3 million in 2018.

II

Conclusion

The Last Word

Summary

Increasing business efficiency; delivering better services to customers and partners; and ensuring sustainable business operations are the three most important benefits of M2M. There is a growing realization about the benefits of mobility in a wide range of industries, which helps to drive adoption of M2M. Providing the appropriate tools, networks, solutions and personnel to help enterprises design, develop, and manage scalable, distributed, and customizable M2M implementations is critical for success of mobile operators' M2M initiatives. M2M solution providers should also provide high-quality support and consulting to continuously improve their customers' operations, thus helping them realize greater cost savings over time. Solutions providers that make it easy to deploy and manage M2M solutions will have a clear competitive advantage in the U.S. M2M communications market. The inherent complexity in M2M can be solved to an extent by deploying cloud-based M2M platforms that allow for easier application development, deployment and ongoing management and reporting. Overall, M2M represents a significant market opportunity for mobile operators in the United States.