

# **Machina Research**

## **White Paper for ABO DATA**

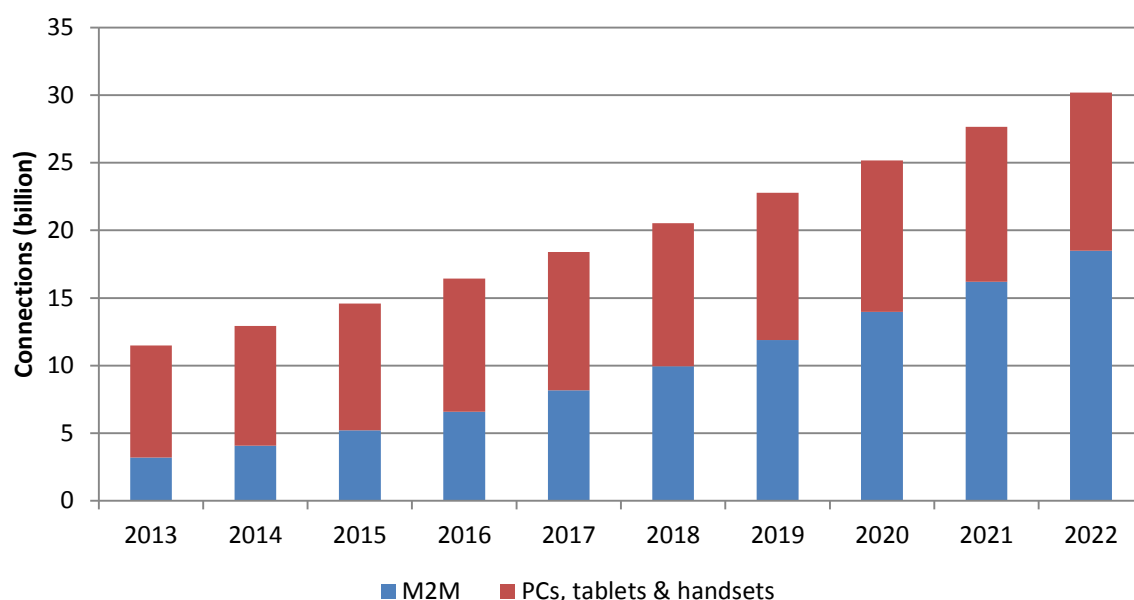
**Data aware platforms deliver a  
differentiated service in M2M, IoT  
and Big Data**

**December 2013**

# Introduction

More and more businesses are making use of machine-to-machine (M2M) connectivity for a diverse range of reasons, including meeting regulatory mandates, adding new product features, and gaining and maintaining a competitive edge through more efficient business processes. The scale of growth of M2M devices will be rapid: from 3.2 billion in 2013, it will grow to 18.5 billion in 2022. If more traditional devices, such as PCs, tablets and handsets are included, the total market will exceed 30 billion connected devices in 2022<sup>1</sup>, up from 11.5 billion today. Figure 1 illustrates the expected growth. The overall market will see a compound annual growth rate (CAGR) of 11% over the forecast period. This growth will be dominated by M2M (22% CAGR) compared to traditional PCs, Tablets & Handsets (4% CAGR).

Figure 1: Global connected devices 2013-22 [Source: Machina Research 2013]



This growth of connected devices has been driven by a number of factors, not least cheaper device and connectivity costs, as well as increasingly simple deployment options. Furthermore, enterprises have become increasingly aware of the additional value of new data assets, which has encouraged further deployments. While there is no disputing that vast quantities of data will be created, the value of this data will remain locked up until processed and contextualised. This transformation will require tools for enterprises to assist them.

M2M and IoT platform providers have also started to enable and simplify the processes around application development and real-time data processing. This has removed some of the earlier barriers for especially smaller and medium enterprises looking to trial M2M solutions. And with more and more enterprises exploring the benefits of real-time analytics, these developments offered by platform providers are addressing a growing demand.

<sup>1</sup> Machina Research Global M2M Forecast Database covers 12 M2M sectors (plus a thirteenth non-M2M sector 'PCs, tablets and handset data'), 61 application groups and over 180 applications across 201 countries. The Database details not only numbers of connected devices but also connection types, traffic and revenues.

# 1 Summary

As more devices, things, people and systems continue to “talk” to one another in the M2M and IoT world, enterprises will look to integrate more of these technology solutions as part of their core business processes, and in so doing, pursue the opportunities from machine-generated data.

Device and connectivity management will become a commodity in this environment, and application development and scalability will drive and sustain the growth of M2M and IoT. Data management, implicit in application development, will closely follow and emerge as a critical platform feature as businesses look to transform data into enterprise assets of value

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*“Plat-One platform of ABO DATA enables this process of transformation through the augmentation and aggregation of data, ideally in the middleware to meet the requirements and benefits of real-time processing.”*

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As data analytics gains momentum, platform providers who may have focused on features of device, connectivity and application management should consider delivering new tools allowing enhanced data management. These extended data-aware platforms should develop such features as data augmentation, data aggregation, real-time and complex event processing, and data masking. These features enable a better management of data by the platforms, and in the longer term, by the customers themselves.

## 2 Applications and data are the new currencies in M2M and IoT

For many enterprises, the implementation of M2M solutions has traditionally focused on specific monitoring and remote management objectives. These stovepipe solutions have involved the complex programming of proprietary applications, running through the complete vertical “stack” of devices and enablement layers. As a result, implementations of M2M solutions have remained costly and resource intensive, and have been limited to large scale implementations.

The hierarchy of M2M solutions, as illustrated in Figure 2-1, reflects a progression from device and process centric models in M2M solutions to a greater focus on applications and data. This focus has resonated to a greater extent with business executives, approaching M2M solutions more as a business solution than a technology option.

Figure 2-1: Hierarchy of M2M [Source: Machina Research, 2013]

	Stage	Description	Comments
Device centric M2M	1	Reactive information	• Devices can be polled for information, or provide information according to a set timetable
	2	Proactive information	• Devices communicate information as necessary
	3	Remotely controllable	• Devices can respond to instructions received from remote systems
	4	Remotely serviceable	• Software upgrades and patches can be remotely applied
Process centric M2M	5	Intelligent processes	• Devices built into intelligent processes
	6	Optimised propositions	• Use of information to design new products
	7	New business models	• New revenue streams and changed concept of 'ownership'
Data and Application centric M2M	8	The Internet of Things	• Publishing information for third parties to incorporate in applications, control commands from diverse sources

Having progressed through two earlier “waves” of device and process centricity, in this third wave, applications and data become the new currencies of M2M and IoT.

A number of M2M and IoT Application platform providers have now recognized these requirements of the market in M2M and IoT solutions. Building on device and connectivity management, platform providers like ABO DATA are have redesigned and developed their platforms further. Aimed at delivering robust device and connectivity management capabilities that enable such features as device driver libraries, firmware updates over-the-air, and protocol normalization, these platforms have also been designed to provide more tools for application development, application management and data management.

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***“It is only natural that M2M solutions started with a focus on the management of devices and their connections. It was technology driven and applications were data driven. What we are now seeing is the full business value being created through applications and data, becoming fully integrated into business processes, and turning data into a valuable business asset. In this environment, applications and the platforms need to be events-driven”***

***Filippo Murrone, CTO ABO DATA***

In the future of M2M and the Internet of Things, scalability will play a prominent role. Platforms able to scale applications, manage complex user groupings, and deliver tools to process, store and manage increasing amounts of data in real-time will deliver a competitive advantage to those enterprises leveraging these capabilities.

## 2.1 Core business processes enabled through applications

For many enterprises, M2M solutions have been viewed as technology solutions to operational requirements, monitoring and remote management being the key functions. As capabilities and opportunities to focus on applications and data in M2M and IoT solutions develop, enterprises are beginning to consider these solutions as integral parts of the overall business processes. Three changes are making this happen:

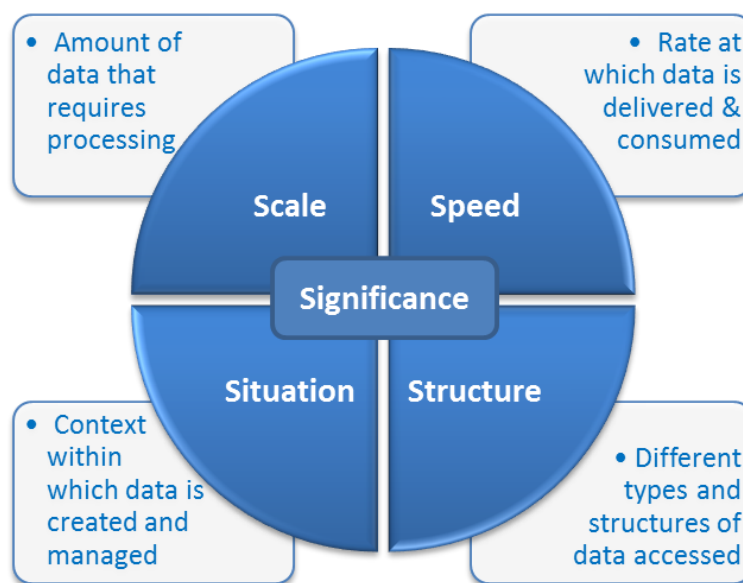
- **Tools for quicker and more efficient application development (e.g. for wireless sensor networks) are now being offered to enterprises.** This enables businesses to work with a single platform that supports multiple languages, connectivity options, platforms, protocols and hardware solutions. As an example, the Plat-One platform from ABO DATA provides these features as well as a series of GUI components to streamline the development of new graphical user interfaces, the option of developing new service bundles in Java through a dedicated SDK, and a Mashup Builder to develop applications in just a few clicks. All this significantly reduces time-to-market and cost factors, and enables enterprises to build solutions across a much more varied estate of M2M devices.
- **Platforms have emerged with a host of APIs, enabling quick and full integration of applications with back-end, third-party supplier solutions.** Previous programming efforts would have required individual programming for each interface but with open API frameworks, integrations are quickly established and managed.
- **The focus on business logic and developing applications has been made possible by abstracting devices and connectivity management from the development of an M2M/IoT solution.** Ready-made, off-the-shelf applications, available in some cases from emerging M2M Apps stores, have enabled enterprises to focus on the core of their business processes. Rather than having to complete end-to-end application development throughout the entire solution, businesses are now able to invest more time and effort on business logic and application features to develop and deliver new and innovative customer experiences and services. These services may include such features as predictive maintenance, real-time fraud detection and enhanced security solutions.

Across all three developments is a common theme of enabling quicker application development time and extending the capabilities of applications through APIs. This allows enterprises to achieve their objectives, and further opens the opportunity to exploit the value of data assets.

## 2.2 Data becomes the new “oil”

Many articles and presentations on Big Data carry a common message – the opportunities from analysing the growing volume of structured and unstructured data in real-time will deliver huge benefits. Enterprises have certainly begun to recognize data as the new “oil” in their businesses, providing real demonstrable benefit to the company. However, to really exploit the value, companies need to understand the data that they have. Big Data, or data analytics in this wave of M2M and IoT solutions may be characterized as the interplay between by the 5 ‘S’s of scale, speed, structure, situation and significance, as illustrated in Figure 3.

Figure 2-2: Five 'S's of Big Data [Source: Machina Research, 2013]

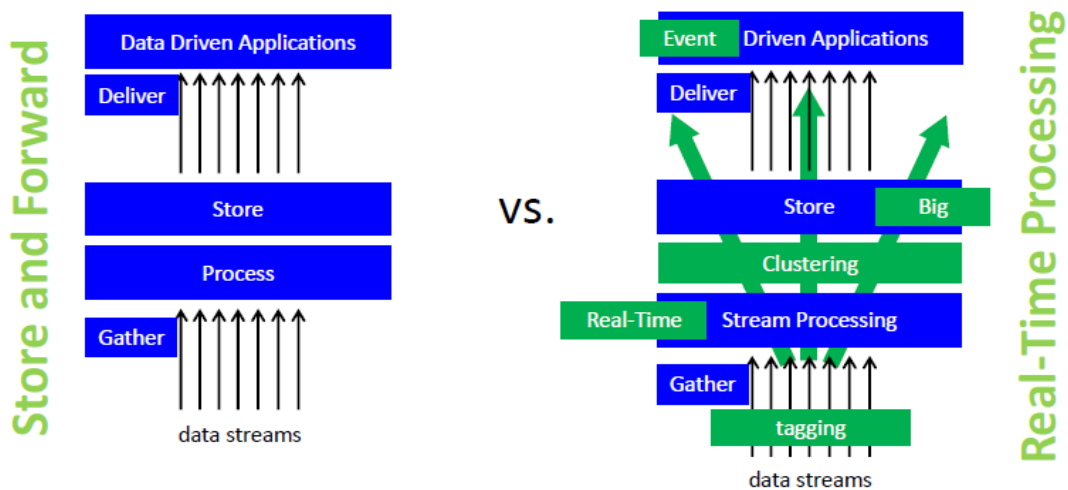


The five elements are:

- **Scale** – This refers to the variety of data sources now generating data for further processing and analysis. In the Big Data context, M2M and IoT devices will contribute a significant amount of data available to enterprises, increasing traditional enterprise data, business-to-business transactional data, and social media resources.
- **Speed** – Implicit in the evolution to ‘Big’ Data is the speed of processing. Historically data analytics may have involved a process where data was captured, processed, stored and delivered to the applications in a “store and forward” model. The new events-driven application model is based on real-time complex event processing. The differentiators will be the ability to capture the data as quickly as possible, augment and aggregate data in real-time, and process and deliver actionable insights from that data into real-time processing models and event-driven applications. Figure 2-3 illustrates the major differences between the two models of data speed.

- **Structure** – Data managed in traditional business intelligence analytics has reflected the capabilities of available technologies for storage and access of data, i.e. traditional relational database management systems (RDBMS). In these approaches, data was made to conform to specific defined structures, and analysis was focused on these relations. In Big Data, enabled by new technologies, the analysis of data is no longer restricted to structured data (e.g. tables) but extends to the management of unstructured and semi-structured data, examples of each being images and social media content.
- **Situation** – Data is neutral. Only when contextualized – either in relation to other data and/or in relation to the origins of the data does significance truly begin to emerge. With this contextualization as a crucial element in data analysis, platform providers will be required to extend such capabilities as part of their solutions.

Figure 2-3: Data driven vs. Event driven Applications [Source: ABO DATA, 2013]



- **Significance** – Significance of data is achieved from intelligent analysis of data. This involves a process of augmenting and aggregating data as well as recognizing patterns of correlation that provide e.g. predictive insights. From so many data sources, identifying “signals” from “noise” in real-time will be a major and challenging task. Aggregating and clustering data will become important features for platform providers to deliver to enterprises.

With enterprises considering and exploring how to optimize the creation and management of data from M2M and IoT solutions, the questions that then emerge are how to get to the value of data and how to ensure that in doing so, the privacy and ownership of data is maintained.

# 3 How to exploit the “hidden” value of data in M2M/IoT

M2M and IoT platforms have witnessed a progressive shift from a vertical stack of device management, connectivity management, service enablement and application support layers to an abstracted and more “glue like” approach introducing M2M/IoT Application Platforms.

In this model where the platforms are focused on application development, application management and scalability,<sup>2</sup> device and connectivity management emerge as hygiene factors rather than competitive differentiators. The main IoT enabling capabilities become application development, application management and scalability. The competitive differentiator emerges from an open application development environment at present including such tools as:

- Drag-and-drop tools for modular service building
- Dedicated software development kits for ease of programming
- Off-the-shelf applications from apps stores
- Application extensibility to third-party solutions and back-end systems enabled by APIs

But the story does not stop here. Delivering applications that underpin business processes is the first crucial step. The next value-added step for the enterprise comes from exploiting the “hidden” or “signal” values of the generated data.

Data received from sensors, modules, gateways, etc. provides a significant stream of data. Within these huge amounts of data, the real challenge of identifying value and significance is two-fold:

- **Distinguishing ‘signals’ from ‘noise’.** The case can certainly be made for the complete capture, processing and analysis of all data but when real-time processing (speed) becomes a core differentiator in data analytics, and value a priority, determining which data points are of significance requires levels of data awareness in the platform.
- **Enhancing data significance** is achieved by filtering the data ‘signals’ from the ‘noise’ and transforming and enriching the data with tagging, augmentation and aggregation.

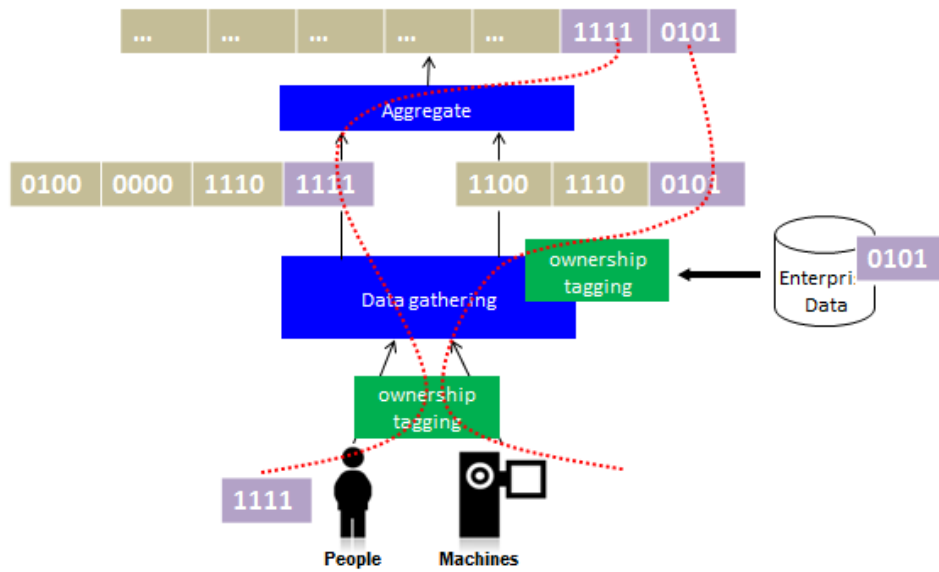
The process of enriching data through tagging, augmentation and aggregation separates what is achieved in traditional data-driven applications (pushing data directly to the application), and events-driven processing where data is enriched and delivers higher levels of “significance.” Figure 3-1 illustrates this enrichment process of data.

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<sup>2</sup> For more information about M2M/IoT Application Platforms, see Machina Research’s White Paper on “The Emergence of M2M/IoT Application Platforms,” introducing M2M platform being re-cast for the age of the ‘Internet of Things,’ September 2013



Figure 3-1: Data augmentation process [Source: ABO DATA 2013]



This enrichment of data could arguably be managed within applications. Within data-driven application scenarios, this is a preferred and suitable model. Where higher data volumes and real-time demands are present, this enrichment of data is best performed at the platform level.

Extending this discussion on data enrichment, the value of data appears when it is contextualized. This contextualization is achieved either by augmenting payload data with meta-data, generated by the assets themselves, or by aggregating data from other sources. Where meta-data may provide information on location, time and condition of the device (and as discussed later, the ownership of that data), payload data may be further augmented with information from other devices, creating a more comprehensive data set which could include as examples temperature, humidity, and energy consumption as captured from other devices. It is this process of combining higher volumes of data from multiple sources and performing this in real-time that drives the requirements for processing data at the platform level.

Leveraging real-time data processing capabilities of ABO DATA's platform, a medical and dental imaging equipment provider extended their customer service and warranty capabilities. After having provided connectivity to all the equipment, the equipment provider was able to present real-time queries to streaming data, allowing them to quickly detect events from imaging equipment where e.g. actual asset locations did not correspond to warranty agreements, constituting fraudulent claims. With data having been aggregated and augmented with e.g. location based information and usage in real-time, the equipment provider enabled its sales staff and customer services to quickly address these anomalies with the distributors. This connectivity to the equipment also allowed the provider to offer an innovative business model to their customers based on a pay-per-print agreement as well as the additional services of resupplying consumables when resources run low and suggesting maintenance attention when predictive maintenance algorithms identified this to be the case from analysed data.

## 4 A technology solution to data privacy and data ownership

Privacy, transparency, ownership, and security are some of the issues that inevitably accompany discussions about Big Data and data management. At its core, there will be a trade-off between the benefits gained from sharing data (by the customer), and the loss of privacy by the customer. An important role for service providers will be to assist enterprises address this trade-off.

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*Enterprises leveraging data for analytics purposes will become increasingly aware of requirements around data privacy and security for customers as well as providing transparency and data management (ownership) of that data to their customers.*

Where many discussions have addressed the regulatory and legal frameworks around data management, one approach with a high degree of potential success is one structured around a policy-based middleware solution. In this structure, ownership of the data is identified through data tagging, and enterprises are able to implement policy-based accountability and privacy management routines.

Encryption, blanking, and anonymization of data become integral parts of the policy-based middleware where customers and/or their service providers are able to define the appropriate policies for sharing of data, and able to align these policies with any regulatory requirements as and when they are defined and developed.

Being able to tag data with ownership information enables not only 'ownership tracking' in terms of how the data is used but reinforces the ability of customers to view what data is held and how it is used, and providing opportunities for customers to determine their levels of consent for the data.

Plat-One is a policy-based middleware where developers and administrators are able to design policies which process the data and generate actions. This differentiates the platform from many other M2M/IoT platforms. The platform delivers application development, application management and scalability as central features in the architecture and has introduced a compelling solution to data management.

## 5 Enabling events-driven applications is a game changer

Enterprises have started to recognize the product and service benefits that can be achieved with data-aware platforms. These platforms, focusing on application development and, more importantly, data management, have introduced game changing features such as events-driven applications which access enriched data from the platform in real-time.

In data-driven applications, data is fairly static and complex queries are less frequent, limiting in effect the ability to scale the solution as data-driven applications struggle to manage and process hundreds or thousands of queries per second. In events-driven applications, data is constantly being processed and enriched with new techniques such as data tagging, real-time processing, and clustering.

As illustrated in Figure 2-3, data-driven applications will be superseded by events-driven applications in time, delivering greater benefits to enterprises from the information processed.

In the case of a service provider of energy management solutions, the Plat-One solution of ABO DATA delivered *continuous* complex event processing and real-time actionable data to their Energy Profiler solution, leading to customers receiving real-time instructions on how to optimize energy usage, access best available prices, and establish closed-loop control feedbacks on appliances such as dimmers, etc. Instead of performing cumbersome and delayed SQL queries and data mining operations, the data-aware platform improved the overall system responsiveness, and has been applied in more recent situations of overcrowding in public buildings during events or congestion in first aid services in hospitals.

## 6 About ABO DATA

ABO DATA brings over 35 years of business experience to the M2M and IoT markets. Building on Research and Development services for software systems in applications, ABO DATA has maintained a leading role in the consolidation, integration, augmentation and analysis of data within M2M, IoT and Big Data solutions. Combined with the unparalleled knowledge of applications, ABO DATA continues to expand its list of successful projects and satisfied clients, helping them to transform their businesses.

The security, performance, availability, scalability and extensibility of the Plat-One solution is further described on [www.plat-one.eu](http://www.plat-one.eu).

For more information about our products, services and solutions, our company, and other information, please visit our website on [www.abodata.com](http://www.abodata.com).

## 7 About Machina Research

Machina Research is the world's leading provider of market intelligence and strategic advice on emerging opportunities in M2M, IoT and Big Data. We provide our blue-chip client base with an Advisory Service which provides access to our highly detailed and granular forecasts of the M2M market opportunity in the Forecast Database, our Sector Reports, Strategy Reports, and Research Notes, and our Analyst Inquiry services and Strategy Briefings.

Our Consulting side provides such services as market opportunity assessments, M2M procurement assistance, and business case development and due diligence.

We are staffed by mobile industry veterans with the knowledge and understanding of these new market opportunities to help your company, whatever its requirements in this space.

For more information and contact details, please visit our website on [www.machinaresearch.com](http://www.machinaresearch.com)

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