OMA Lightweight M2M (LwM2M) - Ready For 5G

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1. The State of the Lightweight M2M Standard – LwM2M

The IoT movement is slated to grow at one of technology's fastest rates in coming years. According to analyst firm IHS Markit, over 62 billion devices will be connected by the year 2023, essentially doubling in size from the 2019 mark.

With this growth, the scope and complexity of solutions expand as integrators bring together varying blends of components from different vendors and providers up and down the value chain. Low power devices constrained in wireless bandwidth, computing power, memory and frequently running on batteries make up the bulk of the expected growth of the IoT. Keeping these types of solutions at the very dense edge of the IoT at low cost, manageable and secure is critical for material growth to happen.

The inadequacy of decades-old protocols and lack of a true-to-form IoT device management standards impact solution providers, integrators and OEMs as these fragments fall short of meeting essential remote management requirements for this very device-dense edge of the IoT.

Another point to note about the growth of the IoT is how fragmented it is likely to remain. IoT is at the core of digital transformation projects across all industries and verticals. With this fragmentation, a unified approach to device management across all application areas is critical for solution providers. Configurable management software shortens development and repurposing of software and hardware across use cases and enables scaling both horizontally across application areas and vertically in deployment size of any specific use case.

To that end, the industry has come together to create a standard to address the need to remotely-manage devices in magnitudes that go from a few to millions. Further, the standard must not only be efficient and streamlined but also be based on current practices and principles in architecture and wireless readiness. System integrators and solution providers must be able to count on standards to establish resource reuse, parameters subject to configuration, and data models. That standard is the OMA Lightweight M2M – LwM2M.

LwM2M takes a standards-based approach to these challenges, aiming at harmonizing the IoT ecosystem and providing a comprehensive and flexible solution, particularly for device management purposes, but also for service enablement. Key benefits of LwM2M include:

- Efficient protocol design, to address a vast range of devices including resource constrained ones
- Standards centric and leveraging IETF core RFCs
- Extensible Object Data Model, with new Objects being added on a regular basis by OMA/IPSO, 3rd party industry associations and vendor ecosystems
- Secure and robust, with transport and application layer security

1.1 5G in a nutshell – The promise, opportunities, challenges

The significant benefits of 5G—revolutionary speeds, low latency, high resilience, network elasticity, quality of service, connection density, energy efficiency, scalability and other game-changing aspects—are creating unprecedented opportunities for business innovation. Imagine, for instance, what a typical 10x reduction in latency could do for a business that relies on telepresence. For a robotic arm that handles hazardous materials, latency of less than 10 milliseconds could eliminate the lag time that currently inhibits accuracy and control.

5G core network can be "sliced" and each piece can be configured to operate in parameters of speed, latency and device density aligned with the application type – massive IoT, enhanced mobile broadband or ultra-reliable, low latency (selfdriving automotive being its main target use case). As 5G moves from its 2018 launch state with non-stand-alone networks delivering primarily fixed wireless services, to the ultimate stand-alone 5G which incorporates a completely new core network and a radio access network, opportunities will rise exponentially. The extreme configurability of 5G will require that standards for device management mature with these advances both in pace and dimension.

1.2 LwM2M is 5G ready

With 3GPP Release 14 and 15, the Cellular IoT, comprised today of the LTE-M and NB-IoT standards, is well established in features and rollout timing to fulfill the role of 5G IoT for what is very likely to be the better part of the next decade. It was conceived to support massive IoT device densities approaching one million end points per Km2. This exponential increase in density and number of endpoints in an IoT deployment will stress and crack legacy approaches to device management.

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Adopters are in fact already reporting issues with the current state of device management. In a recent survey by research firm IDC, a key finding was that "Security and cost continue to be the top inhibitors to IoT projects. Beyond those challenges, organizations continue to struggle with skills gaps and infrastructure readiness."

With low-power, low-bandwidth devices making up a lot of this new category of end points, constraints on resources like power consumption, processing capabilities and use of the cellular radio link are high and getting higher. Beyond the cost of the device itself, the cost of operating them will add to the challenge. Devices must be abundantly configurable and over-the air upgradable to recover from issues, to stay compliant, and to support new capabilities as networks evolve. In the massive IoT scenario, having to physically touch even a small fraction of a large deployment for upgrades and software issue resolution could break the business case.

1.3 LwM2M – The work, accomplishments and 5G enablement

When LTE-M and NB-IoT entered the IoT stage, LwM2M became the natural path for the industry looking for a device management solution. LwM2M was designed to address specifically this category of low power, low data, constrained resource devices which made it easy to incorporate cellular IoT network technologies such as LTE- M and NB IoT.

During development, LwM2M objects were extended to support new requirements and features for these technologies. These are key capabilities of core objects:

- Bearer capabilities and parameters such as radio signal strength and link quality or cellular network characteristics
- Cellular configuration parameters such as bearer, APN and PDN Type and others
- Network statistics, including IP and non-IP data
- Low power modes, PSM and eDRX configuration and timers

The latest version - LwM2M 1.1 - introduced several new transport bindings including support for Non-IP as defined by 3GPP TS 23.401 which further optimizes link utilization.

1.4 Use cases and technologies

LwM2M adoption across verticals and use cases is growing. Leading adopter areas include automotive, agriculture, smart city, smart metering and asset tracking. Major mobile network operators globally have already deployed LwM2M servers in full production environments; with many of them requiring LwM2M support for network device approvals.

Interest in LwM2M is now well rooted across the industry with leading hardware and chipset makers embracing the standard. With that, the number of LwM2M-compliant devices will continue growing at faster pace into 2020 and beyond.

1.5 Future and positioning

LwM2M is an ideal device management solution for massive IoT, with many success stories with LTE-M and NB-IOT deployments. Because technology independent aspects of device management are already addressed in LwM2M, it will remain the standard of choice as it grows to cover a broader scope of use cases and device types in 5G, beyond massive IoT. OMA Device Management and Service Enablement Working Group (DMSE WG) has an active work item for 5G in its roadmap (Including for example 5G enhancements to Cellular Network Connectivity object, Bearer Selection object, APN Connection Profile, 5G QoS parameters, Connectivity Monitoring) to add new functionalities as 5G specifications evolve.

The LwM2M standard supports the needs of key use cases from a variety of industry verticals. OMA is an open standards setting body and invites new members and industry stakeholders to participate in expanding the reach of the standard into the future. Bring your expertise and insights from your industry into the process. Become a member and add to the representation of your needs and requirements to the forum.

Join OMA now.

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[LwM2M_WP_M2M]	OMASpecWorks, 'Lightweight M2M 1.1 White Paper by Ericsson and T-Mobile' https://www.omaspecworks.org/lightweight-m2m-1-1-white-paper-ericsson-and-t-mobile/
[IoT_Standards]	OMASpecWorks 'Comparing IoT Standards – What Services Do They Provide?' https://www.omaspecworks.org/comparing-iot-standards-what-services-do-they-provide-2/
[LTE-M]	Long Term Evolution for Machines
[NBIoT]	NarrowBand-Internet of Things

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Appendix A. Draft / Candidate History (Informative)

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OMA-State-of-the-LwM2M-Standard	12 Nov 2019	all	Initial version of the: OMA-DM-LightweightM2M-2019-0033R01INP_Position_paper__LwM2M_and_5G

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