



White Paper on M2M Device Classification

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1. Scope

This document is to provide a Machine-to-Machine (M2M) device classification framework based on the horizontal attributes (e.g., wide area communication interface, local area communication interface, IP stack, human I/O capabilities, persistent configuration storage) of interest to communication service providers (CSPs) and M2M service providers (MSPs), independent of vertical markets, such as smart grid, connected cars, e-health, smart home, etc.

The objective of the M2M device classification is to enable the M2M industry to group a large and ever increasing number of M2M devices into a manageable number of classes so that M2M device management and service protocols, methods, and procedures can be systematically analyzed for re-useability and incrementally developed for the gaps in handling the M2M device classes not fully addressed by existing standards.

The classification scheme could help not only clarify the scope and requirements of M2M related work in OMA, but also articulate its linkage with all other M2M related standard development organizations (SDOs) to avoid overlapping and facilitate coordination related to M2M. It also enables integration of M2M services and management across the boundaries of vertical markets.

Once the white paper is completed, it can be used as a tool to analyze the applicability of existing requirements and specifications developed by OMA and other cooperative standards development organizations (SDOs) on various M2M devices based on the device classification scheme. It can also be used to identify the requirement and specification areas that need to be qualified or enhanced for the M2M device classes which are not well addressed by the current standards.

2. References

- [ANT-AL] ANT Alliance, <http://www.thisisant.com/ant/ant-alliance>
- [BB-Forum] Broadband Forum, <http://www.broadband-forum.org/>
- [Bluetooth-SIG] Bluetooth Special Interest Group, <http://www.bluetooth.org/>
- [DSRC-ITS] Intelligent Transportation Systems, Joint Program Office, <http://www.its.dot.gov/DSRC/index.htm>
- [ETSI-M2M] ETSI TS 102 690 v1.1.1, 2011-10, Machine-to-Machine Communications (M2M) Functional Architecture, http://www.etsi.org/deliver/etsi_ts/102600_102699/102690/01.01.01_60/ts_102690v010101p.pdf
- [PLC-Forum] Power Line Communications Forum, <http://www.plcforum.com/>
- [WiFi-AL] WiFi Alliance, <http://www.wi-fi.org/>
- [ZB-AL] Zigbee Alliance, <http://www.zigbee.org/>

3. Terminology and Conventions

3.1 Conventions

This is an informative document, which is not intended to provide testable requirements to implementations.

3.2 Definitions

M2M Device A M2M Device is a device that runs (a) M2M application(s) and communicates through the Network Provider's network

3.3 Abbreviations

ADSL	Asymmetric Digital Subscriber Line
CSD	Circuit Switched Data
DSRC	Dedicated Short Range Communication
FL	Fixed (Wired) Local Area Network Interface
FTTH	Fiber To The Home
FW	Fixed (Wired) Wide Area Network Interface
IO	Input/Output
IP	Internet Protocol
M2M	Machine-to-Machine Communication
OMA	Open Mobile Alliance
PLC	Power Line Communications
PS	Persistent Configuration Storage
SIM	Subscriber Identity Module
SMS	Short Message Service
UICC	Universal Integrated Circuit Card
WL	Wireless Local Area Network Interface
WW	Wireless Wide Area Network Interface

4. M2M Device Classification Attributes

M2M devices [ETSI-M2M] are classified using the seven physical or logical attributes shown in Table 1, which include vertical-independent device characteristics of communication interfaces, IP stack, user input/output, and persistent configuration storage.

Attribute Identifier	Attribute Description	Attribute Values and Associated Meaning
#1	Wireless Wide Area Network Interface	<ul style="list-style-type: none"> • WW: with a Wireless Wide Area Network (e.g., 3G, 4G, WiMAX, GPRS) interface. • NWW: without any Wireless Wide Area Network interface. • *: WW or NWW.
#2	Wireless Local Area Network Interface	<ul style="list-style-type: none"> • WL: with a Wireless Local Area Network (e.g., Local WiFi [WiFi-AL], Bluetooth [Bluetooth-SIG], ANT [ANT-AL], Zigbee [ZB-AL], DSRC [DSRC-ITS]) interface. • NWL: without any Wireless Local Area Network interface. • *: WL or NWL.
#3	Fixed Wide Area Network Interface	<ul style="list-style-type: none"> • FW: with a Fixed (Wired) Wide Area Network (e.g., ADSL, FTTH, PLC [PLC-Forum]) interface. • NFW: without any Fixed (Wired) Wide Area Network interface. • *: FW or NFW.
#4	Fixed Local Area Network Interface	<ul style="list-style-type: none"> • FL: with Fixed (Wired) Local Area Network (e.g., Ethernet, USB, RS232, TIA485) interface. • NFL: without any Fixed (Wired) Local Area Network interface. • *: FL or NFL.
#5	IP Stack	<ul style="list-style-type: none"> • IP-UDP: with IP and UDP in communication stack. • IP-UDP+TCP: with IP, UDP, and TCP in communication stack. • IP-*: IP-UDP or IP-UDP+TCP. • NIP: without IP (e.g., SMS, CSD) in communication stack. • *: IP or NIP.
#6	User Input/Output	<ul style="list-style-type: none"> • IO: with user I/O (e.g., keypad, touch screen, speaker). • NIO: without user I/O. • *: IO or NIO.
#7	Persistent Configuration Storage	<ul style="list-style-type: none"> • PS: with persistent configuration storage. (e.g., SIM card, Embedded SIM, on board flash storage, micro SD card). • NPS: without persistent configuration storage. • *: PS or NPS.

Table 1: Attributes for M2M device classification

5. M2M Device Class Examples

Device class with attributes #1 - #7, is expressed in the following notation, where “C” stands for Class:

C (attribute#1, attribute#2, attribute#3, attribute#4, attribute#5, attribute#6, attribute#7)

The examples for device class and associated devices are shown in Table 2.

Device Class Example	Description	Associated Device Examples
C(WW, WL, NFW, FL, NIP, NIO, PS)	M2M device class with Wireless Wide Area Network interface, Fixed Local Area Network interface (e.g., RS232 or TIA485), no IP stack, no user I/O, and persistent configuration storage (e.g., SIM).	GSM utility meter gateways
C(NWW, WL, NFW, NFL, IP, NIO, PS)	M2M device class with only Wireless Local Area Network interface (e.g., WiFi), IP stack, no user I/O, and persistent configuration storage.	Cleaning robots, surveillance robots
C(NWW, WL, NFW, FL, IP, IO, PS)	M2M device class with Wireless Local Area Network interface (e.g., WiFi), Wired Local Area Network interface (e.g., Ethernet), IP stack, user I/O, and persistent configuration storage.	WiFi-enabled smart appliance (washer, dryer, oven, refrigerator)
C(NWW, WL, NFW, NFL, NIP, NIO, NPS)	M2M device class with only Wireless Local Area Network interface (e.g., Zigbee, ANT+), no IP stack, no user I/O, no persistent configuration storage.	Zigbee weather sensors, home security sensors, ANT+ Fitness sensors
C(NWW, WL, NFW, NFL, NIP, IO, PS)	M2M device class with only Wireless Local Area Network interface (e.g., ANT+), no IP stack, user I/O (e.g., touch screen), having persistent configuration storage (e.g., micro SD cards).	Portable GPS devices, ANT+ Medical Monitors, Bluetooth car audio system, car hands free phone units
C(WW, WL, NFW, NFL, IP, IO, PS)	M2M device class with Wireless Wide Area Network interface (e.g., 3G/4G) interface, Wireless Local Area Network Interfaces (e.g., WiFi, Bluetooth), user I/O (e.g., touch screen), with persistent configuration storage (e.g., UICC).	Mobile handsets
C(WW, WL, NFW, FL, NIP, NIO, PS)	M2M device class with Wireless Wide Area	Telematics

	Network interface (e.g., GPRS), Wireless Local Area Network interface (e.g., DSRC), Fixed Local Area Network (e.g., Controller Area Network), no IP stack (e.g., SMS), no user I/O, persistent configuration storage.	onboard unit (with DSRC)
C(NWW, WL, NFW, NFL, IP, *, PS)	M2M device class with Wireless Local Area Network Interface, IP stack, with or without user I/O, with persistent configuration storage (e.g., UICC).	IP Robot: Teaching robot with screen and speaker, or cleaning robots without user I/O
C(NWW, WL, FW, FL, IP, NIO, PS)	M2M device class with no Wireless Wide Area Network interface, Wireless Local Area Network interface (e.g., WiFi), Wired Wide Area Network (e.g., FTTH/ADSL), Wired Local Area Network interface (e.g., Ethernet), IP stack, no user I/O, persistent configuration storage.	Residential Gateway (with WiFi)
C(NWW, NWL, FW, FL, NIP, NIO, PS)	M2M device class with no Wireless Wide Area Network interface, no Wireless Local Area Network interface, Wired Wide Area Network (e.g., PLC/HD-PLC), Wired Local Area Network interface, no IP stack, no user I/O, persistent configuration storage.	Smart Meter (with PLC)

Table 2: Examples of device class

6. Use of M2M Device Classification

The possible ways to use the above device classification scheme is as follows:

- (1) Categorize M2M devices from all verticals into a M2M device class that can have the same device provisioning and management procedures.
- (2) Analyze the existing device provisioning and management specifications with respect to their applicability to M2M device classes.
- (3) Analyze the completeness, gaps, overlapping, and consistency of device provisioning and management specifications in the same or across SDOs on the device class basis.

Appendix A. Change History (Informative)

Document Identifier	Date	Sections	Description
OMA-WP-M2M_Device_Classification-20121030-A	30 Oct 2012	n/a	Approved by OMA TP OMA-TP-2012-0379- INP_M2M_Device_Classification_White_Paper_V1_0_RRP_for_Final_Approval