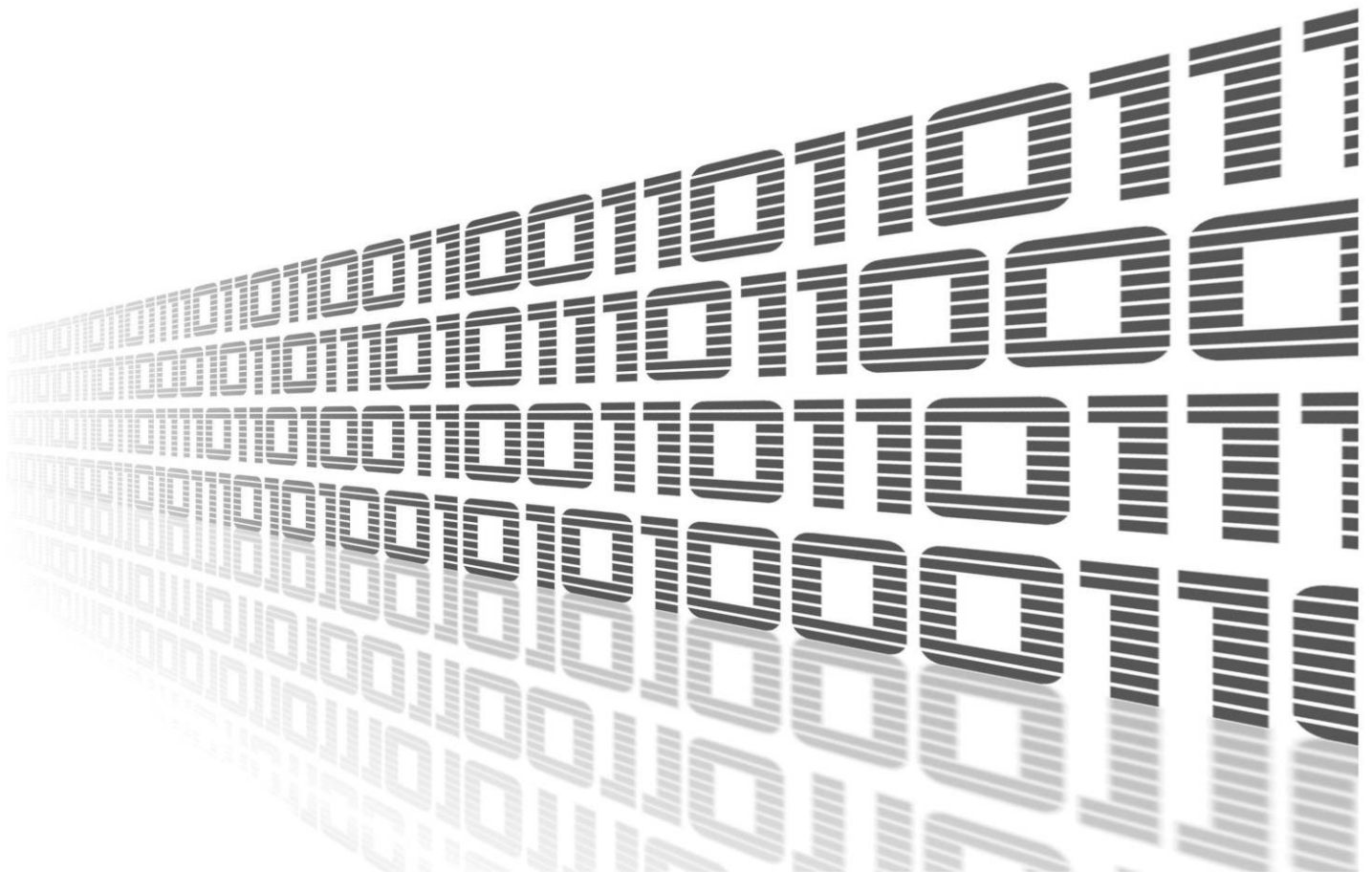




RouterApp

LwM2M Manager



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Used symbols

Important



Important — Indicates a risk to personal safety or potential damage to the router. Follow these instructions precisely to prevent injury or equipment damage.

Warning



Warning — Highlights conditions that may cause malfunction, loss of data, or unexpected behavior in specific situations. Read carefully before proceeding.

Info



Info — Provides helpful tips, context, or references that improve understanding but are not strictly required to complete the task.

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1. Description of Router App

Warning

Router app *LwM2M Manager* is not included in the standard router firmware. Uploading of this router app is described in the Configuration manual (see Chapter 4 *Related Documents*).

The *LwM2M Manager* router app implements an OMA LwM2M 1.1 device management client. It connects the Advantech router to a remote LwM2M server, enabling remote monitoring, configuration, and lifecycle management using the standardised Lightweight Machine-to-Machine protocol.

Communication is carried over CoAP/UDP. The module supports both plain (unencrypted) CoAP and DTLS-secured CoAP, with two DTLS authentication methods: Pre-Shared Key (PSK) and X.509 certificates.

1.1 Connection Modes

The module supports two connection modes:

- **Direct registration** – The device registers directly with the configured LwM2M server. This mode is used when the server address and credentials are pre-configured on the device.
- **Bootstrap** – The device connects first to a bootstrap server, which provisions the LwM2M server URI and security credentials. After successful bootstrap, the device registers with the provisioned server. This mode is suitable for zero-touch provisioning scenarios.

1.2 Registered LwM2M Objects

In LwM2M, each object is identified by a numeric ID assigned by OMA, shown in parentheses as **/ID** (e.g. **/0**, **/6**). The module always registers the following standard LwM2M objects:

- **Security Object (/0)** – Holds server URI, security mode, and credentials.
- **Server Object (/1)** – Registration lifetime, binding mode, and server ID.
- **Device Object (/3)** – Read-only device identity (manufacturer, model, serial number, firmware version) and current time.

The following objects are optional and registered only when the corresponding feature is enabled in the configuration:

- **Location Object (/6)** – GNSS position data (latitude, longitude, altitude, timestamp). Registered only when *Send GNSS Location (object /6)* is enabled and the router hardware supports GNSS.
- **Connectivity Object (/3412)** – Mobile WAN status data (technology, RSSI, IMEI, operator, ICCID, signal strength and quality). Registered when *Send Mobile WAN Status (object /3412)* is enabled.

Info

Location and connectivity resource values are refreshed every 5 seconds. The current time resource is updated every second to keep its value live for server observers.

1.3 Keepalive and NAT Traversal

The module sends an LwM2M registration update to the server every 30 seconds, independently of the configured registration lifetime. This keepalive ensures that NAT mappings remain open and allows the server to send downlink messages (observations, write operations) to the device at any time.

2. Web Interface

A web interface is available for configuring the *LwM2M Manager* router app, as shown in Figure 1. It can be accessed by clicking the module name on the *Router Apps* page of the router's web interface.

On the *Status* → *System Log* page, you can see a part of the system log related to the Router App. The *Configuration* → *Global* page contains the configuration described in the following sections. The *Return* item under the *Administration* section just returns to the router GUI.

LwM2M Manager Configuration

Enable LwM2M Manager

Server

Server URI
Server Port

Use Bootstrap Server

Bootstrap URI
Bootstrap Port
Registration Lifetime s

Security

Security Mode
PSK Identity
PSK Key (hex)

CA Certificate * PEM format

Client Certificate * PEM format

Client Private Key * PEM format

Data

Endpoint Name
Custom Endpoint

Send GNSS Location (object /6)
 Send Mobile WAN Status (object /3412)

* can be blank

Figure 1: Router App configuration GUI

The configuration is organised into three sections: *Server Settings*, *Security Settings*, and *Data Settings*.

2.1 Server Settings

The *Server Settings* section configures the LwM2M server connection and registration parameters.

Item	Description
Enable LwM2M Manager	Enables the LwM2M Manager daemon. The module does not connect to any server when disabled.
Server URI	URI of the LwM2M server (e.g. <code>coap://192.168.1.1</code> or <code>coaps://lwm2m.example.com</code>). Use <code>coap://</code> for plain CoAP and <code>coaps://</code> for DTLS.
Server Port	UDP port of the LwM2M server. Default: <code>5683</code> for plain CoAP, <code>5684</code> for DTLS.
Use Bootstrap Server	Enables bootstrap mode. When checked, the device connects to the bootstrap server first to obtain LwM2M server credentials.
Bootstrap URI	URI of the bootstrap server. Required when <i>Use Bootstrap Server</i> is enabled.
Bootstrap Port	UDP port of the bootstrap server. Default: <code>5683</code> .
Registration Lifetime	Duration in seconds for which the LwM2M registration is valid. The server removes the device registration if no update is received within this interval. Default: <code>300</code> .

Table 1: Server settings parameters

2.2 Security Settings

The *Security Settings* section controls the DTLS security mode and the associated credentials.

Item	Description
Security Mode	Selects the transport security: <ul style="list-style-type: none"> • 0 – None: Plain CoAP without encryption or authentication. • 1 – PSK: DTLS with a Pre-Shared Key. Both <i>PSK Identity</i> and <i>PSK Key</i> must be filled in. • 2 – Certificate: DTLS with X.509 certificates. <i>CA Certificate</i>, <i>Client Certificate</i> and <i>Client Private Key</i> must be filled in.
PSK Identity	Identity string sent to the server during the DTLS PSK handshake. Used when Security Mode is PSK.
PSK Key (hex)	Pre-shared key encoded as a hexadecimal string (e.g. <code>deadbeef1234</code>). Used when Security Mode is PSK.
CA Certificate	CA certificate in PEM format. The client uses this certificate to verify the server identity. Used when Security Mode is Certificate.
Client Certificate	Client certificate in PEM format. Sent to the server for mutual TLS authentication. Used when Security Mode is Certificate.
Client Private Key	Client private key in PEM format. Must correspond to the Client Certificate. Used when Security Mode is Certificate.

Table 2: Security settings parameters

Warning

PSK and certificate credentials are stored in the router configuration. Ensure the router's configuration access is adequately protected.

2.3 Data Settings

The *Data Settings* section controls the device endpoint identity and which optional LwM2M objects are registered with the server.

Item	Description
Endpoint Name	Selects the source of the LwM2M endpoint name used during registration: <ul style="list-style-type: none"> • Serial number: The router's hardware serial number is used as the endpoint name. This guarantees a unique identifier without manual configuration. • Custom: The value entered in <i>Custom Endpoint</i> is used.
Custom Endpoint	Arbitrary endpoint name string (e.g. <code>my-device-001</code>). Required when <i>Endpoint Name</i> is set to Custom.
Send GNSS Location (object /6)	When enabled, the Location Object (/6) is registered with the server and GNSS position data is reported. The option has no effect if the router hardware does not support GNSS.
Send Mobile WAN Status (object /3412)	When enabled, the Connectivity Object (/3412) is registered with the server and mobile WAN status data (signal strength, operator, IMEI, etc.) is reported. Default: enabled.

Table 3: Data settings parameters

3. LwM2M Objects

This chapter provides a resource-level reference for all LwM2M objects implemented by the module. Each object is identified by its OMA-assigned numeric ID shown in the section title (e.g. **/0**, **/3412**); individual resources within an object follow the same notation (e.g. **/0/1**). The Access column uses the following notation: **R** = read-only, **W** = write-only, **RW** = read/write, **E** = executable.

3.1 Object /0 – Security

The Security Object holds the LwM2M server URI, security mode, and credentials. It is always created and is not directly readable by the LwM2M server (access is restricted to the bootstrap interface).

ID	Resource Name	Type	Access
/0	Server URI	String	RW
/1	Bootstrap Server	Boolean	RW
/2	Security Mode	Integer	RW
/3	Public Key or Identity	Opaque	RW
/5	Secret Key	Opaque	RW
/10	Short Server ID	Integer	RW
/11	Client Hold Off Time	Integer	RW

Table 4: Object /0 – security resources

3.2 Object /1 – Server

The Server Object contains the registration parameters for the LwM2M server.

ID	Resource Name	Type	Access
/0	Short Server ID	Integer	R
/1	Lifetime	Integer	RW
/6	Notification Storing When Disabled or Offline	Boolean	RW
/7	Binding	String	RW
/8	Registration Update Trigger	None	E

Table 5: Object /1 – server resources

Info

The *Binding* resource is always set to **U** (UDP). The *Registration Update Trigger* resource can be executed by the server to force an immediate registration update.

3.3 Object /3 – Device

The Device Object provides read-only identity information derived from the router firmware and hardware, plus a writable current time resource.

ID	Resource Name	Type	Access
/0	Manufacturer	String	R
/1	Model Number	String	R
/2	Serial Number	String	R
/3	Firmware Version	String	R
/6	Available Power Sources	Integer (multi)	R
/7	Power Source Voltage	Integer (multi)	R
/13	Current Time	Time	RW

Table 6: Object /3 – device resources

- **Manufacturer** is always `Advantech`.
- **Model Number**, **Serial Number**, and **Firmware Version** are read from the router system at startup.
- **Available Power Sources** and **Power Source Voltage** expose a single instance representing the DC power supply (type 1). Voltage is reported in millivolts.
- **Current Time** returns the Unix timestamp. When written by the server, the client stores the difference as an in-memory offset and reports adjusted time in subsequent messages — the router system clock is not modified and the offset is lost on client restart.

3.4 Object /6 – Location

The Location Object is created only when *Send GNSS Location (object /6)* is enabled and the router hardware provides GNSS capability. Resource values are polled from the hardware every 5 seconds.

ID	Resource Name	Type	Access
/0	Latitude	Float (degrees)	R
/1	Longitude	Float (degrees)	R
/2	Altitude	Float (metres)	R
/5	Timestamp	Time	R

Table 7: Object /6 – location resources

3.5 Object /3412 – Connectivity

The Connectivity Object is created when *Send Mobile WAN Status (object /3412)* is enabled. It reports the current state of the mobile WAN interface. Resource values are polled every 5 seconds.

ID	Resource Name	Type	Access
/1	Technology	String	R
/20	RSSI	Integer (dBm)	R
/22	IMEI	String	R
/23	Operator	String	R
/24	ICCID	String	R
/27	Signal Strength	Integer (dBm)	R
/28	Signal Quality	Integer (%)	R

Table 8: Object /3412 – connectivity resources

- **Technology** reports the current radio access technology as a string (e.g. `LTE`, `NR`).
- **RSSI** and **Signal Strength** report signal power in dBm.
- **Signal Quality** reports a percentage-based quality indicator.

4. Related Documents

- [1] OMA: [OMA LwM2M Technical Specification v1.1](#)
Lightweight Machine-to-Machine protocol specification.
- [2] Eclipse Foundation: [Eclipse Wakaama](#)
Open-source C implementation of the OMA LwM2M standard.

You can obtain all product-related documents, software updates, and supplementary materials on the Advantech *Engineering Portal* at icr.advantech.com.

For easy access to specific resources, please refer to the following sections of the portal:

- **Router Support Materials:** To access your router's supporting documents (such as the *Hardware Manual* and *Configuration Manual*), the latest firmware, or other technical resources, navigate to *Support* → [Router Models](#). Locate your specific model and select the appropriate tab under the *Documents to download* section. Available tabs include *Brochures*, *Manuals*, *Certificates*, *Firmware*, *Images/3D Models*, *PCN/SA*, and *Others*.
- **Router Apps:** To extend your router's functionality, installation packages and comprehensive manuals for various extension modules are available by navigating to *Download* → [Router Apps](#).
- **Application Notes:** For detailed guides, configuration examples, and step-by-step instructions for implementing specific networking features and use cases, navigate to *Download* → [Application Notes](#).
- **Development Documents:** If you are interested in custom scripting, programming your own applications, or compiling custom modules, navigate to the [Development](#) page.