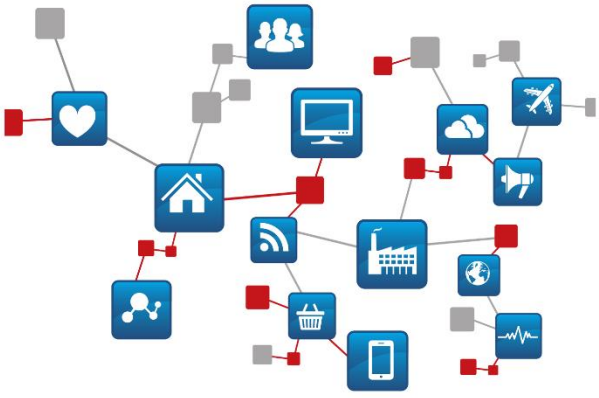
EXECUTIVE BRIEFING

November 2015

# oneM2M:
# Solving the IoT Platform Challenge



## Opportunities and pitfalls in the IoT's new wave of innovation

Access to low-cost electronics has made it relatively easy to embed connectivity capabilities into a wide variety of devices and sensors. Whereas previous generations of connected devices could only be justified for expensive and business-critical machines, nowadays connectivity is becoming the norm in many inexpensive devices including lightbulbs, tooth-brushes and wearables.

To get a sense of the connectivity mega-trend, consider fleet-management, the work-horse machine-to-machine (M2M) use-case, which optimizes the management of delivery routes and fuel consumption for industrial vehicles. The underlying principles have been adapted, at lower cost, to create a framework for new, connected car applications. Similarly, the inventory management techniques for remotely managed vending machines have inspired new business opportunities for connected, coffee dispensers.

This swell of innovation is driving strategic aspirations within industrial and consumer groups. Companies such as Bosch, GE and Salesforce.com expect significant business benefits from reshaping their business practices with IoT at the core. It is no surprise to see such high hopes for the Internet of Things (IoT) market when market analysts are forecasting tens of billions of connected devices and trillions of dollars in economic benefits.

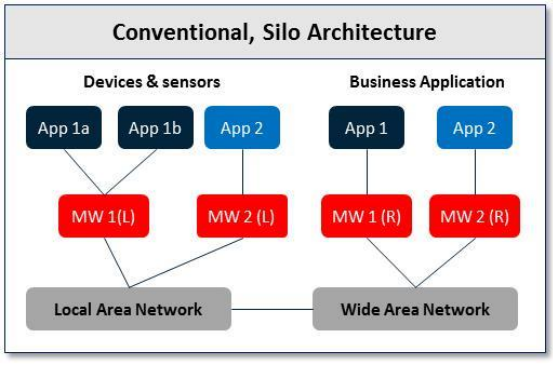
However, in the rush to launch IoT applications and services, are companies making wise technology, service and business-model choices? Will today's solutions provide an adequate platform for large-scale growth, with an evolutionary road-map that supports new features and revenue-generating business opportunities? To understand these issues, let us first consider the key characteristics of an IoT application and the necessary eco-system to launch and support IoT services.

## IoT applications, shared services and the value of inter-operability

In its recent assessment[1] of the IoT market McKinsey & Co, the consulting firm, introduced the concept of 'settings' to illustrate a range of IoT service scenarios. A 'setting' could be a (smart) home, a (connected) car or an (intelligent) manufacturing plant, for example.

Each of these 'settings' hosts a range of connected devices and sensors. A smart home might contain intelligent electricity meters, controllable lights, security sensors, personal health monitors, a smart thermostat and more. The basic architecture for each of these systems is a connected device or sensor, which communicates with a monitoring or control application via a middleware application. Thus, a sensor might trigger an alarm – "a window has been opened from the outside" - that reports to a monitoring station which in turn triggers a control action – "send for the police". This highly 'vertical' arrangement is typical of the architecture of a traditional M2M application.

Consider the following illustration of a simple smart-home system.

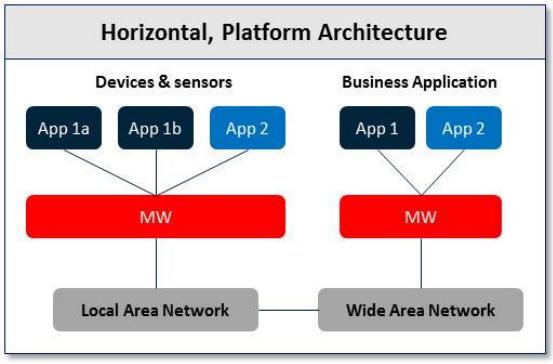



[1] McKinsey Global Institute, The Internet of Things: Mapping the Value Beyond the Hype (June 2015) www.mckinsey.com/insights/business_technology/the_internet_of_things_the_value_of_digitizing_the_physical_world

In this smart-home, two devices (App 1a and App 1b) communicate via a local, middle-ware layer (MW1-L), through local- and wide-area networks to a remote, middleware layer (MW1-R) and eventually to their corresponding back-end business application (App 1). A second standalone application, such as a smart-utility meter (App 2) in the smart-home, communicates to its corresponding business application (App 2) via its local- and remote middle-ware layers (MW 2-L and MW 2-R).

It becomes sub-optimal to configure each and every application within a 'setting', with individual applications, middleware and communications. Hardware is duplicated, software must be customized and data resources can't be shared across application silos. This is also commercially sub-optimal because IoT service providers in the same 'setting' have to manage multiple service contracts and supplier relationships.

The alternative is to look for service enabling commonalities across the individual silo applications, resulting in a harmonized architecture, and where inter-operability is a central design principle. The first stage in meeting this objective is to create a common middleware layer, in effect a horizontal platform, to handle the service functions necessary to support multiple IoT applications.




The previously silo applications now share a common services platform. This arrangement also masks applications from the complexities of the underlying local- and wide-area networks.

An important distinction between M2M and IoT applications is the facility for cross-vertical interactions, which span application silos. In the illustration above, the devices associated with application 1 (App 1a and App 1b) can now supply data to the back-end business application (App 2).

According to McKinsey, this kind of inter-operability accounts for almost 40% of the value potential from the IoT application 'situations' covered in its analysis. Businesses that do not factor this mode of operation in their strategic product and service roadmaps are effectively capping their long-term business prospects.

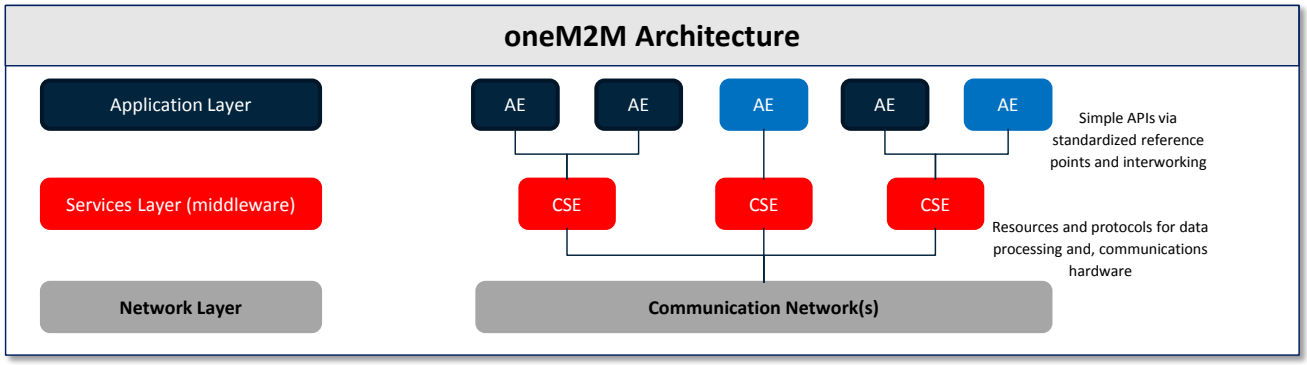
The interoperable, platform architecture offers significant strategic benefits by consolidating the resources needed to deliver a variety of IoT applications and opening up new service and business opportunities by allowing applications to share resources and data.

## oneM2M solves the IoT platform challenge

In 2012, a group of international standards development organizations anticipated the need for a common architecture along with a set of enabling solutions to support inter-operable M2M and IoT applications.

Building on a collaborative effort with input from almost 200 member organizations, oneM2M issued its first release of the standard in January 2015. By September 2015, a multi-company interoperability testing event validated several different company implementations of the standard.

The standard employs a simple horizontal, platform architecture that fits within a three layer model comprising applications, middleware services and networks as illustrated below.




Application Entities (AEs) within individual device and sensor applications provide a standardized interface to manage and interact with applications.

For the middleware layer, Common Services Entities (CSEs) play a similar role. They are present in the services layer which sits between the data processing of the applications layer and the communications hardware in the network layer. The network layer ensures that devices and sensors function in a network-agnostic manner with their associated applications.

One of the benefits of this architecture is that it connects data 'producers' and data 'customers' in a secure manner. A configurable policy manger makes this possible by defining which applications and users can access which devices and sensors.

The service layer also controls when communications occur, depending on factors such as the time-sensitivity of communications and the economics of data transfer. For example, in non-time-critical applications, it is possible to accumulate data for efficient transfer at a later point in time. This may be especially relevant where power consumption is an operational priority, for example.

The oneM2M service layer hides the complexity of network usage from applications, thus simplifying the implementation burden for application developers. In so doing, it takes account of the specific capabilities and constraints of each available underlying network (fibre, satellite, cellular etc.) and makes the best use of them in light of higher layer application needs.

## oneM2M delivers significant business and strategic benefits

The oneM2M specification is an important milestone for the IoT market. Not only does it provide a common technical framework and a globally recognized standard but it also addresses key business objectives of lowering costs, reducing industry fragmentation and creating new business opportunities.

| oneM2M business benefits | |
|---|---|
| **Lower costs - CAPEX** | Lower cost of deployment (library of functions)<br>Programmers can focus on applications (not on underlying communications)<br>Scale economies of horizontal service layer (common functions for diverse use-cases) |
| **Lower costs – OPEX** | Efficient communications (policy-driven and event triggered)<br>Sensor data sharing (produce once, consume many times)<br>Transport economics (use best transport network for business needs) |
| **Reduces fragmentation** | Common services layer for different verticals and segments eliminates the need for application-specific platforms |
| **Enables new business opportunities** | Service innovation and application opportunities from cross sharing of resources and data across silos |

oneM2M is currently available as a Release 1 specification which addresses the basic elements of creating, deploying and managing M2M and IoT applications.

The business drivers in today's IoT market are low-cost connectivity and fast time-to-market. As the market develops, performance expectations from IoT applications will rise. A new set of requirements will take centre stage which means that IoT solutions, and the oneM2M standard, need to evolve. Strategically, companies will prefer a managed standardization process that delivers new generations of functionality over the risk of having to abandon a proprietary solution that lacks the capacity to evolve.

Work is already underway on Release 2 of the oneM2M standard which will include support for managing contextual data, in effect a value-added form of raw sensor data. Release 2 will also include new policy functions through semantic interoperability for home and industrial domains, and end-to-end security including dynamic authorization.

## But aren't there already a lot of platforms to choose from?

Companies that are developing M2M and IoT solutions as well as M2M/IoT service providers face an exciting yet challenging future. On the one hand, IoT applications promise significant economic benefits and new business opportunities. Market entry by large companies such as Cisco, Google, GE, Intel and Samsung testifies to the attractiveness of this market. There is further evidence of market attractiveness based on the many tens of commercial IoT platform providers, each differentiating itself within a geographic market or an application specialization.

The decision for companies that are searching for IoT-enabler technologies is a difficult one, made more complex by the range of choice available. From a strategic viewpoint, companies need to balance rapid time-to-market benefits with business continuity objectives including the following:

- Proprietary IoT solutions offer fast market entry during the early stages of a market, especially where solution providers customize their offerings to meet a specific application's needs. Over the long term, however, proprietary solutions cannot match the economics of open standard solutions which benefit from superior economies of scale and competitive supply through a larger eco-system. The result in practical terms means that companies can chose from different hardware and software vendors offering standard-complaint products. They are also less prone to vendor lock-in because companies can transition from one solution provider to another using the same standard.

- Although most M2M and IoT applications currently operate in silos, future applications will make greater use of interoperability features to: publish data; import data from other device and data sources; and, create cooperative applications. oneM2M contains the tools that allow companies to implement solutions beyond their traditional application and business boundaries without being prey to one-time, systems integration costs.

- Although there may not be a unique standard in the future, oneM2M does provide a common basis to make all devices interwork natively. Among the several technologies that claim to "unite the IoT", oneM2M is the only one that interworks seamlessly thanks to its built-in interworking features. Testing has proven interworking with devices that support AllJoyn, OIC (Open Interconnect Consortium), OMA LighweightM2M and the Nest/Thread technologies.

- oneM2M offers a richer road-map of future features because it draws from a wide range of inputs in developing its specifications. Furthermore, the standards development process, managed by proven standards development organizations (SDOs), provides continuity and a degree of predictability that helps to future-proof IoT product and service development plans.

- As companies deploy large populations of connected devices over time, they will face complexities in managing different generations of a given device at the hardware and firmware levels. oneM2M's standardized use of APIs and reference points masks this element of complexity allowing companies to scale their operations and to source components from a wider supplier base.

- The growth in oneM2M compliant solutions and IoT applications will create a sizeable market opportunity, attracting a large developer community which will contribute economy and ideas to the supply-side eco-system. This process is gaining momentum as open-source, oneM2M platform offerings from European and South Korean organizations come on line.

## oneM2M is well positioned to emulate the success of 'mobile'

oneM2M builds on a heritage of standards development within the mobile industry. It leverages a proven track record of continuous innovation, the development of a vibrant eco-system and an unrivalled accomplishment for delivering affordable communication services to the majority of the world's population.

By replicating these accomplishments, oneM2M will make an equally significant contribution to the IoT market. This development should be an important consideration for companies that are making IoT technology, service and business strategy choices.

## About oneM2M

oneM2M is the global standards initiative that covers requirements, architecture, API specifications, security solutions and interoperability for Machine-to-Machine and IoT technologies. oneM2M was formed in 2012 and consists of eight of the world's preeminent standards development organizations.

| oneM2M Standards Development Organization (SDO) Partners | |
|---|---|
| ARIB (Japan) | ATIS (N. America) |
| CCSA (China) | ETSI (Europe) |
| TIA (N. America) | TSDSI (India) |
| TTA (Korea) | TTC (Japan) |

These SDO Partners collaborate with six industry fora or consortia (Broadband Forum, Continua Alliance, GlobalPlatform, HGI, Next Generation M2M Consortium, OMA) and over 200 member organizations to produce and maintain globally applicable, access independent technical specifications for a common M2M/IoT Service Layer. oneM2M specifications provide a framework to support applications and services such as the smart grid, connected car, home automation, public safety, and health.

oneM2M actively encourages industry associations and forums with specific application requirements to participate in oneM2M, in order to ensure that the solutions developed support their specific needs. For more information, including how to join and participate in oneM2M, see: www.onem2m.org.