DETAILS

- M2M Market
- Technologies
- Benefits
- Ecosystem
- M2M context
- Useful references

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OMA LWM2M & M2M MARKET (1/2)

Since 2002, OMA DM Working Group has released a suite of specifications including:
- 20+ mobile service enablers
- more than 60 Management Objects

More than 20+ Management Objects have been defined by other standardization organizations (ETSI, 3GPP,..)

OMA approach provides cost effective ways to deploy applications & services (Risk, Fragmentation, Duplication are minimized)

In 2010, OMA DM group realized the emergence of one M2M market facet:
- always more connected objects were investing Cars, Home, and the Cities areas..
- a growing category among connected objects have:
  - limited power processing & battery capacity
  - reduced storage capacity, reduced size..
- heterogeneous, fragmented and costly proprietary offers are a brake for this market
OMA LWM2M & M2M MARKET (2/2)

- Then OMA-DM WG has identified several needs:
  - a need for more open and interoperable standards in the M2M arena technologies
  - a need for a M2M standard able:
    - to address Device Management & Application Enablement
    - to be used across various industry segments
  - a need to address Constrained devices and environments, without sacrificing security
  - a need for reducing M2M fragmentation offers to provide:
    - faster solution development time (e.g. selected device could come with inadequate/no remote management capability)
    - lower costs for M2M customers (economies of scale / leverage to innovation).

- Within that scope OMA-DM group developed the Lightweight M2M Enabler providing:
  - an highly innovative, slim and efficient client-server protocol
  - an extendable data model

- **OMA LwM2M Enabler 1.0 has been released in December 2013.**
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LwM2M Enabler defines the application layer communication protocol between a Server and a Client

- Client-Server Protocol is based on open IETF standards
- CoAP is an alternative to HTTP for RESTful APIs in resource-constrained area
- CoAP and DTLS are bound to UDP or SMS bearers

Typically:
- In LwM2M, the Server resides in a Data Center and the Client resides in the Device
- LwM2M separates Protocol Commands and Data Object (as in OMA DM 1.x and 2.0)

LwM2M Enabler is focused on constrained M2M devices (low-power μC, low amount of Flash & RAM)
- Applicable to Cellular, 6LoWPAN, WiFi or any other IP based constrained devices or networks
- Public registry of Objects from OMA, other SDOs or enterprises
OMA-LWM2M TECHNOLOGIES (2/6)

- Client-Server Protocol based on CoAP
  - (HTTP-like protocol adapted to constrained-context)
- Extensible Object and Resource model for application semantics
  - A Client has one or more Object Instances
  - An Object is a collection of Resources
  - A resource may be “Read”, “Written” or “Executed” and “Observed”
  - A Resource may contain:
    - a piece of information (value)
    - a reference to an other Object Instance
  - Resources can have multiple instances
**OMA-LWM2M TECHNOLOGIES (3/6)**

**LwM2M Abstract Message Flow**

- **4 Categories of LwM2M Operations**
  - Bootstrap operations
  - Discovery/Registration operations
  - Device Mgt & Serv. Enablement Operations
  - Observe & Notify operations (Information reporting)

- **LwM2M Operations are mapped on**
  - GET, PUT, POST and DELETE CoAP Operations
OMA-LWM2M TECHNOLOGIES (4/6)

OMA-LwM2M is based on OPEN IETF Standards

- [RFC5262] CoAP main features required for LwM2M
  - the 4-byte binary CoAP message header is used for Request and Response interactions.
  - (12-bytes header for supporting the Information Reporting interface [NOTIFY])
  - Confirmable,Acknowledgement and Reset messages MUST be supported.
  - (Non-Confirmable msg MAY be used by a Client for sending Notifications)
  - GET, PUT, POST and DELETE CoAP methods MUST be supported (LwM2M Operations)
  - Possibility to specify the payload media type (Text, TLV, Opaque, Json)

- [RFC6347] UDP Channel Security for CoAP is DTLS
  - equivalent of TLS v1.2 for HTTP modified to allow UDP unreliable and out of order transfers.
  - use a subset of the Cipher Suites defined in TLS
  - secure handshake with session key generation, mutual authentication, data integrity and confidentiality.
  - Keying material for securing DTLS session:
    - is provided during the Bootstrap phase
    - is carried in a LwM2M Security Object Instance
OMA-LWM2M TECHNOLOGIES (5/6)

- CoAP vs HTTP rational for constrained environments
  - HTTP - ASCII- 55Bytes Header vs CoAP - Binary- 4Bytes header
  - HTTP/TCP flow vs CoAP/ UDP flow
Technical Specification LwM2M 1.0 Released in 4Q 2013

OMA LwM2M Enabler also specifies a set of 8 Device Management-oriented Objects

- **0: Security Object** - handles security aspects between LwM2M Client and Server
- **1: Server** - defines data and functions related to the LwM2M Server
- **2: Access Control** - defines the access rights which can be granted on Client Objects for a given Server
- **3: Device** - details device specific information
- **4: Firmware** - details resources on the device useful for firmware upgrades
- **5: Location** - groups resources providing information about the device current location
- **6: Connectivity Monitoring** - groups resources that assist in monitoring the status of a network connection
- **7: Connection Statistics** - groups resources that hold statistical information about an existing network connection

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OMA-LWM2M BENEFITS

- Provides a Solution for Device and Application Management to access Constrained-Devices

- Services Providers, OEMs, end users take benefit from uniform management of constrained-devices (cost, simplicity, efficiency, multi-source)

- Complementary Solution to existing Dev Management (e.g. OMA DM, BBF-TR 069) in extending the range of devices which can be securely managed

- Based on Open and Interoperable Industry Standards

- Extensible Data Model and open naming authority for Objects registry (OMNA), provide wide and easy access to IoT industry

- A dynamic LwM2M ecosystem is being put in place by the community ….
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LwM2M ecosystem is growing

- IPSO Alliance is defining LwM2M objects for smart city/building applications
- OMA DM current work is adding new functionalities/Objects to LwM2M TS 1.0 Enabler (Connectivity, Wipe and Lock, Software Mgnt, Device Capability Mgnt)
- Eclipse Foundation has started two LwM2M open source projects (Wakaama, Leshan)
- OMA is developing a test suite for interoperability/certification purpose
- OMA LwM2M Test Fest event
  - a first one has been held with ETSI and IPSO Alliance in Nov 2013 in Las Vegas
  - a second one will take place 26-29 Jan 2015 in Dusseldorf, GERMANY
- OMA public available portal for supporting the LwM2M developer’s community
**OMA-LWM2M ECOSYSTEM (2/2)**

**FOCUS**: OMA is developing a web site (available end of December 2014)

**OMA Developer ToolKit main content**

- **LwM2M Technical Specifications**: Web based documents
- **LwM2M Enabler Tutorial**
  - Simulates Client and Server functions
  - Helps to analyze and modify Client/Server messages exchanges
  - Client side is under development. (End of Dec 2014)
- **Object Registration & Object Editor (OMNA)**
- **Editor tool** to construct DM-MO as well as LwM2M Objects & Resources (end of Dec 2014)
- **Lab Kit**
  - Provides a list of platforms supporting OMA LwM2M Client
  - Basic examples dedicated for a given platform
- **LwM2M Test Server**: **Sandbox**
  - This LwM2M Test server is maintained and provided by the Eclipse Foundation
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OMA-LWM2M IN M2M CONTEXT

- OMA has joined oneM2M as a Partner Type 2 (Sept 2012)
- oneM2M uses existing Device Management Technologies:
  - OMA DM, BBF TR-069 but also OMA LwM2M
- oneM2M Service Layer uses DM functions of DM Layer
  - Layers’Interface MUST fulfill some requirements: OMA-DM M2Mi is addressing that topic
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USEFUL REFERENCES

- **OMA-LwM2M**: OMA-TS-LightweightM2M-V1_0, December 2013 (since Jan 2014: 1153 downloads)

- **OMN Lightweight M2M (LwM2M) Object & Resource Registry**

- **[RFC 7252]**: Constrained Application Protocol (CoAP) Shelby, Z., Hartke, K., Bormann, C., and B. Frank, June 2014


- **OMA–Lightweight M2M White paper**: G. Klas, F. Rodermund, Vodafone; Z. Shelby, ARM; S. Akhour, J. Höller, Ericsson; 2014 (572 downloads)

- **IPSO Alliance**

- **Eclipse Foundation**

- **oneM2M _ TS-0005-Management_Enablement (OMA)-V-2014-08**

- **OMA-M2Mi**: OMA Management Interface for M2M V1.0
THANK YOU