

**Interface specification**

**for**

***LWM2M objects***

**of *AR8 Bluemountain***

**s**

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# Introduction

## Scope

This document details LWM2M objects, instances and resources that shall be supported by device.

## References

|  |  |  |
| --- | --- | --- |
| Ref. # | Document title | Doc. # |
|  | Bluemountain MRD | File Hold 4114597 ([Web link](https://carmd-ev-fh01.sierrawireless.local/FH/FileHold/WebClient/LibraryForm.aspx?docId=3826), [FH client link](fda://document/3826)) |
|  | OMA LWM2M specifications | [OMA Web site](http://technical.openmobilealliance.org/Technical/technical-information/release-program/current-releases/oma-lightweightm2m-v1-0) |
|  | LWM2M AirVantage Connector specification | File Hold 4116817 ([Web link](https://carmd-ev-fh01.sierrawireless.local/FH/FileHold/WebClient/LibraryForm.aspx?docId=15234), [FH client link](fda://document/15234)) |
|  | OMA FTP permanent documents | <http://member.openmobilealliance.org/ftp/Public_documents/DM/LightweightM2M/Permanent_documents/> |
|  | Confluence link to LWM2M specification | https://confluence.sierrawireless.com/pages/viewpage.action?title=AirVantage+LightWeightM2M+Specification&spaceKey=AVDEVONBOARD |

## Glossary of terms

| Term | Definition |
| --- | --- |
| 3GPP | 3rd Generation Partnership Project |
| 3GPP2 | 3rd Generation Partnership Project 2 |
| AMSS | Advanced Mobile Subscriber Software |
| APN | Access Point Name |
| CDMA | Code division multiple access |
| CHAP | Challenge Handshake Authentication Protocol |
| CRC | Cyclic Redundancy Check |
| DTLS | Datagram Transport Layer Security |
| EDGE | Enhanced Data rates for Global Evolution |
| ESN | Electronic Serial Number |
| FW | Firmware |
| GPRS | General Packet Radio Service |
| GPS | Global Positioning System |
| GSM | Global System for Mobile Communications |
| ICCID | Integrated Circuit Card Identifier |
| IMSI | International Mobile Subscriber Identity |
| IP | Internet Protocol |
| ISDN | Integrated Services Digital Network |
| LAC | Location Area Code |
| LTE | Long Term Evolution |
| LWM2M | Light Weight M2M |
| M2M | Machien-To-Machine |
| MCC | Mobile Country Code |
| MNC | Mobile Network Code |
| MSISDN | Mobile Station ISDN Number |
| NV | Non-volatile |
| PAP | Password Authentication Protocol |
| PDN | Packet Data Network |
| PIN | Personal Identification Number |
| PN | Pseudo Noise |
| PSK | Pre-Shared Key |
| RSCP | Received signal code power |
| RSRP | Reference Signal Received Power |
| RSRQ | Reference Signal Received Quality |
| SMS | Short Message Service |
| TDD | Time-Division Duplex |
| UDP | User Datagram Protocol |
| UICC | Universal Integrated Circuit Card |
| URI | Uniform Resource Identifier |
| UTC | Coordinated Universal Time |
| WLAN | Wireless Local Area Network |

# Design Overview

## Environment

Bluemountain

## Platform

AR8

## Overall System overview

This Interface Specification list all standard LWM2M objects that a device shall supports and also Sierra Wireless proprietary LWM2M objects.

For each object resource, a support status is given.

This objects can be used by the LWM2M DM server in order to retrieve/update data or execute jobs.

|  |  |
| --- | --- |
| 🗹 | Supported by device |
| 🗹 | Not supported by device |

# Object definition

## LWM2M Object: LWM2M Security - 0

### Description

This LWM2M Object provides the keying material of a LWM2M Client appropriate to access a specified LWM2M Server. One Object Instance SHOULD address a LWM2M Bootstrap Server.  
  
These LWM2M Object Resources MUST only be changed by a LWM2M Bootstrap Server or Bootstrap from Smartcardand MUST NOT be accessible by any other LWM2M Server.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| LWM2M Security | 0 | Multiple | Mandatory | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | LWM2M Server URI | W | S | M | String | 0-255 bytes |  | Uniquely identifies the LWM2M Server or LWM2M Bootstrap Server, and is in the form:  "coaps://host:port", where host is an IP address or FQDN, and port is the UDP port of the Server. | 🗹 | None  In fact, one of credential downloaded in production line |
| 1 | Bootstrap Server | W | S | M | Boolean | [0-1] |  | Determines if the current instance concerns a LWM2M Bootstrap Server (true) or a standard LWM2M Server (false) | 🗹 | None |
| 2 | Security Mode | W | S | M | Integer | [0-3] |  | Determines which UDP payload security mode is used  0: Pre-Shared Key mode  1: Raw Public Key mode  2: Certificate mode  3: NoSec mode | 🗹 | None |
| 3 | Public Key or Identity | W | S | M | Opaque | 128 bytes |  | Stores the LWM2M Client’s Certificate (Certificate mode), public key (RPK mode) or PSK Identity (PSK mode). | 🗹 | None  In fact, one of credential downloaded in production line |
| 4 | Server Public Key or Identity | W | S | M | Opaque |  |  | Stores the LWM2M Server’s or LWM2M Bootstrap Server’s Certificate (Certificate mode), public key (RPK mode) or PSK Identity (PSK mode). | 🗹 | None |
| 5 | Secret Key | W | S | M | Opaque | 128 bytes |  | Stores the secret key or private key of the security mode. This Resource MUST only be changed by a bootstrap server and MUST NOT be readable by any server. | 🗹 | None |
| 6 | SMS Security Mode |  | S | M | Integer | 0-255 |  | Determines which SMS security mode is used (see section 7.2) 0: Reserved for future use 1: DTLS mode (Device terminated) PSK mode assumed  2: Secure Packet Structure mode (S martcard terminated) 3: NoSec mode  4: Reserved mode (DTLS mode with multiplexing Security Association support)  5-203 : Reserved for future use  204-255: Proprietary modes | 🗹 | None |
| 7 | SMS Binding Key Parameters |  | S | M | Opaque | 6 bytes |  | Stores the KIc, KID, SPI and TAR. The format is defined in Section E.1.2. | 🗹 | None |
| 8 | SMS Binding Secret Key(s) |  | S | M | Opaque | 16-32-48 bytes |  | Stores the values of the key(s) for the SMS binding.  This resource MUST only be changed by a bootstrap server and MUST NOT be readable by any server. | 🗹 | None |
| 9 | LWM2M Server SMS Number |  | S | M | Integer |  |  | MSISDN used by the LWM2M Client to send messages to the LWM2M Server via the SMS binding.  The LWM2M Client SHALL silently ignore any SMS not originated from unknown MSISDN | 🗹 | None |
| 10 | Short Server ID | W | S | O | Integer | 1-65535 |  | This identifier uniquely identifies each LWM2M Server configured for the LWM2M Client.  This Resource MUST be set when the Bootstrap Server Resource has false value.  Default Short Server ID (i.e. 0) MUST NOT be used for identifying the LWM2M Server. | 🗹 | None |
| 11 | Client Hold Off Time |  | S | M | Integer | 0 | s | Relevant information for a Bootstrap Server only. The number of seconds to wait before initiating a Client Initiated Bootstrap once the LWM2M Client has determined it should initiate this bootstrap mode  In case client initiated bootstrap is supported by the LWM2M Client, this resource MUST be supported. | 🗹 | None |

## LWM2M Object: LWM2M Server - 1

### Description

This LWM2M Objects provides the data related to a LWM2M Server. A Bootstrap Server has no such an Object Instance associated to it.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| LWM2M Server | 1 | Multiple | Mandatory | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Short Server ID | R | S | M | Integer | 1-65535 |  | Used as link to associate server Object Instance. | 🗹 | None |
| 1 | Lifetime | RW | S | M | Integer |  | s | Specify the lifetime of the registration in seconds. | 🗹 | Heartbeat |
| 2 | Default Minimum Period | RW | S | O | Integer | 30 | s | The default value the LWM2M Client should use for the Minimum Period of an Observation in the absence of this parameter being included in an Observation.  If this Resource doesn’t exist, the default value is 1. | 🗹 | None |
| 3 | Default Maximum Period | RW | S | O | Integer | 60 | s | The default value the LWM2M Client should use for the Maximum Period of an Observation in the absence of this parameter being included in an Observation. | 🗹 | None |
| 4 | Disable | E | S | O | N/A | N/A |  | If this Resource is executed, this LWM2M Server Object is disabled for a certain period defined in the Disabled Timeout Resource. After receiving “Execute” operation, LWM2M Client MUST send response of the operation and perform de-registration process, and underlying network connection between the Client and Server MUST be disconnected to disable the LWM2M Server account.  After the above process, the LWM2M Client MUST NOT send any message to the Server and ignore all the messages from the LWM2M Server for the period. | 🗹 | None |
| 5 | Disable Timeout | RW | S | O | Integer |  | s | A period to disable the Server. After this period, the LWM2M Client MUST perform registration process to the Server. If this Resource is not set, a default timeout value is 86400 (1 day). | 🗹 | None |
| 6 | Notification Storing When Disabled or Offline | RW | S | M | Boolean |  |  | If true, the LWM2M Client stores “Notify” operations to the LWM2M Server while the LWM2M Server account is disabled or the LWM2M Client is offline. After the LWM2M Server account is enabled or the LWM2M Client is online, the LWM2M Client reports the stored “Notify” operations to the Server.  If false, the LWM2M Client discards all the “Notify” operationsor temporally disables the Observe function while the LWM2M Server is disabled or the LWM2M Client is offline.  The default value is true.  The maximum number of storing Notification per the Server is up to the implementation. | 🗹 | None |
| 7 | Binding | RW | S | M | String | U, UQ, S, SQ, US, UQS |  | This Resource defines the transport binding configured for the LWM2M Client.  If the LWM2M Client supports the binding specified in this Resource, the LWM2M Client MUST use that for Current Binding and Mode.  Device only supports “UQ” | 🗹 | None |
| 8 | Registration Update Trigger | E | S | M | N/A | N/A |  | If this Resource is executed the LWM2M Client MUST perform an “Update” operation with this LWM2M Server using the Current Transport Binding and Mode. | 🗹 | None |

## LWM2M Object: Access Control - 2

### Description

Access Control Object is used to check whether the LWM2M Server has access right for performing a operation.

### Object definition

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** | | LWM2M Access Control | 2 | Multiple | Optional | TBD | |  |

### Resource definitions

This object is not used 🗹

## LWM2M Object: Device - 3

### Description

This LWM2M Object provides a range of device related information which can be queried by the LWM2M Server, and a device reboot and factory reset function

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| Device | 3 | Single | Mandatory | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Manufacturer | R | S | O | String | 0-255 chars |  | Human readable manufacturer name | 🗹 | None |
| 1 | Model Number | R | S | O | String | 0-255 chars |  | A model identifier (manufacturer specified string) | 🗹 | None |
| 2 | Serial Number | R | S | O | String | 0-255 chars |  | Serial Number | 🗹 | FSN |
| 3 | Firmware Version | R | S | O | String | 0-255 chars |  | Current firmware version of the device. The Firmware Management function could rely on this resource. | 🗹 | Firmware version |
| 4 | Reboot | E | S | M | N/A | N/A |  | Reboot the LWM2M Device to restore the Device from unexpected firmware failure. | 🗹 | None |
| 5 | Factory Reset | E | S | O | N/A | N/A |  | Perform factory reset of the LWM2M Device to make the LWM2M Device have the same configuration as at the initial deployment.  When this Resource is executed, “De-register” operation MAY be sent to the LWM2M Server(s) before factory reset of the LWM2M Device. | 🗹 | None |
| 6 | Available Power Sources | R | M | O | Integer | 0-7 |  | 0 – DC power 1 – Internal Battery 2 – External Battery 4 – Power over Ethernet 5 – USB 6 – AC (Mains) power 7 – Solar | 🗹 | Power source voltage |
| 7 | Power Source Voltage | R | M | O | Integer |  | mV | Present voltage for each Available Power Sources Resource Instance.  Each Resource Instance ID MUST map to the value of Available Power Sources Resource. | 🗹 | Power source voltage |
| 8 | Power Source Current | R | M | O | Integer |  | mA | Present current for each Available Power Source | 🗹 | Power source voltage |
| 9 | Battery Level | R | S | O | Integer | 0-100 | % | Contains the current battery level as a percentage (with a range from 0 to 100). This value is only valid when the value of Available Power Sources Resource is 1. | TBD |  |
| 10 | Memory Free | R | S | O | Integer | 0-4294967295 | KB | Estimated current available amount of storage space which can store data and software in the LWM2M Device (expressed in kilobytes).  The device will return the whole area storage size | TBD | None |
| 11 | Error Code | R | M | M | Integer |  |  | 0=No error 1=Low battery power 2=External power supply off 3=GPS module failure 4=Low received signal strength 5=Out of memory 6=SMS failure 7=IP connectivity failure 8=Peripheral malfunction  When the single Device Object Instance is initiated, there is only one error code Resource Instance whose value is equal to 0 that means no error. When the first error happens, the LWM2M Client changes error code Resource Instance to any non-zero value to indicate the error type. When any other error happens, a new error code Resource Instance is created.  This error code Resource MAY be observed by the LWM2M Server. How to deal with LWM2M Client’s error report depends on the policy of the LWM2M Server. | TBD | None |
| 12 | Reset Error Code | E | S | O | N/A | N/A |  | Delete all error code Resource Instances and create only one zero-value error code that implies no error. | TBD | None |
| 13 | Current Time | RW | S | O | Time | See Description |  | Current UNIX time of the LWM2M Client.  The LWM2M Client should be responsible to increase this time value as every second elapses.  The LWM2M Server is able to write this Resource to make the LWM2M Client synchronized with the LWM2M Server.  According to LWM2M specification, on atomic read, the returned value is represented as an ASCII integer (9 or 10 bytes), else it’s represented as a binary signed integer in network byte order, where the first (most significant) bit is 0 (for a positive integer). | 🗹 | Local time |
| 14 | UTC Offset | RW | S | O | String | +xx:xx |  | Indicates the UTC offset currently in effect for this LWM2M Device. UTC+X [ISO 8601].  Device returns: “+hh:mn”  Example: “+02:00” | 🗹 | Local time |
| 15 | Timezone | RW | S | O | String |  |  | Indicates in which time zone the LWM2M Device is located, in IANA Timezone (TZ) database format. | 🗹 | Local time |
| 16 | Supported Binding and Modes | R | S | M | String | UQ |  | Indicates which bindings and modes are supported in the LWM2M Client. The possible values of Resource are combination of "U" or "UQ" and "S" or "SQ".  Device will only returned “UQ” | 🗹 | None |

| **Battery Status** | **Meaning** | Description |
| --- | --- | --- |
| 0 | Normal | The battery is operating normally and not on power. |
| 1 | Charging | The battery is currently charging. |
| 2 | Charge Complete | The battery is fully charged and still on power. |
| 3 | Damaged | The battery has some problem. |
| 4 | Low Battery | The battery is low on charge. |
| 5 | Not Installed | The battery is not installed. |
| 6 | Unknown | The battery information is not available. |

Table : Battery status

## LWM2M Object: Connectivity Monitoring - 4

### Description

This LWM2M Object enables monitoring of parameters related to network connectivity.  
  
In this general connectivity Object, the Resources are limited to the most general cases common to most network bearers. It is recommended to read the description, which refers to relevant standard development organizations (e.g. 3GPP, IEEE).  
  
The goal of the Connectivity Monitoring Object is to carry information reflecting the more up to date values of the current connection for monitoring purposes. Resources such as Link Quality, Radio Signal Strenght, Cell ID are retrieved during connected mode at least for cellular networks.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| Connectivity Monitoring | 4 | Single | Optional | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Network Bearer | R | S | M | Integer | [0-50] |  | Indicates the network bearer used for the current LWM2M communication session from the below network bearer list.  0~20 are Cellular Bearers 0: GSM cellular network 1: TD-SCDMA cellular network 2: WCDMA cellular network 3: CDMA2000 cellular network 4: WiMAX cellular network 5: LTE-TDD cellular network 6: LTE-FDD cellular network 7~20: Reserved for other type cellular network  21~40 are Wireless Bearers 21: WLAN network 22: Bluetooth network 23: IEEE 802.15.4 network  24~40: Reserved for other type local wireless network  41~50 are Wireline Bearers 41: Ethernet 42: DSL 43: PLC  44~50: reserved for others type wireline networks. | 🗹 | RAT |
| 1 | Available Network Bearer | R | M | M | Integer | [0-50] |  | Indicates list of current available network bearer. Each Resource Instance has a value from the network bearer list. | 🗹 | Current network Technology |
| 2 | Radio Signal Strength | R | S | M | Integer | [-120, -40] for GSM [-121,-25] for UMTS [-140,-44] for LTE [-75 to -100] for CDMA | dBm | This node contains the average value of the received signal strength indication used in the current network bearer in case Network Bearer Resource indicates a Cellular Network (RXLEV range 0…64) 0 is < 110dBm, 64 is >-48 dBm).  Refer to [3GPP 44.018] for more details on Network Measurement Report encoding and [3GPP 45.008] or for Wireless Networks refer to the appropriate wireless standard. | 🗹 | Signal Level |
| 3 | Link Quality | R | S | O | Integer | 0-255 |  | This contains received link quality e.g., LQI for IEEE 802.15.4, (Range (0..255)), RxQual Downlink (for GSM range is 0…7).  Refer to [3GPP 44.018] for more details on Network Measurement Report encoding. | 🗹 | RxQual (BER) for GSM/GPRS/EDGE  Ec/Io for LTE/UMTS/CDMA  Reference Signal Receive Quality for LTE |
| 4 | IP Addresses | R | M | M | String | 255 char |  | The IP addresses assigned to the connectivity interface. (e.g. IPv4, IPv6, etc.) | 🗹 | IP adress |
| 5 | Router IP Addresse | R | M | O | String |  |  | The IP address of the next-hop IP router.  Note: This IP Address doesn’t indicate the Server IP address. | 🗹 | None |
| 6 | Link Utilization | R | S | O | Integer | 0-100 | % | The average utilization of the link to the next-hop IP router in %. | 🗹 | None |
| 7 | APN | R | M | O | String | 255 char |  | Access Point Name in case Network Bearer Resource is a Cellular Network. | 🗹 | None |
| 8 | Cell ID | R | S | O | Integer | [0-FFFFFFFF] | N/A | Serving Cell ID in case Network Bearer Resource is a Cellular Network.  As specified in TS [3GPP 23.003] and in [3GPP. 24.008]. Range (0…65535) in GSM/EDGE  UTRAN Cell ID has a length of 28 bits.  Cell Identity in WCDMA/TD-SCDMA. Range: (0..268435455).  LTE Cell ID has a length of 28 bits.  Parameter definitions in [3GPP 25.331].  This information is retrieved from the information broadcasted by the network. | 🗹 | Cell ID |
| 9 | SMNC | R | S | O | Integer | [0-999] | % | Serving Mobile Network Code. In case Network Bearer Resource has 0(cellular network). Range (0…999).  As specified in TS [3GPP 23.003]. | 🗹 | Current Operator |
| 10 | SMCC | R | S | O | Integer | [0-999] |  | Serving Mobile Country Code. In case Network Bearer Resource has 0 (cellular network). Range (0…999).  As specified in TS [3GPP 23.003]. | 🗹 | Current Operator |

## LWM2M Object: Firmware Update - 5

### Description

This LWM2M Object enables management of firmware which is to be updated. This Object includes installing firmware package, updating firmware, and performing actions after updating firmware.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| Firmware Update | 5 | Single | Optional | urn:oma:lwm2m:oma:5 |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Package | W | S | M | Opaque |  |  | Firmware package | 🗹  Alternative way is used | FOTA |
| 1 | Package URI | W | S | M | String | 0-255 bytes |  | URI from where the device can download the firmware package by an alternative mechanism. As soon the device has received the Package URI it performs the download at the next practical opportunity. | 🗹 | FOTA |
| 2 | Update | E | S | M | N/A | N/A |  | Updates firmware by using the firmware package stored in Package, or, by using the firmware downloaded from the Package URI.  This Resource is only executable when the value of the State Resource is Downloaded. | 🗹 | FOTA |
| 3 | State | R | S | M | Integer | 1-3 |  | Indicates current state with respect to this firmware update. This value is set by the LWM2M Client.  1: Idle (before downloading or after updating)  2: Downloading (The data sequence is on the way)  3: Downloaded  If writing the firmware package to Package Resource is done, or, if the device has downloaded the firmware package from the Package URI the state changes to Downloaded.  If writing an empty string to Package Resource is done or writing an empty string to Package URI is done, the state changes to Idle.  If performing the Update Resource failed, the state remains at Downloaded.  If performing the Update Resource was successful, the state changes from Downloaded to Idle. | 🗹 | FOTA |
| 4 | Update Supported Objects | RW | S | O | Boolean | [0-1] |  | If this value is true, the LWM2M Client MUST inform the registered LWM2M Servers of Objects and Object Instances parameter by sending an Update or Registration message after the firmware update operation at the next practical opportunity if supported Objects in the LWM2M Client have changed, in order for the LWM2M Servers to promptly manage newly installed Objects.  If false, Objects and Object Instances parameter MUST be reported at the next periodic Update message.  The default value is false. | 🗹 |  |
| 5 | Update Result | R | S | M | Integer | [0-7] |  | Contains the result of downloading or updating the firmware  0: Default value. Once the updating process is initiated, this Resource SHOULD be reset to default value.  1: Firmware updated successfully,  2: Not enough storage for the new firmware package.  3. Out of memory during downloading process.  4: Connection lost during downloading process.  5: CRC check failure for new downloaded package.  6: Unsupported package type.  7: Invalid URI  This Resource MAY be reported by sending Observe operation. | 🗹 | FOTA |

## LWM2M Object: Location - 6

### Description

This LWM2M Objects provide a range of device related information which can be queried by the LWM2M Server, and a device reboot and factory reset function.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| Location | 6 | Single | Optional | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Latitude | R | S | M | String | -90.0000,+90.0000 | Deg | The decimal notation of latitude, e.g. -43.5723 [World Geodetic System 1984]. | 🗹 | Location |
| 1 | Longitude | R | S | M | String | -180.0000,+180.0000 | Deg | The decimal notation of longitude, e.g. 153.21760 [World Geodetic System 1984]. | 🗹 | Location |
| 2 | Altitude | R | S | O | String | 0-65535 | m | The decimal notation of altitude in meters above sea level. | 🗹 | Location |
| 3 | Uncertainty | R | S | O | String | 0-4294967295 | m | The accuracy of the position in meters. | depends on product |  |
| 4 | Velocity | R | S | O | Opaque |  | Refers to 3GPP GAD specs | The velocity of the device as defined in 3GPP 23.032 GAD specification. This set of values may not be available if the device is static. | 🗹 | Location |
| 5 | Timestamp | R | S | M | Time |  |  | The timestamp of when the location measurement was performed. | 🗹 | Location |

## LWM2M Object: Connectivity Statistics - 7

### Description

This LWM2M Objects enables client to collect statistical information and enables the LWM2M Server to retrieve these information, set the collection duration and reset the statistical parameters.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| Connectivity Statistics | 7 | Single | Optional | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Support** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | SMS Tx Counter | R | S | O | Integer | 0-4294967295 |  | Indicate the total number of SMS successfully transmitted during the collection period. | 🗹 | Number of sent SMS |
| 1 | SMS Rx Counter | R | S | O | Integer | 0-4294967295 |  | Indicate the total number of SMS successfully received during the collection period. | 🗹 | Number of received SMS |
| 2 | Tx Data | R | S | O | Integer | 0-4294967295 | Kilo-Bytes | Indicate the total amount of data transmitted during the collection period. '' | 🗹 | Number of sent packets |
| 3 | Rx Data | R | S | O | Integer | 0-4294967295 | Kilo-Bytes | Indicate the total amount of data received during the collection period. | 🗹 | Number of received packets |
| 4 | Max Message Size | R | S | O | Integer |  | Byte | The maximum message size that is used during the collection period. | 🗹 |  |
| 5 | Average Message Size | R | S | O | Integer |  | Byte | The average message size that is used during the collection period. | 🗹 |  |
| 6 | StartOrReset | E | S | M | N/A | N/A |  | Start to collect information or reset all other Resources to zeros in this Object. For example, the first time this Resource is executed, the client starts to collect information. The second time this Resource is executed, the values of Resource 0~5 are reset to 0. | 🗹 |  |

## LWM2M Object: Software Management - 9

### Description

This LWM2M objects provides the resources needed to perform software management on the device. Each software component is managed via a dedicated Software Management Object instance.

This object is only used for download and update a SW application. It is not used for SW application management.  
SW = Legato application, external application

### Object definition

| Name | Object ID | Instances | Mandatory | Object URN |
| --- | --- | --- | --- | --- |
| Sofware Update | 9 | Multiple | Optional | urn:oma:lwm2m:oma:9 |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| ID | Name | O | I | M | Type | Range or Enumeration | Description | Support | Customer oriented name |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | PkgName | R | S | M | String | 0-255 bytes | Name of the software package (Package Name shall need to be provided by AVMS server explicitly thanks to the application data model manifest.) | 🗹  But where is the info ? | “SOTA” |
| 1 | PkgVersion | R | S | M | String | 0-255 bytes | Version of the software package (Package Version shall need to be provided by AVMS server explicitly thanks to the application data model manifest.) | 🗹  But where is the info ? | “SOTA” |
| 2 | Package | W | S | M | Opaque |  | Software package | 🗹 | “SOTA” |
| 3 | Package URI | W | S | M | String | 0-255 bytes | URI from where the device can download the software package by an alternative mechanism. As soon the device has received the Package URI it performs the download at the next practical opportunity. | 🗹 | “SOTA” |
| ~~4~~ | Install | E | S | M | N/A | N/A | Installs software from the package either stored in Package resource, or, downloaded from the Package URI. This Resource is only executable when the value of the State Resource is DELIVERED. | 🗹 | “SOTA” |
| ~~5~~ | Checkpoint | R | S | O | ObjLink |  | Link to a “Checkpoint” object which allows to specify conditions/dependencies for a software update. E.g. power connected, sufficient memory, target system. | 🗹 |  |
| 6 | Uninstall | E | S | M |  |  | Uninstalls the software package, removes it from the Device if present and set Update State back to INITIAL state. | 🗹 | “SOTA” |
| 7 | Update Satate | R | S | M | Integer | [1-5] | Indicates current state with respect to this software update. This value is set by the LWM2M Client.  1: INITIAL (Before downloading).  2: DOWNLOAD STARTED (The downloading process has started and is on-going. 3: DOWNLOADED(The package has been completely downloaded) 4: DELIVERED (In that state, the package has been correctly downloaded and is ready to be installed)  If executing the Install Resource failed, the state remains at DELIVERED.  If executing the Install Resource was successful, the state changes from DELIVERED to INSTALLED.  After executing the UnInstall Resource, the state changes to INITIAL.  5: INSTALLED (In that state the software is correctly installed and can be activated or deactivated according to the Activation State Machine) | 🗹 | “SOTA” |
| 8 | Update Supported Objects | RW | S | M | Boolean | [0-1] | If this value is true, the LWM2M Client MUST inform the registered LWM2M Servers of Objects and Object Instances parameter by sending an Update or Registration message after the software update operation at the next practical opportunity if supported Objects in the LWM2M Client have changed, in order for the LWM2M Servers to promptly manage newly installed Objects.  If false, Objects and Object Instances parameter MUST be reported at the next periodic Update message.  The default value is false | 🗹 | “SOTA” |
| 9 | Update State | R | S | M | Integer | [0-10] | Contains the result of downloading or installing/uninstalling the software  0: Initial value. Prior to download any new package in the Device, Update Result MUST be reset to this initial value. One side effect of executing the Uninstall resource is to reset Update Result to this initial value “0”.  1: Downloading. The package downloading process is on-going.  2: Software d successfully installed,  3: Not enough storage for the new software package.  4: Out of memory during downloading process.  5: Connection lost during downloading process.  6: Package integrity check failure.  7: Unsupported package type.  8: Invalid URI  9: Device defined update error  10: Software installation failure  This Resource MAY be reported by sending Observe operation. | 🗹 | “SOTA” |
| 10 | Activate | E | S | M | N/A | N/A | This action activates the software previously successfully installed (the Package Installation State Machine is currently in the INSTALLED state) | 🗹 | “SOTA” |
| 11 | Deactivate | E | S | M | N/A | N/A | This action deactivates softwareif the Package Installation State Machine is currently in the INSTALLED state. | 🗹 | “SOTA” |
| 12 | Activation State | R | S | M | Boolean | [0-1] | Indicates the current activation state of this software:  0: DISABLED  Activation State is DISABLED if the Software Activation State Machine is in the INACTIVE state or not alive.  1: ENABLED  Activation State is ENABLED only if the Software Activation State Machine is in the ACTIVE state | 🗹 |  |
| 13 | Package Settings | RW | S | O | ObjLink |  | Link to “Package Settings” object which allows to modify at any time software configuration settings. This is an application specific object.  Note: OMA might provide a template for a Package Settings object in a future release of this specification. | 🗹 |  |

## LWM2M Object: Subscription - 10241

### Description

This LWM2M Object provides information on SIM card.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| LWM2M Subscription | 10241 | Single | Mandatory | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Module identity (IMEI) | R | S | M | String | 15 chars |  | IMEI | IMEI |
| 1 | SIM card identifier | R | S | M | String | 20 chars |  | ICCID | ICCID |
| 2 | Subscription identity | R | S | M | String | Up to 16 chars |  | MEID/ESN/IMSI | MEID/ESN/IMSI |
| 3 | Subscription phone number | R | S | M | String | Up to 64 chars |  | MSISDN | MSISDN |

## LWM2M Object: Extended connectivity statistics - 10242

### Description

This LWM2M Object provides monitoring on wireless connectivity parameters.

### Object definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Object ID** | **Instances** | **Mandatory** | **Object URN** |
| LWM2M Extended connectivity statistics | 10242 | Single | Mandatory | TBD |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Units** | **Description** | **Customer oriented name** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Signal bar | R | S | M | Integer | 0-5 |  | Signal bar | Signal bar |
| 1 | Cellular technology used | R | S | M | String | “LTE”, “GSM”, “HSPA”, “HSPA+”, “Edge”, “HSDPA”, “HSUPA”, others |  | LWM2M packet data technology. | Current technology used |
| 2 | Romaing indicator | R | S | M | Integer | 0-1 |  | Indicated if the device is in roaming.Indicated if the device is in roaming.  0: Home  1: Roaming | Roaming indicator |
| 3 | Ec/Io | R | S | M | Integer |  | dBm | Ec/Io | Ec/Io |
| 4 | RSRP | R | S | M | Integer | [-140 - -44] | dBm | RSRP if LTE is used | RSRP |
| 5 | RSRQ | R | S | M | Integer | [-20 - -3] | dB | RSRQ if LTE is used | RSRQ |
| 6 | RSCP | R | S | M | Integer | [-121 - -28] | dBm | RSCP if UMTS is used | RSCP |
| 7 | Device temperature | R | S | M | Integer | [-45 – 130] | °C | Device temperature | Device temperature |
| 8 | Unexpected Reset Counter | R | S | M | Integer | 0-4294967295 |  | Unexpected Reset Counter | Unexpected Reset Counter |
| 9 | Total Reset Coun | R | S | M | Integer | 0-4294967295 |  | Total Reset Coun | Total Reset Counter |
| 10 | LAC | R | S | M | Integer | 0-4294967295 |  | Location Area Code | LAC |

## LWM2M Object: Legato Framework

### Description

This object return information on legato. This object path is /legato/0

### Object definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **path** | **Object Id** | **Instances** | **Mandatory** | **Object URN** |
| Legato Framework | legato | 0 | Single | Mandatory | /legato/0 |

### Resource definitions

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Description** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Version | R | S | M | String | 0 – 255 bytes | Legato Framework version |
| 1 | Restart | E | S | M | N/A | N/A | Restarts the framework |

## LWM2M Objects: Application

### Description

These objects return information on application.

### Objects definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **path** | **Object Id** | **Instances** | **Mandatory** | **Object URN** |
| Application | /le\_appname | 0 | Single | Mandatory | /le\_appname/0 |
| Application processes | /le\_appname | 1 | Multiple | Mandatory | /le\_appname/1 |

### Resource definitions: object 0

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Description** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Version | R | S | M | String | 0 – 255 bytes | Application version |
| 1 | Name | R | S | M | String | 0 – 255 bytes | Application name |
| 2 | State | R | S | M | Integer | [0-2] | Application state  0: stopped  1: Running  2: Idle |
| 3 | Start Mode | R | S | M | Integer | [0-1] | 0 = Auto. The app will be started when the framework starts.  1 = Manual. The app will not be started when the framework starts. |

### Resource definitions: object 1

Column O (Operations): R 🡪 Read; W 🡪 Write; E 🡪 Execute

Column I (Instances): S 🡪 Single; M 🡪 Multiple

Column M (Mandatory): M 🡪 Mandatory; O 🡪 Optional

| **ID** | **Name** | **O** | **I** | **M** | **Type** | **Range or Enumeration** | **Description** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Name | R | S | M | String | 0 – 255 bytes | Process name |
| 1 | ExecName | R | S | M | String | 0 – 255 bytes | Name of the executable that this process was started from |
| 2 | State | R | S | M | Integer | [0-1] | Current state of the process.  0 = Stopped 1 = Running |
| 3 | Fault Action | R | S | M | Integer | [0-4] | The action to take when this process experiences a fault.  0 = Ignore  1 = Restart  2 = RestartApp  3 = StopApp  4 = Reboot |