



1 **LoRaWAN DLMS End-Device Monitoring Guidelines**
2 Copyright © 2020LoRa Alliance, Inc. All rights reserved.

3

4 **NOTICE OF USE AND DISCLOSURE**

5 Copyright © LoRa Alliance, Inc. (2020). All Rights Reserved.

6

7 The information within this document is the property of the LoRa Alliance (“The Alliance”) and its use and disclosure
8 are subject to LoRa Alliance Corporate Bylaws, Intellectual Property Rights (IPR) Policy and Membership
9 Agreements.

10

11 Elements of LoRa Alliance specifications may be subject to third party intellectual property rights, including without
12 limitation, patent, copyright or trademark rights (such a third party may or may not be a member of LoRa Alliance).
13 The Alliance is not responsible and shall not be held responsible in any manner for identifying or failing to identify
14 any or all such third-party intellectual property rights.

15

16 This document and the information contained herein are provided on an “AS IS” basis and THE ALLIANCE
17 DISCLAIMS ALL WARRANTIES EXPRESS OR IMPLIED, INCLUDING BUT NOTLIMITED TO (A) ANY
18 WARRANTY THAT THE USE OF THE INFORMATION HEREINWILL NOT INFRINGE ANY RIGHTS OF THIRD
19 PARTIES (INCLUDING WITHOUTLIMITATION ANY INTELLECTUAL PROPERTY RIGHTS INCLUDING
20 PATENT, COPYRIGHT OR TRADEMARK RIGHTS) OR (B) ANY IMPLIED WARRANTIES OF
21 MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NONINFRINGEMENT.

22

23 IN NO EVENT WILL THE ALLIANCE BE LIABLE FOR ANY LOSS OF PROFITS, LOSS OF BUSINESS, LOSS
24 OF USE OF DATA, INTERRUPTION OFBUSINESS, OR FOR ANY OTHER DIRECT, INDIRECT, SPECIAL OR
25 EXEMPLARY, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND, IN CONTRACT OR
26 IN TORT, IN CONNECTION WITH THIS DOCUMENT OR THE INFORMATION CONTAINED HEREIN, EVEN IF
27 ADVISED OF THE POSSIBILITY OF SUCH LOSS OR DAMAGE.

28

29

30 The above notice and this paragraph must be included on all copies of this document that are made.

31

32 LoRa Alliance, Inc.
33 5177 Brandin Court
34 Fremont, CA 94538

35 *LoRa Alliance® and LoRaWAN® are licensed trademarks. All company, brand and product names may be*
36 *trademarks that are the sole property of their respective owners.*

37



1
2
3 **LoRaWAN[®] DLMS End-device Monitoring**
4 **Guidelines**
5 **Technical Recommendation (TR006)**
6
7

8 **Authored by the LoRa Alliance Technical Committee**
9

10 **Technical Committee Chair and Vice-Chair:**

11 A. YEGIN (Actility), O. SELLER (Semtech)
12

13 **Editor:**

14 O. GIMENEZ (Semtech)
15

16 **Contributors:**

17 M. LE GOURRIEREC (Sagemcom)
18

19 **Version:** 1.0.0

20 **Date:** Oct 6, 2020

21 **Status:** Final
22
23
24
25
26

1 Contents

2	1	Introduction	4
3	2	Conventions	5
4	3	Recommended Parameters	6
5		Glossary	8
6		Bibliography	9
7		References	9
8		NOTICE OF USE AND DISCLOSURE	10
9			

1 Introduction

This document is a Technical Recommendation describing LoRaWAN parameters required by the DLMS User Association for the implementation of interface classes operating over a LoRaWAN network. It is limited to the application of DLMS over LoRaWAN. A list of end-device management and monitoring parameters are provided in this document.

Questions asked by the metering ecosystem using LoRaWAN as a new communication protocol for connecting metering end-devices are answered in this document. Metering is referenced as a typical application and vertical use case. However, this technical recommendation may be used in multiple use cases as the metering ecosystem utilizes different protocols depending on the deployment region. For example, this document may be used by DLMS-COSEM.

Based on a liaison agreement between the LoRa Alliance and DLMS UA, a set of technical specifications are written to define how LoRaWAN will be used with a DLMS compliant meters (see BlueBook Edition 14). The parameters for monitoring the DLMS layer using a LoRaWAN connected device are also outlined in such documents.

DLMS is an application-oriented communication protocol that supports the management of information for a device. DLMS UA requires a list of parameters that will be used to report and monitor a LoRaWAN end-device and included in the LoRaWAN DLMS profile.

The information defined in this document may be available over-the-air through the DLMS protocol over LoRaWAN or other local interfaces.

Following guidelines have been observed for generation of each parameter:

- No additional technical requirements should be imposed on the LoRaWAN protocol
- Requirements must be transparent to any LoRaWAN L2 version (up to 1.1.x)
- Requirements may request modifications of the LoRaWAN stack implementation to deliver the information elements.

1 2 Conventions

2

3 The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD",
4 "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL"
5 in this document are to be interpreted as described in BCP14 [RFC2119] [RFC8174] when,
6 and only when, they appear in all capitals, as shown here.

7

3 Recommended Parameters

The following is a list of parameters that are useful to DLMS. They are organized in three categories: General setup, diagnostic and multicast setup.

General Setup	
Parameter name	Description
DevEUI	
DevAddr	
Versions - Hardware - Software - Regional parameters - LoRaWAN L2 protocol	Vendor specific data
Class	A A + B A + C
State	<ul style="list-style-type: none"> - Never joined - Not joined (joined at least once, but not currently) - Joining (sent Join-request, awaiting Join-accept) - Joined - Join error (sent Join-request and received Join-accepts that are erroneous or multiple Join-request were attempted)
MaxTransmitEIRPsetting	dBm
ADR mode	Boolean: - True: ADR enabled - False: ADR disabled
Regional parameters	EU868 US915 CN779 (will deprecate by Jan 1, 2021) EU433 AU915 CN470 AS923-1 AS923-2 AS923-3 KR920 IN865 RU864
Device operation - TotalJoinRequestCounter - TimeSinceLastJoinRequest - TimeSinceLastJoinAccept	<ul style="list-style-type: none"> - Integer - Seconds - Seconds
Join strategy	Vendor specific
Diagnostic	
Internal error codes	Fault condition identifier. Vendor specific.

Unconfirmed uplink frame counter	Number of unconfirmed uplink frames sent
Confirmed uplinks frame counter	Number of confirmed uplink frames sent
Unconfirmed downlink frame counter	Number of unconfirmed downlink frames received
Confirmed downlink frame counter	Number of confirmed downlink frames received
Downlink mac command counter	Number of MAC commands received from the network
Downlink mac answer error counter	Number of MAC commands answered by the network with an error
Downlink mac ignored counter	Number of MAC commands ignored by the end-device
Downlink PER	Packet Error Rate computed over the last 5 received downlinks (presented as percentage)
Downlink mean RSSI RX1	Computed over the last 5 received downlink on RX1 (dBm)
Downlink mean SNR RX1	Computed over the last 5 received downlink on RX1 (dB)
Downlink mean RSSI RX2	Computed over the last 5 received downlink on RX2 (dBm)
Downlink mean SNR RX2	Computed over the last 5 received downlink on RX2 (dB)
Class B ping slot parameters	Frequency and datarate to use for downlinks on ping slots
Multicast setup, for one to four groups:	
McAddr	Multicast address
McKey	Multicast key
MinMcFCount	Minimum multicast frame counter, device should drop payload with lower frame counter
MaxMcFcount	Maximum multicast frame counter, device should drop payload with higher frame counter
McStartTime	Time to start the Multicast session, if applicable
McDuration	Maximum duration of the multicast session, if applicable
McClass	Device shall switch to the LoRaWAN class during the length of the multicast window, if applicable
Downlink McDatarate	Datarate of the multicast session, if applicable
Downlink McFrequency	Frequency of the multicast session, if applicable

 1
 2

Table - Recommended parameters

1 Glossary

2

3 ADR Adaptive Data Rate

4 COSEM Companion Specification for Energy Metering

5 DLMS Device Language Message Specification

6 LoRa[™] Long Range modulation technique7 LoRaWAN[®] Long Range network protocol

8 MAC Medium Access Control

9 RSSI Received Signal Strength Indicator

10 SNR Signal-to-Noise Ratio

1 **Bibliography**

2 **References**

3

4 [TS001] LoRaWAN[™] 1.0.3 Specification, LoRa Alliance, March 20, 2018.

5 [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP
6 14, RFC 2119, March 1997

7 [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP
8 14, RFC8174, May 1997

9

10

NOTICE OF USE AND DISCLOSURE

Copyright © LoRa Alliance, Inc. (2020). All Rights Reserved.

The information within this document is the property of the LoRa Alliance (“The Alliance”) and its use and disclosure are subject to LoRa Alliance Corporate Bylaws, Intellectual Property Rights (IPR) Policy and Membership Agreements.

Elements of LoRa Alliance specifications may be subject to third party intellectual property rights, including without limitation, patent, copyright or trademark rights (such a third party may or may not be a member of LoRa Alliance). The Alliance is not responsible and shall not be held responsible in any manner for identifying or failing to identify any or all such third-party intellectual property rights.

This document and the information contained herein are provided on an “AS IS” basis and THE ALLIANCE DISCLAIMS ALL WARRANTIES EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO (A) ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OF THIRD PARTIES (INCLUDING WITHOUT LIMITATION ANY INTELLECTUAL PROPERTY RIGHTS INCLUDING PATENT, COPYRIGHT OR TRADEMARK RIGHTS) OR (B) ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT.

IN NO EVENT WILL THE ALLIANCE BE LIABLE FOR ANY LOSS OF PROFITS, LOSS OF BUSINESS, LOSS OF USE OF DATA, INTERRUPTION OF BUSINESS, OR FOR ANY OTHER DIRECT, INDIRECT, SPECIAL OR EXEMPLARY, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND, IN CONTRACT OR IN TORT, IN CONNECTION WITH THIS DOCUMENT OR THE INFORMATION CONTAINED HEREIN, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH LOSS OR DAMAGE.

The above notice and this paragraph must be included on all copies of this document that are made.

LoRa Alliance, Inc.
5177 Brandin Court
Fremont, CA 94538

LoRa Alliance® and LoRaWAN® are licensed trademarks. All company, brand and product names may be trademarks that are the sole property of their respective owners.